Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, AK 99503

September 10, 2007

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: Request for Approval, Incidental Harassment Authorization for Non-Lethal Taking of Seals in the Beaufort Sea, Alaska in Conjunction with On-ice Marine Geophysical (Seismic) Program During Spring 2008

Dear Mr. Lecky:

Shell Offshore Inc. (SOI), a legal entity of Shell Exploration and Production Company proposes to conduct an on-ice marine geophysical (seismic) program during spring 2008. This program will occur on U.S. Minerals Management Service (MMS) Outer Continental Shelf (OCS) lease blocks located offshore from Oliktok Point in the Alaskan Beaufort Sea. We request an Incidental Harassment Authorization (IHA) pursuant to Section 101 (a)(5)(D) of the Marine Mammal Protection Act (MMPA), 16 U.S.C. § 1371 (a)(5), to allow non-lethal takes of seals incidental to on-ice seismic operations.

SOI's IHA application identifies potential take(s) stemming from noise harassment as a result of the on-ice seismic operation vehicles. Surface sources will be two types of industry-standard vehicles described as follows:

- Vibrators will include a 68,000 pound (lb) gross vehicle weight (GVW) wheeled vibrator (capable of 49,440 foot-pounds [ft-lbs] of force),
- 20,000 lb GVW wheeled (to be modified for tracks) Envirovib (capable of 15,000 ft-lbs of force).

The proposed Beaufort Sea on-ice seismic survey is scheduled to begin in early March 2008 with camp mobilization expected to begin approximately March 11 from Oliktok Point, (see attached map). The camp should be established by mid-March and seismic acquisition will begin shortly thereafter. Data acquisition will continue for approximately 60 days until mid-May, followed by camp demobilization to Oliktok Point.

Plan of Cooperation meetings for SOI's 2007 on-ice program were held in Nuiqsut and Barrow on October 16 and 17, 2006, and on January 30 and February 1, 2007, respectively. SOI met again on its on-ice program with Kuukpik Subsistence Oversight Panel and the community of Nuiqsut on March 13, 2007. Additional meetings were held with the Ice Seal Committee, in conjunction with other marine mammal subsistence groups, in June 2007. At these meetings, SOI presented its program and discussed local concerns regarding subsistence-related activities.

The 2008 on-ice marine seismic program is essentially a continuation of the 2007 research and development on-ice marine seismic program, but with fewer types of seismic sound sources, and no underwater sound sources. For the 2008 on-ice marine seismic program, Plan of Cooperation meetings in the communities of Nuiqsut and Barrow are scheduled to occur during October 2007. Additional follow-up meetings are tentatively scheduled for early winter 2008 in the affected communities.

SOI held a pre-application teleconference September 6, 2007 with representatives of the following federal, state, and North Slope Borough agencies, and companies:

- NOAA/NMFS
- MMS
- Alaska Department of Natural Resources (ADNR), Office of Project Management and Permitting OPMP
- ADNR, Division of Oil and Gas
- North Slope Borough Planning Department
- SOI
- ASRC Energy Services, Regulatory and Technical Services
- CGG Veritas

Representatives of the North Slope Borough Wildlife Management Department and U.S Fish and Wildlife Service were invited, but did not attend the pre-application teleconference.

Given the proposed acquisition area and timing of the activities, any impacts on the seal populations of the Beaufort Sea on-ice seismic activity are likely to be short-term and transitory in temporary displacement of individuals or small groups that may be exposed to seismic sounds at the greater than 160 decibel (dB) received levels. The seismic activities will not result in any permanent impact on habitats used by marine mammals or their prey sources. There should be no adverse impacts on the availability of the seals for subsistence users. Items presented pursuant to 50 C.F.R. § 216.104, "Submission of Requests", and § 216.107, "Incidental Harassment Authorization for Arctic Waters", are attached with the application.

Please contact me at (907) 646-7112 for further information or clarification.

Sincerely,

Shell Offshore Inc.

Susan Childs
Regulatory Affairs Manager, Alaska

Attachment: Application for Incidental Harassment Authorization for the Non-lethal Taking of Seals in Conjunction with a Proposed On-ice Marine Geophysical Research and Development Program in the Beaufort Sea, Alaska, During Spring 2008

cc w/attachments:
Shane Guan, NOAA Fisheries - Silver Springs, MD
Doug DeMaster, NOAA Fisheries - Seattle, WA
Ken Hollingshead, NOAA Fisheries - Silver Spring, MD
Brad Smith, NOAA Fisheries - Anchorage, AK
Arnold Brower, Jr. - ICAS
Jeffrey Walker - MMS
Rance Wall - MMS
Don Perrin – ADNR, OPMP
Mark Stone - Shell
Bob Rosenbladt - Shell
Mark Davidson - Shell
A. Michael Macrander - Shell
Greg Horner - ASRC Energy Services, Regulatory and Technical Services
Project File
Administrative File

15214-03.04-07-005/07-375

GH/AH/CW/KP

Application for Incidental Harassment Authorization for the Non-Lethal Taking of Seals in Conjunction with a Proposed On-ice Marine Geophysical (Seismic) Program in the Beaufort Sea, Alaska, During 2008

September 2007

Submitted to:

Shell Offshore Inc.
3601 C Street, Suite 1334
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Prepared by

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

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Anchorage, Alaska 99503

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Shell Offshore Inc. (SOI) used the following guidance to prepare its request for Incidental Harassment Authorization (IHA):

> 50 CFR 216.104 "Submission of Requests"
>
> (a) In order for the National Marine Fisheries Service (NMFS) to consider authorizing the taking by U.S. citizens of small numbers of marine mammals incidental to a specified activity (other than commercial fishing), or to make a finding that incidental take is unlikely to occur, a written request must be submitted to the Assistant Administrator. All requests must include the following information for their activity:

1. A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals:

Information required by 50 CFR § 216.104 (a):

SOI proposes to conduct an on-ice marine geophysical (seismic) program during the spring 2008 over 10 to 20 U.S. Minerals Management Service (MMS) Outer Continental Shelf (OCS) lease blocks located offshore from Oliktok Point in the Alaskan Beaufort Sea (Figure 1). The proposed program location is in the vicinity of Thetis and Spy Islands, north-northwest of Oliktok Point. Figure 1 exhibits an area of approximately 50 OCS blocks; however, the proposed seismic acquisition program would occur over only approximately 10 to 20 OCS blocks (20 to 40%) of that area. The majority of the OCS blocks covered in the proposed program are surrounding the 33 feet (ft) (10 meter [m]) water depth contour. Assuming seismic acquisition occurred over up to 20 OCS blocks, the proposed on-ice seismic project would cover a maximum estimated 3,000 line-miles (4,828 kilometers [km]) of surveying within a 265 square mile (mi^2) (686 square km [km^2]) area. Two types of standard industry vibrator sources will be used on-ice, and no under-ice acoustic sources will be deployed during this on-ice marine seismic program. Receivers will be placed primarily below ice suspended in the water column; however, a few will be placed on-ice in areas where ice is grounded in the shallow marine environment.

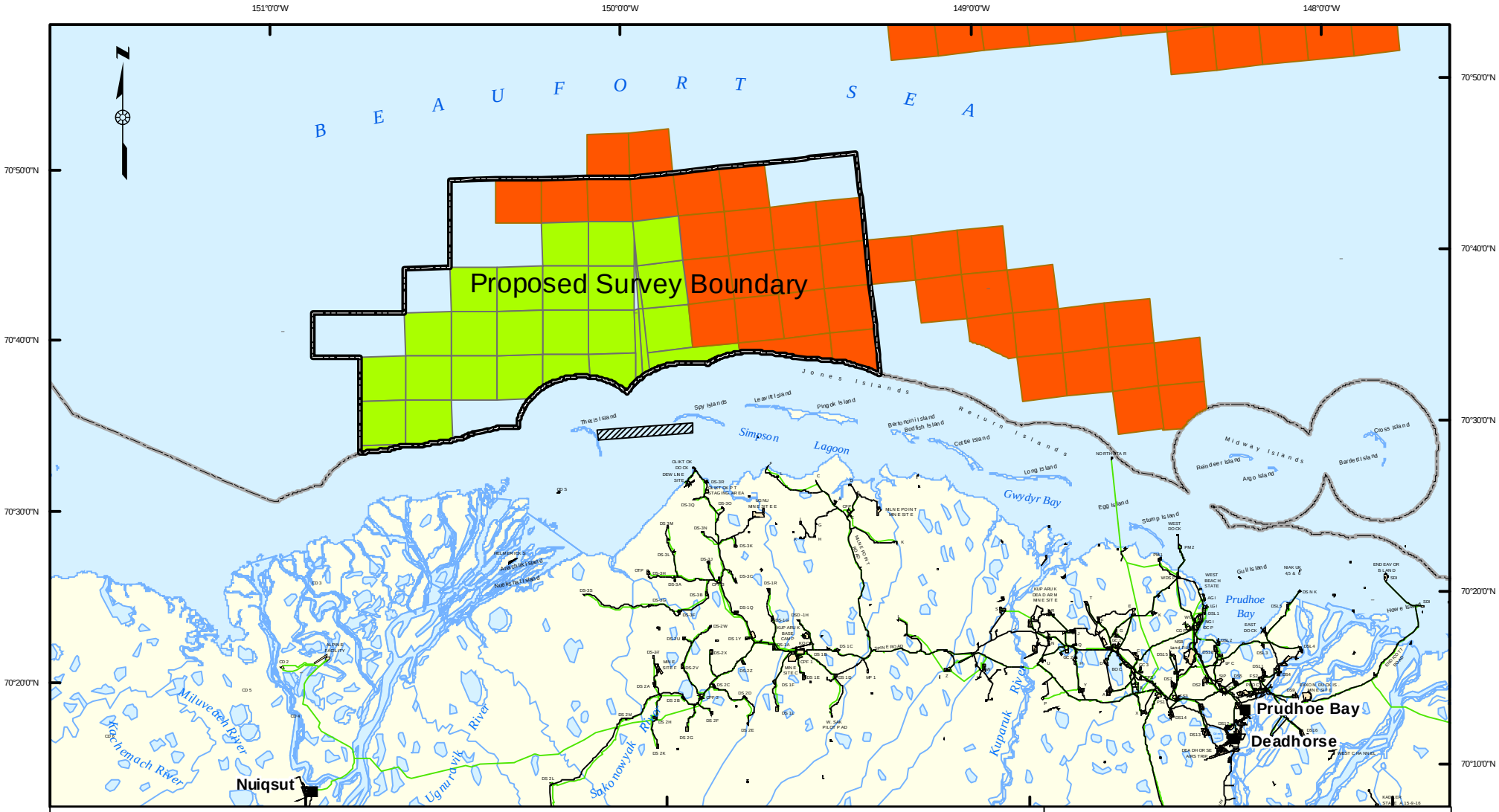
Seismic Sources/Recording Units

Surface sources will be two types of industry-standard vibrator vehicles (see Attachment A for list of equipment specifications). Vibrators will include up to:

- Five, 68,000-pound (lb) (30,800 kilograms [kg]) gross vehicle weight (GVW) Input/Output wheeled vibrators ("heavy vibes") capable of 49,440 foot-pounds [ft-lbs] of force; and
- Nine, 20,000-lb (9,072 kg) GVW Envirovibs (modified to accommodate tracks), capable of 15,000 ft-lbs of force.

Seismic data production is proposed to be collected by groups of four vibrators in series ("nose-to-tail") whether using the heavy vibes, or Envirovibs. Fewer than four vibrators per group may be used, but as a conservative assumption four are assumed for the maximum estimated exposure to marine mammals (e.g., seals – Section 6 of this application). Not all 14 Envirovibs and heavy vibes will be used at the same time. It is assumed that the Envirovibs will conduct approximately 75 percent of the program, with the "heavy vibes" accounting for approximately 25 percent.

The recording unit is comprised of approximately 13 tracked vehicles for crew transport and technical support, two tracked recording trailers, and several ice drilling units.



- Proposed Survey Boundary
- Mobile Field Camp (Area of Movement)
- Shell OCS Lease Blocks
- ENI OCS Lease Blocks
- Village
- Road
- Pipeline
- State-Federal Water Boundary

ASRC Energy Services
Regulatory and Technical Services

SHELL OFFSHORE INC.

2008 On-ice Seismic Program Area

SCALE: 0 2.5 5 10 Miles

FIGURE: 1

AES-RTS: 07-367-001.mxd, 09/04/07, R00

Temporary Mobile Field Camp

The on-ice marine seismic program will require a temporary, mobile camp facility geared to accommodate up to 120 people and will be composed of purpose-built accommodations which are largely self-sufficient for normal operations. Camp facilities are proposed to include as many as 30 to 40 sled trailers including medical facilities, crew quarters, offices, kitchen and dining facilities, laundry facilities, technical work spaces, generators, and fuel storage units. Tracked vehicles will be available for camp site support and access trail maintenance. Prospective mobile camp locations will be chosen based on ice conditions and safety of access to ice. These locations will be moved along with the project as it progresses within the area outlined in Figure 1. The temporary, mobile camp will be stationed on grounded ice alongside the project. Mobilization and demobilization of the camp and equipment will take place from Oliktok Point (Figure 1). Resupply operations will periodically be required for fuel and provisions, and will come from Deadhorse through Oliktok Dock to the mobile field camp.

Some typical equipment planned for on-ice use is shown in Attachment A.

2. The dates and duration of such activity and the specific geographic region where it will occur:

Prior to seismic testing, ice verification and profiling is scheduled to begin late January and continue through early March 2008. The extent, thickness, and integrity of the ice will be measured using satellite imagery, ground-penetrating radar, and a grid pattern of drill holes. Helicopter flights out of Deadhorse will be used to access the project area for ice verification and profiling. Subsistence advisors and polar bear hazers will accompany field crews that perform the ice verification and profiling. A minimum ice thickness of 4 ft (1.2 m) is required in order to support the vibroseis and recording equipment.

Camp mobilization is expected to begin early March 2008. Around March 11, 2008, the camp should be established within the approximated mobile field camp area shown in Figure 1 and seismic acquisition will begin shortly thereafter. Data acquisition will continue for approximately 60 days until early- to mid-May, followed by camp demobilization to Oliktok Point or West Dock.

The proposed program outline is shown in Figure 1. Ten to 20 OCS blocks within the area shown will be selected for the marine seismic program data acquisition. The water depth over the prospective area is approximately 66 ft (20 m); deep enough that the ice is not grounded. Additionally, these locations are designed to be landward of the ice pressure ridges that form between the stable and pack ice. Final location will depend on a combination of imaging requirements, suitable ice conditions, operational efficiency, and location away from permit restrictions (e.g., seal lairs, polar bear dens). Final determination of project placement is expected in early March. The project will be miles distant from any open leads in the pack ice, as the weight of the source and recording equipment requires a minimum of 4 ft (1.2 m) of ice to support the cumulative weight of this equipment.

Ice conditions within the proposed survey areas will determine the areas selected; MMS and NMFS management personnel will be consulted.

3. Species and Numbers of Marine Mammals in Area:

The species and numbers of marine mammals likely to be found within the Eastern Beaufort Sea activity areas are listed in Table 4-1.

A total of three species of pinnipeds (ringed, spotted, and bearded seal), and one marine carnivore (polar bear) are known to occur in or near the proposed study area. Polar bear abundance is addressed separately under a request for Letter of Authorization (LOA) to the U.S. Fish and Wildlife Service (USFWS) under the Beaufort Sea regulations to authorize incidental harassment of polar bears.

In an effort to reduce redundancy, we have included the required information about these species and abundance estimations (to the extent known) of these species in Section 4 below.

4. Status, Distribution and Seasonal Distribution of Affected Species or Stocks of Marine Mammals:

Three species of pinnipeds -(ringed seal, spotted seal, and bearded seal), managed as trust species by NMFS, will occur within the project activity area in the Beaufort Sea. Discussions of abundance of these species are included in this section and presented in Table 4-1. Abundance of the polar bear is included in Table 4-1, given its prevalence in the area, but is not discussed further under the species discussions.

TABLE 4-1
List of species, their habitats, conservation status, and estimated populations inhabiting the proposed seismic activity areas located in the eastern portion of the Beaufort Sea.

Species (Stock)	Habitat	Beaufort Sea Stock and/or ESA Status [1]	Estimated Abundance [2/]
Pinnipeds			
ringed seal (*Phoca hispida*) (Alaska)	Landfast 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 (*Phoca largha*)	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 (*Erignathus barbatus*)	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.
Carnivora			
polar bear (*Ursus maritimus*)	Coastal, ice	Not listed under ESA, not listed as depleted under MMPA, and not classified as a strategic stock	Population estimates for the southern Beaufort Sea population of northern Alaska is 2,272 bears.

1. ESA = Endangered Species Act. Stock listed as "depleted" under the MMPA (Marine Mammal Protection Act) is described as any stock that falls below its optimum sustainable population, 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% of K, or carrying capacity). In other words, a stock that dropped in numbers to below 60% 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 source.

Ringed Seal (*Phoca hispida*)

In the North Pacific, ringed seals are found in the southern Bering Sea and range as far south as the Sea 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 (greater than 157 ft [48 m] 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 winter, ringed seals occupy landfast ice and offshore pack ice of the Bering, Chukchi, and Beaufort Seas. Ringed seals maintain breathing holes in the ice and occupy lairs in accumulated snow (Smith and Stirling 1975). They give birth in lairs from mid-March through April, nurse their pups in the lairs for 5 to 8 weeks, and mate in late April and May (Smith 1973; Hammill et al. 1991; Lydersen and Hammill 1993).

During late April through June, ringed seals are distributed throughout their range from the southern ice edge northward (Braham et al. 1984). Preliminary results from recent surveys conducted in the Chukchi Sea in May and June 1999 and 2000 indicate that ringed seal density is higher in nearshore fast and pack ice, and lower in offshore pack ice (Bengtson et al. [in review] *cited in* Angliss and Outlaw 2005). Frost and Lowry (1999) conducted surveys in May and results indicated that, in the Alaskan Beaufort Sea, the density of ringed seals in May and June is greater toward the east of Flaxman Island than toward the west.

No estimate for the size of the Alaska ringed seal stock is currently available (Angliss and Outlaw 2005). Past ringed seal population estimates in the Bering-Chukchi-Beaufort area ranged from 1 to 3.6 million (Frost et al. 1988). Frost and Lowry (1981) estimated 80,000 ringed seals in the Beaufort Sea during summer and 40,000 during winter.

Aerial surveys within 20 nautical miles (nm) (89 km) of shore were conducted in May and June between 1986 and 1987 for a portion of the range of the ringed seal estimated 44,360 +/-9,130 (96 percent confidence interval [CI]) (Frost et al. 1988). Spring density estimates in the same area from 1985-1987 ranged from 1.01 to 2.94 seals/km^2 (0.4 mi^2) (Frost et al. 1988). Similar surveys for the Alaska Beaufort Sea between Kaktovik and Barrow occurred in the spring during several years in the 1990s with density estimates for all years ranging from 0.81 to 1.17 seals/km^2 with a mean of 0.98 seals/km^2 or approximately 18,000 hauled-out ringed seals in the survey area. Surveys conducted in 1999 and 2000 between Shishmaref and Barrow in the eastern Chukchi Sea estimated abundance of ringed seals at 252,488 (Standard Error [SE] = 47,204) and 208,857 (SE = 25,502), respectively (Bengtson et al. [in review] *cited in* Angliss and Outlaw 2005). Combining this with the average abundance estimate of 230,673 seals from the eastern Chukchi Sea, results in a total of 249,000 seals.

It is not known whether the more recent lower densities correspond to an actual reduction in the population or are related to earlier survey dates in the 1990s. At earlier dates, a higher proportion of the seals are still using their lairs and are unavailable to be counted by aerial surveyors (Kelly et al. 1998). Frost et al. (2002) reanalyzed the earlier estimates for 1985 to 1987 and reported ringed seal densities surveyed between Oliktok Point and Flaxman Island ranged from 0.56 to 1.16 seals/km^2 (about half the density originally reported) during the spring seasons of 1985 to 1987. Based on more recent surveys from 1996 through 1999, ringed seal density in fast ice areas between Oliktok Point and Flaxman Island ranged from 0.48 to 0.77 seals/km^2 (Frost et al. 2002).

BP Exploration (Alaska) Inc. (BPXA)'s Northstar project, located near Prudhoe Bay, developed a seal survey and monitoring program to establish a baseline prior to construction and to monitor during initial operations for comparison. Ringed seal densities reported by Moulton et al. (2002) ranged from 0.39 to 0.63 seals/km^2 prior to construction in the Northstar development area. Ringed seal densities close to Northstar in 2000, 2001, and 2002 were not reduced relative to those farther away or to those during the 1997 to 1999 pre-development period (Moulton et al. 2003 a, b); however, because aerial surveys will underestimate actual seal densities, the above density figures should be used as minimum estimates.

Large concentrations of ringed seals are not expected to be encountered near the proposed seismic activity area during the late March to early May time period. During the 2007 on-ice marine seismic program conducted by SOI, a total of 32 subnivian, ringed seal structures were identified in the approximately 16 km² seismic program area. Of these 32 structures, five were identified as birth lairs, seven as lairs used by rutting males, and the remainder were breathing holes or resting lairs (Smith 2007). This number of 32 seal structures was considered a low relative density for this area of the Beaufort Sea (Smith 2007). The Alaska stock of ringed seals is not classified as a strategic stock by the NMFS.

Spotted Seal (*Phoca largha*)

Spotted seals occur in the Beaufort, Chukchi, Bering and Okhotsk Seas, and south to the northern Yellow Sea and western Sea of Japan (Shaughnessy and Fay 1977). Based on satellite tagging studies, spotted seals migrate south from the Chukchi Sea in October and pass through the Bering Strait in November and overwinter in the Bering Sea along the ice edge (Lowry et al. 1998). As can be discerned from the following, spotted seals are not assumed to be present in the Beaufort Sea at the time of the proposed on-ice seismic program.

In summer, the majority of spotted seals are found in the Bering and Chukchi Seas, but do range into the Beaufort Sea (Rugh et al. 1997; Lowry et al. 1998) from July until September. At this time of year, spotted seals haul out on land part of the time, but also spend extended periods at sea. The seals are most commonly seen in bays, lagoons, and estuaries and are typically not associated with pack ice unless it is near shore.

A small number of spotted seal haul-outs are documented in the central Beaufort Sea near the deltas of the Colville River and, previously, the Sagavanirktok River. Historically, these sites supported as many as 400 to 600 spotted seals, but in recent times less than 20 seals have been seen at any one site (Johnson et al. 1999).

As the ice cover thickens with the onset of winter, spotted seals leave the northern portions of their range and move into the Bering Sea (Lowry et al. 1998).

Previous studies from 1996 to 2001 indicate that few spotted seals (a few tens) utilize the central Alaskan Beaufort Sea (Moulton and Lawson 2002; Treacy 2002 a, b). In total, there are probably no more than a few tens of spotted seals along the coast of the central Alaska Beaufort Sea during summer and early fall with very few, if any, occurring in the eastern portion of the Beaufort Sea.

A reliable abundance estimate for spotted seal is not currently available (Angliss and Outlaw 2005); however, early estimates of the size of the world population of spotted seals was 335,000 to 450,000 animals and the size of the Bering Sea population, including animals in Russian waters, was estimated to be 200,000 to 250,000 animals (Burns 1973 *cited in* Angliss and Lodge 2004). The total number of spotted seals in Alaskan waters is not known (Angliss and Lodge 2004), but the estimate is most likely between several thousand and several tens of thousands (Rugh et al. 1997). Using maximum counts at known haulouts from 1992 (4,135 seals), and a preliminary correction factor for missed seals developed by the Alaska Department of Fish and Game (Lowry et al. 1998), an abundance estimate of 59,214 was calculated for the Alaska stock (Angliss and Lodge 2004).

The activities associated with this proposed on-ice seismic work is expected to encounter few to no spotted seals. The Alaska stock of spotted seals is not classified as a strategic stock by NMFS.

Bearded Seal (*Erignathus barbatus*)

Bearded seals are associated with sea ice and have a circumpolar distribution (Burns 1981). Bearded seals are predominately benthic feeders and prefer waters less than 656 ft (200 m) in depth.

Seasonal movements of bearded seals are directly related to the advance and retreat of sea ice and to water depth (Kelly 1988). During winter they are most common in broken pack ice and in some areas also inhabit shorefast ice (Smith and Hammill 1981). In Alaska waters, bearded seals are distributed over the continental shelf of the Bering, Chukchi, and Beaufort Seas, but are more concentrated in the northern part of the Bering Sea from January to April (Burns 1981).

During winter, most bearded seals in Alaskan waters are found in the Bering Sea. In the Chukchi and Beaufort Seas, favorable conditions are more limited, and consequently, bearded seals are less abundant there during winter. From mid- to late-April to June, as the ice recedes, some of the bearded seals migrate northward through the Bering Strait and spend the summer along the ice edge in the Chukchi Sea (Burns 1967; Burns 1981).

Results of recent spring surveys along the Alaskan coast indicate that bearded seals tend to prefer areas of between 70 and 90 percent sea ice coverage, and are typically more abundant greater than 20 nm off shore, with the exception of high concentrations nearshore to the south of Kivalina in the Chukchi Sea (Bengtson et al. 2000; Simpkins et al. 2003).

A reliable abundance estimate for the Alaska stock of bearded seals is currently not available. The most recent surveys occurred in May and June of 1999 and 2000 between Shismaref and Barrow with average densities of 0.07 seals per km^2 (0.4 mi^2) and 0.14 seals per km^2 (0.4 mi^2) 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).

No reliable estimate of bearded seal abundance is available for the Beaufort Sea (Angliss and Lodge 2002). Aerial surveys conducted by MMS in fall 2000 and 2001 sighted a total of 46 bearded seals during survey flights conducted between September and October (Treacy 2002 a, b), with all but two sightings recorded east of 147ºW and all sightings were within 40 nm of shore. Aerial surveys conducted from 1997 to 2002 in the vicinity of Northstar Development also reported small numbers (up to 15) of bearded seals (Moulton et al. 2003c).

The activities associated with this proposed vibrator seismic work are expected to encounter few to no bearded seals. A single, adult male bearded seal was observed hauled out on the ice during the SOI 2007 on-ice marine seismic program. The Alaska stock of bearded seals is not classified by NMFS as a strategic stock.

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:

The only type of incidental taking sought in this application is that of takes by noise harassment. The sources of harassment will be those noises produced by operation of two types of industry-standard vibrator vehicles. As discussed in Section 1, vibrators will include up to five, 68,000-lb (30,800 kg) GVW (wheeled, heavy vibes) and up to nine, 20,000-lb (9,072 kg) GVW (tracked) Envirovib vibrators. Vibrators will be assembled in groups of up to four vibrators. Not all 14 vibrators will be used at the same time. No sub-ice sound or vibrator sources will be deployed for this 2008 on-ice marine seismic program.

6. Numbers of marine mammals that may potentially be taken:

SOI seeks authorization for potential "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 ringed, spotted, and bearded seals.

The only anticipated impacts to marine mammals, in this case seals, associated with noise propagation during seismic acquisition operations would be the temporary and short-term displacement of seals from within ensonified zones produced by such noise sources. Measures to mitigate impact to seals are discussed more completely in Section 11 of this IHA application.

Avoidance of ringed seal lairs is the greatest single impact to mitigate, since the proposed on-ice seismic program includes a period of time when ringed seal pups will be in birthing lairs beyond the landfast, and bottom fast ice. E.M.C. Eco Marine Corporation and Drakeheath Kennels (Eco Marine) are proposed to accompany the on-ice marine seismic program with ringed seal lair-sniffing Labrador retrievers. Labrador retrievers are used to find ringed seal breathing holes and lairs under the snow in advance of the laying out of seismic lines and seismic acquisition equipment. The monitoring approach of Eco Marine is discussed further under Section 13 of this IHA application.

The proposed area of seismic acquisition for the Beaufort Sea proposed by SOI is not expected to "take" more than small numbers of marine mammals.

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

Taking into account the small total volume and relatively low sound output of the vibrator sources, and planned mitigation measures, effects on pinnipeds are generally expected to be limited to avoidance of a small area (ensonification zone) around the seismic operation and short-term changes in behavior, falling within the MMPA definition of "Level B 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 Beaufort Sea are described below. Density estimates are calculated from relevant studies on ringed seal estimates including Stirling et al. (1982) and Kingsley (1986).

This section provides estimates of the number of potential "exposures" to sound levels greater than 160 decibels (dB) re 1 μPa (rms). The greater than 160 dB criterion is applied for all species of pinnipeds.

The following estimates are based on a consideration of the number of marine mammals that might be disturbed appreciably by a 3,000-line-mile seismic program over 265 mi^2 (686 km^2) over ungrounded ice sitting atop less than 20 m (66 ft) of water. Seismic data source descriptions including energy expressed as force and data point frequency are as follows:

- 68,000 lb Vibrator – 49,440 ft lbs; 200 to 250 vibroseis points per mi^2; and
- Envirovibs – 15,000 ft lbs; 200 to 250 vibroseis points per mi^2.

Pinnipeds

Ringed, spotted, and bearded seals are associated with sea ice, and most census methods used to determine density estimates for pinnipeds are associated with counting the number of seals hauled out on ice. Table 6-1 presents expected densities of marine mammals for the 2008 seismic program.

TABLE 6-1
Expected densities of marine mammals during the 2008 winter seismic test program proposed for offshore areas of the Beaufort Sea

Species	Average Density (#/km^2) [1]	Maximum Density (#/km^2) [1]
Pinnipeds		
ringed seal	0.251	0.92
spotted seal	0.0001	0.0005
bearded seal	0.0128	0.0226

1. These estimates are calculated from various sources including Moore et al. 2000, Stirling et al. 1982, Kingsley 1986, and presented in LGL 2005, Table 4.

Correction factors have been developed for most pinniped species that address biases associated with detectability and availability of a particular species. Extensive surveys of ringed and bearded seals have been conducted in the Beaufort Sea, the majority of which have been conducted over the landfast ice. The most comprehensive survey dataset on ringed seals (and bearded seal) from the central and eastern Beaufort Sea was conducted on offshore pack ice in late spring (Kingsley 1986).

The estimated numbers of potential exposures presented in Table 6-2 are based on the sound source range (i.e., >160 dB re 1 µPa [rms]), for most pinnipeds, the 160 dB threshold should be used to determine "take by harassment" because this range is assumed to be the sound source level at which most pinnipeds may change their behavior in reaction to increased sound exposure.

The number of exposures of a given species to sound levels between 160dB and 190 dB re 1 µPa (rms) is calculated by multiplying:

- The expected species density (average and maximum) shown in Table 6-1;
- The anticipated total line-miles of operations with the described equipment (3,000 mi); and
- The cross-track distances within which received sound levels are predicted from 2007 results.

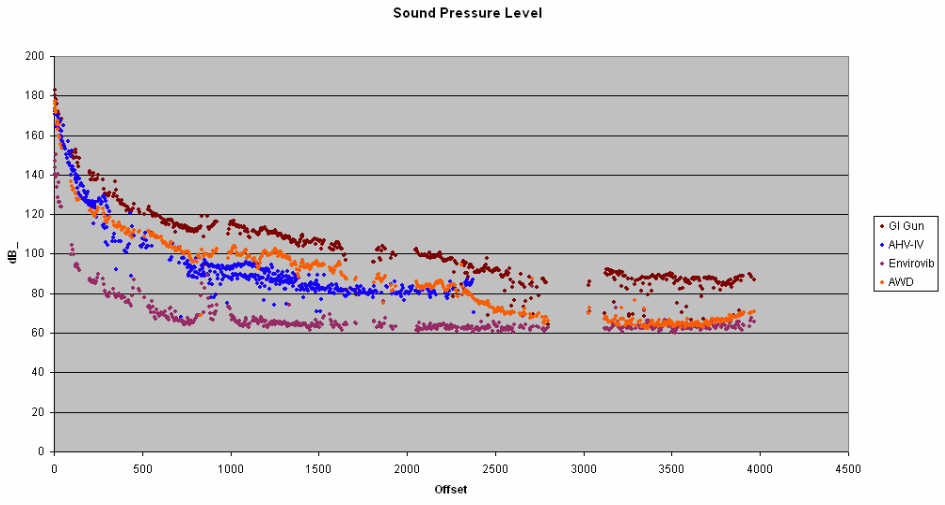
This is a conservative estimate of sound propagation, as the presence of ice cover reduces sound propagation due to its rough under surface which scatters sound waves.

Methodology for Estimating Takes

Estimated take levels were derived by assuming that up to 25 percent 750 miles (mi) (1,207 km) of the potential 3,000 mi (4,828 km) of seismic lines would be acquired utilizing heavy vibes and 75 percent would be acquired utilizing the smaller Envirovibes. The further assumption was made that data would be acquired utilizing four vibrators in series for all data acquisition whether utilizing heavy vibes or Envirovibes.

Distances of sound propagation were derived from field measurements of individual vibrators measured during the 2007 SOI on-ice marine seismic program (Figure 2). Propagation potential for vibrators operating in series was adjusted upward by 10 dB for each distance measurement to account for synergistic propagation.

Figure 2 - Sound Propagation Distances at dB levels 0 to 200 from SOI 2007 On-ice Program



As such propagation distance radii in meters for the vibroseis operation are estimated to be:

TABLE 6-2
Vibroseis Propogation Radii

	190 dB	180 dB	170 dB	160 dB
Heavy Vibe	0.005	0.045	0.08	0.11
Envirovibe	0.001	0.001	0.005	0.04

Average densities of Ringed, Spotted, and Bearded Seal populations were multiplied times the number of miles of seismic lines to be acquired by each equipment type and two times the propagation distance for each equipment type to develop establish average exposure levels. Upper limit exposure levels were derived by multiplying highest reported levels (for ringed seals) and two times average density for spotted and bearded seals times the propagation and line mile distances. Exposure levels for each equipment type were summed to produce total estimated take levels (Table 6-3).

TABLE 6-3
Summed Total of Exposure Calculations for Pinnipeds

Decibel Levels		190 dB	180 dB	170 dB	160 dB	
Pinniped Species	**Average Density (#/km ^{2})**					**Requested Take Authorization**
Estimated Exposures						
Ringed Seal	0.251	4	19	37	88	
Spotted Seal	0.0001	2	2	2	2	
Bearded Seal	0.0128	2	2	3	6	
		190 dB	**180 dB**	**170 dB**	**160 dB**	
Pinniped Species	**Maximum Density (#/km^2)**					
Estimated Exposures						**318**
Ringed Seal	0.92	12	68	132	318	
Spotted Seal	0.0005	2	2	2	2	**2**
Bearded Seal	0.0228	2	3	4	9	**9**

Exposure Calculations for Pinnipeds

Ringed seals would be the most prevalent marine mammal species encountered at the seismic acquisition areas, and would account for over 97 percent of the marine mammals that might be exposed during the seismic operations. The sounds from energy produced by vibrators used during on-ice seismic programs typically are at frequencies well below those used by ringed seals to communicate (1,000 hertz [Hz]). There has been no major displacement of seals away from on-ice seismic operations (Frost et al. 1988). Further confirmation of this lack of major response to industrial activity is illustrated by the fact that there has been no major displacement of seals near the Northstar Development. Studies at Northstar have

shown a continued presence of ringed seals throughout winter and creation of new seal structures (Moulton et al. 2003b). Thus, ringed seal hearing is not likely to be very good at those frequencies and seismic sounds are not likely to have strong masking effects on ringed seal calls.

Spotted and bearded seals may be encountered in much smaller numbers than ringed seals, but also have the potential for exposure.

Summary

The proposed on-ice marine seismic program area north-northwest of Oliktok Point in the Beaufort Sea will involve vibrator seismic source and receiver combinations primarily over ungrounded ice. Taking into account the small total volume and relatively low sound output of the vibrator sources, and planned mitigation measures, effects on pinnipeds are generally expected to be limited to avoidance of a small area around the seismic data acquisition area and short-term changes in behavior, falling within the MMPA definition of "Level B harassment". The requested "take authorization" for each species is based on the estimated maximum number of exposures to greater than or equal to 160 dB re 1 μPa (rms) for pinnipeds (i.e., the highest of the various estimates where a behavioral change may be expected). In addition, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are very low percentages of the population sizes in the Beaufort Sea.

No reliable abundance numbers currently exist for ringed, spotted, and bearded seals for the Beaufort Sea; however, the potential number of exposures would be a very small fraction of earlier abundance estimates.

The short-term exposures to seismic vibrator sounds are not expected to result in any long-term negative consequences for individual pinnipeds or their populations.

A 90-day report will be prepared and submitted to NMFS in accordance with the anticipated IHA requirements.

7. The anticipated impact of the activity on the species or stock:

The only anticipated impacts to marine mammals associated with noise propagation from equipment movement and seismic vibrator operations would be the temporary and short-term displacement of seals within ensonified zones produced by such noise sources. Any impacts on the seal populations of the Beaufort Sea seismic acquisition activity area are likely to be short-term and transitory arising from the temporary displacement of individuals or small groups from locations they may occupy at the times they are exposed to seismic sounds at the greater than 160 dB received levels. As noted in Section 6, it is highly unlikely that animals will be exposed to sounds of such intensity and duration as to physically damage their auditory mechanisms.

8. The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses:

The various pinniped species are all taken by subsistence hunters of the eastern Beaufort Sea villages. The planned on-ice marine seismic program operations will not adversely affect the usual haul-out locations of these species. Pinniped (ringed seal) lairs could be temporarily abandoned when seismic activity is occurring in close proximity, thus avoidance of the lairs is the planned approach. Trained dogs will be used to locate ringed seal lairs before the onset of seismic activities. Subsistence advisors will be used as marine mammal observers during performance of the seismic program. During the seal pupping season, planned seismic line segments will be surveyed via the research biologists teamed with lair sniffing dogs; these teams will be accompanied by Inupiat subsistence hunters experienced in the area of the project.

9. Anticipated impact on habitat:

The seismic activities proposed will not result in any permanent impact on habitats used by marine mammals, or to their prey sources.

A broad discussion on the various types of potential effects of exposure to seismic on invertebrates can be found in LGL (2005), and includes a summary of direct mortality (pathological/physiological) and indirect (behavioral) effects.

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 low impact vibrator sources to be used are predicted to have a negligible effect to the prey resource available to pinnipeds occurring during the project's 60-day duration covering only a 256 mi^2 (663 km^2) area.

10. Anticipated impact of habitat loss or modification:

The total footprint of the proposed seismic survey area covers approximately 265 mi^2 (686 km^2). The effects of the planned seismic activity at the 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 period of seismic acquisition (spring 2008), seals would be dispersed throughout the area.

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

11. The availability and feasibility (economic and technological), methods, and manner of conducting such activity or means of effecting the least practicable impact upon affected species or stock, their habitat, and of their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance:

The following mitigations are proposed:

- The timing and locations for active seismic acquisition work will be scheduled to be initiated and completed at a time of year that has the potential to least affect marine mammals, specifically the ringed seal;
- To use only seismic vibrator sources in a manner that directs energy primarily down to the seabed thus decreasing the range of horizontal spreading of seismic noise;
- To use smaller weight vibrators (Envirovibs), that impart an even smaller propagated radii of sound, for approximately 75 percent of the on-ice marine seismic program data acquisition;
- Use seal lair-sniffing dogs to locate lairs before the seismic programs begins so that the lairs may be avoided.

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 or marine mammal for Arctic subsistence uses, the applicant must submit a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

i. A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation.

ii. A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation.

iii. A description of what measures the applicant has taken and/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

iv. What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

- A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation.

  Plan of Cooperation meetings for SOI's 2007 on-ice program were held in Nuiqsut and Barrow on October 16 and 17, 2006, and on January 30 and February 1, 2007, respectively. SOI met again on its on-ice program with Kuukpik Subsistence Oversight Panel (KSOP) and the community of Nuiqsut on March 13, 2007. Additional meetings were held with the Ice Seal Committee, in conjunction with other marine mammal subsistence groups, in June 2007. At these meetings, SOI presented its program and discussed local concerns regarding subsistence-related activities.

  The 2008 on-ice marine seismic program is essentially a continuation of the 2007 research and development on-ice marine seismic program, but with fewer types of seismic sound sources, and no underwater sound sources. For the 2008 on-ice marine seismic program Plan of Cooperation meetings in the communities of Nuiqsut and Barrow are scheduled to occur during October 2007. Additional follow-up meetings are tentatively scheduled for early winter 2008 in the affected communities.

  SOI held a pre-application teleconference September 6, 2007 with representatives of the following federal, state, and NSB agencies, and companies:

  - NOAA/NMFS
  - MMS
  - Alaska Department of Natural Resources (ADNR), Office of Project Management and Planning (OPMP)
  - ADNR, Division of Oil and Gas
  - North Slope Borough Planning Department
  - SOI
  - ASRC Energy Services, Regulatory and Technical Services
  - CGG Veritas

Representatives of the North Slope Borough Wildlife Management Department and USFWS were invited but did not attend the pre-application teleconference.

- A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation.

  SOI held meetings with the affected subsistence communities of Nuiqsut and Barrow in October 2006 and January, February, March, and June 2007 (see above). SOI will hold community meetings in Barrow and Nuiqsut on its 2008 program, which is substantially the same as its 2007 Program, beginning in October 2007.

- A description of what measures the applicant has taken and/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing;

  Inupiat subsistence hunters will be hired to assist with clearing seismic line surveys, accompanying the lair-sniffing dogs, and as polar bear watch/hazers. These hunters will ensure that SOI's proposed activities, timing and location, will not interfere with access to subsistence resources.

- What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

  SOI conducted a pre-application meeting with the NSB and state and federal agencies on September 6, 2007 to facilitate early identification of key issues and to gain agency input on an appropriate plan of cooperation meeting schedule for the affected subsistence communities of Nuiqsut and Barrow. SOI's plan is to meet with the affected subsistence communities in October 2007 and again just prior to operations in the winter 2008.

  SOI provided all federal and state agencies and the NSB copies of presentations, meeting notes, community concerns, and SOI responses to community concerns in an update of SOI's comprehensive Plan of Cooperation. SOI's comprehensive Plan of Cooperation report includes past stakeholder engagements and this document is periodically updated as additional engagements occur. As stakeholder engagements that describe the 2008 on-ice marine seismic program occur, all affected agencies will receive copies of updates to the comprehensive Plan of Cooperation report, it is anticipated the next update will be late October or early November 2007.

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:

The proposed marine mammal monitoring program will consist of surveys of the proposed seismic acquisition area prior to the start of the project for locating subnivian (under snow), ice seal structures with trained dogs and the establishment of exclusion zones around identified seal structures.

As mentioned above, avoidance of seal structures will be mitigated through the use of seal lair-sniffing dogs. Locations of subnivian seal structures will be monitored and adjustments to the seismic operation will be made when necessary. It should be noted that all sightings of polar bears acquired by observers will be recorded and reported to the USFWS.

Eco Marine's Dr. Thomas G. Smith will use trained dogs to locate seal structures. The recommended prospective area for the seismic research project will be surveyed for the subnivian seal structures using trained dogs running together. These dogs precede Eco Marine representatives traveling by sled. Transects are spaced 250 m (820 ft) apart and oriented 90° to the prevailing wind direction. The search tracks of the dogs are recorded by GPS units on the dogs and the tracks are downloaded daily.

Subnivian structures located are probed by steel rod to check if each is open (active), or frozen (abandoned). Structures are categorized by Eco Marine by size, structure and odor to ascertain whether the structure is a birth lair, resting lair, resting lair of rutting male seals, or a breathing hole.

As was used during past on-ice marine seismic projects, SOI is proposing a 150 m (490 ft) exclusion zone around all located active subnivian seal structures. During active seismic vibrator source testing a 150 m (490 ft) exclusion zone will be monitored for entry by any marine mammal. No seismic vibrator surveys will be conducted if a marine mammal is observed entering the monitored exclusion zone. Monitoring of active seismic spreads can be conducted by marine mammal observers (MMOs) and trained field crew members also tasked with polar bear watch and guard.

A 90-day report will be prepared and submitted to NMFS in accordance with the anticipated IHA requirements that includes a description of the monitoring plan survey techniques, and results of MMO observations during performance of the seismic program.

14. Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects:

SOI is prepared to share information obtained during implementation of our marine mammal monitoring program with a variety of groups who may find the data useful in their research. A suggested list of recipients includes:

- The North Slope Borough Department of Wildlife Management (Craig George)
- The USFWS Office of Wildlife Management (Craig Perham)
- KSOP (Nuiqsut)
- The City of Nuiqsut and the City of Barrow
- Alaska Eskimo Whaling Commission (Barrow)
- Alaska Native Ice Seal Committee
- Inupiat Community of the Arctic Slope (ICAS) (Barrow)

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Project File
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Attachment A
Equipment Specifications

Equipment Pictures

Figure 2: 68,000 lb Vibrator

Figure 3: 20,000 lb mini-vibrator (to be modified for tracks).

Figure 4: Equipment trailer

Figure 5: Personnel carrier

Figure 6: Camp trailers

Figure 7: Fuel trailer