

PROPOSED ACTION: Issuance of an Incidental Harassment Authorization to BlueCrest Alaska Operating LLC, for the Incidental Take of Northern Sea Otters due to Drilling Activities in Cook Inlet, Alaska, 2016.

TYPE OF STATEMENT: Draft Environmental Assessment

LEAD AGENCY: U.S. Department of Interior
U.S. Fish and Wildlife Service

RESPONSIBLE OFFICIAL: Karen P. Clark, Acting Regional Director
Alaska Region
U.S. Fish and Wildlife Service

FOR FURTHER INFORMATION: Michael Hendrick
U.S. Fish and Wildlife Service
Alaska Region
Marine Mammals Management
1011 East Tudor Road, MS 341
Anchorage, Alaska 99503
907-786-3800

LOCATION: Cook Inlet, Alaska.

ABSTRACT: This draft Environmental Assessment analyzes the environmental impacts of the U.S. Fish and Wildlife Service, Alaska Region proposal to issue an Incidental Harassment Authorization, pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act, to BlueCrest Alaska Operating LLC, for the incidental take of small numbers of northern sea otters due to drilling activities in Cook Inlet, Alaska.

DATE: May 2016

Executive Summary

The U.S. Fish and Wildlife Service (Service) prepared this draft Environmental Assessment (EA) to determine whether the direct, indirect, and cumulative impacts related to the issuance of an Incidental Harassment Authorization (IHA) for incidental take of northern sea otters under the Marine Mammal Protection Act (MMPA) during the conduct of BlueCrest Alaska Operating, LLS (BlueCrest) exploratory drilling program in Cook Inlet, Alaska, could be significant. If we deem the potential impacts to be not significant, this analysis, in combination with other analyses incorporated by reference, may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed IHA.

The BlueCrest program includes drilling up to three wells with the total operation time of about 135 days. The exact timing of the project is dependent upon rig availability, but would occur in the summer operating season between April 15 and October 31, 2016.

This operation could acoustically harass local marine mammals, which is a form of take defined under the MMPA and it is subject to governance under MMPA. Incidental and unintentional harassment takes are permitted with the issuance of an IHA from the Service. Proposed project activities could harass local northern sea otters (*Enhydra lutris*).

The environmental analysis identified that the proposed project could impact local northern sea otters by impulsive acoustical harassment from the brief periods of conductor pipe driving and vertical seismic profiling (VSP) activities. However, the continuous underwater noise generated by BlueCrest's proposed drilling operations would expose northern sea otters for at most only a couple of minutes. The Service anticipates that the authorized taking of northern sea otters will not have an unmitigable impact on the availability of the species to a level insufficient for a harvest to meet subsistence uses. Additionally, the Service does not expect any direct loss or modification of northern sea otter habitat as part of the proposed project.

TABLE OF CONTENTS

Chapter 1	Introduction and Purpose and Need	1
1.1.	Description of Proposed Action.....	1
1.1.1.	Background on BlueCrest’s MMPA Petition.....	2
1.1.2.	Marine Mammals in the Action Area.....	3
1.2.	Purpose and Need	3
1.3.	The Environmental Review Process	4
1.3.1.	Laws, Regulations, or Other NEPA Analyses Influencing the EA’s Scope	5
1.3.2.	Scope of Environmental Analysis.....	6
1.3.3.	NEPA Public Scoping Summary	7
1.4.	Other Permits, Licenses, or Consultation Requirements	8
1.4.1.	National Environmental Policy Act	8
1.4.2.	Endangered Species Act.....	8
1.4.3.	Marine Mammal Protection Act.....	8
1.4.4.	Magnuson-Stevens Fishery Conservation and Management Act	8
Chapter 2	Alternatives.....	9
2.1.	Introduction.....	9
2.2.	Description of BlueCrest’s Proposed Activities	10
2.2.1.	Specified Time and Specified Area.....	10
2.2.2.	Exploratory Drilling Operations	10
2.3.	Description of Alternatives	13
2.3.1.	Alternative 1 – Issuance of an IHA with Mitigation Measures.....	13
2.3.2.	Alternative 2 – No Action Alternative	17
2.4.	Alternatives Considered but Eliminated from Further Consideration	17
Chapter 3	Affected Environment.....	18
3.1.	Physical Environment	18
3.2.	Biological Environment	18
3.3.	Socioeconomic Environment	19
Chapter 4	Environmental Consequences.....	20
4.1.	Effects of Alternative 1 – Issuance of an IHA with Mitigation Measures.....	20
4.1.1.	Impacts to Sea Otter Habitat	20
4.1.2.	Impacts to Sea Otters	21
4.1.3.	Impacts on Subsistence	23
4.2.	Effects of Alternative 2 – No Action Alternative	24
4.2.1.	Impacts to sea otter Habitat.....	24
4.2.2.	Impacts to Sea Otters	24
4.2.3.	Impacts to Subsistence	25
4.3.	Compliance with Necessary Laws – Necessary Federal Permits.....	25
4.4.	Unavoidable Adverse Impacts	25
4.5.	Cumulative Effects.....	25
4.5.1.	Subsistence Hunting.....	26
4.5.2.	Pollution.....	26
4.5.3.	Fisheries Interaction.....	26
4.5.4.	Gas and Oil Development	26
4.5.5.	Coastal Zone Development.....	27
4.5.6.	Sea Otter Research.....	27
4.5.7.	Climate Change.....	28
4.5.8.	Conclusion	29
Chapter 5	List of Preparers and Agencies Consulted.....	30
Chapter 6	Literature Cited.....	31

LIST OF ACRONYMS AND ABBREVIATIONS

BlueCrest	BlueCrest Alaska Operating LLC
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB re 1 μ Pa	decibel referenced to one microPascal
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EZ	Exclusion Zone
FONSI	Finding of No Significant Impact
ft	feet
FR	Federal Register
GHG	Greenhouse Gas
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
kHz	kilohertz
km	kilometer
km ²	square kilometer
m	meter
mi	miles
mi ²	square miles
MAI	Marine Acoustics Inc.
MMM	Marine Mammals Management
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
POA	Port of Anchorage
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
TTS	Temporary Threshold Shift
USCG	United States Coast Guard
USFWS	United State Fish and Wildlife Service
VSP	Vertical Seismic Profiling

Chapter 1 Introduction and Purpose and Need

1.1. Description of Proposed Action

The Marine Mammal Protection Act (MMPA) prohibits the taking of marine mammals, including northern sea otters (*Enhydra lutris kenyoni*); with take being defined as to ‘harass, hunt, capture, or kill, or to attempt to harass, hunt, capture, or kill any marine mammal’ (16 U.S.C. 1362(13)). There are exceptions to the MMPA’s prohibition on take. For example, individuals wishing to conduct scientific research or public display of marine mammals may seek a permit for their activities. Additionally, and upon request by citizens of the United States who engage in a specified activity (other than commercial fishing) within a specific geographic region, the MMPA directs the Service to authorize (under Section 101 (a)(5)(D)), for periods of not more than 1 year, subject to such conditions as necessary the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock by such citizens while engaging in that activity within that region. This EA analyzes the effects of the issuance of an Incidental Harassment Authorization (IHA) for the taking of small numbers of sea otters in the Cook Inlet near shore environment, as requested by BlueCrest Alaska Operating, LLC (BlueCrest).

We propose to issue an IHA to BlueCrest under the MMPA. This IHA, if finalized, would allow for the incidental taking of small numbers of northern sea otters, during their 2016 drilling season at BlueCrest’s Cosmopolitan State unit in lower Cook Inlet on State of Alaska Oil and Gas Lease 384403. We note that this Environmental Assessment (EA) does not consider BlueCrest’s exploratory drilling activities themselves, as that action is authorized by a different Federal Agency.

Our proposed action is a direct outcome of BlueCrest requesting an IHA under Section 101(a)(5)(D) of the MMPA to take marine mammals, by harassment, incidental to conducting an exploratory drilling program. The activities proposed by BlueCrest have the potential to take sea otters by exposing them to noise originating from the towing vessel propeller cavitations, deep-well pumps, conductor pipe driving, and vertical seismic profiling (VSP). We anticipate that the acoustic stimuli associated with these activities would result in take otherwise prohibited by the MMPA. BlueCrest therefore requires authorization for incidental take and has requested that we provide it through the issuance of an IHA under section 101(a)(5)(D) of the MMPA.

This Environmental Assessment (EA) is prepared in accordance with the National Environmental Policy Act (NEPA), as amended (42 U.S.C 4321) and the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508. This statute and the implementing regulations require that the Service, as a Federal agency:

- Assess the environmental impacts of any Proposed Action;
- Identify adverse environmental effects that cannot be avoided, should the Proposed Action be implemented;
- Evaluate alternatives to the Proposed Action, including a No Action Alternative; and
- Describe the cumulative impacts of the Proposed Action together with other past, present, and reasonably foreseeable future actions.

This EA, titled “*Issuance of an Incidental Harassment Authorization to BlueCrest Operating Alaska, LLC, for the Take of Marine Mammals Incidental to an Exploratory Drilling Program in Cook Inlet, Alaska,*” (hereinafter, BlueCrest EA) addresses the potential environmental impacts of two alternatives available to us under section 101(a)(5)(D) of the MMPA, namely:

- Issue the IHA to BlueCrest for Level B harassment take of marine mammals under the MMPA during their exploratory drilling program, taking into account the prescribed means of take, mitigation measures, and monitoring requirements required in the proposed IHA; or
- Under the No Action Alternative, BlueCrest could choose not to proceed with their proposed activities or to proceed without an IHA. The Service assumes that the activities would proceed and cause incidental take without the mitigation and monitoring measures prescribed in the proposed IHA. In this alternative, BlueCrest would not be exempt from the MMPA prohibitions against the take of sea otters and would be in violation of the MMPA if take of sea otters occurs.

1.1.1. Background on BlueCrest’s MMPA Petition

BlueCrest is proposing exploratory drilling that will be conducted within a 165-day operating time frame starting on April 15 and completed by October 31, 2016. It is expected that the program will take 135 days to complete. The program includes drilling up to three wells. The exact timing of the project will be dependent upon rig availability. In 2013, BlueCrest conducted exploratory oil and gas drilling at a well site in the lower Cook Inlet. Beginning in spring 2016, BlueCrest proposes to drill two more wells to tap these identified gas layers for production and a third well to collect geological information.

This request and proposed activities are similar in nature to those from the 2013 BlueCrest section 101(a)(5)(D) MMPA IHA request for takes of marine mammals incidental to exploratory drilling in Cook Inlet. Acoustic stimuli generated by the proposed programs deep-well pumps, conductor pipe driving, and VSP have the potential to cause behavioral disturbances to marine mammals in the proposed project area.

In September 2014, BlueCrest released its Cosmopolitan State 2013 Drilling Program Marine Mammal Monitoring and Mitigation 90-day Report. This report is similar in nature to what is discussed in section 2.3.1. of this draft EA. In the September 2014 report, BlueCrest reported that a total of 5,493 individual marine mammals observed in association with all monitored activities. Sea otters were the most common marine mammal recorded. A total of 4,969 sea otters were recorded from the stationary drill rig, and an additional 114 sea otters were observed inside Kachemak Bay during the rig tow. Relative to other activities, few otter groups were observed during the earlier season activities such as drive pipe operations (2 otters) and drilling operations (56 otters). Nearly 97 percent of the individuals were recorded during periods (including the drilling period) when the only significant sound source was the deep-well pump. A few otters were recorded during the periods drive pipe (2 individuals) and VSP (34 individuals) operations were occurring, (but none while the hammer or airguns were actually pounding or firing). During the rig tow from Homer 114 otters were observed, all inside

Kachemak Bay. None were observed within less than 4 m, the 160 dB harassment radius for the modeled propeller noise.

As part of the 2013 field season, the primary mitigation measure implemented was to shut down noise generating activities whenever a marine mammal was observed approaching or within a harassment zone. In some cases the marine mammal was first observed inside a harassment zone, or when other ongoing rig operations or communication issues prevented an immediate shutdown. All totaled, the deep-well pumps were shut down 131 times, of which 114 shut downs were for sea otters. The drive pipe hammering operation was shut down once for sea otters.

Of the marine mammals observed during the 2013 operations, more than 92 percent (5,083) were sea otters. Initially, encountering such large number of otters was an operational concern since many of these animals drifted to within the 120 dB harassment threshold (260 m radius) resulting in more than 100 shutdowns of the deep-well pumps in an attempt to avoid harassment take. However, the Service subsequently ruled that because sea otters do not effectively communicate or hear underwater, and spend the vast majority of the time with their head above water, harassment concerns from continuous or impulsive noises begin at received levels of 160 dB, not 120 dB. Since the deep-well pumps do not emit noise levels exceeding 160 dB re, no harassment takes from the pumps occurred.

1.1.2. Marine Mammals in the Action Area

The proposed exploratory drilling program could adversely affect northern sea otters, the only marine mammal species occurring in the Action Area that is under Service jurisdiction. All other marine mammals are addressed under a separate IHA petition submitted to the National Marine Fisheries Service (NMFS). Marine mammals analyzed as part of the IHA petition to NMFS include: beluga whale (*Delphinapterus leucas*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phoca vitulina*), humpback whales (*Megaptera novaeangliae*), minke whales (*Balaenoptera acutorostra*), gray whales (*Eschrichtius robustus*), killer whales (*Orcinus orca*), Dall's porpoise (*Phocoenoides dalli*), and Steller sea lions (*Eumetopia jubatus*).

1.2. Purpose and Need

The MMPA prohibits “takes” of marine mammals, with a number of specific exceptions. The applicable exception in this case is an authorization for incidental take by harassment of marine mammals in section 101(a)(5)(D) of the MMPA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Interior (Secretary) to authorize, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if we make certain findings and provide a notice of a proposed IHA to the public for review.

Purpose: The primary purpose of our proposed action—the issuance of an IHA to BlueCrest—is to authorize (pursuant to the MMPA) the non-lethal incidental take of small numbers of

northern sea otters that may occur during BlueCrest's proposed activities. The IHA, if issued, would provide BlueCrest an exemption to otherwise prohibited take under the MMPA, allowing the non-lethal incidental take by harassment of northern sea otters.

To authorize the take by harassment of small numbers of marine mammals in accordance with Section 101(a)(5)(D) of the MMPA, we must evaluate the best available scientific information to determine whether the take would have a negligible impact on marine mammals or stocks and not have an unmitigable impact on the availability of affected marine mammal species for certain subsistence uses. We cannot issue an IHA if it would result in more than a negligible impact on marine mammal species or stocks or if it would result in an unmitigable impact on subsistence.

In addition, we must prescribe, where applicable, the permissible methods of taking and other means of effecting the least practicable impact on the species or stocks of marine mammals and their habitat (i.e., mitigation), paying particular attention to pupping areas and other areas of similar significance. If appropriate, we must prescribe means of effecting the least practicable impact on the availability of the species or stocks of marine mammals for subsistence uses. An IHA must also include requirements or conditions pertaining to the monitoring and reporting of such taking in large part to better understand the effects of such taking on the species. Also, we must publish a notice of a proposed IHA in the *Federal Register* for public notice and comment.

The purpose of this EA is therefore to determine whether the take by harassment authorized by our issuing the requested IHA would have a negligible impact on affected marine mammal species or stocks, and would not have an unmitigable adverse impact on the availability of marine mammals for taking for subsistence uses.

Need: In November 2015, the U.S. Fish and Wildlife Service (Service) determined that BlueCrest had submitted an adequate and complete petition demonstrating both the need and potential eligibility for issuance of an IHA in connection with the activities described in section 1.1.1. The Service, under section 101(a)(5)(D) of the MMPA and its implementing regulations, has a corresponding duty to determine whether and how we can authorize take by Level B harassment incidental to the activities described in BlueCrest's petition.

Any alternatives considered under NEPA must meet the agency's statutory and regulatory requirements. Our described purpose and need guide us in developing reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects. Thus, we are developing alternative means of developing and issuing an IHA, which may require the applicant to include additional mitigation and monitoring measures in order for us to make our determinations under the MMPA.

1.3. The Environmental Review Process

We prepared this EA to determine whether the direct, indirect, and cumulative impacts related to the issuance of an IHA for incidental take of sea otters under the MMPA during the conduct of BlueCrest's exploratory drilling program in Cook Inlet, Alaska, could be significant. If we deem the potential impacts to be not significant, this analysis, in combination with other analyses

incorporated by reference, may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed IHA.

1.3.1. Laws, Regulations, or Other NEPA Analyses Influencing the EA's Scope

We have based the scope of the proposed project and nature of the two alternatives (i.e., issue the IHA including prescribed means of take, mitigation measures, and monitoring requirements; or not issue the IHA) considered in this EA on the relevant requirements in section 101(a)(5)(D) of the MMPA. Thus, our authority under the MMPA bounds the scope of our alternatives. After conducting an independent review of the information and analyses for sufficiency and adequacy, we incorporate by reference the relevant analyses on BlueCrest's proposed action as well as a discussion of the affected environment and environmental consequences within the following documents:

- Our notice of the proposed IHA on the following website:
<http://www.fws.gov/alaska/fisheries/mmm/iha.htm>.
- *Application for the Incidental Harassment Authorization for the Taking of Sea Otters in Conjunction with the BlueCrest Alaska Operating LLC Activities at Cosmopolitan State Unit, Alaska, 2016* (BlueCrest/Owl Ridge Natural Resource Consultants, Inc., November 2015);
- *Northern Sea Otter (Enhydra lutris kenyoni): Southcentral Alaska Stock* (USFWS 2014).

MMPA PETITION AND NOTICE OF THE PROPOSED IHA

The CEQ regulations (40 CFR §1502.25) encourage federal agencies to integrate NEPA's environmental review process with other environmental review laws. We rely substantially on the public process for developing proposed IHAs and evaluating relevant environmental information and provide a meaningful opportunity for public participation as we develop corresponding EAs. We fully consider public comments received in response to our publication of the notice of a proposed IHA during the corresponding NEPA process.

On May 13, 2016, we published a notice of a proposed IHA in the *Federal Register* (Docket FWS –R7–ES–2016–N036), which included the following:

- A detailed description of the proposed project and an assessment of the potential impacts on northern sea otters and the availability of northern sea otters for subsistence uses;
- Plans for BlueCrest's mitigation and monitoring measures to avoid and minimize potential adverse impacts to northern sea otters and their habitat and proposed reporting requirements; and
- Our preliminary findings.

We considered BlueCrest's proposed mitigation and monitoring measures that would affect the least practicable impact on northern sea otters including: (1) establishing 190-dB radii exclusion zones (exclusion zones will be established based on the zones of influence (ZOIs), areas ensonified by a specific sound level); for, respectively; (2) monitoring by protected species observers (PSOs) for northern sea otters that would enter established exclusion zones; (3) power-

down or shut-down of acoustic sources if a sea otter is sighted within or is about to enter the applicable exclusion zones; (4) ramping up sounds sources before the survey; and (5) delay power-ups until the 190-dB radii exclusion zone is clear of otters. Through the MMPA process, the Service preliminarily determined — provided that BlueCrest implements the required mitigation and monitoring measures — that the impact on northern sea otters of conducting the proposed exploratory drilling in Cook Inlet, Alaska, from April 15, through October 31, 2016, would result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of northern sea otters. Also through that process, we determined that the activity would not have an unmitigable adverse impact on the availability of northern sea otters for subsistence uses.

Note: Throughout this document dB used as an abbreviation for Decibels. However, it is important to note that in this context this is short for dB re 1 μ Pa at 1 m, or Decibels reference at 1 micro Pascal at 1 meter.

Within our notice, we requested that the public submit comments, information, and suggestions concerning BlueCrest's request, the content of our proposed IHA, and potential environmental effects related to the proposed issuance of the IHA. This BlueCrest EA incorporates by reference and relies on BlueCrest's application (BlueCrest/Owl Ridge Natural Resource Consultants, Inc., November 2015) and our notice of a proposed IHA (May 13, 2016).

In summary, those analyses concluded that with incorporation of monitoring and mitigation measures proposed by BlueCrest, the authorized taking of northern sea otters results in minor, short-term (recoverable) adverse effects on individual northern sea otters. Next, the IHA would not result in individually insignificant, but cumulatively significant impacts, or in cumulative adverse effects that could have a substantial effect on the target species or non-target species. The frequency and duration of the harassment associated with the exploratory drilling operations should allow adequate time for the northern sea otters to recover from potentially adverse effects. Further, the analyses concluded that the Service did not expect that additive or cumulative effects of the exploratory drilling on its own or in combination with other activities would occur. Finally, the environmental analyses did not identify any significant environmental issues or impacts.

1.3.2. Scope of Environmental Analysis

Given the limited scope of the decision for which the Service is responsible (*i.e.*, issue the IHA including prescribed means of take, and prescribed and additional mitigation measures and monitoring requirements; or not issue the IHA) this EA intends to provide more focused information on the primary issues and impacts of environmental concern related specifically to our issuance of the IHA. This EA does not further evaluate effects to the elements of the human environment listed in Table 1 because previous environmental reviews, incorporated by reference (NMFS 2008a,b, USFWS 2014a) have shown that our limited action of issuing an IHA to BlueCrest would not significantly affect those components of the human environment.

Table 1. Components of the human environment not affected by our issuance of an IHA.

Biological	Physical	Socioeconomic / Cultural
Amphibians	Air Quality	Commercial Fishing
Humans	Essential Fish Habitat	Military Activities
Non-Indigenous Species	Geography	Oil and Gas Activities
Seabirds	Land Use	Recreational Fishing
	Oceanography	Shipping and Boating
	State Marine Protected Areas	National Historic Preservation Sites
	Federal Marine Protected Areas	National Trails and Nationwide Inventory of Rivers
	National Estuarine Research Reserves	Low Income Populations
	National Marine Sanctuaries	Minority Populations
	Park Land	Indigenous Cultural Resources
	Prime Farmlands	Public Health and Safety
	Wetlands	Historic and Cultural Resources
	Wild and Scenic Rivers	
	Ecologically Critical Areas	

1.3.3. NEPA Public Scoping Summary

The Service has requested comments on the potential environmental impacts described in BlueCrest’s MMPA petition and in the *Federal Register* notice of the proposed IHA. The CEQ regulations further encourages agencies to integrate the NEPA review process with review under the environmental statutes. Consistent with agency practice we integrated our NEPA review and preparation of this EA with the public process required by the MMPA for the proposed issuance of an IHA.

The proposed IHA, combined with our preliminary determinations, supporting analyses, and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments to us for consideration in both the MMPA and NEPA decision-making processes.

The proposed IHA summarizes the proposed action; states that we would prepare an EA for the proposed action; and invites interested parties to submit written comments concerning the petition and our preliminary analyses and findings including those relevant to consideration in the EA. After the conclusion of the public comment and review process, we will incorporate public comments and post the final EA, and, if appropriate, FONSI, on our website at: <http://www.fws.gov/alaska/fisheries/mmm/iha.htm>.

1.4. Other Permits, Licenses, or Consultation Requirements

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.4.1. National Environmental Policy Act

Issuance of an IHA is subject to environmental review under NEPA. The Service may prepare an EA, an Environmental Impact Statement (EIS), or determine that the proposed action is categorically excluded from further review. While NEPA does not dictate substantive requirements for an IHA, it requires consideration of environmental issues in federal agency planning and decision making. The procedural provisions outlining federal agency responsibilities under NEPA are provided in the CEQ's implementing regulations (40 CFR §§1500-1508).

1.4.2. Endangered Species Act

Section 7 of the ESA and implementing regulations at 50 CFR §402 require consultation with the appropriate federal agency (either NMFS or the Service) for federal actions that "may affect" a listed species or critical habitat. The Services' issuance of an IHA affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Accordingly, the Service is required to ensure that its action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species. However, northern sea otters in the BlueCrest's proposed exploratory drilling area are not listed under ESA, and listed species under NMFS' jurisdiction are addressed in a separate IHA and EA process with that agency.

1.4.3. Marine Mammal Protection Act

The MMPA and its provisions that pertain to the proposed action are discussed above in section 1.2.

1.4.4. Magnuson-Stevens Fishery Conservation and Management Act

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. The EFH has been identified in Cook Inlet for walleye Pollock, rock sole, Pacific cod, skate, weathervane scallop, Pacific salmon, and sculpin. The Services' action of authorizing harassment of northern sea otters in the form of an IHA does not impact EFH; therefore, an EFH consultation was not conducted.

Chapter 2 Alternatives

2.1. Introduction

An EA must consider all reasonable alternatives, including Alternative 1 (Preferred Alternative). It must also consider the No Action Alternative, even if that alternative does not meet the stated purpose and need. This provides a baseline analysis against which we can compare the other alternatives.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, as we previously explained in Chapter 1 of this EA, an alternative only meets the purpose and need if it satisfies the requirements under section 101(a)(5)(D) of the MMPA. We evaluated each potential alternative against these criteria; identified two action alternatives along with the No Action Alternative; and carried these forward for evaluation in this EA.

Alternative 1 includes a suite of mitigation measures intended to minimize potentially adverse interactions with northern sea otters. Alternative 1 is described in this chapter.

As described in Section 1.2.1, we must prescribe the means of affecting the least practicable impact of northern sea otters and their habitat. In order to do so, we must consider BlueCrest's proposed mitigation measures, as well as other potential measures, and assess how such measures could benefit the affected species or stocks and their habitat. Our evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which, and the degree to which, we expect the successful implementation of the measure to minimize adverse impacts to northern sea otters; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Any additional mitigation measure proposed by us beyond what the applicant proposes should be able to or have a reasonable likelihood of accomplishing or contributing to the accomplishment of one or more of the following goals:

- Avoidance or minimization of sea otter injury, serious injury, or death wherever possible;
- A reduction in the numbers of northern sea otters taken (total number or number at biologically important time or location);
- A reduction in the number of times the activity takes individual northern sea otters (total number or number at biologically important time or location);
- A reduction in the intensity of the anticipated takes (either total number or number at biologically important time or location);
- Avoidance or minimization of adverse effects to sea otter habitat, paying special attention to the food base; activities that block or limit passage to or from biologically important areas; permanent destruction of habitat; or temporary destruction/disturbance of habitat during a biologically important time; and
- For monitoring directly related to mitigation, an increase in the probability of detecting northern sea otters, thus allowing for more effective implementation of the mitigation.

2.2. Description of BlueCrest’s Proposed Activities

We presented a general overview of BlueCrest’s proposed exploratory drilling activities in our *Federal Register* notice of a proposed IHA (May 13, 2016). We incorporate those descriptions by reference in this EA and briefly summarize them here.

2.2.1. Specified Time and Specified Area

In 2013, BlueCrest, then in partnership with Buccaneer Energy, conducted exploratory oil and gas drilling at the Cosmopolitan State #A-1 well site (then called Cosmopolitan State #1). Beginning in spring 2016, BlueCrest intends to drill two more wells (Cosmopolitan State #A-2 and #A-3) to tap these identified gas layers for production. These directionally drilled wells have top holes located a few meters from the original Cosmopolitan State #A-1, and together would feed to a future single offshore platform. Both #A-2 and #A-3 may involve test drilling into oil layers. A third well, #B-1, will be located approximately 1.7 kilometer (km) (1 mile [mi]) southeast of the other three wells. This well will be drilled into oil formations to collect geological information. After testing, the oil horizons will be plugged and abandoned, while the gas zones will be suspended pending platform construction. The program includes drilling up to three wells with the total operation time of about 135 days. The exact timing of the project is dependent upon rig availability, but would occur in the summer operating season between April 15 and October 31, 2016. See Table 2 below for exact well locations. Also refer to Figure 1 for project well locations.

Table 2 Locations of Cosmopolitan State well sites #A-1/#A-2/#A-3 and #B-1.

Well Name	Latitude	Longitude	Water Depth
Cosmopolitan State #A-1	N 59°53’13.0”	W 151°52’58.0”	23.8 m
Cosmopolitan State #A-2	N 59°53’13.1”	W 151°52’58.1”	23.8 m
Cosmopolitan State #A-3	N 59°53’13.2”	W 151°52’58.2”	23.8 m
Cosmopolitan State #B-1	N 59°52’12”	W 151°52’17”	20.7 m

2.2.2. Exploratory Drilling Operations

There are four elements of the drilling program that produce noise exceeding 160 dB: rig tow, deep-well pumps, conductor pipe driving, and VSP. The Service has determined that Level B disturbance harassment of northern sea otters can occur when the animals are exposed to underwater noise exceeding 160 dB, regardless of whether the noise is continuous or impulsive.

2.2.2.1. Rig Mobilization

The *Spartan 151* is likely to be moored at Port Graham over the winter of 2015/2016 where it will undergo maintenance and winterization. The intention is to move the drill rig to the Cosmopolitan State #B-1 well site at some point after April 15, a distance of about 50 km (31 mi). This will likely be accomplished within a 48-hour (hr) period. Any subsequent move will be controlled by the owner of the drilling rig. The rig will be towed between locations by ocean-

going tugs that are licensed to operate in Cook Inlet. All tow vessels will be United States Coast Guard (USCG) certified. Move plans will receive close scrutiny from the rig owner's tow master as well as the owner's insurers, and will be conducted in accordance with state and federal regulations. Rig moves will be conducted in a manner to minimize any potential risk regarding safety as well as cultural or environmental impact.

While under tow to the Cosmopolitan well sites, rig operations will be monitored by BlueCrest and the drilling contractor management. Very High Frequency radio, satellite, and cellular phone communication systems will be used while the rig is under tow. Helicopter transport will also be available. A description of helicopter operations is presented below. A certified marine surveyor will be monitoring during rig moves to ensure proper spatial orientation of the rig and well locations and the final rig position at set-down.

Tugs generate their loudest sounds while towing due to propeller cavitation. While these continuous sounds have been measured at up to 171 dB at 1-meter source (broadband), they are generally emitted at dominant frequencies of less than 5 kHz (Miles et al. 1987, Richardson et al. 1995, Simmonds et al. 2004). The distance to the 160 dB isopleth (the Level B disturbance criteria for sea otters) assuming a 171 dB source is only 5 meters (16 feet) using Collins et al.'s (2007) $18.4 \text{ Log}(R) - 0.00188R$ spreading model developed from Cook Inlet.

2.2.2.2. Deep-well Pumps

Because the drilling platform and other noise-generating equipment on the *Spartan 151* are located above the sea's surface, and there is very little surface contact with the water compared to drill ships and semi-submersible drill rigs, lattice-legged jack-up drill rigs are relatively quiet (Richardson et al. 1995, Spence et al. 2007). The *Spartan 151* was hydro-acoustically tested by MAI (2011). These tests revealed that the *Spartan 151* underwater noise levels from drilling were below ambient and generated noises that exceeded 120 dB only to about 50m, and there were not recordings of noises at 160 dB.

2.2.2.3. Conductor/Drive Pipe Driving

A drive pipe is a relatively short, large-diameter pipe driven into the sediment prior to the drilling of oil wells. This section of tubing serves to support the initial sedimentary part of the well, preventing the looser surface layer from collapsing and obstructing the wellbore. The pipe also facilitates the return of cuttings from the drill head. Drive pipes are usually installed using drilling, pile driving, or a combination of these techniques. In offshore wells, the conductor drive pipe is also used as a foundation for the surface diverter; a 20-inch conductor pipe is normally drilled through the drive pipe and supports the wellhead. BlueCrest proposes to drive approximately 60 meters (200 feet below mudline) of 76.2-centimeter (30-inch) pipe at Cosmopolitan #B-1 prior to drilling using a Delmar D62-22 impact hammer. This hammer has impact weight of 6,200 kg (13,640 pounds) and reaches maximum impact energy of 224 kilonewton-meters (165,215 foot-pounds) at a drop height of 3.6 meters (12 feet). Illingworth and Rodkin (2014) measured the hammer noise operating from the *Endeavour* in 2013 and found noise levels exceeding 160 dB out to 1.63 kilometers (disturbance zone) and 190 dB to 55 m (190 ft, injury zone).

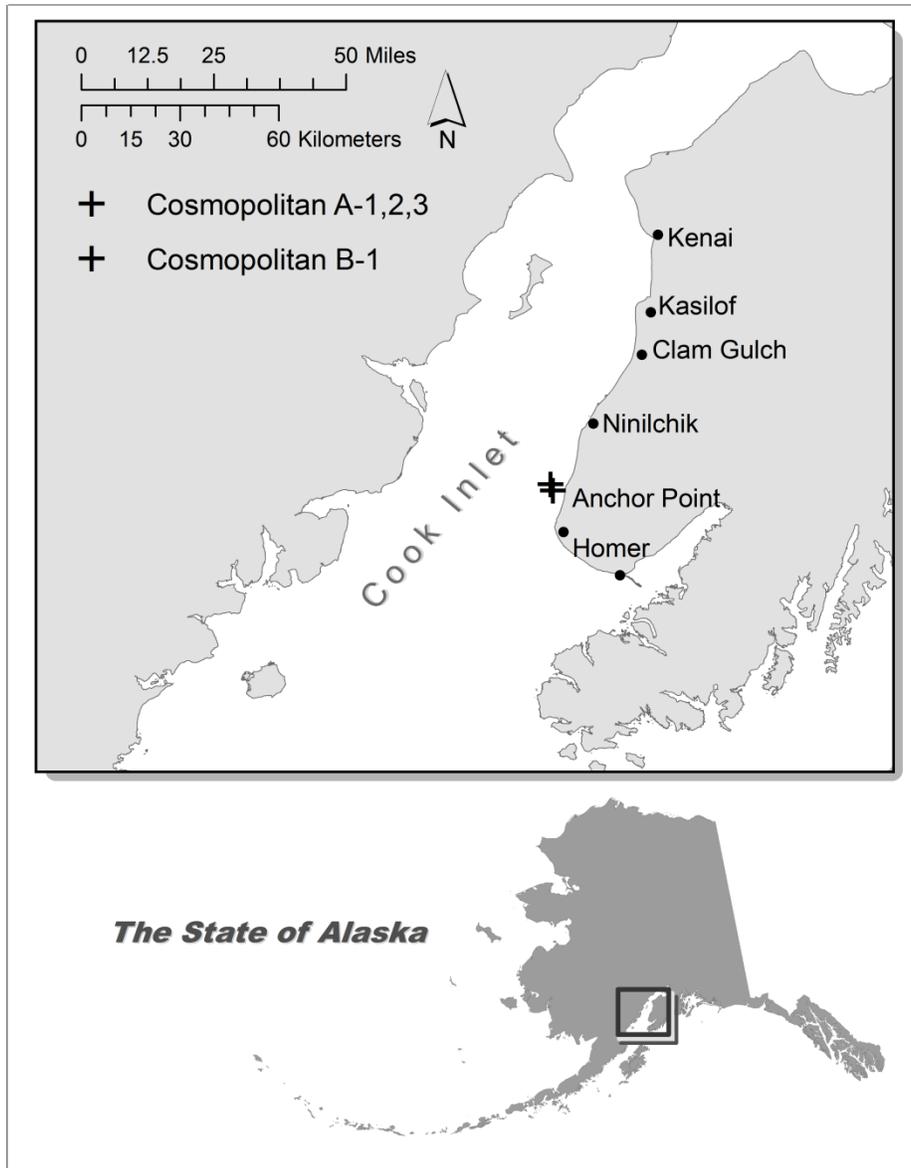


Figure 1. Proposed Project Area for BlueCrest's 2016 Exploratory Drilling Program (BlueCrest/Owl Ridge Natural Resource Consultants, Inc., November 2015)

2.2.2.4. Vertical Seismic Profile

Data on geological strata depth collected during initial seismic surveys at the surface can only be inferred. However, once a well is drilled, accurate follow-up seismic data can be collected by placing a receiver at known depths in the borehole and shooting a seismic airgun at the surface near the borehole. This gathered data provides not only high resolution images of the geological layers penetrated by the borehole, but can be used to accurately correlate (or correct) the original surface seismic data. The procedure is known as vertical seismic profiling, or VSP.

BlueCrest intends to conduct VSP operations at the end of drilling each well using an array of airguns with total volumes of between 600 and 880 cubic inches. Each VSP operation is expected to last less than 1 or 2 days. Illingworth and Rodkin (2014) measured noise levels associated with VSP conducted at Cosmopolitan State #A-1 in 2013. The results indicated that the 190 dB radius (Level A take threshold) from source was 75 meters (246 feet), and the 160 dB radius (Level B disturbance take threshold) at 2.47 kilometers (1.54 miles).

2.3. Description of Alternatives

2.3.1. Alternative 1 – Issuance of an IHA with Mitigation Measures

The Proposed Action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, we would issue an IHA (valid from June 13, 2016 through October 31, 2016) to BlueCrest allowing the incidental take, by Level B harassment, of northern sea otters subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the proposed IHA, along with any additions based on consideration of public comments. The mandatory mitigation and monitoring measures are a combination of those proposed by the applicant and the Service.

The proposed IHA analyzed the potential impacts of this Alternative in detail. We incorporate those analyses by reference in this EA and briefly summarize the mitigation and monitoring measures and reporting requirements that we would incorporate in the final IHA, if issued, in the following sections.

MITIGATION AND MONITORING MEASURES

To reduce the potential for disturbance from acoustic stimuli associated with the activities, BlueCrest has proposed to implement several monitoring and mitigation measures for northern sea otters. The Service has proposed some additional measures. The proposed monitoring and mitigation measures include:

- (1) The Service proposes the use of trained, vessel-based Protected Species Observers (PSOs) to visually watch for and monitor northern sea otters near the conductor pipe driving and VSP sound sources during daytime operations (from nautical twilight-dawn to nautical twilight-dusk) and before and during start-ups of sound sources day or night. The PSOs will record all northern sea otters observed inside the 160 dB authorized harassment zone (radius <3 meters for the deep-well pumps, 4 meters for the rig tow, 1.63 kilometers for the conductor pipe driving, and 2.47 kilometers for VSP). At least one PSO will be on each drill rig tow, and two PSO's will be working alternate shifts during all pipe driving and VSP operations. Conductor pipe driving and VSP activities will be limited to daylight hours, and when sea conditions are light to ensure marine mammal observation conditions will be generally good.
- (2) The Service proposes to establish a 190 dB "exclusion zone" (EZ) for northern sea otters before the conductor pipe driving and VSP is in operation. Based on the sound source verification study conducted by Illingworth and Rodkin (2014) on operations in 2013, the EZ for conductor pipe driving would have a radius of 55 meters while the EZ radius for

VSP would be 75 meters (the deep-well pumps and rig tow propellers do not generate noise exceeding 190 dB).

- (3) The Service and BlueCrest propose to have visual observations of the entire extent of the EZ using qualified PSOs, for at least 30 minutes (min) prior to initiating sound sources. If the PSO finds a sea otter within the EZ, BlueCrest must delay the noise production until the sea otter(s) has left the area. If the PSO sees a sea otter that surfaces, then dives below the surface, the PSO shall wait 10 minutes. If the PSO sees no northern sea otters during that time, they should assume that the animal has moved beyond the EZ.
- (4) The expected source levels from tugs during tow operations are expected to be less than 190 dB, thus there are no Level A injury concerns relative to noise. BlueCrest has estimated the distance to the 120 dB isopleth during tow operations. The 120 dB was used because this covers all marine mammals regardless of status or agency jurisdiction. The Service approves of the 120 dB measurements as its values are more restrictive than the 160 dB threshold for northern sea otters. The estimated distance to the 120 dB isopleth, assuming a 171 dB source (Richardson et al. 1995) and using Collins et al.'s (2007) 18.4 spreading model determined from Cook Inlet, is 523 m (1,712 ft). Because the ocean tugs will be under tow while they are generating noises of concern they will be traveling at very slow speeds (1 to 5 knots) providing sufficient time for marine mammals to move from the vicinity and avoid any possible injury take due to collision or noise exceeding injury thresholds. Altering courses or speeds to avoid harassment takes will be conducted when feasible, but completely shutting engines down would represent a safety concern given the inherent hazards of towing at sea.
- (5) Hydroacoustic tests conducted by MAI (2011) on the *Spartan 151* indicated that the lattice legs of the drill rig were preventing significant noise from entering the water column. MAI (2011) found that underwater noise levels associated with drilling did not exceed ambient, while the large power generators onboard the rig produced noise that exceeded 120 dB only out about 50 m.
- (6) Shutdown the sound source(s) if a sea otter is detected within, approaches, or enters the relevant EZ. A shutdown means all operating sound sources are shut down (*i.e.*, turned off).
- (7) Conductor pipe driving or VSP activity shall not resume until the PSO has visually observed the sea otter(s) exiting the EZ and is not likely to return, or has not been seen within the EZ for 10 min.
- (8) Following a shutdown and subsequent animal departure, survey operations may resume.

BlueCrest proposes marine mammal monitoring in order to implement the mitigation measures that require real-time monitoring and to satisfy the monitoring requirements of the IHA. The PSOs would monitor the area for northern sea otters during all activities. Monitoring would be conducted from the source vessels and attending mitigation vessel. Monitoring data would include the following:

- (1) Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from drill rig, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc., and including responses to ramp-up), and behavioral pace; and

- (2) Time, location, heading, speed, activity of the vessel (including number of airguns operating and whether in state of ramp-up or power-down), Beaufort Sea state and wind force, visibility, and sun glare. These data shall also be recorded at the start and end of each observation watch and during a watch whenever there is a change in one or more of the variables.

REPORTING MEASURES

BlueCrest would prepare daily field reports that include daily activities, marine mammal monitoring efforts, and a record of the marine mammals, and their behaviors and reactions.

Activity reports would be submitted to the Service within 72 hours of completing each of the following activities: rig tow, conductor pipe driving, and VSP. The monthly report will summarize the daily field reports, activity reports and will contain the following information:

- (1) Dates, times, locations, heading, speed, weather, sea conditions (including Beaufort sea state and wind force), and associated activities during all exploratory drilling operations and marine mammal sightings;
- (2) Species, number, location, distance from the vessel, and behavior of any northern sea otters, as well as associated noise activity (number of power-downs and shutdowns), observed throughout all monitoring activities;
- (3) An estimate of the number of northern sea otters that have been exposed to the noise activity (based on visual observation) at received levels greater than or equal to 160 dB and 190 dB with a discussion of any specific behaviors those individuals exhibited.
- (4) A description of the implementation and effectiveness of the mitigation measures of the IHA.

After conclusion of the exploratory drilling and the effectiveness of the IHA, BlueCrest would submit a draft Monitoring Report on all activities and monitoring results to the Service Marine Mammals Management Office (MMM) within 90 days. The Monitoring Report would include:

- (1) Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of northern sea otters);
- (2) Analyses of the effects of various factors influencing detectability of northern sea otters (e.g., sea state, number of observers, and fog/glare);
- (3) Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover;
- (4) Analyses of the effects of survey operations; and
- (5) Sighting rates of northern sea otters during periods with and without exploratory drilling activities (and other variables that could affect detectability), such as: (A) initial sighting distances versus survey activity state; (B) closest point of approach versus survey activity state; (C) observed behaviors and types of movements versus survey activity state; (D) numbers of sightings/individuals seen versus survey activity state; (E) distribution around

the source vessels versus survey activity state; and (F) estimates of take by Level B harassment based on presence in the 160 dB harassment zone.

The Service would review the draft 90-day Monitoring Report. BlueCrest must then submit a final report to the Service within 30 days after receiving comments from the Service on the draft report. If the Service decides that the draft report needs no comments, the draft report shall be considered to be the final report. The September 2014 BlueCrest Cosmopolitan State 2013 Drilling Program Marine Mammal Monitoring and Mitigation 90-day Report, is used as a reference to model future releases of Monitoring Reports.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not authorized by this IHA, such as an injury (Level A harassment), serious injury, or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), BlueCrest shall immediately cease the specified activities and immediately report the incident to the Service MMM. The report must include the following information:

- (1) Time, date, and location (latitude/longitude) of the incident;
- (2) The name and type of vessel involved;
- (3) The vessel's speed during and leading up to the incident;
- (4) Description of the incident;
- (5) Status of all sound source use in the 24 hours preceding the incident;
- (6) Water depth;
- (7) Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- (8) Description of sea otter observations in the 24 hours preceding the incident;
- (9) Species identification or description of the animal(s) involved;
- (10) The fate of the animal(s); and
- (11) Photographs or video footage of the animal (if equipment is available).

Activities shall not resume until the Service is able to review the circumstances of the prohibited take. The Service shall work with BlueCrest to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. BlueCrest may not resume their activities until notified by the Service via letter or email, or telephone.

In the event that BlueCrest discovers an injured or dead marine mammal, and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as described in the next paragraph), BlueCrest would immediately report the incident to the Service MMM. Activities may continue while the Service reviews the circumstances of the incident. The Service would work with BlueCrest to determine whether modifications in the activities are appropriate.

In the event that BlueCrest discovers an injured or dead marine mammal, regardless of whether or not the PSO concludes that the injury or death is not associated with or related to the authorized activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), BlueCrest shall report the incident to the Service MMM within 24 hours of the discovery. BlueCrest shall provide photographs or video footage (if

available) or other documentation of the stranded animal sighting to the Service. Activities may continue while the Service reviews the circumstances of the incident.

In our *Federal Register* notice of proposed IHA, which we incorporate by reference, we preliminarily determined that the measures included in the proposed IHA were sufficient to reduce the effects of BlueCrest's activity on northern sea otters to the level of least practicable impact. In addition, we described our analysis of impacts and preliminarily determined that the taking of small numbers of northern sea otters incidental to BlueCrest's action would have a negligible impact on the relevant species or stocks and would not have an unmitigable adverse impact on affected species or stocks for taking for subsistence uses.

The Preferred Alternative would satisfy the purpose and need of our proposed action under the MMPA—issuance of an IHA, along with required mitigation measures and monitoring that meets the standards set forth in section 101(a)(5)(D) of the MMPA and the implementing regulations.

2.3.2. Alternative 2 – No Action Alternative

We are required to evaluate the No Action Alternative per CEQ NEPA regulations. The No Action Alternative serves as a baseline to compare the impacts of the Preferred and other Alternatives. Under the No Action Alternative, BlueCrest could choose not to proceed with their proposed activities or to proceed without an IHA. If they choose the latter, BlueCrest would not be exempt from the MMPA prohibitions against the take of northern sea otters and would be in violation of the MMPA if take of northern sea otters occurs.

For purposes of this EA, we characterize the No Action Alternative as BlueCrest not receiving an IHA and BlueCrest conducting the Cook Inlet exploratory drilling program without the protective measures and reporting requirements required by an IHA under the MMPA. We take this approach to meaningfully evaluate the primary environmental issues—the impact on northern sea otters from these activities in the absence of protective measures.

2.4. Alternatives Considered but Eliminated from Further Consideration

The Service considered whether other alternatives could meet the purpose and need and support BlueCrest's proposed activities. An alternative that would allow for the issuance of an IHA with no required mitigation or monitoring was considered but eliminated from consideration, as it would not be in compliance with the MMPA and therefore would not meet the purpose and need. For that reason, this alternative is not analyzed further in this document.

Chapter 3 Affected Environment

This chapter describes existing conditions in the proposed action area. Descriptions of the physical, biological, and social environment of the action area are contained in Chapter 1 of this BlueCrest EA. We incorporate those descriptions by reference and summarize or supplement the relevant sections for northern sea otters in the following subchapters.

3.1. Physical Environment

As discussed in Chapter 1, our proposed action and alternative relate only to the authorization of incidental take of northern sea otters. Certain aspects of the physical environment are not relevant to our proposed action (see subchapter 1.3.2 - Scope of Environmental Analysis). We briefly summarize the physical components of the environment here.

We presented information on sea otter habitat and the potential impacts to sea otter habitat in the *Federal Register* notice of the proposed IHA.

3.2. Biological Environment

Cook Inlet is within the range of the Southcentral stock of the northern sea otter. The estimated abundance of the Southcentral sea otter stock is approximately 18,000 northern sea otters. Approximately 6,904 otters from this stock are presumed to use Cook Inlet (USFWS 2014). For purposes of this IHA petition, sea otter habitat is defined as the 60-km coastline between Anchor Point and Clam Gulch, and to 5 km offshore.

Based on the proposed activity area, this EA addresses whether the direct, indirect, and cumulative impacts related to the issuance of an IHA for incidental take of northern sea otters under the MMPA during the proposed BlueCrest exploratory drilling program. The BlueCrest exploratory drilling program has the potential to acoustically impact the Southcentral Alaska stock of the northern sea otter that inhabits the eastern shoreline of lower Cook Inlet. This stock is classified as “non-strategic” as the level of direct human-caused mortality does not exceed the Potential Biological Removal (PBR), and it is neither listed as “depleted” under MMPA, nor as “threatened” or “endangered” under the Federal Endangered Species Act.

There are no published sea otter estimates for the specified project area. Surveys suggest for most of the year, few otters inhabit waters north of Anchor Point (Rugh et al. 2005; Larned 2006; Gill et al. 2009; Doroff and Badajos 2010). Gill et al. (2009) did not survey north of Anchor Point, but did find rafts of dozens of otters along their transect line closest to Anchor Point during August, but not during May or February. Doroff and Badajos (2010) tracked 44 radio-tagged northern sea otters for 3 years, and did not locate any otters outside of Kachemak Bay other than a male that was subsistence harvested by a Ninilchik villager (although the exact location of harvest is unknown). During June surveys for beluga whales conducted between 1993 and 2004, Rugh et al. (2005) recorded 2,111 northern sea otters in lower Cook Inlet, but virtually none north of Anchor Point (even though the length of the Kenai Peninsula was surveyed each year).

Recent (2013) marine mammal monitoring (for the Cosmopolitan State exploratory drilling program) conducted 5 km (3 mi) offshore of Cape Starichkof revealed that during August, up to 481 northern sea otters (median of 72 northern sea otters) were found riding the tides between Anchor Point and some point well north of Cape Starichkof (Owl Ridge NRC 2014). It is likely that this late summer phenomenon is a result of seasonal weather conditions that allow northern sea otters to safely ride the daily tides to foraging grounds outside Kachemak Bay. Since none of the previous surveys were conducted during the fall, it is unknown how late into fall large numbers of northern sea otters are found north of Anchor Point. Doroff and Badajos (2010) could not locate 10 of the radio-tagged northern sea otters in August 2009 but these were subsequently found in September 2009. It is possible that these northern sea otters had moved north of Anchor Point (outside the study area) during August, only to return to Kachemak Bay in September. The primary concern with northern sea otters is where planned seismic activities might overlap with seasonal northern sea otter use north of Anchor Point in August. The proposed exploratory drilling will not occur after October 31, 2016, thus northern sea otter use after that date is not relevant to this IHA.

Biological information for the Southcentral stock of northern sea otters can be found in the Service's Stock Assessment Report for the Southcentral Stock of Northern Sea Otters (USFWS 2014a) (<http://www.fws.gov/alaska/fisheries/mmm/seaotters/reports.htm>).

3.3. Socioeconomic Environment

The proposed exploratory drilling activities will occur near the marine subsistence areas used by the villages of Homer and Ninilchik. The MMPA permits Alaska Natives to harvest sea otters for subsistence purposes or for the purposes of creating authentic Native articles of handicrafts and clothing, provided this is accomplished in a non-wasteful manner. Data from the Service's Marine Mammal Marking, Tagging, and Reporting Program (MTRP) indicates that between 1989 and 2015 (27 years), Alaska Natives harvested a total of 715 otters hunting from the community of Homer, while Port Graham reported 215, Seldovia 122, Nanwalek 39, Kenai 31, and Ninilchik 16 otters harvested (USFWS MTRP unpublished data); the mean reported annual subsistence take from 2009 through 2015 from Homer, Port Graham, Seldovia, Nanwalek, Kenai, and Ninilchik of northern sea otters in or near the proposed project areas was 239 animals (USFWS MTRP unpublished data).

BlueCrest's planned exploratory drilling activities are limited in impact, geographic scope, and time. Moreover, the impact of the activities is unlikely to affect any sea otter sufficient to render it unavailable for subsistence harvest in the future. BlueCrest has reached out and coordinated with local communities, as well as Kenai Peninsula Borough and Cook Inlet Region, Inc. Further, any observed sea otter interactions with the BlueCrest operations deemed potentially harmful to the northern sea otters will be immediately reported by BlueCrest or their representative to the Service. For these reasons, we conclude that these activities will not impact the availability of northern sea otters for subsistence harvest in Cook Inlet nor will the activities affect northern sea otters sufficiently to alter availability for subsistence harvest in the future.

Chapter 4 Environmental Consequences

This chapter of the EA analyzes the impacts of the two alternatives and addresses the potential direct, indirect, and cumulative impacts of our issuance of an IHA. BlueCrest's petition, our notice of a proposed IHA, and other related environmental analyses identified previously, facilitate an analysis of the direct, indirect, and cumulative effects of our proposed issuance of an IHA.

Under the MMPA, we have evaluated the potential impacts of BlueCrest's exploratory drilling activities in order to determine whether to authorize incidental take by harassment of northern sea otters. Under NEPA, we have determined that an EA is appropriate to evaluate the potential significance of environmental impacts resulting from the issuance of our IHA.

4.1. Effects of Alternative 1 – Issuance of an IHA with Mitigation Measures

Alternative 1 is the Preferred Alternative where we would issue an IHA to BlueCrest allowing the incidental take, by Level B harassment, of northern sea otters from June 13, 2016, to October 31, 2016, subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the IHA. We would incorporate the mitigation and monitoring measures and reporting described earlier in this EA into a final IHA.

4.1.1. Impacts to Sea Otter Habitat

BlueCrest's proposed exploratory drilling area is not located within a marine sanctuary or a National Park. State wildlife conservation areas have been designated in Cook Inlet; however, those occur mostly on land with some portions along the coasts and would not be impacted by our proposed action of the issuance of an IHA to take northern sea otters. The proposed exploratory drilling would minimally add to vessel traffic in the region. The proposed activities would not result in substantial damage to ocean and coastal habitats that might constitute sea otter habitat.

The potential direct habitat impact by the BlueCrest drilling operation is limited to the actual drill-rig footprint defined as the area occupied and enclosed by the drill-rig legs. This area was calculated as 0.22 hectares (ha) (0.54 ac) during the land use permitting process. The collective 0.8-ha (2-ac) footprint of the well represents a very small fraction of the 18,950-km² (7,300-mi²) Cook Inlet surface area. Potential damage to the Cook Inlet benthic community will be limited, however, to the actual surface area of the three spud cans (collective total of 442 m² [4,755 ft²]) that form the "foot" of each leg. Given the high tidal energy at the well site locations, drilling footprints are not expected to support benthic communities equivalent to shallow lower energy sites found in nearshore waters where harbor seals mostly feed.

Acoustical effects to prey resources are also limited. Christian et al. (2004) studied seismic energy impacts on male snow crabs (*Chionoecetes* sp.) and found no significant increases in physiological stress due to exposure. No acoustical impact studies have been conducted to date on the above fish species, but studies have been conducted on Atlantic cod (*Gadus morhua*) and sardine (family Clupeidae). Davis et al. (1998) cited various studies which found little effect to

Atlantic cod eggs, larvae, and fry when received levels were 222 dB. What effects were found were to larval fish within about 5 m (16.4 ft), and from air guns with volumes between 3,000 and 4,000 in³. Alternatively, effects to sardine were greatest on eggs and 2-day larvae, and were greatest at 0.5 m (1.64 ft) - again confined to 5 m (16.4 ft). Further, Greenlaw et al. (1988) found no evidence of gross histological damage to eggs and larvae of northern anchovy (*Engraulis mordax*) exposed to seismic air guns, and concluded that noticeable effects would result only from multiple, close exposures. Based on these results, impulsive conductor pipe driving and VSP could acoustically impact local marine communities, but only out to about 2 or 3 m (6 to 9 ft) at most. From an ecological community standpoint, these impacts are considered minor.

The Service does not anticipate that the exploratory drilling operations would physically alter the marine environment or negatively impact the physical environment in the proposed action area. The IHA would not impact physical habitat features, such as substrates and/or water quality. More information on potential impacts to marine mammal habitat is contained in BlueCrest's petition (BlueCrest/Owl Ridge Natural Resource Consultants, Inc., November 2015) and our proposed IHA notice, which are incorporated herein by reference.

4.1.2. Impacts to Sea Otters

We expect that disturbance from acoustic stimuli associated with the exploratory drilling program have the potential to impact marine mammals. Acoustic stimuli generated by the vessel propellers, deep-well pumps, conductor pipe driving, and VSP may affect sea otters in one or more of the following way: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995). Our notice of proposed IHA and BlueCrest's petition (BlueCrest/Owl Ridge Natural Resource Consultants, November 2015) provide detailed descriptions of these potential effects of exploratory drilling operations on sea otters. That information is incorporated herein by reference and summarized next.

Previous work suggests that sea otters may be less responsive to marine seismic pulses than some other marine mammals, such as mysticetes and odontocetes. Riedman (1983, 1984) monitored the behavior of sea otters along the California coast while they were exposed to a single 100-cubic-inch air gun and a 4,089-cubic-inch air gun array. No disturbance reactions were evident when the air gun array was as close as 0.9 kilometers. Sea otters also did not respond noticeably to the single air gun. Sea otters spend a great deal of time at the surface feeding and grooming (Riedman 1983, 1984; Wolt et al. 2012). While at the surface, the potential noise exposure of sea otters would be much reduced by pressure-release and interference (Lloyd's mirror) effects at the surface (Greene and Richardson 1988; Richardson et al. 1995). Finally, the average dive time of a northern sea otter has been measured at only 85 seconds (Bodkin et al. 2004) to 149 seconds (Wolt et al. 2012), thereby limiting exposure during active seismic operations.

Noise has the potential to induce temporary threshold shift (TTS) or permanent threshold shift (PTS) hearing loss (Weilgart 2007). The level of loss is dependent on sound frequency, intensity, and duration. Similar to masking, hearing loss reduces the ability for marine mammals to forage efficiently, maintain social cohesion, and avoid predators (Weilgart 2007).

The TTS could occur as a result of BlueCrest's exploratory drilling operations, but there is no information on TTS impacts to sea otters, an animal that spends much time at the surface. The average dive time of a northern sea otter, the period the otter's ears would be underwater and exposed to underwater sounds, is only 85 seconds (Bodkin et al. 2004) to 149 seconds (Wolt et al. 2012). Wolt et al. (2012) found Prince William Sound northern sea otters to average 8.6 dives per feeding. Multiplied by the average dive time (149 seconds), the average total time a sea otter spends underwater during a feeding bout is about 21 minutes, or 12 to 18 percent of the time of a typical 2 to 3 hour slack-tide seismic shoot. Except for loud screams between pups and mothers (McShane et al. 1995), sea otters do not appear to communicate vocally, either at the surface or under water, and they do not use sound to detect prey. Thus, any TTS due to seismic noise is unlikely to mask communication or reduce foraging efficiency. Finally, sea otters are unlikely to rely on sound to detect and avoid predators. For example, sea otters at the surface are not likely to hear killer whale vocalizations.

The PTS occurs when continuous noise exposure causes hairs within the inner ear system to die. This can occur due to moderate durations of very loud noise levels, or long-term continuous exposure of moderate noise levels. However, PTS is also not an issue with sea otters and impulsive seismic noise. Sea otter exposure to underwater noises generated by vessels (propellers) would be of very short duration because the average dive time of a northern sea otter is only 85 seconds (Bodkin et al. 2004) to 149 seconds (Wolt et al. 2012).

Airborne exposure is also of little concern since pressure release and Lloyd's mirror-effect will reduce underwater seismic noise transmitted to the air. Riedman's (1983, 1984) observations of sea otters lack of reaction to seismic noise was likely due largely to these transmission limits.

Masking occurs when louder noises interfere with marine mammal vocalizations or their ability to hear natural sounds in their environment (Richardson et al. 1995). These noise levels limit their ability to communicate and/or avoid predation or other natural hazards. However, as mentioned above, sea otters do not vocally communicate underwater (Ghoul and Reichmuth 2012) and masking due to exposure to underwater noise is not relevant.

Sea otters do communicate above water with the loud screams between separated mothers and pups of most importance (McShane et al. 1995). Ghoul and Reichmuth (2012) measured these vocalizations and found that the intensity of these calls ranged between 50 and 113 dB, and were loud enough that they can be heard by humans at distances exceeding 1 kilometer (McShane et al. 1995).

Injury: BlueCrest did not request authorization to take northern sea otters by injury (Level A harassment), serious injury, or mortality. Based on the results of our analyses, BlueCrest's environmental analyses, and previous monitoring reports for the same activities, there is no evidence that BlueCrest's planned activities could result in injury, serious injury, or mortality within the proposed action area. The required mitigation and monitoring measures would minimize potential risk for northern sea otters.

Vessel Strikes: The potential for striking northern sea otters is generally not a concern with vessel traffic. Furthermore, based on the limited vessel traffic associated with this proposed project and the relatively slow speeds of said vessels, it is unlikely that there will be any marine mammal impacts.

Estimated Take of Sea Otters by Level B Incidental Harassment: BlueCrest has requested take by Level B harassment as a result of the acoustic stimuli generated by their proposed exploratory drilling. We expect that the survey would cause a short-term behavioral disturbance for northern sea otters in the proposed areas.

As mentioned previously, we estimate that the activities could potentially affect, by Level B harassment only, northern sea otters under our jurisdiction. The total number of northern sea otters that could potentially be taken (Level B) by harassment in association with the proposed activity is 388, which is about two percent of an estimated population size of 18,000 (USFWS 2014). Our proposed IHA notice and BlueCrest's petition (BlueCrest/Owl Ridge Natural Resource Consultants, November 2015) contain descriptions of how these take estimates were derived.

4.1.3. Impacts on Subsistence

Under the Alternative 1 (the Preferred Alternative), BlueCrest's exploratory drilling in the Cook Inlet is expected to have minor and temporary effects on subsistence wildlife and sea otters in the area. Sound generated from rig towing, deep-well pumps, conductor pipe driving, and VSP might temporarily displace wildlife from the area, but animals are expected to return to the area following the cessation of use of sound sources during survey activities. Residents of the villages of Homer and Ninilchik are the primary marine mammal subsistence users in the Action Area. Sea otter subsistence harvest is allowed under Section 109 of the MMPA, as long as the harvest is not wasteful. All otters harvested are to be reported to the Service within 30 days where the pelt is tagged. See Section 3.3.1. for more information.

BlueCrest concluded, and the Service agrees, that the size of the affected area, mitigation measures, and input from the consultations from Alaska Natives should result in the proposed action having no unmitigable adverse impact on the availability of sea otters for subsistence uses. BlueCrest and the Service recognize the importance of ensuring that Alaska Native Organizations and federally recognized tribes are informed, engaged, and involved during the permitting process and BlueCrest will continue to work with the Alaska Native Organizations and tribes to discuss their operations and activities. BlueCrest has reached out and coordinated with numerous communities including the cities and villages of Homer, Port Graham, Kenai, Seldovia, Soldotna, and Ninilchik, as well as Kenai Peninsula Borough, Cook Inlet Region, Inc., Cook Inlet Keeper, United Cook Inlet Drift Association, and the Chugach Alaska Services.

The Service anticipates that any effects from BlueCrest's proposed exploratory drilling activities on northern sea otters would be short-term, site specific, and limited to inconsequential changes in behavior and mild stress responses. The Service does not anticipate that the authorized taking of northern sea otters would reduce the availability of the species to a level insufficient for a harvest to meet subsistence uses by: (1) Causing the northern sea otters to abandon or avoid

hunting areas; (2) directly displacing subsistence users; or (3) placing physical barriers between the northern sea otters and the subsistence hunters; and that cannot be sufficiently mitigated by other measures to increase the availability of northern sea otters to allow subsistence uses to be met.

4.2. Effects of Alternative 2 – No Action Alternative

Under the No Action Alternative, we would not issue an IHA to BlueCrest. As a result, BlueCrest would not receive an exemption from the MMPA prohibitions against the take of northern sea otters and would, if they proceeded with their activities, be in violation of the MMPA if take of northern sea otters occurs.

The impacts to elements of the human environment resulting from the No Action alternative—conducting the exploratory drilling program in the absence of required protective measures for northern sea otters under the MMPA—would be greater than those impacts resulting from Alternative 1, the Preferred Alternative.

4.2.1. Impacts to sea otter Habitat

Under the No Action Alternative, the survey would have no additive effects on the physical environment beyond those resulting from BlueCrest’s activities, which we evaluated in the referenced documents. This Alternative would result in similar effects on the physical environment as Alternative 1.

4.2.2. Impacts to Sea Otters

Under the No Action Alternative, BlueCrest’s activities would likely result in increased amounts of Level B harassment to northern sea otters and possibly takes by injury (Level A harassment), serious injury, or mortality—specifically related to acoustic stimuli—due to the absence of mitigation and monitoring measures required under the IHA. While it is difficult to provide an exact number of takes that might occur under the No Action Alternative, the numbers would be expected to be larger than those presented above because BlueCrest would not be restricted in the total area that could be surveyed and would not be required to abide by the IHA start and end date restrictions.

If the activities proceeded without the protective measures and reporting requirements required by a final IHA under the MMPA, the direct, indirect, or cumulative effects on the human or natural environment of not issuing the IHA would include the following:

- Northern sea otters within the survey area could experience injury (Level A harassment) and potentially serious injury or mortality. The lack of mitigation measures required in the IHA could lead to not shutting down conductor pipe driving or VSP activities when northern sea otters are within applicable injury harassment zones;
- Increases in the number of behavioral responses and frequency of changes in animal distribution because of the lack of mitigation measures required in the IHA. Thus, the

incidental take of northern sea otters would likely occur at higher levels than we have already identified and evaluated in our *Federal Register* notice on the proposed IHA; and

- We would not be able to obtain the monitoring and reporting data needed to assess the anticipated impact of the activity upon the species or stock; and increased knowledge of the species as required under the MMPA.

4.2.3. Impacts to Subsistence

Under the No Action Alternative, BlueCrest would not be required to ensure availability of sea otters for subsistence uses and would not be required to implement mitigation measures to that effect.

4.3. Compliance with Necessary Laws – Necessary Federal Permits

We have determined that the issuance of an IHA is consistent with the applicable requirements of the MMPA, ESA, and our regulations. Please refer to Section 1.4 of this BlueCrest EA for more information.

4.4. Unavoidable Adverse Impacts

BlueCrest’s petition, our notice of a proposed IHA, and other environmental analyses identified previously summarize unavoidable adverse impacts to northern sea otters or the populations to which they belong or on their habitats, as well as subsistence uses of northern sea otters, occurring in the exploratory drilling proposed action area. We incorporate those documents by reference.

We acknowledge that the incidental take authorized would potentially result in unavoidable adverse impacts. However, we do not expect BlueCrest’s activities to have adverse consequences on the viability of northern sea otters in Cook Inlet or on the availability of northern sea otters for subsistence uses, and we do not expect the sea otter populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. We expect that the numbers of individuals of northern sea otters taken by harassment would be small (relative to species or stock abundance), that the exploratory drilling and the take resulting from the exploratory drilling activities would have a negligible impact on northern sea otters, and that there would not be an unmitigable adverse impact to subsistence uses of northern sea otters in Cook Inlet.

4.5. Cumulative Effects

The NEPA defines cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR §1508.7). Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

The Cook Inlet region is a major population center in the State of Alaska and supports a wide range of activities. The proposed exploratory drilling would add another, albeit temporary, industrial activity to upper Cook Inlet. This activity would be limited to a small area of the upper Inlet for a relatively short period of time, and there would be no objects or materials permanently released into the water column. This section provides a brief summary of the human-related activities affecting northern sea otters in the action area.

4.5.1. Subsistence Hunting

As mentioned previously, BlueCrest's proposed exploratory drilling will not measurably impact otters that annually occur near villages for subsistence harvest.

4.5.2. Pollution

As the population in urban areas continue to grow, an increase in amount of pollutants that enter Cook Inlet is likely to occur. Sources of pollutants in urban areas include runoff from streets and discharge from wastewater treatment facilities. Gas, oil, and coastal zone development projects (e.g., the Chuitna Coal Mine) also contribute to pollutants that enter Cook Inlet through discharge. Gas, oil, and coastal zone development will continue to take place in Cook Inlet; therefore, it would be expected that pollutants could increase in Cook Inlet. However, the EPA and the Alaska Department of Environmental Conservation will continue to regulate the amount of pollutants that enter Cook Inlet from point and non-point sources through National Pollutant Discharge Elimination System permits. As a result, permittees will be required to renew their permits, verify they meet permit standards and potentially upgrade facilities. Additionally, the extreme tides and strong currents in Cook Inlet may contribute in reducing the amount of pollutants found in the Inlet.

4.5.3. Fisheries Interaction

Fishing is a major industry in Alaska. As long as fish stocks are sustainable, subsistence, personal use, recreational, and commercial fishing will continue to take place in Cook Inlet. As a result there will be continued prey competition, risk of ship strikes, potential harassment, and potential for entanglement in fishing gear. The NMFS, the Service, and the Alaska Department of Fish & Game will continue to manage fish stocks and monitor and regulate fishing in Cook Inlet to maintain sustainable stocks.

4.5.4. Gas and Oil Development

Currently, there are gas and oil development projects in the proposed action area, and it is likely that future gas and oil development will continue to take place in the action area. BlueCrest, for example, will continue to conduct exploratory drilling in Cook Inlet, and NMFS has received IHA petitions from other oil and gas companies proposing seismic surveys. Impacts from gas and oil development include increased noise from exploratory drilling, seismic activity, vessel and air traffic; discharge of wastewater; habitat loss from the construction of oil and gas facilities; and contaminated food sources and/or injury from a natural gas blowout or oil spill. The risk of these impacts may increase as oil and gas development increases; however, new

development will undergo consultation and permitting requirements prior to exploration and development. If IHAs are issued to these other applicants, they would be required to implement mitigation and monitoring measures to reduce impacts to northern sea otters and their habitat in the area and would be subject to the same MMPA and ESA standards.

4.5.5. Coastal Zone Development

Coastal zone development may result in the loss of habitat, increased vessel traffic, increased pollutants, and increased noise associated with construction and noise associated with the activities of the projects after construction. The Port of Anchorage (POA) is currently expanding their facilities and Port MacKenzie is scheduled to expand their facilities. Both port facilities may have a very slight effect on northern sea otters in the action area due to increased vessel traffic passing through the area on their way to both facilities, although northern sea otters are rarely found in shipping channels.

The POA and Port MacKenzie in upper Cook Inlet are either currently expanding or scheduled to expand their facilities. These ports will contribute to increased vessel traffic throughout Cook Inlet. The POA is expanding its facilities to accommodate increased growth in Alaska and to support one of only 22 designated Department of Defense seaports for the military. In the next five years at Port MacKenzie a fuel tank farm, the Rail Extension, and a deep draft dock are scheduled for construction. The Rail Extension would connect Port MacKenzie to the Alaska Railroad Corporation's existing mainline between Wasilla and Willow, providing freight service between Port MacKenzie and Interior Alaska. Port MacKenzie will be exporting coal from Healy, Alaska with the construction of the Rail Extension. The Rail Extension should be completed in 2016. Additionally, Port MacKenzie is currently preparing permits to construct a deep draft dock. As a result, number of ships calling to port at Port MacKenzie is expected to increase over the next five years. Increased vessel traffic may result in increased noise and potential ship strikes with northern sea otters, although northern sea otters are rarely found in the deeper water shipping channels.

4.5.6. Sea Otter Research

Because many important aspects of sea otter biology remain unknown, or are incompletely studied, and because management of this species requires knowledge of their distribution, abundance, migration, population, ecology, physiology, genetics, behavior, and health, free-ranging northern sea otters species are targeted for scientific research and studies. Research activities normally include close approach by vessel and aircraft for line-transect surveys; behavioral observation; attachment of scientific instruments (tagging); live capture for health assessments. The Service anticipates that scientific research on northern sea otters in Cook Inlet will continue, and possibly expand, due to the increasing need to better understand distribution and abundance relative to temporal and spatial parameters. Any future proposed research on northern sea otters in the Cook Inlet or surrounding area will require its own permitting process.

4.5.7. Climate Change

Our analyses as part of the NEPA process include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). The term “climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007a). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007a).

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has been faster since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions. (For these and other examples, see IPCC 2007a; and Solomon *et al.* 2007). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is “very likely” (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007a, and figures SPM.3 and SPM.4; Solomon *et al.* 2007). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011, p. 4), who concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (e.g., Meehl *et al.* 2007, entire; Ganguly *et al.* 2009, Prinn *et al.* 2011). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (IPCC 2007a, Meehl *et al.* 2007, Ganguly *et al.* 2009, Prinn *et al.* 2011). (See IPCC 2007b, for a summary of other global projections of climate-related changes, such as frequency of heat waves and changes in precipitation. Also see IPCC 2011(entire) for a summary of observations and projections of extreme climate events.)

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables (e.g., habitat

fragmentation) (IPCC 2007). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, Glick *et al.* 2011). There is no single method for conducting such analyses that applies to all situations (Glick *et al.* 2011). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Global climate projections are informative, and, in some cases, the only or the best scientific information available for us to use. However, projected changes in climate and related impacts can vary substantially across and within different regions of the world (e.g., IPCC 2007a). Marine mammals are classified as sentinel species because they are good indicators of environmental change. Arctic marine mammals are ideal indicator species for climate change, due to their circumpolar distribution and close association with ice formation. The Service recognizes that warming of the Arctic, which results in the diminishing of ice, could be a cause for concern to marine mammals. In Cook Inlet, marine mammal distribution is also dependent upon ice formation and prey availability; although a loss of sea ice might benefit northern sea otters given sea ice limits northern sea otter distribution wherever it prevents northern sea otters from foraging.

It is not clear how governments and individuals will respond or how much of these future efforts will reduce greenhouse gas emissions. Although the intensity of climate changes will depend on how quickly and deeply humanity responds, the models predict that the climate changes observed in the past 30 years will continue at the same or increasing rates for at least 20 years. Although the Service recognizes that climate change is a concern for the sustainability of the entire ecosystem in Cook Inlet, it is unclear at this time the full extent to which climate change will affect northern sea otters.

4.5.8. Conclusion

Based on the summation of activity in the area provided in this section, the Service believes that the incremental impact of an IHA for the proposed BlueCrest exploratory drilling in Cook Inlet would not be expected to result in a cumulative significant impact to the human environment from past, present, and future activities. The potential impacts to northern sea otters, their habitats, and the human environment in general are expected to be minimal based on the limited and temporary noise footprint and mitigation and monitoring requirements of the IHA.

Chapter 5 List of Preparers and Agencies Consulted

Agencies Consulted

No other persons or agencies were consulted in preparation of this EA.

Prepared By

Michael Hendrick

Supervisory Fish and Wildlife Biologist

Marine Mammals Management

1011 East Tudor Road, MS 341

Anchorage, Alaska 99503

Chapter 6 Literature Cited

- Bodkin, J.L. and M.S. Udevitz. 1999. An aerial survey method to estimate sea otter abundance, p 13-27 In: Marine Mammal Survey and Assessment Methods, Garner et al. (eds) 287 pp.
- Bodkin, J.L., B.E. Ballachey, T.A. Dean, A.K. Fukuyama and others. 2002. Sea otter population status and the process of recovery from the 1989 'Exxon Valdez' oil spill. Marine Ecology Progress Series 241:237–253.
- Bodkin J, G.G. Esslinger, and D.H. Monson. 2004. Foraging depths of sea otters and implications to coastal marine communities. Mar Mamm Sci 20:305–321.
- Bodkin, J.L., D.H. Monson, and G.E. Esslinger. 2003b. A report on the results of the 2002 Kenai Peninsula and Lower Cook Inlet aerial sea otter survey. USGS Report. 10pp.
- Christian, J.R., A. Mathieu, and R.A. Buchanan. 2004. Chronic effects of seismic energy on snow crab (*Chionoecetes opilio*). Environmental Studies Research Funds Report No. 158, Calgary, AB.
- Collins, K. A. MacGillivray, and S. Turner. 2007. Underwater source level measurements of airgun sources from ConocoPhillips' 2007 Beluga 3D seismic survey, Cook Inlet, Alaska. Unpublished report prepared by JASCO Research Ltd., for Veritas DGC. 27 pp.
- Davis, M.A., Wrage, K.J. & Reich, P.B. (1998) Competition between tree seedlings and herbaceous vegetation: support for a theory of resource supply and demand. Journal of Ecology, 86, 652–661.
- Doroff, A.M. and O. Badajos. 2010. Monitoring survival and movement patterns of sea otters (*Enhydra lutris kenyoni*) in Kachemak Bay, Alaska, August 2007-April 2010: Final Report. Kachemak Bay Research Reserve, 95 Sterling Highway Suite 2, Homer, Alaska. 18 pp.
- Ganguly, A., K. Steinhäuser, D. Erickson, M. Branstetter, E. Parish, N. Singh, J. Drake, and L. Buja. 2009. Higher trends but larger uncertainty and geographic variability in 21st century temperature and heat waves. PNAS. 106: 15555–15559.
- Ghoul, A. and Reichmuth, C. 2012. Aerial hearing sensitivity in a southern sea otter (*Enhydra lutris nereis*). 164th Meeting of the Acoustical Society of America. Kansas City, Missouri, 22-26 October, p. 2008.
- Gill, V.A., A.M. Doroff, and D.M. Burn. 2009. Aerial surveys of sea otters (*Enhydra lutris*) in Kachemak Bay, Alaska, 2008. Anchorage, Alaska: U.S. Fish and Wildlife Service Marine Mammal Management.
- Glick, P., B.A. Stein, and N.A. Edelson (eds.). 2011. Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment. National Wildlife Federation, Washington, DC. 168 pp.
- Greene, C.R., Jr. and W.J. Richardson. 1988. Characteristics of marine seismic survey sounds in the Beaufort Sea. J. Acoust. Soc. Am. 83(6):2246-2254. Hansen, D.J. and J.D. Hubbard. 1999. Distribution of Cook Inlet beluga whales (*Delphinapterus leucas*) in winter. Final Report. Outer Continental Shelf Study, U.S. Department of the Interior, Minerals Management Service, 949 East 36th Ave. Suite 300, Anchorage, Alaska 99508. Rept. 99-0024, v.p.
- Hansen, D.J., and J.D. Hubbard. 1999. Distribution of Cook Inlet beluga whales (*Delphinapterus leucas*) in winter. Final Report. Outer Continental Shelf Study, U.S. Department of the Interior, Minerals Management Service, 949 East 36th Ave. Suite 300, Anchorage, Alaska 99508. Rept. 99-0024, v.p.

- Huber, M., and R. Knutti. 2011. Anthropogenic and natural warming inferred from changes in Earth's energy balance. *Nature Geoscience*. Published online December 4, 2011; DOI: 10.1038/NNGEO1327. 6 pp. plus supplemental material.
- Illingworth & Rodkin, Inc. 2014. 2013 Cook Inlet Exploratory Drilling Program – Underwater Sound Source Verification Assessment. Report prepared for BlueCrest Energy, Inc. Illingworth & Rodkin, Inc., Petaluma, CA. 20 pp.
- IPCC. 2007a. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K., and A. Reisinger (eds.)]. IPCC, Geneva, Switzerland. 104 pp.
- IPCC. 2007b. Summary for Policymakers. Pp. 1–18. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY. 996 pp.
- IPCC. 2011. Summary for Policymakers. In: *Intergovernmental Panel on Climate Change Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY. 29 pp.
- Irons, D. B., D. R. Nysewander, and J. L. Trapp. 1988. Prince William Sound sea otter distribution in respect to population growth and habitat type. U.S. Fish and Wildlife Service, Anchorage, Alaska.
- Larned, W.W. 2006. Winter distribution and abundance of Steller's eiders (*Polysticta stelleri*) in Cook Inlet, Alaska 2004-2005. OCS Study, MMS 2006-066. 37 pp.
- McShane, L., J. Estes, M. Riedman, and M. Staedler. 1995. Repertoire, structure, and individual variation of vocalizations in the sea otter. *Journal of Mammalogy*, 76: 414-427.
- Marine Acoustics, Inc. 2011. Underwater Acoustic Measurement of the Spartan 151 Jack-up Drilling Rig in the Cook Inlet Beluga Whale Critical Habitat. Prepared for Furie Operating Alaska, LLC, Anchorage, AK. 40 pp.
- Meehl, G.A., T.F. Stocker, W.D. Collins, P. Friedlingstein, A.T. Gaye, J.M. Gregory, A. Kitoh, R. Knutti, J.M. Murphy, A. Noda, S.C.B. Raper, I.G. Watterson, A.J. Weaver, and Z.C. Zhao. 2007. Global Climate Projections. Pp. 747–845. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY. 996 pp.
- Miles, P.R., C.I. Malme, and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. OCS Study MMS 87- 0084. BBN Report No. 6509. BBN Inc., Cambridge, Massachusetts. 341 pp.
- NMFS. 2008a. Final Supplemental Environmental Impact Statement – Cook Inlet Beluga Whale Subsistence Harvest. Anchorage, Alaska.
<http://www.fakr.noaa.gov/protectedresources/whales/beluga/seis/default.htm>

- NMFS. 2008b. Final Conservation Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*). National Marine Fisheries Service, Juneau, Alaska.
- Owl Ridge NRC. November 2015. Application for the Incidental Harassment Authorization for the Taking of Sea Otters in Conjunction with the BlueCrest Alaska Operating LLC Activities at Cosmopolitan State Unit, Alaska, 2016. Prepared for BlueCrest.
- Owl Ridge NRC. 2014. Cosmopolitan State 2013 Drilling Program Marine Mammal Monitoring And Mitigation 90-day Report. Prepared for BlueCrest Alaska Operating LLC. 74 pp.
- Prinn, R., S. Paltsev, A. Sokolov, M. Sarofim, J. Reilly, and H. Jacoby. 2011. Scenarios with MIT integrated global systems model: significant global warming regardless of different approaches. *Climatic Change* 104: 515–537.
- Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson. 1995. *Marine Mammals and Noise*. Academic Press, Inc., San Diego, CA.
- Riedman, M.L. 1983. Studies of the effects of experimentally produced noise associated with oil and gas exploration and development on sea otters in California. Rep. by Cent. Coastal Mar. Stud., Univ. Calif. Santa Cruz, CA, for MMS, Anchorage, AK. 92 p. NTIS PB86–218575.
- Riedman, M.L. 1984. Effects of sounds associated with petroleum industry activities on the behavior of sea otters in California. pp. D–1 to D–12 In: Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird, Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior/Phase II: January 1984 migration. BBN Rep. 5586. Rep. by Bolt Beranek & Newman Inc., Cambridge, MA, for MMS. Anchorage, AK. NTIS PB86–218377.
- Riedman, M.L. and J.A. Estes. 1990. The sea otter (*Enhydra lutris*): behavior, ecology, and natural history. Biological Report 90(14). Washington, D.C.: U.S. Fish and Wildlife Service. 126p.
- Rugh, D.J., K.E.W. Shelden, C.L. Sims, B.A. Mahoney, B.K. Smith, L.K. (Litzky) Hoberecht, and R.C. Hobbs. 2005. Aerial surveys of belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004. NOAA Technical Memorandum NMFS-AFSC-149. 71 pp.
- Schneider, K.B. 1976. Assessment of the distribution and abundance of sea otters along the Kenai Peninsula, Kamishak Bay, and the Kodiak Peninsula. Final Report for the Alaska Department of Fish and Game, Anchorage, AK. 72pp.
- Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood, and D. Wratt. 2007. Technical Summary. Pp. 19–91. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY.
- U.S. Fish and Wildlife Service. 2014. Northern Sea Otter (*Enhydra lutris kenyoni*): Southcentral Alaska Stock., <http://www.fws.gov/alaska/fisheries/mmm/stock/stock.htm>.
- U.S. Fish and Wildlife Service. 2014a. Environmental Assessment. Issuance of an Incidental Harassment Authorization to BlueCrest Operating LLC, for the take of small numbers of

- sea otters incidental to conducting an exploratory drilling program in Cook Inlet Alaska. July 2014.
- Weilgart, L.S. 2007. The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology* 85:1091–1116.
- Wolt, R.C., Gelwick, F.P., Weltz, F., Davis, R.W. 2012. Foraging behavior and prey of sea otters in a soft- and mixed-sediment benthos in Alaska. *Mammalian Biology* 77:271–280.