Bird Strike Avoidance and Lighting Plan
Chukchi Sea, Alaska

August 2014

Shell Gulf of Mexico Inc.

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Figures

Attachments

ACRONYMS

BOEM	Bureau of Ocean Energy Management
EP Revision 1	Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, approved by BOEM December 15, 2011
EP Revision 2	Revised Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, August 2014
ESA	Endangered Species Act
ft.	feet/foot
hr(s)	hour(s)
km	kilometer(s)
LBCHU	Ledyard Bay Critical Habitat Unit
m	meter(s)
MBTA	Migratory Bird Treaty Act
MHz	Megahertz
mi	statute mile(s)
PSO	Protected Species Observer
MMS	U.S. Department of the Interior, Minerals Management Service
M/V	Motor Vessel
OCS	Outer Continental Shelf
Plan	Bird Strike Avoidance and Lighting Plan
Shell	Shell Gulf of Mexico Inc.
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

1.1 Background

This document comprises Shell Gulf of Mexico Inc.'s (Shell) Bird Strike Avoidance and Lighting Plan, Chukchi Sea, Alaska and applies to Shell's exploration drilling program as detailed in the Chukchi Sea EP Revision 2. The Plan meets all the requirements of Stipulation No. 7 under the Chukchi Sea Lease Sale 193 (MMS 2008a).

Growing scientific evidence indicates some bird species are attracted to light sources, which may increase the risk of bird strikes. Most related studies conclude that increased darkness, coupled with inclement weather, increases attraction by birds to lighted vessels and structures. Birds drawn to light often become disoriented and can then collide with these structures resulting in injury and death. The chance of a bird strike to the drillship occurring during Shell's exploration drilling program is considered low because the drill sites are more than 64 status miles (mi) (103 kilometers [km]) offshore (Figure 1.1) in an area of the Chukchi Sea with low eider densities, and because of the length of daylight during the exploration drilling season. Nevertheless, Shell will implement the Plan to minimize the chance of bird strikes occurring during exploration drilling operations.

Emphasis of the Plan is on preventing bird strikes by threatened spectacled (*Somateria fischeri*) and Steller's (*Polysticta stelleri*) eiders that may be present in the Chukchi Sea during the period of operations and may, occasionally, venture into the area near Shell's exploration drilling operations. In addition, the Plan includes reporting requirements for any bird strikes and bird observations, which will help better understand the risks of bird strikes associated with drilling vessels.

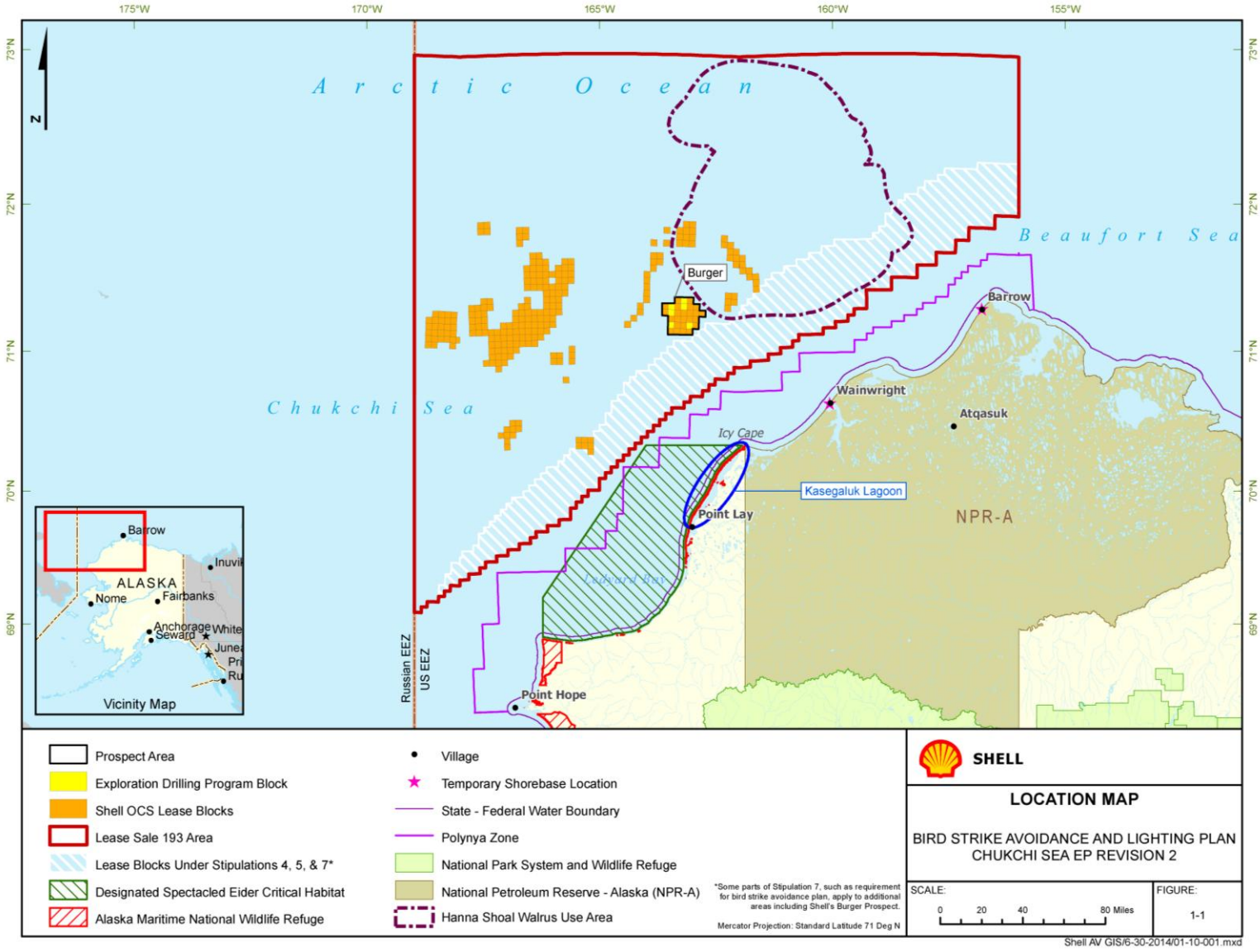
1.2 Proposed Exploration Plan

Shell plans to continue an exploration drilling program on its leases in the Chukchi Sea Planning Area of the Outer Continental Shelf (OCS). Shell's leases were acquired in Oil and Gas Lease Sale 193 (Figure 1.1). Shell plans to drill exploration wells on lease blocks within its Burger Prospect. The locations of the lease blocks are indicated in Figure 1.1. These activities started in 2012. Each drilling season spans the summer and fall (July-October) when migratory birds may be present.

The drilling units *Noble Discoverer* and the *Polar Pioneer* will be used to drill the wells. The drilling units will be attended by vessels that may be used for ice management, anchor handling, oil spill response (OSR), refueling, resupply, and servicing of the drilling operations.

The drilling units and support vessels will transit through the Bering Strait into the Chukchi Sea on or about 1 July, arriving on location in Shell's prospect on or about 4 July. Exploration drilling will commence as ice, weather, and other conditions safely allow, and could continue until on or about 31 October.

Figure 1.1 Location Map



1.3 Endangered Species Act, Migratory Bird Treaty Act, and Lease Stipulation

The exploration activities proposed in Shell's EP Revision 2 are subject to the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), and the Bureau of Ocean Energy Management's (BOEM) Lease Stipulation No. 7, which requires offshore operators to implement certain measures to minimize the likelihood of exploration affecting spectacled and Steller's eiders. Shell has prepared this plan in response to these statutory requirements. This plan represents a practical approach towards using appropriate mitigation measures to reduce potential avian collisions between Shell vessels and the threatened eider species and other migratory birds in the activity area.

1.3.1 Endangered Species Act

The purpose of the ESA is to conserve "the ecosystems upon which endangered and threatened species depend" and to conserve and recover listed species. Under the law, species may be listed as either "endangered" or "threatened." Endangered means a species is in danger of extinction throughout all, or a significant portion of, its range. Threatened means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened (USFWS 2006a). The law requires federal agencies, in this case BOEM, to consult with the U.S. Fish and Wildlife Service (USFWS) to ensure that the actions they authorize would not jeopardize listed species.

Section 7 of the ESA requires federal agencies to ensure that their actions do not jeopardize the continued existence of listed species. To comply with Section 7, the consulting federal agency, or its designated non-federal representative, must review the proposed project for potential impacts to protected species. The two species listed under the ESA that this plan is intended to help protect are the Steller's eider and the Spectacled eider.

1.3.1.1 Steller's Eider

The Alaska-breeding population of Steller's eider was federally designated as threatened in 1997 and is an Alaska Species of Special Concern. Historically, Steller's eiders nested throughout the coastal areas of western and northern Alaska (USFWS 2005b). Today, the Alaska breeding population is primarily confined to the Arctic Coastal Plain in low densities and is extremely scarce in western Alaska (USFWS 2005b). The Steller's eider may have abandoned much of the eastern North Slope in recent decades, but still occur in low densities from Wainwright to as far east as Prudhoe Bay (USFWS 2003). The threatened Alaska breeding population is thought to be in the hundreds or low thousands on the Arctic Coastal Plain and in the dozens on the Yukon Kuskokwim Delta (USFWS 2005b). The species also occurs in Russia; although not precisely known, the Russian Atlantic population is thought to be 30,000 to 50,000 individuals, and the Russian Pacific population 50,000 to 100,000 (USFWS 2005b).

1.3.1.2 Spectacled Eider

The spectacled eider was federally designated threatened throughout its range in 1993 and is an Alaska Species of Special Concern. The breeding distribution of the spectacled eider includes the central coast of the Yukon-Kuskokwim Delta, the Arctic Coastal Plain of Alaska, and the Arctic Coastal Plain of Russia (USFWS 2005b). Spectacled eiders on the Arctic Coastal Plain of Alaska originally ranged to the Canadian border (USFWS 1996). The threatened spectacled eider population is estimated to be about 360,000 worldwide, which includes non-breeders (USFWS 2005b). The population may be in slow decline on the Arctic Coastal Plain of Alaska, where 3,000 to 4,000 nest today (USFWS 2005b). At least 40,000 pairs are thought to nest in Arctic Russia. Molting flocks of spectacled eiders gather in shallow waters off the coast in usually less than 120 ft. (36 meters [m]) deep and travel along the coast up to 31 mi (50 km) offshore (USFWS 2005b).

1.3.2 Migratory Bird Treaty Act

Under the MBTA (16 United States Code [U.S.C.] 703), it is illegal for anyone to "take" migratory birds, their eggs, feathers or nests. "Take" includes by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. The MBTA does not distinguish between intentional and unintentional take. In Alaska, some species of migratory birds may be taken, killed, or possessed during approved hunting seasons for those specified migratory species.

1.3.3 Lease Stipulations

Lease Stipulation No. 7 (full text provided in Attachment A of the Plan) for the Chukchi Sea Lease Sale 193 Area is intended to minimize the likelihood of spectacled and Steller's eiders striking drilling structures or vessels. The stipulation has 4 parts as discussed below:

Part A(1) mandates that EPs for exploration drilling programs include a plan for recording and reporting bird strikes. This component of the stipulation applies to exploration drilling programs located anywhere in the Chukchi Sea Planning Area, and therefore applies to Shell's program.

Parts A(2) and B(2) place travel restrictions and lighting protocol requirements on vessel and aircraft operations when they take place in certain listed blocks, in federal waters shoreward of those blocks, and in the Ledyard Bay Critical Habitat Unit (LBCHU), during specific dates. The listed blocks are shown in Figure 1.1 (as lease blocks under Stipulation No. 7) and are listed at the end of Attachment A of this document. These stipulation components would apply to any aircraft or vessels that are part of Shell's exploration drilling program under EP Revision 2 (and presumably any future revision), if and when the vessels or aircraft are in the identified parts of the Chukchi Sea.

Part B(1) places lighting protocol requirements on drilling structures in the Chukchi Sea. This stipulation requirement applies to drilling structures operating on a lease or staged anywhere in the Chukchi Sea Planning Area, and therefore applies to Shell's drillship.

The above-referenced travel restrictions or conditions and lighting protocol restrictions are summarized below:

General Conditions

- Lessees must include a plan for recording and reporting bird strikes that occur during approved activities to BOEM.
- Vessels associated with the exploration drilling activities should avoid traversing listed blocks (stipulation area), and federal waters between the stipulation area and shore, to the maximum extent possible between 15 April and 10 July. If such traffic cannot be avoided, hazing equipment must be onboard.
- Except during emergencies or for safety, vessels must avoid travel within the LBCHU between 1 July and 15 November. Any required travel in this area must be reported to BOEM within 24 hours (hr).
- Aircraft supporting the exploration drilling operations must avoid operating below an altitude of 1,500 ft. (457 m) over the stipulation area and federal waters between the stipulation area and shore between 15 April and 10 June, or the LBCHU between 1 July and 15 November, to the maximum extent possible. If weather does not permit these altitudes then the flight should take place along a BOEM/USFWS-approved pre-determined flight path. Any deviations from the path due to safety or other issues must be reported within 24 hr.

Lighting Protocols

- Lessees are required to prepare a plan that identifies measures that will be undertaken to minimize the likelihood that migrating and coastal birds will strike exploration drilling structures (drillship), and obtain approval for the plan from BOEM. The plan must include measures that reduce the radiation of light outward from the drillship to minimize the likelihood that birds will strike the structure.
- Surface support vessels must minimize the use of high-intensity work lights, especially while traversing the stipulation area and federal waters between the stipulation area and the coastline. Exterior lights must be used only as necessary to illuminate on-deck work areas during periods of darkness or inclement weather. Interior lights and lights used during navigation may remain on for safety.

The lighting requirements and protocols in this plan apply to activities conducted between 15 April and 15 November.

1.4 Relative Risk Evaluation

The risk of bird collision is largely determined by the timing and location of exploration activities in relation to the presence of spectacled and Steller's eiders in the Chukchi Sea. Spectacled and Steller's eiders nest onshore across the coastal North Slope. The distribution and density of breeding eiders on the North Slope are indicated in Figure 1.4-1 and Figure 1.4-2.

The Alaska-breeding population of the Steller's eider is primarily confined to the Arctic Coastal Plain of Alaska's North Slope, with a concentration of nesting eiders around Barrow (USFWS 2005a, Figure 1.4-2). Their use of offshore waters of the northeastern Chukchi Sea can be generally discussed in terms of spring migration and post-breeding, which includes fall migration and molting.

Spring migration of eiders in the Chukchi Sea occurs in May and June (MMS 2007a,b; MMS 2008b). The migration occurs along the coastal waters (MMS 2006), where many marine birds use the lead system as a migratory pathway to breeding grounds in northern Alaska and the Canadian Arctic (Richardson and Johnson 1981, Woodby and Divoky 1982). Eiders may also migrate overland during spring as they move to the eastern North Slope from the Chukchi Sea (Troy Ecological Research Associates 1999 *cited* in MMS 2003). Offshore exploration drilling operations in the Chukchi Sea would begin on or about 4 July, which is after spring migration has ended.

Post-breeding spectacled and Steller's eiders generally move to the marine environment where they molt and start their fall migration. However, their movement to the marine environment varies by sex and timing. Males and some females with failed nests leave nesting areas for marine waters in late June or in July (MMS 2006). Successful female Steller's eiders and their broods gather near the coast later in the summer (MMS 2006) and some successful female spectacled eiders stay with their young on the nesting grounds until late August to early September, at which time they start their southward migration (USFWS 2005a).

Molting flocks of spectacled eiders gather in shallow waters, usually less than 120 ft. (36 m) deep, and travel along the coast up to 30 mi (50 km) offshore (USFWS 2005a). Critical habitat for the spectacled eider includes Ledyard Bay (i.e., LBCHU), a large offshore area northeast of Cape Lisburne. This area is used for molting by spectacled eiders from July through October (USFWS 2005a). Other important molting and staging areas in the Chukchi Sea include Peard Bay and Kasegaluk Lagoon (Petersen et al. 1999). These areas are outside and shoreward of the lease blocks where the proposed exploration drilling program is scheduled to occur. No habitat on the North Slope has been designated as critical for the Steller's eider (USFWS 2005a).

Fall migration of spectacled and Steller's eiders has been documented by telemetry studies. Spectacled eiders were found to winter in a dense concentration within Norton Sound and fall migrations have been documented to go through the critical habitat described above (Petersen et al. 1999). Telemetry studies have shown Steller's eiders leaving the Arctic Coastal Plain nesting areas near Barrow on 23 June for the coastal marine waters between Wainwright and Dease Inlet between Cape Lisburne and Point Lay (MMS 2006). Eight individuals were tracked from Barrow across the Chukchi Sea to Siberia and back to Alaska (MMS 2006).

Spectacled and Steller's eiders will be most widely distributed in the Chukchi Sea during the post-nesting period. Although the majority of the eiders are likely stay close to the coast where they migrate and molt, some may be encountered far from shore within the exploration drilling areas. In the Chukchi Sea, proposed exploration drilling operations would begin no earlier than July and would be at least 96 km (60 mi) offshore in water depths of 130-150 ft. (40-46 m). Steller's eiders would not be expected to occur in Shell's Burger Prospect, but a small number of spectacled eiders may be found in there during the time period when exploration drilling is planned. Bird surveys were conducted in the Burger Prospect area in July-October in 2009 and 2010 as part of a series of baseline studies. One spectacled eider was observed in the Burger Prospect during two years of these intensive surveys, and no Steller's eiders were recorded (Gall and Day 2009, 2010).

In addition to the risk of bird strikes being minimized by the timing and location of exploration drilling operations, the high amount of daylight hours experienced in the area during the months of July and August also reduces the relative risk of bird strikes.

Figure 1.4-1 Spectacled Eider Densities and Critical Habitat

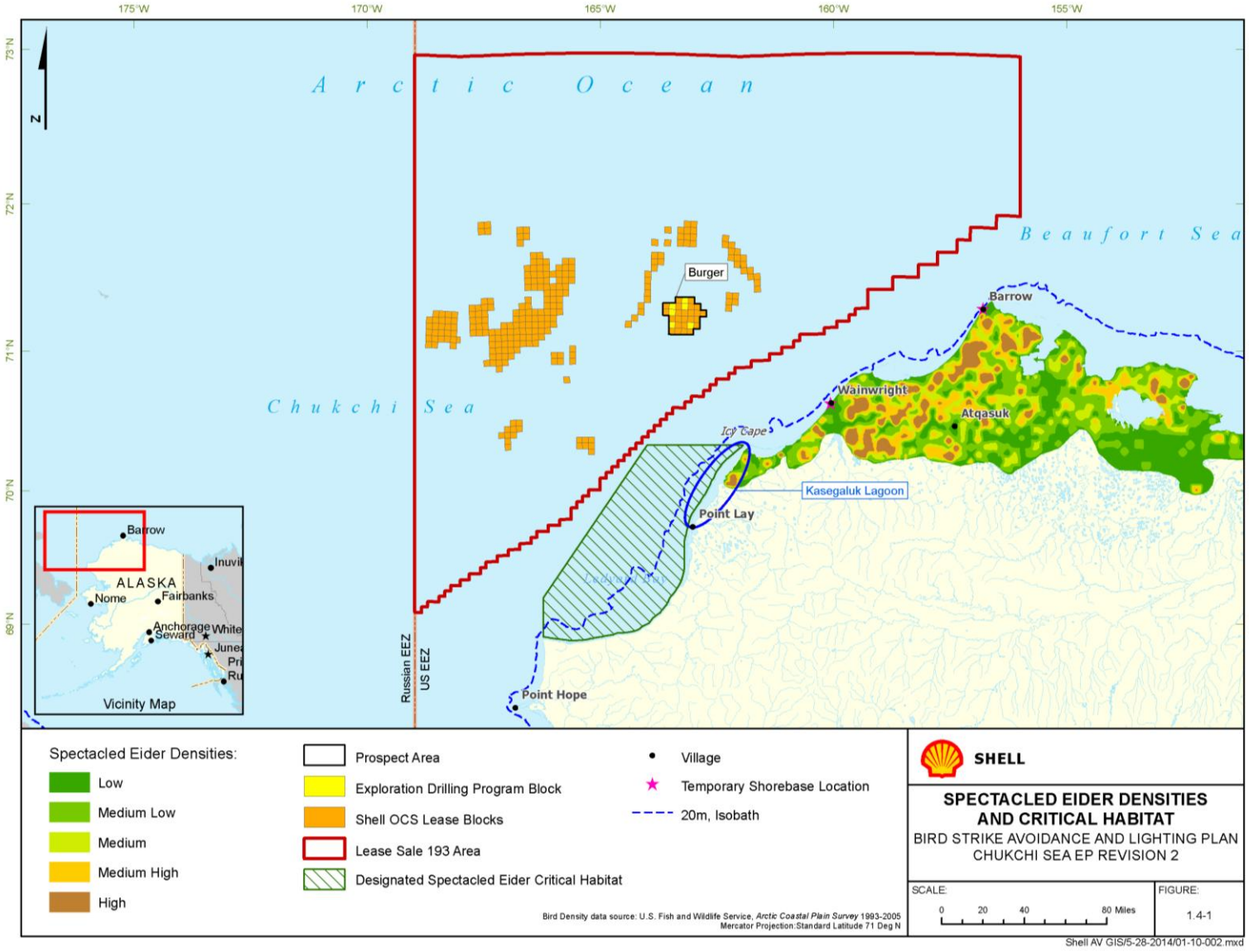
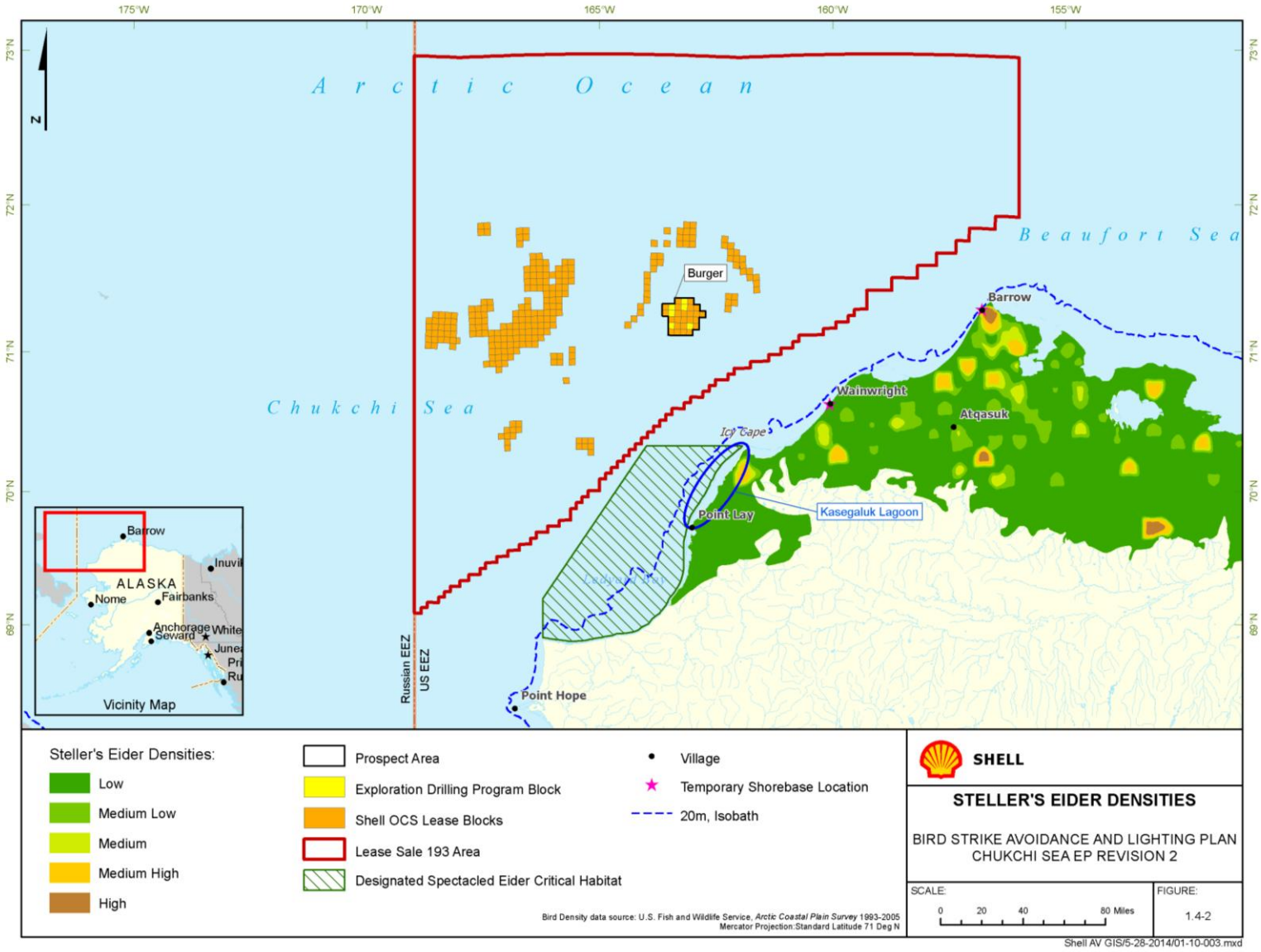


Figure 1.4-2 Steller's Eider Densities



2.0 REVIEW OF MITIGATION MEASURES

A literature review of existing mitigation measures used in Alaska and the lower 48 states was conducted to assess the efficacy of existing mitigation to reduce the chances of bird strikes. The studies were reviewed to determine what mitigation measures would be appropriate for use during Shell's exploration drilling program in the Chukchi Sea. None of the studies are specific to either the spectacled eider or the Steller's eider. Most of the work to date deals with documenting bird collisions with communication towers in the lower 48 states or seabirds with fishing vessels in the Aleutian Islands of Alaska. Light sources, especially from taller structures exceeding 200 ft. (60.9 m) and during periods of low visibility, are implicated in many bird collisions. The following is a brief summary of measures considered by Shell with regard to mitigating the effects of light on birds and reducing avian collisions. The effectiveness of some of these measures has not been studied, and some studies that have been conducted are not conclusive. Shell recognizes the need to reduce vessel light emissions to lower the risk of bird strikes, and has selected the most proven and practical measures for the Plan.

2.1 Low Reflecting Finishes

Painting vessels a dark color would decrease ambient reflected light, thus reducing light output beyond the deck. The amount of light reduced by such an action is unknown. Another option is to paint alternating and contrasting colors, which may allow a vessel to be more easily seen by birds. No studies evaluating the effects of low reflecting finishes are available for review, therefore the efficacy of these measures is unknown.

2.2 Minimum Vessel Light

Birds can be disoriented by and attracted to artificial lights, potentially resulting in injury and mortality if a collision occurs. Organizations working on reducing bird mortality, such as Bird Life International, include minimizing vessel light use (without compromising vessel worker safety) in their general recommendations for reducing bird strikes. This has proven effective in some situations. For a lighthouse, narrowing and decreasing light intensity resulted in a drastically lower bird mortality rate from an average of 200.6-18.5 birds per season during spring and 392.5-9.6 birds during fall (Jones and Francis 2003). Minimization of light can include shading, directing lights towards the deck, avoiding the use of unnecessary lights, and using minimal light output through the replacement of high intensity lights.

2.3 Light Color

It is likely that any light visible to humans is visible to birds, and thus constitutes a potential attractant (Verheijen 1985). Different colors of light (wavelengths) have been considered as mitigation to reduce bird strikes. Research in the North Sea has indicated that white light caused attraction, red light caused disorientation, and that green and blue light caused a weak response (Marquenie 2007). White lights in this study were replaced with specially designed lights that excluded the red spectrum and appeared green (Marquenie 2007). The green lights resulted in 2 to 10 times fewer birds circling offshore platforms when only a limited number of light sources were replaced with green lights. Therefore the results likely underestimate the effect that would occur if all external lights were replaced with green lights (Marquenie 2007).

2.4 Anti-Collision Lighting

The effects of anti-collision lighting systems at Northstar Island were studied for four years for eiders and other birds (e.g. gulls, loons, geese) found in the Beaufort Sea (Day et al. 2005). Analysis of the data revealed some statistically significant responses and some weak responses by eiders to the anti-collision lights. In general, results of the analyses indicate a net movement of eiders away from the island, and a significant slowing of the eiders flight speed at night. The lights clearly did not cause non-eider species to avoid the island and actually appeared to cause attraction at times. Eiders exhibited a natural anti-collision response to the island, which the strobe lights were thought to increase modestly. Day et al. (2005) concluded the anti-collision lights caused some eiders to avoid Northstar Island, but the avoidance response was not consistent and was not dramatic. The effectiveness of the anti-collision lights in reducing the risk of eider collisions was not clear, and the lights did not appear to deter other non-eider species at all. The following summarizes the lighting system used at Northstar (Day et al. 2005):

- 14 white strobe lights (Honeywell Flashguard 2000B strobe lights) are mounted on tall masts approximately 13.7 m (45 ft.) above the ocean surface around Northstar Island
- Each strobe light is set to flash at the rate of 40 flashes/minute
- The strobe lights are not set to flash in pattern or synchrony
- The strobe lights emit white light (all wavelengths) at 20,000 candlepower during the day and 2,000 candlepower during the night
- Photocell controls the switching between the two modes

Anti-collision lights may vary by wavelength, flashing rate, flashing synchrony, and intensity. Some evidence exists that passerines may avoid white lights better than red lights (Manville 2005). White strobe lights are considered less likely to attract night-migrating birds than non-flashing white and red lights (New Mexico Department of Game & Fish 2001). However, the appropriate light wavelength is unknown for best deterring eiders and a continued search for a lighting system that is more effective than the one used at Northstar Island is recommended by Day et al. (2005).

2.5 Radar Assessment

Radar can be used to examine the impact and collision risk of birds with man-made structures. It is a tool that has been used for decades to study birds and track bird movements in a three dimensional space and time. Radar can detect birds that are beyond the visual limit of observers and it is a particularly useful tool when visual observations are limited by darkness, fog, or precipitation. Radar in this respect can be a valuable monitoring tool to help better understand the risks to birds and can used to make informed decisions about whether mitigation efforts (e.g., changes to lighting) are required.

There are limitations to consider when using radar. Radars do not have the ability to determine the species of a bird, however; tracks can be assigned to taxa on the basis of flight speed (Larkin and Thompson 1980) and other variables captured within the return signal echo. During periods of high precipitation and or other radar-clutter causing events (e.g. high sea states), detecting small targets, such as birds, can be challenging.

There are several types of radar that have been used to study bird movements, from low-powered airport surveillance radars and mobile marine surveillance radars to high-powered weather radars and military tracking radars. Each type of radar has characteristics that make it suitable for its particular application (tracking features, range, cost, etc.). In 2005, a German team investigated the avian avoidance response to offshore wind turbines using the radar system Furuno FR2125 (Desholm and Kahlert 2005). The species involved in that analysis were primarily common eider (*Somateria mollissima*) and geese. In another study (Gauthreaux and Livingston 2006), the VERTRAD/TI radar system was used to estimate the

potential collision risk of migrating birds with man-made obstacles of various heights. Another system (BIRDRAD) was able to detect the departure of migrants from different types of habitat within a few kilometers of the radar (Gauthreaux and Belser 2005). This system used a high resolution, marine surveillance radar (Furuno 2155 BB) with a 50-kilowatt transceiver. Gauthreaux and Belser (2005) also discussed the use of WSR-88D Doppler Weather Surveillance Radar to characterize bird echoes to better understand bird migration rates. Overall, radar has many applications making it a valuable tool to help better understand bird movements in relationship to specific conservation concerns.

3.0 PROPOSED MITIGATION

Based upon the mitigation measures reviewed in Section 2.0, Shell has determined appropriate mitigation measures for use during Shell's exploration drilling program in the Chukchi Sea. The mitigation proposed by Shell is based on what is currently and technically feasible and proven effective, in reducing the prospect of bird strikes, while fully considering the lighting requirements needed to maintain a safe work environment. Additional mitigation may be considered as more information becomes available regarding the effectiveness of new mitigation to reduce the risk of bird strikes.

Given the location of Shell's exploration program, impacts from bird strikes with vessels likely would affect only small numbers of individuals with no significant effects at the population level for any species. Implementing the mitigation measures as specified in this Plan will reduce the probability of bird strikes associated with Shell's planned activities.

Shell has prepared this Plan to reduce the chance of bird strikes of the drillship, especially strikes by spectacled and Steller's eiders. The major elements of the Plan are provided below:

- Bird strike monitoring that includes recording and reporting bird strikes for the collection of information on bird strikes and lighting configuration and a better understanding of methods to reduce bird strikes.
- Avian monitoring, including visual observations and radar assessments to determine bird use of the prospect area during the exploration drilling period.
- Installing shading and directing some drillship lights inward and downward to living and work structures to minimize the amount of light radiating from the drillship.
- Minimizing the use of high-intensity work lights on support vessels.
- Restricting aircraft and vessel travel routes and flight altitudes.

3.1 Bird Strike Monitoring

The overall objective of bird strike monitoring is to provide the USFWS with data for risk assessment of bird strikes related to operational activities and weather conditions, with a focus on threatened eiders. The monitoring program is intended to expand the knowledge on the risks of bird strikes in the Chukchi Sea and to determine the effectiveness of mitigation measures. If bird strikes are determined to be a serious risk to birds despite the proposed mitigation measures presented in this document, Shell will evaluate additional mitigation measures for future offshore activities.

All mortalities and injuries from strike events of a spectacled or Steller's eider will be reported to the Alaska OCS Regional Office of the BOEM and the Ecological Services Branch of the USFWS in Anchorage within three days of the event or as soon as is practical. This includes any collisions associated with the drillship, support vessels, and associated aircraft. Other pertinent information that may help better understand the risk of bird strikes will be sent to the USFWS after the end of the drilling season.

The following data will be collected upon a determination that a bird strike has occurred:

- Description of event
- Bird species, if can be determined
- Weather conditions
- Date and time
- Vessel location
- Photographs if practical

Shell will conduct routine deck searches for live, injured birds, or dead birds, especially during or following periods of darkness or inclement weather such as rain or fog. Birds perching on ship structures (such as antennae and rigging) will be allowed to rest and depart on their own.

Any observed bird strike shall be documented and reported within three days to BOEM. Minimum information will include species, date/time, location, weather, identification of the vessel involved and its operational status when the strike occurred. If a bird strikes and remains on the vessel, it will be photographed (if possible) and left there to recover and depart on its own. If necessary to take it out of harm's way, it will be moved to a dry place from where it can depart on its own. If the bird does not depart after about 12 hr and is still alive, it will be gently returned to the sea surface. Shell will consult with the USFWS to further determine the proper handling of injured birds in the event of a bird strike. Carcasses from any lethal strikes will be photographed (if possible) and returned to the sea. Photographs will be taken of the bird with wings spread, top and bottom views, and of the head, to assist with species verification and will be submitted to BOEM and USFWS as part of the collision report.

Strike information will be recorded on the Avian Collision Form provided in Attachment B of this Plan. An avian observer or Protected Species Observer (PSO) with training in bird identification will collect the data associated with any bird strike. Placards will be posted in common areas to inform all personnel to report dead or injured birds. This will increase awareness and the likelihood that data will be recorded. The observer will have equipment such as a bird identification guide, a flashlight, and a camera to help with data collection.

Although Shell will make every effort to record all bird strikes; it is recognized that some bird strikes may not be noticed. Eiders often fly low and fast over water, which suggests that they could possibly strike the hull of the drillship and fall into the water unobserved. In addition, darkness and inclement weather can make visual observations difficult.

3.2 Avian Monitoring

Avian monitoring will consist of observations made by observers on the drillship and radar assessments. These methods will be used concurrently to maximize the value of the data collected by either method.

3.2.1 Avian Observations

Avian monitoring will be performed by PSOs or other designated individuals aboard the drillship that have been trained in bird identification, sampling protocols, and the reporting of bird strikes to the USFWS and BOEM. Monitoring will be conducted systematically during daylight hours from a vantage point on the drillship using binoculars. These avian observers will have an adequate understanding of bird identification, especially of eiders in flight. The daily tasks performed by the observers will include recording weather conditions, bird counts with species identification, observations of general bird flight directions, estimates of bird distances from vessels, strike events, data entry, and report writing.

3.2.2 Radar Assessment

In 2012, a pilot study was conducted using the shipboard radar antenna and dedicated bird radar unit to detect birds near the *Discoverer* in the Chukchi Sea. Preliminary results suggest that birds were detected on radar and their movements were able to be tracked near the *Discoverer*. Further analysis and research is needed to continue to test the efficacy of using radar to monitor and compare bird movements near drillships during periods of good and poor visibility and to optimize radar settings in the offshore environment.

Visual observations (Section 3.2.1) will be conducted in conjunction with radar observations. Comparison of radar and visual observations will be used to help to determine numbers of individuals in flocks and possibly species group (based on flight patterns). Visual observations will supplement radar data by more accurately determining species and obtaining better estimates of individuals in flocks.

Shell will conduct the radar assessment during the course of the field season as time, conditions and availability of personnel permit. The number of sampling sessions will depend on the number of biologists available to collect data. Sampling sessions will be stratified to include all portions of the diurnal cycle as equally as possible.

Some of the data collected by radar observations will be the same as those collected by visual observers although species, number, sex, and height above water may not be determined by radar. For each observation of a bird flock, radar observers will record the date and time, the species type if possible (e.g., eider or goose), flock size, compass direction of the birds in relation to the drillship, direction of flight, initial distance of the birds from the drillship, the closest point of approach of the flock to the drillship, and notes on any avoidance behavior displayed by the flock. The data from the radar assessment will be analyzed to determine:

- If migrating bird flocks pass closer to the drilling units during periods of poor versus good visibility;
- If birds deflect their flight patterns to avoid the drilling units; and
- If deflections of flight patterns occur at further distances during period of good versus poor visibility

3.3 Lighting Protocols

Much of the drilling units lighting will be directed inward and downward, where practical, to minimize escaping light. Additionally, some lights will be fitted with shading that will direct lights to working areas and prevent light escaping to areas where lights are not needed for safety and operations. When practical, lights will be turned off when not in use.

3.3.1 Shading and Minimization

Shell plans to reduce or shade light output from the following locations on the drilling units:

- Deck lighting, doorway and stairway lighting, and pipe rack lighting: lights will be shaded to direct light downward and inward and/or the wattage reduced.
- Crane boom lights: lights to remain unshielded for safety during crane operations.
- Heliport lighting: lights to be dimmed or shut off when not in use.
- Navigation and clearance lights: no change will be made due to safety concerns.
- Lights from windows: shades will be used during darkness.

Shell will minimize the use of high-intensity work lights on the support vessels, especially when traversing the stipulation area and federal waters between the stipulation area and the shoreline. Exterior lights will be used on these vessels only as necessary to illuminate on-deck work areas during periods of darkness or inclement weather. Otherwise the lights will be turned off. Interior lights and lights used for navigation will remain on for safety.

3.4 Vessel and Aircraft Traffic

Surface vessels associated with exploration drilling operations will avoid operating or traversing within the LBCHU between 1 July and 15 November as much as possible (except for emergencies or human/navigation safety). Vessels that do enter into the LBCHU (Figure 1.1) during this time period for emergencies or human/navigation safety will report the information to BOEM within 24 hr.

Aircraft supporting exploration drilling operations will avoid operating below 1,500 ft. (457 m) above sea level over the LBCHU (Figure 1.1) between 1 July and 15 November as practicable. Pre-designated flight routes, which will be approved by the USFWS and BOEM during review of the exploration plan, may be used if the area must be traversed and weather prevents attaining an altitude of 1,500 feet. Flights that are below 1,500 ft. (457 m) and over the LBCHU between 1 July and 15 November will be reported to BOEM within 24 hr of the event.

4.0 REFERENCES

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Attachment A
Lease Stipulation No. 7
Oil and Gas Lease Sale 193 Chukchi Sea

LEASE STIPULATION NO. 7
OIL AND GAS LEASE SALE 193 CHUKCHI SEA

Stipulation No. 7. Measures to Minimize Effects to Spectacled and Steller's Eiders During Exploration Activities. This stipulation will minimize the likelihood that spectacled and Steller's eiders will strike drilling structures or vessels. The stipulation also provides additional protection to eiders within the blocks listed below and Federal waters landward of the sale area, including the Ledyard Bay Critical Habitat Area, during times when eiders are present.

(A) General conditions: The following conditions apply to all exploration activities.

(1) An EP must include a plan for recording and reporting bird strikes. All bird collisions (with vessels, aircraft, or drilling structures) shall be documented and reported within 3 days to MMS. Minimum information will include species, date/time, location, weather, identification of the vessel, and aircraft or drilling structure involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Lessees are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

(2) The following conditions apply to operations conducted in support of exploratory and delineation drilling.

(a) Surface vessels (e.g., boats, barges) associated with exploration and delineation drilling operations should avoid operating within or traversing the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, to the maximum extent practicable. If surface vessels must traverse this area during this period, the surface vessel operator will have ready access to wildlife hazing equipment (including at least three *Breco* buoys or similar devices) and personnel trained in its use; hazing equipment may located onboard the vessel or on a nearby oil spill response vessel, or in Point Lay or Wainwright. Lessees are required to provide information regarding their operations within the area upon request of MMS. The MMS may request information regarding number of vessels and their dates of operation within the area.

(b) Except for emergencies or human/navigation safety, surface vessels associated with exploration and delineation drilling operations will avoid travel within the Ledyard Bay Critical Habitat Area between July 1 and November 15. Vessel travel within the Ledyard Bay Critical Habitat Area for emergencies or human/navigation safety shall be reported within 24 hr to MMS.

(c) Aircraft supporting drilling operations will avoid operating below 1,500 feet above sea level over the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, or the Ledyard Bay Critical Habitat Area between July 1 and November 15, to the maximum extent practicable. If weather prevents attaining this altitude, aircraft will use pre-designated flight routes. Predesignated flight routes will be established by the lessee and MMS, in collaboration with the FWS, during review of the EP. Route or altitude deviations for emergencies or human safety shall be reported within 24 hr to MMS.

(B) Lighting Protocols. The following lighting requirements apply to activities conducted between April 15 and November 15 of each year.

(1) **Drilling Structures:** Lessees must adhere to lighting requirements for all exploration or delineation drilling structures so as to minimize the likelihood that migrating marine and coastal birds will strike these structures. Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration or delineation drilling structures to minimize the likelihood that birds will strike those structures. These requirements establish a coordinated process for a performance-based objective rather than pre-determined prescriptive requirements. The performance-based objective is to minimize the radiation of light outward from exploration/delineation structures while operating on a lease or if staged within nearshore Federal waters pending lease deployment.

Measures to be considered include but need not be limited to the following:

- Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;
- Types of lights;
- Adjustment of the number and intensity of lights as needed during specific activities;
- Dark paint colors for selected surfaces;
- Low-reflecting finishes or coverings for selected surfaces; and
- Facility or equipment configuration.

Lessees are encouraged to consider other technical, operational, and management approaches that could be applied to their specific facilities and operations to reduce outward light radiation. Lessees must provide MMS with a written statement of measures that will be or have been taken to meet the lighting objective, and must submit this information with an EP when it is submitted for regulatory review and approval pursuant to 30 CFR 250.203.

(2) **Support Vessels:** Surface support vessels will minimize the use of high-intensity work lights, especially when traversing the listed blocks and federal waters between the listed blocks and the coastline. Exterior lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they will be turned off. Interior lights and lights used during navigation could remain on for safety.

For the purpose of this stipulation, the listed blocks are as follows:

STIPULATION NO. 7
OIL AND GAS LEASE SALE 193, CHUKCHI SEA
LISTED BLOCKS

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Attachment B
Avian Collision Form

AVIAN COLLISION FORM

Observer (Name or Initials)		Vessel Name	

Collision Observations

Casualty ID*	Date/Time (dd/mm/yy /military)	Injury Status[1]	Species	Sex[2] (M, F, U)/Age[3] (A, J, U)	Cause of Strike	Injury Description (broken wing, etc.)		Photo ID[4]	Observer Comments
		D W U			□ Window □ Structure □ Light □ Other_____				
		D W U			□ Window □ Structure □ Light □ Other_____				
		D W U			□ Window □ Structure □ Light □ Other_____				
		D W U			□ Window □ Structure □ Light □ Other_____				
		D W U			□ Window □ Structure □ Light □ Other_____				
		D W U			□ Window □ Structure □ Light □ Other_____				

*For each new casualty, Create a unique ID value for each new casualty observed. Always start the ID with date (e.g. "020104DUCK" for injured duck found Feb. 1, 2004). Include additional info in ID as needed (e.g. "020104DUCK3" for 3rd injured duck found Feb. 1, 2004). "DUCK" refers to 4-letter species code.

[1] D= dead, W= wounded, U= unknown

[2] M= male, F= female, U = unknown

[3] A= adult, J= juvenile, U= unknown

[4] Name digital photo starting with CASUALTY ID and adding chronological number starting with 001

AVIAN COLLISION FORM

Casualty ID #[1]	Bird ID[2]	Observer	Vessel	Date Time Recorded	Time of Strike	Latitude	Longitude	Injury Status[3]	Sex[4]	Age[5]	Cause of Strike	Injury Description	Carcass Condition[6]	Bf[7]	Visibility[8]	Weather[9]	Sun Glare[10]	Ice Cover[11]	Photo ID[12]	Vessel Light Conditions[13]	Vessel Activity[14]	Observer Comments

[1] For each new casualty create a unique ID value for each casualty observed. Always start the ID with date YYYYMMDD (e.g."20120804DUCK" for injured duck found Aug. 04, 2012). Include additional information in the ID as needed (e.g. "20120804DUCK3" for 3rd injured duck found Aug. 04, 2012). "DUCK" refers to 4-letter species code (see Species 4-letter Code List in instructions).

[2] Use 4-letter species code. Identify to closest known taxa. Don't guess if unknown record- Unidentified Bird (UNBD).

[3] D = dead, W = wounded, U = unknown

[4] M = male, F = female, U = unknown

[5] A = adult, J = juvenile, U = unknown

[6] 0 - barely alive, 1 – very fresh (no rotten smell), 2 – slight decomposition but feathers still firmly attached, 3 – very decomposed, rotten (feathers falling off), 4 – very old, mummified (likely many weeks dead), 5 - alive.

[7] 0-7 or >7

[8] # km visible

[9] Dominate weather conditions over the last 24-hrs (e.g., wind 25-30 knots, snow)

[10] Record if sun glare was LI (Light), MO (Moderate), or SE (Severe) at time of strike. If glare conditions at time of strike is unknown put U.

[11] Percent ice cover visible around vessel at time of strike.

[12] Record the number of photos for an individual bird in a series using alphabetic letters starting with A. For example if you take four photos of a single DUCK note photo range as A-D. When labeling photos, name digital photo starting with CASUALTY ID, Vessel Name, and use alphabetic letters starting with A, B, C... (e.g. 20120804DUCK3_TorVikA).

[13] Vessel light conditions at time of strike: On, Off or Unknown

[14] See PSO handbook for codes