

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON**

**SUPPLEMENTAL RESPONSE TO COMMENTS
FOR
OUTER CONTINENTAL SHELF
PREVENTION OF SIGNIFICANT DETERIORATION PERMITS
NOBLE DISCOVERER DRILLSHIP**

**SHELL OFFSHORE INC.
BEAUFORT SEA EXPLORATION DRILLING PROGRAM
PERMIT NO. R10OCS/PSD-AK-2010-01**

**SHELL GULF OF MEXICO INC.
CHUKCHI SEA EXPLORATION DRILLING PROGRAM
PERMIT NO. R10OCS/PSD-AK-09-01**

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Abbreviations and Acronyms

ADEC	Alaska Department of Environmental Conservation
BACT	Best Available Control Technology
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
CAA	Clean Air Act
CBD	Center for Biological Diversity
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
COA	Corresponding Onshore Area
Discoverer	Noble Discoverer Drillship
EAB	Environmental Appeals Board
EPA	United States Environmental Protection Agency
Fed. Reg.	Federal Register
GHG or GHGs	Greenhouse Gas or Greenhouse Gases
ICAS	Iñupiat Community of the Arctic Slope
km	Kilometers
kW-h	KiloWatt Hours
µg/m ³	Microgram per Cubic Meter
MLC	Mud Line Cellar
MMS	Minerals Management Service
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NSB	North Slope Borough
OCD	Offshore and Coastal Dispersion
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OxyCat	Oxidation Catalyst
PM	Particulate Matter
PM _{2.5}	PM with an Aerodynamic Diameter less than 2.5 Microns
PM ₁₀	PM with an Aerodynamic Diameter less than 10 Microns
ppm	Parts Per Million

PTE.....	Potential to Emit
PDF.....	Portable Document Format
PSD	Prevention of Significant Deterioration
QAPP.....	Quality Assurance Project Plan
REDOIL	Resisting Environmental Destruction on Indigenous Lands
SCR	Selective Catalytic Reduction
Shell.....	Shell Offshore Inc. and Shell Gulf of Mexico Inc.
SIL	Significant Impact Level
SO ₂	Sulfur Dioxide
tpy.....	Tons per Year
VOC	Volatile Organic Compound

I. INTRODUCTION

On March 31, 2010, pursuant to Clean Air Act (CAA) section 328, 42, USC § 7627, the Environmental Protection Agency (EPA) Region 10 (Region 10) issued an Outer Continental Shelf (OCS) Prevention of Significant Deterioration (PSD) Permit to Construct, Permit Number R10OCS/PSD-AK-09-01 (2010 Chukchi Permit), to Shell Gulf of Mexico, Inc. (SGOMI) for operations in the Chukchi Sea. On April 9, 2010, Region 10 issued another OCS PSD Permit to Construct, Permit Number R10OCS/PSD-AK-2010-01 (2010 Beaufort Permit), to Shell Offshore, Inc. (SOI) to authorize operations in the Beaufort Sea.

The 2010 Chukchi and Beaufort Permits (2010 Permits) authorized SGOMI and SOI (collectively, “Shell”) to conduct air pollutant emitting activities for the purpose of oil exploration with the Frontier Discoverer drillship (Discoverer)¹ on lease blocks in the Chukchi and Beaufort Seas off the North Slope of Alaska as authorized by the United States Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE).² Both 2010 Permits provided for the use of an associated fleet of support ships (Associated Fleet), such as icebreakers, oil spill response (OSR) vessels, and a supply ship, in addition to the Discoverer.

Following petitions for review to the Environmental Appeals Board (EAB or Board), the Board remanded the 2010 Permits back to Region 10 for further consideration of several specific issues, including the determination of when the Discoverer is an “OCS source,” Region 10’s environmental justice analysis, and Region 10’s decision not to require modeling of the formation of secondary PM_{2.5} as part of the source impact analysis. See Shell Gulf of Mexico, Inc and Shell Offshore, Inc., Frontier Discoverer Drilling Units, OCS Appeal Nos. 10-01 through 10-04, Order Denying Review in Part and Remanding Permits, dated December 30, 2010 (Remand Order I), Order on Motions for Reconsideration and/Or Clarification dated February 10, 2011 (Clarification Order), and Order on Four Additional Issues dated March 14, 2011 (Remand Order II).³

Following receipt of additional information from Shell to address the remand issues and further analysis by Region 10, Region 10 published notice of the issuance of revised draft OCS/PSD permits on July 6, 2011 (2011 Revised Draft Permits). The 2011 Revised

¹ The Frontier Discoverer has since been renamed “The Noble Discoverer” and will be referred to in this document simply as “the Discoverer.”

² The Secretary of the U.S. Department of the Interior (DOI) regulates and manages the development of mineral resources on the OCS. See 43 U.S.C. § 1334 (authorizing Secretary to administer leasing on the OCS). In particular, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) is responsible for overseeing the safe and environmentally responsible development of energy and mineral resources on the OCS. BOEMRE was established as a result of Secretarial Order 3302, signed on June 18, 2010, by the Secretary of the Interior. Secretary of the Interior, U.S. Department of the Interior, Secretarial Order No. 3302, *Change of the Name of the MMS to the Bureau of Ocean Energy Management, Regulation and Enforcement* (June 18, 2010), available at http://elips.doi.gov/app_so/index.cfm?fuseaction=chroList/.

³ The orders will be collectively referred to as the “EAB Orders.”

Draft Permits addressed the Board's remand orders along with other changes requested by Shell. An informational meeting and public hearing were held in Barrow, Alaska on August 4, 2010, and the public comment period ran through August 5, 2011.

Region 10 received written comments on the draft permits from Shell (the applicant); the Alaska Eskimo Whaling Commission, the Iñupiat Community of the Arctic Slope, and the North Slope Borough in a combined comment letter (collectively, the "North Slope commenters"); the Northwest Arctic Borough; Alaska Wilderness League, Audubon Alaska, Center for Biological Diversity, Defenders of Wildlife, Greenpeace, EarthJustice, National Wildlife Federation, Native Village of Point Hope, Natural Resources Defense Council, Northern Alaska Environmental Center, Ocean Conservancy, Oceana, Pacific Environment, Resisting Environmental Destruction on Indigenous Lands (REDOIL), Sierra Club, the Wilderness Society, and World Wildlife Fund in a combined comment letter (collectively, the "Conservation commenters"); the Alaska Wilderness League (AWL) in a separate comment letter; Pacific Environment (PE) in a separate comment letter; the Native Village of Kivalina; the Alaska Department of Natural Resources (ADNR); the Alaska Oil & Gas Association (AOGA); Representative Charisse Millett in the Alaska Legislature; and other individual commenters. The individual commenters included more than 14,500 identical or similar comments resulting from a campaign sponsored by environmental organizations.

In addition to receiving written comments, Region 10 received numerous comments on these draft permit decisions as oral testimony during the public hearings held in Barrow, Alaska on August 4, 2011. This testimony was transcribed and has been included in the permit record.

This Supplemental Response to Comments document summarizes the written and oral comments received by Region 10 regarding these draft permit decisions. After Region 10's careful review and consideration, responses to these comments are presented below. Comments have been condensed and similar comments have been combined for purposes of this document. Complete copies of all comments are in the administrative record for these permits.

Note that, in accordance with the EAB Orders, any appeals of the 2011 Revised Draft Permits to the Board are limited to issues addressed by the Region in the 2011 Revised Draft Permits and to issues otherwise raised in the petitions on the 2010 Permits before the Board in this proceeding but not addressed by the Region in the 2011 Revised Draft Permits. No new issues may be raised that could have been raised but were not raised in appeals of the 2010 Permits. Remand Order I, at 82. Thus, comments that raised concerns that are unrelated to the conditions of the 2011 Revised Draft Permits that were proposed for revision in this proceeding and the information and analysis supporting those changes, as well as issues raised in petitions on the 2010 Permits but not addressed in the 2011 Revised Draft Permits or analyses, are beyond the scope of these remand proceedings. Accordingly, Region 10 need not address them in this Supplemental Response to Comments document.

RESPONSE TO COMMENTS

A. CATEGORY – COMMENTS OF GENERAL SUPPORT

Comment A.1: Several commenters expressed general support for issuance of the permits and urged Region 10 to issue the permits without further delay. The commenters, several of whom submitted identical or similar form comments, stated that other countries are moving ahead to develop arctic resources and expressed concern that the United States was behind in these efforts. Some commenters support private sector-led energy development to the fullest extent possible and assert the benefits of such development to Alaska and Alaska's rural communities. The commenters also cite to a study titled, Potential National-Level Benefits of Alaska OCS Development by Northern Economics and Institute of Social and Economic Research, University of Alaska Anchorage, which projects that drilling on Alaska's OCS could make Alaska the eighth largest oil resource province in the world. Some commenters note that emissions under the 2011 Revised Draft Permits have been reduced substantially in comparison to the 2010 Permits, as well as the time and money Shell has spent applying for the permits. Commenters also stated their view that all of the EAB's concerns had been addressed, that the permits include additional operational restrictions which strengthen environmental protections, and are supported by a demonstration that Shell's operations will not have disproportionately high or adverse human health or environmental effects on minority or low income populations on the North Slope.

Response: Region 10 is proceeding with issuance of the final permits based on Region 10's determination that all Clean Air Act requirements will be met. Region 10 understands that some individuals support this project due to the expected benefits to the economy and the potential for additional oil and gas resources. Region 10 notes, however, that the potential for economic benefits to Alaska or the United States does not affect the standards for issuing these permits.

We also note that Shell needs a number of other regulatory approvals before it is authorized to engage in exploration operations in the Chukchi and Beaufort Seas. These include approvals of Exploration Plans (for the Chukchi Sea) from BOEMRE, Applications for Permits to Drill from BOEMRE, Marine Mammal Protection Act authorization from the National Marine Fisheries Service and the U.S. Fish and Wildlife Service and a corresponding Endangered Species Act Incidental Take Statement, as well as other approvals. See, e.g., Letter from Jeff Walker, BOEMRE, to Susan Childs, Shell, re: 2012 Revised Camden Bay Exploration Plan, dated August 4, 2011.

B. CATEGORY – COMMENTS RECOGNIZING IMPROVEMENTS TO PERMITS

Comment B.1: Some commenters acknowledged that the revised permits offer some limited improvements over previous permits for these same activities, such as the required use of selective catalytic reduction (SCR) and oxidation catalyst (OxyCat) pollution controls on Ice breaker #1's main propulsion engines and generators and the

revised determination of when the Discoverer becomes an OCS source. Some commenters also acknowledged that Shell has come a long way in learning how to work with local communities and whalers in the area and working to plan their activities so they do not interfere with subsistence activities. These commenters also stated, however, that additional improvements to the permits are needed to meet Clean Air Act requirements and that Region 10 should use its full authority under the Clean Air Act to sustain overall air quality in this area.

Response: Region 10 appreciates the acknowledgment of improvements. Specific concerns raised by the commenters are addressed in the remainder of this Supplemental Response to Comments document.

C. CATEGORY – COMMENTS OF GENERAL OPPOSITION

Comment C.1: Region 10 received over 14,500 identical and similar comments generally opposing issuance of these permits. The commenters ask Region 10 to adopt the strongest and most protective standards for these and other drillship air permits and to permit the proposed emissions only when their impact to the health and welfare of North Slope residents is minimized to the greatest extent possible. The commenters state that air emissions from large scale and long term oil and gas activities in the Arctic Seas, including drillships and icebreakers, result in a large amount of air pollution that puts workers and nearby communities at risk and accelerates already rapid climate change in the region. The commenters encourage EPA and other federal agencies to consider the impacts of oil and gas development on the ecosystem of the Arctic Ocean because they believe there is a lack of sufficient scientific data that demonstrate oil development in this remote area is safe. The commenters are concerned that an oil spill in these waters would be catastrophic for endangered and threatened species and would devastate nearby subsistence communities, and assert that no technology currently exists that safely and effectively contains and cleans up oil spilled in icy waters. Many of these commenters point to the oil spill in the Gulf of Mexico in 2010 as evidence of the risk of offshore drilling and assert that the risks of drilling in the Arctic are even higher than the risks of drilling offshore in the Gulf of Mexico. The commenters encourage Region 10 to consider the cumulative impacts of this and other dangers prior to moving forward with oil drilling in the Arctic Ocean.

Response: As an initial matter, it is important to note that issuance of these Clean Air Act permits does not provide Shell authorization to drill on the OCS. Rather, issuance of these permits authorizes air emissions from Shell's operations and requires compliance with air quality regulations and permits terms and conditions when and if drilling commences. BOEMRE is the federal agency that provides authorization to drill. See also response to comment A.1.

After thorough review and careful consideration of the comments requesting that the permits be denied, Region 10 is proceeding to issue the revised Clean Air Act permits. The permits comply with the requirements of CAA § 328 (governing air pollution from OCS sources), EPA's OCS regulations at 40 CFR Part 55 (OCS regulations), and the

PSD regulations at 40 CFR § 52.21 (PSD regulations). As discussed in more detail in the response to comments for Categories R through AA, Section 5 of the Supplemental Statement of Basis for the 2011 Revised Draft Permits, Section 5 of the Statements of Basis for the 2010 Permits, and the Region 10 Technical Analysis,⁴ Region 10 has conducted an extensive analysis of the air quality impacts of the projects and has determined that the permits will not cause or contribute to a violation of currently applicable NAAQS or PSD increments. Comments and concerns with noise and the possibility of oil spills are outside the scope of the Clean Air Act OCS and PSD programs.

Comment C.2: One commenter asked that Region 10 not allow drilling of any kind in the Arctic National Wildlife Refuge.

Response: These permits authorize the air emissions associated with Shell's exploratory operations on the OCS and not in the Arctic National Wildlife Refuge. See page 10 of the 2010 Chukchi Statement of Basis and page 12 of the 2010 Beaufort Statement of Basis for the locations of the activities authorized under these permits.

D. CATEGORY – GENERAL COMMENTS OF QUALIFIED SUPPORT

Comment D.1: One commenter states that the 2011 Revised Draft Permit for the Chukchi Sea is too onerous and that the quality of the air environment will not be measurably altered by Shell's proposed drilling program or by the accumulative effect of numerous other exploratory events. The commenter continues that global warming is a challenging yet welcome event to the Arctic and that the most significant air quality problems in the area are due to forest fires on Russian taigas. The commenter asks Region 10 to approve the permit without requiring any further reductions in emissions.

Response: As discussed in the response to comment C.1, Region 10 believes that the Chukchi permit is consistent with Clean Air Act requirements and is therefore proceeding with issuance of the final permits.

E. CATEGORY – PUBLIC COMMENT PROCESS

Comment E.1: Commenters state that the 30-day public comment period provided for the 2011 Revised Draft Permits is inadequate and note that the Region also specifically requested comment on a new modeling algorithm used to predict air pollutant concentrations.

Response: Region 10 takes seriously its responsibility to ensure that the public has a meaningful opportunity to participate in permitting decisions. The Region understands

⁴ Technical Support Document: Review of Shell's Supplemental Ambient Air Quality Impact Analysis for the Discoverer OCS Permit Applications in the Beaufort and Chukchi Seas, dated June 24, 2011 (Region 10 Technical Analysis).

that the North Slope commenters and other members of the public have a significant interest in the 2011 Revised Draft Permits and has taken affirmative steps to engage the public and to provide opportunities for public input. In June 2011, the Region held three separate informational meetings in Barrow and Kaktovik, Alaska to describe the draft air permits and the upcoming public participation period so the communities would know what to expect. The Region also invited the North Slope Borough and Inupiat Community of the Arctic Slope to participate in government-to-government consultation on the 2011 Revised Draft Permits in letters dated June 7, 2011. Finally, the Region held an informational meeting and a public hearing on the permits and the modeling algorithms on August 4, 2011 in Barrow, Alaska.

The 30-day public comment period provided for the 2011 Revised Draft Permits and the modeling algorithms complies with the applicable public participation requirements for OCS/PSD permits at 40 CFR § 124.10(b). When Region 10 first issued the draft permits in 2009 and 2010, it provided initial public comment periods of 60 days for the Chukchi Sea draft permit and 35 days for the Beaufort Sea draft permit. A subsequent 40-day period was provided for comment on revisions made to the draft Chukchi permit in response to comments received during the initial comment period. The 30-day public comment period for the 2011 Revised Draft Permits was not intended to reopen public comment on the entirety of the 2011 Revised Draft Permits, but to solicit public comment on the issues addressed by the EAB, the issues otherwise raised in the 2010 Permit petitions but not addressed in issuance of these revised permits, the revised aspects of the permits, and the new modeling algorithms. See Remand Order I at 82 (review of the remanded permits "...shall be limited to issues addressed by the Region on remand and to issues otherwise raised in the petitions before the Board.").

In light of the prior public comment periods and the fact that comment on the 2011 Revised Draft Permits was limited in scope, Region 10 determined that a 30-day comment period was appropriate. During this 30-day period Region 10 received more than 14,000 public comments. Although a majority of these comments contain general statements of support or opposition, the Region received a number of substantive comments on, among other issues, the definition of OCS source: monitoring, compliance and enforcement: choice of model: modeling data: the air quality analysis: and the environmental justice analysis. The volume of comments received and the substantive issues raised by commenters on the technically and legally complex components of the permits and modeling algorithms support the Region's determination that the 30-day period provided adequate time for the public to provide informed and meaningful comment on the 2011 Revised Draft Permits. The commenters have not demonstrated that a period of more than 30 days is necessary to give commenters a reasonable opportunity to comment. See 40 CFR § 124.13.

See also response to comment E.2.

Comment E.2: Commenters reference the fact that the 30-day comment period for the 2011 Revised Draft Permits partially overlaps with the comment periods for draft air permits for Shell to operate the Kulluk drillship in the Beaufort Sea and for

ConocoPhillips to operate a jackup drill rig in the Chukchi Sea. The commenters calculate that Region 10 has provided a total of 60 calendar days for stakeholders to review four technically and legally complex air permits, and contend that such a schedule effectively limits stakeholders to 15 days to review each permit. The commenters also make reference to regulatory measures undertaken by other federal agencies and cite to three public comment periods conducted by the BOEMRE that concluded in July 2011.

More specifically, the North Slope commenters refer to a letter dated June 15, 2011, in which they requested that Region 10 provide a minimum of 45 days to comment on each of the four air permits, with no overlap in the comment periods. The June letter stated that the volume of information associated with each permit would make it impossible to provide meaningful written comments or otherwise adequately participate in the public process. The commenters note that in a letter dated July 21, 2011, Region 10 denied the North Slope commenters' request, stating that the Region must adhere to its original schedule with overlap in comment periods "in order to fulfill our responsibility for issuing timely permits" and because "a short delay in permit issuance can result in a long delay in exploration" because of the short drilling season. The commenters assert that the Region's response was not satisfactory and does not reflect the degree of importance that the Clean Air Act and its implementing regulations, or the EAB, place on adequate opportunity for informed and meaningful public involvement. As an example, the commenters state that a number of modeling experts contacted by the commenters said it would be very difficult, if not impossible, to produce a comprehensive analysis of the model in the comment period provided. The commenters contend that the opportunity to meet with Region 10 permitting officials, while appreciated, should not compress the time required to review voluminous material and does not substitute for an independent review of the new modeling algorithms and model performance evaluation. The commenters also state that the operating season should not drive how quickly Region 10 reviews permit applications and notes that the applicants submitted some application material just before the permits were proposed. According to the commenters, Region 10 is ignoring the complexity of each permit and their obvious differences by providing for simultaneous review.

Response: Region 10 understands that the commenters would like additional time for public participation in each of these permitting actions. The public comment period for each of the draft air permits referenced by the commenters, however, is 30 days or more and complies with applicable public participation requirements. See 40 CFR §§ 124.10(b) and 71.11(d)(2). In fact, the minor source permit for the Shell Kulluk referenced by the commenters is subject to a 46-day comment period, and the minor source permit for ConocoPhillips is subject to a 60-day comment period, both of which are more than the 30 days required by 40 CFR §§ 124.10(b) and 71.11(d)(2).

Although the Region denied the North Slope commenters' request to hold non-overlapping 45-day comment periods for each draft air permit in a letter dated July 21, 2011, Region 10 has subsequently extended the comment period on the ConocoPhillips draft permit for an additional two weeks. This responds to the fact, noted by the

commenters, that ConocoPhillips is not intending to begin operations until July 2013 and addresses to some extent the commenters' concern about overlapping comment periods.

As explained in response to comment E.1, the Region determined that a 30-day comment period for the 2011 Revised Draft Permits was appropriate due to the fact that comments Region 10 is obligated to consider and may be raised in any new appeal are limited to the issues raised in the 2010 permit petitions, the revised aspects of the permits, and the new algorithms. See Remand Order I at 82. To facilitate public comment, the Region made available a redline-strikeout version of the 2011 Revised Draft Permits so commenters could easily identify the specific changes made to the original 2010 Permits. The Supplemental Statement of Basis for the 2011 Revised Draft Permits also includes a section devoted exclusively to explaining the key revisions to the permits. See Supplemental Statement of Basis, Section 1.4 (Key Changes in 2011 Revised Draft Permits).

To ensure the public had access to relevant information to allow for informed participation, the Region provided on its website the 2011 Revised Draft Permits, Supplemental Statement of Basis, Supplemental Ambient Air Quality Impact Analysis (referred to as the Region 10 Technical Analysis), Supplemental Environmental Justice Analysis, permit application documents, and a redline-strikeout version for the public to easily identify the revisions to the permits. In addition, documents that will be contained in the administrative records were burned onto compact discs and provided to a number of commenters who requested the documents.

The Region also notes that the 2011 Revised Draft Permits cover air emissions from the same drillship, the Discoverer, operating in two different seas. As a result, the permits are identical in many respects. For example, the determination of when the Discoverer becomes an OCS source, the owner requested limits, and ambient air boundary are identical in both permits, and provisions addressing monitoring, reporting, and enforcement are also identical in both permits except to the extent operations in the Beaufort are also subject to COA requirements and include three additional vessels. The same model and algorithms were used for both permits, but different background and meteorological data were relied on to account for geographical differences in the permits. Due to the similarity of the 2011 Revised Draft Permits, the Region prepared a single Supplemental Statement of Basis, Region 10 Technical Analysis, and Supplemental Environmental Justice Analysis for both permits.

The Region agrees with the commenters that some aspects of the 2011 Revised Draft Permits are technically and legally complex, which is often the case with PSD permits. The comments submitted, however, demonstrate that the public was able to review, evaluate, and comment on many of the complex issues during the comment period provided. That the North Slope commenters were unable to find a modeling expert to assist with the timely submission of comments does not mean that the public comment period was inadequate. In fact, the Region received substantive comments on a number of modeling issues. The public was informed that modeling data files were available for review upon request, and one commenter requested these files, which were promptly

made available for review through a file transfer site established by the Region. The Region also notes that the North Slope commenters were informed of the upcoming public comment period for the 2011 Revised Draft Permits during the informational meetings held on June 15 – 17, 2011, three weeks prior to the start of the comment period.

The Region understands that the commenters believe the differences between the ConocoPhillips and Shell Kulluk minor source permits support holding non-overlapping public comment periods. The response to the commenters' request to extend the ConocoPhillips and Shell Kulluk comment periods will be addressed separately in the response to comments for those permits. As discussed above, however, Region 10 has extended the comment period on the ConocoPhillips' permit by two weeks.

Comment E.3: The commenters state that public participation is at the core of the PSD program and cite to Section 160(5) of the CAA, which provides that one of the purposes of Part C, Title I of the Act is “to assure that any decision to permit increased air pollution...is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for *informed* public participation in the decisionmaking process” (emphasis in comments). The commenters note that the CAA regulations carry through with this articulated purpose, identifying 30 days as the minimum period for public comment on an individual draft PSD permit. The commenters continue that the EAB has repeatedly emphasized the importance of adequate opportunity for informed public participation and has referred to the Section 160 of the CAA as a “statutory directive” with a “central role” in PSD permitting. As support for these EAB statements the commenters cite to *In re: Russell City Energy Center*, 14 E.A.D. ___ (EAB Jul. 29, 2008), *In re: Rockgen Energy Center*, 8 E.A.D. 536 (EAB Aug. 25, 1999), and *In re Atochem N. Am.*, 3 E.A.D. 498 (EAB Jan. 24, 1991). The commenters also state that the EAB has specifically identified four-month comment period extensions for PSD permits as appropriate, citing again to *Russell City Energy Center*, and list a number of factors to support a finding of inadequate opportunity for public participation, including: technical complexity of the PSD regulations and the permit, the voluminous relevant documents, and a large number of applications being submitted in a short period of time. As support for these factors, the commenters cite to *In the Matter of Proposed Operating Permit for: Louisville Gas & Electric*, 2006 WL 6676160, Permit No. V-02-043 Revision 2 Source I.D. No. 21.223-00002 (EAB March 2, 2006). The commenters also cite to *In the Matter of Proposed Operating Permit for Louisville Gas & Electric* for support that the EAB has also noted that Administrator may not approve a final permit if public access to relevant information forecloses meaningful assessment of the issues and prevents the public from making meaningful substantive comments.

Response: The Region agrees with the commenters and the EAB that public participation plays a “central role” in PSD permitting and that Section 160(5) provides a “statutory directive” to foster effective public participation. However, the three cases cited by the commenters to support this position are clearly distinguishable from the present permitting process. The EAB remanded the PSD permit at issue in *Russell City*

Energy Center because the local air permitting authority failed to provide adequate notice of the issuance of the draft permit and opportunity to comment as required by 40 CFR § 124.10. 14 E.A.D. ____, at Slip Op. p. 27.⁵ In *Rockgen Energy Center* the EAB remanded the permit because the record did not establish that the state permitting authority considered public comments before issuing the permit. The EAB found persuasive the fact that the state failed to issue a complete response to comments when it made its final permitting decision as required by 40 CFR § 124.17(a). 8 E.A.D. at 557. The PSD permit in *Atochem N. Am.* was remanded because EPA only responded to one of two sets of comments submitted by the permittee and therefore did not comply with 40 CFR § 124.17(a)(2) which requires a permitting authority to respond to all significant comments. 3 E.A.D. at 498. In each case cited by the commenters, the reason for remand was the permitting authority's failure to comply with the applicable public participation requirements for PSD permits in 40 CFR Part 124. In proposing the 2011 Revised Draft Permits, the Region has complied with all applicable Part 124 public participation requirements. These requirements implement the statutory directive to foster public participation and to ensure that public participation plays a central role in PSD permitting.

Region 10 is unaware of any EAB or federal court decision that has adopted or applied the factors listed by the commenters for finding public participation inadequate. The commenters cite to *In the Matter of Proposed Operating Permit for Louisville Gas & Electric* and reference this citation as an EAB decision. Instead, it is a petition filed by members of the public requesting that the EPA Administrator object to the issuance of a Title V permit.

For permitting actions that require public participation, the Region agrees that the public needs access to relevant information to provide meaningful substantive comments. As already noted, Region 10 took several measures in addition to meeting regulatory requirements to ensure the public had access to relevant information as quickly as possible during the public comment period. See response to comments E.1 and E.2.

Comment E.4: A commenter asked why Region 10 did not hold public meetings and hearings in more villages and locations on the North Slope.

Response: As discussed above in response to comments E.1 and E.2, Region 10 has taken a number of affirmative steps since 2009 to engage the public and to provide opportunities for public input throughout the process for issuing these permits, including in connection with the proposal of the 2011 Revised Draft Permits. It is challenging to select an appropriate location or locations for hearings where, as in this case, permits are of interest to people that are dispersed over a broad geographic area. The procedural

⁵ The Region disagrees with the commenters' citation to in *Russell City Energy Center* as support for the EAB specifically identifying a four month extension to the public comment period as appropriate. The local permitting authority in *Russell* provided a 30-day comment period. The EAB did not take issue with the length of the comment period, but remanded the permit because it "fell significantly short" of the Part 124 notice requirements. 14 E.A.D. ____, Slip Op. at 38.

rules governing issuance of these permits do not require, if a hearing is held, that a hearing be held in more than one location. In this case, Region 10 determined that Barrow was the most appropriate location for the hearing, as an important center for the North Slope communities and as a reasonably proximate village to both the Chukchi and Beaufort Seas, as well as good infrastructure to hold and broadcast the hearing. Barrow is the economic, transportation, and administrative center for the North Slope Borough, and the largest city on the North Slope of Alaska. Entities such as the Iñupiat Community of the Arctic Slope and the Arctic Slope Regional Corporation have offices in Barrow, and members of the Alaska Eskimo Whaling Commission come from Barrow, as well as from other villages. To increase the opportunity for participation in the informational meeting and hearing, Region 10 made arrangements for North Slope communities outside of Barrow to participate in the informational meeting and public hearing by teleconference at the North Slope Borough teleconference centers in the villages. Additionally, Region 10 notes that providing oral testimony at the hearing was but one way for the public to provide comments on the draft permits. The Region also provided for written and oral comments (on tape, disk or digital audio) to be submitted by mail or email.

Comment E.5: A commenter states that there are more opportunities for industry and others to be involved in this process and that profitability takes a higher standard than the communities' and people's lives and health. The commenter contends that local communities are left out of the decision-making process and their priorities are left behind. The commenter states that the local community has to constantly be aware of what is being reported and what is going to be used in the data sets for this process.

Response: Region 10 has carefully considered all comments received during the public comment process, many of which came from members and organizations of the local communities. After considering all comments, Region 10 concludes that these permits meet all applicable Clean Air Act requirements and is therefore proceeding to issue the permits. Region 10 disagrees that profitability has a higher consideration than the communities' and people's lives and health in the permit issuance process. Although a permitting authority does work with the permittee during the permit issuance process to obtain an understanding of the permittee's emission sources, operations, and processes, all timely and relevant information before the permitting authority, including information submitted by the public, is considered in determining whether the requirements for permit issuance have been met.

F. CATEGORY – DEFINITION OF OCS SOURCE

Comment F.1: Some commenters asserted that the process by which an icebreaker will set the anchors for the Discoverer before it is deemed a source undermines Region 10's finding that the Discoverer becomes an OCS source once the ship's main anchor is attached to the seabed. The commenters note that Shell has indicated that approximately 44 hours are required to set the anchors, allowing for a significant amount of emissions that are not regulated as part of the OCS source.

Response: The draft permits provide that “[t]he Discoverer is an ‘OCS Source’ at any time the Discoverer is attached to the seabed at a drill site by at least one anchor.” See 2011 Revised Draft Chukchi Permit at 13; 2011 Revised Draft Beaufort Permit at 16. According to the information provided by Shell, the 44 hours is the expected duration of the process of mooring the Discoverer to the pre-positioned anchors after the Discoverer becomes an OCS source, not the time needed for the Icebreaker/Anchor Handler to pre-set those anchors. See Mooring Process for the Nobel Discoverer Drillship, Operations Guideline, dated April 21, 2011 (Mooring Operations Guideline) at 11. Because the process of mooring the Discoverer to the pre-set anchors occurs after the ship’s anchor is set, the Discoverer will be an OCS source during all of this time.

Region 10 assumes that the commenters’ concern relates to the time during which the Icebreaker/Anchor Handler is pre-laying the anchors to which the Discoverer will later be attached. The Discoverer is not an OCS source during the time the Icebreaker/Anchor Handler is pre-laying the anchors and its emissions during this time are therefore not subject to regulation under Section 328 of the CAA and 40 CFR Part 55. See also response to Comment F.2.

Comment F.2: Some commenters disagree with Region 10’s proposal that the Discoverer be considered an OCS source only when its attachment to the seabed by an anchor occurs at a drill site. The commenters note that under section 328 of the CAA, an OCS source is any equipment, activity or facility which: 1) has the potential to emit air pollutants, 2) is regulated or authorized under OCSLA, and 3) is located on the OCS or in the waters above the OCS and specifically includes “drillship exploration.” The commenters also cite to the regulatory definition of OCS source in the case of vessels. The commenters assert that because a vessel is an OCS source when it is “temporarily” attached to the seabed, “may be used” for the purpose of exploring for oil and gas resources, and is in an area authorized by OCSLA (*i.e.* Shell’s lease blocks), the Discoverer drillship should be considered to be an OCS source whenever it drops a single anchor within Shell’s lease blocks. As support for this conclusion, the commenters cite to the EAB’s discussion of OCSLA § 4(a)(1) in Shell Remand Order I and to *Alliance to Protect Nantucket Sound, Inc. v. United States Dep’t of the Army*, 288 F. Supp. 2d 64, 75 (D. Mass. 2003). The commenters continue that, in the event Shell anchors the Discoverer within a Shell lease block while the icebreaker is dropping the anchors, then it should be considered to be an OCS source and the emissions from the icebreaker counted in the potential to emit.

Response: In the 2011 Revised Draft Permits, Region 10 proposed that the Discoverer be considered an OCS source any time it is attached to the seabed at a drill site by at least one anchor. A drill site is defined in the permits as any location at which Shell is authorized to operate under the applicable permit and for which Shell has received from BOEMRE an authorization to drill. Region 10 continues to believe this interpretation is consistent with the relevant statutes and regulations as applied to this specific permitting action.

Both EPA's regulatory definition of OCS source at 40 CFR § 55.2 and Section 4(a)(1) of the Outer Continental Shelf Lands Act (OCSLA)—which is referenced in EPA's regulatory definition of OCS source in the case of vessels—discuss more than attachment to the seabed. Both EPA's regulatory definition in the case of vessels and OCSLA § 4(a)(1) reference the additional considerations that the source be “erected” on the seabed as well as the purpose of the attachment. These additional elements in EPA's regulatory definition and the explanatory clause in OCSLA § 4(a)(1) make clear that attachment to the seabed at any location on the OCS is not sufficient to render the Discoverer an OCS source.⁶ Region 10 continues to believe that, as in OCSLA § 4(a)(1), the reference to “erected thereon” in 40 CFR § 55.2 is intended to reflect the process by which a vessel becomes situated at the location where it will be used for the purpose of exploring, developing, or producing resources from the seabed. For the activities authorized under these permits, this requires that the location of the attachment occur at a location where the Discoverer is authorized to engage in such activities, namely at a drill site for which Shell has obtained an authorization to drill for the Discoverer.

The commenters do not argue that any attachment to the seabed alone is sufficient to render the Discoverer an OCS source. Instead, the commenters argue that the Discoverer should be considered an OCS source whenever it is attached to the seabed at any location within a Shell lease block. A review of the facts underlying these permitting actions and the legal requirements for conducting exploratory operations under Shell's leases, however, demonstrates that the commenters' suggestion that the Discoverer be considered an OCS source whenever it is attached to the seabed in a Shell lease block is an overly broad approach that, if applied, could produce illogical results.

Shell's lease blocks in the Chukchi Sea comprise an area of approximately 2442 square miles, and its lease blocks in the Beaufort Sea comprise an area of approximately 1145 square miles. Under the commenter's proposed interpretation, the Discoverer could be considered an OCS source even though it was anchored some 160 miles from a location in the same sea where it had authorization from BOEMRE to drill as long as the anchor location was in a Shell lease block. In contrast, the Discoverer would not be considered an OCS source under the commenters' proposed interpretation if it was located one mile from an authorized drill site waiting to move into location at the drill site if the location at which it was anchored was not in a Shell lease block. It makes little sense to regulate the Discoverer as an OCS source when it is more than 160 miles from a location where it is authorized to engage in exploratory activities, as the commenters' approach would require, but not to regulate the Discoverer as an OCS source when it is not located on a lease block but is one mile from a location where it is authorized to engage in exploratory activities.

The fact that the Discoverer could potentially obtain authorization to drill anywhere within its lease blocks is not a compelling basis for a different result. Even at locations

⁶ Region 10 is aware that the First Circuit has held that OCSLA § 4(a)(1) is not restricted to structures related to mineral extraction. *Alliance to Protect Nantucket Sound, Inc. v. United States Dep't of the Army*, 398 F.3d 105, 107 (1st Cir. 2005). There is nothing in that case to suggest, however, that a vessel that is simply anchored anywhere on the OCS or on leases that it holds is subject to OCSLA's jurisdiction.

where Shell holds leases, Shell would need to submit and obtain BOEMRE approval of an exploration plan and an application to drill (as well as obtain other approvals) before it would be authorized to conduct exploratory operations at a particular location in its lease holdings, a process that takes a minimum of several months. In this respect, a location on the OCS where Shell holds a lease but does not have authorization to drill is more similar to a location on the OCS where Shell does not hold a lease than it is to a location where Shell is the holder of a current authorization to drill from BOEMRE: it is not authorized to engage in exploratory operations except at locations at which it holds a current authorization to drill from BOEMRE. It is not the lease rights held by a company but the authorization to drill that determines the area where a drillship may be erected and used for the purpose of exploring, developing, or producing resources from the seabed. We therefore reject the commenters' suggestion that attachment of the Discoverer to the seabed at any location in a Shell lease block is sufficient to consider the Discoverer an OCS source within the meaning of 40 CFR § 55.2.

Comment F.3: Commenters state that, for the same reasons discussed in comment F.2, if any other vessel associated with Shell's operations anchors to the seabed floor, it should be considered a source. The commenters continue that this is because the provision of OCSLA to which the regulatory definition of OCS source refers was amended in 1978 to ensure that platforms constructed outside the United States and erected on the OCS were subject to U.S. customs laws. H.R. Conf. Rep. 95-1474 at 81, reprinted in 1978 U.S.C.C.A.N. 1674, 1679. In making this amendment, the commenters assert, Congress clarified that "federal law is to be applicable to all activities on all devices in contact with the seabed for exploration, development, and production." H.R. Conf. Rep. 95-1474 at 81, reprinted in 1978 U.S.C.C.A.N. 1674, 1679.

Response: Based on the information in the permit applications, as well as the regulatory definition of OCS source in the case of vessels and the language and legislative history of the statutory definition of OCS source and OCSLA § 4(a)(1), Region 10 does not agree that the other vessels that have been identified as associated with Shell's operations in this case are themselves "OCS sources" by the mere fact that they are anchored to the seabed. The vessels at issue consist of icebreakers, supply ships, oil spill response vessels, and barges for removing drilling muds that comprise the Associated Fleet, as well as oil tankers and other support vessels associated with the Discoverer that will not be operating within 25 miles of the Discoverer when the Discoverer is an OCS source.

In promulgating the regulatory definition of OCS source in the case of vessels, EPA required that a vessel be not only attached to the seabed, but also that it be erected on the seabed and used for the purpose of exploring, developing, or producing resources from the seabed. 40 CFR § 55.2. The commenters appear to be seeking an interpretation that a vessel is "used for the purpose of exploring, developing, or producing resources" from the seabed if it supports the effort of exploring, developing, or producing resources even though it is not itself directly engaged in such activities.

Such a broad interpretation of OCS source is inconsistent with the distinction in the statutory definition of OCS source between the "OCS source" and a "vessel servicing or

associated with an OCS source.” As the EAB recognized, Section 328(a)(4)(c) maintains a distinction between support vessels and the OCS source. Remand Order I at 25 (“Specifically, without making the support vessels part of the OCS source, the statute directs that emissions from those vessels while within twenty-five miles of the OCS source “shall be considered direct emissions from the OCS source.”). In promulgating the regulatory definition of OCS source in Part 55, EPA also recognized this distinction, noting a drillship as an example of a vessel used for the purpose of exploring, developing, or producing resources and discussing that the emissions of other vessels “related to OCS activity” would be included in the “potential to emit” of the OCS source, be more appropriately regulated under Title II of the Act, and not be regulated as an OCS source unless they were attached to an OCS source. 57 Fed. Reg. 40792, 40793-94 (September 4, 1992). Region 10 believes that the term “used for the purpose of exploring, developing, or producing resources” from the seabed is best interpreted in this instance as not encompassing the support vessels at issue in these permits that are used for activities such as icebreaking, resupply, and oil response activities that are conducted in support of the Discoverer drillship.

Important policy considerations also lead Region 10 to conclude that the anchoring of a vessel that supports OCS activities but is not more directly engaged in exploration, development, or production—as is a jackup rig or drillship—is not sufficient to render the support vessel an OCS source. First, because support vessels may at times be used to support OCS activities and at other times to support other activities, it would require the agency to engage in complex decisions regarding when a vessel was sufficiently related to exploration, development, or production activity to become an OCS source upon anchoring to a seabed. Would, for example, an oil spill response vessel that had been stationed near a port in Washington State but was heading north to Alaska to provide support for a drill rig in Alaska be considered an OCS source if it anchored off the coast of Alaska to wait out a storm? Under Region 10’s interpretation, decision-making would be more straight-forward: 1) vessels that support an OCS source but are more than 25 miles from the OCS source are not regulated in any respect under CAA § 328; 2) the emissions of vessels that support OCS activity are considered emissions of the OCS source when within 25 miles of the OCS source; and 3) the stationary source activities of vessels that support OCS activity are regulated as part of the OCS source when they are themselves attached to the OCS source.

In addition, considering vessels that support OCS sources to be themselves OCS sources if they are anchored on the OCS could lead to more emissions. This is because the operators of support vessels might decide to avoid anchoring and instead use their propulsion engines to hold position if anchoring would render the vessel an OCS source within the meaning of 40 CFR § 55.2. For example, Shell’s application states that, when there is no sea ice, the icebreakers will be anchored more than 25 miles from the Discoverer in warm stack mode (anchored and occupied). See Shell, Outer Continental Shelf Pre-Construction Air Permit Application, Frontier Discoverer, Chukchi Sea Exploration Drilling Program (February 23, 2009) at 15 (February 2009 Application). A determination that the icebreakers are themselves OCS sources if they anchor to the seabed could encourage a decision in which the icebreakers continue to use their

propulsion engines to maintain position more than 25 miles of the Discoverer. This would result in more emissions than would occur if the icebreakers were anchored. Moreover, those propulsion engine emissions would not be considered or regulated under 40 CFR Part 55 to the extent the icebreaker held its position through its propulsion engines more than 25 miles from the Discoverer.

The commenter's reference to legislative history of OCSLA § 4(a)(1) stating that "federal law is to be applicable to all activities on all devices in contact with the seabed for exploration, development, and production" does not compel a conclusion that vessels that support OCS activity are themselves to be considered and regulated as OCS sources if they are anchored. As the commenter notes, this quoted statement was made in the context of explaining that OCSLA was amended in 1978 to ensure that "platforms constructed outside the United States and erected on the OCS were subject to U.S. customs laws." The anchoring of an oil spill response vessel or an icebreaker that supports OCS activity differs in significant respects from platforms designed to be erected on the OCS for oil and gas exploration.

In summary, for the reasons discussed above, Region 10 does not agree that the support vessels described in Shell's applications will become OCS sources if they anchor on the seabed. In making this decision, Region 10 emphasizes that this decision is based on the specific support vessels at issue in these permits being used as described in the application materials and Region 10's determination that these vessels are not used directly for the purpose of exploring, developing, or producing resources from the seabed (as those terms are used in the definition of OCS source in 40 CFR § 55.2), but instead are being used to support such activity.

Comment F.4: A commenter stated that consideration of air emissions from the drillship and other vessels in the modeling analysis should not depend on whether the drillship is anchored or not because emissions are still occurring even when the drillship is not anchored.

Response: EPA's authority to regulate air emissions on the OCS is constrained by regulations, and EPA regulations require that a vessel be attached to the seabed. See Response to Comments for OCS/PSD Permit No. R10 OCS/PSD-AK-09-01, Shell Gulf of Mexico, Inc., Frontier Discoverer Drillship, Chukchi Sea Exploration Drilling Program, dated March 31, 2010, at 79-81 (2010 Chukchi Response to Comments) at 19-20. For additional discussion of emissions prior to the Discoverer becoming an OCS source, please see response to comments Z.2 and BB.1.a.

G. CATEGORY – APPLICATION OF BACT TO THE ASSOCIATED FLEET

Comment G.1: Commenters ask Region 10 to reconsider its decision not to require the Associated Fleet to employ best available control technology (BACT), although they acknowledge that the EAB upheld Region 10 in its decision not to impose BACT on vessels that are not "OCS sources." The commenters state that, despite Shell's commitment to using SCR and OxyCat on Icebreaker #1, the Associated Fleet still will

be responsible for close to 90% of Shell's emissions of PM_{2.5}. The commenters are especially concerned because of the potential for numerous oil companies to pursue similar plans in the future and assert that Region 10's failure to strictly control associated vessel emissions could result in the substantial degradation of arctic air quality. These commenters argue that the plain language of the CAA requires that Shell apply BACT to associated vessel emissions because Section 328 of the CAA defines emissions of associated vessels within 25 miles of the OCS source as direct emissions of the source and requires that all OCS source emissions comply with the requirements of the PSD program (citing to 42 U.S.C. §§ 7627 (a)(4)(C) and 7627(a)(1)). The commenters conclude that this leaves no discretion for Region 10 to apply BACT to only some emissions of the OCS source.

Response: As the commenters acknowledge, the EAB has upheld Region 10's determination that BACT does not apply to vessels in the Associated Fleet that are not OCS sources. Remand Order I at 2, 20-38 ("The Region's decision in this case is a permissible interpretation of the statute's ambiguous instruction, and the Region's decision comports with the Agency's regulatory text, as well as the rationale provided in the 1992 regulatory preamble."). Because Region 10's position on this issue did not change in the 2011 Revised Draft Permits, this issue goes beyond the scope of the remand and no further response is necessary. Remand Order I at 82.

H. CATEGORY – USE OF ICEBREAKER #1 FOR SETTING ANCHORS

Comment H.1: Commenters ask Region 10 to require Shell to use Icebreaker #1 to pre-lay the anchors instead of Icebreaker #2, if, as they believe, Icebreaker #2 does not have SCR installed. The commenters point to what they believe is an inconsistency between the permits and the Supplemental Statement of Basis on this issue. The commenters continue that Region 10 should disregard this comment if there are in fact the same controls on both icebreakers.

Response: The discussion in the Supplemental Statement of Basis was discussing only changes in the 2011 Revised Draft Permits as compared to the 2010 Permits. Under the 2010 Permits, large engines on Icebreaker #2 were required to be controlled with SCR, but not with OxyCat, and the large engines on Icebreaker #1 were not controlled. The 2011 Revised Draft Permits require the same control on Icebreaker #2 (SCR), as well as OxyCat, and also require SCR and OxyCat on Icebreaker #1. Thus, both Icebreakers will have the same controls and the commenters' concern is therefore addressed.

I. CATEGORY – DURATION OF OPERATIONS

Comment I.1: Commenters state that EPA's guidance recognizes that in certain instances a permittee may request limits on its operations to avoid new source review (and the accompanying BACT analysis), when in reality these limits are not how the permittee intends to conduct its operations. The commenters are concerned that this may be the case here because they assert that the limits requested by Shell in these permits are

not reflected in other permitting submissions. As an example, the commenters state that Shell has agreed to certain restrictions in these air permits that are not reflected in Shell's Exploration Plan (submitted to BOEMRE) nor reflected in Shell's Incidental Harassment Authorization (IHA) application that accompanies that plan. The commenters assert that, based on the restrictions in the 2011 Revised Draft Permits and information in Shell's Exploration Plan on the amount of time various activities take, Shell could drill only one well in Camden Bay this year and ask Region 10 to confirm Shell's intent.

Response: As an initial matter, the restrictions on "drilling activity" and "MLC activity" (mud line cellar activity) in the 2011 Revised Draft Permits and the final permits are restrictions on the number of hours, not restrictions on the number of days. See, e.g., Discoverer Beaufort Final OCS/PSD Permit, Conditions B.2.2 and B.2.3. In addition, in Table 2 of the commenters' comments, the estimates of 48 days for "Number of Days Drilling" and 67 days for "Total Number of Drilling Days...including MLC construction" appear to assume five additional days for drilling MLCs, whereas the page of Shell's Environmental Impact Assessment cited by the commenters⁷ already includes these five additional days to construct the MLC in the estimate of 44 drilling days for the Torpedo prospect drill site and 34 drilling days for the Sivilliq prospect site. The estimates of "drilling activity" (which includes "MLC activity") and "MLC activity" in Shell's supplemental application materials assumes that Shell is engaged in the identified activity for 24-hours a day for that number of days. These two factors certainly make it possible that Shell could construct wells at both Torpedo and Sivilliq in a single season.

The discussion in the guidance cited by the commenters is a discussion of "sham operational limits," whereby a source applies for a permit as a minor source so as to be able to begin construction quickly without waiting for receipt of major source permit (such as a PSD permit) and then increases its emissions once it has received a PSD permit. Limiting Potential to Emit in New Source Permitting, dated June 13, 1989, at 10-11 (1989 PTE Guidance). In this case, Shell is in fact applying for PSD permits and, although the permits do contain some synthetic minor limits, there is no indication in the permit record that Shell intends to later apply to Region 10 to remove those synthetic minor limits. Moreover, Shell must comply with all requirements of these Clean Air Act permits and failure to do so is a violation of the Clean Air Act. See Discoverer Final Chukchi OCS/PSD Permit, Condition A.2; Discoverer Final Beaufort OCS/PSD Permit, Condition A.3. The fact that Shell's 2012 Revised Camden Bay Exploration Plan or some other authorization might authorize operation in a different manner or for a longer period of time than authorized under these Clean Air Act permits does not relieve Shell of its obligation to comply fully with these permits.

⁷ Attachment F to 2012 Outer Continental Shelf Lease Camden Bay Exploration Plan, and Associated Oil Discharge Prevention and Contingency Plan (ODPCP), May 4, 2011 (2012 Revised Camden Bay Exploration Plan).

J. CATEGORY – OPERATIONS IN SAME SEA

Comment J.1: Commenters request that the Beaufort permit contain a condition like the one Shell agreed to in the draft air permit for the Kulluk drilling unit⁸, namely that the company will not operate more than one drillship in the Beaufort Sea at the same time. Alternatively, if more than one drillship is allowed to operate at the same time in the Beaufort Sea, the commenters continue, then Region 10 must conduct additional modeling to assess the cumulative impacts of these multiple and concurrent operations and ensure compliance with relevant air quality standards before the operations are allowed to proceed. Another commenter asks that the permits prohibit Shell from operating the two drillships or any other drilling mechanism in the same ocean during the same open water season.

Response: Region 10 has proposed permits for two Shell projects. The Discoverer drillship is a major source subject to the PSD permitting program and is the subject of these permitting actions, with one permit covering operation of the Discoverer in the Beaufort Sea and one permit covering operation in the Chukchi Sea. Region 10 has also proposed to issue to Shell's Kulluk drilling unit a Title V permit that contains "synthetic minor" limits that would allow the Kulluk to avoid the PSD permitting program. For two activities (drilling operations) to be considered one "source" for PSD applicability purposes, the two drilling operations must: belong to the same industrial grouping ("Major Group" Standard Industrial Classification code); be located on one or more contiguous or adjacent properties; and be under the control of the same person. See 40 CFR §§ 52.21(b)(5) and (6). Shell's Discoverer and Kulluk drilling operations meet the first and third criteria. To ensure that the Kulluk would not be on "contiguous or adjacent properties" with the Discoverer's operations and thus considered a single source with the Discoverer for PSD applicability purposes, Shell has requested that the draft Kulluk permit restrict the Kulluk from operating in the same sea as the Discoverer within the same drilling season. Kulluk Draft Title V Permit, Condition D.4.8. The prohibition in the draft Kulluk permit, if finalized, effectively prevents the Discoverer and the Kulluk from operating in the Beaufort Sea at the same time, as the commenter requests.

With respect to the concern regarding other drillships or drilling mechanisms, the permits for the Discoverer and the draft permit for the Kulluk only authorize the operation of the equipment specified in the permits. Shell would need to submit another permit application to obtain authorization for air emissions from some other drillship or drilling mechanism.

⁸ Region 10 proposed for public comment an OCS/Title V permit for the Kulluk drilling unit on July 22, 2011. The public comment period closed on September 6, 2011 and Region 10 is currently considering public comments on that permit.

K. CATEGORY – OWNER REQUESTED/POTENTIAL TO EMIT LIMITS

K.1 SUBCATEGORY – IN GENERAL

Comment K.1.a: Commenters request that Region 10 add to the list of “Prohibited Activities” the operation of the vessels between December 1 and June 30 because the draft permits define the duration of operations and specify that the “permittee shall only conduct exploration drilling operations in the Beaufort Sea between July 1 and November 30 each year (referred to hereafter as the “drilling season”).”

Response: The permits clearly state that “The permittee shall only conduct exploration drilling operations in the [Beaufort/Chukchi] Sea between July 1 and November 30 each year (referred to hereafter as the “drilling season”).” Discoverer Final Chukchi OCS/PSD Permit, Condition B.2; Discoverer Final Beaufort OCS/PSD Permit, Condition B.2. This condition adequately prohibits operation of the Discoverer as an OCS source in the Chukchi and Beaufort Seas between December 1 and June 30 of each year, and the additional condition suggested by the commenters is not necessary.

Comment K.1.b: Commenters question whether the owner-requested limits and other provisions designed to limit Shell’s potential to emit are enforceable as a practical matter. These commenters reference EPA guidance providing that production and operational limits must be stated as conditions that can be enforced independently of one another and that EPA recommends a one month limit as the maximum time EPA should generally accept for avoiding a PSD threshold. The commenters also point to EPA guidance stating that rolling periods of longer durations are acceptable for determining applicability to major source review but should only be used if the source is unable to use the monthly limit and then only a 12-month rolling time period and not a calendar year annual limit. The commenters state that the Supplemental Statement of Basis fails to explain why monthly limits could not be imposed in this situation and why Shell was provided the 12-month rolling emissions limits for certain pollutants. In this regard, the commenters note that the Supplemental Statement of Basis notes that “because the annual NAAQS are set based on calendar years, the restriction can similarly apply on a calendar year basis (or, in the case of these permits, a drilling season which is limited by the permit to a specific 5-month period out of any calendar year).” The commenters contend that this statement is misleading because it implies that Shell is complying with the NAAQS and other standards during the limited drilling season instead of taking a rolling 12-month timeframe in which to document compliance.

Response: There are important underlying differences in these permits between the 12-month rolling emission limits for the different pollutants. The 12-month rolling limits on greenhouse gases (GHGs) (Condition B.6.) are designed to limit emissions of GHGs from the Discoverer and the Associated Fleet to below the Tailoring Rule “subject to regulation” thresholds so as to make PSD for GHGs inapplicable to this project. Agency guidance is clear that production or operational limits expressed on a calendar year basis cannot be considered capable of legally restricting potential to emit, and that such limits should generally not exceed one month, but can include longer rolling limits (*e.g.*, on a 12-month rolling basis). 1989 PTE Guidance at 10.

In contrast, limits imposed to ensure compliance with annual NAAQS standards, such as the annual NO_x limit in the permits, can be expressed on a calendar year basis because compliance with the annual NAAQS standards is determined based on calendar years or multi-year averages of calendar years. Thus, although emission limits intended to ensure compliance with an annual NAAQS standard could be written as a 12-month rolling average, they can also be expressed on a calendar year basis. This is the basis for the language in the Supplemental Statement of Basis quoted by the commenters regarding annual NAAQS standards, and it does not apply to limits intended to restrict the potential to emit of the source so as to avoid PSD. A limit that applies on a 12-month rolling basis will always ensure compliance with a limit that applies on a calendar year basis. In addition, contrary to the implication of the comment, the permits require compliance with the NAAQS based on the averaging period for the relevant standard and thus meet all PSD requirements. For example, the permit has 1-hour limits on NO_x to ensure compliance with the 1-hour NO₂ NAAQS, as well as 12-month rolling NO_x limits to ensure compliance with the annual NO₂ NAAQS.

The commenters' concern appears to relate to the fact that the three emission and operational limits that restrict GHGs in Condition B.6 of the permits are 12-month rolling limits even though the Discoverer is prohibited from operating under the permits between December 1 and June 30 of each year. The 12-month rolling limits on GHG emissions, fuel, and waste in Condition B.6 of the permits were established assuming zero emissions during that period when operations are prohibited (December through June of each year). In addition, each of the limits in the permits applies independently of all others. In other words, even though Condition B.6 could—on its own—allow the source to emit GHGs between December 1 and June 30 of each year, Condition B.2 prohibits operation during that time period, and the permittee must comply with both requirements.

The commenters are correct that EPA guidance does express a general preference for monthly rather than 12-month rolling limits. See 1989 PTE Guidance at 9. As the commenters acknowledge, however, EPA has also recognized that longer rolling limits are appropriate for sources with substantial and unpredictable annual variations in emissions, as well as for those sources that curtail operations during part of a year on a regular seasonal cycle. *Id.* at 9-10. Such is the case here. Shell's planned exploratory operations are unusual as compared to other sources because the emission units consist of more than 50 engines and generators on the Discoverer and a fleet of more than nine vessels. Operations will vary from hour to hour, day to day, month to month, and season to season based on factors such as the number of wells drilled, the activity being undertaken (drilling mud cellar lines, other drilling activity, or activity that does not involve drilling), the depth of the wells, whether emergency engines are being run for testing, and ice conditions. Given the variability in operations and thus emissions expected with this source and after considering a full range of options for limiting the source's potential to emit for GHGs, Region 10 believes it is appropriate to establish the GHG PTE limits on a rolling 12-month basis.

The situation in these permits differs greatly from the example cited by the commenters and discussed in the 1989 PTE Guidance. The guidance discusses a hypothetical case of a pulp drier that is periodically shut down from December to April and states that the permitting authority should first consider setting a limit of zero hours of operations for each of those months and an appropriate hourly limit for each of the remaining months before considering a rolling annual limit. 1989 PTE Guidance at 10. As in that example, the permits at issue in this case do not permit any emissions during a certain time period—December 1 through June 30 of each year. Unlike that example, however, available information for the permits being issued here shows that emissions are expected to vary greatly over any given time period when operation is allowed (that is, July 1 to November 30 of each year). Region 10 therefore continues to believe that establishing the emission, fuel type and amount, and waste limits that collectively limit GHGs to below major source thresholds on a 12-month rolling basis is appropriate. The commenter has provided no specific information to show that Shell’s emissions will not vary greatly during the months during which it is allowed to operate under the permits.

K.2 SUBCATEGORY – GREENHOUSE GAS LIMIT

Comment K.2.a: Commenters contend that the permit requirement limiting Shell’s potential to emit carbon dioxide equivalent (CO₂e) is not enforceable because it is neither a production nor an operational limit. The commenters assert that this permit provision fails to limit the amount of final product, the hours of operation, amount of material consumed, or fuel combusted, and it does not specify controls for the emissions. The commenters conclude that this is an unenforceable restriction on the amount of a pollutant that Shell can emit and therefore cannot be relied on to lower Shell’s potential to emit CO₂e.

Response: Operational limits include hours of operation, the amount of raw material consumed, and fuel combusted. See 1989 PTE Guidance at 5. The emission limit on CO₂e is accompanied by operational limits on the amount of time the source can operate, the amount of fuel and waste combusted, and the type of fuel combusted. See, e.g., Discoverer Beaufort Final OCS/PSD Permit, Conditions B.2.1, B.2.2, B.2.3, B.2.5, B.6.2, B.6.3, B.5, and B.7; Discoverer Chukchi Final OCS/PSD Permit, Conditions B.2.1, B.2.2, B.2.3, B.2.5, B.6.2, B.6.3, B.5, and B.7. Together, these operational limits ensure that emissions from the source do not exceed the Tailoring Rule “subject to regulation” threshold for GHGs. Furthermore, the permits include monitoring and recordkeeping requirements to document when emissions must be counted toward these limits, testing requirements that establish source-specific emission factors, monitoring requirements to track and document the fuel and waste combusted, and maintenance requirements to ensure the emission units are properly operated and maintained. See, e.g., Discoverer Beaufort Final OCS/PSD Permit, Conditions B.2.4, B.4, B.5.2, B.6.4, B.7.2, B.25, C.8, C.9; Discoverer Chukchi Final OCS/PSD Permit, Conditions B.2.4, B.4, B.5.2, B.6.4, B.7.2, B.25, C.8, C.9. This approach is consistent with long-standing EPA guidance that generally provides that limits on potential to emit should include production or operational limits in addition to emission limits where the emission limitation does not reflect the maximum emissions of the source operating at full design capacity without

pollution control equipment. See 1989 PTE Guidance at 5-6; cf. 40 CFR § 52.21(b)(4) (providing that [a]ny physical or operational limit on the capacity of the source to emit an air pollutant...shall be treated as part of its design if the limitation or the effect it would have on emissions is enforceable"). The comment ignores the fact that the permits rely on all of the emission and operational limits, along with monitoring, recordkeeping, and reporting requirements, to provide a legally and practicably enforceable limit on the potential to emit of the source for GHGs.

Response: Where an emission limitation reflects a source's maximum capacity to emit a pollutant without controls or other operational restrictions, it may alone limit potential to emit. See 1989 PTE Guidance at 6. In addition, EPA has recognized that there are sources for which inherent physical limitations for the operation restrict the potential emissions of individual emission units. Where these inherent limitations can be documented by the source and confirmed by the agency, it is appropriate to make such judgments and factor them into estimates of stationary source potential emissions. See Memorandum from John S. Seitz, EPA, re: Options for Limiting the Potential to Emit (PTE) of a Stationary Source Under Section 112 and Title V of the Clean Air Act, dated January 25, 1995, at 8.

Methane emissions from the drilling mud system are subject to an operational restriction limiting operations to the five months between July and November and this operational limit is accompanied by monitoring in the form of recordkeeping. See Discoverer Final Chukchi OCS/PSD Permit, Condition B.3; Discoverer Final Beaufort OCS/PSD Permit, Condition B.3. In this case, Shell calculated the potential methane emissions from the drilling mud system based upon the maximum expected capacity over the five-month period of operation taking into consideration inherent physical limitations and actual well data. Email from Pauline Ruddy, Shell, to Doug Hardesty, Region 10, re: GHG Calculation Information, dated June 23, 2011. Relying upon reasonable projections of potential emissions where inherent physical limitations exist is consistent with EPA's guidance for grain terminals. See Memorandum from John Seitz, EPA, re: Calculating Potential to Emit (PTE) and Other Guidance for Grain Handling Terminals, dated November 14, 1995.

To add a measure of safety, Region 10 assumed all of the emissions from the drilling mud system (which includes the cuttings/mud disposal barge) will be point source emissions whereas, in actuality, a significant amount of the emissions from the drilling mud system and all of the emissions from the cuttings/mud disposal barge meet the definition of fugitive emissions and do not have to be counted for this source category in determining a source's potential to emit under the PSD program. See 40 CFR § 52.21(b)(1)(iii). In addition, Region 10 assumed that what Shell estimated as its emissions over the five month drilling season would occur during *each* of the five months (thus increasing the potential to emit from this source by a factor of five) to provide a wide margin of safety in the estimate of potential to emit for the drilling mud system. For comparison purposes, EPA recommends grain terminals apply a safety factor of 1.2 to the highest of the previous five years of throughput to constitute a realistic upper-bound potential to emit. See Memorandum from John Seitz, EPA, re: Calculating Potential to

Emit (PTE) and Other Guidance for Grain Handling Terminals, dated November 14, 1995, at 5. It is important to emphasize that, even with these conservative assumptions, the GHG emissions (85 tons per year CO₂e) from the drilling mud system represent only 0.12% of the total GHG emissions (70,000 tons per year CO₂e) allowed under each permit.

In response to these comments, Region 10 requested Shell to re-examine its estimate and provide the well information previously-claimed by Shell as confidential to confirm that the estimate of methane potential to emit it previously provided to Region 10 is a reasonable upper-bound estimation. See email from Susan Childs, Shell, to Doug Hardesty, Region 10, re: Shell Mud and Cuttings Degassing Emissions, dated September 16, 2011. The information provided shows that Shell relied on well pressure, temperature, porosity, and depth of the hydrocarbon bearing zone from past Arctic exploration projects in its estimation. As in the case of the reasonable, upper-bound projections that EPA believes are appropriate for determining the PTE of grain terminals, Region 10 believes that the emission estimate for methane emissions from Shell's mud drilling system (17 tons per month of CO₂e) assumed in the emission limit on total GHGs is a reasonable upper-bound projection for Shell's operations and is not expected to be exceeded under any reasonably anticipated operating scenario. This is especially true given the other conservative assumptions that Region 10 applied to Shell's estimate to provide a wide margin of safety (considering both point source and fugitive emissions in the estimate and scaling up Shell's estimate by a factor of five).⁹

Region 10 believes that assuming such a conservatively high estimate of the methane emissions that would be emitted from the drilling mud system operating at its maximum design operation rate, coupled with the operational limit on the duration of the operations and other permit restrictions, are collectively sufficient to ensure methane emissions from the drilling mud system do not exceed 17 tons per month of CO₂e or that overall CO₂e emissions do not exceed 70,000 tons per year (tpy) CO₂e on a 12-month rolling basis. Because of the inherent limitations that exist, and especially because of the small contribution of GHGs from the mud drilling system to GHGs from the Discoverer and Associated Fleet as a whole, Region 10 believes no monitoring of emissions or operations from the drilling mud system is necessary or appropriate aside from monitoring the duration of operations and the other monitoring required in the permits. Moreover, Region 10 believes that the monitoring, recordkeeping, and reporting included in the permits for the limits on emissions, fuel, waste, and operations that collectively limit emissions to below the Tailoring Rule "subject to regulation" threshold for GHGs together constitute a "verifiable method to attain and maintain each limit" within the meaning of 18 AAC 50.225 of the COA regulations.

⁹ Region 10 is aware that ConocoPhillips provided an estimate of emissions from its mud drilling system that is much higher than that provided by Shell to support these permits. Region 10 has closely examined the estimates provided by both companies. Shell's estimate is based on well information from past arctic exploration projects. The fact that one company has chosen to rely on even more conservative assumptions in estimating its potential to emit from similar operations does not undermine the validity of using less conservative, but still reasonably conservative assumptions in estimating its emissions.

Comment K.2.c: Some commenters assert that the limit on Shell’s use of fuel is not practically enforceable because, although the draft permits require Shell to track the use of fuel by the Associated Fleet within 25 miles of the source, Shell is only required to record the positions of the Associated Fleet once per hour. The commenters contend that this frequency of monitoring could result in an underestimation of fuel usage if Shell does not record the position of a vessel until well after it has entered the 25 mile radius. Thus, the commenters state, the permits’ owner-requested limits addressing GHGs are not practically enforceable. The commenters assert that Region 10 must either calculate the true maximum potential emissions and apply BACT as necessary, or revise the owner-requested limits so that they are practically enforceable.

Response: The permits limit the type and total amount of fuel combusted by the Associated Fleet whenever within 25 miles of the Discoverer OCS source. Discoverer Beaufort Final OCS/PSD Permit, Condition B.6.2; Discoverer Chukchi Final OCS/PSD Permit, Condition B.6.2. The permits also require Shell to monitor and record the total amount of fuel combusted and the location of the Discoverer and Associated Fleet once per hour. Discoverer Beaufort Final OCS/PSD Permit, Conditions B.4 and B.6.4.1-6.4.3; Discoverer Chukchi Final OCS/PSD Permit, Conditions B.4 and B.6.4.1-6.4.3. The absence of a condition explicitly requiring Shell to document when a vessel in the Associated Fleet first comes within 25 miles of the Discoverer would not relieve Shell of the obligation to count fuel use from the time that such vessel first comes within 25 miles and the time Shell makes the required hourly reading of the location of the vessel. Nonetheless, Region 10 agrees with the commenters that the permits would better assure that all fuel combusted while the Associated Fleet is within 25 miles of the Discoverer is accounted for if the permits require Shell to record the time at which each vessel enters or leaves the 25 mile radius area around the Discoverer when the Discoverer is an OCS source, as well as the location of the Associated Fleet at the time the Discoverer becomes and ceases to be an OCS source. Accordingly, Region 10 has added these requirements to Condition B.4 of each permit. This will require the collection of information needed to ensure, in conjunction with other permit requirements, that all of the fuel combusted by the Associated Fleet while regulated by these permits is accounted for and considered when determining compliance.

L. CATEGORY – ULTRA LOW SULFUR DIESEL FUEL

Comment L.1: Commenters commend Shell’s commitment to purchase ultra low sulfur diesel fuel for its operations, but are concerned that, upon delivery the fuel may have a higher sulfur content because the hull of the barge in which the fuel is transported will not be cleaned out. The commenters point out that Shell acknowledged this fact in its Kulluk application materials and ask Region 10 to explain whether the impacts of transport of the ultra-low sulfur fuel to the North Slope were considered in the modeling and the permit conditions, since the commenters believe it more likely than not will result in the use of higher sulfur fuel. The commenters ask that, if the addition of sulfur during transport was not accounted for in the Discoverer permits, that Region 10 ensure that the appropriate steps are taken to address this issue.

Response: These permits limit the fuel sulfur content of any liquid fuel combusted in the Discoverer and the Associated Fleet to 0.0015 %, require that the fuel in fuel tanks on the Discoverer and the Associated Fleet be sampled before deployment, and require each subsequent fuel shipment to either be sampled or certified as meeting the sulfur limit. Shell considered, but specifically did not request, a higher limit on fuel sulfur content in the permits for the Discoverer to account for the possibility of contamination during transport, even though it did request a higher limit in its permit application for the Kulluk drill rig. See email from Pauline Ruddy, Shell, to Doug Hardesty, Region 10, re: Transmitting Action Item Checklists and Letter of April 15, 2011, dated April 11, 2011.

Shell is therefore aware that it will need to ensure that tank contamination does not cause the fuel to exceed the sulfur limit. By requiring that fuel samples be “representative” and that certifications be of “the shipment,” Conditions B.5 and B.7 of each permit ensure that any certification by a fuel supplier is of the fuel in the shipment tank during transport and not the fuel that was added to the shipment tank for transport and delivery to Shell.

M. CATEGORY – ELECTRICAL POWER OUTPUT LIMITS FOR ICEBREAKER # 2

Comment M.1: A commenter states that, during the application phase, Shell demonstrated that the short- and long-term ambient impacts for NO₂, CO, PM_{2.5} and SO₂ would be within all applicable standards even with the anchor handler (Icebreaker #2) operating continually, including in ice and open water, within the 25-mile radius of the Discoverer. The commenter continues that this demonstration resulted in an increase in allowable NO_x emissions from 71.2 tons in any rolling 12-month period in the prior 2010 Permits to 99.5 tons in any rolling 12-month period, as set forth in Condition P.5.1 of the 2011 Revised Draft Permits. The commenter requests a proportional increase in allowable energy production under Condition P.8 to address this.

Response: The commenter is correct that the NAAQS compliance demonstration supporting issuance of the 2010 Revised Draft Permits supported the increase in the allowable NO_x emissions from 71.2 tons as provided in the 2010 Permits to 99.5 tons in the 2011 Revised Draft Permits. The electrical power output limits for Icebreaker #2 are obviously tied to the emission limits in the permits and therefore can also be raised by the same ratio. Region 10 has made this revision to the permits. Discoverer Beaufort Final OCS/PSD Permit, Conditions P.8; Discoverer Chukchi Final OCS/PSD Permit, Condition O.8.

N. CATEGORY – MONITORING REQUIREMENTS

Comment N.1: In connection with the permit limits on the total amount of fuel and waste combusted that are associated with the limit on CO_{2e}, commenters question whether the fuel and waste combustion limits are practical and enforceable and whether similar provisions in the permits for SO₂ and NO_x are “legitimate.” The commenters state that the monitoring provisions related to these conditions provide for monthly

calculations based on the amount of fuel or waste combusted and are not adequate to protect air quality. The commenters continue that, because the draft permits are based on a new model and new algorithms, the permits should instead require continuous emission monitoring (CEM) systems at least in the beginning.

Response: The commenters have provided no support for their speculation that the fuel and waste combustion limits that, together with the emission limit on CO₂e, limit the source's PTE for CO₂e, are not practical or enforceable. The commenters are correct that the monitoring provisions related to these conditions provide for monthly calculations based on the amount of fuel or waste combusted. See Discoverer Final Chukchi OCS/PSD Permit, Condition B.6.4; Discoverer Final Beaufort OCS/PSD Permit, Condition B.6.4. For a discussion of why Region 10 believes the CO₂e, fuel, and waste limits are legally and practically enforceable and sufficient to limit potential to emit, see response to comments K.1.b, K.2.a, and K.2.b.

The commenters have also provided no support for their speculation that the emission limits in the permits for SO₂ and NO_x are not "legitimate." As an initial matter, emissions of SO₂ are restricted through limitations on the amount and type of fuel combusted (with appropriate monitoring and recordkeeping) and not through limitations on the amount of SO₂ emitted to the air. SO₂ emissions have been reduced to less than two tons per year, far below the regulatory threshold for PSD applicability, and the air quality analysis reflects total concentrations (including background) from 2 to 21% of all averaging periods for the SO₂ NAAQS. In light of these facts, there is no basis for requiring continuous emission monitoring of SO₂.

With respect to NO_x, the emission limits in the permits are not limits designed to limit the potential to emit of the source to below major source thresholds. They are established to reflect Best Available Control Technology and ensure emissions from the source do not cause or contribute to a violation of the NAAQS or increment. The EPA guidance referenced by the commenters, as the commenters acknowledge, is guidance that discusses limits on a source's potential to emit that are sufficient to avoid major new source review permitting. This guidance is therefore not directly applicable to the SO₂ and NO_x emission limits at issue in this comment.

CEMS are a means of ensuring compliance with emission limits and are an appropriate alternative if setting enforceable operational parameters for control equipment is infeasible. See 1989 PTE Guidance at 7-8. CEMs are not the only means, however, of assuring compliance with these BACT and NAAQS-based emission limits. Shell's planned exploratory operations are unusual as compared to other sources because the emission units consist of more than 50 engines and generators on the Discoverer and a fleet of more than nine vessels. SCR and OxyCat are required on multiple engines on three different vessels. CEMs are expensive to purchase, maintain, and operate but more importantly, there are practical considerations given that the emission units, control equipment, and monitoring equipment will be operating in a remote, harsh, arctic environment, and deck space on board the vessels is limited.

The permits require a regimen of stack testing and emission calculations, in conjunction with parametric monitoring of control equipment, to ensure compliance with the NO_x emission limits. Numerous operating restrictions also serve to restrict emissions of NO_x. Region 10 believes that the control equipment parametric monitoring required by the permits – temperature, urea feed, and catalyst activity for SCR¹⁰ and temperature and catalyst activity for the oxidation catalyst device¹¹ – are effective means for ensuring that the controls are working properly and achieving the required emission reductions. For uncontrolled emission units, the permits require monitoring operational rates including fuel, waste, and hours of operation. The commenters have provided no information to indicate that the required monitoring of fuel, waste, hours of operation, and control equipment will not be accurate. Multiplying the tracked fuel and waste combustion rates by source-specific emission factors determined by source testing for many of the emission units will provide a reasonable assurance of compliance with the emission limits in the permits. The commenters have provided no information to the contrary, nor have the commenters identified any specific requirement to use CEMs in this circumstance. Contrary to the commenters' assertion, monitoring emissions using CEMs will have no bearing on the accuracy of the new model or algorithms used by Shell. Region 10 continues to believe that CEMs are not necessary to provide a reasonable assurance of compliance with the particular emission limits in these OCS/PSD permits. In addition, the Discoverer is required to apply for Title V operating permits within one year of commencing operation. See 40 CFR § 71.5(a)(1)(i). Issuance of the Title V operating permits will provide an opportunity for Region 10 to re-evaluate the need for CEMs if operational information collected prior to issuance of Title V permits for the Discoverer indicates that CEMs are necessary or appropriate to ensure compliance with the emission limits.

Comment N.2: Commenters assert that Region 10's proposed monitoring and reporting requirements are not adequate to demonstrate compliance with the 1-hour NO_x limits. The commenters assert that the stack tests required at the beginning of the drilling season, and in some cases only the first drilling season, are not adequate to collect data that will assure compliance with the NO_x emission limits on a continuous basis and that the only way to do so is by requiring CEMs or equivalent. The commenters state that, if there is some technical reason why CEMs are not feasible for these sources, Region 10 must require more frequent stack testing (*e.g.*, at the beginning of each season from every source) and must require the use of the highest stack test results in its hourly calculations. Specifically, the commenters ask that Permit Conditions C.9.5, O.14.12, P.13.12, Q.5.7 in both the Beaufort Sea and Chukchi Sea permits be changed to read:

*Each day, calculate and record for the previous calendar day, the emissions of NO_x, in pounds per hour and pounds per day and the emissions of PM_{2.5} and PM₁₀ in pounds per day from each engine by using the **highest** emission factors for each tested engine collected under Condition C.8.5 and electrical load data collected under Condition C.9.3, to determine emissions from that source.*

¹⁰ See Discoverer Beaufort Final OCS/PSD Permit, Condition B.28; Discoverer Chukchi Final OCS/PSD Permit, Condition B.14.

¹¹ See Discoverer Beaufort Final OCS/PSD Permit, Condition B.29; Discoverer Chukchi Final OCS/PSD Permit, Condition B.15.

Emissions shall be calculated for each ten-minute load reading for each engine.

Response: Region 10 believes that using source-specific emission tests to develop emission factors along with load monitoring every 10 minutes provides a reasonable assurance of compliance with the emission limits in the permits. As discussed above in response to comment N.1, the emission units that have control devices are subject to monitoring of control device parameters. In general, the emission units without control equipment are engines that tend to operate relatively consistently, so there should be less concern for variable emissions that would not be accounted for by the monitoring technique. By requiring load-specific testing, emissions are being calculated specific to the actual load and load-specific emission factor; this results in more accurate emission reporting. Although the commenter is correct that source testing is required only prior to the first year of operation, Region 10 has also reviewed data from source tests on these emission units conducted in 2010. In addition, as discussed above in response to comment N.1, issuance of the Title V operating permits will provide an additional opportunity for Region 10 to consider whether any additional testing and monitoring requirements—including CEMs—are necessary or appropriate to ensure compliance with the emission limits in these permits based on the additional testing, operational, and monitoring information available at that time. See also response to comment P.1 and P.2.

With respect to the commenters' request that the permits require that emission calculations be conducted using the highest stack test results, the permits are effectively requiring the highest emission factor be used. For engines and other emission units (e.g., boilers, incinerators) that do not have load monitoring, the permits generally require testing at two or three load levels and the highest emission factor is used in the emission calculations regardless of the load level that the engines or units operate. This is appropriate because there will be no record of the operational level of these engines or units so emissions must be calculated, and compliance with emission limits must be determined, assuming the highest source-specific emission factors. For engines with load monitoring, the permits require testing at several loads and then require the highest emission factor from each specific load level to be used when the engine is operating within that load range. For these engines, it would be inappropriate to use a (higher) emission factor from another load level for purposes of calculating emissions or determining compliance since a factor from a different load level would not represent actual emissions from the engines at their operating level.

Comment N.3: Commenters appreciate Shell agreeing to install SCR and OxyCat pollution controls on Icebreaker #1 and #2 but are concerned about how these controls will function in arctic conditions. The commenters note that Region 10 stated it “believes that the SCR and OxyCat systems will be effective if the inlet temperature to each system is high enough, the urea feed to the SCR system is operating, and the catalysts are still active.” Because the proper functioning of these controls is essential to compliance with the NO₂ NAAQS, the commenters assert that CEMs rather than weekly measurements with a portable device should be required.

Response: Region 10's determination that the monitoring required in the permits will verify that the control devices are operating properly takes into account that the Discoverer will be operating in arctic conditions. Region 10 believes that the monitoring required by the permit will ensure the control equipment is operating properly. The weekly concentration checks are not considered alternatives to CEMS, but instead serve as a verification that the control equipment is operating properly. As discussed in the Supplemental Statement of Basis (at 35-36), weekly concentration checks should be an effective frequency for confirming whether the catalysts are still active. The overall monitoring strategy is a reasonable and appropriate alternative to CEMS in this specific application. See response to comments N.1, N.2, and P.1.

Comment N.4: A commenter requests that Region 10 require an air monitoring station on Cross Island because the commenter believes a monitoring station at that location would provide a lot of information.

Response: Region 10 believes that the background monitoring data that have been collected in conjunction with the air quality modeling conducted to support these permit actions adequately demonstrate that emissions under the permits will not cause or contribute to a violation of the NAAQS and increments. The emission limits and associated monitoring, recordkeeping, and reporting requirements in the permits are adequate to verify that the NAAQS will not be exceeded and Region 10 therefore does not believe that requiring an additional monitoring station on Cross Island as requested by the commenter is warranted.

The permits do require post-construction monitoring for PM_{2.5}. See Discoverer Beaufort Final OCS/PSD Permit, Condition S; Discoverer Chukchi Final OCS/PSD Permit, Condition R. Region 10 believes that collection of background air quality data within a closer proximity to a community provides more beneficial information on potential health-based exposure than a monitor located well offshore.

O. CATEGORY – REPORTING REQUIREMENTS

Comment O.1: Commenters contend that the proposed revised permits do not include a provision to submit reporting data to Region 10, and instead only require that Shell keep records of the required monitoring data and support information for a period of five years. The commenters request Region 10 to revise the permits to require the submission of reporting data to Region 10 in a timely manner.

Response: The permits require the permittee to submit to Region 10 an annual operating report by March 31 that covers the five month period of operation for the preceding calendar year. That report must include reports of any required monitoring, including all emission calculations required by the permit. See Discoverer Final Chukchi OCS/PSD Permit, Condition A.16; Discoverer Final Beaufort OCS/PSD Permit, Condition A.18. In addition, the permits require the reporting of all excess emissions and deviations from permit requirements within specified time periods (as soon as possible, within 3 business days, or within 30 days of the end of the month in which the deviation occurs). See

Discoverer Final Chukchi OCS/PSD Permit, Condition A.15; Discoverer Final Beaufort OCS/PSD Permit, Condition A.17.

P. CATEGORY – COMPLIANCE MONITORING AND ENFORCEMENT

Comment P.1: Commenters request that Region 10 exercise its authority to inspect Shell’s exploration fleet to ensure compliance with permit requirements both well in advance of and during the operating season and stated that a robust inspection program is necessary to ensure that the air emission controls are actually implemented and effective. The commenters state that this would provide adequate time to undertake appropriate repairs or upgrades if the inspectors identify problems with any source or equipment. Of particular concern to the commenters is that they report that the Discoverer sustained damage in a storm in May 2011 and that the physical condition of engines and other equipment on the Discoverer is unknown. The commenters also state that Shell had previously stated that the Kulluk had been fitted with pollution controls but that this was later found not to be accurate. The commenters want to ensure that the modifications Shell has committed to make to the Discoverer and the Associated Fleet have in fact been made and state that this can only be done by inspecting the vessels. Some commenters request that tribes and local communities should also be able to inspect the Discoverer or that there be a separate entity that would monitor and inspect the drilling process. Commenters also state that Region 10 needs to show that self-monitoring will be enforceable and self-reporting will be honest. Commenters also ask for a strong enforcement presence.

Response: As provided in the EAB Orders, any appeals of the 2011 Revised Draft Permits to the Board are limited to issues addressed by the Region in the 2011 Revised Draft Permits and to issues otherwise raised in the petitions on the 2010 Permits in these proceedings but not addressed by the Region in the 2011 Revised Draft Permits. Some of these comments do not relate to issues addressed by the Region in the 2011 Revised Draft Permits or to issues otherwise raised in the petitions on the 2010 Permits. Accordingly, these comments are beyond the scope of the remand proceeding and do not need to be addressed by Region 10 to the extent they are the same as comments made on the 2010 Permits.

In any event, Region 10 agrees with the commenters that Region 10 has authority to conduct inspections of the Discoverer. See CAA § 114; 40 CFR 55.8(a). Because Shell is not required to meet the emission limits and control requirements in the permits until the Discoverer becomes an OCS source in the applicable sea, however, Region 10 does not necessarily agree with the commenters that inspecting the Discoverer before the first drilling season is the most effective use of agency resources. Such an inspection would only indicate how far along Shell is in installing identified emission units and required control equipment and would not necessarily indicate whether that equipment will meet permit requirements while the Discoverer is an OCS source. Note that the CAA provides “the EPA Administrator or his authorized representative” to conduct inspections. CAA § 114(a)(2).

In addition, inspections are not the only way to determine whether Shell is operating in compliance with permit requirements. The permits contain testing, monitoring, recordkeeping, and reporting requirements to provide information regarding whether Shell is operating in compliance with permit conditions. For example, the permits require stack testing of most emission units prior to initial operation. See, e.g., Discoverer Final Chukchi OCS/PSD Permit, Condition C.6; Discoverer Final Beaufort OCS/PSD Permit, Condition C.6. Shell is required to report all permit deviations to Region 10 and to submit an annual operating report that includes reports of all required monitoring. See Discoverer Final Chukchi OCS/PSD Permit, Conditions A.15 and A.16; Discoverer Final Beaufort OCS/PSD Permit, Condition A.17 and 18. Additional monitoring, recordkeeping, and reporting requirements may be included in the Title V operating permits issued to Shell as appropriate. See generally 40 CFR Part 71.

In addition, the permits include mechanisms that enhance the reliability of Shell's self-monitoring. The permits require Shell to install, maintain, and operate devices to measure and record fuel usage, operating loads, and other emissions-related data. For example, all Catalyzed Diesel Particulate Filter control devices must be equipped with a monitor and alarm unit that records exhaust pressure and temperature, parameters that indicate that the control equipment is working. Under Section 113(c)(2)(C) of the CAA, it is a criminal offense to falsify, tamper with, render inaccurate, or fail to install any monitoring device or method required under the Clean Air Act. All reports and records required to be submitted to Region 10 under the permits must be certified by a responsible official for Shell as to their truth, accuracy, and completeness. Again, Shell could be subject to criminal liability for falsifying these records or reports.

Although self-monitoring by Shell is a component of ensuring Shell is operating in compliance with the permits, as indeed it is for other sources subject to Clean Air Act requirements, Region 10 will have an active oversight role. In the event Shell violates its permits, Region 10 has broad authority under Section 113 of the CAA to issue compliance orders, assess administrative penalties, and to request the Attorney General to bring a civil or criminal action, as appropriate. Region 10 intends to conduct comprehensive compliance evaluations, including on-site inspections, as appropriate and consistent with EPA policies. See Clean Air Act Stationary Source Compliance Monitoring Strategy, April 2001, <http://www.epa.gov/compliance/resources/policies/monitoring/cmstrategy.pdf>

In addition, Region 10 has authority to observe the conduct of stack tests of any emission unit and will review all stack test reports to verify that the proper procedures and equipment were used to measure emissions from the emission units and to evaluate compliance with the permit terms and conditions. Region 10 will also be reviewing periodic reports and episodic (e.g. deviation) reports submitted under the permits. In addition, under Permit Condition A.14 (Chukchi) and A.16 (Beaufort) and Section 114 of the CAA, Region 10 has authority to compel an air pollution source to submit any and all information necessary to determine compliance with CAA requirements and to conduct inspections. Key compliance information will be available via EPA's Enforcement and Compliance History Online (ECHO) website. <http://www.epa-echo.gov/echo/> The public also has a right to request this information under the Freedom of Information Act (FOIA),

5 USC § 552. In some instances, Region 10 may withhold all or a portion of inspection reports and other information in accordance with FOIA, 5 USC § 552(b).

Comment P.2: A group of commenters states that if Region 10 does not have the requisite resources to dedicate to the arctic OCS, Region 10 should coordinate with BOEMRE or other federal agencies to ensure compliance with air permit conditions.

Response: Region 10 will coordinate with other federal agencies as necessary and appropriate to ensure appropriate oversight of Shell's operations under the permits.

Comment P.3: Several commenters request that Region 10 promptly share the records, reports, and information gained from physical inspections of the Discoverer and Associated Fleet with the public and establish methods to communicate results of compliance with the permit conditions and monitoring requirements. The commenters would like to know whether the applicant is within limits, exceeding limits with plans for correction, and/or in-between when it comes to air quality. The commenters state that this of this information will be useful to North Slope Borough staff as well as its residents when reviewing future proposals for offshore activities. Other commenters ask that the Iñupiat Community of the Arctic Slope be copied on all construction reports, monitoring reports, and air pollution emission reports.

Response: This comment was addressed in issuance of the 2010 Permits and was not the subject of a petition. The underlying basis of this issue is not affected by any revisions to the permits or analysis for the 2011 Revised Draft Permits. As such, it is beyond the scope of the remand and a response is not necessary. 2010 Chukchi Response to Comments at 79-81; Remand Order I at 82.

As discussed above, key compliance information will be available via EPA's ECHO website. <http://www.epa-echo.gov/echo/> The public also has a right to request this information under FOIA. See also response to comment P.1.

Comment P.4: A commenter states that the local community wants to see equal enforcement of the laws on the oil companies and that the local community does not have the staff and feel intimidated by the oil companies.

Response: Region 10 shares the commenter's interest in ensuring that laws are enforced in a fair manner. See response to comment P.1 for a discussion of Region 10's enforcement authorities and mechanisms in place to help assure permit requirements are met and violations are detected.

Q. CATEGORY – AMBIENT AIR BOUNDARY

Comment Q.1: Commenters contend that Region 10's decision to set the ambient air boundary at 500 meters from the center of the Discoverer is arbitrary and unlawful and conceals the true maximum impacts of Shell's emissions. The commenters state that, to comply with EPA's longstanding policy on ambient air, Region 10 must set the ambient

air boundary at the hull of the Discoverer, noting that EPA has defined “ambient air” as “that portion of the atmosphere, external to buildings, to which the general public has access.” The commenters state that, under EPA policy, an exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers, and that Shell does not own or control the area within the 500 meter radius and it cannot effectively prevent public access. The commenters continue that Shell’s proposal to implement a public access control program to “locate, identify and intercept the general public” does not constitute the fence or other physical barrier excluding the public that EPA’s policy requires.

Response: Ambient air is defined as “...that portion of the atmosphere, external to buildings, to which the general public has access.” 40 CFR § 50.1(e). Region 10 agrees with the commenters that EPA’s longstanding interpretation is that “exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which the public access is precluded by a fence or physical barrier.” See Letter from Administrator Douglas M. Costle, EPA, to Senator Jennings Randolph, Chairman, Environment and Public Works Committee, re: Ambient Air, dated December 19, 1980. EPA has observed that “control” under this criteria means that “the source has certain rights to use of the land/property, including the power to control public access to it.” Memorandum from Steven D. Page, Office of Air Quality Planning and Standards (OAQPS), re: Interpretation of “Ambient Air” in Situations Involving Leased Land under the Regulations for Prevention of Significant Deterioration, Attachment at 3, dated June 22, 2007 (Leased Land Guidance). Region 10 believes that excluding the area within a safety zone established by the United States Coast Guard from ambient air is consistent with this interpretation.

As discussed in the Supplemental Statement of Basis (at 26), Shell modeled emissions from the Discoverer beginning 500 meters from the center of the Discoverer and assumes that the Coast Guard will impose a safety zone of this distance around the Discoverer to exclude the public from the area in which the Discoverer’s anchor array will be deployed and in which Shell will be conducting its main operations. Shell therefore agreed that Region 10 would require as a condition of operation under the permits that Shell have in place at all times of operation as an OCS source a safety zone of at least 500 meters within which the Coast Guard prohibits public access.¹² See 2011 Revised Draft Beaufort Permit at 12; 2011 Revised Draft Chukchi Permit at 12.

The conditions of the permit provide sufficient assurance that the general public will not have access to the area inside the safety zone, consistent with the two primary criteria EPA has used to determine when such an exclusion may apply. Given that the permitted activities occur over open water in the Arctic, these criteria must be adapted to some

¹²Shell had previously applied for and obtained a Coast Guard Safety Zone for its operations in the Beaufort and Chukchi Seas for the 2010 drilling season. See 75 Fed. Reg. 19404 (April 12, 2010), but had withdrawn its request that the safety zone be used as the ambient air boundary in issuance of the 2010 permits. See response to comment Q.2. Thus, Shell must apply for and the Coast Guard must establish a safety zone for operation under these permits. The Coast Guard establishes safety zones on the OCS pursuant to 33 CFR § 14710.

extent when applied to this environment, but they are still satisfied in this instance in a manner sufficient to effectively preclude public access from the safety zone.

Region 10 recognizes that Shell does not “own” the areas of the Beaufort and Chukchi Seas on which the Discoverer will be operating as might be the case for a stationary source on land. Shell has a lease authorizing the company to use these areas for the activities covered by the permits. The Coast Guard safety zone establishes legal authority for excluding the general public from the area inside the zone. EPA has previously recognized a safety zone established by the Coast Guard as evidence of sufficient ownership or control by a source over areas over water so as to qualify as a boundary for defining ambient air where that safety zone is monitored to pose a barrier to public access. Letter from Steven C. Riva, EPA Region 2, to Leon Sedefian, New York State Department of Conservation, re: Ambient Air for the Offshore LNG Broadwater Project, dated October 9, 2007 (Broadwater Letter).

To meet the second of the criteria applied by EPA and ensure the source actually takes steps to preclude public access, Shell proposed and Region 10 required as a condition of operation under the permits that Shell develop in writing and implement a public access control program to locate, identify, and intercept the general public by radio, physical contact, or other reasonable measures to inform the public that they are prohibited by Coast Guard regulations from entering the area within 500 meters of the Discoverer. Region 10 believes that, for the overwater locations in the arctic environment at issue in these permitting actions, such a program of monitoring and notification is sufficiently similar to a fence or physical barrier on land such that the area within the Coast Guard safety zone qualifies for exclusion from ambient air. See Broadwater Letter at 2.

Shell therefore appropriately excluded the area within 500 meters of the center of Discoverer from the source impact analysis it conducted to meet the requirements of the PSD regulations.

Comment Q.2: Some commenters contend that Region 10 has taken an inconsistent approach in setting the ambient air boundary. The commenters state that, when Shell initially applied for the air permits, the company’s application materials included an ambient air boundary of 900 meters and that Shell assumed that the ambient air would begin at this distance because it had “submitted a request to the US Coast Guard, for issuance of a safety exclusion and equipment protection zone surrounding the Discoverer” Nevertheless, the commenters state, in issuing the 2010 Permits, Region 10 required Shell to model impacts from the hull of the Discoverer, outward, yet Region 10 is now indicating that it will allow Shell to model impacts starting 500 meters from the center of the Discoverer. The commenters allege that if Region 10 were to recognize that the edge of the hull is the appropriate boundary, Shell has not demonstrated that its operations will not cause a violation of air quality standards in the “ambient air” and that Shell has in fact stated that maximum impacts occur only a short distance from the drillship (citing to Shell statements that “at all receptors, the cumulative concentrations were less than the peak Project contribution alone, which occurs only 80 meters downwind of the drill site”).

Response: The commenters are correct that Shell's February 2009 application for an OCS/PSD permit for operations in the Chukchi Sea did request an ambient air boundary based on a Coast Guard safety zone. See Shell February 2009 Application at 63. Shell later withdrew that request. Email from Roger Steen, Air Sciences, to Janis Hastings, EPA, re: Discoverer - Notification of Elimination of the Ambient Air Boundary Based on a Safety Zone, dated April 29, 2009. The 2010 Permits issued by Region 10 therefore did not base the ambient air boundary on a Coast Guard safety zone, but instead assumed that ambient air began at the hull of the Discoverer. 2010 Chukchi Statement of Basis at 99. As discussed in the Supplemental Statement of Basis, the supplemental application materials submitted by Shell to support its revised air quality analysis modeled emissions from the Discoverer beginning 500 meters from the center of the Discoverer and assumes that the Coast Guard will impose a safety zone of this distance around the Discoverer to exclude the public from the area in which the Discoverer's anchor array will be deployed and in which Shell will be conducting its main operations. Supplemental Statement of Basis at 26; Shell March 18, 2011 Submittal at 38, fn. 15. The permits therefore authorize operation only if the Discoverer is subject to a currently effective safety zone established by the Coast Guard. Because the area within the safety zone is not considered ambient air, demonstrating compliance with the NAAQS and PSD increments within that zone is not required. Thus, Region 10 acted consistently with Shell's application materials, legal requirements, and EPA guidance in determining the ambient air boundary based on a Coast Guard safety zone. See also response to comment Q.1.

Comment Q.3: Commenters are concerned that Shell plans to allow marine mammal observers and subcontractors, who the commenters contend are not Shell employees but are instead members of the public, onto and near Shell's vessels within the 500 meter boundary. One commenter states that many observers are Alaskan Natives and must take sometimes scarce job opportunities in their rural villages and he hopes that the observers are informed of and understand the risks they are taking to support their families.

Response: Region 10's understanding is that Marine Mammal Observers will be employees of Shell or Shell contractors. 2012 Revised Camden Bay Exploration Plan at 11-4 (Marine Mammal Observers provide an opportunity for local hire). Under established EPA policy, contractors, subcontractors, and employees that are expressly granted access to a site by the entity with control over the site are not considered the general public vis-à-vis that entity, but instead are considered "business invitees." See Leased Land Guidance Attachment at 5. Their presence within the Coast Guard safety zone thus does not deprive that area from qualifying for exclusion from ambient air.

Comment Q.4: Commenters contend that allowing OCS sources to establish ambient air boundaries in the Arctic based on safety zones raises concerns regarding the cumulative impacts to offshore air quality that several such operations with ambient air quality boundaries would have on air quality. The commenters cite to a Government Accounting Office Report, GAO, EPA's Ambient Air Policy Results in Additional Pollution, July 1989 (available at: <http://archive.gao.gov/d26t7/139340.pdf>) and assert that that EPA has been subject to scrutiny for creating ambient air boundaries in the first instance because they allow for

greater air quality deterioration. The commenters ask Region 10 to explain why this boundary works in the Arctic and how Region 10 arrived at the decision to allow more pollution instead of less, particularly in light of the heavy use of offshore areas by subsistence communities. Commenters expressed concern about what Region 10's decision means for air quality on the OCS where people hunt and fish.

Response: Safety zones are established by the Coast Guard based on safety considerations, not air quality considerations. See, e.g., 75 Fed. Reg. 803 (January 6, 2010) ("The purpose of the temporary safety zone is to protect the DRILLSHIP from vessels operating outside normal shipping channels and fairways. Placing a temporary safety zone around the DRILLSHIP will significantly reduce the threat of allisions, oil spills, and releases of natural gas, and thereby protect the safety of life, property, and the environment")(capitalization in original). However, because such a safety zone combined with Shell's public access control program has the effect of restricting the general public's access to the relevant area, as discussed in response Q.1, Region 10 believes the presence of a safety zone supports excluding the area inside the zone from ambient air for air quality purposes consistent with prior EPA interpretations of its regulations. The GAO report cited by the commenters focused primarily on concerns with land acquisition to increase the size of the ambient air boundary and thus as a pollution control technique, which is not implicated in the application for and the establishment of a Coast Guard safety zone based on safety considerations. As discussed above in response to comment Q.1, EPA has previously determined that a Coast Guard safety zone is an appropriate basis for establishing an ambient air boundary within which demonstration of compliance with the NAAQS is not required. As discussed in Sections 5 and 6.4 of the Supplemental Statement of Basis and the Region 10 Technical Analysis, emissions under these permits are not expected to cause or contribute to violations of the NAAQS in any area that constitutes ambient air, including in areas where local communities regularly conduct subsistence activities. With respect to cumulative impacts, please see the response to comments in Category Z.

Comment Q.5: Commenters request that, if the ambient air boundary remains in place, Region 10 examine options for requiring monitoring at 500 meters from the Discoverer for the first two weeks of the drilling season. The commenters state they are not aware of any reasons why it would not be technologically feasible to operate monitoring equipment from a moored vessel.

Response: Region 10 believes that the background monitoring data that have been collected in conjunction with the air quality modeling conducted to support these permit actions adequately demonstrate that emissions under the permits will not cause or contribute to a violation of the NAAQS. The emission limits and associated monitoring, recordkeeping, and reporting requirements in the permits are adequate to verify that the NAAQS will not be exceeded and Region 10 therefore does not believe the additional monitoring requested by the commenters is warranted.

The permits do require post-construction monitoring for PM_{2.5}. See Discoverer Beaufort Final OCS/PSD Permit, Condition S; Discoverer Chukchi Final OCS/PSD Permit,

Condition R. Given the challenges of conducting ambient air monitoring in harsh, remote arctic conditions, Region 10 does not believe it is appropriate to require that this monitoring be conducted on a vessel at the ambient air boundary. In addition, Region 10 believes collection of background air quality data within a closer proximity to a community provides more beneficial information on potential health-based exposure than a monitor located well offshore.

Comment Q.6.: A commenter states that the ships in question here are large and produce large amounts of exhaust. The commenter contends that moving the location where the standards had to be met half a kilometer away was done to accommodate, or perhaps hide, the amount of emissions that will occur and that it will result in heavy pollutants in a very sensitive area.

Response: Permitted emissions have been significantly reduced under the 2011 Revised Draft Permits as compared to the 2010 Permits. For a discussion of the basis for considering a Coast Guard safety zone as an appropriate basis for an ambient air boundary, please see response to comment Q.1.

R. CATEGORY – GENERAL COMMENTS ON AMBIENT AIR QUALITY ANALYSIS AND SUPPORTING DATA

Comment R.1: One commenter states that Shell will emit large amounts of fine particulate matter which can cause breathing problems, heart disease, and even death and that, according to a panel of experts from the American Heart Association, there is no safe level of fine particulate matter exposure.

Response: Emissions of fine particulate (PM_{2.5}) have been reduced by more than 60% in the 2011 Revised Draft Permits as compared to the 2010 Permits, from 52 tons per year in the Chukchi Sea and 57 tons per year in the Beaufort Sea to 21 tons per year in each Sea. Region 10 Technical Analysis at 8. Moreover, the air quality analysis demonstrates that the 24-hour PM_{2.5} NAAQS will be attained at all areas that constitute ambient air, with an impact, including background, at the modeled location of maximum impact of 67 % of the PM_{2.5} NAAQS in the Chukchi Sea and 52% of the PM_{2.5} NAAQS in the Beaufort Sea. Supplemental Statement of Basis at 57- 58. Onshore impacts from PM_{2.5} emissions from Shell’s operations are predicted to be substantially lower. The NAAQS are health-based standards, set at a level to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics.

Comment R.2: Commenters note Region 10’s statement that “Shell submitted a single analysis for operation in both the Beaufort and Chukchi Seas, using the Associated Fleet to be authorized under the Beaufort 2011 Revised Draft Permit.” The commenters ask Region 10 to verify that the use of the Associated Fleet for the Beaufort Sea is sufficient to capture the impacts from the fleet in the Chukchi Sea, where higher air quality impacts are predicted to occur.

Response: The Associated Fleet in the Discoverer Beaufort Sea permit has the highest emissions of the two permits and therefore should conservatively represent (likely overstating) the emissions from the permitted Associated Fleet in the Chukchi Sea. The Associated Fleet that will be operating in the Beaufort Sea consists of three additional vessels (a Point Class Tug and two skimmers—the Arctic Endeavor Barge and Rozema) that are not permitted to operate in the Chukchi Sea. The Associated Fleet permitted in the Chukchi Sea does not contain any vessels that were not considered in the modeling analysis. The commenters have provided no information suggesting that using the Associated Fleet that will be operating in the Beaufort Sea to model impacts in the Chukchi Sea understates expected impacts.

Comment R.3: A group of commenters state that, aside from encouraging Region 10 to maintain its previous position, they are not providing comments on Region 10’s statement that “[r]esolving point of compliance questions is not necessary in these permitting actions....”

Response: This comment refers to Region 10’s statement in the Supplemental Statement of Basis that “after further consideration of the terms of the CAA and its legislative history, EPA is reconsidering the interpretation described in Section 2.3 of the Statements of Basis for the 2010 Permits that EPA OCS permitting rules “*require* NAAQS and increment compliance in the ambient air” throughout the OCS (emphasis added). EPA is currently assessing how to apply the NAAQS and increment requirements at 40 CFR § 52.21(k) to OCS sources beyond 25 miles of a state’s seaward boundary. And, for sources located within 25 miles of a state seaward boundary, it is considering how to apply those regulatory requirements consistent with the mandate in CAA § 328(a)(1) that requirements to control pollution from OCS sources located within 25 miles of the state seaward boundary “shall be the same as would be applicable if the source were located in the corresponding onshore area.”” Supplemental Statement of Basis at 17.

Region 10 acknowledges the commenters’ request that Region 10 maintain its previous position on this issue. As discussed in the Supplemental Statement of Basis and acknowledged by the commenters, however, resolving the point of compliance issue is not necessary prior to issuance of these final permits because the record shows that, when operating in compliance with permit conditions, the Discoverer will not cause or contribute to a violation of the NAAQS or increment in the ambient air over any point on the OCS or within the state seaward boundary. *Id* at 17.

Comment R.4: A commenter expresses concern with past and current data analysis and asked for an open, transparent process with independent peer review study. The commenter is particularly concerned about the monitoring stations that collect background air quality data and notes problems with a site at Nuiqsut due to extreme temperatures resulting in the failure of data collection. The commenter questions whether the monitoring sites are actually capturing increases in emissions that may be occurring at certain times and is concerned that the monitoring stations are operated by industry. The commenter also does not believe there are enough data to support the modeling.

Response: As discussed in the Region 10 Technical Analysis, Region 10 has reviewed the background monitoring data collected and submitted to support these permitting actions and determined that quality assurance and quality control requirements have been satisfied. Region 10 is aware that air quality monitoring data have been collected at a monitoring site in Nuiqsut that is operated by another company. This data set has not been submitted to Region 10 in support of these permitting actions and Region 10 has therefore not reviewed this data set to determine whether it meets quality assurance and quality control requirements and is appropriate for PSD modeling purposes. Note that, where sufficient representative ambient air quality data is not available from monitoring sites run by State or local air agencies pursuant to EPA's regulations for Ambient Air Quality Surveillance (see 40 CFR Part 58), the CAA and the PSD regulations require individual permit applicants to conduct their own ambient air quality monitoring. See CAA § 165(e) and 40 CFR § 52.21(m). Region 10 is aware that some companies conduct ambient air monitoring in anticipation of future PSD permitting actions and the monitoring site in Nuiqsut appears to be such a site. If and when a permittee applies for a PSD permit and relies on background monitoring data from a company-run monitoring site, the permitting authority reviews the data to ensure it complies with quality assurance and quality control procedures in EPA regulations and guidance.

With respect to the concern that the background monitoring stations relied on to support these permitting actions are operated by industry, as discussed above, monitoring stations to support PSD permitting actions are often operated by the permittee. Region 10 has reviewed the data from the monitoring sites relied on to support these permits and determined that they meet quality control and quality assurance procedures. There are substantial penalties for submitting false information to the federal government. As discussed in response to comment CC.1, Region 10 has determined that Shell has met the requirement to have representative background air quality data as necessary to assess ambient air quality in the area that is expected to be affected by Shell's exploratory operations. While other baseline data may be useful or helpful in connection with other regulatory decisions related to Shell's exploration drilling operations in the Chukchi and Beaufort Seas, no other baseline data is required prior to issuance of these permits and baseline data required for other regulatory determinations is outside the scope of these PSD permit actions.

S. CATEGORY – CHOICE OF MODEL

Comment S.1: Noting that Region 10 is soliciting comments on the use of the non-guideline AERMOD-COARE model in these proposed revised permits, commenters state that the new COARE model is highly involved and explain that to review the details of the model and be able to provide technical comments and broader peer review would take more time than is being provided. The commenters assert that the use of a new modeling approach should be reasonable enough for the Region to provide more time to complete a comprehensive review of the modeling.

Response: Consistent with the requirements of 40 CFR § 52.21(i)(2), Region 10 approved the use of the non-guideline COARE meteorological algorithm to predict air pollutant concentrations in the open-water arctic environment. Memorandum from Herman Wong, Region 10, to Tyler Fox, OAQPS, re: COARE Bulk Flux Algorithm to Generate Hourly Meteorological Data for Use with the AERMOD Dispersion Program; Section 3.2.2.e Alternative Refined Model Demonstration Approval Memorandum, dated April 1, 2011 (Region 10 AERMOD-COARE Approval Memorandum). The use of this algorithm was approved under the case-by-case alternative modeling provisions specified in EPA's modeling guidelines, 40 CFR Part 51, Appendix W, Section 3.2. Region 10 then sought and obtained concurrence from the EPA Model Clearing House on the Region's approval. See Memorandum from George Bridgers, OAQPS, to Herman Wong, Region 10 re: Model Clearinghouse Review of AERMOD-COARE as an Alternative Model Application in an Arctic Marine Ice Free Environment, dated May 1, 2011 (Model Clearinghouse Concurrence Memo). As provided in 40 CFR §§ 52.21(i)(2) and 52.21(q), Region 10 then provided notice and an opportunity for public comment on its approval of COARE in the context of these specific permit actions. This included a 30-day period for public comment as provided for in 40 CFR § 124.10. This 30-day time period was based on the fact that comment was limited to the revised aspects of the 2011 Revised Draft Permits and the COARE algorithm. See Remand Order I at 82. As explained in the response to comments for Category E, the 30-day period complies with all legal requirements and Region 10 believes it provided sufficient time for commenters to address the issues in the 2011 Revised Draft Permits, including the COARE algorithm.

Comment S.2: Commenters question whether the performance evaluations used to assess the model are representative. After looking at the results from the three tracer sites, the commenters state that there is significant variation in model performance and contend that, if there is that much difference between the California and Louisiana sites, it stands to reason that conditions in the Arctic may be a lot different. Commenters state that differences in sea surface temperature, depth of the marine layer, sea surface roughness, among other things, could give substantially different results in an arctic environment, particularly with respect to the 1-hour NO₂ NAAQS. Based on the results of the performance evaluation presented in the Model Clearinghouse review and because this is the first time using this nonguideline modeling approach in the Arctic, the commenters ask Region 10 to require Shell to conduct additional tracer experiments off the North Slope before the final permits are issued and to include a permit condition that requires Shell to collect data for use in evaluating the performance of the AERMOD-COARE model. The commenters cite to language in EPA's approval memo stating that the EPA Model Clearinghouse recommended further investigation to "determine if other tracer gas experiments are available to evaluate AERMOD-COARE, especially for Arctic conditions."

Response: As discussed in the response to comment S.3 below, evaluation of AERMOD-COARE using the three tracer gas experiments indicate that the meteorological variables such as those mentioned by the commenter do not bias the model towards underestimates. Section 3.2.2.e in Appendix W to 40 CFR Part 51 states that an alternative refined model may be used provided that five criteria are met,

including (a) that the necessary data bases (*e.g.*, tracer gas experiments) be available (Element 3); and (b) that appropriate performance evaluations have shown that the alternative refined model (*e.g.*, AERMOD-COARE in this case) is not biased toward underestimation (Element 4). 40 CFR Part 51, Appendix W, § 3.2.2(e)(iii)-(iv). Region 10 determined that the tracer gas experiments conducted at Cameron, Louisiana, and Carpinteria and Pismo Beach, California, are representative of arctic conditions. The basis for this finding is that the experiments simulate over water dispersion, tracer gas concentrations were measured at the shoreline, and there was a range of positive air-sea temperature differences (*i.e.*, stable conditions) like what would be expected in the Arctic. Consequently, Region 10 concluded that these three tracer gas experiments were adequate for the AERMOD-COARE performance evaluation. Region 10 AERMOD-COARE Approval Memorandum, Section B.3; see also Model Clearinghouse Concurrence Memo.

Regarding the commenter's concern that the tracer gas experiments were not conducted in the Arctic, Region 10 recognizes that there are not tracer gas experiments for every geographic region, climatic region, or synoptic region for use in a performance evaluation. Region 10 AERMOD-COARE Approval Memorandum, Section B.3. This is particularly true for the Arctic given the harsh environmental and meteorological conditions in which such an experiment would have to be conducted. Nevertheless, Region 10 concluded that the tracer gas experiments relied on to support approval of the model are acceptable based on the similarity of the tracer gas experiments and the marine arctic air-sea temperatures. *Id.*

After evaluating Shell's demonstrations with respect to the five elements under Section 3.2.2.e in 40 CFR Part 51, Appendix W, Region 10 approved the AERMOD-COARE model as an alternative refined model to estimate emission impacts from marine located combustion sources. AERMOD-COARE was subsequently used by Shell to make the required compliance demonstrations.

When approving Shell's use of this model, Region 10 determined that "Approval to use this alternative model is made on a case-by-case basis. Should a project proponent desire to use AERMOD-COARE in an Arctic marine ice free environment air permit project, a request must be made to R10 prior to the submission of an ambient air quality impact analysis...." Region 10 AERMOD-COARE Approval Memorandum, Section C.1. Hence, should other OCS projects be proposed in the Beaufort or Chukchi Seas, Region 10 will require each project proponent to justify the use of AERMOD-COARE and, if necessary, update the elements under 40 CFR Part 51, Appendix W, Section 3.2.2.e.

The commenter is correct that Region 10 recommended additional investigations to determine if other tracer gas experiments are available to evaluate AERMOD-COARE, particularly for arctic conditions, but none to date have been identified that have occurred in an arctic environment. Region 10 has accepted the Section 3.2.2.e demonstration and determined that the existing experiments provide an adequate basis for accepting the alternative model., Region 10 therefore does not believe it is reasonable to require Shell

to conduct a tracer gas experiment in the Arctic followed by another performance evaluation.

Response to comment S.3 discusses the performance criteria and goals for an acceptable performance evaluation

Comment S.3: Commenters state that it is unclear from the permit record whether Shell tuned the COARE model with the available data sets and then used the same tuned model in the performance evaluation and that Region 10 must ensure, and make it known to the public, that Shell tested the model with an independent data set. The commenters assert that there is very little discussion of performance goals in the modeling evaluation so it is difficult to assess the model performance presented by Region 10. The commenters assert that, from a scientific perspective, the use of AERMOD-COARE is far superior to the OCD model, but state that does not necessarily mean it is accurate in this particular application. The commenters state that Region 10 must make it clear, from the outset, what the acceptable performance results must be, based on the available data (*e.g.*, is it good enough to get within a factor of two or are the data good enough to demand results within 30 %) and be able to clearly demonstrate that the model is accurately predicting impacts to a reasonable degree and that the model is not under-predicting impacts. A commenter also asked that the model be better explained. Other commenters expressed general concern with the data used in the model and requested that the data be the most current data available.

Response: The commenters do not provide specific cases or examples of what they mean by tuning. The meteorology associated with Pismo Beach, California, and Cameron, Louisiana tracer gas experiments are shown in Table 2 and Table 4, respectively, of the Region 10 AERMOD-COARE Approval Memorandum. For example, in the Revised Air-Sea Temp (K) column, there are several hours of values highlighted in red because of inconsistencies between the air-sea temperature difference and the virtual temperature potential lapse rate. The virtual potential temperature lapse rate sometimes indicates a stable boundary layer (positive) when the air-sea temperature difference is unstable (negative). Either there was a low mixed layer not reflected by the mixing height measurements in the tables, or one of the measurements is not representative of the boundary layer profile. The previous Ocean Coastal Dispersion (OCD) model evaluation relied on a measured vertical temperature lapse rate and, so to be consistent with the earlier studies, this performance evaluation adjusted the air-sea temperature difference to be at least as stable as indicated by the virtual temperature lapse rate. Region 10 agreed that this adjustment by Shell was appropriate. This adjustment to the two data sets was carried over to all of the performance evaluations. Region 10 is not aware of other adjustments and the commenter has not identified any others.

As in previous model evaluations and analyses, Region 10 followed certain design criteria to determine model acceptability. In this particular case, the predicted AERMOD-COARE model concentrations, and the Cameron, Louisiana, and the Carpinteria and Pismo Beach, California, tracer gas experiment measurements were sorted and plotted as well as statistically analyzed. These plots and statistical analyses

were used by Region 10 to conclude that AERMOD-COARE is not biased towards underestimates as provided in Element 4 in Section 3.2.2.e under Appendix W of 40 CFR Part 51. The procedures are used to evaluate how well the modeling method explains the frequency distribution of the observed concentration and measures the model's ability to explain the temporal variability of the observations. Generally, the approach with the least scatter would be preferred. See Region 10 AERMOD-COARE Approval Memorandum, Section B.4.b for additional description of the statistical evaluation procedures.

The texts, tables and graphics of the performance evaluation for five cases conducted by Shell using the three experiments are included with the Region 10 AERMOD-COARE Approval Memorandum in Section B.4. Table 1 lists the five cases. The graphics or figures reflect the scatter of the prediction-to-observation ratio results, including over predictions and under predictions, when comparing the model results to actual predictions. Quantile-quantile (Q-Q) plots are shown in Figures 6 to 19 and details a 1:1 line and a factor of 2 line (i.e., $0.5 < \text{ratio} < 2.0$) about the 1:1 line for prediction-to-observation ratios. A ratio on the 1:1 line reflects a perfect match. Ratios between the factor of 2 lines are preferred by EPA. The four plots in Figures 20 to 23 display the bias of the geometric mean (MG) and against scatter (VG). In each plot, there is $\text{MG} = 1$ line and a factor of 2 lines (i.e., $0.5 < \text{MG} < 2.0$). On the horizontal axis, the $\text{MG} = 1$ separates model ratios (in terms of over prediction and under prediction). Table 8 provides a statistical summary of each data set (including all three data sets combined) for the five cases. The statistics analyzed and presented included geometric mean, standard deviation of geometric mean, bias about the geometric mean, scatter, geometric correlation coefficient, fraction within a factor of 2, and robust highest concentration (RHC). The RHC is frequently used by EPA to assess the model's ability to characterize the upper end of the frequency distribution. Section B.4.c in the Region 10 AERMOD-COARE Approval Memorandum summarizes the results in text format. Based on the plots and statistical analyses for the five cases, Region 10 believes AERMOD-COARE is not biased towards underestimates and better represents over water transport such as in the Beaufort and Chukchi Seas as compared to the OCD model. Region 10 agrees with the commenter that AERMOD-COARE is a "far superior" model from a scientific perspective.

The commenters have identified general concerns with the data used in the model and requested that the data be the most recent available, but have identified no specific concerns in making this general comment. In general, the modeling was performed using the most recent available data at the time the modeling was performed. Note that in some cases there is a time lag between the time the data is collected and when the data is ready for use in a modeling analysis resulting from the need to review for quality control and quality assurance or to otherwise conduct required analyses of the data. Region 10 believes the data used in the model were appropriate for these permitting actions.

With respect to concerns with the adequacy of time to review the model, please see response to comment S.1.

Comment S.4: Commenters state that the AERMOD-COARE model does not account for platform building downwash and that, although there are no platforms planned for these proposed projects, the permits should explicitly prohibit their use. The commenters further state that, before AERMOD-COARE is used in an application with platform drilling, Region 10 would need to evaluate more closely the need to simulate cavity effects next to the platform.

Response: The permits authorize air emissions only from the equipment identified in the permits and the underlying applications, and no platform is included in these documents. No such prohibition is therefore needed.

Comment S.5: Commenters state that the AERMOD-COARE model does not account for shoreline fumigation and that it is not clear whether those conditions were included in any of the tracer data sets. The commenters contend that shoreline fumigation can cause higher short-term concentrations, but according to Shell's modeling analysis, the distance to the lease blocks is great enough that the highest concentrations would likely occur over water. Assuming this is true, the commenters continue that, even in the Beaufort Sea where lease blocks are much closer to shore, they would be concerned with the use of AERMOD-COARE in situations where high concentrations are predicted closer to shoreline.

Response: Shoreline fumigation occurs when a plume from a tall stack travels in an over-water stable layer and reaches the land-sea interface, resulting in the plume being mixed down to the ground in an unstable layer. The commenters are correct that AERMOD-COARE does not account for shoreline fumigation and that shoreline fumigation can cause higher short term concentrations. In Shell's case, its stacks are not near the shoreline (greater than 3 miles or 4.8 kilometers) and the highest concentrations are predicted to occur closer to the Discoverer. In response to a Region 10 Second Information and Data Request dated March 7, 2011 asking Shell to address this issue, Shell responded as follows in a submittal dated March 11, 2011:

Shell has presently made no provisions for this analysis within the COARE-AERMOD approach. However, it should be noted that the distance between the drilling locations and the shore where potential fumigation could occur is over 50 kilometers for all locations in the Chukchi Sea and for the Beaufort Sea, the locations are still on the order of many kilometers from any of the villages. The AERMOD model has no provision for fumigation calculations. Further AERMOD has no provision for the internal boundary and subsequent changes in mixing that might occur due to changes in land use for terrestrial applications. Given the long distances to the villages, it seems appropriate that the CALPUFF model should be used in the event EPA requests that this issue be addressed. The CALPUFF model does contain an algorithm for addressing fumigation or spatial changes in terrain, land use or meteorology in general. Another factor to be considered is that the real purpose of fumigation analyses is to treat cases where very elevated plumes are mixed rapidly to the ground when passing over a change in surface regime (i.e.; from stable to unstable boundary layers). The classic

fumigation case is a power plant located on a coastline. For exploratory drilling sources, however, not only are the sources located far from the shoreline, but also, the plumes from Shell's sources are relatively low and would be expected to have reached the surface by the time they reach the shore.

Region 10 agrees that there was no need to address shoreline fumigation in connection with Shell's air quality analysis given the vessels and their locations at issue in these permits.

It is true that, in approving the model, Region 10 recognized that, "While AERMOD-COARE is acceptable to R10 for the current application in the Arctic marine ice free environment, it lacks two features found in OCD: platform building downwash and a shoreline fumigation algorithm. These two features should be coded into the AERMOD dispersion program for wider application in lieu of using OCD." Region 10 AERMOD-COARE Approval Memorandum, Section 3.2.2.e. That the AERMOD-COARE model currently does not account for shoreline fumigation is irrelevant for purposes of this permitting action, however, because the conditions giving rise to shoreline fumigation are not present in the project to be authorized in these permitting actions.¹³

Comment S.6: A commenter asked that the model be extended to the new standards regarding global climate change, including CO and CO₂ levels.

Response: Modeling using AERMOD-COARE was conducted for CO. EPA has not established a National Ambient Air Quality Standard for CO₂. Therefore, there is no requirement to conduct an ambient air quality analysis with respect to CO₂.

Comment S.7: A commenter states that changes to a model and to the variables used in the model is done by EPA and industry scientists and in the process the data is greatly skewed. The commenter states that the local community has no control over the process.

Response: As discussed above in response to comment S.2, the use of alternative elements in a guideline model are approved by Region 10 according to criteria in 40 CFR Part 51, Appendix W, Section 3.2, and are therefore subject to public comment. The local community therefore does have the opportunity to review and have input on the model and model variations and its application in a particular PSD permitting action.

T. CATEGORY – PRORATING IMPACTS

Comment T.1: Commenters note Region 10's statement that:

¹³Fumigation studies were conducted during the Carpinteria, California, tracer gas experiment on October 1, 3, 4 and 5, 1985. Bureau of Ocean, Energy Management, Regulation and Enforcement, Development of the Next Generation Air Quality Models for Outer Continental Shelf (OCS) Application, Final Report: Volume I dated March, 2006. Hence, while Region 10 continues to believe that a shoreline fumigation algorithm is not needed in the modeling supporting these permits, a tracer gas experiment is available for a project proponent to evaluate shoreline fumigation when the situation arises.

Shell prorated the period averages in order to estimate the annual average impacts. For example, to estimate the annual average NO₂, PM_{2.5} or SO₂ impacts, Shell multiplied the 120-day average impact by 0.329 (120 drilling days out of 365 days in a year). Shell's approach for estimating the annual average impact is reasonable since there are no impacts during non-drilling periods.

The commenters disagree that period averages can be prorated, particularly for pollutants such as NO₂ that have rolling 12-month emissions limits. The commenters contend that the permit cannot rely upon a 12-month period in which to demonstrate compliance with air quality standards and at the same time prorate those very same emissions. The commenters request that Region 10 update the permit analysis so that the impacts for NO₂, PM_{2.5}, and SO₂ are not prorated and then update any relevant permit conditions as necessary to ensure compliance with relevant standards.

Response: The use of the term “prorated” in the Supplemental Statement of Basis has introduced some confusion about what Shell actually did. Shell modeled each of 120 drilling days using the estimated emissions for each day. Shell did not model the remaining 245 days since there are no emissions from the Discoverer or the Associated Fleet during these days (*i.e.*, the modeled concentration would be zero). Therefore, multiplying Shell's period average by 0.329 (120 period days divided by 365 calendar days) provides the same annual average value as what would occur if one added 245-days worth of zeros to the 120-days worth of modeled concentrations, and then divided the total by 365 days. The equivalency is illustrated below, where the term “Sum” means the total modeled concentration over the 120 days that Shell modeled. As illustrated by these equations, the period average times 0.329 *is* the annual average concentration.

$$\frac{\text{Sum}}{120} \times 0.329 = \frac{\text{Sum}}{365}$$

Shell then added the resulting annual average value to the annual average background concentration to determine the total annual average impact. Because the modeling approach reflects concentrations based on permitted emissions and provides estimates of the annual average impacts, Region 10 does not believe any additional modeling analysis is needed. The 2011 Revised Draft Permit requirements ensure compliance with the relevant annual standards and use the appropriate averaging period for compliance demonstrations. The fact that the annual emission limits are 12-month rolling limits does not in any way authorize Shell to operate outside of the five month drilling season. See response to comment K.1.b.

U. CATEGORY – METEOROLOGICAL DATA

Comment U.1: Commenters ask Region 10 to justify the use of just one meteorological data set as the “representative meteorological data” in the modeling. The commenters

state that one of the purported benefits of using AERMOD is the ability to use “representative meteorological data” in the modeling. However, the commenters point to Region 10’s statement that “Shell submitted a single analysis for operation in both the Beaufort and Chukchi Seas.” The commenters also ask Region 10 to explain whether the meteorological data used was the most conservative, and if not, why and how the meteorological data was chosen. Based on information available about the Weather Research Forecast (WRF) data used by Shell, information was collected from separate buoys and stations in the Beaufort and Chukchi Seas. More importantly ice formation appears to play a significant role in wind and weather patterns and because ice varies between the two oceans it is critical that a further justification of the meteorological data is provided for these permits.

Response to U.1: Region 10’s statement that “Shell submitted a single analysis for operation in both the Beaufort and Chukchi Seas” was, in hindsight, overly broad. Shell’s analysis did use the same emission sources, same operating scenarios, and the same local coordinate system, and Shell provided its analysis for the two seas in a single document. As explained in the Region 10 Technical Analysis (at 5) and in more detail below, however, Shell used two distinct meteorological data sets and model runs. Shell conducted a series of runs for the Chukchi Sea and another series of runs for the Beaufort Sea. In both cases, Shell used robust sets of meteorological measurements obtained from the given region.

The meteorological measurements relied on in the modeling analyses includes numerous site specific components that were supplemented as appropriate by representative National Weather Service (NWS) data, consistent with Section 8.3.3.2(c) of Appendix W to 40 CFR Part 51. The sets of meteorological data used in these analyses were also designed to account for an issue of representativeness that is somewhat unique to this area, *i.e.*, the influence of ice vs. ice-free conditions on “over-water” dispersion. The Beaufort Sea analysis included surface measurements of wind, temperature, delta-T, solar radiation, and pressure from Reindeer Island, buoy data from Reindeer Island and Sivulliq, profiler data from Endeavor Island, and NWS upper air data from Barrow. Similarly, the Chukchi Sea analysis included surface measurements from Point Lay, Wainwright NWS Station, buoy data from Burger supplemented with Reindeer Island or Sivulliq buoy data, and NWS upper air data from Barrow. Supplemental Statement of Basis at 51.

The processing of the hourly meteorological data for both seas was based on the use of the alternative COARE preprocessor or the standard AERMET preprocessing program, depending on the ice conditions. COARE was used to derive hourly meteorological data in an ice-free marine environment in both seas consistent with the Region 10 AERMOD-COARE Approval Memo. Likewise, AERMET (the standard meteorological processor for AERMOD) was used to process the meteorological data measured during ice conditions in the two seas. In addition, surface characteristics that reflect icy conditions in the two seas were also input into AERMET. Consequently, the influence of ice vs. ice-free conditions on dispersion in the boundary layer was accounted for in the AERMOD modeling results for both seas.

The issue of representativeness of meteorological data is complex and its determination will depend on several factors, including the four factors listed in Appendix W: 1) the proximity of the monitoring site to the area under consideration; 2) the complexity of the terrain; 3) the exposure of the monitoring site; and 4) the period of time during which the data are collected. See 40 CFR Part 51, Appendix W. § 8.3(a). Representativeness may also vary greatly across different meteorological parameters. For example, upper air soundings used in calculating mixing heights are generally considered to be representative over a much larger geographical area than measurements taken near the surface. Among the surface meteorological parameters, representativeness can also vary significantly. For example, surface ambient temperatures (nominally measured between about 2 and 10 meters above ground) are generally representative over a larger area than surface wind speed and direction (nominally measured about 10 meters above ground).

Section 8.3(b) of Appendix W to 40 CFR Part 51 indicates that “[m]odel input data are normally obtained from the National Weather Service or as part of a site specific measurement program.” Section 8.3.1.2 of Appendix W also recommends that “[t]he meteorological data should be *adequately representative*, and may be site specific or from a nearby NWS station” (emphasis in original). While Section 8.3.3.1(a) of Appendix W states that “[s]patial or geographical representativeness is best achieved by collection of all of the needed model input data in close proximity to the actual site of the source(s),” it further clarifies that “while site specific measurements are frequently made ‘on-property’ (*i.e.*, on the source’s premises), acquisition of adequately representative site specific data does not preclude collection of data from a location off property. Conversely, collection of meteorological data on a source’s property does not of itself guarantee adequate representativeness.” Since Appendix W recommends in section 8.3.1.2(a) that meteorological data should be adequately representative, regardless of whether NWS or site specific data are being used, the main distinction between the two types of data is the length of record provided for in section 8.3.1.2(b), which states that “[t]he use of 5 years of NWS meteorological data or at least 1 year of site specific data is required. If one year or more (including partial years), up to five years, of site specific data is available, these data are preferred for use in air quality analyses.” The representativeness of the data and the length of the record for these analyses are discussed more fully in the response to comment U.2.a below.

Region 10 disagrees with the commenter’s suggestion that “the most conservative” meteorological data should be used as inputs to AERMOD. Section 8.3.1.2(a) of Appendix W recommends that “[t]he meteorological data should be *adequately representative*” and makes no statements that would support an assertion that “the most conservative” data should be used. Nor does the commenter reference any rule or other authority that requires that the “most conservative” data be used. As discussed in more detail in response to comment U.2 below, Region 10 believes that the meteorological data used in these modeling analyses for the Beaufort Sea and in the Chukchi Sea are

adequately representative of meteorological conditions in each respective sea in the vicinity of the proposed operations.¹⁴

Comment U.2.a: Commenters assert that Shell has not met minimum regulatory requirements for the amount of site specific meteorological data that Shell must obtain to demonstrate that Shell's operations will not violate air standards. The commenters point to 40 CFR Part 51, Appendix W, § 8.3.1.2, which Region 10 also cited in the Region 10 Technical Analysis (at 5). That section states, under the heading "Recommendations," that "The use of 5 years of NWS data or 1 year of site-specific data is required." The commenters contend that site specific data are data collected on-site, citing to EPA, Ambient Monitoring Guidelines for Prevention of Significant Deterioration at 48 (May 1987). Commenters also contend that the duration of the data collected does not come close to one year. For the Chukchi Sea, the commenters state that Shell has only a few months of site specific data and, because Shell did not obtain site-specific data for early July or late November, the data do not even cover the period during which Shell may drill. The commenters further state that all of Shell's Chukchi data together—including both site specific and on land Wainwright and Point Lay data—amount to roughly 30 months and less than the full five years required for non-site specific data. For the Beaufort Sea, the commenters assert that Shell similarly has failed to provide one year of site specific data or five years of NWS meteorological data, stating that Shell has no site specific data for July or November, and has data for only about half of August and October. The commenters further state that all of Shell's Beaufort Sea data total under 4 years of data, and the vast majority of these data were collected on-land and far from Shell's potential drill sites. The commenters conclude that Region 10 cannot issue Shell's permits because Shell has failed to meet the regulatory minimum requirements for meteorological data collection and that Region 10 must therefore retract the draft permits and direct Shell to collect additional meteorological data.

Response to U.2.a: As explained in the response to comment U.1, robust sets of meteorological measurements were used in both the Beaufort and Chukchi Sea analyses, including numerous site specific components that were supplemented as appropriate by representative NWS data, consistent with Section 8.3.3.2(c) of Appendix W. Region 10 believes the air quality analyses in this case are supported by one year of site specific data, within the meaning of section 8.3.1.2(b) of Appendix W given the activities to be authorized under these permits.

At the outset, it is important to emphasize the unique challenges of collecting any data in this environment. Temperatures are extremely cold, winds can be strong, and the drilling operations are occurring miles offshore. This harsh, remote environment presents obvious

¹⁴ In the absence of "adequately representative" meteorological data, a screening model such as AERSCREEN may be used, which is designed to provide a conservative estimate of concentrations based on a matrix of potential worst-case meteorological conditions. As discussed in response to comment U.2.b, the modeling analysis supporting the 2010 Permits used a screening model, because representative meteorological data was still in the process of being collected at that time. Region 10 has determined that a sufficient and adequately representative set of meteorological data are available to support a refined dispersion modeling analysis using AERMOD, and therefore use of a screening technique is no longer necessary or appropriate.

challenges to the siting and installation of data collection instruments, the operation of those instruments, and the collection of complete, quality-assured data. In the case of the Chukchi Sea, the drilling operations will be conducted more than 60 miles offshore at the closest location. The scale of the area in which activities are to be authorized under these permits is also unique. Shell's lease blocks in the Chukchi Sea cover an area of approximately 2442 square miles, and its lease blocks in the Beaufort Sea cover an area of more than 1145 square miles. As noted in the response to U.1 above, another complication that is somewhat unique to this environment is that the sea is frozen during part of the drilling season, imposing some restrictions on where "site specific" meteorological monitoring equipment can be sited to account for ice versus ice-free conditions.

The permits in this case also differ from most PSD permits in that they authorize operation only from July 1 through November 30 of each year. Therefore, in conducting a modeling analysis, Shell is required to model its emissions only during that period. See Appendix W, Table 8.2, fn. 2 (discussing that if a source is subject to an enforceable limitation on hours of operation, only the hours of authorized operation are to be modeled with emissions from the source). Because the meteorological data is only used in connection with modeling emissions from the permitted source, meteorological data collected from times other than during the periods of authorized operation are not used in the modeling analysis. 40 CFR 52.21(k) requires the owner or operator of a proposed source to demonstrate that allowable emission increases from the proposed source do not cause or contribute to air pollution in violation of a NAAQS or PSD increment (emphasis added). Region 10 believes that, in the case of a source that is authorized (allowed) to operate only during certain times of the year, the one year time period specified in section 8.3.1.2(b) of Appendix W for site specific data is met if the data collection period covers one year's worth of the period of authorized operation. In this case, five months worth of data covering July 1 through November 30 is one year of data within the meaning of that section. Since the permits only authorize operations from July 1 to November 30, emissions and hence contributions to ambient air quality, will both be zero during the remainder of the year.

The commenters apparently consider the buoy data to be "site specific" data and all other data to be non-site specific data. The buoys were generally employed only when the ocean was "ice free," generally beginning sometime in August until sometime in October, when they were either retrieved or became detached from the anchor and floated away. Because there were no buoy data during the early and later part of the July through November drilling season, the commenters contend that there is not even five months of data (which as discussed above is one year of data for purposes of these permits). Region 10 does not agree with this conclusion for several reasons.

First, the commenter's statement that site specific meteorological data must be collected "on site" because of EPA's PSD Ambient Monitoring Guidelines is simply incorrect. The guidance document cited by the commenters dates from 1987 and does refer to one year of "on site data" That guidance document has been revised on this issue, however, by revisions to Appendix W in 2003. Prior to promulgating those revisions, EPA solicited

comment on the terminology and meaning of “site-specific” meteorological data, and based on public comments subsection 9.3.3.1 (renumbered to section 8.3.3.1 in 2005) was revised “to clarify that, while site-specific measurements are frequently made ‘on-property’ (*i.e.*, on the source’s premises), acquisition of adequately representative site-specific data does not preclude collecting data from a location off property. Conversely, collection of meteorological data on property does not of itself guarantee adequate representativeness.” 68 Fed. Reg. 18444, 18446 (April 15, 2003). Specifically, the term “on-site” in reference to meteorological data has been removed from Appendix W. Because Appendix W modified the recommendations of the 1987 guidance after notice and comment and is the later statement from EPA on this issue, it is not true that site specific data must be collected on site.

Region 10 also does not agree that only the buoy data is “site specific” data within the meaning of Appendix W. In the Beaufort Sea, the modeling relies primarily on surface measurements from the Reindeer Island meteorological tower (air temperature, pressure, relative humidity and wind speed), with additional surface information from two oceanographic buoys, one anchored near Reindeer Island and one in the Sivulliq Prospect, that recorded sea surface temperature, air temperature, pressure, and relative humidity during periods when the water was “ice free” until either they were retrieved or became detached from their anchors by ice. Reindeer Island is located about 10 kilometers (roughly 6 miles) offshore and approximately 80 kilometers (roughly 50 miles) west of the nearest lease block where Shell is authorized to drill under this permit. The 6 mile distance is approximately the same offshore distance as Shell’s closest lease blocks with respect to the shoreline.

The Reindeer Island station was specifically established to collect representative meteorological data for these permitting actions. It is the most distant offshore meteorological station to date that has operated year-round in the extremely harsh Beaufort Sea environment. Given the lack of topographical influence, the minimal meteorological influence of the gravel bar itself, and wide homogeneous nature of offshore surface conditions, the station is representative of the meteorological conditions expected over an extremely large offshore area. Region 10 therefore considers the data collected at the Reindeer Island monitoring site both adequately representative and site specific within the meaning of Appendix W.

In the Chukchi Sea, there are no islands anywhere in the vicinity of Shell’s leases and the lease blocks are located more than 96 kilometers (60 miles) from the nearest shore. As a result, a determination was made by Shell to establish an onshore 10 meter tower at Point Lay (located approximately 99 kilometers or 62 miles from the closest lease block) to collect wind speed, wind direction, air temperature, differential temperature between 10 and 2 meters, solar radiation and pressure for periods of ice conditions. These data were processed with AERMET. For the open water period, the Burger Buoy located in the Chukchi Sea in the area of Shell’s leases was used to collect wind speed, wind direction, air temperature, relative humidity, and sea temperature. These data were processed with COARE.

Although the Point Lay station is not located offshore, it is located close to the shoreline in an area with virtually no terrain relief and without any vegetative or other surface roughness elements that would significantly impede or alter the wind flow. Wind speed and direction are key factors in dispersion modeling because they affect both the direction of plume transport and the amount of plume rise. Given the relatively persistent wind and weather patterns across the region and the lack of any localized terrain influences on wind patterns in and along the Chukchi Sea, Region 10 believes the data collected at the Point Lay monitoring site are adequately representative of meteorological conditions in the area where operations will be conducted in the Chukchi Sea despite the distance between the monitor location and the proposed operations. As discussed below, additional modeling conducted for NO₂ for 2010 indicates a potential bias toward more conservative ambient air quality impacts associated with use of on shore wind data as compared to wind data from the buoys located off shore. Given that the Point Lay meteorological station was specifically established to support the Chukchi permit application and given the particular geographic and weather constraints in the location where this source will be operating, Region 10 also believes it constitutes site specific data within the meaning of Appendix W.

Region 10 recognizes that the distance between the Reindeer Island station and Shell's proposed operations in the Beaufort sea, and the Point Lay station and Shell's proposed operations in the Chukchi Sea, are far greater than in most other cases where monitoring sites have been considered to be site specific or representative. Region 10 believes that the scale of the area in general as well as the scale of the area over which operations are to be authorized under these permits are relevant and unique factors such that, in conjunction with the other factors discussed above, the data from the Reindeer Island and Point Lay stations are appropriately considered both adequately representative and site specific within the meaning of Appendix W. One final point worth noting when considering the proximity and representativeness of the collected meteorological data in these permitting applications is that there is less directional dependency in the modeling analysis in these applications as compared with most other cases since the modeled ambient air boundary distance is uniform (a circle of 500 meters) and there are no directionally dependent terrain features near the source, thus limiting the importance of some of the key aspects of representativeness of wind direction in the modeling analysis.

EPA has issued several guidance documents related to the collection and processing of meteorological data for use in dispersion modeling analyses under the PSD regulations. The primary EPA meteorological monitoring guidance documents are: Meteorological Monitoring Guidance for Regulatory Monitoring Applications, EPA-454/R-99-005 dated February 2000; Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, dated March, 2008; and Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), EPA-450/4-87-007 dated May, 1987. In general, Shell followed these three guidance documents in selecting monitoring sites and equipment, installing the meteorological towers, and sensors, developing a quality assurance project plan (QAPP), performing scheduled independent audits, scanning the meteorological data for outliers, achieving 90 percent data recovery on a quarterly basis, and providing hourly data in spreadsheet format with the quarterly,

semi-annual and/or annual reports to Region 10. For the Endeavor Island measurement program, Region 10 developed additional guidance for the collection of upper air temperature profiles using a radiometer. In summary, the site specific meteorological data measured at Reindeer Island, Point Lay, and Endeavor Island was consistent with EPA PSD regulations and applicable guidance pertaining to meteorological data monitoring programs. The other monitoring programs, including NWS surface and upper air measurements, followed their own respective quality assurance and control procedures. Recognizing the robustness of the entire set of meteorological measurements conducted to support these modeling analyses and taking into account the practical challenges imposed on meteorological monitoring due to the remoteness and harsh conditions of this offshore area, Region 10 considers the meteorological data used in the Beaufort Sea and Chukchi Sea modeling analyses to be adequately representative and appropriate for these modeling analyses as a technical matter, and to meet the provisions in Appendix W for one year of site specific data.

Although Shell followed the requirements contained in the respective QAPPs, including polling the data and visiting the monitoring site by the site technician whenever possible, there were periods during open water conditions in 2009 in the Chukchi Sea when the recommended quarterly data recovery rate for a specific meteorological variable was not achieved. These periods of lower data recovery rates were associated with the off-shore wind data collected at the Burger Buoy deployed in the Chukchi Sea, again during the open water period. The loss of data was due to extreme weather events that cause the instruments to fail coupled with the difficulty of visiting the remote monitoring stations and offshore buoys to replace the instrument in a timely fashion during adverse weather conditions.

Considering that a site specific buoy was not operational for the entire open water period and wind data completeness was less than 90 % for the 2009 Chukchi Sea dataset, as the commenter notes, Region 10 acknowledges that the Chukchi Sea modeling analyses based on 2009 meteorological data by themselves do not fully satisfy the Appendix W requirement for five years of representative NWS data or at least one year of site specific data. The 2009 meteorological data for the Beaufort Sea does meet the 90 % data capture for all parameters, and the 2010 meteorological data recovery rates exceeded 90 % for all parameters for both the Chukchi and Beaufort Seas. Therefore, the ambient impact analyses presented in the Supplemental Statement of Basis reflect at least one year of site-specific meteorological data for all cases except for the 1-hour NO₂ NAAQS analysis in the Chukchi Sea, which relied only upon 2009 meteorological data.¹⁵

To address the issue of data completeness for the 1-hour NO₂ NAAQS analysis in the Chukchi Sea, Region 10 has, in response to this comment, supplemented the analysis using 2010 meteorological data in the Chukchi Sea. Region 10 performed these additional runs for 1-hour NO₂ using the latest version of AERMOD (version 11103), with the maximum individual hourly ozone readings from either Point Lay and Wainwright in 2010 (required for input to the PVMRM option in AERMOD), along with the 2010 AERMOD-COARE meteorological data set that Shell had prepared and used in

¹⁵ 2010 data for ozone was not available at the time Shell conducted the modeling to support the 2011 Revised Draft Permits. See Region 10 Technical Analysis at 6.

modeling other pollutants and averaging periods. As was done in the prior Shell analysis, supporting the 2011 Revised Draft Permits, Region 10 used the hour by season NO₂ background values Shell had prepared that included both 2009 and 2010 monitoring data. Because the latest version of AERMOD was used in the 2010 analysis, Region 10 also reran the 2009 1-hour NO₂ scenarios for consistency in comparing the two modeled periods. Region 10 also performed these runs using a refined receptor grid with finer receptor spacing. The modified receptor grid is described in response to comments W.2.a

As discussed in response to comments W.2.a. using the latest version of AERMOD (version 11103) slightly increased the 1-hour NO₂ results in the 2009 runs. For 2009 the maximum 98th percentile 1-hour NO₂ concentration was 175.2 µg/m³. This result occurred in sequence B (the later 120 day period of the 5 month drilling season). In the 2010 runs that Region 10 has performed, the maximum 98th percentile 1-hour NO₂ concentration was 124.4 µg/m³, occurring during sequence A (during the 120 day period at the beginning of the drilling season). The 2010 maximum 1-hour NO₂ concentration for sequence B was 123.4 µg/m³. Because the modeled design value for the 1-hour NO₂ standard is based on an average across the number of years modeled at each receptor,¹⁶ Region 10 performed averaging over the two modeled years, 2009 and 2010. When averaged over the 2 years modeled, the maximum 98th percentile 1-hour NO₂ was 137.3 µg/m³. This occurs at receptor (-1600,1600), or approximately 2260 meters from the ship's center, during sequence B, or the later portion of the 5 month drilling season. This maximum 1-hour 98th percentile value is well under the 1-hour NO₂ NAAQS of 188 µg/m³. Region 10 believes this additional analysis demonstrates that the 1-hour NO₂ NAAQS will be protected and that the use of just the 2009 meteorological dataset was conservative. This result also demonstrates that using a single year in the original NAAQS analysis for a probabilistic standard that is averaged over multiple years may introduce additional conservatism to the result since the maximum modeled 98th percentile concentration may occur at different receptors in each year.

The following results illustrate this effect. In the 2009 analysis the maximum modeled 98th percentile concentration occurred at receptor (-1500,1500). The maximum 98th percentile modeled concentration at this same receptor in 2010 is only 98.9 µg/m³ well below the 2010 modeled high of 124.4 µg/m³. Current modeling guidance for 1-hour NO₂ using NWS data allows for averaging modeled results over 5 years which, based on the results demonstrated above, could lead to an even lower average with additional modeled years. Tables 1 and 2 below demonstrate how the modeled concentrations, when averaged over multiple years, will result in lower values than if one only considers the maximum value in an individual year. The averaging across multiple years in this case also demonstrates that a 3rd modeled year could have a modeled concentration of 289 µg/m³ at the current highest receptor and the 3 year average would still be below the NAAQS threshold. This result also reinforces the very conservative assumption of a single well location over 3 years.

¹⁶ Memorandum from Tyler Fox, OAQPS, re: Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard, dated June 28, 2010, at 4.

This additional modeling analysis for the 1-hour NO₂ NAAQS indicates that Chukchi Sea results based on the 2009 meteorological data show higher ambient impacts than results based on the more complete 2010 meteorological data. Since the 2009 modeling analysis relied more heavily on substituted winds from the Wainwright NWS station for the ice-free period, this indicates a potential bias toward more conservative ambient air quality impacts associated with use of NWS winds than for site specific winds. This potential bias could be explained by the lower wind speeds that would be expected at NWS stations on the coast of the Chukchi Sea due to the overland wind fetch, as compared to winds measured at offshore buoys. Although the modeling results based solely on 2010 meteorological data would meet the minimum meteorological data requirements of at least 1-year of site specific data, Region 10 believes that it is appropriate to utilize all available representative data for both 2009 and 2010 as a more robust basis for these permits.

Tables 1 and 2 present results for the ten highest 2-year average modeled 98th percentile receptors (including monitored background) for the 1-hour NO₂ standard for the two 120 day sequences modeled, sorted in descending order based on the average concentration. These results are based on Region 10's re-analysis of the 1-hour NO₂ impacts in the Chukchi Sea using the most recent version of AERMOD and both the 2009 and 2010 meteorological data sets. As discussed above and in the response to comments W.2.a. these results show how concentrations at any location will vary from year to year based on the meteorology and that impacts are well below the 1-hour NO₂ NAAQS at all locations.

Table 1. Region 10 Re-analysis of 1-Hour NO₂ in the Chukchi Sea, Top 10 Receptors Sorted by Sequence B Two Year Average Impacts

Receptor Location		Sequence B (µg/m ³)		
x	y	2009	2010	Average
-1600	1600	174.4	100.2	137.3
-1900	1100	162.9	111.2	137.1
-1500	1500	175.2	98.9	137.1
-2100	1000	160.5	113.1	136.8
-1900	900	161.2	111.4	136.3
-2000	1100	162.8	109.2	136.0
-1800	1100	157.4	114.4	135.9
-1800	1000	159.7	111.8	135.7
-1400	1400	168.7	101.7	135.2
-1700	1600	164.5	105.7	135.1

Table 2. Region 10 Re-analysis of 1-Hour NO₂ in the Chukchi Sea, Top 10 Receptors Sorted by Sequence A Two Year Average Impacts

Receptor Location		Sequence A (µg/m ³)		
x	y	2009	2010	Average
-1400	1400	99.9	116.3	108.1
-1500	1600	96.4	117.0	106.7
-1500	1500	96.4	114.9	105.6
2000	-200	97.4	112.9	105.1
2100	-300	98.9	111.1	105.0
2000	-250	98.3	111.5	104.9
-1250	1500	93.4	116.4	104.9
-1300	1300	94.9	114.6	104.7
-1400	1500	90.1	119.1	104.6
-1300	1500	96.3	112.5	104.4

See also response to comment U.1.

Comment U.3: Commenters state that many of the data that Region 10 is now relying on in this permitting action were available in 2009, when Region 10 was initially considering these permits but that, at that time, Region 10 did not believe they were sufficient to support an analysis. The commenters refer to the 2010 Statements of Basis which state that Shell used screening meteorology because meteorological data representative of the open Beaufort Sea was not available.

Response: Regarding the 2010 Statements of Basis referenced in the comment, although the data collection began in 2009, the complete measured meteorological data used in the

modeling analyses to support the 2011 Revised Draft Permits were not available to Shell for use at the time Shell submitted its Chukchi permit application on February 23, 2009 and or its Beaufort Sea application on January 18, 2010. Consequently, Shell used the ISC-PRIME model with screening meteorology and upper end scaling factors to derive averaging period concentration estimates for periods greater than one hour for compliance with the NAAQS. Region 10 has determined that a sufficient and adequately representative set of meteorological data are available to support a refined dispersion modeling analysis using AERMOD, and therefore use of a screening technique is no longer necessary or appropriate.

V. CATEGORY – BACKGROUND AIR MONITORING DATA

Comment V.1: Commenters express general support for the use of PM₁₀ and PM_{2.5} data from Wainwright for use in determining background concentrations for the Chukchi Sea, but believe that, to ensure an outcome that is most reflective of conditions in the Chukchi, Region 10 should consider the use of the Point Lay data as representative NO₂ background concentrations in order to ensure better protection of the NAAQS. The commenters are concerned with Region 10's explanation that it used the Wainwright data because the data generally have lower values and thus are more representative of the expected offshore concentrations. The commenters contend that, because the NO₂ modeling conducted for these permits is already not the most conservative analysis, it would be prudent to choose the most conservative data set to use for background concentrations, especially if it will be paired in time with modeled concentrations.

Response: The commenters urge Region 10 to use the most conservative data set for NO₂ background concentrations, but provide no information to show that such use would change Region 10's determination that the 1-hour NO₂ NAAQS will be met.

Background ambient air quality data used in a modeling analysis should be representative of the concentrations in the impact area of the proposed new source or modification, and especially at the location of the highest modeled impact. Ambient Monitoring Guidelines for PSD Permitting, OAQPS, dated May 1987, Section 2.4.1. As discussed in the Statements of Basis for the 2010 Permits and the Supplemental Statement of Basis (at 45), because there are no islands, platforms, or other infrastructure in the Beaufort or Chukchi Seas in the vicinity of Shell's offshore operations on which to install, operate, and maintain ambient air quality monitoring equipment, it is appropriate to use onshore preconstruction monitoring data as a conservative representation of background concentrations in the vicinity of Shell's operations. The background data Shell has collected and is relying on in these permitting actions was collected at onshore locations, often near or in Alaska Native Villages, on the Chukchi and Beaufort Seas. Monitoring data from an onshore location near a village or other onshore sources is expected to be conservative when compared to monitoring data that would be collected miles offshore because onshore data will be more influenced by the local emission sources. In addition, the lifetime of NO₂ in the atmosphere is relatively short (half-life of 1 to 2 hours) and as such NO₂ is not transported very far from its source (such as a fossil-fuel fired power plant). See <http://sos.noaa.gov/datasets/Atmosphere/no2.html>. Therefore, the NO₂

background values collected at both Wainwright and Point Lay are expected to be conservative in representing the levels of NO₂ concentrations at Shell's leases in the Chukchi Sea and specifically at the location of maximum impacts near the Discoverer drillship. It is inappropriate to use higher monitored onshore concentrations from another site simply because the use of those concentrations would be even more conservative.

Furthermore, as Region 10 stated and the commenter notes, the Wainwright monitoring site does not always have lower values than Point Lay. For gaseous pollutants (SO₂, NO₂, CO) that would be expected to include emissions from nearby combustion sources, the Wainwright background value used in analyzing air quality impacts is higher than the highest value for Point Lay for SO₂ but lower than Point Lay's highest value for CO. Because of the data pairing approach used for modeling the 1-hour NO₂ standard, no single background value was used in the analysis. However, a comparison of the limited NO₂ data from Point Lay (the Point Lay site did not begin collecting data until June 1, 2010) with the two years of NO₂ data from Wainwright does not indicate that the levels are substantially different – the 98th percentile values from Wainwright were higher in 2009 and lower in 2010 than the 98th percentile values from the 7 months of Point Lay data and the 2-year average of the 98th percentiles at Wainwright was only 2 parts per billion lower than the 98th percentile based on only 7 months of data from Point Lay (22 ppb at Point Lay versus 20 ppb at Wainwright, compared to the NAAQS of 100 ppb). The NO₂ background value from Wainwright is already a conservative estimate of the concentrations offshore where the maximum impact from Shell's operations would occur, and the commenter has provided no information to show that the use of NO₂ data from Point Lay in a data-paired modeling approach would produce different results. Region 10 therefore believes that the 1-hour modeling analysis for the 1-hour NO₂ standard, which relied on data from the Wainwright monitoring site to conservatively represent background concentrations offshore in the vicinity of Shell's planned operations in the Chukchi Sea, adequately demonstrates that the 1-hour NO₂ NAAQS would not be violated.

Comment V.2: Commenters question Region 10's decision to use PM_{2.5} background concentrations from the Badami Site for the Beaufort Sea impact analysis, especially because Region 10 has proposed the use of the much higher PM_{2.5} background data from the Deadhorse monitoring site for the air quality analysis in the Kulluk permit that Region 10 has proposed to issue. The commenters assert that because the Deadhorse site is: (1) the chosen site of the co-located PM_{2.5} monitor; (2) the site with the longest-running data set; (3) the site with the most current available data; and (4) the data set that better accounts for secondary PM_{2.5} formation, Region 10 must use the PM_{2.5} data from this site in determining compliance with the PM_{2.5} standard for the Discoverer operations in the Beaufort Sea. The commenters contend that because Region 10 relies heavily on the fact that the monitored background concentrations used in the impact analyses include the impacts of secondary PM_{2.5} from onshore sources, the Deadhorse data must be used as representative background concentrations for PM_{2.5} if Region 10 is not going to perform a quantitative assessment of secondary PM_{2.5} impacts. The commenters provide a table which they believe shows the difference in projected PM_{2.5} impacts when using data from Deadhorse instead of Badami and when using maximum modeled concentrations instead

of 98th percentile concentrations, and assert that this indicates that Shell's operations may, in fact, threaten compliance with the 24- hour PM_{2.5} NAAQS.

Response: As an initial matter, Region 10 disagrees with the commenter's contention that Region 10 must use the PM_{2.5} data from the Deadhorse monitoring site as the background value for evaluating compliance with the PM_{2.5} NAAQS for the Discoverer operations in the Beaufort Sea. As discussed above in the response to comment V.1., background data should be representative of the impact area of the proposed source or modification. Although the Deadhorse PM_{2.5} monitoring site is within the modeled impact area of the Kulluk drillship operations in the Beaufort Sea that is the subject of a different permitting action, it is beyond the modeled impact area of the Discoverer's operations (Deadhorse is 84 kilometers from the closest lease block that the Discoverer is allowed to operate on under the 2011 Revised Draft Beaufort Permit). In contrast, the Badami monitoring site is within the 50 kilometer modeled impact area of the Discoverer operations in the Beaufort Sea and Region 10 believes that monitoring site is conservatively representative of background PM_{2.5} concentrations, both primary and secondary, in the Discoverer modeled impact area.

With respect to the four specific points raised by the commenter:

- (1) The critical criterion for siting a collocated PM_{2.5} monitor (referred to as a precision monitor) next to a continuous PM_{2.5} monitor is to favor a location that would experience the highest concentrations among all sites in the network operated under one quality assurance system, rather than one that would be representative of any particular project location. 40 CFR Part 58, Appendix A, Section 3.2.5.5. Therefore, the fact that Deadhorse is the site of the collocated precision monitor does not make it a site that is necessarily representative of the Discoverer operations at an offshore location and, indeed, Region 10 believes that in this case it is not representative.
- (2) The difference in length in the data set for the Deadhorse site versus the Badami site is not significant. As of the time of proposal of the 2011 Revised Draft Beaufort Permit, the Badami site had data from August 20, 2009 through December 31, 2010 and the Deadhorse site had data from October 23, 2009 through December 31, 2010. Essentially, both sites had a full calendar year of data (2010) for purposes of the annual NAAQS and complete data for a drill season (July 1, 2010 through November 30, 2010).
- (3) Deadhorse did not have more current data than Badami at the time of proposal of the 2011 Revised Draft Beaufort Permit. Both sites had data for calendar year 2010, including the 2010 drilling season.
- (4) Again, as discussed above, background monitoring sites should be representative of the project location. Any PM_{2.5} monitor will account for both primary and secondary PM_{2.5} at the location of the monitor. It must then be determined whether the monitor site would be representative of the project location. Region 10 determined that the Deadhorse monitoring site would be conservatively representative of the Kulluk modeled impact area (a drill rig that is the subject of a separate permitting action), including both the primary and secondary PM_{2.5}

contributions from the existing onshore sources within that modeled impact area. However, Region 10 determined that the Badami site would be conservatively representative of the primary and secondary PM_{2.5} contributions from existing onshore sources within the Discoverer modeled impact area. The reasons that the Badami site is more representative than the Deadhorse site for the Discoverer drilling operations include the fact that it is located in the same wind direction as the Discoverer drilling operations from the existing Prudhoe Bay sources and it is sufficiently distant from the existing sources as to not be unduly impacted by their direct PM_{2.5} emissions but far enough to be expected to reflect any secondary PM_{2.5} formation when Prudhoe Bay PM_{2.5} precursors are transported towards the Discoverer drilling operations.

Finally, the commenters' assertion that using background data from Deadhorse would threaten compliance with the 24-hour PM_{2.5} NAAQS is in error. The commenters appear to have misunderstood the discussion of PM_{2.5} impacts in the Region 10 Technical Analysis (specifically the discussion on page 28). The 18.2 µg/m³ concentration for the Beaufort Sea is the sum of Shell's modeled maximum 24-hour impact of 12.2 µg/m³ and the Badami background value of 6 µg/m³. The commenter appears to be incorrectly adding the Deadhorse background value of 17 µg/m³ to the total, thereby adding two different background levels to arrive at the level the commenter asserts is above the NAAQS. Although Region 10 disagrees that using Deadhorse background data for assessing the impacts of these permits is appropriate, even if the Deadhorse background value of 17 µg/m³ were used with the maximum 24-hour PM_{2.5} modeled concentration of 12.2 µg/m³, the resultant concentration would be 29.2 µg/m³, which is below the NAAQS of 35 µg/m³.

Comment V.3: Commenters assert that, with respect to the data used for the annual average NO₂ and SO₂, the "background value" Region 10 is using "is the highest calendar year average from the relevant monitoring site," but that for other pollutants, Region 10 selected the "highest [24-hour] value for either of the possible 5-month drill seasons at the appropriate monitoring sites" (brackets in comment). The commenters request that Region 10 use the highest average for the 5-month drilling season (instead of the entire year) and prefer that the agency select the highest value from the drilling season.

Response: The commenters request that Region 10 use the highest average background concentration for the 5-month drilling season instead of the entire year but has provided no information that consideration of that information would change Region 10's determination that the annual NO₂ and SO₂ NAAQS are met.

The annual NAAQS for NO₂ and SO₂ are calendar year averages of continuous data. As such, an average concentration for a portion of a calendar year, such as the 5-month drilling season, is not appropriate for comparison with the NAAQS for these pollutants and averaging periods. For example, if a 5-month average is above the level of the NAAQS, the concentrations for the remainder of the year could lower the annual average such that there is no NAAQS violation. Conversely, even if a 5-month average is less

than the level of the NAAQS, higher concentrations in the remainder of the year could raise the annual average such that the NAAQS could be violated. It is important to recognize that the limitations in the permits result in emissions from authorized operations impacting short-term and annual standards in different ways. During the drilling season, authorized emissions impact short-term standards during every averaging period (i.e., 1-hour, 3-hour, 8-hour, and 24-hour), but the authorized emissions do not impact those averaging period outside of the drilling season. As such, it is appropriate to use only background concentrations derived from monitoring data collected during the drilling season for determining NAAQS compliance with short-term standards. In contrast, for annual standards (specifically, the annual NO₂ and SO₂ NAAQS), authorized emissions contribute to the calendar year annual average concentration even though operation is not permitted outside of the drilling season. As discussed above, the contribution of the emissions authorized under the permits during the drilling season need to be added to the background concentrations during the entire calendar year in order to compare to the annual NAAQS.

In consideration of the comment, Region 10 has reviewed the NO₂ and SO₂ data to see what, if any, impact using only data from the drill season would have on average concentrations. The results of that review (shown below) show that in all cases, the average concentrations during the drill season are equal to, or less than, the annual average concentrations. Therefore, using annual average concentrations for a calendar year is not only technically correct for use as background levels for the annual NAAQS, in this case it is also more conservative than (incorrectly) using only data from the drill season.

Monitoring Site	Pollutant	Drill Season Average	Annual Average
Wainwright Permanent Site (2010)	SO ₂	0.37 ppb	0.37 ppb
	NO ₂	0.4 ppb	0.6 ppb
Wainwright Near Term Site (2009)	SO ₂	0.11 ppb	0.14 ppb
	NO ₂	0.8 ppb	0.9 ppb
Badami SDI (2007, 2008)	NO ₂	0.3 ppb	0.5 ppb
	SO ₂	0.9 ppb	1.1 ppb
CCP (2009)	NO ₂	0.6 ppb	2.8 ppb
	SO ₂	1.9 ppb	2.6 ppb
A Pad (2008)	NO ₂	10 ppb	10 ppb
	SO ₂	2.5 ppb	3.2 ppb
	NO ₂	1.6 ppb	1.9 ppb

W. CATEGORY – AIR QUALITY ANALYSIS FOR 1-HOUR NO₂ NAAQS

W.1 SUBCATEGORY – IN GENERAL

Comment W.1.a.: A commenter states that Shell’s air pollution will increase levels of NO₂ pollution beyond levels EPA says are safe and that such high NO₂ levels can cause

people to have breathing problems and are especially harmful to older people, children, and people who already have breathing problems such as asthma.

Response: As discussed in Section 5 of the Supplemental Statement of Basis and in the Region 10 Technical Analysis, Region 10 believes Shell has demonstrated that emissions authorized under these permits will not cause or contribute to a violation of the NAAQS, including the NO₂ NAAQS. The NAAQS are health-based standards, set at a level to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics.

Comment W.1.b: Commenters acknowledge EPA’s new “data handling conventions for NO₂” whereby NAAQS compliance is “based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations,” but assert that the new data handling convention is specific to determining “area-wide” compliance with the revised NAAQS. The commenters contend that there is no basis in the Clean Air Act or the new standard itself for the PSD permitting approach that Region 10 has adopted here which allowed a proposed new source to discount its highest projected impacts. The commenters conclude that such an approach ignores both the importance of the absolute value of the NAAQS standard—which must be set at the requisite level to protect human health—as well as the PSD program requirement that a proposed new source demonstrate that it will not cause a NAAQS exceedance.

Response: The commenters appear to be arguing that, as applied in PSD permitting, a source must demonstrate that the impact of its emissions does not exceed the level of the NAAQS. Region 10 disagrees with this position.

Shell’s approach for demonstrating compliance with the 1-hour NO₂ standard is consistent with the form of the NAAQS and EPA guidance on demonstrating compliance with the 1-hour NO₂ NAAQS. See Memorandum from Stephen Page, OAQPS, re: Guidance Concerning the Implementation of the 1-Hour NO₂ NAAQS for the Prevention of Significant Deterioration Program, dated June 29, 2010 (June 2010 1-hour NO₂ Modeling Guidance); Memorandum from Tyler Fox, OAQPS, re: Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO₂ NAAQS, dated March 21, 2011 (March 2011 1-Hour NO₂ Modeling Guidance). The commenters have provided no specific information showing how Shell’s approach “discount[ed] its highest projected impacts” in a manner that is inconsistent with the form of the NAAQS.

Although it is true that the modeling showed individual 1-hour impacts higher than the 100 ppb (188 µg/m³) level of the 1-hour NO₂ NAAQS, the 98th percentile point of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb (188 µg/m³) at any location that constitutes ambient air. The commenters have provided no information to support their contention that, for an air quality analysis submitted in connection with a PSD permit application, the applicant must establish not only that they will not cause or contribute to a violation of the NAAQS, but also that they will not cause or contribute to ambient concentrations that exceed the level of a NAAQS. The

commenters state as part of this argument that the PSD program requires that “a proposed new source [must] demonstrate that it will not cause a NAAQS exceedance, citing to CAA § 165(a)(3) and 40 CFR § 52.21(k). The PSD regulation cited by the commenters, however, plainly states that a source must demonstrate that it will not cause or contribute to “a violation of” any NAAQS, and does not refer to “an exceedance.” See 40 CFR § 52.21(k)(1). To the extent CAA § 165(a)(3)(B) is ambiguous on the issue of whether Congress intended to mean air pollution in excess of the level of the NAAQS or in excess of the NAAQS itself, EPA’s interpretation of that language in 40 CFR § 52.21(k) is entitled to deference and the time for challenging that interpretation has long since past. See CAA § 307(b). See also response to comment W.1.c.

Comment W.1.c: Commenters state that Shell has understated maximum 1-hour NO₂ impacts by failing to accurately calculate the multiyear average of the 98th percentile of the annual distribution of daily maximum 1-hour values. The commenters continue that EPA estimated that, when evaluating the measured concentrations for a year’s worth of monitoring data, the 98th percentile would be equivalent to the 7th or 8th highest daily maximum for the 365-day period. In calculating its compliance with the 1-hour NO₂ standard, the commenters assert, Shell selected the 8th highest daily maximum but that this is an underestimate of the true 98th percentile associated with its operations because Shell’s drilling season is only 120 days long, and it modeled only that many days. The commenters conclude that selecting the 8th highest daily maximum from 120 days corresponds roughly to the 93rd percentile, not the 98th percentile, and that Shell has therefore failed to demonstrate that its proposed operations will not cause or contribute to air pollution violations, as required by 40 CFR § 52.21(k).

Response: Region 10 continues to believe that the air quality analysis performed by Shell for assessing compliance with the 1-hour NO₂ NAAQS is consistent with 40 CFR Part 51, Appendix W (Guideline on Air Quality Models) and EPA guidance for implementing the 1-hour NO₂ NAAQS. In practice, assessing compliance with the 1-hour NO₂ NAAQS can generally be summarized as a three step process involving the collection and preparation of appropriate background data, paring background data with modeled impacts, and finally comparing the resulting total concentration to the NAAQS. Because the form of the 1-hour NO₂ NAAQS is the 3-year average of the 98th percentile of the daily maximum 1-hour averages, there can be a certain number of hourly values each year that exceed the NAAQS threshold. In this analysis, two years of monitoring data are available. Although initially one year of modeled results were available and were used in the compliance demonstration at the time of issuance of the 2011 Revised Draft Permits, in response to public comment, Region 10 has since performed additional modeling for 2010, such that two years of modeled results are used in the demonstration. See response to comment U.2

For the first step, Shell calculated diurnal hourly background values (that is, a background value for each hour of day) for the drilling season (a 5 month period) using background monitoring data collected in 2009 and 2010 for both the Beaufort and Chukchi Seas. Shell took all available hourly NO₂ data during the drilling season period for a particular hour and calculated, for that hour, the 98th percentile NO₂ concentration

recorded for that hour in each of the two years of available monitoring data. 40 CFR Part 50, Appendix S, Table 1 prescribes the rank associated with the 98th percentile value based on the number of available valid samples within a period. Following this procedure for determining a 98th percentile of the monitoring data for each hour, Shell used a 2nd, 3rd or 4th high, depending on the number of available data points, to determine the hourly 98th percentile value (*i.e.*, if 153 hourly values were available, the 4th high represented the 98th percentile for this hour, while a data set with only 100 hourly values would use the 2nd high to represent the 98th percentile for that hour). For each hour, the 98th percentile result for each year is averaged and this average hourly value is then used to pair with the respective modeled result for that hour. The result of this approach is a generic day's worth of NO₂ background data that represents the 98th percentile value for each hour in a drilling season. Results of this procedure are found in Shell's April 29, 2011 submittal "ALTERNATE APPROACHES TO EVALUATING 1-HOUR NO₂ IMPACTS FOR THE SHELL DISCOVERER DRILLSHIP – NO₂ PAIRING AND NO₂/NO_X RATIOS" in Tables 3 and 4, pages 6-7. Region 10 determined that this approach followed EPA guidance and provides a representative monitored hour by season diurnal profile for the drilling season.

For the second and third steps, Shell paired, for each modeled hour and receptor location (again, over a 5 month period), the result of the modeled impact with the hourly monitored background value for that hour calculated in step 1 above. The highest hourly total concentration (paired modeled and monitored impact) in a calendar day was then calculated, and the 8th highest paired modeled/monitored impact for each receptor was used to compare with the NAAQS. Using the 8th highest value that occurred over the 5 month drilling season is appropriate because emissions from Shell's operations during periods other than the drilling season are zero (so the total concentration consists only of the background value, yet the form of the standard is a 3-year average of the 98th percentile daily 1-hour maximums). The time period during which no drilling will be occurring is therefore considered in determining the annual 98th percentile value for each year and the 3-year average of annual 98th percentile values, but, because there will be no emissions from Shell's operations in the total concentration during the periods of no drilling, the 8 highest total concentrations for a given year are not predicted to occur during this period, but instead are predicted to occur during the drilling season for that year. In other words, although there are 365 days used in the 98th percentile calculation, the majority of these days (7 months worth) will have no Shell impacts because Shell is not permitted to operate outside of the 5 month drilling season. Because of this, the 8 highest values, and thus the 98th percentile value,¹⁷ are all days that fall within the drilling season. The commenters have not identified any day outside of the drilling season that would have had a higher total concentration than the 8th highest total concentration during the drilling season.

In summary, Region 10 disagrees with the commenters that selecting the 8th highest daily maximum from 120 days corresponds to the 93rd percentile, not the 98th percentile. For the monitored background data, Shell was required to use a 2nd, 3rd, or 4th high value

¹⁷The 1-hour NO₂ standard is based on the 98th percentile (8th highest) of the annual distribution of maximum daily 1-hour values. March 2011 1-Hour NO₂ Modeling Guidance at 1, fn. 1.

depending on the available data because the monitored data relied on in the modeling analysis consisted of less than a year (approximately 5 months). For the modeled impacts, which are paired with the monitored data, however, Shell appropriately used the 8th high modeled-plus-background value, which is the 98th percentile among the 365 days of the year (the timeframe averaged as part of the standard) and evaluated this value against the NAAQS. This approach is consistent with EPA guidance for the 1-hour NO₂ standard. March 2011 1-Hour NO₂ Modeling Guidance at 2 (discussing the procedure for demonstrating compliance with the NAAQS) and 17-21 (describing the appropriate methodology for incorporating background concentrations into a 1-hour impact analysis). Shell has followed EPA guidance in demonstrating compliance with the 1-hour NO₂ NAAQS.

It is important to note that there are several conservative assumptions that will likely result in substantially lower total concentrations than those predicted by the model. One such assumption is that the modeling assumed the Discoverer will be located at the same drill site for the entire three year period considered in determining compliance with the 1-hour NO₂ standard. In the more likely event that Shell will be operating at a different drill site in each of the three years (and possibly more than one drill site in each year), the expected 3-year average of the 98th percentile concentrations at each drill site would be much lower. Another conservative assumption underlying the modeling analysis is the fact that the background data used to represent offshore conditions was collected onshore, where it is influenced by local sources. See response to comment V.1.

Comment W.1.d Commenters contend that Region 10 has failed to ensure that Shell's modeling assumptions reflect actual operating conditions because Shell does not establish that its modeling captures all realistic combinations of allowable operations, background levels, and meteorological conditions that may result in maximum impacts. In modeling its effect on 1-hour NO₂ standards, the commenters assert, Shell assumes a perfect choreography of closely-timed events and favorable conditions and lines up events and conditions in an unrealistically precise manner by varying—for every hour of its proposed 2,880 hours of operation— meteorological conditions, background concentrations, and fleet operations. This method of modeling operations, the commenters continue, is therefore likely not representative of actual operating conditions, does not capture a full, realistic range of potential operations and conditions, and is vulnerable to missing maximum impacts. Thus, the commenters conclude, Shell has not demonstrated compliance with applicable standards, including the 1-hour NO₂ NAAQS. The commenters assert that Shell's modeling should be based instead on scenarios in which meteorological conditions, background concentrations, and vessel operations combine to maximize impacts and reproduces the full range of operating scenarios and impacts.

Response: Region 10 believes the combinations of operating conditions modeled by Shell accurately reflect the expected emissions that will occur with the permitted operations. It is not possible to model all potential combinations of emissions scenarios, thus the need to select conservatively representative emissions scenarios that conform to the permitted emission rates.

Region 10 carefully reviewed the emissions scenarios and required several model iterations using two different drilling start times such that all hours during the drilling season are accounted for. While Region 10 acknowledges the actual operations will not exactly mirror what was modeled, the approach taken is expected to conservatively represent permitted emissions during a drilling season. The comment does not identify any realistic range of potential operations and conditions that have not been captured in the conservatively representative emissions scenarios used in the modeling supporting these permits.

Region 10 also disagrees that there is a “perfect choreography of closely-timed events and favorable conditions” and that Shell’s modeling “lines up events and conditions in an unrealistically precise manner.” The emissions sequences used in the modeling reflect the general sequence of drilling operations as they would be expected to occur. Obviously, the exact sequence will not exactly mirror that modeled but the general order is correct and reflective of what is allowed in the permits. The other conditions the commenter discusses, such as lining up meteorological and background values, are reflective of actual collected data which, when coupled with conservative assumptions, such as orienting the Associated Fleet with hourly modeled wind direction and using emission release characteristics based on actual meteorological conditions result in a conservative analysis which has demonstrated compliance with the NAAQS.

Moreover, as discussed in response to comment W.1.c and W.3.a, there are several other conservative assumptions underlying the modeling that are not related to the operating scenarios. These assumptions, in conjunction with the reasonable operating scenarios modeled by Shell, make it very unlikely that actual impacts will in fact cause or contribute to a violation of the 1-hour NO₂ NAAQS.

W.2 SUBCATEGORY – LOCATION OF RECEPTORS

Comment W.2: Commenters assert that Region 10 must require Shell to remodel its impact on 1-hour NO₂ concentrations in the Chukchi Sea using a higher density of receptors and that the approach used by Shell may have missed identifying the maximum projected impacts from Shell’s proposed operations. The commenters contend that it is well-established protocol among air agencies that ambient air modeling should include the placement of additional receptors in the vicinity of projected maximum impacts to ensure that the model does not miss the true maximum. As support, they state that the Alaska Department of Environmental Conservation (ADEC) recommends a 25 meter spaced grid surrounding the receptor with the maximum impact to ensure the maximum has truly been defined. Because the maximum 1-hour NO₂ impact in the Chukchi Sea is predicted to occur at 1.5 kilometers from the center of the Discoverer rather than at 500 meters, the commenters contend, Shell did not have a sufficient density of receptors in the location of the predicted maximum impact. The commenters assert that Shell had a spacing of 250 meters at this distance, whereas other permitting agencies would have required a spacing of 25 meters. By failing to model with sufficient receptor points around the location of maximum projected impact, the commenters state, Shell has failed

to account for the true magnitude of the impacts of its NO₂ emissions upon air quality. In fact, the some commenters contend, their modeling expert reviewed Shell's analysis and performed an additional modeling runs revealing a cluster of elevated 1-hour NO₂ concentrations, including numerous receptors registering a level that would exceed 188 µg/m³ when added to the background concentrations for that hour. The commenters allege that this shows that the 98th percentile concentration reported by Shell in the permit application is underestimated and will be higher with additional receptors at 100 m resolution and, since the existing total impact of 174 µg/m³ is close to the NAAQS of 188 µg/m³, it is highly likely that this standard can be exceeded with higher concentrations at these additional receptors. The commenters ask that Region 10 require Shell to rerun its models with additional receptors in the region between 1 and 5 kilometers and that if Shell's additional modeling reveals a NAAQS violation, additional controls must be imposed upon Shell's operations. This is necessary, the commenters assert, to ensure that Shell, as an OCS source, is held to the same requirements "as would be applicable if the source were located in the corresponding onshore area."

Response: In response to these comments, Region 10 repeated the AERMOD modeling run performed by Shell in the Chukchi Sea for the 1-hour NO₂ NAAQS to include a 100 meter receptor spacing domain wide with a 25 meter receptor spacing centered on the highest modeled receptor identified in the Shell modeling and verified in the Region 10 analysis. Region 10 also used the latest regulatory version of AERMOD, version 11103, in this revised analysis. Results for the receptors that are in common in the Shell and Region 10 modeling indicate slightly higher 1-hour NO₂ concentrations when using the latest version of AERMOD. In the prior Shell analysis, the highest modeled impact (including background) in the Chukchi Sea occurred at receptor (-1500, 1500) and was 174.0 µg/m³. In the revised Region 10 analysis using the latest version of AERMOD, the concentration at this receptor is 175.2 µg/m³, an increase of 1.2 µg/m³. Region 10 also reviewed the additional 100 meter spaced receptors and determined that receptor (-1500, 1500) was still the high on the domain. Region 10 then reviewed the 25 meter receptor grid that was placed over the (-1500, 1500) receptor and found a maximum modeled concentration of 175.7 µg/m³.¹⁸

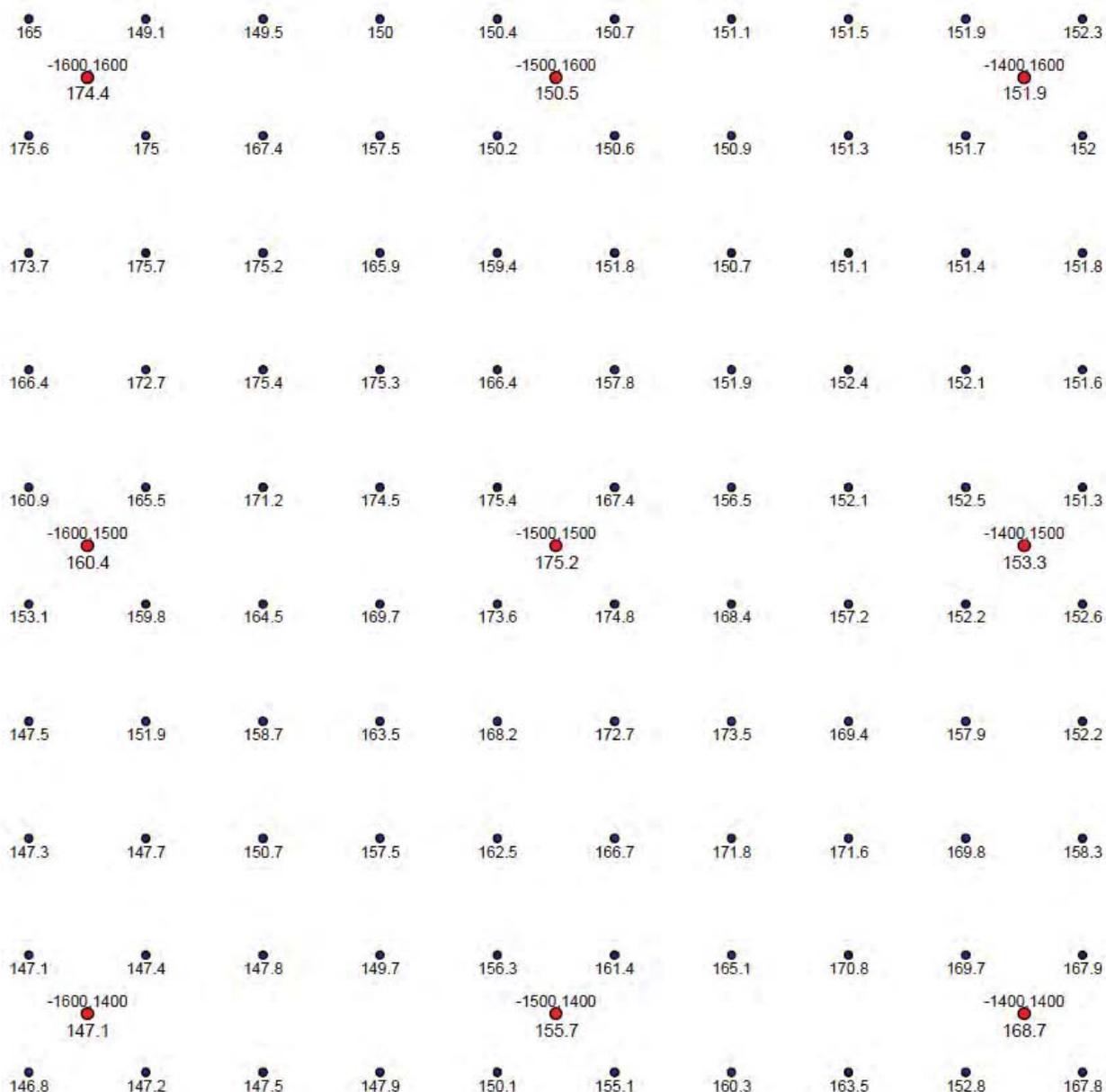
Figure 1 provides an overview of the modeling results that Region 10 performed. Red receptors are those receptors spaced at 100 meters with modeled concentrations labeled below the receptor. Black receptors are the additional 25 meter spaced receptors placed over the domain-wide modeled maximum (receptor -1500, 1500 in case of the Chukchi Sea), with modeled concentrations labeled below the receptor. As discussed above, this analysis determined a maximum modeled concentration of 175.7 µg/m³, at receptor

¹⁸ Region 10 also notes that the ADEC Modeling Review Procedures Manual is an internal guidance document "to help staff more efficiently review air quality ambient assessments (*i.e.*, air quality dispersion modeling analyses), and to improve the processing time of air permit applications." ADEC Modeling Review Procedures Manual at 1. The manual states: "The manual provides general guidance for reviewing common modeling assessments. It does not cover all cases that may occur in Alaska, and does not prohibit staff from using alternative approaches on a case-by-case basis. It is also a 'living document' that will be updated as national modeling techniques and tools change." *Id.* at TOC-1.

(-1587.5, 1562.5). This additional analysis continues to indicate that the 1-hour NO₂ NAAQS will be protected.

Because the modeled differences, using additional receptors and the latest regulatory version of AERMOD, still demonstrate compliance with the NAAQS and have very similar concentrations to the prior Shell analysis, Region 10 believes no additional analysis, other than that provided here, is needed and that the commenter's concerns have been addressed.

Figure 1. Region 10 Supplemental 1-Hour NO₂ Modeling Analysis Using 100 Meter and 25 Meter Receptor Spacing



W.3 SUBCATEGORY – BACKGROUND DATA FOR 1-HOUR NO₂ NAAQS/PAIRED DATA

Comment W.3.a: Commenters state that Shell has understated 1-hour NO₂ impacts by using background data in a manner that understates health and environmental risks and does not demonstrate compliance with the 1-hour NO₂ NAAQS because Shell has used background ambient air data in a manner that systematically understates the impact of its operations. The commenters contend that Shell has neglected to use the highest background pollution levels measured in the vicinity of its proposed operations and has instead adjusted background ambient air data by using multiyear averages of the 98th percentile background concentrations for each hour of the day. The commenters acknowledge that compliance with the 1-hour NO₂ standard is determined using a “probabilistic” form (*i.e.*, the 98th percentile maximum 1-hour impact), but argue that Shell has made two downward adjustments: in addition to discounting the highest concentrations caused by its operations, Shell has assumed that such concentrations will not occur at a time when background concentrations are at their highest observed levels. The commenters contend that this has the effect of “compounding” the 98th percentile adjustment, thereby understating the true maximum impacts that may occur as a consequence of Shell’s operations. Although acknowledging that EPA has indicated that this technique may be appropriate in some circumstances, the commenters contend that this guidance is not consistent with the 1-hour NO₂ standard itself, which they claim is evaluated with a single adjustment for the 98th percentile. According to the commenters, Shell’s manner of selecting 1-hour NO₂ background data for use in its model disregards the highest possible background levels, underestimates the true maximum impact of Shell’s operations, and fails to demonstrate that it will not cause a violation of air quality standards.

Response: The 98th percentile of the monitored background concentrations based on the Badami and Wainwright monitors in the Beaufort and Chukchi Seas is a conservative estimate of the background levels at the location of the 98th percentile of the modeled concentrations, and therefore provides a conservative estimate of cumulative NO₂ impacts from Shell’s operation. Using background concentrations from onshore monitors is a conservative estimate of offshore NO₂ concentrations, where Shell’s operations will be located, because the onshore monitors are influenced by local sources. See response to comment V.1. This is especially true in the Chukchi Sea where Shell’s leases are far from the influence of onshore sources.

The modeled to monitor pairing approach is also appropriate as there may be changes in NO₂ values throughout the season or time of day. Take, for example, space heating using propane or diesel, which will occur more during the colder months than in the 5 month season of July through November when operations are authorized under the permits. Combustion of propane or diesel for space heating may cause higher monitored NO₂ values in onshore locations (and thus higher background values reflected in the background monitoring data incorporated into Shell’s analysis), and this may occur during the 7 month period Shell is not authorized to operate under the permits. Conversely, there may be more activity of other types during the summer months associated with NO₂ emissions. If this is the case, this should be reflected in the

background monitoring data incorporated into the modeling analysis. These simple examples help illustrate why, consistent with EPA guidance on modeling for the 1-hour NO₂ NAAQS, using a seasonal monitored value is appropriate for this NAAQS standard. A similar argument will hold for hourly readings during the day. At any one time, a monitor may be impacted by a single source. For that impact to occur and be captured by the monitor the wind has to move or transport the emissions from the source to the monitor. At this point in time the monitor may read a high value, but another location in the vicinity may be experiencing no impacts. By using an average 98th percentile by hour of the day, Region 10 is attempting to account for systematic variations in activities and transport that may be occurring and that would lead to a higher or lower monitoring concentration in any one hour. Region 10 is also attempting to use an appropriate background monitoring value for the entire offshore modeled area. The averaging approach by hour and season used by Shell provides a more realistic but still conservative background value to use for such a large area.

It is also important to consider the form of the standard, which is based on probability. The modeling/monitoring pairing approach used by Shell uses a background concentration for all receptors, again, that is based on a two-year average of the annual 98th percentile value by hour and season. In reality, the actual NO₂ monitoring data indicates there are many hours with zero monitored concentrations. So the pairing approach Shell has used is already increasing the probability of a high modeled value corresponding to a relatively high background value, when in reality the actual monitoring values show many hours of zeros. When this pairing approach is coupled with other assumptions, such as the Discoverer remaining at a single drill location for 3 years, which also increases the probability of high modeled results at a receptor, the end result is a conservative analysis. Even with these conservative assumptions, the analysis has demonstrated that the NAAQS is protected.

Finally, there is no requirement to base a NAAQS demonstration on “the true maximum impacts that may occur,” and using the overall highest 1-hour monitored 1-hour NO₂ concentration as a background value would be overly conservative in this case. Region 10 strongly disagrees with the commenter that compounding adjustments have occurred which will understate the potential maximum impacts. Region 10 believes instead that it is more likely that compounding assumptions actually increase the probability that the analysis Shell submitted would overstate actual impacts at any single receptor. These assumptions include such things as a single well location for three years, having the Associated Fleet always aligned with the prevailing wind directions, not averaging across three years of meteorological data, and using onshore monitoring data to represent overwater locations while using a diurnal pattern of background monitoring values for all hours when monitoring shows many hours of lower concentrations. All of these assumptions compound to form an analysis weighted towards conservatism. See also response to comments W.1.c, W.3.a, and V.2.

Comment W.3.b: Some commenters support Region 10’s decision not to allow a PM_{2.5} modeling analysis that pairs modeled data with monitored data (in time) to determine compliance with the NAAQS, and contend that EPA has in the past said, that pairing data

does not ensure protection of the air quality standards, citing to a letter from EPA Region 8. The commenters assert that this approach is needed to ensure that a violation will not occur in the future, not simply to determine that a violation occurred over the period of time modeled. The commenters state that even in recently allowing limited, case-by-case situations where paired data can be modeled to demonstrate compliance with the 1-hour NO₂ NAAQS, EPA is admitting that this type of analysis results in “a less conservative” estimate of impacts, citing to EPA’s March 1, 2011 NO₂ Modeling memo. Although these commenters support Region 10’s decision not to allow pairing of NO₂ data as Shell originally proposed (*i.e.*, hour-by-hour pairing of modeled concentrations with background concentrations), the commenters do not agree that the diurnal pairing of the 2-year average of the 98th percentile NO₂ concentrations by hour (based on the number of samples) between July 1 and November 30 with corresponding modeled concentrations for that hour is protective enough of the NAAQS. The commenters state that a more protective approach would be to use the 98th percentile of the annual distribution of daily maximum 1-hour average values averaged across the 2-year meteorological data period used in the dispersion modeling and that a more conservative approach is warranted in this case given the fact that the predicted 1-hour average NO₂ “maximum” modeled impact in the Chukchi Sea is very close to the standard (93% of the NAAQS).

Response: The pairing approach used in the 24-hour PM_{2.5} modeling analysis uses the maximum modeled 24-hour PM_{2.5} concentrations averaged over modeled drilling seasons 2009 and 2010 and this value is paired with a representative 98th percentile monitored background concentration for evaluation against the NAAQS. This approach follows EPA guidance and is conservative. Region 10 appreciates the support.

Concerning pairing for the 1-hour NO₂ standard, Region 10 acknowledges the approach taken is potentially “a less conservative” approach than using the 98th percentile annual distribution. The Region believes the approach taken, however, is still protective of the NAAQS and is consistent with EPA guidance. The commenters also fail to address the difference between the two standards, mainly the averaging period of 1-hour versus 24-hours, and offer no explanation why the pairing approach used for the 1-hour NO₂ standard is not valid and conservative. In addition, it is appropriate to account for diurnal (daily) and seasonal patterns in pairing modeled concentrations with monitored background concentrations. Pairing the 98th percentile of the annual background with the 98th percentile modeled contribution, irrespective of these diurnal or seasonal patterns, may impose additional conservatism that is not warranted. The seasonal pattern is especially relevant in this case because the permits limit operations to a defined period (or season.) Please also see response to comments W.4.a and W.4.b.

W.4 SUBCATEGORY - NO₂/NO_x RATIOS

Comment W.4.a: Noting that that the Plume Volume Molar Ratio Method (PVMRM) algorithm used in the ambient analysis to determine the atmospheric conversion of NO_x to NO₂ requires estimates of in-stack ratios of NO₂/NO_x, some commenters assert that these in-stack ratios appear to be important parameters in the modeling. The commenters go on to state that Region 10 must therefore ensure the ratios used are protective of the

NAAQS since small changes to the ratios used could have a significant impact on modeled concentrations. The commenters contend that this is especially important in this case given the fact that Shell is requesting approval for the least-conservative options for modeling 1-hour NO₂ impacts (*i.e.*, using the non-regulatory-default PRVVM option – a Tier 3 application under Section 5.2.4, App W that requires Regional approval – and pairing NO₂ data in time.

Response: While EPA has placed greater emphasis on the in-stack NO₂/NO_x ratios required for the PVMRM and OLM Tier 3 options in relation to the 1-hour NO₂ NAAQS as compared to the annual NO₂ NAAQS, due to both the increased stringency and 1-hour daily maximum form of the new standard, the relative importance of this parameter will vary from one application to another. Region 10 cautions against overstating the importance of this input parameter. The relative importance of the in-stack ratios will depend on several factors, including source characteristics, meteorological conditions and background ozone concentrations, but the commenters have provided no support for their broad statement that “small changes to the ratios used could have a significant impact on modeled concentrations.” In the extreme case, in terms of the relative importance of the in-stack ratio, with significant ozone-limiting conditions, stable worst-case meteorological conditions and very close ambient air boundary, a small change in the in-stack ratio would only result in a correspondingly small change in the modeled concentrations.

The commenters are correct that Region 10 required Shell to do several iterations of modeling with varying in-stack ratios based on engine testing (*See* 4/29/11 Shell modeling submittal *Alternate_NO₂_Modeling_Disco_04_29_2011.pdf*). This additional analysis did not indicate significant changes in the modeled 1-hour NO₂ concentrations. Region 10 believes Shell has demonstrated the ratios used are protective of the NAAQS.

See also response to comment W.4.b.

Comment W.4.b: Some commenters contend that the proposed revised permits are based on the use of generic NO₂/NO_x ratios, instead of ratios based on actual source testing. The commenters state that, although it appears that the generic ratios are higher for all but the MLC and HPU engines, the resupply ship, skimmer and workboats, a closer look at the actual source test data shows that the equipment-specific ratios that were compared to the generic ratios are based on averages at high loads only and miss higher values. The commenters present a table which they believe supports the assertion that the equipment-specific ratios are, in fact, higher than the generic ratio used by Shell in the modeling. Given the significance of this parameter in the modeling, the commenters continue, it is essential that Region 10 ensure the most protective values are used. The commenters suggest that Region 10 perform a comprehensive review of the measured test data submitted by Shell and calculate average ratio values at the highest loads and that, for the cases where the equipment-specific ratios are higher than the generic ratios, Region 10 should require the use of these higher source-specific values as inputs for to the PVMRM modeling algorithm.

Response: As discussed in response to comment W.4.a, Region 10 disagrees with the commenter's characterization of the significance of this parameter. Region 10 agrees, however, that equipment-specific ratios should be used in lieu of generic ratios when appropriate data are available. Region 10 also supports the use of load-specific ratios when load-dependent data are available. Shell's testing demonstrated that varying loads can impact the in-stack ratios. However, it would not be appropriate to combine the highest tested ratios with the highest permitted emissions irrespective of the load as this would impose an unrealistic degree of conservatism, and would likely be counter-productive by discouraging permit applicants such as Shell from collecting equipment-specific and load-specific NO₂/NO_x ratios. Region 10 required Shell to perform an NO₂ analysis that was based on both the tested ratios and the generic ratios derived from tests. In all modeled cases the NAAQS was protected and the modeled run using the generic ratios actually resulted in the highest modeled result in the Chukchi Sea.

Comment W.4.c: Commenters state that Region 10 must reject Shell's use of Plume Volume Molar Ratio Method (PVMRM) demonstrate compliance with the 1-hour NO₂ standard because, the commenters assert, in predicting ambient air impacts, the PVMRM significantly understates the extent to which NO will convert to NO₂ in the presence of ozone. The commenters note that Region 10 has specifically requested public comment on Shell's use of the PVMRM as a component of its ambient air modeling. The commenters contend that PVMRM fixates on the short-term rates of conversion, even though nearly all NO is eventually converted to NO₂. In reaching this conclusion, the commenters state that the NO_x emissions created during combustion (as occurs in Shell's ship engines and other equipment) are emitted partly as nitric oxide (NO) and partly as NO₂. Once in the atmosphere, the commenters continue, NO interacts with ozone and is ultimately converted to NO₂, but compliance with the final 1-hour NO₂ NAAQS is calculated by measuring NO₂ alone. The commenters assert that the use of PVMRM also contradicts and undermines the underlying assumptions of the NO₂ standard itself. Although NO₂ was chosen as the indicator, EPA intended for the 1-hour standard to not only reduce NO₂ levels, but to provide a corresponding reduction in other harmful nitrogen oxides as well. The commenters contend that PVMRM is necessarily unacceptable because it allows modelers to hide other harmful nitrogen oxides in low NO₂/NO_x ratios, resulting in a substantial understatement of total concentrations. Thus, in order to maintain consistency with EPA's declared purpose of using NO₂ as an indicator to reduce total NO_x, the commenters conclude, Region 10 must reject Shell's use of PVMRM.

Response: The modeling conducted by Shell is consistent with EPA's June 2010 1-hour NO₂ Modeling Guidance recognizing PVMRM as a Tier 3 modeling approach. The commenter has provided no information to show that Shell's use of PVMRM is inconsistent with that guidance. Moreover, the commenters have provided no information to support the assertion that "PVMRM significantly understates the extent to which NO will convert to NO₂ in the presence of ozone." The statement that "PVMRM fixates on the short-term rates of conversion" is incorrect. PVMRM determines the amount of available ozone on a receptor-by-receptor basis, which means the resulting NO₂ to NO_x ratio can vary on a receptor-by-receptor basis and on an hourly basis. PVMRM also

includes an assumed upper limit of 0.9 for the resulting ambient NO₂ to NO_x ratio, which means “nearly all” of the NO could be converted to NO₂ under certain circumstances.

Concerning the commenters’ concern with NO in connection with the NO₂ standard itself, this issue is beyond the scope of these permitting actions. NO is not included directly in the regulatory NAAQS analysis because the NAAQS is written in terms of NO₂ and not NO. This analysis has considered conversion of NO to NO₂, which meets the regulatory permitting requirements at issue in these permitting actions.

Comment W.4.d: Commenters contend that Shell has relied on NO₂/NO_x ratios that underestimate the expected maximum impacts of its operations. The commenters assert that predictions of ambient 1-hour concentrations of NO₂ require data (or assumptions) about the initial, in-stack ratio of NO₂ to NO_x in the emissions generated by a pollution source. Characterizing a source’s emissions with a reliable NO₂/NO_x ratio (or ratios), the commenters continue, is therefore essential to the modeling of 1-hour NO₂ impacts. Commenters contend that an underestimation of the proportion of NO_x emissions that are NO₂ leads to greatly understated projections of ambient NO₂ concentrations. The commenters contend that Shell conducted 90 stack tests to determine empirically the various NO₂/NO_x ratios associated with its emission units and these tests revealed ratios ranging from 0.042 to 0.469 and that the NO₂/NO_x ratios varied depending on the equipment tested and the operating load. The commenters state that Shell’s use of generic ratios is problematic on its face because it falsely characterizes Shell’s intricate operations in which many combinations of different activities could occur together, to the detriment of air quality.

Response: Region 10 carefully reviewed the in-stack ratios Shell has used in its analysis and believes the air quality analysis based on this modeling is protective of the NAAQS. As the commenters note, Shell performed 90 stack tests of engines on the Discoverer under various loads and this testing indicated varying in-stack ratios for different engines and loads. Shell performed a modeling analysis using generic in-stack ratios derived from the testing they had performed. The commenter believes the variability observed in the testing necessitates increasing the complexity of the modeling to account for this variability. Region 10 does not agree that adding model complexity to the point that every potential combination of load and in-stack ratio is warranted.

What is required is an adequate demonstration that the NAAQS are protected. In this case a prior load analysis had determined worst case impacts occurred during 100% load conditions. Testing of in-stack ratios had been performed and these ratios were used to derive generic ratios at full load. These ratios were initially used by Shell in a NAAQS demonstration. Region 10 also required an additional modeling demonstration using tested in-stack ratios in the analysis, which Shell submitted (see 4/29/11 Shell modeling submittal Alternate_NO2_Modeling_Disco_04_29_2011.pdf). Both modeling runs show the NAAQS will be protected and that there was little variation in the resulting modeled concentrations. Modeling all potential combinations of variable in-stack ratios would add complexity to the modeling demonstration and is not required or needed to provide

assurance that authorized emissions are not expected to cause or contribute to a violation of the NAAQS.

Shell's use of ratios have been reviewed and determined to be reasonable by Region 10. It would be overly burdensome to require an applicant to run all possible combinations of loads, emission rates, and in-stack ratios in the modeling analysis. The commenter has not identified specifically which combination of activities or in-stack ratios are falsely characterizing Shell's permitted operations. Region 10 has used professional technical judgment in reviewing the ratios and operating scenarios and believes the ratios chosen adequately represent Shell's permitted operations and that the 1-hour NO₂ NAAQS will be protected by the permit requirements.

Please also see response to comments W.4.a, W.4.b, and W.4.d.

Comment W.4.e: Commenters acknowledge that Region 10 required Shell to conduct "several" additional modeling runs with alternative in-stack ratios, employing Shell's data collected from the in-stack ratios. While this is better than allowing Shell to rely upon generic ratios alone, the commenters continue, it is not clear that these additional modeling runs demonstrate compliance with the 1-hour NO₂ NAAQS. The commenters contend that Shell's stack tests are not sufficiently comprehensive to reveal the full range of emission ratios that might actually occur during Shell's operations and that it is unlikely that the additional modeling runs Region 10 required actually provided a realistic representation of potential operating scenarios. The commenters therefore conclude that Region 10 and Shell have not provided any basis for concluding that the NO₂/NO_x ratios used in Shell's modeling are representative of the ratios that actually may result from Shell's operations and that, due to the importance of these ratios to assessing 1-hour NO₂ impacts, Shell cannot say that it has demonstrated compliance with the standard. The commenters ask that, if Shell believes that its operations are simply too complex to actually measure resultant ratios, region 10 should require the use of a default in-stack NO₂/NO_x ratio (0.50) that is much higher than the ratios utilized by Shell

Response: Region 10 disagrees with the statement that "Shell's generic ratios were not representative of Shell's operations." In fact, the generic ratios were derived based on engine testing that Shell performed on the Discoverer's engines. Region 10 requested the additional modeling from Shell knowing that individual engine testing on the Discoverer engines had been performed and believed it was appropriate to also analyze the modeling impacts using actual specific tested ratios. Shell performed this analysis and demonstrated compliance with the NAAQS. Region 10 believes the use of the tested ratios, which Shell has done, is more appropriate in this case than the use of the default ratio (0.5) as proposed by the commenter. Testing of in-stack ratios on the actual permitted equipment is the basis for concluding the ratios used are representative and that the modeling analysis demonstrates compliance with the NAAQS.

W.5 SUBCATEGORY – AREA POLYGONS

Comment W.5.a: Commenters assert that Shell’s use of area polygons to model the emissions of associated vessels underestimates impacts and that Shell has therefore not demonstrated compliance with 1-hour NO₂ standards, as required by 40 CFR § 52.21(k). The commenters state that Shell’s modeling dilutes Shell’s associated vessel emissions over a large area, artificially reducing projected maximum impacts and that Region 10 should direct Shell to remodel impacts using a method that does not bias modeled impacts in this manner. Commenters assert that Shell’s use of area polygons rather than volume sources to represent the emissions of associated vessels results in the distribution of associated vessel emissions within the “areapoly” and that the ice breaker emissions appear to be distributed over an area of roughly eight square kilometers, while the emissions of other support vessels distributed over four square kilometers. By treating the associated vessel emissions in this manner, the commenters continue, Shell likely overestimates how much its ships will be moving and further underestimates short-term impacts to air quality. The commenters contend that the potential for underestimating impacts is particularly significant with short term standards like the 1-hour NO₂ standard.

Response: Region 10 carefully considered the assumptions and model settings used in Shell’s air quality analysis. In any modeling analysis, the applicant has choices in configuring the model inputs to best reflect its operations. In AERMOD, there are various ways to characterize emissions, such as a point, volume, area circle, area polygon, open pit, or flare. The applicant must choose how to best characterize all their permitted emissions, and the permitting authority conducts a review to ensure the applicant’s approach appropriately characterizes emission sources.

An area source is generally used to model low-level or ground level releases with no plume rise (such as storage piles, lagoons, etc), while a volume source is used to characterize releases from building roof vents, conveyer belts, etc. In this case, Shell chose to characterize its moving Associated Fleet as an area source, or more specifically, as an area polygon. The only difference between an area source and an area polygon is the ability to specify an arbitrary shape in the case of the area polygon.

Conceptually, the effect of using an area polygon is that the source’s emissions during a given hour are treated as if emitted equally across the area of the polygon, rather than at a single point in the polygon. When applied to the Associated Fleet, this treats the vessels in the fleet as moving during an hour such that each vessel spends an equal portion of the hour in each possible position in the polygon. It appears that the commenter believes that each vessel should have been assumed to hold a single position during the hour, and that these positions be ones that would maximize the Associated Fleet’s aggregate impact on 1-hour concentrations by aligning the vessels in the Fleet with each other and with the Discoverer’s emissions along the same wind path. Alternatively, the commenter is suggesting that if an area polygon is used the size of the polygon should have been smaller so that the emissions from the Associated Fleet would have been more concentrated spatially, causing higher ambient concentrations.

Because the Associated Fleet emissions are associated with engines that have plume rise, which as stated above is not addressed in an area source configuration, Shell also had to characterize area source release parameters for every hour for their area polygons. Shell did this by running AERMOD in diagnostic mode using the lowest ice management vessel stack height with a line of receptors extending out to 5 km from the Discoverer. Shell then took the resulting plume height and sigma Z values for the maximum modeled receptor and used these parameters as the initial inputs for the area polygon sources. While this approach is novel and would not generally be performed due to the complexity of its implementation, Region 10 believes it does provide an accurate characterization of the Associated Fleet, which is an unusual source. The area polygon configuration was one of the areas carefully reviewed and considered. Region 10 believes the area polygon configuration along with the hourly emissions release characterizations are an accurate representation of the moving Associated Fleet and will result in a conservative impact analysis that is protective of the NAAQS.

It would be inappropriate to require Shell to use fixed positions for vessels in the Associated Fleet or to use an area polygon configuration that is so small as to not reflect the reality of a moving support fleet. In fact, Shell states in its application that the 5km distance chosen for the ice management vessels is half of the expected furthest distance of expected use. Discoverer Drillship Impact Evaluation for SO₂ and NO₂ Using AERMOD, dated March 18, 2011, at 26. In addition, for each hour the polygons—both for the ice management vessels and OSR—are aligned with the modeled wind direction using the maximum permitted emissions with worst case release characteristics as described above, which results in a conservative analysis. In reality, the Associated Fleet will likely operate in an area even larger than that modeled given that Shell has used half the expected distance of ice management vessel operation and has assumed those operations occur within a 20 degree angle. Also, given that the vessels in the Associated Fleet have particular tasks to perform whenever they are within 25 miles of the Discoverer, it is unreasonable to assume that they all would hold fixed positions for a full hour. In addition, as discussed above in response to comment V.2, W.1.c, and W.3.a, several conservative assumptions, such as a single drilling location over a period of three years, underlie Shell's modeling analysis.

Comment W.5.b: Commenters contend that an additional problem with the area polygons is that due to their size, associated vessel emissions will never be modeled as directly upwind or downwind of major Discoverer emission units. The commenters state that, although Shell represents the Discoverer as being about 150 meters long and a little over 25 meters wide, Shell's area polygon for its ice breakers, at its widest, is over three kilometers wide and this prevents an accurate assessment of the maximum impacts that would be expected during alignment of Discoverer and icebreakers.

Response: Region 10 disagrees that the area polygons used here prevent an accurate assessment of the maximum impacts would be expected during alignment. In responding to this comment, Region 10 has assumed from the context that the commenters are primarily concerned with this issue in connection with modeling for the 1-hour NO₂ standard. Emissions within the area polygons are aligned with the Discoverer drillship on

an hourly basis. The commenter is correct that, at its widest, the area polygon is wider than the Discoverer drillship, but this reflects the reality of the Associated Fleet operations. Region 10 anticipates the ice management vessels will at times when needed by changing conditions be in a fixed position for periods of an hour or more, such as during bow washing, where one of the ice management vessels is in a fixed position near the Discoverer drillship. This type of intermittent activity, as EPA guidance states, should not control a NAAQS demonstration for a probabilistic standard as this would be overly conservative. See March 2011 NO₂ NAAQS Modeling Guidance at 8-10. EPA has stated it is most appropriate to base a compliance demonstration for the 1-hour NO₂ NAAQS on emissions that are continuous enough and frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. March 2011 NO₂ Modeling Guidance at 9. Shell included emissions from intermittent activities in its modeling analysis but appropriate spread the emissions across an area polygon.

If Region 10 had required the entire modeling analysis be performed on the intermittent scenario where an ice management vessel, or some other Associated Fleet vessel, is in a fixed location aligned with the Discoverer, when coupled with the probabilistic form of the standard, this would have resulted in modeled impacts being significantly higher than actual impacts would realistically be expected to be for actual emission scenarios. The potential overestimation in these cases results from the implicit assumption that worst-case emissions will coincide with worst-case meteorological conditions based on the specific hours on specific days of each of the years associated with the modeled design value based on the form of the hourly standard.

EPA modeling guidance specifically addresses these types of intermittent scenarios. Id. The same analogy of an intermittent emergency generator described in this guidance would apply to the ice management vessels operating in a fixed location, such as during bow washing. Region 10 believes, based on EPA guidance and Section 8.2.3.d of Appendix W, the area polygon configurations Shell has used appropriately characterize the unique emission sources at issue in these permitting actions.

Also see response to comment W.5.a.

Comment W.5.c: Commenters contend that Shell's main purpose in using the area polygon approach was to dilute the projected ambient concentrations of its pollutants. The commenters assert that Shell used area polygons because of a problem it encountered with PVMRM, and not because of the accuracy of area polygons. According to Shell, the commenters continue, the regulatory version of the AERMOD model with PVMRM code allows the modeling of volume sources, but it has an error that overestimates the NO₂ chemistry for point sources when volume sources are also included. The commenters further assert that Region 10 provided Shell with a beta version of AERMOD with PVMRM code that addresses this problem, but Shell declined to use it. The commenters conclude that, if there truly is a problem with Shell's use of the regulatory and beta versions of AERMOD, the solution is not to allow Shell to use area polygons that will underestimate impacts.

Response: Shell used the regulatory version of AERMOD available during the timeframe the modeling was occurring, and this version did have a known problem with volume sources when using PVMRM. Shell's approach around this problem was to model the Associated Fleet as area sources. While area and volume sources are used to characterize different types of equipment, as described in response W.5.b, both spread emissions out across an area, which does dilute the projected concentrations when compared to a fixed point source. Shell's approach of configuring the area polygons accounts for both a moving fleet and buoyant stack emissions release. By accurately characterizing the release characteristics in the area source configuration, the two approaches—volume and area—can both be considered acceptable. As discussed in response to comments W.5.a and W.5.b, Region 10 believes the use of area polygons is acceptable and modeling these types of sources as volume sources is not required, especially if there are known errors that result in over predictions.

X. CATEGORY – AIR QUALITY ANALYSIS FOR PM_{2.5} NAAQS

X.1 SUBCATEGORY – IN GENERAL

Comment X.1.a: Commenters state that compliance with the 24-hour PM_{2.5} NAAQS must be demonstrated using the maximum modeled 24-hour average concentration and that this maximum modeled concentration must be added to the 98th percentile monitored background concentration and compared with the NAAQS. The commenters assert that Shell's ambient air quality analysis uses the "98th percentile values consistent with the form of the NAAQS" in combination with the 98th percentile values from the monitoring record to determine compliance with the NAAQS, resulting in a less conservative analysis that does not assure compliance with the standard. The commenters contend that, according to EPA's recent guidance on demonstrating compliance with the PM_{2.5} NAAQS, "[c]ombining the 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment would 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 commenter also states that the EPA Model Clearinghouse specifically recommends the use of "the average of the 1st highest modeled 24-hour impacts over 5 years as the modeled contribution to the cumulative NAAQS compliance analysis." The commenters conclude by stating that Region 10 must ensure that the PM_{2.5} NAAQS is fully protected by using the maximum modeled concentration, as specified by the Model Clearinghouse.

Response: Region 10 has verified that Shell has used the maximum modeled concentration averaged over two years (modeled years 2009 and 2010 based on available meteorological data) and paired this result with the 98th percentile background value. This calculation methodology follows EPA guidance for the 24-hour PM_{2.5}, as the commenter has described, and is protective of the NAAQS. See Memorandum from Tyler Fox, OAQPS, re: Model Clearinghouse Review of Modeling Procedures for Demonstrating Compliance with the PM_{2.5} NAAQS, dated February 26, 2010.

The footnote in Shell's May 19, 2011 submittal cited by the commenters is somewhat confusing, but it appears to be meant to refer to the use of the 98th percentile background concentration and does not mean that Shell also used the 98th percentile modeled concentration for PM_{2.5}.

X.2 SUBCATEGORY – SECONDARY PM_{2.5} FORMATION

Comment X.2.a: Commenters state that Region 10's analysis of potential secondary PM_{2.5} formation remains insufficient because, despite the EAB's clear direction on the issue, neither Shell nor Region 10 has performed a proper analysis of Shell's potential contribution to secondary PM_{2.5}. Noting the EAB remanded the permits to Region 10, in part, based on deficiencies in Region 10's analysis for secondary PM_{2.5}, the commenters state that Shell cannot demonstrate compliance with NAAQS until it has performed a sufficient secondary PM_{2.5} analysis. The commenters contend that, in remanding the permitting decision to Region 10, the EAB specifically instructed that "the Region should . . . provide an explanation of why modeling secondary PM_{2.5} is necessary or not after determining whether PM_{2.5} precursors will be emitted in significant quantities." The commenters conclude that Region 10 has blatantly ignored this order noting that the Supplemental Statement of Basis states that "Region 10 has not made a determination of whether PM_{2.5} precursor emissions from the project are significant" The commenters note in particular that the Supplemental Statement of Basis states that Shell's emissions will exceed the regulatory "significant emission rate" for the precursor NO_x by many times. The commenters conclude by stating that, if Region 10 does not determine whether those precursor emissions are significant, it certainly cannot accurately estimate the amount of potential secondary PM_{2.5} formation and that Region 10 must assess directly whether Shell will emit precursors in a significant quantity

Response: Region 10's determination that secondary PM_{2.5} formation associated with precursor emissions from the Discoverer and the Associated Fleet, together with consideration of impacts from primary PM_{2.5} emissions, is not expected to cause or contribute to a violation of the PM_{2.5} NAAQS is consistent with current EPA guidance for addressing PM_{2.5} precursor emissions and the EAB Orders.

Acknowledging that EPA's preferred dispersion model for near-field PM_{2.5} modeling (AERMOD) does not account for secondary formation of PM_{2.5}, EPA issued guidance on appropriate modeling procedures for demonstrating compliance with the PM_{2.5} NAAQS that relies upon ambient monitored concentrations to adequately account for the contribution of secondary PM_{2.5} to the cumulative impact assessment for demonstrating compliance with the NAAQS, in most cases. Memorandum from Stephen D. Page, OAQPS, re: Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS, dated March 23, 2010, at 9 (March 23, 2010 PM_{2.5} Guidance Memo). In issuing this guidance, EPA took into consideration the regional nature of secondary PM_{2.5} levels, and the fact that peak ambient impacts due to facility emissions of primary PM_{2.5} and secondarily-formed PM_{2.5} due to facility emissions of PM_{2.5} precursors are not likely to be well-correlated in space or time. The portion of EPA's guidance at issue here states that "[w]hile 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.” Id.

There are several points worth highlighting in relation to the March 23, 2010 PM_{2.5} Guidance Memo. Firstly, and at issue here, EPA does not explicitly define what “significant quantities of PM_{2.5} precursors” means in this context. In addition, EPA indicated in the March 23, 2010 PM_{2.5} Guidance Memo that “[w]e plan to issue separately additional guidance regarding this issue.” Id. In light of these considerations, Region 10 believes that the appropriate place to explain when “some assessment” of “potential” secondary PM_{2.5} contributions “may be necessary” is in the upcoming guidance that EPA plans to issue. As that guidance has not yet been issued, Region 10 here took a conservative approach by presuming that the Discoverer and Associated Fleet do emit “significant quantities” of PM_{2.5} precursors, and then assessing the potential contributions of PM_{2.5} precursor emissions to the formation of secondary PM_{2.5}. Further explanation of Region 10 assessment documented in the Supplemental Statement of Basis that PM_{2.5} precursor emissions will not cause or contribute to violations of the PM_{2.5} NAAQS.

In addition, Region 10 disagrees with the commenters’ inference that the reference in the March 23, 2010 PM_{2.5} Guidance Memo to “some assessment” of the source’s potential contribution to cumulative impacts implies a requirement that modeling be conducted. The fact that the guidance refers to “some assessment” rather than a “modeling demonstration” indicates that an “assessment” could be comprised of qualitative and/or quantitative analyses, including a modeling demonstration if appropriate, but it is certainly not limited to nor dependent on a modeling demonstration.

The commenter is correct that, in issuing the 2011 Revised Draft Permits, Region 10 did not make an explicit determination of whether the project emits “significant quantities” of PM_{2.5} precursors as that term is used in the March 23, 2010 PM_{2.5} Guidance Memo. See Supplemental Statement of Basis at 55, fn. 20. Instead, Region 10 took a conservative approach and presumed that the Discoverer and Associated Fleet do emit “significant quantities” of PM_{2.5} precursors, and then conducted an assessment of the potential contributions of PM_{2.5} precursor emissions to the formation of secondary PM_{2.5}, consistent with the March 23, 2010 PM_{2.5} Guidance Memo.¹⁹ Consistent with the EAB Orders, Region 10 provided “an explanation of why modeling secondary PM_{2.5} emissions is necessary or not necessary,” Remand Order II at 41. Region 10 concluded for the reasons explained in the Supplemental Statement of Basis that modeling is not necessary to demonstrate that secondary PM_{2.5} formation from the Discoverer and the Associated

¹⁹ In issuing the 2010 Permits, Region 10 concluded that the Discoverer and the Associated Fleet do not emit “significant quantities” of PM_{2.5} precursors. As discussed above, given that additional guidance has not yet been issued on what is meant by this term, Region 10 took and is taking a more conservative approach in proposing and taking final action on these revised permits in response to the remand. Region 10’s ultimate conclusion—that modeling is not necessary or appropriate in order to conclude that emissions of secondary PM_{2.5} from the Discoverer and Associated Fleet are not expected to cause or contribute to a violation of the 24-hour PM_{2.5} NAAQS—is unchanged.

Fleet is not expected to cause or contribute to a violation of the PM_{2.5} NAAQS. Although the EAB assumed that Region 10 would make a determination on the significance of Shell's emissions, Region 10 does not read the EAB Orders to require Region 10 to do so where Region 10 assumed, for purposes of addressing the order and taking a more conservative approach to the issue, that such emissions were significant. To the extent Remand Order II can be read as ordering Region 10 to determine whether the Discoverer and the Associated Fleet emit "significant quantities" of PM_{2.5} precursors, Region 10 concludes for purposes of issuing these permits that they do.

In support of the 2011 Revised Draft Permits, Region 10 provided a detailed explanation for why it believes that modeling secondary PM_{2.5} emissions is not needed in order to determine that emissions of PM_{2.5} precursors from the Discoverer and Associated Fleet would not, together with emissions of primary PM_{2.5}, cause or contribute to a violation of the 24-hour PM_{2.5} NAAQS. The factors Region 10 relied on to reach this conclusion include:

- 1) The background PM_{2.5} monitoring data considered in the air quality analysis is quality assured, quality controlled data from monitors operating for more than one year that Region 10 believes will have accounted for much of the secondary formation from existing regional emission sources that will occur in the Chukchi Sea and Beaufort Sea regions. Monitoring data show low levels of daily PM_{2.5}, generally in the range of 2 µg/m³, with the higher PM_{2.5} values generally occurring on days where windblown dust or fires are believed to be contributing factors. Thus, there is no indication that secondary formation of PM_{2.5} from existing sources in the North Slope is currently causing or contributing to exceedances or a violation of the PM_{2.5} NAAQS in the onshore communities.
- 2) Modeled primary PM_{2.5} impacts from the Discoverer and Associated Fleet that, when using a conservative "First Tier" approach to combining modeled primary PM_{2.5} impacts with monitored background PM_{2.5} concentrations are less than 67% of the PM_{2.5} NAAQS. Thus, although not expected, considerable formation of secondary PM_{2.5} emissions could occur before the NAAQS would be threatened.
- 3) Secondary PM_{2.5} impacts associated with Discoverer and Associated Fleet precursor emissions are expected to be low near the emission release points where modeled concentrations associated with primary PM_{2.5} emissions are highest, because there has not been enough time for the secondary chemical reactions to occur. Conversely, secondary PM_{2.5} impacts are more likely to be higher farther from the Discoverer and the Associated Fleet where impacts from primary PM_{2.5} emissions from the Discoverer and the Associated Fleet are expected to be lower. This makes it unlikely that maximum primary PM_{2.5} impacts and maximum secondary PM_{2.5} impacts from the Discoverer and the Associated Fleet will occur at the same time (paired in time) or location (paired in space). See March 23, 2010 PM_{2.5} Guidance Memo at 9.
- 4) The relatively small amount of NO_x emissions (a PM_{2.5} precursor) that will be authorized under these permits in comparison to existing NO_x emissions in the

North Slope area in general, together with the generally low levels of PM_{2.5} recorded at monitoring stations in the area, make it unlikely that NO_x emissions from the Discoverer and the Associated Fleet would cause or contribute to a violation of the PM_{2.5} NAAQS.

- 5) The background concentrations of certain chemical species that participate in photochemical reactions to form secondary PM_{2.5}, including ammonia and volatile organic compounds, are expected to be negligible in the offshore air masses where the Discoverer will be permitted to operate. The emissions authorized under the permits of approximately 43 tons per year of VOC and 0.52 tons per year of ammonia (Region 10 Technical Analysis at 8) would also not be expected to result in the conversion of significant quantities of NO_x emissions to secondary particles in the areas impacted by primary PM_{2.5} emissions.
- 6) There are several other conservative assumptions incorporated in the modeling of primary PM_{2.5} emissions. These include the conservatism inherent in using a “First Tier” approach to combining modeled primary PM_{2.5} impacts with monitored background PM_{2.5} concentrations; assuming that the Discoverer will be operating in a single drilling location for 3 years, when it is more likely that the Discoverer will operate in a different location each year (if not more frequently); orienting the Associated Fleet with hourly modeled wind direction and using emission release characteristics based on actual meteorological conditions; and the fact that the background monitored data used to represent offshore conditions was collected onshore, where it is influenced by local sources, and is therefore likely to be a conservative estimate of background PM_{2.5} levels in the area of maximum impact near the Discoverer.
- 7) With respect to the Chukchi Sea impacts, the predominant easterly wind directions in the Chukchi Sea along with the distance between the project location and the existing sources in the North Slope oil and gas fields are such that emissions from the Discoverer and Associated Fleet are not likely to significantly contribute to the maximum ambient concentrations resulting from the existing source emissions.
- 8) Region 10 required post-construction monitoring in the previous permits because the conservative screening modeling resulted in predicted levels that were just below the 24-hour PM_{2.5} NAAQS. With the additional emission reductions in direct PM_{2.5} emissions and the use of a refined model, predicted PM_{2.5} concentrations are now well below the NAAQS. However, Region 10 has decided to retain the post-construction monitoring requirement in order to obtain better information on the quantity of secondary particles in the North Slope communities.

Based on these factors, and consistent with current guidance, Region 10 believes that an adequate assessment has been made to demonstrate that the PM_{2.5} NAAQS will be protected, accounting for primary PM_{2.5} impacts and potential contributions due to PM_{2.5} precursors from the Discoverer and the Associated Fleet, and that it is not necessary to

use a photochemical model to further evaluate secondary PM_{2.5} formation in these permitting actions.

Comment X.2.b: Commenters state that, in analyzing potential secondary PM_{2.5} formation, Region 10 should address additional factors, including ConocoPhillips' potential operations, which will also emit a substantial amount of NO_x. The commenters contend that these two operations will together generate more precursors—resulting in more secondary PM_{2.5}—than if they were operating in isolation. The commenters assert that Region 10 acknowledges that secondary PM_{2.5} formation can occur at a different time and place than where the precursors were emitted and that Region 10 must therefore account for the emission of precursors from Shell's operation before it has technically become an OCS source and after it has stopped being one, since these non-OCS source emissions could react with OCS source emissions.

Response: Even if Region 10 were to require Shell to conduct photochemical modeling for PM_{2.5} precursors, Shell would not be required to include in its modeling consideration of emissions from Conoco-Phillip's operations or emissions from vessels before Shell becomes an OCS source. See response to Comment Z.1 and Z.2. The post-construction monitoring requirement for PM_{2.5} will assist Region 10 in evaluating the significance of secondary formation of PM_{2.5} on a broader scale in the North Slope region.

Comment X.2.c: Commenters state that, in concluding that modeling to assess the impact of secondary PM_{2.5} emissions is not necessary, Region 10 relies heavily on the fact that the monitored background concentrations used in the impact analysis include the impacts of secondary PM_{2.5} from onshore sources and what Region 10 determined is a "significant margin of safety" in the PM_{2.5} NAAQS compliance demonstration. The commenters state that Region 10 is not in fact using the PM_{2.5} background concentrations in the Beaufort Sea that best account for secondary PM_{2.5} formation and that Region 10 must use PM_{2.5} background concentrations from Deadhorse, instead of Badami, to better account for secondary PM_{2.5} impacts. The commenters contend that, using the Deadhorse PM_{2.5} data, emissions from the Discoverer and the Associated Fleet at the locations of maximum impact would be 101% of the NAAQS, leaving no margin of safety to account for the possibility of PM_{2.5} formation. The commenters assert that modeling for secondary PM_{2.5} formation is practical and encourage Region 10 to work with Nuiqsut to obtain the data on air quality collected there that shows elevated particulate matter in the summer.

Response: As discussed in response to comments V.1 and V.2, the Deadhorse PM_{2.5} monitoring site is beyond the modeled impact area of the Discoverer's operations (Deadhorse is 84 kilometers from the closest lease block that the Discoverer is allowed to operate on under the 2011 Revised Draft Beaufort Permit). Region 10 therefore believes that this site should not be automatically assumed to be representative of the modeled impact area's background concentration. In contrast, the Badami monitoring site is within the 50 kilometer modeled impact area of the Discoverer operations and Region 10 believes it is conservatively representative of background PM_{2.5} concentrations, both primary and secondary, in the Discoverer modeled impact area. This is because it is located in the same wind direction as the Discoverer drilling operations from the existing

Prudhoe Bay sources and it is sufficiently distant from the existing sources as to not be unduly impacted by direct PM_{2.5} emissions but far enough to be expected to reflect any secondary PM_{2.5} formation when PM_{2.5} precursors from sources in Prudhoe Bay are transported towards the Discoverer drilling operations. Moreover, even if the Deadhorse background value of 17 µg/m³ is used with the maximum 24-hour PM_{2.5} modeled concentration of 12.2 µg/m³, the resultant concentration would be 29.2 µg/m³, which is sufficiently below the NAAQS of 35 µg/m³ to allow for the possibility of formation of secondary PM_{2.5} emissions without threatening compliance with the NAAQS.

Comment X.2.d: Commenters ask Region 10 to explain why the secondary formation of PM_{2.5} modeling that was performed by Shell and submitted to Region 10 was not relied upon by the agency and what the modeling results showed.

Response: Shell submitted a CALPUFF analysis to Region 10 containing a secondary PM_{2.5} formation analysis. This analysis indicated minimal secondary PM_{2.5} impacts from Shell operations. CALPUFF has never been approved with a chemistry option in Appendix W to 40 CFR Part 51 and is not a preferred/recommended model for the purposes of assessing secondary PM_{2.5} formation for PSD applications in the nearfield (less than 50 kilometers). Shell's use of CALPUFF was not accompanied by a request (*i.e.*, protocol) and analysis seeking approval of an alternative model under 40 CFR Part 51, Appendix W, Section 3.2.2.2.e. Therefore Region 10 did not rely on the CALPUFF analysis submitted by Shell.

Y. CATEGORY – AIR QUALITY ANALYSIS FOR OZONE NAAQS

Comment Y.1: Commenters ask Region 10 to undertake a regional ozone air quality analysis and provide an analysis beyond the existing justification provided in the Statements of Basis for the 2010 Permits, which Region 10 again relied on in issuing the 2011 Revised Draft Permits. The commenters assert that it is essential that the cumulative impacts of the emissions of NO_x and VOCs in this area are addressed now before the draft permits are finalized and issued. Noting the causes and health impacts of ozone, the commenters state they are disappointed that no effort has been made to undertake regional modeling of ozone formation, particularly in light of the fact that Region 10 currently has four air permits for the Arctic pending before it and the already high levels of ozone in the area. The commenters contend that Region 10 has not explained why ozone was not modeled in the Beaufort where other existing sources contribute ozone precursors, given that Region 10 previously recognized “point sources in the North Slope oil and gas fields near Deadhorse contribute approximately 41,000 tpy of NO_x and 1,100 tpy of VOC. The commenters further state that research conducted on air quality in Nuiqsut (in light of the pollution generated by Alpine Oil Field and Prudhoe Bay) showed elevated ozone levels in the winter months.

Response: As provided in Remand Order I, appeals of the 2011 Final OCS/PSD Permits are limited to issues addressed by the Region in the 2011 Revised Draft Permits and to issues otherwise raised in the petitions on the 2010 Permits before the Board in this proceeding but not addressed by the Region in the 2011 Revised Draft Permits. In

issuing the 2010 Draft Permits, Region 10 received adverse comments on its determination that ozone modeling was not needed in order to determine that issuance of the permits would not cause or contribute to a violation of the ozone NAAQS. See, e.g., 2010 Chukchi Response to Comments at 123-128. The adequacy of Region 10's NAAQS analysis for ozone was not the subject of an EAB petition on the 2010 Permits.

As the commenters correctly note, in proposing the 2011 Revised Draft Permits, Region 10 did not revise the basis for its conclusion that it is not necessary to conduct modeling for ozone in order to conclude that issuance of the permits would not cause or contribute to a violation of the NAAQS. Region 10 noted that ozone precursor emissions (NO_x and VOC) have decreased substantially in comparison to those permitted under the 2010 Permits and that more recent air quality data shows that ozone levels remain well below the NAAQS. Supplemental Statement of Basis at 57. Because Region 10's ozone analysis was unchanged in the 2011 Revised Proposed Permits and it was not the subject of petitions on the 2010 Permits, these comments are beyond the scope of the remand proceeding and do not need to be addressed by Region 10.

Region 10 stands by its decision that regional photochemical modeling for this project is not required. As described in the 2010 Statements of Basis, Region 10 reviewed ozone monitoring data along with existing precursor emissions that will impact ozone formation. 2010 Chukchi Statement of Basis at 108-109. Based on this review, Region 10 determined further analysis of ozone was not warranted. As discussed in the Supplemental Statement of Basis (at 57), the 2011 Revised Draft Permits further reduce ozone precursors from the two projects, and as discussed in the response to comment Y.3. below, the most recent ozone monitoring data continues to show low levels of ozone at four monitoring sites. As such, there is nothing new that would change Region 10's original decision not to require regional photochemical modeling for this project.

Region 10 disagrees with the commenters' statement that arctic ozone levels are high because the available ozone monitoring data does not support this statement. With respect to the research on air quality in Nuiqsut and the comment stating that the monitoring data that showed elevated ozone levels in the winter months, the commenter has provided no information that consideration of that information would change Region 10's conclusion regarding the necessity of conducting modeling for ozone. First, as of the time of the 2011 Revised Draft Permits, the data from the Nuiqsut monitoring site had not been reviewed by either the Alaska Department of Environmental Conservation or Region 10 to determine if it was suitable for use in a modeling analysis. More importantly, the maximum 8-hour ozone levels shown in the referenced document (Attachment 5) are lower than the highest 8-hour ozone level relied upon in the 2010 Statement of Basis for the 2010 Draft Beaufort Permit (0.042 ppm in the referenced report versus 0.050 ppm in the 2010 Statement of Basis). The more recent ozone data from agency approved monitoring sites shows similar ozone levels. See response to comment Y.3. below. The reference to "elevated ozone levels in the winter months" appears to be referring to the fact that the levels in the winter are higher than in the summer, not that the levels are "elevated" in comparison to some other reference point, such as the NAAQS.

Comment Y.2: Commenters state that, for the permit for the Chukchi Sea, Region 10's explanation of why ozone modeling is not necessary fails to account for ConocoPhillips' operations for which Region 10 just issued a draft Title V permit. The commenters note that Region 10's statement of basis for the ConocoPhillips permit reflects that ConocoPhillips will emit 207.2 tons per year of NO_x and 25.1 tons per year of VOCs after permit limits are taken into account and that, without these limits, the emissions are 1,948.5 of NO_x and 64.1 of VOCs. The commenters continue that, although these emissions from ConocoPhillips will not occur in the air shed until 2013, they nevertheless will be present and should be considered by Region 10.

Response: Commenters asked Region 10 to consider emissions from ConocoPhillips' anticipated operations in the Chukchi Sea when they submitted public comment on the 2010 Permits in connection with Region 10's ozone analysis (2010 Chukchi Response to Comments at 124-125), but this issue was not the subject of a petition on those permits. Accordingly, this comment is beyond the scope of the remand proceeding, may not be the subject of a petition, and does not need to be addressed by Region 10.

Moreover, as discussed in response to comment Z.1, Shell is not required to consider the emissions under ConocoPhillips' draft permit in these permitting actions for the Discoverer. Even considering the combined permitted emissions of ozone precursors from the Shell Discoverer and the ozone precursors emissions proposed under ConocoPhillips' draft permit, however, no violation of the ozone NAAQS is expected given current ozone levels on the North Slope. The combined ozone precursor emissions to be authorized under the ConocoPhillips draft permit and the Discoverer permit are approximately 543 tpy of NO_x, 68 tpy of VOC, and 359 tpy of CO, which is small in proportion to regional emissions of ozone precursors.

Comment Y.3: Commenters question why Region 10 did not update the information on regional ozone levels in the Supplemental Statement of Basis given that permittees are required to conduct preconstruction monitoring for NO₂ and VOCs emissions over 100 tpy. The commenters also question how Region 10 can still reasonably conclude that "no further evaluation is needed for the ozone standard" given the previous data on background levels of ozone.

Response: As discussed above in the response to comment Y.1, Region 10 did not revise the basis for its conclusion that it was not necessary to conduct modeling for ozone in order to conclude that issuance of the permits would not cause or contribute to a violation of the ozone NAAQS. However, Region 10 did summarize the most recent monitoring data for all pollutants (not just those for which new modeling was conducted for these 2011 Revised Draft Permits) in a memorandum included in the administrative record. See Memorandum from Christopher Hall, Region 10, to Herman Wong, Region 10, re: EPA Region 10 Determination of Appropriate Background Values for the Chukchi Sea and Beaufort Sea OCS Permits, dated June 23, 2011 (Background Data Memo). This memo summarized the 2009 and 2010 ozone data from Shell's and ConocoPhillips' Wainwright and Point Lay monitoring sites as well as 2006 to 2009 ozone data from two other industry run sites in the Prudhoe Bay area (A Pad and CCP) which had recently

been reviewed and approved by the Alaska Department of Environmental Conservation. As shown in the data below from the Background Data Memo, the most recent data, continues to show that ozone levels at sites along the Alaska Arctic Ocean are well below the ozone NAAQS.

Averaging Period	Wainwright	Point Lay	CCP	A Pad
1-hour	0.039 ppm	0.040 ppm	0.040 ppm	0.078 ppm
8-hour	0.037 ppm	0.040 ppm	0.032 ppm	0.034 ppm

Comment Y.4: Commenters emphasize the importance of Region 10’s conclusion that no further evaluation for ozone is needed in light of EPA’s decision to revise the 8-hour standard. The commenters note that, EPA had proposed to adopt a new primary 8-hour standard of between 0.060-0.070 parts per million (ppm) this summer, lower than the existing 8-hour standard of 0.075 ppm. The commenters ask Region 10 to ensure compliance with the new 8-hour standard for ozone because they allege that 1) current background concentrations of ozone are already as high as 0.050 ppm (8-hour average) on the North Slope and the formation of additional ozone as a result of offshore oil and gas operations could take the North Slope out of attainment; 2) the new 8-hour standard is an important health based standard and this standard should be the one that Shell seeks to comply with in its proposed years of future operations in the Beaufort and Chukchi Seas because the proposed air permits are not time limited and thus support the need for compliance with the most recent legal requirements; and 3) both BOEMRE and Shell rely upon the NAAQS to mitigate the impacts of the air emissions associated with Shell’s exploration plans on air quality, marine mammals, and other resources so it is particularly critical that compliance with these emerging standards is ensured.

Response: EPA had proposed to reconsider the 0.075 ppm ozone NAAQS set in 2008 and requested comment on a range between 0.060 and 0.075 ppm. 75 Fed. Reg. 2935 (January 19, 2010). Since this comment was made, however, EPA has announced that, at the President’s direction, EPA will not be taking final action on its current proposal to revise the 8-hour ozone NAAQS. EPA instead intends to consider revisions to the ozone NAAQS in connection with the 5-year mandated revision of the ozone NAAQS in 2013. Statement by the President on the Ozone National Ambient Air Quality Standard, September 2, 2011. There is no requirement that a PSD permit ensure compliance with requirements that come into effect after the PSD permit has been issued. See Memorandum from Steven D. Page, Director, OAQPS, re: Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards, dated April 1, 2010. These permits, when finalized, will meet all applicable requirements in effect at the time of permit issuance.

In any event, based on the most recent ozone data, current ozone levels at four monitoring sites are well below even the low end of the range of the NAAQS EPA had proposed (0.060 ppm). See response to comment Y.3 above. See also response to

comment BB.3 for a discussion of the environmental justice considerations in connection with the proposed 8-hour ozone NAAQS.

Z. CATEGORY – CUMULATIVE IMPACTS

Comment Z.1: Commenters state that Shell has failed to account for emissions from ConocoPhillips' exploration operations planned for the Chukchi Sea and that, contrary to agency guidelines, Shell's modeling assumes that its drilling operations will be undertaken in complete isolation from other arctic development projects, citing to 40 CFR Part 51, Appendix W, Section 8.2.3(b) ("All sources expected to cause a significant concentration gradient in the vicinity of the source . . . under consideration for emission limit(s) should be explicitly modeled."). The commenters contend that Shell's modeling does not comply with this requirement because it fails to account for ConocoPhillips' potential operations in the Chukchi Sea reflected in the draft air permit that Region 10 proposed for issuance on July 22, 2011. The commenters state that ConocoPhillips' main rig could operate as little as 20 miles away from Shell's operations and that its icebreaker and oil spill response vessel operations could take place as little as 15 and 10 miles away, respectively, from Shell's operations. The commenters also note that, in determining that Shell will not contribute to a violation of ozone standards, Region 10 stated that "there are no other stationary sources in the more immediate regional vicinity of Shell's operations in the Chukchi Sea that contribute ozone precursors to the airshed." The commenters state that Conoco's operations will emit large amounts of pollution and will have a potential to emit 225 tpy of NO_x, 173 tpy of CO, and 14 tpy of PM_{2.5}/PM₁₀. The commenters assert that it is especially important for Shell to account for Conoco's potential emissions because the ambient air quality monitoring data will not otherwise account for them and that, by failing to account for such a significant nearby and contemporaneous source of emissions, Shell's modeling underestimates the total, cumulative impact of its own operations. The commenters conclude that this is cause for concern because Shell's current modeling shows 1-hour NO₂ levels reaching 93% of the NAAQS without accounting for ConocoPhillips and that Region 10 must therefore require Shell to rerun its model in a manner that accounts for ConocoPhillips' potential emissions. A commenters also state that assessing these oil and gas activities in a piecemeal fashion does not look at all of the factors that put local communities at risk.

Response: Permitting under the Clean Air Act and EPA's implementing regulations for PSD permitting is essentially a "first-come, first served" approach. When a new or modified source submits a permit application, and it is determined that the application needs to include a NAAQS cumulative impacts analysis, the cumulative analysis must only address certain stationary sources. Specifically, as set out in EPA guidance, the cumulative impact analysis must include emissions from "nearby sources" which include certain existing point sources, sources which have received PSD permits but have not yet begun to operate, as well as sources with complete PSD applications for which a permit has not yet been issued. See Draft New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting (October 1990), C.32 to C.34. These three categories of sources effectively precede the new source or modification which is now submitting a new PSD permit application. The new source in

line for a PSD permit must take into account the impact of all sources that preceded it. However, it need not account for sources that may later submit complete PSD permit applications. In addition, EPA's guidance does not require a NAAQS cumulative impact analysis to address future minor source growth, from either minor sources that have received permits but are not yet operating or minor sources that have submitted complete applications.

ConocoPhillips' drilling operation is not a major source for PSD and it has neither a PSD permit nor has it submitted a PSD permit application. Furthermore, ConocoPhillips' minor source permit application was not complete at the time the Discoverer PSD permit application was determined to be complete. Therefore, in accordance with EPA guidance, the cumulative impact analysis for the Discoverer PSD permits need not consider emissions from ConocoPhillips' proposed drilling operation.

Note, however, that ConocoPhillips' NAAQS cumulative impact analysis is required to include emissions from the proposed Discoverer operation, since the PSD permit application for the Discoverer drilling operation was determined to be complete prior to the submittal of a complete Part 71 permit for the ConocoPhillips drilling operation (the Discoverer Chukchi PSD permit application was deemed complete on July 31, 2009 whereas the ConocoPhillips permit application was deemed complete on April 13, 2010). The cumulative impact analysis for the ConocoPhillips drilling operation does, in fact, include emissions from the Discoverer when they would operate in close proximity and the proposed Part 71 permit for the ConocoPhillips drilling operation includes terms and conditions which ensure that the two operations, together, would not cause or contribute to a violation of any NAAQS. See Statement of Basis for Draft Outer Continental Shelf Title V Air Quality Operating Permit, NO. R10OCS20000, ConocoPhillips Company, Jackup Drill Rig, Chukchi Sea Exploration Drilling Program, Appendix A, at 12 (CP Statement of Basis). Since adequate restrictions are included in the ConocoPhillips proposed Part 71 permit, no further restrictions are needed in the Discoverer proposed PSD permit.

Comment Z.2: Commenters are concerned that the air quality analysis relied upon by Region 10 in issuing the permits does not account for what the commenters contend is the potentially significant contribution of pollutants from vessels/mobile sources that will operate in the same vicinity as the Discoverer and the Associated Fleet. The commenters allege that the air quality analysis does not account for emissions from the Discoverer (including its main propulsion engine), the Icebreakers/Anchor Handlers, or the any of the other Associated Fleet before the Discoverer is determined to be an OCS Source and that such emissions are not represented in the existing background air quality data. The commenters also contend that the modeling conducted by Shell and Region 10 also fails to account for the emissions from nearby mobile sources. The commenters ask Region 10 to clarify whether and how the air quality analysis incorporates the potential emissions from mobile sources related to the drilling program that are not captured in the PTE calculations for the Discoverer and the Associated Fleet. In this regard, the commenters state that they are concerned both with respect to the impacts on short-term standards, including the 1-hour NO_x, but also the annual air quality standards.

Response: Region 10 disagrees with the commenters that emissions from the Discoverer when it is not an OCS source, from vessels in the Associated Fleet when they are more than 25 miles from the Discoverer while it is an OCS source or when it is not an OCS source, or from other mobile sources in the area need to be addressed in the air quality analysis for the OCS/PSD permits for the Discoverer. Although such emissions may occur as a result of the activities of the OCS source, they are emissions from mobile sources. The Clean Air Act and EPA's implementing regulations for PSD are clear with respect to the treatment of mobile source emissions in the PSD permitting process. In the 1990 amendments to the Clean Air Act, Congress clarified that a stationary source does not include emissions from mobile sources. See CAA § 302(z). In the 1990 amendments, Congress also added the OCS provision (CAA § 328), which includes the requirement that emissions from support vessels are considered to be direct emissions from the OCS source when within 25 miles of the OCS source, but does not change any other provisions of the stationary source permitting programs for OCS sources as they relate to mobile sources.

EPA's PSD regulations (which have been incorporated by reference into the OCS regulations at 40 CFR § 55.13(d)) specify what sources of emissions must be included in the NAAQS and PSD increment demonstrations. 40 CFR § 52.21(k) requires that:

...the owner or operator of the proposed source or modification shall demonstrate that allowable emission increases from the proposed source or modification, in conjunction with all other applicable emissions increases or reductions (including secondary emissions), would not cause or contribute to air pollution in violation of:

- (i) Any national ambient air quality standard in any air quality control region; or
- (ii) Any applicable maximum allowable increase over the baseline concentration in any area."

EPA's regulations define "secondary emissions" at 40 CFR § 52.21(b)(18) as:

...emissions which would occur as a result of the construction or operation of a major stationary source or major modification, but do not come from the major stationary source or major modification itself. Secondary emissions include emissions from any offsite support facility which would not be constructed or increase its emissions except as a result of the construction or operation of the major stationary source or major modification. Secondary emissions do not include any emissions which come directly from a mobile source, such as emissions from the tailpipe of a motor vehicle, from a train, or from a vessel." (emphasis added).

Therefore, in accordance with the PSD regulations, emissions from mobile sources, specifically vessels that are not part of the Associated Fleet either because the Discoverer

is not yet an OCS source or because the vessels are beyond 25 miles from the Discoverer when the Discoverer is an OCS source, are not secondary emissions and need not be included in the NAAQS and PSD increment impact analyses.

Comment Z.3: A commenter states that another failure in issuance of the 2011 Revised Draft Permits is the absence of an assessment of the combined effect of multiple rigs. The commenters contend that assessing the rigs separately and not as a whole minimizes their presence and that Region 10 must assess the cumulative effect of multiple giant rigs at once to gauge the real impacts to the local communities.

Response: It is unclear what the commenter means by multiple rigs. With respect to exploratory operations for which Region 10 has received OCS permit applications, the draft permit for the Kulluk drill rig includes conditions that prohibit it and the Discoverer Drillship from operating in the Beaufort Sea during the same drilling season. See Draft OCS Permit to Construct and Title V Operation Permit, Shell Offshore, Inc., Conical Drilling Unit Kulluk, Permit No. R10OCS30000, Condition D.4.8. Region 10 has evaluated the impacts of either vessel (Discoverer or Kulluk) operating alone in the Beaufort Sea for a drilling season and has proposed to prohibit operations of both drill rigs in the Beaufort Sea during the same drilling season such that there can be no cumulative impact. The draft permit for ConocoPhillips' drill rig in the Chukchi Sea includes an assessment of the combined impact of its drill rig and the Discoverer drillship operating at the same time in near proximity. See ConocoPhillips Statement of Basis, Appendix A, at 12. Thus, although not required in connection with issuance of these permits for the Discoverer, Region 10 has assessed the cumulative effect of the drilling operations that currently have permit applications before it for review and is not aware of any other rigs that would be operating in either the Beaufort or Chukchi Seas.

AA. CATEGORY– PM_{2.5} INCREMENT

Comment AA.1: Several commenters note that on October 20, 2010, EPA adopted a final regulation establishing new PSD increments for PM_{2.5} that go into effect on October 20, 2011. The commenters ask Region 10 to require Shell to demonstrate compliance with the new PM_{2.5} increment because the regulation will be effective before Shell's operations begin and that Shell should be required to demonstrate compliance with all requirements that are effective during its period of operation. The commenters also state that the Major Source Baseline Date for EPA's recently finalized PM_{2.5} increments is October 20, 2010 and that after this date, any new major source of air pollution consumes the increment that was established by EPA in its October 20, 2010 final rule. The commenters point to language in the preamble stating that, while EPA will not require any such source to include a PM_{2.5} increment analysis as part of its initial PSD application, an increment analysis ultimately will be required before the permit may be issued if the date of issuance will occur after the trigger date, when the PM_{2.5} increments become effective under the federal PSD program. The commenters continue that the administrative record for the revised permits indicates that Region 10 is planning to issue the final revised permits in September 2011 and that there are no guarantees that Region 10 will be able to thoroughly respond to the public comments in time to issue final

permits before the date that the PM_{2.5} increments take effect on October 20, 2011. The commenters also note that documents in the administrative record indicate that there was a conference call regarding the PM_{2.5} increment in June 2011 but no details on the substance of the call are available as part of the permit records, but that other documents show that Shell inquired about the need to demonstrate compliance with the PM_{2.5} increments and EPA indicated an analysis was not needed.

Commenters note that, in remanding these permits to Region 10, the EAB ordered Region 10 to “apply all applicable standards in effect at the time of issuance of the new permits . . .” and that Region 10 could use “any discretion it has” to interpret what “all applicable standards” means. The commenters contend that Region 10 does not have complete discretion, but must exercise “any discretion it has” within the boundaries of applicable law and through the proper processes. The commenters assert that it is short-sighted for Region 10 to proceed with the issuance of these permits when it is clear that the permitted operations will consume more than the available PM_{2.5} increment allowed in the already-finalized rule. To support this assertion, the commenters point to the fact that the 24-hour average PM_{2.5} increment finalized by EPA is 9 µg/m³ and modeled 24-hour average PM_{2.5} concentrations expected under these permits are 12.4 µg/m³ (Chukchi Sea) and 12.2 µg/m³ (Beaufort Sea). The commenters contend this means that Shell has consumed more than the available increment and would not be able to demonstrate compliance with the PM_{2.5} increments if these permits were to be issued just a few weeks after the outlined schedule. Even if the permits are issued prior to the trigger date of the increments, the commenters request Region 10 to require Shell to demonstrate that it will comply with the PM_{2.5} increments prior to commencement of operations.

Response: In promulgating the PM_{2.5} increments, EPA clearly stated that the requirement to demonstrate compliance with that requirement does not come into effect until October 20, 2011. See 75 Fed. Reg. 64899, 64877, 64898-99 (October 20, 2010) (“Accordingly, we are setting the effective date of the PM_{2.5} increments at 1 year from the date of promulgation of this final rule [October 20, 2010], consistent with the 1-year delay required under section 166(b) of the Act.”). Because these permits are issued prior to October 20, 2011, there is no requirement that the air quality analysis required by 40 CFR § 52.21(k) must include a demonstration with respect to the PM_{2.5} increments. See Remand Order I at 66, fn. 74 (“While the Board disagrees that, apart from the environmental justice analysis, the Region was required to apply the new 1-hour NO₂ standard in its PSD analysis, that issue is mooted by this Order.”); *Ziffrin v. United States*, 318 U.S. 73, 78 (1943) (permitting and licensing decisions of regulatory agencies must reflect the law in effect at the time the agency makes a final determination on a pending application); Memorandum from Steven D. Page, Director, OAQPS, re: Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards, dated April 1, 2010.

Although these permits do not need to include an air quality analysis with respect to the new PM_{2.5} increment under 40 CFR § 52.21(k), Region 10 has nonetheless considered the new PM_{2.5} increment in connection with Region 10’s responsibilities under Executive Order 12898 entitled “Federal Actions To Address Environmental Justice in Minority

Populations and Low-Income Populations.” Exec. Order 12898, 59 Fed. Reg. 7629 (Feb. 16, 1994). As discussed in the Supplemental Statement of Basis (at 56-58) and the Region 10 Technical Analysis (at 29-31), the emissions of the Discoverer and the Associated Fleet, when operating in compliance with permit requirements, will not cause or contribute to a violation of the PM_{2.5} NAAQS. For purposes of the Executive Order on Environmental Justice, the EAB has recently confirmed that “compliance with the NAAQS is emblematic of achieving a level of public health protection that, based on the level of protection afforded by the NAAQS, demonstrates that minority or low-income populations will not experience disproportionately high and adverse human health or environmental effects due to exposure to relevant criteria pollutants.” Remand Order I at 73. This is because the NAAQS are health-based standards, designed to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics and is supported by the fact that “[t]he Agency sets the NAAQS using technical and scientific expertise, ensuring that the primary NAAQS protects the public health with an adequate margin of safety.” Id.

The Board has stated that an EPA permitting authority should exercise its discretion to examine any “superficially plausible” claim that a minority or low-income population may be disproportionately affected by a particular facility that is the subject of a PSD permitting proceeding. Id. at 63-64 & n. 71; *In re: Avenal Power Center, LLC, PSD Appeal Nos. 11-02, 11-03, 11-04 & 11-05, slip op.* at 20 (August 18, 2011) (Avenal Order). The commenters have not raised environmental justice concerns in connection with their comments on the applicability of the PM_{2.5} increment. In any event, in this case, Region 10 believes there will be no disproportionately high and adverse human health or environmental effects due to exposure to PM_{2.5} emissions because the permit ensures that emissions from the Discoverer and the Associated Fleet will not cause or contribute to a violation of the PM_{2.5} NAAQS anywhere within ambient air to which the public has access and EPA has not made any findings that the current PM_{2.5} NAAQS are inadequate to protect public health. In contrast to the NAAQS, which are set at a level to protect public health, CAA § 109, PSD increments are established to prevent the significant deterioration of air quality, CAA § 166. EPA’s consideration of the health and welfare effects of PM_{2.5} in the context of carrying out the statutory requirement to balance the goals of CAA §§ 101 and 160 (to protect public health and welfare, parks, and air quality related values and to insure economic growth) in setting increment does not support a conclusion that PM_{2.5} emissions at levels below the level of the NAAQS have an adverse effect on public health.²⁰

Comment AA.2: A group of commenters asserted that Region 10 has no discretion to determine whether the new PM_{2.5} increment is an applicable standard because the plain

²⁰ Region 10 also notes that the Discoverer is considered a “temporary source” under Title V and is a PSD major source. As such, Shell will be required to demonstrate compliance with any new NAAQS or increments that have since become effective when Shell applies for a Title V operating permit for the Discoverer. This is in contrast to what would be the case if these were PSD permits authorizing construction and operation for an unlimited duration of a source that was not considered a “temporary source” under Title V. See 2010 Chukchi Response to Comments at 52 and 136.

language of section 328 of the Clean Air Act, 42 U.S.C. § 7627(a)(1), defines which standards apply. Section 328 states that “[n]ew OCS sources shall comply with such requirements on the date of promulgation.” 42 USC § 7627 (emphasis added). The commenters state that, as a “new OCS source” yet to commence operation, Shell’s proposed arctic drilling operations must comply with all NAAQS and PSD program requirements that pre-date commencement of operations, including the new PM_{2.5} increments, citing to 42 USC §§ 7411(a)(2), 7475(a), 7627(a)(1) and (a)(4)(D). Moreover, with respect to OCS sources, the commenters continue, Congress clearly prohibited grandfathering by directing that even “existing OCS sources shall comply on the date 24 months” after promulgation of standards. Thus, the commenters conclude, Region 10 may not excuse Shell from the strict requirements of section 328 because it does not have the power to adopt a policy that directly conflicts with its governing statute, citing to *Maislin Indus. v. Primary Steel, Inc.*, 497 U.S. 116, 134-35 (1990).

Response: Region 10 does not interpret the cited language from the Clean Act to address when new regulatory standards take effect. Section 328 authorized EPA to issue regulations to establish requirements to control air pollution from Outer Continental Shelf sources. It directed that “[n]ew sources shall comply with such requirements on the date of promulgation and existing sources shall comply on the date 24 months after. EPA promulgated the regulations authorized by Section 328 on September 4, 1992, and they became effective on that date. 57 Fed. Reg. 40792 (September 4, 1992). This is confirmed by the language of 40 CFR § 55.3(d), which mandates that that new sources “shall comply with the requirements of this part by September 4, 1992.” The permits fully comply with that provision by requiring the sources to comply with the requirements of Part 55.

Comment AA.3: Commenters state that, when Congress adopted the PSD program, it understood that certain sources might get caught by changing permit requirements and it offered “grandfathering” relief only to those sources on which “construction had commenced” before the enactment of the 1977 Clean Air Act Amendments. See 42 U.S.C. § 7478(b). Where, as here, Congress has provided express grandfathering exemptions for certain circumstances but not others, the commenters contend that EPA may not waive otherwise applicable statutory requirements, citing to *Andrus v. Glover Constr. Co.*, 446 U.S. 608, 616-17 (1980) (“Where Congress explicitly enumerates certain exceptions to a general prohibition, additional exceptions are not to be implied, in the absence of evidence of a contrary legislative intent.”) and *Natural Resources Defense Council v. Env’t Prot. Agency*, 489 F.3d 1250, 1259 (D.C. Cir. 2007).

Response: This comment was made in the context of the applicability of the recently promulgated PM_{2.5} increment to Shell’s operations. The Clean Air Act expressly provides that new PSD increments will be effective one year after promulgation (see CAA § 166(b)), which is consistent with the rule for PM_{2.5} increment promulgated by EPA and Region 10’s application of that rule in issuing these permits. The commenter has not identified any instance in which EPA or Region 10 is proposing to grandfather this source from currently effective PSD requirements.

Comment AA.4: A commenter asserts that fine particulate matter also contributes to climate change in the form of black carbon, which is the second most important cause of arctic warming, and that Shell’s modeling shows that it will produce much more fine particulate matter than EPA’s new limit allows.

Response: Because there are no EPA requirements on the emissions or ambient concentrations of black carbon, as black carbon, Region 10 assumes the statement that “modeling shows that it will produce much more fine particulate matter than EPA’s new limit allows.” is referring to the PM_{2.5} increment, which comes into effect on October 20, 2011. See response to comment AA.1. For additional discussion on black carbon, please see response to comment BB.4.b.

BB. CATEGORY – ENVIRONMENTAL JUSTICE

BB.1 CATEGORY – IN GENERAL

CommentBB.1.a: Commenters appreciate that Region 10 has conducted an analysis of compliance with the new 1-hour NO₂ NAAQS but are still concerned that the revised environmental justice analysis omits consideration of important factors that they believe may present a risk to human health, and, therefore a disproportionate risk to environmental justice communities on the North Slope. The commenters state Region 10’s reliance on a demonstration of compliance with the NAAQS in order to assess environmental justice considerations is inconsistent with the EAB’s direction to Region 10 in remanding the permits. The commenters state that the existing modeling of compliance with the NAAQS appears to exclude any potential impacts from mobile source emissions that occur before the Discoverer is deemed to be an OCS Source and/or take place more than 25 miles from the OCS Source, including emissions from the Discoverer’s main propulsion engines while moving to the drill site, the emissions of the icebreaker/anchor handler while setting the eight anchors for the Discoverer, and the emissions from the fleet of support vessels, including icebreakers, before the Discoverer attaches to the first anchor. Although the commenters acknowledge that these emissions are not deemed to be emissions from the OCS source, they assert that Region 10 must provide a rational basis for whether and how the OCS Source and the Associated Fleet emissions have been analyzed in combination with the mobile source emissions in assessing potential adverse health impacts to local communities, both onshore and in offshore areas used for subsistence purposes for purposes of assessing potential adverse impacts to the health of the Iñupiat people. The commenters are concerned that the NAAQS analysis, in and of itself, does not account for the potential combined impacts of the stationary and mobile source emissions, which could be relevant considerations in assessing potential health impacts from short-term and long term exposure to NO₂ as well as exposure to ozone, PM_{2.5}, and PM₁₀, among other pollutants. The commenters contend that Region 10 has some leeway in making sure these emissions are considered and that the ships are set up in such a way so as to bring down emissions to where they need to be.

Response: Executive Order 12898 provides that “[t]o the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and Commonwealth of the [Northern] Mariana Islands.” Section 1-101 of Exec. Order 12898, 59 Fed. Reg. 7629 (February 16, 1994). “Federal agencies are required to implement this order consistent with, and to the extent permitted by, existing law.” Id. at 7632. EPA has recognized that it is appropriate to consider environmental justice in PSD permitting actions. See, e.g., *In re Prairie State Generating Company*, 13 E.A.D. 1, 123 (EAB 2006); *In re Knauf Fiber Glass, GmbH*, 8 E.A.D. 121, 174-75 (EAB 1999) (“Knauf I”).

The language of the Executive Order directing federal agencies to identify and address impacts “as appropriate,” and “[t]o the greatest extent practicable and permitted by law” imparts considerable leeway to federal agencies in determining how to comply with the spirit and letter of the Executive Order. Avenal Order at 24. In implementing Executive Order 12898, it is appropriate for the Agency to consider the best available data that are germane in light of the scope and nature of the action before the agency in analyzing whether there may be disproportionate adverse impacts on minority communities and low-income communities. Shell Remand Order I at 80, fn. 87; Avenal Order at 24. The EAB has recently confirmed that the Executive Order does not require EPA to reach a determinative outcome prior to issuing a permit, particularly when the available data is inconclusive. Avenal Order at 24.

The commenters acknowledge that the emissions it is asking Region 10 to consider—from the Discoverer’s main propulsion engines while moving to the drill site, from the icebreaker/anchor handler while presetting the eight anchors for the Discoverer, and from the fleet of support vessels before the Discoverer attaches to the first anchor—are mobile source emissions that occur before the Discoverer is deemed to be an OCS source and/or take place more than 25 miles from the OCS source. These mobile source emissions are therefore not subject to regulation under these permits and were not required to be addressed in Shell’s application materials. Region 10 has nonetheless considered information available to it. The commenter has previously noted Shell estimates that bringing the Discoverer into and out of the 25-mile radius of a drill site would result in the addition of half a ton of NO_x to Shell’s overall emissions. Letter from AEWC, ICAS and NSB to Region 10 re: Shell Gulf Of Mexico/Shell Offshore Inc.’s Application for a Chukchi Sea Clean Air Act Permit, dated October 20, 2009, Attachment at 12. This is in comparison to the approximately 2.75 tons of NO_x that will be emitted by the Discoverer and the Associated Fleet on a drilling day while operating as an OCS source. The Discoverer will be moving during this time, which will reduce the impact of the emissions at any one location. In addition, Shell has committed to using only ultra-low sulfur diesel fuel for its OCS exploration activities north of Bering Strait, although the permits can only require its use while the Discoverer is an OCS source and the Associated Fleet is within 25 miles of the source. This is expected to significantly reduce

ambient concentrations of SO₂ well below the NAAQS for SO₂ and will also result in a reduction of particulate matter.

Shell's Exploration Plans discuss vessels relating to the Discoverer's operations that are not considered part of the Associated Fleet because they always will be located more than 25 miles from the Discoverer while the Discoverer is an OCS source. See, e.g., 2012 Revised Camden Bay Exploration Plan, Section 13.0. The Exploration Plans, however, do not include estimates of air emissions from these other vessels during the time they are more than 25 miles from the Discoverer or before the Discoverer becomes an OCS source. Region 10 does not have sufficient information regarding these emissions to conclude with certainty that consideration of these emissions, in conjunction with emissions authorized under the permits, would not cause or contribute to a violation of the NAAQS. However, Region 10 does not expect these additional emissions to do so because the vessels in question are expected to be in transit during this time period. Because compliance with the NAAQS is considered with respect to a specific location and because these vessels are expected to be moving during the activities in question, the impact of emissions from these vessels during these activities would be dispersed during transit and the impact at any one location would not be as great as would be the same level of emissions from a stationary source. To the extent any of these vessels would be stationary for any extended period of time, Region 10 expects that such vessels would be anchored and not using their propulsion engines, the emission units that would be expected to have the highest emissions on these vessels.

In summary, although Region 10 has insufficient information to conclude that consideration of emissions from these different vessels and activities would not, in conjunction with emissions authorized under the permits, cause or contribute to a violation of the NAAQS, Region 10 also has no information to suggest that they would do so. Region 10 therefore has no basis to conclude that, even considering these other vessels and activities in conjunction with emissions authorized under the permits, issuance of these permits would have a disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

Comment BB.1.b: A group of commenters caution Region 10 against relying on BOEMRE's evaluation of impacts to subsistence hunts, stating that they have long critiqued the significance thresholds upon which MMS/BOEMRE relies in its National Environmental Policy Act (NEPA) analyses. The commenters continue that the threshold for impacts to subsistence used by BOEMRE demonstrates a lack of appreciation of the importance of subsistence resources to their communities. The commenters cite to the language from a BOEMRE Environmental Impact Analysis quoted by Region 10 in the Supplemental Environmental Justice Analysis:

“One or more important subsistence resources would become unavailable, undesirable for use, or available only in greatly reduced numbers for a period of 1-2 years.” And significance threshold for sociocultural systems, according to MMS is “[c]hronic disruption of sociocultural systems occurs for a period of 2-5 years, with a tendency toward the displacement of existing social patterns.”

The commenters state that all of these articulations are far beyond acceptable thresholds for deeming an impact “significant.”

Response: Region 10 cited the results of BOEMRE’s environmental justice assessment as additional information considered by Region 10 in conducting a review of environmental justice issues in connection with issuance of these permits. The BOEMRE analysis was not the primary basis for the conclusions reached by Region 10 in its environmental justice analysis.

Comment BB.1.c: One commenter asserts that Region 10’s analysis of the permits has multiple issues and did not adequately account for potential detrimental effects to local residents. According to the commenter, these include Region 10 erring in conducting the environmental justice analysis regarding the one-hour concentrations of NO₂. The commenter notes that Region 10’s Supplemental Environmental Justice Analysis states that the EAB “concluded that the Region clearly erred when it relied solely on demonstrated compliance with the then-existing annual NO₂ NAAQS as sufficient to find that the Alaska Native population would not experience disproportionately high and adverse human health or environmental effects from the permitted activity.” The commenter concludes that this needs to be addressed before permits are issued.

Response: The statements cited by the commenter were made by the EAB during its review of the 2010 Permits and prior to issuance of the 2011 Revised Draft Permits. In issuing the 2011 Revised Draft Permits, Region 10 thoroughly addressed the environmental justice concerns previously raised by the Board in Region 10’s Supplemental Environmental Justice Analysis.

Comment BB.1.d: A commenter states that due to the ecological sensitivity of the Arctic, as well as the political sensitivity around possible human rights and environmental justice violations, Shell’s air permits for operations in the Beaufort and Chukchi seas must be denied. In support of this request, the commenter contends that it is a fundamental principle of international law that States have a duty to prevent and remedy violations of their international obligations and that the Inter-American Commission on Human Rights has recognized the responsibility of States to prevent non-governmental entities, such as oil companies, from causing environmental degradation that violate human rights. The commenter points to other statements and principals by and of international bodies and international and human rights organizations in further support of its request that the permits be denied. The commenter also asserts that Shell’s exploration plans to drill in the Beaufort and Chukchi Seas flout the goals of the Arctic Council, of which the United States is a member, which include protecting human health; preventing and reducing degradation of the marine environment and coastal areas; remediating contaminated areas; supporting conservation and sustainable use of marine resources; maintaining biodiversity; and maintaining cultural values. The commenter is concerned that the pollutants released by Shell’s operations will significantly worsen the air quality in and around the drill sites and on the coast and may have serious effects on the health of Alaska Natives in the area, including in the villages of Nuiqsut, Kaktovik,

and Wainwright, and asserts that Alaska Natives on the North Slope are already suffering increased respiratory ailments from development.

Response: For the reasons discussed in the Supplemental Statement of Basis, this Supplemental Response to Comments, and the other documents in the administrative record for these permits, Region 10 is proceeding to issue these permits because the permits comply with the requirements of CAA § 328, 40 CFR Part 55, and 40 CFR § 52.21. Region 10 has conducted an extensive review and analysis of the air quality impacts of the project and has determined that the permits will not cause or contribute to a violation of currently applicable NAAQS or PSD increments. Environmental justice considerations were thoroughly considered to the greatest extent practicable and permitted by law, as discussed in the Supplemental Environmental Justice Analysis and in this Supplemental Response to Comments. Region 10 has concluded that the activities to be authorized under the permits will not have disproportionately high and adverse human health or environmental effects with respect to air pollutants authorized under these permits on minority or low-income populations residing in the North Slope, including coastal communities closest to the proposed operations and including consideration of the impact on communities while engaging in subsistence activities in areas where such activities are regularly conducted. Supplemental Environmental Justice Analysis at 2. Impacts from Shell's proposed operations in the onshore communities are very low, with the highest modeled impact occurring at Kaktovik, constituting just 8.5% of the 1-hour NO₂ NAAQS. See also response to comment BB.1.a.

The commenter has not identified a legal basis for denying issuance of these permits. Region 10 has complied with the Executive Order on Environmental Justice.

Comment BB.1.e: One commenter states that its overall and primary concern is the potential negative impacts to subsistence resources and uses, and environmental justice issues.

Response: See the response to comments in Section DD below for a discussion of the subsistence resource and use issues. The commenter has not identified any specific concerns with Region 10's consideration of environmental justice in the context of these permitting actions.

Comment BB.1.f: A commenter asks Region 10 to enforce the strongest regulations to protect public health and uphold environmental justice.

Response: As discussed in Section 5 of the Supplemental Statement of Basis and the Region 10 Technical Analysis, as well as numerous places throughout this Supplemental Response to Comments document, these permits meet all applicable requirements and emissions authorized under these permits are not expected to cause or contribute to a violation of the NAAQS. The NAAQS are health-based standards, set at a level to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics.

For a discussion of Region 10's enforcement authorities with respect to these permits, please see response to comment P.1.

BB.2 CATEGORY – PUBLIC PROCESS FOR EJ ANALYSIS

Comment BB.2.a: Commenters state that the limited public comment period presents serious environmental justice issues for North Slope communities because local communities were not given adequate opportunity to enlist technical support and provide relevant comments on the critical issue of the appropriate model to be used in assessing impacts to air quality as well as the permits more generally. The commenters state that Region 10 specifically requested input on the new air quality model used for the first time in these permit proceedings and that the modeling that went into that work obviously took many months, if not years, to prepare. The commenters continue that evaluation of that work requires an extremely high level of technical expertise, which is both time consuming and resource intensive, and that the agency's decision to allow no more than 30 days for recognized environmental-justice communities to review, analyze, and then provide comment on a brand new, technical modeling exercise impairs their communities' ability to adequately participate in the process. As a result, the commenters contend, they are unable to submit comments on key aspects of the environmental justice analysis, namely whether the predicted impacts to air quality are accurate and defensible. The commenters ask that Region 10 provide adequate time to obtain an independent technical review of the chosen modeling methodologies and state that Region 10 should have given advanced public notice of this important issue in order to allow for technical review and comment on the modeling.

Response: As discussed above in the response to comments in Category E, Region 10 took a number of steps to provide the opportunity for meaningful involvement and to engage the local communities in these permitting actions, including the approval of the model. Region 10 held three separate informational meetings in Barrow and Kaktovik prior to the public comment period to describe the upcoming permitting actions and public comment opportunities. Region 10 also held an informational meeting and a public hearing on the permits and the underlying model and invited the North Slope Borough and Iñupiat Community of the Arctic Slope to participate in government-to-government consultation. The 30 day public comment period is consistent with the requirements of 40 CFR § 52.21 and 40 CFR Part 124.

BB.3 CATEGORY – 8-HOUR OZONE NAAQS

Comment BB.3.a: Commenters express concern that Region 10 did not consider a newly revised NAAQS– the 8-hour standard for ozone–in conducting its environmental justice analysis. The commenters note that EPA revised the 8-hour ozone standard because the prior standard did not adequately protect human health and that the agency is well aware of existing data suggesting that existing levels of ozone on the North Slope are as high as .050 ppm (8-hour average), and the Discoverer's operations will add to significant existing and planned sources of VOCs. The commenters continue that the

EAB Orders require Region 10 to not only consider compliance with the existing NAAQS, but must also include and analyze other data that is germane to the issue of potential disproportionate adverse health impacts and that the Supplemental Statement of Basis as well as the supporting documents relating to the Supplemental Environmental Justice Analysis, to this point, have not accounted for additional, relevant information related to health threats posed by the potential formation of ozone. The commenters state that Region 10's reliance on the analysis in the 2010 Statements of Basis is inadequate because that underlying analysis was also inadequate and does not in any way address the revised 8-hour ozone standard and whether Shell's emissions may cause or contribute to a violation of that revised standard, especially when considered in conjunction with mobile source emissions and other stationary sources on the OCS and onshore.

Response: As an initial matter, although there may be individual 8-hour concentrations as high as 0.50 ppm, the highest design value for the 8-hour standard for any of the monitoring sites is 0.40 ppm. The design value is in the form of the standard (which for the 8-hour ozone standard is the three year average of the annual fourth highest daily maximum 8-hour concentration), which is the appropriate value for comparison to the NAAQS.

In addition, contrary to the statement by the commenters, the ozone NAAQS had not been revised at the time the comment was submitted, but instead had been proposed for revision. As discussed in response to comment Y.4, EPA had proposed to reconsider the 0.075 ppm ozone NAAQS set in 2008 and requested comment on a range between 0.060 and 0.075 ppm. 75 Fed. Reg. 2935 (January 19, 2010). Since this comment was made, however, EPA has announced that, at the President's direction, EPA will not be taking final action on its current proposal to revise the 8-hour ozone NAAQS. EPA instead intends to consider revisions to the ozone NAAQS in connection with the 5-year mandated revision of the ozone NAAQS in 2013. Statement by the President on the Ozone National Ambient Air Quality Standard, September 2, 2011. In any event, current ozone levels in the area are well below even the low end of the range that had been proposed by EPA (0.060 ppm). As discussed in the response to comments for Category Y above, Region 10 does not believe modeling is required to conclude that emissions of ozone precursors from Shell's operations will cause or contribute to ozone levels that would exceed the low range of the proposed NAAQS.

BB.4 CATEGORY – GLOBAL WARMING AND BLACK CARBON

Comment BB.4.a: Commenters contend that Region 10's environmental justice analysis is arbitrary and fails to meet Executive Order 12898 because it relies entirely on expected NAAQS compliance and does not consider the effect of Shell's GHG and black carbon emissions on indigenous peoples. The commenters allege that the EAB remanded Region 10's environmental justice analysis on the grounds that reliance on then existing NAAQS was insufficient because EPA had indicated that those standards were insufficient to protect public health. The commenters continue that the Arctic is already warming rapidly and that this warming has resulted in visible changes to Alaska's land, water, wildlife, and people, including the disappearance of sea ice. The commenters state that,

as a result of receding and thinning sea ice, scientists have observed polar bears drowning and going hungry, walrus forced onto land, and sharp declines in numbers of ice-dependent sea birds, and that the warming is also threatening indigenous cultures because arctic animals and subsistence hunts are central to Alaska Native cultures. The commenters contend that subsistence hunters have to travel farther to access animals and that the melting permafrost is accelerating coastal erosion and forcing communities to relocate. The commenters note that EPA's Administrator has found that GHGs are "reasonably anticipated to endanger public health, for both current and future generations" and that America's Arctic—home to a large population of Alaska Natives—stands to suffer more than other locations due to the effects of high rates of projected regional warming on natural systems. The commenters assert that Shell stands to contribute to this warming, and resulting harm to indigenous cultures, by emitting GHGs and black carbon and that Region 10 has failed to consider the amount of Shell's GHGs and black carbon emissions that will be emitted over the life of the permits.

Response: Region 10 recognizes that climate change is of particular concern to arctic communities because the Arctic is expected to experience the greatest rates of warming compared with other world regions and there is evidence that climate change is already having observable impacts in the Arctic. Region 10 also acknowledges that black carbon is now recognized as an important climate-forcing agent with particular impact on the arctic region. EPA's Endangerment Finding, Frequently Asked Questions. http://www.epa.gov/climatechange/endangerment/downloads/EndangermentFinding_FA_Qs.pdf

Although it is clear that GHGs contribute to global warming and other climate changes that result in impacts on the environment, due to the global scope of the problem, climate change modeling and evaluations of risks and impacts of GHGs are typically conducted for changes in emissions orders of magnitude larger than the emissions from individual projects that might be analyzed in PSD permit reviews. Quantifying the exact impacts attributable to a specific GHG source obtaining a permit in specific places and points would not be possible with current climate change modeling. PSD and Title V Permitting Guidance for Greenhouse Gases, EPA Office of Air and Radiation, March 2011.

In this case, the permits limit emissions of GHGs from the Discoverer to below PSD major source thresholds. Furthermore, emissions of GHGs from the Discoverer and the Associated Fleet only account for approximately 0.1 % of the Alaska 2005 total statewide estimated GHGs of 53 million tons and 0.40 % of the Alaska 2005 statewide oil and gas industry estimated GHGs of 15 million tons. 2012 Revised Camden Bay Exploration Plan at 3-4. In light of these facts, Region 10 does not expect that issuance of these permits will have disproportionately high and adverse human health or environmental effects on minority or low income communities on the North Slope based on emissions of GHGs, even when considering emissions over the life of the permits.

With respect to black carbon, see response to comment BB.4.b below.

Comment BB.4.b: Commenters state that Shell’s operations also could emit up to 21 tpy of PM_{2.5}, a large proportion of which will be black carbon. The commenters contend that black carbon is generally regarded as the second most important driver of arctic warming and cite an EPA report stating that this occurs because black carbon absorbs incoming and outgoing radiation and darkens snow and ice, which reduces the reflection of light back to space and accelerates melting. The commenters state that emissions of black carbon from sources in the Arctic are particularly troubling because arctic emissions can cause substantially more regional warming than similar amounts of black carbon emitted outside the Arctic and cite to numerous studies supporting this conclusion. The commenters also cite to EPA reports that discuss studies showing that black carbon radiative forcing from both atmospheric concentration and deposition on the snow and ice has contributed to arctic surface warming and that black carbon may be the cause of as much as 50 % of arctic sea ice retreat.

Response: EPA recognizes the concerns regarding black carbon and is committed to fully evaluating its role on climate change. Based on available information at this time, Region 10 does not have information on which to reach a conclusion regarding whether emissions of black carbon from the Discoverer and the Associated Fleet will have disproportionately high and adverse human health or environmental effects on minority or low income communities on the North Slope. To the extent black carbon is comprised of particulate matter, it is regulated as PM₁₀ and PM_{2.5} and emissions of those pollutants have been reduced even further under the 2011 Revised Draft Permits to 22 tons per year of PM₁₀ and 21 tons per year of PM_{2.5} (which is included in the estimate of PM₁₀ emissions).

CC. CATEGORY – BASELINE DATA

Comment CC.1: Commenters maintain that Region 10 must account for the substantial lack of data concerning the arctic environment. The commenters note that since the EAB remanded the Discoverer permits back to Region 10, the Secretary of Interior released a major report from the U.S. Geological Survey on the gaps in the scientific understanding of the United States’ Arctic, citing to Holland-Bartels, Leslie, and Pierce, Brenda, eds., 2011, An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska: U.S. Geological Survey Circular 1370. The commenters state that this document concludes that there are large information gaps about the Arctic Ocean, and these gaps are a “major constraint to a defensible science framework for critical Arctic decision making.” The commenters further note that the Alaska Federal District Court remanded Chukchi Lease Sale 193 because the agency had not fully considered the importance of missing information in its environmental impact analysis. One commenter states that he does not believe any data already collected is accurate enough to be the basis for any real environmental impact assessment and that long term consistent data should be collected before development of the magnitude at issue in these permits is considered so that people can understand what

the affects would be. Another commenter notes that the Northwest Arctic Borough has recognized the need for baseline data, monitoring and filling data gaps, and that the State of Alaska has also expressed its concern about the lack of baseline data for the Chukchi Sea in its final Alaska Coastal Management Program Consistency Response for Chukchi Lease Sale 193. The commenters contend that Region 10 must acknowledge these shortcomings in the scientific understanding of the Arctic and move forward cautiously, ensuring that any permits it issues are designed to provide maximum protection for human health and the environment.

Response: These permits are issued under the authority of the OCS regulations, 40 CFR Part 55, and the PSD program, 40 CFR § 52.21. The PSD program specifies the baseline air quality data and related analysis that is required prior to issuance of a PSD permit. See 40 CFR § 52.21(k), (m), and (o). As discussed in Section 5 of the Supplemental Statement of Basis and in response to comments in Category U and V above, Region 10 has determined that Shell has met the requirements to have representative background data as necessary to assess ambient air quality in the areas that are expected to be affected by Shell's exploratory operations. While other baseline data may be useful or helpful in connection with other regulatory decisions related to Shell's exploration drilling operations in the Chukchi and Beaufort Seas, no other baseline data is required prior to issuance of these permits. Baseline data required for other regulatory determinations is outside the scope of these PSD permit actions.

DD. CATEGORY – IMPACT ON LOCAL COMMUNITIES, SUBSISTENCE ACTIVITIES, AND TRADITIONAL USE

Comment DD.1: A number of commenters expressed concerns regarding the negative impact that Shells' specific exploratory operations and increased arctic oil and gas operations in general may have on the local communities, their environment and subsistence lifestyle. These comments include:

- Kivalina residents and their ancestors have lived along the coast for many generations and depend on ocean and its natural resources for nutritional and cultural subsistence. Kivalina residents expressed concerned about the impacts of pollution upon their lives and their ability to gather traditional foods from traditional places. They are especially concerned about air pollution, as well as harm to the marine environment and dependent, fish, birds and mammals, from oil exploration, oil extraction, and oil spills.
- We are also concerned about what this decision means for air quality on the OCS were our people hunt and fish. We are concerned about the air pollution before the Discoverer is considered to be a source - and about the air pollution that is outside the 25 mile radius of the drillship especially offshore during subsistence activities.

- The industrial pollution will slowly contaminate the marine food chain through the exploration and drilling activities. The resulting oil retrieved will only increase the amount of fossil fuels being burned on a global scaling, accelerating the warming trend we are experiencing throughout the Arctic. I do not believe that a thorough assessment of the cultural impacts of this operation has been completed, and by law it is required.
- The North West Arctic Borough Assembly explained that the majority of Borough residents proudly depend on marine mammals, fish, birds and other marine life for food and survival and expressed its opposition to OCS leasing and development referencing resolution 08-04 which emphasizes the importance of subsistence foods to the Iñupiat way of life.
- The unique way of life integrates a close relationship to the environment in a sustainable manner that has developed over thousands of years and continues today. It is imperative that clean air is maintained for the continued availability of these cultural and economic resources to our residents.
- The inter-generational dependence on these coastal subsistence resources is extremely necessary for survival at a time when the financial costs of living in an arctic climate are continuing to increase among low-income villages with a majority minority population.
- There is concern expressed regarding proposed approval of air pollutant discharges for totally new industrial activities in the Chukchi Sea (where no industrial discharges currently occur) which will have significant negative impacts to the environment and subsistence resources, including cumulative effects. Offshore oil exploration and development are significant changes to the arctic environment, particularly to marine habitats that are critical to the birthing, calving and raising of marine and bird life during the spring to summer months when exploration is scheduled to operate.
- Region 10 should include consideration of impacts to subsistence resources, including cumulative effects. There must be documentation of the potential impacts of new sources of air pollutants with existing sources of air pollution, including long-distance transport of pollutants to arctic areas from far away sources.
- In addition to actual air pollutant risks, the perception of risks to subsistence resource can result in impacts to our residents, especially if such perception leads to substitution of less nutritious foods.
- Here in Nuiqsut, Cross Island is very important to the Nuiqsut whalers, it's where we base our whaling activities on. And most years there are other near barrier islands that we may use, depending on what's happening. Previous activity at Camden Bay increased strike distances for the harvesting of the whale at Nuiqsut,

thereby decrease harvesting of the whale. We had to let one whale go because the weather was too bad after we had struck it, and it turned out to be many, many hours of tow time. Because the prior year we harvested whale within 2 miles of the island. That year the distances were almost 20 miles. And the tow times to get a whale to the shore to process it and cut it all up, we lost the innards and the meat and could not harvest that. One whale we had to let completely go, we couldn't land it. Those are serious impacts - we cannot allow that to happen.

- The law requires that EPA assess how its activities, like issuing air permits, could be especially harmful to minority populations, like Alaska Natives; however, Region 10 has not reviewed how Shell may increase arctic warming in a way that is especially harmful to Alaska Native communities and traditional cultural activities.
- We need the President of the U.S. of America to use his power of authority to oversee the oil industry and state governments to make sure we have a clean and safe environment to live in, and that our traditional lifestyles are able to sustain the Inupiaq people, who depend on these natural god-given animals, plants, resources to sustain our traditional lifestyle like our blanket toss whale harvest festival and harvested resources.
- With previous fish contamination issues, we had to ask for assistance in this process because the information did not get to the communities that were most affected by the information. They did not bring health aids that were going to deal with the people that were affected into this process so that they would be informed as to what to look for and to assess. Our services with Indian Health Service and our health care system are very limited and it is unlikely they will assess for environmental health factors.
- Shell's activities will inevitably contribute to the contamination and degradation of the natural environment upon which our residents rely.
- Our whaling captains and their communities rely on the health of the Beaufort and Chukchi Sea ecosystems to provide the marine life that sustains our people and culture.
- The Chukchi and Beaufort Seas are unique and diverse marine environments and have great cultural significance to the Inupiat. Previous oil and gas activities in the region have caused direct conflicts with the subsistence activities and resources. Because offshore oil and gas activities pose risks to the Inupiat subsistence activities and cultural preservation, they require careful review.

Response: Region 10 appreciates the commenters' interest in and attention to the proposed permits. We recognize the close, integral relationship the local communities have with the arctic environment and its resources and the importance to the local communities of subsistence hunting and fishing and the traditional way of life. However,

the potential impact on the subsistence hunting or interference with traditional way of life is not a factor that the CAA requires EPA to evaluate in issuing PSD and OCS permits. Therefore, specific evaluation of impacts to subsistence hunting and fishing is beyond the scope of these OCS/PSD permits. *In re Shell Offshore Inc., Kulluk Drilling Unit and Frontier Discoverer Drilling Unit, Order Denying Review In Part and Remanding In Part*, 13 E.A.D. _ (September 14, 2007), slip op. at 68-69, fn. 66 (Kulluk EAB decision) ; *In re Knauf Fiber Glass GmbH*, 8 E.A.D. 121, 147 (EAB 1999) (stating that the Board's jurisdiction, and thus review power, is limited, extending only to those issues that are directly related to permit conditions that implement the federal PSD program).

As part of its environmental justice analysis, Region 10 generally considered Shell's impact on local communities while engaging in subsistence activities in areas where such activities are regularly conducted. For example, Region 10 noted that subsistence foods are an important component of the Iñupiat diet, that the residents reported traveling long distances off shore for hunting and other subsistence activities, and that subsistence plays an important cultural role in the communities. Region 10 also noted the location of the Shell lease blocks relative to the subsistence areas. See Supplemental Statement of Basis, Figure 1, at 64-65 (Subsistence Use Areas Mapped over Exploration Sites).

There are other regulatory programs in place to address the commenters' concerns. Kulluk EAB Decision, slip op. at 68-69, fn. 66. For example, BOEMRE did consider the effect and impacts of Shell's exploration activities on subsistence activities and the Iñupiat culture and way of life; risk of oil spills and their potential impacts to area fish and wildlife resources; disturbance to bowhead whale migration patterns; and harassment and potential harm of wildlife from noise, discharges, and vessel operations. See Finding of No Significant Impact, dated August 3, 2011, for Shell Offshore Inc., 2012 Revised Camden Bay Exploration Plan.

http://alaska.boemre.gov/ref/EIS%20EA/2012_Shell_CamdenEP_EA/2012FONSI.pdf;
Letter from Jeffrey Walker, BOEMRE, to Susan Childs, Shell, re: 2012 Revised Camden Bay Exploration Plan, dated August 4, 2011.

http://alaska.boemre.gov/ref/ProjectHistory/2012Shell_BF/2011_0804_soi.pdf

For the BOEMRE's evaluation of Shell's Exploration Plan for the Chukchi Sea see Finding of No Significant Impact, dated December 7, 2010, for Shell Gulf of Mexico, Inc. 2010 Exploration Drilling Program, Burger, Crackerjack, and SW Shoebill Prospects, Chukchi Sea Outer Continental Shelf,

Alaska, http://www.mms.gov/alaska/ref/EIS%20EA/2009_Chukchi_2010EA/fonsi.pdf;

Letter from Jeffrey Walker, MMS, to Susan Childs, Shell, dated December 7, 2009, re: Shell's 2010 Outer Continental Shelf Exploration Plan, OCS Lease Sale 193, Burger, Crackerjack, and SW Shoebill Prospects, OCS Chukchi Sea, Alaska

http://www.mms.gov/alaska/ref/ProjectHistory/2009_Chukchi_Shell/2009_1207.pdf

Finally, as explained in the Supplemental Statement of Basis and this Supplemental Response to Comments, Region 10's analysis indicates that this project, as regulated by the final permits, will not cause or contribute to a violation of any currently applicable NAAQS. Since NAAQS are established to protect public health and welfare, the project is not expected to have an adverse impact upon public health or welfare.

EE. CATEGORY – HEALTH IMPACTS AND GENERAL AIR QUALITY CONCERNS

Comment EE.1: A number of commenters expressed general concern regard potential health impacts from the Shell’s exploratory operations and the increased cumulative air pollutants in the nearby communities.

- The Inupiaq people spend much of our time on the ice and boating on the Arctic Ocean. Winds can carry air pollution for miles, impacting hunters and the nearby communities. EPA should enforce the strongest regulation to protect human health and uphold environmental justice.
- We’re very concerned that we have a number of people, especially in Nuiqsut, that have had respiratory problems, and how adding on more tons of these substances will affect those people that are already ill. All of the villages have had concerns about the substances in their food and about the health of their bodies because they have generations of consumption of these things. We’ve expressed concerns for many, many years about this. We’ve demonstrated increasing concerns about respiratory illnesses. I’m a former resident of Nuiqsut and their health problems there continue today.
- We as residents and a number of affected individuals have to prove that any of our concerns and illnesses are related to some of these concerns, yet some of the studies here and especially in the EU show that chemicals in these substances that are very toxic to our bodies. They make our risk factors greatly increased.
- We as a people have generations that are at risk in this process. There are problems related to our community as a whole related when these assessment models are done in a piecemeal fashion. When the other pieces to these permits are added to it, they are not included in the assessment process, which also increases our risk factors, and our assessments of these models. The process is not really looking at all of the factors that are putting local people near these areas at risk. When your modeling process only looks at only part of the hours per day because it’s based on employees and work schedules and those kinds of things, it doesn’t look at how we are fully affected when we continue to live and work in these environments. It does not look at the temperatures and what does it do with our bodies in these temperatures rates. It doesn’t look at the other factors of the other health criteria that could look at these assumptions that you’re putting in these models and really affect it. When you have other problems and cumulative effects from all of the various activities and you add another piece of the problem to continue with tons and tons of emissions there’s a burden point that our bodies are reaching in some of these areas that are at a higher concern. And because of the environment and our extremes in the way the air currents occur these things come down to us also.

- When you are allowing emissions and the dumping of pollution into our air and into our waters, we're all at risk for generations long before you're here to deal with these permits. Prevention should be done on a preventative basis, a precautionary basis, not on us having to prove that we're getting leukemia and asthma related to continued exposures to near-community activities related to resource extraction. All of these concerns are tremendously affecting us.
- We do not trust this agency to help protect us. We do not trust that the information that you are going to give us is going to help us in any way because our government hasn't taken the lead as it should in protecting the environmental health of all of our people.
- EPA should tell BOEMRE that no permits should be issued to Shell Oil or for any other development in the Arctic. Shell's actions pose great risk to human health and the pelagic environment. The permits under consideration do not do enough to make sure that Shell air pollution will not harm the local people and surrounding environment. EPA should require Shell to comply with additional limits and demonstrate that the air pollution will not violate air standards established to protect public health.
- EPA should fully analyze the potential for Shell's operations to harm Alaska natives whose communities would be exposed to the amount of pollution from Shell's drilling.
- The data to look at health impacts have to have criteria that are documented to even start some of these assessments. There is high turnover among the health professionals that are supposed to be developing these statistical data, which leads to absences in databases.

Response: As explained, in response to comment BB.1.a, as part of Region 10's evaluation of Shell's permit applications, Region 10 considered the NAAQS. These national air quality standards are set at a level designed to protect public health protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly, with an adequate margin of safety. For example, in setting the new 1-hour NAAQS for NO₂ and a new 1-hour SO₂ NAAQS, EPA understood that exposure to NO₂ and SO₂ concentrations above the standard has been linked to respiratory illnesses that lead to emergency room visits and hospital admissions, particularly in at-risk populations such as children, the elderly, and people with respiratory disease. In issuing the new 1-hour NO₂ and SO₂ NAAQS, EPA noted in particular that the prevalence and severity of asthma are higher among certain ethnic or racial groups such as Alaskan Natives. In these promulgations EPA specifically considered the exposure of sensitive subpopulations, including Alaskan Natives. 75 Fed. Reg. 6482 (February 9, 2010); 75 Fed. Reg. 35527 (June 22, 2010). See also Supplemental Statement of Basis at 67-68 and Supplemental Environmental Justice Analysis.

Region 10 determined through detailed modeling and careful analysis that Shell's operations as allowed under the permits will not exceed the national standards. In fact, the emissions are expected to be well below the standards in the North Slope communities and in the areas where the communities regularly conduct subsistence activities. 2011 Supplemental Statement of Basis at 68. For example in the Beaufort Sea, the worst case modeled SO₂ impact at the assumed ambient air boundary of 500 meters from the Discoverer is 35.0 µg/m³, while the modeled concentration at Kaktovik with the source in operation is 12.9 µg/m³ and at Deadhorse and Nuiqsut are 15.4 µg/m³, less than 10% of the 196 µg/m³ 1-hour SO₂ NAAQS.²¹ For the Chukchi Sea, worst case modeled SO₂ concentrations (including background) are 40.3 µg/m³, while at 50 kilometers the concentrations including background emissions in Point Lay and Wainwright are 16.2 µg/m³ and 14.2 µg/m³ respectively, less than 10% of the standard. Supplemental Statement of Basis at 68. For NO_x, at Kaktovik, the modeled NO₂ concentration with the source in operation is 37.0 µg/m³,²² while the modeled NO₂ concentration with the source in operation at Deadhorse and Nuiqsut is 98.9 µg/m³ and at Point Lay, the maximum modeled concentration with the source in operation is 52.8 µg/m³, while at Wainwright it is 42.9 µg/m³. In the same units, the level of the NO₂ NAAQS is 188 µg/m³. Id at 67-68.

Since this project will not cause or contribute to a NAAQS violation and since NAAQS are established to protect public health, the project is not expected to have an adverse impact upon public health.

FF. CATEGORY – OTHER COMMENTS

Comment FF.1: A group of commenters stated that they are incorporating by reference into their comments on the 2011 Revised Draft Permits their comments on the 2010 Chukchi and Beaufort Permits and the 2009 Chukchi Permit.

Response: Region 10 previously responded to all comments on the 2010 Chukchi and Beaufort Permits and the 2009 Chukchi Permit. Those permits were subject to the petitions that were the subject of the EAB Orders. In accordance with the EAB Orders, any appeals of the 2011 Revised Draft Permits to the Board are limited to issues addressed by the Region in the 2011 Revised Draft Permits and to issues otherwise raised in the petitions on the 2010 Permits before the Board but not addressed by the Region in

²¹ The 1-hour SO₂ NAAQS is officially defined in units of parts per billion, at a level of 75. Because air quality models give output in units of µg/m³, the SO₂ is often expressed as having a level of 196 µg/m³.

²² As explained in the Supplemental Statement of Basis for these permits, these modeled concentrations include monitored background concentrations of NO₂, which in all cases are a significant portion of the total concentration. For example, in Nuiqsut and Deadhorse, the modeled impact from Shell's operations is just 4.9 µg/m³ of NO₂ whereas 94 µg/m³ of the total modeled concentration at those locations is background levels of NO₂. Supplemental Statement of Basis at 67.

the 2011 Revised Draft Permits. No new issues may be raised that could have been raised but were not raised in appeals of the 2010 Permits. Remand Order I, at 82. Thus, comments that raise concerns that are unrelated to the conditions of the 2011 Revised Draft Permits that were proposed for revision in this proceeding and the information and analysis supporting those changes are beyond the scope of these remand proceedings. Accordingly, Region 10 need not address them in this Supplemental Response to Comments document. Where the commenters have specifically referred in their comments on the 2011 Revised Draft Permits to their comments on the 2010 and 2009 permits, Region 10 has addressed those comments above. To the extent a comment has not been reasserted specifically with respect to the 2011 Revised Draft Permits or the analysis underlying them, the commenters have not provided sufficient specificity in their incorporation by reference of their previous comments of the comments it is making in these permit proceedings.

Comment FF.2: A commenter would like to see a comprehensive oil and gas plan by all oil companies that are going to utilize the Trans-American pipeline system to deliver the oil and gas for the world market. The commenter states that the community has only seen bits and pieces, such as the leasing plan, the seismic plan, the exploration plan, and the development plan. The commenter would like to see the “big picture”—a comprehensive plan—and a stronger federal government in charge of this comprehensive plan.

Response: This comment does not relate to considerations at issue under the OCS or PSD regulations and is therefore beyond the scope of these permit proceedings.

II. OTHER CHANGES TO THE PERMIT

Region 10 has made several minor changes to the permits in response to comments and to enhance enforceability, clarify requirements, update COA requirements, and correct minor errors. Summaries of those changes are included as Attachment A (Beaufort Sea) and B (Chukchi Sea).

ATTACHMENT A
SUMMARY OF CHANGES
FINAL PERMIT NO. R10OCS/PSD-AK-2010-01
SHELL OFFSHORE INC.
FRONTIER DISCOVERER DRILLSHIP
BEAUFORT SEA EXPLORATION DRILLING PROGRAM

(as compared to July 6, 2011 Revised Draft Permit)²³

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
Page 1	Added issuance date.	
A.17	Revised to make minor changes to reflect most recent COA requirements for excess emissions and permit deviation reports; 2011 Revised Draft Permit did not include the most current COA language. See 18 AAC 346(b)(2), Standard Permit Condition III Excess Emissions and Permit Deviation Reports.	OCS permits on the Inner OCS must include COA requirements. See 40 CFR 55.14.
A.23.3.6	Corrected a typo. Revised the PM ₁₀ Reference Test Method to remove Method 201.	EPA promulgated the final revisions to Method 201A and 202 on December 21, 2010. 57 Fed. Reg. 80118. As a result, Region 10 removed all references to Method 201 in the draft permits, except for condition A.23.3.6. EPA is correcting this oversight. See Supplemental Statement of Basis for Proposed OCS PSD Permits – Noble Discoverer Drillship Section 3.18.
B.2.6	Added requirement to calculate and record	Requires recordkeeping to provide a reasonable

²³ This table is a summary of permit changes and the rationale for the changes. Please see the final permit for the actual language in the final permit.

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
	information on the number of days the Discoverer operates as an OCS source, the number of hours of drilling activity, and the number of hours of MLC activity.	assurance of compliance with Conditions B.2.1, B.2.2, B.2.3.
B.4	Added additional GPS requirement for Shell to monitor the date, time and location of the Associated Fleet when the Discoverer becomes and ceases to be an OCS source and when the Associated Fleet enters or leaves the 25 mile radius area around the Discoverer.	See Response to Comment K.2.c.
B.9.3	Corrected a typo that cross referenced to a permit condition that did not exist.	Corrected typo.
B.17	Added clarification that the COA regulation for Particulate Matter Recordkeeping applies to liquid fired boilers and heaters.	Changed the heading for Condition 17 to be consistent with other condition headings throughout the permit.
B.21.2	Corrected a typo that cross referenced to a permit condition that did not exist. Added language clarifying that the permittee must follow the source test plan except as otherwise agreed to in writing by the EPA prior to conducting the source test.	Clarifying change.
B.21.3	Added language clarifying that this general testing requirement does not apply if otherwise specified in the permit.	Clarifying change.

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
E.5.1.1, E.5.1.2, I.2.3.1, J.1.3.1, L.3.2.1, L.5.8	Corrected a typo that cross referenced the incorrect permit condition	Corrected typo.
B.23 and B.24	Added language requiring permittee to calculate and record the monthly and 12-month rolling average for emission units subject to the annual NO _x limit.	Added to ensure the annual NO _x limits have appropriate recordkeeping requirements.
B.26.1	Added “Perform regular maintenance considering the manufacturer’s or the operator’s maintenance procedures.” See 18 AAC 346(b)(5), Standard Permit Condition VI Good Air Pollution Practices.	Revised to include a subparagraph in a COA requirement that was erroneously omitted.
B.29.6	Corrected a typo in the oxidation catalyst control device monitoring permit condition that referred to SCR.	Corrected typo.
F.8.4, G.10.4, H.9.4, I.10.4, J.7.4, L.5.4, O.13.7, P.13.7, Q.5.5, R.9.4	Increased fuel usage monitoring requirement from daily to hourly basis.	Requires recordkeeping to provide a reasonable assurance of compliance with new hourly NO _x limits.
F.8.1.1, G.10.1.1, H.9.1.1, I.10.1.1, L.5.1.1, R.9.1.1	Added “or engine group.”	Clarified that the fuel flow meters should have no inflows or outflows between individual engines and engine groups.
J.7.1.1, O.13.4.1, P.13.4.1	Added “or boiler group.”	Clarified that the fuel flow meters should have no inflows or outflows between individual boilers and boiler groups.
P.8.1 – P.8.4	Increased the electrical power output limit for Icebreaker #2.	Response to Comment M.1

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
Q.5.2.1	Corrected typo in permit condition that referred to boiler and clarified that the permit condition applies to engines “or engine group.”	Clarified that the fuel flow meters should have no inflows or outflows between individual engines and engine groups.
R.2 and R.3	Removed “NO _x .”	Correction done to maintain permit condition consistency throughout the permit.
R.9.8	Clarified that NO _x emissions must be recorded in pounds per hour and pounds per day.	Revised draft permit had erroneously omitted frequency of recordkeeping requirement.

ATTACHMENT B
SUMMARY OF CHANGES
FINAL PERMIT NO. R10OCS/PSD-AK-09-01
SHELL GULF OF MEXICO INC.
FRONTIER DISCOVERER DRILLSHIP
CHUKCHI SEA EXPLORATION DRILLING PROGRAM

(as compared to July 6, 2011 Revised Draft Permit)²⁴

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
Page 1	Added issuance date	
A.15	Revised to make minor changes to the excess emissions and permit deviation reports.	Revision made for consistency with Beaufort Sea permit.
B.2.6	Added requirement to calculate and record information on the number of days the Discoverer operates as an OCS source, the number of hours of drilling activity, and the number of hours of MLC activity.	Requires recordkeeping to provide a reasonable assurance of compliance with Conditions B.2.1, B.2.2, B.2.3.
B.4	Added additional GPS requirement for Shell to monitor the date, time and location of the Associated Fleet when the Discoverer becomes and ceases to be an OCS source and when the Associated Fleet enters or leaves the 25 mile radius area around the Discoverer.	See Response to Comment K.2.c
B.9.2	Corrected a typo that cross referenced to a permit condition that did not exist. Added language clarifying that the permittee must follow the source test plan	Corrected typo; clarifying change.

²⁴ This table is a summary of permit changes and the rationale for the changes. Please see the final permit for the actual language in the final permit.

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
	except as otherwise agreed to in writing by Region 10 prior to conducting the source test.	
B.9.3	Added language clarifying that this general testing requirement does not apply if otherwise specified in the permit. .	Clarifying change.
B.11 and B.12	Added language requiring permittee to calculate and record the monthly and 12-month rolling average for emission units subject to the annual NO _x limit.	Added to ensure the annual NO _x limits have appropriate recordkeeping requirements.
B.15.6	Corrected a typo in the oxidation catalyst control device monitoring permit condition that referred to SCR.	Corrected typo.
E.7	Corrected a typo in “Carbon Monoxide.”	Corrected typo.
L.5.8, P.5.7	Corrected a typo that cross referenced the incorrect permit condition	Corrected typo.
F.2.4.1, H.2.7.1, L.5.8, P.5.7	Corrected a typo that cross referenced to a permit condition that did not exist.	Corrected typo.
F.8.4, G.10.4, H.9.4, I.10.4, J.7.4, L.5.4, N.13.7, O.13.7, P.5.5, Q.9.4	Increased fuel usage monitoring requirement from daily to hourly basis.	Requires recordkeeping to provide a reasonable assurance of compliance with the new hourly NO _x limit.
F.8.1.1, G.10.1.1, H.9.1.1, I.10.1.1, L.5.1.1, Q.9.1.1	Added “or engine group.”	Clarified that the fuel flow meters should have no inflows or outflows between individual engines and engine groups.
J.7.1.1, N.13.4.1, O.13.4.1	Added “or boiler group.”	Clarified that the fuel flow meters should have no

Permit Condition or Location	Summary of Change	Explanation or Response to Comments Discussion
		inflows or outflows between individual boilers and boiler groups.
O.8.1 – O.8.4	Increased the electrical power output limit for Icebreaker #2.	Response to Comment M.1.
P.5.2.1	Corrected typo in permit condition that referred to boiler and clarified that the permit condition applies to engines “or engine group.”	Clarified that the fuel flow meters should have no inflows or outflows between individual engines and engine groups.
Q.2	Removed “NO _x .”	Correction done to maintain permit condition consistency throughout the permit.
Q.9.7	Clarified that NO _x emissions must be recorded in pounds per hour and pounds per day.	Revised draft permit had erroneously omitted frequency of recordkeeping requirement.