ASRC Energy Services
a subsidiary of Arctic Slope Regional Corporation

April 29, 2008

National Marine Fisheries Service
Office of Protected Resources
Marine Mammal Division
Attn: James H. Lecky, Director
1315 East-West Highway
Silver Spring, MD 20910-3226

Subject: Revised Request for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals in Conjunction with a Proposed Marine Survey Program in the Chukchi Sea, Alaska, 2008, Rev. 2

Dear Mr. Lecky:

ASRC Energy Services (AES) is presenting a second submittal to request an Incidental Harassment Authorization (IHA) from the National Marine Fisheries Service (NMFS) for the non-lethal taking of whales and seals incidental to offshore marine survey operations, pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act, 16 U.S. Code 1371(a)(5).

The revisions in the attached document specifically address Questions No. 6 "Numbers of Mammals to be Taken" and No. 7, "Impacts of the Activity," by presenting more recent scientific literature that more accurately addresses concerns regarding potential impacts to marine mammals by the proposed survey activities.

In addition, AES requests that all future references to the company as an applicant be as follows: ASRC Energy Services (AES). The Federal Register notice dated Monday April 28, 2008 states that the applicant is Arctic Slope Regional Corporation (ASRC) Energy Services (AES). This is not the legal name for the entity known as AES.

If you have any questions regarding this submission, please contact Amanda Henry at (907) 339-5495 or at Amanda.Henry@asrcenergy.com.

Sincerely,

ASRC Energy Services

Bernard Nidowicz, P.E.
Senior Vice President

Attachment: Revised Request for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals in Conjunction with a Proposed Marine Survey Program in the Chukchi Sea, Alaska, 2008, Rev. 2

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cc with attachment:

Ken Hollingshead, NMFS, Washington, D.C.
Shane Guan, NMFS, Washington, D.C.
Taqulik Hepa, NSB Wildlife Department
Robert Suydam, NSB Wildlife Department
Teresa Judkins, Executive Director, Alaska Eskimo Whaling Commission (AEWC)
Harry Brower Jr., Chairman, AEWC
Meda Snyder, Ice Seal Project Director
Willie Goodwin, Chairman, Alaska Beluga Whale Committee

VP/BM/AH/KP

15269.02.10-08-006/08-165

Revised Request for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals in Conjunction with a Proposed Marine Survey Program in the Chukchi Sea, Alaska, 2008

April 2008

ASRC Energy Services
a subsidiary of Arctic Slope Regional Corporation

3900 C Street, Suite 601
Anchorage, Alaska 99503

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ACRONYMS

µPa	microPascal
µPa@1m	microPascal at 1 meter
2D	two-dimensional
3D	three-dimensional
AES	ASRC Energy Services
AEWC	Alaska Eskimo Whaling Commission
AHD	Acoustic Harassment Device
BLM	Bureau of Land Management
BP	British Petroleum
cm	centimeter(s)
Com	Communication
cu inches	cubic inch(es)
dB	decibel(s)
ESA	Endangered Species Act
ft	feet/foot
GPS	Global Positioning System
HP	horsepower
Hz	hertz
I/O	Input/Output
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
J	Joule(s)
K	carrying capacity
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
kW	kilowatt(s)
LOA	Letter of Authorization
m	meter(s)
mi	mile(s)
MMMMP	Marine Mammal Monitoring and Mitigation Plan
MMO	Marine Mammal Observer(s)
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
msec	Millisecond(s)
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NSB	North Slope Borough
OCS	outer continental shelf
OSP	Optimum Sustainable Population
P/B	primary bubble ratio
POC	Plan of Cooperation
PP	peak-to-peak
PTS	Permanent Threshold Shift
pulse/sec	pulse(s) per second
re	relative to

rms	root mean square
R/V	Research Vessel
scfm	standard cubic feet per minute
sec	second(s)
sq km	square kilometer(s)
sq nm	square nautical mile(s)
TTS	Temporary Threshold Shift
USDOI	U.S. Department of the Interior
USFWS	U. S. Fish and Wildlife Service
USW	Ultra Shallow Water
V	volts

1.0 ACTIVITIES THAT RESULT IN TAKES

Detailed Description of The Specific Activity Or Class Of Activities That Can Be Expected To Result In Incidental Taking Of Marine Mammals

1.1 Overview of Activity

ASRC Energy Services (AES) proposes to conduct shallow hazards and site clearance surveys in the Chukchi Sea (Figure 1.1-1) for up to 100 days from approximately July 15, 2008 until November 30, 2008. The marine surveys will be conducted in the Chukchi Sea in the area involved in the U.S. Department of the Interior (USDOI), Minerals Management Service (MMS) Lease Sale 193. The exact locations of proposed surveys will be determined when AES enters into contract with leaseholders for the proposed surveys.

The purpose of the proposed surveys is to: determine water depths; identify and map hazards to drilling in the Chukchi Sea using geophysical methods to characterize, at a minimum, the upper 800 to 1,000 meters (m) (2,625 to 3,281 [ft]) of the sub-seafloor geology and detail the seafloor morphology. The marine surveys will be performed from a research vessel similar to the Research Vessel (R/V) *Cape Flattery* (Figure 1.1-2). Currently, no particular vessel is under contract with AES. At such time a vessel contract is secured, AES will provide National Marine Fisheries Service (NMFS) with the full specifications of said vessel.

Surveys will be conducted 24 hours per day. The marine mammal exclusion zone has a radius of 250 m (820.21 ft) from the vessel which enables visual monitoring to be accomplished either under natural light conditions or by the deck lights on the vessel. The sound sources will only run during survey operations. Following completion of a survey, all survey equipment will be turned off and will likely be brought onboard the vessel while the vessel transits to the next site.

1.2 Shallow Hazard and Site Clearance

1.2.1 Introduction

MMS requires shallow hazards and site clearance surveys to be completed prior to exploratory well drilling. Shallow hazards and site clearance surveys involve geophysical data collection and interpretation that result in the characterization of potentially hazardous conditions at or below the seafloor. These data are vital not only when planning for the design and construction of a facility, but also to assure that all associated activities are completed safely. The proposed marine surveys are designed to identify and map hazards in the Chukchi Sea using the following methods: seafloor imaging, water depth measurements, and high-resolution seismic profiling. Additional needs will be discussed below. Each site is slightly larger than an outer continental shelf (OCS) lease block of 7.77 square kilometers [sq km] (2.27 nautical square miles [sq nm]). If the proposed well is a straight hole, approximately 110 kilometers (km) (59.4 nautical miles [nm]) of data will be collected per site. If the proposed well has a bottom hole that is offset, the number of linear km will increase according to the location of the surface projection from the open-hole slant well bore. It is estimated that each straight-hole site will take 2 to 3 days of geophysical survey time. Tracklines will be provided to MMS prior to operations. At that time, AES will also submit the estimated number of sites to NMFS. All shallow hazards and site clearance surveys will be performed in accordance with and in order to satisfy the MMS Notice to Lessees 05-A01 *Shallow Hazards Survey and Evaluation for OCS Exploration and Development Drilling*.

1.2.2 Location

Marine surveys will be conducted in the Chukchi Sea covering leased areas resulting from MMS Lease Sale 193. Exact location for the proposed survey areas will not be known until the Lease Sale 193 is final and leases have been awarded to successful bidders.

1.2.3 Duration

AES proposes to conduct shallow hazards and site clearance surveys in the Chukchi Sea (Figure 1.1-1) for up to 100 days from approximately July 15, 2008 until November 30, 2008. If ice conditions are favorable, AES may seek authorization to mobilize to the Chukchi Sea in late June. However, it is likely that ice conditions will preclude mobilization as well as survey activities until mid July.

The exact start date for the proposed surveys is directly related to ice conditions in the Chukchi Sea. It is anticipated that ice will begin to leave the Chukchi Sea in early July. The proposed survey season in the Chukchi Sea is not expected to continue past the end of November. Dates are close approximates given the uncertainties in ice conditions and other factors. The subsistence whaling season will be considered for planning purposes. However, due to timing and the location of the proposed survey activity, conflicts with subsistence activities will likely be avoided. Operations will be scheduled and located to avoid bowhead whale (*Balaena mysticetus*) migration routes.

1.3 Geophysical Equipment and Methods

1.3.1 Introduction

Shallow hazards and site clearance surveys are implemented through the use of various geophysical systems. The basic components are: an energy source; a sound source to emit acoustic impulse or pressure waves; a hydrophone or receiver that receives and interprets the acoustic signal; and a recorder/processor that documents the data. The marine surveys being discussed in this document implement one or all of these basic components. If the proposed equipment is not available, similar equipment that does not exceed the noise threshold that has been established will be selected.

Proposed sonar operations will be conducted in accordance with stipulations assigned by the MMS in its Geological and Geophysical Exploration permit, the Incidental Harassment Authorization (IHA) issued by the NMFS, and the Letter of Authorization (LOA) issued by U. S. Fish and Wildlife Service (USFWS).

1.3.2 Research Vessel

A vessel similar to the R/V *Cape Flattery* will be utilized for the proposed geophysical surveys in the Chukchi Sea. Currently, no specific vessel is under contract by AES for these surveys. When a vessel contract is secured, AES will provide NMFS with the full specifications of the vessel.

The R/V *Cape Flattery*, a vessel similar to the one AES will contract, is 56.7 m (186 ft) long with beam of 12 m (40 ft) and loaded draft of 3.7 m (12 ft). She has a cruising speed of 11 knots and reported endurance of 30 days. The R/V *Cape Flattery* main propulsion is provided by one Cummins KTA 50, 1,500-horsepower (HP) diesel engine with one propeller (90x74, four-blade). The ship accommodates 48 workers and the vessel crew.

1.3.3 Seafloor Imagery

A side scan sonar is a sideward-looking, two-channel, narrow-beam instrument that emits a sound pulse and “listens” for its return. The sound energy transmitted is in the shape of a fan that

sweeps the seafloor resulting in a two-dimensional (2D) image that produces a detailed representation of the seafloor and any features or objects on it. The sonar will be towed behind the vessel. One of the following systems will be used in the proposed shallow hazard surveys:

- EdgeTech 4200 dual-frequency side scan sonar: The frequency the side scan sonar emits during operation is 120 kilohertz (kHz), occasionally reaching frequencies up to 410 kHz. The pulse length is up to 20 milliseconds (msec). The source level reaches 210 decibels (dB) relative (re) 1 microPascal at one meter (1µPa@1m) root mean square (rms).
- Klein System 3000 dual-frequency digital side scan sonar: The side scan sonar will typically be run at the 132 kHz frequency band. However, the 445 kHz frequency may be used periodically during any investigation work. The transmission pulse is variable from 25 msec to 400 msec. The peak in the 132 kHz source level beam reaches 234 dB re 1 µPa@1m. The peak in the 445 kHz source level beam reaches 242 dB re 1 µPa@1m.

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176°W 175°W 174°W 173°W 172°W 171°W 170°W 169°W 168°W 167°W 166°W 165°W 164°W 163°W 162°W 161°W 160°W 159°W 158°W 157°W 156°W 155°W 154°W 153°W

72°N 71°N 70°N 69°N

73°N 72°N 71°N 70°N 69°N

N

Popcorn

Crackerjack

Burger

Diamond

Klondike

25 miles

27 miles

40 miles

60 miles

Barrow

Wainwright

Atqasuk

Point Lay

Point Hope

Polynya Zone

National Petroleum Reserve - Alaska (NPR-A)

***Distances are in Nautical Miles

ASRC Energy Services
a subsidiary of Arctic Slope Regional Corporation
Regulatory and Technical Services

AES CHUKCHI SEA IHA

0 10 20 40 Nautical Miles

0 12.5 25 50 Miles

- Previously Drilled Exploration Well
- Village
- Polynya Zone
- State-Federal Water Boundary
- Coastal Zone
- Lease Block Under Stipulations 4, 5 &7
- Proposed Sale 193 Area
- Proposed Sale 193 Lease Block
- Official Protraction Diagram Outline
- National Petroleum Reserve - Alaska

FIGURE:
1.1-1

AES-RTS: 08-165-001.mxd, 04/24/08, R00

Figure 1.1-2 R/V *Cape Flattery*

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1.3.4 Bathymetry

Echosounders measure the time it takes for sound to travel from a transducer, to the seafloor, back to a receiver. The travel time can be converted to a depth value by multiplying it with the sound velocity of the water column. Echosounders are generally mounted to the ship hull or on a side-mounted pole.

Two different echosounding systems will be used to provide bathymetric data during the proposed Chukchi Sea shallow hazards and site clearance surveys: the Odom Hydrotrac digital single beam echosounder and Reason Seabat 8101 multibeam echosounder.

The first sonar that will be used during the proposed survey is an Odom Hydrotrac Digital Echo Sounder. This device emits a single pulse of sound directly below the ship along the vessel trackline and provides a continuous recording of water depth along the survey track. Generally these records require heave compensation to rectify the data point. The Hydrotrac sonar operates at a frequency of 200 kHz and emits approximately 15 pulses per second (pulse/sec). Each pulse phase is between 0.03 and 0.12 millisecond (msec). The peak within the source beam level transmits from 202 to 215 dB re 1 µPa@1m.

The analog prints of the Odom Hydrotrac data will also be reviewed for any evidence of water column anomalies which could indicate gas escaping into the water column. Any water column anomalies will be mapped and reported.

The Reson Seabat 8101 multibeam echosounder consists of a transducer array that emits a swath of sound. The seafloor coverage swath of the multibeam sonar depends on water depth, but is usually equal to two to four times the water depth. This sonar operates at a frequency of 240 kHz. It emits approximately 15 pulses/sec with each pulse duration lasting 21 msec to 225 msec for a swath that can cover up to 500 m (1,640 ft) in width. The peak in the source beam level for the Reson Seabat sonar transmits at 210 dB re 1 µPa@1m.

The multibeam system requires additional non-acoustic equipment including a motion sensor (on vessel) to measure heave, roll, and pitch; a gyrocompass (on vessel); and a sound velocity probe (lowered from the vessel when the vessel is stationary). A TSS DMS-05 Dynamic Motion Sensor, Hemisphere VS110 Global Positioning System (GPS)/Heading System and a Seabird SBE 19 CTD or Odom Digibar Pro will provide these data. The resulting multibeam data will provide a three dimensional (3D) view of the seafloor in the measured area.

1.3.5 High-Resolution Seismic Profiling

An integral part of the shallow hazards and site clearance surveys is high-resolution seismic profiling using three different acoustic source systems. Seismic systems operate on the principal that an acoustic impulse will reflect part of its energy upon encountering a density interface. This will be accomplished through the use of a high-frequency subbottom profiler, an intermediate-frequency seismic profiling system, and a multichannel seismic system. The high-resolution profiling systems, which use smaller acoustic sources, will be utilized as opposed to low-resolution systems or deep exploration seismic systems. The planned surveys are geared toward providing detail of the surficial and shallow subsurface geology and not toward hydrocarbon exploration. The planned high-resolution profiles will provide the detailed information that is not resolved in the deep seismic profiles. The following equipment will be utilized for the high resolution seismic profiling portion of the marine surveys.

1.3.5.1 High Resolution Subbottom Profiler

A subbottom profiler is a high-frequency seismic system that will be used to map geologic features in the proposed survey areas. Many of the modern subbottom profilers are "chirp" systems which are frequency- or pulse-rate modulated. This allows the energy, amplitude, and phase characteristics of the acoustic pulse to be precisely controlled. The 500 hertz (Hz) to 13 kHz frequency in conjunction with the 10-watt to 4-kilowatt (kW) power output generally achieves 25 to 250 msec, or approximately 20 to 200 m (65 to 656 ft) of bottom penetration, detailing the near-surface strata and density layers with a resolution of 6 to 20 centimeters (cm) (2 to 8 inches). The two-way travel time of the acoustic signal, from firing to receiving, is recorded and travel time measurements are subsequently applied to water column velocity information, system delays, and appropriate tow depth corrections to calculate water depths and/or depths to subsurface events. The degree of ocean bottom penetration is variable depending on properties of the bottom and near-surface materials, the output power, and carrier frequency. The subbottom profiler is often used to supplement higher energy seismic systems or coring data to obtain accurate profiles of large areas.

One of the following subbottom profiler systems will be used in the proposed marine surveys:

- GeoAcoustics GeoPulse subbottom profiling system: The subbottom profiler will be used in the 3.5 to 5 kHz frequency range. Pulse cycles range from 1 to 32 cycles of the selected frequency. The peak in the source level beam reaches 214 dB re 1 µPa@1m. The source level beam reaches 214 dB ± 3 dB re 1 µPa@1m rms, (or approximately 224 dB peak). During the survey, 3.5 kHz will likely be used, possibly up to 5 kHz, depending on the geology of the seafloor.

- GeoAcoustics GeoChirp II subbottom profiling system: The subbottom profiler has a frequency range of 0.5 to 13 kHz, which is programmable. The transmission pulse length is typically 32 msec programmable sweeps or user defined pings. The pulse repetition rate is 4 pulses/sec (at maximum) for a

- 32 msec chirp sweep or 10 pulses/sec for pinger waveforms. The peak in the source level beam reaches 205 dB ± 3 dB re 1 µPa@1m. The source level beam reaches 214 dB re 1 µPa@1m rms, (or approximately 224 dB peak).

1.3.5.2 Intermediate Frequency Seismic Profiling System

One intermediate-frequency seismic system is referred to as a "Boomer." The Boomer transducer is a mechanical means of generating enough sound energy to penetrate the subsurface sediments. Signals are reflected from the various bedding planes (density/velocity interfaces) and received by a single-channel hydrophone streamer. The sound reflections are converted into electrical impulses, filtered, and sent to a graphic recorder. The Boomer can effectively detail the upper 40 to 600 m (131 to 1,969 ft) of subbottom, outlining the fine strata and density layers that represent foundation formations for seafloor-based structures. The depth of seismic penetration obtained with this system is determined by the sediment type and the amount of initial discharged energy. In many instances, the presence of organic gas will attenuate the signal and mask any deeper reflections.

The Boomer system will consist of:

- An Applied Acoustics Model AA300 Boomer plate with housing. The maximum energy input is 350 Joules (J) per shot with a maximum power input of 1,000 J per shot. The maximum energy that would be used for these surveys is 300 J. The pulse length ranges from 150 to 400 msec with a reverberation of less than 1/10 of the initial pulse. The peak in the source level beam reaches 218 dB re 1 µPa-m at 300 J with a frequency range of 0.5 to 300 kHz. A Datasonics Model SPR-1200 seismic profiling system also known as a "bubble pulser." It has an electromagnetic source. The frequency of the system is 400 Hz in a narrow band. The peak in the source-level beam reaches 200 dB re 1 µPa@1m.

The power will be provided though one of the following:

- Applied Acoustics CSP-D 1200 Seismic Energy Source. This is a broadband width source, so the frequencies will range from 500 Hz to 3 kHz. The source can output 2,500 to 4,000 volts (V) in a solid-state semi-conductor discharge method. The output energy is variable and ranges from 50 J to 1,200 J. AES will use the lowest input rate possible to collect the data we need to meet the MMS requirements. The charging rate for the source is 1,500 J per sec for continuous operation. The repetition rate is 6 pings per sec at the maximum, and during surveys, the rate will likely be 2 pings per sec.

- Datasonics Model BPS-530 power supply. It has a maximum repetition rate of 1/8 of a second. The signal is received by a Model BPH-540 hydrophone streamer cable.

1.3.5.3 Multichannel Seismic System

The multichannel seismic system will consist of an Ultra Shallow Water (USW) array composed of a SeaSCAN USW Model 40-cubic-inch (cu inch) seismic sound source with four 10-cu-inch Input/Output (I/O) sleeve guns. If desired, the power can also be reduced to 20 cu inches. The reflected energy will be received by a marine digital seismic recording streamer system with 48 channels and 12.5 m (41 ft) groups deployed and retrieved by SeaSCAN streamer reel/winch. This system will provide the lowest resolution of the high-frequency data. The sound source is expected to provide 1.5 to 3 sec of data, two-way travel time with a resolution of 10 msec. It operates at a frequency range of 20 to 200 Hz and a peak sound output of 196 dB for all four guns combined. The frequency range that will be used in the proposed surveys will be between 20 Hz and 200 Hz, nominal. This tool is useful in finding shallow faults and amplitude anomalies.

The power is provided though an Ingersoll 6R-80-100 high-pressure air compressor unit. The air pressure can deliver 100 standard cubic feet per minute (scfm) when utilizing the "Hot Shot" gun controller. The Hot Shot delivers ±33 scfm air volume for shots at 5 sec and 6.25 m (21 ft) intervals (boat speed equals 3.5 to 4 knots). The pressure signature is 6.27 peak-to-peak (PP) bar meters with a primary bubble ratio (P/B) of 8.4.

1.4 Mitigation Measures

Communications of vessel operations and transit will occur in accordance with protocols set forth by the Communication (Com) Center proposed to be operated in Barrow and the Call Centers to be operated in Wainwright, Point Hope, and Point Lay. The use of Com and Call Centers is intended to avoid industry interference with subsistence activities being conducted in the operations area.

The Marine Mammal Monitoring and Mitigation Plan (MMMMP) will include the use of Marine Mammal Observers (MMOs) on the survey vessel. Further mitigation measures will include avoidance of marine mammal concentrations and scheduling of the program to avoid the bowhead whale subsistence hunt in the Chukchi Sea. Further, the proposed marine survey program will be conducted at least 40 km (22 nm) offshore and will not interfere with the subsistence hunt.

1.4.1 Maintaining Safe Radii

While the sonar equipment proposed to be used for this project generates high sound energy ranging from 200 to 242 dB re 1 µPa@1m (peak), the equipment operates at frequencies (>100 kHz) beyond the effective hearing range of the marine mammals likely be encountered (Richardson et al. 1995). However, the equipment proposed for the seismic profiling all operate, at least part of the time, at frequencies of less than 1 kHz, or within the hearing range of baleen whales, toothed whales, and pinnipeds (Richardson et al. 1995). The GeoChirp II seismic profiling system has the greatest sound source with a measured rms of 214 dB and an estimated peak 224 dB. (In general, rms values are approximately 10 dB lower than peak values [McCauley et al. 2000]). Because rms values are the established criteria for assessing impacts to marine mammals, the 214 dB value is used in this report to calculate maximum exposure radii and estimate potential take of local marine mammals.

To reduce incidental takes of marine mammals during proposed surveys, AES will place onboard MMOs on watch during all daylight hours while surveys are conducted unless nighttime or weather conditions make observations impossible. MMOs will ensure that marine mammals are at a safe radius during survey activities and when marine mammals are observed approaching or swimming near the "shutdown" radius, seismic or sonar activities will be temporarily suspended. The purpose of establishing a shutdown radius is to ensure marine mammals are not exposed to sound levels considered injurious: greater than 180 dB for baleen whales and 190 dB for toothed whales and pinnipeds. Based on a 214 dB re 1 µPa@1m source sound level for the GeoChirp II, and a conservative a "15 Log *R*" cylindrical spread rate model, the calculated distance to the 180 dB isopleth is approximately 185 m (607 ft) and to the 190 dB isopleth is about 40 m (131 ft). Because these values are estimates, and not based on field measurements during actual operations, we are proposing, as a precautionary measure, safety radii of 250 m (820 ft) for baleen whales and 75 m (246 ft) for toothed whales and pinnipeds. These distances are easily viewable by MMOs stationed on the survey vessel.

2.0 DURATION AND REGION

Date(s) And Duration of Such Activity And The Specific Geographical Region Where It Will Occur

The start date for the proposed survey area is directly related to ice conditions in the Chukchi Sea. It is anticipated that ice will begin to leave the Chukchi Sea in early July. An end date will rely on weather and ice conditions and could extend into November. The surveys should not extend more than a total of 100 days excluding delays related to ice and weather conditions. Operations will be scheduled and conducted to avoid conflicts with subsistence activities and the bowhead whale migration.

Marine surveys will be conducted in the Chukchi Sea covering the area involved in Lease Sale 193. Exact locations of the proposed survey area will not be known until the Lease Sale 193 is final and leases have been awarded to successful bidders. Figure 1.1-1 depicts the entire Lease Sale 193 area.

3.0 SPECIES IN ACTIVITY AREA

Species And Numbers of Marine Mammals Likely To Be Found Within The Activity Area

In general, the species of principal concern in the Chukchi Sea are the bowhead whale, beluga whale (*Delphinapterus leaucas*); gray whale (*Eschrichtius robustus*); and the bearded (*Erignathus barbatus*), ringed (*Phoca hispida*) and spotted seals (*Phoca largha*); and to a lesser extent, killer (*Orcinus orca*), humpback (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*). All of the above species fall under NMFS management authority.

A total of five cetacean species (bowhead, gray, beluga, and killer whale, and harbor porpoise [*Phocoena phocoena*]), three species of pinnipeds (ringed, spotted, and bearded seal) are known to occur in or near the proposed study area. Only the bowhead whale is listed as "Endangered" under the Endangered Species Act (ESA). Other ESA-listed species, which are known to occur in the adjacent Bering Sea, include Steller sea lion (*Eumetopias jubatus*), sperm whale (*Physeter macrocephalus*), humpback whale, fin whale, blue whale (*Balaenoptera musculas*), and northern right whale (*Lissodelphis borealis*). However, these species are considered to be extra-limital or rare in the Chukchi and Beaufort Seas, although fin whales have been recently reported in the Chukchi Sea, and a humpback whale cow/calf pair was reported in the Beaufort Sea in 2007 (Green et al. 2007). Still, because of the very remote chance of interaction or potential impact, these species (Steller sea lion, and sperm, humpback, fin, blue, and northern right whale) are not discussed further under this IHA application.

The most numerous marine mammal seasonally occurring in the Chukchi Sea is the Pacific walrus (*Odobenus rosmarus divergens*). The polar bear (*Ursus maritimus*) is also an important species found in the Chukchi Sea. However, these two marine mammal species fall under the management authority of the USFWS, and a separate application for a LOA for walrus and polar bears is being made to USFWS for the Chukchi Sea program.

In an effort to reduce redundancy, we have included the required information about the Pacific walrus and the polar bear and associated abundance estimates (to the extent known) in Section 4 below.

4.0 MARINE MAMMAL STOCKS

Description of The Status, Distribution, And Seasonal Distribution (When Applicable) of The Affected Species or Stocks of Marine Mammals Likely To Be Affected By Such Activities

4.1 Introduction

The following eight species of cetaceans and seals can be expected to occur in the region of the proposed seismic activity: bowhead, gray, beluga and killer whales, harbor porpoise; and ringed, spotted, and bearded seals. These species are discussed in this section and are the species for which general regulations governing potential incidental takes of small numbers of marine mammals are sought. The geographic boundaries and distribution, primary habitats, and population trends and risks are discussed under each species.

Three species of marine mammals—the polar bear, Pacific walrus, and sea otter—are managed by the USFWS. Within the proposed seismic activity area in the Chukchi Sea, only the polar bear and Pacific walrus are known to occur. The general status information on polar bear and Pacific walrus is included in Table 4.1-1, but not discussed further under the species discussions.

TABLE 4.1-1
List of Species, Their Habitats, Conservation Status, and Estimated Populations Inhabiting the Proposed Seismic Activity Area Located in the Chukchi Sea

Species (Stock)	Habitat	Chukchi Sea Stock and/or ESA Status [1]	Estimated Stock Abundance [2]
Cetaceans			
Bowhead Whale (Western Arctic stock)	pack ice and coastal	ESA listed as Endangered, listed as depleted under MMPA, and classified as a strategic stock.	10,545
Gray Whale (eastern north Pacific stock)	coastal, lagoons	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	18,813
Beluga Whale (eastern Chukchi Sea/Beaufort Sea)	offshore, coastal, ice edges	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	3,710/39,258
Killer Whale (eastern North Pacific Alaska resident stock)	widely distributed	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	1,123
Harbor Porpoise (Bering Sea Stock)	coastal, inland waters	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	47,356
Pinnipeds			
Ringed Seal (Alaska)	landfast ice and pack ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	Up to 3.6 million. Currently, no reliable abundance estimate is available for the Beaufort Sea; however, combined with surveys from the Chukchi Sea, approximately 249,000 are estimated.
Spotted Seal	pack ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	Several thousand and several tens of thousands. An estimate with correction using 1992 data = 59,214 seals, but is preliminary at best.
Bearded Seal	pack ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	Currently, no reliable abundance estimate is available for this stock. Early estimates of the Bering-Chukchi Seas ranged from 250,000 to 300,000.
Pacific Walrus	Pack ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	The current size of the Pacific walrus population is unknown; however, aerial surveys conducted jointly with the U.S. and Russia every five years between 1975 and 1990 produced population estimates ranging from 201,039 to 234,020.
Carnivores			
Polar Bear (Chukchi/Bering Seas Stock/Southern Beaufort Sea)	coastal, ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock.	Estimated between 2,000 to 5,000 bears for the Chukchi/ Bering Sea population. An estimate for the Southern Beaufort Sea population of northern Alaska is 2,272 bears.

[1] ESA = Endangered Species Act. Stocks listed as depleted under the MMPA (Marine Mammal Protection Act) are described as any stock that falls below its optimum sustainable population must be classified as "depleted," 16 U.S.C. § 1362(1)(A). The numeric threshold for optimum sustainable population (OSP) has been interpreted by NMFS and USFWS as being above 0.6 K (i.e. greater than 60 percent of carrying capacity [K]). In other words, a stock that dropped in numbers to below 60 percent of K would qualify as "depleted" under the MMPA. The term "strategic stock" is defined as a marine mammal stock: (A) for which the level of direct human-caused mortality exceeds the Potential Biological Removal level; (B) which, based on the best available scientific information, is declining and is likely to be listed as a Threatened species under the Endangered Species Act of 1973 . . . within the foreseeable future; or (C) which is listed as a Threatened species or Endangered species under the Endangered Species Act of 1973 . . ., or is designated as depleted under [the MMPA].

[2] See text under individual species for population estimate sources.

4.1.1 Bowhead Whale

Of the five recognized stocks of bowhead whales, the largest is the Western Arctic stock found in the Bering, Chukchi, and Beaufort Seas (Rugh et al. 2003), and is the focus of this request for IHA.

The Western Arctic stock winters in the Bering Sea, migrates across the Chukchi Sea from March through June, and summers in the Canadian Beaufort Sea (Braham et al. 1980; Moore and Reeves 1993).

During the spring migration whales follow open leads in the ice through the Chukchi Sea, while they migrate through more open water during the fall migration. The fall migration across the Chukchi Sea, which begins about mid-September to late October, is apparently more diffuse than the migration through the Beaufort Sea. A few whales might be found anywhere within their range during the summer (D. Rugh, National Marine Mammal Laboratory [NMML], personal communication.

The Western Arctic stock was recently estimated at 10,545 and has been growing at an annual rate of about 3.5 percent (Angliss and Outlaw 2005).

This bowhead population is currently listed as Endangered under the ESA and is classified as a strategic stock by NMFS (Angliss and Outlaw 2005).

4.1.2 Gray Whale

The eastern Pacific or California gray whale population, like all large whale populations, was once hunted to near extinction, but has since recovered significantly from commercial whaling, and now numbers about 18,813 (revised Angliss and Outlaw 2005).

The Pacific gray whale ranges from the Bering, Chukchi, and Beaufort Seas (in summer) to the Gulf of California (in winter) (Rice 1998); however, gray whales have also been documented foraging in waters off of Southeast Alaska, British Columbia, Washington, Oregon, and California (Rice and Wolman 1971; Berzin 1984; Darling 1984; Quan 2000; Calambokidis et al. 2002). Most of the eastern north Pacific population makes a round-trip annual migration of more than 8,000 km (4,320 nm) from Alaska waters to Baja California in Mexico. From late May to early October, the majority of the population concentrates in the northern and western Bering Sea and the Chukchi Sea.

Typically, gray whales are found in shallow water, and usually remain closer to shore than any other large cetacean. Gray whales are considered common summer residents in the nearshore waters of the eastern Chukchi Sea, and occasionally are seen east of Point Barrow in late-spring and summer, as far east as Smith Bay (Green et al. 2007). On wintering grounds, mainly along the west coast of Baja California, gray whales utilize shallow, nearly land-locked lagoons and bays (Rice et al. 1981). From late February to June, the population migrates back to arctic and subarctic seas (Rice and Wolman 1971).

Angliss and Outlaw (2005) recently estimated the Pacific gray whale population at about 19,000 based on surveys conducted in central California in 2000/2001 and 2001/2002, and suggested that the population may have declined from earlier estimates possibly due to the populations reaching carrying capacity.

The eastern Pacific stock was removed from the Endangered Species List in 1994 and is not considered by NMFS to be a strategic stock. They may be encountered during the shallow hazards and site clearance surveys.

4.1.3 Beluga Whale

Of the five beluga stocks occurring in Alaska (O'Corry-Crowe et al. 1997; Angliss and Lodge 2004) only the eastern Chukchi Sea and Beaufort Sea stocks would possibly be encountered. Both stocks will overlap in the Beaufort Sea, and both winter in the Bering Sea (Suydam et al. 2001; Angliss and Lodge 2002). The Beaufort stock moves out of the Chukchi Sea into the Beaufort Sea during the spring (April to May) (Braham et al. 1984; Richardson et al. 1995), and returns in the fall in their annual migration back to Bering Sea wintering areas. Migration generally occurs in deeper water along the ice front (Hazard 1988; Clarke et al. 1993; Miller et al. 1998). Much of the Chukchi stock breeds in Kasegaluk Lagoon in June and July.

The abundance estimate considered the "most reliable" for the eastern Chukchi Sea beluga whale stock is 3,710, a result from 1989–1991 aerial surveys (Frost et al. 1993; Angliss and Lodge 2004). Additional surveys were conducted in 1998 (DeMaster et al. 1998) and again in July 2002 (Lowry and Frost 2002, cited in Angliss and Outlaw 2005), but both were partial surveys and therefore, a more complete abundance estimate for this stock is not available.

Small numbers of belugas may be encountered during the early (July) phase of the proposed shallow hazards and site clearance surveys in the eastern Chukchi Sea; however, the majority of the migration will have passed, while local whales may concentrate at inshore breeding lagoons. Migrating belugas might be encountered, especially if seismic surveys extend into the fall. However, the seismic efforts will avoid the ice conditions favored by this species.

This population is not considered by NMFS to be a strategic stock, but the current population trend of the Beaufort Sea stock of beluga whales is unknown (Angliss and Outlaw 2005).

4.1.4 Killer Whale

Killer whales are found throughout the world's oceans and seas, from the equator's more tropical waters to the cooler waters in the high latitudes. They are most common in cooler coastal waters of both hemispheres, but appear in greatest numbers within 800 km (432 nm) from continental coasts (Mitchell 1975). Killer whales can be found in all Alaskan waters, although they are considered rare in the Beaufort Sea. Sightings near Point Barrow have coincided with the bearded seal migration, which may be an attraction for these whales occurring so far north (J.C. George, North Slope Borough [NSB], personal communication).

Of the eight killer whale stocks recognized in the Pacific, the trans-boundary Alaska Resident stock, found from southeastern Alaska to the Chukchi Sea (Angliss and Outlaw 2005) is the only stock that could possibly be encountered by the shallow hazards and site clearance operations. The NMML began killer whale studies in 2001 in Alaskan waters west of Kodiak Island, including the Aleutian Islands and Bering Sea. Line-transect surveys were conducted in July and August in 2001-2003. Based on surveys conducted by the NMML, a minimum estimate of 1,123 killer whales comprises the Alaska Resident stock (Angliss and Outlaw 2005).

The eastern North Pacific Alaska resident stock of killer whales is not classified as a strategic stock.

4.1.5 Harbor Porpoise

The harbor porpoise is a small coastal cetacean generally found in shallow waters. The Bering Sea stock, which ranges to Point Barrow (Suydam and George 1992), occurs most frequently in waters less than 100 m (328 ft) in depth (Waite and Hobbs *in* Angliss and Outlaw 2005).

The most recent abundance estimate for the Bering Sea stock, based on aerial surveys conducted by NMML in Bristol Bay, is about 48,000 animals (Angliss and Outlaw 2005). These estimates are considered conservative, but are higher than an earlier estimate of about 11,000 by Dahlheim et al. (2000).

Harbor porpoise is unlikely to occur in significant numbers within the seismic acquisition area as the seismic transects will occur well offshore in water depth averaging approximately 250 m (820 ft). Harbor porpoise are not listed as "Depleted" under the MMPA or listed as "Threatened" or Endangered under the ESA. The Bering Sea stock of harbor porpoise is not classified as a strategic stock. Population trends and status of this stock relative to OSP are currently unknown.

4.1.6 Ringed Seal

In the North Pacific, ringed seals are found in the southern Bering Sea and range as far south as the Seas of Okhotsk and Japan. Throughout their range, ringed seals have an affinity for ice-covered waters and are well adapted to occupying seasonal and permanent ice, and are year-round residents throughout the Beaufort, Chukchi, and Bering Seas, as far south as Bristol Bay in years of extensive ice coverage. They tend to prefer large floes (i.e., greater than 48 m [157 ft] in diameter) and are often found in the interior ice pack where the sea ice coverage is greater than 90 percent (Simpkins et al. 2003), and remain in contact with ice most of the year and pup on the ice in late winter to early spring.

During late April through June, ringed seals are distributed throughout their range from the southern ice edge northward (Braham et al. 1984). Bengston et al. (2005) conducted ringed seal surveys in the Chukchi Sea in 1999 and 2000, found densities higher at nearshore locations, and estimated the Chukchi population at about 245,000 animals.

Large concentrations of ringed seals are not expected to be encountered near the proposed seismic survey areas in the northern Chukchi Sea during the summer and fall time period, as these seals are generally found in association with the ice front that would be avoided during this project. The Alaska stock of ringed seals is not classified as a strategic stock by NMFS.

4.1.7 Spotted Seal

Spotted seals are a coastal pinniped that summers in nearshore areas in the Chukchi and winters along the ice edge in the Bering Sea (Quakenbush 1988; Lowry et al. 1998; Simpkins et al. 2003). During the summer months they are found hauled out on sand spits in bays and lagoons in the Bering and Chukchi Seas, with some animals ranging to the Colville River Delta (Rugh et al. 1997; Lowry et al. 1998).

A reliable abundance estimate for spotted seal is not currently available (Angliss and Outlaw 2005), although Angliss and Lodge (2004) did estimate the Alaskan population at about 59,000 animals based on limited surveys conducted by the Alaska Department of Fish and Game.

The activities associated with the proposed shallow hazards and site clearance work in the Chukchi Sea are expected to encounter few, if any, spotted seals, mainly because most seals

would be confined to nearshore waters. The Alaska stock of spotted seals is not classified as a strategic stock by NMFS.

4.1.8 Bearded Seal

The distribution of bearded seals is dictated by the presence of ice and they prefer water depths of less than 200 m (656 ft) (Burns 1981). Bearded seals feed mainly on the seafloor, thus are rarely found in water depths they cannot effectively access. Like all Alaskan ice seals, bearded seals winter along the ice front in the Bering Sea, and then move north in the spring with the receding ice. During the summer, bearded seals can be found in both the Chukchi and Beaufort Seas in high ice coverage along the pack ice edge (Burns et al. 1981; Bengston et al. 2000; Simpkins et al. 2003).

A reliable abundance estimate for the Alaska stock of bearded seals is not available. The most recent surveys occurred in May to June of 1999 and 2000 between Shismaref and Barrow with average densities of between 0.07 and 0.14 seals per sq km (100 per hectare) respectively; however, there is no correction factor available for these data. Early estimates of the Bering-Chukchi Sea population ranged from 250,000 to 300,000 (Burns 1981).

The proposed shallow hazards and site clearance survey areas may encounter bearded seals during the open-water season; however, the number of bearded seals is expected to be small, especially since the operations will specifically avoid ice-front areas where bearded seals concentrate. The Alaska stock of bearded seals is not classified by NMFS as a strategic stock.

5.0 TYPE OF TAKING

Type Of Incidental Taking Authorization That Is Being Requested (I.E., Takes By Harassment Only; Takes By Harassment, Injury and/or Death) And The Method of Incidental Taking

The type of incidental take most likely to occur from the proposed site clearance activities are those associated with Level B harassment or disturbance (greater than 160 dB for cetaceans, and greater than 170 dB for pinnipeds) as the result of noise produced by the sonar and seismic profiling survey equipment. No serious injury or lethal takes are expected as a result of the proposed activity in the Chukchi Sea. Minimum sound levels considered potentially injurious to marine mammals (180 and 190 dB) by NMFS at frequencies detectable by marine mammals, do not extend farther than about 185 m (607 ft), and should be fully mitigated by establishing "shutdown" radii (see Section 1.4.1). The overall number of "incidental" takes that will occur during the proposed operations, the noise level produced during the survey, the species that is affected, and the animal's behavior during exposure to the seismic sounds (See Section 6).

6.0 NUMBERS OF MAMMALS TO BE TAKEN

By Age, Sex, And Reproductive Condition (If Possible), The Number of Marine Mammals (By Species) That May Be Taken By Each Type of Taking Identified In Paragraph (A)(5) of This Section, And The Number of Times Such Takings By Each Type of Taking Are Likely To Occur

6.1 Introduction

AES seeks authorization for potential incidental "taking" of small numbers of marine mammals under the jurisdiction of the NMFS in the proposed region of activity. Species for which authorization is sought are bowhead, gray, humpback, minke, killer, and beluga whales, harbor porpoise, and ringed, spotted, and bearded seals. Polar Bear and Pacific walrus will be covered in a separate LOA application with USFWS.

The only anticipated impacts to marine mammals associated with noise propagation from seismic profiling work would be temporary and short term displacement of seals and whales from within ensonified zones produced by such noise sources.

The proposed area of site clearance activity for the Chukchi Sea is not expected to "take" more than small numbers of marine mammals, or have more than a negligible effect on their populations.

6.2 Basis for Estimating Numbers of Marine Mammals that Might be "Taken by Harassment"

The methods to estimate "take by harassment" and present estimates of the numbers of marine mammals that might be affected during the proposed seismic acquisition area in the Chukchi Sea are described below. The density estimates for the species covered under this IHA are based on the estimates calculated by Ireland et al. (2008) during LGL's 2007 open water surveys in the Chukchi Sea, the 'best science" estimates currently available. Density estimates were not separated by the summer and fall periods. Nearly all the seismic activity will be completed before fall, and density estimates for all species were higher for the summer, thereby providing a conservative estimate for any fall activities.

6.3 Exposure Calculations

Specifically, the average and maximum estimates of "take" were calculated by multiplying the expected average and maximum animal densities provided in Table 6-1 by the area of ensonification for the 160 dB (baleen and toothed whale criterion) and 170 dB (pinniped criterion) isopleths. The area of ensonification was determined by multiplying the total proposed trackline (760 km) times 2 (both sides of the trackline) times the distance to the 160 dB and 170 dB isopleths. The distance to the 160 dB isopleth was calculated as approximately 1,300 m with a corresponding area of ensonification of 1,976 km2, while the distance to the 170 dB isopleth was about 350 m with an ensonification area of approximately 532 km2. The take estimates and requested authorizations are shown in Table 6-2. Because no seismic activity is planned during the bowhead whale migration period for the Chukchi Sea (after September 25th), (and all proposed survey areas are both "downstream" and well offshore of any regions annually hunted each fall for bowhead whales), no exposure estimates to the 120 dB radius were calculated.

TABLE 6.3-1
Expected Densities of Marine Mammals during the Chukchi Sea Shallow Hazards and Site Clearance Surveys.

Species	Average Density (no. per square km) [1]
Cetaceans	
bowhead whale	0.2
gray whale	3.5
humpback whale	0.2
minke whale	0.6
beluga whale	0.1
killer whale	0.04
harbor porpoise	2.8
Pinnipeds	
Ringed/spotted seal	40.5
bearded seal	9.0

[1] Density estimates are from Ireland et al. (2008).

TABLE 6.3-2
Estimates of Possible Numbers of Marine Mammals Exposures to Greater Than 160 Db and Greater Than 170 Db During AES's Proposed Shallow Hazards and Site Clearance Activities in the Chukchi Sea.

Species	Exposures at greater than 160 dB	Exposures at greater than 170 dB (ave. density)	Requested Take Authorization[1]
Cetaceans			
bowhead whale	0.4	N/A	7[3]
gray whale	7.0	N/A	14[2]
humpback whale	0.4	N/A	2[1]
minke whale	1.2	N/A	2[2]
beluga whale	0.2	N/A	21[3]
killer whale	0.08	N/A	5[1]
harbor porpoise	5.6	N/A	12[2]
Pinnipeds			
Ringed/spotted seal	N/A	20	2,118[3]
bearded seal	N/A	4.5	235[3]

[1]Calculated values for were increased to average group sizes.
[2]As a precaution, estimates were doubled.
[3]For consistency, the requested take estimates were adjusted to those estimated by NMFS in the Federal Register Notice dated Monday April 28, 2008 (73 Federal Register 22922 [2008]).

The last column of Table 6-2 shows the numbers of animals for which incidental "harassment take authorization" is requested. This number represents the maximum exposure of baleen and toothed whales to the 160 dB isopleth and pinnipeds to the 170 dB. Where the estimated take was lower than the average group size, the average group size is the requested take authorization (because if these animals were to approach the vessel, it would likely be as a group).

In summary, conservative estimates were used to develop take estimates for the eight species of marine mammals that could potentially occur in the vicinity of proposed site clearance activities. 2).

7.0 IMPACTS OF THE ACTIVITY

Anticipated Impact of The Activity Upon The Species or Stock

7.1 Introduction

The proposed seismic activities potentially affecting marine mammals through seismic sources include airgun operations and side scan sonar. These activities are expected to result in a temporary displacement of whales and seals within the ensonified zones, but are not expected to result in significant behavior disruption. Impacts on Chukchi whale and seal populations are likely to be short-term, and transitory and temporary displacement should occur only when seismic sounds emit received noise levels greater than 160 dB. Although impacts such as brief behavioral and acoustical alterations may occur due to a lack of scientific data, it is impossible to determine the level of physical damage on marine mammal hearing mechanisms. To prevent risk of auditory damage, the MMO program and procedures to ramp-up from 10 cu inches to 40 cu inches prior to seismic data collection, should alleviate significant impact. Further, these activities are not expected to result in a significant impact on species or stocks of marine mammals and should also not affect the availability of species or stocks for subsistence uses.

7.2 Behavioral Response

7.2.1 Bowhead Whale

Bowhead whales will likely show some behavioral changes during airgun activity, but depending on distance from the noise source, overall displacement should be minimal. Bowhead whales in the Beaufort Sea were observed remaining in a location where they were exposed to seismic, dredging, and drilling sounds. Their social and feeding behavior appeared normal as industry-related noises occurred (Richardson and Würsig 1997). When observed over multiple years, bowhead whales in the same area also did not appear to avoid seismic locations. MMS did not find a statistical difference in the change of direction for bowhead whales traveling during seismic activity when analyzing fall migration data from 1996 to 1998 (MMS 2005). Bowhead and gray whales have appeared unbothered when seismic pulses between 160 to 170 dB re 1 µPa were fired from a seismic vessel within a few km of their locality, but tended to avoid the area when levels exceeded 170 dB (Richardson et al. 1997).

It is unclear exactly what causes displacement, but whales have tended to show shorter surface and dive times, fewer blows per surfacing, and longer blow intervals when noise levels were at or above 152 dB and show avoidance of seismic operations within a 20-km (12.4-mile) radius (Ljungbald 1988, Richardson 1999). Bowhead whales may also flee from or show total avoidance of vessels if they are too close. (Richardson and Würsig 1997). Bowhead whales showed total avoidance at distances of 1.3 km, 7.2 km, 3.5 km, and 2.9 km (0.8 mi, 4.5 mi, 2.2 mi, and 1.8 mi) when the sound level was 152 dB, 165 dB, 178 dB, and 165 dB, respectively (Ljungbald et al. 1988).

7.2.2 Beluga Whale

Seismic activities are expected to cause temporary displacement of beluga whales, but the impact is not expected to be significant. Belugas have been shown to have greater displacement in response to a moving source (e.g., airgun activity on a moving vessel) and less displacement or behavioral change in response to a stationary source. The presence of belugas has been documented within the ensonified zones of industrial sites near platforms and stationary dredges and reportedly they did not seemed bothered. When drilling sounds were played to belugas in

industry-free areas, they only showed a behavioral reaction when received noise levels were high (Richardson et al. 1997). Beluga whales have been shown to show only an initial scare when drilling noises are played and came within a proximity greater than 153 dB re 1 µPa. Richardson et al. (1997) suggested that this might be a result of belugas having less sensitivity to low frequency sounds. Other reports suggest that belugas will remain far away from seismic vessels (Miller et al. 2005). A study in the Beaufort Sea observed low numbers of belugas within 10 to 20 km (6 to 12 mi) of seismic vessels (LGL 2006).

7.2.3 Gray Whale

Gray whales can be expected to show avoidance to seismic activity exceeding 170 dB re 1 µPa (Richardson and Würsig 1994). Previous studies have found that feeding and migrating whales are likely to move away from seismic vessels when received airgun levels are greater than or equal to 163 dB re 1 µPa (Malme et al 1988). One whale study found indications of behavioral changes such as increased swim speed and shorter blow periods for seismic activities at a distance of up to 30 km (Würsig et al. 1999). However, when conducting shore-based counts Johnson (2007) did not mention any change in behavior and found no significance between abundance and seismic activity.

7.2.4 Harbor Porpoise

There is a low density of harbor porpoise expected within the AES project area. Activities can be expected to result in temporary behavioral responses. Of the several odontocetes species, harbor porpoises are considered to have acute hearing within a high frequency range (Kastelein 2005). Studies have shown that harbor porpoises show strong avoidance to received levels of at least 140 dB re 1µPa and also displayed sensitivity to acoustic exposure (NMFS 2005). Harbor porpoises have also displayed discomfort at sound levels ranging between 97 to 111 dB re 1 µPa (Kastelein 2005). Harbor porpoises avoided feeding habitat when acoustic harassment devices (AHD) emitting sounds greater than 180 dB re 1 µPa at 1 m were installed within the area. Density also decreased up to 3.5 km (2.2 mi) around the AHD array (Johnston 2002). Harbor porpoises are expected to avoid seismic activities, and mitigation measures including seismic ramp-up procedures should prevent significant impacts and not alter feeding behaviors.

7.2.5 Killer Whales

The estimated density of killer whales in the project area is expected to be minimal and AES seismic activities should have only rare encounters with killer whales . If killer whales should enter the project area, activities can be expected to result in behavioral responses such as avoidance and general displacement. Stone (2003) reported that during seismic activities, killer whale sightings remained constant, but distance from airguns during seismic shooting was significantly greater. Whales also appeared more resilient to seismic sounds in deeper waters (Stone 2003). Killer whales have been shown to avoid AHDs over a number of years (Morton 2002).

7.2.6 Pinnipeds

Seals may show little or no reaction to seismic activities involving firing of airguns. Typically seals may show an initial reaction to loud noises, but generally do not react to noises from airguns. Observation rates for ringed seals, bearded seals, and spotted seals in the Beaufort Sea were similar when there was no airgun firing (0.63 seals per hour), a single airgun firing (0.60 seals per hour), and during a full array (usually consisting of 8 to 11 airguns) firing (0.63 seals per hour) (Harris et al. 2001). In the same study, the mean sighting distance during full array seismic was 234 m (768 ft) and 144 m (472 ft) with no seismic firing (Harris 2001). Only short-term and

temporary displacement should occur as a result of the proposed project. Seals should not be exposed to source levels higher than 190 dB re 1 µPa due to the potential for hearing damage.

7.3 Hearing Impairments

7.3.1 Sound Transmission

Marine mammals rely on sound transmission for foraging, orientation, and predator avoidance (Southall 2007; Au 2000). Marine mammals typically show different reactions to sound based on the species, sex, reproductive status, and previous exposure to sound. Marine mammals have also demonstrated a higher behavioral sensitivity when traveling with their young (MMS 2006). Although various marine mammals hear and vocalize at different frequencies, current criteria set forth by NMFS for cetaceans Level A and B harassment is 180 dB 1 µPa and 160 dB 1 µPa, respectively, for whales; and 170 dB for Level B harassment for pinnipeds (Southall 2007).

Currently, it is presumed that species will remain unaffected by sounds outside of their range of hearing (Southall 2007). Consequently baleen whales and pinnipeds tend show more sensitivity to low and mid frequencies and odontocetes show greater sensitivity to high frequency sounds (MMS 2006; Southall 2007).

7.3.2 Temporary Threshold Shift and Permanent Threshold Shift

When conducting seismic activities, a Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS) is not expected to occur in marine mammals. When marine mammals located within a vulnerable range are impacted by impulsive noises, the noises can lead to TTS or PTS. When TTS occurs, the result is reversible: hearing in exposed mammals is temporarily affected. A TTS may result in mammals failing to locate predators or prey and the inability to communicate effectively with other individuals of the same species. When threshold does not return to the original threshold levels, the damage is classified as PTS. It is unknown what level of sound will cause PTS in marine mammals, but it it is reasoned to occur at a much greater level than that caused by TTS (NMFS 2005).

TTS and PTS in given species' ears depend on the frequency sensitivity of that species. The bowhead and gray whales operate at low frequency, killer whale and beluga at mid frequency, and the harbor porpoise at high frequency (Southall 2005). Finneran (2002) estimated sound levels greater than 192 dB re 1 µPa will lead to a TTS in most cetaceans (NMFS 2005). There are no data identifying the level of sound intensity that causes a TTS in baleen whales, but because most baleen whales show avoidance at certain sound intensities risk of TTS should be avoided (MMS 2006; Southall 2007). Under prolonged exposure pinnipeds have been shown exhibiting TTS. Kastak et al. (1999) investigated the effects of noise on two California sea lions *(Zalophus californianus)*, one northern elephant seal (*Mirounga angustirostris)* and one harbor seal (*Phoca vitulina*). Kastak et al. (1999) subjected each pinniped to a noise source (100 to 2,000 Hz) for 20 to 22 minutes. Each pinniped showed a threshold shift averaging 4.8 dB *(*harbor seal), 4.9 dB *(*sea lion), and 4.6 dB (northern elephant seal) until the hearing threshold returned to pre-exposure values (under a 12-hour period).AES mitigation measures such as monitoring by MMOs within the safety zone, and, ramp-up prior to seismic operations, should prevent marine mammals from sound exposure that causes TTS and PTS.

7.3.3 Masking

Masking is the coverage or reduction of a sound (e.g., marine mammal communications) when a stronger sound (e.g., airgun noises) interferes with that sound (Richardson et al. 1995). Masking is expected to be minimal and rarely interfere with whale calls. It is presumed, but not yet determined, that like humans, marine mammals in their natural environment have the ability to sort out sounds specific to communication, foraging, and safety while overlapping noises occur (Southall 2007; Bergman 1990; Madsen 2005a). During 13 days of seismic survey pulses, sperm whales continued normal calls, and vocalization patterns remained undisturbed by received noise levels up to 146 dB re 1µPa (Madsen 2002). Some studies suggest several whale species might alter their vocalization levels to adjust to various levels of background noise (MMS 2006; MMS 1998). Belugas on the St. Lawrence River in Canada adjusted to high noise levels by vocalizing more loudly when exposed to high level sound sources (Scheifele 2005). Some of the smaller odonocetes communicate at frequencies higher than those produced by airguns, so their calls should naturally avoid masking.

Low frequency sounds emitted by airguns overlap with Mysticeti communication frequency, but not with the frequencies used by odnotocetes and pinnipeds. Mitigation measures are expected to prevent close unsafe contact between marine mammals and airguns, and the precautionary measures should prevent Mysticeti masking and consequently not disrupt communication.

8.0 IMPACTS ON SUBSISTENCE

Anticipated Impact of The Activity on The Availability of The Species or Stocks Of Marine Mammals For Subsistence Uses

8.1 Introduction

Subsistence hunting and fishing is historically, and continues to be, an essential aspect of Native life, especially in rural coastal villages. The Inupiat participate in subsistence hunting and fishing activities in and around the Chukchi Sea. The animals taken for subsistence provide a significant portion of the food that will last the community through the year. Along with the nourishment necessary for survival, the subsistence activities strengthen bonds within the culture, provide a means for educating the young, provide supplies for artistic expression, and allow for important celebratory events.

The potential impact of the noise produced by the proposed survey on subsistence could be substantial. If whales are permanently deflected away from their migration path, there could be significant repercussions to the subsistence use villages. Mitigation efforts will be put into action to minimize or avoid completely any adverse affects on all marine mammals. Additionally, areas being used for subsistence hunting grounds will be avoided. Communication between the project vessels and land-based Com and Call Centers will provide additional insight to current subsistence activities to further ensure that there will be no negative impacts on subsistence activities.

8.1.1 Subsistence Hunting

Alaska Natives, including the Inupiat, legally hunt several species of marine mammals. Communities that participate in subsistence activities potentially affected by seismic surveys within Lease Sale 193 are Point Hope, Point Lay, Wainwright, and Barrow. Marine animals used for subsistence in the proposed area include: bowhead whales, beluga whales, ringed seals, spotted seals, bearded seals, Pacific walrus, and polar bears. Humpback whales are not typically found within the proposed project area of Lease Sale 193. However, during the summer of 2007,

both humpback and fin whales were observed or detected as far as the Beaufort Sea (Joling 2007). In each village, there are key subsistence species. Hunts for these animals occur during different seasons throughout the year. Depending upon the village's success of the hunt for a certain species, another species may become a priority in order to provide enough nourishment to sustain the village.

Point Hope residents subsistence hunt for bowhead and beluga whales, polar bears and walrus. Bowhead and beluga whales are hunted in the spring and early summer along the ice edge. Beluga whales may also be hunted later in the summer along the shore. Walrus are harvested in late spring and early summer, and polar bear are hunted from October to April (MMS 2007). Seals are available from October through June, but are harvested primarily during the winter months, from November through March, due to the availability of other resources during the other periods of the year (MMS 2007).

With Point Lay situated near Kasegaluk Lagoon, the community's main subsistence focus is on beluga whales. Seals are available year-round, and polar bears and walruses are normally hunted in the winter. Hunters typically travel to Barrow, Wainwright, or Point Hope to participate in bowhead whale harvest, but there is interest in reestablishing a local Point Lay harvest.

Wainwright residents subsist on both beluga and bowhead whales in the spring and early summer. During these two seasons the chances of landing a whale are higher than during other seasons. Seals are hunted by this community year-round and polar bears are hunted in the winter.

Barrow residents' main subsistence focus is concentrated on biannual bowhead whale hunts. They hunt these whales during the spring and fall. Other animals, such as seals, walruses, and polar bears are hunted outside of the whaling season, but they are not the primary source of the subsistence harvest (URS Corporation 2005).

8.1.2 Bowhead Whales

Bowhead whales that could potentially be affected by seismic activity in the Chukchi Sea come from the Western Arctic stock. The majority of these whales migrate annually during the spring from wintering grounds in the Bering Sea, through the Chukchi Sea, to summer grounds in the Beaufort Sea. During the fall migration, the whales travel back through the Chukchi Sea to the wintering grounds in the Bering Sea. While on their spring migration route, bowhead whales travel through leads in the ice between the shorefast ice and pack ice.

Ten primary coastal Alaskan villages deploy whaling crews during whale migrations. The primary bowhead-hunting villages affected in the project area are Barrow, Wainwright and Point Hope. These communities are part of the Alaska Eskimo Whaling Commission (AEWC). The AEWC was formed as a response to the International Whaling Commission's (IWC) past prohibition of hunting bowhead whales for subsistence purposes. IWC sets a quota for the whale hunt, and AEWC allocates the quota between villages. Each of these villages is represented by a whaling captains association. Bowhead whales migrate within the hunting range of whaling crews, in the spring (north migration) and the fall (south migration). In the spring, the whales must travel through leads in the ice that tend to occur close to shore, where as in the fall, the water is much more open, allowing the whales to travel further from the coast. Whaling crews in Barrow hunt in both the spring and the fall (Funk and Galginaitis 2005).

The primary bowhead whale hunt in Barrow occurs during spring, while the fall hunt is used to meet the quota and seek strikes that can be transferred from other communities. In the spring, the

whales are hunted along leads that occur when the pack ice starts deteriorating. This tends to occur between the first week of April through May in Barrow and the first week of June in Wainwright, well before the proposed shallow hazards and site clearance surveys will be conducted. The surveys will start after all the ice melts, usually near mid-July. In the fall, whaling activities occur to the east of Point Barrow, and therefore, will not likely be part of the area affected by the project (USDOI, Bureau of Land Management [BLM] 2005). The Point Hope bowhead whale hunt occurs from March to June. Whaling camps are established on the ice edge south and southeast of Point Hope, 10 to 11 km (6 to 7 mi) offshore. (MMS 2007) Due to ice conditions, the Point Hope hunt will likely be completed prior to commencement of the surveys.

In a study of approximately 440 bowhead whales between 1989 and 1994 off the coast of Point Barrow, Richardson et al. (1995) documented movements and behaviors in response to playbacks of sounds similar to those produced by shallow hazards and site clearance surveys. Whale behavior in relation to the sound level being received at the whales' locations was observed. It was concluded by the research team that the sounds emitted did not have a biologically significant effect on bowhead movement, distribution, or behavior.

MMOs will be placed onboard the seismic vessel for the sole purpose of observing and identifying marine mammals. Avoidance mitigations, such as a radius shutdown, will occur following the sighting of any marine mammals, including bowhead whales. Negative impacts to bowhead whales by survey activities are not anticipated to occur.

8.1.3 Beluga Whales

Beluga whales summer in waters of the Chukchi and Beaufort Seas and winter in the Bering Sea. Living in areas mostly covered in ice, they are associated with leads and polynyas (Angliss and Outlaw 2007). Beluga whales can be hunted from the first week in April to possibly July or August. It is common for the Inupiat, other than residents of Point Lay, to refrain from hunting beluga during the spring or fall bowhead whale hunt to prevent scaring the larger whales away from hunting locations. Belugas do not account for a majority of the total subsistence harvest in Barrow or Wainwright (BLM 2005). Between 1999 and 2003, the annual beluga subsistence take was 65 (Angliss and Outlaw 2007).

In a study of sperm whales (a toothed whale, like the beluga) near seismic activity emitting similar sounds that will be emitted from this proposed project, Madsen et al. (2002) found that during the seismic sounding, the distribution of the whales did not change. AES does not plan to survey within 40 km (22 nm) of the coast, near Kasegaluk Lagoon, or near major polynyas. This can assure that any possible effect on the distribution or behavior of belugas will be avoided. MMOs will conduct wildlife surveys from the vessels to ensure that marine mammals are sighted and avoided.

8.1.4 Ringed Seals

Ringed seals are distributed throughout the Arctic Ocean where they inhabit both seasonal and permanent ice. In 2000, the annual estimated subsistence take from Alaska of ringed seals was 9,567. Ice conditions could account for great differences between years in the number of seals available to a particular community for harvest (Angliss and Outlaw 2007). An abundance and distribution study conducted in the Beaufort Sea before, during, and after anthropogenic sound-producing construction found that there were only slight changes near construction activities

around British Petroleum's (BP) Northstar oil development that most-likely were caused by environmental factors (Moulton et al. 2005).

Harris et al. (2001) performed a study using 3D seismic arrays, and found that the number of seal sightings varied only slightly in periods of no sonar firing, single sonar, and multiple-array of sonar firing. Seals tended to stay slightly further away from the vessel at times when full array sonar was fired, but they rarely moved beyond 250 m (820 ft) of the vessel even at that point. Sonar activity was interrupted when seals came within a certain radius (150 to 250 m [492 to 820 ft]) of the vessel in accordance to regulations set by NMFS.

Ringed seals are available to subsistence users year-round, but they are primarily hunted in the winter because of the rich availability of other mammals in the summer. Therefore, the bulk of the ringed seal hunting will occur outside of the time scope of the surveys. To further mitigate the chance of the seismic vessel interfering with the occasional summer subsistence hunting of seals, the vessel will stay offshore and away from the coastal seal hunting ground. Therefore, AES does not anticipate any adverse impacts on ringed seals as a result of the proposed survey.

8.1.5 Spotted Seals

Spotted seals in Alaska are distributed along the continental shelf of the Beaufort, Chukchi, and Bering Seas. These seals migrate south from the Chukchi Sea, through the Bering Strait, into the Bering Sea beginning in October. They spend the winter in the Bering Sea traveling east and west along the ice edge (Angliss and Outlaw 2007). Because of the numbers and opportunities for subsistence harvesting of whales and bearded seals, spotted and ringed seals are primarily hunted during winter months in the Chukchi Sea. Since this time frame is outside of the scope of the proposed surveys, the subsistence activities involving these seals is unlikely (BLM 2005), and as mentioned above, the seismic vessel will stay several miles offshore and will not affect seals near coastal hunting grounds.

8.1.6 Bearded Seals

Bearded seals tend to inhabit relatively shallow water (less than 200 m [656 ft]) that does not have much ice. In Alaska they are distributed along the continental shelf of the Bering, Chukchi, and Beaufort Seas. Most bearded seals migrate in the spring from the Bering Sea, through the Bering Strait, and into the Chukchi Sea, and spend the summer season along the ice edge. Some bearded seals do not migrate and spend all year in the waters of the Bering and Chukchi Seas. According to a subsistence harvest database, the 2000 annual harvest of bearded seals in Alaska was 6,788 (Angliss and Outlaw 2007). Bearded seals are an important source of meat and hide for Chukchi Sea villages. Because of their greater size compared to other seals, they tend to be targeted by subsistence users. This provides a lot of meat to the communities as well as skins for constructing boats (BLM 2005). To avoid affecting subsistence users that hunt bearded seals during the time of the seismic surveys, the vessel will stay offshore away from coastal hunting grounds.

8.1.7 Walruses

There are two stocks of walrus. They are the Atlantic walrus (*Odobenus rosmarus rosmarus*) and the Pacific walrus. The only stock that may be affected by the proposed seismic activity is the Pacific walrus. A majority of this population travels to the Chukchi Sea during the summer. The breeding season for these animals occurs during late winter. The average estimated annual harvest occurring in arctic regions of Alaska and Russia for this stock is 5,789. Barrow, Point Hope, Point Lay, and Wainwright participate in walrus subsistence hunting (Angliss and Lodge

2002). Walrus subsistence activity occurs between June and mid-August, with the peak harvest occurring in July and August. Because walrus hunts occur during the time frame that AES plans to conduct the seismic surveys, it is possible that walruses could be negatively impacted. If the walruses in or around hunting grounds are negatively affected, the hunt could be compromised. However, it is unlikely that the seismic survey areas will overlap with subsistence hunting grounds. The surveys will be conducted in Lease Area 193, at least 40 km (22 nm) from shore, more likely greater than 60 km (32 nm) from shore. This is well beyond the distance covered by subsistence hunters in search of walrus.

8.1.8 Polar Bears

Polar bears have a circumpolar distribution. The stocks that could most likely be affected by the proposed seismic activity come from the Chukchi/Bering Seas stock and the southern Beaufort Sea stock. Polar bears occur at low densities. The bears are harvested by Alaska Natives for subsistence, crafts, and recreation. The estimated annual statewide harvest between 1996 and 2000 was 44.8 (Angliss and Lodge 2002). Polar bears in the NSB are monitored by USFWS. Subsistence hunting for polar bears occurs during the winter and spring and comprises only a small percent of the marine mammal takes for subsistence. Therefore, polar bear subsistence hunting should not be impacted by the seismic activities in the project area. MMOs posted onboard the seismic vessel will monitor and report polar bear sightings in order to avoid the animals.

9.0 IMPACTS ON HABITAT

Anticipated Impact of The Activity Upon The Habitat of The Marine Mammal Populations, And The Likelihood Of Restoration Of The Affected Habitat

The shallow hazards and site clearance surveys proposed will not result in any permanent impact on habitats used by marine mammals, or to their prey sources. Site clearance activities will occur during the time of year when bowhead whales are widely distributed and would be expected to occur in very low numbers within the surveys area (mid-July through November). The northeastern-most of the recurring feeding areas is in the northeastern Chukchi Sea southwest of Barrow. Important walrus feeding areas will be addressed in a separate request for IHA. Any effects would be temporary and of short duration at any one place. The primary potential impacts to marine mammals are associated with elevated sound levels from the proposed seismic air guns and side scan sonar, and discussed in detail earlier in Sections 6 and 7.

A broad discussion on the various types of potential effects of exposure to seismic on fish and invertebrates can be found in LGL: *Request by the University of Alaska to Allow the Incidental Take of Marine Mammals During a Marine Geophysical Survey Across the Arctic Ocean* (2005), and includes a summary of direct mortality (pathological/physiological) and indirect (behavioral) effects.

Mortality to fish, fish eggs, and larvae from seismic energy sources would be expected within a few meters (0.5 to 3 m [1.6 to 10 ft]) from the seismic source. Direct mortality has been observed in cod and plaice within 48 hours that were subjected to seismic pulses 2 m (7 ft) from the source (Matishov 1992); however, other studies did not report any fish kills from seismic source exposure (La Bella et al. 1996; IMG 2002; Hassel et al. 2003). To date, fish mortalities associated with normal seismic operations are thought to be slight. Saetre and Ona (1996) modeled a worst-case mathematical approach on the effects of seismic energy on fish eggs and larvae, and concluded that mortality rates caused by exposure to seismic are so low compared to natural mortality that issues relating to stock recruitment should be regarded as insignificant.

Limited studies on physiological effects on marine fish and invertebrates to acoustic stress have been conducted. No significant increases in physiological stress from seismic energy were detected for various fish, squid, and cuttlefish (McCauley et al. 2000) or in male snow crabs (Christian et al. 2003). Behavioral changes in fish associated with seismic exposures are expected to be minor at best. Because only a small portion of the available foraging habitat would be subjected to seismic pulses at a given time, fish would be expected to return to the area of disturbance anywhere from 15 to 30 minutes (McCauley et al. 2000) to several days (Engas et al. 1996).

Available data indicates that mortality and behavioral changes do occur within very close range to the seismic source; however, the proposed shallow hazards and site clearance activities in the Chukchi Sea are predicted to have a negligible effect to the prey resource of the various life stages of fish and invertebrates available to marine mammals.

10.0 IMPACT OF HABITAT LOSS OR MODIFICATION

Anticipated Impact of The Loss or Modification of The Habitat On The Marine Mammal Populations Involved

It is currently unknown at how many locations the shallow hazards and site clearance surveys will occur. However, the area of any site activity will not exceed 20 sq km (6 sq nm). This area estimation is based on a 250-m (820-ft) radius and a maximum 160-m (525-ft) isobath. The effects of the planned seismic activity at each of these locations on marine mammal habitats and food resources are expected to be negligible, as described in Section 9. It is estimated that only a small portion of the animals utilizing the areas of the proposed activities would be temporarily displaced.

During the shallow hazards and site clearance surveys (mid-July through November), most marine mammals would be dispersed throughout the area. The peak of the fall bowhead whale migration through the Chukchi Sea typically occurs in October, and efforts to reduce potential impacts during this time will be addressed at the actual start of the migration and with the whaling communities. The timing of survey activities in the Chukchi Sea will be when the whales are widely distributed and would be expected to occur in very low numbers within the seismic activity area. Starting in late August, bowheads may travel in proximity to the survey areas and hear sounds from vessel traffic and seismic activities, of which some might be temporarily displaced. The numbers of cetaceans and pinnipeds subject to displacement are very small in relation to abundance estimates for the mammals addressed under this request for IHA.

In addition, feeding does not appear to be an important activity of bowheads migrating through the Chukchi Sea in most years; however, sightings of bowhead whales do occur in the summer near Barrow (Moore and DeMaster 2000), and there are suggestions that certain areas near Barrow are important feeding grounds. In addition, a few bowheads can be found in the Chukchi and Bering Seas during the summer, and Rugh et al. (2003) suggest that this may be an expansion of the Western Arctic stock although more research is needed. In the absence of important feeding areas, the potential diversion of a small number of bowheads away from survey activities is not expected to have any significant or long-term consequences for individual bowheads or their population. Bowheads, gray, beluga, and killer whales, and harbor porpoise are not expected to be excluded from any habitat.

The proposed activities are not expected to have any habitat-related effects that would produce long-term effects to marine mammals or their habitat due to the limited extent of the acquisition areas and timing of the activities.

11.0 MITIGATION

Availability And Feasibility (Economic And Technological) Of Equipment, Methods, And Manner of Conducting Such Activity or Other Means of Effecting The Least Practicable Adverse Impact Upon The Affected Species or Stocks, Their Habitat, And on Their Availability For Subsistence Uses, Paying Particular Attention To Rookeries, Mating Grounds, And Areas of Similar Significance

Several mitigation efforts will be followed in order to cause the minimal adverse impact upon affected species. For the proposed seismic survey in the Chukchi Sea, seismic reflection systems composed of multibeam and single beam sonar and digital side scan sonar will be deployed. The side scan sonar will transmit sound energy in the shape of a fan which will sweep the sea floor, resulting in 2D mapping. In this type of mapping, recordings are arranged in a straight line, while the use of 3D mapping results in recordings arranged in a grid-like pattern. By using 2D side scan sonar, AES expects to decrease the area of harassment surrounding the seismic vessel. Most of the energy will be deflected in a downward direction, decreasing the sound levels at all horizontal distances, minimizing harassment.

The time frame for the proposed seismic surveys will be largely dictated by ice and weather conditions. Surveys could start in early July and could possibly end in November. It is not expected that the surveys will last more than a total of 100 days (excluding delays related to ice or weather conditions.) The subsistence whaling season will be considered for planning purposes, but due to the location of the proposed activity, it does not appear to be in conflict. The seismic vessel will not come within 40 km (22 nm) of the shoreline and it expected to remain 60 km (32 nm) or more offshore. Areas where bowhead whales are likely to occur will be avoided during migration periods (late spring and mid autumn.)

MMOs will be placed onboard the seismic vessel to ensure no marine mammals are injured by entering the safety radii while noise-generating equipment is operating. Communications of vessel operations and transit will occur in accordance with protocols set forth by the Com and Call Centers proposed to be operated in Barrow, Point Hope, and Point Lay. This will further enable vessel operators to be aware of marine mammals and subsistence activity in the area. Furthermore, ramp-up and soft-start methods will be conducted while initiating seismic operations. This is intended to alert marine mammals in the area so that they may swim away from the source before the full energy source is employed.

12.0 PLAN OF COOPERATION

Location of Proposed Activity – In or Near a Traditional Arctic Subsistence Hunting Area and Impact on Availability of A Species or Stock of Marine Mammals for Arctic Subsistence Uses, Applicant Must Submit A "Plan of Cooperation" or information to Identify planned measures to minimize Adverse Effects on Availability of Marine Mammals for Subsistence Uses.

As part of the application for an IHA from NMFS, AES will demonstrate that we have developed a Plan of Cooperation (POC) in accord with 50 CFR 126.104(a)(12). The POC specifies measures AES will take to minimize adverse effects on marine mammals where proposed activities may affect the availability of a species or stock of marine mammals for arctic subsistence uses or near a traditional subsistence hunting area. The draft POC will be distributed to the affected subsistence communities.

AES has conducted POC meetings for its seismic operations in the Chukchi Sea in Barrow, Wainwright, Point Lay, and Point Hope, and with the AEWC. Additional meetings will be held with the Alaska Ice

Seal Committee, Alaska Beluga Committee, Eskimo Walrus Commission, and Alaska Nanuuq Commission prior to operations. At these meetings, AES will present its program and discuss local concerns regarding subsistence activities. The final POC will be submitted to NMFS and the affected subsistence communities following the conclusion of the open water meeting scheduled for April 14-16, 2008 in Anchorage.

13.0 MONITORING AND REPORTING PLAN

Suggested Means of Accomplishing The Necessary Monitoring And Reporting That Will Result In Increased Knowledge of The Species, The Level of Taking or Impacts on Populations of Marine Mammals That Are Expected To Be Present While Conducting Activities And Suggested Means of Minimizing Burdens By Coordinating Such Reporting Requirements With Other Schemes Already Applicable To Persons Conducting Such Activity. Monitoring Plans Should Include A Description of The Survey Techniques That Would Be Used To Determine The Movement And Activity Of Marine Mammals Near The Activity Site(S) Including Migration And Other Habitat Uses, Such As Feeding. Guidelines For Developing A Site-Specific Monitoring Plan May Be Obtained By Writing To The Director, Office of Protected Resources.

The proposed MMMMP is included as Appendix B of this application. It should be noted that all sightings of polar bears and walrus acquired by onboard or aerial observers will be recorded and reported to the USFWS.

14.0 COORDINATING RESEARCH TO REDUCE AND EVALUATE TAKES

Suggested Means of Learning of, Encouraging, And Coordinating Research Opportunities, Plans, And Activities Relating To Reducing Such Incidental Taking And Evaluating Its Effects

To reduce and evaluate incidental take, AES will encourage and coordinate collaborative research opportunities within state, federal, and NSB divisions. Active communication will ensure proper regulatory compliance, build local biological knowledge, and thus may reduce incidental take. Contacts such as USFWS and National Oceanic and Atmospheric Administration can assist with marine mammals or avian interactions and abnormal behavior. To better understand the importance of issues surrounding marine mammals and fisheries within the region, NSB Department of Wildlife Management biologists might also provide input and advice.

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Appendix A
R/V *Cape Flattery* Current Specifications

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R/V Cape Flattery

Contact: Kevin Kennedy
907-351-3850
kevin_k@coastalvillages.org

Specially Equipped & Rigged to Perform:

- **MARINE CONSTRUCTION**
- **DIVING AND ROV OPERATIONS**
- **SURVEYS - BATHYMETRY & SIDE SCAN SONAR**
- **OFFSHORE SUPPLY VESSEL**
- **OIL SPILL RESPONSE**

This versatile workboat has a four-point mooring system, large open deck space on two levels, and an 11-ton crane. With 5000' of line to each anchor, the Cape Flattery covers a large area from the same anchor set in 30' to 2400' of water. The comfortable berths, full galley with cooking and laundering facilities allow the vessel to accommodate 40 people for 30 days at sea.

R/V CAPE FLATTERY:

Official Number:	1111595	Call Sign:	WDA7384
Class:	ABS A1E AMS	Built By:	McDermott, Inc.
Home Port:	Seattle, WA	Date Built:	1990
ABS Classification:	Annual Load Line	Hull Construction:	Steel

USCG Certificate of Inspection: 2007

DIMENSIONS:

Gross Tonnage:	496	Net Tonnage:	1011 ITC
Length Overall:	186'	Deck Cargo:	140 Tons
Draft Light:	10'-6"	Beam:	40'
Molded Depth:	10 Avg.	Draft Loaded:	12'
Enclosed Work Rooms:	(1) 16' X 17'	Clear Deck Space:	46' x 40' (main deck)
	(1) 12.6' X 30'	Clear Deck Space:	32' x 20' (upper deck)

MACHINERY:

Main Propulsion:	(1) Cummins KTA 50, 1500 H.P.
Reduction Gear:	Reintjes WAV 870, 7:1
Z-Drives:	(2) Ulstien, 300 HP
Steering:	Joystick Control
Bow Thruster:	Omni-Thruster, 300 HP
Generators:	(3) 650 kW
Generator Engines:	(3) Cummins 1728
Auxiliary Power Unit:	(1) Cummins NT855
Propeller:	90 x 74, 4 blade, nickel-bronze

DECK EQUIPMENT:

Cranes:
(1) Hydraulic, 11 Ton @ 34' Radius 72' Max Reach

(1) Knuckle Boom, 2 Ton 25' Radius 40' Max Reach

Anchor Winch: 10 Ton
Mooring Winches: (4) Traction, Fritz Culver, 10 Ton
Capstan: 3 Ton

ACCOMMODATIONS:

Berthing Capacity:	10 Crew and 30 Passengers (expandable to 48)
Galley:	Fully Equipped w/Walk-In Refrigerator and Freezer

CAPACITIES:

Ballast Capacity:	302,000 Gal.
Potable Water Capacity:	25,000 Gal.
Fuel Capacity:	68,000 Gal.

COMMUNICATION / NAVIGATION:

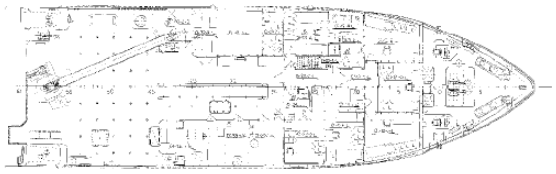
Radars:	(2) Furuno
GPS:	(1) Furuno, (1) Trimble
Gyrocompass:	Sperry
Radio – VHF:	(3) Motorola
Radio SSB:	(1) Stephens, (1) ICOM
Fathometer:	(2) Furuno
Autopilot:	Sperry and Robinson
Loud Hailer:	IMC
Weather Fax:	Furuno

PERFORMACE ESTIMATE:

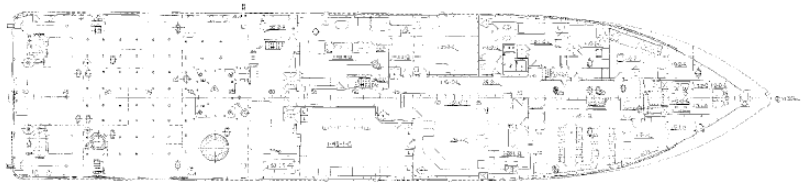
Max Speed:	11 Knots
Fuel Consumption:	1500 Gal/Day At 11 Knots
Range:	4,000 miles
Endurance:	30 days

RESCUE / SERVICE BOAT

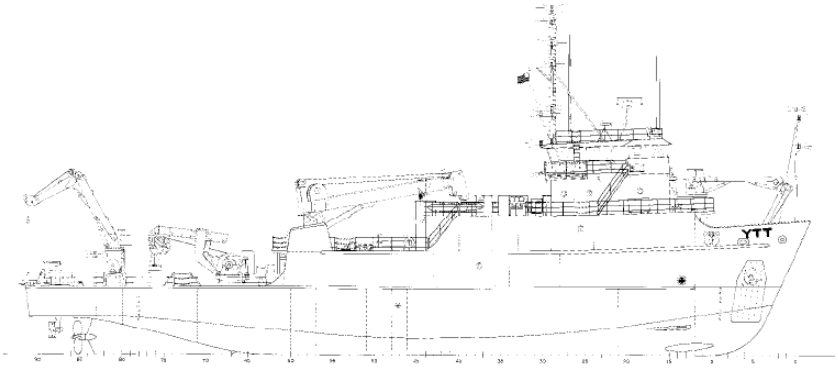
3 M RIB
22' Glacier Bay Work Skiff



FORECASTLE DECK



MAIN DECK



OUTBOARD PROFILE

Full Range of Diving Equipment and Remotely Operated Vehicles Available to Meet Any Requirements

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Appendix B
Marine Mammal Monitoring and Mitigation Plan

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Marine Mammal Monitoring and Mitigation Plan

April 2008

Prepared by

3900 C Street, Suite 601
Anchorage, Alaska 99503

and

Tetra Tech EC
19803 North Creek Parkway
Bothell, WA 98011

Table of Contents

ACRONYMS

µPa	micropascals
AES	ASRC Energy Services
BWSP	Bowhead Whale Survey Program
dB	decibel(s)
ft	foot/feet
GPS	Global Positioning System
IHA	Incidental Harassment Authorization
kHz	kilohertz
km	kilometer(s)
nm	Nautical mile(s)
m	meter(s)
MMMMP	Marine Mammal Monitoring and Mitigation Plan
MMOs	Marine Mammal Observer(s)
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NMFS	National Marine Fisheries Service
re	relative to
rms	Root mean square
R/V	Research Vessel
ZOI	Zone of Influence

1.0 INTRODUCTION

ASRC Energy Services (AES) is proposing to conduct shallow hazard and site clearance surveys in the Chukchi Sea during the 2008 open-water season. Exact locations of surveys have not yet been determined, but would occur within the lease blocks of Minerals Management Service's (MMS) Lease Sale 193. Because the lease sale area is inhabited by marine mammals, AES is applying for an Incidental Harassment Authorization (IHA) from the National Marine Fisheries Service (NMFS) for small takes of marine mammals as authorized under the Marine Mammal Protection Act (MMPA). Section 13 of the IHA application stipulates that the applicant provide "Suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding." This Marine Mammal Monitoring and Mitigation Plan (MMMMP) was developed to meet the obligation of Section 13.

2.0 PROJECT OVERVIEW

The purpose of the proposed surveys is to: determine water depths; identify and map hazards to drilling in the Chukchi Sea using geophysical methods to characterize, at a minimum, the upper 800 to 1,000 meters (m) (2,625 to 3,281 feet [ft]) of the sub-seafloor geology and detail the seafloor morphology. The marine surveys will be performed from a research vessel similar to the Research Vessel *(*R/V*) Cape Flattery* (See Figure 1.1-2 in the IHA). It should be noted that AES will not have the R/V *Cape Flattery* under contract for the 2008 season. At such time a vessel contract is secured, AES will provide NMFS with the full specifications of said vessel. See Appendix A of the IHA for vessel specifications for the desired R/V.

The start date for the planned surveys is directly related to ice conditions in the Chukchi Sea. It is anticipated that ice will begin to leave the Chukchi Sea in mid-July. If ice conditions are favorable, AES may seek authorization to mobilize to the Chukchi Sea in late June. However, it is likely that ice conditions will preclude mobilization as well as survey activities until early July. An end date will rely on weather and ice conditions and could extend into November. The surveys should not extend more than a total of 100 days excluding any delays related to ice and weather conditions. Marine surveys will take place in the Chukchi Sea covering future leased areas as a result of MMS Lease Sale 193. Exact locations for the proposed survey areas will not be known until AES enters into contract with leasholders for the proposed surveys.

Shallow hazard and site-clearance surveys are implemented through the use of seismic reflection systems. The basic components are: a sound source to emit acoustic impulse or pressure waves, an energy source, a hydrophone receiver that receives and interprets the acoustic signal, and a recorder/processor that documents data. The survey equipment proposed to be used will include:

- Multi-beam sonar,
- Single-beam sonar,
- Digital side-scan sonar,
- Multi-beam fathometer,
- Precision single-beam fathometer,
- Chirp-II sub bottom profiler,
- Bubble-Pulsar intermediate penetration profiler, and

- Global Positioning System (GPS) equipment.

As explained in Sections 1 and 6 of the IHA application, the activities of concern are the use of the side-scan sonar and the high-resolution seismic profiler. Both systems generate source noise levels considered injurious (>180/190 decibels [dB]) or harassing (>160/170 dB) to marine mammals. AES's proposed plan to mitigate and monitor for these potential impacts follows.

3.0 MITIGATION

AES's proposed operations can avoid injuring marine mammals or reduce the chances of harassment by either avoiding areas where marine mammals occur or shutting down noise-generating operation while marine mammals are present.

3.1 Avoidance

The bowhead whale spring migration, and the associated spring whaling hunts by the villages of Point Hope, Wainwright, and Barrow, occurs in open leads from about March to June, well before the mid-July start date of the proposed open water surveys. Few bowhead whales are found in the Chukchi Sea during the summer months. Surveys may coincide with the fall bowhead whale migration and hunt; however, the migration across the Chukchi Sea appears to be diffuse and densities are low. Further, the lease sale area begins about 64.4 kilometers (km) (34.8 nautical miles [nm]) from shore, beyond the general range of Barrow whalers (Point Hope and Wainwright generally do not participate in the fall hunt). Point Lay residents participate in a Beluga whale hunt between June 15th and July 10th. Because the survey will be conducted at a sufficient distance from shore, polynyas and other beluga hunting grounds will be avoided.

Gray whales do occur in large numbers in Chukchi Sea during the open water period where they form loose feeding herds. Available information on these herds suggests that the feeding occurs largely in the shallower waters between Icy Cape and Point Barrow (Clarke et al. 1989, Green and Hall 2003). However, some concentrations have been found in September in an area corresponding to the sale lease area (Clarke et al. 1989). Nevertheless, any information on the 2008 locations of these animals (e.g., from the MMS Bowhead Whale Survey Program [BWSP], 2008 seismic acquisition programs, transiting support vessels) will be used to schedule surveys away from animal concentrations.

The contracted vessel and any support vessels are not equipped to operate in the vicinity of ice; therefore, survey scheduling will be planned to totally avoid areas near ice. Doing so greatly reduces the probability of encountering significant numbers of beluga whales, ringed seals, and bearded seals, species generally found in association with ice. Because the lease sale area occurs greater than 64.4 km (35.8 nm) off shore, nearshore species such as harbor porpoise and spotted seals will likely be avoided.

By operating offshore during the open-water season, and avoiding ice or areas of known animal concentrations, AES's proposed survey program should successfully reduce its risk of encountering significant numbers of marine mammals.

3.2 Safety Radii

While the sonar equipment proposed to be used for this project generates high sound energy ranging from 200 to 242 db related to (re) 1 micropascals (µPa)-m (peak), the equipment operates at frequencies (>100 kilohertz [kHz]) beyond the effective hearing range of the marine mammals likely to be encountered (Richardson et al. 1995). However, the equipment proposed for the seismic profiling all operate, at least part of the time, at frequencies of less than 1 kHz, or within the hearing range of baleen whales, toothed whales, and pinnipeds (Richardson et al. 1995). The GeoChirp II seismic profiling system has the

greatest sound source with a measured root mean square (rms) of 214 dB and an estimated peak 224 dB. (In general, rms values are approximately 10 dB lower than peak values [McCauley et al. 2000]). Because rms values are the established criteria for assessing impacts to marine mammals, the 214 dB value is used in this report to calculate maximum exposure radii and estimate potential take of local marine mammals.

To reduce incidental takes of marine mammals during proposed surveys, AES will place Marine Mammal Observers (MMOs) on watch during all daylight hours while surveys are conducted unless nighttime or weather conditions make observations impossible. MMOs will ensure that marine mammals are at a safe radius during survey activities and when marine mammals are observed approaching or swimming near the "shutdown" radius, seismic or sonar activities will be temporarily suspended. The purpose of establishing a shutdown radius is to ensure marine mammals are not exposed to sound levels considered injurious: greater than 180 dB for baleen and toothed whales and 190 dB for pinnipeds. Based on a 214 dB re 1 µPa-m source sound level for the GeoChirp II, and a "Received Level = Source Level – 17.4 Log R – 0.00057 R" spread rate model developed by Austin et al (2006) for the Chukchi Sea, the calculated distance to the 180 dB isopleth is approximately 100 m and to the 190 dB isopleth is about 25 m. Because these values are estimates, and not based on field measurements during actual operations, we are proposing, as a precautionary measure, safety radii of 250 m for baleen whales and 75 m for toothed whales and pinnipeds. These distances are easily viewable by MMO's stationed on the R/V *Mt. Mitchell*.

4.0 MONITORING

As stipulated in Section 13 of the IHA application, monitoring and reporting are necessary requirements of the IHA. AES's approach to monitoring is to station two or more MMOs aboard the research vessel to document the occurrence of marine mammals near the research vessel, to help implement mitigation requirements, and to record the reactions of marine mammals to the survey. At least one, if not all, MMOs will be an Inupiaq trained in collecting marine mammal data. Each MMO will, while on duty, scan the area of operation (using 8-10 power binoculars) for marine mammals, recording the species, location, distance from survey vessel, and behavior (and associated weather data) of all that are seen (a copy of the proposed survey form is attached).

Each MMO determines that the safety radii is "clear" of marine mammals 30 minutes prior to start up of high-energy sound equipment, and each will have the authority to suspend active side-scan sonar or sleeve gun operations should a marine mammal be observed approaching the safety radii. If a marine mammal is sited in the safety zone, no acoustic source would start until the marine mammal leaves the area on its own or it is not sighted for at least 30 minutes. Due to the size of the guns, ramp up will consist of one gun being started at a time with approximately 5 minutes in between each start up. If a marine mammal is sighted within the safety zone, the acoustic source shall be shut-down immediately. When a marine mammal is outside the safety zone but traveling towards its radius, a vessel may alter its course to prevent marine mammal presence within the safety zone. If it is not safe or practical to alter the vessel then the acoustic source will be shutdown until the mammal is seen leaving the area.

Observer watches will last no more than 4 consecutive hours, and no observer will watch more than 12 total hours in a 24-hour day Observation will occur continuously during daylight when survey operations are conducted unless nighttime or weather conditions make observations impossible. Use of a night-scope for fall monitoring will be explored prior to the fall field season). If seismic surveys occur at night, acoustic sources operated through the day will not be shut down and will remain running through the night. If acoustic sources are turned off after daylight and visual monitoring cannot detect marine mammal presence in the safety zone, no site clearance or shallow hazards survey equipment will be turned on with the exception of navigational sonar (for safety reasons). In conjunction with the nighttime seismic surveys, AES will also participate in the industry passive acoustic monitoring protocol.

NMFS will be provided weekly reports of the marine mammal observations as long as the onboard communication systems allow. A final report describing the field operations, locations and reactions of the marine mammals observed, and the number of animals potentially "taken" will be provided. A Level B Harassment "take" will be defined as any baleen or toothed whale observed within the 160 dB criterion zone of influence (ZOI) while equipment is operating (e.g., any whale within 1.3 km (0.70 nm) of the vessel while the sound producing equipment is operating), and any pinnipeds observed within the 170 dB criterion ZOI (within 350 m [1,148 ft] of the vessel). Any animal overtly reacting to the presence of the survey operation, while high-energy sound sources are not operating, will be duly recorded and later evaluated as a possible "take". It should be noted that sound source verification for the equipment will be conducted once the vessel has mobilized to the Chukchi Sea and is authorized to operate. The sound source verification will establish in the field more exact distances to the 190 dB, 180 dB, 170 dB 160 dB and 120 dB isopleths. The final report will be prepared by a marine mammal biologist familiar with marine mammal/oil exploration issues, and provided to NMFS within 90 days of the end of the field season.

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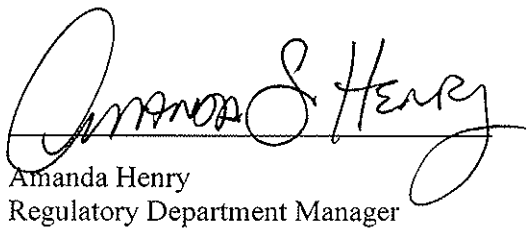

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