UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

SEP 0 4 2009

OFFICE OF
AIR, WASTE AND TOXICS

Ms. Susan Childs
Regulatory Affairs Manager, Alaska Venture
Shell Offshore Inc.
3601 C Street, Suite 1314
Anchorage, Alaska 99503

Re: Incompleteness Determination for Outer Continental Shelf Pre-Construction Air Permit Application for the Frontier Discoverer Beaufort Sea Exploration Program.

Dear Ms. Childs:

On May 29, 2009, U.S. Environmental Protection Agency (EPA) Region 10 received Shell Offshore Inc.'s (SOI) Outer Continental Shelf (OCS) Pre-Construction Air Permit Application for the Frontier Discoverer Beaufort Sea Exploration Program in the Beaufort Sea. EPA conducted a partial completeness review of the May 29, 2009 permit application and determined that it was incomplete. EPA's July 29, 2009 partial incompleteness determination was based on a preliminary review of the section 2: Project Description and Emissions and section 3: Regulatory Applicability of the permit application. EPA's partial completeness determination did not include a review of information relating to the air quality modeling, air impact analyses and sections of the application relating to the emission control technology review.

On August 21, 2009 EPA received a fax of SOI's partial incompleteness letter[1] response. We have reviewed the response to determine if SOI has provided all the information requested in our July 29th letter. In addition, regional staff have reviewed the air quality modeling and air impact analyses of the Pre-Construction Air Permit Application for the Frontier Discoverer Beaufort Sea Exploration Program. EPA has not reviewed the emission control technology sections of the permit application. The information and data that SOI submitted to EPA as part of the Chukchi Sea OCS/ Prevention of Significant Deterioration (PSD) permit application that SOI wishes to be considered as part of the Beaufort Sea permit application should be submitted. EPA requests SOI update the Beaufort Sea application with the applicable Best Available Control Technology (BACT) determinations from the Chukchi Sea OCS/PSD permit application. We presume this will complete the emission control technology sections of the Beaufort Sea permit application.

Based on our review of SOI's partial incompleteness letter response and air quality modeling and air impact analyses sections of the permit application, we have determined that SOI's Pre-Construction Air Permit Application for the Frontier Discoverer Beaufort Sea Exploration Program is still incomplete. Pursuant to 40 CFR 124.3(c), we are listing below the information necessary to make these sections of the application complete. In addition,

[1] SOI's Partial Incompleteness Letter Response for the Frontier Discoverer Drill Vessel in the Beaufort Sea is dated August 21, 2009.

Attachment A includes a detailed list of technical comments on the modeling and monitoring sections. Additionally, we understand that SOI will be submitting revised emission data. Accordingly the emission data portion of the submission has not been fully reviewed.

Shell Offshore Inc. Partial Incompleteness Letter Response

1. SOI provided EPA with a list of Chukchi Sea permit application updates since February 23, 2009 that SOI intends to incorporate by reference into the Beaufort Sea permit application. Rather than this incorporation by reference approach, EPA requests that SOI submit a permit application for the Beaufort Sea that that is a standalone document. Incorporating by reference components of the Chukchi Sea permit application in the Beaufort Sea permit application will slow EPA's review of the application, complicate the public review process, and lead to possible errors in what EPA determines to be the full and complete Beaufort Sea permit application.

   Please submit a revised application that includes the relevant portions of the information SOI submitted for the Frontier Discoverer Drill Vessel in Chukchi Sea. This includes the updated emission inventory and any associated updates to the BACT, modeling analyses, operation scenarios, requested restrictions, etc.

2. EPA requested SOI to provide an update to Table 2-2 to reflect the correct potential to emit (PTE) (tons per year) of the OCS source for all regulated new source review (NSR) pollutants in order to document which pollutants exceed the significant emission rates for purposes of determining PSD applicability. SOI stated that the emission rates in Table 2-2 of the Beaufort Sea permit application accurately reflect potential emissions from the OCS source however EPA's review of Table 2-2 indicates that it more correctly reflects the requested allowable or permitted emissions and not the PTE as defined in 40 CFR Part 55. The PTE of the OCS source should reflect the effect on emissions of any existing, legally enforceable requirements, but not the effect of the SOI requested restrictions. This is important because SOI has indicated that the requested restrictions are not intended to limit the source's potential to emit and hence are not Owner Requested Limits under 18 AAC 50.

   Please update Table 2-2 to provide a correct summary of the PTE (tons per year) for all regulated NSR pollutants in order to document which pollutants exceed the significant emission rates for purposes of PSD applicability.

3. The application does not include a proposed allowable emission inventory for particulate matter (PM), which is also required to determine the BACT requirements for PM.

   Please provide EPA with the inventory for PM, including the supporting calculations, in the same format as the other BACT pollutants.

4. SOI stated in their partial incompleteness letter that the Alaska Department of Conservation (ADEC) has the authority to require SOI to obtain a permit to comply with 18 AAC 50.080 – Ice Fog Standards. Given that EPA is implementing ADEC's rules within 25 miles of Alaska's seaward boundary, EPA, and not ADEC will make a determination if an ice fog issue exists. Until we have a complete application, EPA is unable to determine if an ice fog issue would exist and therefore has not made the determination under this rule. No additional information is needed at this time with regard to this provision.

Air Quality Modeling and Air Impact Analyses Incompleteness

5. SOI has stated that they will redo the modeling analysis based on recent discussions with EPA.

   Please provide EPA with an updated modeling analysis that reflects the latest information on emissions, operating scenarios, background data, etc.

6. SOI has identified other operating scenarios that need to be analyzed and included in the application. Permit terms and conditions may be included to reflect modeling assumptions including source locations and operating schedules and scenarios. Therefore, the modeling inputs should reflect SOI's operational needs and intentions.

   If secondary operating scenarios are envisioned, please submit descriptions and the associated air impact analyses in the application.

7. While the application included PM_{10} background data, it is not clear whether conservative PM_{10} measurements were used to determine compliance with the national ambient air quality standards (NAAQS). The location of the monitoring site and the time period of the data were not identified but EPA believes it is data from Badami that was collected in 1999. The application contained no justification that this data is still representative of, or a conservative estimate of, current air quality at the project location.

   Please submit PM_{10} background data that is representative of current air quality at the project location. If using existing data, include a justification that the data is either representative of current air quality or is a conservative estimate of current air quality.

8. The permit application contained $PM_{2.5}$ background data that is not representative of current air quality levels at the project location and failed to meet data quality requirements as well as EPA's Quality Assurance/Quality Control requirements in Appendix A of 40 CFR Part 58. SOI used data from Wainwright which has not been demonstrated to be representative of, or a conservative estimate of, air quality in the Beaufort Sea project area. Wainwright $PM_{2.5}$ measurements from

November, 2008 to February, 2009 were used but this period of data is unacceptable because of data quality issues arising from a problem with the instrumentation, which has since been addressed.

Please submit $PM_{2.5}$ background data that is representative of current air quality at the project location and which satisfies Appendix A requirements. If using existing data, include a justification that the data is either representative of current air quality or is a conservative estimate of current air quality.

9 The current application contains $PM_{2.5}$ background air quality data collected at Wainwright prior to the May submittal date. However, we are concerned about the use of this time period because the recent summer months (i.e., July and August) showed higher measured concentrations at Wainwright than earlier months. This is probably due to higher ambient temperatures which changes and/or thaws out any surface cover and the ground. Consequently, $PM_{2.5}$ data collection at a minimum, should represent the SOI drill season months of July to December so that EPA can be reasonably assured there won't be a NAAQS violation.

Please submit background $PM_{2.5}$ data that is representative of air quality concentrations during the SOI drill season of July 1 through December 31.

As we've previously discussed, the final permit issuance date turns on when EPA has received all of the necessary information to make significant progress processing the permit. Accordingly, please submit the missing information at your earliest convenience. If you have any questions, please contact Natasha Greaves at 206-553-7079.

Sincerely,

for Richard Albright, Director
Office of Air, Waste and Toxics

Enclosure

cc Eric Hansen, Environ International Corporation
Mark Schindler, Octane, LLC
Jeffrey Walker, MMS-Alaska Region
Kirk Winges, Environ International Corporation

ATTACHMENT A

Air Quality Impact Analysis Comments to
Outer Continental Shelf Pre-Construction Air Permit Application
Frontier Discoverer Beaufort Sea Exploratory Drilling Program
Dated May, 2009

I. General Comments

A. EPA understands that there are new operating scenarios and revised operating scenarios (e.g., bow ice washing, anchor handling, and ice breaker and oil spill response vessel replenishment). As part of the revised application,

1. Please include a table that lists and briefly summarizes **all** the primary and secondary operating scenarios.

2. Please provide justification for performing either a quantitative or qualitative analysis of the emissions associated with each primary and secondary operative scenario.

3. Please assimilate the new and revised analyses in the form of text, tables, figures and references into a revised application.

B. If new or additional modeling is performed, please provide all input and output files on a CD or DVD as part of a revised application.

C. EPA understands that SOI Offshore Inc. (SOI) started data collection on 15 August 2009 instead of June 2009 at the Badami monitoring station. The air pollutants being measured at the station include NO_2 and $PM_{2.5}$. Again, EPA request SOI to also measure PM_{10} and O_3 at this station. Please note that EPA will adhere to the data representativeness criteria contained in the 1987 Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD) and Section 8.2.2.c in Appendix W of 40 CFR Part 51, and the PSD significant monitoring levels specified in 40 CFR Part 52.21(i)(5)(i).

D. Because of new information provided to EPA, certain sections in the SOI Beaufort Sea outer continental shelf (OCS) PSD application and the CD containing the supporting modeling files were not reviewed.

E. Please indicate if the National Park Service was provided a copy of the original May, 2009 PSD application. Please include an additional copy of a revised application and EPA will forward that copy to the National Park Service.

Note: Permit conditions may be included to reflect any modeling assumptions such as source location, operating scenarios and schedules to ensure compliance with ambient air quality standards and air quality increments. Therefore, model inputs should reflect SOI's operational needs and intentions.

II. Specific Comments

A. Section 1, Introduction

Page 1 states the Frontier Discoverer will be conducting exploratory drilling operations within and beyond 25-miles from the Alaska seaward boundary of the Beaufort Sea.

1. Please identify the lease sale area(s) where the drilling will occur.

2. Please identify the specific lease blocks within each lease sale area where the drilling may occur. (Page 76 in the OCS PSD application indicates 64 lease blocks are considered for exploratory drilling.).

3. Please redo Figure 1-1 to show both the 3-mile boundary line and the 25-mile line from the seaward boundary.

B. Section 2, Project Description and Emissions

1. Page 5, fourth paragraph conveys that a helicopter will be used to transport workers from Deadhorse or Barrow to the drill ship every three to four weeks.

   a. How many trips a day will the helicopter transport workers?

   b. Will the helicopter be used for any other purpose and how frequently? Please be specific.

2. First line on page 14 states that the drill season is 168 days starting in July. Please confirm the beginning and ending dates of the drill season within a calendar year (i.e., 01 July to 31 December).

3. Page 18, second paragraph states that "...the ice management and anchor handling fleet would be either downwind of the Discoverer or beyond the 25-mile radius from the Discoverer..."

   a. Please explain the downwind operations and duration of the ice management and anchor handling fleet and any changes to the maximum predicted concentrations and its locations that are used

to demonstrate compliance with ambient air quality standards and air quality increments. If these are secondary operating scenarios, please list them in the applicable table (see Comment I.A).

b. Please confirm that there will be no more than the two vessels that compose the ice management and anchor handling fleet.

c. The third paragraph on page 19 mentions bow ice washing of the Frontier Discoverer by the anchor handler vessel and this particular scenario was not modeled. Please provide a modeling analysis of this bow ice washing scenario.

d. The first and second paragraphs on page 21 mentions anchor deployment and retrieval. Please provide a modeling analysis of this anchor handling scenario.

e. SOI has recently conveyed that the ice management and anchor handling fleet, and the oil spill response vessel could have other operating scenarios not defined in the application. SOI is requested to:

   1. Identify and describe these secondary operating scenarios (see Comment I.A).

   2. Quantify the emission rates and list the source parameters of each of these scenarios.

   3. Provide a graphics showing the operating location of these scenarios relative to the Frontier Discoverer and the other vessels.

   4. Conduct a modeling analysis of these other secondary operating scenarios.

f. Page 22 states that a tanker will be operating 25-miles beyond the Frontier Discoverer. EPA believes the tanker should be part of a growth analysis which warrants an assessment. Please identify the tanker in the operating scenario table (see Comment I.A), quantify the emissions of the tanker, and show the rates in the appropriate table. In addition, please conduct a quantitative or qualitative analysis of the tanker and provide justification for the selected analysis type.

C. Section 5, Ambient Impact Modeling

1. 40 CFR Part 50 does not list an annual standard for PM_{10}. SOI is requested to add a footnote at the bottom of Table 5-1 to reflect that there is no annual federal PM_{10} standard.

2. In the first paragraph on page 62, SOI states that the ISC-Prime model is a U.S. EPA approved, steady-state, multiple-source Gaussian plume mode. In actuality, the ISC-Prime model is a non-guideline model requiring EPA approval prior to its use in air permit applications. SOI is requested to correct this erroneous statement in its revised application.

3 Third paragraph on page 64 indicates that the anchor handler/ice management will operate at virtual idle. Please explain what is meant by "described distance" and "virtual idle."

4. Last sentence, second paragraph on page 65 implies that there is not a minimum distance from the Frontier Discoverer to the anchor handler/ice management and ice breaker vessels during ice breaking activities. Please discuss the consistency of this sentence with the first sentence in the same paragraph and how it affects the modeling results.

5. The oil spill response fleets consist of an offshore management/skimmer, three 34-foot work boats and one 47-foot Rozema skimmer (page 21). Further, it is mentioned on page 66, first paragraph that the Nanuq could be in the vicinity and will provide berthing for the oil spill response crew.

   a. Please confirm that the emissions and stack parameters have been provided for these particular sources and these sources have been modeled as part of the compliance demonstration with ambient air quality standards and air quality increments.

   b. If the Nanuq is not available, please discuss the berthing options and associated air quality impacts.

6. Page 69 provides a description of how the oil spill response fleet will be characterized for modeling purposes. EPA recommends that each vessel composing the oil spill response fleet have its own distinct volume source length rather than an average length of 50-meters.

7. Graphics of the modeling domain are provided in Figures 5-3 to 5-5.

   a. Figures 5-3 to 5-5 are provided but not mentioned in the Section 5.5. Please clarify.

b. Figure 5-5 shows a rectangle south of the Frontier Discoverer. Please identify this rectangle.

c. If additional modeling scenarios are analyzed such as those identified in Section II.B, please provide graphics of those domains if different from Figures 5-3 to 5-5.

8. Third paragraph on page 74 describes the locations of the associated fleets relative to the Frontier Discoverer for modeling purposes. Because the modeling is based on this operating configuration of the vessels, permit terms and conditions may be included to reflect modeling assumptions including source locations and operating schedules and scenarios. If this is unacceptable to SOI, please provide justification and any supporting modeling analyses demonstrating a permit condition is unnecessary.

9. Page 74, third paragraph states that the supply ship will be located 50-feet astern of the Frontier Discoverer. Please identify the method used to transfer supplies and fuel to the Frontier Discoverer.

10. EPA Region 10 issued a memorandum dated 02 July 2009 which discusses "Implementing PSD Baseline Dates, Baseline Areas, and Baseline Concentrations on the Outer Continental Shelf in Alaska." SOI is requested to address baseline dates, baseline areas, trigger dates, and baseline concentrations as it relates to the proposed project in a revised application that is consistent with the memorandum. A copy of the 02 July 2009 memorandum is attached.

11. Pages 76 to 80 (and Section 7) provide a discussion of the allowable and actual emission inventories used to address compliance with ambient air quality standards and air quality increments. Alan Schuler at the State of Alaska has provided EPA and ENVRON (SOI's contractor) with his comments regarding the adequacy of the two inventories in a 26 August 2009 email (see attached email).

a. Please respond to Comment #1 in the email and identify and include emission rates from any major or minor source applications that have been deemed complete but a permit has not been issued by the State of Alaska in the two inventories.

b. Please identify and include any fugitive and area sources in the two inventories.

c. For Comment #4, EPA agrees with the State of Alaska that there is no justification to double annual impacts to obtain short term impacts. EPA requests SOI to redo the modeling for **all** air pollutants using the maximum hourly emission rates. Furthermore,

the assumptions and methodologies used in developing the hourly emission rates for each air pollutant should be documented and incorporated in a revised application. If short term emission rates are not available, please contact EPA and the State of Alaska to discuss possible options.

d. Related to Comment #5, please describe how long term and short actual emission rates for each applicable air pollutant were derived in a revised application.

e. As part of Comment #6, please discuss the source of the stack parameters if either the stack height, stack gas exit temperature, stack gas exit velocity, inside stack diameter and/or stack location were not available. This comment also applies to area and volume sources and their modeling parameters.

f. Per Comment #8, please provide a description of the assumptions, methods and references used to develop the two inventories in the revised application.

D. Section 6, Background Concentrations

1. EPA agreed that SOI could use conservative background measurements to represent ambient air quality levels in the Beaufort Sea.

a. Please provide the source of the gaseous data and the period of record of the data as footnotes to Table 6-1.

b. Please provide verification and text that the BP Exploration Alaska, Inc. Liberty Development Project collected SO_2, NO_2 and CO data from 2007 and 2008 satisfy PSD data collection requirements including data quality.

c. Please discuss the representativeness of the BP Exploration Alaska, Inc. Liberty Development Project measurements in terms of conservatism and if there are any nearby sources that could contribute to the measurement levels.

2. The fourth paragraph on page 81 discusses PM_{10} measurements from BPX in Prudhoe Bay with 24-hour concentrations as high as 55 micrograms per cubic meters. In the same paragraph, it states but fails to explain why this high 24-hour concentration was not used with SOI predicted impacts since the total impact is not expected to exceed the ambient air quality standards.

a. Please explain why the 24-hour and annual PM_{10} data from Prudhoe Bay are not used as background since the data would be conservative.

b. Please identify the source of the PM_{10} numbers appearing in Table 6-1.

(It should be noted that EPA has expressed concerns that the 1999 Badami PM_{10} data is unrepresentative because it is not current.)

3. The PSD preconstruction monitoring level for PM_{10} is 10 microgram per cubic meter for a 24-hour average. From Table 5-7 on page 75, the maximum predicted PM_{10} 24-hour concentration is 27.4 micrograms per cubic meter. This maximum predicted concentration exceeds the monitoring level and consequently, SOI should initiate PM_{10} data collection at the Badami monitoring station which restarted on 15 August 2009 to measure NO_2 and $PM_{2.5}$ background.

4. As early as April, 2008, EPA recommended that SOI start a preconstruction ambient air quality monitoring program for all criteria air pollutants consistent with the PSD regulation and guidance if they intended to propose projects in the Beaufort Sea OCS in the near future. EPA made the recommendation to SOI because of the lack of any current ambient air quality data including $PM_{2.5}$ that would be representative of the OCS and without knowing if a proposed project predicted concentrations would exceed PSD ambient monitoring thresholds. In addition, EPA informed SOI about our concerns that the 1999 measurements at Badami were not representative because they are not current.

SOI started a $PM_{2.5}$ (and NO_2) data collection program on 15 August 2009 (delayed from June, 2009) at the refurbished Badami monitoring station to represent air quality levels in the Beaufort Sea OCS. However, the minimum required four months of data will not be available until 15 December 2009. In lieu of waiting four months, SOI proposed the use of four months of $PM_{2.5}$ collected at the Wainwright monitoring station from November, 2008 to February, 2009. Nevertheless, EPA has determined this period of $PM_{2.5}$ data collected at Wainwright to be unacceptable because certain data quality requirements were not satisfied, arising from a problem with the instrumentation, which has since been fixed. $PM_{2.5}$ data collected after 5 March 2009 at Wainwright is meeting the data quality requirements.

Recently provided data from Wainwright shows nine 24-hour periods of $PM_{2.5}$ measurements equal to or greater than the 8.0 micrograms per cubic meter during the months of July and August, 2009, with the highest

measured concentration at 14.42 micrograms per cubic meter. The 8.0 micrograms per cubic meter for a 24-hour average was measured in June, 2009. After its initial review and consideration of all the $PM_{2.5}$ 24-hour measurements from 06 March 2009 to 31 August 2009 at Wainwright, EPA now believes it is prudent to extend the $PM_{2.5}$ data collection at Wainwright and Badami such that the measurements include the months that SOI intends to conduct exploratory drilling operations. This would be the months of July to December for the SOI Beaufort Sea OCS PSD permit application.

In addition, Appendix A in 40 CFR Part 58 requires collocated $PM_{2.5}$ sampling at the monitoring station or at one of the PSD network monitoring stations. The monitoring stations at Wainwright and Badami currently are not operating a collocated sampler.

In summary, SOI is requested to submit $PM_{2.5}$ measurements representative of the months of July to December which meets the requirements contained in paragraph (m)(3) in 40 CFR Part 52.21 and Appendix A of 40 CFR Part 58. For the SOI Beaufort Sea OCS PSD application, EPA recommends measurements that are collected at Badami.

E. Section 7, Impact Modeling Results

Specific comments are not provided since SOI has proposed to redo the modeling analysis.

F. Section 8 Additional Impact Analyses

Data and information that SOI provided as part of its Chukchi OCS/PSD permits application that it wishes to be considered as part of the Beaufort Sea OCS/PSD permit application should be submitted as part of a revise application.

G. Air Quality Modeling Files, SOI OCS Beaufort Sea Permit Application CD

Specific comments are not provided since SOI has proposed to redo the modeling analysis.

Attachments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

July 2, 2009

Reply To: AWT-107

MEMORANDUM

SUBJECT: Implementing PSD Baseline Dates, Baseline Areas, and Baseline Concentrations on the Outer Continental Shelf in Alaska

FROM: David C. Bray
Senior Policy Advisor

TO: Rick Albright, Director
Office of Air, Waste, and Toxics

Janis Hastings, Associate Director
Office of Air, Waste, and Toxics

Introduction

The purpose of this memorandum is to clarify how EPA Region 10 intends to implement the PSD increments on the OCS in Alaska the absence of formal area designations under section 107(d).

Background

Pursuant to Section 328 of the Clean Air Act (Act) EPA has promulgated regulations to control air pollution from Outer Continental Shelf (OCS) sources to attain and maintain Federal and State ambient air quality standards and to comply with the provisions of Part C of title I (prevention of significant deterioration of air quality or PSD). See 40 CFR Part 55.

In Part C of Title I of the Act, Congress sets forth a program for preventing significant deterioration of air quality in areas that have air quality better than the National Ambient Air Quality Standards (NAAQS). Specifically, Congress established an approach for defining "significant deterioration" that relies upon changes in air quality concentrations from a baseline. The "baseline concentration" is defined in section 169(4) of the Act and the acceptable changes in concentration, called "increments," are defined in sections 163 (for Congressionally-established increments) and 166 (for EPA-established increments) of the Act.

Under Section 169(4) of the Act, the term "baseline concentration" means, "with respect to a pollutant, the ambient concentration levels which exist *at the time of the first application for a permit in an area subject to this part*, based on air quality data available in the Environmental Protection Agency or a State air pollution control agency and on such monitoring data as the permit applicant is required to submit. Such ambient concentration levels shall take into account

all projected emissions in, or which may affect, such area from any major emitting facility on which construction commenced prior to January 6, 1975, but which has not begun operation by the date of the baseline air quality concentrations determination. Emissions of sulfur oxides and particulate matter from any major emitting facility on which construction commenced after January 6, 1975, shall not be included in the baseline and shall be counted against the maximum allowable increases in pollutant concentrations established under this part." (emphasis added). EPA has promulgated regulatory definitions for the phrases "the time of the first application for a permit" (known as the "minor source baseline date") and "in an area subject to this part" (known as the "baseline area"). These definitions are found in 40 CFR 52.21(b) of EPA's regulations and incorporated into the OCS regulations at 40 CFR 55.13.

The requirements to which OCS sources are subject depend on the distance of the source from shore. From the State's seaward boundary (typically 3 miles from shore) and extending out 25 miles, the requirements for the Corresponding Onshore Area (COA), as well as federal requirements, apply to OCS sources; beyond 25 miles from the State's seaward boundary, only federal requirements apply. See 40 CFR 55.3(b) and (c). Because of these different regulatory requirements, the implementation of PSD increments is different in these two portions of the OCS.

Sources located less than 25 miles from the State's seaward boundary

In accordance with section 328 of the Act and EPA's implementing regulations at 40 CFR Part 55, an OCS source located less than 25 miles from the State's seaward boundary is subject to the same requirements as would be applicable if the source were located within the COA. Section 328(a) of the Act; 40 CFR 55.3(b). As a result, EPA incorporates by reference the air quality regulations, including the major source permitting programs, that are in effect in the COA and applies them to OCS sources inside this 25 miles limit. See 40 CFR 55.12. The OCS rules define the term "onshore area" in terms of the section 107(d) area designations. 40 CFR 55.2. Hence the COA is generally synonymous with a section 107(d) area and, if designated attainment or unclassifiable, with a PSD baseline area.

Since the COA PSD rules look to the designation of the COA for determining baseline dates, applying the COA PSD rule to an OCS source includes using the COA minor source baseline dates. Importantly, the minor source baseline dates for a section 107(d) area are not established in regulation, but rather they are determined through the implementation of the PSD regulations. See 40 CFR 52.21(b)(definition of "minor source baseline date"). Where the COA PSD rules apply on the OCS, the baseline date that has already been determined under the COA rule is the baseline date that applies for the permitting of the OCS source. This baseline date is then used to determine the baseline concentration in the area of the OCS source in accordance with the COA PSD rules.

When using the onshore minor source baseline date for OCS sources located less than 25 miles from the State's seaward boundary, there is no need to define separate baseline areas (and hence section 107 area designations) for the OCS source. In fact, establishing this portion of the OCS as a separate baseline area, or extending the onshore baseline area onto the OCS, would be contrary to the current Part 55 rules which require a case-by-case determination of the COA for the purpose of determining the applicable onshore rules. See 40 CFR 55.5. Since the COA may be different than the nearest onshore area (NOA), and can actually differ from permit to permit,

the applicable permitting rules, and hence the baseline date, could be different than that of the NOA. As such, a fixed baseline area for the OCS within 25 miles of the State's seaward boundary could potentially prevent the utilization of the COA minor source baseline date, contrary to the intent of Congress that such sources be subject to the same requirements as would be applicable if the sources were located within the COA.

Sources located more than 25 miles beyond the State's seaward boundary

For sources locating on the OCS more than 25 miles from the State's seaward boundary, the EPA PSD rules at 40 CFR 52.21 apply. The definition of "baseline area" in the federal PSD rules relies on the existence of intrastate areas designated as attainment or unclassifiable under section 107(d) of the Act. See 40 CFR 52.21(b). Until EPA either designates section 107(d) areas on the OCS and/or promulgates revisions to the definition of "baseline area" in 40 CFR Part 55, it is appropriate to implement the term "baseline area" in 40 CFR 52.21(b), for OCS areas more than 25 miles from the State's seaward boundary by using the boundaries of the coastal Air Quality Control Regions on shore as a guide. Accordingly, the following areas will be considered as separate "baseline areas" for purposes of 40 CFR 52.21:

> Each area bounded on the shoreward side by a parallel line 25 miles from the State's seaward boundary; on the seaward side by the boundary of U.S. territorial waters; and on the other two sides by the seaward extensions of the onshore Air Quality Control Region boundaries.

This approach is consistent with the approach of the Clean Air Act and EPA's implementing regulations for defining baseline areas on shore. Section 107 of the Act sets forth the criteria and processes for defining Air Quality Control Regions (AQCR's) and attainment/nonattainment designations. AQCR's for all States have been promulgated by EPA in 40 CFR Part 81, Subpart B. States are required, under section 107(d) to submit to the Administrator recommendations for attainment/nonattainment designations for (air quality control) regions or portions thereof. The final attainment/nonattainment designations for each State have been promulgated by EPA in 40 CFR Part 81, Subpart C. Under this statutory scheme, the largest possible onshore PSD baseline area is an AQCR. See Section 107(d) of the Act and 40 CFR 52.21(b)(definition of "baseline area"). The approach set forth in this memo essentially mirrors the onshore AQCR's for purposes of establishing separate offshore baseline areas in order to implement the PSD increments on the OCS for the areas more than 25 miles from the State's seaward boundary.

Once the "baseline area" is determined according to the above approach, the "minor source baseline date" and the "baseline concentration" are determined in accordance with the rules at 40 CFR 52.21.

cc: Herman Wong, OEA
Pat Nair, OAWT,
Doug Hardesty, OAWT
Natasha Greaves, OAWT

"Schuler, Alan E (DEC)"
<alan.schuler@alaska.gov>
08/26/2009 04:01 PM

To Herman Wong/R10/USEPA/US@EPA
cc Alan Schuler <alan.schuler@alaska.gov>, Kirk Winges <kwinges@Environcorp.com>, Scott Winges <swinges@Environcorp.com>
bcc
Subject ADEC Verification of Shell Regional Inventory

History: This message has been replied to and forwarded.

Herman,
I conducted a cursory review of Shell's North Slope regional inventory. I've also corresponded with Shell's consultant regarding the inventory (see attached e-mail).

It is very evident that Shell put lot of work into developing this inventory. Most aspects are acceptable. However, I have several comments and/or recommendations, which are provided below.

Stationary Source List/Location

1. Shell's off-site stationary source list is extensive and appears to be fairly complete. I only noticed one missing item – the drill rig and turbine associated with BPXA's Liberty development project (which is a component of the Endicott stationary source inventory). These emission units have been permitted, but may not be fully operational yet. However, since they could be operating concurrently with Shell's operation, ***Shell should include the Liberty rig/turbine in the off-site assessment*** .

2. The off-site inventory covers multiple UTM zones. Shell therefore established a consistent coordinate system (UTM Zone 6) for the modeling analysis. I viewed the resulting source locations using a proprietary ISC/AERMOD Graphical User Interface. (Shell provided the PM-10 input files so that I could do this – see attached email.) I also imported quad-maps from the USGS to provide a visual reference. While I did not take the time to confirm the accuracy of each stationary source location, the general layout matches the layout shown on industry maps.

3. It appears that Shell is using the very conservative approach of assessing the *combined* impact from the off-site stationary sources. This is conservative since many of the stationary sources could likely be culled from the inventory per Section 8.2.3 of the Guideline on Air Quality Models, due to non-overlapping significant impacts (with Shell's project).

Short-term Emission Rates

4. Shell modeled the annual emissions and then estimated the short-term impacts by doubling the annual concentration. I have no ready means for assessing the *general* accuracy of the 2-fold assumption. However, I did find that in the case of BPXA's Central

Compressor Plant and BPXA's Central Gas Facility (which are currently going through the PSD permit process for SO2 emission increases), the maximum short-term emission rates can be *much greater* than Shell's 2-fold assumption. (I also found *limited* cases where Shell's emission rates are greater than the previously accepted emission rates – for an unknown reason.) Since Shell has access to the previously accepted maximum short-term emission rates for some of the stationary sources (especially the SO2 emission rates), ***I recommend that they remodel the short-term SO2 impacts using the highest available emission rate for a given emission unit*** . This approach should provide a more accurate assessment of the short-term impacts than use of the 2-fold factor.

Annual Emission Rates

5. I spot-checked Shell's potential NOx emissions and found the values to be consistent with my records. I did not check any of Shell's actual annual emissions since that would take more work to confirm than what I could commit to this project (note: our applicants generally do not use actual emissions in their modeling assessments so the actual emission inventory is not readily accessible.)

Stack Parameters

6. I spot-checked Shell's stack parameters with the parameters used in the most recent modeling submittals by other applicants. Most of the values matched. Where differences were found, the values used by Shell are acceptable for an off-site inventory (i.e., they would likely result in a slightly more buoyant plume that would increase the potential for an overlapping impact with Shell's operations).

Additional Comments

7. Shell did *not* include downwash in their off-site analysis. This is appropriate given the large distances between Shell's project area and the off-site sources. However, this approach may need to be re-evaluated if this data set is used by future applicants with tighter source-source distances.

8. The only documentation I saw regarding the regional (off-site) inventory is the attached e-mail. ***Shell should provide in their application (if they haven't already) a short description of the general method used to develop the regional inventory*** .

9. My review was extremely cursory – which is adequate given: a) the large source-to-source distances; b) the resulting expectation that the off-site impact constitutes a small fraction of the total impact (which Shell's consultant verbally confirmed); and c) Shell's very conservative approach of combining the off-site impact. However, a more thorough review may be warranted if this data set is used by future applicants with tighter source-source distances.

Please contact me if you have any questions.

Alan

Alan Schuler, P.E.
Environmental Engineer
Alaska Department of Environmental Conservation
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From: Wong.Herman@epamail.epa.gov [mailto:Wong.Herman@epamail.epa.gov]
Sent: Monday, August 17, 2009 9:25 AM
To: Schuler, Alan E (DEC)
Subject: Fw: ADEC Verification

Alan:

EPA met and discussed with Shell's consultants, ENVIRON, about the air quality impact analysis requirements for a proposed PSD source in the Beaufort Sea. As part of the PSD requirements, they have developed a nearby allowable and actual emissions inventory (including stack parameters) based on information and data from ADEC's web site and files. We have informed Shell that we would accept the emissions inventories and stack parameters if ADEC determines them to be adequate.

I understand that Shell's consultant has already contacted you about this review. From my perspective, it would be most efficient for you to work directly with Shell and their consultant, since they will be able to answer any questions you may have about their emission calculations and assumptions, and the stack parameters when they are missing.

EPA request ADEC's assistance in reviewing the Shell's project emission inventories and stack parameters. Once you have completed the review, please provide your conclusions directly to me, along with any supporting documentation.

Thanks,

Herman

----- Message from "Schuler, Alan E (DEC)" <alan.schuler@alaska.gov> on Fri, 21 Aug 2009 11:43:05 -0800 -----

To: Scott Winges <swinges@Environcorp.com>
cc: Kirk Winges <kwinges@Environcorp.com>, "Schuler, Alan E (DEC)" <alan.schuler@alaska.gov>
Subject: RE: Regional Emission Inventory

Scott,

I got waylaid on another project, so just got to your 8/20/09 e-mail now. Your write-up is *very* helpful.

Your explanation for item 4 has triggered some thoughts which I should have recalled and shared with you when you were in our office. Applicants frequently modeled the unrestricted SO2/PM-10 emissions in order to demonstrate compliance with the short-term standards/increments. For convenience, they used the same unrestricted SO2/PM-10 emissions for demonstrating compliance with the annual SO2/PM-10 standards/increments. This approach would be used even if there was an annual operating restriction imposed on the unit/source for NOx reduction purposes (either to protect the NO2 std/inc, or to avoid PSD-major classification). This is probably why the modeled SO2/PM-10 emissions are inconsistent with the Title V emissions summary (which would reflect the SO2/PM-10 emissions as restricted by the annual limit).

I'm going to look at a couple of other items and then get back with you and Kirk.
Alan

From: Scott Winges [mailto:swinges@Environcorp.com]
Sent: Thursday, August 20, 2009 2:51 PM
To: Schuler, Alan E (DEC)
Cc: Kirk Winges
Subject: RE: Regional Emission Inventory

Hi Alan,

The regional emissions inventory has evolved into an extraordinarily complex series of spreadsheets. I will do my best to answer your questions here, but this is very complicated, so please feel free to call me to discuss any further questions or concerns about the regional emissions inventory.

#1
I may not have read this right, but I believe what you're looking for is a key to link sources taken from ADEC files (for potential emissions) to sources that were taken from the ADEC emission inventory (for actual emissions). For the sources that we took from the emission inventory, the tables (usually) give a description of the emission source. Unfortunately, the only key I have for the modeling files I received from you is the one I received from you when I came up to grab the files. The key is very old, and more often than not it is unhelpful for determining what these model ID's represent. Instead of analyzing these on a source by source basis, I typically analyzed the facility as a whole – looking specifically at facility wide potentials to emit.

#4
The answer your question #4 is extremely complicated, but I will do my best to explain the steps taken…

When I grabbed modeling files from ADEC I QA/QC'd them quite a bit since there were many discrepancies on how facilities were modeled (it was very common to find multiple modeling files in which a facility was modeled in several completely different manners - with different total emissions). One method I used to resolve this was to compare title 5 permit conditions with these modeling files – specifically their potentials to emit. If I could find that the sum of all emissions (for a given pollutant) was close to their potential to emit I would assume that these modeling files were accurate and up to date and would use them to represent the facility. Unfortunately, many times I could only find up to date modeling files for 1 pollutant – typically NOx. Since I primarily focused on NOx emissions when I came up there, most of our NOx files were complete and up to date. The PM10 files were a little less accurate, and the

SO2 files were even worse.

Many times the PM10 and especially the SO2 modeling files retrieved from ADEC represented a sum of emissions very different than the title 5 potential to emit. For instance, for the Central Compressor Plant example you brought up - if you were to add all the emissions up from the modeling files it would total (assuming we're looking at the same file) ~472 tons per year of SO2. The title 5 permit claims that the Central Compressor Plant has a maximum potential to emit of 147 tpy of SO2. Also, there were additional Central Compressor Plant sources modeled for NOx that were not included in these SO2 files. To deal with this issue, I first calculated the ratio of the facility's potential to emit for NOx to the facility's potential to emit for SO2. I then divided the potential NOx emissions (from the ADEC files that matched the title 5 permit) by the ratio of PTE NOx to SO2 to achieve potential SO2 emissions for each source – the sum of which is equal to the Title 5 permit potential to emit for SO2. I believe I did this for several facilities to achieve accurate emission totals.

I do not have a neat spreadsheet that documents all of these calculations. I have a couple "lovely" spreadsheets that document many calculations done for actual and potential emissions that we calculated, but this does not include the calculations done on ADEC files. If a spreadsheet documenting all of those calculations is needed I can provide it (with a little bit of time).

I uploaded reduced versions of the "lovely" spreadsheets to our ftp server so you can check them out. The two spreadsheets contain tons of calculations for each facility - so it might not be particularly easy to navigate, but it could be of use. You may access these on our ftp server at:
ftp://ftp.environ.org/pub/webaccess/Shell/

Again, this is a complicated emission inventory – so please do not hesitate to call me (or email me) with any questions.

Cheers,
-Scott

Scott Winges | Associate
ENVIRON International Corporation
Direct: 425.412.1821 | Fax: 425.412.1840
swinges@environcorp.com

From: Kirk Winges
Sent: Thursday, August 20, 2009 1:02 PM
To: Schuler, Alan E (DEC)
Cc: Eric Hansen; Mark Schindler; Scott Winges
Subject: RE: Regional Emission Inventory

Answers below in red

Kirk Winges | Principal Consultant
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V: 425.412.1813 | F: 425.412.1840

From: Schuler, Alan E (DEC) [mailto:alan.schuler@alaska.gov]
Sent: Thursday, August 20, 2009 12:50 PM
To: Kirk Winges
Cc: Eric Hansen; Mark Schindler; Alan Schuler

Subject: RE: Regional Emission Inventory

Kirk,
I have a couple of questions/requests regarding Shell's Regional Inventory.

1. Contrary to what I said yesterday on the phone, I do need a key that links the various sets of model IDs used in Shell's spreadsheet. For example, there are two sets of Model IDs (along with different inventory counts) for the BP Central Compressor Plant. Please provide a key to reconcile the Model ID numbers.
I'll get Scott to put together a key for you. I'll try to have that to you later today.

2. Did Shell use annual emissions to model the *short-term* averaging periods, or did they use unrestricted emissions (which would be the proper way – unless there's a short-term operating limit)?
No, we used 2X times annual for short term. We literally had nothing to go on for short term, so that's best we could come up with.
3. Was BP's "Liberty" project included in the regional modeling analysis? I didn't see it, but given the size of the inventory, I may have overlooked it. (The Liberty project is a massive drill rig and turbine that will be located at Endicott).
No, it was not in there. We had no actuals for that source, only potentials.

4. I'm coming up with very different annual SO2 emissions in many of my spot-checks (and in some cases, slightly different PM-10 emissions). For example, for model ID 801P (BP CCP) I'm coming up with an SO2 PTE of 32 tpy based on BP's recently modeled emission rate of 0.92 g/s. Shell had 10 tpy (9.89 tpy to be exact). Please provide sample emission calculations, or the spreadsheets used to derive the emissions.
I will send you the ugly spreadsheet with all the calculations. Some of these discrepancies may result from access you have to modeling files and/or information we didn't have. Sometimes, we had conflicting info as well, and had to make a judgment call.

Thanks.
Alan

From: Kirk Winges [mailto:kwinges@Environcorp.com]
Sent: Friday, August 14, 2009 1:07 PM
To: Schuler, Alan E (DEC)
Cc: Eric Hansen; Mark Schindler
Subject: Regional Emission Inventory

Hi Alan:

As I indicated, I am providing our regional emission inventory for the Prudhoe Bay area. I have a much uglier spreadsheet that has all the calculations fed into it. It's barely small enough for email (about 9MB), but the main reason I haven't sent it is that it's very mess, with lots of notes and other stuff that might be confusing. If at some point you get involved and would like to see all the background details, I am happy to provide that.

Kirk

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----- Message from Kirk Winges <kwinges@Environcorp.com> on Fri, 14 Aug 2009 13:07:17 -0800 -----

To: "Schuler, Alan E (DEC)" <alan.schuler@alaska.gov>
cc: Eric Hansen <ehansen@Environcorp.com>, Mark Schindler <mark.octane@me.com>
Subject: Regional Emission Inventory

Hi Alan:

As I indicated, I am providing our regional emission inventory for the Prudhoe Bay area. I have a much uglier spreadsheet that has all the calculations fed into it. It's barely small enough for email (about 9MB), but the main reason I haven't sent it is that it's very mess, with lots of notes and other stuff that might be confusing. If at some point you get involved and would like to see all the background details, I am happy to provide that.

Kirk

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delete all copies of the message.

----- Message from Kirk Winges <kwinges@Environcorp.com> on Wed, 19 Aug 2009 15:56:11 -0800 -----

To: "Schuler, Alan E (DEC)" <alan.schuler@alaska.gov>

Subject: Input files

Here's a couple of model input files. One for PM10 actual emission and one for PM10 potential emissions.

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BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

IN THE MATTER OF:	)	Appeal No. PSD 10-
	)	
SHELL GULF OF MEXICO INC. and	)	PSD Approval No.
SHELL OFFSHORE INC.	)	R10OCS/PSD-AK-09-01
	)	

Declaration of Megan Williams

I, Megan M. Williams, hereby declare as follows:

1. I have a Master of Science degree in Air Resources Management from the Nelson Institute for Environmental Studies at the University of Wisconsin, Madison. I have a Bachelor of Science degree in Applied Mathematics, with an emphasis in Mechanical Engineering, from the College of Engineering and Applied Sciences at the University of Colorado, Boulder.

2. I have over ten years of experience working on air quality issues. Previously, I worked at the U.S. Environmental Protection Agency (EPA) from January of 1998 through November of 2002. While at the EPA, I lead the Region 8 program for nonattainment new source review and prevention of significant deterioration policy development and planning, reviewed state implementation plan revisions related to new source review permitting, contributed to air quality dispersion modeling analyses, and co-lead a national working group to re-examine agency policy on defining "baseline areas" under the Clean Air Act.

3. Prior to that, I managed EPA Region 8's Indoor Air Quality Program, providing technical assistance and outreach to schools, state/local officials and the general public on indoor air quality management techniques and managing research projects to assess indoor air quality interventions. As an air permit engineer at the State of Wisconsin's Department of Natural Resources from August 1995 to December 1997, I wrote Title V operating permits for various sources in northwest Wisconsin.

4. Currently, and for the past seven years, I have been an independent Air Quality Consultant, providing a variety of technical and policy analyses related to national, regional and local air quality and energy issues to various non-profit and government organizations.

5. I have reviewed Shell Offshore Inc. /Shell Gulf of Mexico's (Shell) applications for permits under the Clean Air Act for both the company's Beaufort and Chukchi Sea

operations, as well as the Environmental Protection Agency's (EPA) statements of basis, EPA's response to comments, and draft and final Prevention of Significant Deterioration (PSD) permits for these operations.

6. Shell's operations in the Chukchi and Beaufort Seas are substantially similar in terms of the equipment and vessels being used and the controls being applied. The calculated potential to emit (PTE) from Shell's operations are documented in EPA's statements of basis for the PSD permits and reproduced in this chart, in tons per year (TPY):

Pollutant	Significance thresholds for emissions [TPY]	Chukchi PTE [TPY]	Beaufort PTE [TPY]
CO	100	449	464
NO_x	40	1,188	1,371
PM	25	260	81
$PM_{2.5}$	10	52	57
PM_{10}	15	58	65
SO_2	40	2	2
VOC	40	87	96
Lead	0.6	0.11	0.111
Ozone	40 for precursors VOC or NO_x	See VOC and NO_x	See VOC and NO_x

7. In addition, I have reviewed all the other documents cited or referred to in this declaration and ensured they were provided to EPA during the public comment period. I make this declaration based upon my own personal knowledge.

Potential Impacts to Coastal Communities

8. Shell's proposed exploration activities in the Chukchi Sea are predicted to result in substantial pollutant concentrations within approximately 100 kilometers of the North Slope communities of Wainwright and Point Lay. According to the modeling completed for Shell's PSD permit application, its exploration activities will result in concentrations of NO_x at Wainwright and Point Lay that exceed the Significance Level established by regulation in 30

CFR 250.303(e).[1] Therefore, a full impact analysis is required in order to adequately determine the cumulative impacts of the proposed emissions along with all other emissions that impact the same areas impacted by the exploration activities.

9. EPA's re-proposed Statement of Basis for Shell's Chukchi Sea exploration drilling program presents modeling results for assessed impacts to these local communities (Table 5-13). Of significance, fine particulate matter ($PM_{2.5}$) concentrations at Wainwright and Point Lay are already at almost three-quarters of the short-term National Ambient Air Quality Standards (NAAQS) with Shell's contribution consuming ten percent of the total concentration at both locations. Shell's operations contribute to increased concentrations of $PM_{2.5}$ in these communities. Shell's operations also contribute to increased concentrations of PM_{10} in these communities, where short-term PM_{10} concentrations are already at 78% of the NAAQS in both Wainwright and Point Lay.

10. Shell's proposed exploration activities in the Beaufort Sea are predicted to result in substantial pollutant concentrations within approximately 13, 36 and more than 50 kilometers from the North Slope communities of Kaktovik, Badami and Nuiqsut, respectively. According to Shell's exploration plan (EP), "[t]he preliminary air quality impact analysis shows that Shell will exceed the Significant Impact Levels (SILs) at the Beaufort Sea shoreline." EP at 207. Therefore, a full impact analysis is required in order to adequately determine the cumulative impacts of the proposed emissions along with all other emissions that impact the same areas impacted by the exploration activities.

[1] *See* Table 5-13 in EPA's Re-Proposed Statement of Basis for the proposed OCS/PSD Permit No. R10OCS/PSD-AK-09-01. Predicted annual average NO_2 concentrations are 1.7 $\mu g/m^3$ at Wainwright and 1.8 $\mu g/m^3$ at Point Lay (compared with EPA's 1 $\mu g/m^3$ significance level). No significant ambient impact concentrations have been established for $PM_{2.5}$.

11. EPA's proposed Statement of Basis for Shell's Beaufort Sea exploration drilling program presents modeling results for assessed impacts to these local communities (Tables 5-25, 5-26 and 5-27). Of significance, $PM_{2.5}$ concentrations at Kaktovik - with no modeled onshore source contribution - are over half of the short-term NAAQS with Shell's contribution alone consuming almost a quarter of the short-term NAAQS (24%) at this location. Predicted $PM_{2.5}$ concentrations at Badami and Nuiqsut - including modeled onshore source contributions at Badami only - consume 45% and 41% of the short-term NAAQS, respectively. Shell's operations - particularly near Kaktovic where they contribute almost half of the total impact - contribute to increased concentrations of $PM_{2.5}$ in these communities.

12. The EPA has been regulating $PM_{2.5}$ since 1997 and recently lowered the short-term NAAQS for $PM_{2.5}$ from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ because scientific information showed that the pollutant is a health concern at levels lower than what the previous standard allowed.[2] Even $PM_{2.5}$ concentrations lower than the current NAAQS are a concern for human health. In fact, the Clean Air Scientific Advisory Committee (CASAC) - appointed by the EPA Administrator to recommend revisions to the existing standards, per section 109(d)(2) of the Clean Air Act - in their letter to the EPA on the revised $PM_{2.5}$ standard, unanimously recommended that the 24-hr $PM_{2.5}$ standard be lowered from 65 $\mu g/m^3$ to 30-35 $\mu g/m^3$ and that the annual standard be lowered from 15 $\mu g/m^3$ to 13-14 $\mu g/m^3$.[3] EPA set the standard on the high end of the CASAC recommended range for the short-term standard and chose not to lower the annual standard at all. In response, CASAC made it clear in their September 29, 2006 recommendation letter to the EPA that their recommendations were based on "clear and convincing scientific evidence" and

[2] 71 FR 61144, effective December 18, 2006.
[3] EPA-CASAC-LTR-06-003, Clean Air Scientific Advisory Committee Recommendations Concerning the Final National Ambient Air Quality Standards for Particulate Matter, September 29, 2006.

that the EPA's decision not to lower the annual standard does not provide for "an adequate margin of safety … requisite to protect the public health" as required by the CAA and, furthermore, that their recommendations were "consistent with the mainstream scientific advice that EPA received from virtually every major medical association and public health organization that provided their input to the Agency".

13. Rates of chronic lung disease on the North Slope are dramatically higher than the general U.S. population.[4] Relying solely on compliance with the NAAQS risks increasing a pre-existing health disparity between the North Slope population and human populations elsewhere. In fact, the Nation's leading health objective, as articulated by the Department of Health and Human Services' Healthy People 2010 initiative, is "the elimination of health disparities."[5] Given the affected population and significant scientific controversy regarding the level of the $PM_{2.5}$ NAAQS, relying solely on this measure to protect human health may not be sufficient. The fact that the EPA has set the $PM_{2.5}$ standards at levels that are not adequate to protect human health should result in the agency performing additional analyses – including consideration of secondary $PM_{2.5}$ formation - before approving a PSD permit including an environmental justice analysis where necessary.

Secondary Pollutant Formation – Particulate Matter

[4] Beaufort Sea and Chukchi Sea Planning Areas, Oil and Gas Lease Sales 209, 212, 217, and 221 OCS EIS/EA MMS 2008-0055, Draft Environmental Impact Statement, p. 3-232.

[5] "*Healthy People 2010*, a broad-based collaborative effort among Federal, State, and Territorial governments, as well as hundreds of private, public, and nonprofit organizations, has set national disease prevention and health promotion objectives to be achieved by the end of this decade (www.healthypeople.gov). The effort has two overarching goals: to increase the quality and years of healthy life and **to eliminate health disparities**. *Healthy People 2010* features 467 science-based objectives and 10 Leading Health Indicators, which use a smaller set of objectives to track progress toward meeting *Healthy People 2010* goals." [Emphasis added] See http://www.healthypeople.gov/LHI/Priorities.htm.

14. Particulate matter pollution is a mixture of soot, smoke and tiny particles formed in the atmosphere from sulfur dioxide (SO_2), nitrogen oxides (NO_x) and ammonia (NH_3). Fine particles ($PM_{2.5}$) contain microscopic solids or liquid droplets that are so small they can get deep into the lungs and even into the bloodstream, bypassing the body's defense systems. They are implicated in thousands of premature deaths each year. Fine particles such as black carbon may have significant impacts on climate change, especially in the Arctic region.

15. In addition to primary $PM_{2.5}$ emissions (directly emitted from combustion point sources and from fugitive emissions sources), emissions of NO_x, VOCs, SO_2 and ammonia can form, after being emitted into the atmosphere, into $PM_{2.5}$ and this can potentially be a significant component of ambient $PM_{2.5}$ concentrations.[6] While primary $PM_{2.5}$ emissions are generally a localized issue, secondary $PM_{2.5}$ emissions can occur on a more regional scale. Secondary $PM_{2.5}$ formation could be especially important considering the fact that the modeling results presented in the Statements of Basis for Shell's air permits predict $PM_{2.5}$ concentrations at over 84 percent of the 24-hour NAAQS and are barely within the appropriate margin of error when considering the accuracy of the data inputs for the analysis.[7]

16. The fraction of $PM_{2.5}$ concentrations in the ambient air that is due to the secondary formation of $PM_{2.5}$ (*e.g.*, sulfates and nitrates), as opposed to directly emitted [primary] $PM_{2.5}$ (*e.g.*, as a product of combustion) is dependent on many factors. However, the presence of strong temperature inversions that limit dispersion contribute to the formation of secondary $PM_{2.5}$ in the atmosphere and can increase secondary $PM_{2.5}$ formation. $PM_{2.5}$ concentrations, therefore, can be due to gaseous pollutants that form fine particles after reacting with other compounds in the air during meteorological inversions and it is important to consider

[6] *See* Damberg, Policies for Addressing PM 2.5 Precursors.
[7] EPA Re-Proposed Stmt of Basis at Table 5-12.

these $PM_{2.5}$ precursor sources (*e.g.*, NO_x from the diesel combustion sources associated with Shell's exploration drilling programs) when looking at overall $PM_{2.5}$ impacts. Because of the presence of strong temperature inversions on the North Slope, the contribution from secondary $PM_{2.5}$ to total $PM_{2.5}$ concentrations from the permitted sources on the OCS needs to be considered. Secondary $PM_{2.5}$ is an important, yet unidentified, component of Shell's air emissions.

17. The Environmental Protection Agency's Support Center for Regulatory Atmospheric Modeling (SCRAM) provides various resources for modeling the impacts of secondary $PM_{2.5}$ emissions. SCRAM is a resource that EPA could have relied upon for guidance in analyzing secondary $PM_{2.5}$ formation. Additionally, EPA's recently-developed model based on the Community Multi-scale Air Quality (CMAQ) model, which was used in support of the development of the $PM_{2.5}$ NAAQS, has been shown to "reproduce the results from an individual modeling simulation with little bias or error" and "provides a wide breadth of model outputs, which can be used to develop emissions control scenarios".[8] The Comprehensive Air quality Model with extensions (CAMx) is another tool available to assess secondary $PM_{2.5}$ formation. CAMx has source apportionment capabilities and can assess a wide variety of inert and chemically reactive pollutants, including inorganic and organic $PM_{2.5}$ and PM_{10}. The Regional Modeling System for Aerosols and Deposition (REMSAD) can also model concentrations of both inert and chemically reactive pollutants on a regional scale, "including those processes relevant to regional haze and particulate matter". These are just some examples of current models with the capability to assess secondary $PM_{2.5}$ impacts.

[8] *See* Technical Support Document for the Proposed PM NAAQS Rule.

18. There have been several oil and gas Environmental Impact Statements that have already used (or are using) CMAQ or CAMx to estimate $PM_{2.5}$ concentrations. The Uinta Basin Air Quality Study in Utah and the Four Corners Air Quality Group Modeling Project in Colorado are examples of completed modeling studies of this type.[9] And both the Continental Divide and Hiawatha EISs in Wyoming are examples of NEPA projects using grid modeling to assess $PM_{2.5}$ concentrations.[10]

19. Knowledge of the secondary $PM_{2.5}$ component is critical to understanding the best way to mitigate potential $PM_{2.5}$ impacts from Shell's operations.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge.

Dated: April 30, 2010

Megan M. Williams

[9] *See* Uinta Basin Air Quality Study (UBAQS) News Release (Attachment 5); Four Corners Air Quality Task Force Modeling Information (Attachment 6).

[10] *See,* Continental Divide EIS documents (available at http://www.blm.gov/wy/st/en/info/NEPA/rfodocs/cd_creston.html) and Hiawatha EIS documents (available at http://www.blm.gov/wy/st/en/info/NEPA/rsfodocs/hiawatha.html).

May 11, 2007

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Running Grass
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Seattle, WA 98101

Re: **Shell Offshore Inc. OCS Air Quality Comments**
2007-2009 Exploration Plan for an OCS Operation in the Beaufort Sea
30 CFR Part 250 (Minerals Management Service)
40 CFR Part 55 (Environmental Protection Agency)
11 AAC 110, 11 AAC 112, and 18 AAC 50 (State of Alaska)

Dear Ms. Greaves, Mr. Meyer, Mr. Mendivil, Mr. Walker, Mr. Chapple, Dr. Greene and Mr. Grass,

The North Slope Borough (NSB) provides the following comments on the Shell Offshore Inc. (Shell) OCS Air Permit Applications that were submitted to the Environmental Protection Agency on December 29, 2006, and supplemented on March 26, 2007, for the Beaufort Sea 2007-2009 OCS Exploration Drilling Program for the Shell Kulluk and Frontier Discoverer drilling units.

While EPA has issued the Shell Offshore Air Permit application for public comment, requesting input on compliance with EPA's regulations for OCS air emission sources under EPA's regulations at 40 CFR 55, the NSB is also providing comments on the air permit to MMS and ADEC to address compliance with MMS's federal regulations at 30 CFR Part 250, and the State of Alaska's regulations at 11 AAC 112, 11 AAC 110, and 18 AAC 50 for OCS air emission sources. EPA and MMS both have an obligation to meet the 1994 Executive Order 12898 on Environmental Justice. These comments have been submitted to EPA and MMS to address the NSB's Environmental Justice concerns as well.

All four agencies that have regulations that apply to the review and approval of OCS air pollution. Each agency is responsibility for specific actions. The NSB has provided its comments to all four agencies, because there is a need for a coordinated effort for this air permit review. The NSB has found a number of areas in which one agency assumes that another is addressing their requirements, or interpreting their regulations correctly, but they are not. The NSB requests a coordinated review take place, and each agency ensure that their statutory and regulatory obligations are met on this project.

Summary of NSB's Comments

Overall, the NSB finds that Shell's air permit application does not meet EPA's, MMS's or ADEC's OCS air emission regulations, nor does it meet the obligations of the Clean Air Act. The NSB's key concerns are summarized in the list below, followed by a more detailed explanation.

1. MMS, ADEC and EPA did not hold a meaningful public process to obtain input from residents to meet their Environmental Justice, tribal, government-to-government and Coastal Zone Management Act obligations.
2. The permit application is based on scant data and models which have not been validated under arctic conditions, with no monitoring data whatsoever in the area of concern.
3. The lack of site specific monitoring and meterologic data requires state and federal agencies to use conservative assumptions in permitting this project to ensure human health and the environment are protected; however, conservative assumptions have not been used introducing risk and concern. A conservative and regulatory sound approach would be to permit this project as a major source of air pollution, adhering to the rigors of the Clean Air Act.
4. The operations proposed by Shell will produce substantial air pollution, close to population centers such as Kaktovik, Nuiqsut and Barrow, and within very commonly used subsistence corridors. Air pollution in the Arctic is much more significant than in a more temperate region. The arctic region is subject to extreme atmospheric inversions, which results in the pollution being trapped in a mixing layer only a few feet above the surface. The health impact is thus likely to be much more substantial in the Beaufort Sea even at much lower levels of pollution than urban areas.
5. Shell's definition of an OCS source is not consistent with the Clean Air Act. The OCS source is the drill ship, not the drill site. Nothing in the Clean Air Act (CAA) defines an OCS source as a single exploration well site.
6. Nothing in state or federal law defines an OCS source as a drill site.

7. Shell has applied for a minor source air permit for each and every drill site they plan to explore over the next three years (2007-2009), to avoid the rigors of obtaining a major source air permit for each drilling ship. Shell should be applying for a major source air permit for each OCS source (drill ship).

8. Shell's exploration operations meet the definition of major source of air pollution under 40 CFR 55.2, which defines an OCS source as any equipment, activity, or facility which (1) emits or has the potential to emit any air pollutant, (2) is regulated or authorized under the OCS Lands Act, and (3) is located on the OCS or in or on waters above the OCS.

9. All of Shell's proposed operations meet the definition of a major source of air pollution because they are located on one or more of their contiguous or adjacent OCS leases, are under the control of the same company, and fall under the same Standard Industrial Code.

10. Shell proposes to avoid major source review to avoid baseline air quality monitoring data collection. The lack of baseline data collection adversely impacts the air pollution modeling results.

11. Shell proposes to avoid major source permitting to avoid the requirement to review and install the best available air pollution control technology on its OCS air pollution sources. This circumvents the fundamental goal of the Clean Air Act, which is pollution prevention.

12. Although seeking to avoid a "major source" designation may be expeditious for Shell from a business perspective, it is a flagrant and grievous violation of the principles of environmental justice. Given the already distressing increases and alarmingly high rates of pulmonary disease and cancer, our population warrants a particularly cautious regulatory approach to prevent further incremental degradation of our health.

13. Alaska State regulations for portable oil and gas operations were developed to permit land based oil and gas drilling rigs mounted on wheels to be driven from one well site to another on the North Slope. Nothing in the background for developing the portable oil and gas operations contemplated applying these regulations to drill ships or major OCS sources of air pollution.

14. EPA's public notice states that Alaska Regulations at 18 AAC 50.502(c)(2) require OCS sources to obtain a minor permit from EPA before commencing operation. Nothing in 18 AAC 50.502(c)(2) address an OCS drill ship or specifically states that an OCS drill ship is required to obtain a minor source permit.

15. EPA's January 12, 2007 EPA Guidance Memo directs air permitting authorities to begin their analysis by evaluating whether each individual surface site qualified as a separate stationary source. In Shell's case, each individual surface site does not qualify as a separate source, because the OCS source is the drill ship.

16. EPA's January 12, 2007 EPA Guidance Memo directs air permitting authorities to use a major source determination for oil and gas operations that (1) reasonably carries out the purposes of PSD, (2) approximates a common sense notion of a plant, and (3) avoids aggregating pollutant –emitting activities that as a groups would not fit in the ordinary meaning of building, structure, facility, or installation.

17. Shell should revise its air permit applications to include all of the drill ship emissions (and associated support vessels and equipment) into a single major source permit application to

reasonably carry out the purposes of PSD, and ensure best available pollution control equipment is installed when operating in the Beaufort Sea.

18. A drill site does not approximate a common sense notion of a plant. A plant is the combustion source, which is the drill ship. A drill site itself is not a "plant;" it is a location.

19. The emissions from a drill ship fit in the ordinary meaning of structure, facility, or installation. A drill site does not. A drill site is a location on a lease. A drill site is not a structure; it is not a facility; it is not an installation.

20. There are a number of areas in which one agency assumes that another is addressing the requirements or interpreting the regulations correctly, but they are not. A coordinated review should be carried out so that each agency is accountable for assuring regulatory compliance.

21. MMS' air pollution control regulations at 30 CFR 250 are not equivalent to EPA's regulation at 40 CFR 55. MMS has not demonstrated that the requirements of 30 CFR 250 have been met.

22. EPA's regulations at 40 CFR 55 do not relieve MMS of its obligation to address air pollution under 30 CFR 250.

23. MMS' regulations at 30 CFR 250.218(a)(1) require Shell's Exploration Plan to include the: projected peak hourly emissions; total annual emissions in tons per year; emissions over the duration of the proposed exploration activities; frequency and duration of emissions; and total of all emissions. This information is not found in the EPA air permit, nor has MMS evaluated it during the NEPA review, or during approval of Shell's Exploration Plan.

24. MMS' federal regulations 30 CFR 250 still exist and apply to OCS sources in the Beaufort Sea. MMS' regulations at 30 CFR 250.218 were not repealed when the EPA issued OCS regulations at 40 CFR 55.

25. Nothing in federal or state air pollution law or regulation establishes a 500 meter distance for aggregating or not aggregating pollution from OCS sources. The EPA's proposed use of 500 meters in determining whether air pollution must be aggregated for the purpose of major source classification is arbitrary and capricious. The Clean Air Act defines an OCS source as a drill ship and all other OCS support activities within a 25 mile radius. EPA can not redefine Congressional intent through a single permitting action.

26. Shell asserts in its permit applications at Section 3.2 that ADEC has no direct authority over the review and approval of the Shell project and its air permit. This is incorrect.

27. Shell's proposed project does not meet the requirements of 11 AAC 110 and 112, because it does not comply with all federal and state air quality laws and regulations.

28. In 1993, the Kulluk was determined to be a major OCS source, under the EPA's PSD regulations and MMS'OCS exploration approvals. ARCO was the operator of the Kulluk, and was required to complete a comprehensive major source air permit application, ambient air quality modeling assessment, BACT evaluation and human health impact assessment.

29. In 1993, ARCO estimated 120 days of Kulluk operation, along with its support vessels, would produce over 2,300 tons of NO_x and over 260 tons of Carbon Monoxide (CO) Both pollutants exceeded the 250 ton PSD permit threshold for a major source. Surprisingly, Shell estimates the Kulluk drill ship emissions at 245 tons of NO_x and over 82 tons of

Carbon Monoxide (CO). It is not reasonable for one operator, ARCO to be required to permit the Kulluk as a major source of air pollution in 1993, and later to permit the Kulluk as a minor source of air pollution for a very similar Exploration Plan in 2007.

30. The scope of Shell's air permit approval and application is not clear. Site specific data is missing for most years, and it is unclear if Shell is requesting a three (3) or five (5) year permit.

31. There are a number of deficiencies in Shell's emission inventory which are listed below:

- Shell's emission inventory does not meet MMS' regulations at 30 CFR 250, because it does not include the total emissions over the duration of the proposed exploration activities, examine the impacts of small particulate matter, or does it examine particulate emissions at 2.5 microns or less ($PM_{2.5}$).
- It is not clear if Shell is proposing to conduct well tests flow back oil or flare gas.
- The emission inventory does not address sources of emission that vent directly to atmosphere.
- Shell has not included the emissions from a potential relief well.
- It is unreasonable to issue a permit for 59 days of operation when the applicant clearly has stated that drilling could continue for 75 days or more per well if ice conditions or unanticipated drilling issues arise.
- Shell has not estimated the potential to emit (PTE) for the ice breaker combustion sources assuming heavy ice conditions which can reasonably be expected during later September, October, and November in the Beaufort Sea. Shell bypassed the PTE requirements and immediately sought to avoid the rigors of a PSD major source permit, by proposing to reduce operating hours on units on an "assemblage of reasonable maximum activity levels."
- Shell's emission inventory for the Kulluk drill ship and its associated support vessels of 245 tons of oxides of nitrogen (NO_x), just barely falls below the PSD threshold for a major source permit of 250 tons. There is little room for error in this emission estimate. The total emissions can easily exceed 250 tons, at any single well if it takes longer than 59 days to drill, heavy ice conditions are encountered, if any of Shells operating restriction assumptions are incorrect, or if a relief well is required.
- Shell's emission inventory for the Kulluk drill ship and the Discoverer Drill Ships should include a cumulative total of all emissions required to drill the exploration wells planned on a calendar year. Total drill ship emissions for each ship, on a yearly basis, exceed the PSD threshold for a major source permit of 250 tons by several magnitudes. A minor source permit is inappropriate for these large industrial sources of air pollution.
- Shell's application excludes emissions from the Bow Thruster Diesel engine when it is used to move the supply boat (Jim Kilabuk) next to the drill ships. However, this clearly contradicts the CAA requirement to include all support vessel emissions in the emission inventory if they are operating within 25 miles of the OCS source.
- Shell does not provide a historical operating basis for the operating hours or equipment use assumptions used in its application. The NSB requests that agencies require Shell to provided operating records for the Kulluk and Discoverer to verify combustion source usage requirements in similar previous exploration wells, so that the agencies and public

can determine if the operating hours and usage restrictions proposed by Shell are realistic and appropriate.

- Shell has not properly inventoried or modeled carbon monoxide emissions for units that will be operated at low loads, where carbon monoxide emissions will be elevated.

- Shell's emission estimates for 2007 are inconsistent with the emission estimates for 2008 and 2009. While Shell purports that its operating hour estimates are realistic for 2007 based on a maximum operating timeframe of 60 days at a drill site, it does not provide any technical rationale to support the proposed reduction to 43 days per drill site in 2008 and 2009.

- Shell's ambient air quality analysis is not site-specific, does not include the maximum potential to emit for all combustion sources included in the OCS source definition, does not use appropriate background monitoring data for all OCS source locations, does not use an EPA approved meteorologic data set, and is based on a simple single pollution stack screening model, rather than a site specific, multiple stack emission model.

- Shell's air pollution modeling approach is not site-specific and does not meet the technical quality required by the EPA or MMS on past OCS exploration projects in the Beaufort Sea using the Kulluk.

- Shell's application lacks data to adequately assess human health impacts to our coastal communities, and to subsistence hunters and subsistence resources that will be located downwind of Shell's large industrial pollution source.

- Shell's application does not include all required supporting technical information.

- Shell's application estimates hazardous air pollutants at a drill site level, but not at an OCS source level. In addition to this error, Shell's application does not provide hazardous air pollutant emission estimates for sources vented to atmosphere; Shell only provides estimates for combustion sources.

Attached are NSB's detailed comments supporting these conclusions.

To discuss these comments, please contact Gordon Brower (907) 852-0440, or in his absence during whaling season, please contact Martha Falk at the same number. The NSB requests a written response to our comments and concern by each agency addressed on this letter, and an opportunity for the NSB to review the responses and discuss them prior to any permits or approvals being issued on this project.

Sincerely,

Johnny Aiken
Director

Enclosure: Attachment No.1; NSB's Detailed Air Quality Comments

Cc: NSB Mayor Edward S. Itta
Karla Kolash, NSB Mayors Special Assistant
Gordon Brower, NSB Land Management Regulations
Taqulik Hepa, NSB Wildlife Department
Bessie O'Rourke, NSB Law Department
Layla Hughes, NSB Law Department
Harvey Consulting, LLC.
City of Pt. Lay
City of Pt. Hope
City of Wainwright
City of Atqasuk
City of Anaktuvuk Pass
City of Barrow
City of Kaktovik
City of Nuiqsut
Alaska Eskimo Whaling Commission
Inupiat Community of Arctic Slope (IRA)
Native Village of Barrow Inupiat Traditional Government
Native Village of Nuiqsut
Native Village of Kaktovik
Village of Wainwright
Point Lay Tribal Council (IRA)
Native Village of Point Hope
Richard Albright, EPA Region 10
Nancy Helm, EPA Region 10
Running Grass, EPA Region 10
John Goll, MMS Director, Anchorage
Tom Chapple, ADEC Air Quality Director, Anchorage
Ben A. Greene, PhD, ADNR, Anchorage
Glenn Gray and Associates
Dr. Aaron Wernham

Badami QAPP
Damiana, Thomas
to:
Christopher Hall
02/16/2010 06:09 PM
Cc:
Mary Portanova, Janis Hastings, Ann Williamson, "Hodek, Eric", "Miller, Pete"
Show Details

Chris,

Attached is the final version of the Badami QAPP Revision 02. We have revised the QAPP I sent on February 14, 2010 to incorporate the couple of typos we caught while discussing it with you during our teleconference today. This one is ready for USEPA signatures when you all are comfortable with it.

As before, once we get a signed approval page from you, we will publish the necessary hardcopies you will need for your records. In the mean time, please don't hesitate to contact me if you have questions.

Tom

Tom Damiana
Meteorologist/Engineer, Air Quality, Mountain/Southwest Region
Environment
D 970.530.3465
thomas.damiana@aecom.com

AECOM
1601 Prospect Parkway, Fort Collins, CO 80525-9769
T 970.493.8878 F 970.493.0213
www.aecom.com

Re: Badami QAPP

Christopher Hall to: Damiana, Thomas 02/17/2010 10:12 AM

Cc: Ann Williamson, "Hodek, Eric", Janis Hastings, Mary Portanova, "Miller, Pete", Juliane Matthews, Herman Wong

Tom,
Attached is the approval page with EPA signatures added. Please send three hard copies of the final QAPP to R10 at your earliest convenience.

Thanks, Chris

Badami QAPP v2 approval page Feb 2010.pdf

"Damiana, Thomas" Chris, 02/16/2010 06:09:02 PM

From:	"Damiana, Thomas" <Thomas.Damiana@aecom.com>
To:	Christopher Hall/R10/USEPA/US@EPA
Cc:	Mary Portanova/R5/USEPA/US@EPA, Janis Hastings/R10/USEPA/US@EPA, Ann Williamson/R10/USEPA/US@EPA, "Hodek, Eric" <Eric.Hodek@aecom.com>, "Miller, Pete" <Pete.Miller@aecom.com>
Date:	02/16/2010 06:09 PM
Subject:	Badami QAPP

Chris,

Attached is the final version of the Badami QAPP Revision 02. We have revised the QAPP I sent on February 14, 2010 to incorporate the couple of typos we caught while discussing it with you during our teleconference today. This one is ready for USEPA signatures when you all are comfortable with it.

As before, once we get a signed approval page from you, we will publish the necessary hardcopies you will need for your records. In the mean time, please don't hesitate to contact me if you have questions.

Tom

Tom Damiana

Meteorologist/Engineer, Air Quality, Mountain/Southwest Region

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[attachment "Badami_Ambient_Monitoring_QAPP_rev02_01_28_2010.pdf" deleted by Christopher Hall/R10/USEPA/US]

A Project Management Elements

A.1 Approvals

E. A. Hodek — January 28, 2010

Eric Hodek
AECOM Environment
Project Manager

P. P. Miller II — January 28, 2010

Peter P. Miller II
AECOM Environment
Quality Assurance Manager

for — 2/17/10

Ginna Grepo-Grove
USEPA Region 10
Quality Assurance Manager

02-17-10

Mary Portanova
United States Environmental Protection Agency, Region 9
Project Coordinator

RE: Deadhorse Precision & Bias goals

Christopher Hall to: Damiana, Thomas 12/09/2009 09:34 AM

Cc: "DeBell, Linsey"

Bcc: Denise Gertis

History: This message has been forwarded.

Tom,
I am not questioning the way you analyzed the State data set. Please take a look at the updated test worksheet (attached). I would suspect you would agree that these instruments were not in agreement even though the MQO goals are being met.

I will call you shortly.

Chris

AECOM stddev bias equations.xls

$PM_{2.5}$ Absolute Bias

Site ID: {Enter Site ID}		Pollutant type: $PM_{2.5}$ (Absolute Bias) - d calculated using actual differences					Bias (%)
Meas Val (Y)	**Audit Val (X)**	**d actual**	**25th Percentile**	**d^2**	**$\|d\|$**	**$\|d\|^2$**	
9	2	7.000	-7.000	49.000	7.000	49.000	
4	10	-6.000	**75th Percentile**	36.000	6.000	36.000	
1			4.000				
4	2	2.000		4.000	2.000	4.000	
3	9	-6.000		36.000	6.000	36.000	
6	2	4.000		16.000	4.000	16.000	
5	2	3.000		9.000	3.000	9.000	
4	15	-11.000		121.000	11.000	121.000	
7	2	5.000		25.000	5.000	25.000	
4	2	2.000		4.000	2.000	4.000	
4	12	-8.000		64.000	8.000	64.000	
3	9	-6.000		36.000	6.000	36.000	
6	2	4.000		16.000	4.000	16.000	
5	2	3.000		9.000	3.000	9.000	
11	2	9.000		81.000	9.000	81.000	
6	2	4.000		16.000	4.000	16.000	
2	9	-7.000		49.000	7.000	49.000	
2	14	-12.000		144.000	12.000	144.000	
3	10	-7.000		49.000	7.000	49.000	
5	2	3.000		9.000	3.000	9.000	
3	11	-8.000		64.000	8.000	64.000	
7	2	5.000		25.000	5.000	25.000	
3	12	-9.000		81.000	9.000	81.000	

	n	$\sum\|d\|$	$\sum\|d\|^2$
	23	131.000	943.000
n-1		$\sum d$	$\sum d^2$
	22	-29.000	943.000

Bias (%) (Eqn 3)
7.03
Signed Bias (%)
+/-7.03

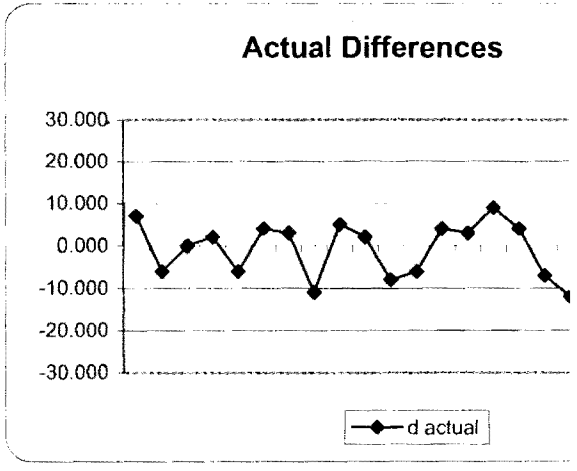

Exhibit 21
AEWC & ICAS

date	primary FEM	audit FRM	diff (a-p)	abs diff		
10/23/2009	9	5	-4	4		
10/24/2009	4	3	-1	1		
10/25/2009	1	3			-1.00	mean
10/26/2009	4	3	-1	1	1.59	stddev
10/27/2009	3	3	0	0	0.79	AECOM precision
10/28/2009	6	3	-3	3	1.30	AECOM bias
10/29/2009	5	4	-1	1		
10/30/2009	4	3	-1	1		
10/31/2009	7	6	-1	1		
11/1/2009	4	3	-1	1		
11/2/2009	4	-				
11/3/2009	3	3	0	0		
11/4/2009	6	5	-1	1		
11/5/2009	5	3	-2	2		
11/6/2009	11	6	-5	5		
11/7/2009	6	4	-2	2		
11/8/2009	2	-				
11/9/2009	2	3	1	1		
11/10/2009	3	4	1	1		
11/11/2009	5	5	0	0		
11/12/2009	3	4	1	1		
11/13/2009	7	7	0	0		
11/14/2009	3	3	0	0		

date	primary FEM	audit FRM	diff (a-p)	abs diff	
10/23/2009	9	2	-7	7	red text = test data values
10/24/2009	4	10	6	6	
10/25/2009	1	5			1.32 mean
10/26/2009	4	2	-2	2	6.56 stddev
10/27/2009	3	9	6	6	3.28 AECOM precision
10/28/2009	6	2	-4	4	5.95 AECOM bias
10/29/2009	5	2	-3	3	
10/30/2009	4	15	11	11	
10/31/2009	7	2	-5	5	
11/1/2009	4	2	-2	2	
11/2/2009	4	12	8	8	
11/3/2009	3	9	6	6	
11/4/2009	6	2	-4	4	
11/5/2009	5	2	-3	3	
11/6/2009	11	2	-9	9	
11/7/2009	6	2	-4	4	
11/8/2009	2	9	7	7	
11/9/2009	2	14	12	12	
11/10/2009	3	10	7	7	
11/11/2009	5	2	-3	3	
11/12/2009	3	11	8	8	
11/13/2009	7	2	-5	5	
11/14/2009	3	12	9	9	

Fw: Precision and Bias measurements for PSD preconstruction monitoring at Prudhoe Bay Alaska.

Christopher Hall to: Damiana, Thomas 08/18/2009 03:12 PM

Cc: Herman Wong

2nd of 3 emails.

----- Forwarded by Christopher Hall/R10/USEPA/US on 08/18/2009 03:10 PM -----

Herman Wong/R10/USEPA/US

08/18/2009 07:48 AM

To Dennis Crumpler/RTP/USEPA/US@EPA

cc Christopher Hall/R10/USEPA/US@EPA

Subject Re: Precision and Bias measurements for PSD preconstruction monitoring at Prudhoe Bay Alaska.

Morning Dennis:

Below are my thoughts on #2 and #3 in color.

Herman

Dennis Crumpler Hi Hermon, I guess we covered a lot more than I... 08/17/2009 12:42:06 PM

2. Network definition.

In the Region 10 Alaska case, we have a contractor, AECOM, installing, operating and maintaining ambient air monitoring stations for Conoco-Phillips and Shell. Currently, AECOM is operating and maintaining monitoring stations at Nuisqut for Conoco-Phillips, Badami for Shell, and Wainwright for Conoco-Phillips and Shell. AECOM will also be installing collocated PM2.5 samplers per PSD regulation and 40 CFR Part 58 at Prudhoe Bay for the benefit of Shell and Conoco-Phillips.

Under this AECOM network operation, I believe it is appropriate that the collocated PM2.5 sampling data at Prudhoe Bay can be used to comply with 40 CFR Part 58 for the Badami monitoring station. At Badami, Shell is installing a PM2.5 FEM sampler.

Do you have any thoughts on this point and the definition of "network"?

Network for PSD is an interesting concept , and I understand that it is even more interesting for outer continental shelf source permitting . I can speak authoritatively only on the QA aspects of design and I quote Section 3.2.5.5 of Appendix A.

3.2.5.5 For each PSD monitoring network, one site must be collocated. A site with the predicted highest 24-hour pollutant concentration must be selected.

Regarding bias I refer back to my response on Question 2, which in this case means that you probably need 5 independent FRM-based bias measurement events . However, since there is some question about the negative values , more events might not be a bad idea . It might give some hint as to the conditions that produce the negative values .

In reviewing language and how "network" is used in Appendix A, my interpretation is that AECOM is running a PSD network at the North Slope for Conoco-Phillips and Shell. Hence, the collocated sampler monitoring station at Prudhoe Bay can be used by AECOM clients to satisfy Appendix A of Part 58.

3. At Wainwright, valid PM2.5 data collection started on 06 March 2009. Assuming that the collocated sampling program at Prudhoe begins by 01 September 2009,

Is the PM2.5 data collected from 06 March 2009 to 30 August 2009 acceptable even though there was no concurrent collocated sampling during this period?

A strict interpretation would be that the data does not meet 40 CFR Part 51.21(m)(3) which links to Appendix A in 40 CFR Part 58.

A discretionary interpretation would be "yes" provided there are 25 valid sample pairs between 6 March 2009 and 5 March 2010 (assuming a one year data collection program).

I agree with the discretionary interpretation . Keep in mind that this is not a carte blanc acceptance of the data from Wainwright . A couple of the 5 subsequent bias measurements could be made at Wainwright. And, if there are other independent reasons to suspect the accuracy (bias) or precision of the data, those concerns would need to be resolved .

Shell is collecting the minimum four months of air quality data to meet 40 CFR Part 52.21(m)(1)(iv) and (m)(3). Paragraph (m)(3) refers to Appendix A in Part 58 and in there, I did not find any exemptions or discretionary words to the collocated monitoring. The language I read referred to scheduled samples and analysis on an annual or yearly basis. There was no indication of random samples, delayed samples or unscheduled samples. Hence, my interpretation of the regulations is that any valid and useable PM2.5 data in a PSD application ambient air quality analysis must be collected during the period in which there was concurrent and collocated sampling occurring at a monitoring station or network station. This is what I am willing to defend if challenged.

RE: Recently PM2.5 Wainwright Measurements
Damiana, Thomas to: Herman Wong 08/26/2009 10:13 AM
Cc: Christopher Hall, Pat Nair

History: This message has been replied to.

It was a more complex demonstration than that - it basically involved demonstrating that the high project impacts did not occur under the same conditions (season, wind speed, wind direction, etc.) as the high background impacts, and then demonstrating also that project impacts predicted under the same conditions that generated the high background value did not exceed the standards after adding in the high background value. It is a two part demonstration. Notice that according to this methodology, you never eliminate the high background value from consideration.

I think that Appendix W leaves the door open for dealing with this situation in a couple of ways though.

Tom

-----Original Message-----
From: Wong.Herman@epamail.epa.gov [mailto:Wong.Herman@epamail.epa.gov]
Sent: Wednesday, August 26, 2009 10:54 AM
To: Damiana, Thomas
Cc: Hall.Christopher@epamail.epa.gov; Nair.Pat@epamail.epa.gov
Subject: RE: Recently PM2.5 Wainwright Measurements

Are you thinking about eliminating measurements based on wind direction?

"Damiana, Thomas" <Thomas.Damiana@aecom.com>
08/26/2009 09:50 AM

To: Herman Wong/R10/USEPA/US@EPA, Pat Nair/R10/USEPA/US@EPA
cc: Christopher Hall/R10/USEPA/US@EPA
Subject: RE: Recently PM2.5 Wainwright Measurements

Herman and Pat,

Just wanted to interject,

I do not feel like the high impact in Wainwright could be classified as

an Exceptional Event. In fact, I think it would be hard to classify it as an exceptional event.

What I do think is possible, and I would recommend to Shell, is to use approved Appendix W (Guideline on Air Quality Models) techniques to eliminate the high background from consideration. Rob Wilson turned us on to this methodology years ago when we had to deal with high particulate numbers at Nuiqsut. The Appendix W techniques would be approved for use by Herman, and you would not need to wait for an answer.

Tom

-----Original Message-----
From: Wong.Herman@epamail.epa.gov [mailto:Wong.Herman@epamail.epa.gov]
Sent: Wednesday, August 26, 2009 8:40 AM
To: Nair.Pat@epamail.epa.gov
Cc: Hall.Christopher@epamail.epa.gov; Damiana, Thomas
Subject: Recently PM2.5 Wainwright Measurements

Pat:

Yesterday, Tom Damiana and I spoke about the PM2.5 measurements from Wainwright. Tom conveyed that there is another quarter worth of measurements that will be available to EPA soon and one of the measured 24-hour PM2.5 concentrations was 14 micrograms per cubic meter.

In Table 11 of my AQIA TSD, a background of 8 micrograms per cubic was added to the predicted impact which resulted in a total impact of 96 percent of the NAAQS. If 14 is added to the predicted impact, the total impact would be 113 percent of the NAAQS. We can't issue a permit with a predicted violation! This is in addition to the collocated sampler issue.

Tom expressed to me that Shell may make the case that this is an exceptional event. Should this happen, I assume that OEA would make the determination which could be a long process.

Another option would be for Shell to remodel the PM2.5 emissions without condensables. Dave mentioned this option to me because of what may happen for the other Shell application. He will verify with OAQPS that EPA will not be issuing a reconsideration decision regarding condensables within the next 3-4 months.

I need to be reasonably certain that a model violation of the PM2.5 NAAQS would not occur based on the modeling results. Currently, we are assuming that a minimum four months of collected data is adequate. Based on the Wainwright measurements, I now believe that it would be prudent to change the data collection period to include the Shell drilling season in the Chukchi Sea, i.e., data collection from July to December which I assume is a permit condition.

Herman

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 23 2010

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards

TO: See Addressees

This memorandum addresses the need for recommendations regarding appropriate dispersion modeling procedures which can be used to demonstrate compliance with $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). The need for these recommendations arises from several recent regulatory actions and proposals which increase the likelihood that applicants for permits under the new source review (NSR) and prevention of significant deterioration (PSD) programs may be required to demonstrate compliance with $PM_{2.5}$ NAAQS rather than relying upon the PM_{10} surrogate policy established in 1997. These recommendations are intended to facilitate appropriate and consistent implementation of current guidance regarding $PM_{2.5}$ dispersion modeling contained in the *Guideline on Air Quality Models*, Appendix W to 50 CFR Part 51, while acknowledging that such guidance is somewhat limited in detail due to technical issues associated with $PM_{2.5}$ modeling.

This memorandum provides recommendations on two aspects of the modeling procedures for demonstrating compliance with the $PM_{2.5}$ NAAQS. First, this memorandum discusses some of the technical issues that must be addressed by any applicant or permitting authority that is seeking to rely on the PM_{10} surrogate policy. Second, this memorandum provides additional information on modeling procedures to demonstrate compliance with $PM_{2.5}$ NAAQS without relying upon the PM_{10} surrogate policy.

BACKGROUND

On July 18, 1997, EPA revised the NAAQS for particulate matter to add new annual and 24-hour standards for fine particles using $PM_{2.5}$ as the indicator. EPA revised the 24-hour NAAQS for $PM_{2.5}$ on September 21, 2006, reducing the standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. EPA also retained the previous 1997 annual standard for $PM_{2.5}$ and the 24-hour standard for PM_{10}, while revoking the previous annual standard for PM_{10}. For attainment of the new 24-hour $PM_{2.5}$ NAAQS based on ambient monitoring, the average of the 98th percentile 24-hour values

over three years of monitoring must not exceed 35 $\mu g/m^3$. The annual $PM_{2.5}$ NAAQS is set at 15 $\mu g/m^3$ based on the average of the annual mean $PM_{2.5}$ concentrations over three years.

Citing significant technical difficulties with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling, EPA established a policy, known as the PM_{10} surrogate policy, on October 23, 1997. This policy allowed permit applicants to use compliance with the applicable PM_{10} requirements as a surrogate approach for meeting $PM_{2.5}$ NSR requirements until the technical difficulties were resolved. On May 16, 2008, EPA promulgated final rules governing the implementation of the NSR program for $PM_{2.5}$, which included a "grandfathering provision" allowing applicants for federal PSD permits covered by 40 CFR § 52.21, with complete permit applications submitted as of July 15, 2008, to continue relying on the PM_{10} surrogate policy. In response to a petition challenging the continued use of the PM_{10} surrogate policy for issuing PSD permits, on June 1, 2009, EPA issued a 3-month administrative stay of the grandfathering provision for $PM_{2.5}$ affecting federal PSD permits to give EPA time to propose repealing the challenged grandfathering provision. On September 16, 2009, the original 3-month stay was extended to June 22, 2010, to allow additional time for EPA to formally propose repeal of the grandfathering provision from the $PM_{2.5}$ NSR implementation rule for federal PSD permits issues under 40 CFR § 52.21. On February 11, 2010, EPA published its proposal to repeal the grandfathering provision in the *Federal Register* at 75 FR 6827. These actions cite the fact that the technical difficulties which necessitated the PM_{10} surrogate policy have been largely, although not entirely, resolved.

As part of the proposed rulemaking to repeal the grandfathering provision contained in the federal PSD program, EPA has also proposed to end the use of the PM_{10} surrogate policy for state PSD programs that EPA has approved as part of the state implementation plan (SIP) under 40 CFR § 51.166. Under the PSD programs for $PM_{2.5}$ currently in effect for SIP-approved states, states would be allowed to continue using the PM_{10} surrogate policy until May 2011, or until EPA approves the revised SIP for $PM_{2.5}$, whichever occurs first. While we continue to allow states to use the PM_{10} surrogate policy during their transition to the new $PM_{2.5}$ requirements, we have also made it clear that the policy needs to be implemented by taking into account court decisions that address the surrogacy concept. Accordingly, an applicant seeking a PSD permit under a SIP-approved PSD program may still rely upon the PM_{10} surrogate policy as long as (1) the appropriateness of the PM_{10}-based assessment for determining $PM_{2.5}$ compliance has been adequately demonstrated based on the specifics of the project; and (2) the applicant can show that a $PM_{2.5}$ analysis is not technically feasible. Absent such demonstrations, applicants would be required to submit a $PM_{2.5}$-based assessment to demonstrate compliance with the $PM_{2.5}$ standards, in addition to meeting the other requirements under the NSR/PSD programs.

PM_{10} SURROGACY DEMONSTRATIONS

Given the need for applicants that continue to rely on the PM_{10} surrogate policy to demonstrate the appropriateness of the policy based on the specifics of the project, we feel that it is appropriate and timely to address some of the technical issues associated with a surrogacy demonstration. EPA's August 12, 2009, Administrative Order in response to petitions regarding the Title V permit for Louisville Gas and Electric Company (LG&E), Trimble Generating Station, provides a brief summary of the case law history that bears on the PM_{10} surrogacy issue

which suggests that an appropriateness demonstration "would need to address the differences between PM_{10} and $PM_{2.5}$."[1] The LG&E order cites two examples in this regard: 1) "emission controls used to capture coarse particles may be less effective in controlling $PM_{2.5}$"; and 2) "particles that make up $PM_{2.5}$ may be transported over long distances while coarse particles normally only travel short distances." These examples serve to highlight the two main aspects of PSD permitting for which the appropriateness of the surrogate policy should be demonstrated: 1) the Best Available Control Technology (BACT) emission control technology assessment; and 2) the ambient air quality impact assessment to demonstrate compliance with the applicable NAAQS.

While acknowledging "an evolving understanding of the technical and legal issues associated with the use of the PM_{10} Surrogate Policy," the LG&E order offers two steps as possible approaches for making an appropriateness demonstration, without suggesting that the "two steps are necessary or sufficient to demonstrate that PM_{10} is a reasonable surrogate for $PM_{2.5}$" and clearly stating that "these two steps are not intended to be the exclusive list of possible demonstrations" regarding surrogacy. The two steps offered in the LG&E order are primarily relevant to the appropriateness demonstration regarding emission controls under BACT, while the discussion here will be focused on the appropriateness demonstration in relation to ambient air impacts.

Given the range of application-specific factors that may need to be addressed for an appropriateness demonstration in relation to ambient air impacts, it is not practical to provide detailed guidance regarding how to conduct such demonstrations. However, the following list identifies some of the "differences between PM_{10} and $PM_{2.5}$" in relation to ambient air impacts that should be addressed in the development of a surrogacy demonstration:

1. While EPA revoked in 2006 the annual PM_{10} standard that was in effect when the surrogate policy, the surrogacy demonstration would still need to address the appropriateness of the PM_{10} surrogate policy in relation to the annual $PM_{2.5}$ standard, and would likely require a modeling analysis of annual PM_{10} impacts.
2. The current 24-hour NAAQS of 35 $\mu g/m^3$ is well below the previous level of 65 $\mu g/m^3$ that was in effect when the PM_{10} surrogate policy was established. The background monitored levels of $PM_{2.5}$ are, therefore, likely to account for a more significant fraction of the cumulative impacts from a modeling analysis relative to the current 24-hour $PM_{2.5}$ NAAQS than for PM_{10}.
3. Secondary formation of $PM_{2.5}$ from emissions of NO_x, SO_x and other compounds from sources across a large domain will often contribute significantly to the total ambient levels of $PM_{2.5}$, and may be the dominant source of ambient $PM_{2.5}$ in some cases. In contrast, secondarily formed particles are less likely to be significant portion of PM_{10}, which may result in significant differences in the spatial and temporal patterns of ambient impacts between $PM_{2.5}$ and PM_{10}.

[1] A discussion of the case law that bears on the PM_{10} surrogacy issue also appears in the February 11, 2010, proposed rule at 75 FR 6831-6832.

4. The probabilistic form of the $PM_{2.5}$ NAAQS, based on the multiyear average of the 98th percentile for the daily standard, differs from the expected exceedance form of the PM_{10} NAAQS, which allows the standard to be exceeded once per year on average using the high-sixth-high (H6H) value over 5 years. These differences affect the temporal and spatial characteristics of the ambient air impacts of PM_{10} and $PM_{2.5}$. Differences in the form of the NAAQS also complicate the process of combining modeled impacts with monitored background levels to estimate cumulative impacts under the NSR/PSD permitting programs, as well as the determination of whether modeled impacts from the facility will cause a significant contribution to any modeled violations of the NAAQS that may occur.

These factors complicate the viability of demonstrating the appropriateness of the PM_{10} surrogate policy to comply with the requirement for a $PM_{2.5}$ ambient air quality impact assessment. In light of these complications, applicants may elect to use $PM_{2.5}$ dispersion modeling to explicitly meet the requirement of an ambient air quality impact assessment under the PSD permitting program, provided that the technical difficulties with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling have been sufficiently resolved in relation to the specific application.

For surrogacy demonstrations, it is assumed that as an initial step the applicant will have conducted an appropriate dispersion modeling analysis which demonstrates compliance with the PM_{10} NAAQS, including an analysis of annual PM_{10} impacts to address item 1. A simple example illustrating when a PM_{10} modeling analysis might serve as a surrogate for $PM_{2.5}$ modeling would be if a clearly conservative assumption is made that all PM_{10} emissions are $PM_{2.5}$, and the modeled PM_{10} impacts are taken as a direct surrogate for $PM_{2.5}$ impacts and compared to the $PM_{2.5}$ NAAQS. If an adequate accounting for contributions from background $PM_{2.5}$ concentrations to the cumulative impact assessment can be made, and a reasonable demonstration that the modeled PM_{10} emission inventory adequately accounted for potential nearby sources of $PM_{2.5}$, then the appropriateness of surrogacy could be reasonably found in this example. An analysis of source-specific $PM_{2.5}$/ PM_{10} emission factor ratios may also support the assumption of a more realistic, yet still conservative approach for taking a ratio of modeled PM_{10} ambient impacts to provide conservative estimates of $PM_{2.5}$ impacts.

While additional modeling analyses, short of explicit $PM_{2.5}$ modeling, may also be used to the support the surrogacy demonstration in some cases, it is important to make a clear distinction between modeling analyses for purposes of surrogacy demonstrations and modeling analyses that are intended to explicitly demonstrate compliance with the $PM_{2.5}$ standards. The distinction between these two types of modeling analyses may not always be clear, but one important distinction is whether or not a $PM_{2.5}$ emission inventory has been developed as the basis for the modeling. The distinction between these types of modeling is important because modeling procedures that may be considered appropriate for one type of analysis may not be appropriate for the other. The following section elaborates further on this point.

$PM_{2.5}$ MODELING ANALYSES

The differences between PM_{10} and $PM_{2.5}$ described above in relation to surrogacy demonstrations, especially items 2 through 4, also have implications on how best to conduct an explicit $PM_{2.5}$ NAAQS compliance demonstration through dispersion modeling. Due to the potentially significant contribution from secondary formation of $PM_{2.5}$, and the more prominent role of monitored background concentrations of $PM_{2.5}$ in the cumulative analysis, certain aspects of standard modeling practices used for PM_{10} and other criteria pollutants may not be appropriate for $PM_{2.5}$. Our recommendations for addressing these issues in terms of explicit $PM_{2.5}$ modeling analyses are described in more detail below.

Given the issues listed above, and especially the important contribution from secondary formation of $PM_{2.5}$, which is not explicitly accounted for by the dispersion model, PSD modeling of $PM_{2.5}$ should currently be viewed as screening-level analyses, analogous to the screening nature of the guidance in Section 5.2.4 of Appendix W regarding dispersion modeling for NO_2 impacts given the importance of chemistry in the conversion of NO emissions to ambient NO_2. The screening recommendations presented below for demonstrating compliance with the $PM_{2.5}$ NAAQS through dispersion modeling have been developed with the factors listed above in mind. As with any modeling analysis conducted under Appendix W, alternative models and methods may be considered on a case-by-case basis, subject to approval by the Regional Office in accordance with the recommendations in Section 3.2 on "Use of Alternative Models."

The following sections describe the recommended modeling methods for the two main stages in a typical PSD ambient air quality analysis: 1) preliminary significant impact analysis; and 2) cumulative impact assessment. The rationale for the recommendations is also provided.

Preliminary Significant Impact Analysis

The initial step in air quality impact assessments under NSR/PSD is typically a significant impact level analysis to determine whether the proposed emissions increase from the proposed new or modified source (i.e., project emissions) would have a "significant" ambient impact. Thus, the first step of the ambient impact analysis is to determine whether those emissions would result in ambient air concentrations that exceed a de minimis level, referred to as the Significant Impact Level (SIL). If modeled impacts from the facility do not exceed the SIL, then the permitting authority may be able to conclude, based on this preliminary analysis, that the project would not cause or contribute to a violation of the NAAQS. Under these circumstances, EPA would not consider it necessary for the facility to conduct a more comprehensive cumulative impact assessment that would involve modeling the facility's total emissions along with emissions from other nearby background sources, and combining impacts from the modeled emission inventory with representative ambient monitored background concentrations to estimate the cumulative impact levels for comparison to the NAAQS. The SIL is also used to establish the significant impact area of the facility for purposes of determining the geographic range of the background source emission inventory that would be appropriate should a cumulative impact assessment be necessary.

EPA's 2007 proposed rule to establish PSD increments, SILs, and a Significant Monitoring Concentration (SMC) for $PM_{2.5}$ included three options for the $PM_{2.5}$ SILs for both the 24-hour and annual NAAQS. Until the $PM_{2.5}$ SILs are finalized, the proposed SILs may not be presumed to be appropriate de minimis impact levels. However, EPA does not preclude states from adopting interim de minimis impact levels for $PM_{2.5}$ to determine whether a cumulative impact analysis will be necessary, provided that states prepare an appropriate record to support the value used. Such de minimis levels do not necessarily have to match any of the SILs that have been proposed for $PM_{2.5}$, but the levels proposed by EPA and the record supporting EPA's proposed rule could be considered in the state's determination.

The modeling methods used in this initial significant impact assessment phase of the $PM_{2.5}$ analysis, based on either a state's interim de minimis levels or EPA-finalized SILs, are similar to the methods used for other pollutants, including the use of maximum allowable emissions. However, due to the probabilistic form of the NAAQS, we recommend that the highest average of the modeled annual averages across 5 years for National Weather Service (NWS) meteorological data or the highest modeled annual average for one year of site-specific meteorological data be compared to the annual screening level (SIL). Similarly, the highest average of the maximum 24-hour averages across 5 years for NWS meteorological data or the highest modeled 24-hour average for one year of site-specific meteorological data should be compared to the 24-hour screening level (SIL).

Using the average of the highest values across the years modeled preserves one aspect of the form of the NAAQS, while using the average of the first highest 24-hour averages rather than the 98^{th} percentile (8^{th} highest) values from the distribution is consistent with the screening-level nature of the analysis. In addition, since the $PM_{2.5}$ NAAQS is based on air quality levels averaged over time, it is appropriate to use an average modeled impact for comparison to the SIL since that will more accurately characterize the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impacts from individual years. At the present time, the dispersion modeling recommendations presented here are based on modeling only the primary or direct $PM_{2.5}$ emissions from the facility.

Cumulative Impact Assessment

Unless modeled ambient air concentrations of $PM_{2.5}$ from the project emissions are shown to fall below the state's de minimis level or EPA's promulgated SIL (when finalized), then a cumulative impact assessment would be necessary to account for the combined impact of facility emissions, emissions from other nearby sources, and representative background levels of $PM_{2.5}$ within the modeling domain. The cumulative impacts are then compared to the NAAQS to determine whether the facility emissions will cause or contribute to a violation of the NAAQS. Several aspects of the cumulative impact assessment for $PM_{2.5}$ will be comparable to assessments conducted for other criteria pollutants, while other aspects will differ due to the issues identified above.

Modeling Inventory

The current guidance on modeling emission inventories contained in Section 8.1 of Appendix W will generally be applicable for the $PM_{2.5}$ modeling inventory, recognizing that these recommendations only address modeling of primary $PM_{2.5}$ emissions. The guidance in Appendix W addresses the appropriate emission level to be modeled, which in most cases is the maximum allowable emission rate under the proposed permit. Nearby sources that are expected to cause a significant concentration gradient in the vicinity of the facility should generally be included in the modeled inventory. Since modeling of $PM_{2.5}$ emissions has not been a routine requirement to date, the availability of an adequate $PM_{2.5}$ emission inventory for background sources may not exist in all cases. Recommendations for developing $PM_{2.5}$ emission inventories for use in PSD applications will be addressed separately, but existing PM_{10} inventories may provide a useful starting point for this effort.

Monitored Background

The determination of representative background monitored concentrations of $PM_{2.5}$ to include in the $PM_{2.5}$ cumulative impact assessment will entail different considerations from those for other criteria pollutants. An important aspect of the monitored background concentration for $PM_{2.5}$ is that the monitored data should account for the contribution of secondary $PM_{2.5}$ formation representative of the modeling domain. As with other criteria pollutants, consideration should also be given to the potential for some double-counting of the impacts from modeled emissions that may be reflected in the background monitoring, but this should generally be of less importance for $PM_{2.5}$ than the representativeness of the monitor for secondary contributions. Also, due to the important role of secondary $PM_{2.5}$, background monitored concentrations of $PM_{2.5}$ are likely to be more homogeneous across the modeling domain in most cases, compared to other pollutants. We plan to address separately more detailed guidance on the determination of representative background concentrations for $PM_{2.5}$.

Comparison to NAAQS

Combining the modeled and monitored concentrations of $PM_{2.5}$ for comparison to the $PM_{2.5}$ NAAQS also entails considerations that differ from those for other criteria pollutants, due to the issues identified above. Given the importance of secondary contributions for $PM_{2.5}$ and the typically high background levels relative to the NAAQS for $PM_{2.5}$, greater emphasis is placed on the monitored background contribution relative to the modeled inventory. Also, given the probabilistic form of the $PM_{2.5}$ NAAQS, careful consideration must be given to how the monitored and modeled concentrations are combined to estimate the cumulative impact levels.

The representative monitored $PM_{2.5}$ design value, rather than the overall maximum monitored background concentration, should be used as a component of the cumulative analysis. The $PM_{2.5}$ design value for the annual averaging period is based on the 3-year average of the annual average $PM_{2.5}$ concentrations; for the 24-hour averaging period, the design value is based on the 3-year average of the 98^{th} percentile 24-hour average $PM_{2.5}$ concentrations for the daily standard. Details regarding the determination of the 98^{th} percentile monitored 24-hour value

based on the number of days sampled during the year are provided in the ambient monitoring regulations, Appendix N to 40 CFR Part 50.

The modeled annual concentrations of (primary) $PM_{2.5}$ to be added to the monitored annual design value should be computed using the same procedure used for the initial significant impact analysis based on the highest average of the modeled annual averages across 5 years for NWS meteorological data or the highest modeled annual average for one year of site-specific meteorological data. The resulting cumulative annual concentration would then be compared to the annual $PM_{2.5}$ NAAQS of 15 $\mu g/m^3$.

For the 24-hour NAAQS analysis, the modeled concentrations to be added to the monitored 24-hour design value should be computed using the same procedure used for the preliminary analysis based on the highest average of the maximum modeled 24-hour averages across 5 years for NWS meteorological data or the maximum modeled 24-hour average for one year of site-specific meteorological data. As noted above, use of the average modeled concentration across the appropriate time period more accurately characterizes the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impact from individual years, while using the average of the first highest 24-hour averages rather than the 98th percentile (8th highest) values is consistent with the screening nature of $PM_{2.5}$ dispersion modeling. Furthermore, combining the 98th percentile monitored with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS.

The recommendations provided above constitute a First Tier modeling analysis for $PM_{2.5}$ compliance demonstrations. For applications where impacts from primary $PM_{2.5}$ emissions are not temporally correlated with background $PM_{2.5}$ levels, combining the modeled and monitored contributions as described above may be overly conservative. In these cases, a Second Tier modeling analysis may be considered that would involve combining the monitored and modeled $PM_{2.5}$ concentrations on a seasonal or quarterly basis, and re-sorting the total impacts across the year to determine the cumulative design value. We plan to provide separately additional details regarding this Second Tier, including a discussion of circumstances where this approach may be appropriate.

Determining Significant Contributions to Modeled Violations

If the cumulative impact assessment following these screening recommendations results in modeled violations of the $PM_{2.5}$ NAAQS, then the applicant will need to determine whether the facility emissions are causing a significant contribution to those modeled violations. A "significant contribution" determination is based on a comparison of the modeled impacts from the project emissions associated with the modeled violation to the appropriate SIL. The significant contribution determination should be made following the same procedures used during the initial significant impact analysis, based on a comparison of the average of the modeled concentrations at the receptor location showing the violation, across 5 years for NWS meteorological data and the highest modeled concentration for one year of site-specific meteorological data. For a violation of the annual NAAQS, the average of the annual values at

the affected receptor(s) is compared to the SIL, while the average of the highest 24-hour average concentrations at the affected receptor(s) should be used for the 24-hour NAAQS. Use of the average modeled concentration is appropriate in this context since it is consistent with the actual contribution of the facility to the cumulative impacts at the receptor(s) showing violations and accounts for the fact that modeled violations of the 24-hour NAAQS represent average impacts across the modeling period.

Synopsis

Significant Impact Analysis: Compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour average concentrations from project emissions to their respective screening levels, which may be based on the state's de minimis levels or EPA-finalized SILs. If modeled impacts exceed the screening levels, a cumulative impact assessment would need to be performed.

Cumulative Impact Assessment: Develop an emission inventory of background sources to be included in the modeling analysis using traditional guidance. That would include using the significant impact area established in the initial significant impact analysis, plus a 50-km annular ring to determine the geographic extent of the background emission inventory. From data obtained within this combined area, compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour averages, plus representative background monitored concentrations, to their respective NAAQS. Monitored background concentrations are based on the 3-year average of the annual $PM_{2.5}$ concentrations, and the 3-year average of the 98^{th} percentile 24-hour averages. To determine whether the proposed project's emissions cause a significant contribution to any modeled violations of the NAAQS, the proposed project's impacts at the affected receptor(s) are determined based on the average of the highest modeled individual years' annual averages and average of the first highest individual years' 24-hour averages from the proposed project's emissions, and are compared to the state's de minimis levels or EPA-finalized SILs.

Additional Caveats

A few additional caveats should be considered while implementing these recommendations:

1. The current preferred dispersion model for near-field $PM_{2.5}$ modeling, AERMOD, does not account for secondary formation of $PM_{2.5}$. Therefore, any secondary contribution of the facility's or other modeled source's emissions is not explicitly accounted for. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from background sources in most cases, if the facility emits significant quantities of $PM_{2.5}$ precursors, some assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ may be necessary. In determining whether such contributions may be important, keep in mind that peak impacts due to facility primary and secondary $PM_{2.5}$ are not likely to be well-correlated in space or time, and these relationships may vary for different precursors. We plan to issue separately additional guidance regarding this issue.

2. While dry and/or wet deposition may be important processes when estimating ambient concentrations of particulate matter (PM) in general, these factors are expected to be minor for $PM_{2.5}$ due to the small particle size. In addition, there may be additional uncertainty associated with deposition modeling for $PM_{2.5}$ due to the variable makeup of the constituent elements for $PM_{2.5}$ and the fact that deposition properties may vary depending on the constituent elements of $PM_{2.5}$. Therefore, use of deposition algorithms to account for depletion in estimating ambient $PM_{2.5}$ concentrations should be done with caution and only when clear documentation and justification of the deposition parameters is provided.
3. While EPA has proposed PSD increments for $PM_{2.5}$, the increments have not been finalized yet. Until the increments are finalized, no increment analysis is required for $PM_{2.5}$. However, it should be noted that some of the recommendations presented here in relation to NAAQS modeling analyses may need to be modified for $PM_{2.5}$ increment analyses due to the differences between the forms of the NAAQS and increments. We plan to provide further clarification of these differences separately, once the increments are finalized.

This memorandum presents EPA's views on these issues concerning modeling procedures for demonstrating compliance with the $PM_{2.5}$ NAAQS. The statements in this memorandum do not bind State and local governments and the public as a matter of law. If you have any questions concerning this memorandum, please contact Tyler Fox, Leader, Air Quality Modeling Group at (919) 541-5562.

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Policies for Addressing PM2.5 Precursor Emissions

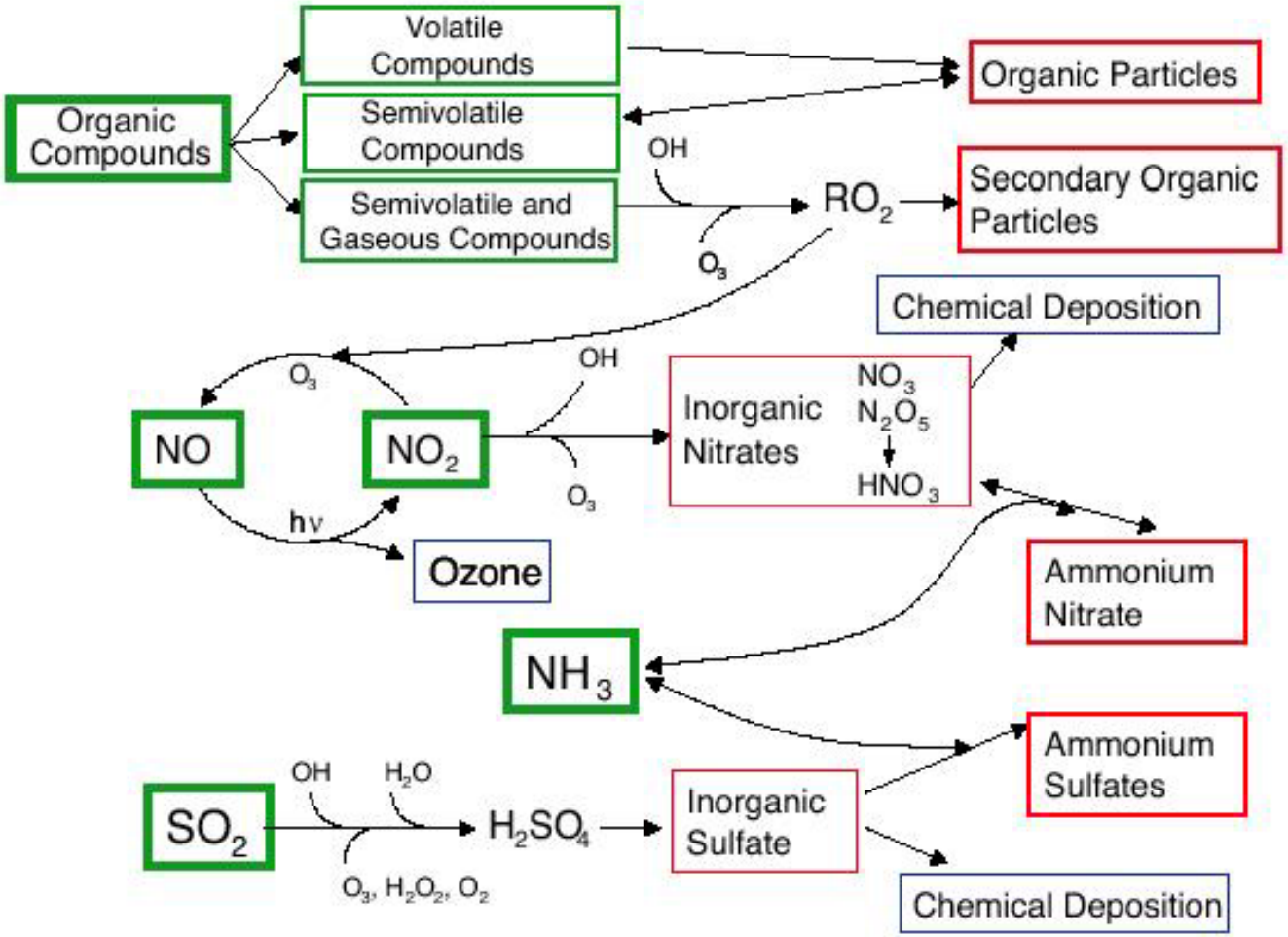
Rich Damberg
EPA Office of Air Quality Planning and Standards

June 20, 2007

Overview

- Sources of direct PM2.5 and SO2 must be evaluated for control measures in all nonattainment areas
- For a specific area, the presumptive policy for NOx, VOC, or ammonia can be reversed if the State and/or EPA provide a robust technical demonstration
- Implication: if statewide emissions of the precursor contribute significantly to PM2.5 concentrations in the area, then the state will need to evaluate sources of that precursor for reasonable control measures
  - These measures could include RACT/RACM for sources in the nonattainment area, and measures on other sources located in the state as needed for expeditious attainment

ATMOSPHERIC AEROSOL PROCESSES



Source: Particulate Matter Science for Policy Makers – A NARSTO Assessment, 2003.

Direct PM2.5 and SO2

- Sulfate and carbon are significant fractions of $PM_{2.5}$ mass in all nonattainment areas.
- Reductions in SO2 lead to net reductions in PM2.5 mass concentrations despite potential slight increases in particulate nitrate levels.
- Policy: Direct PM2.5 emissions (includes organic carbon, elemental carbon, and crustal material) and SO2 must be addressed in all areas

VOC

- The organic carbon component of ambient PM2.5 is a complex mixture of hundreds or even thousands of organic compounds.
- High molecular weight VOC condense readily when emitted to ambient air and are considered direct organic carbon particle emissions.
- The relative importance of anthropogenic and biogenic VOC in the formation of secondary organic aerosol (SOA) varies from area to area, depending upon local emissions sources, atmospheric chemistry, and season of the year.
- While significant progress has been made in understanding the role of gaseous organic material in the formation of organic PM, this relationship remains complex. SOA remains probably the least understood component of PM2.5.

VOC (cont.)

- Organic carbon typically exhibits higher mass during the summer, when photochemical SOA formation and biogenic VOC emissions are highest.
- Aromatic compounds such as toluene, xylene, and trimethyl benzene are considered to be the most significant anthropogenic SOA precursors and have been estimated to be responsible for 50 to 70 percent of total SOA in some airsheds. Man-made sources of aromatic gases include mobile sources, petrochemical manufacturing and solvents.
- Policy: States are not required to address VOC in PM2.5 implementation plans and evaluate control measures for VOC unless the State or EPA makes a technical demonstration that emissions of VOCs from sources in the State significantly contribute to PM2.5 concentrations in a given nonattainment area.

Ammonia

- Ammonia reacts with sulfuric acid and nitric acid to form ammonium sulfate and ammonium nitrate. Ammonium sulfate formation is preferential under most conditions, though ammonium nitrate is favored by low temperature and high humidity.
- Emission inventories of ammonia contain uncertainties. Researchers are seeking improvements through process-based inventory approaches for animal feeding operations.
- Monitoring of ammonia gas and nitric acid is important for identifying when PM2.5 formation in an area is limited by ammonia or by nitric acid. However, there are a limited number of such monitoring sites.

Ammonia (cont.)

- Reducing ammonia emissions in some areas may increase the acidity of particles and of deposition. Increased acidity is linked to adverse ecological effects and is suspected to be linked with human health effects and with an increase in the formation of secondary organic compounds.
- In areas with high SO2 emissions, ammonia reductions may marginally reduce PM2.5 concentrations, but particle and precipitation acidity may increase.
- After substantial SO2 reductions in the east, in general PM2.5 changes are predicted to be less responsive to reductions in ammonia than to reductions in nitric acid.
- Policy: A State is not required to address ammonia in its attainment plan or evaluate sources of ammonia emissions for reduction measures unless the State or EPA makes a technical demonstration that emissions of ammonia from sources in the State significantly contribute to PM2.5 concentrations in a given nonattainment area.

NOx

- Nitrate continuously transfers between the gas and the condensed phases through condensation and evaporation processes in the atmosphere.
- The formation of aerosol ammonium nitrate is favored by the availability of ammonia, low temperatures, and high relative humidity.
- Because ammonium nitrate is semivolatile and not stable in higher temperatures, nitrate levels are typically lower in the summer months and higher in the winter months.
  - Similarly, PM2.5 concentrations typically will respond most effectively to NOx reductions in the winter.
- Under warm temperatures, Federal Reference Method monitors retain less nitrate in measured PM2.5.

NOx (cont.)

- Ammonia reacts preferentially with SO2, but in the absence of significant amounts of SO2, nitric acid will readily form ammonium nitrate (such as in many western cities).
- A decrease in NOx can reduce the oxidation process and thereby reduce sulfate formation.
- Policy: States are required to address NOx as a PM2.5 attainment plan precursor and evaluate reasonable controls for NOx in PM2.5 attainment plans, unless the State and EPA make a finding that NOx emissions from sources in the State do not significantly contribute to PM2.5 concentrations in the relevant nonattainment area.

Technical Demonstrations

- Any proposed technical demonstrations should be developed in advance of the attainment demonstration and in consultation with the EPA Regional Office
- Demonstration should consider all available scientific and technical information
- As part of the SIP, it will be subject to public review and comment under State administrative process
- If the administrative record related to development of the SIP shows that the presumption for a precursor is not technically justified for that area, the State must submit a demonstration to reverse the presumption

  [40 CFR 51.1002 (c)(5)]

Technical Demonstrations (cont.)

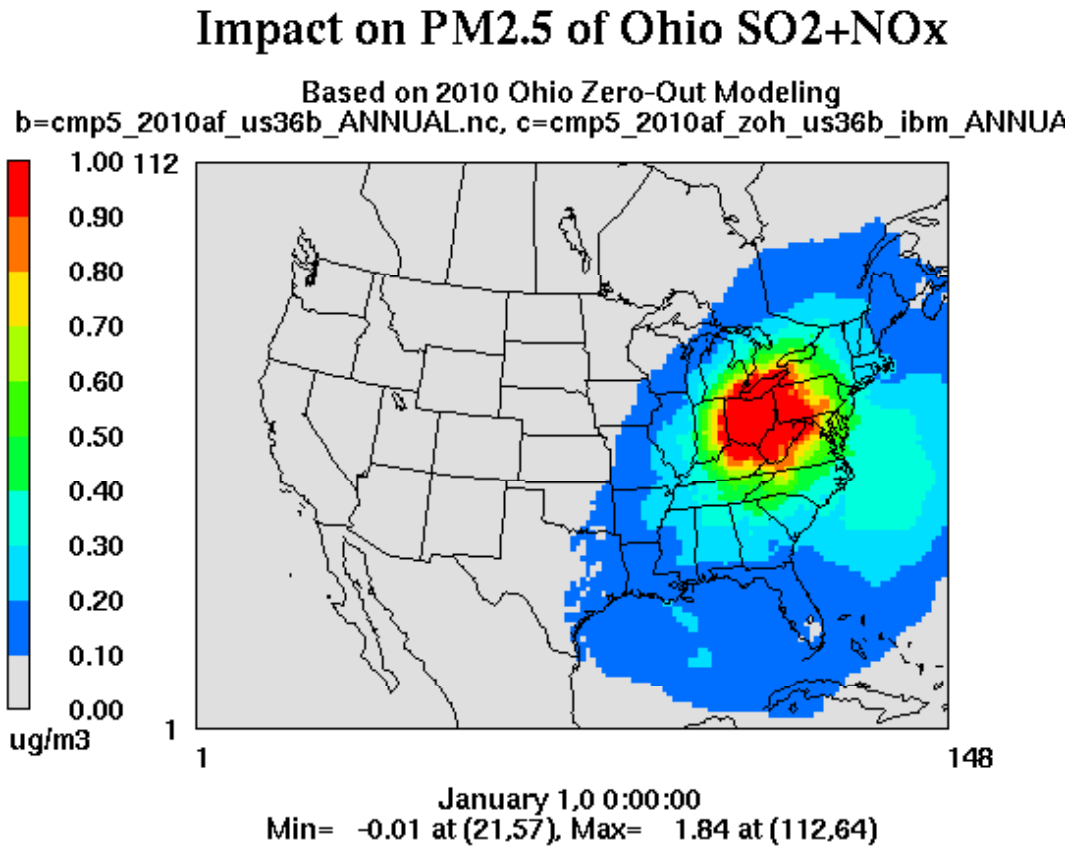
- Weight of evidence approach based on a number of technical analyses
  - Potential analyses vary by pollutant
- Demonstrations will be reviewed on case-by-case basis

Tools for Assessing Significance / Insignificance of Contribution from All Statewide Sources to Nonattainment Area PM2.5 Concentrations

- Photochemical modeling – zero-out analysis; sensitivity analysis
- Photochemical source apportionment tools (PSAT, DDM, TSSA, etc.)
  - For estimating impact of all sources
- Receptor modeling (e.g. PMF, CMB)
- Analysis of ambient monitoring data, speciation data, and trends
- Analysis of emissions inventories and trends
- Others…

Questions to Address in Technical Demonstrations

1) What is the contribution of all Statewide sources of the precursor (e.g. NOx, VOC, or ammonia) towards annual average PM2.5 concentrations in the nonattainment area?



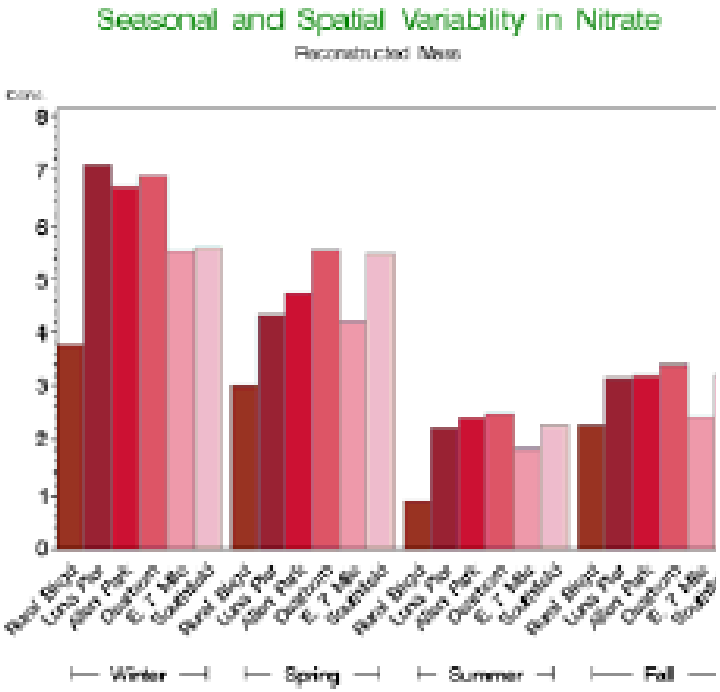
Example

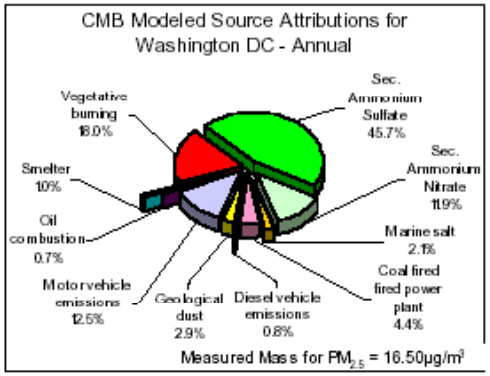
Questions to Address in Technical Demonstrations (cont.)

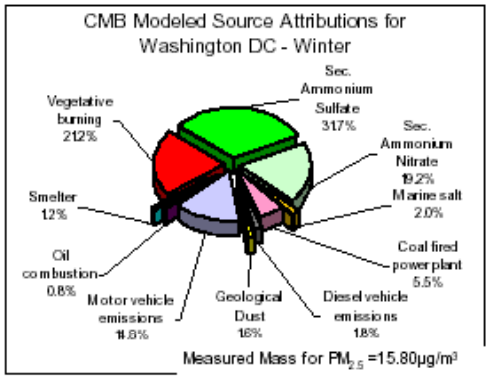
2) Do contributions from the precursor to PM2.5 vary by season?

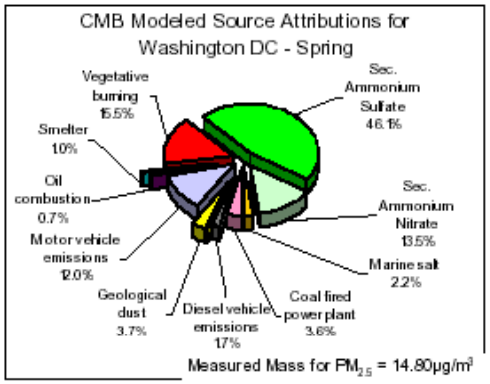
   - If so, are the contributions small in one or more seasons, but possibly significant in other seasons?

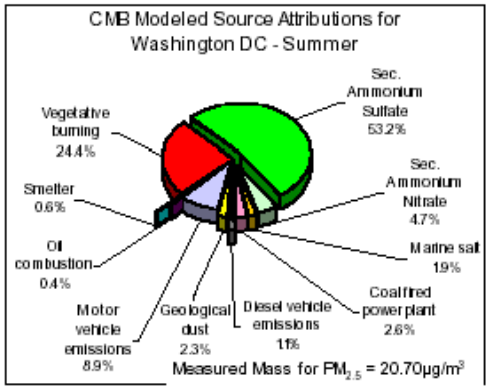
   - Is the precursor a key contributor to high concentrations on individual days?











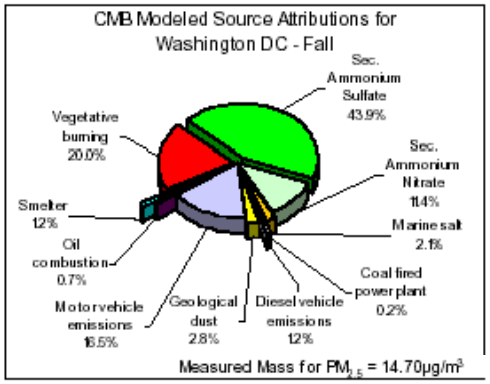
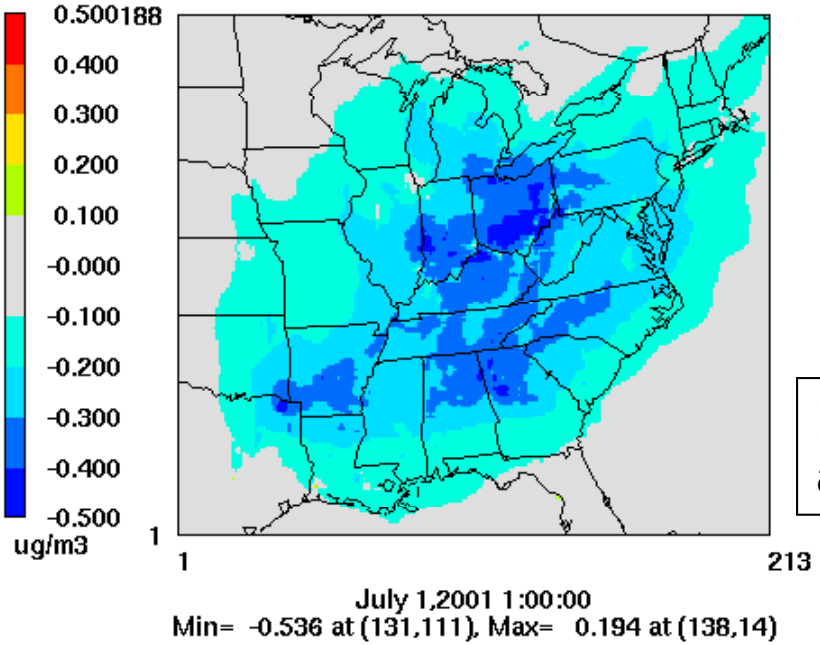


Figure 6.6-5 CMB modeled source attributions for mean annual and seasonal data subsets from Washington DC

Source: "Source Apportionment Analysis of Air Quality Monitoring Data: Phase II," prepared by Desert Research Institute, March 2005, for the Mid-Atlantic/Northeast Visibility Union And Midwest Regional Planning Organization

Questions to Address in Technical Demonstrations (cont.)

3) Do reductions or increases in the precursor affect the concentrations of other PM2.5 species? If so, what is the individual impact on each PM2.5 species?
   - Effect of ammonia reductions on atmospheric acidity
   - Effect of NOx reductions on sulfate and SOA
   - Effect of anthropogenic VOC reductions on SOA, sulfate, and nitrate



Impact on Sulfate Concentrations from a Domainwide 50% NOx reduction

Questions to Address in Technical Demonstrations (cont.)

4) Does ambient monitoring support the conclusions?

   - Are there available monitoring data to determine whether an area is ammonia-limited or nitric acid limited?

Questions to Address in Technical Demonstrations (cont.)

5) Are there uncertainties in the emissions inventories that might lead to inconclusive findings regarding significance/insignificance of a precursor?

6) Do the uncertainties in the air quality models lead to inconclusive findings regarding significance/insignificance of a precursor?

North Slope Particulate Summary

Damiana, Thomas to: Herman Wong 08/26/2009 08:53 AM
Cc: "Thomas, Brad C"

History: This message has been replied to and forwarded.

Herman,

Here is the summary of particulate concentrations measured by the ConocoPhillips particulate monitoring network so far this year:

North Slope Particulate Data Summary

- Wainwright March 6 through August 23, 2009
- Nuiqsut, Alaska July 21 through August 23, 2009

	Wainwright		Nuiqsut	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
Number of Valid Values	149	158	34	32
Average of all Valid Values	17	3	17	10
Maximum	114	14	96	89
Minimum	-2	-3	-1	3
Number of Values > 3 $\mu g/m^3$	NA	80	NA	31
Average of Values > 3 $\mu g/m^3$	NA	5.2	NA	10
No. of Values > 3 $\mu g/m^3$ (1 in 3 day)	NA	26	NA	11
Avg. of Values > 3 $\mu g/m^3$ (1 in 3 day)	NA	5.3	NA	9.1

The spreadsheet of raw values is attached to this email incase there are some numbers that you would like to see that I have not calculated.

As we discussed on the phone, there has been an increase in particulate concentrations measured during July and August as the temperatures have increased, and the disturbed areas have dried out. I have not done a thorough analysis yet, but I am sure that all of the elevated concentrations that we have measured at both Nuiqsut and Wainwright are the result of windblown fugitive dust. For me, at Nuiqsut it was odd to see PM2.5 concentrations nearly equal to the PM10 concentrations during the strongest of these events (see the maximum concentration shown above for Nuiqsut) – it suggests that the fugitive dust is concentrated in the smaller size fractions, which is entirely anticipated. However, we know that the dust in Nuiqsut, unlike the dust in Wainwright, is from silt deposits along the river banks adjacent to the station, so maybe the small size fractions make sense. These fugitive dust impacts are going to present a problem for us when modeling just as the PM10 impacts do since we are seeing maximum 24-hr PM2.5 impacts over the NAAQS. I think the Wainwright concentrations show a much more typical relationship between PM2.5 and PM10, and that is likely because the source is nearby roadways.

I also wanted to reiterate my experience with collocated PM10 monitoring in the early days of the Nuiqsut project. In about 2000, we conducted 2-years of collocated FEM/FRM particulate monitoring in Nuiqsut on a 1 in 3 day sampling schedule. During that entire time, I only recall two sample pairs that were above 20 micrograms per cubic meter, which at the time was the threshold for making valid precision comparisons. In the end, the collocated sampling was not successful in establishing precision; however, the data did convince the State of Alaska that the FEM was overestimating concentrations and decided that the collocated program was no longer necessary.

Hope this analysis helps you understand the concentrations we are measuring, and please give me a shout if you would like to discuss the analysis.

Tom

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North Slope Particulate Summary.xls