## Shell Exploration & Production

U.S Fish and Wildlife Services
Marine Mammals Management
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September 16, 2014

**Re: Requests for Letter of Authorization (LOA) for the Incidental Take of Polar Bears and Pacific Walrus, and the Intentional Take of Polar Bears and Walrus by Harassment; Exploration Drilling Program, Chukchi Sea, Alaska**

Dear Mr. Perham:

Shell Gulf of Mexico Inc. (Shell) hereby requests Letters of Authorization (LOAs) from the U.S. Fish and Wildlife Service (USFWS) for the non-lethal incidental, unintentional "take" of small numbers of Polar Bears and Pacific Walrus, and the intentional take of Polar Bears and Walrus by harassment, which may occur during execution of Shell's Outer Continental Shelf (OCS) exploration drilling program during 2015 in the, Chukchi Sea, Alaska. This letter is submitted to fulfill the requirements regarding incidental, unintentional take of protected marine mammals pursuant to 50 Code of Federal Regulations (CFR) Part 18 and intentional take of polar bears and walrus pursuant to Sections 101(a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act of 1972, as amended. The governing regulations for incidental take (73 FR 33212) are entitled, *Nonlethal Taking of Pacific Walruses and Polar Bears Incidental to Oil and Gas Exploration Activities in the Chukchi Sea and Adjacent Coast of Alaska*.

As described in the attached supporting documentation, Shell's exploration drilling program, which began in 2012 will continue as planned for various U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM) OCS lease blocks in the Chukchi Sea. Shell's exploration drilling activities in the Chukchi Sea are planned to begin on or about July 4th and run through October 31st.

As part of the application for obtaining an LOA for exploration drilling in the Chukchi Sea, Shell developed a Plan of Cooperation (POC) in accordance with 50 CFR§18.124(c)(4) that that was submitted to USFWS in May 2009 and updated as Addenda to the POC in 2011 and 2012. This POC was described in our initial Chukchi Sea EP in May 2009, and the now approved EP in 2011. This POC has been updated for the continuation of exploration activities as described in the approved Chukchi Sea EP. The POC Addendum documents meetings undertaken to specifically inform North Slope stakeholders and obtain their input. The initial POC and POC Addendum mitigate the effects of Shell's exploration drilling program where exploration activities would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses. The POC and POC Addendum were prepared in consultation with affected Beaufort and Chukchi Sea communities, marine mammal commissions, and subsistence groups. During these consultations, Shell focused on lessons learned from prior year's activities and presented mitigation measures for avoiding potential conflicts, which are outlined in the POC Addendum included with Shell's current LOA application.

Any potential impacts from the approved Chukchi Sea exploration drilling program on the polar bear and Pacific walrus populations of the Chukchi Sea will be short-term and transitory (i.e., the temporary displacement of individuals or small groups of marine mammals that may be exposed to the planned activities). The planned activities will not result in any permanent impact on habitats used by marine mammals or their prey. As outlined in the attached documents, Shell will take appropriate measures to prevent unreasonable impacts on the availability of marine mammals for subsistence users.

Items required pursuant to 50 CFR 18 are attached. Items include:

1. Polar Bear, Pacific Walrus, and Grizzly Bear Avoidance and Human Encounter/Interaction Plan, *Exploration Drilling Program, Chukchi Sea, Alaska* (which includes a complete description of proposed activities),
2. Marine Mammal Monitoring and Mitigation Plan (Attachment B to the Polar Bear, Pacific Walrus, and Grizzly Bear Avoidance and Human Encounter/Interaction Plan); and
3. POC Addendum (Attachment H to the Polar Bear, Pacific Walrus, and Grizzly Bear Avoidance and Human Encounter/Interaction Plan).

If you have any questions regarding this submission, please contact me at (907) 646-7112 or at Susan.Childs@Shell.com, or Greg Horner at (907) 646-7131 or at Greg.Horner@Shell.com.

Thank you,

Susan Childs
Alaska Venture Support Integrator, Manager

*Enclosure:*

Polar Bear, Pacific Walrus, and Grizzly Avoidance and Human Encounters/Interaction Plan

# Polar Bear, Pacific Walrus, and Grizzly Bear Avoidance and Human Encounter/Interaction Plan Exploration Drilling Program Chukchi Sea, Alaska

**September 2014**

**Prepared by:**

Shell Gulf of Mexico Inc.
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Ice Management Plan

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Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses

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Marine Mammal Monitoring and Mitigation Plan (4MP)

Attachment C

Bear Avoidance and Encounter Procedures

Attachment D

Wildlife Notification Flow Chart

Attachment E

Polar Bear Sighting Report

Attachment F

Grizzly Bear Observation Form

Attachment G

Walrus Sighting Report

Attachment H

Plan of Cooperation Addendum

# ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 4MP | Marine Mammal Monitoring and Mitigation Plan |
| ACS | Alaska Clean Seas |
| ADF&G | Alaska Department of Fish and Game |
| *Aiviq* | Anchor Handler M/V *Aiviq* |
| AMP | Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses |
| *Arctic Challenger* | Oil Spill Containment System Barge *Arctic Challenger* |
| *Arctic Seal* | Shallow Water Vessel M/V *Arctic Seal* |
| bbl | Barrels |
| BOEM | Bureau of Ocean Energy Management |
| BSEE | Bureau of Safety and Environmental Enforcement |
| CFR | Code of Federal Regulations |
| $cm^3$ | Cubic Centimeter(s) |
| *Corbin Foss* | Oil Spill Containment System Tug M/V *Corbin Foss* |
| DIMP | Drilling Ice Management Plan |
| *Discoverer* | M/V Noble *Discoverer* |
| *Endeavor* | Barge *Endeavor* |
| Exploration Drilling Program | Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, Revision 2 |
| ESA | Endangered Species Act |
| ft. | Foot/Feet |
| FR | Federal Register |
| *Guardsman* | OSR Tug M/V *Guardsman* |
| IMP | Ice Management Plan |
| $in^3$ | Cubic Inch(es) |
| *Klamath* | OSR barge *Klamath* |
| km | Kilometer(s) |
| LOA | Letter of Authorization |
| m | Meter(s) |
| $m^3$ | Cubic Meter(s) |
| mi | Mile(s) |
| MLC | Mudline Cellar |
| MMPA | Marine Mammal Protection Act |
| MODU | Mobile Offshore Drilling Unit |
| *Nanuq* | Oil Spill Response Vessel M/V *Nanuq* |
| *Nordica* | Ice Management Vessel M/V *Nordica* |
| OCS | Outer Continental Shelf |
| OSRP | Oil Spill Response Plan |
| OSR | Oil Spill Response |
| OST | Oil Storage Tanker |
| OSV | Offshore Supply Vessel |
| POC | Plan of Cooperation |
| *Point Oliktok* | Tug M/V *Point Oliktok* |
| *Polar Pioneer* | MODU Transocean *Polar Pioneer* |
| PSO | Protected Species Observer |
| RS/FO | Regional Supervisor/Field Operations |
| SAR | Search and Rescue |

| | |
|---|---|
| Shell | Shell Gulf of Mexico Inc. |
| U.S. | United States |
| USFWS | U. S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| VSI | Vertical Seismic Imager |
| VSP | Vertical Seismic Profile |
| WCD | Worst Case Discharge |
| ZVSP | Zero-Offset Vertical Seismic Profile |

# 1.0 INTRODUCTION

This Polar Bear, Pacific Walrus, and Grizzly Bear Avoidance and Human Encounter/Interaction Plan has been developed by Shell Gulf of Mexico Inc. (Shell) in support of its Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, Revision 2 (Exploration Drilling Program), which began in the summer of 2012. Shell plans to continue this exploration drilling program in 2015 and several years thereafter.

## 1.1 Background

The Plan details the policies and procedures to be implemented at Shell's operations across Alaska's North Slope and in the Chukchi Sea. The Plan is intended to support activities that may encounter polar bears (Ursus maritimus) and Pacific walrus (Odobenus rosmarus divergens), both trust species of the U.S. Fish and Wildlife Service (USFWS), as well as grizzly bears (Ursus arctos horribilis), which are under the jurisdiction of the Alaska Department of Fish and Game (ADF&G). Even though the chance of interactions with grizzly bears is extremely remote in this offshore exploration drilling program, the Plan includes discussion and guidance for avoiding them.

The Plan ensures that workers are familiar with the issues and safety precautions associated with working in bear country. The goal of this document is to standardize bear interaction and avoidance protocol and wildlife reporting efforts for the project. With proper knowledge and training, workers will detect the presence of bears and walrus quickly and respond appropriately through monitoring, avoidance, and/or, if necessary, active deterrence by USFWS certified bear hazers. The awareness and prevention of human/bear and human/walrus interactions will ensure the safety of workers as well as wildlife.

This Plan supports Shell's request for authorization for the incidental, non-lethal, unintentional take of polar bear and Pacific walrus, under the current Chukchi Sea incidental take regulations (ITRs; promulgated June 12, 2013, pages 35364-35427 of Federal Register, Vol. 78, No. 113); developed under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA) to allow for incidental, but not intentional, take of small numbers of marine mammals that may occur while conducting otherwise lawful activities within a specific geographical region. This Plan fulfills the requirement for a "site specific polar bear awareness and interaction plan," as required by 50 Code of Federal Regulations (CFR) 18.124(c)(3), which is part of the requirements for a Letter of Authorization (LOA) for the incidental, non-lethal, unintentional take of polar bear and Pacific walrus as specified under 50 CFR 18, Subpart J. This Plan also applies to the intentional take of polar bears and walrus by hazing pursuant to section 101(a)(4)(A), 109(h), and 12(e) of the MMPA. The MMPA prohibits, with certain exceptions, the "taking" of marine mammals. A "Take" is defined as, "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal." The "taking" of polar bears is allowed for Alaska Native subsistence or to protect human life. The MMPA and supporting regulations make provision to "take" marine mammals in the course of scientific research and other legitimate work in polar bear habitat.

On May 15, 2008, the polar bear was listed as a threatened species under the Endangered Species Act (ESA). In June 2008, a special rule under authority of section 4(d) of the ESA was adopted, which states that the regulatory requirements under the ESA are met by following the requirements of the MMPA, including obtaining a LOA. The USFWS designated critical habitat for polar bears on December 7, 2010. On January 10, 2013, the U.S. District Court for the District of Alaska issued an order vacating and remanding to the Service the designation. Therefore, at this time, there is no critical habitat designated for the polar bear. The grizzly bear is not protected in Alaska under the MMPA or ESA, but is protected by State game laws.

Like polar bears, Pacific walrus are also protected under the MMPA. Also, as of February 10, 2011 the USFWS published its 12-month finding that listing the Pacific walrus as endangered or threatened under

the ESA is warranted. With the publication of the 12-month finding, USFWS has added the walrus to the candidate species list. Consistent with section 4(b)(3)(C)(iii) of the ESA, USFWS will review the status of the Pacific walrus through an annual Candidate Notice of Review.

## 1.2 Proposed Exploration Plan

The locations of lease blocks where the planned exploration drilling will occur, and the locations of activities in support of exploration drilling, are located in Figure 1.2-1. Shell plans to use two drilling units the Motor Vessel Noble *Discoverer* (*Discoverer*) and semi-submersible Transocean *Polar Pioneer* (*Polar Pioneer*) to drill the exploration wells. The drilling units will be accompanied by support tugs, ice management vessels, oil spill response (OSR) vessels, and other support vessels during the exploration drilling program.

### Anticipated Duration of this Permit

Shell anticipates that the LOA issued by USFWS for the planned Chukchi Sea exploration drilling program will be valid from the date of issuance through the conclusion of the 2015 drilling season. Exploration drilling activities in the Chukchi Sea will continue until on or about 31 October, while the unmooring of the drilling units and movement off-site of the drilling units and support vessels may continue into November. Transit entirely out of the Chukchi Sea by all vessels associated with exploration drilling may take well into the month of November due to ice, weather, and sea states.

### Timing of Mobilization and Demobilization of the Drilling Units

The drilling units will move through the Bering Strait and into the Chukchi Sea on or after 1 July and then onto the Burger Prospect as soon as ice and weather conditions allow. Exploration drilling activities will continue until on or about 31 October, the drilling units and support vessels will exit the Chukchi Sea at the conclusion of each exploration drilling season. Transit entirely out of the Chukchi Sea by all vessels associated with exploration drilling may take well into the month of November due to ice, weather, and sea states.

### Exploration Drilling

Shell plans to continue its exploration drilling program on Bureau of Ocean Energy Management (BOEM) Alaska Outer Continental Shelf (OCS) leases at drill sites greater than 64 miles (mi) (103 kilometers [km]) from the Chukchi Sea coast during the 2015 drilling season (Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, Revision 2 [Exploration Drilling Program]) (Figure 1.2-1).

During 2012, Shell drilled a partial well at the drill site Burger A. In 2015, Shell plans to conduct exploration drilling activities at up to four drill sites at the Burger Prospect (Table 1.2-1). It is presumed that it may take several seasons to complete all six of the wells shown in Table 1.2-1. As with any Arctic exploration drilling program, weather and ice conditions, among other things, will dictate actual operations.

This plan also contemplates a situation where a well that has been started, may be temporarily abandoned due to ice, weather, or other conditions, and finished later in the same drilling season. Work completed at the Burger A well in 2012 included drilling and completing the tophole section of the well (this includes the mudline cellar (MLC), the 36 in. casing section and the 26 in casing section). Burger A did not reach a depth at which a vertical seismic profile (VSP) would be conducted, so none occurred in 2012. If the final well in a drilling season cannot reach objective depth by the end of the drilling season, the well will be suspended in compliance with applicable BSEE regulations and with the approval of the Regional Supervisor, Field Operations (RS/FO). Shell may conduct a geophysical survey referred to as a zero-

offset vertical seismic profile (ZVSP) at each drill site where a well is drilled. Once the objective intervals are fully evaluated, each well will be plugged and abandoned in compliance with BSEE regulation.

**Table 1.2-1 Drill Site Locations and Water Depths**

| Drill Site | Approximate Distance from shore (statute miles) | Lease Block No. | Surface Location (NAD 83) | | Water Depth |
|---|---|---|---|---|---|
| | | | Latitude (North) | Longitude (West) | Feet/Meters |
| Burger A[1] | 75 | 6764 | 71° 18' 30.92" | 163° 12' 43.17" | 150/45.8 |
| Burger F | 76 | 6714 | 71° 20' 13.96" | 163° 12' 21.75" | 149/45.4 |
| Burger J | 69 | 6912 | 71° 10' 24.03" | 163° 28' 18.52" | 144/44.0 |
| Burger R | 75 | 6812 | 71° 16' 06.57" | 163° 30' 39.44" | 143/43.7 |
| Burger S | 78 | 6762 | 71° 19' 25.79" | 163° 28' 40.84" | 147/44.9 |
| Burger V | 65 | 6915 | 71° 10' 33.39" | 163° 04' 21.23" | 147/44.7 |

[1] Burger A drill site where a partial well was started in 2012

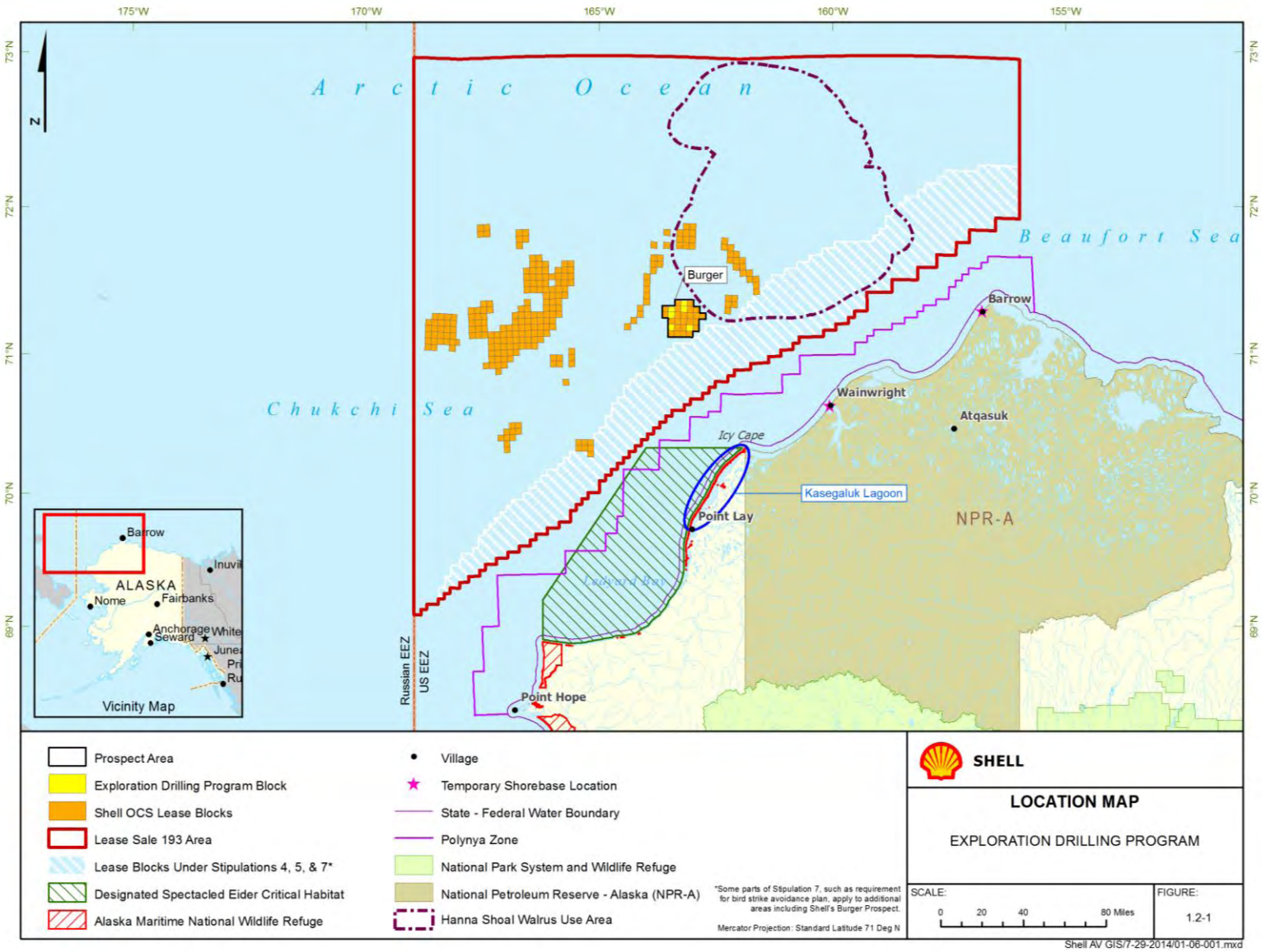
## Drilling Units

All planned exploration drilling in the identified lease blocks will be conducted with the *Discoverer* and the *Polar Pioneer*.

The *Discoverer* is a turret moored self-propelled drillship. Station keeping is accomplished using a turret-moored, 8-point anchor system. The underwater fairleads prevent ice fouling of the anchor lines. Turret mooring allows orientation of the vessel's bow into the prevailing metocean conditions to present minimum hull exposure to drifting ice. The vessel is rotated around the turret by hydraulic jacks. Rotation can be augmented by the use of the fitted bow and stern thrusters. Ice-strengthened sponsons have been retrofitted to the drillship's hull. The *Discoverer* is classed by Det Norske Veritas (DNV) as a MODU for worldwide service. It is a "1A1 Ship-Shaped Drilling Unit l" and is capable of performing drilling operations offshore of Alaska.

The *Polar Pioneer* is also classed by DNV as a MODU for worldwide service. It is a non-self-propelled, "SPM thruster assisted" semisubmersible offshore drilling unit of twin-hull configuration. The rig is a "+ A1 Column Stabilized Unit" and is capable of performing drilling operations offshore of Alaska. Positioning is accomplished with a combination of an eight-point all chain catenary mooring system and thruster assisted mooring system.

**Figure 1.2-1 Planned Exploration Drilling Area**



## Support Vessels

During this exploration drilling program, the *Discoverer* and *Polar Pioneer* will be supported by the types of vessels listed in Table 1-2-2.

Two ice management vessels will support the drilling units. These vessels will enter and exit the Chukchi Sea with or ahead of the drilling units, and will generally remain in the vicinity of the drilling units during the drilling season. Ice management and ice scouting is expected to occur at distances of 20 mi (32 km) and 30 mi (48 km) respectively. However, these vessels may have to expand beyond these ranges depending on ice conditions.

Up to three anchor handlers will support the drilling units. These vessels will enter and exit the Chukchi Sea with or ahead of the drilling units, and will generally remain in the vicinity of the drilling units during the drilling season. When the vessels are not anchor handling, they will be available to provide other general support. Two of the three anchor handlers may be used to perform secondary ice management tasks if needed.

The planned exploration drilling operations will use three offshore supply vessels (OSVs) for resupply of the drilling units and support vessels. Drilling materials, food, fuel, and other supplies will be picked up in Dutch Harbor (with possible minor resupply coming out of Kotzebue) and transported to the drilling units and support vessels.

Shell plans to use up to two science vessels; one for each drilling unit, from which sampling of drilling discharges (drill discharge monitoring) would be conducted. The science vessel specifications are based on larger OSVs, but smaller vessels may be used.

Two tugs will tow the *Polar Pioneer* from Dutch Harbor to the Burger Prospect. After the *Polar Pioneer* is moored, the tugs will remain in the vicinity of the drilling units to help move either vessel in the event that either drilling unit has to be moved off the drilling site due to ice or any other event.

Shell may deploy a mudline cellar remotely operated vehicle (MLC-ROV) system from an OSV type vessel that could be used to construct MLCs prior to the drilling units arriving. If used, this vessel would be located at a drill site on the Burger Prospect. When not in use, the vessel would be outside of the Chukchi Sea lease sale planning area.

**Table 1.2-2 Chukchi Sea Exploration Drilling Program – Proposed Vessel List**

| Specification | Ice Management Vessel (x2)[2] | Anchor Handler (x3)[3] | OSV (x3)[4] | Drilling Discharge Monitoring Science Vessel (x2)[5] | Shallow Water Vessel (x2)[6] | Support Tugs (x2)[7] | Resupply Tug and Barges (x2)[8] | | MLC ROV Vessel[9] |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Tug | Barge | |
| Length | 380 ft. (116 m) | 361 ft. (110.1 m) | 300 ft. (91.5 m) | 300 ft. (91.5 m) | 134 ft. (40.8 m) | 146 ft. (44.5 m) | 150 ft. (45.7 m) | 400 ft. (122 m) | 280 ft. (85.3 m) |
| Width | 85 ft. (26 m) | 80 ft. (24.4 m) | 60 ft. (18.3 m) | 60 ft. (18.3 m) | 32 ft. (9.7 m) | 46 ft. (14 m) | 40 ft. (12.2 m) | 99.5 ft. (30.3m) | 60 ft. (18.3 m) |
| Draft | 27 ft. (8.4 m) | 28 ft. (8.5 m) | 15.9 ft. (4.9 m) | 15.9 ft. (4.9 m) | 6 ft. (1.8 m) | 21 ft. (6.4 m) | 19.5 ft. (5.9 m) | 25 ft. (7.6 m) | 16.5 ft. (5 m) |
| Accommodations | 82 | 64 | 50 | 50 | 22 | 13 | 11 | -- | 26 |
| Maximum Speed | 16 knots (30 km/hr.) | 15 knots (28 km/hr.) | 13 knots (24 km/hr.) | 13 knots (24 km/hr.) | 10 knots (18 km/hr.) | 16 knots (30 km/hr.) | 12 knots (22 km/hr.) | -- | 13 knots (24 km/hr.) |
| Available Fuel Storage | 14,192 bbl (2,256m$^3$) | 11,318 bbl (1,799 m$^3$) | 5,786 bbl (920 m$^3$) | 5,786 bbl (920 m$^3$) | 667 bbl (106 m$^3$) | 5,585 bbl (888 m$^3$) | 4,800 bbl (774 m$^3$) | -- | 6,233 bbl (991 m$^3$) |

[1] Or similar *vessel*
[2] *Based on Nordica or similar vessel*
[3] Based on *Aiviq* or similar vessel
[4] Based on the *Harvey Champion* or similar vessel
[5] Based on the *Harvey Champion* or similar vessel
[6] Based on the *Arctic Seal*
[7] Based on the tug *Ocean Wave*
[8] Based on the *Lauren Foss* (tug) and *Tuuq* (barge)
[9] Based on the *Harvey Spirit*

## Oil Spill Response Vessels

The OSR vessel types supporting the exploration drilling program are listed in Table 1.2-3.

One dedicated OSR barge and on-site OSRV will be staged in the vicinity of the drilling unit(s) when drilling into potential liquid hydrocarbon bearing zones. This will enable the OSRV to respond to a spill and provide containment, recovery, and storage for the initial response period in the unlikely event of a well control incident.

The OSR barge, and an associated tug, and OSRV possess sufficient storage capacity to provide containment, recovery, and storage for the initial operational period. Shell plans to use two oil storage tankers (OSTs). An OST will be staged at the Burger Prospect. This tanker will hold fuel for Shell's drilling units, support vessels, and have space for storage of recovered liquids in the unlikely event of a well control incident. A second OST will be stationed outside the Chukchi Sea lease sale planning area and will be sited such that it will be able to respond to a well control event before the first tanker reaches its recovered liquid capacity.

The tug and barge will be used for nearshore OSR. The nearshore tug and barge will be moored near Goodhope Bay, Kotzebue Sound. The nearshore tug and barge will also carry response equipment, including one 47 ft. (14 m) skimming vessel, 34 ft. (10 m) workboats, mini-barges, boom and duplex skimming units for nearshore recovery and possibly support nearshore protection. The nearshore tug and barge will also carry designated response personnel and will mobilize to recovery areas, deploy equipment and begin response operations.

**Table 1.2-3 Chukchi Sea Exploration Drilling Program – Proposed Oil Spill Response Vessel List**

| Specifications | OSRV [1,2] | Offshore OSR [1,3] | | Nearshore OSR[1,4] | | OST [1,5] | OST [1,6] | Containment System [1,7] | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tug | Barge | Tug | Barge | | | Tug | Barge |
| Length | 301 ft. (91.9 m) | 126 ft. (38.4 m) | 333 ft. (101.5 m) | 90 ft. (27.4 m) | 205 ft. (62.5 m) | 748 ft. (228 m) | 813 ft. (248 m ) | 150 ft. (45.7 m) | 316.5 ft. (96.5 m) |
| Width | 60 ft. (18.3 m) | 34 ft. (10.4 m) | 76 ft. (23.1 m) | 32 ft. (9.8 m) | 90 ft. (27.4 m) | 105 ft. ( 32 m) | 141 ft. (48 m) | 40 ft. (12.2 m) | 105 ft. (32 m) |
| Draft | 19 ft. (5.8 m) | 17 ft. (5.2 m) | 22 ft. (6.7 m) | 10 ft. (3 m) | 15 ft. (4.6 m) | 66 ft. (20 m) | 69 ft. (21 m) | 19.5 ft. (5.9 m) | 12.5 ft. (3.8 m) |
| Accommodations | 41 | 15 | -- | 8 | 25 | 25 | 25 | 11 | 72 |
| Maximum Speed | 16 knots (30 km/hr.) | 12 knots (22 km/hr.) | -- | 12 knots (22 km/hr.) | -- | 15 knots (28 km/hr.) | 15 knots (28 km/hr.) | 10 knots (19 km/hr.) | -- |
| Available Fuel Storage | 7,692 bbl (1,223 $m^3$) | 1,786 bbl (284 $m^3$) | 390 bbl (62 $m^3$) | 1,286 bbl (204.5 $m^3$) | -- | 16,121 bbl (2,563$m^3$) | 20,241 bbl (3,218 $m^3$) | 4,800 bbl (763 $m^3$) | 6,630 bbl (1,054 $m^3$) |
| Available Liquid Storage | 12,245 bbl (1,947 $m^3$) | -- | 76,900 bbl (12,226 $m^3$) | -- | 17,000 bbl (5,183 $m^3$) | 106,000 bbl8 (16,852 $m^3$) | 670,000bbl (106,518 $m^3$) | -- | -- |
| Workboats | (3) 34 ft. work boats | | -- | - | (1) skim boat 47 ft. (14 m) (3) work boats 34 ft. (10 m) (4) mini-barges | -- | -- | -- | -- |

[1] Or similar vessel
[2] Based on the *Nanuq*
[3] Based on the tug *Guardsman* (tug) and *Klamath* (barge)
[4] based on the Point Oliktok (tug) and *Endeavor* (barge)
[5] Based on a Panamax type tanker
[6] Based on an Aframax type tanker
[7] Based on the *Corbin Foss* (tug), *Arctic Challenger* (barge)
[8]Total available storage is 350,000 bbl; however, 244,000 bbl of ULSD or a fuel with equal or lower sulfur content (used to refuel the drilling units and support vessels) will take up storage space, leaving 104,000 bbl for recovered liquids. Storage space for recovered liquids will increase as fuel is dispensed for refueling.

## Aircraft

Offshore operations will be serviced by up to three helicopters operated out of an onshore support base in Barrow. The helicopters are not yet contracted. . Sikorsky S-92s (or similar) will be used to transport crews between the onshore support base and the drilling units and support vessels with helidecks. The helicopters will also be used to haul small amounts of food, materials, equipment, samples and waste between vessels and the shorebase. Approximately 40 Barrow to Burger Prospect round trip flights will occur each week to support the additional crew change necessities for an additional drilling unit, support vessels, required sampling and analytical requirements under the NPDES exploration facilities GP.

The route chosen will depend on weather conditions and whether subsistence users are active on land or at sea. These routes may be modified depending on weather and subsistence uses.

Shell will also have a dedicated helicopter for Search and Rescue (SAR). The SAR helicopter is expected to be a Sikorsky S-92 (or similar). This aircraft will stay grounded at the Barrow shorebase location except during training drills, emergencies, and other non-routine events. The SAR helicopter and crews plan training flights for approximately 40 hr. /month.

A fixed wing propeller or turboprop aircraft, such as Saab 340-B, Beechcraft 1900, or De Havilland Dash 8, will be used to transport crews, materials, and equipment between Wainwright and hub airports such as Barrow or Fairbanks. It is anticipated that there will be one round trip flight every three weeks.

A fixed wing aircraft, Gulfstream Aero-Commander (or similar), will be used for photographic surveys of marine mammals. These flights will take place daily depending on weather conditions. PSO flight paths are located in the Marine Mammal Monitoring and Mitigation Plan (4MP) (Attachment B).

An additional Gulfstream Aero Commander may be used to provide ice reconnaissance flights to monitor ice conditions around the Burger Prospect. Typically, the flights will focus on the ice conditions within 50 mi (80 km) of the drill sites, but more extensive ice reconnaissance may occur beyond 50 mi (80 km). These flights will occur at an altitude of approximately 3,000 ft. (915 m).

**Table 1.2-4 Trip Information for Support Aircraft**

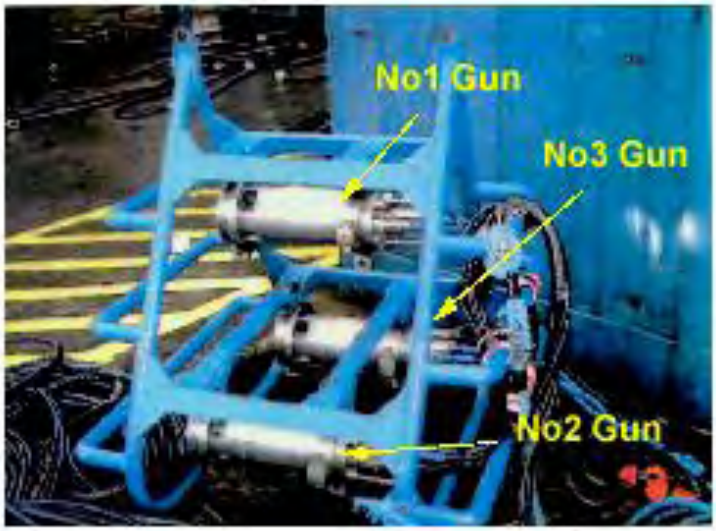
| Aircraft Type 1 / Purpose | Trip Frequency or Duration |
|---|---|
| (1) Saab 340 B, Beechcraft 1900, Dash 8, or similar fixed-wing aircraft for transport from shorebase to regional jet service in Deadhorse or Barrow | 1 trip every 3 weeks between Wainwright and Barrow or Anchorage |
| (3) S-92, EC225, or similar helicopters for crew rotation & groceries/supply | Approximately 40 round trips/week between shorebase & prospect – approx. 3.0 hr./trip |
| (1) S-61, S-92, EC225, or similar helicopter for search-and-rescue | Stationed in Barrow – 40 hr./month for proficiency training & trips made in emergency |
| (2) Gulfstream 690 Aero Commander (or similar) | Photographic marine mammal surveys and ice reconnaissance; both to occur daily when possible |

[1] Similar model of aircraft may be contracted for these purposes

## Shorebase Locations

Barrow and/or Wainwright have been selected as the temporary shorebase locations for the Chukchi Sea exploration drilling program. However, no exploration drilling program activities are planned to occur onshore. Nearshore or onshore incursions by exploration drilling program support activities (e.g., OSR training exercises) may occur at the shorebase in Wainwright, on a limited basis. The Barrow shorebase will be used as the primary airbase for crew changes and SAR between land and the drilling units and for temporary housing for these crewmembers. This interaction plan therefore includes interaction and awareness guidance for workers regarding grizzly bears, and polar bears that may be present in the nearshore or land. Interactions with grizzly bears are highly unlikely offshore, and at the shorebases as well. Pacific walrus are present in offshore and nearshore waters of the Chukchi Sea including the area of Shell's prospects, and observations of walrus are likely to occur during the exploration drilling program. All three species are addressed in this plan, although interactions and encounters grizzly bears are considered unlikely for this project.

**Figure 1.2-2 Three Airgun Array in Sled**




## Vertical Seismic Profile

Shell may conduct a geophysical survey referred to as a vertical seismic profile or VSP at each drill site where a well is drilled in 2015. During VSP surveys, an airgun array is deployed at a location near or adjacent to the drilling units, while receivers are placed (temporarily anchored) in the wellbore. The sound source (airgun array) is fired, and the reflected sonic waves are recorded by receivers (geophones) located in the wellbore. The geophones, typically a string of them, are then raised up to the next interval in the wellbore and the process is repeated until the entire wellbore has been surveyed. The purpose of the VSP is to gather geophysical information at various depths, which can then be used to tie-in or ground-truth geophysical information from the previous seismic surveys with geological data collected within the wellbore.

Shell will be conducting a particular form of VSP referred to as a ZVSP, in which the sound source is maintained at a constant location near the wellbore (Figure 1-2-3). Shell may use one of two typical sound sources: 1) a three-airgun array consisting of three 150 $in^3$ (2,458 $cm^3$) airguns, or 2) a two-airgun array consisting of two 250 in.3 (4,097 $cm^3$) airguns. Specifications for the maximum volume of the array are provided in Table 1.2-5. An airgun array is depicted within its frame or sled in the photograph below. Typical receivers would consist of a standard wireline four-level vertical seismic imager (VSI) tool, which has four receivers 50 ft. (15.2 m) apart.

**Figure 1.2-3 Schematic of ZVSP**

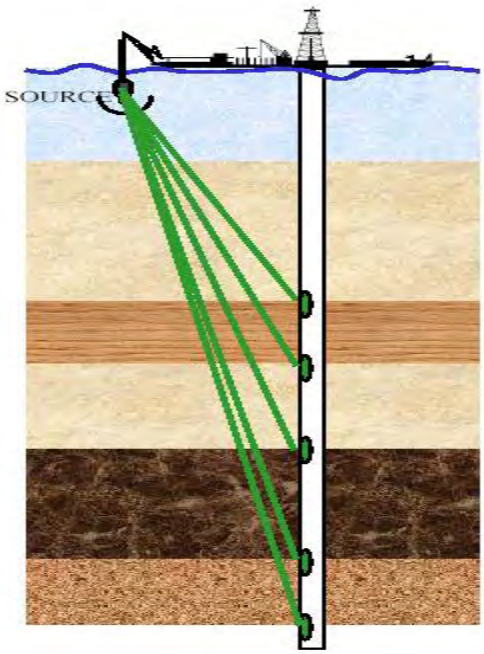



**Table 1.2-5 Sound Source (Airgun Array) Specifications for ZVSP Surveys in the Chukchi Sea**

| Source Type | No. Sources | Max. Total Chamber Size | Pressure | Source Depth | Zero-Peak Sound Pressure Level |
|---|---|---|---|---|---|
| Sleeve Array | (3) airguns<br>(3) 150 $in^3$ | 450 $in^3$<br>7,374 $cm^3$ | 3,000 psi<br>207 bar | 23 ft. (7.0 m) | 418 dB re1µPa @1m |
| Sleeve Array | (2) airguns<br>(2) 250 $in^3$ | 500 $in^3$<br>8,194 $cm^3$ | 3,000 psi<br>207 bar | 23 ft. (7.0 m) | 239 dB re1µPa @1m |

µPa – micropascal
dB - decibel

A ZVSP survey is normally conducted at each well after total depth is reached but may be conducted at a shallower depth. For each survey, Shell would deploy the sound source (airgun array) over the side of the *Discoverer* or *Polar Pioneer* with a crane (sound source will be 50-200 ft. (15-61 m) from the wellhead depending on crane location), to a depth of approximately 10-23 ft. (3-7 m) below the water surface. The SI, with its four receivers will be temporarily anchored in the wellbore at depth. The sound source will be pressured up to 3,000 pounds per square inch (psi) (207 bar), and activated 5-7 times at approximately 20-second intervals. The SI will then be moved to the next interval of the wellbore and re-anchored, after which the airgun array will again be activated 5-7 times. This process will be repeated until the entire wellbore is surveyed in this manner. The interval between anchor points for the SI is usually 200-300 ft. (61-91 m). A normal ZVSP survey is conducted over a period of about 10-14 hours depending on the depth of the well and the number of anchoring points.

## 1.3 Ice Management

Polar bears and walrus are strongly associated with sea ice so that ice management has the potential to affect individuals of these species. Shell also recognizes the exploration drilling program is located in an area that is characterized by active sea ice movement, ice scouring, and storm surges. In anticipation of potential ice hazards that may be encountered, Shell will implement its Drilling Ice Management Plan (DIMP) (see Attachment A) to ensure real-time ice and weather forecasting to identify conditions that might put operations at risk and modify its activities accordingly. Shell's DIMP relies heavily on the observations and experience of its Ice Specialists and Ice Advisors, a group of Arctic-seasoned mariners whose sole duty is to provide critical information and advise drilling unit supervisors and the drilling unit masters about any and all ice-related threats. These observers and advisors will be stationed on the drilling units, the ice management vessels and the anchor handlers. Shell's DIMP also contains ice threat classification levels depending on the time available to suspend drilling operations, secure the well, and escape from advancing hazardous ice. Real-time ice and weather forecasting will be available to personnel during operations for planning purposes and to alert all vessels and drilling units of impending hazardous ice and weather conditions. Ice and weather forecasting is provided by Shell's Ice and Weather Advisory Center (SIWAC). This center is continuously manned by experienced personnel who rely on a number of data sources for ice forecasting and tracking including:

- Radarsat data Synthetic Aperture Radar- provides all-weather imagery of ice conditions with very high resolution;
- Moderate Resolution Imaging Spectroradiometer (MODIS) - a satellite providing lower resolution visual and near infrared imagery;
- Other publically available remote sensing satellite data such as Visible Infrared Imaging Radiometer Suite, Oceansat-2 Scatterometer, and Advanced Very High Resolution Radiometer;
- Aerial reconnaissance - Opportunistic photographic and observational feedback from rotary or fixed wing aircraft;
- Reports from Ice Specialists on the ice management vessels and anchor handlers and from the Ice Observer on the drilling units;
- Incidental ice data provided by commercial ships transiting the area; and
- Information from the National Oceanic and Atmospheric Administration ice centers and the University of Colorado

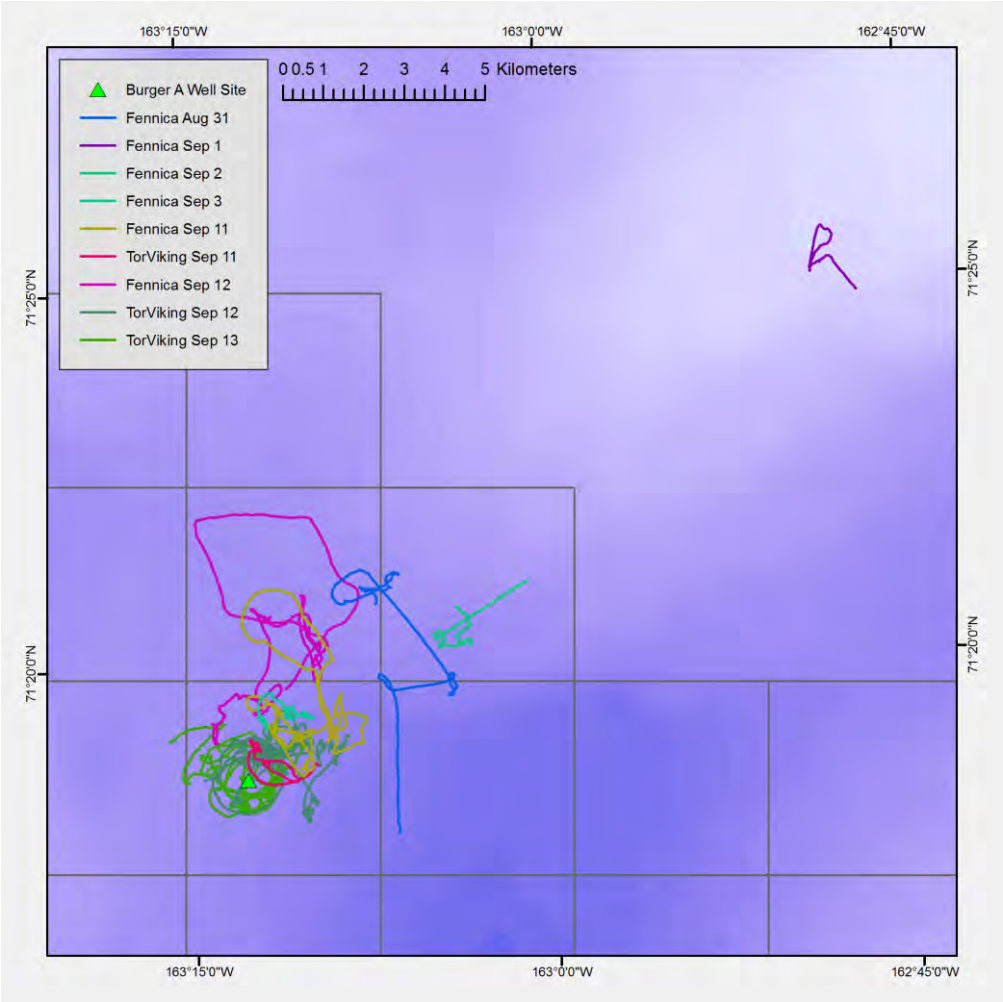
Marine mammal monitoring by PSOs is also ongoing while ice reconnaissance, ice management vessel movements and actions are underway with regard to ice-related threats. PSOs, operating under the guidance of the marine mammal monitoring and mitigation plan (4MP) (see Attachment B) for this exploration drilling program advise ice management specialists and advisors on the necessary mitigation measures while ice conditions are being reconned or is being managed by vessels. In order to address the prospect of ice management where walruses might be present, Shell developed an Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses Plan (AMP) (Attachment A-1) for use by PSOs and ice advisors in consultation with USFWS. This document displays Shell's commitment to protecting walruses during ice management and will be referenced during ice management where walruses might be present (Section 3.4). Shell's ice management vessels will consist of four vessels: two ice management vessels and two anchor handling vessels.

Drift ice will be actively managed by ice management vessels, consisting of the ice management vessels and anchor handling vessels. Ice management for safe operation of Shell's planned exploration drilling program will occur far out in the OCS, remote from the vicinities of any routine marine vessel traffic in the Chukchi Sea, thereby resulting in no threat to public safety or services that occur near to shore. Shell vessels will also communicate movements and activities through the 2015 North Slope Communications Centers (Com Centers). Management of ice by ice management vessels will occur during a drilling season

predominated by open water and thus will not contribute to ice hazards, such as ridging, override, or pileup in an offshore or nearshore environment.

The ice-management/anchor handling vessels would manage the ice by deflecting any ice floes that could affect the *Discoverer* or *Polar Pioneer* when they are drilling or anchor mooring buoys even if the drilling units are not anchored at a drill site. When managing ice, the ice management vessels will generally operate in 90° arc up to 32 km (20 mi) upwind of the *Discoverer*, since the wind and currents contribute to the direction of ice movement. Ice management will most likely occur between a point originating at the *Discoverer* up to 32 km (20 mi) or more, but might occur further away. Ice reconnaissance or ice scouting forays may occur out to 48.3km (30mi) from the drilling units and are conducted by the primary and/or secondary ice management vessels into ice that may exhibit the potential of moving into the vicinity of exploration drilling operations, such as a drilling unit anchored at a drill site, or in-place anchor moorings. These forays would provide the ship and shore-based ice advisors with the information required to deem whether or not active ice management is necessary, and when. The actual distances from the drilling units and the patterns of ice management (distances between vessels, and width of the swath in which ice management occurs) will be determined by the ice floe speed, size, thickness, and character, and wind forecast.

**Figure 1.3-1 Ice Management Vessels Configuration During 2012 in the Chukchi Sea**



The ice floe frequency and intensity are unpredictable and could range from no ice to ice densities that exceed ice management capabilities, in which case exploration drilling operations would be stopped and the *Discoverer* or *Polar Pioneer* disconnected from its anchors and moved off site. The *Discoverer* was disconnected from its moorings once during August 2012 to avoid a potential encounter with multi-year ice flows of sufficient size to halt operations. Advance scouting of ice primarily north and east of the Burger A well (see Figure 1.3-1) by the ice management vessels did not detect ice of sufficient size or thickness to warrant disconnecting the *Discoverer* from its moorings during the remainder of the 2012 season. If ice is present, ice management activities may be necessary in early July, at discrete intervals at other times during the season, and towards the end of operations in late October, despite Shell's experience in 2012, data regarding historic ice patterns in the Chukchi Sea indicates that it will not be required throughout the planned exploration drilling seasons. Figure 1.3-1 depicts the vessel tracts of the M/V *Fennica* and M/V *Tor Viking* in the Chukchi Sea from 31 August to 3 September and 11 September to 13 September 2012, during which active ice management occurred in relation to the location of Burger A. Combined, these vessel tracts show the patterns of ice management by vessel and the duration of time necessary for active ice management in 2012. In total, seven days of active ice management by vessels occurred in support of Shell's exploration drilling program occurred in the Chukchi Sea in 2012.

When ice is present at the drill site, ice disturbance will be limited to the minimum needed to allow drilling to continue. First-year ice will be the type most likely to be encountered. The ice management vessels will be tasked with managing the ice so that it will flow easily around and past the *Discoverer* or *Polar Pioneer* and its anchor moorings without building up in front of either. This type of ice is managed by the ice management vessel continually moving back and forth across the drift line, directly updrift of the *Discoverer* or *Polar Pioneer* and making turns at both ends, or in circular patterns. During ice management, the vessel's propeller is rotating at approximately 15 to 20 percent of the vessel's propeller rotation capacity. Ice management occurs with slow movements of the vessel using lower power and therefore slower propeller rotation speed (i.e., lower cavitation), allowing for fewer repositions of the vessel, and thereby reducing cavitation effects in the water. Occasionally, there may be multi-year ice ridges that would be managed at a much slower speed than that used to manage first-year ice.

As detailed in Shell's DIMP, in 2012 Shell's primary and secondary ice management vessels conducted ice management to protect moorings for the *Discoverer* after the drillship was moved off the Burger A well. This work consisted of re-directing flows as necessary to avoid their potential impact with mooring buoys. Actual breaking of ice may have to occur in the event that ice conditions in the immediate vicinity of operations create a safety hazard for the drilling units, or moorings. In such a circumstance, operations personnel will follow the guidelines established in Shell's DIMP to evaluate ice conditions and make the formal designation of a hazardous, ice alert condition, which would trigger the procedures that govern any actual icebreaking operations. Historical data relative to ice conditions in the Chukchi Sea in the vicinity of Shell's planned operations, and during the timeframe for those operations, establish that there is a low probability (i.e., minimal) for the type of hazardous ice conditions that might necessitate icebreaking (e.g., records of the National Naval Ice Center archives). This probability could be greater at the shoulders of the drilling season (early July or late October).

## 1.4 Oil Spill Response

Shell is committed to conducting safe and environmentally responsible operations in the Chukchi Sea. To achieve this goal, oil spill prevention is a primary priority in all aspects of operations. Shell's Chukchi Sea Regional Exploration Program Oil Spill Response Plan (OSRP) emphasizes the prevention of oil pollution by employing the best control mechanisms for blowout prevention, fuel transfer operations, as well as implementing mandatory prevention training programs for field operating personnel. Prevention training will include strict procedures and management practices to eliminate spills in all aspects of operations. All project personnel, including employees and contractors, involved in oil spill contingency prevention and response would receive prevention and response training as described in the OSRP. Training drills also would be conducted periodically to familiarize personnel with on-site equipment, proper deployment techniques, and maintenance procedures.

The likelihood of a large oil spill event is very low. Shell has designed a response program based upon a regional capability of responding to a range of spill volumes, from small operational spills up to and including the Worst Case Discharge (WCD) from an exploration well blowout. Shell's program is developed to fully satisfy the response planning requirements of the State of Alaska and federal oil spill planning regulations. The OSRP presents specific information on the response program that includes a description of personnel and equipment mobilization, the incident management team organization, and the strategies and tactics used to implement effective and sustained spill containment and recovery operations.

Shell provides dedicated response vessels and equipment for the onshore, nearshore and offshore operations. Response activities will be conducted using Shell or Alaska Clean Seas (ACS) tactics as defined in Shell's Beaufort and Chukchi Seas Regional Tactics Manual and/or the ACS Technical Manual, or otherwise as defined in the OSRP.

A dedicated OSRV and OSR tug and barge, possessing sufficient onboard storage capacity to provide containment, recovery, and storage for the initial 24-hour operational period, will be staged in the vicinity of the drilling units when drilling into potential liquid hydrocarbon bearing zones. The OSRV will also have three 34-ft (10-m) workboats.

Shell plans to use two OSTs. An OST will be staged at the Burger Prospect. This tanker will hold fuel for Shell's drilling units and support vessels in addition to storage space to store collected recovered liquids if there is a well control event. A second OST will be stationed outside the Chukchi Sea lease sale planning area and will be sited such that it will be able to respond to a well control event before the first tanker reaches its recovered liquid capacity.

A tug and barge will be used for nearshore OSR. This tug and barge will be moored in Kotzebue Sound. It will carry a 47-ft (14-m) skimming vessel, three 34-ft (10-m) workboats, four mini-barges, and boom and duplex skimming units for nearshore recovery.

Shell's oil spill containment system, housed on the Arctic Challenger barge, will be accompanied by a tug. The containment system will be moored in or near Goodhope Bay in Kotzebue Sound.

Shell is a member of the North Slope based Oil Spill Response Organization (OSRO), ACS. ACS may be used as a response action contractor for spill response activities in the Chukchi Sea Planning Area. In addition to ACS, contracted response organizations, AES-RO and ARS, will also be available while critical drilling operations are underway in hydrocarbon-bearing zones. These organizations may also provide response in the event of an actual oil spill incident, which includes related maintenance, ongoing assurance of response capabilities, and coordination of training activities.

The Wildlife Protection Plan is contained in Appendix I of the OSRP, and is supported by the ACS Technical Manual, Volume 1 Tactics W-1 through W-6. The Wildlife Protection Plan also includes procedures to provide for polar bears and walrus. The primary objective is to protect wildlife by preventing birds and mammals from entering spill or containment areas. Containment areas will be monitored until the USFWS and/or the ADF&G determine that monitoring is no longer required. In general, wildlife protection strategies include, but are not limited to;

- containment and controls to limit the spread of oil, and the area influenced by the spill and response options;
- The drillship has protected species observers (PSOs) aboard at all times;
- Hazing of birds and mammals;
- Capture and relocation of wildlife in direct threat; and
- Aircraft monitoring.

Refer to the following documents (not attached) for additional information;

- Chukchi Sea Regional OSRP Appendix I - Wildlife Response Plan;
- ACS Tactics Manual, Volume 1, Tactics Descriptions – Sections W1 through W6;and
- DRAFT "Oil Spill Response Plan for Polar Bears in Alaska", USFWS Marine Mammals Management, June 2010.

In the event of an accidental release that may impact shoreline resources additional certified bear guards and security staff would be deployed to protect workers and polar bears. Hazing equipment will be stored at the Deadhorse warehouse and office building. USFWS staff may also be deployed to provide additional oversight and consultation in the event of a major response. Section 3.5 of this plan outlines an adaptive management approach between Shell and the USFWS to protect polar bears and walrus in the unlikely event of an oil spill.

# 2.0 POLAR BEAR, GRIZZLY BEAR, AND PACIFIC WALRUS, PRESENCE DURING PLANNED EXPLORATION DRILLING ACTIVITIES OFFSHORE CHUKCHI SEA

## 2.1 Polar Bear

Polar bears are widely distributed at low densities throughout the Arctic. About 2,000 polar bears can be found in the Chukchi-Bering Sea stock which inhabits an area as far west as the extreme eastern portion of the Eastern Siberian Sea, as far east as Point Barrow, and as far south as the Bering Sea. A small portion of the Southern Beaufort Sea stock of polar bears also utilizes the Chukchi Sea, primarily during the ice-covered season.

Polar bears spend most of their time during summer on the drifting pack ice (ADF&G 2008a). Polar bears typically remain widely distributed in their range, as they are predominantly solitary animals. Polar bears in the Chukchi Sea spend most of their time near pack and annual ice over shallow, productive waters where their predominant prey of ice seals exist. Predominant polar bear distribution in the Chukchi Sea retreats north in the spring/summer with the retreating ice pack, then returns south in the fall as the ice pack again extends south. In the area of Shell's planned exploration drilling activities of the Chukchi Sea, polar bears are more abundant in May and June, then again in late October and November, but may be found in the area of Shell's prospects at any time throughout the drilling season. Polar bears were encountered near Shell's prospects during previous drilling efforts in 1989-1991, and a small number were observed during recent Shell baseline surveys conducted in the prospects in August and September of 2008.

Shell's exploration drilling program activities will begin approximately 4 July and will end on or about 31 October. There will likely be some sightings of polar bears during the exploration drilling program, with the number of bears depending on the amount of ice in the area. Nearshore sightings or encounters only are envisioned if Shell's marine vessels traveling to a shorebase observed such a bear. Bears have been known to venture inland, but this is not common. When polar bears emerge from dens with their cubs in the spring they start traveling on drifting sea ice and forage for food. Extra care is necessary at these times to properly store and dispose of food waste to prevent polar bear attraction and their entry into work areas. Polar bears will generally avoid human activities if they are not attracted by food and food wastes. U.S. Geologic Service (USGS) data document polar bear sightings and den locations (Fischbach et al. 2007). Polar bears typically exit their dens in March or April; therefore there would be no active dens during the exploration drilling program.

## 2.2 Pacific Walrus

A single stock of Pacific walrus inhabits the shallow continental shelf waters of the Bering and Chukchi seas. The distribution of walrus varies seasonally. Winter concentrations occur in the Bering Sea, while at other times of the year walrus are found in open leads, polynyas, on pack ice, and on island or shoreline haul outs in the Chukchi Sea. Most Pacific walrus migrate northward following the retreating ice pack during spring and return south during the fall. Migrations are directly related to the seasonal advance and retreat of the sea ice (ADF&G 2008b). During the summer months, Pacific walrus are widely distributed across the shallow continental shelf of the Chukchi Sea with the most significant concentrations in the ice pack within 62 mi (100 km) of the leading edge of the ice pack. If pack ice is not suitable, walrus haul out on land, but usually remain near their prey base. There are haul-outs along the eastern Chukchi shoreline at Cape Thompson, Cape Lisburne, and Icy Cape. Pacific walrus can also be expected in shallow waters near the coast or on ice closer to land.

USFWS surveys have estimated up to 101,213 walrus on the Chukchi Sea pack ice in September. Walrus distributions in the Chukchi Sea are highly dependent on the distribution and extent of seasonal pack ice. Walrus were observed in the area of the drillship and support vessels in previous exploration drilling efforts in 1989-1991, and some were observed in the vicinity of Shell's prospects during baseline surveys conducted July-October of 2008 and 2009. When Shell's exploration drilling program could be expected to be on location in the Chukchi, most walrus are assumed to be within the pack ice north of the prospects. The number of walrus that will be encountered during the planned exploration drilling program will depend on the amount of ice in the area.

## 2.3 Grizzly Bear

Grizzly bears are present on the North Slope during the summer months and may be present along the shoreline where they forage for food, taking advantage of whale or seal carcasses or eating human refuse. Given that the vast majority of exploration drilling activities are over 64 mi (103 km) offshore, and the habitat of the grizzly bear is onshore, it is extremely unlikely that interactions with grizzly bears will happen during drilling activities with the possible exceptions at the shorebase(s).

# 3.0 THE PLAN SPECIFIC OBJECTIVES AND ACTIONS

Because exploration drilling activities and/or support activities will be occurring in polar bear habitat and in areas where Pacific walrus and grizzly bear may occasionally be found, complete avoidance of these animals cannot be ensured. However, precautions detailed in this document can reduce the chances of human encounters and problems with bears and walrus.

Objectives of the Plan are to:

- prevent (avoid) bear/human and walrus/human encounters and interactions;
- educate workers about the controls used to prevent encounters and interactions;
- protect workers, bears and walrus during drilling activities, ice management and in the unlikely event of an oil spill; and
- implement reporting and observation procedures.

During the duration of the exploration drilling activities, Shell will utilize an existing 24 hour direct connection (duty line) to personnel from the USFWS.

## 3.1 Prevent Polar and Grizzly Bear/Human Interactions

There is always the potential for bear encounters during field activities even when all precautions are taken to avoid and eliminate attractants. Early detection of bears in the vicinity of operations is an essential element to prevent bear/human encounters. Bear avoidance and encounter procedures are presented in Attachment C. Workers will regularly and frequently observe their surroundings to detect bears in project areas. PSOs are the most likely personnel to notice bears or walrus because their job description requires them to look for and identify marine mammals (Attachment B) near project activities. They will be the primary support for project activities with the potential to encounter bears.

In contact situations, the main concern is to maintain the safety of personnel. The goal is to avoid and minimize potential conflict and bear/human interactions. Actions to take if bears are in the area:

- If a bear is observed, alert all on-site personnel so work activities can be altered or stopped to avoid interactions. Bear sightings will be reported to the designated representative.
- Depending on the distance between the bear and the activities, retreating to the safety of vessels, emergency shelter, or buildings or vehicles if an encounter occurs in developed onshore areas may be necessary.
- Personnel should give bears plenty of room and should not approach or crowd bears. Every bear has “personal space” the distance in which they feel threatened. The greater the distance between the worker and the bear, the better for conflict avoidance.
- Personnel are forbidden from feeding bears or any other wildlife.

## 3.2 Protecting Workers and Bears

Worker safety is a priority. The following procedures will be implemented to ensure worker awareness and knowledge about their own safety concerning bears. A copy of the Bear Avoidance and Encounter Procedures are provided as Attachment C.

- To avoid surprise encounters, personnel exiting a vessel or other facility will check behind doors, blind spots, and access areas prior to exiting to avoid a surprise encounter.
- Polar bears traverse along the barrier island corridor throughout the year. During summer months, increased numbers are anticipated in this area, particularly during the months of August and September.
- Personnel will be made aware that bears will hide behind structures, and to be conscious of this.
- Areas will be illuminated during hours of darkness, when workers are present.
- Periodic safety sessions will be conducted to address and elevate awareness of bear avoidance techniques and activities.
- Outdoor work crews will survey the surrounding area, to ensure bears cannot enter without being detected.
- Workers will become familiar with the local environment.
- A "buddy system" will be employed, to ensure fellow workers are informed about the whereabouts and activities that may bring workers in contact with bears.
- Workers and facility occupants will be alerted if a bear is observed.
- A Bear Guard will be designated, if necessary, to monitor for the presence of bears. The Bear Guard may also hold another work position that would allow him or her to monitor for the presence of bears, such as equipment operator.
- Bear hazing will be approved by the designated representative (e.g., site manager). Only a designated properly trained and authorized bear hazer will be permitted to haze bears. Personnel other than the designated bear Hazer will not attempt to haze a bear.
- Aircraft and vessels will not operate, other than emergency, within 0.5mi (800 m) exclusion zone of polar bears observed on land or ice. Due to their importance as polar bear summer resting habitat, aircraft flight paths will be offset from the coastline of Chukchi Sea barrier islands by at least 0.5 mile (800 m) horizontal and 1,500 feet vertical distances.
- Aircraft will maintain a minimum altitude of 1,500 ft. (457 m) within 0.5 mi (800 m) of polar bears hauled out onto land or ice, unless weather does not permit this altitude.
- Vessels will maintain a 0.5 mile (800 m) distance from polar bears observed on ice, in water, or on land. If polar bears are observed in water, vessels underway will reduce speed, not separate members of a group of polar bears, and avoid multiple changes of direction.
- Vessel speed to be reduced during inclement weather conditions in order to avoid collisions with bears.
- During ZVSP surveys, establish and monitor with trained PSOs an acoustically verified exclusion zone for polar bear surrounding the ZVSP airgun arrays where the received level would be ≥ 190 dB re 1 µPa.

Polar bear monitoring, reporting, and survey activities will be conducted in accordance with the regulations that implement the MMPA as outlined in 78 FR 35364. The basic monitoring and reporting requirements are:

- Follow a chain-of-reporting, and responding to polar bear sightings. Attachment D depicts the Wildlife Notification Flow Chart.
- Designating a qualified individual or individuals to observe, record, and report the effects of the activity on polar bears. A USFWS-approved monitoring plan requires trained onboard PSOs. PSOs will monitor the exclusion zone for bears. If a bear is sighted, mitigation measures as specified in the 4MP (Attachment B) will be implemented.

## 3.3 Protecting Workers and Walrus

Worker safety is priority. The following procedures are to ensure worker awareness and knowledge about their own safety concerning walrus.

- Drilling support vessels will maintain 0.5 mile (800 m) distance from walrus observed on ice or in water and 1 mi (1.6 km) of walruses when observed on land. Vessels will take all practical measures (i.e., reduce speed, change course headings) to maintain a minimum 0.5 mi (0.8 km) operational exclusion zone around groups of 12 or more walruses encountered in the water. Vessels may not be operated in such a way as to separate members of a group of walruses. Ice management vessels will maintain these distances and procedures except during active ice management (see Section 3.4 and the adaptive ice management plan [Attachment A-1] for procedures during ice management which may include real-time consultation with the USFWS).
- Vessel speed to be reduced during inclement weather conditions in order to avoid collisions with walrus.
- Aircraft will maintain a minimum altitude of 1,500 ft. (457 m) within 0.5 mi (800 m) of Pacific walrus in water, hauled-out onto ice, or within 1 mi (1.6 km) of walrus groups observed on land, unless weather does not permit this altitude. If aware of walrus haulout areas, helicopters must take all precautions possible to avoid flying at altitudes less than 3,000 ft. (914 m) within 1 mi horizontal distance of walruses observed on land.
- During ZVSP surveys, establish and monitor with trained PSOs an acoustically verified exclusion zone for walruses surrounding the ZVSP airgun arrays where the received level would be ≥ 180 dB re 1 µPa.

Walrus monitoring, reporting, and survey activities will be conducted in accordance with those outlined in the incidental take regulations (78 FR 35364). The basic monitoring and reporting requirements are:

- Follow a chain-of-reporting, and responding to walrus sightings. Attachment D depicts the Wildlife Notification Flow Chart.
- Designating a qualified individual or individuals to observe, record, and report the effects of the activity on walrus. A USFWS-approved monitoring plan requires trained onboard PSOs. PSOs will monitor the exclusion zone for walrus. If a walrus is sighted, mitigation measures as specified in the 4MP (Attachment B) will be implemented.

## 3.4 Protecting Polar Bear and Walrus During Ice Management

Broken ice is an important habitat for walrus. Pack ice provides a moving platform that increases the likelihood of the animals finding fresh food resources on each foraging trip. The ice also creates a platform on which the walrus, especially females and their young in the Chukchi Sea, haul out for rest. Large numbers of walrus sometimes haul out on relatively small diameter ice floes resulting in densely packed distribution. Hundreds of walrus may be found on ice floes less than 600-1,000 ft. (183-305 m) in diameter. The behavior of walrus at haulout sites renders them susceptible to stampedes from ice / land platforms, which can result in injuries or mortalities to the animals.

Because ice management is conducted for the integrity and safety of the drillship and its crew, and because the vessels must come into contact with the ice floes during ice management activities, special protocols are called for when management of ice which walruses are hauled out on is necessary. As a consequence, Shell developed the AMP in 2012. The AMP was submitted to USFWS on April 6, 2012 and intended for use while operating vessels potentially in close proximity of walruses hauled out on ice. The AMP is a feature of this request for incidental and intentional harassment as defined in this LOA application. The AMP is described herein to familiarize individuals in the field with this plan and all other authorizations issued by USFWS for harassment during operations in the Chukchi Sea. An updated version of the AMP is included as Attachment A-1 to this document.

Adherence to the AMP enables Shell's operations to provide to USFWS accurate indications of walrus distribution in combination with ice maps and forecasts, and generate daily assessments of the potential need to manage ice and the potential for such activities to interact with walruses. Via the AMP, Shell will implement these protocols in a phased approach, in consultation with USFWS, based partially on the number of observed walrus in the vicinity of the ice management operations and the perceived ice threat to drilling operations and safety. These protocols will be in place during these activities to minimize the potential for effects on walrus. The AMP integrates the resources of Shell's Ice Specialists/Advisors and PSOs with USFWS on the approach to management of ice by vessels where walruses may be present when protection of the drilling units, associated vessels, and/or the in-place anchor mooring s for the drilling units. The AMP is a management tool through which the USFWS and Shell can extend the resources of Shell's DIMP to facilitate communication with the USFWS, and mitigate potential effects of active ice management by marine vessels operating in support of Shell's exploration drilling program in the Chukchi Sea. The phased approach of the AMP is based partially on the number of observed walrus in the vicinity of the ice management operations and the perceived ice threat to drilling operations and safety.

### Reconnaissance

- Shell will conduct real-time monitoring of sea ice as described in the DIMP (Attachment A) and summarized above in Section 1.3.
- Shell will have PSOs on the ice management vessels as required by the LOA and 4MP.

### Consultation with USFWS

- A 24 hour duty phone will be established with the USFWS
- All polar bear and walrus sightings will be reported to USFWS as described in Sections 8.1 and 8.3, respectively
- Indication that large areas of pack ice are approaching the area of the drilling units and may require management, and/or sightings of large numbers of walrus on ice, will be reported to the USFWS contact identified in Section 8.3, immediately by telecommunications (duty phone); this will commence consultation and involve the USFWS in accordance with the AMP (Attachment A-1).

### Adaptive Management

- If the polar bears are deemed to be a threat to personnel safety, or to their selves, hazing techniques as permitted under an intentional take authorization will be used to keep the bears out of harms way. Shell will follow the appropriate reporting protocol in this event (Section 8.1).
- If hauled-out walrus are present, and the prospect of ice management may be necessary, Shell will implement the procedures of the AMP as permitted under an intentional take authorization in consultation with the USFWS (see Attachment A-1 for procedures and protocols).

All mitigation measures listed in Section 3.2 and 3.3 will be adhered to unless the mitigation measures need to be adjusted/altered/or avoided based on guidance from USFWS because they are in conflict with the adaptive management approach described in this section.

## 3.5 Protecting Polar Bears and Walrus During an Oil Spill

The probability of a very large oil spill from a well blowout occurring is extremely low. Worker safety is a priority during the unlikely event that there will be an oil spill response situation. Shell has prepared an OSRP for implementation in the event of an oil spill and the plan includes procedures to be implemented in order to protect wildlife. The OSRP has been approved by BSEE. ACS is one of Shell's primary response action contractors. Wildlife protection strategies to be implemented in the event of an oil spill are outlined in Tactics W1-W6 in Volume 1 of the ACS Technical Manual, and summarized below. The tactics manual is part of the OSRP as approved by BSEE.

The following procedures are to ensure worker awareness and knowledge about their own safety concerning polar bears and walrus. The approach will also necessarily be one of adaptive management because all situations cannot be foreseen. Defined levels of response for both offshore and onshore in the event of an oil spill are adapted from the ACS Tactics Manual Section W-1, which in turn is based on the Wildlife Protection Guidelines for Alaska, Annex G of the Alaska Regional Response Team Unified Plan.

### Primary Response

Containment and Recovery of Oil: this level of response deals with controlling the spread of oil and keeping it from important habitat; oil is recovered as quickly as possible:

- Primary response for protecting polar bears and walrus from oil spills shall be to prevent oil from reaching areas where the animals are concentrated.
- Areas of concentration for walrus include areas of pack ice, and locations on the mainland and barrier island shores of the Chukchi Sea, where walrus are known to haul out – such as Cape Thompson, Cape Lisburne, and Icy Cape as well as numerous locations along the Chukotka coast and Wrangel Island in Russia.
- Areas of concentration for polar bears include areas of pack ice and barrier islands.

## Secondary Response

Wildlife hazing by trained personnel: haze wildlife away from and prevent them from entering the spill area; hazing techniques include passive excluders (e.g., balloons, reflector tape), propane fueled cannons, shotguns, pistols, cracker shells, banger, rubber bullets (for bear deterrence) and shotgun slugs (for protection from bears); electric fencing may be used on land.

- Secondary response for protecting polar bears and walrus from oil spills shall be to deter the animals from an oil slick or contaminated habitat.
- Any deterrence or hazing of polar bears or walrus would require an intentional take authorization through the on-scene coordinator from USFWS or National Marine Fisheries Service (NMFS), and would be conducted according to protocol identified in Tactic W-1 of the ACS Technical Manual.
- Dead oiled wildlife shall be collected and disposed of as indicated in Tactic W-14 of the ACS Technical Manual to prevent any secondary poisoning through ingestion of petroleum.

## Tertiary Response

Capture, stabilization and treatment of oiled wildlife by trained and authorized personnel.

- Tertiary response includes the capture, stabilization, and treatment of oiled wildlife
- Any capture or treatment of polar bears or walrus would require authorization from the on-scene coordinator and a permit from USFWS or NMFS
- Any tertiary response would be conducted according to protocol identified in Tactic W-1 and W-2 of the ACS Technical Manual

Oiled walrus or polar bears may be captured by authorized USFWS personnel (or personnel authorized by the USFWS; not Shell) using tranquilizers or baited culvert traps (polar bears only). Upon capture, it will transported by truck or helicopter to an ACS stabilization facility. Those animals that are determined to be able to survive in the wild are released. Other animals that are deemed incapable of surviving release to the wild will be held for potential transport to a zoo. In some cases, animals may be euthanized depending on the extent of their injuries. Details surrounding the capture, stabilization and treatment of oiled polar bears can be found in the DRAFT version of the Oil Spill Response Plan for Polar Bears in Alaska, USFWS Marine Mammal Management June 2010.

ACS maintains a facility and equipment in Prudhoe Bay that is capable of being transported in an emergency situation. Equipment includes a cleaning, treatment and necropsy kit; three temporary holding cages and a large water tank. Potential short term holding facilities occur in Barrow at the BASC/NARL facility, the Anchorage Zoo and the Seward Sealife Center. All mitigation measure listed in Section 3.2 and 3.3 will be adhered to by Shell personnel involved in implementing response tactics, unless after consultation with USFWS personnel they are in are in direct conflict with the adaptive management procedures.

# 4.0 FOOD WASTE MANAGEMENT PLAN

The most important factor in the avoidance of attracting bears to active operations is to correctly handle food and associated waste. Proper handling of food and food-associated waste is important in reducing the potential for bears and walrus to associate humans and facilities with food. The following practices will be implemented:

- Food wastes will not be discharged overboard from the drilling units;
- Personnel will separate food waste from other solid wastes. Food and food-associated waste will be placed only into containers secured from wildlife access aboard vessels or in vehicles. Personnel will use only designated receptacles for food and associated waste inside facilities or those that are secure from wildlife access;
- No food-associated wastes may be placed into solid-waste containers;
- Containers will be located where there is good visibility and away from high-traffic areas;
- Personnel will back-haul food-associated waste to approved bear-proof containers;
- Dedicated receptacles will be secured – there should be no food-associated attractants in the containers; and
- Back-hauled food-associated waste will not be left in unmanned facilities, vessels, or unsecured vehicles.

# 5.0 SAFETY AND COMMUNICATION

The following safety and communication practices will be implemented:

- Personnel should contact the designated Bear Guard or designated representative for the most recent bear sighting information;
- If you sight a bear, look around for other bears while moving to a safe location. Alert other workers in the area. Do not attempt to scare the bear away. Do not approach a bear for any reason. Once in a secure location, immediately report the bear sighting to the on-site Shell representative. Only trained personnel are authorized to deal with animal problems. Do not try to photograph a bear unless you are in a secure location. Early bear detection is essential to limit human/bear encounters;
- Use the “buddy system” during outside jobs;
- Make sure personnel are trained to operate radios or other communication equipment;
- Make noise before walking into an area with poor visibility;
- Do NOT take food with you. If it is necessary to eat away from the designated camp mess unit, make sure that all food is safely stored inside secure containers; and
- Personnel should coordinate with other field operations to ensure the activities are compatible with bear avoidance and protection.

# 6.0 TRAINING

## 6.1 Protected Species Observer Training

Prior to departure of a vessel housing PSOs, the PSOs onboard will have completed a training course to recognize marine mammals, including polar bear and Pacific walrus, in water or on land or ice, to properly record sightings, and to advise what mitigation measures should be followed. The PSO training curricula will be pre-approved by the USFWS and NMFS. Trained PSOs will receive a document to verify course completion. Course information will include:

- Overview of MMPA and relevance to drilling activity and mammals;
- Overview of drilling activities;
- Overview of mitigation measures;
- PSO roles and responsibilities;
- PSO regulatory requirements;
- Identification of arctic marine mammals by species, sex, and age;
- Search methods for marine mammals; and
- Overview of data collection and reporting requirements.

## 6.2 Bear Guard Training

Bear guards will undergo an intensive training program performed by USFWS and ADF&G. Training will include:

- bear habits, and range;
- how to minimize the number of human/bear interactions;
- the proper use of deterrents and projectiles to haze bears;
- how to report a bear sighting, hazing, and/or fatal taking; and
- weapons handling/safety qualifications.

## 6.3 Other Training Materials and Meetings

Employees will be provided training that describes bear behavior and safety concerns, including hazing (e.g., new employee orientation, safety discussions). All hazing will be performed by a designated person who is trained in appropriate hazing tactics and firearms safety. Features of the employee safety training program will include: Bear Avoidance Action Plan;

- USFWS or ADF&G (or comparable) Bear Encounter/Hazing Training;
- Firearms training for designated Bear Guards;
- Bear awareness reinforced at daily safety meetings; and
- Additional training material as available.

# 7.0 AT-RISK LOCATIONS AND SITUATIONS

With the exception of shorebase facilities in Barrow and Wainwright, work areas during the exploration drilling program will be exclusively offshore and distant from most prospective at-risk locations. Given that all personnel will be vessel-based, the prospects of at risk situations are remote for offshore exploration workers. However, in the event that exceptional circumstances occur, the list below shows locations/situations where the risk of a bear encounter may be higher and where attention to mitigating these risks is essential:

- sea ice floes, during ice management by vessels;
- coastal bluffs;
- barrier islands;
- small watercraft (i.e., oil spill response drills or onshore equipment inspections);
- marine vessels;
- waste generation and collection facilities; and
- “blind” areas that are obscured by facilities, equipment, or other obstacles.

At-risk situations and activities include:

- transit in sea ice, and ice management by vessels;
- activities on or around barrier islands;
- any portable, temporary shelter (i.e., oil spill response drills or equipment caching);
- emerging from vessels or facilities; and
- dark/unlighted and visually obscured areas.

# 8.0 REPORTING

Sightings of bears or walrus by PSOs or other workers during the exploration drilling program will be recorded and reported to USFWS and ADF&G by a Shell Regulatory Affairs staff designee. Given that PSOs will be on the drilling units, ice management vessels, and anchor handlers, the majority of sightings/observations are expected to be marine mammals. Polar bear sightings will be reported according to the procedures and process described in Section 8.1 of this Plan. Grizzly bear sightings will be reported in accordance with Section 8.2. Walrus sightings will be reported in accordance with Section 8.3.

Shell developed a 4MP (see Attachment B) for its exploration drilling program activities in the Chukchi Sea. The 4MP supports protection of the marine mammal resources in the area by adhering to mitigation measures, fulfilling wildlife sighting/observation and reporting obligations to the USFWS (and NMFS), and providing data useful for understanding the impacts of exploration drilling activities on Pacific walrus and polar bear. The 4MP dedicates multiple personnel 24-hours per day to the task of watching for, recording observations of, and instituting mitigation measures for wildlife observed, most notably those protected by the MMPA, ESA, or both. The outcome of conducting the 4MP will be the reporting of polar bear and Pacific walrus observed in the vicinity of Shell's exploration drilling program activities. The 4MP for program activities is provided with the LOA application (see Attachment B) and is included as an appendix to the Chukchi Sea the Exploration Plan (EP).

After the appropriate bear or walrus encounter procedures have been followed, workers will be required to report the presence of a bear or walrus using the procedure outlined below. A copy of the Wildlife Notification Flow Chart is included as Attachment D.

1) Workers are required to notify immediately the on-site Shell representative of a bear or walrus sighting and complete the appropriate sighting/observation form (Attachments E through G).
2) Workers are to document any interactions (such as the use of cracker shells, vehicle horns, or other auditory devices; using vehicles or equipment to deter bears from an area; taking direct action to harass a bear out of an area; etc.) in the sighting/observation form.
3) If the bear or walrus is sited within an exclusion zone or human/bear interaction takes place (i.e., actions listed under bullet 2 above), the on-site Shell representative must promptly contact Shell Regulatory Affairs at 907-830-7435 (24 hours). The on-site Shell representative must also fax or e-mail the completed sighting/observation form to the Shell Regulatory Affairs designee in Anchorage at 907-646-7136 (fax). The Shell Regulatory Affairs designee will send (fax or e-mail) the completed sighting/observation form within 24 hours of the bear observation to the USFWS or ADF&G agency contact.
4) If a bear or walrus is sighted outside an exclusion zone and no human/bear interaction takes place, the PSO will provide the sighting/observation information to the Shell Regulatory Affairs designee in Anchorage by e-mail in the daily PSO report.

## 8.1 Polar Bear Reporting

Actions will be taken to the maximum extent practicable to avoid and minimize potential interactions with polar bears. PSOs will be assigned to project vessels to identify potential encounters and record polar bear behavior. Using the procedure provided in Section 8.0 and in the Wildlife Notification Flow Chart (Attachment D), the Shell Regulatory Affairs designee will be informed of polar bear sightings/observations. All relevant information must be recorded. The Polar Bear Sighting Report (Attachment E) must be completed to the greatest extent possible prior to submission. Regular reports of polar bear sightings in accordance with the LOA stipulations will be made to the USFWS.

**The Primary Polar Bear Contact:**

Craig Perham
USFWS – Marine Mammals Section
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: 907-786-3810 (direct); 907-887-3082 (mobile); 907-786-3800 (main office)
Fax: 907-786-3816
E-mail: craig_perham@fws.gov

**Alternate Polar Bear Contact:**

Christopher Putnam
USFWS – Marine Mammals Section
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: 907-786-3844 (direct); (907) 268-0577 (mobile); 907-786-3800 (main office)
Fax: 907-786-3816
E-Mail: christopher_putnam@fws.gov

## 8.2 Grizzly Bear Reporting

Actions will be taken to the maximum extent practicable to avoid and minimize potential interactions with grizzly bears. Using the procedure provided in Section 8.0 and in the Wildlife Notification Flow Chart (Attachment D), the Shell Regulatory Affairs designee will be informed of grizzly bear sightings/observations. All relevant information must be recorded. The Grizzly Bear Observation Form (Attachment F) is a typical report form must be completed to the greatest extent possible prior to submission. Regular reports of grizzly bear sightings will be made to the ADF&G.

**The ADF&G Grizzly Bear Contact:**

Dick Shideler
Alaska Department of Fish & Game
1300 College Road
Fairbanks, AK 99709-4173
Phone: 907-459-7283
Fax: 907-459-3091
E-mail: dick.shideler@alaska.gov

**Local Contact:**

Geoff Carroll
Alaska Department of Fish & Game
Area Wildlife Biologist
P.O. Box 1284
Barrow, Alaska 99723-1284
Phone: 907-852-3464
Fax: 907-852-3465
E-mail: geoff.carroll@alaska.gov

## 8.3 Walrus Reporting

Vessel traffic will avoid any walrus to the maximum extent practicable to avoid and minimize potential interactions. PSOs will be assigned to project vessels to identify potential encounters and record walrus behavior. Weekly reports of walrus sightings would be made to the USFWS using the Walrus Sighting Report Form (Attachment G).

Actions will be taken to the maximum extent practicable to avoid and minimize potential interactions with walrus. PSOs will be assigned to project vessels to identify potential encounters and record walrus behavior. Using the procedure provided in Section 8.0 and in the Wildlife Notification Flow Chart (Attachment D), the Shell Regulatory Affairs designee will be informed of walrus sightings/observations. All relevant information must be recorded. The Walrus Sighting Report (Attachment G) is a typical report that must be completed to the greatest extent possible prior to submission. Regular reports of walrus sightings in accordance with the LOA stipulations will be made to the USFWS.

**Primary Pacific Walrus Contact:**

James MacCracken
USFWS – Marine Mammals Section
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: 907-786-3803 (direct); 907-786-3800 (main office)
Fax: 907-786-3816
E-mail: james_maccracken@fws.gov

**Secondary Pacific Walrus Contacts:**

Craig Perham
USFWS – Marine Mammals Section
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: 907-786-3810 (direct); 907-887-3082 (mobile); 907-786-3800 (main office)
Fax: 907-786-3816
E-mail: craig_perham@fws.gov

Christopher Putnam
USFWS – Marine Mammals Section
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: 907-786-3844 (direct); (907) 268-0577 (mobile); 907-786-3800 (main office)
Fax: 907-786-3816
E-Mail: christopher_putnam@fws.gov

# 9.0 INTENTIONAL"TAKE" ACTIONS FOR BEARS

Early detection and worker awareness will reduce chance encounters with a bear. If a bear remains on site for an extended period, the on-site Shell representative/Shell Regulatory Affairs designee will contact USFWS or ADF&G (as appropriate) for advice. Firearms with bean bags or rubber bullets, noisemakers, or other appropriate materials will be available on site to provide deliberate and intentional harassment of bears to ensure worker safety. These potential actions constitute a "take". If a lethal or non-lethal "take" occurs, despite preventative action to protect human life, the following information must be recorded and actions performed:

- Personnel must record all details of the event including time, exact location, bear's behavior, preventive measures followed, etc.
- Personnel must record all witness statements.
- Polar Bears - Immediately notify Craig Perham with USFWS at (907) 786-3810 (direct line); 907-887-3082 (mobile); or (907) 786-3800 (main office). An alternate contact is Christopher Putnam with USFWS at 907-786-3844 (direct line); (907) 268-0577 (mobile); or 907-786-3800 (main office).
- Grizzly Bears – Immediately notify Dick Shideler (Fairbanks ADF&G) at (907) 459-7283 and Geoff Carroll (Barrow ADF&G) at (907) 852-3464.
- If there is a lethal "take", the entire animal carcass will be transported to Barrow for sealing and processing under the direction of either a responsible USFWS agent designee or an ADF&G agent designee. The agent designee will determine disposition of useable meat (e.g., donation to a Native village).

The trained bear Guard or designated representative is responsible for the following:

- recording all the event details including time, exact location, bear's behavior, preventive measures followed, etc.; and
- recording all witness statements.

# 10.0 INTENTIONAL "TAKE" ACTIONS FOR WALRUS

Early detection and vessel awareness will reduce chance encounters with walrus. If walrus are sighted in an area targeted for ice management, the Adaptive Management Plan (AMP) will be followed (Attachment A-1). The following information must be recorded and actions performed:

- Personnel must record all details of the event including time, exact location, walrus's behavior, preventive measures followed, etc.
- Notification as dictated by the AMP to USFWS personnel: Craig Perham at (907) 786-3810 (direct line); 907-887-3082 (mobile); or (907) 786-3800 (main office). An alternate contact is Christopher Putnam at 907-786-3844 (direct line); (907) 268-0577 (mobile); or 907-786-3800 (main office).

# 11.0 PLAN OF COOPERATION

A Plan of Cooperation (POC) has been developed as a required component of a LOA application under 50 CFR 18.114(c)(4). A POC is also required as part of an application for an IHA from NMFS under 50 CFR § 216.104(a) (12), and under the BOEM lease stipulation 5 for lease sale 193. A POC was prepared and was submitted with the initial Chukchi Sea EP, and addenda have been submitted with successive revisions of the Chukchi Sea EP. Each addendum to the POC was prepared with updated POC information regarding proposed changes to the exploration drilling program, and includes documentation from meetings undertaken to inform stakeholders about the proposed exploration drilling program. For this LOA application, Shell has prepared a POC Addendum for the 2015 drilling season. The POC Addendum includes documentation of meetings undertaken to specifically gather feedback from stakeholder communities on Shell's implementation of the 2012 exploration drilling program, plus inform and obtain input regarding the proposed 2015 program.

The POC Addendum identifies the measures that Shell has developed in consultation with North Slope communities and will implement during its planned Chukchi Sea exploration drilling program to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC Addendum details Shell's communications and consultations with local communities concerning the approved Chukchi Sea EP, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)). Shell has documented its contacts with the North Slope communities, as well as the substance of its communications with subsistence stakeholder groups.

Tables summarizing the substance of Shell's communications, and responses thereto are included in Attachment H. This POC Addendum may be further supplemented, as appropriate, to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements.

# 12.0 HANNA SHOALS WALRUS USE AREA

A portion of the planned activities may occur within the Hanna Shoal Walrus Use Area (HSWUA) that was designated in the June 12, 2013 ITRs (Federal Register 78, No. 113; 50 CFR § 18.118 (a)(4)(v)) for oil and gas exploration activities in the Chukchi Sea and adjacent western coast of Alaska. The USFWS states additional mitigation measures may be applied to activities occurring within the HSWUA between 1 July and 30 September.

Shell is requesting authorization to:

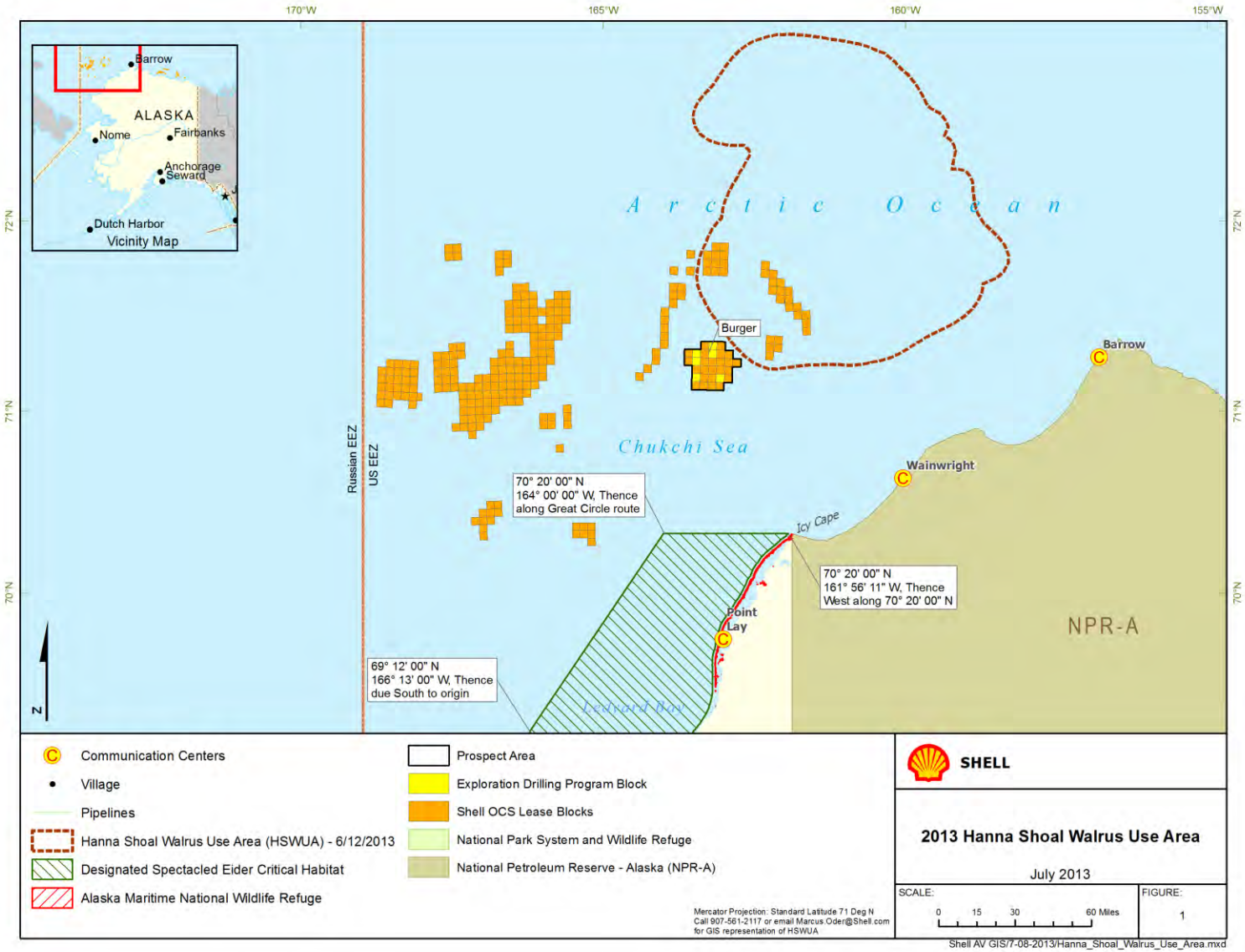
- allow transit through the HSWUA for ice avoidance;
- allow ice management in HSWUA as necessary for protection of actively deployed exploration drilling program assets; and
- allow transit through the southern portion of the HSWUA by the *Discoverer*, *Polar Pioneer* and support vessels to and from a transfer point near Barrow for crew and resupply purposes.

All activities in the HSWUA will adhere to the 4MP (Attachment B) and the ITRs as summarized in section 3.3. In addition, prior to entry into the HSWUA, all vessels must follow the risk assessment approach outlined in the Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses (Attachment A-1), aka AMP, including identification of date(s) and time(s) of vessel entry or departure to/from HSWUA.

In accordance with the AMP Shell will synthesize the best available near real time data from multiple sources that provide accurate indications of walrus distribution in combination with ice maps and forecasts. Shell will be able to generate assessments of the potential for such activities to interact with walruses prior to a vessel planned entry into the HSWUA. In line with the AMP, the adaptive approach process will be used to rank risks and initiate consultation both within Shell and between Shell and USFWS is depicted on page 34.

| | |
|---|---|
| **Step 1:** Ice and weather forecasting will evaluate the potential risk to walrus on the basis of proximity of ice to survey vessel and factors influencing ice movement. Sighting data from available sources will be evaluated to assess walrus presence/absence.<br><br>**Step 2:** The risk level will be communicated to USFWS prior to entering the HSWUA. | |
| | If the area of operation is ice free or there is a low probability that walrus are present the risk level is **1:**<br>• monitoring continues, and<br>• USFWS notified by email. |
| | If ice is present and the possibility exists that walrus may be present based on recent observations in the area, the risk level will assessed as a **2**.<br>• The USFWS would be notified by email, and<br>• updates will be provided by telephone, or in person, during regular business hours. |
| | If ice is present and walruses are known to be in the area, the risk level is a **3**:<br>• The on duty compliance representative for Shell will notify a designated USFWS representative by calling a duty phone to engage in real-time consultation. |

**Figure 12-1 Hanna Shoal Walrus Use Area**



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# Attachment A
# Drilling Ice Management Plan

**SHELL OFFSHORE INC.**

3601 C Street, Suite 1000
Anchorage, AK 99503

# DRILLING ICE MANAGEMENT PLAN
# Chukchi Sea, Alaska

Submitted to:

U. S. Department of the Interior
Bureau of Safety and Environmental Enforcement
Alaska Outer Continental Shelf Region

**Submitted by:**

**Shell Gulf of Mexico Inc.**

# DRILLING ICE MANAGEMENT PLAN

**Approval:** **Approved for the Alaska Asset**

| Shell Exploration & Production Company | Approved | Date |
|---|---|---|
| VP Wells Arctic & Industry Regulatory Affairs | *Signature on file* | 7/9/2014 |

**Effective** This document is effective per the latest approval date above.

**Expires** In force until revised and/or superseded.

**Custodian** Alaska Marine Manager

**Author** Ice Management Lead (July, 2014 Revision)

**Reviewers**
Principal Arctic Marine Facilities Advisor
VP Alaska BOM
VP Arctic HSSE
VP Alaska Operations
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Alaska Wells Operations Manager
Arctic Execution Manager
Offshore Regulatory Team Lead

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| | |
|---|---|
| **Topic** | Define the method and system to ensure the safe departure of the drilling unit from the well site due to incursion of hazardous sea ice. |
| **Purpose/Scope** | The purpose of this Drilling Ice Management Plan is to provide a consistent, safe method for full compliance with the Alaska Venture operating / permitting requirements with regard to the Critical Operation Curtailment Plan which encompasses the Drilling Ice Management Plan. |
| **Applies to** | This document applies to all Shell employees and contractors conducting operations on behalf of the Shell Alaska Venture. |
| **Primary Responsibility** | Alaska Venture Maritime & Logistics supervision shall be responsible for assuring that this plan is provided and that operators are instructed to use this procedure prior to all marine drilling operations in Arctic waters where sea ice incursion is expected. |

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# I. INTRODUCTION

## A. Scope

A Critical Operations Curtailment Plan (COCP) is in place for the Shell Gulf of Mexico Inc. (Shell) Chukchi Sea Exploration Drilling Program. As part of the COCP, this Drilling Ice Management Plan (DIMP) has been developed. The description of notification of curtailment (an excerpt from the COCP) is presented in Attachment 1.

Drilling operations in the Chukchi Sea will be conducted using two drilling units operating simultaneously. The drilling units are the *"Noble Discoverer"* and the *"Polar Pioneer"*. Both drilling units will operate according to this Drilling Ice Management Plan

The DIMP addresses the following activities:

- Vessels
- Shell Ice and Weather Advisory Center (SIWAC), located in Anchorage
- Ice Alerts and Procedures
- Ice Management Philosophy
- Well Suspension Contingencies
- Mooring System Recovery and Release
- Moving onto or returning to the Drill Site
- Training

The DIMP:

- Defines Roles and Responsibilities
- Establishes Alert Levels
- Establishes Responses to Alert Levels

The DIMP facilitates appropriate decision-making and responses to the threat of hazardous ice and procedures set forth in the DIMP to prevent damage or harm to personnel, assets, or the environment.

Nothing in this document takes away the authority and accountability of the Master(s) of the vessels for the safety of their personnel and vessels, and for protection of the environment.

This plan is not a substitute for good judgment.

**Guidance Note:** This document is not intended to contain detailed procedures. Detailed procedures are contained within the vessel-specific operating manuals and the Shell Ice Management Guidance and Procedures manual.

## B. Drilling Ice Management Plan Objective

- The objectives of the DIMP are to detect and monitor sea ice conditions, identify hazardous ice and determine manageability as per the DIMP and Alert System in order to ensure risk to personnel, drilling units, vessels or wells is reduced to ALARP.
- The Ice Alert System is central to the function of the DIMP. It is based on five progressive alert levels. Each level defines operational status, roles, responsibilities and actions required.

## C. Drilling Ice Management Principles

- Early detection of ice features
- Assessment of the ice regime
- Identification of Hazardous Ice
- Assessment of Ice Management Vessel (IMV) capabilities to manage ice
- Calculation and monitoring of Hazardous Ice arrival at drill site, Hazard Time (HT)
- Continuous assessment of time required to secure the well, Secure Time (ST)
- Continuous assessment of time required to move rig off location, Move Time (MT)
- Alert Level assignment which triggers the appropriate responses
- Development of ice management strategy
- Monitoring effectiveness of strategy
- Predefined roles and responsibilities

# II. DEFINITIONS

## A. Roles and Responsibilities

Responsibilities have been defined for key on-site personnel in Section V. In addition to the defined personnel the following onshore positions have a role to play in the DIMP.

### Wells Operations Manager

Shell's Wells Operations Manager is the senior Shell shore-based manager responsible for all Shell well operations offshore Alaska.

### Wells Operations Team Leads

The Wells Operations Team Leads are responsible for Shell well operations at a specific well site. There is a Wells Operations Team Lead ashore for each drilling location who will update the OEMT on Ice Alert Status or changes to the Ice Alert Level.

### Ice Management Lead Anchorage

The Ice Management Lead heads the ice management team and works with the offshore Ice Advisors (IAs) stationed on vessels to develop daily strategies and designate areas or ice features which are of concern. The Ice Management Lead liaises with the Shell Wells Operations Team Lead, SIWAC and the OEMT.

### Shell Ice and Weather Advisory Center (SIWAC)

Based in Anchorage Alaska SIWAC develops ice and weather forecasts and analysis for Shell Management and the marine fleet. A full description is available in section IV.

### SIMOPS Coordinators

The SIMOPS Coordinators working under the direction of the OEMT, will assist in coordinating the cascading activities of the entire fleet from the consequences of having to relocate a drilling unit(s) per the DIMP.

### Operations Execution Management Team (OEMT)

The OEMT, comprised of leadership from each business function and representation from support functions, implements the control and recovery of the 7-day operational Integrated Activity Plan (IAP) in accordance with the Integrated Operations Management Procedures (IOMP). The scope of the IOMP is to support field operations by maintaining up-to-date information, providing resources as needed, coordinating activities, and to bring decision-makers together to coordinate exploration and support activities.

## B. Definitions and Abbreviations

| | |
|---|---|
| AHTS | anchor handling tug supply |
| *Aiviq* | MV *Aiviq* – Secondary IMV and anchor handling vessel |
| APD | Applications for Permit to Drill |
| AT | Alert Time - The result of (HT) – (T-Time) which translates to Alert Level |
| API | American Petroleum Institute |
| bbl | barrel(s) |
| BHA | Bottom Hole Assembly |
| BOP | Blowout preventer |
| BSEE | Bureau of Safety and Environmental Enforcement |
| CFR | Code of Federal Regulations |
| CIS | Canadian Ice Services |
| cm | centimeter(s) |
| COCP | Critical Operations Curtailment Plan |
| Dia. | diameter |
| DNV | Det Norske Veritas |

| | |
|---|---|
| DP | Dynamic Positioning |
| ea | each |
| *Fennica* | M/V *Fennica* – Primary IMV |
| ft | foot/feet |
| FTP | file transfer protocol |
| FY | First-year ice. Sea ice of not more than one winter's growth, developing from young ice; 12 inches (in.) (30 centimeters [cm]) or greater. It may be subdivided into thin FY 30-70 cm – sometimes referred to as white ice, medium FY 70-120 cm and thick FY >120 cm up to 2 m. |
| gals. | gallons |
| GFS | Global Forecast System |
| GIS | Geographic Information System |
| Hazardous Ice | Ice, which due to its size, stage of development, concentration, set and drift is considered to be a threat to the safety of personnel, the drilling unit and well operations. Close proximity of an ice feature regardless of its set and drift may determine it to be hazardous ice.<br>Guidance Note: Sea state as well as visibility may influence what is categorized as hazardous ice. |
| HOS | Hang-off Sub |
| hp | horsepower |
| HT | Hazard Time. The estimated time it will take for hazardous ice to reach the drill site. |
| Hz | hertz |
| IA | Ice Advisor |
| IAP | Integrated Activity Plan |
| IOC | Integrated Operations Center |
| IOMP | Integrated Operations Management Procedures |
| IMO | International Maritime Organization |
| DIMP | Drilling Ice Management Plan |
| IMV | Ice management vessel. Any ice class vessel tasked with ice management duties in support of the drilling unit. This includes the primary ice management vessel (IMV) and the ice class Anchor Handling Tug Supply (AHTS) |
| in. | Inch(es) |
| kg | kilogram(s) |
| kW | kilowatt(s) |
| lb | pound(s) |

| | |
|---|---|
| LMRP | Lower Marine Riser Package |
| m | meter(s) |
| $m^2$ | square meter(s) |
| $m^3$ | cubic meter(s) |
| MHz | megahertz |
| MODU | Mobile Offshore Drilling Unit. MODU's are facilities designed or modified to engage in drilling and exploration activities. The term MODU includes drilling vessels, semisubmersibles, submersibles, jack-ups, and similar facilities that can be moved without substantial effort. These facilities may or may not have self-propulsion equipment on board and may require dynamic positioning equipment or mooring systems to maintain their position. |
| mt | metric tons |
| MT | Move-off Time. The time required to clear decks on the anchor handler recover or release moorings conventionally and move off the drill site in an orderly fashion. |
| M/V | Motor Vessel |
| MY | Multi-year ice. Old Ice (OI) up to 3 m or more thick which has survived at least two summers' melt. Hummocks are smoother than on SY and the ice is almost salt-free. Where bare, this ice is usually blue in color. The melt pattern consists of large interconnecting, irregular puddles on the surface in summer and a well-developed drainage system. |
| NOAA | National Oceanic and Atmospheric Administration |
| *Noble Discoverer* | Turret-moored drilling vessel (MODU) |
| *Nordica* | M/V *Nordica* – Primary IMV |
| OCS | Outer Continental Shelf |
| OEMT | Operations Execution Management Team |
| OI | Old ice. Sea ice which has survived at least one summer's melt. Topographic features generally are smoother than FY. It may be subdivided into Second-year (SY) ice and Multi-Year (MY) ice. |
| OIM | Offshore Installation Manager |
| OSR | Oil Spill Response |
| OSV | Offshore Supply Vessel |
| PIC | person in charge |
| *Polar Pioneer* | Column stabilized semi-submersible drilling unit (MODU). |
| psi | pounds per square inch |
| RAR | rig anchor release |
| RP | Recommended Practice |

| | |
|---|---|
| RPM | revolutions per minute |
| SAR | Synthetic Aperture Radar |
| Shell | Shell Gulf of Mexico Inc. |
| SIMOPS | Simultaneous Operations |
| SIWAC | Shell Ice and Weather Advisory Center |
| Support Vessels | Includes all vessels defined in this plan (IMV/OSR/AHTS/OSV). |
| SWL | Safe Working Load |
| SY | Second-year ice. OI which has survived only one summer's melt. Thicker than FY with thickness up to 2.5 m, it stands higher out of the water. Ridged features as a result of melting during the preceding summer attain a smooth rounded shape. In contrast to MY ice, summer melting produces a regular pattern of numerous small puddles. Bare patches and puddles are usually greenish-blue. |
| ST | Secure Time. The time required to secure the well, disconnect the LMRP from the BOP, recover and secure the riser. |
| TD | Total depth |
| T-Time | Total Time. The sum of ST + MT |
| *Tor Viking II* | M/V *Tor Viking II* – Secondary IMV and anchor handling vessel |
| UHF | ultra high frequency |
| U.S. | United States |
| USCG | United States Coast Guard |
| VMT | Vessel Management Team. This team is headed by the drilling contractor's Master / OIM and includes the drilling contractor's Rig Manager / OIM, and the Chief Engineer/Barge Captain and Shell's Drilling Supervisor and IA |
| Wx | weather |

## III. VESSELS COVERED BY THE DRILLING ICE MANAGEMENT PLAN

- Drilling Unit – *"Noble Discoverer"*
- Drilling Unit – *"Polar Pioneer"*
- Primary Ice Management Vessel (IMV) – "*M/V Fennica"*
- Primary Ice Management Vessel (IMV) – "*M/V Nordica*"
- Secondary Ice Management Vessel (IMV) and Anchor Handler – "*M/V Tor Viking II"*
- Secondary Ice Management Vessel (IMV) and Anchor Handler – "*M/V Aiviq*"

**Guidance Note:** The term "drilling unit" is used throughout this document and refers to both the *"Noble Discoverer"* a self propelled drilling vessel and the *"Polar Pioneer"* a non self-propelled semi-submersible. Both units are defined as MODU's. The final authority with regard to safety onboard a drilling vessel is the Master. The final authority for safety onboard a non self-propelled semi-submersible is the OIM

## A. Drilling Units

All planned exploration drilling in the identified lease blocks will be conducted with the *Noble Discoverer* and the *Polar Pioneer*.

The *Noble Discoverer* is a turret moored self-propelled drillship. Station keeping is accomplished using a turret-moored, 8-point anchor system. The underwater fairleads prevent ice fouling of the anchor lines. Turret mooring allows orientation of the vessel's bow into the prevailing metocean conditions to present minimum hull exposure to drifting ice. The vessel is rotated around the turret by hydraulic jacks. Rotation can be augmented by the use of the fitted bow and stern thrusters. Ice-strengthened sponsons have been retrofitted to the ship's hull.

The *Noble Discoverer* is classed by Det Norske Veritas (DNV) as a Mobile Offshore Drilling Unit (MODU) for worldwide service. It is a "1A1 Ship-Shaped Drilling Unit l" and is capable of performing drilling operations offshore Alaska. The *Noble Discoverer* has been issued with a DNV Appendix to Class stating:

"*The structural strength and material quality of the 'Ice Belt' formed by the sponsons below the 8,950 mm A/B level, have been reviewed against the requirements for the DNV ICE-05 Additional Class Notation and found to meet those requirements (as contained in DNV Rules for Classification of Ships, Pt 5 Ch 1, July 2006) for a design temperature of -15 degrees C.*"

The *Polar Pioneer* is classed by Det Norske Veritas (DNV) as a Mobile Offshore Drilling Unit (MODU) for worldwide service. It is a non-self-propelled, "SPM thruster assisted" (TA) semisubmersible offshore drilling unit of twin-hull configuration. The rig is a "+ A1 Column Stabilized Unit" and is capable of performing drilling operations offshore Alaska.

Positioning is accomplished with a combination of an eight-point all chain catenary mooring system and dynamic positioning system.

*Polar Pioneer* was built in 1985, with unlimited operation area, in accordance with the "Norwegian Maritime Directorate" and to "Det Norske Veritas regulations," current at that time. While operating in Norwegian waters, the installation, with its inventory, equipment, crew and machinery was required to comply with current rules and regulations for operation on the Continental Shelf of Norway.

The drilling units will undergo inspections by BSEE and Det Norske Veritas (DNV) for certification before entering the theater. The DNV certificates will be forwarded to BOEM.

The drilling units will comply with all of the regulations of DNV, the International Maritime Organization (IMO), and the U.S. Coast Guard (USCG). All exploration drilling operations will be conducted under the provisions of 30 CFR Part 250 Subpart D, and other applicable regulations and notices including those regarding the avoidance of potential drilling hazards, safety and pollution control.

Procedures for monitoring and reacting to ice in the prospect areas are provided in the Critical Operations and Curtailment Plan (COCP) and the Drilling Ice Management Plan (DIMP)

**Drillship Principal Dimensions**

| Dimensions | "Noble Discoverer" | |
|---|---|---|
| Length Overall | 514 ft | 156.7 m |
| Transit Draft | 27 ft | 8.2 m |
| Drilling Draft | 25.12 ft | 7.67 m |
| Breadth | 85 ft | 26 m |

**Drill Rig Principal Dimensions**

| Dimensions | "Polar Pioneer" | |
|---|---|---|
| Length Overall | 400 ft | 122 m |
| Breadth over all | 292 ft | 89 m |
| Transit Draft | 30 ft | 9.15 m |
| Drilling Draft | 75.44 ft | 23 m |
| Survival Draft | 62.32 ft | 19 m |

## B. Ice Management Vessels

Ice management support to the drilling units will be provided by the *Fennica, Nordica, Tor Viking II and Aiviq.* The drill units will be supported by these IMVs from the beginning of the campaign until the vessel departs the area. A description of these vessels is provided in Attachment 2.

**Ice Management Vessel Principal Dimensions**

| Dimensions | Fennica & Nordica DNV Icebreaker Polar-10 | Tor Viking II DNV Icebreaker Ice-10 | Aiviq ABS A-3 Icebreaker |
|---|---|---|---|
| Length Overall | 380 ft (116 m) | 275 ft (83.7 m) | 361 ft (109.9 m) |
| Draft | 27 ft (8.4 m) | 20 ft (6.0 m) | Ice Max 25 ft (7.62 m) |
| Breadth | 85 ft (26 m) | 59 ft (18.0 m) | 80 ft (24.38 m) |
| Bollard Pull | 230 tonnes | 200 tonnes | 200 tonnes |

### 1. Primary Ice Management Vessels

The *Fennica* and the *Nordica* are designated as the primary IMVs. Both vessels are classed by DNV as +1A1 Tug Supply Vessel Icebreaker Polar-10. Designed for ice management, maintenance and service of offshore oil wells, the 380-ft (116-m) *Fennica* and *Nordica* are multi-purpose vessels specialized in marine construction and icebreaking. The *Fennica* and *Nordica* are equipped with diesel-electric propulsion systems and their innovative combination of capabilities, based on extensive design and engineering work, facilitates use of these systems in arctic conditions.

## 2. Secondary Ice Management Vessels / Anchor Handlers

The *Aiviq* is designated as a secondary IMV and anchor handler. The Aiviq is classed by ABS as ✠ A1, A3 (Icebreaker). Designed for ice management, anchor handling, and maintenance and service of offshore oil wells, the 361-ft (109.9-m) *Aiviq* is a multi-purpose vessel specialized in anchor handling and icebreaking.

The *Tor Viking II* is designated as a secondary IMV and anchor handler. The *Tor Viking II* is classed by DNV as +1A1 Supply Tug Icebreaker Ice-10. Designed for ice management, anchor handling, and maintenance and service of offshore oil wells, the 275-ft (83.7-m) *Tor Viking II* is a multipurpose vessel specialized in anchor handling and icebreaking.

**Guidance Note:** Ice Management Vessels supporting the drilling units may be deployed to assist other vessels or assigned to assist other Shell drilling units as operations and ice conditions dictate. Diverting ice management resources away from the drilling units may require a curtailment of activities. The decision to curtail activities as a result of diverting ice management resources away from the drilling vessel shall be made jointly by the Shell Drilling Supervisor and the Drilling Vessel Master/OIM. The onshore Shell Wells Operations Team Leader (in consultation with the drilling contractor's Rig Manager) will endorse the plan or set priorities if agreement cannot be reached at the field level.

# IV. SHELL ICE AND WEATHER ADVISORY CENTER

SIWAC is an integrated forecasting service staffed 24/7 by industry-leading specialists under Shell contract in Anchorage, Alaska. SIWAC's primary function is to provide present and forecast ice and weather conditions directly to field operations and planning managers during the operational season. SIWAC provides information to decision makers and field principals to help them minimize risks when operating in the presence of ice. To provide quality and accurate information, SIWAC depends on skilled forecasters, subscription and public satellite imagery, numerical models, field observations, Geographic Information System (GIS) software tools, and a robust communication network.

## A. SIWAC ICE DATA INPUTS

Ice forecasts are developed and issued daily. The Lead Ice Analyst compiles available data from subscription, specialized, and public services in ArcMAP (GIS Software) such as:

- MDA RadarSat 2 imagery
- MODIS satellite
- Canadian Ice Services
- National Ice Center
- Contract weather services
- Field observations
- IceNav images

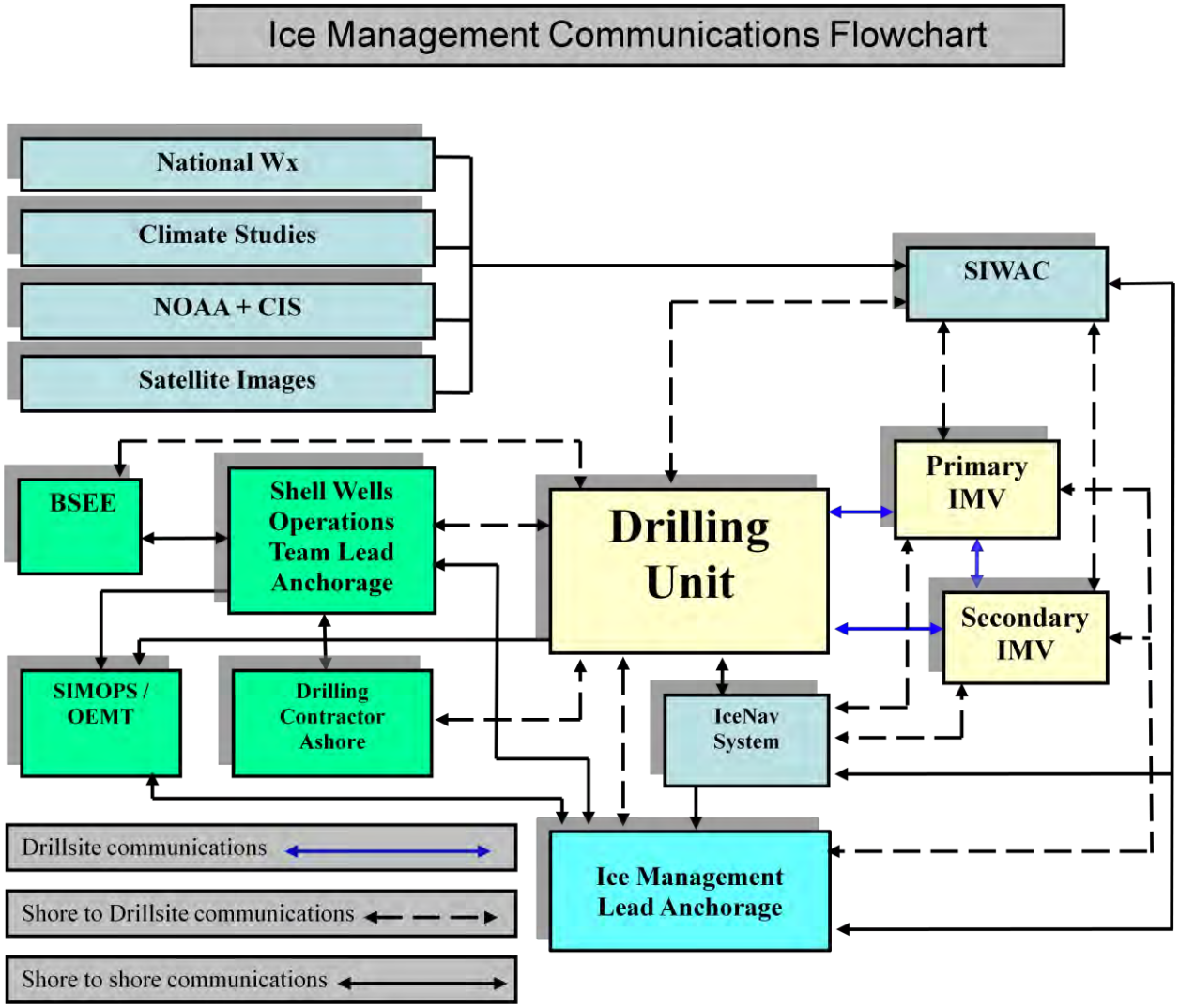
## B. Data Transmission

Effective communication of SIWAC ice and weather guidance and reciprocal feedback and field observations requires a robust and capable data network. The drilling units and IMVs are equipped with high-speed data and voice satellite service that has been proven to perform well in the U.S. Chukchi and Beaufort Seas.

Data, including satellite imagery and observations, are relayed through a file transfer protocol (FTP) site between SIWAC and the field vessels using automated processes. This keeps both the field and forecasters continuously refreshed with the latest information. In addition, SIWAC maintains a secure website that allows direct, on demand access to all forecast reports and data products. Additional information about SIWAC is provided in Appendix 3.

## Ice Information Flow Chart

NOTE: This graphic depicts the constant two-way communication that would occur between the various components of the system.




**Guidance Note:**

Additional information regarding ice may be requested by the Master of the drilling units. Any means appropriate to the circumstances, shall be used to provide this information. Where this information is to be obtained by aerial reconnaissance, the Ice Management Lead in Anchorage will liaise with Shell Logistics to provide the appropriate resources.

# V. ICE ALERT LEVELS AND PROCEDURES

These procedures define five Alert Levels that are linked to the time that hazardous ice is forecast to be at the drilling location, and the time required to secure the well and move the drilling unit off location if it becomes necessary. Roles, responsibilities, and actions required are specified according to the Alert Level.

## A. Ice Alert Levels

| ALERT LEVEL | TIME CALCULATION | STATUS |
|---|---|---|
| **Green** | Alert Time is greater than 24 hours | Normal operations |
| **Blue** | Alert Time is greater than 12 hours Less than 24 hours | Initiate risk assessment Validate secure times (ST) & move time (MT) |
| **Yellow** | Alert Time is greater than 6 hours Less than 12 hours | Limited well operations in line with COCP, Commence securing well |
| **Red** | Alert Time is less than 6 hours | Well securing operations completed. Commence anchor recovery operations. |
| **Black** | Drillsite evacuated | Move drilling unit to a safe location |

HT = Hazard Time
MT = Move Time
ST = Secure Time
T-Time (Total Time) = ST + MT
AT = Alert Time
AT = HT – T-Time

**Guidance Note:**

If the Alert Time (AT) value becomes negative at any time well securement and drillsite evacuation contingency plans will be initiated. Ice Alert Roles and Responsibilities
The following tables summarize roles, responsibilities and actions required for key on-site personnel for each Ice Alert Level.

# ROLES AND RESPONSIBILITIES FOR ALL ALERT LEVELS

| Drilling Unit Master / OIM | Shell Ice Advisor Drilling Unit | Shell IMV Ice Advisor | IMV Master | Rig Manager – Noble Drilling OIM – Transocean Drilling Unit | Shell Drilling Supervisor Drilling Unit |
|---|---|---|---|---|---|
| The Master / OIM is the person in charge (PIC) of the drilling unit. He is the final authority in regards to safety of the vessel, crew and compliment. All changes of Alert Level are issued by the Master / OIM.<br><br>The respons bility to evacuate the drillsite in response to a hazard rests with the Master / OIM.<br><br>Evaluates information from SIWAC, IAs and Vessel Management Team (VMT).<br><br>Establishes MT in conjunction with the AHTS Masters.<br><br>Establishes Ice Alert Level on advice from IA and is respons ble for ice management operations.<br><br>Ensures Alert Level status is broadcast to fleet and internally throughout drilling unit at intervals dependent on Alert Level or at change of Alert Level. | Collates and evaluates information from the SIWAC, IMV IAs and VMT.<br><br>Advises Master / OIM on establishing Ice Alert Level.<br><br>Directs ice management operations as required.<br><br>Correlates Secure Time (ST) and Move Time (MT) with information from rig operations.<br><br>Establishes Hazard Time (HT) in conjunction with IMVs and advises Master / OIM and VMT.<br><br>Works in conjunction with IAs on IMVs to develop and establish effective ice management strategies and advises Master / OIM.<br><br>Ensures current ice drift is broadcast to fleet, and liaises with SIWAC. | The IA is Shell's IM representative onboard the IMVs and is the primary contact for all communications with the Master / OIM. He advises the IMV Master in executing the ice management strategies.<br><br>Works in conjunction with Master of IMVs to determine the local ice conditions and hazardous ice.<br><br>Works in conjunction with drilling unit IA and IMV Master to develop and implement effective ice management strategies.<br><br>Provides feedback on effectiveness of strategy and reports any anomalies pertaining to ice. | The Master is the PIC of the IMV. He is the final authority in regards to safety of the vessel, crew and complement.<br><br>Evaluates advice from SIWAC and IAs (drilling unit and IMVs).<br><br>Works in conjunction with IA on drilling unit and IA of IMV to develop and execute effective ice management strategies within the capability of the vessel.<br><br>Provides feedback on effectiveness of the strategy to the IA on the IMV.<br><br>Reports to IMV IA any condition which inh bits vessel performance. | The Rig Manager / OIM is the drilling contractor on-site supervisor responsible for all drilling-related operations aboard the drilling unit.<br><br>Establishes (ST) and informs VMT of (ST) and well conditions.<br><br>Validates drilling team is aware of their duties under present Ice Alert status.<br><br>Validates well secure contingency plans. | The Drilling Supervisor is the senior on-site Shell supervisor with responsibility for overseeing drilling and well operations and for initiating spill response as the Onsite Incident Commander for spills originating from the well site.<br><br>Validates well ST in conjunction with the Rig Manager / OIM. Informs Master / OIM regarding ongoing and upcoming critical operations and curtailment plans.<br><br>Communicates status of well and Ice Alert level to Shell shore management and SIMOPS coordinator<br><br>Under the authority of the Shell Wells Operations Team Lead, the Shell Drilling Supervisor may raise the Ice alert level at any time. He may order the suspension of drilling operations, and securing of the well. |

| Alert | Condition | VMT Meeting Frequency | Drilling Unit | Shell Ice Advisor Drilling Unit | Shell IMV Ice Advisor | IMV Master | Rig Manager – Noble Drilling OIM – Transocean Drilling Unit | Shell Drilling Supervisor Drilling Unit |
|---|---|---|---|---|---|---|---|---|
| **Green** | Alert Time is greater than 24 hours. | Every 24 hours, or more frequently as needed. | Discharges duties as per accountabilities | Discharges duties as per accountabilities. | Discharges duties as per accountabilities. | Discharges duties as per accountabilities. | Discharges duties as per accountabilities. | Discharges duties as per accountabilities. |
| **Blue** | Alert Time is greater than 12 hours and less than 24 hours. | Every 12 hours, or more frequently as needed. | Ensures readiness to execute contingency plans.<br><br>Ensures primary IMV is available to execute Ice Management strategies for the given ice regime.<br><br>Ensures AHTS / IMV readiness for ice management and anchor handling operations. | Establishes Ice Management Strategies in conjunction with IMVs and IA onboard IMVs.<br><br>Directs ice management operations | Proposes appropriate Ice Management Strategies based on real time assessment of the Ice Regime and advises IMV Master and drilling unit IA.<br><br>Validates readiness of IMV to execute ice management strategy. | Executes Ice Management Strategies in conjunction with IA on IMVs.<br><br>Establishes and states readiness of IMV to execute ice management strategy. | Establishes ST and assesses upcoming well operations for changes to ST with regard to COCP.<br><br>Informs VMT of ST and well conditions.<br><br>Validates securing contingency plans. | Validates ST in conjunction with the Rig Manager / OIM.<br><br>Informs Master / OIM regarding ongoing and upcoming critical operations and COCP.<br><br>Reports Alert changes to Shell shore-based management and SIMOPS coordinator |
| **Yellow** | Alert Time is greater than 6 hours, and less than 12 hours. | Every 6 hours, or more frequently as needed. | Establishes and Validates MT.<br><br>Establishes departure strategy.<br><br>Ensures Alert status is broadcast to fleet and internally at 1-hour intervals or at change of Alert Level. | Establishes HT, and advises Master / OIM and VMT.<br><br>Works in conjunction with IA on IMVs to initiate ice management strategies.<br><br>Directs ice management operations<br><br>Ensures current ice drift is broadcast to fleet. | Implements ice management strategies as directed by drilling unit IA in conjunction with IMV Master.<br><br>Provides feedback on effectiveness of strategy. | Executes ice management strategies as directed by drilling unit IA.<br><br>Provides feedback on effectiveness of the strategy. | Commences securing well in accordance with agreed plan. Informs VMT of progress. | Monitors Well Securing Operations and effectiveness of ice management operations.<br><br>Communicates overall drilling unit status to Shell shore management and SIMOPS coordinator |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Red** | Alert Time is less than 6 hours. | Every hour. | Initiates departure plans following confirmation from Rig Manager / OIM that the Lower Marine Riser Package (LMRP) has been retrieved and secured and guide wires are released.<br><br>Ensures Alert status is broadcast to fleet and internally. Directs AHTS activities. | Assesses effectiveness of Ice Management Strategy in line with ongoing operations.<br><br>Directs ice management operations and assists Master / OIM as needed.<br><br>Ensures current ice drift is broadcast to fleet during anchor recovery operations. | Continues to implement ice management strategies in support of drilling unit and anchor recovery operations. | Executes ice management strategies as directed by drilling unit IA.<br><br>Conducts activities associated with releasing the drilling unit from moorings as directed by Master or OIM. | Confirms well is secured and that LMRP is disconnected, retrieved and secured.<br><br>Commences securing drill floor for departure from site. | Monitors rig securing operations and departure plan.<br><br>Communicates status to Shell shore management and SIMOPS coordinator<br><br>Organizes additional support as needed for site departure operations (for example logistics). |
| **Black** | Drill site evacuated | As needed. | Directs operations leading to safe departure from drill site to pre-agreed safe area.<br><br>Complies with all regulatory reporting requirements (internal and external).<br><br>Works with VMT and IA and IMVs to establish further course of action. | Continues to monitor ice conditions.<br><br>Works in conjunction with IMV IAs to plan a route to safe area and passes routing to Master.<br><br>Provides Master / OIM and VMT with information to aid further decision making. | Advises IMV Master on operations leading to safe transit from drill site to pre-agreed safe area.<br><br>Provides information to drilling unit Master /OIM to aid further decision making. | Works under direction of the drilling unit Master and IMV IA during transit. | Confirms drill floor and associated areas are secured and ready to depart drill site.<br><br>Provides information to Master / OIM and VMT to aid further decision making. | Informs Shell shore management and SIMOPS coordinator of evacuation.<br><br>Complies with all regulatory reporting requirements (internal and external).<br><br>Provides information to Master / OIM and VMT to aid further decision making. |

## VI. ICE MANAGEMENT PHILOSOPHY

An effective Drilling Ice Management Plan is designed to enable execution of the exploration program, with the appropriate barriers in place to manage and mitigate against risks associated with ice. Additionally, it also identifies the worst case scenario that is caused by the failure of barriers and addresses the procedures to deal with consequences of escalation.

The worst case scenario for the purpose of the DIMP is the forced and uncontrolled departure of the drilling unit from the drillsite by incursion of hazardous ice. This section addresses the activities associated with ice management as a barrier to this worst case scenario. The strategy to prevent this event is to have the following elements as effective barriers:

- proper equipment,
- skilled people,
- appropriate information, and
- work processes

The key elements identified above are discussed herein.

## A. Proper Equipment

- The Primary IMVs will have the appropriate ice class with ice breaker capabilities and have been contracted to support the exploration campaign.
- IceNav: The drilling units and IMVs will be outfitted with IceNav Equipment (Enhanced radar imaging of ice and geo-synchronized satellite imagery).
- *Tor Viking II* and *Aiviq* are high specification anchor handling vessels and have been designated as the secondary IMVs and anchor handling vessels.
- Ice reconnaissance aircraft capability

## B. Skilled People

- The drilling units and all IMVs will carry specialist IAs, in addition to the regular crew complement.
- The drilling units will have two IA's onboard for 24/7 coverage.
- The Primary IMVs will have two IA's onboard providing 24/7 coverage.
- The Secondary IMVs will have one IA onboard.
- The IAs supporting the exploration campaign will have documented experience of having performed ice management activities associated with supporting offshore exploration.
- SIWAC will be staffed with world-class industry-acknowledged experts in weather, satellite, and Ice Synoptic analysis.
- Qualified and experienced ice observers for ice reconnaissance flights.
- IMVs will have crews who are experienced operating in ice.

## C. Appropriate Information

A multi-layered, systematic approach is taken to provide relevant information from SIWAC with a feedback loop from the vessels using:

- Wide Area Satellite Imagery
- High Resolution Satellite Imagery
- Meteorological Buoys
- Field Observation from IMV ice reconnaissance
- Numerical Models
- Local Radar
- Vessels are outfitted with Fit for Purpose Data and Communications link

## D. Work Process

A systematic approach for risk mitigation is adopted by developing effective work processes.

- Development of effective ice management strategies based on available information (Global and Local)
- Deployment of assets to deliver strategy:
- Threat Sectors identified
- Assess manageability of ice feature (preferably by trial breaking as this is the only way to determine manageability)
- Appropriate management of ice feature (breaking/deflecting)
- Primary Icebreaker deployed at an effective perimeter to reduce floes to manageable size in advance of Hazardous Ice triggering an increase in Alert Level
- Scheduled VMT meetings (Frequency Dictated by Alert levels)
- Planning/Coordination meetings with specific focus on Ice Alert Levels

# VII. WELL SUSPENSION PROCEDURES

Effectiveness of the DIMP is dependent upon being able to accurately establish HT, ST and MT. ST is time taken to secure the well, disconnect and retrieve the LMRP.

As part of securing the well, well suspension procedures have been established. These procedures will be contained within the drilling unit operating procedures. Return to the drill site following exit due to the threat of Hazardous Ice is covered in Section IX.

## A. Well Suspension Options

Securing and suspending the well can be accomplished by several means. The base case is to suspend the well with mechanical and/or cement plugs. This method is to be used for Ice Alert Level calculations. Should ice or well conditions develop where ST must be reduced, the following contingencies and options or combination thereof can be chosen. The option or contingency will be dependent upon well conditions, environmental conditions and (or) equipment limitations. Shell will employ the most effective suspension procedure under the specific circumstances at the time.
Relevant information associated with well suspension will be documented in the daily drilling reports. The BSEE field representative will be apprised, and relevant records will be submitted to BSEE. Potential well suspension options are listed in the following table.

| | Mechanical Plugging | Drill pipe Hang-off | Pull Out of Hole | Shearing Drill Pipe | Dropping String |
|---|---|---|---|---|---|
| Time Required / Preference | Requires most time. Is the base case procedure for securement and for Ice Alert Level calculation. | Less time than plugging. | Potentially less time, depending upon position in hole. | Least amount of time. Stuck pipe contingency. | Comparable to shearing drill pipe. Contingency to cope with mechanical hoisting failure. |
| Provides wellbore Isolation | Yes | Yes (blind/shears closed) | Yes (blind/shears closed) | Yes (blind/shears closed) | Yes (blind/shears closed) |
| Hang-off Sub (HOS) Required | No | Yes (Emergency Drill Pipe Hang-off Tool) | No | No | No |
| Packers / Bridge Plug Required | Yes | No | No | No | No |
| Potential to Leave String in Hole | Yes, if suspended below packer. | Yes | No | Yes, but access to pump through sheared string is questionable. | String in hole but requires fishing trip and overshot to circulate. |
| Remarks | Mechanical plugs are preferred method in cased hole. | In this case, no down hole plugging has been assumed. | This method is acceptable in situations where casing has been run and cemented, but not drilled out yet. Pipe can be pulled and blind/shears closed without further containment. | Contingency for stuck pipe situation. | Contingency to cope with mechanical hoisting failure. |
| Advantages | Provides complete wellbore isolation. Equipment readily available. | Provides wellbore isolation via blind/ shear rams. Equipment readily available. Can be done in a timely manner. Leaves kill string in place for potential well control requirements. | Requires less time in situations where casing has been run but not drilled out, or if already out of the hole as noted above, for logging or changing the Bottom Hole Assembly. | Quickest way to secure the well and prepare for move-off. | Next to shearing, quickest way to prepare rig for move-off. Also leaves the top of the string in the hole undamaged and ready for recovery or circulating via overshot and packoff. |
| Disadvantages | Takes longer. Packers require additional tripping. Cementing requires mixing/ pumping time and introduces potential for contamination. | No down hole wellbore isolation. | Not a preferred method with open hole conditions because no pipe is left in the hole for potential well control methods. No down hole wellbore isolation. | Potential to leave a deformed pipe profile complicating fishing and circulating operations. | No down hole isolation is accomplished. Requires fishing trip to reestablish down hole circulation. |

# VIII. MOORING SYSTEM RECOVERY / DISCONNECTION

## A. Conditions Present to Initiate Mooring System Disconnection or Recovery

This section addresses mooring disconnection / recovery operations if ice conditions have triggered an Ice Alert Level of yellow and escalated to a red. The following discussion assumes the well has been secured and all recoverable well related equipment has been retrieved and secured.

## B. Disconnection / Recovery Options

Mooring System disconnection / recovery can be accomplished by several means. The base case is to recover moorings in the conventional manner. This method and the resultant MT is to be used for the determination of the Ice Alert Level. In the event conditions develop where the drilling unit must reduce MT, the selection of a specific contingency option and the execution of the procedures rests with the drilling unit Master / OIM who informs the VMT. Potential options and contingencies are listed in the table below.

**Guidance Note:** Conventional recovery for the Noble Discoverer refers to the disconnection of the drilling unit mooring lines from the pre-laid anchor system by an anchor handler. For the Polar Pioneer conventional recovery refers to recovery and racking of the complete anchor system

## C. Mooring System Release / Recovery

| | | Contingency Mooring Release Options | |
|---|---|---|---|
| | **Conventional Mooring Recovery** | **Rig Anchor Release (RAR)** | **Running off Wires** |
| Time Required / Preference | Requires most time. Is the base case procedure for recovery | Less time than conventional recovery | Contingency plan if RARs fail to activate. |
| Advantages | System is intact. Ready for redeployment. | Reduced MT | Allows disconnection of mooring system in event of RAR failure. |
| Disadvantages | None | Increased redeployment time. Requires back up equipment. Relies on actuation by acoustic release. | Complicates redeployment. High potential for seabed fouling. Potential to compromise the mooring system. |

**Guidance Note:** The drilling units will have a RAR release command unit onboard. A second RAR release command unit will be onboard the IMV / anchor handler.

# IX. MOVING ONTO OR RETURNING TO THE DRILLSITE

The authority to move on to or return to the drillsite will be issued by the Shell Wells Operations Team Lead with the concurrence of the OEMT Shell Drilling Supervisor and Rig Manager / OIM. Relevant regulatory authorities will be notified in accordance with the requirements.

A thorough reconnaissance of ice regimes in the vicinity will be conducted and hazardous features plotted prior to commencing mooring operations.

An Ice Alert Level of green, together with a favorable ice condition forecast is required before mooring commences.

Recognizing HT will be the only argument available for the Alert Level calculation before mooring, a minimum HT of 60 hours and a minimum distance of 30 miles to Hazardous Ice is required to give a reasonable period of time to set moorings and stay within Green Alert at completion of mooring.

Upon authorization by the Shell Wells Operations Team Lead, the final decision to move on to or return to the drillsite is dependent upon the drilling unit Master or OIM who is advised by the VMT. The Master / OIM and VMT will assess the various operational, weather and ice parameters with input from the drilling unit IA supported by the IMV Masters and the IAs to determine the practicality of the decision. A decision to commence mooring operations assumes a realistic expectation that the drilling unit will be able to stay on location and commence drilling operations for a productive length of time. The OEMT will be informed of all decisions as they are made.

## X. TRAINING

All personnel will be made aware of their roles and responsibilities within this DIMP through a training session on each vessel. This training will also include a Table Top Exercise, which will be executed prior to beginning operations, providing exposure to and test communications and procedures of the COCP, and the DIMP. Participants at the table top exercise will include:

- Shell and Wells leadership
- Rig Crews (both Drilling and Marine Contractor staff)
- Oil Spill Response (OSR) representative
- SIWAC representatives
- BSEE Operations representatives
- IMV Masters or Senior officers
- IAs
- Alaska Logistics ( Marine and Aviation ) Representatives
- SIMOPS Coordinators

Observations from the Table Top Exercise will be documented.

# XI. ATTACHMENTS

## Attachment 1 – Extract from Critical Operations Curtailment Plan

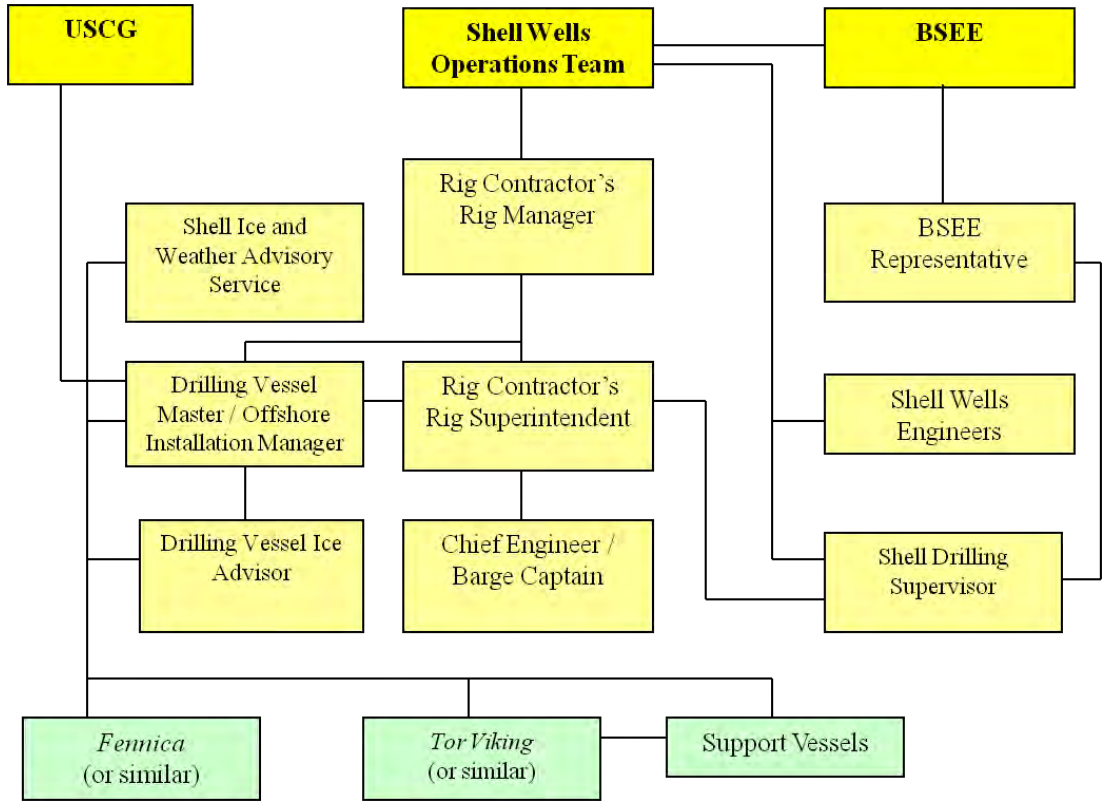
**Per Section 8 of the COCP:**

Notification of the decision for curtailments to Shell, USCG and BSEE agency representatives will be made as soon as practical, but in a manner that does not interfere with the safety of the crew, environment, or vessel. All operations curtailment decisions will be documented on the Shell Daily Operations Report and conveyed to the on-site BSEE representative as they develop. Operations curtailment decisions will also be formally conveyed to BSEE on a weekly basis via the Well Activity Report and at the end of the well operations as part of the End of Operations Report. The following chart illustrates the lines of communication in the field and from the field to the shore base.

**Guidance Note**:

Well Suspension procedures are described in step by step detail in a document called Secure Times and Procedures contained within Shell Applications for Permit to Drill (APD) which have been submitted to BSEE under portions of 30 CFR 250 and less so under 30 CFR 550. These Secure Times and Procedures were submitted to BOEM under 30 CFR 550.213(g)

The following chart illustrates the lines of communication in the field and from the field to the shore base.



## Attachment 2 – Vessel Description

### "*Noble Discoverer* Specifications"

| ***NOBLE DISCOVERER* SPECIFICATIONS** | |
|---|---|
| TYPE- DESIGN | Drillship - Sonat Offshore Drilling *Discoverer* Class |
| SHAPE | Monohull with sponsons added for ice-resistance1 |
| SHIP BUILDERS & YEAR | Namura Zonshno Shipyard, Osaka, Japan - hull number 355 |
| YEAR OF HULL CONSTRUCTION | 1965 |
| YEAR OF CONVERSION | 1976 |
| DATE OF LAST DRY-DOCKING | 2014 |

| ***NOBLE DISCOVERER* DIMENSIONS** | | |
|---|---|---|
| LENGTH | 514 ft | 156.7 m |
| LENGTH BETWEEN PERPINDICULARS (LBP) | 486 ft | 148.2 m |
| WIDTH | 85 ft | 26 m |
| MAXIMUM (MAX) HEIGHT (ABOVE KEEL) | 274 ft | 83.7 m |
| HEIGHT OF DERRICK ABOVE RIG FLOOR | 175 ft | 53.3 m |

| ***NOBLE DISCOVERER* MOORING EQUIPMENT** | |
|---|---|
| Anchor pattern symmetric 8 point system. The unit is fitted with Sonat Offshore Drilling patented roller turret mooring system giving the unit the ability to maintain favorable heading without an interruption of the drilling operations. | |
| ANCHORS | Stevpris New Generation 7,000 kilograms (kg) each (ea) 15,400 pounds (lb) ea. |
| ANCHOR LINES | Chain Wire Combination |
| SIZE/GRADE | 2.75-in. wire 3-in. ORQ Chain |
| LENGTH | 2,750 ft (838 m) wire + 1,150 ft (351 m) chain (useable) per anchor |
| | |

| ***NOBLE DISCOVERER* OPERATING WATER DEPTH** | |
|---|---|
| MAX WATER DEPTH | 1,000 ft (305 m) with present equipment (can be outfitted to 2,500 ft [762 m]) |

| | | |
|---|---|---|
| MAX DRILLING DEPTH | 20,000 ft | 6,098 m |

| | |
|---|---|
| DRAW WORKS | EMSCO E-2,100 - 1,600 horsepower (hp) |
| ROTARY | National C-495 with 49 ½ -in. opening |
| MUD PUMPS | 2 ea. Continental Emsco Model FB-1600 Triplex Mud Pumps |
| DERRICK | Pyramid 170 ft. with 1,300,000 lb nominal capacity |
| PIPE RACKING | BJ 3-arm system |
| DRILL STING COMPENSATOR | Shaffer 400,000 lb with 18-ft (5.5 m) stroke |
| RISER TENSIONS | 8 ea. 80,000 lb Shaffer 50-ft (15.2 m) stroke tensioners |
| CROWN BLOCK | Pyramid with 9 ea. 60-in. (1.5 m) diameter sheaves rated at 1,330,000 lb |
| TRAVELING BLOCK | Continental - Emsco RA60-6 |
| BLOWOUT PREVENTER (BOP) | Cameron Type U 18 ¾ -in. (48 cm) x 10,000 pounds per square in. (psi) |
| RISER | Cameron RCK type, 21-in. (53 cm) |
| TOP DRIVE | Varco TDS-3S, with GE-752 motor, 500 ton |
| BOP HANDLING | Hydraulic skid based system, drill floor |

| ***NOBLE DISCOVERER* DISPLACEMENT** | |
|---|---|
| FULL LOAD | 20,253 metric tons (mt) |
| DRILLING | 18,780 mt (Drilling, max load, deep hole, deep water) |

| ***NOBLE DISCOVERER* DRAUGHT** | | |
|---|---|---|
| DRAFT AT LOAD LINE | 27 ft | 8.20 m |
| TRANSIT | 27 ft (fully loaded, operating , departure) | 8.20 m |
| DRILLING | 25.16 ft | 7.67 m |

| ***NOBLE DISCOVERER* HELIDECK** | |
|---|---|
| MAXIMUM HELICOPTER SIZE | Sikorsky 92N |
| FUEL STORAGE | 2 ea. 720-gallon tanks |

| ***NOBLE DISCOVERER* ACCOMODATIONS** | |
|---|---|
| NUMBER OF BEDS | **140** |
| SEWAGE TREATMENT UNIT | Hamworthy ST-10 |

| ***NOBLE DISCOVERER* PROPULSION EQUIPMENT** | |
|---|---|
| PROPELLER | 1 ea 15 ft 7-in. (4.8 m) diameter, fixed blade |
| PROPULSION DRIVE UNIT | Marine Diesel, 6 cylinder, 2 cycle, Crosshead type |
| HORSEPOWER | 7,200 hp @ 135 revolutions per minute (RPM) |
| TRANSIT SPEED | 8 knots |

| **GENERAL STORAGE CAPACITIES** | |
|---|---|
| SACK STORAGE AREA | 934 cubic meters ($m^3$) |
| BULK STORAGE | |
| Bentonite / Barite | 180 $m^3$ - 4 tanks |
| Bulk Cement | 180 $m^3$ - 4 tanks |
| LIQUID MUD | |
| Active | 1,200 barrels (bbl) |
| Reserve | 1,200 barrels (bbl) |
| Total | 1,200 barrels (bbl |
| POTABLE WATER | 1,670 bbl / 265.5 $m^3$ (aft peak can be used as add. pot water tank) |
| DRILL WATER | 5,798 bbl / 921.7 $m^3$ |
| FUEL OIL | 6,497 bbl / 1,033 $m^3$ |

[1] Sponsons designed and constructed to meet requirements of Det Norske Veritas (DNV Additional Class Notation ICE-05

**"*Polar Pioneer* Specifications"**

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**POLAR PIONEER**

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# POLAR PIONEER
# Executive Summary

## INTRODUCTION TO POLAR PIONEER

- The POLAR PIONEER is a 4th generation semi-submersible rig of the Polar (Sonat)/Hitachi Design, built in 1985 by Hitachi Zosen, Ariake, Japan.
- The rig is specially designed and constructed for operation in cold, harsh, sub-zero environments.
- The rig is classified by the Norske Veritas and complies to the regulations of the flag state (NMD of Norway), UK Department of Energy and UK Health and Safety Executive and international requirements of IMO-MODU Codes and SOLAS.
- POLAR PIONEER can operate in water depths from 70 m to 500 m and is equipped with 15,000 psi well control equipment. The BOP and the choke system is specially fitted for handling High Temperature/High pressure wells.

## GENERAL INFORMATION

| | |
|---|---|
| Port of registry | Majuro, Marshall Island |
| Unit classification | Det Norske Veritas Classification A/S . Maltese Cross 1A1-Column Stabilised Unit |
| Additional class notifications | Drill, HELDK, POSMOOR(ATA), CRANE, E0, Non-selfpropelled |
| Rated drilling depth | 7,600 m (25,000 ft) RKB |
| Maximum water depth | 500 |
| Minimum water depth | 70 m |
| Rig design | Polar (Sonat)/Hitachi |
| Year of construction | 1985 |
| Yard | Hitachi Zosen, Ariake, Japan |
| No of thrusters | 4 each of 2,450 kW |
| Transit speed towed | 6 knots |
| Transit speed w/ thruster | 6 knots |
| Fuel consumption, transit | 40 tonne/day |
| Fuel consumption, drilling | 25 tonne/day |
| Total drilling variable load | 3,514 tonnes |
| Tot. survival variable load | 3,514 tonnes |
| Total transit variable load | 3,514 tonnes |
| Accommodation | 110 beds |
| Ballast system | Four ballast/pump rooms, one in each end of the pontoons. |
| Helicopter deck | Arranged for S-61N and Chinook helicopter w/ refuling station. |

## STORAGE CAPACITIES

| | |
|---|---|
| Diesel oil | 1795 $m^3$ |
| Helicopter fuel | 10 $m^3$ |
| Drilling water | 1771 $m^3$ |
| Potable water | 770 $m^3$ |
| Active/reserve liquid mud (on deck) | 202/263 $m^3$ |
| Reserve liquid mud (OBM in pontoons) | 500m $^3$ |
| Brine/Completion fluid | 457m $^3$ |
| Low toxic oil | 770 m $^3$ |
| Bulk bentonite/barite | 1,i76 tonnes/560 $m^3$ |
| Bulk cement | 690tonnes/460 $m^3$ |
| Sack storage | All mud and mud additives suppled in 40 x 3 $m^3$ containers for automatic feeding. |
| Pipe/casing racks area | 2330 tonnes/745 $m^2$ |
| Pipe/Riser racks | 2430/811$m^2$ |
| BOP storage | 220 tonnes /25$m^2$ |
| Miscellaneous storage area | 150 $m^2$ |

## MARINE AND STATION KEEPING FACILITIES

| | |
|---|---|
| Power Plant, diesels | Five Bergen Diesel KVG-18 of 2,750 kW each, in two separate engine rooms. Total power: 13,750 kW |
| Power Plant, Generators | Five each Nebb,of 6000V, 2750 kW, in two separate engine rooms. |
| Power distribution | Sixteen ABB SCR's, 8680 kW |
| Emergency Power | Dieselgenerator 1 x MTU 12-396 of 1137 kW w/ separate 440V switchboard. |
| Posision keeping/Thrusters | 8-point anchor spred plus four azimuths thrusters, each of 2,400 kW |
| Positioning System | Acoustic, Kongsberg K-Pos DPM 11 - Positioning Mooring System |

## AUXILIARY EQUIPMENT

| | |
|---|---|
| Cranes | One each Brattvaag Crane Port : 30 mt @ 14 m outlay , max sea 2,0 m Hs 15 mt @ 40 m outlay, max sea 0,5 m Hs One each Liebherr BOS 4200 - 50 Litronic Crane Stb.: 50 mt @ 18 m outlay ,max sea 2,2 m Hs, 25 m/s wind 11,2 mt @ 56 m outlay, max sea 1,0 m Hs |
| Lifesaving equipment | As per SOLA and NMD |
| Fire fighting equipment | As per SOLA and NMD |
| Boilers | Two Aalborg Industries MISSION TM OS, 2 x 6000 kg/h |
| Watermakers | Three Nirex JWP-36-125 75 mt/day |
| Sewage/Pollotion Control | Closed drain system for OBM and cutting transport system for OBM cuttings. |

## DRILLING EQUIPMENT

| | |
|---|---|
| Derrick | 453 mt (1000,000 lbs) nom. Cap. |
| Racking platform | Capacity:6 5/8" DP: 110 stds. Capacity:5" DP: 65 stds. Capacity 9 1/2" DC: 9 stds. |
| Drillpipe handling syst, remote controled equipm | Vertical handling with upper and lower racking arm and for bringing tubulars from rack to drill floor |
| Drawworks | Continental Emsco C3, 3000 hp, 1.5" drilling line, Baylor 7838 eddy current brake |
| Crown block | 650 tons (590 mt) |
| Travelling block | 650 tons (590 mt) |
| Hook | 650 tons (590 mt) |
| Drill string motion | MH-CBC 270-25, Stroke 7.6 m |
| Compensator (Crown Mounted) | Capacity – compensated: 277 mt Capacity – locked: 453 mt |
| Active Heave Compensator | Mercur/MH. 15 tons – 7,6 m stroke |
| Rotary table | Cont. Emsco T4950-65, 49 1/2" |
| Top drive | Maritime Hydraulics/DDM 650-HY Rated capacity 590 mt |
| Iron Roughneck | MH Type 1898 Range 3-1/2"thru 9-3/4". Remote controlled |
| Mud pumps. 3 each. | 5000 psi WP. Cont. Emsco FB1600 7"x12" with 2 x GE 752 R motors. Each rated to 1200 kW cont. service |
| Shale Shakers | 5 each Thule VMS 100 |

## SUBSEA/WELL CONTROL EQUIPMENT

| | |
|---|---|
| BOP stack | Hydril 18 3/4" 15,000 psi WP. Rated for H2S service. Consisting of: • WH Connector , type Vetco H4 ExF 18-3/4" 15K. • Two double "Hydril" MPL Ram Bops 18-3/4" 15K with 22" Shear Ram Bonnets • One Annular Preventer, type Hydril GX, 10,000 psi WP. • Cameron 18-3/4" 10K Mod 70 Riser Connector. • Eight K & C Failsafe valves, type CIW, DF, 3-1/16", 15000 psi WP |
| BOP Control System | Valvcon Hydraulic control system and an acoustic emergency control system |
| Marine Riser | Hughes 21" OD x 20"ID Model, HMF, 3 1/2" ID Kill and Choke lines, WP 15,000 psi, 4" ID Booster line, WP 3000 psi , Sufficient riser for 450 m water depth |
| Telescopic Joint | Two ea Hughes HMF, telescoping joint , double seals, support ring with integrated kill/choke and booster lines. |
| Choke and Kill System | WOM 15,000 psi, 2-9/16", one manual, two remote controlled chokes, fitted with temp gauges for HP/HT wells. |
| Buoyancy Modules | Make: Eccofloat, for 15 joints. |
| Diverter BOP | Hughes KFDS, 49 1/2" opening |
| Riser tensioners | Eight tensioners, each rated for 100 kips |

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# POLAR PIONEER
## Capabilities and Marine Equipment

### INTRODUCTION TO POLAR PIONEER

- The POLAR PIONEER is a 4th generation semi-submersible rig of the of Polar (Sonat)/Hitachi Design, built in 1985 by Hitachi Zosen, Ariake, Japan.
- The rig is specially designed and constructed to operate in cold, harsh, sub-zero environments.
- The rig is classified by the Norske Veritas complies and to the regulations of the flag state (NMD of Norway), UK Department of Energy and UK Health and Safety Executive and international requirements of IMO-MODU Codes and SOLAS.

POLAR PIONEER can operate in water depths from 70 m to 500 m and is equipped with 15,000 psi well control equipment. The BOP and the choke system is specially fitted for handling High Temperature/High Pressure wells.

### GENERAL INFORMATION

| | |
|---|---|
| Unit Name | POLAR PIONEER |
| Unit Owner and Operator | Transocean Offshore Inc. |
| Flag/Port of registry | Majuro, Marshall Island |
| Unit classification | Det Norske Veritas Classification A/S . Maltese Cross 1A1-Column Stabilised Unit., |
| Additional class notifications | Drill, HELDK, POSMOOR(ATA), CRANE, E0, ICE T. NON-SELFPROPELLED |
| Rated drilling depth | 7,600 m RKB |
| Maximum water depth | 500 m |
| Minimum operating water depth | 70 m |
| Rig design | Polar (Sonat)/Hitachi |
| Year of construction | 1985 |
| Yard | Hitachi Zosen, Ariaki, Japan |
| Year placed in service | 1985 |
| Unit shape/unit design | 8 x columns x 2 pontoon supported semi- submersible |
| No of thrusters | 4 each of 2,450 kW |
| Transit speed towed | 6 knots |
| Transit speed thrusters | 6 knots |
| Positioning system (anchor, DP, combined) | Eight point anchor/chain system, automatic thruster assisted (ATA) |
| Main deck width | 71m. Breath all over: 89m |
| Main deck length | 85m. Length all over: 122m |
| Depth keel to main deck | 41.65 m |
| Draughts, Drilling | 23 m - Displacement: 46,440 tonnes |
| Draught, Survival | 19 m - Displacement: 43,312 tonnes |
| Draught, Transit | 9.15 m - Displacement: 32,554 tonnes |
| Total drilling variable load, ex. anchor tension | 3.514 tonnes |
| Total survival variable load | 3.514 tonnes |
| Total transit variable load | 3.514 tonnes |
| Accommodation | Maximum 110 people in two-men cabins |
| Helideck designed for | Chinook and Sikorski S61N |

### ENVIRONMENTAL CRITERIA FOR OPERATION

| ENVIRONMENTAL CONDITIONS | SURVIVAL CONDITIONS | LIMITING OPERATION CONDITION DRILLING |
|---|---|---|
| Wind speed | 55 m/s 10 min average | 30 m/s |
| Wave height | $H_{max}$ 32 m) | Hmax 13.8 m |
| Mean wave period | 11-15 s | 12 s |
| Current speed | 1.6 m/s | 0.75 m/s |

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# POLAR PIONEER
# Capabilities and Marine Equipment

## STORAGE CAPABILITIES AND MARINE EQUIPMENT

### Storage capacities

| | |
|---|---|
| Diesel oil | 1,795 $m^3$ |
| Helicopter fuel | 10 $m^3$ |
| Fuel consumption, transit | 40 tonne/day |
| Fuel consumption, drilling | 25 tonne/day |
| Drilling water | 1771 $m^3$ |
| Potable water | 770 $m^3$ |
| Active/Reserve liquid mud( on deck) | 202 $m^3$ /263 $m^3$ |
| Reserve liquid mud ( in pontoons) | 500 $m^3$ |
| Brine/low toxic oil storage | 457 $m^3$/770 $m^3$ |
| Bulk bentonite/barite | 560 $m^3$ |
| Bulk cement | 360 $m^3$ |
| Sack storage | All mud and addetiyes supplied in 40x3$m^3$ cont. for auto-feeding |
| Pipe racks area | 2330tonnes/745$m^2$ |
| Riser racks | 2430tonnes/811$m^2$ |
| BOP storage | 220 tonnes /25$m^2$ |
| Miscellaneous storage area | 150 $m^2$ |

### Rig power plant

Complete power system comprising of diesel driven generator sets supplying AC and DC power. In the drilling mode sufficient power are available to control and power simultaneously two mud pumps and top drive both at full load and the drawworks at half load with thrusters working to assist positioning unit and with one diesel engine generator as a stand-by.

### Diesel engine plant

5 each diesel engines, in two engine rooms
Make Bergen Diesel.
Type KVG-18, each 2750 kW
Total output, 13,750 kW at 720 rpm.
Independent fuel supply to each engine and automatic engine shut down in case of 'racing'.

### AC - Generator

One generator set, capable of taking the peak demand, with a second as a 100% stand-by.

| | |
|---|---|
| Quantity | 5 |
| Make | NEBB |
| Type, | WAB 900 G10 HW |
| At rotation speed of | 720 RPM |
| Continuous output | 2,750 kW |
| Output Voltage | 6,000 V |

### Emergency generator

One emergency generator set of 1137 kW complete with its own switch board and wiring. The emergency system is completely independent of the main system and powers all emergency lightning and functions .

### SCR system

| | |
|---|---|
| Number of SCRs | 16 |
| Make/Type | ABB |
| Maximum power | 8,680 kW |
| Output Voltage | 600 V |

### Transformer system

| | |
|---|---|
| Quantity | 2 |
| Make/Type | National Ind. |
| Continuous power | 4,000 KVA |
| Output Voltage | 6000, 440, 220, 230 V |
| Frequency | 60 Hz |

### Propulsion/thrusters

4 each azimuth thrusters.

| | |
|---|---|
| Type | Liaaen TNCP 105/75-280 |
| Motors | NEBB |
| Output | 2400 kW |

### Positioning System

| | |
|---|---|
| Subsea Acoustic | Transponder System |
| Type | Kongsberg K-Pos DPM 11 - Positioning Mooring System |
| Pos. ref | Kongsberg Simrad HPR 309 |
| Type | Furuno GPS/WAAS Navigator GP32 |

### Mooring System

8 point spread, $45^0$ between the anchor lines.
4 double Pusnes, 750cu windlasses.
8 Anchors, type Stevepris MK6, 15 tonnes.
8 Anchor Chains, Type K4, 84 mm, 737 tonnes breaking strength, 151 kg/m, 2000 m each.
The mooring system is thruster assisted.

### Telecommunication equipment

- VHF-AM aeronautical radio equipment. Minimum output power 15 W. Frequency continuously selectable.
- Aeronautical Non-Directional Beacon. Minimum output power 50 W.
- Sailor Compact-GMDSS station (GMDSS/DSC) VHF/MF/HF.
- V-SAT, telefon/fax/data.
- Iridium Scansat-7701 Sat. telephone

### Evacuation Systems

**Survival craft**

| | |
|---|---|
| Make | Umoe Scat-Harding A/S |
| Type | 28 MCR & 28 MCB - Fire protected |
| Quantity | 2 + 2 |
| Capacity persons | 2 x 50 / 2 x 60 |

Life rafts

| | |
|---|---|
| Make/Type | Viking KF |
| Number on board | 6 |
| Capacity each | 20 |

**Rescue boat x 2**

1. Make/type: MP-741 Springer
2. Make/type: Watercraft WH FPB 650 DJ

Weather limitations on launching; Wave height 2.5 m. Wind 21 knots.

### Safety Equipment

The unit is equipped with safety equipment according to IMO Code, and Norwegian Regulations.

### Firefigting Equipment

The unit is equipped with fire fighting equipment according to IMO Code and Norwegian Regulations.

### Fire and gas detection Equipment

The unit is equipped with fire and gas detection equipment according to IMO Code and Norwegian Regulations.

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# POLAR PIONEER
# Drilling Equipment

## AUXILIARY EQUIPMENT

### Revolving cranes

One each Brattvaag Crane
Port : 30 mt @ 14 m outlay , max sea 2,0 m Hs
15 mt @ 40 m outlay, max sea 0,5 m Hs
One each Liebherr BOS 4200 - 50 Litronic Crane
Stb.: 50 mt @ 18 m outlay ,max sea 2,2 m Hs, 25 m/s wind
11,2 mt @ 56 m outlay, max sea 1,0 m Hs
The cranes are fitted with instrumentation, safety devices and alarms according to Norwegian regulations.

### Overhead deck cranes for pipe handling in accordance with Norwegian Regulations

3 each Pipe Rack Overhead Crane for tubular handling. Make: Miko, Cap: 20 tonnes SWL.
Equipped with lifting arrangements.
1 each Riser Rack Overhead Crane for Riser handling.
Make: Miko. Cap: 23 tonnes SWL.

### Pneumatic winches

| | |
|---|---|
| Make | Atlas Copco |
| Type | A32TB |
| Capacity in Tonnes | 3.2/5 |
| Wire diameter in mm | 19 |
| No on drillfloor | 1 |
| No on cellar deck | 4 |
| No in tension system | 8 |
| No in derrick | 1 |
| On top of BOP crane | 1 |
| Make | Ingersoll Rand |
| Type | FA5i |
| Capacity in Tonnes | 5 |
| No on drillfloor | 2 |

### 'Man-riding' winches

Satisfies NPD requirement for man riding winches

| | |
|---|---|
| Make | Vestnorsk Engineering A/S |
| Locations | 2 each on Drill Floor<br>2 each on Cellar Deck |

### Auxiliary machinery

3 each Water maker, Cap: 75 mt/day total
2 each , Sunrod CPH-60, Steam generators, 13,000 kg /hr
3 each Rig air compressors and 2 each bulk air compressors .
Cap. of each: 21.5 $m^3$/min at 8.6 bar pressure

### Winterization for operation in Harsh Environmental Conditions

All escape routes are electrically heat traced.
Helicopter Deck is electrically heat traced.
All compartments are heated so that no compartment or void to have a temperature below 2$^{o}$C for an external temperature of -20$^{o}$ C.
Drillfloor shielded and heated by six spot heaters , each with cap. of 35 kW, total output 210 kW.
Cellar Deck enclosed on all sides and heated by five spot heaters, total heating cap. 175 kW. Moonpool partly closed with sliding deck
Riser and Casing Deck (forward) fully enclosed .
Pipe Deck (aft) fully enclosed
Hot water taps for removal of snow and ice are available through a heat exchanger of 4,000 kg/h steam, which is connected to the general service line.

### Derrick/mast

| | |
|---|---|
| Make/type | Maritime Hydraulics |
| Height | 51,80 m |
| Width of base | 12 x 12 m |
| Width of top | 5,49 x 5,49 m |
| Gross nominal cap. | 453 mt |
| Number of lines | 12 |
| Setback capacity, total | 255 tonnes |
| Hookload capacity with full setback: | 409 mt |

### Racking platform

| | |
|---|---|
| Make/type | MH996 |
| Capacity of 6 5/8" DP | 110 std |
| Capacity of 5" DP | 65 std in addition to 6 5/8" DP |
| Capacity of 9.5" DC | 9 stds |

Pipe handling control cabins

### Drawworks

| | |
|---|---|
| Make/type | Continental Emsco C3 |
| Drum type | Lebus, Grooved |
| Spinning cathead type | Cont. Emsco GB |
| Breakout cathead type | Cont. Emsco GB |
| Crown safety device | Crown-O-Matic & IE TBC |
| Sandline | NA |
| Drum diameter | 915 mm |
| Max. lift cap 12 lines | 453 mt |
| Max. lift cap 10 lines | 448 mt |
| No. of electric motors | 3 |
| Electric motor make | NEBB |
| Output power | 2,230 kW |

Hydraulic operated emergency disk brakes

### Auxiliary brake

| | |
|---|---|
| Make/Model | Baylor Elmagco mod. 7820 |
| Independent back-up system | Battery pack |

### Kinetic Energy Monitoring system

| | |
|---|---|
| Make/type | Innduative Electronics |

### Crown block

| | |
|---|---|
| Make/type | MH |
| Rated capacity | 590 mt |
| No of sheaves | 7 |
| Sheave diameter | 1524 mm |
| Sheave grooved for line | 38 mm |

### Travelling block

| | |
|---|---|
| Make/type | MH |
| Rated capacity | 590 mt |
| No of sheaves | 6 |
| Sheave diameter | 1524 mm |

### Drill string motion compensator (Crown Mounted)

| | |
|---|---|
| Make | Maritime Hydraulics |
| Type | CBC 270-25 |
| Stroke in m | 7,6 m |
| Capacity - compensated | 269 mt |
| Capacity - locked | 453 mt |

### Active heave compensator

| | |
|---|---|
| Make | Mercur/Maritime Hydraulics |
| Type | Hydraulic |
| Stroke | 7,6 m |
| Capacity | max hydraulic force +- 15 mt |

### Rotary table

| | |
|---|---|
| Make/type | Cont. Emsco T4950-65 Maximum |
| opening | 1257,3 (49 1/2") |
| Rated capacity in mt | 590 |

Driven by an independent electric motor,

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# POLAR PIONEER
# Drilling Equipment

two speed gearbox
Electric motor type/make NEBB
Output power in kW 746
Maximum continuous torque 50,000 ft lbs.

### Master Bushings (split type)
Make/Type : Varco MPCH
Full range of inserts bowls to suit all contractor's tubulars and for running all standard casing sizes.

### Drillpipe rack to drillfloor handling system
MHI/Miko Pipe Handling System; overhead cranes bringing tubulars into remote operated skid way, which delivers piping to the drillfloor. Satisfies latest NPD requirement.

### Top drive
Make/Type : Maritime Hydraulics / DDM 650-HY
Rated capacity : 590 mt
Working pressure in bar : 350 (5000 psi)
Remote operated kelly cock : 1 ea
Hydraulic Driven by motor : 4 ea ( 4 x 500 ccm)
Make : Rexroth (MH)
Output torque in Nm : 54012 @ 132 rpm
Gearbox, no of gears : 3
Maximum rotary speed, RPM : 206 @ 33488 Nm
Mudline diameter in inch :3

### Drill pipe
Rig is capable of handling tubulars in range from 3 ½" to 6 5/8"

### Hevi-wate drill pipe
5 ½" OD, 5 ½ FH connections
5" x 50 lbs/ft, NC 50 connections

### Drill collars
Rig is equipped with
9 1/2" OD, 2 13/16" ID, 7 5/8" Reg Connections,. Spiraled
8-1/4" OD, 2 13/16" ID, 6 5/8" Reg Connections, Spiraled,
6 1/2" OD, 2 13/16" ID, NC50 Connections, Spiraled

### Cross-over subs
Enough cross-over subs to make up all drill and fishing string configurations of contractor's equipment.

### Handling tools
Elevators and slips to handle all the Contractor's tubulars, and casing elevators and casing slips to handle standard casing strings.
Manual tongs to handle all Contractor's tubulars and standard casing strings.

### Iron roughneck
Make Maritime Hydraulics
Type 1898
Range size 3-1/2" thru 9-1/2"
Remote controlled

### Fishing equipment
Fishing equipment for all of the Contractor's downhole equipment.

### Diverter BOP
Make : Reagan Offshore International
Model : KFDS
Size inch : 10" x 24"
WP : 35 bar
OD outlets : 49-1/2" top & bottom of housing
Insert packer size inch : 12"
Diverter flowlines : 2 each
OD of flowlines inch : 19

### BOP stack
One Hydril 18 3/4" BOP stack, Working Pressure 103400 kPa (15,000 psi). Rated for $H_2S$ service containing:

- Well head Connector, Vetco H4
- Two double "Hydril-Dual Cam" rams containing: Four ram type preventers with MPL ram locks, of which three preventers for drill pipe and one with single-piece shearing blind rams
- Acoustic control System
- 1060 litres subsea accumulators

### Pipe rams available
Rams available to dress BOP with shear/blind ram and variable rams to suit ranges from 3 ½" to 7 5/8" OD
Rams dressed for Sour service

### Lower Marine Riser Package
(from bottom to top:)
Hydraulic connector, Make Camerson Mod 70, Size 18-3/4", WP kPa 68900 (10,000 psi)
Bag type preventer, Make Hydril, Type "GX", Size inch 18-3/4", WP kPa 68900 (10,000 psi)
Flex joint, Make Oil State, Type Flex Joint Assy 18-3/4"

### Choke and kill valves
8 each, CIW DF, 3-1/16"
WP kPa 103,400 (15,000 psi)

### BOP stack handling system
The BOP is moved by skidding arrangement from storage area to moonpool and under the rotary table.
Overhead crane of 220 mt above storage for handling BOP & LMRP.
The system is fitted with a mechanical stabilising device, permitting running the BOP in $1.5^0$ of roll and pitch.

### Marine riser
Rig is equipped with marine riser for 450 m water depth
Make: Hughes Offshore
Model: HMF
21" OD x 20"ID
3 ½" ID Kill and Choke lines, WP 15,000 psi,
4" ID Booster line, WP 3000 psi

### Telescopic joint
2 ea Hughes Offshore HMF, telescoping joint , double seals, support ring for tensioning lines and 3" bore kill and choke hoses, and booster line with WP corresponding to BOP.
Hydraulic locking of inner barrel.

### Buoyancy modules
Make: Eccofloat Type RG 24
Quantity: elements for 15 joints

### BOP control System
Valcon Hydraulic control system with pilot controlled subsea valves electric/pneumatic powerpack, 40 x 15 gal bottles, total capacity 2835 litres surface accumulators, 2 remote control stations and complete emergency electric and pneumatic power back-up of all control functions

### Acoustic emergency BOP control system
An acoustic emergency control system , type Simrad
HPR 309, with six functions to be used in the event the BOP functions are inoperable due to a failure of the hydraulic control system.
Description of functions Controls:
LMRP Connector, 2 Pipe Rams, Shear Rams.

### Choke manifold
WOM choke manifold, rated to 15,000 psi, with two Cameron remote operated chokes and 1 Cameron manually operate choke. The choke manifold is rated for $H_2S$ service.

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# POLAR PIONEER
# Drilling Equipment

### Riser tensioners
One marine riser tensioning system of 8 eight tensioners c/w control panel, air receivers, sheaves and wireline to give a total stroke of 15,25 m. The system is independent, having its own electrically powered compressors and chemical or refrigeration air drying unit.
8 each, make Wichman, Capacity each, 45 mt (100 kips).
Maximum cylinder stroke, 3.81 m. Total wireline travel 15,2 m
Wireline size inch, 1-3/4.

### Guideline and Podline system
Guideline tensioning system complete with control panel, air receivers, sheaves and 3/4" wirelines to give a total of 12 m line travel, having a capacity of 6.8 ton each with line storage drums behind tensioners.
4 + 2 each, make Wichman, Capacity each kN 71 (16 kips)

### Mud pumps
3 each mud pumps of 5000 psi WP Cont. Emsco FB1600 7"x12" with 2 x DC motors. Each pump rated to 1472 kW continuous service. The mud pumps are fed by 3 each supercharge pumps, each of 30 kW.

### Mud storage capacity
2 each active mud tanks, each of 80 $m^3$, total 160 $m^3$ on deck.
4 each reserve mud tanks total of 226 $m^3$ on deck.
2 each mud storage tanks, total of 430 $m^3$ in column.
1 each base oil tanks of 770 $m^3$ in pontoon.
2 each brine tanks, total of 750 $m^3$ in pontoon.

### Mud mixing system
STEP Offshore Mud Mixing System
3 each mud mixing pumps, 75 kW each.
2 each sack mixing stations with a total of 3 hoppers.
The hoppers are served by 3 surge tanks , two of 23 $m^3$ and one of 14 $m^2$ capacity.

### Mud treatment system
5 each Thule VMS 100 Shale Shakers, total flowrate 4.5 $m^3$ /min.
16 cone Demco desilter system, fed by 75 kW supply pump. Cap. each 1,400 gpm.
1 each Brandt degasser, Cap. 3785 $m^3$/h.
1 each Swaco mud/gas separator an 8" nom diam vent line to top of derrick.
2 each mud centrifuges.

### Cementing system
Twin Halliburton Electric powered cementing unit for 1035 bar (15,000 psi) service.
Twin batch tanks 12 $m^3$ each. Recalculation Averaging Mixer with capacity of 1,27 $m^3$/min (8 BPM) depending on slurry density.

### Oil Based Mud arrangement
2 each removable Conveyor Screws are installed for transportation of cuttings from shaker into containment tanks. Space available on deck for installation of 3d party Cutting Containment System

### Radar
2 each Furuno FAR-2127BB

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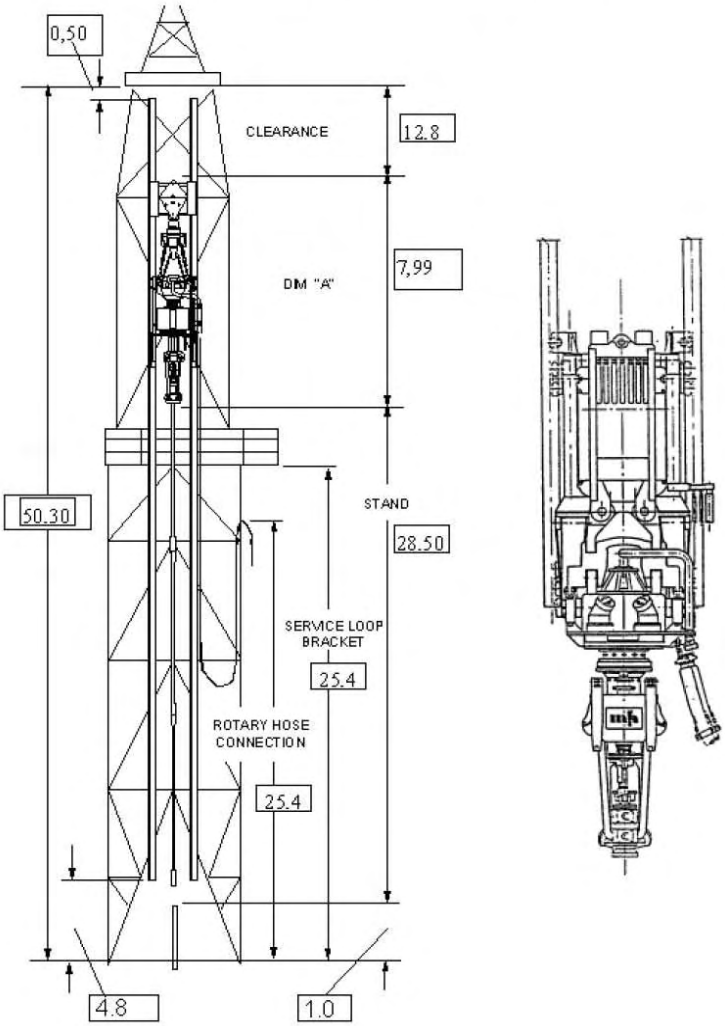
**POLAR PIONEER**
**Hoisting Data**

**DERRICK HEIGHT INTERFACE REQUIREMENTS**

TOP DRIVE (Make) : Maritime Hydraulic
TOP DRIVE (Type) : DDM 650 HY
All measurements in meters.

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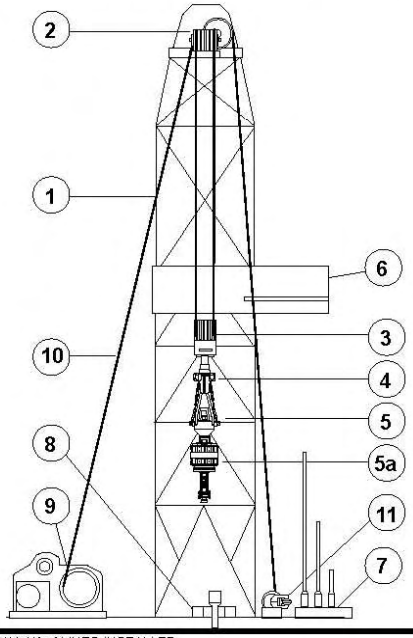
**POLAR PIONEER**
**Hoisting Data**

**RIG COMPONENT HOISTING CHARACTERISTICS**




| MAX. LOAD CONSIDERING MAX. N° of LINES INSTALLED | | | |
|---|---|---|---|
| ITEM | DESCRIPTION | STATIC CAPACITY | Remarks |
| 1 | DERRICK Gross nominal capacity (mt.) | 453 | |
| | Hook load capacity (mt.) | 409 | Net string wt |
| | With max. number of lines (nr.) | 12 | |
| 2 | CROWN BLOCK Rated load capacity (mt.) | 590 | |
| 3 | TRAVELLING BLOCK Rated load capacity (mt.) | 590 | |
| 4 | HOOK BLOCK Rated load | NA | Not installed |
| 5 | SWIVEL HEAD Rated load capacity (mt.) | NA | Not installed |
| 5 a | TOP DRIVE Rated load capacity (mt.) | 590 | |
| 6 | RAKING PLATFORM Rated load capacity (DP, DC) | 5500 m DP | Total 255 mt on both setbacks |
| 7 | RIG FLOOR SET BACK Rated load capacity (mt.) | 255 | |
| 8 | ROTARY CASING CAPACITY Rated load capacity (mt.) | 800 | |
| 9 | DRAWWORK: main drum Rated load capacity (mt.) | 590 | Low / Low using 14 lines. |
| 10 | DRILLING LINE Rated load capacity (mt.) | 97,6 | Breaking load. |
| 11 | DEAD LINE ANCHOR Rated load capacity (mt.) | 44,6 | |
| | Max. load that rig can handle | 453 | Using 12 lines and with Safety factor 2 for the drilline. |
| | Due to the weakest equipment (to be specified) | | Drilline. |

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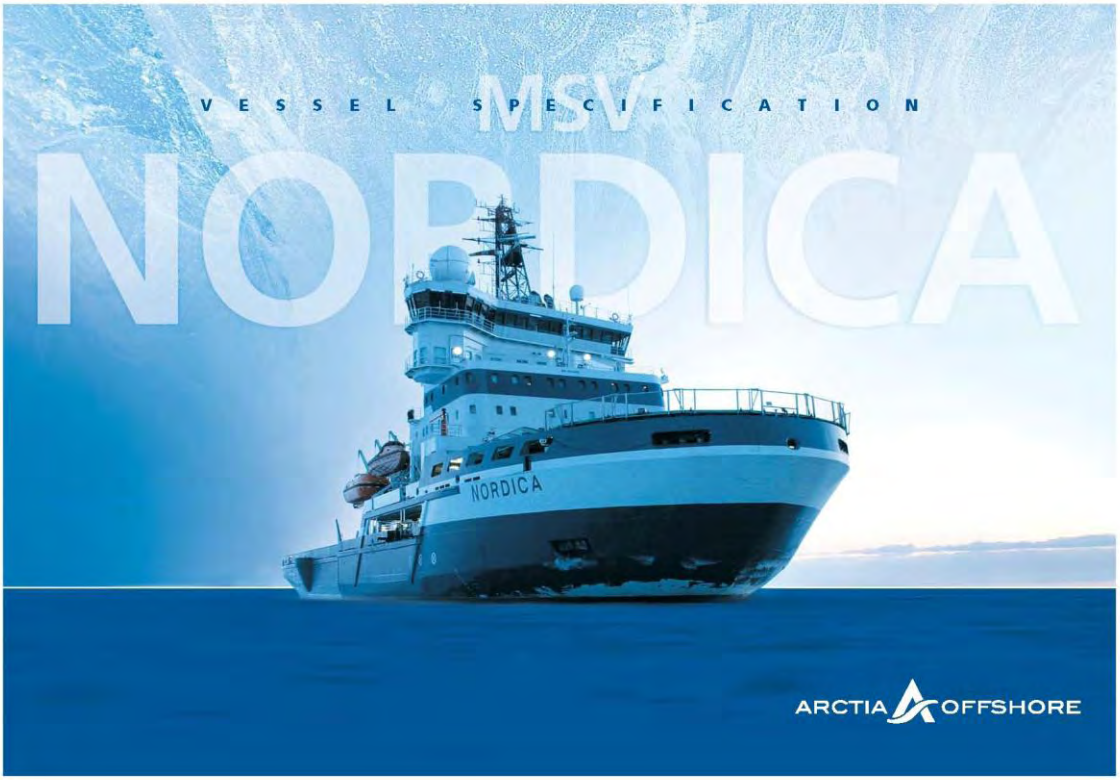
## *"Nordica"* Specifications



ARCTIA OFFSHORE – POWER AT SEA

Globally unique multipurpose icebreakers – Botnica, Fennica and Nordica – are well-equipped and suited for demanding offshore work which requires a high degree of manoeuvrability and accuracy. All three are excellent vessels for ice management tasks in arctic areas.

All of the operations do not, however, take place in the North Sea, Baltic Sea or arctic regions. Vessels sailing under the Arctia flag have also worked in the Gulf of Mexico, West Africa and in the Mediterranean Sea.

Our expertise is founded on an experienced staff and specialised vessels. These two are a strong foundation that enables us to offer first class services to our customers.

Arctia Offshore is a part of Arctia Shipping Group, a specialised shipping company offering icebreaking, ice management, offshore services and marine construction using multipurpose icebreakers and conventional icebreakers. We also offer oil-spill response and ferry services.

Arctia Shipping's fleet consists of variety of vessels ranging from small ferries to multi-purpose icebreakers:

- 5 conventional icebreakers
- 3 multipurpose icebreakers
- 11 ferries.

2

MSV NORDICA

## MSV NORDICA SHORT VESSEL DESCRIPTION

The Nordica is a multifunctional vessel based on a modified icebreaker design with diesel-electric propulsion. The vessel is specially designed for a wide range of offshore related work.

The vessel is designed to carry out offshore installation tasks and can be equipped for laying pipes, cables and umbilicals. The optional 160T SWL crane is well suited for deploying trenching machines and ploughs. Her large bollard pull and strong winches make the Nordica ideal for ploughing operations and towing.

With the main components such as winches and cranes already installed, a change of function can be achieved rapidly. Nordica meets all the stringent rules and regulations for offshore work.

## ICEBREAKING

The Nordica is a part of Arctia Offshore's icebreaker fleet, one of the most powerful in the world. Icebreaking services include ice management, assistance, towing, securing vessel traffic safety, and traffic control for vessels proceeding in icy conditions.

Nordica's icebreaking capability is excellent. The 15 MW dieselgenerators produce power for two Aqua-master azimuth-thrusters to make the vessel easily manoeuvrable. The Nordica is excellent for DP work, all kinds of marine operations and in harsh icy conditions for towing merchant vessels.

## VESSEL DETAILS

| | |
|---|---|
| IMO No. | 9056985 |
| Call Sign | OJAE |
| MMSI | 230 275 000 |
| Type of Vessel | Ice Breaker & Multipurpose Support |
| Flag State | Finland |
| Port of Registry | Helsinki |
| Owners | Arctia Offshore |
| Built | 1994 |
| Lightweight | 7.935 T |
| Deadweight (approx.) | 4.800 T |
| Displacement | 12.800 T |
| LOA | 116.0 m |
| LWL | 96.7 m |
| Breadth Moulded | 26.0 m |
| Depth Moulded | 12.5 m |
| Draught (Scantling) | 8.4 m |

## CLASSIFICATION

| | |
|---|---|
| DNV | 1A1 POLAR10 Icebreaker Tug Supply Vessel SF HELDK EPR EØ DYNPOS-AUTR |

## CAPACITIES AND CONSUMABLES

| | |
|---|---|
| Fuel Oil (Dual Fuel) | 1690 m³ HFO |
| | 817 m³ DO |
| Lubricating Oil | 85 m³ |
| Fresh Water | 400 m³ |
| Water Ballast | 2200 m³ |
| F.W. Making Capability | 25 T / day |
| Consumables, 8.4 m Draught: | |
| Type of Fuel (Dual Fuel) | HFO / DO |
| Fuel Consumption, 13 knots | abt. 42 T / day |
| Fuel Consumption, 11 knots | abt. 30 T / day |
| Fuel Consumption, DP | abt. 15 T / day |
| Duration, 13 knots | abt. 45 days |
| Duration, 11 knots | abt. 67 days |

Duration times on DP depend on distance and speed of transit, to location.

3

## ICE BREAKING CAPABILITIES

| | |
|---|---|
| Maximum ice thickness | where vessel is capable to maintain speed is 1.8 m |
| Speed | of 8 knots at 0.8 m level ice |

## PROPULSION

| | |
|---|---|
| Power | 16 V 32 / 6000 kW Wärtsilä Vasa x 2 |
| | 12 V 32 / 4500 kW Wärtsilä Vasa x 2 |
| Propeller Type | Fixed pitch |
| | variable rpm |
| Nozzle Fitted | 2 pcs (for aquamasters) |
| El.Prop Motor | 2 |
| Type | 2 pcs ABB Strömberg Drives |
| Rating | Both rated at 7500 kW |

## BOW THRUSTERS

| | |
|---|---|
| Number | 3 |
| Make | Brunvoll |
| Type | FU-80 LTC-2250 |
| Power | 1150 kW |
| Propeller Type | Variable Pitch |

## SWITCHBOARDS

| | |
|---|---|
| Make | ABB distribution |
| Type | 6.3 kV prod. 6989C S001 |
| Transformers | 2 x 2000 kva 6300 / 400 V 50 Hz + 1250 kva 6300 / 400 V 50 Hz |

## GENERATORS (MAIN)

| | |
|---|---|
| Number | 4 |
| Make | ABB Strömbberg Drives |
| Type | 2 x HSG 1120 MP8 |
| | 2 x HSG 900 LR8 |
| Rating | 8.314 kVA / 6.3 kV / 750 rpm |
| | 6.235 kVA / 6.3 kV / 750 rpm |

## GENERATORS (HARBOUR SET)

| | |
|---|---|
| Number | 1 |
| Make | Wärtsilä |
| Type | VASA 4R22 |
| Rating | 710 kW / 1000 rpm |
| Generator | |
| Type | ALPC 500 AG |
| Rating | 840 kVA / 400V |

## GENERATORS (EMERGENCY)

| | |
|---|---|
| Number | 1 |
| Make | Caterpillar |
| Type | 3412 |
| Rating | 300kW / 1500 rpm / 400 v / 50 Hz |

## BOLLARD PULL

| | |
|---|---|
| Bollard pull / Aqua master | 234 T |

## ROLL REDUCTION

| | |
|---|---|
| INTERING | |
| Active roll reduction tank | 720 m³ |

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MSV NORDICA

## DYNAMIC POSITIONING

| DP –AND AUTOMATION HARDWARE | |
|---|---|
| Type (DP) | Kongsberg K-POS DP-22 (Installed 2009) |
| Operator stations (OS) | 2 pcs |
| Dual redundant controller | 1 pc (one cabinet with separated controllers) |
| Redundant joystick (cJoy) | 1 pc (with own independent cJoy -controller) |
| Process/fi eld stations (FS) | 8 pcs (for thrusters and power/propulsion plant) |
| Network Distribtion Units | 6 pcs |
| Type (Automation) | Kongsberg K-Chief (Installed 2009) |
| Operator Stations | 5 pcs |
| Automation / K-Chief stations are part of the K-POS -system | |

| REFERENCE SYSTEMS / EQUIPMENTS | |
|---|---|
| The DP -system is supported by the following reference systems: | |
| Hydro acoustic | 1 pc Kongsberg HiPaP 500 |
| Tautwire | 1 pc Kongsberg LTW MK15/500 |
| Satellite positioning | 3 pcs Kongsberg DPS -type receivers<br>4-5 Differential signals<br>(IALA, Inmarsat-B, SPOT, Glonass)<br>High Precision corrections possible<br>upon separate agreement |
| Artemis | 1 pc MK-4 (of explosion proof type) |
| Fanbeam | 1 pc Fanbeam optional |
| Vertical Reference | 3 pcs Kongsberg MRU2 and MRU5 -types |
| Gyro | 3 pcs Ixsea Octans (Fiber Optic Gyros) |
| Anemometer | 2 pcs GILL Ultrasonic wind sensors |

| MAIN OPERATING MODES | |
|---|---|
| Joystick Mode | Manual Positioning using the three-axis joystick |
| Mixed Joystick / Auto Mode | Selecting any of the three degrees of vessel movement, as manual and / or auto |
| Auto Heading Mode | Selecting vessel heading at auto control |
| Auto Position Mode | Station keeping at selected heading and position |
| Follow Target Mode | Automatic following of moving target |
| Auto Track (low speed) Mode | Track keeping in low speed |
| Auto Track (high speed) Mode | Track keeping in medium or high speed |
| Alongships External Force | Manual input of force in tonnes by the joystick is used e.g. towing and cable laying |
| Compensation by Joystick | |

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## BRIDGE EQUIPMENT

THE VESSEL'S INTEGRATED NAVIGATION SYSTEM IS EQUIPPED WITH
- Multi-Sensor radar and positioning system
- Type approved Dual ECDIS system

SYSTEM PROVIDES
- Flexible route planning, steering and monitoring
- Continuous calculations of own position and display on ECDIS
- Continuous target tracking by radars and AIS
- Continuous target presentation by ECDIS

## EXTERNAL COMMUNICATION SYSTEM

| | |
|---|---|
| GMDSS portable VHF | 3 pcs + VHF portable 1 pc |
| Helicopter Communication, fixed | 2 pcs aviation VHF |
| Helicopter comms. Portable VHF Aero | 4 pcs |
| Distress Transponders | 4 pcs 9 GHz<br>(2 on the bridge,<br>2 on the lifeboats) |
| EPIRB<br>(Emergency Position Indicating Radio Beacon) | 2 pcs |

COMPRISING
- GMDSS - A3 radio station
- Telenor SEALINK 2 on Dual band
- Inmarsat Fleet 77
- Aviation VHF (fixed + portables)
- Additional VHF/UHF radios

SEARCHLIGHT
- The following Xenon remote controlled search lights are provided:
- 2 x 1600 W (360 dgr)
- 3 x 1000 W (360 dgr)

## INTERNAL COMMUNICATION SYSTEM

AUTOMATIC TELEPHONE SYSTEM
- The telephone system consists of automatic exchange and phone sets.
- In addition to the land lines there are mobile cellular and ship's satellite communication system connected to the PABX. All cabins fitted with telephones.

NB! The following numbers are subject to change depending upon current project and location.
- 4 pcs outside telephone lines available for Project / Client
- Radio / TV cable network
- Radio / TV cable network receives terrestrial radio / TV broadcasts as well as satellite broadcasts, which are further distributed to the ship's cable network and TV sets.

| TO SHIP | |
|---|---|
| Ku Band | + 47 5140 7124 |
| Ku Band | + 47 5140 7125 |
| Ku Band / Project | + 47 5140 7126 |
| GSM / via Finland | + 358 400 246 551 |
| Via Finland | + 358 306 207 800 |

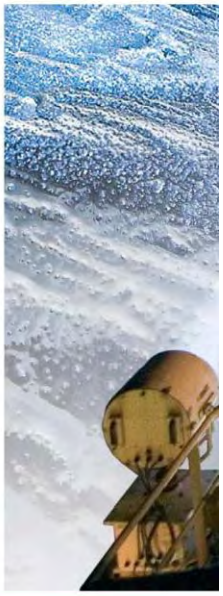
| FAX | |
|---|---|
| Inmarsat fleet | + 870 1600 544 511 |
| GSM | + 358 408 860 855 |
| Norsat VSAT / via Finland | + 358 306 207 815 |

## DATA NET (CLIENT)

- The Data Network is a cat. 5 10 / 100 TX Ethernet.
- The network is connected to the Norsat KU band communication system onboard.
- (May change between projects)

THE NETWORK HAS OUTLETS ON THE FOLLOWING LOCATIONS ONBOARD

| | |
|---|---|
| Bridge | |
| Operation Center | 4th Bridge deck |
| Conference Room | 2nd deck |
| Owners cabins | |
| Aft Deck | |
| Hospital | 2nd Bridge deck |



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MSV NORDICA

## HELIDECK

| | |
|---|---|
| Helideck 'D'Value | 19 m / 8.6 T |
| Rated | Super Puma L1 or similar |
| HMS | 1 pc Kongsberg HMS 100 |

## DECK LAYOUT

| | |
|---|---|
| Shark Jaw | 2 pcs<br>(adapters 38 mm 86 mm 95 mm) |
| Air on Deck | 16 connecting points,<br>300 m³ / h, 7 bar |
| Air Receiver | 1000 l |
| Sea and Fresh Water | 4 connecting points,<br>40 m³ / h, 7 bar |

ELECTRICITY ON DECK

Power Outlets 400 V (± 10%) / 50 Hz, rated at 1100 kW

| | |
|---|---|
| 2 pcs 16 A | 7 pcs 125 A |
| 2 pcs 32 A | 4 pcs 250 A |
| 4 pcs 63 A | 2 pcs 630 A |

(Additional MA-set available,
output 440 V / 60 Hz / 2 x 160 A / rated at 320 kW)

Power Outlets 230 V (± 5%) / 50 Hz, rated at 40 kW
6 pcs 16 A (2 ph)
2 pcs 32 A (3 ph)

7

## DECK CRANES

MAIN CRANE

| | |
|---|---|
| Max single line lift capacity | SWL 150 mt on outer lay (full drum) |
| a. Lifting capacity | single line arr. SWL 25 mt / 35 m outreach |
| b. Lifting capacity | single line arr. 150 mt / 10 m outreach |
| Winch capacity | 3000 m |
| Wire Size | OD Ø 77 mm |
| Main Hook Active Heave Compensation (AHC) capacity | |
| Performance | 0-75 T single line |
| Performance | 75-150 T single line 50% of above |
| Aux winch lifting capacity | single line SWL 20 mt / 36 m outreach |
| Winch capacity | 2000 m |
| Wire Size | OD Ø 24 mm |
| Aux Hook Active Heave Compensation (AHC) capacity | |
| Performance | 0-10 T single line |
| Performance | 10-20 T single line 50% of above |

SECONDARY CRANE (OPTIONAL)

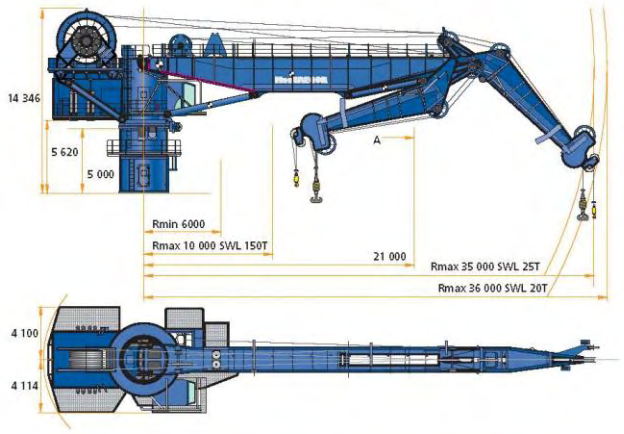
| | |
|---|---|
| Manufacturer | MacGregor |
| Main hook | 5 T / 15 m |
| Wire Length | 80 m |
| Wire Size | 22 mm |
| Drum Capacity | 100 m |

A- FRAME (OPTIONAL)

| | |
|---|---|
| Safe Working Load | 120 T |
| Clearance between legs | 12 m |
| Hook height | 15 m |
| Working Depth / appx. | 300 m |

MAIN DIMENSIONS [MAIN CRANE]

| | | |
|---|---|---|
| Max radius | | 36 000 SWL 20T |
| Overal width | W | 8 214 [mm] |
| Height to top of king | H2 | 14 346 [mm] |
| Height of pedestal | | 5 000 [mm] |
| Boom angle in parked position | 1 | 0 [°] |

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MSV NORDICA

## WINCHING CAPACITIES

| | | |
|---|---|---|
| DECK LOADING | | |
| Deck Area | approx. 1100m² | |
| Capacity | 10 T / m² (Defined loading area) | |
| | **First Layer** | **Outmost Layer** |
| ANCHOR HANDLING DRUM | 1084 mm | 2030 mm |
| Maker | Aquamaster-Rauma | |
| Type | TAW 3000 / 3000E | |
| Drive | Electric, 2 DC motors each 225 kW | |
| Pay out / in speed | Stepless from 0 to max speed | |
| Cable lifters | 2, for 84 mm Ø stud link chain, 1 on each drum | |
| a) At low gear stalling pull 2 min | 3750 kN | 1765 kN |
| Nominal load S1 | 3000 kN | 1412 kN |
| At speed | 0-8 m / min | 0-17 m / min |
| Maximum Speed | 18 m / min | 38 m / min |
| At load | 1325 kN | 623 kN |
| Safety Clutch | 66 m / min | 140 m / min |
| Max speed | 2.1 knots | 4.5 knots |
| b) At high gear stalling pull 2 min | 1656 kN | 779 kN |
| Nominal load S1 | 1325 kN | 623 kN |
| At speed | 0-18 m / min | 0-38 m / min |
| Maximum Speed | 40 m / min | 85 m / min |
| At load | 585 kN | 275 kN |
| Safety Clutch | 148 m / min | 314 m / min |
| Max speed | 4.7 knots | 10 knots |
| c) Band Brake static holding load | 4500 kN | 2118 kN |

## TOWING

| | | |
|---|---|---|
| TOWING | In auto-tension mode or with brake engaged Interfaced to DP | |
| | **First Layer** | **Outmost Layer** |
| TOWING DRUM | 1283 mm | 2577 mm |
| a) At low gear stalling pull | 3750 kN | 1867 kN |
| Nominal load S1 | 3000 kN | 1495 kN |
| At speed | 0-8 m / min | 0-16 m / min |
| Maximum Speed | 18 m / min | 36 m / min |
| At load | 1325 kN | 660 kN |
| Safety Clutch | 66 m / min | 133 m / min |
| Max speed | 2.1 knots | 4.3 knots |
| b) At high gear stalling pull 2 min | 1656 kN | 824 kN |
| Nominal load S1 | 1325 kN | 660 kN |
| At speed | 0-18 m / min | 0-36 m / min |
| Maximum Speed | 40 m / min | 80 m / min |
| At load | 585 kN | 291 kN |
| Safety Clutch | 148 m / min | 296 m / min |
| Max speed | 4.7 knots | 9.6 knots |
| c) Band Brake static holding load | 4500 kN | 2240 kN |

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## ACCOMMODATION

| | |
|---|---|
| Total Accommodation | 77 Persons incl. crew (normally 47 client beds) |
| Day Room / Mess for client: | |
| Day Room | 5th Bridge deck |
| Messroom and coffeeshop | Upper deck |
| Laundry Room | 2nd deck (+ Laundry stations on different decks) |
| Gymnasium | 1st Bridge deck |
| Sauna | 2nd deck |
| Kiosk | Upper deck |
| Operation Center | 4th Bridge deck |
| Saloon Room | 5th Bridge deck |
| Client Office / Conference Room | 1 x 20 m² Office 2nd deck |
| Reception (deck office) | Upper deck |
| Hospital | 2nd Bridge deck |

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MSV NORDICA

**SURVEY FACILITIES**

The MSV NORDICA has no permanent ROV system on board, but it does have the capability for an ROV system should the project require it.

**MANNING**

| | |
|---|---|
| Master | 1 |
| Chief Officer / DPO | 1 |
| First Officer / DPO | 1 |
| Second Officer / DPO jr. | 2 |
| Chief Engineer | 1 |
| 1st Engineer | 2 |
| Electrical Engineer | 1 |
| Electrician | 1 |
| Boatswain | 1 |
| Deck Repairman | 2 |
| Engine Repairman | 2 |
| Motorman | 1 |
| Cook Steward | 1 |
| 1st Cook | 2 |
| 2nd Cook | 2 |
| Catering Assistants | 3 |
| Crane tech. | 1 |
| Crane ops. | 2 |

Total Marine Crew about 27 persons, however this may change between projects.

**LIFE SAVING, FIREALARM AND RESCUE EQUIPMENT**

| | |
|---|---|
| Lifeboats | 2 pcs, 82 persons each |
| Type | Waterman 371 |
| Dimensions | L 9.35 m / B 3.26 m / draught 1.22 m |
| Weight including Equipment | 4730 kg |
| Engine | Sabb N4.295 |
| Regulation | NMD |
| Lifeboat Davit | Davit int.type D-NP.120 |
| MOB Boat | 1 pc, 6 persons, S-side |
| Type | Waterman 372 |
| Dimensions | L 7.10 m / B 2.72 m / draught 1.20 m |
| Engine | Sabb N4.295 |
| Speed | 21 knots |
| Regulation | NMD |
| MOB Boat Davit | Davit D-RTS-40 |
| Life rafts | 2 x 25 and 6 x 20 persons |
| Type | Viking Life-saving |
| Life raft davit | 2 pcs Davit D-RB.21 |
| Fire Alarm system | 1 pc Autronica BK-30 IB44 |

DETAILS BELIEVED TO BE CORRECT BUT NOT GUARANTEED.

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## *"Fennica"* Specifications

## ARCTIA OFFSHORE – POWER AT SEA

Globally unique multipurpose icebreakers – Botnica, Fennica and Nordica – are well-equipped and suited for demanding offshore work which requires a high degree of manoeuvrability and accuracy. All three are excellent vessels for ice management tasks in arctic areas.

All of the operations do not, however, take place in the North Sea, Baltic Sea or arctic regions. Vessels sailing under the Arctia flag have also worked in the Gulf of Mexico, West Africa and in the Mediterranean Sea.

Our expertise is founded on an experienced staff and specialised vessels. These two are a strong foundation that enables us to offer first class services to our customers.

Arctia Offshore is a part of Arctia Shipping Group, a specialised shipping company offering icebreaking, ice management, offshore services and marine construction using multipurpose icebreakers and conventional icebreakers. We also offer oil-spill response and ferry services.

Arctia Shipping's fleet consists of variety of vessels ranging from small ferries to multi-purpose icebreakers:

- 5 conventional icebreakers
- 3 multipurpose icebreakers
- 11 ferries.

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## MSV FENNICA

### MSV FENNICA SHORT VESSEL DESCRIPTION

The Fennica is a multifunctional vessel based on a modified icebreaker design with diesel-electric propulsion. The vessel is specially designed for a wide range of offshore related work.

The vessel is designed to carry out offshore installation tasks and can be equipped for laying pipes, cables and umbilicals. The optional 120T SWL A-frame is well suited for deploying trenching machines and ploughs. Her large bollard pull and strong winches make the Fennica ideal for ploughing operations and towing.

With the main components such as winches, cranes and A-frame already installed, a change of function can be achieved rapidly. Fennica meets all the stringent rules and regulations for offshore work.

### ICEBREAKING

The Fennica is a part of Arctia Offshore's icebreaker fleet, one of the most powerful in the world. Icebreaking services include ice management, assistance, towing, securing vessel traffic safety, and traffic control for vessels proceeding in icy conditions.

Fennica's icebreaking capability is excellent. The 15 MW dieselgenerators produce power for two Aqua-master azimuth-thrusters to make the vessel easily manoeuvrable. The Fennica is excellent for DP work, all kinds of marine operations and in harsh icy conditions for towing merchant vessels.

### VESSEL DETAILS

| | |
|---|---|
| IMO No. | 9043615 |
| Call Sign | OJAD |
| Type of Vessel | Ice Breaker & Multipurpose Support |
| Flag State | Finland |
| Port of Registry | Helsinki |
| Owners | Arctia Offshore |
| Built | 1993 |
| Lightweight | 7.935 T |
| Deadweight (approx.) | 4.800 T |
| Displacement | 12 800 T |
| LOA | 116.0 m |
| LWL | 96.7 m |
| Breadth Moulded | 26.0 m |
| Depth Moulded | 12.5 m |
| Draught (Scantling) | 8.4 m |

### CLASSIFICATION

| | |
|---|---|
| DNV | 1A1 POLAR10 Icebreaker Tug Supply Vessel SF HELDK EPR EØ DYNPOS-AUTR |
| Helideck | |

### CAPACITIES AND CONSUMABLES

| | |
|---|---|
| Fuel Oil (Dual Fuel) | approx. 1690 m³ HFO |
| | approx. 817 m³ DO |
| Lubricating Oil | approx. 85 m³ |
| Fresh Water | approx. 400 m³ |
| Water Ballast | approx. 2200 m³ |
| F.W. Making Capability | approx. 25 T/ day |
| Consumables / 8.4 m Draught: | |
| Type of Fuel (Dual Fuel) | HFO / DO |
| Fuel Consumption / 13 knots | 42 T / day |
| Fuel Consumption@ 11 knots | 30 T / day |
| Fuel Consumption / DP | 15 T / day |
| Duration / 13 knots | 45 days |
| Duration / 11 knots | 67 days |

Duration times on DP depend on distance and speed of transit, to location.

3

### PROPULSION

| | |
|---|---|
| Power | 16 V 32 / 6000 kW Wärtsilä Vasa x 2 |
| | 12 V 32 / 4500 kW Wärtsilä Vasa x 2 |
| Propeller Type | Fixed pitch, variable rpm |
| Nozzle Fitted | 2 pcs (for aquamasters) |
| El.Prop Motor | 2 |
| Type | 2 pcs ABB Strömberg Drives |
| Rating | Both rated at 7500 kW |

### BOW THRUSTERS

| | |
|---|---|
| Number | 3 |
| Make | Brunvoll |
| Type | FU-80 LTC-2250 |
| Power | 1150 kW |
| Propeller Type | Variable Pitch |

### SWITCHBOARDS

| | |
|---|---|
| Make | ABB distribution |
| Type | 6.3 kV prod. 6989C S001 |
| Transformers | 2 x 2000 kva 6300 / 400 V 50 Hz + |

### GENERATOR (MAIN)

| | |
|---|---|
| Number | 4 |
| Make | ABB Strömbberg Drives |
| Type | 2 x HSG 1120 MP8 |
| | 2 x HSG 900 LR8 |
| Rating | 8.314 kVA / 6.3kV / 750 rpm |
| | 6.235 kVA / 6.3kV / 750 rpm |

### GENERATORS (HARBOUR SET)

| | | |
|---|---|---|
| Diesel | | |
| Number | | 1 |
| Make | | Wärtsilä |
| Type | | VASA 4R22 |
| Rating | | 710 kW / 1000 rpm |
| Generator | Type | ALPC 500 AG |
| | Rating | 840 kVA / 400VGENERATORs (EMERGENCY) |

### GENERATORS (EMERGENCY)

| | |
|---|---|
| Number | 1 |
| Make | Caterpillar |
| Type | 3412 |
| Rating | 300kW / 1500 rpm / 400 v / 50 Hz |

### BOLLARD PULL

| | |
|---|---|
| Bollard pull / Aqua master | About 230 tonnes |

### ROLL REDUCTION

| | |
|---|---|
| INTERING | |
| Active roll reduction tank | 720 m³ |

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MSV FENNICA

### DYNAMIC POSITIONING

| DP–AND AUTOMATION HARDWARE | |
|---|---|
| Type (DP) | Kongsberg K-POS DP-22 (Installed 2009) |
| Operator stations (OS) | 2 pcs |
| Dual redundant controller | 1 pc (one cabinet with separated controllers) |
| Redundant joystick (cJoy) | 1 pc (with own independent cJoy -controller) |
| Process/fi eld stations (FS) | 8 pcs (for thrusters and power/propulsion plant) |
| Network Distribtion Units | 6 pcs |
| Type (Automation) | Kongsberg K-Chief (Installed 2009) |
| Operator Stations | 5 pcs |
| Automation / K-Chief stations are part of the K-POS -system | |

| REFERENCE SYSTEMS / EQUIPMENTS | |
|---|---|
| The DP -system is supported by the following reference systems: | |
| Hydro acoustic | 1 pc Kongsberg HiPaP 500 |
| Tautwire | 1 pc Kongsberg LTW MK15/500 |
| Satellite positioning | 3 pcs Kongsberg DPS -type receivers |
| | 4-5 Differential signals |
| | (IALA, Inmarsat-B, SPOT, Glonass) |
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| Follow Target Mode | Automatic following of moving target |
| Auto Track (low speed) Mode | Track keeping in low speed |
| Auto Track (high speed) Mode | Track keeping in medium or high speed |
| Alongships External Force | Manual input of force in tonnes by the joystick is used e.g. towing and cable laying |
| Compensation by Joystick | |

5

## BRIDGE EQUIPMENT

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- Multi-Sensor radar and positioning system
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| Helicopter comms. Portable VHF Aero | 3 pcs |
| Distress Transponders | 4 pcs 9 GHz (2 on the bridge, 2 on the lifeboats) |
| EPIRB (Emergency Position Indicating Radio Beacon) | 2 pcs |

COMPRISING
- GMDSS - A4 radio station
- Telenor SEALINK 2 on Dual band
- Inmarsat Fleet 77
- Aviation VHF (fixed + portables)
- Additional VHF/UHF radios

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NB! The following numbers are subject to change depending upon current project and location.
- 4 pcs outside telephone lines available for Project / Client
- Radio / TV cable network
- Radio / TV cable network receives terrestrial radio / TV broadcasts as well as satellite broadcasts, which are further distributed to the ship's cable network and TV sets.

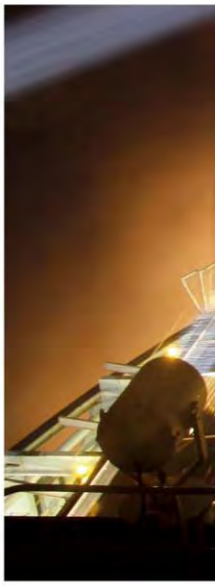
| TO SHIP | | FAX | |
|---|---|---|---|
| GSM | + 358 400 107 157 | GSM | + 358 401 107 159 |
| GSM | + 358 400 107 159 | VSAT | + 358 30 620 7715 |
| VSAT | + 358 30 620 7700 | SAT B | + 870 32 302 4520 |
| SAT B | + 870 32 302 4511 | | |

## DATA NET (CLIENT)

- The Data Network is a cat. 5 10 / 100 TX Ethernet.
- The network is connected to the VSAT Satellite communication system onboard.
- (May change between projects)

THE NETWORK HAS OUTLETS ON THE FOLLOWING LOCATIONS ONBOARD

| | | |
|---|---|---|
| Bridge | | |
| Operation Center | 4th | Bridge deck |
| Conference Room | 2nd | deck |
| Owners cabins | | |
| Aft Deck | | |
| Hospital | 2nd | Bridge deck |



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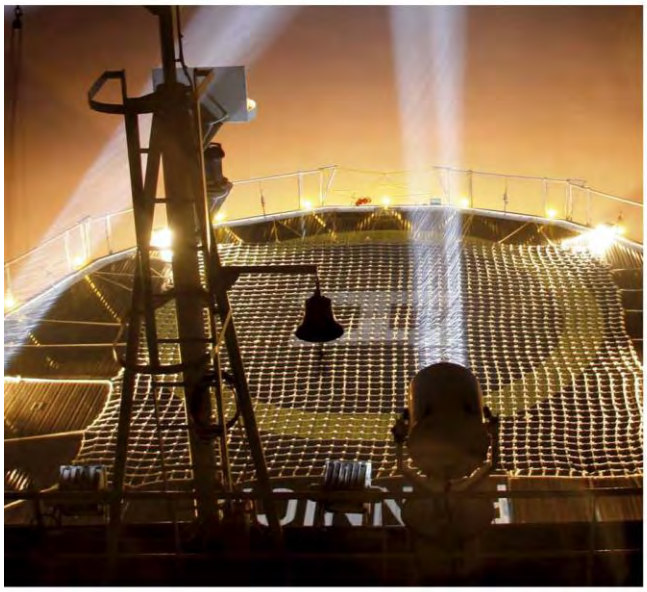
MSV FENNICA



## HELIDECK

| | |
|---|---|
| Helideck 'D'Value | 19 m / 8.6 T |
| Rated | Super Puma L1 or similar |
| HMS | 1 ps Kongsberg HMS 100 |

## DECK LAYOUT

| | |
|---|---|
| Shark Jaw | 2 pcs (adapters 38 mm 86 mm 95 mm) |
| Air on Deck | 16 connecting points 300 m³ / h, 7 bar |
| Air Receiver | 1000 l |
| Sea and Fresh Water | 4 connecting points 40 m³ / h, 7 bar |
| MS3 Panel Outlets | 4 pcs 63 A<br>8 pcs 125 A<br>4 pcs 250 A<br>2 pcs 200 A |

ELECTRICITY ON DECK
- Power Outlets 400 V (± 10%) / 50 Hz, rated at 1100 kW

| | |
|---|---|
| 2 pcs 16 A | 7 pcs 125 A |
| 2 pcs 32 A | 4 pcs 250 A |
| 4 pcs 63 A | 2 pcs 630 A |

(Additional MA-set available, output 440 V / 60 Hz / 2 x 160 A / rated at 320 kW)

Power Outlets 230 V (± 5%) / 50 Hz, rated at 40 kW
- 6 pcs 16 A (2 ph)
- 2 pcs 32 A (3 ph)

7

## DECK CRANES

| | |
|---|---|
| MAIN CRANE | |
| Manufacturer | HYDRALIFT ASA |
| Main hook | 30 T Double fall / 11 m radius |
| | 15 T Single fall / 20 m radius |
| Wire Length | 510 m |
| Working depth | approx. 350 m / Single fall |
| | approx. 180 m / Double fall |
| Wire Size | 32 m |
| SECONDARY CRANE | |
| Manufacturer | MacGregor |
| Main hook | 5 T, 14 m / 1.5 T, 30 m |
| Wire Length | 100 m |
| Wire Size | 22 mm |
| Drum Capacity | 100 m |
| A- FRAME (OPTIONAL) | |
| Safe Working Load | 120 T |
| Clearance between legs | 12 m |
| Hook height | 15 m |
| Working Depth/appx. | 300 m |

8

MSV FENNICA

## WINCHING CAPACITIES

| | | |
|---|---|---|
| DECK LOADING | | |
| Deck Area | approx. 1100 m² | |
| Capacity | 10 T / m² (defined loading area) | |
| | **First Layer** | **Outmost Layer** |
| ANCHOR HANDLING DRUM | 1084 mm | 2030 mm |
| Maker | Aquamaster-Rauma | |
| Type | TAW 3000/3000E | |
| Drive | Electric, 2 DC motors each 225 kW | |
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| Cable lifters | 2, for 84 mm Ø stud link chain, 1 on each drum | |
| a) At low gear stalling pull 2 min | 3750 kN | 1765 kN |
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| At load | 1325 kN | 623 kN |
| Safety Clutch | 66 m / min | 140 m / min |
| Max speed | 2.1 knots | 4.5 knots |
| b) At high gear stalling pull 2 min | 1656 kN | 779 kN |
| Nominal load S1 | 1325 kN | 623 kN |
| At speed | 0-18 m / min | 0-38 m / min |
| Maximum Speed | 40 m / min | 85 m / min |
| At load | 585 kN | 275 kN |
| Safety Clutch | 148 m / min | 314 m / min |
| Max speed | 4.7 knots | 10 knots |
| c) Band Brake static holding load | 4500 kN | 2118 kN |

## TOWING

| | | |
|---|---|---|
| Towing | In auto-tension mode or with brake engaged Interfaced to DP | |
| | **First Layer** | **Outmost Layer** |
| TOWING DRUM | 1283 mm | 2577 mm |
| a) At low gear stalling pull | 3750 kN | 1867 kN |
| Nominal load S1 | 3000 kN | 1495 kN |
| At speed | 0-8 m / min | 0-16 m / min |
| Maximum Speed | 18 m / min | 36 m / min |
| At load | 1325 kN | 660 kN |
| Safety Clutch | 66 m / min | 133 m / min |
| Max speed | 2.1 knots | 4.3 knots |
| b) At high gear stalling pull 2 min | 1656 kN | 824 kN |
| Nominal load S1 | 1325 kN | 660 kN |
| At speed | 0-18 m / min | 0-36 m / min |
| Maximum Speed | 40 m / min | 80 m / min |
| At load | 585 kN | 291 kN |
| Safety Clutch | 148 m / min | 296 m / min |
| Max speed | 4.7 knots | 9.6 knots |
| c) Band Brake static holding load | 4500 kN | 2240 kN |

9

## ACCOMMODATION

| | |
|---|---|
| Total Accommodation | 77 Persons incl. crew (normally 48 client beds) |
| Day Room / Mess for client: | |
| Day Room | 5th Bridge deck |
| Messroom and coffeeshop | Upper deck |
| Laundry Room | 2nd deck (+ Laundry stations on different decks) |
| Gymnasium | 1st Bridge deck |
| Sauna | 2nd deck |
| Kiosk | Upper deck |
| Operation Center | 4th Bridge deck |
| Saloon Room | 5th Bridge deck |
| Client Office / Conference Room | 1 x 20 m² Office, 2nd deck |
| Reception (deck office) | Upper deck |
| Hospital | 2nd Bridge deck |

10

MSV FENNICA

## SURVEY FACILITIES

The MSV Fennica has no permanent ROV system on board, but it does have the capability for an ROV system should the project require it.

## MANNING

| | |
|---|---|
| Master | 1 |
| Chief Officer / DPO | 1 |
| First Officer / DPO | 1 |
| Second Officer / DPO jr. | 2 |
| Chief Engineer | 1 |
| 1st Engineer | 2 |
| Electrical Engineer | 1 |
| Electrician | 1 |
| Boatswain | 1 |
| Deck Repairman | 2 |
| Engine Repairman | 2 |
| Motorman | 1 |
| Cook Steward | 1 |
| 1st Cook | 2 |
| 2nd Cook | 2 |
| Catering Assistants | 3 |
| Crane ops. | 2 |

Total Marine Crew about 26 persons, however this may change between projects.

## LIFE SAVING, FIREALARM AND RESCUE EQUIPMENT

| | |
|---|---|
| Lifeboats | 2 pcs, 82 persons each |
| Type | Waterman 371 |
| Dimensions | L 9.35 m / B 3.26 m / draught 1.22 m |
| Weight including Equipment | 4730 kg |
| Engine | Sabb N4.295 |
| Regulation | NMD |
| Lifeboat Davit | Davit int.type D-NP.120 |
| MOB Boat | 1 pc, 6 persons, S-side |
| Type | Waterman 372 |
| Dimensions | L 7.10 m / B 2.72 m / draught 1.20 m |
| Engine | Sabb N4.295 |
| Speed | 21 knots |
| Regulation | NMD |
| MOB Boat Davit | Davit D-RTS-40 |
| Life rafts | 6 x 25 and 2 x 20 persons |
| Type | Viking Life –saving |
| Life raft davit | 2 pcs Davit D-RB.21 |
| Fire Alarm system | 1 pc Autronica BK-30 IB44 The vessel is equipped with an automatic fire detection system |

DETAILS BELIEVED TO BE CORRECT BUT NOT GUARANTEED.

11

**"*Tor Viking II*" Specifications**

## AHTS/Icebreaker *Tor Viking II* - Main Characteristics

**Design:** KMAR 808 AHTS/ ICEBREAKER (Now; MOSSMAR)
**Classification:** DnV,+1A1, SUPPLY, SF, TUG ICEBREAKER ICE-10, DK(+) EO HELDK-SH DYNPOS-AUTR HL(2,8) W1-OC
**Built / Delivered:** Havyard Leirvik, Norway - 03/2000
**Registered / Flag:** Skärhamn, Sweden

**Dimensions**
Length Over All (LOA): 83.70 metres
Length between p.p.: 75.20 metres
Breadth, moulded: 18.00 metres
Depth, moulded: 8.50 metres
Draught (scantling): 7.20 metres
Draught (design): 6.00 metres
Freeboard (design): 2.50 metres
Dead Weight: 2,528 tonnes
Light Ship: 4,289 tonnes
Gross: 3,382 tonnes
Net: 1,145 tonnes

**Capacities**
Dry Bulk: 283 $m^3$ in 4 tanks - totaling 10,000 $ft^3$
Pot Water: 724 $m^3$
Drill Water / Ballast: 1,205 $m^3$
Brine: 400 $m^3$ – SG 2.5
Oil Based Mud: 612 $m^3$ – SG 2.8

Base Oil: 242 $m^3$
Fuel Oil: 1,190 $m^3$ Marine Gas Oil (Diesel)
Urea: 94 $m^3$
Diesel Overflow: 21 $m^3$ with alarm
Diesel Service / Settling: 2 x 20 $m^3$
Deck Load: Abt 1,350 ts
Deck Area: 603 $m^2$ / 40.20 m x 15.0 m
All products in dedicated tanks – no dual purpose tanks

**Propulsion**
Main Engine: MAK 18,300 BHP - 4 eng (father/son) 2 x 3,840 kW + 2 x 2,880 kW = 13,440 kW
Thrusters: Bow 1,200 BHP in tunnel (Electr) + 1,200 BHP 360 deg retractable = 2,400 BHP: Stern 1,200 BHP in tunnel
Bollard Pull: Bollard Pull: 202 continuous (DnV certified) / Abt. 210 max pull
Speed/Consumption: 16 knots – Abt. 42.7 MT / 24 hrs at 6.0 metres draught , 12 knots – Abt. 25.0 MT

**Towing & Anchor Handling Equipment**
AHT Winch: Brattvaag towing/anchor handling winch 400 ts pull / 550 ts brake holding caps
AHT Drum: One of 1,400 mm dia. x 3,750 dia. x (1,250 mm + 1,250 mm) length
Wire Capacity: 2 x 1,900 metres of 77 mm wire or 2 x 1,650 metres of 83 mm wire
AH Drum: One of 1,400 mm dia. x 3,750 mm dia. x 3,000 mm length
Wire Capacity: 4,100 metres of 83 mm wire
Winch Control: TOWCON 2000 Automatic Control with printer
Pennant Reels: One off 2 x 1,500 m of 77 mm wire or 2 x 1,300 m of 83 mm wire capacity: One off 3,400 m of 77 mm wire or 1 x 3,100 m of 83 mm wire capacity
Large Reel Inner Core: 1,500 mm dia.
Cable Lifters: 2 x 76 mm and 2 x 84 mm onboard
Chain Lockers: 2 x 129 m 3 / giving abt 2 x 6,000 ft of 3 inch chain
Shark Jaws: 2 pairs of Karm Forks arranged for chain up to 165 mm dia. / 750 ts SWL
Inserts for handling of 65, 75, 85, 100, and 120 mm dia. wire/chain
Stern Roller: One of 3,5 metres dia. x 6.0 metres length – SWL 500 ts

Guide Pins: 2 pairs Karm Fork Hydraulic pins – SWL 170 ts

**Deck Equipment**
Capstans: 2 x 15 ts pull
Tugger Winches: 2 x 15 ts pull
Smit Brackets: One bracket on B Deck Forward – SWL 250 ts
Cranes: 1 hydraulic crane on fore cargo deck giving 6 / 12 ts at 20/10 m arm (360 deg)
: 1 telescopic crane on aft cargo deck giving 1.5 / 3 ts at 15/10 m arm (360 degr)
: 1 hydraulic crane on for-castle deck for stores etc.

Windlass: 1 hydraulic windlass / mooring winch. 2 declutch-able drums 46 mm K3 chain

**Accommodation: Accommodation of a total of 23 persons, including crew.**
All accommodation equipped with air-condition and humidification facilities.

**Dynamic Positioning**
The vessel is equipped with Kongsberg Simrad SDP 21 Redundant DP System – Green DP.

"*Aiviq*" Specifications

# M/V AIVIQ

## Specifications 03/12

REGISTRATION: Hull #247
Year Built: 2012, La Ship and North American Shipbuilding

Vessel Type: Ice Class A3 Anchor Handling Towing Supply Vessel

| | U.S. MEASUREMENTS | METRIC EQUIVALENTS |
|---|---|---|
| DIMENSIONS | 360'8" X 80' X 34' | 109.9 m X 24.38 m X 10.36 m |
| Draft (Loadline): | 28'1.6875" | 8.58 m |
| Draft (Normal): | 26' | 7.92 m |
| Draft (Max. Ice): | 25' | 7.62 m |
| Draft (Min. Ice): | 21' | 6.4 m |
| Free Deck Space: | 150' x 61' | 45.72 m x 18.59 m |
| Clear Deck Area (Total): | 9,150 sq. ft. | 850 $m^2$ |
| Clear Deck Area (Cargo): | 4,880 sq. ft. | 453 $m^2$ |
| Deck Strength (Cargo): | 1,024 lb/sq. ft. | 4 $MT/m^2$ |
| Deadweight Tonnage: | 5,113 LT | 5,195 MT |
| | | |
| CAPACITIES | | |
| Fuel Oil: | 528,155 gals. | 1,999 $m^3$ |
| Liquid Mud/Brine/Rec. Oil: | 10,160 barrels | 1,615 $m^3$ |
| Ballast/Rig Water: | 562,684 gals. | 2,130 $m^3$ |
| Rig Water (Dedicated): | 421,667 gals. | 1,596 $m^3$ |
| Glycol: | 8,677 gals. | 32.85 $m^3$ |
| 13 Service Tanks: | 30,019 gals. | 113.63 $m^3$ |
| Dry Bulk: | 8,840 cu. ft. @ 80 psi | 250.4 $m^3$ @ 5.5 bars |

| MACHINERY | |
|---|---|
| Main Engines: | Four (4) CAT C280-12 diesels (5,444 BHP each) |
| Propulsion: | Two (2) 4,600 mm dia. CP propellers in nozzles |
| Bow Thrusters: | Two (2) Brunvoll FU100 2,450 mm 1,500 kW |
| | One (1) Rolls-Royce 2,000 kW fold down |
| Stern Thruster: | Two (2) Brunvoll FU80 LTA 2,000 mm 1,050 kW |
| Speed: | 15 knots in SS3 open water |
| | 5 knots in 1.0 m ice thickness |
| Bollard Pull: | 200 MT |
| Generators: | Four (4) CAT 3512C 1,700 kW |
| | Two (2) 2,000 kW shaft generators |
| | Two (2) CAT C32 910 kW emergency generators |

| CLASSIFICATION | |
|---|---|
| ABS | Maltese Cross A1 (Hull) |
| ABS | Ice Class A3 (Icebreaker) |
| ABS | Maltese Cross A1 (Towing) |
| ABS | Maltese Cross AMS (Machinery) |
| ABS | Maltese Cross ACCU (Automation) |
| ABS | Maltese Cross FiFi 2 (Firefighting) |
| ABS | Maltese Cross DPS-2 (Dynamic Positioning) |
| ABS | Oil Recovery Capability Class 1 |
| ABS | Safety Standby Vessel (300 Survivors) |
| ABS | HELIDK (SRF) |
| ABS | Protected Oil Tanks (POT) |
| ABS | CCO Polar (-40°C, -50°C) (HR 36) |
| ABS | AH Offshore Support Vessel |
| USCG | Subchapter I (Cargo) |
| SOLAS, MARPOL | Current |

| ACCOMMODATIONS: | 64 |
|---|---|
| | 36 client, 28 crew |

| ADDITIONAL FEATURES/EQUIPMENT | |
|---|---|
| Firefighting: | Four (4) 1,800 $m^3$/hr fire monitors |
| Helideck: | Suitable for Sikorsky S92 (12.8 MT/21 m dia.) |
| Client/Crew Features: | Conference room, two (2) client lounges, crew lounge, client office, ship's office, exercise room, and three (3) laundry rooms |
| Standby/Rescue: | Rescue zones, decontamination area, change room, treatment room, recovery room, morgue, and medical medical storage |

| LIFESAVING EQUIPMENT |
|---|
| Two (2) 64-Man Arctic Class Enclosed Lifeboats with davits |
| Six (6) 25-Man Inflatable Life Rafts |
| One (1) 10-Man Fast Rescue Craft with davit |
| One (1) 15-Man Daughter Craft with davit |
| One Rescue Platform |
| Other gear as required by USCG and SOLAS |

EDISON CHOUEST OFFSHORE
16201 East Main Street
Cut Off, LA 70345-3804
985-601-4444 Fax: 958-632-2282
www.chouest.com

## Attachment 3 – Shell Ice and Weather Advisory Center

## Operational Support Overview

Safe and efficient offshore operations in the Arctic are contingent upon quality and timely ice and weather forecasts. Using state of the art satellite technology, large areas of the Beaufort and Chukchi Seas are monitored remotely by the SIWAC to track movement of ice and make estimates of its type and concentration.

Synthetic Aperture Radar (SAR) instruments on board the RADARSAT 2 satellite are contracted to acquire necessary images of sea ice over areas of interest several times per week. These images are transmitted to ground stations, processed, and made available for analysis within hours of acquisition. Interpretation of the ice edge and features are performed by experienced specialists using powerful mapping software to produce ice charts that are considerably more detailed than those available from national ice centers. These charts are then distributed to operational personnel and planning managers and can be validated or ground-truthed using actual ice regime assessments from the IMV fleet.

Knowing the location and composition of the ice at any given moment is a valuable tool; however, it is not enough. It is important to forecast how the ice may change over time. A complementary component of ice forecasting is quality weather information. Weather conditions in the Arctic are among the most severe on the planet and change dramatically in a short time. National weather services do not provide measurements and forecasts that sufficiently resolve the conditions over small areas or short time spans in the Arctic offshore. Therefore, dedicated meteorologists with Arctic forecasting experience are employed full time to produce accurate snapshots of the current conditions and reliable forecasts of weather conditions into the future.

Using global weather models, such as ECMWF and GFS numerical weather model as a starting point, the meteorologists produce a high resolution grid in proprietary modeling software of weather parameters, such as atmospheric pressure, wind speed, and wave height, that have been corrected based on local observations from Shell's vessels at sea, meteorological buoys, and coastal weather stations. The result is a model that accurately reflects current and forecast weather conditions over short distances in the Beaufort and Chukchi Seas, making marine operations and vessel transits safer and more responsible. Without this innovative forecast effort, weather products from other sources tend to describe the average or general conditions that one could expect over large areas, such as the entire U.S. Beaufort Sea, which results in local conditions rarely matching what is forecast.

The wind vectors, which are a set of points indicating the speed and direction of the wind distributed over the Beaufort and Chukchi Seas, and other output from the weather model are applied to the ice charts in the mapping software. This allows the ice analyst to assess the effect of wind and weather systems on the future movement and development of the ice.

**Attachment 4 – Ice Alert Logs**
**Ice Alert Level Log**

| ICE ALERT LEVEL LOG | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DRILLING UNIT | | | | | | | | |
| Date | Time | HT | ST | MT | T-Time | Remarks | Alert Level | Master |
| | | | | | | | | |
| | | | | | | | | |
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### Ice Alert Level Notification

## Notice of Ice Alert Status Change

| | |
|---|---|
| Drilling Unit | |

| | |
|---|---|
| Date | |
| Time | |

| | |
|---|---|
| Previous Ice Alert Level | |

**Ice Alert Arguments**

| | |
|---|---|
| Hazard Time (HT) | |
| Secure Time (ST) | |
| Move Time (MT) | |
| Alert Time (AT) | |

| | |
|---|---|
| **New Ice Alert** | |

**Present Ice and Weather Conditions**

| |
|---|
| |
| |
| |

**Forecast Ice and Weather Conditions**

| |
|---|
| |
| |
| |

**Comments**

| |
|---|
| |
| |
| |
| |
| |

**Approved By Master/OIM**

| | |
|---|---|
| Signature | |
| Date & Time | |

## Well Secure Time Log

| WELL SECURE TIME LOG | | | | | |
|---|---|---|---|---|---|
| DRILLING UNIT | | | | | |
| Date | Time | Well Secure Time (ST) | Initials Rig Manager / OIM | Remarks | Initials Shell Drilling Supervisor |
| | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |

# Attachment A-1
# Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses

# Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses

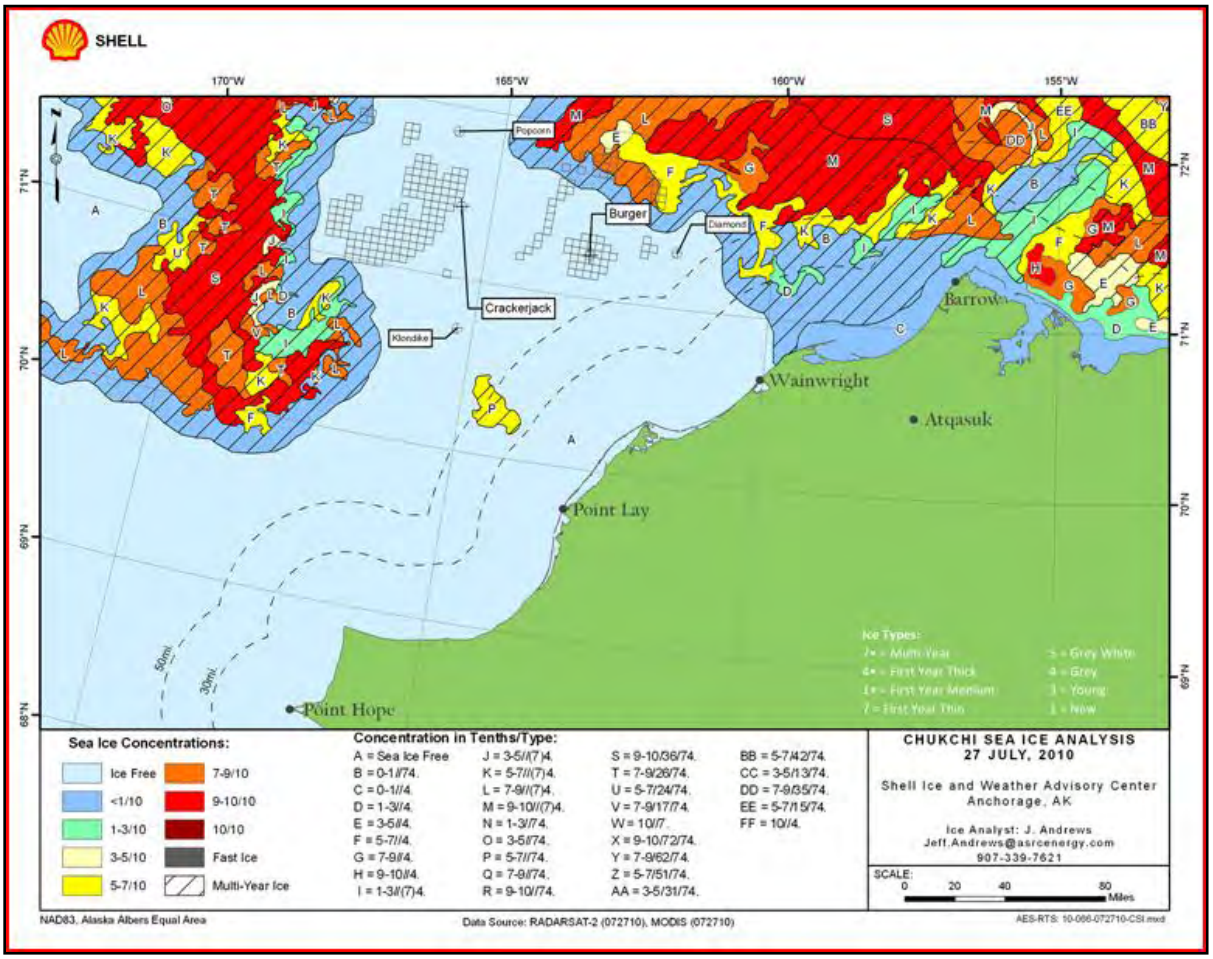


**Figure 1: High resolution ice map from the SIWAC program depicting ice distribution and characteristics**

The corner post of the adaptive management approach to managing ice in areas occupied by Pacific walruses will be monitoring of both ice and marine mammals, including walruses, such that sufficient lead time is provided for consultation and planning. During the period of operations Shell will conduct a robust program of ice and weather monitoring and forecasting. A team of ice specialists will work daily with synthetic aperture radar images purchased for the purpose of producing high resolution maps of ice floes within the project area (Chukchi Sea (Figure 1). The results of these analyses and forecasts are posted daily to the Shell Ice and Weather Advisory Center (SIWAC). The SIWAC information is available by permission at www.siwac.com.

Weather forecasts are supported by a network of industry funded and deployed met-ocean buoys, coastal weather reporting installations, and regular observations following standardized protocols from all Shell vessels operating in the theater. Professional meteorologists analyze these data and update NOAA weather models to provide real time support of operations and localized weather forecasts.

Satellite imagery of ice conditions is also supplemented by observations from vessels. When conditions indicate the need, the primary ice management vessel will scout ice in the vicinity of drilling operations. Professional ice advisors will assess ice conditions and provide detailed descriptions and real time

consultation to the ice team. Through ice tracking and weather forecasting, the likelihood that Shell would be surprised by changing ice conditions and forced to take action without appropriate consultation and planning is low.

Walrus distribution data will be derived from three different sources. Protected species observers (PSOs) will be aboard vessels engaged in the Shell drilling program and will provide daily reports of walrus and other marine mammal observations. These observations will be reported to U.S. Fish & Wildlife Service (FWS) on a daily basis. Due to the critical activities of the primary ice management vessels, five PSOs will be aboard these vessels and will provide coverage 24 hours per day with two people on duty. Since these vessels are most likely to be operating in close proximity to the ice, the PSOs and vessel operators will have additional training in walrus avoidance and mitigation requirements. Observations will also be aided by the installation of Big-Eye binoculars. The data from these vessels will be reported at least daily. In addition to the observations of vessel based PSOs, Shell will operate aerial overflights in both the nearshore (within 25 miles of shore), alongshore, and offshore (Figures 2 and 3). The overflights will be conducted utilizing a fixed winged aircraft flying at 1,000 feet elevation during surveys. High resolution still frame cameras will capture overlapping images during surveys. This sensor package is being evaluated for applicability in unmanned aerial system (UAS), which is the preferred platform for aerial monitoring in the future. The imagery from these offshore overflights will be processed as soon as possible.

When the offshore drilling area cannot be accessed, the nearshore/alongshore (N/A) flights will be conducted, weather permitting (Figure 3). There is also the possibility that the N/A flights would be shifted to higher priority, if observations of possible haulouts were deemed of greater value. Priority for operation of offshore v. n/a flights will be established through consultation with trust agencies, including FWS, and stakeholders.

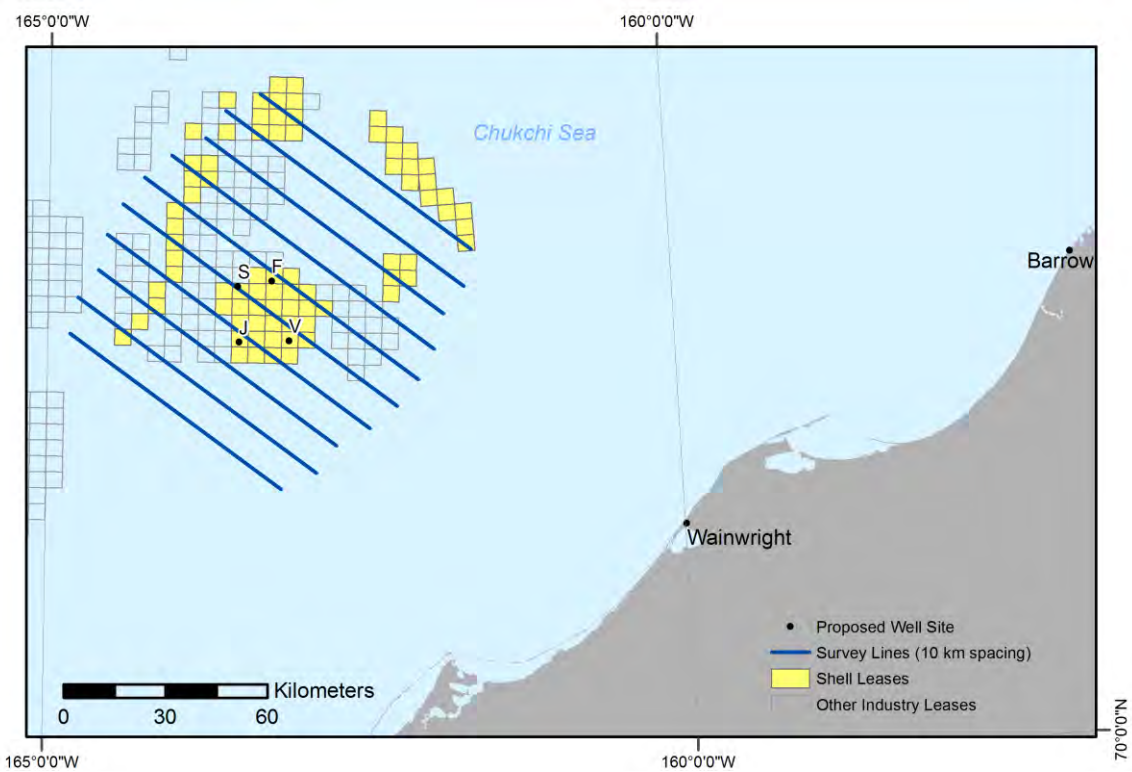


**Figure 2: Proposed survey grid for offshore aerial overflights.**

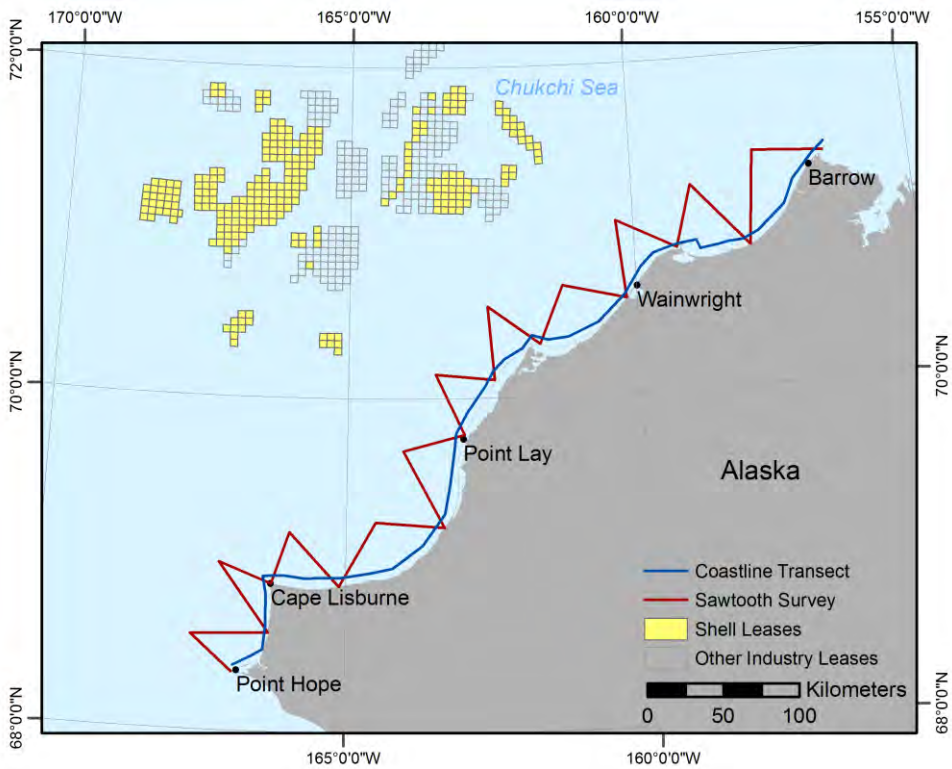


**Figure 3: Proposed survey grid for nearshore/alongshore aerial surveys.**

Additional sources of information that will be utilized to forecast the potential for presence of walruses in the project area will be the data from NMFS aerial survey flights (ASSAM) and USGS tagged animals. At a minimum, Shell will utilize data posted to the USGS walrus tracking and NMFS aerial survey websites. Shell will also endeavor to work closely with agencies, such that Shell will have access to data prior to its being posted on the website.

Utilizing these three data sources that provide indications of walrus distribution in combination with ice maps and forecasts, Shell will be able to generate daily assessments of the potential need to manage ice and the potential for such activities to interact with walruses.

On the basis of these daily assessments, risk can be assessed as:

- **1** (no immediate need to manage ice and/or no walrus are present in the project area),
- **2** (possibility exists for ice management and walrus may be present), and
- **3** (active ice management will be required, walruses are present and potential exists for impacts to walruses).

Risk level will be developed by Shell through consultation between ice & weather monitoring and marine mammal monitoring, both of which report to the Science Lead, and with the wells group. The daily risk level will be communicated to USFWS by email as a part of the daily report. The flow chart in Figure 4 presents the process that will be used to rank risks and initiate consultation both within Shell and between Shell and USFWS. The Adaptive Approach functions as outlined in Table 1.

At present the nominal plan is for both Shell and USFWS to maintain a 24 hour duty phone for the purpose of consultation.

**Table 1: Risk Levels for Interactions with Walrus**

| | |
|---|---|
| **Step 1**: Ice and weather forecasting will evaluate the potential risk to vessels and the drilling process on the basis of proximity of ice to the drilling operation and factors influencing ice movement.<br>**Step 2**: The risk level will be communicated to USFWS on a daily basis. | |
| | If the area of operation is ice free or there is a low probability that ice could impact vessels and drilling operations the risk level is **1:**<br>• monitoring continues, and<br>• USFWS notified by email. |
| | If ice is in close proximity, or otherwise potentially threatening vessels and drilling operations, walrus distribution information will be considered. Walrus distribution information will be treated conservatively. There may be times during the season (e.g. late October) when the potential for walruses within the project area is extremely low and risk level could be assessed as **1**. Otherwise, the difficulty of knowing where all concentrations are, given incomplete monitoring capabilities, leads to the assumption that they may be present. In such cases, the risk level would be elevated to **2**.<br>• The USFWS would be notified by email, and<br>• Updates will be provided by telephone, or in person, during regular business hours.<br>When at a risk level of **2**, ice management vessels will provide scouting reports that evaluate ice conditions and the presence and distribution of walruses. PSOs on board these vessels will provide around the clock monitoring and will endeavor to assess the potential to disturb walruses through ice management activities.<br>If ice management is needed and IF the entire ice floe and surrounding areas can be visualized and no walruses are hauled out on the ice, ice management may proceed with care. |
| | If walruses are present and hauled out on ice which poses an imminent threat to vessels and/or drilling operations and ice management is needed, the risk level will be elevated to **3**:<br>• The on duty compliance representative for Shell will notify a designated USFWS representative by calling a duty phone to engage in real-time consultation.<br>• The Shell drilling supervisor will be engaged to evaluate the status of drilling operations and the potential for implementation of ice avoidance measures that may include cessation of drilling activities and moving off hole in extreme cases. If such alternatives are available and can be implemented, these procedures will be implemented.<br>• Real-time communications will be established with the lead PSO on the ice management vessel(s) to assess the proximity and status of walruses hauled out on ice floes that need to be managed. Descriptions of the situation will be shared with the consultation team.<br>• If the team agrees that ice management can go forward, the vessel will approach the ice floe slowly in an effort to avoid causing a stampede. Video cameras and still cameras will be used to document procedures and results to enhance the understanding of the risks posed by ice management activities.<br>• Real time consultation will continue as long as ice management is required, or until the consultation team agrees that procedures are going forward successfully.<br>• A post action report will be filed with USFWS within 24 hours. To the extent that communications will allow the transfer of still frame and video, photographic documentation will be included.<br>• If real-time consultation cannot be established, and, if ice management cannot be avoided to protect vessels and critical drilling operations, Shell will proceed as per the flow chart below exercising all due care to avoid impacts to walruses. |

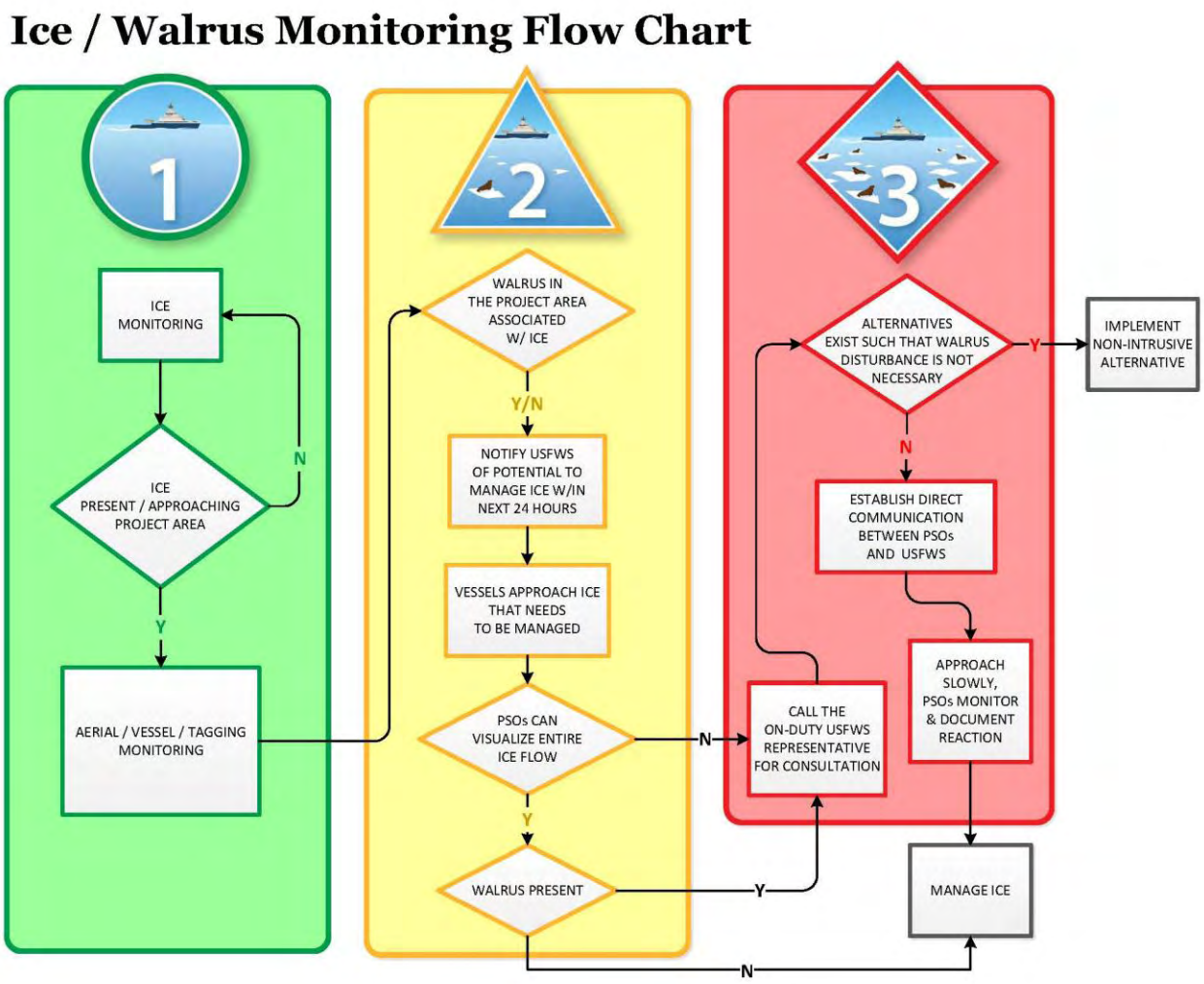


**Figure 4: Flow chart of risk levels based upon ice, weather, and walrus monitoring.**

# Attachment B
# Marine Mammal Monitoring and Mitigation Plan (4MP)

# Marine Mammal Monitoring and Mitigation Plan

## Exploration Drilling of Selected Lease Areas in The Alaskan Chukchi Sea

**Shell Gulf of Mexico Inc.**

## August 2014

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**ACRONYMS**

| | |
|---|---|
| °C | degrees Celsius |
| °T | degrees True North |
| µPa | microPascals(s) |
| 4MP | Marine Mammal Monitoring and Mitigation Plan |
| AEWC | Alaska Eskimo Whaling Commission |
| AMAR | Advanced Multi-channel Acoustic Recorder |
| BOEM | Bureau of Ocean Energy Management |
| BSEE | Bureau of Safety and Environmental Enforcement |
| DASAR | Directional Autonomous Seafloor Acoustic Recorder |
| dB | decibel |
| CD | Compact Disc |
| $cm^3$ | cubic centimeter |
| ESW | effective strip width |
| ft. | feet |
| GPS | Global Positioning System |
| Hz | Hertz |
| IHA | Incidental Harassment Authorization |
| JASCO | JASCO Applied Sciences |
| kHz | kilohertz |
| km | kilometer |
| LBCHU | Ledyard Bay Critical Habitat Unit |
| Leq | sound energy equivalent level |
| LOA | Letter of Authorization |
| m | meter(s) |
| mi | mile(s) |
| psi | pounds per square inch |
| PSO | Protected Species Observer |
| MMS | Minerals Management Service |
| NMFS | National Marine Fisheries Service |
| NSB | North Slope Borough |
| NVD | Night-vision Device |
| rms | Root Mean Square |
| Shell | Shell Gulf of Mexico Inc. |
| SAR | Search and Rescue |
| UAS | Unmanned Aerial System |
| USFWS | U.S. Fish and Wildlife Service |
| VSI | vertical seismic imager |
| ZVSP | Zero-offset Vertical Seismic Profile |

# INTRODUCTION

Shell Gulf of Mexico Inc. (Shell) will conduct a Marine Mammal Monitoring and Mitigation Plan (4MP) for exploration drilling activities in the Chukchi Sea during the drilling season. The 4MP developed for Shell's exploration drilling program supports protection of the marine mammal resources, fulfills reporting obligations to the Bureau of Ocean Energy Management (BOEM), Bureau of Safety and Environmental Enforcement (BSEE), the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS); and establishes a means for gathering additional data on marine mammals for future operational planning.

Shell plans to conduct exploration drilling within existing leases in the Chukchi Sea. Drilling will be conducted from the self-propelled drillship M/V *Noble Discoverer* (*Discoverer*) owned and operated by Noble Corporation and the towed semi-submersible *Polar Pioneer* owned by Transocean. The *Discoverer* is ice-class rated and capable of performing drilling operations in offshore Alaska. Similarly, the *Polar Pioneer* is specially designed and classed by Det Norske Veritas (DNV) as a 1A1 column stabilized drilling unit capable of operating in offshore Alaska. During this exploration drilling program a Mud-Line Cellar (MLC) Remotely Operated Vehicle (ROV) system may be used in place of or in addition to the MLC bit system operated as part of the drilling units to construct MLCs. The MLC ROV system may be deployed from a vessel rather than a drilling unit. In addition to the drilling units and the MLC ROV system, various support vessels will be required. The support vessels will include tugs and barges, ice management vessels, anchor handlers, and oil spill response vessels.

At or near the end of well construction, a Zero Offset Vertical Seismic Profile (ZVSP) survey will be conducted for each well. During the ZVSP surveys, an airgun array is deployed adjacent to the drilling units, while receivers are placed in the wellbore. The sound source (airgun array) is fired, then the reflected sonic waves are recorded by receivers (geophones) located in the wellbore. The surveys may last 10-14 hours each; as the receivers are moved through the length of the wellbore, the airguns may be fired 5-7 times after each movement. The purpose of the ZVSP survey is to gather geophysical information at various depths, which can then be used to tie in or ground truth geophysical information from the previous seismic surveys with geological data collected within the wellbore.

Shell's 4MP is a combination of active monitoring in the area of operations and the implementation of mitigation measures designed to minimize project impacts to marine resources. Monitoring will provide information on the numbers of marine mammals potentially affected by exploration activities, in addition to facilitating real time mitigation to prevent injury of marine mammals by industrial sounds or activities. These goals will be accomplished by conducting vessel based visual monitoring, aerial photographic monitoring, and acoustic monitoring programs to document the potential reactions of marine mammals in the area to the various sounds and activities, in addition to characterizing the sounds produced by drilling activities, support vessels, and ZVSP surveys.

A minimally-manned aerial photographic survey around the offshore drilling operations, opportunistic aerial photographic surveys to monitor marine mammals in coastal and nearshore areas of the Chukchi Sea, and recordings of ambient sound levels and vocalizations of marine mammals from bottom-founded hydrophones placed in large arrays across the Chukchi Sea will be used to interpret potential reactions of marine mammals to the offshore exploration drilling operations and in subsistence use areas closer to shore. Acoustic measurements will be made to establish exclusion zones for real time mitigation around ZVSP surveys and to verify pre-season estimates of the sound footprints and disturbance zones for exploration drilling activities. The exploration drilling activities that will be characterized include movement of the drilling units, drilling sounds, resupply and discharge monitoring support vessels using dynamic positioning (DP) while in direct support of the moored drilling units, MLC construction, anchor setting and connecting of the drilling units, and ice management activities; as well as the sound signatures of contracted Shell vessels that have not previously been recorded in the activity area. Preliminary sound source analyses will be supplied to the NMFS within 120 hours of completion of the measurements if

possible. A detailed report will be issued to the NMFS as part of the 90-day report following the end of the exploration drilling season. Shell will continue to measure the sound propagation of exploration drilling activities throughout the exploration drilling season.

# VESSEL BASED MARINE MAMMAL MONITORING PROGRAM

Shell's vessel based 4MP is designed to meet the requirements of the Incidental Harassment Authorization (IHA) and the Letter of Authorization (LOA) which Shell requested from the NMFS and the USFWS, respectively. The 4MP also addresses other stipulated agreements between Shell and additional agencies or groups. The objectives of the program are to ensure that disturbance to marine mammals and subsistence hunts is minimized, that effects on marine mammals are documented, and that data is collected on the occurrence and distribution of marine mammals in the project area.

The 4MP will be implemented by a team of experienced protected species observers (PSOs). The PSOs will be experienced biologists and Alaska Native personnel trained as field observers. PSOs will be stationed on both drilling units, ice management vessels, anchor handlers and other drilling support vessels engaged in transit to and between drill sites to monitor for marine mammals. The duties of the PSOs will include; watching for and identifying marine mammals, recording their numbers, recording distances and reactions of marine mammals to exploration drilling activities, initiating mitigation measures when appropriate, and reporting results of the vessel based monitoring program, which will include the estimation of the number of marine mammal "exposures" as defined by the NMFS and stipulated in the IHA.

Exploration activity dates and areas will depend upon ice and weather conditions. The *Discoverer,* the *Polar Pioneer* and support vessels will transit through the Bering Strait into the Chukchi Sea on or about July 1, and will arrive on location at the Burger Prospect to commence drilling activities as soon as ice, weather, and other conditions safely allow. Vessel based monitoring for marine mammals will be done throughout Shell's exploration drilling activities in compliance with the IHA and LOA issued by the NMFS and the USFWS, respectively.

The vessel based work will provide:

- the basis for real-time mitigation, if necessary, as required by the various permits that Shell receives;
- information needed to estimate the number of "exposures" of marine mammals to sound levels that may result in harassment, which must be reported to NMFS and USFWS;
- data on the occurrence, distribution, and activities of marine mammals in the areas where drilling activity is conducted;
- information to compare the distances, distributions, behavior, and movements of marine mammals relative to the drilling unit during times with and without drilling activity occurring;
- a communication channel to coastal communities including whalers; and
- employment and capacity building for local residents, with one objective being to develop a larger pool of experienced Alaska Native PSOs.

The 4MP will be operated and administered consistent with monitoring programs conducted during past exploration drilling activities, seismic and shallow hazards surveys, or alternative requirements stipulated in permits issued to Shell. Agreements between Shell and other agencies will also be fully incorporated. PSOs will be provided training through a program approved by the NMFS and Shell.

# MITIGATION MEASURES DURING EXPLORATION DRILLING ACTIVITIES

Shell's planned exploration drilling activities incorporate design features and operational procedures aimed at minimizing potential impacts on marine mammals and subsistence hunts. The design and operational procedures of the mitigation measures have been described in the IHA, to which this 4MP is appended, and are also included in Shell's LOA application. Some of the mitigation design features include:

- timing and locating drilling support activities to avoid interference with the annual subsistence hunt by Chukchi villages;
- conducting pre-season acoustic modeling to establish the appropriate exclusion and disturbance zones;
- vessel based monitoring to implement appropriate mitigation if necessary, and to determine the effects of drilling activities on marine mammals;
- acoustic monitoring of drilling and vessel sounds and marine mammal vocalizations; and
- aerial surveys with photographic equipment over operations and in coastal and nearshore waters with photographic equipment and PSOs to help determine the effects of project activities on marine mammals; and seismic activity mitigation measures during acquisition of the ZVSP surveys.

The potential disturbance of marine mammals during drilling activities will be mitigated through the implementation of several vessel based mitigation measures as necessary.

## *Exclusion and Disturbance Zones*

Under current NMFS guidelines (e.g., NMFS 2000), "safety radii" or "exclusion zones" for marine mammals around airgun arrays and other impulsive industrial sound sources are customarily defined as the distances within which received levels are ≥180 dB re 1 µPa (rms) for cetaceans and ≥190 dB re 1 µPa (rms) for pinnipeds. The ≥180 and ≥190 dB (rms) guidelines are also employed by USFWS for Pacific walrus and polar bear. These safety criteria are based on a cautionary assumption that sound energy at lower received levels will not harm these animals or impair their hearing abilities, but that higher received levels might have some such effects. Disturbance or behavioral effects to marine mammals from underwater sound may occur after exposure to sound at distances greater than the exclusion zone (Richardson et al. 1995). The NMFS assumes that marine mammals exposed to pulsed airgun sounds with received levels ≥160 dB re 1 µPa (rms) or continuous sounds from vessel activities with received levels ≥120 dB re 1 µPa (rms) have the potential to be disturbed. As a result, these sound level thresholds are currently used by NMFS to define acoustic disturbance criteria.

### *Exploration Drilling Activities*

The areas exposed to sounds produced by the drilling units *Discoverer* and *Polar Pioneer* were determined by measurements from drilling in 2012 or were modeled by JASCO Applied Sciences. The 2012 measurement of the distance to the 120 dB (rms) threshold for normal drilling activity by the *Discoverer* was 0.93 mi (1.5 km) while the distance of the ≥120 dB (rms) radius during MLC construction was 5.1 mi (8.2 km).

Measured sound levels for the *Polar Pioneer* were not available. Its sound footprint was estimated with JASCOs Marine Operations Noise Model (MONM) using an average source level derived from a number of reported acoustic measurements of comparable semi-submersible drill units, including the Ocean Bounty (Gales, 1982), SEDCO 708 (Greene, 1986), and Ocean General (McCauley, 1998). The model yielded a propagation range of 0.22 mi (0.35 km) for rms sound pressure levels of 120 dB for the *Polar Pioneer* while drilling at the Burger Prospect.

In addition to drilling and MLC construction, numerous activities in support of exploration drilling produce continuous sounds above 120 dB (rms). These activities in direct support of the moored drilling units include ice management, anchor handling, and supply/discharge sampling vessels using DP thrusters. Detailed sound characterizations for each of these activities are presented in the 2012 Comprehensive Report (LGL et al. 2013)

The source levels for exploration drilling and related support activities are not high enough to cause temporary reduction in hearing sensitivity or permanent hearing damage to marine mammals. Consequently, mitigation as described for seismic activities including ramp ups, power downs, and shut downs should not be necessary for exploration drilling activities. However, Shell plans to use PSOs onboard the drilling units, ice management, and anchor handling vessels to monitor marine mammals and their responses to industry activities, in addition to initiating mitigation measures should in-field measurements of the activities indicate conditions that may present a threat to the health and well-being of marine mammals.

### *ZVSP Surveys*

Two sound sources have been proposed by Shell for the ZVSP surveys. The first is a small airgun array that consists of three 150 $in^3$ (2,458 cu $cm^3$) airguns for a total volume of 450 $in^3$ (7,374 $cm^3$). The second ZVSP sound source consists of two 250 $in^3$ (4,097 cu $cm^3$) airguns with a total volume of 500 $in^3$ (8,194 $cm^3$). Sound footprints of the ZVSP airgun array configurations were estimated using JASCO Applied Sciences' Marine Operations Noise Model (MONM). The model results were maximized over all water depths between 9.9 and 23 ft (3 and 7 m) to yield sound level isopleths as a function of range and direction from the source. The 450 $in^3$ airgun array at a source depth of 23 ft. (7 m) yielded the maximum ranges to the ≥190, ≥180, and ≥160 dB (rms) isopleths. The estimated 95th percentile distances to these thresholds were: 190 dB = 558 ft. (170 m), 180 dB = 3,018 ft. (920 m), and 160 dB = 26,148 ft. (7,970 m). These distances were multiplied by 1.5 as a conservative measure, and the resulting radii are shown in Table 1.

PSOs on the drilling units will initially use the radii in Table 1 for monitoring and mitigation purposes during ZVSP surveys. An acoustics contractor will perform direct measurements of the received levels of underwater sound versus distance and direction from the ZVSP array using calibrated hydrophones. The acoustic data will be analyzed as quickly as reasonably practicable and used to verify (and if necessary adjust) the threshold radii distances during later ZVSP surveys. The mitigation measures to be implemented will include pre-ramp up watches, ramp ups, power downs and shut downs as described below.

**TABLE 1. ESTIMATED DISTANCES OF THE ≥190, 180, AND 160, DB (RMS) ISOPLETHS TO BE USED FOR MITIGATION PURPOSES DURING ZVSP SURVEYS UNTIL SSV RESULTS ARE AVAILABLE.**

| Threshold levels in dB re 1 µPa (rms) | Estimated Distance (m) |
|---|---|
| ≥190 | 255 |
| ≥180 | 1,380 |
| ≥160 | 11,960 |

## Ramp Ups

A ramp up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume is achieved. The purpose of a ramp up (or "soft start") is to "warn" cetaceans and pinnipeds in the vicinity of the airguns and to provide time for them to leave the area, thus avoiding any potential injury or impairment of their hearing abilities.

During the proposed ZVSP surveys, the operator will ramp up the airgun arrays slowly. Full ramp ups (i.e., from a cold start when no airguns have been firing) will begin by firing a single airgun in the array. A full ramp up will not begin until there has been observation of the exclusion zone by PSOs for a minimum of 30 minutes to ensure that no marine mammals are present. The entire exclusion zone must be visible during the 30 minutes leading into to a full ramp up. If the entire exclusion zone is not visible, a ramp up from a cold start cannot begin. If a marine mammal is sighted within the exclusion zone during the 30 minutes prior to ramp up, ramp up will be delayed until the marine mammal is sighted outside of the exclusion zone or is not sighted for at least 15-30 minutes: 15 minutes for small odontocetes and pinnipeds, or 30 minutes for baleen whales and large odontocetes.

## Power Downs and Shut Downs

A power down is the immediate reduction in the number of operating energy sources from all firing to some smaller number. A shut down is the immediate cessation of firing of all energy sources. The arrays will be immediately powered down whenever a marine mammal is sighted approaching close to or within the applicable exclusion zone of the full arrays, but is outside the applicable exclusion zone of the single source. If a marine mammal is sighted within the applicable exclusion zone of the single energy source, the entire array will be shut down (i.e., no sources firing).

## Protected Species Observers

Vessel based monitoring for marine mammals will be done by trained PSOs on both drilling units, ice management and anchor handler vessels throughout the exploration drilling activities to comply with mitigations contained in Shell's IHA and LOA. The observers will monitor the occurrence and behavior of marine mammals near the drilling units, ice management and anchor handling vessels, during all daylight periods during the exploration drilling operation, and during most periods when exploration drilling is not being conducted. PSO duties will include watching for and identifying marine mammals; recording their numbers, distances, and reactions to the exploration drilling activities; and documenting exposures to sound levels that may constitute harassment as defined by NMFS.

### *Number of Observers*

A sufficient number of PSOs will be onboard to meet the following criteria

- 100 percent monitoring coverage during all periods of exploration drilling operations in daylight;
- Maximum of four consecutive hours on watch per PSO; and
- Maximum of approximately 12 hours on watch per day per PSO

PSO teams will consist of trained Alaska Natives and field biologist observers. An experienced field crew leader will be on every PSO team aboard the drilling units, ice management and anchor handling vessels, and other support vessels during the exploration drilling program. The total number of PSOs aboard may decrease later in the season as the duration of daylight decreases assuming the NMFS does not require continuous nighttime monitoring. PSOs will help ensure that the vessel communicates with the Communications and Call Centers (Com Centers) in Native villages along the Chukchi Sea coast.

### *Crew Rotation*

Shell anticipates that there will be provisions for crew rotation at least every three to six weeks to avoid observer fatigue. During crew rotations detailed notes will be provided to the incoming crew leader. Other communications such as email, fax, and/or phone communication between the current and oncoming crew leaders during each rotation will also occur when necessary. In the event of an unexpected crew change Shell will facilitate such communications to insure monitoring consistency among shifts.

### *Observer Qualifications and Training*

Crew leaders serving as PSOs will have experience from one or more projects with operators in Alaska or the Canadian Beaufort.

Biologist-observers will have previous PSO experience, and crew leaders will be highly experienced with previous vessel based marine mammal monitoring projects. Resumes for those individuals will be provided to the NMFS for approval. All PSOs will be trained and familiar with the marine mammals of the area. A PSO handbook, adapted for the specifics of the planned Shell drilling program will be prepared and distributed beforehand to all PSOs.

Most observers will also complete a two-day training and refresher session on marine mammal monitoring, to be conducted shortly before the anticipated start of the drilling season. The training sessions will be conducted by marine mammalogists with extensive crew leader experience from previous vessel based seismic monitoring programs in the Arctic.

Primary objectives of the training include:

- review of the 4MPfor this project, including any amendments adopted, or specified by the NMFS the USFWS, the BOEM, the BSEE, or other agreements in which Shell may elect to participate;
- review of marine mammal sighting, identification, (photographs and videos) and distance estimation methods, including any amendments specified by NMFS or USFWS in the IHA or LOA;
- review operation of specialized equipment (e.g., reticle binoculars, big eye binoculars, night vision devices, GPS system); and
- review of data recording and data entry systems, including procedures for recording data on mammal sightings, exploration drilling and monitoring activities, environmental conditions, and entry error control. These procedures will be implemented through use of a customized computer databases and laptop computers.

### *PSO Handbook*

A PSO Handbook will be prepared for Shell's monitoring program. The Handbook will contain maps, illustrations, and photographs as well as copies of important documents and descriptive text and are intended to provide guidance and reference information to trained individuals who will participate as PSOs. The following topics will be covered in the PSO Handbook:

- summary overview descriptions of the project, marine mammals and underwater sound energy, the 4MP(vessel-based, aerial, acoustic measurements, special studies), the NMFS IHA and USFWS LOA and other regulations/permits/agencies, the Marine Mammal Protection Act;
- monitoring and mitigation objectives and procedures, including initial exclusion and disturbance zones;
- responsibilities of staff and crew regarding the4MP;
- instructions for staff and crew regarding the4MP;
- data recording procedures: codes and coding instructions, common coding mistakes, electronic database; navigational, marine physical, and drilling data recording, field data sheet;
- use of specialized field equipment (e.g., reticle binoculars, Big-eye binoculars, NVDs, laser rangefinders);
- reticle binocular distance scale;
- table of wind speed, Beaufort wind force, and sea state codes;
- data storage and backup procedures;
- list of species that might be encountered: identification, natural history;
- safety precautions while onboard;
- crew and/or personnel discord; conflict resolution among PSOs and crew;
- drug and alcohol policy and testing;
- scheduling of cruises and watches;
- communications;
- list of field gear provided;

- suggested list of personal items to pack;
- suggested literature, or literature cited;
- field reporting requirements and procedures;
- copies of the IHA and LOA will be made available; and
- areas where vessels cannot operate such as the Ledyard Bay Critical Habitat Unit (LBCHU) and Hana Shoal Walrus Use Area (HSWUA).

## MONITORING METHODOLOGY

The observer(s) will watch for marine mammals from the best available vantage point on the drilling units and support vessels. Ideally this vantage point is an elevated stable platform from which the PSO has an unobstructed 360$^{o}$ view of the water. The observer(s) will scan systematically with the naked eye and $7 \times 50$ reticle binoculars, supplemented with Big-eye binoculars and night-vision equipment when needed (see below). Personnel on the bridge will assist the marine mammal observer(s) in watching for pinnipeds and cetaceans. New or inexperienced PSOs will be paired with an experienced PSO or experienced field biologist so that the quality of marine mammal observations and data recording is kept consistent.

Information to be recorded by marine mammal observers will include the same types of information that were recorded during previous monitoring projects (e.g., Moulton and Lawson 2002; Reiser et al. 2010, 2011; Bisson et al. 2013). When a mammal sighting is made, the following information about the sighting will be carefully and accurately recorded:

- species, group size, age/size/sex categories (if determinable), physical description of features that were observed or determined not to be present in the case of unknown or unidentified animals;
- behavior when first sighted and after initial sighting;
- heading (if consistent), bearing and distance from observer;
- apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and behavioral pace;
- time, location, speed, and activity of the vessel, sea state, ice cover, visibility, and sun glare, on support vessels the distance and bearing to the drilling unit will also be recorded; and
- positions of other vessel(s) in the vicinity of the observer location.

The vessel's position, speed, water depth, sea state, ice cover, visibility, and sun glare will also be recorded at the start and end of each observation watch, every 30 minutes during a watch, and whenever there is a change in any of those variables.

Distances to nearby marine mammals will be estimated with binoculars (Fujinon 7×50 binoculars) containing a reticle to measure the vertical angle of the line of sight to the animal relative to the horizon.

An electronic database will be used to record and collate data obtained from visual observations during the vessel-based study. The PSOs will enter the data into the custom data entry program installed on field laptops. The data entry program automates the data entry process and reduces data entry errors and maximizes PSO time spent looking at the water. PSOs also have voice recorders available to them. This is another tool that will allow PSOs to maximize time spent focused on the water.

PSO's are instructed to identify animals as unknown when appropriate rather than strive to identify an animal when there is significant uncertainty. We also ask that they provide any sightings cues they used and any distinguishable features of the animal even if they are not able to identify the animal and record it as unidentified. Emphasis is also placed on recording what was not seen, such as dorsal features.

### *Monitoring At Night and In Poor Visibility*

Night-vision equipment "Generation 3" binocular image intensifiers or equivalent units will be available for use when needed. However, past experience with night-vision devices (NVDs) in the Beaufort Sea and elsewhere indicates that NVDs are not nearly as effective as visual observation during daylight hours (e.g., Harris et al. 1997, 1998; Moulton and Lawson 2002; Hartin et al, 2011).

### *Specialized Field Equipment*

Shell will provide or arrange for the following specialized field equipment for use by the onboard PSOs: reticle binoculars, Big-eye binoculars, GPS unit, laptop computers, night vision binoculars, and possibly digital still and digital video cameras. Big eye binoculars will be mounted and used on key monitoring vessels including the drilling units, ice management vessels and the anchor handler.

### *Field Data-Recording, Verification, Handling, and Security*

The observers on the drilling units and support vessels will record their observations directly into computers using a custom software package. The accuracy of the data entry will be verified in the field by computerized validity checks as the data are entered, and by subsequent manual checking. These procedures will allow initial summaries of data to be prepared during and shortly after the field season, and will facilitate transfer of the data to statistical, graphical or other programs for further processing. Quality control of the data will be facilitated by (1) the start-of-season training session, (2) subsequent supervision by the onboard field crew leader, and (3) ongoing data checks during the field season.

The data will be sent off of the vessel to Anchorage on a daily basis and backed up regularly onto storage devices on the vessel, and stored at separate locations on the vessel. If practicable, hand-written data sheets will be photocopied daily during the field season. Data will be secured further by having data sheets and backup data devices carried back to the Anchorage office during crew rotations.

In addition to routine PSO duties, observers will be encouraged to record comments about their observations into the "comment" field in the database. Copies of these records will be available to the observers for reference if they wish to prepare a statement about their observations. If prepared, this statement would be included in the 90-day and comprehensive reports documenting the monitoring work.

PSOs will be able to plot sightings in near real-time for their vessel. Significant sightings from key vessels including drilling units, ice management, anchor handlers and aircraft will be relayed between platforms to keep observers aware of animals that may be in or near the area but may not be visible to the observer at any one time. Emphasis will be placed on relaying sightings with the greatest potential to involve mitigation or reconsideration of a vessel's course (e.g., large group of bowheads, walruses on ice).

Observer training will emphasize the use of "comments" for sightings that may be considered unique or not fully captured by standard data codes. In addition to the standard marine mammal sightings forms, a specialized form was developed for recording traditional knowledge and natural history observations. PSOs will be encouraged to use this form to capture observations related to any aspect of the arctic environment and the marine mammals found within it. Examples might include relationships between ice and marine mammal sightings, marine mammal behaviors, comparisons of observations among different years/seasons, etc. Voice recorders will also be available for observers to use during periods when large numbers of animals may be present and it is difficult to capture all of the sightings on written or digital forms. These recorders can also be used to capture traditional knowledge and natural history observations should individuals feel more comfortable using the recorders rather than writing down their comments. Copies of these records will be available to all observers for reference if they wish to prepare a statement about their observations for reporting purposes. If prepared, this statement would be included in the 90-day and final reports documenting the monitoring work.

### *Field Reports*

Throughout the exploration drilling program, the biologists will prepare a report each day or at such other interval as required summarizing the recent results of the monitoring program. The reports will summarize the species and numbers of marine mammals sighted. These reports will be provided to NMFS as required.

## REPORTING

The results of the vessel-based monitoring, including estimates of exposure to key sound levels, will be presented in the 90-day and final technical report(s). Reporting will address the requirements established by NMFS in the IHA, and USFWS in the LOA (if so stipulated).

The technical report(s) will include:

- summaries of monitoring effort: total hours, total distances, and distribution of marine mammals through study period for sea state, and other factors affecting visibility and detectability of marine mammals;
- analyses of the effects of various factors influencing detectability of marine mammals: sea state, number of observers, and fog/glare;
- species composition, occurrence, and distribution of marine mammal sightings including date, water depth, numbers, age/size/gender categories (when discernible), group sizes, and ice cover; and
- analyses of the effects of exploration drilling operations:
    - sighting rates of marine mammals during periods with and without exploration drilling activities (and other variables that could affect detectability);
    - initial sighting distances versus drilling state;
    - closest point of approach versus drilling state;
    - observed behaviors and types of movements versus drilling state;
    - numbers of sightings/individuals seen versus drilling state;
    - distribution around the drilling units and support vessels versus drilling state; and
    - estimates of “take by harassment”.

Data will be visualized by plotting sightings relative to the position of the exploratory drilling activities. We will also overlay the sightings data with acoustic data that indicates the sound levels associated with the exploration drilling activity and with maps of call locations determined by the seafloor recorders. Additionally, sightings data will be incorporated into animations of the call locations around the exploration drilling activity. Seafloor recorders used in the Chukchi Sea do not have the ability to localize calls. Larger groups of recorders, however, can localize calls using arrival times of the calls captured on several nearby recorders.

Shell will consider requests for data collected during the marine mammal monitoring only after the data have been put through a quality control/quality assurance program. Such requests may include incorporating the data with other companies’ data and/or integrating the raw data with data from other marine mammal studies.

# ACOUSTIC MONITORING PLAN

## EXPLORATION DRILLING, ZVSP AND VESSEL SOUND MEASUREMENTS

### *Objectives*

Exploration drilling sounds are expected to vary significantly with time due to variations in the level of operations and the different types of equipment used at different times onboard the drilling units. The goals of these measurements are:

- to quantify the absolute sound levels produced by exploration drilling and to monitor their variations with time, distance and direction from the drilling unit;
- to measure the sound levels produced by vessels while operating in direct support of exploration drilling operations. These vessels will include crew change vessels, tugs, ice-management vessels, and spill response vessels not measured in 2012; and
- to measure the sound levels produced by an end-of-hole zero-offset vertical seismic profile (ZVSP) survey using a stationary sound source.

### *Exploration Drilling Sound Characterization*

Sound characterization and measurements of all exploration drilling activities will be performed using five Autonomous Multichannel Acoustic Recorders (AMAR) (Figures 1 and 2) deployed on the seabed along the same radial at distances of 0.31, 0.62, 1.2, 2.5 and 5 mi (0.5,1, 2, 4 and 8 km) from each drilling unit. All five recording stations will sample at least at 32 kHz, providing calibrated acoustic measurements in the 5 Hz to 16 kHz frequency band. The logarithmic spacing of the recorders is designed to sample the attenuation of drilling unit sounds with distance. The autonomous recorders will sample through completion of the first well, to provide a detailed record of sounds emitted from all activities. These recorders will be retrieved and their data analyzed and reported in the project's 90-day report.

**FIGURE 1. Geometry of the five AMAR will sample sound produced by exploration drilling operations for the drilling units *Discoverer* and *Polar Pioneer***

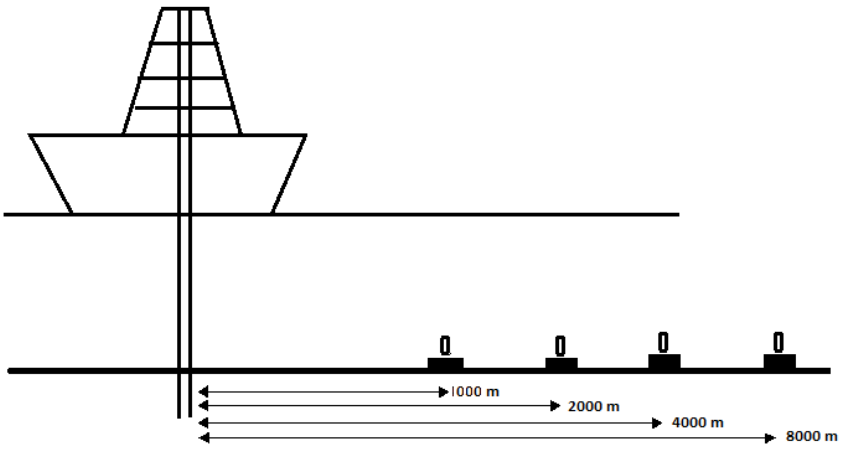


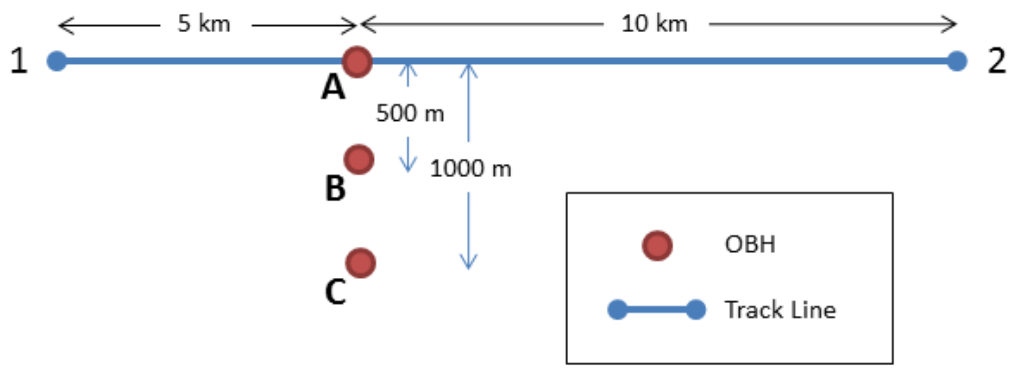

**FIGURE 2. AMAR autonomous acoustic recorder for acoustic monitoring of exploratory drilling activities**

The deployment of drilling sound monitoring equipment will occur before, or as soon as possible after the *Discoverer* and the *Polar Pioneer* are on site. Activity logs of exploration drilling operations and nearby vessel activities will be maintained to correlate with these acoustic measurements. All results, including back-propagated source levels for each operation, will be reported in the 90-day report.

### *Vessel Sound Characterization*

Vessel sound characterizations will be performed using dedicated recorders deployed at sufficient distances from exploration drilling operations so that sound produced by those activities does not interfere. Three AMAR acoustic recorders will be deployed on and perpendicular to a sail track on which all Shell contracted vessels will transit. The deployment geometry will be as shown in Figure 3. This geometry is designed to obtain sound level measurements as a function of distance and direction. The fore and aft directions are sampled continuously over longer distances to 3 and 6 miles (5 and 10 km) respectively, while broadside and other directions are sampled as the vessels pass closer to the recorders.

**FIGURE 3. AMAR recorder deployment geometry relative to vessel sail track for support vessel sound characterization measurements**




Vessel sound measurements will be processed and reported in a manner similar to that used by Shell and other operators in the Beaufort and Chukchi Seas during seismic survey operations. The measurements will further be analyzed to calculate source levels. Source directivity effects will be examined and reported. Preliminary vessel characterization measurements will be reported in a field report to be delivered 120 hours after the recorders are retrieved and data downloaded. Those results will include sound level data but not source level calculations. All vessel characterization results, including source levels, will be reported in 1/3-octave bands in the project 90-day report.

### *Zero-Offset Vertical Seismic Profiling Sound Monitoring*

Shell may conduct a geophysical survey referred to as a zero-offset vertical seismic profile, or ZVSP, at two drill sites in 2015. During ZVSP surveys, an airgun array, which is much smaller than those used for routine seismic surveys, is deployed at a location near or adjacent to the drilling unit, while receivers are placed (temporarily anchored) in the wellbore. The sound source (airgun array) is fired repeatedly, and the reflected sonic waves are recorded by receivers (geophones) located in the wellbore. The geophones, typically a string of them, are then raised up to the next interval in the wellbore and the process is repeated until the entire wellbore has been surveyed. The purpose of the ZVSP survey is to gather geophysical information at various depths in the wellbore, which can then be used to tie-in or ground-truth geophysical information from the previously collected 2D and 3D seismic surveys with geological data collected within the wellbore.

Shell will conduct a ZVSP surveys in which the sound source is maintained at a constant location near the wellbore. Two sound sources have been proposed by Shell for the ZVSP surveys in 2015. The first is a small airgun array that consists of three 150 $in^3$ (2,458 cu $cm^3$) airguns for a total volume of 450 $in^3$ (7,374 $cm^3$). The second ZVSP sound source consists of two 250 $in^3$ (4,097 cu $cm^3$) airguns with a total

volume of 500 $in^3$ (8,194 $cm^3$). Specifications of the arrays are provided in Table 2. A representative depiction of the arrays to be used by Shell in 2015 is depicted within its frame or sled (Figure 4).

**FIGURE 4. REPRESENTATIVE DEPICTION OF THE SOUND SOURCE TO BE USED FOR THE ZVSP SURVEYS DURING SHELL'S EXPLORATION DRILLING PROGRAM IN THE CHUKCHI SEA**

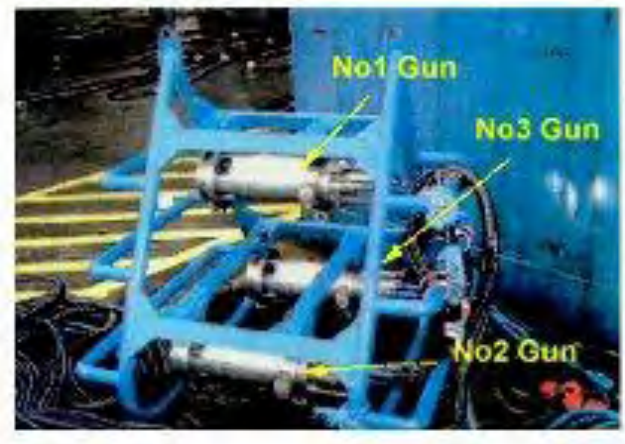
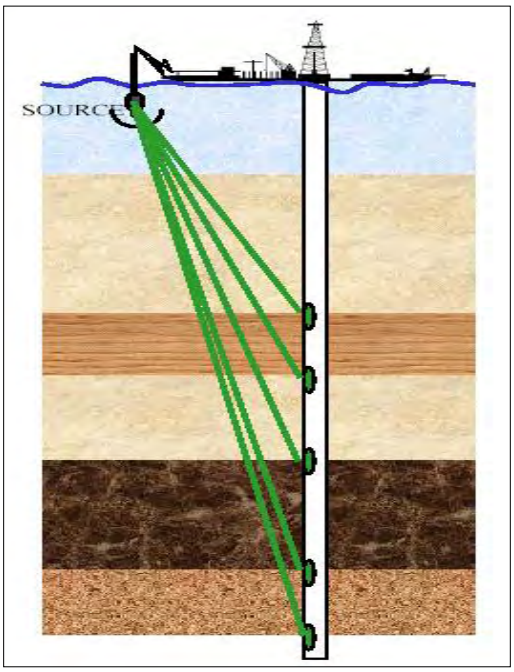



**TABLE 2. SOUND SOURCE (AIRGUN ARRAY) SPECIFICATIONS FOR ZVSP SURVEYS IN THE CHUKCHI SEA**

| Source Type | No. Sources | Maximum Total Chamber Size | Pressure | Source Depth | Zero-Peak Sound Pressure Level |
|---|---|---|---|---|---|
| Sodera Triple G150 | 3 airguns: 3 X 150 $in^3$ | 450 $in^3$ (7,374 $cm^3$) | 3,000 psi (207 bar) | 7 m (23 ft.) | 241 dB re1μPa @1m |
| Sodera Parallel G250 | 2 airguns: 2 X 250 $in^3$ | 500 $in^3$ (9,194 $cm^3$) | 3,000 psi (207 bar) | 7 m (23 ft.) | 239 dB re1μPa @1m |

A ZVSP survey is typically conducted at each well after total depth is reached but may be conducted at a shallower depth. For each survey, the sound source (airgun array) would be deployed over the side of the *Discoverer* or the *Polar Pioneer* with a crane. The sound source will be positioned 50-200ft (15-61 m) from the wellhead (depending on crane location), at a depth of ~10-23ft (3-7 m) below the water surface. Receivers will be temporarily anchored in the wellbore at depth (Figure 5). The sound source will be pressured up to 3,000 pounds per square inch (psi), and activated 5-7 times at approximately 20-second intervals. The receivers will then be moved to the next interval of the wellbore and re-anchored, after which the airgun array will again be activated 5-7 times. This process will be repeated until the entire wellbore has been surveyed in this manner. The interval between anchor points for the receiver array is usually 200-300ft (61-91 m). A typical ZVSP survey takes about 10-14 hours to complete per well (depending on the depth of the well and the number of anchoring points in each well).

**FIGURE 5. A SCHEMATIC OF ZVSP OPERATIONS TO BE CONDUCTED DURING ZVSP SURVEYS DURING SHELL'S EXPLORATION DRILLING PROGRAM IN THE CHUKCHI SEA**

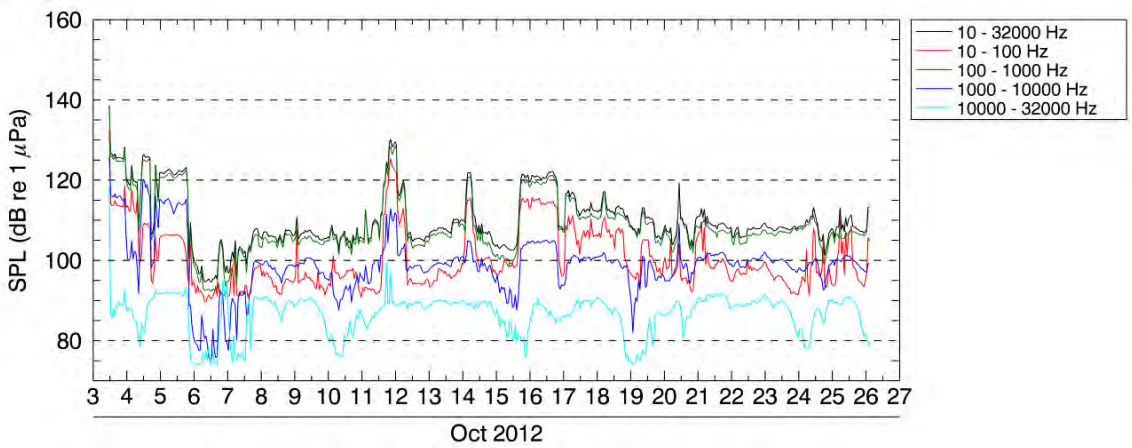



ZVSP sound verification measurements will be performed using either the AMARs that are deployed for drilling unit sound characterizations, or by JASCO Ocean Bottom Hydrophone (OBH) recorders. The use of AMARS or OBHs depends on the specific timing these measurements will be required by NMFS; the AMARs will not be retrieved until several days after the ZVSP as they are intended to monitor during retrievals of drilling unit anchors and related support activities. If the ZVSP acoustic measurements are required sooner, four OBH recorders would be deployed at the same locations and those could be retrieved immediately following the ZVSP measurement. The ZVSP measurements can be delivered within 120 hours of retrieval and download of the data from either instrument type.

### *Acoustic Data Analyses*

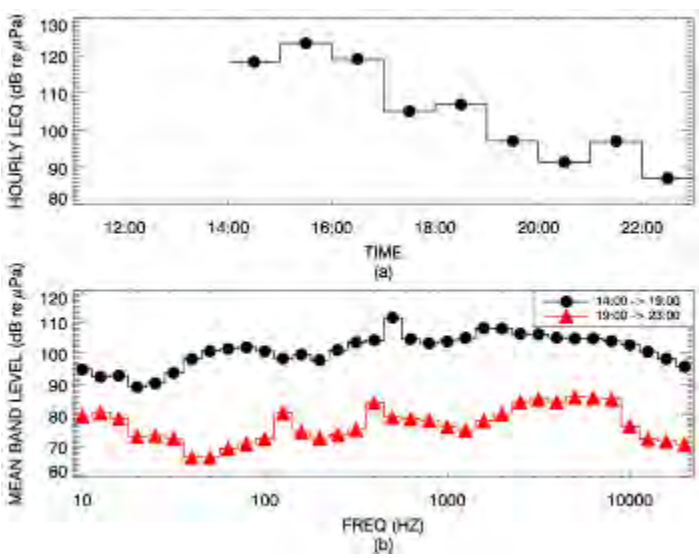
Exploration drilling sound data will be analyzed to extract a record of the frequency-dependent sound levels as a function of time. Figure 6 shows results of this type of analysis. These results are also useful for correlating measured sound energy events with specific survey operations. The analysis provides absolute sound levels in finite frequency bands that can be tailored to match the highest-sensitivity hearing ranges for species of interest. For example, bowhead hearing is thought to be most acute in the 100 Hertz (Hz) – 1,000 Hz frequency range that corresponds with the green line in the upper plot of Figure 6.

**FIGURE 6. EXAMPLE RESULT DISPLAY SHOWING SOUND LEVEL SPECTRAL ENERGY DISTRIBUTION BETWEEN SEVERAL DIFFERENT FREQUENCY BANDS**




The analyses will also consider sound level integrated through 1-hour durations (referred to as sound energy equivalent level Leq (1-hour). Figure 7 shows an example of a Leq analysis of hydrophone data. Similar graphs for long time periods will be generated as part of the data analysis performed for indicating drilling sound variation with time in selected frequency bands.

**FIGURE 7. UPPER: 1-HOUR LEQ LEVELS THAT WILL BE CALCULATED FROM ACOUSTIC MEASUREMENTS FOR USE IN CORRELATING WITH POSSIBLE BOWHEAD WHALE DEFLECTION DATA. LOWER: FREQUENCY BAND DISTRIBUTION OF SOUND ENERGY IN TWO DIFFERENT TIME PERIODS**



### *Reporting of Results*

Acoustic sound level results will be reported in the 90-day and comprehensive reports for this program. The results reported will include:

- sound source levels for the drilling units and all drilling support vessels;
- spectrogram and band level versus time plots computed from the continuous recordings obtained from the hydrophone systems;
- hourly Leq levels at the hydrophone locations; and
- correlation of exploration drilling source levels with the type of exploration drilling operation being performed. These results will be obtained by observing differences in drilling sound associated with differences in drilling unit activities as indicated in detailed drilling unit logs.

## ACOUSTIC "NET" ARRAY IN CHUKCHI SEA

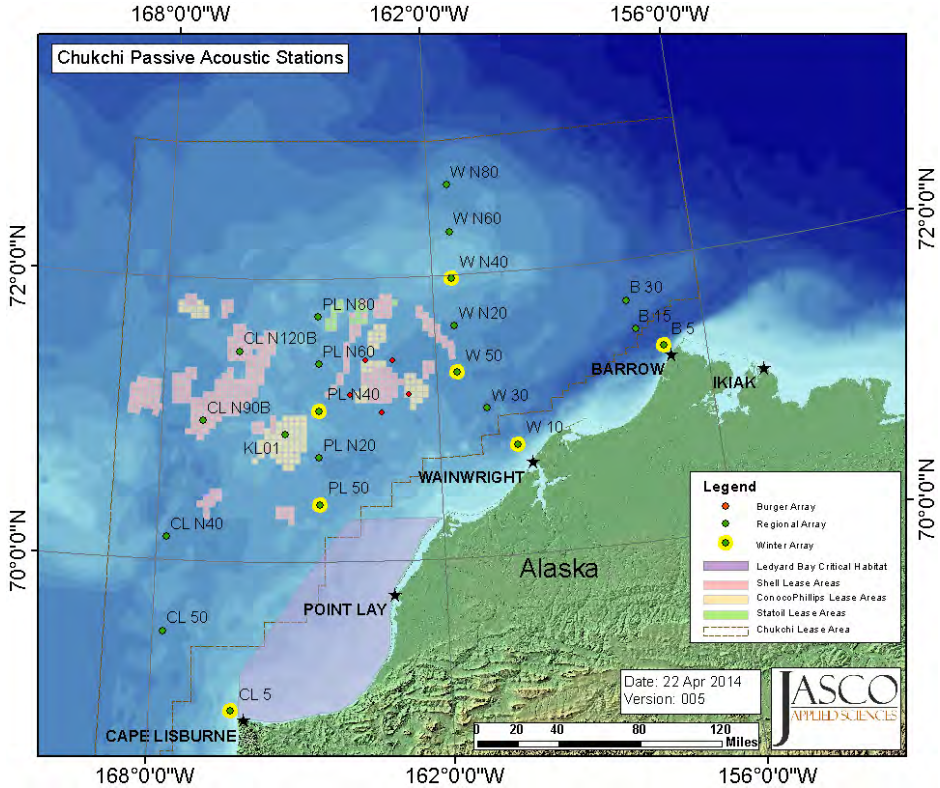
### *Background and Objectives*

This section describes acoustic studies that were undertaken from 2006 through 2013 in the Chukchi Sea as part of the Joint Monitoring Program and that will be continued by Shell during exploration drilling activities. The acoustic "net" array used during the 2006–2013 field seasons in the Chukchi Sea was designed to accomplish two main objectives. The first was to collect information on the occurrence and distribution of marine mammals (including beluga whale, bowhead whale, walrus and other species) that may be available to subsistence hunters near villages along the Chukchi Sea coast and to document their relative abundance, habitat use, and migratory patterns. The second objective was to measure the ambient soundscape throughout the eastern Chukchi Sea and to record received levels of sounds from industry and other activities further offshore in the Chukchi Sea.

### *Technical Approach*

A net array configuration similar to that deployed in 2007–2013 is again proposed. The basic components of this effort consist of autonomous acoustic recorders deployed widely across the US Chukchi Sea during the open water season and then more limited arrays during the winter season. These calibrated systems sample at 16 kHz with 24-bit resolution, and are capable of recording marine mammal sounds and making anthropogenic noise measurements. The net array configuration will include a regional array of 23 AMAR recorders deployed July–October off the four main transect locations: Cape Lisburne, Point Lay, Wainwright and Barrow as shown in Figure 8. All of these offshore systems will capture sounds associated with exploration drilling, where present, over large distances to help characterize the sound transmission properties in the Chukchi Sea. Six additional summer AMAR recorders will be deployed around the Burger drill sites to monitor directional variations and longer-range propagation of drilling-related sounds. These recorders will also be used to examine marine mammal vocalization patterns in vicinity of exploration drilling activities. The regional recorders will be retrieved in early October 2015; acoustic monitoring will continue through the winter with 8 AMAR recorders deployed October 2015–August 2016 at the highlighted locations in Figure 8. The winter recorders will sample at 16 kHz on a 17% duty cycle (40 minutes every 4 hours). The winter recorders deployed in previous years have provided important information about fall and spring migrations of bowhead, beluga, walrus and several seal species.

**FIGURE 8. PROPOSED OPEN WATER DEPLOYMENT LOCATIONS OF ACOUSTIC RECORDERS IN THE EASTERN CHUKCHI SEA, ALASKA**




## *Analysis and Reporting*

The Chukchi acoustic net array will produce an extremely large dataset comprising several Terabytes of acoustic data. The analyses of these data require identification of marine mammal vocalizations. Because of the very large amount of data to be processed, the analysis methods will incorporate automated vocalization detection algorithms that have been developed over several years. While the hydrophones used in the net array are not directional, and therefore not capable of accurate localization of detections, the number of vocalizations detected on each of the sensors provides a measure of the relative spatial distribution of some marine mammal species, assuming that vocalization patterns are consistent within a species across the spatial and geographic distribution of the hydrophone array. These results therefore provide information such as timing of migrations and routes of migration for belugas and bowheads.

A second purpose of the Chukchi net array is to monitor the amplitude of exploration drilling sound propagation over a very large area. It is expected that sounds from exploratory drilling activities will be detectable on hydrophone systems within approximately 30 km of the drilling units when ambient sound energy conditions are low. The drilling sound levels at recorder locations will be quantified and reported.

Analysis of all acoustic data will be prioritized to address the primary questions. The primary data analysis questions are to (a) determine when, where, and what species of animals are acoustically detected on each recorder (b) analyze data as a whole to determine offshore distributions as a function of time, (c) quantify spatial and temporal variability in the ambient sound energy, and (d) measure received levels of exploration drilling survey events and drilling unit activities. The detection data will be used to develop spatial and temporal animal detection distributions. Statistical analyses will be used to test for changes in animal detections and distributions as a function of different variables (e.g., time of day, season, environmental conditions, ambient sound energy, and drilling or vessel sound levels).

# CHUKCHI OFFSHORE AERIAL PHOTOGRAPHIC MONITORING PROGRAM

Shell has been reticent to conduct manned aerial surveys in the offshore Chukchi Sea because conducting those surveys puts people at risk. There is a strong desire; however, to obtain data on marine mammal distribution in the offshore Chukchi Sea and Shell will conduct a photographic aerial survey that would put fewer people at risk as an alternative to the fully-manned aerial survey. The photographic survey would reduce the number of people on board the aircraft from six persons to two persons (the pilot and copilot) and would serve as a pilot study for future surveys that would use an Unmanned Aerial System (UAS) to capture the imagery. Successful aerial surveys with only pilots and camera systems were conducted over drilling locations in the Chukchi Sea in 2012.

Aerial photographic surveys have been used to monitor distribution and estimate densities of marine mammals in offshore areas since the mid-1980s, and before that, were used to estimate numbers of animals in large concentration areas. For example, Koski and Davis (1980), Koski et al. (2002) and Richard et al. (1990) used aerial photography to provide more precise estimates of numbers of belugas in concentration areas during aerial surveys of Lancaster Sound and Hudson Bay, respectively. Later Richard et al. (1994), Witting et al. (2005) and Heide-Jørgensen et al. (2010) used aerial photography to estimate numbers and densities of narwhals and minke whales in their survey areas.

Digital photographs provide many advantages over observations made by people if the imagery has sufficient resolution (Koski et al. 2013). With photographs there is constant detectability across the imagery, whereas observations by people decline with distance from the center line of the survey area. Observations at the outer limits of the transect can decline to 5-10% of the animals present for real-time observations by people during an aerial survey. The distance from the trackline of sightings is more accurately determined from photographs; group size can be more accurately determined; and sizes of animals can be measured, and hence much more accurately determined, in photographs. As a result of the latter capability, the presence or absence of a calf can be more accurately determined from a photograph than by in-the-moment visual observations. Another benefit of photographs over visual observations is that photographs can be reviewed by more than one independent observer allowing quantification of detection, identification and group size biases.

During the 2012 field season Shell successfully conducted photographic surveys using two Nikon D800 cameras obliquely mounted in a Twin Otter to record marine mammals around their drill sites in the Chukchi Sea. In addition, a HD video camera was tested and compared to the still camera for evaluation as a tool for real-time monitoring during future studies. Shell plans to use an Aero Commander aircraft, supported by Firstmark Corp, with similar Nikon cameras mounted in the airplane. If there is enough room, we will also mount a third vertically-mounted DSLR camera with a longer lens. The longer lens will give higher resolution imagery and will help us understand if we are missing seals and may allow us to identify many of the unidentified small pinnipeds detected during the 2012 study.

The proposed photographic survey will provide imagery that can be used to evaluate the ability of future studies to use the same image capturing systems in an UAS where people would not be put at risk. Although the two platforms are not the same, the slower airspeed and potentially lower flight altitude of the UAS would mean that the data quality would be better from the UAS. Initial comparisons have been made between data collected by human observers on board both the Chukchi and Beaufort aerial survey aircraft and the digital imagery collected in 2012. Overall, the imagery provided better estimates of the number of large cetaceans and pinnipeds present but fewer sightings were identified to species in the imagery than by PSOs, because the PSOs had sightings in view for a longer period of time and could use behavior to differentiate species. The comparisons indicated that some cetaceans that were not seen by PSOs were detected in the imagery; errors in identification were made by the PSOs during the survey that could be resolved from examination of the imagery; cetaceans seen by PSOs were visible in the imagery;

and during periods with large numbers of sightings, the imagery provided much better estimates of numbers of sightings and group size than the PSO data.

### *Camera Specifications*

The cameras that we will use are Nikon D800s, which are 36.3 megapixel cameras that store imagery in 7,360×4,912 pixel arrays. The aircraft will be flown at 1,000 or 1,500 ft. above sea level and the cameras will be triggered to provide 50% overlap with adjacent photos and 100% overlap among all imagery. Actual trigger timing will depend on the survey speed and altitude of the aircraft but would be about every three (when at 1000 ft.) or five seconds (when at 1500 ft.). The cameras will have 21 mm f/2.8mm Zeiss lenses, which will each cover a swath ~720 or ~1000 m on the water surface with one pixel representing a 6–9 cm square at the water surface on the trackline and about 31 or 46 cm at the outer edge of the frame. The cameras will be mounted such that one DSLR points 25° to the right and one 25° to the left side of the trackline, with the inner edge of both cameras' field of view overlapping about 67 or 100 m on either side of the centerline. These pixel sizes on the trackline are one seventeenth or one eighth of the pixel size (25 cm square) tested by Koski et al. (2009) during their tests with a video camera for detection of kayaks and is a smaller pixel size (better resolution) on the trackline than was tested by Amanda Hodgson (16.8 cm) during her surveys of humpback whales off Australia and which proved adequate for counting humpback whales in their imagery.

This camera configuration was used successfully in 2012 during surveys at both 1,000 and 1,500 ft. and the resolution permitted detection and identification of all medium and large cetaceans seen by PSOs on the manned aircraft. Further, it also permitted counting of walrus/bearded seals (Koski et al 2013) and some unknown fraction of small pinnipeds. The resolution does not always permit differentiation of bearded seals from walrus, especially when they are in the water. This imagery resolution provides slightly better ability for determining species and detecting animals than people would have in an aircraft flying at 1,000 ft. above sea level and more pinnipeds were sighted during the review of the imagery than PSOs saw in the same swath during the survey.

Route planning and data storage software are off-the-shelf products. The set up includes a harness to connect the camera and GPS to the Photo Coupler Controller which is connected to a GPS for triggering capture of images and recording of metadata for each image. The system can be powered by 10–32 volt DC or a custom power source and has a back-up battery power source to prevent interruption to data capture. Data will be stored on a memory card in the camera and camera settings will be set before the survey with shutter speed priority to ensure that motion blur is minimized. The system is "plug-and-play" and does not require input from persons on board the aircraft during the flight. The system can be pre-programmed to take photographs starting and stopping at predetermined times.

### *Survey Timing and Frequency*

Photographic surveys would start as soon as the ice management, anchor handler and drilling units are at or near the first drill site and would continue throughout the drilling period and until the drilling related vessels have left the exploration drilling area. Since the current plans are for vessels to enter the Chukchi Sea on or about 1 July, surveys would be initiated on or about 3 July. This start date differs from past practices of beginning five days prior to initiation of an activity and continuing until five days after cessation of the activity because the presence of vessels with helidecks in the area where overflights will occur is one of the main mitigations that will allow for safe operation of the overflight program this far offshore. The surveys will be based out of Barrow and the same aircraft will conduct the offshore surveys around the drilling units and the coastal saw-tooth pattern. The surveys of offshore areas around the drilling units will take precedence over the sawtooth survey, but if weather does not permit surveying offshore, the nearshore survey will be conducted if weather permits.

### *Survey Pattern*

The aerial survey grids are designed to maximize coverage of the sound level fields of the drilling units during the different exploratory drilling activities. The survey grids can be modified as necessary based on weather and whether a noisy activity or quiet activity is taking place. The intensive survey design maximizes the effort over the area where sound levels are highest. The outer survey grid covers an elliptical area with a 45 km radius near the center of the ellipse. The spacing of the outer survey lines is 10 km, and the spacing between the intensive and outer lines is 5 km. The expanded survey grid covers a larger survey area, and the design is based on an elliptical area with a 50 km radius centered on the well sties as shown in Figure 10. For both survey designs the main transects will be spaced 10 km apart which will allow even coverage of the survey area during a single flight if weather conditions permit completion of a survey. A random starting point will be selected for each survey and the evenly spaced lines will be shifted NE or SW along the perimeter of the elliptical survey area based on the start point. The total length of survey lines will be about 1,000 km and the exact length will depend on the location of the randomly selected start point.

**FIGURE 9. AERIAL SURVEY TRANSECT LINES (OUTER AND INTENSIVE GRIDS) IN THE EASTERN CHUKCHI SEA OUTER SURVEY GRID DESIGN IS BASED ON A 45 KM SURVEY RADIUS AND INTENSIVE SURVEY GRID DESIGN IS BASED ON THE AREAS LIKELY TO HAVE HIGHER SOUND LEVELS**

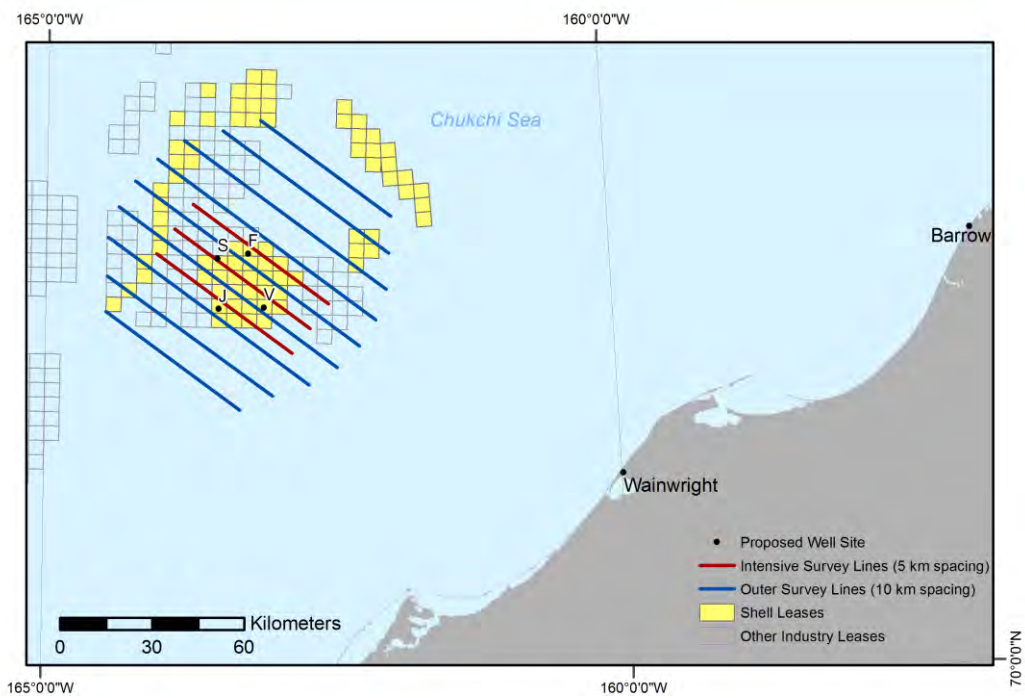
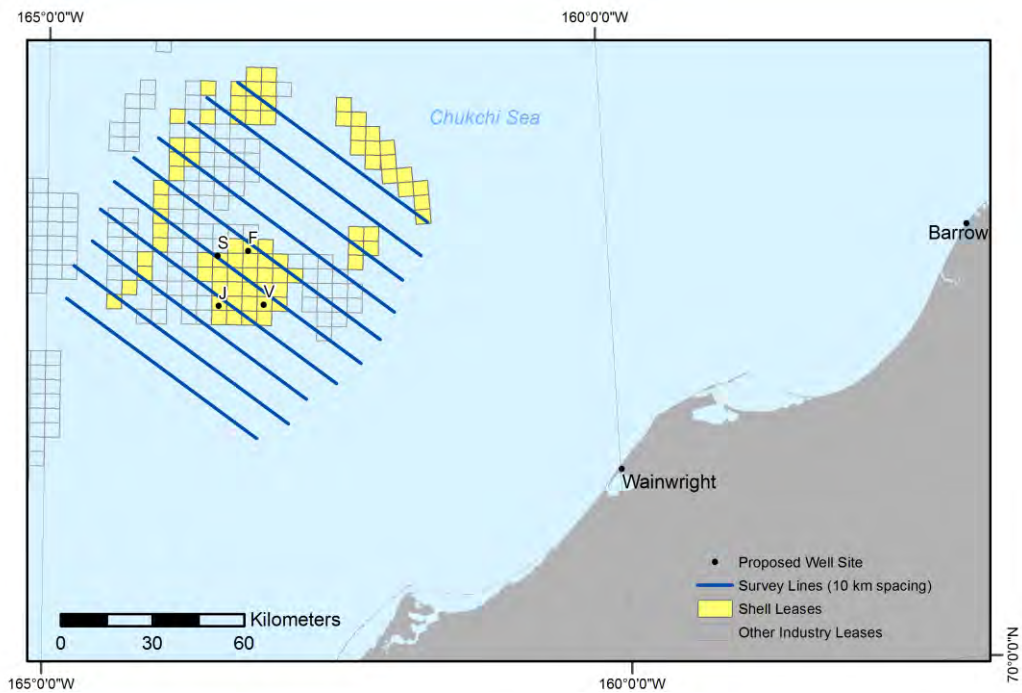


**FIGURE 10. AERIAL PHOTOGRAPHIC SURVEY TRANSECT LOCATIONS FOR THE EASTERN CHUKCHI SEA- GRID IS BASED ON A 50 KM SURVEY RADIUS**




## *Data Analyses*

Following each survey, the imagery will be downloaded from the memory card to a portable hard drive and then backed up on a second hard drive and stored at accommodations in Barrow until the second hard drive can be transferred to Anchorage. In Anchorage, the imagery will be processed through a computer-assisted analysis program to identify where marine mammal sightings might be located among the many images obtained. A team of trained photo analysts will review the photographs identified as having potential sightings and record the appropriate data on each sighting. If time permits, a second review of some of the images will be conducted while in the field, but the sightings recorded during the second pass will be identified in the database as secondary sightings, so that biases associated with the detection in the imagery can be quantified. If time does not permit that review to be conducted while in the field, the review will be conducted by personnel in the office during or after the field season. A sample of images that are not identified by the computer-assisted analysis program will be examined in detail by the image analysts to determine if the program has missed marine mammal sightings. If the analysis program has missed mammal sightings, these data will be to develop correction factors to account for these missed sightings among the images that were not examined.

## *Other Imagery and Sensors*

In addition to the imagery indicated above, Shell is examining systems that are in development that would allow collection of additional imagery. They include collection of multi-spectral/hyperspectral imagery, infrared sensors, and a multi-camera system that would allow collection of imagery over a wider area. If these systems are ready for testing in 2015, Shell will consider incorporating these systems into the Chukchi Sea program.

# CHUKCHI SEA COASTAL AERIAL SURVEY

Nearshore aerial surveys of marine mammals in the Chukchi Sea were conducted over coastal areas to approximately 23 miles (mi) [37 kilometers (km)] offshore in 2006–2008 and in 2010 in support of Shell's summer seismic exploration activities. In 2012 these surveys were flown when it was not possible to fly the photographic transects out over the Burger well site due to weather or rescue craft availability. These surveys provided data on the distribution and abundance of marine mammals in nearshore waters of the Chukchi Sea. Shell plans to conduct these nearshore aerial surveys in the Chukchi Sea as opportunities unfold and surveys will be similar to those conducted during previous years except that no PSOs will be onboard the aircraft. As noted above, the first priority will be to conduct photographic surveys around the offshore exploration drilling activities, but nearshore surveys will be conducted whenever weather does not permit flying offshore. As in past years, surveys in the southern part of the nearshore survey area will depend on the end of the beluga hunt near Point Lay. In past years, Point Lay has requested that aerial surveys not be conducted until after the beluga hunt has ended and so the start of surveys has been delayed until mid-July.

Alaskan Natives from villages along the east coast of the Chukchi Sea hunt marine mammals during the summer and Native communities are concerned that offshore oil and gas exploration activities may negatively impact their ability to harvest marine mammals. Of particular concern are potential impacts on the beluga harvest at Point Lay and on future bowhead harvests at Point Hope, Point Lay, Wainwright and Barrow. Other species of concern in the Chukchi Sea include the gray whale; bearded, ringed, and spotted seals; and walrus. Gray whale and harbor porpoise are expected to be the most numerous cetacean species encountered during the proposed aerial survey; although harbor porpoise are abundant they are difficult to detect from aircraft because of their small size and brief surfacing. Beluga whales may occur in high numbers early in the season. The ringed seal is likely to be the most abundant pinniped species. The current aerial survey program will be designed to collect distribution data on cetaceans but will be limited in its ability to collect similar data on pinnipeds and harbor porpoises because they are not reliably detectable during review of the collected images unless a third camera with a 50 mm or similar lens is deployed.

### *Objectives*

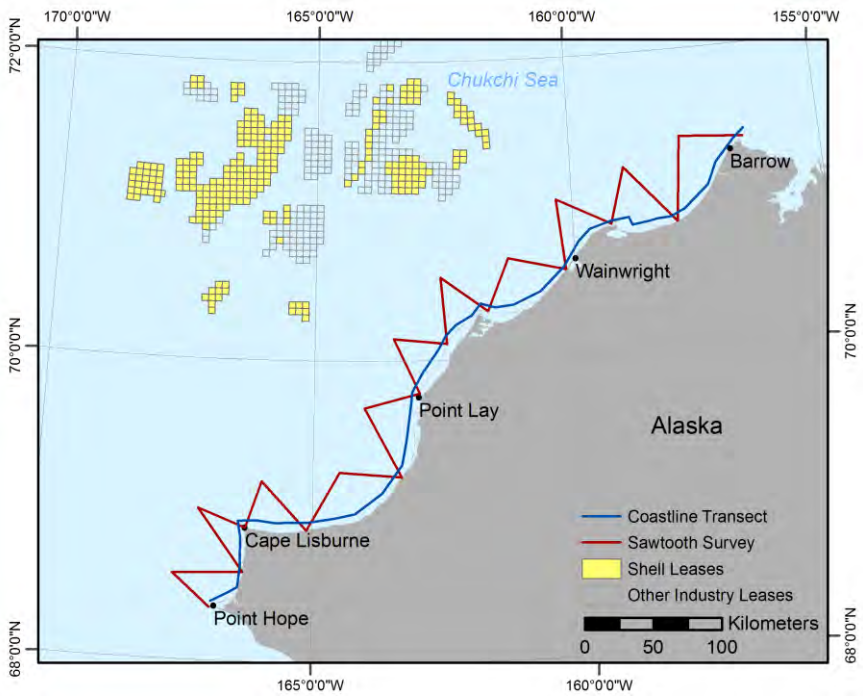
The aerial survey program objectives will be:

- to collect data on the distribution and abundance of marine mammals in coastal areas of the eastern Chukchi Sea;
- to collect and report data on the distribution, numbers, orientation and behavior of marine mammals, particularly beluga whales, near traditional hunting areas in the eastern Chukchi Sea; and
- to collect marine mammal sighting data using digital media.

### *Survey Procedures*

Transects will be flown in a saw-toothed pattern between the shore and 23 mi (37 km) offshore as well as along the coast from Point Barrow to Point Hope (Figure 11). This design will permit completion of the survey in one to two days and will provide representative coverage of the nearshore region. Sawtooth transects were designed by placing transect start/end points every 34 mi (55 km) along the offshore boundary of this 23 mi (37 km) wide nearshore zone, and at midpoints between those points along the coast. The transect line start/end points will be shifted along both the coast and the offshore boundary for each survey based upon a randomized starting location, but overall survey distance will not vary substantially. The coastline transect will simply follow the coastline or barrier islands. As with past surveys of the Chukchi Sea coast, coordination with coastal villages to avoid disturbance of the beluga whale subsistence hunt will be extremely important. "No-fly" zones around coastal villages or other hunting areas established during communications with village representatives will be in place until the end of the hunting season.

**FIGURE 11. AERIAL SURVEY TRANSECTS LOCATION AND GENERAL PATTERN FOR THE EASTERN CHUKCHI SEA. SPECIFIC TRANSECT START-/END-POINTS WILL BE ALTERED RANDOMLY FROM SURVEY TO SURVEY, AND HUNTING AREAS WILL BE AVOIDED WHEN HUNTING IS OCCURRING**




Standard aerial survey procedures used in previous marine mammal projects (by Shell as well as by others) will be followed. This will facilitate comparisons and (as appropriate) pooling with other data, and will minimize controversy about the chosen survey procedures. The aircraft will be flown at 110–120 knots ground speed and usually at an altitude of 1,000 ft. (305 m). In accordance with anticipated stipulations in the LOA, survey aircraft will be flown at 1,500 ft. (457 m) over the LBCHU. Aerial surveys at an altitude of 1,000 ft. (305 m) do not provide much information about seals but are suitable for bowhead, beluga, and gray whales. The need for a 1,000+ ft. (305+ m) or 1,500+ ft. (454+ m) cloud ceiling will limit the dates and times when surveys can be flown. Selection of a higher altitude for surveys would result in a significant reduction in the number of days during which surveys would be possible, impairing the ability of the aerial program to meet its objectives.

The surveyed area will include waters where belugas are usually available to subsistence hunters. If large concentrations of belugas are encountered during the survey, the aircraft will climb to ~10,000 ft. (3,050 m) altitude to avoid disturbing the cetaceans. If cetaceans are in offshore areas, the aircraft will climb high enough to include all cetaceans within a single photograph; typically about 3,000 ft. (914 m) altitude. When in shallow water, belugas and other marine mammals are more sensitive to aircraft over flights and other forms of disturbance than when they are offshore (see Richardson et al. 1995 for a review). They frequently leave shallow estuaries when over flown at altitudes of 2,000–3,000 ft. (610-904 m); whereas they rarely react to aircraft at 1,500 ft. (457 m) when offshore in deeper water. Additionally, if large groups of other marine mammals are encountered on the surveys, such as the large aggregations of walruses seen in 2007 and 2010, we will attempt to photograph the animals and provide location information to interested stakeholders.

### *Coordination with Other Aerial Surveys*

The BOEM, the NMFS, the USFWS, the NSB, or other organizations may also conduct aerial surveys in the Chukchi Sea during the exploration drilling season. Shell will consult with any groups or organizations conducting aerial surveys along the eastern Chukchi Sea coast regarding coordination during the exploration drilling season. The objectives will be:

- to ensure aircraft separation when both crews conduct surveys in the same general region;
- to coordinate the aerial survey projects in order to maximize consistency and minimize duplication; and
- to maximize consistency with previous years' efforts in so far as feasible.

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# Attachment C
# Bear Avoidance and Encounter Procedures

# Bear Avoidance and Encounter Procedures

All personnel should understand and follow the procedures listed below to detect the presence of bears in work areas and avoid human/ bear encounters.

If your work assignment requires you to be outside of areas that are secure from bears (buildings, heavy equipment cabs, etc.) check directly with your supervisor for the latest report from the designated representative Bear Guard to find out whether bears or bear sign were reported. Potential at-risk situations are walking between enclosed structures at the shore base, outside vehicles and at various work locations.

Arrange with your crew foreman to maintain radio or visual contact with the designated Bear Guard so that you can be alerted immediately to select a secure place if a bear is sighted. Plan the best route in advance to reach safe locations at the shore base or on a vessel from your work area.

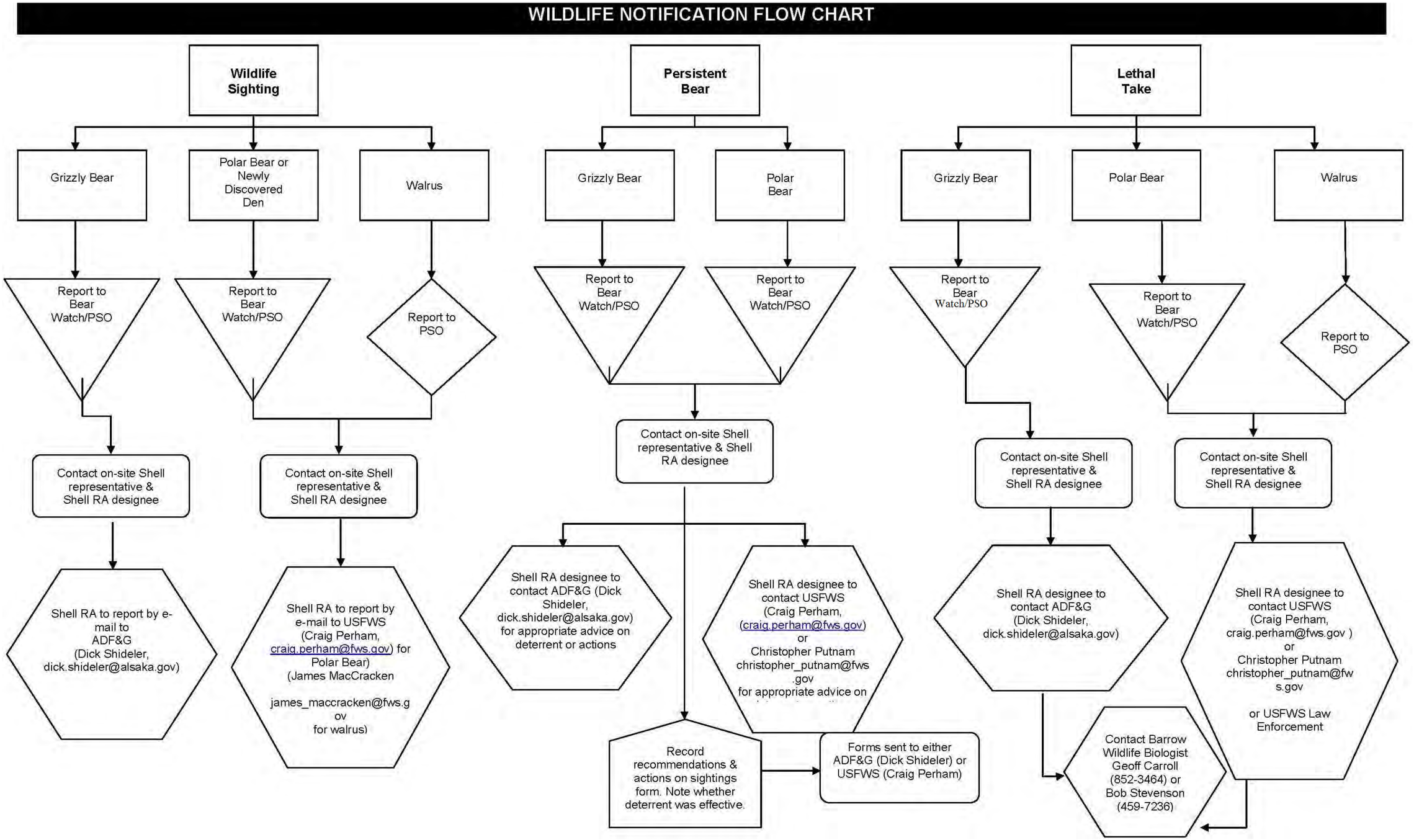
Be especially alert in dark conditions and areas of poor visibility outside where most pedestrian areas are illuminated.

Do NOT take food with you. If it is necessary to eat away from the vessel galley or shore base mess unit, make sure that all food is safely stored inside containers aboard ship or inside secure vehicles.

Do NOT leave food wastes or other material that may attract bears outside.

Report all bear sightings (including sign and tracks) immediately to the designated Shell representative when you are in a secure location. Do not expose yourself to look at the bear. Do not try to photograph a bear unless you are in a secure location. Early bear detection is essential to limit human/ bear encounters.

# Attachment D
# Wildlife Notification Flow Chart


WILDLIFE NOTIFICATION FLOW CHART
Wildlife Sighting
Grizzly Bear
Polar Bear or Newly Discovered Den
Walrus
Report to Bear Watch/PSO
Report to Bear Watch/PSO
Report to PSO
Contact on-site Shell representative & Shell RA designee
Contact on-site Shell representative & Shell RA designee
Shell RA to report by e-mail to ADF&G (Dick Shideler, dick.shideler@alsaka.gov)
Shell RA to report by e-mail to USFWS (Craig Perham, craig.perham@fws.gov) for Polar Bear) (James MacCracken
james_maccracken@fws.gov
for walrus)
Persistent Bear
Grizzly Bear
Polar Bear
Report to Bear Watch/PSO
Report to Bear Watch/PSO
Contact on-site Shell representative & Shell RA designee
Shell RA designee to contact ADF&G (Dick Shideler, dick.shideler@alsaka.gov) for appropriate advice on deterrent or actions
Shell RA designee to contact USFWS (Craig Perham, (craig.perham@fws.gov) or Christopher Putnam christopher_putnam@fws.gov for appropriate advice on
Record recommendations & actions on sightings form. Note whether deterrent was effective.
Forms sent to either ADF&G (Dick Shideler) or USFWS (Craig Perham)
Lethal Take
Grizzly Bear
Polar Bear
Walrus
Report to Bear Watch/PSO
Report to Bear Watch/PSO
Report to PSO
Contact on-site Shell representative & Shell RA designee
Contact on-site Shell representative & Shell RA designee
Shell RA designee to contact ADF&G (Dick Shideler, dick.shideler@alsaka.gov)
Shell RA designee to contact USFWS (Craig Perham, craig.perham@fws.gov ) or Christopher Putnam christopher_putnam@fws.gov
or USFWS Law Enforcement
Contact Barrow Wildlife Biologist Geoff Carroll (852-3464) or Bob Stevenson (459-7236)

# Attachment E
# Polar Bear Sighting Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Road
Anchorage, Alaska 99503-6199

**POLAR BEAR SIGHTING REPORT**

Date:_____ Observer name:_____
Time:_____ Contact number/email:_____

**Location**: _____
_____
Latitude:_____ Longitude_____ Datum:_____

**Weather conditions**: Fog_____ Snow_____ Rain_____ Clear_____ Temperature_____ F/C

Wind speed_____ mph/kts
Wind direction_____

Visibility: Poor _____
Fair _____
Good _____
Excellent_____

**Number of bears**:
_____ Adult M/F
_____ Sub-adult
_____ Unknown

_____ Sow/cub(s)
_____ Sow/yearling(s)
_____ Sow/2YO(s)

**Estimated distance of bear(s)** from personnel_____ (meters) and facility _____ (meters)
(closest point) (closest point)

**Bear behavior (Initial Contact)**: _____

**Bear behavior (After Contact)**: _____

**Description of encounter**:_____
_____
_____
_____

**Duration of encounter**:_____ **Possible attractants present:**_____

**Deterrents used/distance**:
_____ Crackershell
_____ Vehicle
_____ Rubber bullet
_____ Bean bag

_____ Horn/siren
_____ Spotlight/Headlight
_____Other _____

Agency/Contacts:
USFWS_Craig Perham (786-3810) (FAX: 786-3816)_____ Time_____ Date_____

ADF&G_Dick Shideler (459-7283) (FAX: 456-3091)_____ Time_____ Date_____

# Attachment F
# Grizzly Bear Observation Form

Bear 10# ____ (ADF&G only)

## GRIZZLY BEAR OBSERVATION FORM

**Observer:** _____ Company / Agency: _____

**Observation Date:** _____ Time: Start _____ Stop _____

**Observation from:** ☐ Vehicle ☐ Ground ☐ Building ☐ Other _____

Observer's distance from bear: _____ meters

**General Location:** ☐ Barrow ☐ Wainwright ☐ Point Lay ☐ Pt Hope ☐ Endicott

☐ Milne Point ☐ Lisburne ☐ Point McIntyre ☐ TAPS (MP#): _____

☐ Other (latitude/longitude if known): _____

**Specific Location:** _____ meters _____ (direction) of _____ (facility name)

Dumpster present: ☐ Yes ☐ No ☐ Unknown

**Weather:** _____ ºF ☐ Clear / Partly Cloudy ☐ Rain ☐ Fog ☐ Snow

Direction of wind: _____ at _____ mph

**Bear Identification:** Earflag color: Right _____ Left _____

(Note: "right" / "left" of bear, not observer)

Natural Markings (scars, torn ear, etc.): _____

**Other Bears Present:** ☐ None ☐ Cubs: # of cubs _____ # of yearlings _____ # of other

**Bear Activity:** When 1st seen, the bear was: ☐ Resting ☐ Feeding (natural food)

☐ Feeding (garbage) ☐ Feeding/Traveling ☐ Traveling

☐ Other: _____

**Bear's reaction to Observer:** ☐ Ignore ☐ Approach ☐ Avoid

Were other people in area (i.e. not with observer): ☐ Yes ☐ No ☐ Unknown

Bear's reaction to other people: ☐ Ignore ☐ Approach ☐ Avoid

Comments: _____

**Deterrence Action Taken:** ☐ Yes ☐ No If "Yes", did you use:

☐ Horn ☐ Siren ☐ Plastic Slugs ☐ Cracker Shell ☐ Firecracker

☐ Birdshot ☐ Other: _____

Bear Reaction: ☐ Ignore ☐ Approach ☐ Withdraw

**Additional Remarks:** _____

**Please return to:** Dick Shideler, Alaska Department of Fish & Game
1300 College Road, Fairbanks, Alaska 99701
Phone: 907-459-7283, FAX: 907-459-3091

# Attachment G
# Walrus Sighting Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Road
Anchorage, Alaska 99503-6199

**WALRUS SIGHTING REPORT**

Date: _____
Time: _____

Location: (include GPS coordinates if possible) _____
_____

Observer name: _____

Weather conditions: Fog_____ Snow_____ Rain_____ Clear_____ Approx. temperature_____

Wind speed_____ Wind direction_____

Total number of walrus: Adult_____ Sub-adult_____ Unknown_____

Estimated distance of walrus from personnel/facility:_____

Possible attractants present:_____

Walrus behavior: Curious_____ Aggressive_____ Predatory_____ Other_____

Description of encounter: _____
_____
_____

Duration of encounter: _____

Deterrents used/distance: Vehicle_____ Noise-maker_____ Firearms_____ Other_____

Injuries sustained: Personnel: _____
Walrus:
_____

Agency/Contacts:

USFWS___James MacCracken_____Time_____
Date_____
ADF&G_____ Time_____ Date_____
CLIENT_____ Time_____ Date_____

# Attachment H
# Plan of Cooperation Addendum

# Plan of Cooperation Addendum
# Chukchi Sea Exploration Plan, Revision 2
# Chukchi Sea, Alaska

**August 2014**

**Prepared by:**

**Shell Gulf of Mexico Inc.**
**3601 C Street, Suite 1000**
**Anchorage, AK 99503**

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Attachment B Chukchi Sea Communication Plan

# ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 4MP | Marine Mammal Monitoring and Mitigation Plan |
| AEWC | Alaska Eskimo Whaling Commission |
| BOEM | Bureau of Ocean Energy Management |
| CFR | Code of Federal Regulations |
| CLO | Community Liaison Officer |
| COCP | Critical Operations and Curtailment Plan |
| Com Centers | Communication and Call Centers |
| dB | decibel(s) |
| EP Revision 1 | Approved Chukchi Sea Exploration Plan |
| EP Revision 2 | Revisions to the approved Chukchi Sea EP (Revision 1) |
| ft. | foot/feet |
| IHA | Incidental Harassment Authorization |
| DIMP | Drilling Ice Management Plan |
| km | kilometers |
| LOA | Letter of Authorization |
| m | meter/meters |
| MAWP | Maximum Anticipated Wellhead Pressure |
| mi | mile(s) |
| min | minute(s) |
| MMPA | Marine Mammal Protection Act |
| NMFS | National Marine Fisheries Service |
| NSB | North Slope Borough |
| NWAB | Northwest Arctic Borough |
| OSR | Oil Spill Response |
| OSRV | Oil Spill Response Vessel |
| OSRP | Oil Spill Response Plan |
| POC | Plan of Cooperation |
| PSO | Protected Species Observers |
| SA | Subsistence Advisor |
| Shell | Shell Gulf of Mexico Inc. |
| USFWS | United States Fish and Wildlife Service |
| WCD | Worst Case Discharge |

# INTRODUCTION

Shell Gulf of Mexico Inc. (Shell) has an approved Chukchi Sea Exploration Plan (initial EP and subsequent EP Revision 1) to drill six wells on six outer continental shelf lease blocks in the Chukchi Sea (Figure 1-1). The EP Revision 1, titled *Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska. Burger Prospect: Posey Area Blocks 6714, 6762, 6764, 6812, 6912, and 6915. Chukchi Sea Lease Sale 193* was approved by Bureau of Ocean Energy Management (BOEM) on December 16, 2011. During the 2012 drilling season, Shell partially drilled the Burger A well. In subsequent years, Shell plans to continue drilling with all six wells drilled to their proposed total depth.

BOEM Lease Sale Stipulation No. 5 requires that all exploration activities be conducted in a manner that prevents unreasonable conflicts between oil and gas exploration activities and subsistence resources and activities. This stipulation also requires adherence to United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) regulations, which require an operator to implement a Plan of Cooperation (POC) to mitigate the potential for conflicts between the proposed activity and traditional subsistence activities (50 Code of Federal Regulations [CFR] §18.124(c)(4) and 50 CFR §216.104(a)(12)). A POC was prepared and was submitted with the initial Chukchi Sea EP, updated with EP Revision 1 and again with EP Revision 2. This POC Addendum provides updates regarding changes in the proposed exploration drilling program, and documentation of meetings undertaken to inform stakeholders of proposed plans for exploration drilling activities.

The POC Addendum identifies the measures that Shell has developed in consultation with North Slope communities and subsistence user groups. The POC measures will be implemented during the planned Chukchi Sea exploration drilling program to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC details Shell's communications and consultations with local communities concerning its exploration drilling program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)). Shell has documented its contacts with the North Slope communities, as well as the substance of its communications with subsistence stakeholder groups. Tables summarizing Shell's communications and responses are included in Attachment A. As appropriate, this POC Addendum may be supplemented to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements.

Shell will implement the POC and the associated mitigation measures set-forth herein for its Chukchi Sea exploration drilling program.

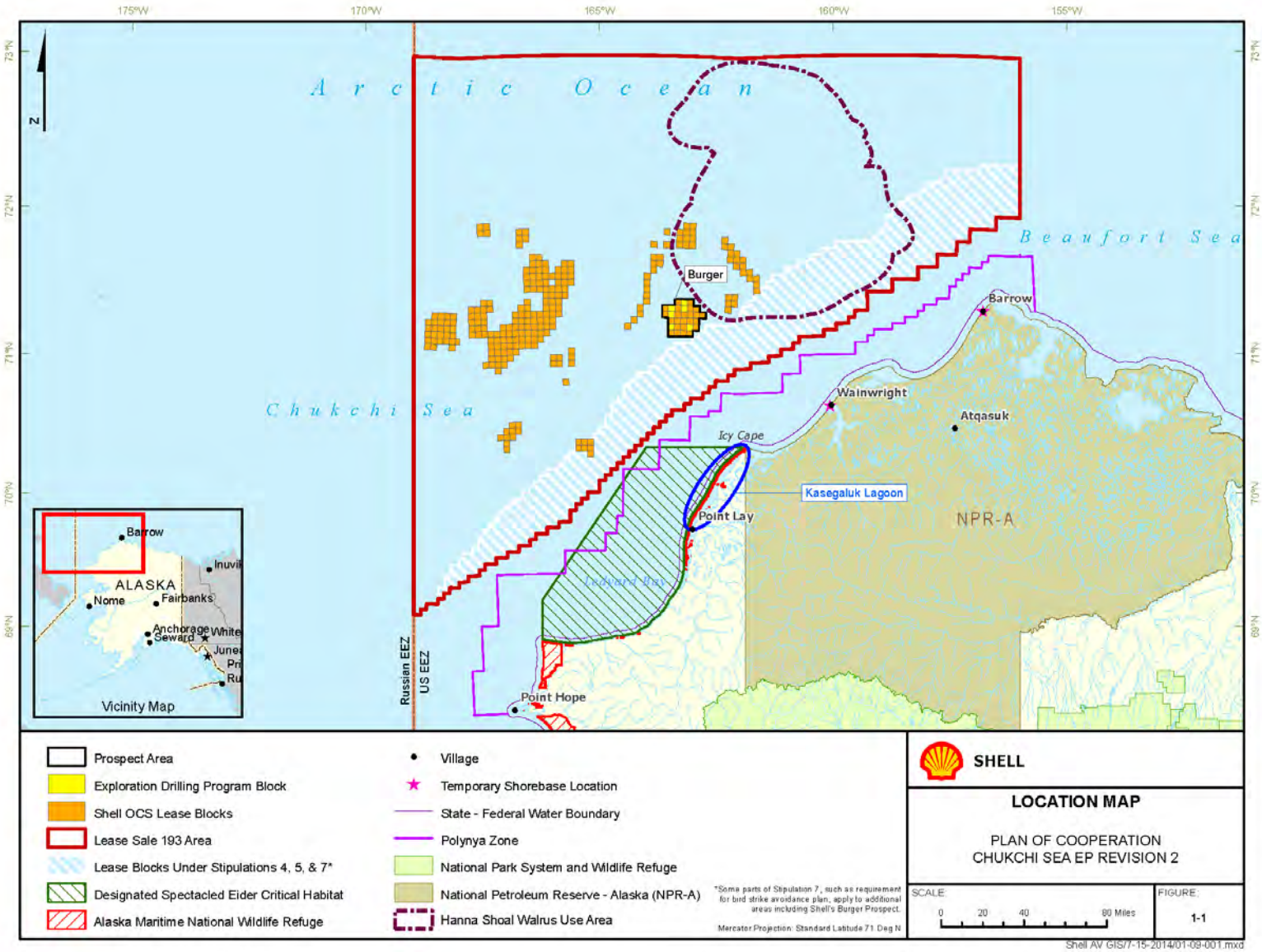
# 1.0 POC LEASE STIPULATION AND REGULATORY REQUIREMENTS

BOEM Lease Sale Stipulation No. 5 requires that all exploration activities be conducted in a manner that prevents unreasonable conflicts between oil and gas activities, and subsistence resources and activities of the residents of the North Slope. Specifically, Stipulation No. 5 requires the operator to consult directly with potentially affected North Slope subsistence communities such as the North Slope Borough (NSB), the Alaska Eskimo Whaling Commission (AEWC), and co-management groups including the Alaska Beluga Whale Committee, Eskimo Walrus Commission, Ice Seal Commission, and Nanuuq Commission.

Consultation is needed "to discuss potential conflicts with the siting, timing, and methods of proposed activities and safeguards or mitigating measures which could be implemented by the operator to prevent unreasonable conflicts." Stipulation No. 5 also requires the operator to document its contact with and the substance of the communications with subsistence stakeholder groups during the operator's consultation process.

The requirements of Stipulation No. 5 parallel requirements for receipt of a USFWS Letter of Authorization (LOA) and a NMFS Incidental Harassment Authorization (IHA). The LOA and IHA provide authorization for the nonlethal harassment of species protected by the Marine Mammal Protection Act (MMPA). Both the USFWS and NMFS require an applicant to implement a POC to mitigate the potential for conflicts between the proposed activity and traditional subsistence activities (50 CFR §18.124(c)(4) and 50 CFR §216.104(a)(12)). The POC must identify the measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, both USFWS and NMFS require an applicant to communicate and consult with local subsistence communities concerning proposed activity, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR §18.128(d) and 50 CFR §216.104(a) (12) (i), (ii), (iv)).

**Figure 1-1 Location Map: Plan of Cooperation Chukchi Sea EP Revision 2**



# 2.0 MEASURES IN PLACE

The following mitigation measures, plans, and programs are integral to this POC Addendum and were developed through consultation with potentially affected subsistence groups, communities, and the NSB. These measures, plans, and programs will be implemented by Shell during its exploration drilling activities in the Chukchi Sea. The mitigation measures described below allow Shell the ability to monitor and mitigate potential impacts to subsistence users and resources.

## 2.1 EP Revision 2 Mitigation Measures

The mitigation measures Shell has adopted, and will implement during its exploration drilling activities are listed and discussed below. These mitigation measures reflect Shell's experience conducting exploration activities in Alaska since 2006, and its ongoing consultations with local subsistence communities to better understand their concerns and develop appropriate and effective mitigation measures to address those concerns. Shell's planned mitigation measures have been presented to community leaders and subsistence user groups starting in 2009, and have evolved over time in response to the comments and concerns expressed during the consultation process. Some mitigation measures appear under more than one sub-heading since they pertain to more than one "category" within the mitigation measures.

### 2.1.1 Subsistence Mitigation Measures

To minimize any cultural or resource impacts to subsistence beluga whaling or walrus hunting, exploration drilling activities will not take place in the Chukchi Sea until or after July 1. Shell will implement the following measures to ensure coordination of its activities with local subsistence users, in addition to minimizing the risk of impact to marine mammals and interfering with subsistence hunting.

<u>Communications</u>

- Shell has developed a Communication Plan and will implement this plan before initiating exploration drilling operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts. The Communication Plan includes procedures for coordination with Com Centers to be located in coastal villages along the Chukchi Sea during Shell's proposed exploration drilling activities.
- Shell will employ local SAs from the Chukchi Sea villages that are potentially impacted by Shell's exploration drilling activities. The SAs will provide consultation and guidance regarding the whale migration and subsistence activities. There will be one per village, working approximately 8-hr per day and 40-hr weeks during the drilling seasons. The subsistence advisor will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and provide advice on ways to minimize and mitigate potential negative impacts to subsistence resources during the drilling season. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information; coordinating with the Com and Call Center personnel; and, advising how to avoid subsistence conflicts.

Aircraft Travel

- Aircraft over land or sea shall not operate below 1,500 ft. (457 m) altitude unless engaged in marine mammal monitoring; approaching, landing, or taking off; in poor weather (fog or low ceilings); or in an emergency situation.
- Aircraft engaged in marine mammal monitoring shall not operate below 1,500 ft. (457 m) in areas of active whaling; such areas to be identified through communications with the Com Centers.
- Aircraft will not operate within 0.5 mi (0.8 km) of polar bears when observed on land or ice.
- Helicopters will not operate at an altitude lower than 3,000 ft. (914 m) within 1 mi (1.6 km) of walrus groups observed on land, and fixed-wing aircraft will not operate lower than 1,500 ft. (457 m) within 1 mi (1.6 km) of walrus groups observed on land.
- If aircraft must be operated below 1,500 ft. (457 m) because of weather, the operator will avoid flying within 0.5 mi (805 m) of known walrus or polar bear concentrations over sea, and will avoid walrus groups by 1 mi (1.6 km) on land.

Vessel Travel

- The drilling units and support vessels will enter the Chukchi Sea through the Bering Strait on or after 1 July, minimizing effects on marine mammals and birds that frequent open leads and minimizing effects on spring and early summer bowhead whale hunting.
- The transit route for the drilling units and drilling support vessels will avoid known fragile ecosystems and the Ledyard Bay Critical Habitat Unit (LBCHU), and will include coordination through Com Centers.
- PSOs will be aboard the drilling unit(s) and all transiting support vessels.
- Vessels will not operate within 0.5 mi (0.8 km) of walruses or polar bears when observed on ice or water.
- Vessels will not operate within 1.0 mi (1.6 km) of walruses or 0.5 mi (0.8 km) polar bears when observed on land.
- When within 900 ft. (274 m) of whales, vessels will reduce speed, avoid separating members from a group and avoid multiple changes of direction.
- Vessels should take all reasonable precautions (i.e., reduce speed, change course heading) to maintain a minimum operational exclusion zone of 0.5 mi (805 m) around groups of 12 or more walruses in the water.
- Vessel speed will be reduced during inclement weather conditions in order to avoid collisions with marine mammals.
- Shell will communicate and coordinate with the Com Centers regarding all vessel transit.
- Use of some lighting on the drilling units and support vessels will be minimized and shaded to reduce potential disorientation and attraction of birds and to reduce the possibility of a bird collision (Bird Strike Avoidance and Lighting Plan, Appendix E, EP Revision 2).

ZVSP

- Airgun arrays will be ramped up slowly during ZVSPs to warn cetaceans and pinnipeds in the vicinity of the airguns and provide time for them to leave the area and avoid potential injury or impairment of their hearing abilities. Ramp ups from a cold start when no airguns have been firing will begin by firing a single airgun in the array. A ramp up to the required airgun array volume will not begin until there has been a minimum of 30 min of observation of the safety zone by PSOs to assure that no marine mammals are present. The safety zone is the extent of the 180 dB radius for cetaceans and 190 dB for pinnipeds. The entire safety zone must be visible during the 30-min lead-in.to an array ramp up. If a marine mammal(s) is sighted within the safety zone during the 30-min watch prior to ramp up, ramp up will be delayed until the marine mammal(s) is sighted outside of the safety zone or the animal(s) is not sighted for at least 15-30 min: 15 min for small odontocetes and pinnipeds, or 30 min for baleen whales and large odontocetes.

Ice Management

- Shell has developed and will implement an Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses.
- Real time ice and weather forecasting from the Shell Ice and Weather Advisory Center (SIWAC).

Oil Spill Response (OSR)

- The primary oil spill response vessels (OSRV) will be on standby at all times when drilling into zones capable of flowing liquid hydrocarbons in measurable quantities to ensure that oil spill response capability is available within one hour, if needed.
- Shell will deploy OSR support vessels that are capable of collecting oil on the water in excess of the calculated WCD flow rate of a blowout in the unlikely event that one should occur. The remainder of the OSR support vessels will be fully engaged within 72 hours.
- In addition to the OSR support vessels, oil spill containment equipment will be available for use in the unlikely event of a blowout. The containment system tug and barge will be located in or near Goodhope Bay, Kotzebue Sound.
- Capping stack equipment will be stored aboard one of the ice management vessels and will be available for immediate deployment in the unlikely event of a blowout. Capping stack equipment consist of subsea devices assembled to provide direct surface intervention capability with the following priorities:
    - Attaching a device or series of devices to the well to affect a seal capable of withstanding the maximum anticipated wellhead pressure (MAWP) and closing the assembly to completely seal the well against further flows (commonly called “Cap and Contain”).
    - Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (commonly called “Cap and Flow”).
- A polar bear culvert trap has been constructed in anticipation of OSR needs and will be available prior to exploration drilling.
- Pre-booming is required for all fuel transfers between vessels.

Air Emissions

- Procuring ultra-low sulfur diesel (ULSD) fuel or a fuel with equal or lower sulfur content to reduce $SO_2$ emissions for each of the drilling units and all vessels operating as part of the exploration drilling program;
- Use of selective catalytic reduction (SCR) emission controls to reduce NOX emissions on *Discoverer*'s primary generation units and certain units on support vessels;
- Use of catalytic diesel particulate filters (CDPF) emission controls to reduce CO, PM, and VOC emissions on the *Discoverer*'s primary generation units and certain units on support vessels; and
- Use of oxidation catalysts (OxyCat) emission controls to reduce CO, PM, and VOC emissions on certain units on support vessels.

### 2.1.2 Marine Mammal Mitigation Measures

Marine mammal mitigation measures will focus on the utilization of PSOs to ensure that exploration drilling and support vessel activities do not disturb marine mammal resources and avoid unreasonable interference with the subsistence hunt of those resources. PSOs will be stationed, at a minimum, on the drillship, ice management and anchor handler vessels to monitor the exclusion zone (areas within isopleths of certain sound levels for different species) for marine mammals. For vessels in transit, if a marine mammal is sighted from a vessel within its respective safety radius, the Shell vessel will reduce activity (e.g., reduce speed and/or change course) and noise level to ensure that the animal is not exposed to sound above their respective safety levels. Full activity will not be resumed until all marine mammals are outside of the exclusion zone and there are no other marine mammals likely to enter the exclusion zone. Regular overflight surveys and support vessel surveys for marine mammals will be conducted to further monitor prospect areas. Shell will also implement flight restrictions prohibiting aircraft from flying below 1,500 ft. (457 m) altitude (except during takeoffs and landings, in emergency situations, or for PSO overflights), further reducing the likelihood of impacts.

Anchored vessels, or vessels on DP, will remain at anchor or on DP and continue ongoing activities if approached by a marine mammal. An approaching animal that is not exhibiting avoidance behavior, is likely curious and not regarded as harassed. The anchored vessel, or vessel on DP, will remain in place and continue ongoing activities to avoid possibly causing avoidance behavior by suddenly changing noise conditions.

In addition to the use of PSOs, Shell will implement the measures detailed in 2.1.1 to avoid disturbances to marine mammals that potentially could rise to the level of incidental take, and ensure coordination of its activities with local subsistence users to minimize further the risk of impacting marine mammals and interfering with the subsistence hunt. Complete PSO protocol is located in the Marine Mammal Monitoring and Mitigation Plan (4MP) (EP Revision 2, Appendix B).

### 2.1.3 Mitigation Measures for Activities and Oil Spill Prevention and Response

BOEM has concluded that the probability of a large oil spill occurring during an exploration drilling project is extremely remote. Nevertheless, as required by both federal and state regulations, Shell has developed and will implement a comprehensive Oil Spill Response Plan (OSRP) during its exploration drilling activities, in addition to other plans including the Drilling Ice Management Plan (DIMP) and the Critical Operations and Curtailment Plan (COCP). The OSRP has been reviewed and approved by federal regulators to ensure that Shell has the spill response resources necessary to respond to any spill that might occur. While the probability of a spill is very remote, Shell will dedicate all necessary resources to respond to any spill that may occur. In addition to the maintenance and implementation of its OSRP, Shell will implement the OSR measures detailed in section 2.1.1 to further minimize any risk of a spill that could impact marine mammals and interfere with subsistence hunting.

## 2.2 Exploration Drilling Marine Mammal Monitoring And Mitigation Program

Under 50 CFR 218.108, NMFS requires any holder of an IHA in Arctic waters to complete monitoring and reporting requirements established in the IHA and published regulations. Additionally, the USFWS requires all applicants for LOAs to conduct monitoring under 50 CFR 18.128 and BOEM's Chukchi Sea Lease Sale 193 Stipulation #4 requires a site-specific bowhead whale monitoring program. To meet these requirements, a 4MP was developed for the Chukchi Sea exploration drilling program. The 4MP is designed to avoid, minimize, and mitigate potential adverse impacts to marine mammal subsistence resources that may result from offshore activities. The 4MP is included as Attachment B to the Chukchi Sea EP Revision 2. The 4MP for the exploration drilling program includes the following provisions:

- PSOs will support, at a minimum, the transit of the drillships, ice management vessels, and anchor handlers and other activities in the Chukchi Sea. The shipboard PSO program is designed to provide real time observations of marine mammals by trained observers from individual vessels to document exposure to industrial activities. PSOs, at a minimum, will be present on the drillship, ice management vessels, and anchor handlers (i.e., all vessels in transit) to monitor for the presence of marine mammals, assist maintenance of marine mammal safety radii around vessels, monitor and record avoidance or exposure behaviors, and communicate with the Com Centers and local subsistence hunters by marine radio. The experience and abilities of the NSB residents in sighting and identifying marine mammals during Shell's exploration programs contributed significantly to the success of Shell's previous monitoring and mitigation program.
- Aerial Survey Program will collect information in the Chukchi Sea regarding distribution and abundance of bowhead whales and other marine mammals.
- Acoustic Recorders that include a combination of recorder technology, such as pop-up or Directional Autonomous Seafloor Acoustic Recorder buoys, to monitor wide area distribution of marine mammals, specifically bowhead whales, in relation to Shell's proposed activities.
- Sound Modeling of vessels utilized for seismic and exploration drilling activities.
- Sound Source Verification intended for field measurement sound propagation profiles for support vessels that were not already recorded in 2012 or 2013 and will be utilized by Shell in the exploration drilling program in the Chukchi Sea.

## 2.3 Interaction And Avoidance Plan For Polar Bear And Pacific Walrus

Shell has prepared an interaction and avoidance plan for polar bear and Pacific walrus to meet the requirements of 50 CFR 18.128 for holders of LOAs issued by the USFWS. The plan outlines procedures for mitigating potential impacts to polar bear and Pacific walrus, as well as monitoring program requirements. A copy of the plan for Shell's exploration drilling activities outlined in the EP Revision 1 was sent to the USFWS for the 2012 exploration drilling program and this plan was updated and submitted to USFWS. Measures in the plan which cover all Shell activities associated with exploration drilling are summarized below.

- New polar bear dens, identified by industry, local residents, and regulatory agencies are reported annually and will be incorporated into project plans to ensure both bear and worker safety. Bear dens discovered during exploration drilling activities will be reported to the designated USFWS representatives.
- Trash will be collected and separated so that all food-associated waste is placed in an appropriate bear-resistant dumpster.
- Hazardous wastes, if generated, would be transported off-site for disposal at an approved facility.
- Employees will be prohibited from directly feeding animals or deliberately leaving food for polar bears and other animals.
- If a polar bear is observed, all on-site personnel will be alerted so that work activities can be altered or stopped to avoid interactions. Personnel will contact the designated USFWS representative whenever a

polar bear is sighted. Depending on the distance between the polar bear and the activities this may mean retreating to the safety of vehicles, emergency shelter, temporary buildings, or other safe haven.

- When a polar bear is observed, a designated bear watcher will be assigned to ensure continuous monitoring of the bear's movements. The On-Scene Shell Supervisor will be contacted before any bear hazing activities. Trained polar bear hazers and bear guards will support field activities.
- Exploration drilling and support vessels will observe a 0.5 mi (0.8 km) exclusion zone around any polar bear or walrus observed on water or ice during transit.
- Aircraft will maintain 1,500 ft. (457 m) minimum altitude within, 0.5 mi (0.8 km) of polar bear or Pacific walrus when observed on water or ice, or a polar bear on land. Due to their importance as polar bear summer resting habitat, flight paths for aircraft will be offset from the coastlines of Chukchi Sea barrier islands by at least 0.5 mile (0.8 km) and 1,500 ft. (457 m) above ground level.
- In addition to above, helicopters will not operate at an altitude lower than 3,000 ft. (914 m) and fixed wing aircraft will not operate at an altitude lower than 1,500 ft. (457 m) within 1 mi (1.6 km) of walrus observed on land.
- Vessels will not operate within 1 mi (1.6 km) of walrus or 0.5 mi (0.8 km) of polar bears when observed on land.
- Ice management mitigation measures, such as "ice scouting," will use radar, satellite imagery, observations by trained Ice Advisors from support vessels, and possibly reconnaissance flights to monitor ice movement in areas near the prospect prior to and during exploration drilling activities. These measures will provide an early warning of bears in the vicinity so appropriate measures can be taken to limit polar bear/human interaction.
- Polar bear monitoring, reporting, and survey activities will be conducted in accordance with those outlined in 78 Federal Register 35364-35427.

# 3.0 AFFECTED SUBSISTENCE COMMUNITY MEETINGS

Affected subsistence communities that are consulted regarding Shell's approved EP and EP Revision 2 include: Barrow, Wainwright, Point Lay, Point Hope, Kotzebue and Deering.

The following table (3.2.1) outlines POC meetings held in several villages between 2012-2014. In 2012, Shell met with villagers and discussed the next exploration drilling program in the Chukchi Sea. In July 2013, Shell personnel travelled to Kotzebue and met with representatives of the borough, city, village corporation and the native village government. In 2013 and 2014, Shell traveled to Barrow, Wainwright, Point Lay, Point Hope, Deering and Kotzebue for POC meetings to update the communities on potential exploration drilling activities in the Chukchi Sea. Revisions to the exploration drilling program that are outlined in the Chukchi Sea EP Revision 2 have been presented during the summer 2014 POC meetings.

Additionally, Shell met with subsistence groups including the AEWC, the Nanuuq Commission, the Eskimo Walrus Committee, the Beluga Commission, the Ice Seal Commission, and the Native Village of Barrow, and presented information regarding proposed activities to the NSB and Northwest Arctic Borough (NWAB) Assemblies, and NSB and NWAB Planning Commissions. Several one-on-one meetings were also held throughout the villages.

## 3.1 Consultation with Community Leaders

Shell holds one-on-one meetings with representatives from the NSB and NWAB, subsistence-user group leadership, the Inupiat Community of the Arctic Slope and Village Whaling Captain Association representatives. These meetings take place at the convenience of the community leaders and in various venues. Meetings began in January 2009 and have continued to date. Shell's primary purpose in holding individual meetings is to inform key leaders, prior to the public meetings, so that they are prepared to give appropriate feedback on planned activities.

## 3.2 Community Meeting Summaries

Table 3.2-1 provides a list of public meetings attended by Shell while developing this POC Addendum. Comment analysis tables for numerous meetings held during late 2012, 2013 and 2014 summarize feedback from the communities regarding Shell's planned ongoing exploration drilling activities. Comment analysis tables from 2014 meetings, with responses from Shell and corresponding mitigation measures pertinent to the comments are included in Attachment A. Presentation materials are also included in Attachment A.

**Table 3.2-1 Meeting Dates and Locations for this POC Addendum**

| **2012** | **Meeting Location** | **Meeting Attendees – Position** |
|---|---|---|
| 23 October | Point Lay | Plan of Cooperation Community Meeting |
| 24 October | Wainwright | Plan of Cooperation Community Meeting |
| 29 October | Barrow | Plan of Cooperation Community Meeting |
| 6 November | Barrow | NSB Assembly Workshop Meeting |
| **2013** | **Meeting Location** | **Meeting Attendees – Position** |
| 5-7 March | Anchorage | Arctic Open Water Meeting |
| 29 July | Kotzebue | NWAB, City of Kotzebue, Village Corporation and Native Village Government representatives |
| 5 November | Wainwright | Plan of Cooperation Community Meeting |
| 6 November | Point Lay | Plan of Cooperation Community Meeting |
| 8 November | Barrow | Plan of Cooperation Community Meeting |
| 12 November | Point Hope | Plan of Cooperation Community Meeting; Native Village of Point Hope; City of Point Hope |
| **2014** | **Meeting Location** | **Meeting Attendees – Position** |
| 28 January | Kotzebue | Plan of Cooperation Community Meeting |
| 30 June | Barrow | Plan of Cooperation Community Meeting |
| 1 July | Wainwright | Plan of Cooperation Community Meeting |
| 7 July | Point Lay | Plan of Cooperation Community Meeting |
| 8 July | Point Hope | Plan of Cooperation Community Meeting |
| 9 July | Kotzebue | Plan of Cooperation Community Meeting |
| 17 July | Deering | Plan of Cooperation Community Meeting |

## 3.3 Project Information and Presentation Materials

To present consistent and concise information regarding the planned exploration drilling program as detailed in EP Revision 2, Shell has prepared presentation materials (Attachment A) for meetings with stakeholders across the North Slope.

Attachment A includes a presentation that was given in Wainwright on July 1, 2014. There are slight differences between the lengthy presentations given at each village since the presentations are slightly modified and tailored for each village. Rather than submit five very similar presentations, Shell is submitting the Wainwright presentation.

### 3.4 Meeting Process

Prior to Shell's public meetings, notices and flyers were sent to each of the communities via email and Shell's locally-based Community Liaison Officers (CLO). Announcements of upcoming Shell meetings were posted by CLO's around the villages and announcements were also transmitted by radio to all the communities.

Community meetings are designed to allow the public to voice their concerns and speak one-on-one with project experts. Subject matter experts were available in the communities to facilitate direct communications and comment cards were supplied to all meeting attendees upon arrival. The comment cards have Shell's return address printed on them to enable community members to send comments in at their leisure. A toll-free phone number and e-mail address were also provided in case questions arose after the meeting. Every effort was made to ensure the maximum amount of feedback was received and that all questions were addressed and answered to the fullest extent possible.

After each meeting, comments were gathered and compiled into a comment analysis table. A separate comment analysis table was completed for each POC meeting. These tables are included in Attachment A.

## 4.0 CONCLUSION

As discussed in Section 4, and detailed in the attached documents, stakeholders have been provided information relevant to the project and have been invited to offer input on potential environmental, social, and health impacts, as well as and proposed mitigation and conflict avoidance measures. Shell is seeking alignment with stakeholders and, where appropriate and feasible, will incorporate the recommendations of stakeholders into project planning.

As required by applicable lease sale stipulations, as well as anticipated IHA and LOA stipulations, Shell will continue to meet with the affected subsistence communities and users to resolve conflicts and to notify the communities of any changes in its planned activities. The POC Addendum may be supplemented, as appropriate, to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements. Shell respectfully submits that this POC Addendum meets its obligations under Stipulation No. 5, as well as the POC requirements established by applicable USFWS and NMFS regulations (50 CFR 216.104, 50 CFR 18.124 and 128).

# Attachment A
# Communication and Consultation with North Slope Subsistence Stakeholders: Community Meeting Comments, Responses and Presentations Given

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Drill Sites | How far are your prospects in the Chukchi Sea from shore? | Burger is 75 miles from Wainwright | N/A |
| Protected Species Observers | Are you going to have PSOs from Deering for this season? | We won't have PSOs in moored vessels. | F |
| Vessel Traffic | I haven't seen any contingencies for related emergencies? The traffic through the Bering Sea has increased dramatically with over 400 vessels passing through. Are you required to help if something happens? | Yes – if there is an accident in the area, the USCG will send out a call to all mariners for help and we will respond. | N/A |
| Arctic Science | The Science information you are talking about - is it public information? | We share the results on a website called chukchiscience.com and all the reports are there. We recently published several years of results in a publication called Continental Shelf Research. This entire, peer reviewed journal was dedicated to our science program and Shell has paid to have the articles accessed by anyone, free of charge. | N/A |
| Local Hire | Are you going to have local hire for crew members? | We take local hire very seriously and do our very best to influence our contractors. The first contact is Willie. He will be able to help find out the answers to your questions. We were asked earlier today to provide a list of contractors to the community. | N/A |
| Community Relations | Will you invite representatives from the City or the Tribe to tour your vessels? | I don't see why not. We have provided many tours of our vessels in the past. We do have safety requirements that must be met for any visitors. | N/A |
| Community Relations | You will have representatives in the community - are you going to do community activities with the kids? | That is an excellent idea. | N/A |

| | | | |
|---|---|---|---|
| Economics | We bear all the risks – what is the reward? Not just oil spills but noise pollution - lots of risks | We have lots of programs to mitigate those risks. The vessels we are staging here are all about oil spill response. The economic benefits are important for the state without TAPS, 80% of our budget source is gone. We recognize that providing benefits is a long term commitment and that is why we are investing in education in this area. | All |
| Economics | Any chance of the reward being reduction in the high cost of fuel? | The economics of petroleum don't fit neatly into an equation that provides an easy answer for me to give you. This community is uniquely situated – there is the potential for more benefits to come to this area as a result but I can't guarantee lower fuel costs will be one of them. Most refineries exist outside of Alaska and that feeds into the costs we experience. | N/A |
| Arctic Science | NWAB Science is $1M a year? Not as much as your profits | We have made no profits from the Chukchi Sea at yet. We are committing to planning for the future. The exploration phase takes 5 or 6 years. | N/A |
| Community Relations | Is there any rent that you might be paying to stage your vessels in Kotzebue Sound? | Rent is not required. It is a recognized anchorage area. We have people staged here and there will be economic benefit associated with that.<br><br>When we started looking at an area to stage the ACS and looked at Kotzebue Sound. It was a place that had protection and was an excellent choice. We are excited about the opportunity to be here and to look for logistics support here in this community. | N/A |
| Air Emissions | One of your vessels had issues with air emissions – and had to pay a fine. The EPA is the one that fined you but we (the people whose air was polluted) got nothing. Is the new vessel sound? | The Disco emission violations happened at the Burger site primarily when the engines were started. The permit we received from the EPA was not achievable. Responsibility for air permitting has been transferred to the Bureau of Ocean Energy Management, regulatory agency with a lot of experience with oil and gas issues. | N/A |

| | | | |
|---|---|---|---|
| Oil Spill Response | Is there a spill response organization? Do we have community people that are part of the spill response? | There are emergency response personnel. There are no village response teams in this area that we know of. We have committed to connect with the local emergency management services here. | H |
| Oversight | There should be a watch group that is overseeing your efforts | That is something that you will have to initiate. | N/A |
| Drilling Program | How soon will we know if you decide to drill in 2014? | We are planning for a drilling season but there are many decisions gates that we must successfully pass through before a final decision is made. | N/A |

*Mitigation Measures are only assigned to applicable comments.
"Not applicable" (N/A) is used to designate comments that do not require mitigation measures as a course of action. See Mitigation Measures Index definitions according to assigned letter.

**Proposed Mitigation Measures**

A-Communication Plan for avoiding conflicts with subsistence users.
B-Collaboration and Communication with Whaling Associations
C-Plan of Cooperation (will work to obtain a CAA)
D-Will honor Camden Bay blackout dates for Nuiqsut and Kaktovik whaling.
E-Subsistence Advisors based in Chukchi and Beaufort Sea Villages and Kotzebue
F-Protected Species Observers
G-Robust Marine Mammal Monitoring Protocol
H-OSR support vessels on standby 24/7 near drilling location
I-Real time Ice and Weather Forecasting
J-Crew change by helicopter and collaboration on routes to and from shore base
K-zero discharge in Camden Bay of the Chukchi Sea: drilling fluids and cuttings after the 26-in casing; gray and treated black waters; bilge and ballast waters
L-enhanced blowout prevention and mitigation measures (i.e., second set of blind shear rams, redundant ROV hot stab panel, prefabricated subsea collection and containment system, and relief well plan with designated elief well drilling unit).

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Drill rig location | How many miles offshore is the Burger site? | 65 nautical miles from Wainwright//130 nautical miles from Barrow | N/A |
| Oil spill response | How many oil spill response vessels will Shell have in the fleet | Nanuq, Klamath, Guardsman, 2 Tankers, Aiviq and Sisuaq have OSR capability as well. | H, L |
| Vessel specific/oil spill response | Are your tankers double-hulled? | Yes | H |
| Subsistence | Seals, walrus near Wainwright – are they going to be harmed? | We have near shore oil spill response in addition to the fleet offshore. Oil spill response assets in Wainwright and Pt. Lay. Shell contracts to hold 8 oil spill response trainings each year in Chukchi villages | A,B, C, E, F, G |
| Subsistence | Flight activities – how will they affect subsistence? | We listen to all concerns: Our subsistence advisor program holds 2 calls each day between pilots/vessel captains/Shell, during which the Subsistence Advisors report where subsistence activities are occurring. Shell then adjusts its operations to avoid those areas. | A,B, C, E, F, G, J |
| Employment/co mmunity impact | Percentage of local hire and impact of inflow of people into community | Barrow housing plan explained. Shell has listened to community, which does not want us in middle of town, impacting the village. We use man camps past NARL, on outskirts of town, so as not to not impact town housing, community, and restaurants. | N/A |
| Emergency Response | Kulluk situation brought up – concerned how Shell will handle a spill in the arctic with high winds. Doesn't feel Shell is ready for a disaster when it occurs. Mentioned how many people will need to be hired locally as mandated per ICAS resolution 80-8. Should really work with ICAS in hiring. | Thanked him for the comments, will look into the resolution. | H, L |

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Waste Disposal | Are you going to be dumping your trash in the ocean? Do the tankers have capability for water disposal, etc? | We will not dump our trash in the ocean. We will store it on our barges and bring it down to the Lower 48 for appropriate disposal. | N/A |
| Drilling Vessels | How many anchor points do each vessels have | The Polar Pioneer has eight 15 ton anchors. The Discoverer, eight 9-15 ton anchors. One of the anchor features is a remote release system so if there is ice approaching, rather than waiting while we bring up all the anchors, we can remotely release them and move our rigs out of the way of ice. | N/A |
| Development | Once in development, is Shell pumping anything back in the ground/water? | Water and natural gas are pumped back into some wells around the world to help recover more oil from those wells. It is too early to tell if that will occur in the Chukchi. You really have to know the reservoir intimately to pump water/gas back into it. | N/A |
| Ice/Weather | Lag in helicopter time to respond during Kulluk situation. And search and rescue question. Can the helicopters fly in high winds, like 80 miles per hour? | Helicopters will have rotors that won't freeze like they did in Kulluk. Explained helicopter limitations and additional vessels to accommodate search and rescue if they cannot fly due to high winds. | N/A |
| Drilling Vessels | Concerned about the Burger area even when there's no ice. Where the rigs are, with high winds, believes the swells are going to pull the anchors loose. | Shell has contingency plans and if needs to, will take rigs out of the storm. Have remote rapid release mechanism for our rig anchors, so we can move them quickly. | N/A |
| Drilling Vessels | Concerned about the age of the 30 year old rig. | The Polar Pioneer has been completely refurbished. It's tested and has a successful track record in subarctic waters. It's valuable because of this. | N/A |
| Ice/Weather | Concerned about the ice and pulling out in time before it ices over | Ice gouge study explained. | N/A |
| Ice/Weather | Need to go look around the ice this year to see what Shell is facing next year. | Thanked for comment. | N/A |

Notes:

*Mitigation Measures are only assigned to applicable comments.
"Not applicable" (N/A) is used to designate comments that do not require mitigation measures as a course of action. See Mitigation Measures Index definitions according to assigned letter.

**Proposed Mitigation Measures**

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F-Protected Species Observers
G-Robust Marine Mammal Monitoring Protocol
H-OSR support vessels on standby 24/7 near drilling location
I-Real time Ice and Weather Forecasting
J-Crew change by helicopter and collaboration on routes to and from shore base
K-zero discharge in Camden Bay of the Beaufort Sea: drilling fluids and cuttings after the 26-in casing; gray and treated black waters; bilge and ballast waters
L-enhanced blowout prevention and mitigation measures (i.e., second set of blind shear rams, redundant ROV hot stab panel, prefabricated subsea collection and containment system, and relief well plan with designated relief well drilling unit).

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Drill sites | Were the two drill sites capped in 2012? | Yes, the top holes were permanently sealed with concrete and weren't at oil-bearing depths. | N/A |
| Drilling Units | What types of rigs are going to be used? | Described two rigs we will bring to Chukchi if we drill in 2015 – Polar Pioneer and Noble Discoverer. | N/A |
| Drilling Units | The Polar Pioneer is decades old. Is it going to fall apart? | No. Was built in 1985 and has been completely renovated twice in its life. It's being modified and renovated now. The reason we chose to go with this type is because it's proven in subarctic waters. Difficult to find rigs that have this track record. | N/A |
| Drill sites | What is the distance from Wainwright to the Burger site? | 65 nautical miles straight | N/A |
| Drill sites | How deep is the ocean near the Burger site? | About 150 feet. | N/A |
| Wastes | Will Shell contaminate the landfill? | No, everything except food waste will be shipped out. | N/A |
| Oil Spill Response | Is anyone qualified in oil spill response and to train others in Wainwright? And in 15 to 20 ft swells, can the oil spill be contained? | We contract with ARS to provide 2 oil spill response trainings per year in Wainwright. | H, I |
| Oil Spill Response | If there is an oil spill under the ice is there submersibles capable of containing an oil spill? | Yes, we have ROVs that can assist underwater if a spill occurs. We will only be operating in open water. The US Coast Guard also certifies all of Shell's vessels. | H, L |
| Oil Spill Response | How much oil spill containment efforts have been tested in Norway? | Not a lot, enough to test the condition and in different circumstances. | N/A |
| Oil Spill Response | Is Shell trained for oil spill response in rough terrains? | Shell has received specific training overseas. Shell hasn't been able to test here in Alaska because it isn't allowed by the US Government. But, Shell does extensive training in Valdez, and vessel crews receive training before the season. | N/A |

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Oil Spill Response | If rough waves are out in the ocean near Burger can vessels launch from Wainwright? And what about in low tide? There is in need of a launch dock other than at the beach. | Yes, outside of Wainwright. Good comment on needing a new launching dock. Shell will take this into consideration. | N/A |
| Oil Spill Response | Can light gas be contained in the event of a spill? Will it be burned or how will it be disposed? | Yes, with a sea boom. Primary plan is to contain it with the boom. Shell needs permission to burn it but plans on disposing of any oil properly | H |
| Subsistence Advisiors | How do people become Subsistence Advisors? | Once Shell starts ramping up, Shell will advertise through our contractors and will be looking for people to work in the communication centers. Olgoonik can also connect people with job opportunities. | N/A |
| Safety Zone | Does Shell have boundaries around the Burger site that other vessels cannot approach? | There is a zone around the drilling rigs that other vessels will be asked not to enter if they approach. | N/A |
| Drilling Units | Is Discoverer the vessel that was having trouble in Kodiak? | No, that was the Kulluk and it has been sold. | N/A |
| Oil Spill Response | How far are the oil spill response vessels going to be? | Several layers of response – immediate response near the drilling rig, near-shore response in the Chukchi, and more response assets in Kotzebue Sound. | H, L |
| Invasive Species | With such a wide array of vessels, they are coming from somewhere not used to the Arctic climate and potentially marine life attached to the vessels or rodents – what is Shell doing to eliminate the exposure to invasive species?` | A good number of these vessels have to be fit to purpose for the Arctic and cleaned of all invasive species. Shell hasn't contracted all its vessels yet. Once we do, those will be outfitted too. | N/A |
| Oil Spill Response | How many gallons will Shell's tanker hold? | It's in excess of 500,000 | H |
| Support Fleet | Are Shell's vessels made for breaking ice? | Yes, our Ice Management vessels can do this. | N/A |

Notes:

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| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Oil | Was any oil found in 2012? | The wells were only drilled half-way. Shell is still yet to complete the drilling. | N/A |
| Drilling | Is Shell going to drill whether it is half-way right or not? | No, Shell isn't going to drill unless all measures are in place to drill responsibly. | N/A |
| Permits | Does the President of the United States need to approve or sign Shell's permit plans? | No, but federal agencies do provide permits for our drilling program. | N/A |
| Leases | Once the oil leases became available for sale, it seems like it was a race to the oil. | When Shell entered into Alaska in 2005 and 2006, several lawsuits were filed because Shell didn't listen to and collaborate with the communities. Since then, Shell has changed our strategy to listen to community members and baseline studies to ensure all safety and regulatory measures are adhered to and at a responsible pace. | N/A |
| Oil rigs | Are the other oil companies going to be using different rigs than Shell? | Shell can't speak on behalf of any other company. As of right now, there aren't any plans for any other companies to use Shell rigs. | N/A |
| Developme nt plans | Statoil visited Pt. Lay in 2013; does Shell have any plans with informing residents of Shell's plan to drill? Or training and educating residents in their oil development plans? | Coming further in slide pack. Yes, community members will be informed of Shell's plan to drill and train and educate those who are qualified and able to. | N/A |
| Invasive species | Are the vessels carrying any foreign species? | When our vessels enter into the United States, they will be purged in Seattle before arriving to Alaska and be cleared by customs and immigration. | N/A |
| Crew change outs | Why is Shell using Barrow to switch the crew members when Pt. Lay and Wainwright are closer sites? | The reason Shell is staging out of Barrow is because there is the hangar infrastructure for helicopters there. If Shell does find oil, there may be a potential for adding new hangars elsewhere. | N/A |
| OSR | Are residents trained in OSR? | Yes, community members are trained twice a year. | N/A |

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| OSR | A community member expressed concern for Pt. Lay – a lack of OSR training. Also mentioned she thought Wainwright and Pt. Hope were receiving more Shell benefits from exploration than Pt. Lay | A community member identified himself as being one trained by Shell. Shell seeks qualified people to hire but they must pass a drug tests. If 6 people can't pass the test, then those who can are flown into Barrow for the training. | N/A |
| Communication Center | In regards for the communication center, the money has gone to Cully Corporation. They have no affiliation with the tribe and Shell should look into correcting this. | Shell met with the tribe earlier in the day and appreciated hearing this information from them and will look into this matter. | N/A |
| Whaling | Does Shell have a shutdown date period during fall whaling? | Shell did have a shutdown date in the Beaufort Sea in previous years because the whaling was so close to the drill site. Shell doesn't do so in the Chukchi Sea because we are so far offshore but uses the Subsistence Advisors and PSO to help minimize our impact on the bowheads during the fall hunting season. | D |
| Satellite tracking | Is Shell involved in any of the satellite tracking for mammals? | Shell has worked closely with federal agencies and the NSB; and also uses nautical recorders that can track the migration of mammal sea life. | N/A |
| Belugas | A recommendation was made for Shell to donate to the Beluga whale tagging program and that Shell should have OSR equipment in Pt. Lay. | Shell acknowledged the NSB Wildlife Department and their efforts. Shell donates to the NSB to address projects such as beluga tagging. Shell has a NSB science agreement. Shell does have OSR equipment in Point Lay. | N/A |
| Previous baseline studies | Pt. Lay had some baseline studies about water usage, is Shell using any of this knowledge from Steven Braun and Associates? | Shell is aware of the information and recently used it in our EIS for trends and patterns. | N/A |
| Oil | How does Shell know there is oil at the wells? | Shell has drilled at least 5 oil wells in the past and found evidence of a structure that Shell believes has oil. | N/A |

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Past oil wells | In the past few weeks, there were helicopters flying around the old drill sites. Did Shell have anything to do with these on land oil wells that were capped? | These oil wells were likely drilled by the Navy years ago. The helicopters were likely checking on the coal wells, not the oil wells. The government was doing so to ensure they are in compliance with safety and compliance regulations. | N/A |
| OSR | What preventative measures has Shell taken to prevent a failure in tow systems similar to Kulluk? | The US Coast Guard was instrumental in helping Shell during the Kulluk Incident, and identified measures for Shell to improve in its recent report – such as, better management of Shell contractors. This is an example of measures Shell has implemented to prevent a similar incident. | N/A |
| Vessels | Does Shell use scuba divers around the drill site? | Shell has underwater remote vessels, unsure about scuba divers. | N/A |
| PSO | Does every vessel have PSO's? | Yes, all of them. | F, G |
| Vessels | Are these tankers single or double hulled? | Double hulled. | N/A |
| Pirates | Does Shell expect any pirating? | Shell hasn't been aware of any pirating to date, but remains in close communication with the Coast Guard in case it ever does become an issue. Explained what happens when unauthorized persons board a vessel. | N/A |
| OSR | Does Shell have only one OSR vessel? This was a concern because community members didn't feel it was enough to contain an oil spill, if one were to happen. | Shell has a 4 level OSR plan. It was explained in great detail. Shell has a unique plan and system in place with assets situated that are fully capable of OSR. | H, L |
| Native Hire | What is the percentage Shell will use once drilling begins for local Native hire? | Shell is at the beginning of exploration and if we are successful with growing, Shell is committed to local hire and will partner with organizations when moving forward. | N/A |

| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Subsistence/ Permitting | Shell, on your permits, has a start date of July 1. This date coincides with beluga hunting because Shell , at that time, will likely interfere with the beluga migration because you will be in Pt. Lay waters moving north up to the rig . What's Shell's plan for timing and moving through the Bering Strait? Would like to see Shell to commit to changing their permit to July 15. | The Subsistence Advisor program will be running before July 1 to not impact the hunting. As far as July 1, from a regulatory view, Shell tends to lean towards existing permits. The key is learning coexistence between subsistence and exploration, and in some instances, it won't be fitting and plans may need to be modified. | A, B, C, E, F, G |

Notes:

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| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Resupply | How many trips per season are your OSVs making back and forth between Dutch Harbor and your Chukchi fleet? | 5 to 8 per vessel but possibly up to 30 round trips total | N/A |
| Oil spill restitution | I attended a Shell meeting in Europe and was told that Shell will not provide restitution for oil spill victims. | Shell initiated its Good Neighbor Policy, in collaboration with Wells Fargo Bank, in which we have $25 million ready to go for restitution in the event of an oil spill. | N/A |
| Conflicts with subsistence | If Shell does impact subsistence hunting, will Shell recompense people? If their vessels cause the walrus to stampede or leave our area, will Shell recompense our hunters who didn't get any walrus? | In 2012, Shell's onshore science program involved helicopter flights over land. Our Subsistence Advisor Program worked well, but there were a couple times our helos got too close to hunting by accident or because hunters moved quicker than we learned about. Shell worked with our Subsistence Advisors to investigate each incident, and if we found that our flights did cause hunters to lose hunting opportunities, we did recompense them. Shell would follow the same principles with its offshore activities. | A, B, C, E, F, G |
| Drilling discharge | Do we use oil-based drilling mud in our drilling? | No, we have chosen less toxic, non-oil-based drilling muds for our drilling operations. | N/A |
| Waste water discharge | What about waste water? Does your waste water follow the latest regulations? | We have installed brand new MSDs – marine sanitation devices – on our two drilling rigs this year. They use the latest technology and are up to date on the latest regulations. | N/A |

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| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Science | Is there opportunity for high school students to go on vessels for science learning opportunities? | We are looking at possible vessel tours in Good Hope Bay. Comments are captured for regulators. Shell will look at incorporating more opportunities for students to participate in these activities. | N/A |
| Logistics | Can native tribe members participate in daily logistics teleconference? | Subsistence advisor talks daily with community members and relay issues during teleconference. Will look into this. | N/A |
| Science | Can traditional native experts participate in science activities and participate on the actual teams in order to bridge traditional local science knowledge with conventional western science? | Shell answered that there would be dialogue between traditional and western science input. | N/A |

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| Issues | Comments | Shell Response | Mitigation Measures |
|---|---|---|---|
| Kulluk | A question was asked about Kulluk. What preventative measures is Shell taking to ensure a situation like at Kulluk does not happen? | Kulluk situation described, as well as lessons learned by Shell. Referenced Coast Guard report and Shell's internal investigations. | N/A |
| Subsistence | The vessels won't affect any wildlife? | The Subsistence Advisor program and the Protected Species Observer (PSO) programs were described. | A, B, C, E, F, G |
| OSR | Concern was expressed in OSR. And mention of shallow waters in Goodhope Bay. | Shell will not be drilling in Goodhope Bay so an oil spill is unlikely. Burger drilling site was further explained. | H |
| OSR | A community member expressed that every coastal village should have OSR equipment and training because in currents up to 90 mph, OSR vessels may not make it to the spill for up to 5 days. | The OSR vessels that will be in Goodhope Bay were described in further detail. Maniksaq thanked the community member for his comment. | H |
| Location | A community member mentioned she has seen many barges in Goodhope Bay. She wanted to know why Goodhope Bay was chosen. | The State has designated Goodhope Bay as Potential Place Of Refuge. This is why barges will be staged here. | N/A |
| Local hire | How many people will be hired in Deering? | One person as a subsistence advisor and it varies for the communication center. | N/A |
| Local hire | A question was asked to further discuss the PSO. | For stationary vessels with no personnel on board, such as barges, Shell hasn't decided whether PSOs will be placed. Local hire was discussed further. | F, G |
| OSR | How many days is it going to take to get to Pt. Barrow in the case of an oil spill? | Shell also has OSR vessels located near the drill rigs that provide immediate response. Vessels that are stationed in Goodhope Bay will not be needed for days because of the vessels near the site. | H |

| | | | |
|---|---|---|---|
| Extraction | Will Shell be drilling during the winter time or will it be seasonal? Concerned was expressed about ice conditions during winter time and the effect it will have on extracting oil. | Ice is a concern. Shell is proposing now to drill when ice does not cover Burger drill sites. If we are successful at finding oil, we would look at putting in a structure that can function within year-round environmental conditions. The preferred method would be to build a pipeline underwater that wouldn't be impacted by ice. The timing for this is yet to be determined. | I |
| Oil spill | What happens to plankton, etc. during an oil spill – will it affect the whales? | The role of whale food has been studied for the past 7 years to ensure that we take them into account during the case of an oil spill. This effort of extensive studies is to protect all marine life in the case of an oil spill. | N/A |
| Vessels | How many vessels will be stationed in Goodhope Bay? | We are still in the planning stages so the number isn't final but is potentially 16-18 in the Chukchi Sea and 10 in the Kotzebue Sound. | N/A |
| Partnerships | Will Shell partner with UAF on their different studies? | Shell does work closely with UAF and is looking forward to our partnership with the Northwest Arctic Borough. | N/A |
| Partnerships | A question was asked about the technical center in Kotzebue. | Shell has a 3 year partnership with the Alaska Technical Center in Kotzebue. We donate $100,000 to them each year. | N/A |
| OSR | Concern was expressed not about drilling, but what Shell plans to do after drilling. And further concern about OSR. | OSR training was explained. | N/A |
| CLO | Who is a Shell advocate in the Kotzebue region? | Willie Goodwin Jr. is our Community Liaison Officer in Kotzebue. | N/A |

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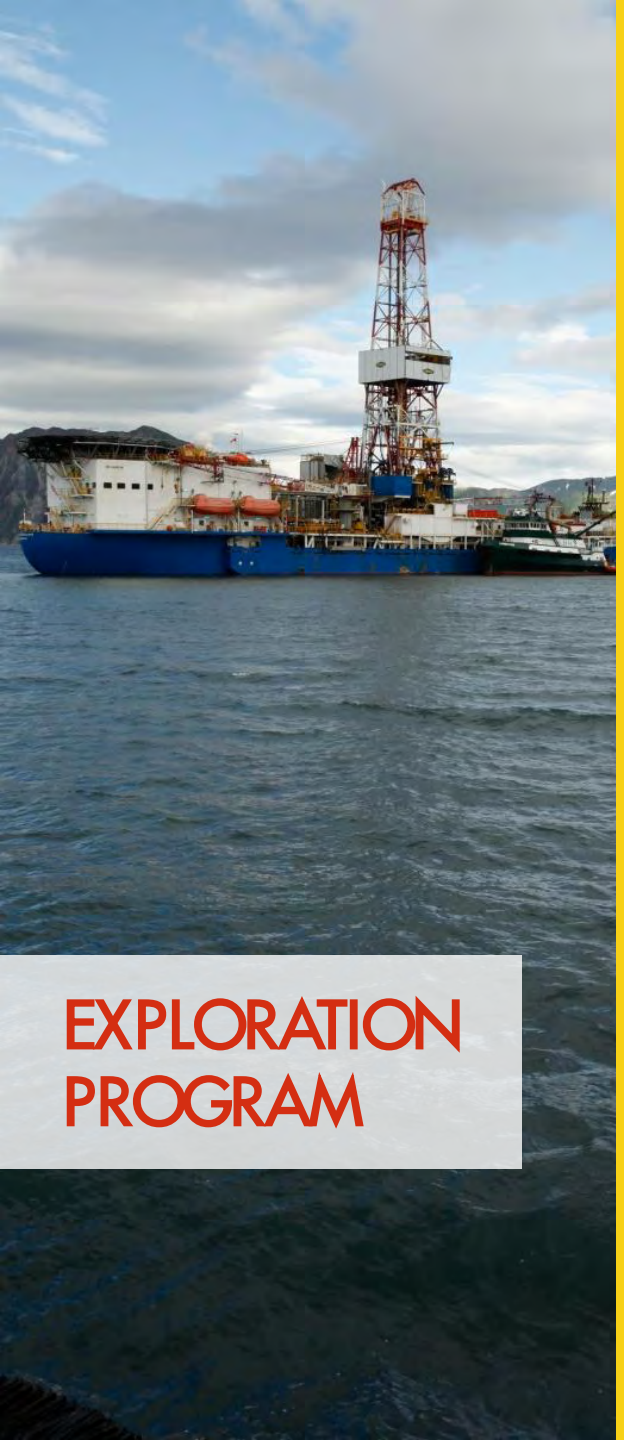
# SHELL ALASKA

## Community Update

**July 2014**



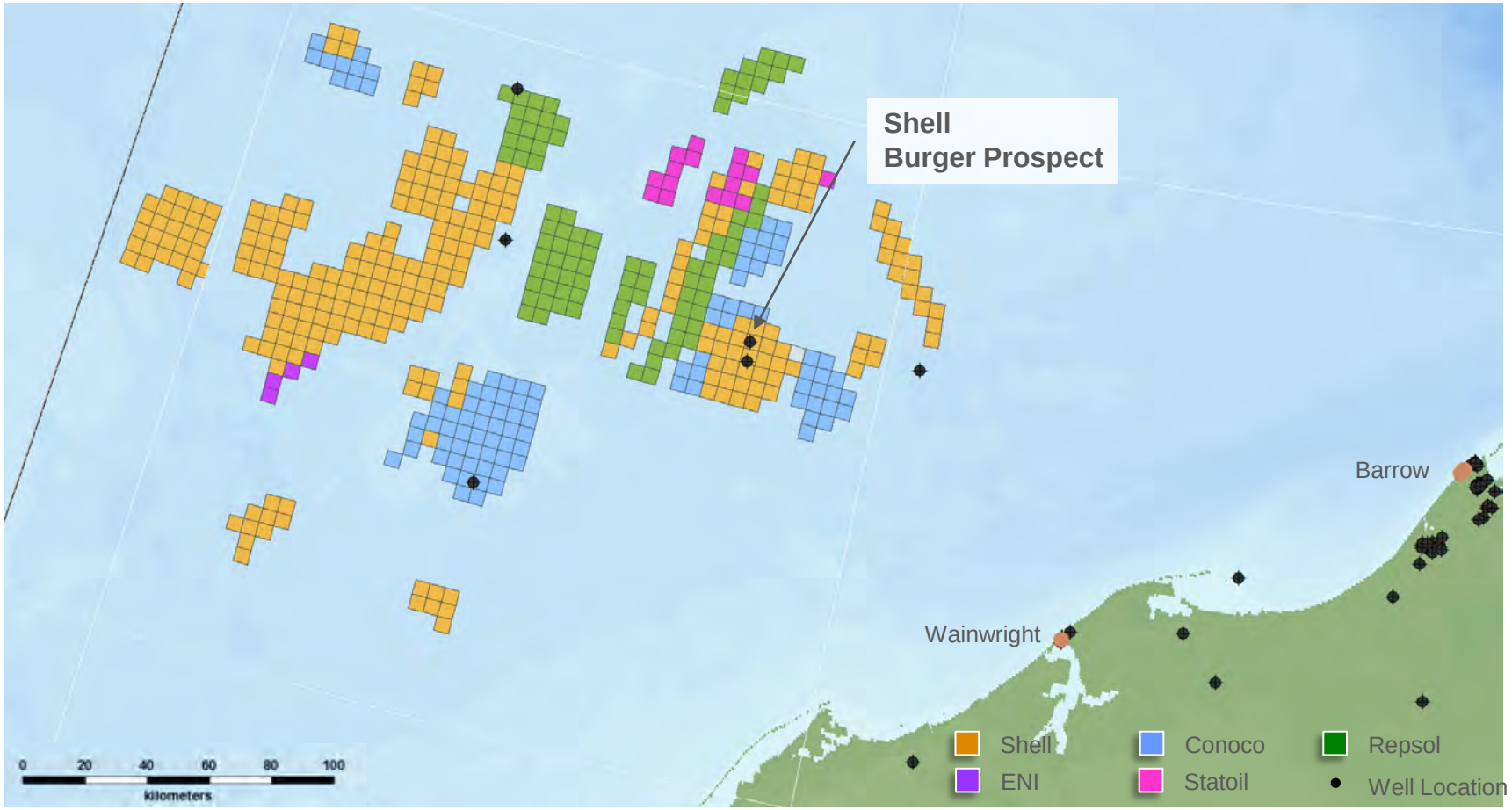
# EXPLORATION PROGRAM

- Committed to developing Alaska's Outer Continental Shelf in a measured and responsible pace
- 2013 and 2014
  - Paused exploration activity

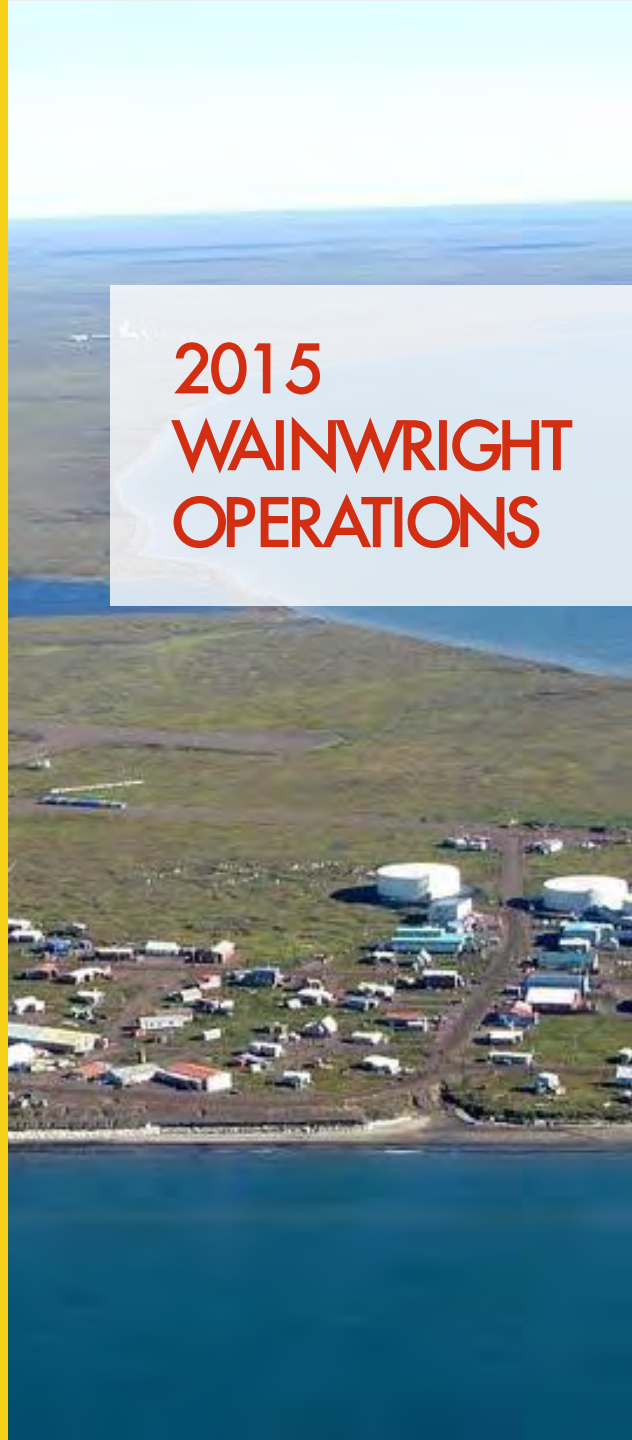
# 2015 EXPLORATION PLANNING

- 2015 – planning for a drilling program in Chukchi Sea at Burger site
  - Drilling rigs:
    - Noble Discoverer
    - Transocean's Polar Pioneer
  - Fleet of support vessels, similar to 2012
    - Anchor handlers, ice management, oil spill response, supply & towing
  - Ninth Circuit – Lease Sale 193

# CHUKCHI LEASES

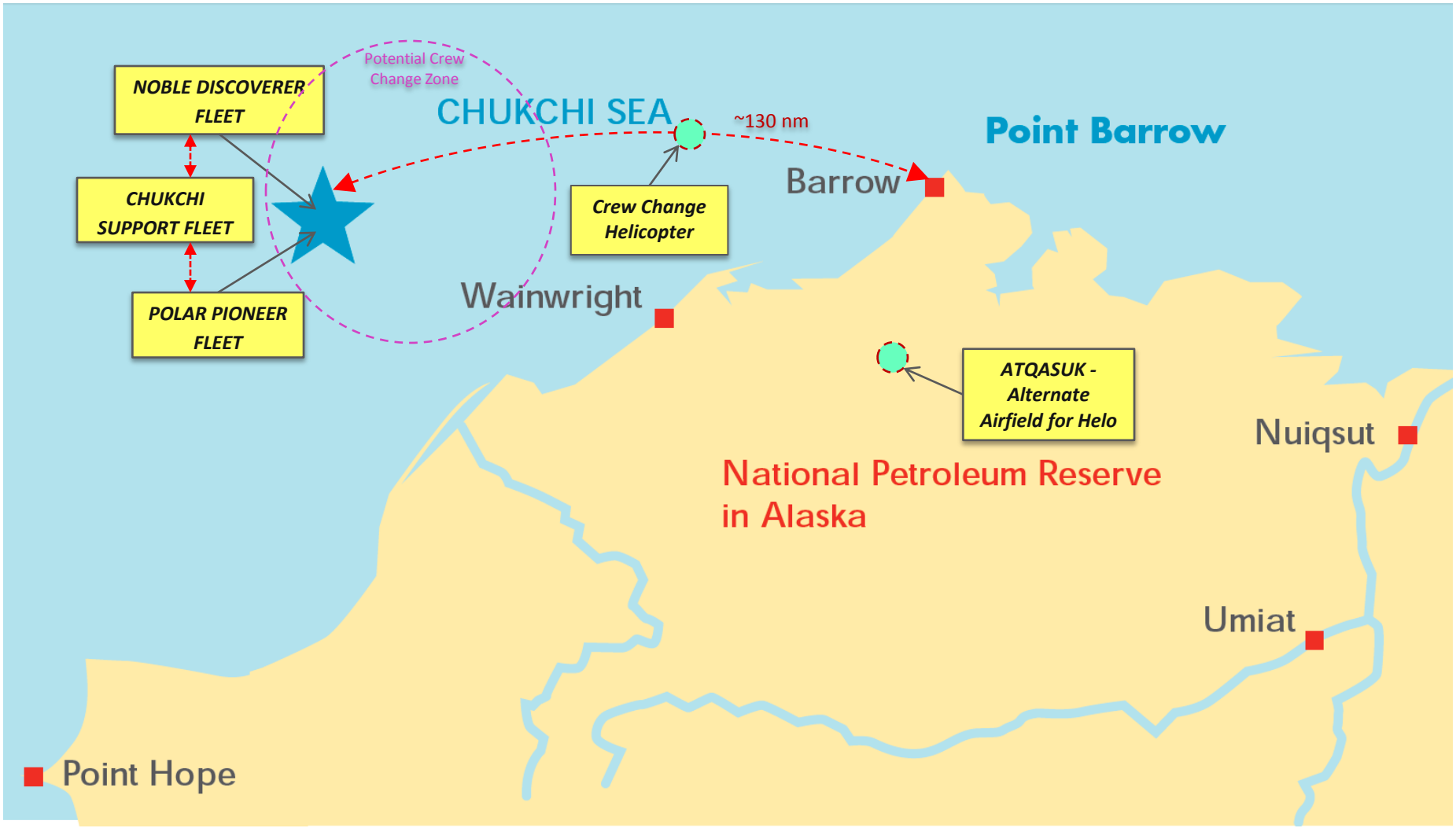


# 2015 WAINWRIGHT OPERATIONS



- Oil spill response support
  - Camp, yard and crew change
- June to October 2015
  - Charter crew change flights from Barrow
    - 15 personnel, once every 3 weeks
  - Accommodations
    - Olgoonik 24-bed camp
    - 15 personnel
    - 4 camp support (local hire)
  - Yard space
    - Oil spill response equipment storage
  - Waste
    - Camp kitchen waste at Wainwright Landfill
    - All other waste to Lower 48 for disposal

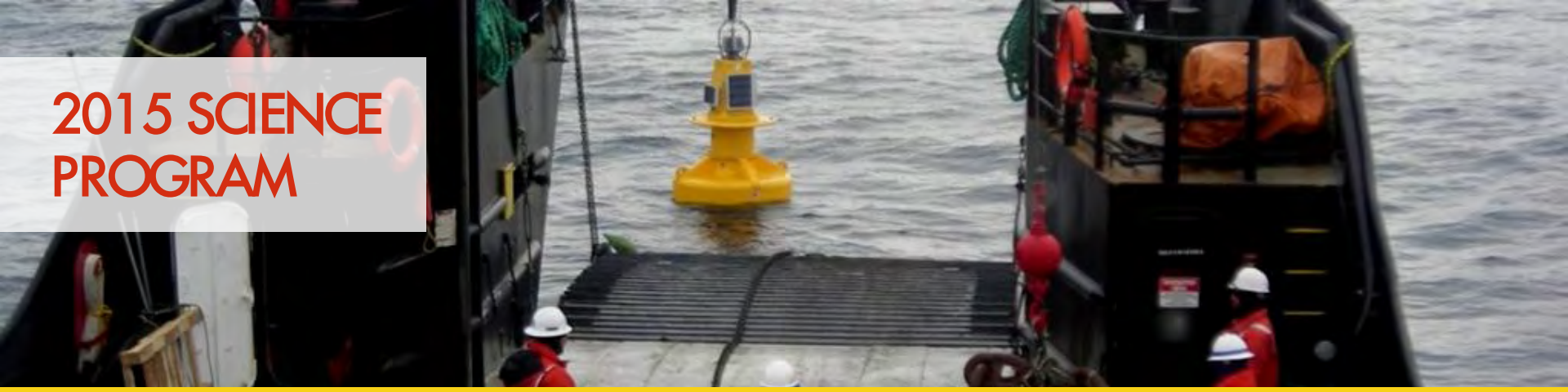
# 2015 CHUKCHI CREW CHANGE OPERATIONS



- Collaboration and communication with subsistence users
- Communication Centers
- Subsistence Advisors
- Public community meetings twice a year
- Protected Species Observers on all vessels
- Community Liaison Officers
- Maximizing opportunities to utilize local contracting
- North Slope Borough Science Agreement

# 2014 SCIENCE

- Offshore Ecological Studies (Aug – Oct)
- Jointly funded by Shell, ConocoPhillips and Statoil
- Eco-system wide baseline studies (benthic, zooplankton, fisheries, marine mammals, DSAR's, sea birds)
- Ice and Metocean buoys
- Provides critical data for ice and weather forecasting
- Supports NOAA forecasting
- Building a strong science baseline
- North Slope Science Agreement



# 2015 SCIENCE PROGRAM

- Continue Offshore/Nearshore Ecological Studies (August – October)
  - Jointly funded by Shell, ConocoPhillips and Federal agencies
  - Eco-system wide baseline studies
  - Ice and Metocean buoys
  - North Slope Science Agreement

# 2015 SCIENCE PROGRAM

- North Slope Borough Baseline Studies Program
  - Surface drifter current buoys
  - Ringed seal satellite tracking
  - Workshop on sea ice and currents
  - Bowhead and beluga hearing
  - Assessment of bowhead sense of smell
  - Stress monitoring in Arctic mammals
  - Contaminants and biomarkers in beluga whales
  - Bowhead ship strike and entanglement scar baseline
  - Caribou calving, fox den, & wolverine surveys

# DRILLING RIGS

## Discoverer

- **Drilling Rig**
- Length: 514 ft
- Width: 71 ft
- Draft: 26 ft
- Accommodations: 124
- Owner/Operator: Noble Corporation

## Polar Pioneer

- **Drilling Rig**
- Length: 279 ft
- Width: 233 ft
- Draft: 30 ft
- Accommodations: 100
- Owner/Operator: TransOcean (Panama)

# ICE MANAGEMENT

## Nordica

- **Ice Management**
- Length: 380 ft
- Width: 85 ft
- Draft: 27 ft
- Accommodations: 77
- Owner/Operator: Arctia Offshore (Finland)

## Fennica

- **Ice Management**
- Length: 380 ft
- Width: 85 ft
- Draft: 27 ft
- Accommodations: 77
- Owner/Operator: Arctia Offshore (Finland)

# ICE MANAGEMENT

**Aiviq**

- **Anchor Handler**
- Length: 360.8 ft
- Width: 80 ft
- Draft: 28 ft
- Accommodations: 64
- Owner/Operator: Edison Chouest

**Ross**

- **Anchor Handler**
- Length: 256 ft
- Width: 54 ft
- Draft: 18 ft
- Accommodations: 39
- Owner/Operator: Edison Chouest

**Tor Viking**

- **Anchor Handler**
- Length: 274 ft
- Width: 59 ft
- Draft: 20 ft
- Accommodations: 23
- Owner/Operator: Trans Viking (Sweden)

# FLEET RESUPPLY

**Sisuaq**

- **Fleet Resupply**
- Length: 292 ft
- Width: 64 ft
- Draft: 19.6 ft
- Accommodations: 50
- Owner/Operator: Harvey Gulf

**Champion**

- **Fleet Resupply**
- Length: 300 ft
- Width: 64 ft
- Draft: 19.6 ft
- Accommodations: 50
- Owner/Operator: Harvey Gulf

**Supporter**

- **Fleet Resupply**
- Length: 300 ft
- Width: 64 ft
- Draft: 19.6 ft
- Accommodations: 50
- Owner/Operator: Harvey Gulf

# OCEAN-GOING TUGS

**Ocean-going Tug** *(TBN - not contracted)*

- **Tug Support Vessel**
- Length: 146 ft
- Width: 46 ft
- Draft: 21 ft
- Accommodations: 13
- Owner/Operator: Crowley

**Ocean-going Tug** *(TBN – not contracted)*

- **Tug Support Vessel**
- Length: 146 ft
- Width: 46 ft
- Draft: 21 ft
- Accommodations: 13
- Owner/Operator: Crowley

# OIL SPILL RESPONSE

**Guardsman**

- **Tug Support - OSR**
- Length: 136.2 ft
- Width: 36.6 ft
- Draft: 20 ft
- Accommodations: 11
- Owner/Operator: Crowley

**Klamath**

- **Oil Spill Response**
- Length: 333 ft
- Width: 76 ft
- Draft: 22 ft
- Accommodations: 0
- Owner/Operator: Crowley

**Nanuq**

- **Oil Spill Response**
- Length: 301 ft
- Width: 60 ft
- Draft: 21 ft
- Accommodations: 41
- Owner/Operator: Edison Chouest

# TANKER & DRILL DISCHARGE MONITORING

DDM Vessel

**Tanker** *(TBN – not contracted)*

- **OSR/Refueling**
- Length: 748 ft
- Width: 105.9 ft
- Draft: 46.8 ft
- Accommodations: 24
- Owner/Operator: Transpetrol (Singapore)

**TBD** *(not contracted)*

- **Drilling Discharge Monitoring**
- Length: TBD
- Width: TBD
- Draft: TBD
- Accommodations: TBD
- Owner/Operator: TBD

# Attachment B
# Chukchi Sea Communication Plan

# COMMUNICATION PLAN
# EXPLORATION DRILLING PROGRAM CHUKCHI SEA, ALASKA

The following Communication Plan will be used during each exploration drilling season to coordinate activities with local subsistence users, including the Alaska Eskimo Whaling Commission (AEWC), Eskimo Walrus Commission (EWC), Alaska Nanuuq Commission (ANC), Alaska Beluga Whale Committee (ABWC), Ice Seal Committee (ISC), and village Whaling Captains Associations (WCA). Each planned drilling season in the Chukchi Sea will begin with transit through the Bering Strait into the Chukchi Sea on or after July 1, then on location at a drill site on or about July 4 and end on or about October 31.

The Communications Plan will be implemented in two phases. Phase I describes the guidelines already in place to ensure proper communication during the drilling season. Phase II describes what to do in the event Shell Gulf of Mexico Inc. (Shell) activities potentially affect subsistence activities and how to keep subsistence user groups informed of Shell activities. Phase I and II are designed to minimize the potential for interference of Shell activities with subsistence activities and resources and to keep operators up-to-date regarding the timing and status of the beluga and bowhead whale migrations in the Chukchi Sea as well as the timing and status of other subsistence hunts.

Drilling program operations will be performed in compliance with all applicable permits and authorizations, including the Plan of Cooperation (POC), Letter of Authorization (LOA) per U.S. Fish & Wildlife Service (USFWS), Incidental Harassment Authorization (IHA) per National Marine Fisheries Service (NMFS) and Lease Stipulation #5 from Chukchi Sea lease sale 193 per the Bureau of Ocean Energy Management (BOEM).

## PHASE I

- Shell will fund the operation of Communication and Call Centers (Com Centers) in the coastal villages to enable communications between Shell operations and vessels, local subsistence users, and Subsistence Advisors (SA), thereby notifying the subsistence community of any vessel transit route changes and avoiding conflicts with subsistence activities.
- Protected Species Observers (PSO) will be onboard exploration drilling-related vessels with responsibilities to; monitor for the presence of marine mammals, assist with the maintenance of marine mammal safety radii around vessels, monitor and record avoidance or exposure behaviors, and communicate with the Com Centers and local subsistence hunters by marine radio.
- If a conflict arises with offshore activities, the PSO will immediately contact the vessel captain and the Com Centers. The Com Centers will then contact Shell's simultaneous operations emergency response team. If avoidance is not possible, the next phase will include communication between a Shell representative and a representative from the impacted subsistence hunter group(s) to resolve the issue and plan an alternative course of action by either industry or the subsistence groups.
- Shell will employ local SAs from the Chukchi Sea villages that may be potentially impacted by Shell's exploration drilling activities. The SAs will provide consultation and guidance regarding whale migration and subsistence activities. There will be one SA per village, working approximately 8 hours per day and 40 hours per week during each drilling season. The subsistence advisors will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and provide advice on ways to minimize and mitigate

potential negative impacts to subsistence resources during each drilling season. Responsibilities will include reporting any subsistence concerns or conflicts, coordinating with subsistence users, reporting subsistence related comments, concerns, and information, coordinating with the Com and Call Center personnel, and advising on how to avoid subsistence conflicts.

- Aircraft traffic will not fly below 1,500 ft. (457 m) altitude (except during takeoffs and landings, in emergency situations or for PSO overflights) while over land or sea. If flights need to deviate from their routine planned routes due to an emergency, weather or other unavoidable reasons, the new flight information will be shared as outlined by Shell's Health, Safety, Security, and Environment (HSSE) requirements with Com Centers so area subsistence users can be notified.
- Regular overflight surveys and support vessel surveys for marine mammals will be conducted to further monitor prospect areas and identify areas currently being used for subsistence activities to avoid potential conflicts with users.

## PHASE II

All guidelines in Phase I will be adhered to in addition to the following:

- If potential conflicts are identified between Shell activities and subsistence activities; the Com Center Action Plan will be used to manage the issue.
- Shell will continue with engagements and regular communications with the AEWC, EWC, ANC, ABWC, ISC, and the WCAs of Barrow, Wainwright, Point Lay and Point Hope once transiting of vessels begins through the Chukchi Sea, during drilling activities, and during mobilization from the Chukchi Sea.