

**APPLICATION FOR INCIDENTAL HARASSMENT AUTHORIZATION
TO NMFS**

FOR

**OPEN WATER SEISMIC OPERATIONS
IN THE NORTH NINILCHIK AREA OF
COOK INLET**

Submitted by

Marathon Oil Company

Anchorage, Alaska

May 2007

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1. Description of the Specific Activity or Class of Activities that can be Expected to Result in Incidental Taking of Marine Mammals.

Marathon Oil Company is planning to conduct an ocean bottom-cable seismic (OBC) survey during the fall of 2007 in lower Cook Inlet on the eastern shore at North Ninilchik. The operation will be confined to a single 68.51 km² (26.45 mi²) block of area bordering the shoreline, extending from shore to a water depth of 15 m (48 ft). Seismic operations will involve a 900 cu in BOLT airgun array with two subarrays of 3, 225 cu in guns and 3, 75 cu in guns. The array will be much smaller than most large arrays used for seismic operations elsewhere in Alaska. The seismic operation will be active 24 hours per day, but the airguns will only be active for 1-2 hours during each of the 3-4 slack tide periods. Vessels will lay and retrieve cable on the bottom between the periods of acquiring seismic data. The seismic vessel currently planned for use is the M/V Peregrine Falcon, which will be supported by 3-4 bow pickers. The project is anticipated to require 45 days to shoot 146 km (90.7 mi) line, starting as early as 1 October and ending no later than 30 November depending on the completion date of the Granite Point seismic program and weather conditions. The North Ninilchik seismic operation will be conducted immediately after Union Oil Company of California completes the Granite Point seismic survey program; the same vessels and equipment will be used for the North Ninilchik seismic survey program. Consequently, the two seismic programs will occur consecutively and not simultaneously.

Overview of Ocean Bottom-Cable Seismic Surveys

The following provides a general overview of OBC seismic surveys compared to 3D streamer seismic surveys. The configuration and features of the OBC seismic survey that Marathon Oil Company will use in the North Ninilchik project is described later in this section.

Ocean-bottom cable (OBC) seismic surveys are used in Alaska to acquire seismic data in water that is too shallow for the data to be acquired using a marine-streamer vessel and/or too deep to have static ice in the winter. This type of seismic survey requires the use of multiple vessels for cable layout/pickup,

recording, shooting, and possibly one or two smaller utility boats. The vessels are generally smaller than those used in streamer operations, and the utility boats can be very small, in the range of 10-15 m.

An OBC operation begins by laying cables off the back of the layout vessel. Cable length typically is 4-6 km but can be up to 12 km. Groups of seismic-survey receivers (usually a combination of both hydrophones and vertical-motion geophones) are attached to the cable in intervals of 25-70 m. Multiple cables are laid on the seafloor parallel to each other using this layout method, with a cable spacing of less than ½ mile, depending on the geophysical objective of the survey. When the cable is in place, a vessel towing the source array passes over the cables with the source being activated every 25 -50 m. The sound source levels (zero to peak) associated with the OBC seismic survey are the same for most 2D and 3D marine seismic surveys (233-240 dB re 1uPA at 1 m). The ship speed is typically between 4-5 knots.

After one source line is acquired, the source vessel takes about 10-15 minutes to turn around and pass over the next source path. When a cable is no longer needed to record seismic survey data, it is recovered by the cable-pickup vessel and moved to the next recording position. A particular cable can lay on the seafloor anywhere from 2 hours to several days, depending upon operating conditions. An OBC seismic survey covers a smaller area and spends several days in the area. In contrast, 3D streamer seismic surveys cover a much larger area and only stay in a particular area for a few hours.

2007 Fall Acquisition Program

The data acquisition proposal incorporates the use of a lightweight Sercel 408 recording system, several shallow draft vessels and a team of seasoned personnel with extensive experience in Cook Inlet Sea transition zone operations. Veritas (VTS) will use a light weight, helicopter-portable recorder which can be positioned onshore or on the mother ship. The M/V Peregrine Falcon is self contained and able to house their 24 hour crew compliment, although, smaller cable support vessels will house their crew compliment on a mother ship offshore. The recording staff (observers) will be capable of 24 hour recording and trouble shooting, which will allow acquisition to proceed efficiently throughout the short window, and minimize the exposure period to marine mammals.

Mobilization

The mobilization effort for the survey will involve simply moving the M/V Peregrine Falcon and 3-4 bow pickers from the Union Oil Company of California Granite Point seismic operation to the North Ninilchik project area. The mobilization will occur immediately after seismic operations are completed at the Granite Point project area, probably in late September.

Navigation

The proposed navigation system will remotely link five operating systems located on each of the vessels assigned to the survey. VTS will supply an integrated navigation system utilizing DGPS for both prime and secondary positioning. A minimum of two differential base stations will be maintained at all times. The raw data used to calculate the corrections will be gathered on an exhibit archiving system. The integrated navigation system (INS) will be capable of many features that are critical to efficient Transition Zone operations.

The system will include a hazard display system that can be loaded with known obstructions along with pre-plotted source and receiver line positions. Typically the hazard displays are also loaded with the day-to-day operational hazards, buoys, etc. These daily hazards are added and subtracted to the hazard database as the crew occupies and abandons patches.

The asset monitor will update the position of each of the vessels in the survey area every few seconds. Individual ship's positions are polled port-to-port from the recording truck and then displayed on the hazard screen along with the other details that are part of its database. This feature gives the crew a quick heads up display as to each vessel's position relative to the various obstructions. It also allows the crew administrators to properly manage the vessels in the most efficient manner depending on their locations. This display gives a quick reference when a potential question regarding positioning or tracking arises. In the case of inclement weather, the hazard display can and has been used to vector vessels to safety. For this reason VTS feels that INS is a valuable safety attribute.

Receiver Positioning

Receiver positioning will be required for all receiver lines. The positions of each receiver are established through a first arrival technique. Prior to the acquisition of a stroke, the source vessel will be driven down either side of the receiver line (50 m offset is typical). The source vessel fires an accurately positioned single gun multiple times along either side of the receiver cables. Multiple gun locations are then calculated along with the first arrival times at a given receiver to triangulate an accurate position for the receiver. In shallower water (under 20 feet) it is typical to use the laid positions of the receivers at first arrival as acoustical data is often skewed in shallow water depths.

Cable Deployment and Retrieval

The deployment and retrieval of the bottom cables would be accomplished with the use of the M/V Peregrine Falcon and 3-4 bow pickers during high tides. These vessels will be rigged with hydraulically driven deployment and retrieval “Squirters”. The M/V Arctic Wolf vessel will serve as the vessel to house the bow picker workers. The marine mammal observers may also be best positioned to conduct observations from this vessel during shooting activities. This vessel will house the crews, store cable/parts and be used as a cable repair facility. The larger of the two cable vessels, Peregrine Falcon, is self-contained and will maintain 24-hour operations. The Peregrine is capable of carrying 600 channels of dressed 408 cables. The smaller bow picker style cable vessels can carry 300 channels of dressed 408 cables. All three vessels are capable of beach landings where crews could then interconnect to the land spreads. The 408 cables are extremely small while still allowing a pull of 800 pounds. Each of the cable vessels is powered with, twin jet diesels. The Arctic Wolf (Mother Ship, page 11) is a prop-driven vessel.

The proposed cable vessels are depicted below:

MV/Peregrine



Bow Pickers

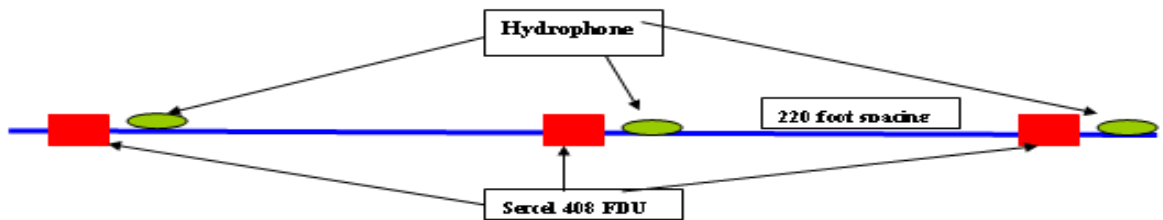


All vessels have been used extensively on previous Cook Inlet bottom cable and streamer efforts.

All equipment will be quality control inspected prior to re-deployment to insure a minimal amount of down time due to “out of spec” equipment. If VTS can ensure that the equipment is within operating specifications prior to deploying the gear, a better quality product results.

Recording

As outlined above VTS will utilize a 1500 channel Sercel 408 recording system. This system is lightweight and robust and rated to 75 feet of water depth, which allows it to operate well in the water depths anticipated on this program. The system will be configured with hydrophones taped to the cable, weighted with chain. The 408 is a single channel unit, which is located at each hydrophone group. The fact that each sensor plugs directly into the telemetry box should reduce the risk of leakage caused by cable jacket damage.



VTS will use its winter recording room as the recorder for the project. This recorder would be truck mounted and can be located onshore.

Marathon Oil Company's, equipment manufacturers', and VTS' operating standards and procedures will be followed throughout all phases of the project. Industry standard test equipment and specifications will be used. Veritas has an internal audit system to ensure compliance with all QC/QA requirements.

Source

The source for acquisition will be a 900 CUI Bolt air gun array situated on the source vessel Peregrine Falcon. VTS will have a second complete backup source rigged on a second A-frame if needed. The array will be made up of two sub-arrays, each with two, three gun clusters separated by 1.5 meters off the stern of the vessel. One cluster will consist of 3, 225 cu in guns and the second cluster will have 3, 75 cu in guns. During recording, the sub-arrays will fire at 25-50 m intervals. They are designed to focus energy downward as the vessel travels at 4 to 5 knots. A near-field hydrophone is mounted about 1 meter above each gun station (one phone is used per cluster), one depth transducer per position is mounted on the gun's ultrabox, and a high pressure transducer is mounted at the aft end of the sub-array to monitor high pressure air supply. The Sercel 408 recording cable system is lightweight and robust and rated to 75 feet of water depth. The system will be configured with hydrophones taped to the cable, weighted with chain and laid on the sea floor. All the data from these sensors are transmitted to the vessel for input into the onboard systems and recording to tape. A single 200 CFM PRICE compressor would supply air for the array. There will be two back up compressors: one located on the vessel; the second on the dock in Homer. The compressor will be run through a pressure regulated valve tree. Water

separators and dehumidifiers are also part of the source system. The array will be located with the use of DGPS antennas located on top of the A-Frames. The A frame would be lowered and raised based on water depth before the firing of the guns. All airgun activity will occur during the 3-4 daily slack tides, representing about 3-8 hours per day for seismic data acquisition.

The *Arctic Wolf* will serve as the primary platform from which vessel-based marine mammal observers will watch for marine mammals before, during, after airgun operations. One of the two MMOs may monitor from the Peregrine Falcon during data acquisition periods, when weather and logistics permit an MMO to be transferred by boat from the *Arctic Wolf*, which will house the MMOs as well as personnel working on the bow picker vessels.

Other details of the *Arctic Wolf* include the following:

Owner:	Fairweather Marine
Operator:	Fairweather Captain
Flag:	United States of America
Length:	135'
Beam:	38''
Draft:	3'
Hull:	Steel
Gross Tonnage:	2516
Fathometers:	2
Accommodation Capacity:	24 crew



2. The Date(s) and Duration of Such Activity and the Specific Geographical Region Where it will Occur.

Marathon Oil Company seeks an incidental take authorization for a period of approximately one and a half months (1 October to 30 November, 2007). Mobilization of operations will occur immediately after seismic operations are completed at the Granite Point project area by Union Oil Company of California, probably in late September. Seismic operations will continue for 45 days, beginning as early as 1 October and ending no later than 30 November, depending on the completion date of the Granite Point project and weather. The geographic region of activity encompasses a 68.51 km² (26.45 mi²) area in lower Cook Inlet on the eastern shore, paralleling the shoreline for about 15.2 km (9.5 mi) and extending from shore into the inlet an average of about 6.1 km (3.8 mi) (Figure 1).

There are no major rivers flowing into the open water seismic project area. Water depths range from 0 to 15 m (48 ft), with most of the area less than 7.3 m (24 ft) deep. The approximate boundaries of the region of the project area located over water are N 60 09, W 151 30, N 60 12, W 151 34, N 60 17, W 151 25, and N 60 16, W 151 21. Seismic operations will occur in an adjacent shoreward area on land which is not part of the IHA.

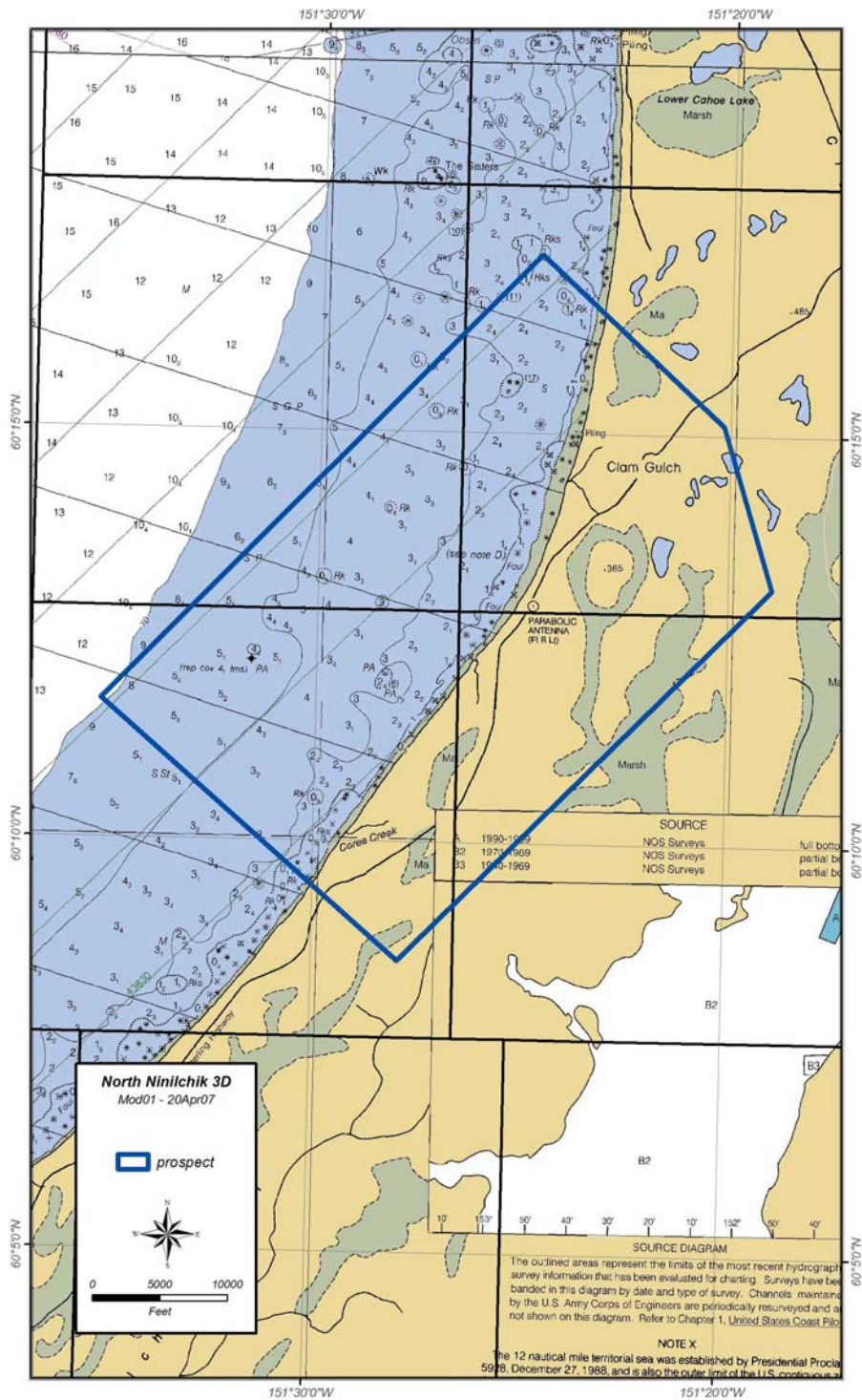


Figure 1. Seismic area of operations

3. Species and Numbers of Marine Mammals Likely to be found within the Activity Area.

A total of three cetacean and two pinniped species are known to occur in the vicinity of the project area. One of the species, the northern sea lion, is listed as Endangered under the Endangered Species Act (ESA). The beluga whale is listed as depleted under the Marine Mammal Protection Act (MMPA). The other species (killer whale, harbor porpoise, and harbor seals) have no special designation under the ESA or the MMPA. NMFS recently issued a proposed rule to list the Cook Inlet beluga whale population as an endangered species under the ESA. Listing is not likely to occur until after Marathon has completed its seismic program in Cook Inlet.

The table below summarizes the estimated abundance and ESA/MMPA status of each species (Angliss and Outlaw 2005; David Rugh, NMML, personal communications, July 25, 2006). There are no estimates for these species in Cook Inlet, except for beluga whales, so estimates are for the entire stocks. The population estimate for the harbor porpoise and harbor seal are for the Gulf of Alaska stocks, which include Cook Inlet. The population estimate for resident killer whales is for the Eastern North Pacific stock, whereas the estimate for the transient population is for the Gulf of Alaska, Aleutian Islands, and Bering Sea stock, both of which overlap Cook Inlet. The northern sea lion estimate is for the western U.S. stock, which also includes Cook Inlet. Only the population estimate for the beluga whale stock is exclusively for Cook Inlet, since the stock is assumed to reside in the inlet year-round. Except for the beluga whale, very small proportions of the populations for the other species occur in Cook Inlet, and even fewer in the upper Cook Inlet near the project site. Each species is more fully discussed in section 4.

Species	Estimated Abundance	ESA Status	MMPA Status
Beluga Whale	302 (CV=0.16)	Proposed	<i>Depleted</i>
Harbor Porpoise	30,506 (CV=0.214)	None	None
Killer Whale	-	None	None
Resident	1,123	None	None
Transient	314	None	None
Harbor Seal	29,175 (CV=0.052)	None	None
Northern Sea Lion	38,513	<i>Endangered</i>	<i>Depleted</i>

Note: Coefficient of Variation (CV) is provided where available for a given species.

4. Description of the Status, Distribution, and Seasonal Distribution (When Applicable) of the Affected Species or Stocks or Marine Mammals Likely to be Affected by such Activities.

The information developed for the technical elements of the application was derived from published and unpublished literature, personal communications with marine mammal scientists, other IHA applications, and Union Oil Company of California.

Beluga Whale: In Alaska, beluga whales comprise five distinct stocks: Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet (O’Corry-Crowe et al. 1997). For the proposed project, only the Cook Inlet stock could occur in the project area. The Cook Inlet stock is the most isolated of the five stocks, since it is separated from the others by the Alaska Peninsula (Laidre et al. 2000). Beluga whales from the Cook Inlet stock have been an important subsistence resource for native communities along the Inlet.

The NMFS’ most recent estimate for the size of the Cook Inlet beluga whale stock is 302 whales (Confidence Interval 222-410) based on June 2006 surveys (Rod Hobbs personal communications, unpublished data, April 26, 2007). Although this estimate is larger than the estimate of 278 for 2005, it is still below the average of 370 for the years 1999-2004. A trend line fit to the estimates for 1999 to 2006 estimates an average rate of decline of 4.1% per year (SE = 0.0165) (Rod Hobbs, personal communications, April 26, 2007). The NMFS has conducted annual aerial surveys covering an estimated 13-33% of the inlet including a 3 km (1.9 mi) wide strip along the ashore and approximately 100 km (521 mi) of off-shore transects from 1994 to the present (Rugh et al. 2005, 2006). Abundance estimates from these surveys indicated the population declined an average of about 14% per year during the mid 1990s, but stabilized over the past eight years (NMFS 2005, Angliss and Outlaw 2005). From 1994 to 1998, the beluga whale abundance declined from an estimated 653 to 347 whales. From 1998 to 2006, abundance estimates ranged from an estimated 278 to 435 whales. The most current population estimate (302) places the population at about 40% of the Optimum Sustainable Populations (OSP) of 780 whales (60% of the estimated carrying capacity (k) of 1,300 whales). The estimate has remained below half of the OSP, which is the threshold NMFS is required to use to designate the population as depleted under the MMPA (Angliss and Outlaw 2005).

Historically, beluga whales believed to be from the Cook Inlet population were reported in areas outside of the inlet such as Yakutat and Prince William Sound (Angliss and Outlaw 2005). In recent years, the reduced population appears to be confined to the inlet (Hobbs et al. 2005). Current summer and fall activity is concentrated in the upper inlet where belugas congregate near the mouths of rivers and along tidal flats (Hobbs et al. 2005, Rugh et al. 2005). Movements

during summer and fall appear to be influenced by the timing and locations of eulachon and salmon runs (NMFS 2005) and tidal fluctuations (Funk et al. 2005). During summer and fall, beluga whales are concentrated near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay, where they often remain stationary for many weeks or move back and forth between them in response to fish runs (Hobbs et al. 2005, Rugh et al. 2006). During winter, belugas concentrate in offshore waters in the mid-inlet to lower inlet along the west side of Cook Inlet as far as Chinitna and Tuxedni bays (Hobbs et al. 2005), although belugas are reported in the upper inlet in Knik and Turnagain arms throughout winter. The east side of the inlet south of Soldotna appears to receive very little use by belugas (Hobbs et al. 2005). Within this distribution, NMFS (2005) classified beluga habitat in the inlet into 4 types in descending order of relative value, of which the North Ninilchik project area is classified as type 3. Type 3 habitat includes winter areas, secondary summering sites, and historic sites. Type 3 habitat extends southward from approximately a line connecting Beluga River and Moose Point down the inlet to the Gulf of Alaska.

Cook Inlet belugas demonstrate site fidelity, where they regularly occur in just a few areas each year (Seaman et al. 1985, Moore et al. 2000). While there is interannual variability and overlap in beluga use among areas, generally belugas concentrate in the Susitna and Chickaloon areas in May to July; Knik Arm, Little Susitna River Delta, Point Possession, and Turnagain Arm in August; Knik Arm, Susitna River Delta, Turnagain Arm, and Chickaloon Bay, extending use along the west coast of the upper inlet to the Beluga River and north of North Foreland in September; and the mid-Cook Inlet between Point Possession and Kalgin Island in January through April (Rugh et al. 2000, 2004; Hansen and Hubbard 1999; Hobbs et al. 2005; Markowitz et al. 2006). Distribution in October and November is similar to September, but whales range more widely as prey species become more dispersed in the inlet. These patterns are consistent with those recorded for 14 tagged beluga whales tracked by satellite from 2000 to 2003 (Hobbs et al. 2005).

Information on beluga whale use and distribution in the vicinity of the North Ninilchik project area during mid to late fall is limited to studies by Hobbs et al. (2005), since others studies were conducted in the upper inlet (LGL 2006) or only during summer months (Rugh et al. 2000, 2005, 2006); however, these studies demonstrate that belugas are in the upper inlet during the fall as well as winter. Hobbs et al. (2005) documented movements of 14 satellite tagged whales in Cook Inlet between July and March from 2000-2004. Movements during confined to the upper inlet and west side of the inlet during October and November. None were present near the project area in October or November. These results show that few if any belugas likely occur in or near the project area during mid to late fall when seismic operations are planned, and if use does occur it is probably brief, infrequent, and widely scattered as a small number of belugas transit to the mid-inlet to winter.

Beluga whales calve from mid-May to mid-July (Calkins 1983). Alaska natives reported a slightly more extended calving period lasting from April through August, with calving believed to occur in Kachemak Bay in the lower inlet in April and May, off the Beluga and Susitna Rivers in May, and in Chickaloon Bay during summer (Huntington 2000). Belugas with near-term fetuses have been harvested in the Susitna delta in May and neonates are seen there throughout the summer, indicating the area may be important for calving or nursing (Huntington 2000). Mating is thought to follow the calving period, as is common in many marine mammal species (NMFS 2005). Calving or mating would not occur during the planned seismic operations.

Belugas commonly feed in river mouths and shallow estuaries, but also feed in deep submarine canyons (Reeves et al. 2002). They often congregate at river mouths and estuaries where fish concentrate during seasonal runs (Fried et al. 1979; Hazard 1988; NMFS 2005). During spring and summer, belugas prey on salmon and eulachon, often entering river channels on high tide to capture fish (Huntington 2000). Funk et al. (2005) reported beluga whales also feeding at low tide in Eagle Bay and Sixmile Creek in the Knik Arm. There is little information on fall or winter diet of beluga whales, although stomach contents of a dead beached whale in Cook Inlet during winter included saffron cod, walleye Pollock, Pacific cod, eulachon, tanner crab, bay shrimp, and polychaetes suggesting belugas prey on a wide variety of prey (NMFS 2005). Most of these species would be expected in water deeper than that in the project area.

Sources of beluga mortality in Cook Inlet include strandings, predation by killer whales, commercial fishing, and subsistence harvest. Stranding events are fairly common in Cook Inlet, particularly during spring tides (NMFS 2005). Approximately 7.6 belugas have died from strandings each year in Cook Inlet since 1988 because of high tides or possible killer whales (NMFS 2005). Killer whales killed an estimated one beluga per year between 1985 and 2002 (Sheldon et al. 2003). Five killer whales were observed in the mid- to upper inlet between 2000 and 2002, which was at the same time killer whales reportedly attacked a pod of belugas (Hobbs et al. 2005). Killer whale predation in Cook Inlet appears to be random, and no clear seasonal patterns have been identified (Sheldon et al. 2003), leaving no conclusive evidence that summer beluga distribution is influenced by killer whale occurrence (Hobbs et al. 2005). No beluga whale mortalities have been reported from commercial fishing in recent years (NMFS 2005). Lastly, subsistence harvest was reduced by NMFS to two whales per year after years of taking (struck and lost) as many as 67 per year (NMFS 2005). While a number of factors contribute to beluga mortalities, over-harvest by subsistence communities has had the most significant impact on the status of the Cook Inlet beluga whale population.

Harbor Seal: The size of the Gulf of Alaska stock is estimated at 29,175 seals (Angliss and Outlaw 2005). A relatively small proportion of the population occurs in Cook Inlet. Harbor seals are more abundant in lower Cook Inlet than in

the upper inlet, and some seals occur in the inlet throughout most of the year (Rugh et al. 2005). Most sightings in the lower inlet occur on the west shore and islands, which provide better habitat and are less developed and populated than the east shore (Rugh et al. 2005). Little information is available on harbor seal occurrence in the vicinity of the project area, but use is generally low. Some feeding may occur in the vicinity during fall and seals may pass by as they move through the inlet to the Gulf of Alaska (Peter Boveng, personal communications, April 26, 2007). Only three groups of 1 to 7 harbor seals have been reported during 1 of 13 annual aerial surveys by NMFS during summer in or near the much broader area bracketing the project area from East Forelands to Calm Gulch (Rugh et al. 2005). There is no recently published information on harbor seal use of the project area vicinity during October or November; however coastal surveys conducted by NMML in 2003, 2004, and 2005 recorded no seals indicating use in the vicinity of the project area is very low during the fall (Figure 2). Small numbers of harbor seals may transit through the project area during this time to the Gulf of Alaska.

The closest traditional haul out site to the project area is located on Kalgin Island, which is about 30-40 km from the project area. Most haul out sites are on the west shore of the lower inlet where the habitat is more suitable for providing haul out sites. The more rocky and linear structure (few coves, inlets, islands) of the east shore makes it largely unsuitable for haul out sites. Surveys conducted between 2003 to 2005 by NMML found no haul out sites between Anchor Point and East Forelands, which brackets the project area (Boveng et al. 2006a,b). Haul out sites are primarily used during the spring and summer, but some use may occur during fall and winter. Consequently, there are no traditional haul out sites in the vicinity of the project area, although there may be isolated occurrences of small number of seals infrequently hauling out on the larger borders found along the east shoreline.

Northern Sea Lion: The most recent estimate of the western U.S. stock of northern seal lion is 35,513 animals (Angliss and Outlaw 2005). They are most abundant in the Aleutians and Gulf of Alaska but range throughout the North Pacific Ocean from California to the Bering Sea and Japan. Northern sea lions occur in Cook Inlet but south of Anchor Point around the offshore islands and along the west coast of the upper inlet in the bays (Chinitna Bay, Iniskin Bay, etc.) (Rugh et al. 2005). Portions of the southern reaches of the lower inlet are

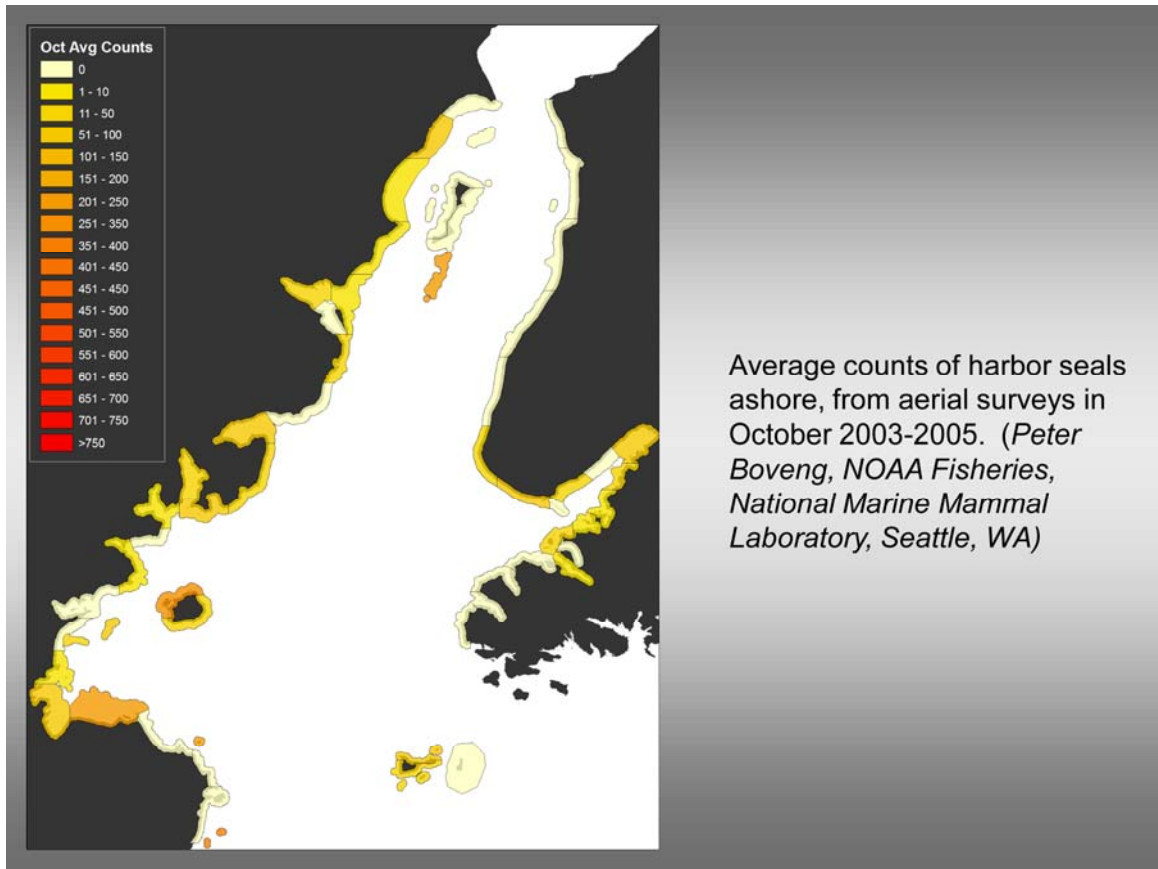


Figure 2. Harbor seal counts in Cook Inlet during October, 2003-05.

designated as critical habitat for this species. Critical habitat includes a 20-nautical mile buffer around all major haul out sites and rookeries, which are located in Prince William Sound, the south side of the Kenai and Alaska Peninsula, Kodiak Island, and throughout the Aleutian Islands. Rookeries and haul out sites in lower Cook Inlet include those near the mouth of the inlet at Gore Point, Elizabeth Island, Perl Island, the Barren Islands, and Chugach Island, which are considerably south of the project area (Figure 3). Northern sea lions gather at these traditional sites from mid May through mid July to pup and breed. No haul outs or concentration areas occur in or near the vicinity of the project area. Moreover, most seal lions would likely be in the Gulf of Alaska or Bering Sea during the time of the proposed seismic program. Consequently, it is unlikely that any sea lions would be in the project area during operations.

Harbor Porpoise: The size of the Gulf of Alaska stock is estimated at 30,506 animals (Angliss and Outlaw 2005). Harbor porpoise occur throughout Alaska waters where they are often observed in harbors, bays, and near river mouths but also occur offshore. They typically occur as solitary animals and can travel great distances. They mate sometime between July and August and give birth the following year between May and July.

A small proportion of the Gulf of Alaska harbor porpoise stock occurs in Cook Inlet. Dahlheim et al. (2000) estimated the average density of harbor porpoises in Cook Inlet was 7.2 animals per 1000 km² (386 square miles) or 0.0072 animals per km², which indicates densities are very low in the inlet. Harbor porpoises occur throughout the inlet but are more abundant in upper Cook Inlet than in the lower inlet (Rugh et al. 2005). Most (>95%) harbor porpoise in the lower inlet have been observed in the mid inlet, bays along the western shore, and near the mouth of the inlet (Rugh et al. 2005). Consequently, no more than a few harbor porpoises are likely to occur in project area during the proposed seismic operations.

Killer Whales: The Eastern North Pacific stock of killer whales includes transient and resident killer whales in the Gulf of Alaska and Cook Inlet. The resident portion of the stock is estimated at 1,123 animals and the transient portion at 314 animals (Angliss and Outlaw 2005). Killer whales are more abundant in the lower inlet than in the upper inlet, but the absolute numbers are small relative to the overall population size. Rugh et al. (2005) reported 23 killer whales in the upper inlet during 3 of 15 years of aerial survey between 1993 and 2004, and all were south of Homer. Sheldon et al. (2003) reported 11 sightings of killer whales in the upper inlet from the Susitna Flats east into Turnagain Arm and north into Knik Arm over the last 20 years. Similarly, two recent marine mammal studies in the upper inlet and Knik Arm did not observe any killer whales (Funk et al. 2005; Ireland et al. 2005). There are no records of killer whales in or near the North Ninilchik project area, and few if any would be expected to pass through the project area during seismic operations.



Figure 3. Northern sea lion rookeries and haul out locations in the vicinity of Cook Inlet (figure provided by Lowell Fritz of the National Marine Mammal Laboratory).

Other Marine Mammals: Fin, humpback, minke, and gray whales, Dall’s porpoise, and sea otter occur in the lower inlet but south of approximately Homer (Rugh et al. 2005). It would be unlikely for any of these marine mammals to occur in the project area based on the available information.

5. The 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.

Marathon Oil Company is requesting authorization for incidental taking by harassment (Level B as defined in 50 CFR 216.3) of small numbers of marine mammals during its planned geophysical project in the North Ninilchik region of Cook Inlet from October 1 to no later than November 30, 2007. The operations outlined in sections 1 and 2 have the potential to take (Level B) small numbers of marine mammals by harassment. Sounds will mainly be generated by the airguns used during the seismic survey, which is the focus of this request for an IHA. Vessel sounds generally do not occur in the primary range of odontocetes, and those measured in upper Cook Inlet were found to be below the 160 dB level for assessing take (Blackwell and Greene, 2002). Furthermore, belugas have been observed to show little if any reaction to vessel sounds in Cook Inlet (Blackwell and Greene 2002) as has also been the case for seals throughout Alaska (Richardson et al. 1995).

“Takes” by harassment will potentially result when marine mammals near the seismic activities are exposed to the pulsed sounds generated by the airguns. The effects will depend on the species of cetacean or pinniped, the behavior of the animal at the time of reception of the stimulus, as well as the distance and received level of the sound (see section 7). Temporary, short term disturbance reactions (Level B) are likely amongst some small number of marine mammals in the general vicinity of the project when air guns are activated. No take by serious injury (Level A) is anticipated, given the nature of the planned operations and the planned mitigation measures (see section 11, “MITIGATION MEASURES”). No intentional or lethal takes are expected.

6. By Age, Sex, and Reproductive Condition (if Possible), the Number of Marine Mammals (By Species) that May be Taken by Each Type of Taking, and the Number of Times such Takings by Each Type of Taking are Likely to Occur.

All anticipated takes would be "takes by harassment", involving short term, temporary changes in behavior. The mitigation measures to be applied will minimize the possibility of injurious takes. However, there is no specific information demonstrating that injurious "takes" would occur even in the absence of the planned mitigation measures. In the sections below, we describe methods to estimate "take by harassment" and present estimates of the numbers of marine mammals that might be affected during the proposed seismic survey. **The estimates are based on data obtained during marine mammal surveys by the NMFS in 2004 in the Susitna Delta, which is bracketed by the North Forelands and Point MacKenzie and includes the project area (Rugh et al. 2005).** There are no published density estimates for marine mammals in the project area vicinity, but there is an estimate for harbor porpoise in the inlet.

The estimated take of marine mammals is presented in Table 2 based on the density estimates in Table 1 and noise transmission loss estimates in Table 3. Disturbance was assumed to occur at and above the 160 dB level for all marine mammal species based on NOAA guidelines. Estimated distances at received levels were calculated from data reported by JASCO Resources Ltd. for the Beluga River seismic operations (ConocoPhillips Alaska, Inc), which is the same seismic system that will be used by Marathon at the North Ninilchik project area. Marathon Oil Company anticipates the actual trackline shot may be less than the estimated planned trackline distance because of weather and other factors causing unsuitable conditions for seismic surveys.

Table 1. Estimated density or number of marine mammals in the project area vicinity during 2007 seismic operations (Density estimation procedures are provided in the text following Table 2.)

Species	Average Density (#/km ²) Or Count	Source	Comment
Beluga Whale	0.003	NMML Unpublished data from 2006 survey of Cook Inlet by Rugh	See estimation method below in text
Harbor Seal	0-10 seals	NMML Unpublished data from 2003-5 survey of Cook Inlet by Boveng	See estimation method below in text
Harbor Porpoise	0.007	Dahlheim et al. (2000)	
Northern Sea Lion	N/A		
Killer Whale	N/A		

Table 2. Estimated take of marine mammals during 2007 seismic survey in Cook Inlet

Month	Track Planned (km)	Beluga Whale	Harbor Seal	Harbor Porpoise	N. Sea Lion	Killer Whale
Oct/Nov	146 (90.7 mi)	<3	<20	<8	<1	<1
Total		<3	<20	<8	<1	<1

Take = (A) x (2B) x (C), where

A = planned km of track shot with the 6 gun array (Table 2)

B = estimated transmission loss distance (km) to 160dB for the 6 gun arrays for all species multiplied by 2 to account for both sides of array (Table 3)

C = estimated average density (Table 1).

CPAI estimates that actual trackline shot may be less than planned because of weather and other factors causing conditions not suitable for seismic surveys.

Take Calculation Example: $146 \text{ km} \times (3.92 \text{ km} \times 2) \times 0.003 \text{ (density)} = 3 \text{ belugas}$.

Take was calculated based on the following approaches:

- Density was calculated for beluga whales by dividing 10% of the population (302) by 50% of the surface area (19,863 km²) of Cook Inlet. Based on the available information on the fall distribution of beluga whales it seems reasonable if not conservative to assume that 10% of the population could be temporarily exposed to the seismic operations.
- Average counts were used to estimate take instead of density for harbor seals, since count data were available from Boveng, but data were not available to calculate density. Although no seals were counted in the vicinity of the project area, it is likely a small number of seals transit through the project area in the fall. In order to account for seal occurrence in the project area, the count (1-10) at the location (Anchor Point) nearest to the project area was used as the basis for calculating take. This count was doubled to account for seals in the water, since the count was for seals observed on shore. The doubling of the count provides a very conservative estimate of take, which is more likely high than low.
- The available information indicates that northern sea lions would not be expected to occur in the project area during operations, and killer whales would be rare given the small numbers reported in the inlet. Rugh et al. reported 22 killer whales over 12 years of annual surveys between 1994 and 2004 with only 3-11 seen in any one year and all occurred south of Homer.

Marathon Oil Company believes the estimated take is quite conservative. Animals passing through the project area would be widespread and most likely in the middle of the inlet or along the western shore according to the available information.

Take was not calculated for the vessel noises, since beluga whales and seals show little to no reaction to the sounds of vessels, and vessel sounds are typically below the level for calculating take, except, in some cases, when immediately next to the source. Blackwell and Greene (2002) measured noise from a variety of small and large vessels in upper Cook Inlet and concluded that the sound levels were considerably below the 160 dB NMFS has identified for causing behavioral disturbance (Level B). They further stated that beluga hearing is generally above the frequency range (> 1 kHz) of most industrial noise including vessels. This is supported by their observations of belugas traveling within a few meters of the haul and stern of a docked cargo freight ship. These and other observations of belugas subjected to frequent boat traffic have shown that they can become habituated and tolerant of vessels (Blackwell and Greene 2002).

7. The Anticipated Impact of the Activity on the Species or Stock

This section includes a description of the impact of seismic activities on marine mammals.

Potential Effects of Airgun Sounds

The effects of sounds from airguns on marine mammals might include one or more of the following: tolerance, masking of natural sounds, behavioral

disturbance, and at least in theory, temporary (≥ 180 dB for cetaceans and ≥ 190 dB for pinnipeds as determined by NMFS) or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995); temporary or permanent impairment and non-auditory physical effects are theoretical and also not likely to occur due to mitigation measures required by NMFS for seismic program and, therefore they are not discussed in this application. Because the air guns will only be active during slack tides or about 3-4, 1-2 hour sessions per 24 hour day, the seismic program will be occur for relatively short periods (1-2 hr) for a small proportion ($\leq 17-33\%$) of a day, and the mitigation procedures will be implemented when marine mammals are in the project area, it is unlikely there would be any temporary or especially permanent hearing impairment, or non-auditory physical effects on marine mammals. In addition, most of nearshore area of Cook Inlet is a poor acoustic environment because of its shallow depth, soft bottom, and high background noise from currents and glacial silt which greatly reduces the distance sound travels (Blackwell and Greene 2002). Consequently, any behavioral disturbance is expected to be short term, temporary, and limited to relatively close distances to the sound source.

Tolerance

Studies have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers, but they don't necessarily cause behavioral disturbances. Numerous studies have shown that marine mammals at distances over a few kilometers from operating seismic vessels often show no apparent response. That is often true even when pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Although various baleen whales, toothed whales, and (less frequently) pinnipeds have been shown to temporarily react behaviorally to airgun pulses under some conditions, at other times they have shown no overt reactions. In general, pinnipeds and small odontocetes are more tolerant of exposure to airgun pulses than baleen whales.

Masking

Masking of marine mammal calls and other natural sounds are expected to be limited, although there are very few specific data of relevance. Some whales are known to continue calling in the presence of seismic pulses. Their calls can be heard between seismic pulses (e.g., Richardson et al. 1986; McDonald et al. 1995; Greene et al. 1999; Nieukirk et al. 2004). Masking effects of seismic pulses are expected to be negligible in the case of the odontocete cetaceans, given the intermittent nature of seismic pulses. Also, the sounds important to small odontocetes are predominantly at much higher frequencies than are airgun sounds. Therefore, the potential problem of auditory masking for beluga whales is diminished by the small amount of overlap between frequencies produced by seismic and other industrial noise (< 1 kHz) and frequencies which beluga whales

call (0.26-20 kHz) and ecolocate (40-60 kHz and 100-120 kHz) (Blackwell and Greene 2002).

Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Based on NMFS (2001, p. 9293), we assume that simple exposure to sound, or brief reactions that do not disrupt behavioral patterns in a potentially significant manner, do not constitute harassment or “taking”. By potentially significant, we mean “in a manner that might have deleterious effects to the well-being of individual marine mammals or their populations”.

Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, environmental conditions, and many other factors (Richardson et al. 1995). If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a short distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, which is not anticipated in the proposed seismic program, impacts on the animals could be significant. Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice to estimate how many mammals were present within a particular distance of industrial activities, or exposed to a particular level of industrial sound to assess behavioral disturbance. However, this procedure likely overestimates the numbers of marine mammals that are affected in some biologically important manner.

The sound criteria used to estimate how many marine mammals might be disturbed to some biologically important but unknown degree by a seismic program are based on behavioral observations during studies of several species. However, information is largely lacking for many species including those species likely to occur in the North Ninilchik project areas. Detailed studies have been done on other species found elsewhere in Alaska waters including gray whales, bowhead whales, and ringed seals. The criteria established for these marine mammals, which are applied to others are conservative and have not been demonstrated to significantly affect individuals or populations of marine mammals in Alaska waters. Therefore, the effect of the North Ninilchik seismic program on the behavior of marine mammals should be no more than negligible for reasons stated earlier, and since the immediate project area is not an important feeding or breeding area, and it appears to be primarily a transition area during the fall that marine mammals pass through while going between the mid or upper inlet to the lower inlet and Gulf of Alaska to winter. Furthermore, the proposed seismic array is much smaller than arrays typically used in Alaska, which have

not been shown to have a biologically significant effect on individuals or populations of seals or whales (Richardson et al. 1995).

Toothed Whales. Little systematic information is available about reactions of beluga whales, killer whales, and harbor porpoise to noise pulses. Beluga whales exhibit changes in behavior when exposed to strong, pulsed sounds similar in duration to those typically used in seismic surveys (Finneran et al. 2000, 2002). However, the animals tolerated high received levels of sound (peak–peak level >200 dB re 1 μ Pa) before exhibiting aversive behaviors (Richardson et al. 1995). Some belugas summering in the Eastern Beaufort Sea may have avoided the specific area of seismic operations (2 arrays with 24 airguns per array), which used a much larger array than the proposed program (2 arrays of 3 airguns per array), by 10-20 km, although belugas occurred as close as 1,540 m to the line of seismic operations (Miller et al 2005). Observers stationed on seismic vessels operating off the United Kingdom from 1997–2000 have provided data on the occurrence and behavior of various toothed whales exposed to seismic pulses (Stone 2003; Gordon et al. 2004). Killer whales were found to be significantly farther from large airgun arrays during periods of shooting compared with periods of no shooting. The displacement of the median distance from the array was ~0.5 km (0.3 n.mi.) or more. Killer whales also appear to be more tolerant of seismic shooting in deeper water. Killer whales as well as harbor porpoises are rare to uncommon in the inlet, and the planned seismic program with its relatively small array, narrow window of operation, time of the program and location should have no more than a negligible effect on them or beluga whales and no effect on the populations.

Pinnipeds. While there are no published data on seismic effect on sea lions or harbor seals, anecdotal data and data on arctic seals indicate that sea lions and other pinnipeds generally tolerate strong noise pulses (Richardson et al 1995). Monitoring studies in the Alaskan and Canadian Beaufort Sea during 1996–2002 provided considerable information regarding behavior of arctic seals exposed to seismic pulses (Miller et al. 2005; Harris et al. 2001; Moulton and Lawson 2002). These seismic projects usually involved arrays of 6 to 16 with as many as 24 airguns with total volumes 560 to 1500 in³. The combined results suggest that some seals avoid the immediate area around seismic vessels. In most survey years, ringed seal sightings tended to be farther away from the seismic vessel when the airguns were operating than when they were not (Moulton and Lawson 2002). However, these avoidance movements were relatively small, on the order of 100 m (328 ft) to (at most) a few hundred meters, and many seals remained within 100–200 m (328–656 ft) of the trackline as the operating airgun array passed by them. Seal sighting rates at the water surface were lower during airgun array operations than during no-airgun periods in each survey year except 1997. Miller et al. (2005) also reported higher sighting rates during non-seismic than during line seismic operations, but there was no difference for mean sighting distances during the two conditions nor was there evidence ringed or bearded seals were displaced from the area by the operations.

The operation of the airgun array had minor and variable effects on the behavior of seals visible at the surface within a few hundred meters of the array. The behavioral data from these studies indicated that some seals were more likely to swim away from the source vessel during periods of airgun operations and more likely to swim towards or parallel to the vessel during non-seismic periods. No consistent relationship was observed between exposure to airgun noise and proportions of seals engaged in other recognizable behaviors, e.g. “looked” and “dove”. Such a relationship might have occurred if seals seek to reduce exposure to strong seismic pulses, given the reduced airgun noise levels close to the surface where “looking” occurs (Miller et al. 2005; Moulton and Lawson 2002).

Consequently, by using the responses of bearded, ringed, and spotted seals (least amount of data on reaction to seismic operations) to seismic operations as surrogates for harbor seals and sea lions, it is reasonable to conclude that the relatively small numbers of harbor seals and the even smaller numbers of sea lions possibly occurring in the project area during seismic operations are not likely to show a strong avoidance reaction to the proposed airgun sources. Pinnipeds frequently do not avoid the area within a few hundred meters of operating airgun arrays, even for airgun arrays much larger than that planned for the proposed project (e.g., Harris et al. 2001). Reactions are expected to be very localized and confined to relatively small distances and durations, with no long-term effects on individuals or populations.

Strandings and Mortality

There is no evidence in the literature that airgun pulses can cause serious injury, death, or stranding of marine mammals even in the case of much larger airgun arrays than planned for the proposed program. While strandings have been associated with military mid-frequency sonar pulses, Marathon Oil Company does not plan to use such sonar systems during the 2007 seismic program. Seismic pulses and military mid-frequency sonar pulses are quite different. Sounds produced by airgun arrays are broadband with most of the energy below 1 kHz. Typical military mid-frequency sonars operate at frequencies of 2-10 kHz, generally with a relatively narrow bandwidth at any one time. Thus, it is inappropriate to assume that there is a direct connection between the effects of military sonar and seismic surveys on marine mammals.

8. The Anticipated Impact of the Activity on the Availability of the Species or Stocks of Marine Mammals for Subsistence Uses

Marine mammals, particularly beluga whales, have been an integral part of the subsistence economy of the native community near the project area. Tyonek, which is predominately a Dena’ina Athapaskan community, is about 100 km north of the project area. While it is the only village that hunts beluga whales, Alaska natives unaffiliated with a Cook Inlet community who have moved to the region

and visit the region also have historically harvested beluga whales in the inlet (Mahoney and Sheldon 2000). The role of marine mammals in the subsistence economy of Tyonek and other Alaska natives has been diminished by the almost complete elimination of the harvest of Cook Inlet beluga whales because of their greatly reduced stock size. In recent years Tyonek natives harvested one beluga whale per year and occasionally harbor seals (Huntington 2000), but their primary source of red meat is moose (Foster 1982). Salmon and other fish also contribute substantially to their subsistence diet (Foster 1982). The Tyonek village recently announced (April 16, 2007) that they would not harvest any belugas in 2007 due to the status of the population.

The past harvest levels by subsistence hunters significantly reduced the Cook Inlet beluga whale population, particularly over the last 20 years (NMFS 2005). The substantial decline in the population can be accounted for by the estimates of subsistence harvest of beluga whales between 1994 and 1998. During this time, NMFS estimated that the average annual takes, including whales struck and lost, was over 60 whales per year (NMFS 2005). Annual harvest estimates were 21 whales in 1994, 70 in 1995, 98 in 1996, 70 in 1997, and 50 in 1998 representing over 300 whales harvested in five years. The harvest, which was 20% of the stock in 1996, was sufficiently high to account for a 14% annual rate of decline in the stock during this period (Hobbs et al. 2000). Since 1999, a moratorium was enacted to prohibit the harvest of beluga whales except through a co-management agreement between the NMFS and the Alaska Native Organization. Under this agreement, one whale was taken by subsistence hunters in 2001, 2002, and 2003.

The project should not have any effect on subsistence because no beluga harvest will occur in 2007, and the area is not an important native subsistence site for other subsistence species of marine mammals (harbor seals). Tyonek native subsistence activities have become focused closer to the village as more non-natives utilize and occupied traditional subsistence areas combined with harvest regulation restrictions, changes in the abundance and distribution of subsistence resources, and other factors.

Although no effect is anticipated from the seismic operation, Marathon Oil Company will meet with the Cook Inlet Marine Mammal Commission (CIMMC) and the affected native community, if practicable, to discuss the proposed seismic program.

9. The Anticipated Impact of the Activity upon the Habitat of the Marine Mammal Populations, and the Likelihood of Restoration of the Affected Habitat.

The proposed seismic survey will not cause any permanent impact on habitats and the prey used by marine mammals as described in earlier responses and restated below regarding prey.

There is a relative lack of knowledge about the potential physical (pathological and physiological) effects of seismic energy on marine fish and invertebrates. Available data suggest that there may be physical impacts on eggs and on larval, juvenile, and adult stages at very close range (within meters) to seismic energy sources. Considering typical source levels associated with seismic arrays, close proximity to the source would result in exposure to very high energy levels. Whereas egg and larval stages are not able to escape such exposures, juveniles and adults most likely would avoid them. In the cases of eggs and larvae, it is likely that the numbers adversely affected by such exposure would be very small in relation to natural mortality. Limited data regarding physiological impacts on fish and invertebrates indicate that these impacts are short-term and are most apparent after exposure at very close range (McCauley et al. 2000a,b, Dalen et al. 1996).

As in the case with physical effects of seismic on fish and invertebrates, available information on behavioral effects is relatively scant and often contradictory. There have been well-documented observations of fish and invertebrates exhibiting behaviors that appeared to be responses to exposure to seismic energy (i.e., startle response, change in swimming direction and speed, and change in vertical distribution (Wardle et al. 2001, Pearson et al. 1992). Some studies indicate that such behavioral changes are very temporary, whereas others imply that fish might not resume pre-seismic behaviors or distributions for a number of days (Engås et al. 1996). The type of behavioral reaction (startle, alarm, and avoidance) appears to depend on many factors, including the type of behavior being exhibited before exposure, and proximity and energy level of the sound source. The ultimate importance of those behaviors is unclear, but they do appear to be local and temporary.

Only a small fraction (<0.1%) of the potentially available habitat (19,863 km²) in Cook Inlet would be impacted by noise at any given time during the seismic survey, the constant movement of the seismic vessel would prevent any area from sustaining high noise levels for extended periods of time, and any impacts would be limited to 1-2 hours for each of the 3-4 slack tide periods airguns would be activated each day. Disturbance to fish and other prey species would be short-term, temporary, and very localized. Thus, the proposed activity is not expected to have any effects on habitat or prey that could cause permanent or long-term consequences for individual marine mammals or their populations, since seismic operations will be limited in duration, location, timing, and intensity.

10. The Anticipated Impact of the Loss or Modification of the Habitat on the Marine Mammal Populations Involved

The proposed seismic program will not result in any permanent impact on habitats used by marine mammals, or to the food sources they utilize. The main issues are direct and indirect impacts to habitat. Direct impacts are physical destruction or alteration of habitat, which will not occur from the seismic program. Indirect

impacts are primarily caused by ensonification of habitat from noise, which will be very localized and short term, since the proposed seismic surveys will be of short duration and confined to one location. Ensonification from seismic operations should have no more than a negligible effect on marine mammal habitat because:

- The seismic program will be in a relatively small area bordered on one side by the shoreline and the air guns will be active for about 3-4, 1-2 hour periods per day during slack tide, thereby confining noise levels to one location for short time periods widely spaced throughout a 24-hour day resulting in affecting a very small proportion of the available habitat in Cook Inlet for prey species or their habitats.
- No studies have demonstrated that seismic noise affects the life stages, condition, or amount of food resources (fish, invertebrates, eggs) comprising habitats used by marine mammals, except when exposed to sound levels within a few meters of the seismic source or in a few very isolated cases. Where fish or invertebrates did respond to seismic noise, the affects were of temporary and of short duration (See above). Consequently, disturbance to fish species would be short-term and fish would return to their pre-disturbance behavior once the seismic activity ceases. Thus, the proposed survey would have little, if any, impact on marine mammals to feed in the area where seismic work is planned. Furthermore, belugas are not thought to feed nearshore during mid to late fall, since salmonid runs have ended by this time, and there are no major rivers in the project area to support fish populations.
- The seismic area covers a small percentage (<0. 1%) of the potentially available habitat used by marine mammals in Cook Inlet allowing beluga and other marine mammal to move away from any seismic program sounds to feed, rest, migrate or conduct other elements of their life history.

Thus, the proposed activity is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, since operations will be limited in duration, location, timing, and intensity.

11. Mitigation Measures (The Availability and Feasibility (Economic and Technological) of Equipment, Methods, and Manner of Conducting Such Activity or 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).

Marathon Oil Company's seismic operations will deploy a 900 cu in bolt airgun array consisting of two subarrays each with three 225 cu in airguns and three 75

cu in airguns in a 68.51 km² (26.45 mi²) area (< 0.1% of Cook Inlet) extending offshore approximately 6.1 km (3.8 mi) in an area that should attenuate the sounds because of its nearshore location characterized with a soft, mud bottom in relatively shallow water (0-15 m deep). The primary marine mammal species potentially exposed to seismic sounds will be beluga whales and harbor seals. With the short duration, limited daily activation of the airguns, relatively small array, and rapid transmission loss of sound combined with the proposed monitoring, ramp-up, power-down, and shut-down mitigation provisions described below, the planned seismic program is expected to have no more than negligible impacts on the marine mammals species and stocks, and their availability for subsistence. There are no known rookeries, mating grounds, or areas of similar significance in the project area.

Marine Mammal Monitoring

Two vessel-based observers will monitor marine mammals at the seismic program during all hours of airgun operations. These observations will provide the real-time data needed to implement some of the key mitigation measures. When marine mammals are observed within, or about to enter, designated safety zones (see below) where there is a possibility of significant effects on hearing or other physical effects, airgun operations will be powered down (or shut down if necessary) immediately.

The vessel-based observers will watch for marine mammals at the seismic operation during all periods with shooting and for a minimum of 30 minutes prior to the planned start of airgun operations after an extended shut down. Marathon Oil Company personnel will also watch for marine mammals (insofar as practical) and alert the observers for the airgun(s) to be shut down if marine mammals are observed in or about to enter the safety radii.

Proposed Safety Radii

Received sound levels for determining take were obtained from the results of a field validation test conducted by JASCO for a seismic program identical to the one planned by Marathon Oil Company (JASCO 2007). JASCO Research Ltd. carried out acoustic measurements of an 880 cubic inch airgun array as a function of distance from the source for ConocoPhillips's 2007 Beluga 3D Seismic Shoot survey program. Acoustic measurements were obtained using calibrated, high-resolution Ocean Bottom Hydrophone (OBH) recorders during 10-11 April, 2007. The site characteristics (shallow water and nearshore location) were generally similar for the two areas, including shallow water and nearshore locations. While there may be some slight differences in the results, the nominal ranges for the Beluga site should be representative of the acoustic sound levels at the North Ninilchik project area. The maximum distances from the airgun(s) where sound levels of 190, 180, and 160 dB re 1 μ Pa (rms) are predicted to be received are shown Table 3.

Table 3. Estimated distances sound levels \geq 190, 180, and 160 dB RMS might be received from an array of 6 airguns used in seismic surveys in Cook Inlet.

Seismic Source	190dB (Safety Criterion for Seals, Sea Lions)	180dB (Safety Criterion for Whales)	160dB (Assumed Onset of Behavioral Harassment)
880 cu in Bolt Airgun array with 6 airguns including 3 @ 225 cu in and 3 @ 75 cu in	<0.220 km (0.14 mi)	<0.688 km (0.43 mi)	<3.923 km (2.44 mi)

RMS values referred to 1 μ Pa

RMS can be converted to Peak-to-Peak by adding 9 dB

Airguns will be powered down (or shut down if necessary) immediately when marine mammals are detected within or about to enter the appropriate radius: 180-dB (rms) for cetaceans, and 190-dB (rms) for pinnipeds. The 180 and 190 dB shutdown criteria are consistent with guidelines listed for cetaceans and pinnipeds, respectively, by NMFS (2000) and other guidance by NMFS.

Mitigation During Operations

The mitigation and marine mammal monitoring measures listed and described below will be adopted during the proposed seismic program, provided that doing so will not compromise operational safety requirements:

1. Speed and course alteration
2. Power-down procedures
3. Shut down procedures; and
4. Ramp-up procedures.

Speed or Course Alteration

If a marine mammal is detected outside the safety radius and, based on its position and the relative motion, is likely to enter the safety radius, the vessel's speed and/or direct course may, when practical and safe, be changed that also minimizes the effect on the seismic program. The marine mammal activities and movements relative to the seismic and support vessels will be closely monitored to ensure that the marine mammal does not approach within the safety radius. If the mammal appears likely to enter the safety radius, further mitigative actions will be taken, i.e., either further course alterations or power down or shut down of the airgun(s).

Power-down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180-dB (or 190-dB) zone is decreased to the extent that marine mammals are not in the safety zone. During a power down, one airgun is operated. The continued operation of one airgun is intended to alert marine mammals to the presence of the seismic guns in the area. In contrast, a shut down occurs when all airgun activity is suspended.

If a marine mammal is detected outside the safety radius but is likely to enter the safety radius, the airguns may (as an alternative to a complete shut down) be powered down before the mammal is within the safety radius. Likewise, if a marine mammal is already within the safety zone when first detected, the airguns will be powered down immediately if this is a reasonable alternative to a complete shut down.

Following a power down, airgun activity will not resume until the marine mammal has cleared the safety zone. The animal will be considered to have cleared the safety zone if it:

- Is visually observed to have left the safety zone, or
- Has not been seen within the zone for 15 min in the case of pinnipeds, or
- Has not been seen within the zone for 30 min in the case of whales.

Shut-down Procedures

The operating airgun(s) will be shut down completely if a marine mammal approaches or enters the applicable safety radius and a power down is not practical. The operating airgun(s) will also be shut down completely if a marine mammal approaches or enters the estimated safety radius of the source that would be used during a power down. The shutdown procedure should be accomplished within several seconds (of a “one shot” period) of the determination that a marine mammal is within or about to enter the safety zone.

Airgun activity will not resume until the marine mammal has cleared the safety radius. The animal will be considered to have cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the radius for 15 minutes (beluga, harbor porpoise, killer whales, seals, and sea lions).

Ramp-up Procedures

A “ramp up” procedure will be followed when the airgun array begins operating after a specified-duration period without airgun operations. NMFS normally requires that the rate of ramp up be no more than 6 dB per 5 minute period. Ramp

up will begin with the smallest gun in the array that is being used for all subsets of the 6-gun array. Guns will be added in a sequence such that the source level in the array will increase at a rate no greater than 6 dB per 5-minutes, which is the normal rate of ramp up for larger airgun arrays. During the ramp up (i.e., when only one airgun is operating), the safety zone for the full 6-airgun system will be maintained.

If the complete safety radius has not been visible for at least 30 minutes prior to the start of operations, ramp up will not commence unless one gun has been operating during the interruption of seismic survey operations. This means that it will not be permissible to ramp up the 6-gun source from a complete shut down in thick fog or at other times when the outer part of the safety zone is not visible. If the entire safety radius is visible, then start up of the airguns from a shut down may occur until visibility returns. If one airgun has operated during a power-down period, ramp up to full power will be permissible in poor visibility, on the assumption that marine mammals will be alerted to the seismic operations by the sounds from the single airgun and could move away if they choose. Ramp up of the airguns will not be initiated if a marine mammal is sighted within or near the applicable safety radii at any time.

12. Where the Proposed Activity Would Take Place in or Near a Traditional Arctic Subsistence Hunting Area and/or May Affect the Availability of a Species or Stock of Marine Mammal for Arctic Subsistence Uses, the Applicant Must Submit Either a Plan of Cooperation or Information that Identifies What Measures have Been Taken and/or Will be Taken to Minimize any Adverse Effect on the Availability of Marine Mammals for Subsistence Uses.

Marathon Oil Company will meet with the coastal residents of the Clam Gulch-Ninilchik-Anchor Point area, the Cook Inlet Marine Mammal Commission (CIMMC), and notify the Tyonek Village Council about the seismic program. Meetings with the local coastal residents and CIMMC will provide a basis for discussing the project and complying with the IHA requirement for a plan of cooperation (POC). NMFS found this level of communication to be sufficient for the Unocal Oil Company of California seismic operation at Granite Point in Cook Inlet to comply POC (NMFS, K. Hollingshead, personal communications, Sept 8, 2006). These meetings will provide information on the time, location, and features of the seismic operations, opportunities for involvement by local people, potential impacts to marine mammals, and mitigation measures to avoid or minimize impacts.

A number of actions will be taken by Marathon Oil Company during the seismic surveys to minimize any adverse effect on the availability of marine mammals for subsistence. There will be no harvest of belugas in 2007, but small numbers of

harbor seals could be harvested for subsistence. These actions have been identified in this application and will be further developed in the plan of cooperation. They include the following:

- Seismic program will occur outside of the traditional areas for hunting marine mammals
- Seismic operation will follow procedures to avoid, power down, shut down, and ramp up within specific safety radii to minimize effects on the behavior of marine mammals and, therefore, opportunities for harvest by local communities;
- Regional subsistence representatives may be hired to perform marine mammal observations along with onboard marine mammal biologist who will fill the remainder of the marine mammal observation team.

The combination of the timing, location, duration, size of seismic guns, mitigation measures, and input from local communities and organization will minimize if not eliminate the effect of the seismic operations on current or future availability of marine mammals for subsistence uses, which are expected to be no more than negligible.

13. The 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 the Population 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.

Marathon Oil Company's proposed Monitoring Plan is described below. Marathon Oil Company understands that this Monitoring Plan will be subject to review by NMFS and others, and that refinements may be required.

The monitoring work described has been planned as a self-contained project independent of any other related monitoring projects occurring simultaneously in the same regions. Marathon Oil Company is prepared to discuss coordination of its monitoring program with any related work done by other groups insofar as this is practical and desirable.

Vessel-based Visual Monitoring

Vessel-based observers will monitor marine mammals near the seismic vessel during (1) all hours of seismic operation; (2) start ups, and (3) at periods of low

visibility when marine mammals are suspected of either approaching or within the safety radii. When feasible, observations will also be made during transits, moving cable, and other operations when guns are inactive.

During seismic operations two observers will be based aboard the Arctic Wolf. Marine mammal observers (MMOs) will be hired by Marathon Oil Company, with NMFS consultation. One resident from the local native communities, who is knowledgeable about marine mammals of Cook Inlet may be included as part of the two member MMO team aboard the vessel. Observers will follow a schedule so observers will monitor marine mammals near the seismic vessel during all ongoing operations and poor-visibility start ups of the airguns. MMO(s) will normally be on duty in shifts no longer than 4 hours. The vessel crew will also be instructed to assist in detecting marine mammals and implementing mitigation requirements (if practical). Before the start of the seismic survey the crew will be given additional instruction on how to do so.

The vessel is a suitable platform for marine mammal observations. When stationed on the flying bridge, the observer will have an unobstructed view around the entire vessel. If surveying from the bridge, the observer's eye level will be about 6 m (20 ft) above sea level. During operations, the MMO(s) will scan the area around the vessel systematically with reticle binoculars (e.g., 7 × 50 Bushnell or equivalent) and with the naked eye. Laser range finders (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. They are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly.

When mammals are detected within or about to enter the designated safety radius, the airgun(s) will be powered down (or shut down if necessary) immediately. The observer(s) will continue to maintain watch to determine when the animal(s) are outside the safety radius. Airgun operations will not resume until the animal is outside the safety radius. The animal will be considered to have cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the radius for 15 minutes (beluga whales, harbor porpoise, seals, and sea lions) or 30 minutes (killer whales).

All observations and airgun shut downs will be recorded in a standardized format. Data will be entered into a custom database using a notebook computer. The accuracy of the data entry will be verified by computerized validity data checks as the data are entered and by subsequent manual checking of the database. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, or other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (airgun shut down).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS.
3. Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.
4. Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity.
5. Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

Reporting

A report will be submitted to NMFS within 90 days after the end of the project. The report will describe the operations that were conducted and the marine mammals that were detected near the operations. The report will be submitted to NMFS, providing full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report will also include estimates of the amount and nature of potential “take” of marine mammals by harassment or in other ways.

14. Suggested Means of Learning of, Encouraging, and Coordinating Research Opportunities, Plans, and Activities Relating to Reducing such Incidental taking and Evaluating its Effects.

Open-water seismic operations have been conducted in Alaska waters for over 25 years and, during this time there have been no noticeable adverse impacts from them on the marine mammal populations or their availability for subsistence uses. This includes seismic operations involving air gun arrays far more powerful than that proposed for the North Ninilchik project. Over the time period these larger air gun arrays have been used in the Chukchi and Beaufort seas, bowheads, gray whales, and other species have increased to where they are approaching or at carrying capacity of the habitat. Furthermore, the subsistence harvest of bowhead whales has been very consistent over the last ten years among the whaling villages suggesting no decrease in their availability for harvest (Suydam and George 2004). While seismic studies have not been conducted in Cook Inlet, those referred above for the Alaska Arctic suggest the nearshore location, site characteristic, short time frame, limited number and length of time of active seismic operations each day, and relative small airgun array of the proposed seismic program should have no more than a negligible affect on the marine mammal populations.

However, to further ensure that there will be no adverse effects resulting from the planned seismic operations, Marathon Oil Company will continue to cooperate with the NMFS, MMS, other appropriate federal agencies, the State of Alaska, CIMMC, Tyonek Village Council, the affected communities, and other

monitoring programs to coordinate research opportunities and assess all measures than can be taken to eliminate or minimize any impacts from these activities.

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