

**PROPOSED ACTION:** Issuance of an Incidental Harassment Authorization to BlueCrest Operating Alaska LLC, for the take of small numbers of sea otters incidental to conducting an exploratory drilling program in Cook Inlet, Alaska.

**TYPE OF STATEMENT:** Environmental Assessment

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

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**LOCATION:** Cook Inlet, Alaska.

**ABSTRACT:** This 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 Operating Alaska LLC, for the take of small numbers of sea otters incidental to conducting an exploratory drilling program in Cook Inlet, Alaska.

**DATE:** July 2014

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## LIST OF ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
ADCCE	Alaska Department of Commerce, Community, and Economic
ADNR	Alaska Department of Natural Resources
AKRO	Alaska Regional Office
ANO	Alaska Native Organization
Authorization	Incidental Harassment Authorization
BlueCrest	BlueCrest Operating Alaska LLC
BOEM	Bureau of Ocean Energy Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIMMC	Cook Inlet Marine Mammal Council
cui	cubic inches
dB re 1 $\mu$ 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
Hz	Hertz
km	kilometer
km <sup>2</sup>	square kilometer
m	meter
mi	miles
mi <sup>2</sup>	square miles
m <sup>3</sup> /sec	cubic meters per second
MHHW	Mean Higher High Water
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
PAM	Passive Acoustic Monitoring
PRD	Protected Resources Division
PSO	Protected Species Observer
rms	root-mean-squared

## Chapter 1 Introduction and Purpose and Need

### 1.1. Description of Proposed Action

The Marine Mammal Protection Act (MMPA) prohibits the incidental taking of marine mammals, including sea otters (*Enhydra lutris*). The incidental take of a marine mammal falls under three categories: mortality, serious injury, or harassment, which includes injury and behavioral effects. The MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment). There are exceptions to the MMPA's prohibition on take such as the authority at issue here for us to authorize the incidental taking of small numbers of marine mammals by harassment upon the request of a U.S. citizen provided we follow certain statutory and regulatory procedures and make determinations. We describe this exception set forth in the MMPA at Section 101(a)(5)(D) in more detail in Section 1.2.

We propose to issue an Incidental Harassment Authorization (Authorization) to BlueCrest Operating Alaska, LLC, (BlueCrest) under the MMPA for the incidental taking of small numbers of sea otters, incidental to the conduct of an exploratory drilling program in Cook Inlet, Alaska. We do not have the authority to permit, authorize, or prohibit BlueCrest's drilling activities under Section 101(a)(5)(D) of the MMPA, as that authority lies with a different Federal agency.

Our proposed action is a direct outcome of BlueCrest requesting an authorization under Section 101(a)(5)(D) of the MMPA to take marine mammals, by harassment, incidental to conducting an exploratory drilling program because these activities 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 an Authorization for incidental take and has requested that we provide it through the issuance of an Incidental Harassment Authorization under section 101(a)(5)(D) of the MMPA.

Our issuance of an Authorization to BlueCrest is a major federal action under the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508. Thus, we are required to analyze the effects on the human environment and determine whether they are significant such that preparation of an Environmental Impact Statement (EIS) is necessary.

This Environmental Assessment (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 Authorization to BlueCrest for Level B harassment take of sea otters 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 Authorization; or

- Not issue an Authorization to BlueCrest in which case, for the purposes of NEPA analysis only, we assume that the activities would proceed and cause incidental take without the mitigation and monitoring measures prescribed in the proposed Authorization; or

### **1.1.1. Background on BlueCrest's MMPA Application**

BlueCrest proposes to conduct an exploratory drilling program in Cook Inlet, Alaska. The activity would occur for approximately two months between September 1 and October 31, 2014 contingent on the availability of a drilling rig. If a drilling rig is not available this fall, an alternate timeframe will be determined, but is likely to be not until the spring or early summer of 2015. In order to accommodate the uncertainty in the timing, a period of the permit is requested to be from September 1, 2014 through August 31, 2015 recognizing that drilling would normally not be conducted between the period of November 1 and April 15 when ice may be present unless specifically approved by the Alaska Department of Environmental Conservation. This is the first section 101(a)(5)(D) MMPA Authorization request from BlueCrest for takes of sea otters incidental to exploratory drilling in Cook Inlet. Acoustic stimuli generated by the programs deep-well pumps, conductor pipe driving, and vertical seismic profiling (VSP) have the potential cause behavioral disturbances to marine mammals in the proposed project area.

### **1.1.2. Marine Mammals in the Action Area**

The proposed exploratory drilling program could adversely affect sea otters (*Enhydra lutris*), the one marine mammal species occurring in the action area that is under our jurisdiction:

### **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 of sea otters in section 101(a)(5)(D) of the MMPA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking 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 authorization to the public for review. Entities seeking to obtain authorization for the incidental take of marine mammals under our jurisdiction must submit such a request (in the form of an application) to us.

We have issued regulations to implement the Incidental Take Authorization provisions of the MMPA (50 CFR Part 216) and have produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for authorizations. All applicants must comply with the regulations at 50 CFR § 216.104 and submit applications requesting incidental take according to the provisions of the MMPA.

**Purpose:** The primary purpose of our proposed action—the issuance of an Authorization to BlueCrest—is to authorize (pursuant to the MMPA) the take of marine mammals, in this case sea otters, incidental to BlueCrest Environmental Assessment

BlueCrest's proposed activities. The Authorization, if issued, would exempt BlueCrest from the take prohibitions contained in the MMPA.

To authorize the take 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 sea otters and not have an unmitigable impact on the availability of sea otters for certain subsistence uses. We cannot issue an Authorization if it would result in more than a negligible impact on sea otters 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 sea otters 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 sea otters for subsistence uses. Authorizations 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 Authorization in the *Federal Register* for public notice and comment.

The purpose of this EA is therefore to determine whether the take resulting from BlueCrest's exploratory drilling activities would have a negligible impact on affected sea otters, would not have an unmitigable adverse impact on the availability of sea otters for taking for subsistence uses, and develop mitigation and monitoring measures to reduce the potential impacts.

**Need:** On December 23, 2013, BlueCrest, through its program partner at the time, Buccaneer Alaska Operations, LLC, submitted an adequate and complete application demonstrating both the need and potential eligibility for issuance of an Authorization in connection with the activities described in section 1.1.1. We now have a corresponding duty to determine whether and how we can authorize take by Level B harassment incidental to the activities described in BlueCrest's application. Our responsibilities under section 101(a)(5)(D) of the MMPA and its implementing regulations establish and frame the need for this proposed action.

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 and analyzing alternative means of developing and issuing an Authorization, 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**

NEPA compliance is necessary for all "major" federal actions with the potential to significantly affect the quality of the human environment. Major federal actions include activities fully or partially funded, regulated, conducted, authorized, or approved by a federal agency. Because our issuance of an Authorization would allow for the taking of sea otters consistent with provisions under the MMPA and incidental to the applicant's activities, we consider this as a major federal action subject to NEPA.

We prepared this EA to determine whether the direct, indirect, and cumulative impacts related to the issuance of an Authorization 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 Authorization.

### **1.3.1. Laws, Regulations, or Other NEPA Analyses Influencing the EA’s Scope**

We have based the scope of the proposed action and nature of the two alternatives (i.e., issue the Authorization including prescribed means of take, mitigation measures, and monitoring requirements; or not issue the Authorization) 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. We conclude that this analysis—when combined with the analyses in the following documents—fully describes the impacts associated with the proposed exploratory drilling program with mitigation and monitoring for sea otters. 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 per 40 CFR 1502.21:

- our notice of the proposed Authorization in the *Federal Register* (78 FR 80386, December 31, 2013);
- *Application for the Incidental Harassment Authorization for the Taking of Sea Otters in Conjunction with the Buccaneer Drilling Activities at Cosmopolitan State Unit in Cook Inlet, Alaska, 2014* (Buccaneer/Owl Ridge NRC, 2013);
- *Northern Sea Otter (Enhydra lutris kenyoni): Southcentral Alaska Stock* (USFWS 2014).

## **MMPA APPLICATION AND NOTICE OF THE PROPOSED AUTHORIZATION**

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 Authorizations 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 proposed Authorization during the corresponding NEPA process.

On [date], we published a notice of proposed Authorization in the *Federal Register* ([volume]), which included the following:

- a detailed description of the proposed action and an assessment of the potential impacts on sea otters and the availability of sea otters for subsistence uses;
- plans for BlueCrest’s mitigation and monitoring measures to avoid and minimize potential adverse impacts to 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 sea otters including: (1) establishing 190-dB radii exclusion zones for, respectively; (2) monitoring by protected species observers (PSOs) for sea otter that would enter these 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 sound sources before the survey; and (5) delays power-ups until the 190-dB radii exclusion zone is clear of otters. Through the MMPA process, we preliminarily determined — provided that BlueCrest implements the required mitigation and monitoring measures — that the impact on sea otters of conducting the proposed exploratory drilling in Cook Inlet, Alaska, from September 1 to October 31, 2014, would result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of sea otters. Also through that process, we determined that the activity would not have an unmitigable adverse impact on the availability of sea otters for subsistence uses.

Within our notice, we requested that the public submit comments, information, and suggestions concerning BlueCrest’s request, the content of our proposed Authorization, and potential environmental effects related to the proposed issuance of the Authorization. This BlueCrest EA incorporates by reference and relies on BlueCrest’s application (submitted as Buccaneer/Owl Ridge NRC 2013) and our notice of a proposed Authorization ([date]).

In summary, those analyses concluded that with incorporation of monitoring and mitigation measures proposed by BlueCrest, the authorized taking of sea otters results in minor, short-term (recoverable) adverse effects on individual sea otters. Next, the Authorization 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 from the exploratory drilling should allow adequate time for the sea otters to recover from potentially adverse effects. Further, the analyses concluded that USFWS 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 we are responsible (*i.e.*, issue the Authorization including prescribed means of take, mitigation measures, and monitoring requirements; not issue the Authorization; or issue the Authorization with additional mitigation measures) this EA intends to provide more focused information on the primary issues and impacts of environmental concern related specifically to our issuance of the Authorization. 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,c, 2013a,b) have shown that our limited action of issuing an Authorization to BlueCrest or BlueCrest’s proposed action would not significantly affect those components of the human environment.

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

Biological	Physical	Socioeconomic / Cultural
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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

We requested comments on the potential environmental impacts described in BlueCrest’s MMPA application and in the *Federal Register* notice of the proposed Authorization. The CEQ regulations further encourage 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 Authorization.

The *Federal Register* notice of the proposed Authorization, 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 *Federal Register* notice of the proposed Authorization summarizes our proposed action; states that we would prepare an EA for the proposed action; and invites interested parties to submit written comments concerning the application 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 Authorization is subject to environmental review under NEPA. USFWS may prepare an EA, an EIS, or determine that the action is categorically excluded from further review. While NEPA does not dictate substantive requirements for an Authorization, 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 USFWS) for federal actions that "may affect" a listed species or critical habitat. USFWS' issuance of an Authorization affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these Section 7 consultation requirements. Accordingly, USFWS 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, 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. EFH has been identified in Cook Inlet for walleye Pollock, rock sole, Pacific cod, skate, weathervane scallop, Pacific salmon, and sculpin. USFWS' action of authorizing harassment of sea otters in the form of an Authorization does not impact EFH; therefore, an EFH consultation was not conducted.

## Chapter 2 Alternatives

### 2.1. Introduction

The NEPA and the implementing CEQ regulations (40 CFR §§ 1500-1508) require consideration of alternatives to proposed major federal actions and 516 DM6 Appendix 1 provides agency policy and guidance on the consideration of alternatives to our proposed action. 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) 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 sea otters. Alternative 1 is described in this chapter.

As described in Section 1.2.1, we must prescribe the means of effecting the least practicable impact of 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 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 sea otters taken (total number or number at biologically important time or location);
- A reduction in the number of times the activity takes individual 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 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 operations in our *Federal Register* notice of proposed Authorization ([date]). We incorporate those descriptions by reference in this EA and briefly summarize them here.

### **2.2.1. Specified Time and Specified Area**

BlueCrest proposes to conduct an exploratory drilling program at Cosmopolitan State well site #B-1 from September 1 to October 31, 2014 (well site #A-1 was drilled in 2013). The exact well location is latitude N 59°52'13.887", longitude W 151°52'17.225". The water depth is 61 feet.

### **2.2.2. Exploratory Drilling Operations**

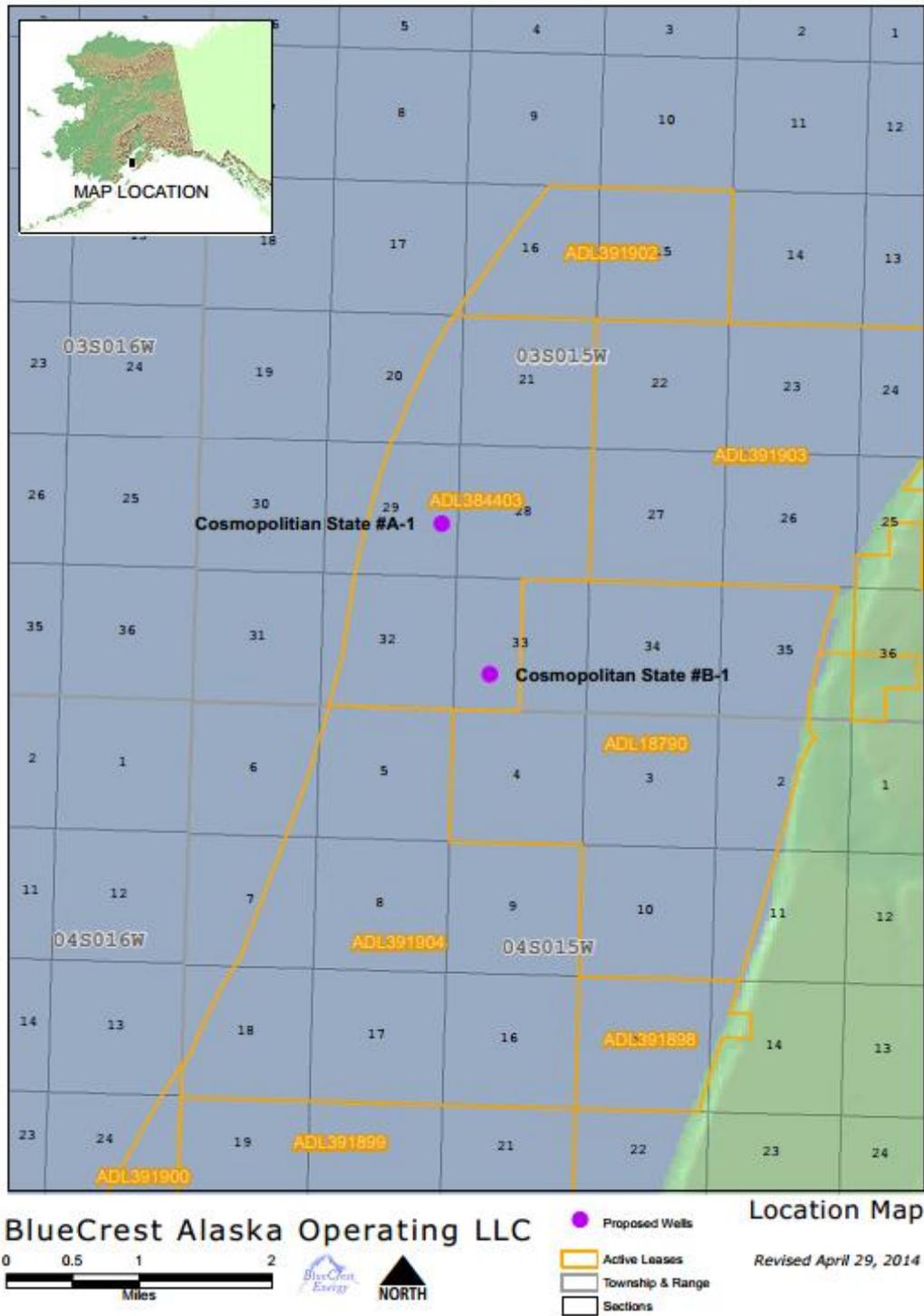
There are four elements of the drilling program that produce noise exceeding 160 dB re 1  $\mu$ Pa (rms): rig tow, deep-well pumps, conductor pipe driving, and VSP.

#### **2.2.2.1. Rig Mobilization**

The proposed drilling rig to be used for the 2014 drilling program at Cosmopolitan State #B-1 is the *Endeavour, Spirit of Independence*. The *Endeavour* is currently (July 2014) moored at Port Graham where it is undergoing maintenance and winterization. The intention is to move the drill rig to the Cosmopolitan State #B-1 well site on September 1, 2014, a distance of about 50 kilometers (31 miles), where it will commence drilling operations. If the maintenance and winterization efforts are not completed by September 1, 2014, the drilling rig mobilization might need to be delayed until the late spring or early summer of 2015.

The rig will be towed between locations by ocean-going tugs that are licensed to operate in Cook Inlet by the Southwest Pilots Association. 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.

Tugs generate their loudest sounds while towing due to propeller cavitation. While these continuous sounds have been measured at up to 171 dB re 1  $\mu$ Pa-m (rms) 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.



**Figure 1. Proposed Project Area for BlueCrest’s 2014 Exploratory Drilling Program**

### **2.2.2.2. Deep-well Pumps**

Because the drilling platform and other noise-generating equipment on the *Endeavour* 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 *Endeavour* was hydro-acoustically tested during drilling activities by Illingworth and Rodkin (2014) in May 2013 while the rig was operating at Cosmopolitan State #A-1. The results from the sound source verification indicated that noise generated from drilling or generators were below ambient. The generators used on the *Endeavour* are mounted on pedestals specifically to reduce noise transfer through the infrastructure, and they are enclosed in an insulated engine room, which may further have reduced underwater noise transmission to levels below ambient. Also, as mentioned above, the lattice legs limit transfer of noise generated from the drilling table to the water.

However, the sound source verification revealed that the submersed deep-well pumps that charge the fire-suppression system and cool the generators (in a closed water system) do generate noise levels exceeding 160 dB re 1 $\mu$ Pa (rms) out a distance of approximately 3 meters (10 feet).

### **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 (and any associated delineation wells) prior to drilling using a Delmar D62-22 impact hammer. This hammer has impact weight of 6,200 kg (13,640 pounds) and reaches a 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 re 1 $\mu$ Pa (rms) out to 1.63 kilometers (disturbance zone) and 190 dB re 1 $\mu$ Pa (rms) to 55 meters (injury zone).

### **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 9.83 and 14.42 liters (600 and 880 cubic inches). Each VSP operation is expected to last less than one or two 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 Authorization with Mitigation Measures**

The Proposed Action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, we would issue an Authorization (valid from September 1, 2014-through August 31, 2015) to BlueCrest allowing the incidental take, by Level B harassment, of sea otters subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the proposed Authorization, if issued, along with any additions based on consideration of public comments.

Our *Federal Register* notice requesting comments on the proposed Authorization 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 Authorization, if issued, in the following sections.

#### **2.3.1.1. 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 sea otters. USFWS has proposed some additional measures. The proposed monitoring and mitigation measures include:

- (1) Utilize trained, vessel-based Protected Species Observers (PSOs) to visually watch for and monitor 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 sea otters observed inside the 160 dB re 1  $\mu$ Pa (rms) 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).
- (2) Establish a 190 dB re 1  $\mu$ Pa (rms) “exclusion zone” (EZ) for sea otters before the conductor pipe driving and VSP is in operation. Based on the sound source verification study conducted by Illingworth and Rodkin on Buccaneer’s 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 re 1  $\mu$ Pa (rms)).
- (3) Visually observe 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 sea otters during that time, they should assume that the animal has moved beyond the EZ.
- (4) 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).
- (5) 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.
- (6) Following a shutdown and subsequent animal departure, survey operations may resume.

BlueCrest proposes to sponsor marine mammal monitoring during the present project, in order to implement the mitigation measures that require real-time monitoring and to satisfy the monitoring requirements of the Authorization. The researchers would monitor the area for sea otters during all noise 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.

#### **2.3.1.2. Reporting Measures**

BlueCrest would submit a weekly field report, no later than close of business each Thursday during the weeks when in-water exploratory drilling activities take place. The field reports would summarize species detected, in-water activity occurring at the time of the sighting, behavioral reactions to in-water activities, and the number of sea otters taken. These reports must contain and summarize 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 sea otters, as well as associated noise activity (number of shutdowns), observed throughout all monitoring activities;
- (3) An estimate of the number of sea otters that have been exposed to the noise activity (based on visual observation) at received levels greater than or equal to 160 dB re 1  $\mu$ Pa (rms) and 190 dB re 1  $\mu$ Pa (rms) with a discussion of any specific behaviors those individuals exhibited.

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

- (1) Summaries of monitoring effort (e.g., total hours, total distances, and sea otter distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of sea otters);
- (2) Analyses of the effects of various factors influencing detectability of 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 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.

USFWS would review the draft 90-day Technical Report. BlueCrest must then submit a final report to the USFWS within 30 days after receiving comments from USFWS on the draft report. If USFWS decides that the draft report needs no comments, the draft report shall be considered to be the final report.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this Authorization, 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 USFWS 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 USFWS is able to review the circumstances of the prohibited take. USFWS 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 USFWS via letter or email, or telephone.

In the event that BlueCrest discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown 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 USFWS MMM. The report must include the same information identified in the Condition 9(a) above. Activities may continue while USFWS reviews the circumstances of the incident. USFWS 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, and the lead PSO determines 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 USFWS 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 USFWS. Activities may continue while USFWS reviews the circumstances of the incident.

In our *Federal Register* notice of proposed Authorization, which we incorporate by reference, we preliminarily determined that the measures included in the proposed Authorization were sufficient to reduce the effects of BlueCrest's activity on 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 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.

### **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 Authorization. If they choose the latter, 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.

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

### **2.4. Alternatives Considered but Eliminated from Further Consideration**

USFWS 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 Authorization 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 areas. Complete descriptions of the physical, biological, and social environment of the action area are contained in the documents listed in Section 1.3.1 of this BlueCrest EA. We incorporate those descriptions by reference and briefly summarize or supplement the relevant sections for 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 sea otters and not to the physical environment. 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.

#### **3.1.1. Sea Otter Habitat**

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

### **3.2. Biological Environment**

#### **3.2.1. Sea Otters**

Gorbics and Bodkin (2001) determined that the sea otters inhabiting Cook Inlet are members of the unlisted Southcentral Alaska Stock. This stock extends from Cape Yakataga to the eastern shoreline of lower Cook Inlet, and includes Prince William Sound and the Kenai Peninsula coast (Allen and Angliss 2013). Sea otter populations found along the western shoreline of lower Cook Inlet, including Kamishak Bay, are part of the listed Southwest Alaska Stock. The most recent population estimate (2000-2003) for this stock is 15,090 (Allen and Angliss 2013). While this stock was thought to be stabilizing by 2002 (Bodkin et al. 2002) after several decades of growth (Irons et al. 1988, Bodkin and Udevitz 1999), the Kachemak Bay population alone increased 26 percent annually between 2002 and 2008, with the most recent bay estimate at about 3,600 animals (Gill et al. 2009). However, until recently, only a very small fraction of these otters were recorded north of Anchor Point (Rugh et al. 2005, Gill et al. 2009, Doroff and Badajos 2010), especially during the winter (Hansen and Hubbard 1999, Larned 2006). Doroff and Badajos (2010) tracked 44 radio-tagged sea otters in Kachemak Bay for three years and did not find any of them to travel north of Anchor Point. In 2004 and 2005, Larned (2006) recorded sea otters during intensive (approximately 30 percent area coverage) winter (December to April) surveys for Steller's eiders between Anchor Point and Clam Gulch. The survey teams observed an average of less than 8 otters per survey month (9 months total). The highest estimate was 92 otters inhabiting about 300 square kilometers north of Anchor Point during December 2004. During June surveys for beluga whales conducted between 1993 and 2004, Rugh et al. (2005) recorded 2,111 sea otters in lower Cook Inlet, but virtually none north of Anchor Point (although the length of the Kenai Peninsula was surveyed each year).

However, marine mammal monitoring associated with the 2013 Cosmopolitan State exploratory drilling program conducted 3 miles offshore of Cape Starichkof revealed that during July and August, relatively large numbers of sea otters can be found riding the tides between Anchor Point and some point well north of Cape Starichkof. It is likely that this late summer phenomenon is a result of seasonal weather

conditions that allow 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 sea otters are found north of Anchor Point. Doroff and Badajos (2010) could not relocate 10 of the radio-tagged otters in August 2009 but these were subsequently relocated in September 2009. It is possible that these otters had moved north of Anchor Point (outside the study area) during August, only to return to Kachemak Bay in September.

### **3.3. Socioeconomic Environment**

#### **3.3.1. Subsistence**

The proposed exploratory drilling activities will occur 12 miles south of Ninilchik and 30 miles (by water) northwest of Homer. 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. There are no harvest quotas for Cook Inlet sea otters, but dozens are taken there annually. Between 1989 and 2013 (26 years), villagers from Homer harvested 613 otters, while Ninilchik 16 otters harvested. It is likely the nearly all the harvest of otters by Homer hunters occurred inside Kachemak Bay.

Given the very low number of otters (~1/year) harvested by the village closest to the Cosmopolitan well site (Ninilchik), BlueCrest's planned exploration activities will not impact the availability of sea otters for subsistence harvest in Cook Inlet. The impact of drilling operations is unlikely to affect any sea otter sufficient to render it unavailable 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 Authorization. BlueCrest's application, our notice of a proposed Authorization, and other related environmental analyses identified previously, facilitate an analysis of the direct, indirect, and cumulative effects of our proposed issuance of an Authorization.

Under the MMPA, we have evaluated the potential impacts of BlueCrest's exploratory drilling activities in order to determine whether to authorize incidental take of 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 Authorization.

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

Alternative 1 is the Preferred Alternative where we would issue an Authorization to BlueCrest allowing the incidental take, by Level B harassment, of sea otters from September 1, 2014 to August 31, 2015, subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the Authorization, if issued. We would incorporate the mitigation and monitoring measures and reporting described earlier in this EA into a final Authorization.

#### 4.1.1. Impacts to Sea Otter Habitat

Our proposed action would have no additive or incremental effect on the physical environment beyond those resulting from the proposed activities. 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 Authorization to take 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 Cosmopolitan State unit is located in lower Cook Inlet. Lower Cook Inlet extends from the Forelands southwest to the inlet mouth demarked by an approximate line between Cape Douglas and English Bay. Water circulation in lower Cook Inlet is dominated by the Alaska Coastal Current (ACC) that flows northward along the shores of the Kenai Peninsula until it is turned westward and mixed by the combined influences of freshwater input from upper Cook Inlet, wind, topography, tidal surges, and the coriolis effect (Field and Walker 2003, MMS 1996). Upwelling by the ACC brings nutrient-rich waters to lower Cook Inlet and contributes to a biologically rich and productive ecology (Sambrotto and Lorenzen 1986).

In general, the lower Cook Inlet marine invertebrate community is of low abundance, dominated by polychaetes, until reaching the mouth of the inlet (Saupe et al. 2005). Overall, the lower Cook Inlet marine ecosystem is fed by midwater communities of phytoplankton and zooplankton, with the latter composed mostly of copepods, and barnacle and crab larvae (Damkaer 1977, English 1980). However, the lower inlet does support a wide variety of invertebrates and fish including Pacific halibut (*Hippoglossus stenolepis*), Dungeness crab (*Cancer magister*), tanner crab (*Chionecetes* spp.), pandalid shrimp (*Pandalus* spp.), Pacific cod (*Gadus macrocephalus*), and rock sole (*Lepidopsetta bilineata*), while the soft-bottom sand and silt communities are dominated by polychaetes, bivalves, and other

flatfish (Field and Walker 2003). Urchins (*Strongylocentrotus* spp.) and sea cucumbers (*Parashichopus californicus*), important otter prey, are also found in the shell debris communities. Razor clams (*Siliqua patula*) are found all along the beaches of the Kenai Peninsula.

Sea otters inhabiting Kachemak Bay feed primarily on mussels (41 percent), crabs (32 percent), and clams (12 percent) (Doroff et al. 2012). Sessile invertebrates, mussels and clams, were especially important during fall when they comprised 75 to 80 percent of the prey volume (Doroff et al. 2012). Thus, the nearshore habitats that support this species are of most importance to Cook Inlet sea otters.

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 (0.54 acres) during the land use permitting process. The collective 0.8-hectare (2-acre) footprint of the wells represents a very small fraction of the 18,950 -square-kilometer (7,300-square-mile) 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 square meters [4,755 square feet]) 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 sea otters mostly feed.

Acoustical affects from impulsive noise sources to prey resources are also limited. Christian et al. (2004) studied seismic energy impacts on male snow crabs (*Chionoecetes opilio*) 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 (*Clupea* sp.). Davis et al. (1998) cited various studies found no effects to Atlantic cod eggs, larvae, and fry when received levels were 222 dB. What effects were found were to larval fish within about 5 meters, and from air guns with volumes between 49.2 and 65.5 liters (3,000 and 4,000 cubic inches). Similarly, effects to sardine were greatest on eggs and 2-day larvae, but these effects were greatest at 0.5 meters, and again confined to 5 meters. 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 meters at most. From an ecological community standpoint, these impacts are considered minor.

Overall, rig placement and acoustical effects on prey resources will have a minor effect at most on the sea otter habitat within the vicinity of the well sites. Some prey resources might be temporarily displaced, but no long-term effects are unexpected. More information on potential impacts to marine mammal habitat is contained in BlueCrest’s application (Buccaneer/Owl Ridge NRC 2013) and our proposed Authorization 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 ways:

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 Authorization and BlueCrest's application (Buccaneer/Owl Ridge NRC 2013) provide detailed descriptions of these potential effects of exploratory drillings on sea otters. That information is incorporated herein by reference and summarized next.

**Masking:** 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 SPL re 20  $\mu$ Pa, and were loud enough that they can be heard by humans at distances exceeding 1 kilometer (McShane et al. 1995). Any potential masking effect from any noise entering the air from the impact hammer or VSP air gun would be brief (a strike or shot) and would likely disappear a few meters from the source.

**Behavioral Response:** Previous work suggests that sea otters may be less responsive to impulsive underwater noise 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, while 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. 2007), thereby limiting exposure during active continuous noise operations. It remains unclear whether both impulsive and continuous noise levels even rise to the level of harassment "take" at distances beyond 0.9 kilometers, given the animal's poor underwater hearing ability and surface behavior, and for continuous noise at all given the time otters spend underwater is so infrequent and of short duration compared other marine mammals.

**Temporary and Permanent Threshold Shift:** 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).

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 BlueCrest Environmental Assessment

William Sound sea otters to average 8.6 dives per feeding bout. 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. 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 (*Orcinus orca*) vocalizations.

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 continuous noise sources. Sea otter exposure to underwater noises generated by vessels (propellers) or underwater pumps 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 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.

**Injury:** BlueCrest did not request authorization to take 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 action area. The required mitigation and monitoring measures would minimize any potential risk for sea otters.

**Vessel Strikes:** The potential for striking sea otters is generally not a concern with vessel traffic. Studies have associated ship speed with the probability of a ship strike resulting in an injury or mortality of an animal. However, while vessel strikes of sea otters have been reported, the typical vessel speed of the tugs while towing the drill rig is 2-4 knots, or slow enough for otters to avoid. Moreover, mitigation measures would require the tugs to reduce speed or alter course if collisions with sea otters appear likely.

**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 sea otters in the proposed areas.

As mentioned previously, we estimate that the activities could potentially affect, by Level B harassment only, sea otters under our jurisdiction. Table 3 outlines the number of Level B harassment takes that we propose to authorize in this Authorization, the regional (Southcentral Alaska Stock) population estimate for sea otters in the action area, and the percentage of the stock that may be taken as a result of BlueCrest's activities.

**Table 2. Proposed Level B harassment take levels and sea otter stock abundance.**

Species	Proposed Level B Take	Abundance
Sea Otter	332	369

Our proposed Authorization notice contain complete 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 these 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 USFWS within 30 days where the pelt is tagged. For the past 26 years, subsistence hunters from the village of Homer have taken an average of 24 otters per year, probably nearly all within Kachemak Bay. The village to where the exploratory drilling work would occur, Ninilchik, harvested only one otter over the past five years (2008-2013).

BlueCrest has identified the following features that are intended to reduce impacts to marine mammal subsistence users:

- In-water exploratory drilling activities would follow mitigation procedures to minimize effects on the behavior of sea otters and, therefore, opportunities for harvest by Alaska Native communities; and
- Regional subsistence representatives may support recording marine mammal observations along with marine mammal biologists during the monitoring programs and would be provided with annual reports.

BlueCrest concluded, and the USFWS 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 USFWS recognize the importance of ensuring that Alaska Native Organizations and federally recognized tribes are informed, engaged, and involved during the permitting process and will continue to work with the ANOs and tribes to discuss their operations and activities. BlueCrest has reached out and coordinated with numerous local communities including the communities of Anchor Point and Ninilchik, as well as the Kenai Peninsula Borough. Other groups may be contacted as appropriate such as the United Cook Inlet Drift Association.

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

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

#### **4.2. Effects of Alternative 2 – No Action Alternative**

Under the No Action Alternative, we would not issue an Authorization to BlueCrest. As a result, BlueCrest would not receive an exemption from the MMPA prohibitions against the take of sea otters and would, if they proceeded with their activities, be in violation of the MMPA if take of 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 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 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 Authorization. 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 in Table 3 above because BlueCrest would not be restricted in the total area that could be surveyed and would not be required to abide by seasonal restrictions to reduce the number of takes.

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

- 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 Authorization could lead to not shutting down conductor pipe driving or VSP activities when 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 Authorization. Thus, the incidental take of sea otters would likely occur at higher levels than we have already identified and evaluated in our *Federal Register* notice on the proposed Authorization; 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, the survey would have no additive effects on subsistence beyond those resulting from BlueCrest's activities, which we evaluated in the referenced documents. The only potential difference in impacts is that 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 Authorization 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 application, our notice of a proposed Authorization, and other environmental analyses identified previously summarize unavoidable adverse impacts to sea otters or the populations to which they belong or on their habitats, as well as subsistence uses of sea otters, occurring in the exploratory drilling 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 sea otters in Cook Inlet or on the availability of 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 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 sea otters, and that there would not be an unmitigable adverse impact to subsistence uses of sea otters in Cook Inlet.

#### **4.5. Cumulative Effects**

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 sea otters in the action area.

##### **4.5.1. Subsistence Hunting**

As mentioned previously, very few sea otters (~1/year) are harvested by Kenai and Ninilchik subsistence hunters, the two villages adjacent to the action area. BlueCrest's proposed exploratory drillings will not make what few otters annually occur near these villages unavailable 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 ADEC will continue to regulate the amount of pollutants that enter Cook Inlet from point and non-point sources through NPDES 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. NMFS, USFWS, and the ADF&G 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 no gas and oil development projects in the proposed action area besides the Cosmopolitan State project. However, there are at least two seismic survey programs (Apache and SAE) planned for 2014 along the Kenai Peninsula that could eventually lead to additional gas and oil development in the action area. Impacts from gas and oil development include increased noise from exploratory drilling activity, vessel and air traffic and well drilling; 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 Authorizations are issued to these other applicants, they would be required to implement mitigation and monitoring measures to reduce impacts to 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 sea otters in the action area due to increased vessel traffic passing through the area on their way to both facilities, although sea otters are rarely found in shipping channels.

#### ***Port of Anchorage and Port MacKenzie Expansions***

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 military services at JBER. 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 2014. 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 in water noise and potential ship strikes with sea otters, although 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 sea otters species are frequently 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. USFWS anticipates that scientific research on 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.

#### **4.5.7. Climate Change**

The 2007 Intergovernmental Panel on Climate Change concluded that there is very strong evidence for global warming and associated weather changes and that humans have "very likely" contributed to the problem through burning fossil fuels and adding other "greenhouse gases" to the atmosphere (IPCC, 2007). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Evidence of climate change in the past few decades, commonly referred to as global warming, has accumulated from a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not uniform and affect different areas in different ways and intensities. Arctic regions have experienced some of the largest changes, with major implications for the marine environment as well as for coastal communities. Recent assessments of climate change, conducted by international teams of scientists (Gitay et al., 2002 for the Intergovernmental Panel on Climate Change; (IPCC) Arctic Climate Impact Assessment, 2004; IPCC, 2007), have reached several conclusions of consequence for this EA:

- Average arctic temperatures increased at almost twice the global average rate in the last 100 years.

- Satellite data since 1978 show that perennial arctic sea ice extent has shrunk by 2.7 percent per decade, with larger decreases in sea ice extent in summer of 7.4 percent per decade.
- Arctic sea ice thickness has declined by about 40 percent during the late summer and early autumn in the last three decades of the 20<sup>th</sup> century.

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. USFWS 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 sea otters given sea ice limits otter distribution wherever it prevents 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 USFWS 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 sea otters.

#### **4.5.8. Conclusion**

Based on the summation of activity in the area provided in this section, USFWS believes that the incremental impact of an Authorization 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 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 Authorization.

## **Chapter 5 List of Preparers and Agencies Consulted**

Agencies Consulted

Add other people and organizations.

Prepared By

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## Chapter 6 Literature Cited

- Allen, B.M. and R.P. Angliss. 2013. Alaska Marine Mammal Stock Assessments, 2012. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-245, 282 pp.
- 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.
- 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.
- 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.
- Gorbics, C.S. and J.L. Bodkin. 2001. Stock structure of sea otters (*Enhydra lutris kenyoni*) in Alaska. Marine Mammal Science. 17(3):632-647.
- Greene, C.R., Jr. and W.J. Richardson. 1988. Characteristics of marine exploratory drilling 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.
- Irons,
- 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.
- 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
- BlueCrest Environmental Assessment

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.

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.

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.

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