United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

FEB 15 2008

Ms. Susan Childs
Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, Alaska 99503

Dear Ms. Childs:

Your application dated November 1, 2007, requests a Federal permit to conduct geophysical operations on certain Outer Continental Shelf (OCS) lands. The activity is in the Beaufort Sea area as shown on the map accompanying your application. Your application specified WesternGeco will be your service providing company, and will conduct the subject operations using the vessels described in the Operation Plan. Operations are proposed to begin on or after August 1, 2008, and will be completed on or before November 15, 2008. The proposed program is a 3D marine seismic acquisition using airguns as an energy source.

Your application states that Shell Offshore Inc. has requested an Incidental Harassment Authorization (IHA) from the National Marine Fisheries Service (NMFS) for whales and pinnipeds and a Letter of Authorization (LOA) from the US Fish and Wildlife Service (USFWS) for polar bears and walrus. The MMS will require a copy of the IHA and LOA authorizations prior to conducting seismic operations. The IHA from NMFS and the LOA from USFWS will address subsistence-related concerns and insure that impacts to marine mammals are not significant.

OCS Permit 08-04 is hereby granted to conduct geophysical exploration operations on the OCS in the area and manner described in the application. A detailed track map of planned operations must be submitted to this office prior to the start of seismic operations. All operations are subject to the enclosed stipulations (see enclosure) and approved Permit for Geophysical Exploration for Mineral Resources on the OCS. In all cases, the specific mitigating measures identified in the NMFS IHA and the USFWS LOA will apply and will take precedence over any MMS requirements, where applicable, including protocols for monitoring programs.

The information contained in the following paragraphs should be evaluated before initiating operations and appropriate action taken:

Endangered whales, primarily the bowhead whale, may occur in the Beaufort Sea during operations. Bowhead whales pass through the area on their fall migration back to the Bering Sea. They begin to leave Canadian Beaufort Sea waters in August and September and travel west through the southern Beaufort Sea into the Chukchi Sea. Other marine mammals that may

TAKE PRIDE IN AMERICA

appear in the project vicinity include beluga whales, spotted, bearded and ring seals, gray whales, polar bears, and walrus.

The Endangered Species Act (ESA) states there shall be no activity conducted which might jeopardize the continued existence of an endangered species or result in the destruction or adverse change of habitat of such species. In addition, the Marine Mammal Protection Act (MMPA) provides there shall be no unauthorized take of marine mammals. "Take" means to harass, hunt, capture, collect, kill, or attempt to harass, hunt, capture, collect, or kill any marine mammals. Whenever whales or marine mammals are encountered in the project vicinity, Shell Offshore Inc. and its contractors should exercise precautions to assure that activities are not in violation of the provisions of the MMPA or the ESA.

Further information on the identification and occurrence of endangered whales or marine mammals in the proposed area of operations and the provisions and penalties of the ESA and the MMPA are available. This information may be obtained from the

U.S. Fish and Wildlife Service
Alaska Region
1011E.Tudor Road
Anchorage, AK 99503
Telephone (907) 786-3467

And from the

National Marine Fisheries Service
Federal Building, Room C-554
Anchorage, AK 99513
Telephone (907) 271-5006

This permit is effective from the date of approval until November 15, 2008, or the completion of the survey, whichever occurs earlier. Please be advised that this office requires a weekly report of daily operations. Daily reports may be substituted for this requirement. We will require a completion report within 30 days following cessation of field operations.

Sincerely,

Rance R. Wall
Regional Supervisor
Resource Evaluation

3 Enclosures

Minerals Management Service (MMS), Alaska OCS Region Seismic Survey G&G Permit Stipulations for Permit 08-04

- No solid or liquid explosives shall be used without specific approval.
- Permittee operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Permittee operations shall maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permittee operators shall use the lowest sound levels feasible to accomplish their data-collection needs.
- Vessels and aircraft shall avoid concentrations or groups of whales. Permittee operators shall, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, shall aircraft be operated at an altitude lower than 1,000 feet above sea level (ASL) when within 1,500 lateral feet of groups of whales. Helicopters shall not hover or circle above such areas or within 1,500 lateral feet of such areas.
- When weather conditions do not allow a 1,000-foot ASL flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot ASL altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet ASL because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 1,500 yards of groups of whales.
- When the Permittee operates a vessel near a concentration of whales, every effort and precaution shall be taken to avoid harassment of these animals. Therefore, vessels shall reduce speed when within 900 feet of whales and those vessels capable of steering around such groups should do so. Vessels shall not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators shall avoid multiple changes in direction and speed when within 900 feet of whales. In addition, operators shall check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.
- Small boats shall not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels shall adjust speed accordingly to avoid the likelihood of injury to whales.

- When any operator becomes aware of the potentially harassing effects of operations on whales, or when any operator is unsure of the best course of action to avoid harassment of whales, every measure to avoid further harassment shall be taken until the NMFS is consulted for instructions or directions. However, human safety shall take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of whales.
- The Permittee shall notify MMS, NMFS, and FWS in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays shall not be towed in the vicinity of fragile biocenoses (e.g., the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. The Permittee shall report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, seismic and surface support vessels will minimize the use of high-intensity work lights, especially within the 20-meter-bathymetric contour. High-intensity lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they shall be turned off. Deck lights, interior lights, and lights used during navigation could remain on for safety.[1]
- All bird collisions (with vessels and aircraft) shall be documented and reported within 3 days to MMS. Minimum information shall include species, date/time, location, weather, identification of the vessel or aircraft involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Permittees/operators are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

The following monitoring and mitigation measures are related to the requirements of the MMPA and ESA. However, final mitigation and monitoring requirements defined in any NMFS (the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus) and FWS (the Federal agency in having MMPA management authority for Pacific walrus, polar bear, and sea otter) ITA and/or Letters of Authorization (LOA) obtained by the seismic survey operator <u>will have precedence over any related measures listed below</u>:

- **Exclusion Zone** – A 180/190 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and

[1] Nothing in this mitigation measure is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level A harassment (injury).The 180 dB applies to cetaceans and the Pacific walrus, and the 190 dB applies to pinnipeds other than the Pacific walrus. The exclusion zones specified in ITAs and/or LOAs will take precedence over the MMS-identified exclusion zone.

- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the marine mammal monitoring program and observers.
- **Shut Down/Power Down** – A seismic survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal in no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or whenever sighting conditions allow for the exclusion zone to be effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.
- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at 20-to-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.
- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than solely relying on modeling techniques before entering the field. When moving a seismic-survey operation into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.
- **Reporting Requirements** – Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of

occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.

- **Walrus-** Vessels and aircraft should avoid concentrations or groups of walruses. Operators should, at all times, conduct their activities at a maximum distance from such aggregations. Seismic-survey and associated support vessels shall observe a 0.5-mile safety radius around Pacific walrus groups hauled out onto land or ice. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,500 feet ASL when within 0.5-mile of walrus groups. Helicopters may not hover or circle above such areas or within 2,500 lateral feet of such areas.
- **Polar Bear -** Seismic survey operators shall adhere to any mitigation measures identified by the FWS to protect polar bears from being harassed and/or injured.

FINDING OF NO SIGNIFICANT IMPACT/ ENVIRONMENTAL IMPACT STATEMENT DETERMINATION

Minerals Management Service – Alaska Outer Continental Shelf Geological and Geophysical Permit Application 08-04 Shell Offshore, Inc.

Beaufort Sea Outer Continental Shelf: Open water, 3D Deep Penetration Seismic Survey

Shell Offshore Inc.'s (SOI) application for a Geological and Geophysical (G&G) permit (PA 08-04) to perform geological and geophysical exploration for mineral resources on the Outer Continental Shelf (OCS) of the Beaufort Sea has been reviewed. In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, the Department of the Interior, Minerals Management Service (MMS) prepared an environmental assessment (EA) for the subject G&G permit. The EA contains an assessment of potential environmental impacts of SOI's proposed action in the Beaufort Sea, which include conducting 3D deep penetration seismic surveys and implementing a marine mammal mitigation and monitoring plan during the 2008 open water season.

In accordance with Council on Environmental Quality regulations and guidelines, the EA focused on analyzing the potential for adverse and significant impacts of SOI's activities on environmental resources and identifying mitigation measures to avoid and/or minimize those impacts. The following more prominent issues and concerns applicable to this EA were identified:

- protection of subsistence resources and the Inupiat culture and way of life;
- disturbance to bowhead whale migration patterns;
- impacts of seismic operations on marine fish;
- harassment and potential harm of wildlife, including marine mammals and marine birds, by vessel operations and movements;
- impacts to threatened and endangered species; and
- impacts to all marine mammals.

Previous MMS seismic survey-related environmental assessments (e.g. 2006 Programmatic Environmental Assessment) concluded that the following resources would be negligibly or not impacted by open water, 3D deep penetration seismic survey operations in the Chukchi Sea: (1) air quality; (2) coastal wetlands; (3) freshwater fishes; (4) sediments; (5) terrestrial mammals; and (6) water quality, as potentially affected by vessels discharges and petroleum and other lubricant spills. Therefore, the aforementioned resources were not considered further in the EA prepared for SOI's 2008 open water seismic survey season in the Beaufort Sea.

The results of Endangered Species Act (ESA) informal consultation with the U.S. Fish and Wildlife Service (FWS) were that no adverse impacts on threatened, endangered, or candidate species under their jurisdiction would occur. The National Marine Fisheries Service (NMFS) stated in their 2006 Arctic Region Biological Opinion (ARBO) that the activities associated with seismic surveys in the Beaufort Sea might adversely affect but not jeopardize the continued existence of the endangered bowhead whale, *Balaena mysticetus*, which is under their jurisdiction. The MMS has re-initiated ESA/Section 7 consultation with the NMFS over reported sightings of humpback whales in the Beaufort Sea, the results of which may be NMFS supplementing its 2006 ARBO to include additional humpback whale-related mitigation and conservation measures and incorporating such measures in SOI's incidental harassment authorization (IHA). While the re-initiation process proceeds, however, the existing 2006 ARBO remains in effect, but does not allow for the legal "take" of humpback whales from seismic survey operations.

Further coordination with the State of Alaska State Historic Protection Officer is not required because SOI is not proposing to conduct ocean-bottom-cable seismic survey operations in the Beaufort Sea.

As part of their proposed action, SOI plans to incorporate both design features and operational procedures for mitigating potential impacts on cetaceans and pinnipeds and on subsistence hunts; they include: (1) timing and locating seismic activities to avoid interference with the annual fall bowhead whale hunts; (2) configuring the airgun arrays to maximize the proportion of energy that propagates downward and minimizes horizontal propagation; (3) limiting the size of the seismic energy source to only that required to meet the technical objectives of the seismic survey; and (4) conducting pre-season modeling and early season field assessments to establish and refine (as necessary) NMFS-directed safety zones, and other radii relevant to behavioral disturbances.

SOI's planned mitigation also includes implementing their *Marine Mammal Monitoring and Mitigation Plan* and yet-to-be-completed "Plan of Cooperation" (POC), the latter of which will formally specify times and areas to avoid possible conflicts with traditional subsistence hunts by the villages of Kaktovik, Nuiqsut (Cross Island), and Barrow. SOI plans to include the provisions of a Conflict Avoidance Agreement (CAA) with the Alaska Eskimo Whaling Commission and Whaling Captains' Association as a component of the POC. If SOI is unable to secure a CAA or other type of similar agreement, then under the auspices of the Marine Mammal Protection Act (MMPA), the NMFS will develop conflict avoidance measures so that no unmitigable impacts to subsistence activities would occur.

SOI and its seismic survey contractor WesternGeco currently have an IHA from NMFS to allow non-lethal takes of whales and seals incidental to offshore geophysical seismic operations in the Beaufort Sea. The existing IHA covers incidental take by noise harassment from SOI's seismic source and support vessels, and expires August 1, 2008. SOI and WesternGeco have applied for another Beaufort Sea IHA from the NMFS covering their seismic survey operation for the period August 2, 2008, to August 1, 2009. MMS is aware that SOI has also applied to the FWS, under the MMPA, for an incidental

take authorization (ITA) for polar bear and walrus for the 2008 open water season in the Beaufort Sea.

Determination

The effects of SOI's proposed activities have been examined and based on the findings and conclusions of the EA (PA 08-04), it is determined that SOI's activities will not significantly affect (40 CFR 1508.27) the quality of the human environment and no further NEPA analysis is required. Therefore, an environmental impact statement will not be prepared.

We also concluded that the mitigation which follows is required to: (1) be consistent with environmental policy as required by NEPA, ESA, and MMPA; and (2) comply with 40 CFR 1500.2(f) regarding the requirements for Federal agencies to avoid or minimize any possible adverse effects of their actions upon the quality of the human environment. Implementing mitigation measures also fulfills MMS's statutory mission and responsibilities, i.e., to issue G&G exploration permits for seismic surveys that are technically safe and environmentally sound while considering environmental, technical, and economic factors.

This FONSI is valid only insofar as the following mitigation measures (in concert with applicable MMS's standard stipulations, http://www.mms.gov/alaska/re/permits/stips1-5.htm) are implemented:

- No solid or liquid explosives shall be used without specific approval.
- Permittee operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Permittee operations shall maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permittee operators shall use the lowest sound levels feasible to accomplish their data-collection needs.
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- When weather conditions do not allow a 1,000-foot ASL flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot ASL altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet ASL because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 1,500 yards of groups of whales.
- When the Permittee operates a vessel near a concentration of whales, every effort and precaution shall be taken to avoid harassment of these animals. Therefore, vessels shall reduce speed when within 900 feet of whales and those vessels capable of steering around such groups should do so. Vessels shall not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators shall avoid multiple changes in direction and speed when within 900 feet of whales. In addition, operators shall check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.
- Small boats shall not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels shall adjust speed accordingly to avoid the likelihood of injury to whales.
- When any operator becomes aware of the potentially harassing effects of operations on whales, or when any operator is unsure of the best course of action to avoid harassment of whales, every measure to avoid further harassment shall be taken until the NMFS is consulted for instructions or directions. However, human safety shall take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of whales.
- The Permittee shall notify MMS, NMFS, and FWS in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays shall not be towed in the vicinity of fragile biocenoses (e.g., the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. The Permittee shall report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, seismic and surface support vessels will minimize the use of high-intensity work lights, especially within the 20-meter-bathymetric contour. High-intensity lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they

shall be turned off. Deck lights, interior lights, and lights used during navigation could remain on for safety.[1]

- All bird collisions (with vessels and aircraft) shall be documented and reported within 3 days to MMS. Minimum information shall include species, date/time, location, weather, identification of the vessel or aircraft involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Permittees/operators are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

The following monitoring and mitigation measures are related to the requirements of the MMPA and ESA. However, final mitigation and monitoring requirements defined in any NMFS (the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus) and FWS (the Federal agency in having MMPA management authority for Pacific walrus, polar bear, and sea otter) ITA and/or Letters of Authorization (LOA) obtained by the seismic survey operator will have precedence over any related measures listed below:

- **Exclusion Zone** – A 180/190 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level A harassment (injury).The 180 dB applies to cetaceans and the Pacific walrus, and the 190 dB applies to pinnipeds other than the Pacific walrus. The exclusion zones specified in ITAs and/or LOAs will take precedence over the MMS-identified exclusion zone.
- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the marine mammal monitoring program and observers.
- **Shut Down/Power Down** – A seismic survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal in no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or whenever sighting conditions allow for the exclusion zone to be

[1] Nothing in this mitigation measure is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.

- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at 20-to-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.
- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than solely relying on modeling techniques before entering the field. When moving a seismic-survey operation into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.
- **Reporting Requirements** – Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.
- **Walrus-** Vessels and aircraft should avoid concentrations or groups of walruses. Operators should, at all times, conduct their activities at a maximum distance from such aggregations. Seismic-survey and associated support vessels shall observe a 0.5-mile safety radius around Pacific walrus groups hauled out onto land or ice. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,500 feet ASL when within 0.5-mile of walrus groups. Helicopters may not hover or circle above such areas or within 2,500 lateral feet of such areas.
- **Polar Bear -** Seismic survey operators shall adhere to any mitigation measures identified by the FWS to protect polar bears from being harassed and/or injured.

_____ _____
Deborah Cranswick Date
Chief, Environmental Assessment Section
Leasing and Environment, AK OCS Region

_____ _____
Cleve Cowles Date
Regional Supervisor
Leasing and Environment, AK OCS Region

UNITED STATES DEPARTMENT OF THE INTERIOR MINERALS MANAGEMENT SERVICE

Alaska OCS Region
Anchorage, Alaska

ENVIRONMENTAL ASSESSMENT

OF

GEOLOGICAL & GEOPHYSICAL EXPLORATION FOR MINERAL RESOURCES IN THE BEAUFORT SEA OUTER CONTINENTAL SHELF

Geological and Geophysical
Permit Application 08-04
Shell Offshore, Inc. (SOI)

January 31, 2008

ENVIRONMENTAL ASSESSMENT

Minerals Management Service – Alaska Outer Continental Shelf Geological and Geophysical Permit Application 08-04 Shell Offshore, Inc.

Beaufort Sea Outer Continental Shelf: Open water, 3D Deep Penetration Seismic Survey

1.0 PURPOSE AND NEED

Shell Offshore Inc. (SOI) has submitted a Geological and Geophysical (G&G) permit application (08-04) and supporting documents for a proposed 2008 open water, 3D deep penetration, seismic survey exploration program within the mid- and eastern-Beaufort Sea Outer Continental Shelf (OCS) Planning Area (Figure 1). The purpose of the seismic surveys is to collect geophysical information for the use in evaluating the potential for hydrocarbon accumulations and making decisions related to leasing and further exploration. The proposed seismic survey activities are authorized under the OCS Lands Act and are regulated under 30 CFR 251 (G&G Explorations of the OCS).

An environmental evaluation is being conducted so that SOI's seismic survey activities are carried out, "in a safe and environmentally safe manner so as to prevent harm or damage...to any life (including fish and other aquatic life)...or the marine, coastal, or human environment." (30 CFR Part 251, §251.2).

This environmental assessment (EA) document will: (1) environmentally appraise SOI's proposed action, focusing on those G&G activities the Regional Supervisor for Resource Evaluation has the authority to permit; (2) determine if any significant adverse affects (40 CFR 1508.27) on the quality of the human environment would occur; (3) identify mitigation measures (if any) to be incorporated into SOI's G&G permit; and (4) determine if further National Environmental Policy Act (NEPA) analysis is required, i.e. an environmental impact statement (EIS) needs to be prepared.

This EA also tiers off readily available Minerals Management Service (MMS) documents which: (1) provided a comprehensive characterization of the Arctic Ocean's biological and socio-economic resources and Alaska Native subsistence activities; and (2) evaluate a broad spectrum of potential seismic survey-related impacts. The tiering-process is detailed in NEPA's implementing regulations (40 CFR §1502.20 and §1508.28) and is designed to eliminate repetitive discussions of the same issues and concentrate on specific issues related to specific activities (i.e., SOI's 2008 open water season seismic survey in the Beaufort Sea).

Incorporated by reference into this EA is the information (e.g. existing environment, impact assessment, and cumulative scenario) contained in the following seismic survey-related MMS NEPA documents:

> *Final Programmatic Environmental Assessment, Arctic Ocean Outer Continental Shelf, Seismic Surveys – 2006 (OCS EIS/EA MMS 2006-038) June 2006.* **(2006 Final Seismic PEA)**
>
> *Environmental Assessment/Finding of No Significant Impact, Shell Offshore Inc. Exploration Plan, (OCS EIS/EA MMS 2007-009) February 2007.* **(Exploration Plan EA)**
>
> *Draft Programmatic Environmental Impact Statement, Seismic Surveys in the Beaufort and Chukchi Seas, Alaska. (OCS EIS/EA MMS 2007-001) March 2007.* **(Draft Seismic PEIS)**
>
> *Final Environmental Impact Statement, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea (OCS EIS/EA MMS 2007-026) May 2007.* **(Final Chukchi EIS)**
>
> *Environmental Assessment/Finding of No Significant Impact, Beaufort Sea OCS: Deep Penetration Seismic Survey, Minerals Management Service and Geophysical and Geophysical Permit Application 07-04, Shell Offshore, Inc. July 12, 2007.* **(07-04 EA)**

2.0 DESCRIPTION OF SOI'S PROPOSED ACTION

Information about SOI's proposed action was obtained from their G&G permit application, dated November 1, 2007, and supporting information which included: (1) permit application forms MMS-327, *Application for Permit to Conduct G&G Exploration for Mineral Resources or Scientific Research in the OCS* and MMS-328, *Permit for Geophysical Exploration for Mineral Resources or Scientific Research in the OCS*; (2) a location figure (Figure 1) showing the general area of the proposed 2008 3D seismic program; (3) the equipment and vessel specifications for the *M/V Gilivar*; and (4) the *2008 Marine Mammal Monitoring and Mitigation Plan for Seismic Exploration in the Alaskan Chukchi and Beaufort Seas.* Additional information about SOI's whaling/subsistence-related mitigation measures and additional background information was obtained from SOI's October 2007, *Application for Incidental Harassment Authorization* (IHA) *for the Non-Lethal Taking of Whales and Seals in Conjunction with a Proposed Open Water Seismic and Marine Survey Program in the Chukchi and Beaufort Seas, Alaska, During 2008-2009.*

The following summarizes the major features of SOI's proposed action:

Geographic Survey Area	Subset area of the Beaufort Sea OCS Planning Area (Figure 1)
Survey Type	Open water, 3D deep penetration seismic survey
Permit Authorization Period	August 1, 2008 – November 30, 2008
Number of Seismic Source Vessels	1
Number of Seismic Source Arrays	2
Energy Source Array	~3,000 cubic inches bolt gun array
Receiving Array	~6 streamer cables, each ~6,000 meters long
Streamer Array Width	600 - 800 meters
Streamer Buoyancy	liquid paraffin (isopar)
Support Vessels	1 or 2 chase/guard boats, 1 crew change vessel, 1 landing craft
Aircraft	Twin Otter will be used for aerial surveys and support, if necessary.
Mitigation & Monitoring	National Marine Fisheries Service - Incidental Harassment Authorization U.S. Fish and Wildlife Service - Letter of Authorization Marine Mammal Monitoring and Mitigation Plan, dated October 2007 Plan of Cooperation
Contractor	WesternGeco

SOI's proposes to conduct its seismic survey from WesternGeco's vessel *M/V Gilavar*. One chase/guard boat is proposed to be the *M/V Gulf Provider* (which was used in SOI's 2007 seismic survey operation) and the other is not yet contracted. The chase boats will not deploy seismic data acquisition gear. In addition, a crew change vessel and a landing craft, such as the *M/V Peregrine* or similar vessel, will support the *M/V Gilivar*, and the two chase/guard boats.

As part of their proposed action, SOI plans to incorporate both design features and operational procedures for mitigating potential impacts on cetaceans and pinnipeds and on subsistence hunts; they include: (1) timing and locating seismic activities to avoid interference with the annual fall bowhead whale hunts; (2) configuring the airgun arrays to maximize the proportion of energy that propagates downward and minimizes horizontal propagation; (3) limiting the size of the seismic energy source to only that required to meet the technical objectives of the seismic survey; and (4) conducting pre-season modeling and early season field assessments to establish and refine (as necessary)

National Marine Fisheries Service (NMFS)-directed safety zones, and other radii relevant to behavioral disturbances.

SOI and its seismic survey contractor WesternGeco currently have an IHA from NMFS to allow non-lethal takes of whales and seals incidental to offshore geophysical seismic operations in the Beaufort Sea. The existing IHA covers incidental take by noise harassment from SOI's seismic source and support vessels, and expires August 1, 2008. SOI and WesternGeco have applied for another Beaufort Sea IHA from the NMFS to cover their seismic survey operation for the period August 2, 2008, to August 1, 2009. MMS is aware that SOI has also applied to the U.S. Fish and Wildlife Service (FWS), under the Marine Mammal Protection Act (MMPA), for an incidental take authorization (ITA) for polar bear and walrus for the 2008 open water season in the Beaufort Sea.

SOI's planned mitigation also includes implementing their *Marine Mammal Monitoring and Mitigation Plan* and yet-to-be-completed "Plan of Cooperation" (POC), the latter of which will formally specify times and areas to avoid possible conflicts with traditional subsistence hunts by the villages of Kaktovik, Nuiqsut (Cross Island), and Barrow. SOI is proposing to include the provisions of a Conflict Avoidance Agreement (CAA) with the Alaska Eskimo Whaling Commission (AEWC) and Whaling Captains' Association as a component of the POC. If SOI is unable to secure a CAA or other type of similar agreement, then under the auspices of the MMPA, the NMFS will develop conflict avoidance measures so that no unmitigable impacts to subsistence activities would occur.

3.0 ALTERNATIVES

This EA incorporates by reference the descriptions and environmental evaluations of the alternatives contained in the 2006 Final Seismic PEA.

Alternative 1. No seismic-survey permits issued for geophysical exploration activities (No Action).

Alternative 2. Seismic surveys for geophysical-exploration activities would be permitted with existing Alaska OCS G&G exploration stipulations and guidelines.

Alternative 3. Seismic surveys for geophysical exploration activities would be permitted incorporating existing Alaska OCS G&G exploration stipulations and guidelines and additional protective measures for marine mammals, including a 120-decibel (dB)-specified exclusion zone.

Alternative 4. Seismic surveys for geophysical-exploration activities would be permitted incorporating existing Alaska OCS G&G exploration stipulations and guidelines and additional protective measures for marine mammals, including a 160-dB-specified exclusion zone.

Alternative 5. Seismic surveys for geophysical-exploration activities would be permitted incorporating existing Alaska OCS G&G exploration stipulations and guidelines and additional protective measures for marine mammals, including 160-dB- and 120-dB-specified exclusion zones.

Alternative 6. Seismic surveys for geophysical-exploration activities would be permitted incorporating existing Alaska OCS G&G exploration stipulations and guidelines and additional protective measures for marine mammals, including a 180/190-dB-specified exclusion zone.

The 2006 Final Seismic PEA considered the aforementioned alternatives before: 1) identifying Alternative 6 as the Selected Alternative; 2) determining a Finding of No Significant Impact (FONSI); and 3) determining that there was no need to prepare an EIS. The 2006 Final Seismic PEA FONSI concluded that seismic surveys could result in adverse, but not significant impacts, and that environmental protection measures need to be implemented to mitigate possible impacts.

4.0 ENVIRONMENTAL EVALUATION

4.1 Affected Environment

Based on the information obtained from previous seismic survey-related EAs and EISs, Open Water meetings with stakeholders, traditional knowledge, and public hearings, the resources that follow are: (1) of primary concern; (2) are relative to SOI's proposed activities and considered further in this EA; and (3) are briefly described.

- fish and essential fish habitat;
- birds, including threatened and endangered species;
- marine mammals, including threatened and endangered species; and,
- subsistence resources and activities.

More detailed descriptions of the aforementioned primary resources of concern and other biological and socioeconomic resources are provided in the 2006 Final Seismic PEA and Draft Seismic PEIS.

4.1.1 Fish and essential fish habitat.

The Beaufort Sea is noted for its low species diversity of fish, with many species occurring at the northern limits of their ranges. Investigations have documented 13 orders, 22 families, and 77 species of fish as occurring in freshwater, nearshore brackish, or marine waters of the Alaska-Beaufort Sea region. The distribution, abundance, ecology, and life-history statistics of the vast majority of marine species in the region are poorly known. Pacific salmon populations are not common in waters east of Pont Barrow, as some reports describe stocks of pink and chum salmon straying into the area. The expansion of chinook, sockeye, and chum salmon into the Arctic appears restricted by cold temperatures. Presently, Pacific salmon are the only managed species with essential fish habitat (EFH) designated in the Alaskan Beaufort Sea.

4.1.2 Birds, including threatened and endangered species.

There are two bird species that occur in the Beaufort Sea area that are listed as threatened under the Endangered Species Act (ESA), they are the spectacled eider and Steller's eider. The Kittlitz's murrelet is a candidate species.

The spectacled eider, Steller's eider, and Kittlitz's murrelet are known to seasonally occur in the Beaufort Sea area. The largest spectacled eider breeding population in North America is on the North Slope; however, low densities occur offshore of the Colville Delta while staging for

migration. Spectacled eiders winter in the Bering Sea. During the open-water period when seismic-survey activities are possible, spectacled eiders often are encountered moving between tundra breeding areas on the North Slope and the primary molting area at Ledyard Bay in the Chukchi Sea. Based on telemetry data for molt migration in the Chukchi Sea, male spectacled eiders migrate an average of 35 kilometers offshore of the coast, and females fly an average of 60 km offshore. Unlike spectacled eiders, Steller's eiders do not molt in the Chukchi Sea. The Steller's eider primary molting areas are near Kuskokwim Shoals or in lagoons on the north side of the Alaska Peninsula. Steller's eiders were surveyed in marine waters within 100 kilometers of the Beaufort Sea shoreline east of Barrow to Demarcation Point during the summers 1999-2001, and were the least numerous of all the birds observed during the surveys. Kittlitz's murrelets have been observed on a regular basis as far north as Point Barrow however, there is a great deal of annual variation in their occurrence in the Chukchi Sea. The Kittlitz's murrelet is thought "likely to occur" in the Beaufort Sea by the FWS. No critical habitat has been designated in the Beaufort Sea OCS Planning Area.

Several million birds of about 70 species occur regularly in the Arctic Coastal Plain and Beaufort Sea habitats. Nearly all are migratory, present for all or part of the period May to early November. Many seabirds (e.g., murres) and sea ducks (e.g., common eiders and long-tailed ducks) will closely follow leads during spring migration. A majority of species found in coastal areas are waterfowl or shorebirds.

4.1.3 Marine mammals, including threatened and endangered species.

There are two species of cetaceans that occur in the Beaufort Sea that are listed as endangered under the ESA, they are: bowhead whales and humpback whales.

Bowhead whale. There is one ESA-listed endangered species under NMFS' jurisdiction, the bowhead whale, which regularly occurs seasonally within the Beaufort Sea OCS Planning Area. No critical habitat has been designated for the species. Data indicate that what is currently referred to as the Western Arctic stock (by NMFS) or as the Bering-Chukchi-Beaufort (BCB) Seas stock (by the International Whaling Commission) of bowheads is increasing in abundance. There are scientific analyses indicating that BCB Seas bowheads may have reached or are approaching, the lower limit of their historic population size. There are related analyses supporting their removal from the list of threatened and endangered species. Bowhead whales may occur in the portions of the Beaufort Sea project area from spring through late fall. Currently, the whales are first seen at Barrow around April 9-10, and this early pulse is dominated by juveniles. Beginning in May, large whales and cow/calf pairs are seen. Most of the herd is believed to have migrated past Barrow by late May. After passing Barrow, whales travel in spring leads through heavy pack ice, eventually heading east toward the southeastern Beaufort Sea, reaching the Canadian Beaufort by July. In late summer (typically early September, but sometimes beginning earlier), bowhead whales migrate west. Data indicate that bowheads occupy inner and outer shelf habitat in light and moderate ice years but occur in outer shelf and slope habitat in years of heavy ice.

Humpback whale. The northern Bering Sea, Bering Strait, and southern Chukchi Sea along the Chukchi Peninsula are the northern extreme of the humpback whale's range. Their known current summer feeding habitat includes the southern portion, especially the southwestern portion, of the Chukchi Sea. Humpback whales in Alaska feed principally on herring, other small schooling fish, and on swarms of euphausiids (krill). Recent observations of humpback whales in the western Beaufort Sea have been reported.

There is one species of marine mammal occurring in the Beaufort Sea area that is proposed to be listed as a threatened species under the ESA: polar bear. The public

comment period on the FWS's proposal to list the polar bear as a threatened species closed on October 22, 2007, and a final decision is pending.

> *Polar bear.* There are two polar bear stocks recognized in Alaska: the southern Beaufort Sea (SBS) and the Chukchi/Bering Seas stocks (CBS); though there is considerable overlap between the two. A reliable estimate for the CBS stock does not exist, and its current status is in question. Recent information suggests that the SBS population may be smaller then previously estimated. Neither the SBS nor the CBS stock is listed as "depleted" under the MMPA. Polar bear habitat use and distribution may reflect more than prey availability; it also may reflect time allocated for hunting prey and the use of retreat habitats. Modeling of polar bear ice habitat selection showed that shallow-water areas where different ice types intersected were preferred.

There are six species of marine mammals that occur in the Beaufort Sea that are not listed as endangered or threatened under the ESA, they are: ringed, bearded, and spotted seals; Pacific walrus; and, beluga and gray whales.

> *Seals (ringed, bearded, spotted).* The only ice-dependent seal in the proposed action area is the ringed seal, as they have the unique ability to maintain breathing holes in thick ice. Ringed seals numbers are considerably higher in the Bering and Chukchi seas, particularly during the winter and spring. Data indicate that the highest density of ringed seals along the central Beaufort Sea coast occurs between Kaktovik and Brownlow Point. The Alaska stock of ringed seals is not classified by NMFS as a strategic stock. Most of the bearded seals are found in the Bering and Chukchi seas, and no reliable estimate of bearded seals in the Beaufort Sea exists; however, bearded seals are know to occur in the vicinity of Northstar Island. The Alaska stock of bearded seals is not classified by NMFS as a strategic stock. Spotted seals are a seasonal visitor to the Beaufort Sea from populations in the Bering and Chukchi seas, and occur primarily in the nearshore area between August and October and 100-200 kilometers offshore during January to June. A small number of spotted seal haulouts are documented in the central Beaufort Sea near the deltas of the Colville and Sagavanirktok rivers. The Alaska stock of spotted seals is not classified by NMFS as a strategic stock.
>
> *Pacific Walrus.* The Pacific walrus population (which comprises about 80% of the world population), in general, is associated with the moving pack ice year-round. They spend winter in the Bering Sea; and the majority of the population summers throughout the Chukchi Seas, including the westernmost part of the Beaufort Sea. Although capable of diving to deeper depths, Pacific walruses for the most part are found in waters of 100 meters or less, possibly because of higher productivity of their benthic foods in the shallower water. Recent reports indicate the climate change has caused walrus to haulout more terrestrially than on ice, which increases the likelihood of abortion, injury, and death during stampedes at crowded haulouts.
>
> *Beluga whale.* The Beaufort Sea and Chukchi Sea beluga whale stocks winter in the Bering Sea and summer in the Beaufort and Chukchi seas, migrating around western and northern Alaska. The majority of the Beaufort Sea stock migrates into the Beaufort Sea in April and May. Belugas are not commonly observed in the central Beaufort Sea during the summer, as they are strongly associated with the ice and prefer areas with moderate to high ice coverage.
>
> *Gray whales.* Gray whales return annually to primary feeding areas in the northern Bering Sea and Chukchi Sea. However, in recent years more gray whales have been observed entering the Beaufort Sea east of Point Barrow, especially in the late summer and autumn. Gray whales are the only baleen whales that are mainly bottom feeders.

There are no State of Alaska-listed marine mammal species of special concern within the Beaufort Sea OCS Planning Area.

4.1.4 Subsistence resources and activities.

The North Slope Borough (NSB) Municipal Code (19.20.020 (67)) defines subsistence as: "an activity performed in support of the basic beliefs and nutritional needs of the residents of the borough and includes hunting, whaling, fishing, trapping, camping, food gathering, and other traditional and cultural activities." The sharing, trading, and bartering of subsistence foods structures relationships among communities, while at the same time the giving of these foods helps maintain ties with family members elsewhere in Alaska. Subsistence resources also provide special foods for religious and social occasions; the most important ceremony, *Nalukataq*, celebrates the bowhead whale harvest. Two major subsistence-resource categories occur on the North Slope: the coastal/marine and the terrestrial/aquatic. In the coastal/marine group, the food resources traditionally harvested are whales, seals, walruses, waterfowl, and fish. In the terrestrial/aquatic group, the resources sought are caribou, freshwater fishes, moose, Dall sheep, edible roots and berries, and furbearing animals. While subsistence-resource harvests may differ from community to community, the resource combination of caribou, bowhead whales, and fish is the primary grouping of resources harvested in the NSB. The subsistence pursuit of bowhead whales has major importance to the communities of Kaktovik, Nuiqsut, Barrow, Wainwright, and Point Hope (some Point Lay men whale with crews from Wainwright, and some Atqasuk men whale with Barrow crews). The sharing of whale *muktuk*, or fat, and whale meat is important to the inland community of Atqasuk and continues to be the most valued activity in the subsistence economy of these communities. In terms of the whale harvest, Barrow is the only community within the project area known to traditionally harvest whales in the spring and fall.

5.0 IMPACT ANALYSIS

5.1 Issues and Concerns

The noise and energy emitted from airguns, the acoustic source for 3D seismic surveys, have the greatest potential to cause adverse impacts. Vessel and aircraft traffic, vessel noise and lights, and seafloor disturbances associated with seismic surveys might also have associated potential adverse impacts.

Issues and concerns associated with seismic-survey operations - similar to what SOI (PA 08-04) is proposing - have been documented by the scientific community, in government publications, and at scientific symposia. The more prominent issues and concerns applicable to this EA include the:

- protection of subsistence resources and the Inupiat culture and way of life;
- disturbance to bowhead whale migration patterns;
- impacts of seismic operations on marine fish;
- harassment and potential harm of wildlife, including marine mammals and marine birds, by vessel operations and movements;
- impacts to threatened and endangered species; and
- impacts to all marine mammals.

Previous MMS seismic survey-related environmental assessments (e.g. 2006 Final Seismic PEA) concluded that the following resources would be negligibly or not impacted by open water, 3D deep penetration seismic survey operations in the Chukchi

Sea: (1) air quality; (2) coastal wetlands; (3) freshwater fishes; (4) sediments; (5) terrestrial mammals; and (6) water quality, as potentially affected by vessels discharges and petroleum and other lubricant spills. Therefore, the aforementioned resources are not considered further in this EA. See Section III-D (Preliminary Screening of Seismic-survey Activities and Potential Impacts) in the Draft Seismic PEIS for a detailed discussion on this topic.

Table 1 compares SOI's (PA 08-04) seismic survey operational features with the range of seismic survey features environmentally evaluated in the 2006 Final Seismic PEA, which resulted in a FONSI. Both the 2006 Final Seismic PEA and Draft Seismic PEIS provided a detailed analysis of potential environmental impacts from seismic survey operations in the Arctic Ocean. The following synopsis describing potential environmental impacts was excerpted from the aforementioned documents and is applicable to the analysis of potential environmental impacts from SOI's proposed activities.

5.1.1 Fish and essential fish habitat.

Fish responses to seismic sources are species specific and may differ according to the species' lifestage. Fishes of greatest concern, due to their distribution, abundance, trophic relationships, or vulnerability, are: (1) the diadromous fishes that are abundant seasonally in the nearshore zone, especially arctic char, least cisco, and broad whitefish; (2) cryopelagic fishes such as the arctic cod, an abundant and trophically important fish; (3) intertidal/estuarine/nearshore spawning and/or rearing fishes (e.g., capelin and Pacific herring); and (4) Pacific salmon. Some of these species also are important because they figure prominently in subsistence (e.g., arctic char, ciscoes, whitefishes, arctic cod, rainbow smelt, capelin, and salmon). Immediate mortality and physiological damage to eggs, larvae, and fry, adult and juvenile marine fishes is unlikely to occur, unless the fish are present within 5 meters (m) of the sound source (although more likely 1 m). Damage to tissue may not be immediately apparent. Behavioral changes to marine fish and invertebrates may include balance problems (but recovery within minutes); disoriented swimming behavior; increased swimming speed; tightening schools; displacement; interruption of important biological behaviors (e.g., feeding, mating); shifts in the vertical distribution (either up or down); and occurrence of alarm and startle responses. Potential impacts from vessel noise, anchor or cable deployment, and recovery of fuel spills is regarded as a negligible adverse but not significant impact to fish and EFH. Based on the review of available scientific and fishery management literature, SOI's activities could result in adverse but not significant impacts to fish.

5.1.2 Birds, including threatened and endangered species.

Potential negative effects of the proposed seismic-survey activities on coastal and marine birds can be summarized in categories of:

- Disturbance from the physical presence of vessels;
- Disturbance from noise by vessels, seismic airguns, and support aircraft;
- Collision with vessels or aircraft; and
- Direct and indirect results of petroleum product spills from vessels.

Seismic-vessel activity is expected to have only temporary and localized disturbance effects on relatively small numbers of certain marine bird species that are distributed in low density over a large action area. Similarly, disturbance to pelagic species are expected to be minimal, because they are expected to move away from the slow-moving seismic vessel well in advance of the towed seismic-airgun array. Any displacement to these birds is expected to be dynamic and

temporary. During the course of normal feeding or escape behavior, some birds could be near enough to an airgun to be injured by a pulse. Although MMS has no information about the circumstances where this might occur, the reactions of birds to airgun noise suggest that a bird would have to be very close to the airgun to receive a pulse strong enough to cause injury, if that were possible at all.

Aircraft operating at low altitudes may disturb birds that are in the path of the aircraft. There is an energetic cost to repeatedly moving away from aircraft disturbances as well as a cost in terms of lost foraging opportunities or displacement to an area of lower prey availability. Many seabirds, attracted to lights and vessels in nearshore waters, could collide with structures and be injured or killed. No birds were reported to have collided with seismic survey vessels during the 2006 open water seismic survey season when these mitigation measures were in effect. With the implementation of measures to mitigate impacts, no birds would likely be adversely impacted by SOI's activities.

5.1.3 Marine mammals, including threatened and endangered species.

Bowhead whale. Available information indicates that bowhead whales, an endangered species, are responsive to anthropogenic noise in their environment. The bowhead's primary response to 3D seismic surveys most likely would be avoidance of such operations, sometimes at considerable distance; however, responses are variable and not fully understood. Avoidance behavior would help bowhead whale from possibly incurring hearing injuries from the firing airgun. Seismic surveys during the open-water period also have the potential to cause bowhead whales to avoid areas used for resting and feeding, and data indicate that fall migrating bowhead whales can show greater avoidance of active seismic survey vessels than do feeding bowhead whales. The potential adverse effects of long-term added noise, disturbance, and related avoidance of feeding and resting habitat in an extremely long-lived species such as the bowhead whale are unknown. Bowhead whale responses are likely to vary with time of year; sex and reproductive status of individuals exposed; activity levels and their characteristics (e.g., airgun source levels, array configuration and placement in the water column); context (e.g., feeding versus migrating whales); the individual's motivation to be in an area; and the individual's options for alternative travel routes and places to feed. Available information does not indicate there were detectable, long-term population-level adverse effects on the BCB seas bowhead whale population from the high level of seismic surveys and exploration drilling during the late 1970's and 1980's in the Beaufort and Chukchi seas. However, no research studies were performed in this population to determine if sublethal impacts (such as reduced hearing or increased stress) occurred and/or affected this population's recovery.

Other marine mammals. Potential effects from seismic survey activities on Beaufort Sea non-threatened and non-endangered marine mammals (pinnipeds including the Pacific walrus, gray whales, beluga whales) are similar to those potential effects on bowhead whales: (1) tolerance, that is the capacity of the individuals to endure or become less responsive to the repeated exposure; (2) masking of natural sounds; (3) behavioral disturbance; and (4) auditory impacts, e.g., temporary and permanent threshold shifts, and other physiological effects. Seismic surveys, either alone or in combination with other factors, could also have subtle, chronic effects such as excluding individuals from important habitats (e.g., feeding and resting) at important times, interfering with their migrations and movements, contributing to habitat degradation, disrupting biologically important behaviors, and increasing levels of stress.

Increased disturbance from vessel and aircraft activity could prematurely cause pinnipeds to abandon haul-out locations and enter the water, though individual responses could be highly variable. Such an event would have a greater impact if a stampede occurred and pups were consequently trampled to death, injured, or separated from their mothers.

Because any polar bears encountered will most likely be on the ice, air gun effects on them are expected to be minor. If polar bears are encountered in the water, received sound levels would be

substantially reduced due to the pressure release effects near the water surface. The most likely impacts to polar bears from seismic surveys and associated activities would be disturbance and possible impacts to bears' food resources. Any impacts of seismic activity to polar bear food resources will probably be minor, local and brief in nature. Bearded and ringed seals are the primary prey of polar bears in the action area, and abundance and availability of these seals are not expected to be significantly altered by the proposed seismic surveys and associated activities.

No documented instances of marine mammal deaths or physical injuries from seismic surveys have been reported, although again these may be difficult to document.

5.1.4 Subsistence resources and activities.

Seismic surveys have the potential to disrupt the traditional subsistence bowhead whale hunts of the Alaska Native communities of Kaktovik, Nuiqsut, and Barrow, as seismic-survey operations could deflect bowhead whales away from traditional hunting areas. The possible long-term deflection of whale migratory routes or increased skittishness of whales due to seismic-survey activities in the Beaufort Sea might make subsistence harvests more difficult, dangerous, and expensive; however, to date, no long-term deflections of bowheads have been demonstrated.

Disruption of the Barrow bowhead whale harvest, in particular, could have significant effects on regional subsistence resources and harvest practices. Such disruptions could impact sharing networks, subsistence task groups, and crew structures as well as cause disruptions of the central Inupiat cultural value: subsistence as a way of life. These disruptions also could cause a breakdown in family ties, the community's sense of well-being, and could damage sharing linkages with other communities.

Because the seismic-survey activities are vessel based, stresses to local village infrastructure, health care, and emergency response systems are expected to be minimal; therefore, social systems in these communities would experience little direct disturbance from the staging of people and equipment for seismic exploration.

Avoidance planning, stipulations and required mitigation, and conflict avoidance measures under IHA requirements, as defined by NMFS and FWS and made a part of SOI's proposed action, would serve collectively to mitigate disturbance effects on subsistence resources and activities. Also avoided would be significant impacts on the Alaska Native communities' sociocultural systems.

5.2 Cumulative Impacts

Cumulative impacts can result from individually minor but collectively significant actions taking place over time. The main agents of the cumulative activities scenario are past, present, and foreseeable: (1) marine seismic surveys; (2) vessel traffic and movements; (3) aircraft traffic; (4) oil and gas exploration in Federal and State waters; and (5) miscellaneous activities and factors. The miscellaneous activities and factors include subsistence-harvest activities, military activities, industrial development, community development, and climate change. Incorporated by reference into this EA is the cumulative activities scenario (Section III.C, pages III-12 through III-18) and cumulative impact assessment (Section III.H, pages III-197 through III-235) from the Draft Seismic PEIS. Major findings and conclusions from the Draft Seismic PEIS are summarized as follows:

Anthropogenic disturbances associated with the main agents identified in the cumulative activities scenario synergistically may interact with climate change and accelerate potential impacts to fish

> habitat; changes may be beneficial, adverse, or both. Seismic surveys, especially as mitigated, are not expected to add significantly to the fishery impacts from past, present, and future activities.
>
> Seismic surveys on the OCS and in State waters and by vessel and air traffic have a collective potential to affect marine and coastal birds in the Beaufort Sea; however the incremental increased potential for impacts from seismic survey activities, including the inclusion of mitigation measures, is not expected to add significantly to the impacts from past, present, and future activities.
>
> Overall, seismic surveys are likely to result in incremental cumulative effects to bowhead, humpback, and fin whales through the potential exclusion or avoidance of bowhead whales from feeding or resting areas and disruption of important associated biological behaviors. Mitigation measures including those imposed through the MMPA authorizations process are designed to avoid Level A Harassment (injury), reduce the potential for population-level significant adverse effects on bowhead and humpback whales, and avoid an unmitigable adverse impact on their availability for subsistence purposes. Seismic surveys are not expected to add significantly to the cumulative impacts on bowhead, humpback and fin whales from past, present, and future activities.
>
> Due to the ongoing effects of climate change in the Arctic, and because of the observed and predicted impacts that climate change can have on them, continued close attention and effective mitigation practices with respect to non-endangered marine mammals populations and distributions are warranted, particularly with respect to ringed seals and polar bears, which will likely be among the first marine mammals to show the negative effects of climatic warming.
>
> Limited monitoring data of past activities prevents effective assessment of subsistence-resource damage; resource displacement; changes in hunters' access to resources; increased competition; contamination levels in subsistence resources; harvest reductions; or increased effort, risk, and cost to hunters. Seismic surveys, especially when mitigated, would not be expected to add significant impacts to overall cumulative effects on subsistence-harvest resources and harvest practices from past, present, and future activities. Protective mitigation measures and IHA-related conflict avoidance-type measures are expected to reduce potential impacts on subsistence resources and harvest practices.

Besides SOI's open water seismic survey program, other MMS-permitted seismic surveys are expected to be conducted in the Beaufort Sea OCS in 2008, they include: (1) PA 08-02, SOI's on-ice operation; and (2) PA 08-05, BP Exploration (Alaska) Inc. (BPXA) Liberty ocean-bottom-cable seismic survey program to cover their extended reach bore holes. Less certain are SOI's plans to conduct site clearance and shallow hazard seismic surveys associated with their Beaufort Sea exploration plan (EP). During the 2007 open water season a court order prevented SOI from implementing its Beaufort Sea exploration plan and it is not clear if SOI will have an opportunity to conduct its exploration activities during the 2008 open water season. For the purposes of this EA, it is assumed that SOI will be permitted to implement its 2008 EP in the Beaufort Sea OCS; therefore, the cumulative scenario described in the Exploration Plan EA *(OCS EIS/EA MMS 2007-001)* and G&G Permit 07-04 EA are incorporated by reference.

SOI's EP states that their operations would be conducted in a manner that is consistent with the lease terms, including two special MMS stipulations: No. 4 Industry Site-Specific Bowhead Whales-Monitoring Program, and No. 5 Conflict Avoidance Mechanisms to Protect Subsistence Whaling and other Subsistence Activities. To address the potential cumulative, noise-generating impact of their various operations, SOI

proposes to identify a 10-day period (between August 25 and September 19) in which SOI would temporarily shut down their seismic survey and drilling operations.

The State of Alaska (State) issued two 2007 open water season permits for conducting geophysical technical surveys in State waters near Point Thompson. SOI has requested the State reissue-extend the Point Thompson area pipeline site investigation (MLUP/NS 06-03). This investigation would use some active energy sources that are typically shallow focused for geotechnical purposes. BPXA has applied for a State geophysical exploration permit for open water seismic to cover their extended reach bore hole at their Liberty Production Facility. State mitigation measures and lessee advisories for the Beaufort Sea can be found at:
http://www.dog.dnr.state.ak.us/oil/products/publications/beaufortsea/bsaw2006/bs_2006mits.pdf.

6.0 CONCLUSION AND RECOMMENDATIONS

SOI's proposed 2008 open water seismic survey activities are within and less than the scope of activities covered by the 2006 Final Seismic PEA FONSI and other MMS seismic survey-related NEPA documents, i.e., the 2006 Final Seismic PEA/FONSI concluded that four concurrently operating seismic surveys in the Beaufort Sea could result in adverse but not significant effects. In addition, potential cumulative impacts are not likely to exceed those described in the 2006 Final Seismic PEA, Draft Seismic PEIS, and SOI Exploration Plan EA.

SOI's proposed action is also within the scope of our previous: (1) ESA/Section 7 consultation with the NMFS and FWS; (2) MMPA coordination with NMFS and FWS; and (3) EFH consultation with NMFS. The finding of informal consultation with the FWS was that no adverse impacts on threatened, endangered, or candidate species under their jurisdiction would occur. The NMFS stated in their 2006 Arctic Region Biological Opinion (ARBO) that the activities associated with seismic surveys in the Beaufort Sea might adversely affect but not jeopardize the continued existence of the endangered bowhead whale, *Balaena mysticetus*, which is under their jurisdiction. The MMS has re-initiated ESA/Section 7 consultation with the NMFS over reported sightings of humpback whales in the Beaufort Sea, the results of which may be NMFS supplementing its 2006 ARBO to include additional humpback whale-related mitigation and conservation measures and incorporating such measures in SOI's IHA. While the re-initiation process proceeds, however, the existing 2006 ARBO remains in effect, but does not allow for the legal "take" of humpback whales from seismic survey operations.

Further coordination with the State of Alaska State Historic Protection Officer is not required because SOI is not proposing to conduct ocean-bottom-cable seismic survey operations in the Beaufort Sea.

MMPA-related mitigation and monitoring requirements [as identified in an IHA and Letter of Authorization (LOA)] would help prevent non-negligible impacts to marine

mammals and unmitigable impacts to subsistence uses. Implementation of a conflict avoidance-type agreement with the AEWC and the affected villages' Whaling Captains Association (as SOI proposes to do) would also help prevent significant social or economic impacts on the coastal inhabitants of the Beaufort Sea, i.e., potential adverse impact on subsistence marine-mammal-harvest activities will be avoided. If SOI is unable to secure a conflict avoidance-type agreement then NMFS has the Federal authority to develop - and incorporate into SOI's IHA - conflict avoidance measures so that no unmitigable impacts to subsistence activities would occur.

By incorporating our recommended mitigation measures (Appendix 1) into SOI's permit (08-04), we have concluded that: (1) no significant adverse affects (40 CFR 1508.27) on the quality of the human environment would occur from SOI's seismic survey activities as proposed in their G&G permit application (08-04); and, (2) no further NEPA analysis of SOI's (PA 08-04) proposed seismic survey activities in the Beaufort Sea is required. Therefore, a FONSI will be prepared.

Our recommended mitigation measures: (1) represent those that are under the jurisdiction of MMS; (2) complement those measures likely to be included in NMFS and FWS MMPA-related IHAs and/or LOAs; and (3) address concerns from local, state, and federal agencies, non-governmental agencies, Alaska Native Tribes, and the general public. Furthermore, we acknowledge and endorse that mitigation and marine mammal monitoring requirements in MMPA-authorizations will have precedence over any comparable marine-mammal-related, G&G permit requirements.

To further help prevent unmitigatable impacts on marine mammal subsistence activities, we recommend that MMS not permit SOI to begin seismic survey operations in the Beaufort Sea until such time that they provide MMS copies of their MMPA authorizations from the NMFS and FWS.

7.0 CONSULTATION AND COORDINATION

The MMS has received and considered public and stakeholders input on issues, concerns, alternatives, and mitigation related to seismic surveying in the Arctic Ocean.

- The MMS and NMFS prepared a programmatic environmental assessment on seismic surveying in the Arctic OCS for the 2006 open water season. The draft PEA *(OCS EIS/EA MMS 2006-019)* was published for public review and comment and a final PEA (OCS EIS/EA MMS 2006-038) and Finding of No Significant Impact were posted on the MMS website: http://www.mms.gov/alaska/.

- The MMS prepared an exploration plan environmental assessment *(OCS EIS/EA MMS 2007-009)* on SOI's exploration activities in the Beaufort Sea, which included a cumulative analysis of their 2007 open water seismic survey season. The entire NEPA analysis developed a mitigation plan and resulted in a FONSI.

An approval letter from MMS, dated February 15, 2007, was sent to SOI regarding their Exploration Plan activities, which included a list of stipulations. SOI's Exploration Plan EA and MMS's approval letter were posted on MMS's web site: http://www.mms.gov/alaska/ref/PublicInfo/Shell_BF/BF.HTM.

- The MMS prepared a draft *(OCS EIS/EA MMS 2006-060)* and final (OCS EIS/EA MMS 2007-026) environmental impact statement *Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 and Seismic Surveying Activities*. The EISs were published and released for public review and comment, and public hearings and government-to-government meetings were held. The subject documents were posted on the MMS website: http://www.mms.gov/alaska/.

- Comments were received from the public in response to the November 2006, MMS and NMFS-joint Notice of Intent to prepare a draft programmatic environmental impact statement *Seismic Surveys in the Beaufort and Chukchi Seas, Alaska*.

- The MMS and NMFS prepared a draft *(OCS EIS/EA MMS 2007-001)* PEIS and it was released for public review and comment, and public hearing and government-to-government meetings were held. The PEIS was posted on the MMS website: http://www.mms.gov/alaska/.

Applications for seismic survey-related G&G permits in the Arctic Ocean OCS have been and continue to be posted on the MMS website at http://www.mms.gov/alaska/re/recentgg/recentgg.htm and are available for public review. The MMS also provides written notification of these permit applications to the North Slope Borough and potentially affected Alaska Native Tribes and communities.

8.0 REFERENCE MATERIAL

Department of the Interior, Minerals Management Service, 2003. Final Environmental Impact Statement, Beaufort Sea Planning Area, Oil and Gas Lease Sales 186, 195, and 202 (OCS EIS/EA MMS 2003-001) Alaska OCS Region. February 2003

Department of the Interior, Minerals Management Service, 2004. Environmental Assessment, Proposed Oil and Gas Lease Sale 195, Beaufort Sea Planning Area (OCS EIS/EA MMS 2004-028) Alaska OCS Region. July 2004

Department of the Interior, Minerals Management Service, 2006. Final Programmatic Environmental Assessment, Arctic Ocean Outer Continental Shelf, Seismic Surveys – 2006 (OCS EIS/EA MMS 2006-038) Alaska OCS Region. June 2006

Department of the Interior, Minerals Management Service, 2006. Environmental Assessment, Proposed Oil and Gas Lease Sale 202, Beaufort Sea Planning Area (OCS EIS/EA MMS 2006-001) Alaska OCS Region. August 2006

Department of the Interior, Minerals Management Service, 2007. Environmental Assessment/Finding of No Significant Impact, Shell Offshore Inc. Exploration Plan. (OCS EIS/EA MMS 2007-009) Alaska OCS Region. February 2007

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Department of the Interior, Minerals Management Service, 2007. Final Environmental Impact Statement, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea (OCS EIS/EA MMS 2007-026) Alaska OCS Region. May 2007

Department of the Interior, Minerals Management Service, 2007. Environmental Assessment/Finding of No Significant Impact, Beaufort Sea OCS: Deep Penetration Seismic Survey, Minerals Management Service and Geophysical and Geophysical Permit Application 07-04, Shell Offshore, Inc. Alaska OCS Region. July 12, 2007

Shell Offshore Inc. 2007. Application for Incidental Harassment Authorization for the Non-lethal Taking of Whales and Seals in Conjunction with a Proposed Open Water Seismic and Marine Survey Program in the Chukchi and Beaufort Seas, Alaska, During 2008-2009. Prepared by ASRC Energy Services and LGL Alaska Research Associates, Inc. October 2007. 52 pages + attachments.

Shell Offshore Inc. 2007. Marine Mammal Monitoring and Mitigation Plan for Seismic Exploration in the Alaskan Chukchi and Beaufort Seas, 2008. Prepared by LGL Alaska Research Associates, Inc. October 2007. 52 pages.

Shell Offshore Inc. 2007. Geological and Geophysical Permit Application (Forms MMS-327 and MMS-328) for proposed 2008 3D Seismic Exploration Program in the Outer Continental Shelf of the Beaufort Sea, Alaska. Submitted to Minerals Management Service Alaska OCS, Anchorage, AK. November 1, 2007.

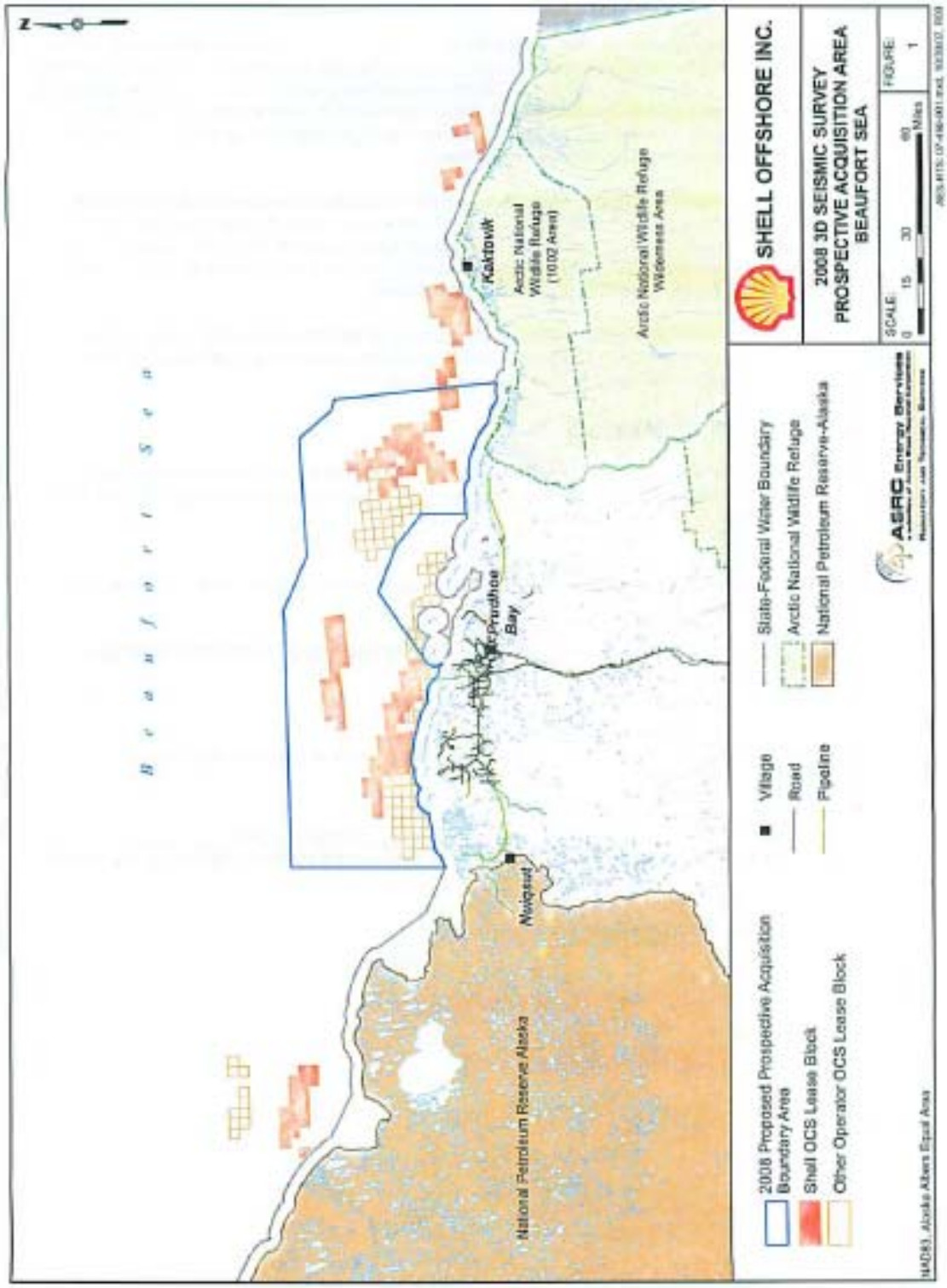

Figure 1. Shell Offshore Inc.'s 2008 3D seismic survey prospective acquisition area, Beaufort Sea.

Table 1. The following table compares the key features of the proposed activities in the SOI's G&G permit application (PA 08-04) for deep penetration 3D seismic survey activities in the Beaufort Sea OCS with the scope of seismic survey activities environmentally assessed in the 2006 Final Seismic PEA/FONSI.

Comparative Factor	2006 Final Seismic PEA/FONSI Scenario	Shell Offshore, Inc. Proposed Seismic Survey Activities (PA 08-04)
Geographic Survey Area	Chukchi Sea OCS Beaufort Sea OCS	Beaufort Sea OCS
Survey Type	2D/3D streamer ocean-bottom-cable high resolution, site-clearance	Open water, 3D deep penetration
Seismic Survey Season.	July 1 to December 31	August 1 to November 15
Number of Seismic Surveys Being Conducted Simultaneously	4	1
Number of Seismic Source Vessels	1 - 2 seismic source vessels per seismic survey	1
Source Arrays	1 - 3 source arrays	2
Airgun Array Size	1,800 - 4,000 cubic inches	~3,000 cubic inches
Receiver Streamers (3D seismic)	4 - 12 streamer-receiver cables, each cable could be 3 - 8 kilometers long	6 - 8 streamer-receiver cables, each cable would be ~6 kilometers long
Streamer Array Width (3D seismic)	400 - 900 meters	600 - 800 meters
Streamer Buoyancy	liquid paraffin or solid/gel	liquid paraffin (isopar)
Support Vessels	Up to 3 per survey (including crew boats, supply boats, monitoring vessels, icebreakers)	1 or 2 chase/guard boats, 1 crew change vessel, 1 landing craft
Aircraft	Fixed-wing aircraft and helicopters	Twin Otter will be used for aerial surveys and support, if necessary.

Appendix 1: Recommended environmental protection measures to accompany the Geological and Geophysical Permit (08-04) the Mineral Management Service (MMS) is considering issuing to Shell Offshore Inc., who is planning to conduct 3D deep penetration seismic surveys in the Beaufort Sea Outer Continental Shelf (OCS) during the 2008 open water season.

- No solid or liquid explosives shall be used without specific approval.
- Permittee operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Permittee operations shall maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permittee operators shall use the lowest sound levels feasible to accomplish their data-collection needs.
- Vessels and aircraft shall avoid concentrations or groups of whales. Permittee operators shall, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, shall aircraft be operated at an altitude lower than 1,000 feet above sea level (ASL) when within 1,500 lateral feet of groups of whales. Helicopters shall not hover or circle above such areas or within 1,500 lateral feet of such areas.
- When weather conditions do not allow a 1,000-foot ASL flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot ASL altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet ASL because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 1,500 feet of groups of whales.
- When the Permittee operates a vessel near a concentration of whales, every effort and precaution shall be taken to avoid harassment of these animals. Therefore, vessels shall reduce speed when within 900 feet of whales and those vessels capable of steering around such groups should do so. Vessels shall not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators shall avoid multiple changes in direction and speed when within 900 feet of whales. In addition, operators shall check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.

- Small boats shall not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels shall adjust speed accordingly to avoid the likelihood of injury to whales.
- When any operator becomes aware of the potentially harassing effects of operations on whales, or when any operator is unsure of the best course of action to avoid harassment of whales, every measure to avoid further harassment shall be taken until the National Marine Fisheries Service (NMFS) is consulted for instructions or directions. However, human safety shall take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of whales.
- The Permittee shall notify MMS, NMFS, and U.S. Fish and Wildlife Service (FWS) in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays shall not be towed in the vicinity of fragile biocenoses (e.g., the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. The Permittee shall report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, seismic and surface support vessels will minimize the use of high-intensity work lights, especially within the 20-meter-bathymetric contour. High-intensity lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they shall be turned off. Deck lights, interior lights, and lights used during navigation could remain on for safety.[1]
- All bird collisions (with vessels and aircraft) shall be documented and reported within 3 days to MMS. Minimum information shall include species, date/time, location, weather, identification of the vessel or aircraft involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Permittees/operators are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

The following monitoring and mitigation measures are related to the requirements of the Marine Mammal Protection Act (MMPA) and Endangered Species Act. However, final mitigation and monitoring requirements defined in any NMFS [the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus] and FWS (the Federal agency in having MMPA management authority for Pacific walrus, polar bear, and sea otter) incidental take authorization (ITA) and/or Letters of

[1] Nothing in this mitigation measure is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

Authorization (LOA) obtained by the seismic survey operator will have precedence over any related measures listed below:

- **Exclusion Zone** – A 180/190 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level A harassment (injury).The 180 dB applies to cetaceans and the Pacific walrus, and the 190 dB applies to pinnipeds other than the Pacific walrus. The exclusion zones specified in ITAs and/or LOAs will take precedence over the MMS-identified exclusion zone.
- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the marine mammal monitoring program and observers.
- **Shut Down/Power Down** – A seismic survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal in no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or whenever sighting conditions allow for the exclusion zone to be effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.
- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at 20-to-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.
- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than solely relying on modeling techniques before entering the field. When moving a seismic-survey operation

into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.

- **Reporting Requirements** –Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.
- **Walrus**- Vessels and aircraft should avoid concentrations or groups of walruses. Operators should, at all times, conduct their activities at a maximum distance from such aggregations. Seismic-survey and associated support vessels shall observe a 0.5-mile safety radius around Pacific walrus groups hauled out onto land or ice. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,500 feet ASL when within 0.5-mile of walrus groups. Helicopters may not hover or circle above such areas or within 2,500 lateral feet of such areas.
- **Polar Bear –** Seismic survey operators shall adhere to any mitigation measures identified by the FWS to protect polar bears from being harassed and/or injured.