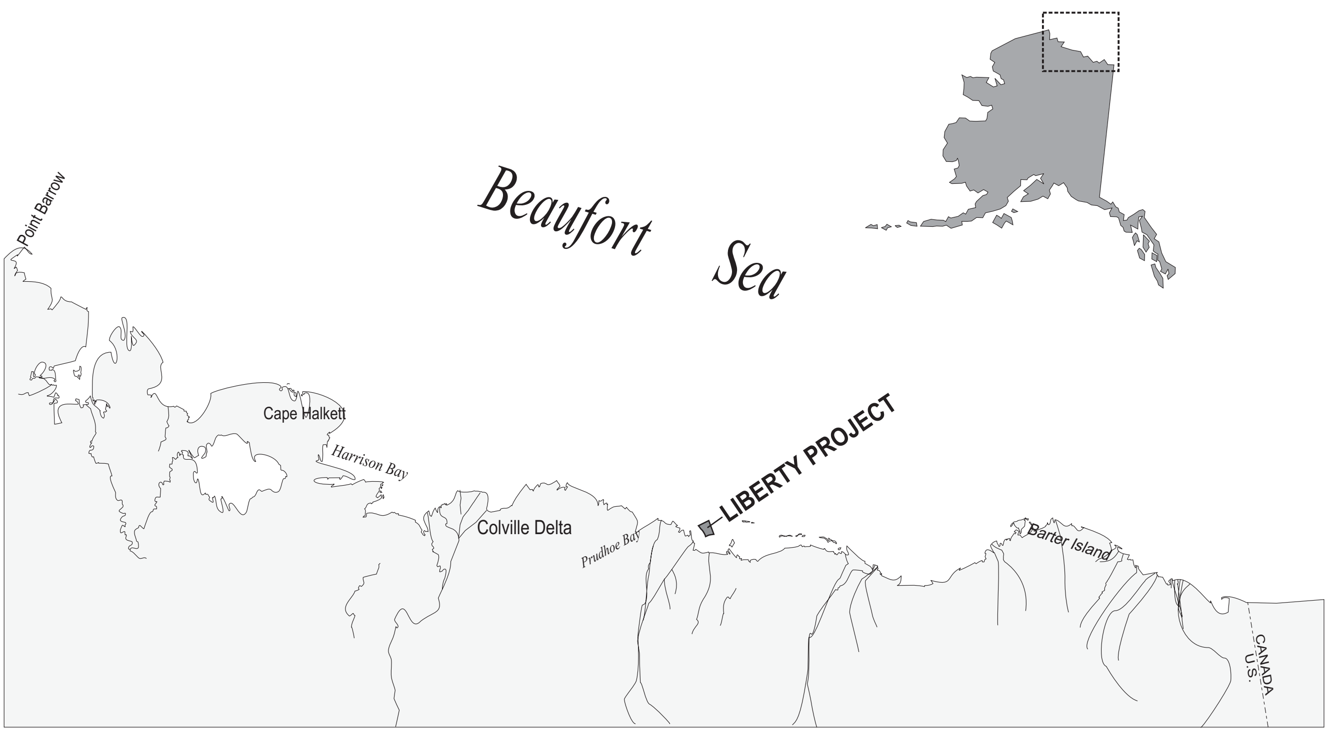
Alaska Outer Continental Shelf

OCS EIS/EA
MMS 2002-019

# Liberty Development and Production Plan

Final Environmental
Impact Statement

## Volume II
(Sections VI through IX, Bibliography, Index)





U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

**Liberty Development and Production Plan, Final Environmental Impact Statement**,
**OCS EIS/EA, MMS 2002-019**, in 4 volumes:
Volume I, Executive Summary, Sections I through V,
Volume II Sections VI through IX, Bibliography, Index
Volume III, Tables, Figures, and Maps for Volumes I and II
Volume IV, Appendices

The summary is also available as a separate document:
Executive Summary, **MMS 2002-020.**

The complete EIS is available on CD-ROM (**MMS 2002-019 CD**) and on the Internet (**http://www.mms.gov/alaska/cproject/liberty/**).

This Environmental Impact Statement (EIS) is not intended, nor should it be used, as a local planning document by potentially affected communities. The exploration, development and production, and transportation scenarios described in this EIS represent best-estimate assumptions that serve as a basis for identifying characteristic activities and any resulting environmental effects. Several years will elapse before enough is known about potential local details of development to permit estimates suitable for local planning. These assumptions do not represent a Minerals Management Service recommendation, preference, or endorsement of any facility, site, or development plan. Local control of events may be exercised through planning, zoning, land ownership, and applicable State and local laws and regulations.

With reference to the extent of the Federal Government's jurisdiction of the offshore regions, the United States has not yet resolved some of its offshore boundaries with neighboring jurisdictions. For the purposes of the EIS, certain assumptions were made about the extent of areas believed subject to United States' jurisdiction. The offshore-boundary lines shown in the figures and graphics of this EIS are for purposes of illustration only; they do not necessarily reflect the position or views of the United States with respect to the location of international boundaries, convention lines, or the offshore boundaries between the United States and coastal states concerned. The United States expressly reserves its rights, and those of its nationals, in all areas in which the offshore-boundary dispute has not been resolved; and these illustrative lines are used without prejudice to such rights.

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Author
**Minerals Management Service**
**Alaska OCS Region**

Cooperating Agencies
**U.S. Army Corps of Engineers**
**Alaska District Office**

**U.S. Environmental Protection Agency**
**Region 10**

**U.S. Department of the Interior**
**Minerals Management Service**
**Alaska OCS Region**

May 2002

# Notice to Readers Regarding the Status of the Liberty Development and Production Plan (DPP)

In January 2002, BP Exploration (Alaska) Inc. (BPXA) publicly announced they were putting the Liberty Project on hold pending an ongoing re-evaluation of project configuration and costs. On March 5, 2002, BPXA sent a letter to Minerals Management Service (MMS) and others saying that pending completion of project re-evaluation, affected agencies should consider submitted permit applications incomplete and recommended processing of these applications be suspended. Also in March, BPXA indicated informally that submission of a modified DPP for the Liberty Project would likely take six months or more.

The MMS has decided to publish and file with Environmental Protection Agency (EPA) this final environmental impact statement (EIS) for the Liberty DPP because it includes substantial changes made in response to comments on the draft EIS. Also, MMS expects this final EIS will serve as a reference document for future projects.

The U.S. Army Corps of Engineers (Corps) and EPA, as cooperating agencies, had intended to use this final EIS as the NEPA document supporting permitting decisions by these agencies. The Corps and EPA hereby solicit comments on the adequacy of, and alternatives considered in, this final EIS.

Due to the applicant's re-evaluation of the project design, and the incomplete status of permit applications, the Corps and EPA are not soliciting comments on their permit decisions at this time. When revised permit applications are received with project changes, the Corps and EPA will issue public notices to request comments on the project proposal. Depending on the changes made, comments received, and any new information available, the three agencies will evaluate whether or not to use this final EIS as the primary NEPA documentation, issue a supplemental EIS or issue new environmental documentation to meet the agencies' respective NEPA compliance and permit evaluation requirements.

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# VI. Description of the Affected Environment

This section describes the environment that the proposed Liberty Project and the alternatives would affect. The proposed project is in Foggy Island Bay of Stefansson Sound in the Beaufort Sea northeast of Prudhoe Bay. BPXA's Environmental Report for the Liberty Development Project (BPXA, 2000a) describes the environment in detail, and the Final Environmental Impact Statement (EIS) for the adjacent Northstar Development Project (U.S. Army Corps of Engineers, 1999) also describes the Beaufort Sea area. These (USDOI, MMS, 1998) and Section III of the Sale 144 Final EIS (USDOI, MMS, 1996a) also describe the existing environment of the Beaufort Sea and the North Slope of Alaska and are incorporated by reference. Other EIS's that describe the existing environment for the Beaufort Sea and North Slope area include the final EIS's for Sales BF and 71 (USDOI, Bureau of Land Management, Alaska OCS Office, 1979 and 1982) and 87, 97, and 124 (USDOI, MMS, 1984, 1987, and 1990b, respectively).

## A. BIOLOGICAL ENVIRONMENT

The following seven resource categories describe the existing biological environment:

- Threatened and Endangered Species
- Seals, Walruses, Beluga Whales, and Polar Bears
- Marine and Coastal Birds
- Terrestrial Mammals
- Lower Trophic-Level Organisms
- Fishes
- Vegetation-Wetland Habitats
- Essential Fish Habitat

### 1. Threatened and Endangered Species

#### a. Threatened and Endangered Species In or Near the Planning Area

The Endangered Species Act of 1973 defines an endangered species as any species that is in danger of extinction throughout all or a significant portion of its range. The act defines a threatened species as one that is likely to become endangered within the foreseeable future. Endangered bowhead whales and threatened spectacled and Steller's eiders (birds) may occur in the general area of the Liberty Project development.

##### (1) Bowhead Whales

The bowhead whale was listed as endangered on June 2, 1970. No critical habitat has been designated for the species although the National Marine Fisheries Service (NMFS) recently received a petition to designate critical habitat for bowhead whales.

The Western Arctic stock of bowhead whales was estimated to be 8,000 individuals in 1993 with a range between 6,900 and 9,200 individuals with a 95% confidence interval (Zeh, George, and Suydam, 1995; Hill and DeMaster, 1999). Zeh, Raftery, and Schaffner (1995) subsequently revised this population estimate by incorporating acoustic data that were not available when the earlier estimate was developed. The revised estimate of the population was between 7,200 and 9,400 individuals in 1993, with 8,200 as the best population estimate, and the estimate recognized by the International Whaling Commission. This revised population estimate also is the population estimate used by the NMFS in their stock assessments (Hill and DeMaster, 1999; Ferrero et al., 2000; and Angliss, Lopez, and DeMaster, 2001). An alternative method produced an estimate of 7,800 individuals with a 95% confidence interval of 6,800-8,900 individuals. Zeh, Raftery, and Schaffner (1995) estimate that the Western Arctic stock increased at a rate of 3.2% per year from 1978-1993. The increase in the estimated population size is most likely due to a combination of improved data and better censusing techniques along with an actual increase in the population. The historic population was estimated at 10,400-23,000 whales in 1848, before commercial whaling, compared to an estimate of between 1,000 and 3,000 animals in 1914, near the end of the commercial-whaling period (Woody and Botkin, 1993).

The Western Arctic stock (Bering Sea stock) of bowhead whales migrates through the Alaskan Beaufort Sea semiannually between wintering areas in the Bering Sea and summer feeding grounds in the Canadian Beaufort Sea.

Bowhead whales have an affinity for ice and are associated with relatively heavy ice cover and shallow continental shelf waters for much of the year. Throughout the winter, bowheads frequent the marginal ice zone, regardless of where the zone is, and polynyas (irregular areas of open water). Polynyas in the Bering Sea along the northern Gulf of Anadyr, south of St. Matthew Island, and near St. Lawrence Island, are important wintering areas for bowheads. Bowheads also congregate in these polynyas before starting their spring migration (Moore and Reeves, 1993).

The bowheads' northward spring migration appears to coincide with ice breakup. They pass through the Bering Strait and eastern Chukchi Sea from late March to mid-June through newly opened leads in the shear zone between the shorefast ice and the offshore pack ice. The migration occurs in pulses, or aggregations of whales swimming together, with the first pulse passing Point Barrow in late April or early May, the second pulse in mid-May, and a less well-defined pulse in late May to mid-June (Moore and Reeves, 1993). Several studies of acoustical and visual comparisons of the bowhead's spring migration off Barrow indicate that bowheads also may migrate under ice within several kilometers of the leads. Data from several observers indicate that bowheads migrate underneath ice and can break through ice 14-18 centimeters (5.5-7 inches) thick to breathe (George et al., 1989; Clark, Ellison, and Beeman, 1986). Bowheads may use cues from ambient light and echoes from their calls to navigate under ice and to distinguish thin ice from multiyear floes (thick ice). After passing Barrow from April through mid-June, they move easterly through or near offshore leads. East of Point Barrow, the lead systems divide into many branches that vary in location and extent from year to year. Andrew Oenga, who hunted bowhead whales as a crew member out of Barrow from 1943 to 1960 stated: "I believe from my experience that bowhead whales would reach the leads offshore from Prudhoe Bay by early May" (Oenga, as cited in U.S. Army Corps of Engineers, 1999). The spring-migration route is far offshore of the Liberty Project development area. Bowheads arrive on their summer-feeding grounds near Banks Island from mid-May through June and remain in the Canadian Beaufort Sea and Amundsen Gulf until late August or early September (Moore and Reeves, 1993).

Some biologists conclude that almost the entire Bering Sea bowhead population migrates to the Beaufort Sea each spring and that few whales, if any, summer in the Chukchi Sea. However, some scientists maintain that a few bowheads swim northwest along the Chukotka coast in late spring and summer in the Chukchi Sea. Incidental sightings suggest that bowhead whales may occupy the northeastern Chukchi Sea in late summer more regularly than commonly believed (Moore, 1992). Records of bowhead sightings from 1975-1991suggest that bowheads may occur regularly along Alaska's northwestern coast in late summer; however, no one has yet established if these are "early-autumn" migrants or whales that have summered nearby (Moore et al., 1995). Harry Brower, Jr., stated that he has seen whales in the Barrow area in the middle of the summer while the hunters are out hunting bearded seals on the ice edge (Brower, as cited in USDOI, MMS, 1995b). Bowheads found in the Bering and Chukchi seas in the summer may be part of the expanding Western Arctic stock (DeMaster et al., 2000, as referenced in Angliss, Lopez, and DeMaster, 2001).

After summer feeding in the Canadian Beaufort Sea, bowheads begin moving westward into Alaskan waters in August and September. Generally, few bowheads are seen in Alaskan waters until the major portion of the migration takes place, typically between mid-September and mid-October. In some years, bowheads are present in substantial numbers in early September. Greene and McLennan (2001) reported detecting substantial rates of bowhead whale calls on September 2-3 while conducting acoustic monitoring studies around the Northstar Project. In 1997, Treacy (1998) reported sighting 170 bowheads, including 6 calves, between Cross Island and Kaktovik on September 3, during the first flight of the survey that year. There is some indication that the fall migration, like the spring migration, occurs in pulses or aggregations of whales (Moore and Reeves, 1993). The pulses may represent segregation by age class, with smaller whales migrating first, followed by large adults and females with calves. Inupiat whalers estimate that bowheads take about 2 days to travel from Kaktovik to Cross Island, reaching the Prudhoe Bay area in the central Beaufort Sea by late September, and 5 days to travel from Cross Island to Point Barrow (T. Napageak, 1996, as cited in USDOC, NOAA, NMFS, 1999).

Wartzog et al. (1989) placed radio tags on bowheads and tracked the tagged whales in 1988. One tagged whale was tracked for 915 kilometers as it migrated west at an average speed of 2.9 kilometers per hour in ice-free waters. It traveled at an average speed of 3.7 kilometers per hour in relative ice-free waters and at an average speed of 2.7 kilometers through eight-tenths ice cover and greater. Another whale traveled 1,291 kilometers at an average speed of 5.13 kilometers per hour in ice-free waters but showed no directed migratory movement, staying within 81 kilometers of the tagging site. Additional tagged whales in 1989 migrated 95-1,347 kilometers at average speeds of 1.5-2.5 kilometers per hour (Wartzog et al., 1990). Mate, Kruzitkowsky, and Winsor (2000) tagged 12 juvenile bowhead whales with satellite-monitored radio tags in the Canadian Beaufort Sea. Individual movements and average speeds (1.1-5.8 kilometers per hour) varied widely. The whale with the longest record traveled about 3,886 kilometers from Canada across the Alaskan Beaufort Sea to the Chukchi Sea off Russia and averaged 5.0 kilometers per hour. This whale's speed was faster, though not significantly faster, in heavy ice than in open water.

Oceanographic conditions can vary during the fall migration from open water to more than nine-tenths ice coverage. The extent of ice cover may influence the timing or duration of the fall migration. Miller, Elliot, and Richardson (1996) observed that whales within the Northstar region (long. 147º-150º W.) migrate closer to shore in light and moderate ice years and farther offshore in heavy ice years, with median distances offshore of 30-40 kilometers (19-25 miles), 30-40 kilometers (19-25 miles), and 60-70 kilometers (37-43 miles), respectively. Moore (2000) looked at bowhead distribution and habitat selection in heavy, moderate, and light ice conditions in data collected during the autumn from 1982-1991. This study concluded that bowhead whales select shallow inner-shelf waters during moderate and light ice conditions and deeper slope habitat in heavy ice conditions. During the summer, bowheads selected continental slope waters and moderate ice conditions (Moore, DeMaster, and Dayton, 2000). Interseasonal depth and ice cover habitats were significantly different for bowhead whales. Ljungblad et al. (1987) observed during the years from 1979-1986 that the fall migration extended over a longer period, that higher whale densities were estimated, and that daily sighting rates were higher and peaked later in the season in light ice years compared to heavy ice years.

Fall aerial surveys of bowhead whales in the Alaskan Beaufort Sea have been conducted since 1979 by the Bureau of Land Management and MMS (Ljungblad et al., 1987; Treacy, 1988-1998, 2000). Over an 18-year period (1982-1999), there were 15 years with some level of offshore seismic exploration and/or drilling activity and three blank years (1994, 1995, and 1999) in which neither offshore activity took place during September or October. The parametric Tukey HSD test was applied to MMS fall aerial-transect data (1982-1999) to compare the distances of bowhead whales north of a normalized coastline in two analysis regions of the Alaskan Beaufort Sea from 140º-156º W. longitude (Figure VI.A-1). While the Tukey HSD indicates significant differences between individual years, it does not compare actual levels of human activity in those years. It also does not test for potential effects of sea ice and other oceanographic conditions on bowhead migrations (Treacy, 2000).

Treacy (2000) observed that general ice cover may affect the distance from shore and the water depth at which bowhead whales migrate in the fall. The years with heavy and medium ice cover had the greatest median distance from shore for the West Region. All of the median distances greater than 42 kilometers and the median water depths greater than 35 meters in the West Region correspond with heavy or medium ice years, suggesting that bowheads may migrate farther offshore and in deeper water in years with more ice cover. Conversely, the small median distance from shore and small median water depth indicate a tendency for bowheads to migrate closer to shore and in shallower water during years of light general ice cover.

Further evidence that bowhead whales migrate at varying distances from shore in different years is provided by recent site-specific studies monitoring whale distribution relative to local seismic exploration in nearshore waters of the central Beaufort Sea (Miller et al., 1997; Miller, Elliot, and Richardson, 1998; Miller et al., 1999). In 1996, bowhead sightings were fairly broadly distributed between the 10-meter and 50-meter depth contours. In 1997, bowhead sightings were fairly broadly distributed between the 10-meter and 40-meter depth contours, unusually close to shore. In 1998, the bowhead migration corridor generally was farther offshore than in either 1996 or 1997, between the 10-meter and 100-meter depth contours and approximately 10-60 kilometers from shore.

Aerial surveys near the proposed Liberty Development Project in 1997 (BPXA, 1998a) showed that the primary fall migration route was offshore of the barrier islands, outside the development area. However, a few bowheads were observed in lagoon entrances between the barrier islands and in the lagoons immediately inside the barrier islands, as shown in Figures 4-4 and 4-5 of the Environmental Report submitted by BPXA for the Liberty Development Project (BPXA, 1998a). Because survey coverage in the nearshore areas was more intensive than in offshore areas, maps and tabulations of raw sightings overestimate the importance of nearshore areas relative to offshore areas. Transects generally did not extend south of the middle of Stefansson Sound. Nevertheless, these data provide information on the presence of bowhead whales near the proposed Liberty development area during the fall migration. Probably only a small number of bowheads, if any, came within 10 kilometers (6 miles) of the Liberty area.

Some bowheads may swim inside the barrier islands during the fall migration. Frank Long, Jr., reported that whales are seen inside the barrier islands near Cross Island nearly every year and are sometimes seen between Seal Island and West Dock (U.S. Army Corps of Engineers, 1999). Thomas Brower, Sr., from Barrow, participated in the last commercial whale hunt in 1919. He said that when he went along with the commercial whale hunts, he saw crews from the whaling ships look for the whales near the barrier islands in the Beaufort Sea and in the lagoons inside the barrier islands (Brower, 1980). Brower also said that whales have been known to migrate south of Cross Island, Reindeer Island, and Argo Island during years when fall storms push ice against the barrier islands. Inupiat whaling crews from Nuiqsut also have noticed that the whale migration appears to be influenced by wind, with whales stopping when the winds are light and, when the wind starts blowing, the whales started moving through Captain Bay towards Cross Island (Tuckle, as cited in USDOI, MMS, 1986b). Some bowhead whales have been observed swimming about 25 yards from the beach shoreline near Point Barrow during the fall migration (Rexford, as cited in USDOI, MMS, 1996c). A comment received from the Alaska Eskimo Whaling Commission on the Liberty draft EIS indicated that Inupiat workers at Endicott have, on occasion, sighted bowheads on the north side of Tern Island, but no source for the reference was provided nor was any specific information provided regarding the location of the whale.

Data are limited on the bowhead fall migration through the Chukchi Sea before the whales move south into the Bering Sea. Bowhead whales commonly are seen from the coast to about 150 kilometers (93 miles) offshore between Point Barrow and Icy Cape, suggesting that most bowheads disperse southwest after passing Point Barrow and cross the central Chukchi Sea near Herald Shoal to the northern coast of the Chukotsk Peninsula. However, scattered sightings north of 72º N. latitude suggest that at least some whales migrate across the Chukchi Sea farther to the north. After moving south through the Chukchi Sea, bowheads pass through the Bering Strait in late October through early November on their way to overwintering areas in the Bering Sea.

Bowheads are filter feeders, filtering prey from the water through baleen fibers in their mouth. Bowheads apparently feed throughout the water column, including bottom or nearbottom feeding as well as surface feeding. Food items most commonly found in the stomachs of harvested bowheads are zooplankton, including euphausiids, copepods, mysids, and amphipods. Euphausiids and copepods are the primary prey species.

The importance of the Alaskan Beaufort Sea as a feeding area for bowheads is an issue of concern to Inupiat whalers. There have been numerous observations of bowheads feeding during both the spring migration north to the Beaufort Sea and the fall migration west across the Alaskan Beaufort Sea. However, quantitative data showing how food consumed in the Alaskan Beaufort Sea contributes to the bowhead whale population's overall annual energy needs is fairly limited.

Carroll et al. (1987) and Sheldon and Rugh (1995) report that stomach contents collected from bowheads harvested between St. Lawrence Island and Point Barrow during April into June, indicate some whales feed opportunistically during the spring migration. Carroll et al. report that the region west of Point Barrow seems to be of particular importance for feeding, at least in some years, but whales may feed opportunistically at other locations in the lead system where oceanographic conditions produce locally abundant food. Sheldon and Rugh also suggest the lead system near Point Barrow may serve as an important feeding area in the spring in years when oceanographic conditions are favorable. Lowry (1993) reported that the stomachs of 13 out of 36 spring-migrating bowheads harvested near Point Barrow between 1979 through 1988 contained food. Lowry estimated total volumes of contents in stomachs ranged from less than 1 to 60 liters, with an average of 12.2 liters in eight specimens. The extent or importance of the area to bowheads for feeding is not known, because no estimate was provided of total stomach volume for the whales.

Bowheads have been reported feeding in the eastern Beaufort Sea and Amundsen Gulf region in Canada during the summer, but the proportion of time spent feeding and the types of prey being consumed are unknown (Lowry, 1993). Over the years, bowheads have been observed feeding in, various places in the Alaskan Beaufort Sea as they move westward during their fall migration. Some bowheads appear to feed east of Barter Island as they migrate westward (Thomson and Richardson, 1987). Feeding frequently is seen in the area near and east of Kaktovik during September, though not in all years. Specific feeding locations near Kaktovik vary among years. Lowry reports that the stomachs of 13 out of 15 whales harvested off Kaktovik during 1979-1988 contained food, suggesting that nearly all bowheads taken at Kaktovik had been feeding prior to capture. Lowry estimated total volumes of contents in stomachs ranged from 3-48 liters, with an average of 25.9 liters in eight specimens. One whale was noted as having a full stomach, but no stomach volume was reported. Except for the one whale, the extent or importance of the area to bowheads for feeding is not known, because no estimate was provided of total stomach volume for the whales.

It is likely that bowheads continue to feed opportunistically where food is available as they migrate westward across the Alaskan Beaufort Sea, similar to what they are thought to do during the spring migration. Some bowheads apparently take their time returning westward during the fall migration, sometimes barely moving at all, with some localities being used as staging areas due to abundant food resources or social reasons (Bodfish, 1981; Akootchook, 1995, as reported in USDOC, NOAA, NMFS, 2001). Inupiat believe that whales follow the ocean currents carrying food organisms. If the currents go close to Cross Island, whales migrate near there (Napageak, 1996, as reported in USDOC, NOAA, NMFS, 2001). Bowheads have been observed feeding not more than 1,500 feet offshore in about 15-20 feet of water (Brower, 1979; Rexford, 1979, as reported in UDOC, NOAA, NMFS, 2001). Nuiqsut Mayor Nukapigak testified at the Nuiqsut Public Hearing on March 19, 2001, that he harvested a bowhead whale 2 miles from the Northstar island in 1997. He also testified that he and others saw a hundred or so bowhead whales and gray whales feeding near Northstar Island (USDOI, 2001b).

Bowheads occasionally have been observed feeding north of Flaxman Island and, in some years but not all years, fairly large groups of them have been seen feeding east of Point Barrow between Smith Bay and Point Barrow. Ljungblad et al. (1986) reported that feeding bowheads comprised approximately 25% of the total bowheads observed during aerial surveys conducted in the Beaufort Sea from 1979-1985. Richardson, Lawson, and Greene (1999) reported observing many aggregations of feeding whales in nearshore waters near or just offshore of the 10-meter depth contour during late summer/autumn 1997. Stomachs of five out of six whales taken at Point Barrow during 1976-1988 contained food (Lowry, 1993). The total volume of contents of the stomach of one whale was estimated at 109 liters, and three others were estimated at 8 liters. Again, no estimate was provided of the total stomach volume of the whales, and the extent or importance of feeding in the area is not known.

A study by Richardson (1987) concluded that food consumed in the eastern Beaufort Sea did not contribute significantly to the overall bowhead whale population's annual energy needs, although the area may be important to some individual whales in some years. The North Slope Borough's Science Advisory Committee (1987) believed there were problems in the study's design and length. The main concerns expressed by the Committee were the short duration of the study (two field seasons, one of which was limited by ice cover), suboptimal sampling designs, and difficulties in estimating food availability and consumption. Two years is too short a period in which to fully characterize use of an area by bowheads. The Committee did not accept the conclusion that the study area is unimportant as a feeding area for bowhead whales. To respond to these concerns and to better understand the importance of the eastern Alaska Beaufort Sea to bowhead whales, the MMS funded a second study on bowhead whale feeding east of Barter Island, entitled *Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information* (USDOI, MMS, Alaska OCS Region, 1997). The study emphasizes cooperation among local government, subsistence-whale hunters, scientists, and MMS in its planning and execution. Following the first year of fieldwork on this study, Richardson and Thomson (1999) noted that the average zooplankton biomass in the study area was higher in 1986 than in 1998. Habitat suitable for feeding appears to have been less common in the eastern Alaskan Beaufort Sea in 1998 than it was in 1986. In 1998, the principal feeding area within the eastern study area appeared to have been near Kaktovik. Bowhead whales moved quickly through the area in 1998 and did not stop to feed for any great period of time. In contrast, during 1986, some individual whales stopped to feed in the study area for periods of at least several days. In 1999, the main bowhead feeding areas were 20-60 kilometers offshore in waters 40-100 meters deep in the central part of the study area east and northeast of Kaktovik, between Kaktovik and Demarcation Bay (Koski, Miller, and Gazey, 2000). One bowhead remained in the study area for at least 9 days, and 10 others remained for 1-6 days. Their mean rate of movement was about one-eighth of the rate observed in 1998. Samples of stomach contents in 1998 indicated that 74% of the whales harvested at Kaktovik had fed recently, and 47% of the whales harvested at Barrow were considered to have been feeding. Samples of stomach contents from 29 whales harvested near Kaktovik from 1979-1999 indicated that 79% had been feeding prior to death. Samples of stomach contents from 93 whales harvested near Barrow from 1976-1999 indicated that 70% had been feeding prior to death.

Koski (2000) summarized that the most common activity of bowheads in the eastern Alaskan Beaufort Sea during late summer and autumn was feeding. Bowhead use of the eastern Alaskan Beaufort Sea during late summer and autumn can be highly variable from year to year, with substantial differences in the numbers, size classes, residence times, and distributions of bowheads recorded there during 1985, 1986, 1998, and 1999.

Carbon-isotope analysis of bowhead baleen has indicated that a significant amount of feeding may occur in wintering areas (Schell, Saupe, and Haubenstock, 1987). Baleen from bowhead whales provides a multiyear record of isotope ratios in prey species consumed during different seasons, including information about the occurrence of feeding in the Bering Sea and Chukchi Sea system. Carbon-isotope analysis of zooplankton, bowhead tissues, and bowhead baleen indicates that a significant amount of feeding may occur in areas west of the eastern Alaskan Beaufort Sea, at least by subadult whales (Schell, Saupe, and Haubenstock, 1987). The isotopic composition of the whale is compared with the isotope ratios of its prey from various geographic locations to make estimates of the importance of the habitat as a feeding area. Subadult whales show marked changes in the carbon isotope over the seasons, indicating that carbon in the body tissues is replaced to a large extent from feeding in summer and feeding in the autumn-winter months. In contrast, adult animals sampled show very little seasonal change in the carbon isotope and have an isotopic composition best matched by prey from the western and southern regions of their range, implying that little feeding occurs in summer (Schell and Saupe, 1993).

The isotopic data also indicates that primary productivity in the Bering and southern Chukchi Seas is declining. Schell (1999a) looked at baleen from 35 bowheads that were archived, as well as whales from recent harvest, and constructed an isotopic record that extends from 1947-1997. He inferred from this record that seasonal primary productivity in the North Pacific was higher from 1947-1966 and then began a decline that continues to the most recent samples from 1997. Isotope ratios in 1997 are the lowest in 50 years and indicate a decline in the Bering Sea productivity of 35-40% from the carrying capacity that existed 30 years ago. If the decline in productivity continues, the relative importance of the eastern Beaufort Sea to feeding bowheads may increase (Schell, 1999b).

Information regarding age at sexual maturity or mating behavior and timing for bowhead whales is not known with certainty. Most bowheads mate and calve from April through mid-June, coinciding with the spring migration. Mating may start as early as January and February, when most of the population is in the Bering Sea, but it also has been reported as late as September and early October (Koski et al., 1993). Calving occurs from March to early August, with the peak probably occurring during the spring migration between early April and the end of May (Koski et al., 1993). Females give birth to a single calf probably every 3-4 years.

Several researchers have explored techniques for aging bowheads, including tympanic bullae lamina, carbon isotopes in baleen, photographic recapture, and aspartic acid racemization of the eye lens. The various approaches at aging bowhead whales and estimating survival rates all suggest slow growth, great longevity, and high survival rates. Schell and Saupe (1993) looked at baleen plates as a means to determine the age of bowhead whales and concluded that bowheads are slow growing, taking about 20 years to reach breeding size. Zeh et al. (1993), while looking at population structure and dynamics, also concluded that the bowhead is a late-maturing, long-lived animal with fairly low mortality. Photographic recaptures by Koski et al. (as reported in George et al., 2000) also suggested advanced age at sexual maturity of late teens to mid-twenties. The discovery of traditional whaling tools recovered from five bowheads landed since 1981 also suggest advanced longevity (George et al., 1995), in some instances exceeding 100 years. George et al. (1999), using the aspartic acid racemization techniques, estimated the age of 42 whales. The results indicated that four animals exceeded 100 years of age.

There is little information regarding natural mortality for bowhead whales in the Bering, Chukchi, and Beaufort seas. Bowhead whales have no known predators except, perhaps, killer whales and subsistence whalers. Attacks by killer whales have occurred, but the frequency probably is low. George et al. (1994) concluded that the relatively low frequency of bite marks likely reflects a relatively low frequency of killer whale attacks and predation pressure. Likewise, the scarcity of observations of vessel-inflicted injuries suggests that the incidence of ship collisions with bowhead whales also is quite low. There also are some reports of bowheads becoming entangled in ropes from crab pots, harpoon lines, or fishing nets; however. the frequency of occurrence is not known. Some whales likely die as a result of entrapment in ice, but the number is thought to be relatively small (Philo et al., 1993). Little is known about the effects of microbial or viral agents on natural mortality.

## (2) Spectacled Eider

### *(a) Population Status*

An estimated 7,029 spectacled eiders seasonally occupy the Arctic Coastal Plain (Larned, Platte, and Stehn, 2001), about 2.0% of the estimated 363,000 birds in the world population. This value is an index unadjusted for eiders undoubtedly present but undetected. Most of the world population is made up of birds from arctic Russia. Aerial breeding population surveys indicate a slight nonsignificant decreasing trend of about 3% from 1993-2000 (Larned, Platte, and Stehn, 2001). The Liberty Prospect is near the easternmost extent of the species' range on the coastal plain, where densities are much lower than to the west.

Numbers occupying this region over the past 6 years have been relatively stable. The size of the nonbreeding population is unknown. It is assumed nonbreeders remain at sea throughout the year until they attempt to breed at 2-3 years, but their location during this period is unknown. Other life history information for this species also is uncertain, although that information available indicates they are long lived with relatively high adult survival, low recruitment to breeding age, and delayed sexual maturity.

### *(b) Spring Migration*

Routes traveled by spectacled eiders during their spring migration are not well known. They generally have been recorded passing Point Barrow in the last week of May or first week of June (Johnson and Herter, 1989). Few spectacled eiders have been recorded using the lead system 5-6 kilometers offshore extending eastward from Point Barrow (Suydam, pers. commun., as cited in Troy Ecological Research Assocs., 1999; Woodby and Divoky, 1982). Suydam et al. (1997) recorded only 55 spectacled eiders among 213,477 king and common eiders passing Point Barrow in spring 1994. Low numbers (0.5-0.7 birds per hour) have been recorded at several points in Simpson Lagoon (Johnson and Richardson, 1981), but some of these probably were movements of local birds rather than migrants. This species has been observed to make limited use of areas of meltwater overflow off river deltas. Thus, because relatively few spectacled eiders are seen in marine areas, spring migration may be primarily overland from the Chukchi Sea (Troy Ecological Research Assocs., 1999). Local observations that spectacled eiders flew inland north of Wainwright, reported by Myres (1958), support this view.

### *(c) Nesting*

Within the general Liberty area, spectacled eiders are known to nest on the Sagavanirktok River Delta (Troy Ecological Research Assocs., 1993c, 1995a, 1997) and in the vicinity of the Kadleroshilik and Shaviovik rivers (Field et al., 1988; Nickles et al., 1987; Troy Ecological Research Assocs., 1995b, 1996a,b; Map 5). Spectacled eiders are dispersed nesters (Derksen, Rothe, and Eldridge, 1981; Warnock and

Troy, 1992), occurring at low density (0.03-0.79 birds per square kilometer; Larned and Balogh [1997]) within about 70 kilometers of the coast. In the Prudhoe Bay area, they are most concentrated west of the Sagavanirktok River within about 25 kilometers of the coast (Troy Ecological Research Assocs., 1997; Troy, 1995). Sightings of this species were made in the area south of Foggy Island Bay in 1994 (Troy Ecological Research Assocs., 1995b). Three nests were located on study plots in the Kadleroshilik River area; however, nest success was low and few broods were observed in July 1994. Few spectacled eiders are found in the area east of the Shaviovik River; densities determined from aerial surveys ranged from 0.05-0.30 birds per square kilometer (Byrne, Ritchie, and Flint, 1994; Larned and Balogh, 1994). Available information indicates some female spectacled eiders may return to the vicinity of previous nests.

Limited survey data for the Kadleroshilik River area in 1994 (Troy Ecological Research Assocs., 1995b) indicate that eider density probably is relatively low throughout the area during summer:

| Period | Density per Square Kilometer |
|---|---|
| Breeding season nests | 0.3 nests |
| Breeding season individuals (average) | 0.4 birds |
| June 14~27 (males present) | 1.7 birds |
| Broodrearing and postbreeding periods | 0.0 birds |
| August 24~30 (fledging period) | 1.3 birds |

Nest density in the Kadleroshilik area was 0.3 per square kilometer, while the density of birds ranged from 0.0-1.7 per square kilometer. Prenesting and nesting spectacled eiders are most commonly found on large shallow lakes with emergent sedges and grasses and low islands (Larned and Balogh, 1997).

#### *(d) Staging and Fall Migration*

Flocks of spectacled eiders staging before migration are expected in offshore waters beyond the barrier islands from late June to September, although the numbers generally are unknown. Average breeding season density of 0.4 birds per square kilometer in the Kadleroshilik River area in 1994 (Troy Ecological Research Assocs., 1995b), the low numbers of birds counted on aerial surveys (estimated population index = 61 in the area between Harrison and Mikkelsen Bays; Stehn and Platte, 2000), and relatively low proportion of locations of satellite-tagged birds in the Beaufort Sea, may suggest that fewer than 200 birds occupied the area from Foggy Island Bay to Prudhoe Bay. Although as a result, we typically would expect relatively low numbers of spectacled eiders to be found in offshore waters in the Liberty area during the staging/migration period in early June to September, these observations may underestimate numbers, because the limited aerial surveys may not accurately represent use of the entire area, and a substantial proportion of the “unidentified” eiders may have been spectacled. Observations made offshore by Divoky (1984) suggested that larger flocks may contain hundreds of individuals of this species; he found the largest sitting flocks to contain more than 100 birds and flying flocks more than 300 individuals.

Most male spectacled eiders depart the nesting areas from early June to early July, typically soon after females begin incubating, on average June 22 (±11 days). They migrate a median distance of 6.6 kilometers (average = 10.1 kilometers) offshore (Petersen, Larned, and Douglas, 1999). Locations of satellite transmitter-equipped males in the Beaufort Sea have been primarily in the western Harrison Bay and western Simpson Lagoon areas. Initial locations for many of these tagged individuals have been in the Chukchi Sea, suggesting they migrate overland or only briefly occupy the Beaufort Sea (Troy Ecological Research Assocs., 1999). For some individuals, however, the Beaufort Sea may be an important staging and migration route (Petersen, Larned, and Douglas, 1999).

After nesting, spectacled eider females with broods leave coastal plain broodrearing sites (lakes), on average August 29 (±10.5 days). However, because females leave the nesting area after failing to breed or experiencing nest failure or brood loss, which may occur at different stages of the breeding period, they depart over an extended period from the third week of June through the end of August (Troy Ecological Research Assocs., 1999). Locations of females with satellite-transmitters indicate they stage and migrate in the Beaufort Sea and, like some males, use Harrison Bay. Half the tagged females were relocated twice in the Beaufort Sea, indicating a residence time of at least 4 days. Aerial surveys in late August 1999 recorded four spectacled eiders, a female with two young and an individual of unspecified sex in western Harrison Bay (USDOI, Fish and Wildlife Service, 1999, pers. commun.). Although satellite-tagged females have been relocated more than 40 kilometers offshore in the Beaufort Sea (Troy Ecological Research Assocs., 1999), the median distance for migrating individuals is 16.5 kilometers (average = 21.8 kilometers) offshore (Petersen, Larned, and Douglas, 1999).

#### *(e) Critical Habitat*

The U.S. Department of the Interior, Fish and Wildlife Service designated approximately 101,000 square kilometers (38,992 square miles) on the Yukon-Kuskokwim Delta and in Norton Sound, Ledyard Bay, and the Bering Sea between St. Matthew and St. Lawrence Islands as critical habitat (66 *FR* 9146). Within the Yukon-Kuskokwim Delta area, habitats considered essential to the conservation of the species include all deep waterbodies, all waterbodies that are part of basin wetlands, all permanently flooded wetlands, waterbodies containing the plants *Carex aquatilis* (sedge) or *Arctophila fulva* (grass), and all habitat immediately surrounding such areas. Marine waters designated include flora and fauna in the water column and the underlying bottom community. Spectacled eiders are bottom feeders, presumably capable of diving to depths of

70 meters (the depth of water in the Bering Sea wintering area) (Petersen, Piatt, and Trust, 1998).

### (3) Steller's Eider

The range of the Steller's eider has been contracting for decades; recently it has been found rarely in the vicinity of the Colville River Delta and even less commonly to the east (King, unpublished. data; Larned, unpublished data), despite intensive fieldwork at numerous sites, for example, in the Prudhoe Bay area. Because the current distribution of Steller's eiders only marginally extends east of the Colville River delta, this species is not expected to be found nesting in the Liberty area. Although over the past several decades small numbers of Steller's eiders have been observed onshore as far east as the Sagavanirktok River, the extent of their use of offshore Beaufort Sea waters is unknown. Aerial breeding population surveys indicate a coastal plain population of 178 at an estimated density of 0.07-0.09 birds per square kilometer (ABR, Inc., 1999; Larned, Platte, and Stehn, 2001). The sample size is too small to determine trends within a useful timeframe. The Fish and Wildlife Service designated approximately 7,333 square kilometers (2,830 square miles) on the Yukon-Kuskokwim Delta and elsewhere in southwest Alaska as critical habitat (66 *FR* 8850).

## b. Threatened and Endangered Species Along the Marine Transportation Route

Many of the species found along southern and Far East tanker transportation routes were described in the Cook Inlet Planning Area Oil and Gas Lease Sale 149 Final EIS (USDOI, MMS, Alaska OCS Region, 1996), the Northeast National Petroleum Reserve-Alaska Final Integrated Activity Plan Final EIS (USDOI, Bureau of Land Management and MMS, 1998), the Beaufort Sea Planning Area Oil and Gas Lease Sale 144 Final EIS (USDOI, MMS, 1996a), and the biological evaluations for the consultation for those projects. This section describes additional listed, proposed listed, and candidate species; changes in listing status; and designation or proposed designation of critical habitat identified by the Fish and Wildlife Service and the NMFS along the transportation route that were not included in the previous consultations or EIS's.

### (1) Mammals

#### *(a) Steller Sea Lion*

Steller sea lions were listed as a threatened species throughout its range in 1990 (55 *FR* 49204). Their range extends from California and associated waters to Alaska, including the Gulf of Alaska and Aleutian Islands, and into the Bering Sea and North Pacific and into Russian waters. The NMFS designated critical habitat for the species on August 1993 (58 *FR* 45269), which includes all U.S. rookeries; major haulouts in Alaska; horizontal and vertical buffer zones around these rookeries and haulouts; and three aquatic foraging areas in North Pacific waters-Seguam Pass. Southeastern Bering Sea shelf, and Shelikof Strait. Based on biological information collected since the species was listed in 1990, the NMFS is now reclassifying Steller sea lions as two distinct population segments under the Endangered Species Act (62 *FR* 24345). The Steller sea lion population segment west of 144° W. longitude (near Cape Suckling, Alaska) is reclassified as endangered. The threatened listing is being maintained for the remainder of the U.S. Steller sea lion population.

#### *(b) Northern Sea Otter*

The northern sea otter subspecies in the Aleutian Islands was designated a candidate species on November 9, 2000 (65 *FR* 67343), prompted by an apparent substantial population decline detected between the early 1980's (Calkins and Schneider, 1985) and 1992 (Evans et al., 1997) in this area. The otter populations of several island subgroups had unexpectedly declined by more than 50%, and boat-based surveys documented a continuing decline in the 1990's (Estes et al., 1998). The Aleutian Islands population may have declined to as few as 6,000 otters (Fish and Wildlife Service unpublished data cited at 65 *FR* 67345) from an estimated high of 55,100-73,700 in the 1980's. Although potential or contributing causes may include disease, starvation, and pollution, it has been hypothesized recently that predation by killer whales is an important factor in the decline (Estes et al., 1998). These predators may have shifted from more typical pinniped or fish prey to otters in response to declining availability of the former. Declines in those populations may be associated with changes in the Bering Sea ecosystem that have resulted in declining forage fish populations that, in turn, may be associated with a shifting temperature regime and current pattern in addition to changes in fish populations brought about by intense commercial-fishing pressure.

### (2) Birds

#### *(a) Marbled Murrelet*

The marbled murrelet is listed as a threatened species in Washington, Oregon, and California. It is a small seabird that forages in the nearshore marine environment and nests in large trees in coniferous forests. The marbled murrelet population in Washington, Oregon, and California nests in most of the major types of coniferous forests in the western portions of these states, wherever older forests remain inland of the coast. For nesting habitat to be accessible to marbled murrelets, it must be close enough to the marine environment for murrelets to fly back and forth. This species was discussed in previous Endangered Species Act consultations for Cook Inlet Oil and Gas Lease Sale 149 and Gulf of Alaska/Yakutat Planning Area Oil and Gas Lease Sale 158. It is addressed in this EIS to include critical habitat, which was designated for the species on May 24, 1996 (61 *FR* 26255). Only the terrestrial habitat has been designated as critical habitat. No critical habitat has been designated in the marine environment for this species.

#### *(b) Western Snowy Plover*

The western snowy plover is listed as a threatened species along the Pacific coast. This species was discussed in previous Endangered Species Act consultations for Cook Inlet Oil and Gas Lease Sale 149 and Gulf of Alaska/Yakutat Planning Area Oil and Gas Lease Sale. It is addressed in this EIS to include designation of critical habitat, which was proposed for the species on March 2, 1995 (60 *FR* 11767), and subsequently designated on January 6, 2000 (64 *FR* 68507). The Pacific coast population of the western snowy plover breeds in loose colonies primarily on coastal beaches from southern Washington to southern Baja California, Mexico. This habitat is unstable because of unconsolidated soils, high winds, storms, wave action, and colonization by plants. Sand spits, dune-backed beaches, unvegetated beach strands, open areas around estuaries, and beaches around river mouths are the preferred coastal habitats for nesting. Other less common nesting habitat includes salt pans, coastal dredged spoil-disposal sites, dry salt ponds, and salt-pond levees and islands. The breeding season extends from early March to late September. In winter, plovers are found on many of the beaches used for nesting, but they also are found on beaches not used for nesting. In Washington, the main wintering location is Leadbetter Point in Willapa Bay. In California, the majority of wintering plovers concentrate on sand spits and dune-backed beaches, but some also occur on urban and bluff-backed beaches, which are rarely used for nesting. The wintering season extends roughly from October to February but often overlaps the nesting season to some extent.

Two sites are designated as critical habitat in Washington: Leadbetter Point in Willapa Bay in Pacific County and Damon Point in Grays Harbor County. In Oregon, designated critical habitat includes Bayocean Spit in Tillamook County, Heceta Head to Sutton Creek and Siltcoos River North in Lane County, Siltcoos River to Threemile Creek in Lane and Douglas counties, Umpqua River to Horsfall Beach in Douglas and Coos counties, Horsfall Beach to Coos Bay in Coos County, and Bandon Park to Floras Lake in Coos and Curry counties. In California, designated critical habitat includes Humboldt Coast Lagoon beaches (Stone Lagoon, Big Lagoon) and Eel River beaches (Eel River North, Eel River South) in Humboldt County, portions of Bodega Bay (Bodega Harbor and Doran Spit) in Sonoma County, Dillon Beach in Marin County, Half Moon Bay beaches in San Mateo County, portions of Santa Cruz Coast beaches (Waddell Creek, Scott Creek, Laguna Creek, and Wilder Creek) in Santa Cruz County, portions of Monterey Bay beaches in Santa Cruz and Monterey counties (Sunset, Mudowski, Salinas River, Fort Ord/Seaside and Point Sur beaches and Elkhorn slough), Arroyo Hondo Creek Beach, Arroyo Laguna Creek Beach, and portions of Morro Bay beaches (Toro Creek, Atascadero, Morro Bay) in San Luis Obispo County, Pismo Beach/Nipomo Dunes in San Luis Obispo and Santa Barbara counties, Point Sal to Point Conception beaches and Santa Barbara Coast beaches in Santa Barbara County ( Santa Ynez River mouth/Ocean, Jalama, Devereaux, Harbor, and Carpinteria), Oxnard Lowlands (San Buenaventura, Mandalay Bay/Santa Clara River Mouth, Ormond, Mugu) and San Nicolas Island beaches in Ventura County, Malibu Lagoon in Los Angeles County, and Mission Beach and Bay and South San Diego Coast beaches (Silver Strand/Delta Beach and Tijuana River Beach) in San Diego County (64 *FR* 68507).

#### *(c) Short-Tailed Albatross*

The short-tailed albatross was proposed for listing as endangered in the United States on November 2, 1998 (63 *FR* 58692) and subsequently listed as endangered on August 30, 2000 (65 *FR* 46643). This species previously was listed as endangered throughout its range except in the U.S. Short-tailed albatrosses range throughout the North Pacific Ocean and north into the Bering Sea during the nonbreeding season. Occasional sightings of this albatross in the Gulf of Alaska have been reported in recent decades (Hasegawa and DeGange, 1982; Sherburne, 1993). Breeding colonies are limited to two Japanese islands, Torshima and Minami-kojima, but several individuals have been observed regularly during the breeding season on Midway Island in the northwestern Hawaiian Islands. Currently, the world population of this species is estimated at approximately 1,200 individuals, with approximately 600 breeding-age birds (65 *FR* 46643). There are no breeding populations of short-tailed albatrosses in the United States, but several individuals have been observed regularly during the breeding season on Midway Atoll in the northwestern Hawaiian Islands. The short-tailed albatross is a surface feeder and is more often observed in coastal areas than other albatross species. Based on the historical record, it is reasonable to assume that individuals of this North Pacific species occasionally may be present in the vicinity of tanker routes through the Gulf of Alaska and along the northeast Pacific coast (DeGange, 1981; Grinnel and Miller, 1944; Sherburne, 1993).

### (3) Fishes

There are a number of Evolutionarily Significant Units (ESU's) of salmon and steelhead that may occur in waters of Washington, Oregon, and California along the oil-transportation route from Alaskan ports to U.S. ports on the Pacific coast. An ESU is a population of the species that is considered distinct, frequently because it is substantially reproductively isolated from other population units of that species. Salmon and steelhead in these ESU's that occur along the transportation route have been proposed for listing as either threatened or endangered or as candidate species by the NMFS and, thus, are included in this EIS. In addition, the bull trout, coastal cutthroat trout, tidewater goby, Sacramento splittail, and Pacific hake are included.

### *(a) Chinook Salmon*

Information on chinook salmon was taken from the March 9, 1998, *Federal Register* (63 *FR* 11481). The NMFS designated critical habitat for several ESU's of chinook salmon on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed salmon or steelhead within the range of the ESU's listed, except for reaches on Indian lands. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches. Chinook salmon are easily distinguished from other salmonid species by their large size. Adults weighing more than 120 pounds have been caught in North American waters. Chinook salmon are anadromous and migrate as adults from a marine environment into their natal freshwater streams and rivers, where they spawn and die. Adult female chinook prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth, and velocity. Redds vary widely in size and in location within the stream or river. The adult female chinook may deposit eggs in 4-5 "nesting pockets" within a single redd. After laying eggs in a redd, adult chinook will guard the redd from 4-25 days before they die. Chinook salmon eggs will hatch, depending on water temperatures, between 90 and 150 days after deposition. Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to estuarine areas as smolts and then into the ocean to feed and mature. Chinook salmon remain at sea for 1-6 years (more commonly 2-4 years), with the exception of a small proportion of yearling males (called jack salmon), which mature in freshwater or return after 2-3 months in saltwater.

Two distinct races of chinook salmon have evolved: "stream type" and "ocean type." The stream-type chinook is found most commonly in headwater streams. They have a longer freshwater residency and make extensive offshore migrations before returning to their natal streams in the spring or summer months. Juveniles of stream-type chinooks are more dependent on freshwater stream ecosystems because of their extended residence in these areas. Stream-type (yearling) smolts are larger than their ocean-type (subyearling) counterparts when they enter saltwater and are able to move offshore relatively quickly. The ocean-type chinook commonly is found in coastal streams. They typically migrate to sea within the first 3 months of emergence but may spend up to a year in freshwater before emigration. They also spend their ocean life in coastal waters. Ocean-type chinook salmon return to their natal rivers or streams as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. Juveniles of ocean-type chinook salmon use estuaries and coastal areas more extensively for rearing.

Chinook salmon on the west coast of the United States have experienced declines in abundance in the past several decades as a result of loss, damage, or change to their natural environment. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic use, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin basins) have greatly reduced or eliminated historically accessible habitat and degraded remaining habitat. An estimated 80-90% of the historic riparian habitat has been eliminated in most Western states. Wetlands in Washington and Oregon are estimated to have diminished by one-third, while California has had a 91% loss of its wetland habitat. Loss of habitat complexity and habitat fragmentation also has contributed to the decline of chinook salmon. Sedimentation from extensive and intensive land use activities (timber harvests, road building, livestock grazing, and urbanization) is recognized as a primary cause of habitat degradation in the range of west coast chinook salmon.

Other factors besides degradation of aquatic and riparian ecosystems may have contributed to the decline of these salmonids, including overfishing. Also, increased predator populations from the introduction of non-native species and habitat modifications significantly may influence salmonid abundance in some local populations, when other prey are absent and physical conditions lead to the concentration of adults and juveniles. Infectious disease can influence adult and juvenile chinook-salmon survival as a result of exposure to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Scientific studies indicate that chinook salmon may be more susceptible to disease organisms than other salmonids. Habitat conditions such as low waterflows and high temperatures can exacerbate susceptibility to disease. Abundance and survival of west coast chinook salmon and the quality of their habitat also are affected by a variety of Federal, State, tribal, and local laws, regulations, and treaties that, in many cases, are not adequate to protect them. Extensive hatchery programs have been implemented throughout the range of west coast chinook salmon and have strongly influenced chinook salmon populations in some ESU's. Hatchery programs intended to compensate for habitat losses likely have masked declines in natural stocks.

#### *1) Upper Columbia River Spring-Run Chinook Salmon*

This ESU of chinook salmon was proposed for listing as endangered on March 9, 1998 (63 *FR* 11481), and subsequently listed as endangered on May 24, 1999 (64 *FR* 14307). The Final rule listing this ESU as endangered was published on May 24, 1999 (64 *FR* 14307). This ESU includes stream-type chinook salmon spawning above Rock Island Dam in the Wenatchee, Entiat, and Methow rivers.

Chinook salmon in the Okanogan River apparently are ocean type and are considered part of the Upper Columbia River summer and fall run ESU.

Rivers in this ESU drain the east slopes of the Cascade Range and are fed primarily by snowmelt. The waters tend to be cooler and less turbid than the Snake and Yakima rivers to the south. Although these fish appear to be closely related genetically to stream-type chinook salmon in the Snake River, there are substantial ecological differences between the Snake and Columbia rivers, particularly in the upper tributaries favored by stream-type chinook salmon.

Hatchery programs have had a considerable influence on this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the Grand Coulee Fish-Maintenance Project from 1939-1943. During that project, all spring chinook salmon reaching Rock Island Dam, including those destined for areas above Grand Coulee Dam, were collected and they or their progeny were dispersed into streams in this ESU. Some ocean-type fish undoubtedly also were incorporated into this program. Spring run escapements to the Wenatchee, Entiat, and Methow rivers were severely depressed before the project but increased considerably in subsequent years, suggesting that the effects of the program may have been substantial. It is probable that the majority of returning spring run adults trapped at Rock Island Dam for use in the Grand Coulee Fish-Maintenance Project probably were not native to these three rivers. Widespread transplants of Carson stock spring chinook salmon (derived from a mixture of Columbia River and Snake River stream-type chinook salmon) also have contributed to erosion of the genetic integrity of this ESU.

In spite of considerable homogenization, this ESU still represents an important genetic resource, in part because it presumably contains the last remnants of the gene pools for populations from the headwaters of the Columbia River. Hatchery efforts recently have focused on supplementing naturally spawning populations in this ESU. The potential exists for hatchery-derived non-native stocks to genetically impact naturally spawning populations, especially given the recent low numbers of fish returning to rivers in this ESU. The risks associated with interactions between wild and hatchery chinook salmon are a concern.

Access to a substantial portion of historical habitat was blocked by the Chief Joseph and Grand Coulee dams. There are local habitat problems related to irrigation diversions and hydroelectric development and degraded riparian and instream habitat from urbanization and livestock grazing. Hydroelectric development on the mainstem Columbia River has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat. Some populations in this ESU must migrate through nine mainstem dams.

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nine stocks within the ESU were considered, eight of which were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU have experienced record low returns for the last few years. Six stocks were identified as extinct. Because of a lack of information on chinook salmon stocks that are presumed to be extinct, the relationship of these stocks to existing ESU's is uncertain.

Recent total abundance of this ESU is quite low, with escapements in 1994-1996, the lowest in at least 60 years. Almost all of the remaining naturally spawning populations are small, with fewer than 100 spawners. In addition, both recent and long-term trends in abundance are downward. The NMFS concluded that chinook salmon in this ESU are in danger of extinction.

Critical habitat was designated on February 16, 2000 (65 *FR* 7764), to include all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of the Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Chief Joseph Dam in Washington. Excluded are areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*2) Central Valley California Spring-Run Chinook Salmon*

This ESU of chinook salmon was proposed for listing as endangered on March 9, 1998 (63 *FR* 11481) and subsequently listed as threatened on September 16, 1999 (64 *FR* 50393). This ESU includes chinook salmon that enter the Sacramento River and its tributaries from March to July and spawn from late August through early October, with a peak in September. Mill and Deer creeks and possibly Butte Creek (tributaries to the Sacramento River) are the only streams considered to have wild spring run chinook salmon, and these are relatively small populations with sharply declining trends. Demographic and genetic risks due to small population sizes are thus considered to be high. Historically, spring chinook salmon were the dominant run in the Sacramento and San Joaquin River basins, which represents a large portion of the historic range and abundance of the ESU. However, native populations in the San Joaquin River and its tributaries apparently have all been extirpated.

Spring-run fish in the Sacramento River exhibit an ocean-type life history, emigrating as fry, subyearlings, and yearlings. Recoveries of hatchery chinook salmon indicate that salmon from this ESU are found primarily in coastal waters off California and Oregon. There were minimal differences in the ocean distribution of fall- and spring-run fish from the Feather River Hatchery; however, due to hybridization that may have occurred in the hatchery between these two runs, this similarity in ocean migration may not be representative of wild runs. Substantial ecological differences in the historical spawning habitat for spring-run versus fall- and late-fall-run fish have been recognized. The timing of the spring chinook salmon run was suited to gaining access to the upper reaches of river systems (up to 1,500 meters in elevation) before the onset of prohibitively high water temperatures and low flows that inhibit access to these areas during the fall. Differences in adult size, fecundity, and smolt size also occur between spring- and fall/late-fall-run chinook salmon in the Sacramento River.

Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River basins due to impassable dams, and spawning currently is restricted to the mainstem and a few river tributaries in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration routes.

There appears to be threats to genetic integrity posed by hatchery programs in the Central Valley. Most of the spring-run chinook salmon production in the Central Valley is of hatchery origin, and naturally spawning populations may be interbreeding with both fall/late-fall- and spring-run hatchery fish. This problem is exacerbated by the increasing production of spring chinook salmon from the Feather River and Butte Creek hatcheries, with reports suggesting a high degree of mixing between spring- and fall/late-fall- run broodstock in the hatcheries. Hatchery strays are considered to be an increasing problem because of the management practice of releasing a larger proportion of fish into the Sacramento River Delta and San Francisco Bay.

Four stocks have been identified as extinct (spring/summer-run chinook salmon in the American, McCloud, Pit, and San Joaquin) and two stocks (spring-run chinook salmon in the Sacramento and Yuba rivers) have been identified as being at a moderate risk of extinction.

As discussed, habitat problems were considered to be the most important source of ongoing risk to this ESU. However, the NMFS also is quite concerned about threats to genetic integrity posed by hatchery programs in the Central Valley and related harvest regimes that may not be allowing recovery of this at-risk population. Based on this risk, the NMFS concluded that chinook salmon in this ESU are in danger of extinction.

Critical habitat was designated on February 16, 2000 (65 *FR* 7764), to include all river reaches accessible to listed chinook salmon in the Sacramento River and its tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *3) California Coastal Chinook Salmon*

This ESU of chinook salmon was proposed for listing as threatened on March 9, 1998 (63 *FR* 11481), as part of the larger Southern Oregon and California Coastal chinook salmon ESU. This larger ESU includes all naturally spawned coastal spring and fall chinook salmon spawning from Cape Blanco (inclusive of the Elk River) to the southern extent of the current range for chinook salmon at Point Bonita (the northern landmass marking the entrance to San Francisco Bay). Chinook salmon spawn in several small tributaries to San Francisco Bay; however it is uncertain whether these small populations are part of this ESU or wanderers from Central Valley chinook salmon ESU's.

Based on a reassessment of information relevant to this ESU, the NMFS concluded on September 16, 1999, that the proposed Southern Oregon and California Coastal chinook salmon ESU should be split into two ESU's. The California Coastal chinook salmon ESU consisting of California coastal populations extending from Redwood Creek (Humboldt County) south through the Russian River subsequently was listed as threatened on September 16, 1999 (64 *FR* 50393). Other coastal populations to the north of this ESU extending from Euchre Creek through the Lower Klamath River (and originally proposed as threatened) are now considered part of a separate Southern Oregon and Northern California Coastal chinook salmon ESU that does not warrant listing at this time. The reconfiguration of the original proposed ESU was based on a number of issues, including genetic differences, ecological differences, and migration patterns.

Chinook salmon in this ESU exhibit an ocean-type life history, and ocean distribution is predominantly off the California and Oregon coasts. Life-history information on smaller populations, especially in the southern portion of the ESU, is extremely limited. Additionally, there is limited information on abundance of several spring-run populations, including the Chetco, Winchuck, Smith, Mad, and Eel rivers. This ESU is genetically distinguishable from the Oregon Coast, Upper Klamath and Trinity River, and Central Valley ESU's. Life-history differences exist between spring- and fall-run fish in this ESU, but not to the same extent as observed in larger inland basins. In the California Coastal chinook salmon ESU, fall chinook salmon occur in relatively low numbers in northern streams and only sporadically in streams in the southern portion of the ESU's range.

The majority of the river systems in this ESU are relatively small and heavily influenced by the maritime climate. Low summer flows and high temperatures in many rivers result in seasonal physical and thermal barrier bars that block the movement of anadromous fish. The Rogue River is the largest river basin in this ESU and extends inland into the Sierra Nevada and Cascades regions.

The spawning abundance of chinook salmon in this ESU is highly variable among populations, with populations in California and spring-run chinook salmon throughout the ESU being of particular concern. There is a general pattern of downward trends in abundance in most populations for which data are available, with declines being especially pronounced in spring-run populations. The extremely depressed status of almost all coastal populations south of the Klamath River is an important source of risk to the ESU. The NMFS has a general concern that no current information is available for many river systems in the southern portion of this ESU, which historically maintained numerous large populations. Although these California coastal populations do not form a separate ESU, they represent a considerable portion of genetic and ecological diversity within this ESU.

Habitat loss and/or degradation is widespread throughout the range of the ESU. Habitat blockages and fragmentation, logging and agricultural activities, urbanization, and water withdrawals were reported as the most predominant problems for anadromous salmonids in California's coastal basins. Habitat problems have been identified for each major river system in California. The most vital habitat factor for coastal California streams was degradation because of improper logging followed by massive siltation, log jams, etc. Road building was cited as another cause of siltation in some areas. A variety of specific critical habitat problems were identified in individual basins, including extremes of natural flows (Redwood Creek and Eel River), logging practices (Mad, Eel, Mattole, Ten Mile, Noyo, Big, Navarro, Garcia, and Gualala rivers), and dams with no passage facilities (Eel and Russian rivers), and water diversions (Eel and Russian rivers). Such problems also occur in Oregon streams within the ESU. The Rogue River Basin in particular has been affected by mining activities and unscreened irrigation diversions in addition to the problems resulting from logging and dam construction. One-third of spring chinook salmon-spawning habitat in the Rogue River was estimated to be inaccessible following the construction of Lost Creek Dam in 1977. Major flood events in 1996 and 1997 probably affected habitat quality and survival of juveniles within this ESU. Although the NMFS has little information on the effects of these floods on this ESU, effects probably are similar to those discussed in the following subsections for the Oregon and Washington Coastal Region.

Hatchery programs in the Southern Oregon and Coastal California ESU are less extensive than those in the Klamath/Trinity or Central Valley ESU's. The Rogue, Chetco, and Eel river basins and Redwood Creek have received considerable releases, derived primarily from local sources. Current hatchery contribution to overall abundance is relatively low except for the Rogue River spring run. The hatchery-to-total run ratio of Rogue River spring chinook salmon, as measured at Gold Ray Dam, has exceeded 60% in some years.

Previous assessments of stocks within this ESU have identified nine stocks as being at risk or of concern. The fall chinook salmon in the Rogue River was the only relatively healthy population identified in this ESU. There is a pattern of downward trends in abundance in most populations within this ESU for which data are available, with declines being especially pronounced in the spring-run populations. There is a high degree of uncertainty regarding the status of these populations because of the lack of population monitoring. The NMFS concluded that the extremely depressed status of most coastal populations south of the Klamath River is an important source of risk to the ESU. They further concluded that the California Coastal chinook salmon ESU is likely to become endangered in the foreseeable future.

Critical habitat is designated to include all river reaches and estuarine areas accessible to listed chinook salmon from Redwood Creek (Humboldt County, California) to the Russian River (Sonoma County, California) inclusive. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *4) Central Valley Fall/Late-Fall Run Chinook Salmon*

This ESU of chinook salmon was proposed for listing as threatened on March 9, 1998 (63 *FR* 11481). It was subsequently determined on September 16, 1999, that listing is not warranted at this time but the species will be considered as a candidate species (64 *FR* 50393). This ESU includes fall and late-fall chinook salmon that enter the Sacramento and San Joaquin rivers and their tributaries from July through April and spawn from October through February. Both runs are ocean-type chinook salmon, emigrating predominantly as fry and subyearlings and remaining off the California coast during their ocean migration.

Sacramento/San Joaquin Basin chinook salmon are genetically and physically distinguishable from all other coastal forms. There were also a number of life-history differences noted between Sacramento and San Joaquin river basin fall/late-fall-run populations. San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations. These differences could be due to the generally warmer temperature and lower flow conditions found in the San Joaquin River Basin relative to the Sacramento River Basin. There was no apparent difference in the distribution of marine recoveries from Sacramento and San Joaquin river hatchery populations, nor are there major genetic differences between Sacramento and San Joaquin river-fall/late-fall-run populations.

Although total population abundance in this ESU is relatively high, perhaps near-historic levels, the NMFS identified several concerns regarding its status. They concluded that a large proportion of the historic range of this ESU is severely degraded, because the abundance of natural fall chinook salmon in the San Joaquin River Basin is low. Habitat blockage is not as severe for fall/late-fall-run chinook salmon as it is for winter- and spring-run chinook salmon in this region, because most of the fall/late-fall-run spawning habitat was below dams constructed in the region. However, there has been a severe degradation of the remaining habitat, especially due to agricultural and municipal water-use activities in the Central Valley (which result in pollution, elevated water temperatures, diminished flows, and smolt and adult entrainment into poorly screened or unscreened diversions). Additionally, stray rates are high, because many hatchery fish are released off station to avoid adverse river conditions, resulting in a much larger proportion of hatchery chinook salmon present in the natural spawning population.

Some of the Sacramento and San Joaquin river basin tributaries are showing recent, short-term increases in abundance. However, the streams supporting natural runs considered to be the least influenced by hatchery fish have the lowest abundance and the most consistently negative trends of all populations in the ESU. In general, high hatchery production and infrequent monitoring of natural production make the assessment of natural production difficult, resulting in uncertainty in assessing the status of this ESU.

Other concerns about salmon in this ESU are the high ocean and freshwater harvest rates in recent years, which may be higher than is sustainable by natural populations given the productivity of the ESU under present habitat conditions. The mixed-stock ocean salmon off California fisheries are managed to achieve spawning escapement goals for two main indicator stocks, the Sacramento River fall chinook and Klamath River fall chinook. Harvest may be further constrained to meet the NMFS's Endangered Species Act requirements for listed species, including Sacramento River winter chinook, Central California Coastal and Southern Oregon/Northern California coho, and Snake River fall chinook. Since 1993, addressing Indian fishing rights in the Klamath River Basin has required significant reductions in the ocean harvest rate on Klamath River fall chinook. Because of the need to constrain ocean harvest rates on Klamath River fall chinook, commercial fisheries have not been allowed to harvest Central Valley stocks to the extent that would be permitted by the management goal for Sacramento River fall chinook alone (122,000-180,000 adult hatchery and natural spawners). Spawning escapements have been well above the goal range in recent years. A record number of adults (324,000) returned in 1997.

Two stocks in this ESU (San Joaquin and Cosumnes river stocks) have been identified as being of special concern. Even though total population abundance in this ESU is relatively high, the abundance of natural fall chinook salmon in the San Joaquin River Basin is low. Habitat problems were considered to be the most important source of ongoing risk to this ESU, although the NMFS is extremely concerned about threats to genetic integrity posed by hatchery and harvest programs related to fall/late-fall-run chinook salmon. They concluded that chinook salmon in this ESU presently are not in danger of extinction but are likely to become endangered in the foreseeable future.

Areas that may constitute critical habitat were discussed in the proposed rule (63 *FR* 11481). Critical habitat, if designated, could include all river reaches accessible to chinook salmon in the Sacramento and San Joaquin rivers and their tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge from San Pablo Bay to the Golden Gate Bridge). Excluded are areas upstream of the Merced River and areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *5) Puget Sound Chinook Salmon*

This ESU of chinook salmon was proposed for listing as threatened on March 9, 1998 (63 *FR* 11481) and subsequently listed as threatened on May 24, 1999 (64 *FR* 14307). This ESU encompasses all naturally spawned spring, summer, and fall runs of chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula, inclusive. Chinook salmon in this area all exhibit an ocean-type life history. Although some spring run chinook salmon populations in the Puget Sound ESU have a high proportion of yearling smolt emigrants, the proportion varies substantially from year to year and appears to be environmentally mediated rather than genetically determined. Puget Sound stocks all tend to mature at ages 3 and 4 and exhibit similar, coastally oriented, ocean migration patterns. There are substantial ocean distribution differences between Puget Sound and Washington coast stocks, with recoveries of Washington coastal chinook found in much larger proportions from Alaskan waters. The marine distribution of Elwha River chinook salmon most closely resembled other Puget Sound stocks rather than Washington coast stocks.

The boundaries of the Puget Sound ESU correspond generally with the boundaries of the Puget Lowland Ecoregion. Despite being in the rainshadow of the Olympic Mountains, the river systems in the western portion of Puget Sound maintain high flow rates due to the melting snowpack in the surrounding mountains. Temperatures tend to be moderated by the marine environment. The Elwha River, which is in the Coastal Ecoregion, is the only system in this ESU that lies outside the Puget Sound Ecoregion. In life-history and genetic attributes, the Elwha River chinook salmon appear to be transitional between populations from Puget Sound and the Washington Coast ESU.

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Both long- and short-term trends in abundance are predominantly downward, and several populations are exhibiting severe, short-term declines. Spring chinook salmon populations throughout this ESU all are depressed.

Habitat throughout the ESU has been degraded. In general, upper tributaries have been impacted by forest practices, and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation resulting from forestry practices and urban development are cited as problems throughout the ESU. Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood-control projects are major habitat problems in several basins. A variety of important habitat issues have been identified for streams in this ESU, including changes in flow regime (all basins); sedimentation (all basins); high temperatures (Dungeness, Elwha, Green/Duwamish, Skagit, Snohomish, and Stillaguamish rivers); streambed instability (most basins); estuarine loss (most basins); loss of large, woody debris (Elwha, Snohomish, and White rivers); loss of pool habitat (Nooksack, Snohomish, and Stillaguamish rivers); and blockage or passage problems associated with dams or other structures (Cedar, Elwha, Green/Duwamish, Snohomish, and White rivers). Reductions in habitat capacity and quality have contributed to escapement problems for Puget Sound chinook salmon, as shown by loss of tributary and mainstem habitat due to dams and loss of slough and side-channel habitat due to diking, dredging, and hydromodification.

Nearly 2 billion fish have been released into Puget Sound tributaries since the 1950’s. Hatchery production throughout the ESU may mask trends in natural populations and make it difficult to determine whether they are self sustaining. This difficulty is compounded by the lack of data pertaining to the proportion of naturally spawning fish that are of hatchery origin. There also has been widespread use of a limited number of hatchery stocks, resulting in an increased risk of loss of fitness and diversity among populations. An estimated 11 out of 29 stocks in this ESU are being sustained, in part, through artificial propagation. The vast majority of these have been derived from local returning fall-run adults.

Returns to hatcheries have accounted for more than half of the total spawning escapement, although the hatchery contribution to spawner escapement probably is much higher than that due to hatchery-derived strays on the spawning grounds. In the Stillaguamish River, summer chinook have been supplemented under a wild-broodstock program for the last decade. In some years, returns from this program have comprised up to 30-50% of the natural spawners, suggesting that the unaided stock is not able to maintain itself. Almost all of the releases into this ESU have come from stocks within this ESU, with the majority of within-ESU transfers coming from the Green River Hatchery or hatchery broodstocks that have been derived from Green River stock. The pervasive use of Green River stock throughout much of the hatchery network that exists in this ESU may reduce the genetic diversity and fitness of naturally spawning populations.

Previous assessments of stocks within this ESU have identified several stocks as extinct or possibly extinct and several stocks as being at risk or of concern. Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and both long and short-term trends in abundance are predominantly downward. Several populations are exhibiting severe, short-term declines. Spring chinook salmon populations throughout this ESU all are depressed. The NMFS concluded that chinook salmon in this ESU presently are not in danger of extinction but are likely to become endangered in the foreseeable future.

Critical habitat is designated to include all marine, estuarine, and river reaches accessible to listed chinook salmon in Puget Sound (65 *FR* 7764). Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Straits of Juan De Fuca to a straight line extending north from the west end of Freshway Bay, inclusive. Excluded are areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

### *6) Lower Columbia River Chinook Salmon*

This ESU of chinook salmon was proposed for listing as threatened on March 9, 1998 (63 *FR* 11481), and subsequently listed as threatened on May 24, 1999 (64 *FR* 14307). This ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. Celilo Falls, which corresponds to the edge of the drier Columbia Basin Ecosystem and historically may have presented a migrational barrier to chinook salmon at certain times of the year, is the eastern boundary for this ESU. "Tule" fall chinook salmon in the Wind and Little White Salmon rivers is included in this ESU but not the introduced "upriver bright" fall chinook salmon populations in the Wind, White Salmon, and Klickitat rivers.

In addition to the geographic features mentioned, genetic and life-history data were important factors in defining this ESU. Populations in this ESU are considered ocean type. Some spring-run populations have a large proportion of yearling migrants, but this trend may be biased by yearling hatchery releases. Subyearling migrants were found to contribute to the escapement. Recoveries for Lower Columbia River ESU populations indicate a northerly migration route but with little contribution to the Alaskan fishery. Populations in this ESU also tend to mature at age 3 and 4, somewhat younger than populations from the coastal, upriver, and Willamette ESU's. Ecologically, the Lower Columbia River ESU crosses several ecoregions—Coastal, Willamette Valley, Cascades, and East Cascades. Apart from the relatively large and apparently healthy fall-run population in the Lewis River, production in this ESU appears to be predominantly hatchery driven with few identifiable naturally spawned populations.

All basins are affected by habitat degradation. Major habitat problems primarily are related to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in floodplains and low-gradient tributaries. Substantial chinook salmon-spawning habitat has been blocked or impaired in the Cowlitz, Lewis, Clackamas, Hood, and Sandy rivers.

Hatchery programs to enhance the abundance of chinook salmon fisheries in the lower Columbia River began in the 1870's, rapidly expanded, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, more than 200 million fish from outside the ESU have been released since 1930. A particular concern at the present time is the straying by Rogue River fall chinook salmon, which are released into the lower Columbia River to augment harvest opportunities. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations. In addition, the exchange of eggs between hatcheries in this ESU has led to the extensive genetic homogenization of hatchery stocks. The large numbers of hatchery fish in this ESU make it difficult to determine the proportion of naturally produced fish. In spite of the heavy impact of hatcheries, genetic and life-history characteristics of populations in this ESU differ from those in other ESU's. The loss of fitness and diversity within the ESU is an important concern.

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. One assessment identified two stocks as extinct (Lewis River spring run and Wind River fall run), four stocks as possibly extinct, and four stocks as a high risk of extinction. Another assessment considered 20 stocks within the ESU, of which only 2 (Lewis River and East Fork Lewis River fall runs) were considered to be of native origin, predominantly natural production, and healthy. There have been at least six documented extinctions of populations in this ESU, and it is possible that extirpation of other native populations has occurred but has been masked by the presence of naturally spawning hatchery fish. About half of the populations comprising this ESU are very small, increasing the likelihood that risks from genetic and demographic drift processes in small populations will be important. The NMFS concluded that chinook salmon in this ESU presently are not in danger of extinction but are likely to become endangered in the foreseeable future.

Critical habitat is designated to include all river reaches accessible to listed chinook salmon in Columbia River tributaries between the Grays and White Salmon rivers in Washington and the Willamette and Hood rivers in Oregon, inclusive (65 *FR* 7764). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

### *7) Upper Willamette River Chinook Salmon*

This ESU of chinook salmon was proposed for listing as threatened on March 9, 1998 (63 *FR* 11481), and subsequently listed as threatened on May 24, 1999 (64 *FR* 14307). This ESU includes naturally spawned spring-run populations above the Willamette Falls. Fall chinook salmon above the Willamette Falls are introduced and, although they are naturally spawning, they are not considered a population for purposes of defining this ESU. Historic, naturally spawned populations in this ESU have an unusual life history that shares features of both stream and ocean types. Scale analysis of returning fish indicate a predominantly yearling smolt life history and maturity at 4 years of age, but these data primarily are from hatchery fish and may not accurately reflect patterns for the natural fish. Young-of-year smolts have been found to contribute to the returning 3-year old year-class. The ocean distribution is consistent with an ocean-type life history, and considerable numbers of recoveries occur in the Alaskan and British Columbian coastal fisheries. Intrabasin transfers have contributed to the homogenization of Willamette River spring chinook salmon stocks; however, Willamette River spring chinook salmon remain one of the most genetically distinctive groups of chinook salmon in the Columbia River Basin.

While the abundance of Willamette River spring chinook salmon has been relatively stable over the long term and there is evidence of some natural production, it is apparent that the natural population is not replacing itself. Total abundance has been relatively stable at approximately 20,000-30,000 fish. However, recent natural escapement is fewer than 5,000 fish and has been declining sharply. Natural production accounts for only one-third of the natural spawning escapement, suggesting that the natural population is falling far short of replacing itself. While hatchery programs in the Willamette River Basin have maintained broodlines that are relatively free of genetic influences from outside the basin, they may have homogenized the population structure within the ESU. The introduction of fall-run chinook salmon into the basin and laddering of Willamette Falls have increased the potential for genetic introgression between wild spring-run and hatchery fall-run chinook salmon, but there is no direct evidence of hybridization (other than an overlap in spawning times and locations) between the two runs. Prolonged hatchery propagation of the majority of the production from this ESU also may have had deleterious effects on the ability of Willamette River spring chinook salmon to reproduce successfully in the wild.

Habitat blockage and degradation are significant problems in this ESU. Available habitat has been reduced by construction of dams in the Santiam, McKenzie, and Middle Fork Willamette river basins, and these dams probably have adversely affected remaining production through thermal effects. Agricultural development and urbanization are the main activities that have adversely affected habitat throughout the basin. Another concern is that commercial and recreational harvests are high relative to the apparent productivity of natural populations.

A previous assessment of risk to stocks in this ESU identified the Willamette River spring-run chinook salmon as of special concern due to its vulnerability to minor disturbances, the special character of this stock, and insufficient information on population trend. The NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future.

Critical habitat is designated to include all river reaches accessible to listed chinook salmon in the Willamette River and its tributaries above the Willamette Falls (65 *FR* 7764). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Excluded are areas above specific dams identified in the March 9, 1998, *Federal Register* (63 *FR* 11481) or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *(b) Chum Salmon*

Information on chum salmon was taken from the March 10, 1998, *Federal Register* (63 *FR* 11773) and the March 25, 1999, *Federal Register* (64 *FR* 14507). The NMFS designated critical habitat for several ESU's of chum salmon on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed salmon or steelhead within the range of the ESU's listed, except for reaches on Indian lands. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches. Chum salmon have the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean than that of the other salmonids. Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States as far south as Monterey, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Chum salmon usually spawn in coastal areas, and juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds. This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus *Oncorhynchus* (for example, coastal cutthroat trout, steelhead, coho salmon, and most types of chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids, which depend heavily on freshwater habitats) than on favorable estuarine and marine conditions. Another behavioral difference between chum salmon and most species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation.

Most chum salmon (95%) mature between 3 and 5 years of age, with 60-90% of the fish maturing at 4 years of age. However, a higher proportion of 5-year-old fish occurs in the north, and a higher proportion of 3-year-old fish occurs in the south.

Chum salmon usually spawn in the lower reaches of rivers typically within 100 kilometers of the ocean. Redds usually are dug in the mainstem or in side channels of rivers. In some areas (such as in Alaska), they typically spawn where upwelled groundwater percolates through the redds. During the spawning migration, adult chum salmon enter natal river systems from June to March, depending on characteristics of the population or geographic location. Migration timing is used to distinguish anadromous populations of chum salmon as summer versus fall or early fall versus late fall. In Washington, a variety of seasonal runs are recognized, including summer, fall, and winter populations, with fall-run fish being predominant. Summer runs are found in Hood Canal, the Straits of Juan de Fuca, and in southern Puget Sound; winter-run fish are found in only two rivers, both in southern Puget Sound.

*1) Columbia River Chum Salmon*

This ESU of chum salmon was proposed for listing as threatened on March 10, 1998 (63 *FR* 11773), and subsequently listed as threatened on May 24, 1999 (64 *FR* 14507). Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (more than 500 kilometers inland). Today, only remnant chum salmon populations exist, all in the lower Columbia River.

The Columbia River historically had large runs of chum salmon that supported a substantial commercial fishery in the first half of the twentieth century. Presently, neither recreational nor directed commercial fisheries for chum salmon exist in the Columbia River, although some chum salmon are taken incidentally in the gillnet fisheries for coho and chinook salmon, and there has been some recreational harvest in some tributaries. Returns of chum salmon to three streams in the Columbia River suggest that there may be a few thousand, perhaps up to 10,000 chum salmon spawning annually in the Columbia River basin. On the Oregon side of the Columbia River, 23 spawning populations have been identified, but no estimate is available of the number of spawners in these populations. Current abundance probably is less than 1% of historical levels, and the ESU undoubtedly has lost some of its original genetic diversity. These populations may have been influenced by hatchery programs and/or by introduced stocks, but information on hatchery-wild interactions is unavailable.

A number of factors may threaten naturally reproducing chum salmon throughout its range, including destruction, modification, or curtailment of its habitat or range; overuse for commercial, recreational, scientific, or educational purposes; disease or predation; inadequacy of existing regulatory mechanisms; and other natural or human-caused factors.

The present depressed condition of many populations is the result of several long-standing, human-induced factors, including habitat degradation, water diversions, harvest, and artificial propagation, that are additive to the adverse effects of natural factors, such as competition and predation, or environmental variability from such factors as drought and poor ocean conditions. Among habitat losses documented by the NMFS, those with the most impact on chum salmon include:

- water withdrawal, conveyance, storage, and flood control (resulting in insufficient flows, stranding, juvenile entrainment, and instream temperature increases);
- logging and agriculture (loss of large woody debris, sedimentation, loss of riparian vegetation, habitat simplification);
- mining (especially gravel removal, dredging, pollution); and
- urbanization (stream channelization, increased runoff, pollution, habitat simplification).

Many spill dams and other small hydropower facilities were constructed in lower river areas, and the Bonneville Dam presumably continues to impede recovery of upriver populations. Substantial habitat loss in the Columbia River estuary and associated areas presumably was an important factor in the decline and also represents a significant continuing risk for this ESU. Because chum salmon generally spend only a short time relative to other salmonids in streams and rivers before migrating downstream to estuarine and nearshore marine habitats, the survival of early life-history stages depends more on the health and ecological integrity of estuaries and nearshore environments than it does for most other Pacific salmon. Habitat loss in the estuarine or nearshore marine environment is difficult to quantify, because there are few historical studies that include baseline information, and these studies encompass a variety of classification methods and several time intervals to measure change.

In addition to habitat degradation, other concerns include overuse, disease, predation, existing regulatory mechanisms, and other natural or human-caused factors. Chum salmon have been targeted for commercial and recreational fisheries throughout their range. Incidental harvest in salmon fisheries in the Straits of Juan de Fuca and coho salmon fisheries in Hood Canal are considered to be a significant threat for the Hood Canal summer-run ESU. There is no clear evidence that disease poses a risk factor, but predation has been identified as a risk factor. Existing regulatory mechanisms may not provide adequate protection for this species. Climatic conditions are known to have changed recently in the Pacific Northwest. Most Pacific salmonids south of British Columbia have been affected by changes in ocean production that occurred during the 1970's. Hatcheries in the U.S. Pacific Northwest have produced chum salmon to increase harvest and rebuild depleted runs for almost 100 years. Potential problems associated with hatchery programs include genetic impacts on indigenous, naturally reproducing populations; disease transmission; predation of wild fish; difficulty in determining wild-stock status due to incomplete marking of hatchery fish; depletion of wild-stock to increase broodstock; and replacement rather than supplementation of wild stocks through competition and continued annual introduction of hatchery fish. The more hatchery fish that are released, the more likely natural populations are to be impacted by hatchery fish.

Critical habitat for this ESU is designated to include all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) in the Columbia River downstream from the Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river kilometer 144 near the town of St. Helens (65 *FR* 7764). Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*2) Hood Canal Summer-Run Chum Salmon*

This ESU of chum salmon was proposed for listing as threatened on March 10, 1998 (63 *FR* 11773) and subsequently listed as threatened on May 24, 1999 (64 *FR* 14507). This ESU includes summer-run chum salmon populations in Hood Canal in Puget Sound and in Discovery and Sequim bays on the Straits of Juan de Fuca. These fish spawn from mid-September to mid-October.

In general, summer-run chum salmon are most abundant in the northern part of the range, where they spawn in the mainstems of rivers. Farther south, water temperatures and stream flows during late summer and early fall become unfavorable for salmonids. These conditions do not improve until the arrival of fall rains in late October/November. Few summer chum populations are found south of northern British Columbia. Ecologically, summer-run chum salmon populations from Washington must return to freshwater and spawn during periods of peak high water temperature, suggesting an adaptation to specialized environmental conditions that allow this life-history strategy to persist in an otherwise inhospitable environment.

Summer-run chum salmon in this ESU have experienced a steady decline over the past 30 years. Spawning escapement of summer-run chum salmon in Hood Canal numbered more than 40,000 fish in 1968 but was reduced to only 173 fish in 1989. In 1991, only 7 of 12 streams that historically contained spawning runs of summer chum salmon still had escapements. In 1995-1996, escapement increased to more than 21,000 fish in northern Hood Canal, the largest return in more than 20 years. These increases in escapement were observed primarily in rivers on the west side of Hood Canal, with the largest increase occurring in the Big Quilcene River where the Fish and Wildlife Service had been conducting an enhancement program starting with the 1992 brood year. Streams on the east side of Hood Canal continued to have either no returning adults or no increases in escapement. Several factors may have contributed to the dramatic increase in abundance in 1995-1996, including hatchery supplementation, reduction in harvest rate, increase in marine survival, and improvements in freshwater habitat.

A number of factors may threaten naturally reproducing chum salmon throughout its range, including destruction, modification, or curtailment of its habitat or range, overuse for commercial, recreational, scientific, or education purposes, disease or predation, inadequacy of existing regulatory mechanisms, and other natural or human-caused factors. These are discussed in the section on Columbia River chum salmon.

Critical habitat for this ESU is designated to include all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington (65 *FR* 7764). Also included are estuarine/marine areas of Hood Canal, Admiralty Inlet, and the Straits of Juan De Fuca to the international boundary and as far west as a straight line extending north from Dungeness Bay. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

***(c) Coho Salmon***

This assessment includes the threatened Oregon coast coho salmon ESU and two candidate ESU's, the Puget Sound/Strait of Georgia ESU and the lower Columbia River/southwest Washington coast ESU. The central California coast ESU also is included. This ESU was consulted on previously but critical habitat for this ESU was designated on May 5, 1999 (64 *FR* 24049). Coho salmon on the west coast of the contiguous United States and much of British Columbia generally exhibit a relatively simple 3-year lifecycle. Adults typically begin their freshwater spawning migration in the late summer and fall, spawn by midwinter, and then die. The run and spawning times vary between and within coastal and Columbia River Basin populations. Depending on river temperatures, eggs incubate in redds for 1.5-4 months before hatching as alevins (a larval lifestage dependent on food stored in a yolk sac). Following yolk-sac absorption, alevins emerge from the gravel as young juveniles or fry and begin actively feeding. Juveniles rear in freshwater for up to 15 months, then migrate to the ocean as smolts in the spring. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream to spawn as 3-year olds. Some precocious males, called jacks, return to spawn after only 6 months at sea.

Historically, this species probably inhabited most coastal streams in Washington, Oregon, and northern and central California. Some populations, now extinct, are believed to have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington and the Snake River in Idaho.

#### *1) Oregon Coast Coho Salmon*

This ESU of coho salmon was listed as threatened on August 10, 1998 (63 *FR* 42587). It was initially described and proposed as threatened on July 25, 1995 (60 *FR* 38011). The NMFS designated critical habitat for this ESU of coho salmon on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed salmon or steelhead within the range of the ESU's listed, except for reaches on Indian lands. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches.

This ESU includes coho salmon from Oregon coastal drainages between Cape Blanco and the Columbia River. Genetically, coastal Oregon populations are distinct from Columbia River, Washington coastal, and northern California/southern Oregon populations. Within the Oregon coast ESU, hatchery populations from the north Oregon coast form a distinctive subgroup. Adult run and spawn timing are similar to those along the Washington coast and in the Columbia River, but less variable. Most rivers in this area drain the Coast Range Mountains, have a single peak in flow in December or January, and have relatively low flow during summer and early fall. The coastal region receives fairly high precipitation levels, and the vegetation is dominated by Sitka spruce and western hemlock. Upwelling off the Oregon coast is much more variable and generally weaker than areas south of Cape Blanco. While marine conditions off the Oregon and Washington coasts are similar, the Columbia River has greater influence north of its mouth, and the continental shelf becomes broader off the Washington coast.

Based on historical commercial landing statistics and estimated exploitation rates, escapement of coho salmon in coastal Oregon was estimated to be nearly 1 million fish in the early 1900's, with a harvest of nearly 400,000 fish. Recent estimates indicate an average spawning escapement of less than 30,000 adults. While the methods of estimating total escapement are not comparable between the historical and recent periods, these numbers suggest that current abundance of coho salmon on the Oregon coast may be less than 5% of that in the early part of this century. Based on the NMFS's examination of the available information, it is apparent that spawning escapements for coho salmon populations in the Oregon coastal ESU have declined substantially during this century. Of the 43 Oregon coho salmon stocks north of Cape Blanco, 31 were considered as either depressed or of special concern, and only 6 stocks were considered healthy. In another assessment, two stocks were considered to be at high risk of extinction and 14 stocks at moderate risk of extinction.

The present depressed condition of this population is the result of several long-standing, human-induced factors. The major activities responsible for the decline of coho salmon in Oregon are logging, road building, agricultural activities, grazing, urbanization, stream channelization, dams, wetland loss, water withdrawals, and unscreened diversions for irrigation. Other factors include disease and predation, particularly in local areas, inadequate regulations, poor ocean conditions, and widespread use of hatchery programs. Also, coastwide abundance of many stocks appears to be very low, and there has been a complete ban of most ocean fishing for coho salmon. For these reasons, the NMFS concludes that coho salmon in the Oregon coast ESU presently are threatened.

Critical habitat is designated to include all river reaches and estuarine areas accessible to listed coho salmon from coastal streams south of the Columbia River and north of Cape Blanco, Oregon (65 *FR* 7764). Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *2) Lower Columbia River/Southwest Washington Coast Coho Salmon*

This ESU of coho salmon initially was described and proposed to be placed on the candidate species list on July 25, 1995 (60 *FR* 38011). This ESU includes coho salmon from all tributaries of the Columbia River below approximately the Klickitat and Deschutes rivers, and coastal drainages in southwest Washington between the Columbia River and Point Grenville. The Columbia River estuary and Willapa Bay and Grays Harbor in southwest Washington all have extensive intertidal mud- and sandflats and differ substantially from estuaries to the north and south. This similarity results from the shared geology of the area and the transportation of Columbia River sediments northward along the Washington coast. Rivers draining into the Columbia River have their headwaters in increasingly drier areas, moving from west to east. Columbia River tributaries that drain the Cascade Mountains have proportionally higher flows in late summer and early fall than rivers on the Oregon coast.

Genetic data indicate that Columbia River coho salmon are distinct from coastal Oregon populations but are similar to populations from several coastal streams in southwest Washington. Based on its present status review, the NMFS has determined that the range of the historic ESU probably extended beyond the lower Columbia River to include coho salmon populations from the southwest Washington coast and the Willamette River below Willamette Falls (including the Clackamas River).

An evaluation was made of the status of coho salmon in the Columbia River Basin. Coho salmon stocks above the Bonneville Dam (except Hood River) were classified as extinct. Hood River, Sandy River, and all other lower Columbia tributary stocks were classified as having a high risk of extinction, except the Clackamas River stock, which was classified as having a moderate risk of extinction. The historic ESU also included populations in portions of the southwest Washington coast. Coho salmon stocks in

Willapa Bay were identified by one source as having an unknown status and by another source as having a high risk of extinction. All stocks in Grays Harbor tributaries were thought to be healthy.

The largest production of coho salmon along the southwest Washington coast is in the Chehalis River Basin, with an estimated current coho salmon run (before terminal harvest) in this basin (including the Humptulips River) totaling about 266,000 adults, of which 135,000 are naturally-produced and 131,000 are of hatchery origin. Hatchery influence on these runs has increased rapidly since 1970. No escapement estimates are available for other streams in Grays Harbor or Willapa Bay.

Abundance of late-run coho salmon in the Clackamas River has been measured since 1950 as adult passage at River Mill (1950-1957) and North Fork (1958-present) dams, and total run size (early and late runs) has ranged from 416 (1950) to 4,700 (1968). The late portion of the run has ranged from 309 (1958) to 3,588 (1968); however, it is unclear whether these are native fish or naturalized hatchery fish. At this time it is not possible, with the limited information available, to identify with certainty native, naturally reproducing populations in lower Columbia River tributaries or along the Washington coast south of Point Grenville. If native coho salmon persist in the Clackamas River or in southwest Washington, they would represent a small fraction of the ESU's historical abundance.

The NMFS concludes that a listing presently is not warranted for the lower Columbia River/southwest Washington coast ESU. However, there is sufficient concern regarding the overall health of this ESU (especially in light of evidence that some native, naturally reproducing fish may exist). Therefore, the NMFS is adding the lower Columbia River/southwest Washington coast ESU to the Candidate List until the distribution and status of the native populations can be resolved.

*3) Puget Sound/Strait of Georgia Coho Salmon*

This ESU of coho salmon was initially described and proposed to be placed on the candidate species list on July 25, 1995 (60 *FR* 38011). This ESU includes coho salmon from drainages of Puget Sound and Hood Canal, the eastern Olympic Peninsula (east of Salt Creek), and the Strait of Georgia from the eastern side of Vancouver Island and the British Columbia mainland (excluding the upper Fraser River).

This region is drier than the rain forest area of the western Olympic Peninsula and is dominated by western hemlock forests. Streams are similar to those of the Olympic Peninsula, characterized by cold water, high average flows, and a relatively long duration of peak flows, including a second snowmelt peak. Drainages entering the Strait of Georgia from both sides share many of the physical and environmental features that characterize the Puget Sound area. From Vancouver Island south, coho salmon typically smolt at age 1, whereas 2-year old smolts are common from southeast Alaska north. Between the north end of Vancouver Island and southeast Alaska is a transition zone for this life-history trait. The NMFS concluded that, at least until further information is developed, the geographic boundaries of this ESU extend into Canada to include drainages from both sides of the Strait of Georgia as far as the north end of the Strait.

Only three rivers have long-term (extending back to the 1930's or 1940's) escapement data from which to estimate trends. Long-term trap counts at Baker River and White River generally showed declining trends in the 1960's and 1970's, with some evidence of recovery in the 1980's. The number of adults passed above the hatchery racks on the Samish River showed neither increasing nor decreasing trends over a 55-year period. Overall catch of coho salmon in Puget Sound fisheries shows a substantial decline from 1896 to the early 1940's, but this is attributed largely to the prohibition of fishing for this species with purse seines and fish traps starting in 1935. Overall catch within Puget Sound has increased gradually since that time but has not returned to earlier levels, possibly as a result of greater interceptions of coho salmon in ocean fisheries. The range of the ESU that includes Puget Sound coho salmon extends into southern British Columbia. Two of their regions include fish that are part of this ESU. Coho salmon have shown both historical (1800's to 1953-1992 average) and recent (1953-1992) declines both on Vancouver Island and along the southcentral British Columbia coast (excluding the Fraser River). In both areas, the historical decline was roughly twofold. On Vancouver Island, coho salmon escapements recently have declined from more than 300,000 in the mid-1950's to about 150,000 at present. Along the southcentral coast, escapement declines in the same period have been more dramatic, from about 500,000 in the mid-1950's to fewer than 100,000 at present. This is a much more severe decline than the trends documented in the U.S. portion of the ESU.

Three coho salmon stocks in this region have been identified as at high risk of extinction, and one (Nooksack River) to be possibly extinct. One assessment considered stocks in this region to range from healthy to critical in status, predominantly of mixed origin, and predominantly of composite production. None of the stocks in this region that were identified as healthy were of strictly native origin. Two stocks (Deer Creek and Sumas/Chilliwack) were identified as of native origin with wild production but of unknown status.

It is difficult to directly assess general trends in habitat conditions, either throughout the State or within individual regions or watersheds. However, some general relationships between land use and habitat changes have been well documented. Salmon production is strongly tied to freshwater-habitat conditions, which continue to be destroyed or degraded in Puget Sound. Human population growth probably is the best overall measure of disturbance to freshwater salmonid ecosystems, because accompanying land use changes can adversely affect freshwater and marine habitats in a variety of ways, examples of which include reduced infiltration of water into the soil due to increases in impervious surfaces and loss of forest habitats, simplification of stream channel structure, changes in flow patterns, water-quality degradation, loss of stream-bank cover, loss of wetland habitats, dissociation of wetlands from stream channels, and loss of gravel sources due to bank stabilization. These changes affect all anadromous salmonids, but they have particularly severe impacts on coho salmon.

Because of the general lack of definitive information on the identified risk factors, and because the number of naturally reproducing fish within the ESU is fairly large and apparently stable, the NMFS concludes that a listing is not warranted for the Puget Sound/Strait of Georgia ESU at this time. However, there is sufficient concern regarding the overall health of this ESU and, therefore, the NMFS is adding it to the Candidate List.

*4) Central California Coast Coho Salmon*

The central California coast ESU of coho salmon was listed as threatened on October 31, 1996 (61 *FR* 56138). This ESU is composed of populations of all coho salmon naturally reproduced in streams between Punta Gorda, Humboldt County, California and the San Lorenzo River, Santa Cruz County, California.

In the 1940’s, estimated abundance of coho salmon in this ESU ranged from 50,000-125,000 natural-spawning adults. Today, it is estimated that there are probably fewer than 6,000 naturally reproducing coho salmon, and the vast majority of these fish are considered to be of non-native origin (either hatchery fish or from streams stocked with hatchery fish) (61 *FR* 56138).

Critical habitat is designated to include all rivers reaches accessible to listed coho salmon (including estuarine areas and tributaries) between Punta Gorda and the San Lorenzo River (inclusive) in California, including two streams entering San Francisco Bay, Arroyo Corte Madera Del Presidio, and Corte Madera Creek (64 *FR* 24049).

***(d) Ozette Lake Sockeye Salmon***

This ESU of sockeye salmon was proposed for listing as threatened on March 10, 1998 (63 *FR* 11749), and subsequently listed as threatened on May 24, 1999 (64 *FR* 14528). The NMFS designated critical habitat for this ESU of sockeye salmon on February 16, 2000 (65 *FR* 7764). This ESU consists of sockeye salmon that return to Ozette Lake through the Ozette River and spawn primarily in lakeshore upwelling areas in Ozette Lake. Minor spawning may occur below Ozette Lake in the Ozette River or in Coal Creek. Sockeye salmon presently do not spawn in tributary streams to Ozette Lake, although they may have spawned there historically.

Sockeye salmon are anadromous, meaning they migrate from the ocean to spawn in freshwater. They are the third most abundant of the Pacific salmon species. Sockeye salmon exhibit a wide variety of life-history patterns that reflect varying dependency on the freshwater environment. The vast majority of sockeye salmon spawn in or near lakes, where the juveniles rear for 1-3 years before migrating to sea. They typically spawn in inlet or outlet tributaries of lakes or along the shoreline of lakes where upwelling of oxygenated water through gravel or sand occurs. For this reason, the major distribution and abundance of large sockeye salmon stocks are closely related to the location of rivers that have accessible lakes in their watersheds for juvenile rearing. On the Pacific coast, sockeye salmon inhabit riverine, marine, and lake environments from the Columbia River and its tributaries north and west to the Kuskokwim River in western Alaska.

After emerging from the substrate, sockeye salmon alevins exhibit a varied behavior that appears to reflect local adaptations to spawning and rearing habitat. Lake-type sockeye salmon juveniles move either downstream or upstream to rearing lakes. Periods of stream-bank holding are limited for most juvenile sockeye salmon, as emergents in streams above or between connecting lakes use the current to travel to the nursery lake. Lake-residence time usually increases the farther north a nursery lake is located, ranging from 1-2 years in Washington and British Columbia to 3, or rarely 4, years in Alaska. Juvenile sockeye salmon in lakes are visual predators, feeding on zooplankton and insect larvae. Smolt migration typically occurs between sunset and sunrise, beginning in late April and extending through early July.

Once in the ocean, sockeye salmon feed on copepods, euphausiids, amphipods, crustacean larvae, fish larvae, squid, and pteropods. The greatest increase in length is typically in the first year of ocean life, whereas the greatest increase in weight is during the second year. Sockeye salmon spend from 1-4 years in the ocean before returning to freshwater to spawn. Adult sockeye salmon home precisely to their natal stream or lake habitat. Stream fidelity in sockeye salmon is thought to be adaptive, because this ensures that juveniles will encounter a suitable nursery lake.

The most recent (1992-1996) 5-year average annual escapement for this ESU was about 700. Historical estimates indicate run sizes of a few thousand sockeye salmon in 1926, with a peak recorded harvest of nearly 18,000 in 1949. Subsequently, the commercial harvest declined steeply to only a few hundred fish in the mid-1960’s and was ended in 1974. Assuming that Ozette River harvest consisted of sockeye salmon destined to spawn in this system, comparison of these estimates indicates that recent abundance is substantially below the historical abundance range for this ESU. Habitat degradation from logging and associated road building and overfishing in the 1940’s and 1950’s have been identified as the major causes of the decline. The NMFS concluded that the Ozette Lake sockeye salmon ESU presently is not in danger of extinction; however, if present conditions continue into the future, it is likely to become extinct in the foreseeable future.

Critical habitat is designated to include all lake areas and river reaches accessible to listed sockeye salmon in Ozette Lake, in Clallam County, Washington (65 *FR* 7764). Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine, riverine, and lake areas in watersheds draining into and out of Ozette Lake. Accessible areas are those within the historical range of the ESU that still can be occupied by any lifestage of sockeye salmon. Inaccessible areas are those above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years). Adjacent riparian zones are defined as those areas within a horizontal distance of 300 feet (91.4 meters) from the normal line of high water of a stream channel, adjacent off-channel habitat (600 feet or 182.8 meters, when both sides of the channel are included), or lake.

***(e) Steelhead***

On August 9, 1996, the NMFS issued a proposed rule to list five ESU's as endangered and five ESU's as threatened under the Endangered Species Act (61 *FR* 41541). On August 18, 1997, the NMFS subsequently issued a Final Rule listing two ESU's (Southern California and Upper Columbia River) as endangered and three ESU's (Central California Coast, South-Central California Coast, and Snake River Basin) as threatened (62 *FR* 43937). The NMFS extended the deadline for five other ESU's (Lower Columbia River, Oregon Coast, Klamath Mountains Province, Northern California, and California Central Valley) for 6 months to solicit, collect, and analyze additional information (62 *FR* 43974). On March 19, 1998, they issued a Final Rule listing the Lower Columbia River and California Central Valley ESU's as threatened (63 *FR* 13347). On March 25, 1999, the NMFS issued a Final Rule (64 *FR* 14517) listing two additional ESU's as threatened (Middle Columbia River and Upper Willamette River). These two ESU's were proposed for listing as threatened on March 10, 1998 (63 *FR* 11797). On February 11, 2000, the NMFS issued a proposed rule (65 *FR* 6960) to list the Northern California ESU as threatened. The Oregon Coast and Klamath Mountains Province ESU's have not been listed at this time. The NMFS proposed designating critical habitat for several ESU's of steelhead on February 5, 1999 (64 *FR* 5740), and critical habitat was subsequently designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead within the range of the ESU's listed, except for reaches on Indian lands. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches.

All of these steelhead ESU's and steelhead life-history information were included in the Biological Evaluation prepared for the Proposed Northeast National Petroleum Reserve-Alaska Integrated Activity Plan dated December, 1998 as part of the Endangered Species Act consultation for that project (USDOI, Bureau of Land Management, 1998). They are included in this biological assessment because of either a change in the status of their listing since 1997 or designation of critical habitat.

Steelhead exhibit one of the most complex suites of life-history traits of any salmonid species. Steelhead may exhibit anadromy (they migrate as juveniles from freshwater to the ocean, and then return to spawn in freshwater) or freshwater residency (they reside their entire life in freshwater). Resident forms usually are referred to as rainbow trout, while anadromous lifeforms are termed steelhead. Few detailed studies have been conducted regarding the relationship between resident and anadromous forms and, as a result, the relationship between these two lifeforms is poorly understood. The scientific name for the biological species that includes both steelhead and rainbow trout recently was changed from *Salmo gairdneri* to *Oncorhychus mykiss* to reflect the premise that all trout from western North America share a common lineage with Pacific salmon.

Steelhead typically migrate to marine waters after spending 2 years in freshwater. They then reside in marine waters for typically 2 or 3 years before returning to their natal stream to spawn as 4- or 5-year olds. Unlike Pacific salmon, steelhead are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. Steelhead adults typically spawn between December and June (Bell, 1990, as cited in 61 *FR* 41541). Depending on water temperature, steelhead eggs may incubate in redds for 1.5-4 months before hatching as alevins. Following yolk-sac absorption, alevins emerge from the gravel as young juveniles or fry and begin actively feeding. Juveniles rear in freshwater from 1-4 years and then migrate to the ocean as smolts.

Biologically, steelhead can be divided into two reproductive ecotypes, stream maturing" and "ocean maturing," based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. Stream-maturing steelhead enter freshwater in a sexually immature condition and require several months to mature and spawn. Ocean-maturing steelhead enter freshwater with well-developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (for example, summer and winter steelhead).

Historically, steelhead likely inhabited most coastal streams in Washington, Oregon, and California and many inland streams in these states and Idaho. However, during this century, more than 23 indigenous, naturally reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams in Washington, Oregon, Idaho, and California.

*1) Southern California*

This coastal steelhead ESU occupies rivers from (and including) the Santa Maria River to the southern extent of the species range, which presently is considered to be Malibu Creek in Los Angeles County. Migration and life-history patterns of southern California steelhead depend more strongly on rainfall and stream flow than is the case for steelhead populations farther north. River entry ranges from early November through June, with peaks in January and February. Spawning primarily begins in January and continues through early June, with peak spawning in February and March. Average rainfall is substantially lower and more variable in this ESU than regions to the north, resulting in increased duration of sand berms across the mouths of streams and rivers and, in some cases, complete dewatering of the marginal habitats. Environmental conditions in marginal habitats may be extreme (for example, elevated water temperatures, droughts, floods, and fires) and presumably impose selective pressures on steelhead populations. Relatively little life-history information exists for steelhead from this ESU. Estimates of historical (pre-1960's) abundance for some of the major streams are as follows: Santa Ynez River (20,000-30,000), Ventura River (4,000-6,000), Santa Clara River (7,000-9,000), and Malibu Creek (1,000). The present total run size for these streams plus Gaviota Creek and Matilija Creek is estimated at fewer than 200 adults. The NMFS concludes that the Southern California steelhead ESU presently is in danger of extinction (61 *FR* 41541).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Santa Maria River to Malibu Creek, California (inclusive). Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*2) Upper Columbia River*

This inland steelhead ESU occupies the Columbia River Basin upstream from the Yakima River in Washington to the United States/Canada Border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion. The Wenatchee and Entiat rivers are in the Northern Cascades Physiographic Province, and the Okanogan and Methow rivers are in the Okanogan Highlands Physiographic Province. The river valleys in this region are deeply dissected and maintain low gradients except in extreme headwaters. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Stream flow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers. Life-history characteristics for Upper Columbia River Basin steelhead are similar to those of other inland steelhead ESU's; however, some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU. This may be associated with the cold stream temperatures. Based on limited data available from adult fish, smolt age in this ESU is dominated by fish that are 2 years old. Steelhead from the Wenatchee and Entiat rivers return to freshwater after 1 year in saltwater, whereas most Methow River steelhead return to freshwater after 2 years in saltwater. Estimates of historical (pre-1960's) abundance from fish counts at the Rock Island Dam averaged 2,600-3,700, suggesting a run in excess of 5,000 adults for tributaries above the dam. Recent average total escapement for the Wenatchee River stock was 2,500 and for the Methow and Okanogan rivers stock was 2,400. The NMFS concludes that the Upper Columbia River steelhead ESU presently is in danger of extinction (61 *FR* 41541).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*3) South-Central California Coast*

This coastal steelhead ESU occupies rivers from the Pajaro River, located in Santa Cruz County, California to (but not including) the Santa Maria River. Most rivers in this ESU drain the Santa Lucia Range, the southernmost unit of the California Coast ranges. The climate is drier and warmer than in the north, which is reflected in the vegetational change from coniferous forest to chaparral and coastal scrub. The mouths of many of the rivers and streams in this area are seasonally closed by sand berms that form during periods of low flow in the summer. Only winter steelhead are found in this ESU. River entry ranges from late November through March, with spawning from January through April. Little other life-history information exists for steelhead in this ESU. In the mid-1960's, 27,750 steelhead were estimated to be spawning in the rivers of this ESU. While no recent estimates for total run size exist for this ESU, recent estimates for those rivers where comparative abundance information is available show a substantial decline during the past 30 years. The NMFS concludes that the South/Central California Coast steelhead ESU presently is in danger of extinction (61 *FR* 41541).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Pajaro River (inclusive) to (but not including) the Santa Maria River in California. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *4) Central California Coast*

This coastal steelhead ESU occupies river basins from the Russian River to Soquel Creek, Santa Cruz County (inclusive) and the drainages of San Francisco and San Pablo bays, except for the Sacramento-San Joaquin River Basin of the Central Valley of California. This area is characterized by very erosive soils in the coast range mountains. Redwood forest is the dominant coastal vegetation for these drainages. Precipitation is lower here than in areas to the north, and elevated stream temperatures (greater than 20 degrees Celsius) are common in the summer. Only winter steelhead are found in this ESU. River entry ranges from October in the larger basins and late November in the smaller coastal basins, and it continues through June. Steelhead spawning begins in November in the larger basins, December in the smaller coastal basins, and it can continue through April, with peak spawning generally in February and March. Little other life-history information exists for steelhead in this ESU. In the mid-1960's, 94,000 steelhead were estimated to be spawning in many rivers in this ESU, including 50,000 and 19,000 fish in the Russian and San Lorenzo rivers, respectively. Recent estimates by the NMFS for the Russian and San Lorenzo rivers was approximately 7,000 fish and 500 fish, respectively, indicating that recent total abundance in the two rivers is less than 15% of their abundance 30 years ago. The NMFS concludes that the Central California Coast steelhead ESU presently is in danger of extinction (61 *FR* 41541).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Russian River to Aptos Creek, California (inclusive), and the drainages of San Francisco and San Pablo Bays. Also included are all the waters of San Pablo Bay westward of the Carquinez Bridge and all |he waters of San Francisco Bay from San Pablo Bay to the Golden Gate Bridge. Excluded is the Sacramento-San Joaquin River Basin of the California Central Valley as well as areas above specific dams or above longstanding, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *5) Snake River Basin*

This inland steelhead ESU occupies the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. The Snake River flows through terrain that is warmer and drier on an annual basis than the upper Columbia Basin or other drainages to the north. The environmental factors of the Snake River Basin result in a river that is warmer and more turbid, with higher pH and alkalinity, than is found elsewhere in the range of inland steelhead. Snake River Basin steelhead are summer steelhead, as are most inland steelhead, and comprise two groups, A-run and B-run, based on migration timing, ocean-age, and adult size. Snake River Basin steelhead enter freshwater from June to October and spawn in the following spring from March to May. A-run steelhead are thought to be predominately fish with l year in the ocean, while B-run steelhead are thought to have been in the ocean for 2 years. Snake River Basin steelhead usually smolt at age 2 or 3 years. No estimates of historical (pre-1960's) abundance are available for this ESU. The trend in abundance for this ESU (indexed at the Lower Granite Dam) has been increasing since 1975, although natural escapement has been declining during the same period. Naturally produced escapement has declined sharply in the last 10 years. The NMFS concludes that the Snake River Basin steelhead ESU presently is not in danger of extinction but is likely to become endangered in the foreseeable future (61 *FR* 41541).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *6) Lower Columbia River*

This coastal steelhead ESU occupies tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington and the Willamette and Hood rivers in Oregon. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington. This ESU is composed of both winter- and summer-run steelhead. Genetic data show steelhead from this ESU to be distinct from steelhead from the upper Willamette River and coastal streams in Oregon and Washington.

Rivers draining into the Columbia River have their headwaters in increasingly drier areas, moving from west to east. Columbia River tributaries that drain the Cascade Mountains have proportionally higher flows in late summer and early fall than rivers on the Oregon coast. No estimates of historical (pre-1960's) abundance are available for this ESU. Total run size for the major stocks in the lower Columbia River for the early 1980's are estimated to be approximately 150,000 winter steelhead and 80,000 summer steelhead, but approximately 75% of the total run was estimated to be of hatchery origin. Of the 18 stocks for which adequate adult escapement-trend data exist, 11 have been declining and 7 increasing. The NMFS concludes that the Lower Columbia River steelhead ESU presently is not in danger of extinction but is likely to become endangered in the foreseeable future (61 *FR* 41541).

Since the previous review of this ESU, NMFS has identified several major concerns (63 *FR* 13347). Populations are at low abundance relative to historic levels, placing this ESU at risk due to random fluctuations in genetic and demographic parameters. There have been almost universal declines in abundance in both winter-run and summer-run steelhead runs in this ESU since the mid-1980's. The NMFS also has concerns about the widespread occurrence of hatchery fish in naturally spawning steelhead populations throughout this ESU. Based on available information, they concluded in the March 19, 1998, Federal Register (63 *FR* 13347) that steelhead in the Lower Columbia River ESU warrant listing as a threatened species.

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind rivers in Washington and the Willamette and Hood rivers in Oregon, inclusive. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*7) California Central Valley*

This coastal steelhead ESU occupies the Sacramento and San Joaquin rivers and their tributaries. In the San Joaquin Basin, however, the best available information suggests that the current range of steelhead has been limited to the Stanislaus, Tuolumne, and Merced rivers (tributaries) and the mainstem San Joaquin River to its confluence with the Merced River by human alteration of formerly available habitat. The Sacramento and San Joaquin rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for anadromous fish. Steelhead within this ESU have the longest freshwater migration of any population of winter steelhead. The distance from the Pacific Ocean to spawning streams can exceed 300 kilometers.

The Central Valley is much drier than the coastal regions to the west, receiving on average only 10-50 centimeters of rainfall annually. The valley is characterized by alluvial soils, and native vegetation was dominated by oak forests and prairie grasses prior to agricultural development. There essentially is one continuous run of steelhead in the upper Sacramento River. River entry ranges from July through May, with peaks in September and February. Spawning begins in late December and can extend into April. Historical (pre-1960's) abundance estimates for this ESU are not available. In 1961,t the total run size in the Sacramento River, including San Francisco Bay, was estimated to be 40,000 fish. Limited data exist on recent abundance for this ESU, but it is estimated that the present total run size probably is fewer than 10,000 fish. The NMFS concludes that the Central California Coast steelhead ESU presently is in danger of extinction (61 *FR* 41541).

No new abundance data has been received for this ESU since it was proposed for listing as an endangered species in 1996. Based on available information, the NMFS concluded in the March 19, 1998, *Federal Register* (63 *FR* 13347) that steelhead in this ESU warrant listing as a threatened species.

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in the Sacramento and San Joaquin rivers and their tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta; all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas of the San Joaquin River upstream of the Merced River confluence and areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

*8) Middle Columbia River Basin*

The NMFS issued a final rule on March 25, 1999 listing this ESU as threatened (64 *FR* 14517). This inland steelhead ESU occupies the Columbia River Basin and tributaries from above Wind River in Washington and the Hood River in Oregon exclusive, upstream to and including the Yakima River, Washington. Steelhead of the Snake River Basin are excluded. This region includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 centimeters of rainfall annually. Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes. All steelhead in the Columbia River Basin upstream from the Dalles Dam are summer-run, inland steelhead. Life- history information for steelhead of this ESU indicates that most steelhead smolt at 2 years and spend 1-2 years in saltwater before reentering freshwater, where they may remain up to a year before spawning.

Estimates of historical (pre-1960's) abundance for this ESU indicate that the total historical run size might have been in excess of 300,000. Current population sizes are substantially lower than historic levels, especially in the rivers with the largest steelhead runs in the ESU, the John Day, Deschutes, and Yakima rivers (64 *FR* 14517). The most recent 5-year average run size was 142,000, with a naturally produced component of 39,000. These data indicate approximately 74% hatchery fish in the total run to this ESU (61 *FR* 41541). Trends in natural escapement in the Yakima and Umatilla rivers have been highly variable since the mid- to late 1970's. One of the most significant sources of risk to steelhead in this ESU is the recent and dramatic increase in the percentage of hatchery fish in natural escapement in the Deschutes River. It has been estimated that the percentage of hatchery strays in the Deschutes River has exceeded 70%. Coincident with this increase in the percentage of strays has been a decline in the abundance of native steelhead. The NMFS concluded that the Middle Columbia River steelhead ESU presently warrants being listing as threatened (64 *FR* 14517).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *9) Upper Willamette River*

The NMFS issued a final rule on March 25, 1999 listing this ESU as threatened (64 *FR* 14517). This coastal steelhead ESU occupies the Willamette River and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive (64 *FR* 14517). Steelhead from the upper Willamette River are genetically distinct from those in the lower river. Reproductive isolation from the lower river populations may have been facilitated by Willamette Falls. Winter steelhead and spring chinook salmon occurred historically above the falls, but summer steelhead and fall chinook salmon did not. The native steelhead of this basin are late-migrating winter steelhead entering freshwater primarily in March and April, whereas most other populations of west coast winter steelhead enter freshwater beginning in November or December.

No estimates of historical (pre-1960's) abundance for this ESU are available. Over the past several decades, total abundance of natural late-migrating winter steelhead ascending the Willamette Falls fish ladder has fluctuated several times over a range of approximately 5,000-20,000 spawners. The last peak occurred in 1988 and was followed by a steep and continuing decline. Abundance in each of the last 5 years has been below 4,300 fish and the run in 1995 was the lowest in 30 years. Hatchery fish are widespread and escape to spawn naturally throughout the region. Estimates of the proportion of hatchery fish in natural spawning escapements range from 5-25%. The NMFS concludes that the Upper Willamette River steelhead ESU warrants listing as a threatened species (64 *FR* 14517).

Critical habitat for this ESU was designated on February 16, 2000 (65 *FR* 7764). Critical habitat is designated to include all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls upstream to and including the Calapooia River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Excluded are areas above specific dams or above long-standing, naturally impassable barriers (natural waterfalls in existence for at least several hundred years).

#### *10) Northern California*

The NMFS issued a proposed rule on February 11, 2000, to list this ESU as threatened (65 *FR* 6960). The final rule listing this species as threatened was issued on June 7, 2000 (65 *FR* 36074). This coastal steelhead ESU occupies river basins from Redwood Creek in Humboldt County, California, to the Gualala River, inclusive. Dominant vegetation along the coast is redwood forest, while some interior basins are much drier than surrounding areas and are characterized by many endemic species. Elevated stream temperatures are a factor in some of the larger river basins but not to the extent that they are in river basins farther south. Precipitation is generally higher in this geographic area than in regions to the south, averaging 100-200 centimeters of rainfall annually. With the exception of major river basins, such as the Eel, most rivers in this region have peak flows of short duration. Strong and consistent coastal upwelling begins at approximately Cape Blanco and continues south into central California, resulting in a relatively productive nearshore marine environment.

This ESU includes both winter-run- and summer steelhead, including what is presently considered to be the southernmost population of summer-run steelhead, in the Middle Fork Eel River. As with the Rogue and Klamath rivers, some of the larger rivers in this area have migrating steelhead year round, and seasonal runs have been named. River entry ranges from August through June, and spawning from December through April, with peak spawning in January in the larger basins and late February and March in the smaller coastal basins.

Historical (pre-1960's) abundance information for this ESU is available from dam counts in the upper Eel River (annual average of 4,400 adults in the 1930's), South Fork Eel River (annual average of 19,000 in the 1940's), and Mad River (annual average of 3,800 adults in the (1940's). In the mid-1960's, steelhead spawning populations for many rivers in this ESU were estimated to total 198,000 fish. While no overall recent abundance estimate exists for this ESU, the substantial declines in run size from historic levels at major dams in the region indicate a probable similar overall decline in abundance from historic levels.

Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, and domestic and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Among other factors, the NMFS specifically identified timber harvest, agriculture, mining, habitat blockages, and water diversions as important factors for the decline of steelhead in the Northern California ESU. The NMFS also identified the potentially adverse impacts of the release of nonindigenous hatchery-produced steelhead in this ESU as an important factor, and expressed concerns regarding the lack of reliable abundance and trend data for assessing the status of steelhead in this ESU. Finally, the NMFS also was concerned about the impacts of recreational angling because of the depressed status of steelhead populations and the uncertainty regarding the status of this ESU.

The status of this ESU was recently reviewed in January 2000. Based on a review of updated abundance and trend information that was available, it was concluded that the current status of the ESU has not changed significantly since it was last evaluated in December 1997 (64 *FR* 6960). The NMFS concludes that the Northern California steelhead ESU presently is not in danger of extinction but is likely to become endangered in the foreseeable future (61 *FR* 41541).

#### *(f) Bull Trout*

The Coastal-Puget Sound population segment of the bull trout was proposed for listing as threatened by the Fish and Wildlife Service on June 10, 1998 (63 *FR* 31693), and subsequently listed as threatened on November 1, 1999 (64 *FR* 58909). No critical habitat has been designated for bull trout. The best available information supports designating five distinct population segments of bull trout. The Coastal-Puget Sound bull trout distinct population segment (DPS) encompasses all Pacific coast drainages within the coterminous United States north of the Columbia River in Washington State. This population segment is discrete, because it is geographically segregated from other subpopulations by the Pacific Ocean and the Cascade Mountain Range. The population segment is significant, because it is thought to contain the only anadromous forms of bull trout in the contiguous Unites States occurring in a unique (marine) ecological setting. The loss of this population segment would significantly reduce the overall range of the taxon. No bull trout exist in coastal drainages south of the Columbia River.

Bull trout, members of the family *Salmonidae*, are char native to the Pacific northwest and western Canada. They are closely related to Dolly Varden and are present over part of the Dolly Varden's range, most notably in the Coastal-Puget Sound Region in Washington. The taxonomic classification between these two char has been controversial. Initially bull trout and Dolly Varden were considered as a single species, but they have been recognized as separate species since 1980. Bull trout exhibit both resident and migratory life-history strategies. Resident populations generally are found in small headwater streams where they spend their entire lives; migratory populations spawn and rear in tributary streams for 1-4 years before migrating downstream into a larger river or lake to mature. Although bull trout generally are not anadromous, it is thought they may migrate to saltwater to mature in some coastal areas. Some biologists believe the existence of anadromous bull trout is uncertain. However, historical accounts and collection records suggest an anadromous life-history form in the species. All life-history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools.

Bull trout become sexually mature in 4-7 years and live as long as 12 years. They typically spawn in August through October in consecutive or alternate years in low-gradient streams with clean, loosely compacted gravel; groundwater inflow; and water temperatures ranging from 4-10 degrees Celsius. Postspawning mortality, longevity, and repeat spawning frequency are not well known. Incubation of eggs normally requires from 100-145 days, depending on water temperature. Juveniles remain in the substrate after hatching, emerging in early April through May.

Bull trout are opportunistic feeders. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, amphipods, mysids, crayfish, and small fish. Adult migratory bull trout are primarily piscivorous, known to feed on various trout, salmon, whitefish, yellow perch, and sculpin.

The Coastal-Puget Sound population segment contains 35 subpopulations of native char (bull trout, Dolly Varden, or both species). Fifteen of these subpopulations have been analyzed, and 12 of the 15 confirmed the presence of bull trout, either as bull trout only or both bull trout and Dolly Varden. The Fish and Wildlife Service believes it is likely that bull trout also will occur in the majority of the remaining 20 subpopulations. The 35 subpopulations have been grouped into five analysis areas: Coastal, Straits of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary. Ten subpopulations occur in five river basins in the Coastal analysis area: the Chehalis River-Grays Harbor, Coastal Plains-Quinault River, Queets River, Hoh River-Goodman Creek, and Quillayute River. Five subpopulations occur in three river basins in the Straits of Juan de Fuca analysis area: the Elwha River, Angeles Basin, and Dungeness River. Three subpopulations occur in the Skokomish River basin in the Hood Canal analysis area. Sixteen sub-populations occur in eight river basins in the Puget Sound analysis area: the Nisqually River, Puyallup River, Green River, Lake Washington basin, Snohomish River-Skykomish River, Stillaguamish River, Skagit River, and Nooksack River. One subpopulation occurs in the Chilliwack River basin in the Transboundary analysis area. Historical accounts from the Puget Sound analysis area indicate that anadromous char entered rivers in the southern portion of the area in large numbers during the fall. However, native char now are rarely collected in the southern drainages of this area.

Bull trout in the Coastal-Puget Sound population segment have been adversely affected by flood-control structures; hydroelectric projects; water-diversion structures, including irrigation withdrawals; forestry practices; agricultural cultivation; grazing; urbanization; and industrial development. Many of these practices have resulted in increased sediment load to the streams, reduced channel stability, increased peak stream flows, and an overall loss of quality stream habitat, including reduced cover and large woody debris, loss of deep pools, increased water temperatures, and sedimentation of spawning areas. Although fishing for native char is closed in most of the waters within the Coastal-Puget Sound DPS, poaching is still a factor negatively affecting the population in nine drainages. Disease or predation are not thought to be a primary factor in the decline of bull trout in this population segment.

#### *(g) Southwestern Washington/Columbia River Coastal Cutthroat Trout*

On April 5, 1999 (64 *FR* 16397), the NMFS and Fish and Wildlife Service jointly proposed that the southwestern Washington/Columbia River coastal cutthroat trout in Washington and Oregon be listed as threatened. On April 21, 2000 (65 *FR* 21376), the Fish and Wildlife announced that they had assumed all Endangered Species Act regulatory jurisdiction over coastal cutthroat trout.

The life history of coastal cutthroat trout may be one of the most complex of any Pacific salmonid. Unlike other anadromous salmonids, sea-run forms of coastal cutthroat trout do not overwinter in the ocean and only rarely make extended migrations across large bodies of water. Their migrations in the marine environment usually are within 10 kilometers (6 miles) of land but have been detected up to 80 kilometers (50 miles) offshore. Although most anadromous cutthroat trout enter seawater as 2-or 3-year-old fish, some may remain in fresh water up to 5 years before entering the sea. Other cutthroat trout may not outmigrate to the ocean, but remain in small headwater tributaries. Still other cutthroat trout may migrate entirely within freshwater environments, even when they have access to the ocean. In the Umpqua River, anadromous, nonmigratory, and freshwater migratory (river-migrating) life-history forms have been reported. Reviews of coastal cutthroat trout life history and ecology, including characteristics of particular life-history forms, indicate that the genetic and environmental factors determining these life-history forms are poorly understood, a situation that has complicated the characterization of ESU boundaries and risk for coastal cutthroat trout.

The proposed boundaries of the southwestern Washington/Columbia River ESU are similar to those of the lower Columbia River/southwest Washington Coast coho salmon ESU. The ESU comprises cutthroat trout in the Columbia River and its tributaries downstream from the Klickitat River in Washington and Fifteenmile Creek in Oregon (inclusive) and the Willamette River and its tributaries downstream from Willamette Falls. The ESU also includes cutthroat trout in Washington coastal drainages from the Columbia River to Grays Harbor (inclusive). Support for these ESU boundaries comes primarily from ecological and genetic information. Ecological characteristics of this region include the presence of extensive intertidal mud- and sandflats, similarities in freshwater and estuarine fish faunas, and differences from estuaries to the north of Grays Harbor and to the south of the Columbia River. Genetic samples from coastal cutthroat in southwestern Washington also show a relatively close genetic affinity to the samples from the Columbia River.

Some data support a split of the Columbia River from southwestern Washington coastal cutthroat trout populations. Tagging and recovery data for chinook, coho, and chum salmon indicate different marine distributions for fish from the two areas. The limited dispersal ability of anadromous cutthroat trout may restrict genetic exchange among populations in the two areas, and the areas exhibit differences in their physical estuarine characteristics. The Washington Department of Fish and Wildlife has conducted an unpublished analysis of a small number of southwestern Washington populations in which it detected a greater differentiation of populations between this ESU and those in the Columbia River than did the NMFS in its more comprehensive analysis. The Washington Department of Fish and Wildlife also argues that extensive hatchery influence in some populations may have obscured natural genetic differences between southwestern Washington and lower Columbia River coastal cutthroat trout. However, the NMFS concludes that these analyses collectively do not provide compelling evidence for separate coastal cutthroat trout ESU's for the southwestern Washington coast and the Columbia River.

Habitat degradation and impacts associated with logging and related land management activities, in particular, likely have contributed to the decline of coastal cutthroat trout. Removal of forest canopy can cause an increase in both the maximum and the diurnal fluctuation of water temperatures, leading to disease outbreaks, altered timing of migration, and accelerated maturation. The removal of streamside vegetation can deplete the bank area of potential new woody debris, which provides cover for cutthroat trout. In addition, loss of riparian areas can result in decreased invertebrate production and detritus sources, both of which are key components of the species' food chain. Siltation, often caused by certain logging practices, may hinder fry emergence from the gravel and limit production of benthic invertebrates. Degradation of estuarine habitats likely has contributed to the decline of this species. Estuarine areas are highly productive habitats and play an important role in the lifecycle of cutthroat trout. Dredging, filling, and diking of estuarine areas for agricultural, commercial, or municipal uses have resulted in the loss of many estuarine habitats. Cutthroat trout are not harvested commercially, and scientific and educational programs probably have had little or no impact on these populations. However, cutthroat trout are a popular game fish and recreational fishing may have contributed to the general decline of cutthroat trout populations. Hatchery practices may adversely affect cutthroat trout. There has been a widespread release of hatchery rainbow trout throughout the native range of interior cutthroat trout. Cutthroat trout and rainbow trout readily hybridize, which may pose serious risks for cutthroat trout. Also, coho salmon fry released into streams in high numbers can compete with cutthroat trout for feeding and rearing habitat.

#### *(h) Tidewater Goby*

The tidewater goby was listed as an endangered species on February 4, 1994 (59 *FR* 5494). This species was discussed in a previous Endangered Species Act consultation for the Proposed Northeast National Petroleum Reserve-Alaska Integrated Activity Plan (USDOI, Bureau of Land Management, 1998). The Fish and Wildlife Service proposed on June 24, 1999, to remove the northern populations of the tidewater goby from endangered status, based on a re-evaluation of the species status throughout its range (64 *FR* 33816). The species currently is classified as endangered throughout its entire range. The northern and southern populations are genetically distinct from each other and from the central populations sampled. It was determined that more populations of the species exist north of Orange County than were known at the time of the listing, threats to those populations are less severe than previously thought, and the species has a greater ability to recolonize former habitats than was known in 1994 when it was listed. The populations of tidewater goby in Orange and San Diego counties constitute a distinct population segment that is genetically distinct and continues to be threatened by habitat loss and degradation, predation by non-native species, and extreme weather and stream flow conditions. It was proposed that this distinct population segment be retained as an endangered species and critical habitat designated for tidewater goby in Orange and San Diego counties. Designation of critical habitat subsequently was proposed for the species on August 3, 1999 (64 *FR* 42249), for the populations in Orange and San Diego Counties. A draft economic analysis was subsequently prepared and made available for comment on June 28, 2000 (65 *FR* 39850), and the comment period for proposed critical habitat determination was reopened. Critical habitat was designated on December 20, 2000 (65 *FR* 69693).

The following information about the life history of the tidewater goby was obtained from 59 *FR* 5494 and 64 *FR* 42249.

The tidewater goby occurs in tidal streams associated with coastal wetlands in California. It is a small, benthic fish that rarely exceeds 2 inches (5.1 centimeters) standard length and is characterized by large pectoral fins and a ventral suckerlike disk formed by the complete fusion of the pelvic fins. The tidewater goby is almost unique among fishes along the Pacific coast of the United States in its restriction to waters with low salinities in California's coastal wetlands. The tidewater goby does not have a marine life-history phase. All lifestages of the tidewater goby are found at the upper end of lagoons in salinities less than 10 parts per thousand. This lack of a marine phase severely restricts the frequency of genetic exchange between coastal lagoon populations and significantly lowers the potential for natural recolonization of a locality once extirpated. The tidewater goby has a short lifespan and appears to have an annual lifecycle, further restricting its potential to recolonize habitats from which it has been extirpated. The tidewater goby occurs in loose aggregations of a few to several hundred individuals on the substrate in shallow water less than 3 feet (0.91 meter) deep, although gobies have been observed at depths of approximately 5-8 feet (1.5-2.5 meters). Tidewater gobies often are found in waters of relatively low salinities (around 10 parts per thousand) in the uppermost brackish zone of larger estuaries and coastal lagoons. They can tolerate a wide range of salinities ranging from freshwater in upstream areas to 28 parts per thousand or more in the lagoons.

Peak nesting activities begin in late April through early May, when male gobies dig a vertical nesting burrow 4-8 inches (10.2-20.3 centimeters) deep in clean, coarse sand. Suitable water temperatures for nesting are approximately 75-80 degrees Fahrenheit with salinities of 5-10 parts per thousand. Male gobies remain in the burrows to guard eggs, which are hung from the ceiling and walls of the burrow until hatching. Larval gobies are found midwater around vegetation until they become benthic. Although the potential for year-round spawning exists, it probably is unlikely because of seasonal low temperatures and disruptions of lagoons during winter storms. Studies performed at two sites documented spawning taking place as early as the first week in January.

This species has declined significantly throughout its historic range and continues to be threatened by loss and degradation of its coastal habitat. Since 1900, the tidewater goby has disappeared from nearly 50% of the coastal lagoons within its historic range, including 74% of the lagoons south of Morro Bay in central California. Only three populations exist south of Ventura County. The tidewater goby is distributed discontinuously throughout California, ranging from Tillas Slough (mouth of the Smith River) in Del Norte County south to Agua Hedionda Lagoon in San Diego County. Areas of precipitous coastlines that preclude the formation of lagoons at stream mouths have created three natural gaps in the distribution of the goby. Gobies apparently are absent from three sections of the coast between (1) Humboldt Bay and Ten Mile River, (2) Point Arena and Salmon Creek, and (3) Monterey Bay and Arroyo del Oso.

Critical habitat was designated for the populations in 10 coastal stream segments in Orange and San Diego counties, California on November 20, 2000 (65 *FR* 69693), totaling approximately 9 linear miles of streams. The following general areas are designated as critical habitat:

- Aliso Creek (Orange County) and its associated lagoon and marsh from the Pacific Ocean to approximately 1.0 kilometer (0.6 mile) upstream
- San Mateo Creek and its associated lagoon and marsh from the Pacific Ocean to approximately 1.3 kilometers (0.9 mile) upstream
- San Onofre Creek and its associated lagoon and marsh from the Pacific Ocean to approximately 0.6 kilometer (0.4 mile) upstream
- Las Flores Creek and its associated lagoon and marsh from the Pacific Ocean to Interstate 5 approximately 1.0 kilometer (0.6 mile)
- Hidden Creek and its associated lagoon and marsh from the Pacific Ocean to Interstate 5 approximately 0.8 kilometer (0.5 mile)
- Aliso Creek and its associated lagoon and marsh from the Pacific Ocean to Interstate 5 approximately 0.7 kilometer (0.4 mile)
- French Creek and its associated lagoon and marsh from the Pacific Ocean to Interstate 5 approximately 0.7 kilometer (0.4 mile)
- Cockleburr Creek and its associated lagoon and marsh from the Pacific Ocean to Interstate 5 approximately 1.0 kilometer (0.6 mile)
- Santa Margarita River from the Pacific Ocean to a point approximately 5.0 kilometers (3.1 miles) upstream
- Agua Hedionda Lagoon and its associated marsh and creek from the Pacific Ocean to a point approximately 3.7 kilometers (2.3 miles) upstream

Each area includes the current 50-year floodplain. Although the majority of land being designated is under Federal administration and management, some estuary and riparian systems are on State, county, city, and private lands. Buena Vista Lagoon and its associated marsh and creek, from the Pacific Ocean to a point approximately 3.4 kilometers (2.1 miles) upstream was proposed for designation of critical habitat but not designated.

#### *(i) Sacramento Splittail*

The Sacramento splittail was proposed for listing as threatened on January 6, 1994 (59 *FR* 862), and subsequently listed as threatened on March 10, 1999 (64 *FR* 5963). The following information about the life history of the Sacramento splittail was obtained from 59 *FR* 862 and 64 *FR* 5963. Critical habitat has not been designated at this time.

The Sacramento splittail is a large cyprinid that can exceed 16 inches (40.6 centimeters) in length. Although primarily a freshwater species, the splittail can tolerate salinities as high as 10-18 parts per thousand. Splittails are relatively long lived, with a life span of approximately 5-7 years. Females are highly fecund and produce more than 100,000 eggs each year. Populations fluctuate annually depending on spawning success, which is highly correlated with freshwater outflow and the availability of shallow-water habitat with submerged vegetation. Fish usually reach sexual maturity by the end of their second year. The onset of spawning is associated with rising temperature, and peak spawning occurs from March through May over flooded vegetation in tidal freshwater and euryhaline habitats of estuarine marshes and sloughs and slow-moving reaches of large rivers. Larvae remain in shallow, weedy areas close to spawning sites and move into deeper water as they mature. Splittails are benthic foragers that feed on opossum shrimp and detritus. They also feed on earthworms, clams, insect larvae, and other invertebrates.

Splittails are endemic to California’s Central Valley, where they were once widely distributed. The Sacramento splittail has declined by 62% over the last 15 years. Historically, splittails were found as far north as Redding on the Sacramento River, as far south as the present-day site of Friant Dam on the San Joaquin River, and as far upstream as the current Oroville Dam site on the Feather River and Folsom Dam site on the American River. During wet years splittails have migrated farther upstream on the Sacramento River and San Joaquin River. Successful spawning has been recorded in the lower Tuolumne River during wet years in the 1980’s and in 1995. Except for very wet years, the species now is confined mostly to the San Francisco Bay-Sacramento-San Joaquin River Estuary, including the delta, Suisun Bay, Suisun Marsh, and Napa Marsh.

This species is threatened primarily by changes in waterflows and water quality resulting from the export of water from the Sacramento and San Joaquin rivers, periodic prolonged drought, loss of shallow-water habitat, introduced aquatic species, and agricultural and industrial pollutants.

#### *(j) Marine Fish*

The NMFS received a petition on February 8, 1999, to list 18 species of Puget Sound marine fishes and to designate critical habitat under the Endangered Species Act. The petitioned fishes include 1 herring, 1 cod, 1 hake, 1 pollock, and 14 rockfish species. The NMFS determined on June 21, 1999 (64 *FR* 33037), that the petition presents substantial scientific information indicating that the petitioned action may be warranted for seven of the species: Pacific herring, Pacific cod, Pacific hake, walleye pollock, brown rockfish, copper rockfish, and quillback rockfish and information and comments pertaining to these seven species. The NMFS completed an ESA status review for Pacific cod, Pacific hake, and walleye pollock populations from the eastern North Pacific Ocean between Puget Sound, Washington, and southeast Alaska (65 *FR* 70514). After reviewing available scientific and commercial information, the NMFS determined that none of the petitioned populations in Puget Sound constitute "species" under the Endangered Species Act. The agency concludes that these populations are part of larger DPS's that qualify as species under the Endangered Species Act but do not warrant listing as threatened or endangered at this time. However, the NMFS is adding the Georgia Basin Pacific hake DPS to the agency's list of candidate species because of remaining uncertainties about its stock structure and status. The Pacific herring and brown, copper, and quillback rockfish in Puget Sound are still under review, and the results of the status reviews are expected to be announced in February 2001.

*1) Pacific Hake*

On November 24, 2000, the NMFS added the Puget Sound/Georgia Basin Pacific hake DPS to the agency's list of candidate species for future reassessment due to remaining uncertainties about its stock structure and status (65 *FR* 70514).

Hake range from Sanak Island in the western Gulf of Alaska to Magdalena Bay, Baja California and are most abundant in the California Current System. There is considerable evidence indicating that Puget Sound and Strait of Georgia stocks (inshore stocks) represent a population that is distinct from coastal populations (65 *FR* 70514). Coastal stocks spawn off California in the winter, then mature adults begin moving northward and inshore, following the food supply and Davidson currents. Hake reach as far north as southern British Columbia by fall; by late fall, they begin migrating to southern spawning grounds and more offshore areas. In addition to the abundant migratory population of Pacific hake that spawn offshore from Cape Mendocino, California to southern Baja California, several other stocks of Pacific hake have been identified, including at least two that spawn in Puget Sound, several in the Strait of Georgia, several in the west coast inlets of Vancouver Island, and a small-bodied ("dwarf hake") off the west coast of southern Baja California. Hake that spawn in the Strait of Georgia, in Puget Sound at Port Susan and Dabob Bay, and in Nootka Sound, Barkley Sound, and Sydney Inlet on Vancouver Island essentially are resident stocks, although they may undertake relatively short spawning migrations. Puget Sound and Strait of Georgia stocks spend their entire lives in these estuaries, indicating that little intermixing takes place between these populations and their coastal counterparts.

Hake may spawn more than once per season at depths between 130 and 500 meters. Spawning in Puget Sound occurs primarily from February through April and peaks in March. Stocks in the Strait of Georgia and Puget Sound spawn adjacent to major sources of freshwater inflow, near the Fraser River in the Strait of Georgia and near the Skagit and Snohomish rivers in Port Susan. Eggs hatch in 4-6 days, depending on the water temperature. Larvae typically metamorphose into juveniles in 3-4 months. Juveniles reside in shallow coastal waters, bays, and estuaries and move to deeper water as they get older. Adult hake school at depths between 50 and 500 meters during the day; they move to the surface and disband at night to feed.

In Puget Sound and the Strait of Georgia, female hake mature at 4-5 years of age and growth ceases for both sexes at 10-13 years. The maximum age for hake is about 20 years, but hake more than 12 years old are rare. Absolute fecundity is difficult to determine, because hake may spawn more than once per season. Coastal stocks have 180-232 eggs per gram of body weight, but Puget Sound and Strait of Georgia stocks have only 50-165 eggs per gram of body weight.

In addition, available data show that inshore stocks have substantially slower growth rates than the coastal hake. Studies also indicate that individuals in the inshore population are substantially smaller than those in the coastal population, further suggesting discreteness between the two populations.

There is much uncertainty regarding the effects of potential risk factors on hake stocks within the Georgia Basin DPS. While there are data on some risk factors, other factors are not well documented or are only suspected to be factors for decline. Examples of the latter include habitat alterations in Puget Sound, resulting in the potential loss of eelgrass and kelp beds that contribute important hake food sources, and changes in river flow patterns and increased turbidity that could degrade habitat conditions. In contrast, the NMFS was able to examine more quantitatively the possible effects of harvest and pinniped predation on hake in the Georgia Basin.

While there is some uncertainty regarding the geographic extent of this DPS and its overall level of risk, available evidence suggests that millions of hake are present in large parts of the DPS. Therefore, the NMFS concludes that the Georgia Basin Pacific hake DPS presently is in danger of extinction and is not likely to become extinct in the foreseeable future. Resources permitting, the NMFS will reassess the status of this DPS when new information becomes available to resolve remaining uncertainties about its stock structure and status.

### (4) Invertebrates

The callippe silverspot butterfly and the Behren's silverspot butterfly were included in previous consultations. They are included in this biological assessment because of a change in their listing status. The white abalone is a marine invertebrate that has been proposed for listing as an endangered species. The black abalone is included as a candidate species.

#### *(a) Callippe Silverspot Butterfly*

This butterfly was proposed to be listed as an endangered species on February 4, 1994 (59 *FR* 5377), and subsequently was listed as endangered on December 5, 1997 (62 *FR* 64306). This species is found in native grassland and adjacent habitats. Historically, it was known to occur in seven populations in the San Francisco Bay region. Currently, extant colonies are known only from San Bruno Mountain in San Mateo County and a city park in Alameda County. The primary cause of decline is the loss of habitat from human activities, including off-road vehicle use, trampling by hikers and equestrians, livestock grazing, and invasive exotic vegetation.

#### *(b) Behren's Silverspot Butterfly*

This butterfly was proposed to be listed as an endangered species on February 4, 1994 (59 *FR* 5377), and subsequently was listed as endangered on December 5, 1997 (62 *FR* 64306). The historic range of this species extended from the mouth of the Russian River in Sonoma County northward along the coast to southern Mendocino County near Point Arena. The only extant population is located on private land near Point Arena in Mendocina County. This species is found in coastal terrace prairie habitat.

#### *(c) Abalone*

Abalone are marine gastropods. They have separate sexes and are broadcast spawners, releasing millions of eggs or sperm during a spawning event. Fertilized eggs hatch and develop into free-swimming larvae, spending from 5-14 days as nonfeeding zooplankton before development into the adult form. The chance that an individual larva will survive to adulthood is very low, with mortality probably exceeding 99%. After metamorphosis, the larvae settle onto hard substrates in intertidal and subtidal areas.

Abalone eat marine algae, with giant kelp, bull kelp, feather boa kelp, and elk kelp the preferred species. Abalone grow slowly and have relatively long lifespans of 30 years or more. Abalone have a variety of predators during their lifecycle. The eggs and larvae are eaten by filter-feeding animals; juveniles by crabs, octopuses, starfish, fish, and predatory snails; and the adults by fish and sea otters.

Abalone have been an important component of both commercial fishing and recreational fishing. The abalone fishery has undergone marked declines during the last half of the 1900's. Predation, mortality of sublegal sizes, overharvesting, competition, illegal harvesting, and loss of habitat have been identified as the primary reasons for the decline.

##### *1) White Abalone*

This abalone was proposed for listing as endangered by the NMFS on May 5, 2000 (65 *FR* 26167). The NMFS is not proposing to designate critical habitat at this time. The NMFS designated the white abalone as a candidate species on July 14, 1997, based on information indicating a major decline in abundance of the species. Historically, white abalone ranged from Point Conception, California to Punta Abreojos, Baja California, Mexico. They are the deepest living of the west coast *Haliotis* species, usually reported at subtidal depths between 20-60 meters. The NMFS believes the decline of white abalone in California primarily is the result of overharvesting in the early 1970's. By March 1996, the State of California closed commercial and recreational fishing for white abalone. The best available information indicates that white abalone habitat currently is not at risk from destruction or modification.

##### *2) Black Abalone*

This abalone has been designated as a candidate species by NMFS in June 1999 (64 *FR* 33466). Black abalone are found from Mendocino County, California to southern Baja California in intertidal and shallow subtidal areas down to a depth of about 20 feet. Black abalone in particular are significantly affected by withering syndrome, which is caused by a bacterium that affects the digestive glands of abalone. Surveys of black abalone suffering from withering syndrome have found large numbers of empty black abalone shells. Since the mid-1980's, black abalone practically have disappeared from the northern Channel Islands off southern California and are now declining along the Californian mainland. Black abalone populations showed declines at three of five sample sites north of the Channel Islands, with the most southerly location showing the most significant decline, 97%, between 1992 and 1995.

### (5) Plants

Several species of plants that were proposed for listing during previous consultations have subsequently been listed and are included here.

#### *(a) Coastal Dunes Milk Vetch*

The coastal dunes milk vetch was proposed for listing as endangered on August 2, 1995 (60 *FR* 39326), and subsequently listed as endangered on September 11, 1998 (63 *FR* 43100). This species is an annual in the pea family. It occurs on a relatively flat coastal terrace within 100 feet of the ocean beach and 25 feet above sea level. Individual plants are found on the bottoms or sides of swales on the terrace surface, growing in association with other low-growing grasses and herbs. The only known extant population occurs along 17-Mile Drive on the western edge of the Monterey Peninsula in California on land owned by the Pebble Beach Company. This species currently is threatened with alteration of habitat from trampling associated with recreational activities including hiking, picnicking, ocean viewing, wildlife photography, equestrian use, and golfing.

#### *(b) Hickmann's Potentilla*

Hickmann's potentilla was proposed for listing as endangered on August 2, 1995 (60 *FR* 39326) and subsequently listed as endangered on September 11, 1998 (63 *FR* 43100). This species is a perennial herb in the rose family. This species currently is known in only one location in San Mateo County and one location in Monterey County. It grows in a meadow opening within Monterey pine forest on the western Monterey Peninsula in California. Habitat for this species has been altered, destroyed, and fragmented by a subdivision of residential lots and conversion to golf courses and other recreational facilities.

#### *(c) La Graciosa Thistle*

The La Graciosa thistle was a candidate species in 1997 (USDOI, Fish and Wildlife Service, 1997a). It was proposed for listing as endangered on March 30, 1998 (63 *FR* 15164), and subsequently listed as endangered on April 19, 2000 (65 *FR* 14888). It is a spiny member of the sunflower family and is endemic to the coastal wetlands of southern San Luis Obispo County and northern Santa Barbara County, California, from the Pismo dune lake area south to the mouth of the Santa Ynez River. The species currently is restricted to marshes and the edges of willow thickets in damp swales in the Guadalupe dune system. There are seven populations, five of which have fewer than 50 plants each. Only one population has a substantial number of plants, fluctuating between 6,000 and 54,000 individuals. This population is located at the mouth of the Santa Maria River, where a commercial abalone operation and a port have been proposed. Herbicides, groundwater pumping, off-road vehicle use, and coastal developments are continuing threats to this species.

#### *(d) Yellow Larkspur*

The yellow larkspur was a candidate species in 1997 (USDOI, Fish and Wildlife Service, 1997b). It was proposed for listing as endangered on June 19, 1997 (62 *FR* 33383), and subsequently listed as endangered on January 26, 2000 (65 *FR* 4156). It is a member of the buttercup family and occurs within the coastal scrub plant community on rocky areas from sea level to 300 feet in elevation near Bodega Bay, California. Only two populations remain, each with a total of 50 plants. They are on private land near Bodega. Development, rock quarrying, overcollection, sheep grazing, and naturally occurring events threaten these populations.

#### *(e) Suisun Thistle*

The Suisun thistle was proposed for listing as endangered on June 12, 1995 (60 *FR* 30999), and subsequently listed as endangered on December 22, 1997 (62 *FR* 61916). The following information about the life history of the Suisun thistle was obtained from 60 *FR* 30999 and 62 *FR* 61916. The Suisun thistle is a perennial herb in the aster family. The Suisun thistle occurs in either saltwater or brackish tidal marshes in the San Francisco Bay area of northern California and is restricted to two locations at Suisun Marsh in Solano County. The population of this species is estimated at a few thousand individuals occupying a total area of less than 1 acre. The plant occurs in a very narrow tidal band, typically in higher elevation zones within larger tidal marshes that have fully developed tidal channel networks. They grow in the upper reaches of tidal marshes in association with narrow-leaf cattail, Olney's bulrush, Baltic rush, and saltgrass. They usually do not occur in smaller fringe tidal marshes that generally are less than 300 feet (91.4 meters) in width or in nontidal areas. The Suisan thistle's highly restricted distribution increases its susceptibility to catastrophic events such as disease or pest outbreak, severe drought, oil spills, or other natural or human-caused disasters. Habitat conversion, habitat fragmentation, indirect effects from urban development, increased salinity, projects that alter natural tidal regime, mosquito abatement activities, competition with non-native plants, and inadequate regulatory mechanisms also threaten this species. The highly restricted distribution of the species increases its susceptibility to catastrophic events such as pest outbreaks, severe drought, oil spills, or other natural or human-caused disasters.

#### *(f) Soft Bird's-Beak*

The soft bird's-beak was proposed for listing as endangered on June 12, 1995 (60 *FR* 30999), and subsequently listed as endangered on December 22, 1997 (62 *FR* 61916). The following information about the life history of the soft bird's-beak was obtained from 60 *FR* 30999 and 62 *FR* 61916. Soft bird's beak is an annual herb in the snapdragon family. It is found predominantly in the upper reaches of salt grass-pickleweed marshes at or near the limits of tidal action. It is found in association with Virginia glasswort, saltgrass, fleshy jaumea, alkai heath, and arrow-grass. There are thought to be nine locations where this species occurs, widely scattered throughout salt or brackish tidal marshes fringing San Pablo and Suisun Bays in Contra Costa, Napa, and Solano counties. The entire distribution of this species is restricted to about 31 acres of occupied habitat. The total number of individuals reported among the populations varies from 1 at the smallest site to 150,000 plants at the largest site. Habitat conversion, habitat fragmentation, water pollution, indirect effects from urban development, increased salinity in tidal marshes due to upstream withdrawals of freshwater, projects that alter natural tidal regime, mosquito abatement activities, competition with non-native plants, erosion, insect predation, and other random events threaten this species.

#### *(g) Sonoma Alopecurus*

The Sonoma alopecurus was proposed for listing as endangered on August 2, 1995 (60 *FR* 39314), and the final rule was published on October 22,1997 (62 *FR* 54791). This species is a perennial in the grass family. It is restricted to moist soils in permanent freshwater marshes in Sonoma and Marin counties in California. It is known from five natural populations, three in Sonoma County and two on the Point Reyes National Seashore in Marin County. Three more natural sites in Marin County have since been identified. All populations occur in moist soils in permanent freshwater marshes at an elevation range between 20-680 feet. This species is declining due to competition from non-native plant species, trampling and grazing by cattle, and low regeneration.

#### *(h) Showy Indian Clover*

Showy Indian clover was proposed for listing as endangered on August 2, 1995 (60 *FR* 39314), and the final rule was published on October 22, 1997 (62 *FR* 54791). This species is an annual in the pea family. It typically is found in low, wet swales and grasslands. This plant was thought to be extinct, but a single plant was found in Sonoma County, California in 1993. No plants were found at the site in 1994 or 1995 and the site has since been developed (62 *FR* 54791). The species currently exists only in cultivation, where it is being cultivated to produce seed for future reintroduction efforts. Should other individuals of this species be found, it is likely they would be threatened by urbanization, competition with non-native plants, land conversion to agriculture, and livestock grazing.

#### *(i) Other Species Included on the Fish and Wildlife Service Species List*

The Fish and Wildlife Service's Sacramento office also identified the northern spotted owl, mission blue butterfly, San Bruno elfin butterfly, California freshwater shrimp, and California tiger salamander as species to consider for inclusion in the Liberty biological assessment. The northern spotted owl inhabits coniferous and mixed conifer-hardwood forests. The two butterflies are found in the Twin Peaks area and San Bruno Mountains in San Francisco. California freshwater shrimp are found in flowing water in lowland perennial streams in Sonoma, Marin, and Napa counties. The California tiger salamander inhabits low elevation, vernal pools and seasonal ponds and the associated grassland, oak savannah, and coastal scrub-plant communities. None are likely to occur in coastal intertidal areas.

The Fish and Wildlife Service's Sacramento office also identified the Presidio manzanita, marsh sandwort, robust spineflower, Sonoma spineflower, Presidio clarkia, Santa Cruz cypress, Baker's larkspur, Santa Cruz tarplant, clover lupine, and white-rayed pentachaeta as plant species to be considered for inclusion in the biological assessment. Presidio manzanita is typically associated with soils derived from a serpentine substrate and is associated with coastal prairie and chaparral-plant communities. Marsh sandwort typically is found in swamps and freshwater marshes in coastal areas. Some robust spineflower can be found on active coastal dunes but most are located inland from the immediate coast in sandy openings within scrub, maritime chaparral, or oak woodland habitats. Sonoma spineflower and clover lupine are found in the foredunes and dune scrub communities and associated habitats occupied by coastal scrub and coastal terrace prairie. Presidio clarkia and white-rayed pentachaeta are found in serpentine soil outcrops near San Francisco Bay. The Santa Cruz cypress is an evergreen tree found on dry ridges within the coastal chaparral and mixed evergreen forest vegetation. Baker's larkspur grows in coastal prairie, coastal scrub, or chaparral habitats. The Santa Cruz tarplant is found in coastal grasslands and prairies. None are likely to occur in coastal intertidal areas.

These species are likely to be affected by urban and commercial development, alteration of hydrology, competition with alien plant species, off-road vehicle use, trampling by hikers and livestock, grazing, soil erosion, etc. None are likely to be affected by oil spilled from a tanker carrying oil from the Liberty Project.

## 2. Seals, Walruses, Beluga Whales, and Polar Bears

The Sale 170 final EIS (USDOI, MMS, 1998:Section III.B.4), and BPXA (1998a) describe seals and polar bears in the proposed Liberty area, and these descriptions are summarized and incorporated here by reference. The Liberty Project could affect ringed and bearded seals and polar bears, which are common in the area. Map 2b only portrays sightings of these species and sightings of terrestrial mammals included in the Liberty Development Project Environmental Report (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research 1998). Other species that are uncommon or rare in the project area include beluga whales and walruses.

### a. Ringed Seals

Widely distributed throughout the Arctic, this species is the most abundant seal in the Beaufort Sea. Its estimated population in the Alaskan Beaufort Sea is 80,000 during the summer and 40,000 during the winter (Frost and Lowry, 1981). Ringed seal densities within the Liberty area depend on food availability, water depth, ice stability, and distance from human disturbance. Seal densities reflect changes in the ecosystem's overall productivity in different areas (Stirling and Oritsland, 1995). In the zone of floating shorefast-ice of the Beaufort Sea, ringed seals range from 1.5-2.4 seals per square nautical mile (Map 2A showing the floating shorefast-ice; Frost, Lowry, and Burns, 1988). Surveys in May 1996 through 1999 recorded densities of about 0.81 seal per square kilometer in the Beaufort Sea fast-ice habitat (Frost and Lowry, 1999). Ringed seals probably are a polygamous species. When sexually mature, they establish territories during the fall and maintain them during the pupping season. Pups are born in late March and April in lairs that seals excavate in snowdrifts and pressure ridges. During the breeding and pupping season, adults on shorefast ice (floating fast-ice zone) usually move less than individuals in other habitats; they depend on a relatively small number of holes and cracks in the ice for breathing and foraging. During nursing (4-6 weeks), pups usually stay in the birth lair. This species is a major resource that subsistence hunters harvest in Alaska (see Section VI. B-1 Subsistence-Harvest Patterns).

## b. Bearded Seals

This species is found throughout the Arctic and usually prefers areas of less stable or broken sea ice, where breakup occurs early (Cleator and Stirling, 1990). Most of the bearded seals in Alaskan outer continental shelf areas, an estimated 300,000-450,000 seals, are found in the Bering and Chukchi seas. Estimates on the abundance of bearded seals in the Beaufort Sea and in Alaskan waters currently are unavailable. Bearded seals stay on moving ice habitat in the Beaufort Sea. Their densities in the western Beaufort Sea and in the Liberty area are highest during the summer and lowest during the winter. Their most important habitat in winter and spring is active ice or offshore leads. Map 2b shows recent sightings in the Liberty area.

Pupping takes place on top of the ice from late March through May mainly in the Bering and Chukchi seas, although some takes place in the Beaufort Sea. These seals do not form herds but sometimes do form loose groups. Bearded seals (ugruk) are a main subsistence resource and a favorite food of subsistence hunters (residents of Barrow, as cited in S.R. Braund and Assocs. and University of Alaska, Anchorage, Institute for Social and Economic Research, 1993).

## c. Walruses

The North Pacific walrus population was estimated at about 201,000 animals in 1990 (USDOI, Fish and Wildlife Service, 1995b), comprising about 80% of the world population. In general, most of this population is associated with the moving pack ice year-round. Walruses spend the winter in the Bering Sea; the majority of the population summers throughout the Chukchi Sea, including the westernmost part of the Beaufort Sea. Although a few walruses may move east throughout the Alaskan portion of the Beaufort Sea to Canadian waters during the open-water season, the majority of the Pacific population occurs west of 155° W. longitude north and west of Barrow, with the highest seasonal abundance along the pack-ice front.

Nearly all the adult females with dependent young migrate into the Chukchi Sea during the summer, while a substantial number of adult males remain in the Bering Sea. Spring migration usually begins in April, and most of the walruses move north through the Bering Strait by late June. Females with calves comprise most of the early spring migrants. During the summer, two large Arctic areas are occupied—from the Bering Strait west to Wrangell Island and along the northwest coast of Alaska from about Point Hope to north of Point Barrow. With the southern advance of the pack ice in the Chukchi Sea during the fall (October-December), most of the walrus population migrates south of the Bering Strait. Solitary animals occasionally may overwinter in the Chukchi Sea and in the eastern Beaufort Sea.

## d. Beluga Whales

The beluga whale, a subarctic and arctic species, is a summer seasonal visitor throughout offshore habitats of the Alaskan portion of the Beaufort Sea. The Beaufort population currently is estimated to be in excess of 32,000 whales (Ferrero et al., 2000). Most of this population migrate from the Bering Sea into the Beaufort Sea in April or May. However, some whales may pass Point Barrow as early as late March and as late as July. The spring-migration routes through ice leads are similar to those of the bowhead whale. A major portion of the Beaufort Sea population concentrates in the Mackenzie River estuary during July and August. This eastern Chukchi Sea stock currently is estimated to be at a minimum of about 3,7000 whales (Ferrero et al., 2000). In the Arctic, belugas feed primarily on arctic and saffron cod, whitefish, char, and benthic invertebrates (Hazard, 1988).

Fall migration through the western Beaufort Sea is in September or October. Although small numbers of whales have been observed migrating along the coast, surveys of fall distribution strongly indicate that most belugas migrate offshore along the pack-ice front (Frost, Lowry, and Burns, 1988; Treacy, 1987-1999). Beluga whales are an important subsistence resource of Inuit Natives in Canada and also are important locally to Inupiat Natives in Alaska.

## e. Polar Bears

The Southern Beaufort Sea's population (from Icy Cape to Cape Bathurst, Northwest Territories, Canada) is about 1,800 bears (Amstrup, 1995; Wiig, Born, and Garner, 1995; Gorbics, Garlich-Miller, and Schliebe, 1998). However, recent modeling results suggest that the population could be more than 2,500 bears, if the number of males has increased in the same proportion as the number of females (Amstrup, McDonald, and Stirling 2001). This population has increased over the past 20-30 years at 2% or more per year and is believed to be increasing slightly or stabilizing near its carrying capacity (Amstrup, 1995; USDOI, Fish and Wildlife Service, 1995b). Their seasonal distribution and local abundance vary widely in the Alaskan Beaufort Sea. Amstrup, Durner, and McDonald ( 2000) assumed that a bear density of one bear per 25 square kilometers occurs in seasonal concentration areas. Much lower densities occur beyond 100 miles offshore and higher densities near ice leads, where seals concentrate during the winter. Another study estimated their overall density from Point Barrow to Cape Bathurst as one bear every 141-269 square kilometers (54-103 square miles) (Amstrup, Stirling, and Lentfer, 1986). Sea ice and food are the two most important natural influences on their distributions.

Drifting pack ice off the coast of the Alaskan Beaufort Sea probably supports more polar bears than either shorefast ice or polar pack ice, probably because young seals are abundant in this habitat. Polar bears prefer rough sea ice, floe-edge ice, and moving ice over smooth ice for hunting and resting (Martin and Jonkel, 1983; Stirling, Andriashek, and Calvert, 1993). Polar bears sometimes concentrate along Alaska's coast when pack ice drifts close to the shoreline, at whale-carcass locations, and when shorefast ice forms early in the fall. Polar bears can swim great distances and are very curious animals (Adams, 1986).

Pregnant and lactating females with newborn cubs are the only polar bears that occupy winter dens for extended periods. Typically, dens are more sparsely distributed in the Alaskan coastal zone than in areas receiving consistent use, areas such as Wrangell Island, Russia and in Hudson Bay and James Bay, Canada. Pregnant females come to coastal areas in late October or early November to build maternity dens. Most onshore dens are close to the seacoast, usually not more than 8-10 kilometers inland (Map 2A). Offspring are born from early December to late January, and females and cubs break out from dens in late March or early April.

Polar bear dens have been located on river banks in northeast Alaska and on shorefast ice close to islands east of the mouth of the Colville River. Dens have been found recently in the Liberty area. Topographic relief (hills, banks, and other terrain features) provides areas where enough snow accumulates for bears to build dens. Polar bear hunters from Nuiqsut and Kaktovik identified several of the coastal dens shown in Map 2A (USDOI, Fish and Wildlife Service, 1995b; Kalxdorff, 1997).

Female polar bears usually do not use the same den sites each year (Ramsay and Stirling, 1990; Amstrup, Garner, and Durner, 1992), but they often do use the same geographic areas (Amstrup, Garner, and Durner, 1992). Shifts in the distribution of den locations in Canada may be related to changes in sea-ice conditions (Ramsay and Stirling, 1990).

In addition to being protected by the Marine Mammal Protection Act of 1972, polar bears and their habitats are covered further by the International Agreement on the Conservation of Polar Bears. This 1976 agreement among Canada, Denmark, Norway, the Union of Soviet Socialist Republics, and the United States addresses protection of "habitat components such as denning and feeding sites and migration patterns." A bilateral agreement between the United States and Russia to conserve polar bears in the Chukchi/Bering seas also was signed in October 2000.

The North Slope Borough/Inuvialuit Game Council's management of polar bears for the southern Beaufort Sea includes sustainable harvest quotas based on estimated population size, sustainable harvest rates for female polar bears, and information regarding the sex ratio of the subsistence harvest.

## 3. Marine and Coastal Birds

About 70 species of birds are expected to occur regularly in the Liberty area (BPXA, 1995, 1998a; Johnson and Herter, 1989; USDOI, MMS, 1996a, 1998; Troy Ecological Research Assocs., 1993b, 1995b). Nearly all species are migratory, inhabiting Arctic Slope or Beaufort Sea habitats at most from May to early November. Major groups and species that may be fairly common to abundant in this area during all or part of this period include:

- **Loons and Waterfowl:** red-throated loon, Pacific loon, tundra swan, greater white-fronted goose, snow goose, Canada goose, brant, northern pintail, king eider, common eider, long-tailed duck (formerly, oldsquaw), scaup, scoters
- **Shorebirds:** black-bellied plover, lesser golden-plover, red-necked phalarope, red phalarope, long-billed dowitcher, stilt sandpiper, dunlin, ruddy turnstone, semipalmated sandpiper, pectoral sandpiper, buff-breasted sandpiper
- **Seabirds:** parasitic jaeger, long-tailed jaeger, glaucous gull, arctic tern
- **Hawks:** northern harrier
- **Passerines:** Lapland longspur, savannah sparrow, redpoll

Species that commonly use nearshore coastal waters (20-meter depths or less) include loons and the brant, long-tailed duck, common eider, king eider, red phalarope, and glaucous gull. Species that may overwinter in the onshore development area include gyrfalcon, ptarmigan, snowy owl, and common raven. The area may be visited in summer by occasional peregrine falcons, rough-legged hawks, golden eagles, and a variety of other species.

## a. Annual Cycle

### (1) Spring Migration

Waterfowl species such as the **long-tailed duck**, **king eider**, **common eider**, and **brant** migrate eastward along a broad front that includes inland (various river valleys in western Alaska), coastal, and offshore routes from about mid-May to mid-June (Johnson and Herter, 1989; Johnson and Richardson, 1981; Richardson and Johnson, 1981). However, individuals of some species arrive earlier, such as gulls and ducks observed by Andrew Oenga in the Point Brower area of the Sagavanirktok River Delta in late April (North Slope Borough, Commission on History and Culture, 1980). The availability of open water offshore determines, in part, the routing and timing of **king eider** (Suydam, 2000) and **long-tailed duck** arrival, and probably other species. Open leads usually occur within 10 kilometers offshore of barrier islands but also occur farther offshore with some regularity. Spring-migrant waterbirds can be expected to land on any available water (Schamel, 1978; Richardson and Johnson, 1981). As the earliest spring migrants, male **king eiders** are particularly subject to stranding and starvation when wind and ice conditions close off traditionally used leads (Barry, 1968). During a recent spring migration, an estimated 373,000 **king eiders** and 71,000 **common eiders** passed Point Barrow (Suydam et al., 1997). For these two sea ducks and many other species, a substantial proportion of the Pacific breeding population nests in northeast Alaska and Canada and, thus, passes the general Liberty area during spring (and fall) migration. For example, an estimated 200,000-260,000 **king eiders** occupy western Canada during the breeding season (Dickson et al., 1997), and a majority of those nesting in Alaska probably occupy the area east of the proposed Liberty site; therefore, potentially three-quarters of the North Slope/Canadian population could pass the Liberty area during migration. However, migrants do not necessarily pass through the nearshore zone where Liberty island would be located, particularly during spring migration (for example, king eiders using offshore leads) and may not be as vulnerable as it would appear. **Loons** and **eiders** gather in spring runoff water off river deltas during late May and early June until local nesting areas are free of snow (Bergman et al., 1977; Johnson and Herter, 1989). Likewise, most **shorebirds** and other **waterfowl** concentrate in snow-free coastal or inland areas until nest sites are available.

### (2) Nesting Period

**Lesser snow geese** and **brant** nest on Howe and Duck islands in the Sagavanirktok River Delta (Johnson, 1994a,b; Stickney and Ritchie, 1996) and move to this and other delta areas and tidal flats for broodrearing from early July to late August (Maps 6 and 7). Other important broodrearing areas for **brant** include Point McIntyre and the northwest side and head of Prudhoe Bay. As many as 241 **brant** nests have been recorded on the delta and islands during the nesting season (Stickney and Ritchie, 1996). Most **brant** occupy scattered locations in sedge-grass meadows on tidal flats, lagoons, creek mouths, barrier islands and spits, and islands in river deltas within 0.8 kilometer of the coast for broodrearing (Johnson and Herter, 1989). Up to 170 adults and goslings have been recorded in the delta and 551 in areas to the east as far as Tigvariak Island, including the Kadleroshilik River delta (Stickney and Ritchie, 1996). In 1993, 455 **snow goose** nests, about 3 nests per acre, were located on Howe Island (Johnson, 1994b). In the Sagavanirktok River Delta area, 826 and 838 adults and goslings, respectively, were captured. Important broodrearing areas are found throughout Foggy Island Bay (Johnson, 1994b), including the eastern Sagavanirktok River Delta, Kadleroshilik River Delta, Shaviovik River Delta, to Mikkelsen Bay; approximately 31% of all captures between 1980 and 1993 were made in these areas. **Common eiders** nest on barrier islands offshore from the Liberty area (Map 7) as well as on Duck Island, abandoned exploratory islands in the Sagavanirktok River Delta, and on the Endicott causeway (Johnson, Wiggins, and Rodrigues, 1993; Johnson and Herter, 1989; Schamel, 1978) (Map 8). **Loons**, **tundra swans** (Map 7), **greater white-fronted geese**, **Canada geese**, and other waterfowl nest, forage, rear their broods, and molt in wetland habitats that would be crossed by the onshore portion of the proposed pipeline that connects Liberty to the Badami pipeline. In the area between Prudhoe Bay and the Badami Prospect, nest densities for several species—including **Pacific loon**, **Canada goose**, **black-bellied plover**, **pectoral sandpiper**, **dunlin**, **stilt sandpiper**, and **red phalarope**—reach their highest levels in coastal habitats surrounding the lower Kadleroshilik River (Troy Ecological Research Assocs., 1995b). Male buff-breasted sandpipers, an uncommon breeder on the coastal plain, have been observed occupying a lek on an island in the lower Kadleroshilik River (see Appendix D-8). **Glaucous gulls** and **arctic terns** (and potentially some **black guillemots**) nest on barrier and other islands in the Liberty area.

### (3) Postnesting Period

Among **phalaropes** and some **sandpipers**, the nonincubating members of pairs leave nesting areas on the tundra (from mid-June to late July), soon after the eggs are laid, and concentrate in coastal habitats. The other parent and fledged young follow in several weeks. In mid- to late August, juveniles form large flocks on coastal and barrier island beaches, foraging intensively on outer beaches, lagoon shorelines, and mudflats (Johnson and Richardson, 1981). Most have departed the area by mid-September. **Brant** move to delta areas and tidal flats for broodrearing from early July to late August. Male **common eiders** migrate to coastal molting areas in western Alaska, departing when incubation begins in late June and early July (Johnson and Herter, 1989). Nonbreeding and failed breeding females probably accompany the males, forming large flocks before heading west. Successful females with fledged young move from nest areas to molting sites, possibly nearby in coastal lagoons or other nearshore areas (Barry, 1968; Johnson and Herter, 1989) before moving south to wintering areas beginning in late August. Likewise, male **king eiders** undertake a migration to molting areas in the Chukchi and Bering seas from early July through August (Cotter, Dickson, and Gratto, 1997). Suydam et al. (1997) observed adult males migrating past Point Barrow in September and October, indicating that some apparently molt in the Beaufort Sea. Females migrate from mid-August into September (Suydam et al., 1997), and young leave the breeding areas in September and October (Map 8). From mid-July to early September, **long-tailed ducks** gather in coastal lagoons (Map 6) and large lakes to feed and molt before migrating westward in the fall; some individuals regain flight in July. Simpson Lagoon is a traditional important molting area (Johnson, 1985; Johnson and Richardson, 1982). Males, failed breeders, and nonbreeders are present early in this interval; females with young move to such areas following molt. By late August, **long-tailed ducks** begin migrating along the Beaufort coast at rates that currently are unknown. Many waterbirds depart the area by the middle or end of August; but **loons** and **tundra swans** may be found in remaining open-water areas through September, **long-tailed ducks** through October, and **king eiders** and **common eiders** into early November. In late August to mid-September, immature **arctic peregrine falcons** and **gyrfalcons** forage in coastal areas.

## b. Habitats

### (1) Offshore Marine Waters

Bird densities generally are low in offshore areas (Divoky, 1984). For example, densities of **long-tailed ducks** were fewer than 11 birds per square kilometer outside the barrier islands just east of Foggy Island Bay, and fewer than 3 birds per square kilometer were found farther offshore (Johnson and Gazey, 1992). During aerial surveys in 1999 and 2000 (Map 8), **loons**, **glaucous gulls**, **common eiders**, **king eiders**, and **long-tailed ducks** were the most commonly recorded species in late June (Fischer, Tiplady, and Larned, In review; Stehn and Platte, 2000). By late July, king eiders dominated the counts in offshore waters. By late August, **king eiders** still were numerous, but substantial numbers of **loons** and **long-tailed ducks** also occurred; most birds were within about 50 kilometers of the coast. There is a continual movement of eiders to the west from early July to November as fall migration proceeds (USDOI, Fish and Wildlife Service, 1999b).

### (2) Nearshore Marine Waters

In the Liberty area, shallow waters in Foggy Island Bay and saltmarsh habitat along the Sagavanirktok and Kadleroshilik river deltas probably provide the most protected areas for feeding and rearing young. **Loons**, diving ducks such as the **long-tailed duck** and **common eider**, as well as **scaup, scoters,** and **glaucous gulls** forage in nearshore waters. Lagoons formed by barrier islands provide important feeding and staging habitat for waterfowl, particularly molting and staging **long-tailed ducks** and **eiders**. Simpson Lagoon, beyond Prudhoe Bay to the west, is the closest well-defined lagoon system. However, barrier and other islands on the west side of Foggy Island Bay, the outer Sagavanirktok, Kadleroshilik, and Shaviovik River deltas, and the McClure Islands and Tigvariak Island also provide protected areas. Concentrations of **king eiders** are found in and offshore of Harrison Bay, and the greatest densities of **scoters** are found in the bay. The highest numbers of **long-tailed ducks** are found in the outer portions of lagoons just inside the barrier islands, particularly in the Stockton Islands (Maps 6 and 8). Lagoons become increasingly important for these species later in the season, as melting ice makes larger areas of open water available (Johnson and Richardson, 1982). Shorebird concentrations are found along lagoon shorelines, saltmarshes, river deltas, and mudflats in July and August before the fall migration.

### (3) Barrier Islands

These sparsely vegetated gravel islands provide nesting habitat for **common eiders**, **glaucous gulls**, and **arctic terns**. **Common eiders** nest here almost exclusively. Small scattered groups of **black guillemots** also may nest on these islands. Many **phalaropes** come here after breeding, typically foraging along the seaward side (Johnson and Richardson, 1981), and small numbers of other shorebirds may be present. The occurrence of many species on barrier and other islands in particular has been noted by Native residents. For example, Etta Ekolook recalled aaqhaaliq (**long-tailed duck**) molting in the Tigvariak Island area, although more so at other barrier islands with other duck species. Mitqutailaq (**arctic tern)** nested at Tigvariak, and occasional niglingaq (**brant)** passed by (Ekolook, as cited in North Slope Borough, Commission on History and Culture, 1980). Also, aqargiq (**ptarmigan**) were observed on the ice out of sight of land. Further east, Mary Akootchook and Josephine Itta have seen many amauligruaq (**common eider**) and quinaluk (**king eider**) at Flaxman, Pole, and Belvedere islands, niglingaq (**brant**) near Flaxman, and aqargiq (**ptarmigan**) and ukpik (**snowy owl**) on the island (Akootchook and Itta, as cited in North Slope Borough, Commission on History and Culture, 1980). Thomas Napageak cites Pole Island as an important nesting area for **eiders** and other waterfowl (Napageak, as cited in U.S. Army Corps of Engineers, 1999); Fenton Rexford notes that many waterfowl go through the Kaktovik area (Rexford, as cited in U.S. Army Corps of Engineers, 1996), and Jennie Ahkivak recalls accompanying her father to Cross Island each spring to hunt ducks (Ahkivak, as cited in USDOI, BLM, 1974).

### (4) Tundra

Onshore habitats available to birds include moist and wet tundra, flooded tundra, ponds, and lakes. River gravel or sandbars usually are barren or sparsely vegetated and relatively little used by birds for breeding. However, approximately 60% of the surveyed Kadleroshilik River gravel island that is proposed as a gravel mine site is vegetated, with ponds and river gravels occupying 13% and 27%, respectively (Noel and McKendrick, 2000). Bird species confirmed as nesting on the island in late June 2001, or probable breeders, include **black-bellied plover**, **lesser golden plover**, **ruddy turnstone**, **rock ptarmigan**, and **Lapland longspur** (see Appendix D-8). The **buff-breasted sandpiper** is an uncommon local breeder along the Beaufort Sea coast (Johnson and Herter, 1989). On the island, four individuals consistently occupied a lek area where males were observed giving "wing flash" territorial displays. Other species that commonly occur on the island or in the river include **Pacific loon**, **white-fronted goose**, **Canada goose**, **long-tailed jaeger,** and **glaucous gull**. Individuals of most of these species, as well as occasional **brant**, **whimbrel**, **arctic tern**, **golden eagle**, and **common raven** also were observed overflying the island to or from adjacent mainland areas, and occasionally may stop to forage. In addition, **northern pintail**, **semi-palmated sandpiper**, and **pectoral sandpiper** occasionally were observed foraging on the island and parasitic jaegers hunting over it. On adjacent mainland areas, **red-throated loon**, **snow goose**, **long-tailed duck**, **dunlin,** and **northern harrier** were fairly common, as were many of the species noted above. The most numerous shorebird species in the area prefer wet tundra habitats (sandpipers, phalaropes) or nest on or near well-drained gravelly areas (plovers), whereas loons use lakes, and geese prefer deeper ponds (**brant**) or wet tundra near lakes (**greater white-fronted goose**). **Long-tailed ducks** nest on small ponds where emergent sedges and grasses surround an open central area with deeper water. **King eiders** nest near deeper ponds that have less emergent vegetation (Larned and Balogh, 1997).

### (5) Other Habitats

River deltas in the Liberty area (outer Sagavanirktok and Shaviovik), particularly the outer mud flats, are heavily used by shorebirds (Andres, as cited in Nickles et al., 1987); this probably also is true of the Kadleroshilik.

## c. Abundance

Most of the **long-tailed ducks** nesting in western arctic North America pass through the Beaufort Sea region (Wilbor, 1999). At least 250,000 and perhaps up to four times this number are involved (USDOI, Fish and Wildlife Service, 1999b). After the breeding season, flocks of as many as 2,400 molting and postmolting **long-tailed ducks** have been recorded in the McClure Islands northeast of the Liberty area. Johnson and Gazey (1992) recorded average densities of 120-534 birds per square kilometer in Liberty area lagoons between Flaxman Island and the Jones Islands. Recent surveys (1999) in the area between West Dock and Pole Island have recorded average densities of 65 birds per square kilometer during the molt period (late July-August) and up to about 122 postmolting (late August) birds per square kilometer (Noel, Johnson, and Wainwright, 2000). The McClure Islands appear to be especially important in the Liberty area. Johnson and Richardson (1981) observed densities averaging as high as 566 birds per square kilometer in Simpson Lagoon, and densities as high as 749 birds per square kilometer off Gwydyr Bay west of the Liberty area in mid- to late July, suggesting that up to 50,000 individuals were present (Johnson and Herter, 1989; Johnson and Richardson, 1981).

Recent offshore and nearshore surveys by the Fish and Wildlife Service in the central Beaufort Sea area between Oliktok Point and Brownlow Point beginning in late June/late July and late August 1999 (Map 8) and 2000 (Stehn and Platte, 2000; Fischer, Tiplady, and Larned, In review) resulted in an estimated population index for the **long-tailed duck** of 20,994 (June/July survey) to 37,792 (August survey). Indices for other species were: **king eider,** 19,842 (June/July) and 6,698 (August); **common eider,** 3,300 (June/July) and 1,477 (August); **Pacific loon**, 764 (June/July) and 666 (August); **red-throated loon**, 164 (June/July) and 169 (August); **yellow-billed loon,** 95 (June/July) and 17 (August); and **scoter species,** 4,814 (June/July) and 3,494 (August). Estimates of density for the **long-tailed duck** ranged as high as 73.8 birds per square kilometer (June/July) along the mainland shoreline in the eastern portion of the survey area (relatively undisturbed), 32.3 birds per square kilometer in the eastern barrier island area, and 12.2 birds per square kilometer in the eastern nearshore area. Densities of this species in most other areas to the west (including some areas off Prudhoe Bay) were less than 4 birds per square kilometer. High densities for other species were: **king eider**, 3.6 birds/square kilometer (June/July) in western offshore waters and 10.0 (August) along western mainland shoreline; **common eider**, 4.6 birds/square kilometer (June/July) in west-central barrier island pass area and 56.4 birds per square kilometer in eastern barrier island pass area. Density of **loons** and **scoters** was very low.

Onshore, a study near the proposed Badami pipeline found that nest density of all species combined in the Kadleroshilik River area was 69.7 per square kilometer in 1994 (Troy Ecological Research Assocs., 1995b). **Lapland longspur** (25.0 per square kilometer), **pectoral sandpiper** (12.0 per square kilometer), **semipalmated sandpiper** (9.0 per square kilometer), and **red phalarope** (7.7 per square kilometer) were the most abundant nesting species (Table VI.A-1). The highest breeding-season densities for all 34 species recorded ranged from 251.7 birds per square kilometer in the second week of June to 167.0 in mid-July, and 131.7 in mid-August. Most abundant were the four species noted above plus **dunlin** and **red-necked phalarope**. The average density of all species for the entire breeding season was 185.6 birds per square kilometer; during broodrearing and postbreeding periods, the density was 88.2 and 119.2 birds per square kilometer, respectively. Troy (1982) found peak shorebird densities of 62 birds per kilometer of shoreline predominantly **semipalmated sandpiper**, **dunlin**, and **stilt sandpiper** on the Sagavanirktok River Delta in early August. These values are comparable to those obtained at the Point McIntyre Reference Area just west of Prudhoe Bay (Troy Ecological Research Assocs., 1993a). The highest nesting densities generally occur in areas of mixed wet and dry habitats, whereas birds often move to wetter areas for broodrearing. Differences in nest and bird density relative to habitat and the breeding-season period often arise due to some species foraging in different habitat than where the nest is placed, and/or that one member of the pair departs soon after eggs are laid.

Population indices for loons, waterfowl, and other groups nesting on the coastal plain have been calculated annually from aerial survey information since 1992 (Larned, Platte, and Stehn, 2001). Average values for breeding plus nonbreeding birds are: Pacific loon, 20,987; red-throated loon, 2,943; tundra swan, 6,141; brant, 3,704; white-fronted goose, 61,381; northern pintail, 55,586; long-tailed duck, 32,882; king eider, 12,395; arctic tern, 9,152; and glaucous gull, 12,456.

## d. Population Status

In the Beaufort Sea region, aerial surveys over the Arctic Coastal Plain have shown most waterfowl and other waterbird species have exhibited nonsignificant population trends since 1986 or 1992 (Larned and Balogh, 1997; Larned et al., 1999; Larned, Platte, and Stehn, 2001; Mallek and King, 2000), although there is conflicting evidence for some species. For example, counts of birds passing Point Barrow in spring and aerial surveys suggest that the **common eider** population declined by 56%, and **king eiders** 53% in the period 1976-1994 (Suydam et al.,1997, 2000; USDOI, Fish and Wildlife Service, 1999b). However, aerial breeding pair surveys show a stable or slightly increasing trend for king eiders on the coastal plain (Larned, Platte, and Stehn, 2001), but these surveys do not include some areas with the highest nesting densities (for example, northwest Canada). Although aerial breeding pair surveys in late June/early July have documented a nonsignificant increase in **long-tailed duck** numbers on the Arctic Coastal Plain since 1992, numbers have declined since 1996, (Conant et al., 1997; Eliot, 1997; Larned and Balogh, 1997; Larned, et al., 1999, Mallek and King, 2000; Mallek, 2001). Fischer, Tiplady, and Larned (In review) found a significant decline in long-tailed duck density in nearshore areas compared to densities found by Johnson and Gazey (1992); however, this was not reflected in offshore survey data. Populations in northwestern Canada declined significantly up to at least 1997 (Conant et al., 1997). **Pacific loon**, **jaegers**, **glaucous gull**, **northern pintail**, **greater scaup**, **white-winged scoter**, **brant**, **snow goose**, and **tundra swan** have exhibited overall nonsignificant increasing trends, while **yellow-billed loon**, **Sabines' gull**, and **snowy owl** show decreases (Larned, Platte, and Stehn, 2001; USDOI, Fish and Wildlife Service, 1999b). The other two scoter species that may occur in this area may have declined (Eliot, 1997; USDOI, Fish and Wildlife Service, 1999b). The coastal plain **brant** population has remained relatively stable since the 1970's, although numbers nesting at particular colonies varies considerably (Stickney and Ritchie, 1996). The small- to medium-sized colonies characteristic of the coastal plain nesting population of this species makes individual colonies more vulnerable to predation than larger colonies, but dispersed distribution may decrease this effect on a regional scale (Raveling, 1989). The **snow goose** population nesting on Howe Island in the Sagavanirktok River Delta area just west of Liberty has increased steadily over the past 2 decades (Johnson, 1994b; Johnson and Noel, 1996). **Greater white-fronted goose** and **arctic tern** increased significantly, while **red-throated** loon decreased significantly.).

# 4. Terrestrial Mammals

Among the terrestrial mammals that occur in the Liberty area, the caribou, muskox, grizzly bear, and arctic fox are the species most likely to be affected by development. Maps 2A and B portray only sightings of these species and sightings of marine mammals included in the Liberty Development Project Environmental Report (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998). Other species, such as moose, are too sparse in the project area to be affected by development of the Liberty Project. The Final EIS for Lease Sale 170 (USDOI, MMS, 1998) and the BPXA Environmental Report (BPXA, 1998a) more thoroughly describe terrestrial mammals occurring across Alaska's Arctic Coastal Plain, and these descriptions are incorporated here by reference.

## a. Caribou

The Central Arctic Herd occurs immediately adjacent to the project area. Its range extends from the Itkillik River east to the Canning River and from the Beaufort Sea coast south into the Brooks Range. Some caribou of the Porcupine Caribou Herd may frequent the coastal plain near the Liberty area, but few or none calve there and few use the area after calving (Clough et al., 1997, as cited in LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998).

The Central Arctic Herd was estimated at 23,000 caribou in 1992 but declined to about 18,100 in 1994 (Abbott, 1993; Whitten, 1995, pers. commun.). In 1995, the herd totaled 18,100 caribou with 6,327 west of the Sagavanirktok River and 11,766 east of it. In 1997, the herd increased to 19,730 caribou, with about 12,000 west of the river and 7,730 east of it (Lenart, 1999; Whitten, 1998, pers. commun.). The differences between the 1995 and 1997 counts show considerable movement between the eastern and western segments of the herd (Lenart, 1998, pers. Commun.; Cronin, Whitlaw, and Ballard, 2000; Cronin et al 1997). The decline in herd numbers in the early 1990's coincided with relatively low calf production and, similarly, the recent increase in numbers coincided with high calf production in 1996 and 1997 (Murphy and Lawhead, 2000. The most recent estimate for the Central Arctic Herd is over 27,000 animals (Lawhead and Prichard, 2001).

The eastern calving area for the Central Arctic Herd is shown in Map 2B. The herd usually calves within 30 kilometers of the Beaufort Sea coast. The herd separates into two segments based on the locations of the calving-concentration areas, one on each side of the Sagavanirktok River. The eastern segment occurs within the Liberty area and ranges along the Arctic Coastal Plain from the Sagavanirktok River east to the Hulahula River during the summer. Only a few hundred caribou of this herd winter on the coastal plain during most years.

Calving takes place in the spring, generally from late May to late June (Hemming, 1971). During and just after calving, cows and calves are most sensitive to human disturbance. They join into increasingly larger groups, foraging mainly on the emerging buds and leaves of willow shrubs and dwarf birch (Thompson and McCourt, 1981). In the postcalving period, July through August, caribou form the largest groups.

Insect-relief areas become quite important during the insect season from late June to mid-August (Lawhead, 1997). Insect harassment reduces foraging efficiency and increases physiological stress (Reimers, 1980). Caribou use various coastal and upland habitats for relief from insect pests—typically sandbars, spits, river deltas, some barrier islands, mountain foothills, snow patches, and sand dunes. In these areas, stiff breezes keep insects from concentrating and landing on the caribou. In the Liberty Project area, caribou of the Central Arctic Herd usually congregate near the coast for insect relief. Caribou herds often move from insect-relief areas along the Arctic coast to and from green foraging areas.

## b. Muskoxen

Populations of muskoxen died out in the 1800's in northern Alaska (Smith, 1989) but were reintroduced in the 1960's and 1970's. In the east, muskoxen were reintroduced to the Arctic National Wildlife Refuge in 1969 and to the Kavik River area (between Prudhoe Bay and the Refuge) in 1970. In the west, they were reintroduced near Cape Thompson on the Chukchi coast in 1970 and 1977 (Smith, 1989). The reintroductions to the east established the Refuge population, which grew rapidly and expanded both east and west of the Refuge (Garner and Reynolds, 1986). An estimated 270 muskoxen were counted between the Colville River and the Refuge, and a breeding population has been established in the area of the Itkillik-Colville rivers (Johnson et al., 1996).

Muskoxen generally do not migrate but will move in response to seasonal changes in snow cover and vegetation. They use riparian habitats along the major river drainages on the Arctic Slope year-round. Calving takes place from about April to early June (Garner and Reynolds, 1987). Distribution of muskoxen during the calving season, summer, and winter are similar, with little movement during winter (Reynolds, 1992). Only 14 muskoxen were sighted in the project area (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998) mostly along the Kadleroshilik River (Map 2B).

## c. Grizzly Bears

The grizzly bear population on the western North Slope was considered stable or slowly increasing in 1991. Densities were highest in the foothills of the Brooks Range and lowest on the Arctic North Slope (Carroll, 1991). On the North Slope, grizzly bear densities vary from about 0.3-5.9 bears per 100 square miles, with a mean density of 1 bear per 100 square miles. The number of grizzly bears using the Prudhoe Bay and Kuparuk oil fields adjacent to the Liberty area has increased in recent years. An estimated 60-70 bears, or approximately 4 per 1,000 square kilometers, currently inhabit the oil field area (Shideler and Hechtel, 2000). The State of Alaska, Department of Fish and Game captured and marked 27 bears while studying the bears' use of the oil fields (Shideler and Hechtel, 1995). These bears have very large home ranges (2,600-5,200 square kilometers) and travel up to 50 kilometers a day (Shideler and Hechtel, 1995). Since 1991, 17 grizzly bears were recorded in the Liberty area (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998). On the North Slope, grizzly dens occur in pingos, banks of rivers and lakes, sand dunes, and steep gullies in uplands (Harding, 1976; Shideler and Hechtel, 1995).

LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research (1998) recently located two dens in the project area (Map 2B). Grizzlies select dens mostly based on southern exposure and deep snow accumulation (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998). They usually enter dens in early October to late November and emerge in early April to mid-May.

Within the Liberty area, most bears forage in riparian areas (along streams and other bodies of water) Along the coast, they scavenge on the carcasses of marine mammals and prey on waterfowl eggs and young. They also feed on sedges and grasses, prey on arctic ground squirrels and rodents, and forage on plant roots and berries (BPXA, 1998a).

### d. Arctic Foxes

The arctic fox population on the North Slope has increased since 1929, as the values and harvest rates of white fox pelts declined (Chesemore, 1967). Fox populations peak whenever lemmings (their main prey) are abundant. Other food sources include ringed seal pups and the carcasses of other marine mammals and caribou, which are important throughout the year (Chesemore, 1967; Hammill and Smith, 1991). Tundra-nesting birds also are a large part of their diet during the summer (Chesemore, 1967; Fay and Follmann, 1982; Quinlan and Lehnhausen, 1982; Raveling, 1989). The availability of winter food sources directly affects the foxes' abundance and productivity (Angerbjorn et al., 1991). Arctic foxes on the Prudhoe Bay oil field readily use development sites for feeding, resting, and denning; their densities are greater in the oil fields than in surrounding undeveloped areas (Eberhardt et al., 1982; Burgess et al., 1993). Development on the Prudhoe Bay oil fields probably has led to increases in fox abundance and productivity (Burgess, 2000). However, arctic foxes are particularly subject to outbreaks of rabies, and their populations tend to fluctuate with the occurrence of the disease and with changes in the availability of food. Marine mammals are an important part of the diet of arctic foxes that occur along the coast of western Alaska (Anthony, Barten, and Seiser; 2000).

## 5. Lower Trophic-Level Organisms

This section summarizes information described in former environmental impact statements for the Beaufort Sea (USDOI, MMS, 1998) and in the Liberty Environmental Report (BPXA, 1998a), which are incorporated here by reference. Lower-trophic-level organisms are the basis of food webs. The shrimp, crab, and phytoplankton "are all tied into the whale and the ugruk [bearded seal]," as explained by Fenton Rexford of Kaktovik during a Northstar hearing (Rexford, as cited in U.S. Army Corps of Engineers, 1999:Sec. 6.2.6.2). The same relationship was described by John Armstrong: "the algae, the [animal] plankton and the fish . . .all form a food chain link" (Armstrong, as cited in Dames and Moore, 1988:2). The food chain extends to human subsistence; as explained by Merlin Traynor, "much comes from the sea here for subsistence, such as birds, bearded seals, seals, fish, whitefish, char, plus the whales" (Traynor, as cited in Dames and Moore, 1988:40).

Lower trophic-level organisms in the Beaufort Sea include both plants and animals in two distinct habitats or communities: planktonic (living in the water column) and benthic/coastal (living on or in the sea bottom). We describe first the planktonic communities, including those on the underside of the ice during the winter (epontic communities). Next, we describe coastal and benthic communities, including the Boulder Patch kelp habitat.

Each year, the shorefast ice dominates the coastal area, and freshwater and sediment flow through after breakup. These conditions disturb the intertidal and nearshore subtidal zones of the Beaufort Sea (0-2 meters deep), which support no permanent marine organisms but many opportunistic ones that recolonize the zones during the summer.

### a. Planktonic Communities

Annual primary production in the Alaskan Beaufort Sea is very low compared to that of other oceans. Recent estimates are up to 30 grams of carbon per square meter per year in the shelf and coastal environments. This is roughly the same as that produced in the central gyres (areas of lowest primary productivity) of the Atlantic and Pacific oceans (Schell, 1988; Cooney, 1988). Also, phytoplankton in the Beaufort Sea do not appear to bloom, as is common in other oceans, but increase a modest amount during and after ice breakup. In stark contrast to this, the annual plankton bloom along the Bering Sea's ice edge produces as much as 725 grams of carbon per square meter per hour (Hood and Calder, 1981).

Annual primary production in nearshore waters such as Stefansson Sound typically is 5-20 grams of carbon per square meter per year (Schell et al., 1982). The most productive areas of Alaska's Beaufort Sea are the area just east of Barrow in the west and the Barter Island area in the east. Near Barrow, this production comes from the annual springtime influx of plankton-rich waters from the northern Bering Sea, which contributes to primary production as high as 50 grams of carbon per square meter per year (Schell et al., 1982). Near Barter Island, upwelling events increase the amount of available nutrients for plankton growth (Schell, 1988). The abundance of phytoplankton appears to be greatest in nearshore waters less than 5 meters deep, with decreasing numbers farther offshore. However, they produce more grams of carbon per square meter per year in the clearer waters farther offshore, where they have more sunlight (Horner, Coyle, and Redburn, 1974). Phytoplankton are most abundant in late July and early August, when sunlight is strongest. Because primary production is low in Alaska's Beaufort Sea, the zooplankton communities are impoverished and are characterized by low diversity, low biomass, and slow growth (Cooney, 1988). Nevertheless, more than 100 species of zooplankton have been identified in the Alaskan Beaufort Sea:

- species that occur throughout the Arctic Basin;

- species that are swept into the area from the Bering and Chukchi seas;
- species that live in nearshore, less saline environments; and
- the larval forms of animals that live in the benthos (meroplankton) (USDOC, NOAA, 1978).

In a study of the eastern Beaufort Sea, Richardson (1986) found that copepods represented 87% of the individual zooplankters and 78% of the zooplankton wet-weight biomass. Zooplankton spread out over hundreds of kilometers in the eastern Beaufort Sea. Off Kaktovik, patches of zooplankton were more abundant in nearshore and inner shelf waters, and biomass was greater than in more offshore waters (Richardson, 1986).

Epontic communities consist of plants and animals living on or in the undersurface of sea ice. Microalgae in the ice are mainly pennate diatoms and microflagellates. Although approximately 200 diatom species have been identified from Arctic Sea ice, only a few species dominate. Microalgae are found in sea ice as it forms in the fall, but their origin is unknown (Horner and Schrader, 1981). They distribute, develop, and produce variably based on available light. Ice algae in Stefansson Sound were responsible for nearly all primary production during the winter and spring (Horner and Schrader, 1982). Schell and Horner (1981) estimated that their production was only about one-twentieth of the annual total nearshore. Dunton (1984) found that ice algae beneath clear ice contributed about 25% of the carbon produced in Stefansson Sound's Boulder Patch. The production of ice algae is key during early spring. They are food for animals living in or near ice (e.g., protozoans, copepods, nematodes, amphipods), in the water column, and on the bottom (Horner and Schrader, 1981).

## b. Benthic and Coastal Communities

The benthic and coastal communities in Alaska's Beaufort Sea contain macrophytic algae (large kelp), benthic microalgae and bacteria, and benthic invertebrates. Although the silty sediment in the Beaufort Sea does not suit most macrophytes, cobbles and boulders are suitable and do exist. The largest kelp community thus far described occurs in Stefansson Sound and is commonly known as the Boulder Patch (Map 1). For additional information concerning the flora and fauna of this area, see Dunton and Schonberg (1981, 2000); Dunton, Reimnitz, and Schonberg (1982); Dunton (1984); Martin and Gallaway (1994); and BPXA (1998a:4-15 to 4-20). The depended fauna include fish such as a local eelpout and *Liparis*, also known as the clingfish or leatherfin lumpsucker, but no widespread anadromous species such as salmon or the abundant arctic cisco (Dunton and Schell, 1987).

The densest part of the Boulder Patch is just west of the proposed Liberty site (Map 1 and Figure III.C-2). Other rocky beds, although smaller in size, occur near the Stockton Islands, Flaxman Island, and Demarcation Bay (Thorsteinson, 1983). The rocky area offshore of Kayutak near Flaxman Island was known as unusual by the Natives for many years (Jacobson and Wentworth, 1982). As explained in the Liberty Environmental Report (BPXA, 1998a), these Alaskan kelp beds are separated by hundreds of kilometers from the primary range of kelp in the Canadian Arctic. With few spatially limited exceptions, Stefansson Sound is unique along the Alaskan Beaufort Sea. It provides the necessary combination of rock substrate, depth sufficient to allow a 12- to 14-foot thick layer of free water under the ice during winter, and protection from extensive ice gouging by the offshore shoals and barrier islands.

The Boulder Patch was studied intensively during the late 1970's and early 1980's as part of the National Oceanic and Atmospheric Administration/Outer Continental Shelf Environmental Assessment Program. In addition, a refined delineation of the distribution for a portion of the Boulder Patch resulted from offshore oil and gas exploration in Stefansson Sound. The summer 1997 BPXA program of side-scan sonar surveys, complimented with ROV and diver observations, provided data that further refine the known distribution of this community in Stefansson Sound (Figure III.C-1).

As explained in the Liberty Environmental Report (BPXA, 1998a), a study initiated in 1984 determined the rates and diversity of faunal and floral recolonization. Two bare Flaxman boulders were deployed at each of three locations with varying densities of kelp, and were positioned away from neighboring boulders to reduce rapid recolonization by vegetative growth from bordering communities. Recolonization in 1986 and 1987 was considered negligible, although there was early episodic colonization dominated by species of polychaetes and algae. By 1988, some encrusting bryozoans and hydroids were evident at all sites. By 1989, one study boulder was inhabited by six species and, by 1990, this same boulder was colonized by soft coral.

Another example of recolonization was described during the MMS Arctic Kelp Workshop (USDOI, MMS, Alaska OCS Region, 1998a). One of the participants described the kelp that recolonized the slope-protection system at the old Northstar Island, which is several miles from the Boulder Patch. Concrete mats were placed around the island when it was constructed for exploration purposes in 1985. Small kelp plants were growing on the concrete mats near the surface within 8 years of when they were installed. The 8 years and the slow rate of recolonization on Flaxman boulders are similar time ranges to the 10 years that Martin and Gallaway (1994) estimate for kelp communities to colonize bare rock. For this reason, a recolonization time of 1 decade is used herein as the generation time for kelp communities in the Boulder Patch.

A recent survey showed that, even though some of the slope-protection mats on artificial islands were abandoned in place, the kelp did not survive. A recent post-abandonment survey revealed that essentially all of the mats are covered with gravel from the eroding top of the berm (Coastal Frontiers Corp., 2000). In contrast to the abandonment of the old Northstar Island, essentially all of the concrete mats were removed from Tern when it was abandoned. There have been no biological surveys of Tern, but the side slopes probably would be like the ones at Northstar—covered with eroding gravel and unsuitable for kelp. The gravel probably would be inhabited by typical fast-growing benthic organisms. Baseline studies of the Beaufort Sea coast, including Foggy Island Bay, showed that the abundant, fast-growing organisms included polychaete worms, amphipods, isopods, and bivalve mollusks (USDOC, NOAA, 1978:196).

The rocks of the Boulder Patch are widely scattered and range in size from pebbles to boulders. Boulders up to 2 meters across and 1 meter high exist, but most rocks are pebbles or cobbles. The boulders lie on the sediment surface in a layer that apparently is very thin, “no more than one boulder thick” (Dunton, Reimnitz, and Schonberg, 1982). Most of the Boulder Patch area has from no rock cover to less than 25% rock cover; however, several areas have more than 25% rock cover, and one has more than 50% (Martin and Gallaway, 1994). Water is 4-9 meters deep in the Boulder Patch. The rocks in this area have a layer of ice-free water (about 4 meters thick) that prevents ice from gouging them. This characteristic (and the presence of rocks for settlement) makes the benthic communities of the Boulder Patch much more abundant and diverse than elsewhere in Alaska’s Beaufort Sea. Large kelp, soft corals, sponges, snails, hydroids, sea anemones, bryozoans, chitons, sea stars, sea squirts, crabs, clams, and polychaete worms are among those found in the benthic environment of this area. The communities usually do not grow in water less than 4 meters deep because of sediment influx during breakup and groundfast ice in winter.

The brown alga, *Laminaria solidungula*, dominates the Boulder Patch’s kelp communities. During the winter (about 8 months), kelp communities normally receive only about 10% of the sun’s yearly energy input, but *L. solidungula* still completes nearly 90% of its yearly growth during this time by using food reserves stored during the summer. In years when they get more light (due to reduced ice cover), their growth can be 30-40% higher (with enough food reserves) (Dunton, 1990, as cited in Martin and Gallaway, 1994; Dunton et al., 2002:Figure 12). However, more light does not necessarily increase growth during the summer, because *L. solidungula* will not grow if the light is too strong. Approximately 98% of the carbon produced annually in the Boulder Patch comes from kelp and phytoplankton. Dunton (1984) estimates that benthic microalgae contribute about 2% of the annual carbon produced in the Boulder Patch.

During the MMS Arctic Kelp Workshop (USDOI, MMS, Alaska OCS Region, 1998a), a participant explained that there are records of kelp growth and light levels from 1984-1991. The growth from year to year varied considerably. If the ice was clear and the plants received even a small amount of light during the winter, they grew a fair amount. The growth during 1990 was exceptional, but 1988 was a really bad year for photosynthetic carbon fixation by kelp. No carbon was stored during 1988. That meant that during the following year, 1989, only small blades or fronds were formed.

During the workshop there was extensive discussion about suspended sediments that might reduce light levels (USDOI, MMS, Alaska OCS Region, 1998a). One participant described a study of the BF-37 gravel island near the outer edge of the Boulder Patch. The study showed that the slope-protection system on that island successfully limited the amount of sediment in the water column. The participant also explained, in response to a question about suspended sediment from natural barrier islands, that the islands are very old geologically and that the fine sediment has pretty much been winnowed away. The following year, an additional report, *Liberty Development: Construction Effects on Boulder Patch Kelp Production* (Ban et al., 1999) was prepared for BPXA to further quantify the effects of suspended sediments. The estimates in the report, that sediment from the Liberty Project would reduce annual kelp productivity by 2-4% per year during two consecutive growth years (Ban et al., 1999), are described further in Section III.C.3.e.

Other benthic and coastal invertebrates typically are divided into epifauna and infauna, based on their relationship with the bottom substrate. A description of these organisms and the general patterns of their distribution and abundance are in the final EIS’s for Sales 97, 124, and 144 (USDOI, MMS, 1987, 1990a, and 1996a, respectively); the final EIS for Sale 109 (USDOI, MMS, Alaska OCS Region, 1987); and in Thorsteinson (1983). Because landfast ice is present in winter and freshwater and sediment flow in after breakup, relatively few species are in nearshore waters less than 2 meters deep. Biomass and diversity generally increase with depth, except in the shear zone at 15-25 meters. A lot of ice gouging occurs in this zone between the landfast ice and the moving polar pack ice, which usually disturbs the sediments where infaunal organisms live. Polychaetes, bivalves, and gammarid amphipods dominate this area. The coastal lagoons of the Beaufort Sea support a nearshore benthic environment that many vertebrates use as a feeding ground in the late summer (Thorsteinson, 1983). Dominant benthic invertebrates include amphipods, mysids, copepods, and other motile crustaceans. They are food for some fishes, birds, and marine mammals (Envirosphere Company, 1985). Other invertebrates, such as bivalves, snails, crabs, and shrimp, are food for some marine mammals (for example, walruses and bearded and ringed seals [Frost and Lowry, 1983]). In general, the food habits of marine invertebrates vary depending on habitat, season, and preferences; but they typically rely on marine plants, other invertebrates, waste, and carrion.

The benthos near the Liberty site was studied during construction and monitoring of the Endicott causeway, and the results are summarized in BPXA's Environmental Report (BPXA, 1998a:4-15). The report explains that these studies identified 99 taxa of marine macrobenthos within southeastern Stefansson Sound seaward of the 2-meter isobath, which would correspond with the depth range of the Liberty pipeline corridor and island site. The report also notes that the faunal diversity was low and changed annually during the 5-year study, which was considered typical for shallow, ice-stressed benthic habitats in the Arctic.

Site-specific studies of the benthos in the proposed island site and pipeline corridors were conducted for BPXA by LGL and Coastal Frontiers Corporation, and the results of both studies were summarized by the principal investigators during an MMS Arctic Kelp Workshop in May 1998. They explained that there was a high degree of local variability in the benthos, as noted in the workshop Proceeding (USDOI, MMS, Alaska OCS Region, 1998a).

The effects on these resources from potential oil spills and disturbance from the proposed project are analyzed in Sections III.C.2.e and 3.e.

## 6. Fishes

Fishes inhabiting the Arctic must cope with harsh environmental conditions not required of their counterparts to the south (Figure VI. A-2). For example, during the 8- to 10-month winter period, freezing temperatures reduce their habitat by more than 95% (Craig, 1989). Food is very scarce during this time, and most of their yearly food supply must be acquired during the brief arctic summer (Craig, 1989). As a result, fishes inhabiting the Arctic grow slowly compared to those inhabiting warmer regions. Nevertheless, several types of fishes are year-round residents in the Arctic. They include:

- freshwater fishes that spend their entire life in freshwater (some also spend brief periods in brackish coastal waters);
- marine fishes that spend their entire life in marine waters (some also spend brief periods in brackish coastal waters); and
- migratory fishes that typically move between fresh, brackish, and marine waters for various purposes (some individual fishes do not migrate).

The freshwater environment of the Arctic Coastal Plain consists of slow-moving rivers and streams in addition to lakes, ponds, and a maze of interconnecting channels. Some waterbodies are completely isolated; however, most are permanently, seasonally, or sporadically connected. Seasonally connected lakes are flooded during breakup, while sporadically connected lakes are flooded only during high-water years (Parametrix, Inc., 1996). Many of these waters support freshwater and migratory fish populations. At least 20 species of fishes have been collected in or near the Colville drainage system to the west (11 freshwater and 9 migratory species) (Moulton and Carpenter, 1986; Bendock, 1997). The distribution and abundance of freshwater and migratory fishes on the Arctic Coastal Plain depend on (1) adequate overwintering areas, (2) suitable feeding and spawning areas, and (3) access to these areas (typically provided by a network of interconnecting waterways) (Parametrix, Inc., 1996). Studies on the Sagavanirktok River have shown that different fishes dominate at different times of the year:

- Summer: arctic grayling, round whitefish, Dolly Varden char (also called arctic char), broad whitefish, and slimy sculpin (Hemming, 1988; Woodward-Clyde Consultants, 1980)
- March: broad and humpback whitefish, arctic grayling, round whitefish, burbot, and slimy sculpin in the lower part of the river
- April: broad and humpback whitefish, arctic and least cisco, arctic grayling, round whitefish, burbot, and slimy sculpin
- May: broad whitefish, arctic and least cisco, arctic grayling, round whitefish, and burbot (Craig, 1989)

In winter, bodies of freshwater less than 6 feet deep are frozen to the bottom (Craig, 1989). In deeper waters that do not freeze to the bottom, the amount of dissolved oxygen is of critical importance. Flowing waters exceeding 7-10 feet in depth (depending on water velocity) generally are considered deep enough to support overwintering fishes. However, in standing waters the ice becomes thicker, and dissolved oxygen becomes less available as the winter progresses. In such cases, depths of up to 18 feet have been suggested as being the minimum required to support overwintering freshwater fishes (USDOI, BLM, 1990).

The marine coastal environment of the Beaufort Sea consists of inlets, lagoons, bars, and numerous mudflats (USDOI, BLM, 1978a). During the open-water season, the nearshore zone of this area is dominated by a band of relatively warm, brackish water that extends across the entire Beaufort Sea coast. The summer distribution and abundance of coastal fishes (marine and migratory species) is strongly affected by this band of brackish water. The band typically extends 1-6 miles offshore and contains more abundant food resources than waters farther offshore. It is formed after breakup by freshwater input from rivers such as the Colville and Sagavanirktok. It has its greatest extent off river-delta areas, with a plume sometimes extending 15 miles offshore. During the open-water season, migratory fishes tend to concentrate in the nearshore area, which is used also by marine fishes and occasionally by some freshwater fishes. Migratory fishes acquire nearly all of their yearly food supplies during the brief open-water season. The areas of greatest species diversity within the nearshore zone are the river deltas (Bendock, 1997). Sixty-two species of fish have been collected from the coastal waters of the Alaskan Beaufort Sea (69% marine, 26% migratory, 5% freshwater). All (except salmon) are typical of fishes resident to arctic coastal waters from Siberia to Canada (Craig, 1984). Thirty-seven species were collected in the warmer nearshore brackish waters, and 40 species were collected in the colder marine waters farther offshore (some use both habitats). As the summer progresses, the amount of freshwater entering the nearshore zone decreases, and nearshore waters become colder and more saline. From late summer to fall, migratory fishes move back into rivers and lakes to overwinter and to spawn (if sexually mature). In winter, nearshore waters less than 6 feet deep freeze to the bottom. Before they freeze, marine fishes continue to use the nearshore area under the ice but eventually move into deeper offshore waters, when the ice freezes to the bottom (Craig, 1984).

Subsistence fishermen harvest freshwater, marine, and anadromous fish in the area at differing times of the year, although the majority are harvested in summer. For example, summer fishing for whitefish occurs all around the Shaviovik River Delta, and Tom cod, sculpin, ling cod, flounder, and other marine species are taken in the Foggy Island area (North Slope Borough, Commission on History and Culture, 1980). In spring, subsistence fishermen harvest arctic char as they migrate to sea and later in summer, as the char move about in nearshore waters. In fall, large migrations of whitefish and lake trout are fished along the Beaufort Sea shoreline in less than 3 feet of water. Changes in fish populations have been observed by Wilson Soplu, a subsistence fisherman, who noted that fish populations in the Shaviovik River have changed from many small fish to fewer large fish (North Slope Borough, Commission on History and Culture, 1980). For additional information concerning subsistence fishing and those harvesting fish, see Section VI.B.1.

## a. Freshwater Fishes

Freshwater fishes inhabit many of the rivers, streams, lakes, and ponds landward of the Liberty area. They include lake trout, arctic grayling, Alaska blackfish, northern pike, longnose sucker, round whitefish, burbot, ninespine stickleback, slimy sculpin, arctic lamprey, and threespine stickleback (rare). Freshwater fishes are found almost exclusively in freshwater (Moulton and Carpenter, 1986). Those with access to rivers, such as the Colville and Sagavanirktok (for example, arctic grayling), are sometimes found in the nearshore band of brackish coastal water described earlier. All of the above freshwater species have been collected near the mouth of the Colville River during summer (USDOI, BLM, 1978a); however, their presence in the coastal environment is sporadic and brief, with a peak occurrence expected during or immediately following spring breakup.

Many of the streams on the Arctic Coastal Plain serve as interconnecting links to the many lakes in the area (Bendock, 1997). Some waters are used primarily as nursery areas, others for feeding, others for spawning and/or overwintering, and others as corridors linking these areas together. Juvenile fishes prefer the warmer shallow-water habitats that become available during the ice-out period (Hemming, Weber, and Winters, 1989). The most abundant freshwater fish is the ninespine stickleback (Hemming, 1996). The highest numbers are found in waters having emergent and submerged vegetation suitable for spawning and rearing, with overwintering sites nearby (Hemming, 1993). In streams, the most common freshwater fishes include arctic grayling, ninespine stickleback, and slimy sculpin (Netsch et al., 1977; Bendock and Burr, 1984). In lakes, the most common freshwater fishes include lake trout, arctic grayling, round whitefish, and burbot. Older lake fishes usually are dominant. In general, the larger, deeper, clearer lakes with outlets and suitable spawning areas are more likely to support fish. Smaller lakes that are more shallow and turbid, without outlets or suitable spawning areas, are not likely to support fish (Netsch et al., 1977; USDOI, BLM, 1978a). Bodies of freshwater less than 6 feet deep generally do not have resident fish populations, although some may be used during summer for feeding, rearing, or as access corridors to other waters.

Freshwater fishes feed on terrestrial and aquatic insects and their larvae, zooplankton, clams, snails, fish eggs, and small fishes (Bendock and Burr, 1984; USDOI, BLM, 1978a; Hemming, Weber, and Winters, 1989). Lake trout and burbot are reported to forage heavily on least cisco, round whitefish, grayling, and particularly on slimy sculpin and ninespine stickleback. Lake trout also have been reported to feed on voles (USDOI, BLM, 1978b) and burbot on Arctic lamprey (Bendock and Burr, 1984). Except for burbot, which spawns under ice in late winter, freshwater fishes spawn from early spring to early fall in suitable gravel or rubble. With the onset of winter, freshwater fishes move into the deeper areas of lakes, rivers, and streams.

The Kadleroshilik River supports only small numbers of ninespine stickleback, Dolly Varden (a migratory species), and arctic grayling (Hemming, 1996). Neither spawning nor overwintering are believed to occur in the river or near the proposed Kadleroshilik River mine site. Small runs of pink and chum salmon (anadromous species) sometimes occur in the Colville River, and in some of the drainages west of the Colville River; however, neither species has established populations anywhere on the North Slope (Bendock and Burr, 1984).

## b. Marine Fishes

Both marine and migratory fishes inhabit coastal waters. Marine fishes include arctic cod, saffron cod, twohorn (uncommon) and fourhorn sculpins, Canadian eelpout, arctic flounder, capelin, Pacific herring (uncommon), Pacific sand lance (uncommon), and snailfish (Craig, 1984; Moulton and Carpenter, 1986). Marine fishes prefer the colder, more saline coastal water seaward of the nearshore brackish-water zone described earlier. As summer progresses, the nearshore zone becomes more saline due to decreased freshwater input from rivers and streams. During this time, marine fishes often share this same nearshore environment with migratory fishes, primarily to feed on the abundant epibenthic fauna or to spawn (Craig, 1984). In the fall, when migratory fishes have moved out of the nearshore area and into freshwater systems to spawn and overwinter, marine fishes remain in the nearshore area to feed.

Common marine fishes in the nearshore area include fourhorn sculpin and capelin (Schmidt, McMillan, and Gallaway, 1989; Thorsteinson, Jarvela, and Hale, 1991). Saffron cod, arctic flounder, and snailfish also use the nearshore area; however, their occurrence is sporadic and variable and in much lower numbers. Common marine fishes in waters farther offshore include arctic cod and kelp snailfish (Craig, 1984; Schmidt, McMillan, and Gallaway, 1989; Thorsteinson, Jarvela, and Hale, 1991). Arctic cod are infrequent visitors to nearshore habitats during the first portion of the open-water season when waters are warmest and salinities are low (Craig et al. 1982). Arctic cod have been found to be more concentrated along the interface between the warmer nearshore water and colder marine water. The warmer nearshore zone with its more moderate salinity is thought to be an essential nursery area for juvenile arctic cod (Cannon, Glass, and Prewitt, 1991). Nevertheless, adults and juveniles are abundant in both nearshore and offshore waters, and contribute significantly to productivity in arctic coastal waters. Because of the significant contribution they make to the diets of marine mammals, birds, and other fishes, arctic cod have been described as a “key species in the ecosystem of the Arctic Ocean” (Craig, 1984). They are believed to be the most significant consumer of secondary production in the Alaskan Beaufort Sea (Frost and Lowry, 1983) and even to influence the distribution and movements of marine mammals and seabirds (Craig, 1984, citing Finley and Gibb, 1982).

Marine fishes in the area primarily feed on marine invertebrates. They rely heavily on epibenthic and planktonic crustacea such as amphipods, mysids, isopods, and copepods. Flounders also feed heavily on bivalve mollusks, while fourhorn sculpins supplement their diets with juvenile arctic cod. Because the feeding habits of marine fishes are similar to those of migratory fishes (amphidromous and anadromous species), some marine fishes are believed to compete with migratory fishes for the same prey resources (Craig, 1984; Fechhelm et al., 1996). Competition is most likely to occur in the nearshore brackish-water zone, particularly in or near the larger river deltas, such as the Colville and the Sagavanirktok. As the nearshore ice thickens in winter, marine fishes continue to feed under the ice but eventually leave as the ice freezes to the bottom some 6 feet thick. Seaward of the bottomfast ice, marine fishes continue to feed and reproduce in nearshore waters all winter (Craig, 1984). Most spawn during the winter, some in shallow coastal waters, and others in offshore waters. Arctic cod spawn under the ice between November and February (Craig and Haldorson, 1981). Snailfish spawn farther offshore by attaching their adhesive eggs to a rock or kelp substrate.

## c. Migratory Fishes

The members of this group commonly are referred to as anadromous fishes. They are born and reared in freshwater, migrate to sea as juveniles, and return to freshwater as adults to spawn and die. Migratory fishes indigenous to the arctic environment (amphidromous species) differ substantially from migratory fishes inhabiting warmer waters to the south (anadromous species). Amphidromous fishes live much longer, grow much slower, and become sexually mature much later in life. Additionally, they do not make one far-ranging ocean migration and return years later to freshwater to spawn and die like anadromous fishes (for example, salmon). Instead, they make many migrations between freshwater and the sea for purposes other than just spawning. Unlike anadromous fishes, amphidromous fishes spend much more time in brackish coastal waters than they do in marine waters. Additionally, they return to freshwater to overwinter, not necessarily to spawn. In fact, amphidromous fishes typically return many times to freshwater before reaching spawning age. Even after reaching spawning age, spawning occurs only if their nutritional requirements were met during the brief arctic summer. When they do spawn, they do not necessarily die; some return years later to spawn again before dying. Despite these major differences, the term amphidromous is seldom used when referring to the indigenous migratory fishes of the arctic environment (Craig, 1989). For this reason and because the term anadromous is misleading, this review simply refers to this group of mostly amphidromous species as migratory fishes.

Migratory fishes inhabit many of the lakes, rivers, streams, interconnecting channels, and coastal waters. They include arctic cisco, least cisco, Bering cisco, rainbow smelt, humpback whitefish, broad whitefish, Dolly Varden char (formerly known as arctic char), and inconnu. The highest concentration and diversity of migratory fishes in the area occurs in river-delta areas, such as the Colville and the Sagavanirktok (Bendock, 1997). Small runs of pink and chum salmon (anadromous species) sometimes occur from the Colville River west; however, neither species has established populations anywhere in the area (Bendock and Burr, 1984). While the occurrence of salmon east of the Colville River is rare, small numbers of pink salmon have been taken in the Sagavanirktok River; however, spawning is not known to have occurred there (Fechhelm and

Griffiths, 2001, citing Griffiths et al. 1983). The most common migratory fishes in nearshore waters are arctic and least cisco (Craig, 1984). Lakes that are accessible to migratory fishes typically are inhabited by them as well as the resident freshwater fishes. Least cisco is the most abundant migratory fishes found in these lakes.

With the first signs of spring breakup (typically June 5-20), adult migratory fishes (and the juveniles of some species) move out of freshwater rivers and streams and into the brackish coastal waters nearshore. They disperse in waves parallel to shore, each wave lasting a few weeks or so. Some disperse widely from their streams of origin (for example, arctic cisco and some Dolly Varden char). Others, like broad and humpback whitefish and least cisco, do not; and they are seldom found anywhere but near the mainland shore (Craig, 1984). Most migratory fishes initiate relatively long and complex annual migrations to and from coastal waters (Bendock, 1997). However, some populations of Dolly Varden char, least cisco, and broad and humpback whitefish never leave freshwater (Craig, 1989). Many believe that arctic cisco in the Colville River area originated from spawning stocks of the Mackenzie River in Canada (Gallaway et al., 1983; Fechhelm and Fissel, 1988; Fechhelm and Griffiths, 1990). There are reports from fishermen that arctic cisco in spawning condition have been caught in at least the upper Colville and Chipp rivers (Moulton, Fawcett, and Carpenter, 1985, citing W. Matumeak, 1984, pers. commun.). However, the scientific evidence is overwhelming that the vast majority of the arctic cisco inhabiting the Alaskan Beaufort Sea were carried there from Canada by westerly currents.

During the 3- to 4-month open-water season that follows spring breakup, migratory fishes accumulate energy reserves for overwintering and, if sexually mature, they spawn. They prefer the nearshore brackish-water zone, rather than the colder, more saline waters farther offshore. While their prey is concentrated in the nearshore zone, their preference for this area is believed to be more correlated with its warmer temperature (Craig, 1989; Fechhelm et al., 1993). Migratory fishes are more abundant along the mainland and island shorelines, but they also inhabit the central waters of bays and lagoons. Larger fishes of the same species are more tolerant of colder water (e.g., Dolly Varden char and arctic and least ciscoes) and range farther offshore (Moulton, Fawcett, and Carpenter, 1985; Thorsteinson, Jarvela, and Hale, 1991). Smaller fishes are more abundant in warmer, nearshore waters and the small, freshwater streams draining into the Beaufort Sea (Hemming, 1993).

Infaunal prey density in the nearshore substrate is very low and provides little to no food for migratory fishes. However, prey density in the nearshore water column is high, about five times that of freshwater habitats on the Arctic Coastal Plain. The nearshore feeding area also is much larger than that of freshwater habitats on the coastal plain (Craig, 1989). For these reasons, both marine and migratory fishes come to feed on the relatively abundant prey found in nearshore waters during summer. Migratory fishes feed on epibenthic mysids and amphipods (often greater than 90% of their diet) and on copepods, fishes, and insect larvae (Craig and Haldorson, 1981; Craig et al., 1984; Craig, 1989). In early to midsummer when migratory fishes are most abundant in nearshore waters, little dietary overlap is observed among them. However, in late summer when they are less abundant and their prey is more abundant, dietary overlap is common in nearshore waters (Moulton, Fawcett, and Carpenter, 1985). Marine birds also compete for the same food resources during this time. Migratory fishes do little to no feeding during their migration back to freshwater and when spawning, but some resume feeding during winter. Most migratory fishes return to freshwater habitats in the late summer or fall to overwinter and, if sexually mature, to spawn. Others, such as cisco and whitefish, return much earlier, arriving 6-10 weeks before spawning starts, thus forfeiting about half of the nearshore-feeding period (Craig, 1989). Char, ciscoes, and whitefish spawn in streambed gravels in fall in the Sagavanirktok River. Spawning in the arctic environment can take place only where there is an ample supply of oxygenated water during winter. Because of this and the fact that few potential spawning sites can meet this requirement, spawning often takes place in or near the same area where fishes overwinter (Craig, 1989).

## 7. Vegetation-Wetland Habitats

Detailed information on vegetation of the central Arctic Coastal Plain, including the Prudhoe Bay oil fields and the Liberty area, is available in Walker and Acevedo (1987) (U. S. Geological Survey Beechey Point Quadrangle, vegetation and land cover series L-0211). The authors produced comprehensive vegetation maps and reports that not only describe the area's vegetation but also provide techniques to show the changes over time resulting from oil-field development.

Sedge, grasses, and shrubs dominate the vegetation classes. Water sedge (*Carex aquatilis*) is the dominant species in the wet tundra class, in both of the flooded tundra classes, and in the one aquatic class that bears its name. Pendant grass, *Arctophila fulva*, dominates the other aquatic class. *Eriophorum vaginatum*, commonly called tussock cotton grass, dominates the tussock tundra class.

Common shrub species include mountain alder (*Alnus crispa*); dwarf birch (*Betula nana*); four-angled mountain heather (*Cassiope tetragona*); crowberry (*Empetrum nigrum*); *Ledum palustre;* cloudberry (*Rubus chamaemorus*); bog blueberry (*Vaccinium uliginosum*); lingonberry (*Vaccinium vitis-idaea*); and species of the genera *Andromeda*, *Arctostaphylos*, *Dryas*, and willow (*Salix*). *Salix* and, to a much lesser extent, *Alnus,* are the dominant species of the low and tall shrub classes. Except for *Betula*, all are dwarf shrubs.

The four dominant types of plant cover next to Foggy Island Bay and the Liberty area (Walker and Acevedo, 1987) are:

- Open-water and pond complexes having more than about 40% open water with aquatic grass tundra (about 70% of the land cover).
- Wet herbaceous tundra dominated by wet-sedge (*Carex*) and cotton-grass species (*Eriophorum*). It has little permanent water or up to 40% water-covered ground or 30% moist herbaceous tundra that includes wet coastal areas periodically flooded with saltwater (about 13% of the total land cover).
- Moist or dry tundra dominated by dwarf shrubs such as willow (*Salix*), lichens, and forbs.
- Barren areas along major streams composed of 60% barren peat, mineral soil, or gravel. These areas may have patches with sparse cover of forbs and dwarf shrubs.

Liberty's onshore area has large expanses of moist sedge (*Carex* and *Eriophorum* spp.) and willow dwarf shrub (*Salix* spp.) (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998). The area's coast includes eroding bluffs, sandy beaches alternating with lower tundra areas having some saltwater intrusions, sand dunes, sandy spits, and estuarine areas at the mouths of streams (LGL Alaska Research, Woodward-Clyde, and Applied Sociocultural Research, 1998). Deltas of the Sagavanirktok, Kadleroshilik, and Shaviovik rivers support a complex mix of wet arctic saltmarsh; dry coastal barrens; salt-killed tundra; typical moist and wet tundra; and dry, partially vegetated gravel bars.

In freshwater wetlands, high abundances of invertebrate populations correlate strongly with the presence of emerging water sedge (*Carex*) and pendant grass (*Arctophila*) (Bergman et al., 1977).

The vegetation at the proposed Liberty pipeline junction site with the Badami pipeline primarily is low polygons with *Carex aquatilis* dominant in basins, *Eriophorum angustifolium* prevalent in troughs, and *Salix planifolia* spp. *Pulchra domiant* dominant on rims with cover-classification category wet sedge/moist sedge, dwarf shrub tundra complex present (Noel and McKendrick, 2000). The shoreline landing for the proposed Liberty pipeline is moist/wet high centered polygons with deep troughs. The vegetation is predominantly *Eriophorum angustifolium, Carex aquatilis, Salix reticulata, Salix planifolia* spp. *Pulchra,* and *Vaccimium vitis-idaea* with cover-classification category moist sedge, dwarf shrub tundra present (Noel and McKendrick, 2000).

Seventy vascular plant species were found at the proposed gravel mine site on the Kadleroshilik River (Noel and McKendrick, 2000). Five wetland plant communities were identified at the gravel bar site corresponding to age of habitat since deposition, a gradation of fine soil accumulation, and soil wetness. Ten land-cover classes were identified (Figure II.A-7b). The youngest habitat on the gravel bar is sparsely vegetated with *Artemisia glomerata* the dominant plant with cover-classification categories river gravel and dry barren/forb complex present . The next youngest habitat was dominated by *Salix ovallifolia* with cover-classification category dry dwarf shrub, crustose lichen tundra and dry barren/dwarf shrub, forb grass complex present. The vegetation cover in this community has been heavily grazed by caribou and muskoxen (Noel and McKendrick, 2000). The *Salix ovalifolia* community is replaced by *Dryas integrifolia* on the next older habitat plant with cover-classification categories dry dwarf shrub, crustose lichen tundra and dry barren/dwarf shrub, forb grass complex present. *Carex aquatilis* dominates the oldest community on the gravel bar with cover classification categories wet sedge tundra, moist sedge, dwarf shrub tundra, and dry dwarf, crustose lichen tundra present. Grasses dominate a community composed of *Poa arctica, Bromus pumpellianus, Agropyron macrourum, Deschampsia caespitosa, Trisetum spicatum, Artemisia tilesii, Epilobium latifolia,* and *Lupinus arcticus* which is associated with an area of wind-deposited sands/silts. This community contains about 30-50% cover and is classified as dry barren/dwarf shrub, grass complex (Noel and McKendrick, 2000).

# 8. Essential Fish Habitat

## a. Magnuson Fishery Conservation and Management Act

The Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801-1882) established and delineated an area from the State's seaward boundary out 200 nautical miles as a fisheries conservation zone for the United States and its possessions. The Act established national standards for fishery conservation and management, and created eight Regional Fishery Management Councils to apply those national standards in fishery management plans. Congress amended and reauthorized the Magnuson Act through passage of the Sustainable Fisheries Act of 1996. The reauthorization implements a number of reforms and changes. The Act, as amended, requires a fishery management plan to be based on the best available scientific and economic data for each commercial species (or related group of species) of fish that is in need of conservation and management within each respective region.

Another provision requires that Fishery Management Councils identify and protect essential fish habitat for every species managed by a fishery management plan (50 CFR 600). The essential fish habitat is defined as the water and substrate necessary for fish spawning, breeding, feeding, and growth to maturity. Section 600.10 defines "waters" as aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate. "Substrate" is the sediment, hard bottom, and structures underlying the waters and associated biological communities. The act also requires Federal Agencies to consult on activities that may adversely affect essential fish habitats designated in the fishery management plans. An adverse effect is "…any impact which reduces the quality or quantity of EFH." The activities may have direct (for example, physical disruption) or indirect (for example, loss of prey species) effects on essential fish habitats and be site-specific or habitatwide. Loss of prey is considered an adverse effect on essential fish habitat, because one component of the essential fish habitat is that it be necessary for feeding. The adverse effects must be evaluated individually and cumulatively.

## b. Essential Fish Habitat

Five fishery management plans exist for fisheries in Alaska. They cover groundfish in the Gulf of Alaska, groundfish and crabs in the Bering Sea and Aleutian Islands, and salmon and scallops Statewide. Five species of salmon are covered under the fishery management plan for salmon in Alaskan waters, including king (chinook) salmon, red (sockeye) salmon, silver (coho) salmon, chum (dog) salmon, and pink (humpbacked) salmon. Of the fishery management plans for Alaskan fisheries, only the plan for salmon designates essential fish habitat in the Beaufort Sea (Amendment 5). Essential fish habitat for salmon was defined as "…the aquatic habitat, both freshwater and marine, necessary to allow for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to healthy ecosystems." In Alaska, essential fish habitat for salmon was defined as: (1) "…all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon…" and (2) "…all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. EEZ."

Essential fish habitat for salmon in marine areas was limited to include only the subset of habitat to a depth of 500 meters. Essential fish habitat was defined for six stages of salmon life history:

- eggs and larvae,
- juveniles in freshwater,
- juveniles in the estuary,
- juveniles before their first winter in the marine environment,
- immature and maturing adults in the marine environment, and
- adults in freshwater.

Habitat Areas of Particular Concern have been recognized for salmon in Alaska. These include, all anadromous streams, lakes and other freshwater areas used by salmon, and nearshore marine and estuarine habitats such as eelgrass beds, submerged aquatic vegetation, emergent vegetated wetlands, and certain intertidal zones. Although it is possible that all five species of salmon that live in Alaskan waters could be found in the Beaufort Sea, there are no commercial salmon fisheries there. Only pink salmon appear to be present in the Liberty area in sufficient numbers to permit small (0-1.5 kilograms/year/person) subsistence fisheries for residents of Nuiqsut and Kaktovik (State of Alaska, Dept. of Fish and Game, 1998). Although chum salmon are believed to be present in the Liberty area, in recent years, they appear to be little used for subsistence purposes by those villages.

## c. Analysis of Possible Effects

The proposed action is the development of the Liberty Prospect by BPXA for purposes of producing oil with associated transportation to U.S. and world markets. The project is fully described in Sections I and II.

Analyses of the effects, including cumulative effects, of the proposed action and its alternatives on salmon, salmon habitat, and associated species, including potential prey species, is given in various sections of this document; see also Table I-2.

We note that in any evaluation of the effect of an action on the condition of an important resource, it is critical to have some standard against which to judge the effect of the action on the resource in question. In this sense, the analysis of essential fish habitat for salmon in the Beaufort Sea appears to lead to a contradiction. In Amendment 5 to the Fishery Management Plan for the Salmon Fisheries in the Exclusive Economic Zone off the Coast of Alaska, essential fish habitat is said to consist of "…the aquatic habitat … necessary to allow for salmon production needed to support a long-term sustainable fishery and salmon contributions to healthy ecosystems." An adverse effect, as defined by 50 CFR 600.910, is "any impact which reduces the quality or quantity of EFH." Because of this linkage, confusion could exist when judging if a development could have an adverse affect on essential fish habitat (essential fish habitat constituting the habitat necessary to support viable populations and sustained commercial fisheries), when there are no commercial fisheries and salmon are rare and do not reproduce in the area affected by the development.

Therefore, for purposes of evaluating the effects of Liberty-related development on essential fish habitat, to be judged an adverse effect, the effect need only have the potential to be adverse, in the sense that the quality or quantity of potential habitat, including potential prey, for salmon could be diminished, assuming that salmon actually occupied the habitat under consideration (which they do not).

### d. Mitigation of Impacts to Salmon Essential Fish Habitat

In Amendment 5 to the Fishery Management Plan for the Salmon Fisheries in the Exclusive Economic Zone off the Coast of Alaska, recommendations are listed for mitigation to be undertaken during development activities to minimize adverse effects on essential fish habitat. The recommendations relevant to Liberty include: (1) assess cumulative effects of oil and gas production, (2) minimize disposal or dumping of dredge spoils and drilling muds, and (3) minimize deposition of fill in wetlands. Liberty's contribution to the cumulative effects of development in the Beaufort Sea area is discussed in Section V. Implementation of measures to minimize these and other actions is discussed in Section I.H.6 and summarized in Tables I-2 and I-3. Potential alternatives would not substantially change the effect of the proposed action on essential fish habitat. These alternatives are described in Section II.C and are analyzed in Section IV.

# B. SOCIAL ENVIRONMENT

There are six categories that describe the existing social environment and past MMS leasing:

- Subsistence-Harvest Patterns
- Sociocultural Systems
- Archaeological Resources
- Economy
- Land Use Plans and Coastal Management Programs
- Brief History of Leasing and Drilling in the Area

## 1. Subsistence-Harvest Patterns

### a. Subsistence-Harvest Areas

#### (1) A Definition of Subsistence

Generally, subsistence is considered hunting, fishing, and gathering for the primary purpose of acquiring food. The Alaska National Interest Land Conservation Act defines subsistence as the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade (16 U.S.C. § 3113). The North Slope Borough Municipal Code defines subsistence as an activity performed in support of the basic beliefs and nutritional needs of the residents of the borough and includes hunting, whaling, fishing, trapping, camping, food gathering, and other traditional and cultural activities (North Slope Borough Municipal Code 19.20.020 (67)). As a lifeway for Native Alaskans, subsistence is more than the harvesting, processing, sharing, and trading of marine and land mammals, fish, and plants. Subsistence should be understood to embody cultural, social, and spiritual values that are the essence of Alaskan Native cultures (Bryner, 1995; State of Alaska, Dept. of Natural Resources, 1997).

#### (2) Nuiqsut Harvest Areas

Specific harvest areas for wildfowl, caribou, moose, fish, whales, and seals for Nuiqsut are shown in Map 9. The Inupiat community of Nuiqsut has subsistence-harvest areas in and adjacent to the Liberty Project area. However, most sources indicate that the project area is not visited regularly by Nuiqsut subsistence hunters primarily because of its distance from the community. Seaward of the project area, at Cross Island, is a crucially important region for Nuiqsut subsistence bowhead whale hunting. Cross Island, Nuiqsut's principal staging area for subsistence whale hunting, is a barrier island 20 miles northwest of the gravel island proposed for Liberty development in Foggy Island Bay. Before oil development at Prudhoe Bay, the onshore area from the Colville River Delta in the west to Flaxman Island in the east and inland to the foothills of the Brooks Range (especially up the drainages of the Colville, Itkillik, and Kuparuk rivers) was historically important to Nuiqsut for the subsistence harvests of caribou, waterfowl, furbearers, fish, and polar bears. Offshore, in addition to bowhead whale hunting, seals historically were hunted as far east as Flaxman Island. Commercial whaling near and within the barrier islands during the late 1800's has been documented (Thomas P. Brower, as cited in North Slope Borough, Commission on History and Culture,1980). Bowheads also have been observed inshore of the barrier islands, and recent mention has been made of the area being used as a whale feeding area (V. Nauwigewauk, as cited in Shapiro, Metzner, and Toovak, 1979; Isaac Akootchook, as cited in USDOI, MMS, 1979a; Thomas P. Brower, as cited in North Slope Borough, Commission on History and Culture, 1980; Frank Long, Jr., as cited in Dames and Moore, 1996c; Burton Rexford, as cited in USDOI, MMS, 1996d; and Isaac Nukapigak, as cited in USDOI, MMS, Alaska OCS Region, 1998b).

#### (3) Kaktovik Subsistence Areas

In the past, Kaktovik's area for subsistence harvests extended onshore as far west as Prudhoe Bay and offshore as far west as Tigvariak Island. Recent Kaktovik subsistence activity does not take place this far west, but some of the preferred species—bearded seal (ugruk) and, to a lesser extent, beluga whale—pass through the area potentially affected by Liberty development.

### (4) Barrow Subsistence Areas

Historically, Barrow's subsistence harvest areas do not extend this far east, ending for the most part at the Colville River Delta. More extensive descriptions of community harvest patterns for these communities can be found in the Beaufort Sea Sale 144 Final EIS (USDOI, MMS, 1996a), the Beaufort Sea Planning Area Oil and Gas Lease Sale 170 Final EIS (USDOI, MMS, 1998), the Northeast National Petroleum Reserve-Alaska Draft Integrated Activity Plan/EIS (USDOI, Bureau of Land Management and MMS, 1997), and the Beaufort Sea Oil and Gas Development/ Northstar Project Draft EIS (U.S. Army Corps of Engineers, 1998).

## b. General Discussion of Subsistence and Harvest Patterns

### (1) The Cultural Importance of Subsistence

Subsistence activities are assigned the highest cultural values by the Inupiat and provide a sense of identity as well as being an important economic pursuit. Many species are important for the role they play in the annual cycle of subsistence-resource harvests, yet effects on subsistence can be serious, even if the net quantity of available food does not decline. Subsistence resources provide more than dietary benefits. They also provide materials for personal and family use, and the sharing of resources helps maintain traditional Inupiat family organization. Subsistence resources also provide special foods for religious and social occasions; the most important ceremony, Nalukataq, celebrates the bowhead whale harvest. The sharing, trading, and bartering of subsistence foods structures relationships among communities, while at the same time the giving of such foods helps maintain ties with family members elsewhere in Alaska.

### (2) Annual Cycle of Harvest Activities

Annual subsistence cycles for Nuiqsut are described in Figure VI.B-1. Full-time wage employment has affected the subsistence hunt positively by providing cash for snowmachines, boats, motors, and fuel—important tools for the hunt. On the other hand, full-time employment limits the time a subsistence hunter can spend hunting to after work hours. During winter, this time window is further limited by waning daylight. In summer, extensive hunting and fishing activities can be pursued after work without any light limitation.

### (3) Community Subsistence-Harvest Patterns

Two major subsistence-resource categories occur on the North Slope: the coastal/marine and the terrestrial/aquatic. In the coastal/marine group, the food resources harvested are whales, seals, walrus, waterfowl, and fish. In the terrestrial/aquatic group, the resources sought are caribou, freshwater fish, moose, Dall sheep, grizzly bear, edible roots and berries, and furbearers. Generally, communities harvest resources most available to them, and harvests tend to be concentrated near communities, along rivers and coastlines, and at particularly productive sites. The distribution, migration, and the seasonal and more extended cyclical variation of animal populations make determining what, where, and when a subsistence resource will be harvested a complex choice. Many areas might be used infrequently, but they can be quite important harvest areas when they are used (USDOI, Bureau of Land Management, 1978c).

Use by a village of any particular species can vary greatly over time, and data from short-term harvest surveys often can lead to a misinterpretation of use/harvest trends. For example, if a particular village did not harvest any bowhead whales in one year, obviously their use of whales would go down; consequently, consumption and use of caribou and other species likely would go up—in absolute and percent terms. If caribou were not available one winter, other terrestrial species could be hunted with greater intensity. The subsistence harvest of vegetation by communities adjacent to the project area is limited, while the harvest of faunal resources, such as marine and terrestrial mammals and fish, is heavily emphasized. The total spectrum of available resources in the arctic region is limited when compared with more southerly regions.

While subsistence-resource harvests differ from community to community, the resource combination of caribou, bowhead whales, and fish was identified as being the primary grouping of resources harvested. Caribou is the most important overall subsistence resource in terms of effort spent hunting, quantity of meat harvested, and quantity of meat consumed. The bowhead whale is the preferred meat and the subsistence resource of primary importance, because it provides a unique and powerful cultural basis for sharing and community cooperation (Stoker, 1984, as cited by Alaska Consultants, Inc. [ACI], Courtnage, and Braund, 1984). In fact, the bowhead could be said to be the foundation of the sociocultural system. Depending on the community, fish is the second or third most important resource after caribou and bowhead whales. Bearded seals and various types of birds also are considered primary subsistence species. Waterfowl are particularly important during the spring, when they provide variety to the subsistence diet. In the late 1970's, when bowhead whale quotas were low and the Western Arctic Herd (caribou) crashed (and the Alaska Board of Game placed bag limits on them), hunters turned to bearded seals (ugruk), ducks, geese, and fish to supplant the subsistence diet. Seal oil from bearded seals is an important staple and a necessary complement to other subsistence foods.

The subsistence pursuit of bowhead whales has major importance to the communities of Barrow, Nuiqsut, and Kaktovik and continues today to be the most valued activity in the subsistence economy of these communities. This is true even in light of harvest constraints imposed by quotas of the International Whaling Commission; relatively plentiful supplies of other resources such as caribou, fish, and other subsistence foods; and supplies of retail grocery foods. Whaling traditions include kinship-based crews, use of skin boats (only in Barrow for their spring whale-hunting season), distribution of the meat, and total community participation and sharing. In spite of the rising cash income, these traditions remain as central values and activities for all Inupiat in these North Slope communities. Bowhead whale hunting strengthens family and community ties and the sense of a common Inupiaq heritage, culture, and way of life. In this way, whale-hunting activities provide strength, purpose, and unity in the face of rapid change. In terms of the whale harvest, Barrow is the only community within the area that harvests whales in both the spring and the fall. Nuiqsut and Kaktovik residents hunt bowheads only during the fall whaling season.

An important shift in subsistence-harvest patterns occurred in the late 1960's, when the substitution of snowmachines for dogsleds decreased the importance of ringed seals and walruses as key sources of dog food and increased the relative importance of waterfowl. This shift illustrates that technological or social change can lead to the modifications of subsistence practices. Because of technological and harvest-pattern changes, the dietary importance of waterfowl also may continue to increase; however, these changes would not affect the central and specialized dietary roles that bowhead whales, caribou, and fish—the three most important subsistence-food resources to North Slope communities—play in the subsistence harvests of Alaska's Inupiat, and for which there are no practical substitutes.

Subsistence resources used by Nuiqsut, Barrow, and Kaktovik are listed in Table VI.B-1 by common species name, Inupiaq name, and scientific name. For a comparison of the proportion of Inupiaq household foods obtained from subsistence in the years 1977, 1988, and 1993, see Table VI.B-2. Table VI.B-3 shows the percentage of households that participated in successful harvests of subsistence resources in the three communities being discussed, and Table VI.B-4 shows individual species' percentages of the total average subsistence harvest for each community.

## c. Nuiqsut Subsistence-Harvest Seasons and Harvest Success Profile

Nuiqsut's population stood at 354 in 1990 and rose to 410 by 1995 (USDOC, Bureau of the Census, 1991; State of Alaska, Dept. of Labor figures as cited in State of Alaska, Dept. of Fish and Game, 1995a). Nuiqsut is located near the mouth of the Colville River, which drains into the Beaufort Sea. For Nuiqsut, important subsistence resources include bowhead whale, caribou, fish, waterfowl, ptarmigan and, to a lesser extent, seals, muskoxen, and Dall sheep. Polar bears, beluga whales, and walruses are seldom hunted but can be taken opportunistically while in pursuit of other subsistence species. A 1993 Department of Fish and Game subsistence study showed that nearly two-thirds of all Nuiqsut households received more than half of their meat, fish, and birds from local subsistence activity (Pedersen et al., 1995, as cited in Fall and Utermohle, 1995). Nuiqsut's marine and terrestrial subsistence-harvest areas can be seen in Map 9. The preferred harvest periods for Nuiqsut are indicated in Figure VI.B-1. A summary of subsistence resources harvested in the 1993 and 1994-1995 seasons can be seen in Tables VI.B-5 and VI.B-6, respectively.

### (1) Bowhead Whales

Even though Nuiqsut is not located on the coast (it is approximately 25 miles inland with river access to the Beaufort Sea), bowhead whales are a major subsistence resource. Bowhead whale hunting usually occurs between late August and early October, with the exact timing depending on ice and weather conditions. Ice conditions can dramatically extend the season up to 2 months or contract it to less than 2 weeks. Unlike the Barrow spring whale hunt, staged from the edge of ice leads using skin boats, Nuiqsut whalers use aluminum skiffs with outboard motors to hunt bowheads in open water in the fall. Generally, bowhead whales are harvested by Nuiqsut residents within 10 miles of Cross Island, but hunters may at times travel 20 miles or more from the island. Historically, the entire coastal area from Nuiqsut east to Flaxman Island and the Canning River Delta has been used, but whale hunting to the west of Cross Island has never been as productive and whale hunting too far to the east requires long tows of the whales back to Cross Island for butchering, creating the potential for meat spoilage (Impact Assessment, Inc., 1990a).

In the past, Nuiqsut has not harvested many bowhead whales (20 whales from 1972-1995); however, their success has improved in the past few years. Unsuccessful harvests were more common in the 1980's, with no whales taken in 1983, 1984, 1985, and 1988; but in the 1990's, the only unsuccessful years have been 1990 and 1994 (USDOI, MMS, 1996a; U.S. Army Corps of Engineers, 1998). A 1993 Alaska Department of Fish and Game subsistence survey in Nuiqsut indicated that 31.8% of the total subsistence harvest was marine mammals, and 28.7% of the total harvest was bowhead whales (State of Alaska, Dept. of Fish and Game, 1995a; Tables VI.B-5 and VI.B-6). The harvest of bowhead whales at Nuiqsut greatly affects the percentage of total harvest estimates, because in years when whales are taken, other important subsistence species are underrepresented due to the great mass of the total pounds of whale harvested.

Although in Nuiqsut bowheads are not the main subsistence resource in terms of edible pounds harvested per capita, they remain, as in other North Slope communities, the most culturally prominent to the Inupiat. The bowhead is shared extensively with other North Slope communities and often with Inupiat residents in communities as far away as Fairbanks and Anchorage. Nuiqsut Whaling Captains Association President, Frank Long, Jr., presented a history of Nuiqsut bowhead whaling and summarized major issues of concern in the Proceedings of the 1995 Arctic Synthesis Meeting (USDOI, MMS 1996d).

### (2) Caribou

Nuiqsut harvests several large land mammals, including caribou and moose; of these, caribou is the most important subsistence resource. Caribou may be the most preferred mammal in Nuiqsut's diet and, during periods of high availability, it provides a source of fresh meat throughout the year. Data gathered in 1976 show caribou provided an estimated 90.2% of the total subsistence harvest (S.R. Braund and Assocs. and University of Alaska, Anchorage, Institute of Social and Economic Research, 1993). More recent subsistence caribou-harvest data are shown in Tables V.B-5 and V.B-6 (State of Alaska, Dept. of Fish and Game, 1995a). Caribou are harvested throughout the year. Caribou-harvest statistics for 1976 show that 400 caribou provided approximately 47,000 pounds of meat (Stoker, 1983, as cited in ACI, Courtnage, and Braund, 1984). In 1985, an estimated 513 caribou were harvested, providing an estimated 60,000 edible pounds of meat (37.5% of the total subsistence harvest; State of Alaska, Dept. of Fish and Game, 1993). A 1993 Alaska Department of Fish and Game subsistence study estimated a harvest of 674 caribou, providing about 82,000 edible pounds of meat (30.6% of the total subsistence harvest; State of Alaska, Dept. of Fish and Game, 1995a). In 1993, 74% of Nuiqsut's households harvested caribou, 98% used caribou, 79% shared caribou with other households, and 79% received caribou shares. Harvests occurred at 16 locations with the highest harvest, 111 caribou, at Fish Creek (Pedersen et al., 1995, as cited in Fall and Utermohle, 1995). A subsistence-harvest survey conducted by the North Slope Borough, Division of Wildlife Management covering the period from July 1994 to June 1995 reported 249 caribou harvested by Nuiqsut hunters, or 58% of the subsistence harvest in edible pounds. The report noted this as quite a low number of caribou when compared to reported harvests for earlier years. Explanations offered by local hunters were: (1) the need to travel longer distances to harvest caribou than in the past; (2) the increasing numbers of muskox that hunters believe keep caribou away from traditional hunting areas; and (3) restricted access to traditional subsistence hunting areas due to oil exploration and development in these areas (Brower and Opie, 1997; Brower and Hepa, 1998).

Because of the unpredictable movements of the Central Arctic and Teshekpuk Lake caribou herds, and because of ice conditions and hunting techniques that depend on the weather, Nuiqsut's annual caribou harvest can fluctuate markedly; but when herds are available and when weather permits, caribou are harvested year-round. Elders Samuel and Sarah Kunaknana related that caribou hunters in the past had to go inland to hunt caribou, because they never came down to the coast as they do now (Shapiro, Metzner, and Toovak, 1979).

### (3) Fish

Fish provide the most edible pounds per capita of any subsistence resource harvested by Nuiqsut (see Tables VI.B-5 and VI.B-6; State of Alaska, Dept. of Fish and Game, 1993, 1995a). The harvests of most subsistence resources, such as caribou, can fluctuate widely from year to year because of variable migration patterns and because harvesting techniques depend on ice and weather conditions—much the same as the conditions surrounding the bowhead whale hunt. Even though fish-harvest rates (and total catch) vary from year to year, the harvest of fish is perhaps more consistent than the harvest of land animals. The harvesting of fish is not subject to seasonal limitations, a situation that adds to their importance in the community's subsistence round. Nuiqsut has been shown to have the largest documented subsistence fish harvest on the Beaufort Sea coast (Moulton, 1997; Moulton, Field, and Brotherton, 1986). Moreover, in October and November, fish may provide the only source of fresh subsistence foods.

Fishing is an important activity for Nuiqsut residents because of the community's location on the Nechelik Channel of the Colville River, which has large resident fish populations. The river supports 20 species of fish, and approximately half of these are taken by Nuiqsut residents (George and Nageak, 1986). Local residents generally harvest fish during the summer and fall, but the fishing season basically runs from January through May and from late July through mid-December. The summer, open-water harvest lasts from breakup to freezeup (early June to mid-September). The summer harvest covers a greater area, is longer than the fall/winter harvest, and a greater number of species are caught. Broad whitefish, the primary species harvested during the summer, is the only anadromous species harvested in July. Thomas Napageak relates that "in the summer when it is time to fish for large, round-nosed whitefish the place called Tirragruag gets filled with them as well as the entrance to Itqiliq. Nigliq River gets filled with nets all the way to the point where it begins. We do not go to Kuukpiluk in the summer months. Then we enter Fish Creek...another place where they fish for whitefish is Nuiqsagruaq" (Thomas Napageak [USDOI, Bureau of Land Management, 1998]). In July, lake trout, northern pike, broad whitefish, and humpback whitefish are harvested south of Nuiqsut. Traditionally, coastal areas were fished in June and July, when rotting ice created enough open water for seining. Nuiqsut elder Sarah Kunaknana, interviewed in 1979, said: "...in the little bays along the coast we start seining for fish (iqalukpik). After just seining 1 or 2 times, there would be so many fish we would have a hard time putting them all away" (Shapiro, Metzner, and Toovak, 1979). Salmon species reportedly have been caught in August but not in large numbers. Pink and chum salmon are the most commonly caught, although there reportedly has not been a great interest in harvesting them (George and Nageak, 1986). Arctic char is found in the main channel of the Colville River but does not appear to be a major subsistence species because, although apparently liked, it is not abundantly caught (George and Nageak, 1986; George and Kovalsky, 1986; State of Alaska, Dept. of Fish and Game, 1993, 1995a).

The fall/winter under-ice harvest of fishes begins after freezeup, when the ice is safe for snowmachine travel. Local families can fish approximately 1 month after freezeup. The Kuukpigruaq Channel is the most important fall fishing area in the Colville region, and the primary species harvested are Arctic and least cisco. Even after freezeup, people continue to fish for whitefish (Thomas Napageak [USDOI, Bureau of Land Management, 1998]). Nuiqsut resident Ruth Nukapigak recounts a recent winter fishing trip in December 1997: "I, myself, took my net out in December right before Christmas Day. I was catching whitefish in my net" (USDOI, Bureau of Land Management, 1998). Arctic and least cisco amounted to 88 and 99% of the harvest in 1984 and 1985, respectively; however, this percentage varied greatly depending on the net-mesh size. Humpback and broad whitefish, sculpin, and some large rainbow smelt also are harvested, but only in low numbers (George and Kovalsky, 1986; George and Nageak, 1986). A fish identified as "spotted least cisco" also has been harvested. This fish is not identified by Morrow (1980) but may be a resident form of least cisco (George and Kovalsky, 1986). Weekend fishing for burbot and grayling occurs at Itkillikpaat, 6 miles from Nuiqsut (George and Nageak, 1986; State of Alaska, Dept. of Fish and Game, 1995a).

The summer catch in 1985 totaled about 19,000 pounds of mostly broad whitefish; in the fall, approximately 50,000 pounds of fish were caught, for an annual per capita catch of 244 pounds; some of this catch was shipped to Barrow (Craig, 1987). A 1985 Alaska Department of Fish and Game subsistence survey estimated the edible pounds of all fish harvested at 176.13 pounds per capita (44.1% of the total subsistence harvest; State o Alaska, Department of Fish and Game, 1993). In 1986, there was a reduced fishing effort in Nuiqsut; and the fall harvest was only 59% of that taken in 1985 (Craig, 1987). In 1992, 34% of the edible pounds of the total subsistence harvest was fish and, by 1993, the estimate for edible pounds of all fish harvested had risen to 250.62 pounds per capita (33.7% of the total subsistence harvest; George and Fuller, In prep.; State of Alaska, Dept. of Fish and Game, 1995a). A subsistence-harvest survey conducted by the North Slope Borough Division of Wildlife Management covering the period from July 1994-June 1995 reported that the subsistence fishing provided 30% of the total subsistence harvest (see Table V.B-6; Brower and Opie, 1997; Brower and Hepa, 1998). A recent survey shows that 80% of all Nuiqsut households participate in some fishing activity (State of Alaska, Dept. of Fish and Game, 1995a).

### (4) Other Marine Mammals

#### *(a) Seals*

Seals are hunted year-round, but the bulk of the seal harvest occurs during the open-water season, with breakup usually occurring in June. In the spring, seals can be hunted once the landfast ice goes out. Present-day sealing is most commonly done at the mouth of the Colville when it begins flooding in June. According to Thomas Napageak:

> …when the river floods, it starts flowing out into the ocean in front of our village affecting the seals that include the bearded seals in the spring month of June…. When the river floods, near the mouth of Nigliq River it becomes filled with a hole or thin spot in [the] sea ice that has melted as the river breaks up. When it reaches the sea, that is the time that they begin to hunt for seals, through the thin spot in the sea ice that has melted. They hunt for bearded seals and other types of seals (USDOI, Bureau of Land Management, 1998).

Nuiqsut resident Ruth Nukapigak recounts past trips to this same sealing area: "I love to follow my son Jonah every year just when the ice begins moving down there and it takes us one hour travel time to get there. That is where we go to hunt for seals" (USDOI, Bureau of Land Management, 1998). Nuiqsut elder Samuel Kunaknana, when interviewed in 1979, noted that when the ice is nearshore in the summer, it is considered to be good for seal hunting (S. Kunaknana, as cited in Shapiro, Metzner, and Toovak, 1979). While seal meat is eaten, the dietary significance of seals primarily comes from seal oil, served with almost every meal that includes subsistence foods. Seal oil also is used as a preservative for meats, greens, and berries. Seal skins are important in the manufacture of clothing and, because of their beauty, spotted seal skins often are preferred for making boots, slippers, mitts, and parka trim. In practice, however, ringed seal skins are used more often in the making of clothing because the harvest of this species is more abundant. A 1993 Department of Fish and Game subsistence survey in Nuiqsut indicates that 31.8% of the total subsistence harvest was marine mammals, and 3.1% of the total harvest was seals (State of Alaska, Dept. of Fish and Game, 1995a). George and Fuller (In prep.) estimated 24 ringed seals, 6 spotted seals, and 16 bearded seals were harvested in 1992, and the overall marine mammal contribution (including bowhead whales) to the total subsistence harvest was estimated at 36%. A subsistence-harvest survey conducted by the North Slope Borough Division of Wildlife Management covering the period from July 1994-June 1995 reported a harvest of 23 ringed seals and a contribution of marine mammals of only 2% to the total subsistence harvest, because no bowhead whales were harvested that season (Brower and Opie, 1997; Brower and Hepa 1998).

#### *(b) Polar Bears*

The harvest of polar bears by Nuiqsut hunters begins in mid-September and extends into late winter. Polar bear meat is eaten, although little harvest data are available. One documented bear was harvested in the 1962-1982 period; for the period 1983-1995 Nuiqsut harvested 20 polar bears (Schliebe, 1995; State of Alaska, Dept. of Fish and Game, 1993, 1995a; Brower and Opie, 1997; Brower and Hepa, 1998). According to whaling captain Thomas Napageak's statement at the Beaufort Sea Sale 144 Public Hearings in Nuiqsut, the taking of polar bear is not very important now because Federal regulations prevent the selling of the hide: "...as valuable as it is, [it] goes to waste when we kill a polar bear" (USDOI, MMS, 1995b).

#### *(c) Beluga Whales*

Some sources have mentioned beluga whales being taken incidentally during the bowhead harvest, but Thomas Napageak, President of the Native Village of Nuiqsut, in recent testimony stressed that the village of Nuiqsut has never hunted beluga whales: "I don't recall a time when I went hunting for beluga whales. I've never seen a beluga whale here" (USDOI, Bureau of Land Management, 1998).

#### *(d) Walrus*

The Alaska Department of Fish and Game subsistence-survey data indicate that two walruses were harvested in the 1985/1986 harvest season, but no new walrus data for the community have been gathered since then (State of Alaska, Department of Fish and Game, 1993, 1995a). Walruses probably are incidentally taken during seal hunting.

### (5) Moose

Moose normally are harvested from August-October by boat on the Colville (upriver from Nuiqsut), Chandler, and Itkillik rivers, but the timing of harvest varies, depending on the current hunting regulations. Harvest data show that moose have been harvested during the winter months by snowmachine (Brower and Opie, 1997). In 1985, hunters from 40 households out of a total 76 households surveyed reported a harvest of seven moose (State of Alaska, Dept. of Fish and Game, 1993). In 1993, 62 households out of a total 91 households surveyed managed to harvest nine moose (State of Alaska, Dept. of Fish and Game, 1995a). A subsistence-harvest survey conducted by the North Slope Borough Division of Wildlife Management covering the period from July 1994-June 1995 reported five moose harvested, or 5% of the total edible pounds harvested that season (Brower and Opie, 1997; Brower and Hepa, 1998). In 1992, caribou and moose accounted for 27% of the total subsistence harvest (George and Fuller, In prep.); in 1993, moose and caribou accounted for 33% (Pedersen, 1996); and in the period covered by the North Slope Borough subsistence survey (July 1994-June 1995), caribou and moose accounted for 63% of the edible pounds of subsistence resources harvested by Nuiqsut hunters (Brower and Opie, 1997; Brower and Hepa, 1998). This jump to a much higher percentage for terrestrial mammals is likely explained by an unsuccessful bowhead whale harvest during the study period (Suydam et al., 1994).

### (6) Wildfowl

Waterfowl and coastal birds are a subsistence resource that has been growing in importance since the mid-1960's. Birds are harvested year-round, with peak harvests in May-June and September-October. The most important species for Nuiqsut hunters are the Canada and white-fronted goose and brant; eiders are harvested in low numbers. Ruth Nukapigak relates that "...when the white-fronted goose come, they do hunt them. When the thin ice near the mouth of the river breaks up, that is when they start duck hunting. We, the residents of Nuiqsut, go there to hunt for ducks when they arrive" (USDOI, Bureau of Land Management, 1998). The only upland bird hunted extensively is the ptarmigan (State of Alaska, Dept. of Fish and Game, 1993, 1995a; Brower and Opie, 1997). Recent data indicated the subsistence bird harvest provided 5% of the total subsistence harvest (Brower and Opie, 1997; Brower and Hepa, 1998). Waterfowl hunting occurs mostly in the spring, beginning in May, and continues throughout the summer. In the summer and early fall, such hunting usually occurs as an adjunct to other subsistence activities, such as checking fish nets.

## 2. Sociocultural Systems

The topic of sociocultural systems encompasses the social organization and cultural values of a society. This section provides a profile of the sociocultural systems that characterize the North Slope communities of Barrow, Nuiqsut, and Kaktovik. The ethnic, sociocultural, and socioeconomic makeup of the communities on the North Slope is primarily Inupiaq. Nuiqsut is the closest Inupiat community to the Liberty Project area.

The communities of Barrow, Nuiqsut, and Kaktovik potentially could be affected by development in the project area. Their populations and current socioeconomic conditions are discussed before the important variables in a sociocultural analysis—social organization, cultural values, institutional organization, and other ongoing issues—are considered.

The following summarizes and incorporates by reference detailed descriptions of sociocultural systems found in the Beaufort Sea Sale 144 Final EIS (USDOI, MMS, 1996a), the Northeast National Petroleum Reserve-Alaska Draft Integrated Activity Plan/EIS (USDOI, Bureau of Land

Management and MMS, 1997), the Beaufort Sea Sale 170 Final EIS (USDOI, MMS, 1998), and the Beaufort Sea Oil and Gas Development Project/ Northstar Draft EIS (U.S. Army Corps of Engineers, 1998). The summary is augmented by additional material, as cited.

## a. Characteristics of the Population

The North Slope has a fairly homogeneous population of Inupiat, approximately 72% in 1990. This is an approximation, because the 1990 Census did not distinguish between Inupiat and other Alaskan Natives and American Indians, although there were only 110 individuals (1.8% of the total North Slope Borough population) in the North Slope Borough that fell into these latter two classifications. The percentage in 1990 ranged from 92.7% Inupiat in Nuiqsut to 61.8% Inupiat in Barrow (USDOC, Bureau of the Census, 1991). In 1999, Alaska Department of Labor population estimates were 4,438 for Barrow, 486 for Nuiqsut, and 259 for Kaktovik (State of Alaska, Dept. of Labor, 1998).

North Slope society responded to early contacts with outsiders by successfully changing and adjusting to new demands and opportunities (Burch, 1975a,b; Worl, 1978; North Slope Borough Contract Staff, 1979). Since the 1960's, the North Slope has witnessed a period of "super change," a pace of change quickened by the area's oil developments (Lowenstein, 1981). In the Prudhoe Bay/Kuparuk industrial complex, oil-related work camps have altered the seascape and landscape, making some areas off limits to traditional subsistence hunting. In addition, large North Slope Borough Capital Improvement Projects have dramatically changed the physical appearance of North Slope Borough communities.

Social services have increased dramatically since 1970, with increased Borough budgets and grants acquired early on by the Inupiat Community of the Arctic Slope, and later by the Arctic Slope Native Association and other borough nonprofits. In 1970 and 1977, residents of North Slope villages were asked about their state of well-being in a survey conducted by the University of Alaska, Anchorage, Institute of Social and Economic Research (Kruse et al., 1983). The survey noted significant increases in complaints about alcohol and drug use in all villages between 1970 and 1977. Health and social-services programs have attempted to address these problems with treatment programs and shelters for wives and families of abusive spouses and with greater emphasis on recreational programs and services. In the last decade, all communities in the North Slope Borough have struggled with banning the sale, use, and possession of alcohol, and the issue of whether a community will become "dry" or stay "wet" is constantly being brought before local voters.

The introduction of modern technology has tied the Inupiat subsistence economy increasingly to a cash economy (Kruse, 1982). Nevertheless, oil-supported revenues have been able to support a lifestyle that still is distinctly Inupiaq, and outside pressures and opportunities have sparked what may be viewed as a cultural revival (Lantis, 1973). What exists in the communities of the North Slope is "a unique lifestyle in which a modern cash economy and traditional subsistence are interwoven and interdependent" (USDOI, Bureau of Land Management, 1979). North Slope residents exhibit an increasing commitment to areawide political representation, local and regional tribal governments, and the cultural preservation of such institutions as whaling crews and dancing organizations as well as the revival of traditional seasonal celebrations. People continue to hunt and fish, but aluminum boats, outboards, snow machines, and all-terrain vehicles now blend these pursuits with wage work. Inupiat whale hunting remains a proud tradition that involves ceremonies, dancing, singing, visiting, cooperation between communities, and the sharing of foods. Effects from ongoing and proposed oil development on subsistence have been, are, and will continue to be a major issue for residents of North Slope communities (Kruse et al., 1983; ACI and Braund, 1984; USDOI, MMS, 1994, 1995b, 1996a; Stephen R. Braund and Assocs., In prep.; USDOI, BLM, 1997c; USDOI, MMS, 1998).

## b. Socioeconomic Conditions

### (1) Barrow

On the North Slope, Barrow is the largest community and the regional center. Barrow's estimated population in 1999 was 4,438 (State of Alaska, Dept. of Labor, 1999). Barrow already has experienced dramatic population changes as a result of increased revenues from onshore oil development and production in Prudhoe Bay and other smaller oil fields; these revenues early on served to stimulate the North Slope Borough Capitol Improvement Program. In 1970, the Inupiat population of Barrow represented 91% of the total population (USDOC, Bureau of the Census, 1971). In 1985, non-Natives outnumbered Natives between the ages of 26 and 59 (North Slope Borough, Dept. of Planning and Community Services, 1989). By 1990, Inupiat representation had dropped to 63.9% (USDOC, Bureau of the Census, 1991; Harcharek, 1992). Barrow's entire terrestrial and marine subsistence-harvest area lies well to the west of the Liberty area.

From 1975-1985, Barrow experienced extensive social and economic transformations. The North Slope Borough Capital Improvement Program stimulated a boom in the Barrow economy and an influx of non-Natives to the community; between 1980 and 1985, Barrow's population grew by 35.6% (Kevin Waring Associates, 1989). Inupiat women entered the labor force in the largest numbers ever and achieved positions of political leadership in newly formed institutions. The proportion of Inupiat women raising families without husbands also increased during this period, a noticeable alteration in a culture where the extended family, operating through interrelated households, is salient in community social organization (Worl and Smythe, 1986). During this same period, the social organization of the community became increasingly diversified with the proliferation of formal institutions and the large increase in the number of different ethnic groups. Socioeconomic differentiation is not new in Barrow. During the commercial-whaling period and the reindeer-herding period, there were influxes of outsiders and significant shifts in the economy. Other fluctuations have occurred during different economic cycles: fur trapping, U.S. Navy and arctic contractors' employment, the Capital Investments Program boom, and periods of downturn (Worl and Smythe, 1986). As a consequence of the changes it already has sustained, Barrow may be more capable of absorbing additional changes as a result of development than would smaller, homogeneous Inupiat communities such as Nuiqsut and Kaktovik.

#### (2) Nuiqsut

Nuiqsut is located on the west bank of the Nechelik Channel of the Colville River Delta, about 25 miles from the Arctic Ocean and approximately 150 miles southeast of Barrow. The population was 354 (92.7% Inupiat) in 1990 (USDOC, Bureau of the Census, 1991) and was estimated at 486 in 1999 (State of Alaska, Dept. of Labor, 1999). Nuiqsut, one of three abandoned Inupiat villages in the North Slope region identified in the Alaska Native Claims Settlement Act, was resettled in 1973 by 27 families from Barrow. Nuiqsut's important bowhead whale hunting area at Cross Island is northwest of the Liberty Project area. Today, Nuiqsut is experiencing rapid social and economic change with the building of a new hotel, the influx of non-Inupiat oil workers, and the potential development of oil in the National Petroleum Reserve-Alaska and the Alpine field adjacent to the community.

#### (3) Kaktovik

Kaktovik, incorporated in 1971, is the easternmost village in the North Slope Borough. In 1990, it had a population of 224 (83% Inupiat) and an estimated population of 259 in 1999 (USDOC, Bureau of the Census, 1991; State of Alaska, Department of Fish and Game, 1995b; Kevin Waring Associates, 1989; State of Alaska, Dept. of Labor, 1999). Kaktovik is located on the north shore of Barter Island, situated between the Okpilak and Jago rivers on the Beaufort Sea coast. Barter Island is one of the largest of a series of barrier islands along the north coast and is about 300 miles east of Barrow. Kaktovik's subsistence-harvest areas are well to the east of the Liberty area, but some species migrating eastward, seaward of the project area, potentially could be affected by activities there.

### c. Social Organization

The social organization of these Inupiat communities is strongly kinship oriented. Kinship forms "the axis on which the whole social world turn[s]" (Burch, 1975a,b). Historically, households were composed of large, extended families, and communities were kinship units. Today, there is a trend away from the extended-family household because of increases in mobility, availability of housing, and changes in traditional kinship patterns. However, kinship ties in Inupiat society continue to be important and remain a central focus of social organization.

The social organization of North Slope Inupiat encompasses not only households and families but also wider networks of kinspeople and friends. These various types of networks are related through various overlapping memberships and are embedded, as well, in those groups that are responsible for hunting, distributing, and consuming subsistence resources (Burch, 1970). An Inupiat household on the North Slope may contain a single individual or group of individuals who are related by marriage or ancestry. The interdependencies that exist among Inupiat households differ markedly from those found in the United States as a whole. In the larger non-Inupiat society, the demands of wage work emphasize a mobile and prompt workforce. While modern transportation and communication technologies allow for contact between parents, children, brothers, sisters, and other extended-family members, more often than not, independent nuclear households (father, mother, and children) or conjugal pairs (childless couples) form independent "production" units that do not depend on extended-family members for the day-to-day support of food, labor, or income. A key contrast between non-Native and Inupiat cultures occurs in their differing expectations of families—the Inupiat expect and need support from extended-family members on a day-to-day basis.

Associated with these differences, the Inupiat hold unique norms and expectations about sharing. Households are not necessarily viewed as independent economic units; and giving, especially by successful hunters in the community, is regarded as an end in itself, although community status and esteem accrue to the generous. Kinship ties are strengthened through the sharing and exchanging of subsistence resources (Nelson, 1969; Burch, 1971; Worl, 1979; ACI, Courtnage, and Braund, 1984; Luton, 1985; Chance, 1990).

### d. Cultural Values

Traditionally, Inupiat values focused on the Inupiat's close relationship with natural resources, specifically game animals. The Inupiat also had a close relationship to the supernatural with specific beliefs in animal souls and beings who control the movements of animals. Other values included an emphasis on the community, its needs, and its support of other individuals. The Inupiat respect persons who are generous, cooperative, hospitable, humorous, patient, modest, and industrious (Lantis, 1959; Milan, 1964; Chance, 1966, 1990). Although there have been substantial social, economic, and technological changes in Inupiat lifestyle, subsistence continues to be the central organizing value of Inupiat sociocultural systems. The Inupiat remain socially, economically, and ideologically loyal to their subsistence heritage. Indeed, "most Inupiat still consider themselves primarily hunters and fishermen" (Nelson, 1969). This refrain is repeated again and again by the residents of the North Slope (Kruse et al., 1983; ACI, Courtnage, and Braund, 1984; Impact Assessment, Inc., 1990a,b; USDOI, MMS, 1994). Task groups still are organized to hunt, gather, and process subsistence foods. Cooperation in hunting and fishing activities also remains an integral part of Inupiat life, and who one cooperates with is a major component of the definition of significant kin ties (Heinrich, 1963). Large amounts of subsistence foods are shared within the community, and who one gives to and receives from are also major components of what makes up significant kin ties (Heinrich, 1963; ACI, Courtnage, and Braund, 1984).

On the North Slope, "subsistence" is much more than an economic system; the hunt, the sharing of the products of the hunt, and the beliefs surrounding the hunt tie families and communities together, connect people to their social and ecological surroundings, link them to their past, and provide meaning for the present. Generous hunters are considered good men, and good hunters are often respected leaders. Good health comes from a diet of products from the subsistence hunt, and young hunters still give their first game to the community elders. To be generous brings future success. These are some of the essential ways that subsistence and beliefs about subsistence join with sociocultural systems.

The cultural value placed on kinship and family relationships is apparent in the sharing, cooperation, and subsistence activities that occur in Inupiat society; however, cultural value also is apparent in the patterns of residence, reciprocal activities, social interaction, adoption, political affiliations (some families will dominate one type of government administration, for example, the village corporation), employment, sports activities, and membership in voluntary organizations (Mother's Club, Search and Rescue, etc.) (ACI, Courtnage, and Braund, 1984).

Bowhead whale hunting remains at the center of Inupiat spiritual and emotional life; it embodies the values of sharing, association, leadership, kinship, arctic survival, and hunting prowess (see Bockstoce et al., 1979; ACI, Courtnage, and Braund, 1984). Barrow resident Beverly Hugo, testifying at public hearings for MMS' Beaufort Sea Sale 124, summed up Inupiaq cultural values this way:

> …these are values that are real important to us, to me; this is what makes me who I am…the knowledge of the language, our Inupiat language, is a real high one; sharing with others, respect for others…and cooperation; and respect for elders; love for children; hard work; knowledge of our family tree; avoiding conflict; respect for nature; spirituality; humor; our family roles. Hunter success is a big one, and domestic skills, responsibility to our tribe, humility….These are some of the values…that we have…that make us who we are, and these values have coexisted for thousands of years, and they are good values…(USDOI, MMS, 1990c).

The importance of the whale hunt is more than emotional and spiritual. The organization of the crews does much to delineate important social and kin ties within communities and to define community leadership patterns as well. The structured sharing of the whale helps determine social relations both within and between communities (Worl, 1979; ACI, Courtnage, and Braund, 1984; Impact Assessment, Inc., 1990a). Structured sharing also holds true for caribou hunting, fishing, and other subsistence pursuits. In these communities, the giving of meat to elders does more than feed old people; it bonds giver and receiver, joins them to a living tradition, and draws the community together.

Today, this close relationship between the spirit of a people, their social organization, and the cultural value of subsistence hunting may be unparalleled when compared with other areas in America where energy-development is taking place. The Inupiat's continuing strong dependence on subsistence foods, particularly marine mammals and caribou, creates a unique set of potential effects from onshore and offshore oil development on the social and cultural system. Barrow resident Daniel Leavitt articulated these concerns during the 1990 public hearing for Beaufort Sea Sale 124: "…as I have lived in my Inupiat way of livelihood, that's the only…thing that drives me on is to get something for my family to fill up their stomachs from what I catch" (USDOI, MMS, 1990c).

Another great concern that North Slope Borough Inupiat communities express is the lack of traditional knowledge and testimony appearing in government documents, particularly MMS's oil lease-sale EIS's. Mayor George N. Ahmaogak, Sr., of the North Slope Borough said in a 1990 letter to MMS: "The elders who spoke particularly deserve a response to their concerns…. You should respect the fact that no one knows this environment better than Inupiat residents…" (Ahmaogak, 1990, pers. commun.). In public testimony in 1993 concerning a Letter of Authorization for bowhead whale monitoring at the Kuvlum Prospect, the late Burton Rexford, Chairman of the Alaska Eskimo Whaling Commission, stated that the most important environmental information would come from whaling captains, crew members, and whaling captains' wives. "We know our environment—our land and resources—at a deep level" (USDOC, NOAA, NMFS, 1993). These same concerns were unanimously echoed by those testifying for Barrow, Kaktovik, and Nuiqsut in hearings and scoping meetings for Beaufort Sea Sales 144 and 170, for National Petroleum Reserve-Alaska management, and for the Northstar and Liberty projects (Public Hearing Transcripts, Beaufort Sea Sale 144 [USDOI, MMS, 1995a,b,c], Beaufort Sea Sale 170 [USDOI, MMS, 1997b], National Petroleum Reserve-Alaska Integrated Activity Plan Draft EIS [USDOI, Bureau of Land Management and MMS, 1997], Beaufort Sea Oil and Gas Development Project/Northstar [U.S. Army Corps of Engineers, 1996], and the Liberty Project [USDOI, MMS, Alaska OCS Region, 1998b]).

### e. Institutional Organization of the Communities

The North Slope Borough provides most government services for the communities of Barrow, Nuiqsut, Kaktovik, and other communities in the Borough. These services include public safety, public utilities, fire protection, and some public-health services. Future fiscal and institutional growth is expected to slow because of economic constraints on direct Inupiat participation in oil-industry employment and growing constraints on the Statewide budget, although North Slope Borough revenues have remained healthy and its own permanent fund account continues to grow as does its role as primary employer in the region (Kruse et al., 1983; Harcharek, 1992, 1995). The Arctic Slope Regional Corporation, formed under the Alaska Native Claims Settlement Act, runs several subsidiary corporations. Most of the communities also have a village corporation, a Traditional Village or Indian Reorganization Act Village Council, and a city government. The Indian Reorganization Acts and village governments have not provided much in the way of services, but village corporations have made many service contributions. The Inupiat Community of the Arctic Slope, the regional tribal government, recently has taken on a more active and visible role in regional governance.

### f. Other Ongoing Issues

Other issues important to an analysis of sociocultural systems are those that will affect or are already affecting Inupiat society (i.e., cumulative impacts). The EIS's for MMS Sales 97, 124, 144, and 170 and for the National Petroleum Reserve-Alaska detail issues about changes in employment, increases in income, decreases in Inupiaq fluency, rising crime rates, and substance abuse (Section III.C.1 in USDOI, MMS, 1987, 1990a, 1996a, 1998, and USDOI, Bureau of Land Management and MMS, 1998) and also discuss the fiscal and institutional growth of the North Slope Borough. These discussions are incorporated by reference and summarized briefly below. In addition, Smythe and Worl (1985) and Impact Assessment, Inc. (1990a) detail the growth and responsibilities of local governments.

The baseline of the present sociocultural system includes change and strain. The very livelihood and culture of North Slope residents come under increasingly close scrutiny, regulation, and incremental alteration. Increased stresses on social well-being and on cultural integrity and cohesion come at a time of relative economic well-being. The expected challenges on the culture by the decline in Capital Improvement Project funding from the State of Alaska have not been as significant as once expected. The buffer effect has come mostly through the dramatic growth of the Borough's own permanent fund, the North Slope Borough taking on more of the burden of its own capital improvement, and its emergence as the largest employer of local residents. However, funding challenges (and subsequent challenges to the culture) continue as the Alaska State Legislature experiments with new formulas that would reduce funding for rural school districts and as revenues from oil development at Prudhoe Bay decline.

## 3. Archaeological Resources

The following analyses represent the Prehistoric Resource Analysis and Shipwreck Update Analysis required in the MMS Handbook for Archaeological Resource Protection (620.1-H). See also the Liberty Development Project, Environmental Report (BPXA, 1998a:4-50 to 4-53), for a more complete discussion on these resources.

### a. Prehistoric Resources

Prehistoric resources "pertain to that period of time before written history. In North America, 'prehistoric' usually refers to the period before European contact" (MMS Manual 620.1-H).

#### (1) Onshore

The Alaska Heritage Resources Survey site files show sites where prehistoric components have been recorded in the Beaufort Sea Planning Area. They consist of habitation sites, lithic scatters, and isolated finds (Dale, 1996, pers. commun.). No prehistoric sites have been found within the proposed Liberty Project area (Lobdell, 1998a:12).

#### (2) Offshore

We evaluated geophysical/geological and archaeological data to determine whether the Liberty Project area may have submerged prehistoric sites. The prehistoric archaeological site potential was analyzed with respect to the distribution and survivability of potential preserved terrestrial sediments and submerged landforms. The project area includes lease OCS-Y 1650 and neighboring Federal and State lands on the outer continental shelf within the project area and the pipeline corridor.

We incorporate by reference the archaeological analyses prepared for previous Beaufort Sea lease sales and previous works concerning the geologic processes that affect the survivability of potential prehistoric sites. Wherever appropriate, these sources have been updated with current reports, surveys, and information.

### (3) Review of the Baseline Study

No new baseline studies exist for archaeological resources in the Beaufort Sea. The analysis for Lease Sale 170 is the most current and was referred to while we prepared this report.

### (4) Review of Reports on Geology and Cultural Resources

We reviewed the following geohazards and geotechnical reports to prepare this analysis:

- *The Preliminary Liberty Cultural Resources Report* (Watson Company, 1999).
- *The Liberty High Resolution Geophysical Survey, Foggy Island Bay in Stefansson Sound, Alaska* (Watson Company, 1998a).
- *Liberty Pipeline Route Survey, Foggy Island Bay in Stefansson Sound* (Watson Company, 1998b).
- *Geotechnical Exploration, Liberty Development Project, Foggy Island Bay, Alaska* (Duane Miller & Assocs., 1997).
- *Geotechnical Exploration, Liberty Development North Slope, Alaska* (Duane Miller & Assocs., 1998).

BPXA provided these studies to support the Liberty Project.

We also reviewed the following geohazards and geotechnical reports prepared to support exploration in the Liberty area:

- *Beaufort Sea Shallow Hazards Synthesis Liberty #1 Well* (Arctic Geoscience, Inc., 1997).
- Geophysical and Geotechnical Site Evaluation, Karluk Prospect, Beaufort Sea Alaska (Harding-Lawson Associates, 1981a), in support of Chevron USA's Karluk OCS-Y 0194 Well #1.
- Geotechnical Investigation Tract 42 Well Site, Beaufort Sea, Alaska, (Harding-Lawson Associates, 1981b), for Shell Oil Company's Tern Prospect.
- *Geologic Hazards Report for Shell Oil Company's Tern Prospect* (Harding-Lawson Associates [1981c])
- The Warthog No. 1 Camden Bay, Beaufort Sea, Shallow Hazards Survey Results (Fairweather E&P Services Inc., 1997). This was reviewed because of its relevance to potential archaeological resources in the shallow Beaufort Sea.

A sediment core southwest of the Liberty Prospect contained a 10-foot-thick layer of Holocene sediments. It consisted of a 3-foot-thick basal layer of gray, silty sand with a trace of shell fragments overlain by a layer of soft, saturated, fibrous peat. Many sediment cores collected in Foggy Island Bay, Stefansson Sound area have contained an organic-rich silt with fibrous material at the base of the Holocene section. Core B-7, collected by Duane Miller in 1997, contains a peat layer at the base of the 18-foot-thick Holocene section, about 3.5 miles southwest of the proposed Liberty Island. This core indicates the presence of an intact sequence of Holocene-age terrestrial and nearshore sediments close to the Liberty Prospect.

Subbottom profiler data collected in the area indicate well-preserved paleochannel features in the Liberty area, but the Liberty Island site appears to have no paleochannel features. At the Warthog Prospect, the subbottom profiler data also show well-preserved channel-edge features, such as levees and terraces. These channel features all occur just below the seafloor, suggesting that they date from a recent low stand of sea level that occurred during the late Wisconsinan glaciation (about 19,000-6,000 Years Before Present); however, their absolute age is uncertain. If the features in the Warthog area are late Wisconsinan in age, they would represent areas where prehistoric archaeological resources may occur. A sediment core collected about 5 kilometers southwest of the Warthog Prospect contained a layer composed of 40% organics at a depth of about 15 feet subbottom. However, woody fragments from a sediment layer higher in the same core and shell fragments from other cores in nearby shallow-water State lands were radiocarbon age-dated by ARCO and yielded dates older than 20,000 Years Before Present. These organics are probably reworked older material.

### (5) Review of Sea-Level History

Because Liberty is within the shallow Beaufort Sea, which was exposed as dry land and available for people to live on until the sea level rose and flooded the project area sometime around 5,000 to 6,000 Years Before Present, it may contain archaeological resources. Relative sea level in the Beaufort Sea was approximately 50 meters below present at 13,000 Years Before Present (Hopkins, 1967), which is just before the general timeframe for the arrival of people in the Arctic.

### (6) Review of Geological/Geophysical Data to Determine the Potential for Survival of Archaeological Sites

The geohazards and geotechnical reports and surveys collected in the Liberty Project area suggest there may be potential for archaeological resources to have survived the destructive erosional processes that operated on the coast as sea level rose and sculpted the seafloor. Sediment core(s) collected in Foggy Island Bay, Stefansson Sound contained a peat layer in the Holocene section. Peat does not prove the existence of archaeological resources but only shows that there is the potential for Holocene-age sedimentary sequences, including archaeological sequences, in the Liberty area. It also shows that erosion from ice gouging, thermokarst erosion, etc., was not significant enough to thoroughly rework the Holocene section.

The subbottom profiler data show the presence of well-preserved late Pleistocene/Holocene-age fluvial channels within the project area. The subbottom profiler data also show a buried lake or lagoon along the western pipeline route with underlying peat beds approximately 12 feet below the seafloor. The age of the peat is unknown. Adjacent to this buried depression is a seafloor shoal that may represent a drowned island. The buried edge of this island terminates in a possible buried paleoterrace at the edge of the paleolagoon or paleolake. The banks, terraces, and point bars of these channels and lagoons, and areas on paleoislands, are places that would have been chosen by prehistoric people for campsites and subsistence activity. Because these features appear to be well preserved, any archaeological sites that are present also would be well preserved. Also, because the channels and lagoon terraces are buried by only a few meters of Holocene sediments, any sites would be detectable with physical sampling techniques such as sediment coring.

The analysis of prehistoric resources for Beaufort Sea Sale 144 concluded that destructive geologic processes such as ice gouging, thermokarst erosion, and storm surges had strongly reworked the near-surface shelf sediments in the Beaufort Sea Planning Area. Therefore, it was concluded that prehistoric archaeological sites had a very low potential for survival. The geophysical data from the Liberty Project area and the Warthog Project contradict this previous conclusion. Information from the side-scan sonar and underwater video images of the seafloor show that ice gouging is sparse to nonexistent at these two locations. Evidence shows that locations beneath floating shorefast ice and landward of the barrier islands get more protection from ice gouging and other destructive geologic processes that operate on the open shelf and perhaps were sheltered from some of the erosional effects of rising sea level.

Thus, after reviewing geophysical high-resolution data and geotechnical core data from the Liberty Project area, we conclude that prehistoric archaeological sites potentially may exist and may have survived the destructive geologic processes of the Holocene sea transgression and those that operate at the modern seafloor.

## b. Historic Resources

Historic resources pertain “to the period of time for which written history exists” (MMS Manual 620.1-H) including, but not limited to, shipwrecks.

### (1) Onshore

A review of the Alaska Heritage Resource Survey site files shows sites with historic components in the Beaufort Sea Planning Area. They consist of a Distant Early Warning line station and its research equipment and habitation, cemetery, military debris, camp, hunting, reindeer-herding, trapping, ice cellar, and lookout-tower site types (Dale, 1996, pers. commun.).

Lobdell (1998a) surveyed the proposed project area in August 1997 and recorded two Historic Period sites: Foggy Island Bay Site #2 (49-XBP-024) and Foggy Island Bay Site #3 (49-XBP-026). Both are ruins of historic sod houses. Foggy Island Bay Site #2 is 0.2 mile northwest of the proposed onshore pipeline route (Alternative I) and undergoes active thermokarst erosion (Lobdell, 1998a:8). Foggy Island Bay Site #3 is 1 mile southeast of the proposed onshore pipeline route under Alternative III. In addition to ruins of sod houses, this site also contains a grave 70 meters from the house ruins. Thermokarst erosion has not affected the site, because a substantial fronting strand flat protects it from geological processes (Lobdell, 1998a:11).

The State Historic Preservation Officer accepted the report of the onshore survey on May 2, 1998. The historian concurred that the preferred mitigation of the two recorded historic sites was avoidance (Bittner, 1993).

### (2) Offshore

Our computerized list of shipwrecks for the project area shows two known shipwrecks. In 1894, the *Reindeer*, a 340-ton whaling bark, wrecked near Reindeer Island in the Midway Islands, probably 25-30 miles west of the proposed project location. In 1907, the *Duchess of Bedford*, a 60-ton expedition schooner, wrecked near Flaxman Island some 40-45 miles east of the proposed location (Burwell, 1996, pers. commun.; Tornfelt and Burwell, 1992). The final distribution of a shipwreck on the seafloor depends on such factors as sediment depth and composition, sea currents, water depth, size and type of ship, and geologic processes. To date, no surveys have been done to find these wrecks, and the information we have is not enough to assign them to specific locations.

Rates of sedimentation sufficient to bury shipwrecks within recent history have not been identified for the Liberty Project area. There are no indications in the side-scan sonar or subbottom profiler records of any seafloor anomalies. Therefore, it is unlikely that either of these shipwrecks is located within the project area.

### (3) Assessment Procedures

*Archaeological resource* means any material remains of human life or activities that are at least 50 years of age and that are of archaeological interest. *Of archaeological interest* means capable of providing scientific or humanistic understandings of past human behavior, cultural adaptation, and related topics through the application of scientific or scholarly techniques such as controlled observations, contextual measurement, controlled collection, analysis, interpretation and explanation. *Material remains* means physical evidence of human habitation, occupation, use, or activity, including the site, location, or context in which such evidence is situated. Our policy is to consider the effects on archaeological resources in all decisions on planning, leasing, permitting, and regulatory actions. To do this, we must assess whether the proposed action may affect archaeological resources within the area (MMS Manual Part 620.1.1).

Properties may be eligible for the National Register of Historic Places if they contain or are likely to contain information to contribute to our understanding of human history or prehistory. This national inventory of sites has certain criteria for listing. Most archaeological sites listed on or eligible for the National Register meet Criterion D, Information Potential. With rare exception, properties must be 50 or more years old to be considered eligible for the National Register (USDOI, National Park Service, 1991).

Nominating a site is time consuming. One must detail specific information, measurements, location, and historical background. Consequently, properties officially listed on the Register are only a fraction of those sites that would be eligible after assessment. All sites are given initial equal protection in the process. Checking the Register for a list of sites is a start. However, most of the Beaufort Sea Planning Area has not been surveyed for archaeological sites, and the National Register lists no sites on the outer continental shelf. As a result, we must identify archaeological resources or potential resources within the planning area using regional baseline studies as predictive models, geophysical and geological data, historical accounts of shipwreck disasters, and marine remote-sensing data compiled from required shallow-hazards surveys.

# 4. Economy

## a. Employment

### (1) History of Employment in the North Slope Borough

Employment as a whole and by sector in the North Slope Borough, including the oil-industry workers at Prudhoe Bay between 1990 and 1998, is shown in Table VI.B-7. Mining employment is the petroleum employment at Prudhoe Bay and nearby facilities. Nearly all of these workers commute to Southcentral Alaska and Fairbanks. The total employment less mining reflects workers who reside permanently in the North Slope Borough.

For details on employment, see the Final EIS for Sale 170 (USDOI, MMS, 1998, Section III.C.1), which is incorporated here by reference.

Nuiqsut had 193 people in their labor force in 1993-1994. Of these, 125 were permanent full time, 42 temporary or seasonal, 16 part time, and 10 unemployed. Others were underemployed. The Borough employed 46%, the Borough School District employed 17%, and the Village Corporation employed 20% of those employed in 1993 (North Slope Borough, 1995).

### (2) The North Slope Borough is the Largest Employer of Permanent Residents in the Borough

The Borough's government employs many people directly and finances construction projects under its Capital Improvement Program, which employs even more. For details, see the Final EIS for Sale 170 (USDOI, MMS, 1998, Section III.C.1).

### (3) Unemployment in the North Slope Borough

According to State figures, unemployment in the North Slope Borough was 3.5-5.5% from 1975-1998. However, according to the 1993 North Slope Borough Census, 24% of the Borough's resident labor force believe themselves to be underemployed (North Slope Borough, 1995). For details, see the Final EIS for Sale 170 (USDOI, MMS, 1998, Section III.C.1).

### (4) North Slope Oil-Industry Employment of North Slope Borough Resident Natives

One of the North Slope Borough's main goals has been to create employment for Native residents. It has been successful in hiring many Native people for the Borough's construction projects and operations. Only a few permanent residents hold jobs at the industrial enclaves at Prudhoe Bay.

The North Slope Borough has tried to facilitate employment of Native people in the oil industry at Prudhoe Bay. They are concerned that the oil industry has not done enough to train unskilled laborers or to allow them to participate in subsistence hunting. The Borough also is concerned that the oil industry recruits using methods common to western industry. The Borough would like to see serious efforts by industry to hire the Borough's residents (Nageak, 1998). For further information, see the Final EIS for Sale 170 (USDOI, MMS, 1998, Section III.C.1).

The purpose of BPXA's Itqanaiyagvik Program is to increase North Slope Borough Native employment. It is a joint venture with the Arctic Slope Regional Corporation and its oil-field subsidiaries and is being coordinated with the Borough and the Borough's School District (BPXA, 1998b).

#### (5) Most North Slope Oil-Industry Workers Reside in Southcentral Alaska and Fairbanks

In the past, most workers at oil operations centered at Prudhoe Bay commuted between worker enclaves on the North Slope and permanent residences in other parts of the State. Most of these workers reside in Southcentral Alaska and the Fairbanks area. Some workers have commuted between the enclaves and permanent residences outside Alaska. As explained, mining employment on Table VI.B-7 indicates workers at and near Prudhoe Bay, but most of these workers reside in Southcentral Alaska and Fairbanks.

Employment in the Anchorage-Matsu Region, the Kenai Peninsula Borough, and Fairbanks North Star Borough is shown in Table VI.B-8.

### b. Revenues

#### (1) Federal Revenues

Federal outer continental shelf revenues in the Beaufort Sea, which include royalties and rents, are: 1995, $1.1 million; 1996, $1.7 million; 1997; $1.1 million; 1998, $2.1 million; 1999, $1.4 million; and 2000, $1.4 million. Bonuses in the 1995-2000 period are $14.4 million for Lease Sale 144 in 1996 and $5.3 million for Lease Sale 170 in 1998. Total revenues are: 1995, $1.1 million; 1996, $16.1 million; 1997, $1.1 million; 1998, $7.4 million; 1999, $1.4 million; and 2000, $1.4 million.

Federal income tax collected from outer continental shelf workers is estimated to be $1.1 million for drilling and related activity on Warthog and Liberty Island in 1997. There was no income tax in 1995, 1996, or 1998-2000, because there was no worker activity on the outer continental shelf.

#### (2) State Revenues

The Federal Government distributed outer continental shelf revenues to the State of Alaska for rents, bonuses, royalties, escrow funds and settlement payments as follows: 1995, $9.4 million; 1996, $9.5 million; 1997, $17.3 million; 1998, $13.6 million; 1999, $14.7 million; and 2000, $13.7 million.

State income tax and State spill and conservation tax related to the Beaufort outer continental shelf 1995 to 1998 is zero.

#### (3) North Slope Borough Revenues

The North Slope Borough received no outer continental shelf revenues for the period 1995-2000.

The tax base in the Borough since the 1980’s has consisted mainly of high-value property owned or leased by the oil industry in the Prudhoe Bay area. In Fiscal Year 1995, more than 95% of revenues came from property taxes, according to the Final EIS for Sale 144 (USDOI, MMS, 1996a, Section III.C.1).

North Slope Borough revenues (exclusive of the North Slope Borough School District) were $224-$235 million between 1992 and 1997. Revenues were $285, $266, and $245 million in 1998, 1999, and 2000, respectively (Abbott, 2001, pers. commun.). In 1997, the assessed value of all property was $11.7 billion; in 1998, 1999, and 2000, assessed values were $11.4, $10.8 and $10.8 billion, respectively. The North Slope Borough projects’ total assessed value will decline steadily from $10 billion in 2002 to $5 billion in 2013 (Wright, 2001, pers. commun.).

In Fiscal Year 1994, the North Slope Borough applied a rate of 18.5 mills to assessed property—4.78 mills for operations and 13.72 mills for debt service. Although the mill rate for operations is at the limit allowed by State statutes, the Borough’s mill rate to repay bonded indebtedness is unlimited. Therefore, the Borough can raise the mill rate to repay bonds without legal restraints, and limits on short-term revenues do not drive current capital expenditures. The State perceives a limit of 20 mills on the rate for oil and gas property; thus, self limitation at an 18.5-mill rate leaves the North Slope Borough a buffer to increase revenues, if assessed values fall unexpectedly (Nageak, 1998).

#### (4) Net Present Value to the Government

The net present value of receipts to Federal and State governments for projects on the Beaufort outer continental shelf in 2000 is zero.

### c. Subsistence as a Part of the North Slope Borough’s Economy

The predominately Inupiat residents of the North Slope Borough traditionally have relied on subsistence activities. Although not part of the cash economy, subsistence hunting is important to the Borough’s whole economy and even more important to the culture (see Sections VI.B.1 and 2).

### d. Additional Information on the Economy

See *Liberty Development Project* (Northern Economics, Inc., 1998) for additional information on the economy.

## 5. Land Use Plans and Coastal Management Programs

Most of the land in the North Slope Borough is held by a few major landowners:

- The Federal Government. More than half of the 20 million hectares in the region is contained in the National Petroleum Reserve-Alaska and the Arctic National Wildlife Refuge.
- The State of Alaska (1.4 million hectares).

- Eight Native village corporations and the Arctic Slope Regional Corporation (totaling 1.9 million hectares).

Complex land-ownership patterns result from the Alaska Native Claims Settlement Act, which requires conveying only surface-estate rights to Native village corporations but allows subsurface-estate rights to be conveyed to Native regional corporations. In selected Federal holdings, such as the Arctic National Wildlife Refuge and the National Petroleum Reserve-Alaska, the act restricts village corporations to surface-estate rights and reserves the subsurface estate for the Federal Government; the Arctic Slope Regional Corporation had to select its subsurface estate outside these holdings.

Major land uses on the North Slope are divided between traditional subsistence uses of the land and hydrocarbon-development operations. The extent and location of hydrocarbon exploration, development, and production on the North Slope and offshore areas are described under major projects for the cumulative case (Section V.B).

## a. Federal Lands

Federal lands are mainly associated with offshore oil and gas leases and coastal management. In addition, onshore Federal lands on the North Slope consist of small Distant Early Warning line sites, the Arctic National Wildlife Refuge, and the National Petroleum Reserve-Alaska.

Of the seven Distant Early Warning-line sites on Alaska's northern coast, three were decommissioned and converted entirely to North Warning System sites. One of these, the Bullen site, is about 20 miles from the proposed activity.

The Arctic National Wildlife Refuge is located about 110 miles east of the project area, and the National Petroleum Reserve-Alaska is about 90 miles west (Map 3a).

## b. State Lands and Coastal Management Standards

The State of Alaska's lands cover most of the arctic coast between the National Petroleum Reserve-Alaska and the Arctic National Wildlife Refuge. This jurisdiction extends to submerged lands within 3 miles of the coastline (Map 1).

The Federal Coastal Zone Management Act and the Alaska Coastal Management Act were enacted in 1972 and 1977, respectively. Through these acts, development and land uses in coastal areas are managed to balance using coastal areas and protecting valuable coastal resources. The Federal Coastal Zone Management Act is administered by the Office of Ocean and Coastal Resource Management within the National Oceanic and Atmospheric Administration's National Ocean Service. The Act requires that direct and indirect Federal activities be consistent with a State's federally approved coastal management program. Indirect activities are those that require Federal permits, such as activities described in development and production plans. The Federal consistency requirement is an important mechanism to address coastal effects, to ensure adequate Federal consideration of State coastal management programs, and to avoid conflicts between States and Federal Agencies. The provisions and policies of the Federal and State coastal management programs are described in MMS Reference Paper 83-1 (McCrea, 1983). We summarize this paper in the following paragraphs and incorporate it by reference.

Statewide standards of Alaska's Coastal Management Program may be refined through local coastal programs prepared by coastal districts. Coastal districts are encouraged to prepare local programs to supplement the Statewide standards. Alaska's Coastal Policy Council and the Secretary of the U.S. Department of Commerce must approve these district programs through the Office of Ocean and Coastal Resource Management before they can go into Alaska's Coastal Management Program. The North Slope Borough is the only coastal district near the sale area, and its coastal management program is part of Alaska's program. We describe the Borough's program after discussing the Statewide standards.

The Alaska Coastal Management Program, as initially approved by the Office of Ocean and Coastal Resource Management, includes:

- The Alaska Coastal Management Act
- Guidelines and standards developed by the Coastal Policy Council
- Maps depicting the interim boundaries of the State's coastal zone

The Federal Coastal Zone Management Act, as amended, requires lessees to certify that activities in their development and production plans comply with the State's coastal program, if they affect any land or water use in the coastal zone. The State must concur with, or object to, the lessees' certification.

The type of Federal activity we evaluate in this EIS is approval of a Federal license or permit detailed in an outer continental shelf plan. The State reviews these activities to determine whether they will be consistent with its plan. This review authority applies to the proposed development and production activities in the Liberty Project area. The Federal Government cannot permit these activities unless the State concurs, or is conclusively presumed to have concurred, that the plan follows its management program for the coastal zone (43 U.S.C. 1340(c) and 1351(d); 16 U.S.C. 1456(c)(3)). If we receive the State's concurrence, we may approve permits for activities described in the plan under 15 CFR 930.63(c). We may require changes to the plan, if the operator has agreed to the State's requirements.

If we get a written consistency objection from the State before the review period expires, we will not permit an activity described in the plan unless the following is done:

- The operator amends the plan to meet the objection under 15 CFR 930.83 and we then receive, conclusively presumed, concurrence.
- On appeal, the Secretary of Commerce, under 15 CFR 930.120, finds the plan consistent with the objectives of the Federal Coastal Zone Management Act or necessary in the interest of national security.
- Courts declare the original objection invalid.

The State must determine within 6 months that a proposed activity is not consistent with its approved program and must notify the applicant. The State objection must describe the following:

- how the proposed activity will be inconsistent with specific elements of the management program and
- alternatives that the applicant could adopt that would allow the proposed activity to be consistent with the management program.

The State also must tell applicants they can appeal to the Secretary of Commerce under 15 CFR 930 Subpart H. Applicants have 30 days from receipt of the objection to file a notice of appeal with the Secretary of Commerce. They may appeal if the activity either furthers the purposes or objectives of the Federal Coastal Zone Management Act or is necessary in the interest of national security.

### c. North Slope Borough

The North Slope Borough is a home-rule municipality governed by State law and a municipally adopted charter. Their land-management regulations are codified in Title 19 of the Borough's Municipal Code and are applied to all lands within the Borough not owned by the Federal Government. Municipal powers include platting (control over the subdivision of land) and regulations of land use, which must be based on a comprehensive plan. Platting regulations and land use controls within the municipal boundary, which extends to the limit of State waters in the Alaskan Beaufort Sea, are under Borough control.

#### (1) The North Slope Borough's Comprehensive Plan and Land Management Regulations

These were first adopted in December 1982. The Land Management Regulations were revised on April 12, 1990. The revisions simplified the regulatory process but did not alter the basic premise of the comprehensive plan—to preserve and protect the land and water habitats essential to subsistence living and the Inupiat way of life. The plan identifies important issues and directs how to handle them within the Borough. It is the basis for the Borough's Land Management regulations, which establish zoning districts and performance-based policies for using land. Areawide policies in the Land Management regulations are, for the most part, the same as those for the Borough's coastal management. The main differences are how they carry out these policies. Coastal management policies cover only activities within the coastal zone, or activities that affect uses of this zone.

#### (2) The North Slope Borough District's Coastal Management Program

This program was adopted in 1984 and approved by Alaska's Coastal Policy Council in April 1985 and the Federal Office of Ocean and Coastal Resource Management in May 1988. The coastal management boundary adopted for the Borough's program varies slightly from the interim boundary of Alaska's Coastal Management Program. In the mid-Beaufort sector, the boundary was extended inland on several waterways to include habitats that support spawning and overwintering of anadromous fishes. Along the Chukchi Sea coast, it was extended inland to include the Kukpuk River and a 1.6-kilometers corridor along each bank.

The Borough's program was developed to balance exploring, developing, and extracting nonliving natural resources against maintaining and accessing the living resources vital to the Inupiat people's traditional cultural values and way of life.

### d. Native Allotments

These allotments are important uses of land near the Liberty project and are considered Indian trust resources (lands). They are small land parcels (up to 160 acres) given to families for private use under the Alaska Native Allotment Act (1906). The use or lease of these allotments requires consensus of all family heirs and the approval of the Bureau of Indian Affairs. Map 1 shows Native allotments near the Liberty Project area.

## 6. Brief History of Leasing and Drilling in the Area

### a. Previous Lease Sales in the Beaufort Sea

Sale BF, December 11, 1979
Sale 71, October 13, 1982
Sale 87, August 22, 1984
Sale 97, March 16, 1988
Sale 124, June 26, 1991
Sale 144, September 18, 1996
Sale 170, August 5, 1998

These sales resulted in 686 issued leases, which generated more than $3.5 billion in bonus revenues for the State and

Federal treasuries. All Beaufort Sea leases have a primary term of 10 years. Companies owning them may choose to relinquish them at any time before the primary term expires. Of the 686 original leases, 592 have been relinquished or have expired. Ninety-six leases remain active as of October 31, 1998.

### b. Drilling History

During 20 years in the Beaufort Sea, industry has drilled 30 exploratory wells, and 10 leases have been determined capable of producing. BPXA considers the Northstar and Liberty Prospects producible and proposes to develop them.

# C. PHYSICAL ENVIRONMENT

There are five categories that describe the physical environment of the area:

- Geology
- Marine Water Quality
- Air Quality
- Climate and Meteorology
- Oceanography of Foggy Island Bay

## 1. Geology

Shallow geological and geophysical data provide the initial, and sometimes only, information about marine archaeology, engineering considerations, and critical biological habitats on the outer continental shelf (Thurston, Choromanski, and Crandall, 1999). The term "shallow" is relative but usually means a depth of about 1,000 feet (300 meters) or less beneath the seafloor, which normally includes Pleistocene strata and recent sediments. In the following discussion, shallow geological data include maps, diagrams of cross-sections and boreholes, and data from rock or sediment samples; the geophysical data are mainly high-resolution seismic-reflection data from high-resolution instruments, such as side-scan sonars (aerial views), fathometers, subbottom profilers, boomers, mini-sparkers, and air- or waterguns (all cross-sectional records with variable power, penetration, and resolution).

Shallow geology of the Liberty area is described in published information on regional geology (Dinter, Carter, and Brigham-Grette, 1990; Craig, Sherwood, and Johnson, 1985; Dunton, Reimnitz, and Schonberg, 1982; Barnes and Rearic, 1985, 1986; Barnes, Rearic, and Reimnitz, 1985; Barnes, McDowell, and Reimnitz, 1977; Wolf, Reimnitz, and Barnes, 1985; Bruggers and England, 1979; and Hopkins and Hartz, 1978) combined with site-specific geological and geophysical data (Watson Company, 1998a,b; Watson Company, 1999; Arctic Geoscience, Inc., 1997; Blanchet et al., 2000; Coastal Frontiers Corporation, 1998; Duane Miller & Assocs., 1997, 1998; Harding-Lawson Assocs., 1981a,b,c; LGL Ecological Research Associates, 1998; and Woodward-Clyde Consultants, 1981, 1982).

### a. Regional Setting

Foggy Island Bay, located east of Prudhoe Bay between the deltas of the Sagavanirktok and Canning rivers, opens to Stefansson Sound on the central Beaufort Sea coast. The bay and sound are sheltered from the Arctic Ocean by the McClure group of barrier islands (Figure VI.C-1). The coastal and inland physiography is typical of the Arctic Coastal Plain, a vast, low-angle, sloping plain that extends north from the Brooks Range to the Beaufort Sea. This tundra-covered, frozen plain has many permafrost features such as pingos, ice wedges, thaw lakes, and patterned ground. Rivers dissect the plain and form deltas along the coast. Four rivers empty into the Beaufort Sea and form modern deltas south of the proposed Liberty Island location: from west to east, the Sagavanirktok, Kadleroshilik, Shaviovik, and Canning rivers (Maps 1 and 2). The deltas contain features such as distributary channels, small islands, barrier bars, spits, and lagoons. Typical coastal features include bluffs, terraces, wave-cut cliffs, and beach ridges. The coast erodes (Figure VI.C-2) on the order of 6-9 feet (2-3 meters) a year (Hopkins and Hartz, 1978), but these rates vary greatly depending on coastal geomorphology, sediment composition, and exposure to storm and tidal forces. Rates generally are higher on bluffs, headlands, and coastal segments consisting of fine-grained and permafrost material. River deltas do not show any erosion.

The barrier islands of the McClure Island group lie northeast, relatively far offshore compared to other barrier islands—about 9.5 miles (15.5 kilometers) from the coast and 7 miles (11 kilometers) from the proposed production island. Individual islands and shoals have a core that remains from the paleo-Arctic Coastal Plain. These island cores consist mainly of deposits from the Pleistocene Gubik Formation, which mantle the onshore Arctic Coastal Plain. The islands apparently are eroding and building up, gradually moving sediment to the south and west, as suggested in a comparison of ocean charts from 1952 and 1990 (Figure VI.C-3).

Foggy Island Bay overlies the northern flank of the eastern end of the Barrow Arch geologic structure and lies about 40 miles (64 kilometers) south of the Hinge Line Fault Zone (Craig, Sherwood, and Johnson, 1985). The Barrow Arch and associated structures, combined with Paleozoic and Mesozoic rocks, form the prolific oil fields of the North Slope. These structural features typically are not geologically active, and there is no evidence of recent seismic activity in the area west of the Canning River and south of the Hinge Line Fault Zone. However, the island site is 60-70 miles (96-112 kilometers) west of the geologically and seismically active Camden Bay region, which has had earthquakes, including a magnitude 5.3 in 1968 (Craig, Sherwood, and Johnson, 1985). The proximity of the active seismic zone to the Foggy Island Bay brings the Liberty location potentially within the area of ground-shaking during large Camden Bay earthquakes.

## b. Quaternary Geological History

The Quaternary geological history of Alaska generally reflects glacial advances and retreats and the effects of glacial processes. In the Beaufort Sea area, glaciers played only a small or indirect role in shaping the physical environment. Glaciation generally was limited to alpine and mountain-front glaciers. Glacial and eustatic sea-level fluctuations, however, have dominated the Quaternary history and geomorphology of the area.

The Arctic Coastal Plain and its seaward continuation contains interfingering wedges of marine and nonmarine sediments of the Gubik Formation. These sediments were deposited during higher and lower Pleistocene sea-level stands starting at approximately 70,000 years ago. When the sea went down, streams and rivers deposited sediments as alluvial layers and deltas and wedges that thin towards the sea. When the sea rose, it deposited silts and clays, with some boulders carried by ice, to form wedges that thin towards land.

Since the late Pliocene era (approximately 3.5 million years ago), the sea rose at least five times, reaching heights of 200 feet (60 meters) above present-day levels. Table VI.C-1 shows the major Quaternary episodes of increases in sea level.

Since the late Pleistocene, sea level has fluctuated from 21-30 feet (7-10 meters) higher than today (about 70,000 years ago), to 270 feet (90 meters) or more lower than today (18,000 years ago), resulting in the overlapping marine and nonmarine sediment wedges described earlier. At the lowstand 18,000 years ago, the paleo-shoreline was seaward of the present-day barrier islands. When the sea rose, it drowned onshore features such as river channels, lagoons, paleo-shorelines and associated coastal features, permafrost and related features, and organic deposits. Sea level generally has risen from 18,000 years ago (Table VI.C-2) until today, with a few notable times when it leveled off or retreated. About 13,000 years ago, the sea level stood at -50 meters, corresponding to the late Wisconsin glacial advance. The shoreline during this period was seaward of the McClure Islands. Near the beginning of the Holocene 11,000 years ago, the sea level began to rise to its present position, reached about 5,000 years ago.

## c. Offshore Geology

The Liberty Island site lies in Federal waters in outer Foggy Island Bay, between Foggy Island on the Sagavanirktok River Delta 5.5 miles (8.5 kilometers) to the west and Karluk Island in the McClure group 6.5 miles (10.5 kilometers) to the northeast (Figure VI.C-1). Water depths are shallow, less than 23 feet (7 meters).

It is commonly assumed that the Holocene marine transgression extensively eroded and "planed off" terrestrial landforms as they progressively were drowned by the rising water. However, evidence from high-resolution seismic-profiling systems have indicated that many recognizable landform features and terrestrial strata exist offshore and, therefore, have survived the rise in sea level. These landforms have been modified somewhat by marine processes such as ice gouging, wave erosion, current and strudel scouring, and sedimentation.

### (1) Stratigraphy

#### *(a) Pleistocene Deposits*

Offshore, Pleistocene strata have the same interfingering wedges of the Gubik Formation as the Arctic Coastal Plain. These deposits underlie the seafloor across the Beaufort shelf and, where Holocene sediments are absent, they crop out and become exposed at the seafloor.

Pleistocene strata on the shelf generally thicken seaward away from the Brooks Range. Based on shallow seismic data (Figure VI. C-4), the thickness of the Gubik Formation is hundreds to several hundreds of feet (Figure VI. C-5 [Dinter, Carter, and Brigham-Grette, 1990]). The base of the Gubik Formation offshore is not well defined on seismic data, because it is similar to the marine and deltaic strata of the underlying Tertiary Brookian sequence and displays similar acoustic reflection properties (Figure VI.C-4). Craig, Sherwood, and Johnson (1985) have seen a possible regional unconformity on seismic data (Figure VI.C-4) between the Gubik Formation and underlying Pliocene and older strata. In the study area, a strong reflector on seismic profiles (representing an unconformity) that occurs about 300 feet (90 meters) below the seafloor may represent this boundary. Above this layer, two broad seismic-stratigraphic (Figure VI.C-4) units of the Gubik Formation are in the study area, separated by another prominent seismic reflector (upper and lower seismic-stratigraphic units in Figure VI.C-4). Dinter, Carter, and Brigham-Grette (1990) mapped a regional seismic reflector that they believe represents the base of Pelukian-age deposits, which are roughly time-equivalent to the Gubik Formation (Figures VI.C-4 and VI.C-5). This probably is the reflector that separates the upper and lower Pleistocene seismic stratigraphic (Figure VI.C-4) units in the study area.

The lower Pleistocene unit rests on older Plio-Pleistocene rocks of the Brookian sequence and is about 200 feet (60 meters) thick. It has an uneven upper surface, which is characteristic of subareal erosion from streams or glaciers. The unit is crudely stratified and includes many internal layers and discontinuous sedimentary bodies. It correlates with strata encountered in shallow cores that consist mainly of terrestrial beach, lagoon, delta, and alluvial deposits, plus sands, sandy gravels, and silty sands (Duane Miller & Assocs, 1997, 1998; Watson Company, 1998a,b; Watson Company, 1999). This unit is predominantly a nonmarine member of the Gubik Formation.

The upper Pleistocene unit unconformably overlies the lower unit and is 100-110 feet (30-34 meters) thick. In the western study area, a unit of the Gubik Formation laden with boulders and cobbles crops out at the seafloor (Figures VI.C-6 and -7) and forms part of the Boulder Patch biological habitat. This unit consists of marine silts, clays, sands, and isolated organic-rich silts and peat. It contains occasional boulders and cobble erratics. The upper Pleistocene unit probably correlates with the Pelukian-age strata mapped in Figure VI.C-5 (Dinter, Carter, and Brigham-Grette, 1990).

Their similarity to onshore deposits and evidence from core-hole data (Dinter, Carter, and Brigham-Grette, 1990) suggest that the seafloor exposures of boulders and cobbles are likely outcrops of the marine Flaxman Member of the Gubik Formation. Erosion of the Flaxman sediments left a lag made of gravel, cobbles, and boulders (Figure VI.C-7) called the Boulder Patch. The Flaxman Member is a marine deposit containing a lot of ice-rafted sediments whose unique composition suggests they came from the Canadian Arctic islands about 70,000 years ago. Winnowing of fine-grained parts of this unit left the lag behind.

#### *(b) Holocene (Recent)*

Holocene sediments are usually thin throughout the shallow Beaufort shelf (Figure VI.C-2) and cover the eastern part of the study area. Geotechnical borings collected in the Liberty area (Bruggers and England, 1979; Duane Miller & Assocs, 1997, 1998; Harding-Lawson Assocs., 1981c) show that Holocene sediments are mainly soft, reworked marine silts, clays, and fine-grained sands. The geological report for Liberty shows Holocene sediments, where present, are more of a mixture of sands and silts typical of nearshore deposits. Holocene marine sediments thicken from nothing to about 9 feet (2.6 meters) on a line running generally north-to-south through the central part of the area. Correlation of seismic with geotechnical data suggests that Holocene sediments are slightly thicker than seismic profiles show.

The source of Holocene marine strata is stream sediment and fine-grained marine sediments carried by coastal currents. Seasonal storms and offshore currents rework and redistribute fine-grained sediments. This reworked Holocene veneer covers older Holocene and Pleistocene features such as drowned lagoons, stream channels, and more recent features like ice gouges and strudel scoured depressions. Borings in older Holocene and Pleistocene strata have recovered medium-stiff to stiff silts, sands with local organic-rich silts and stiff clays, and peat (Duane Miller & Assocs., 1997, 1998). These materials support the idea of rapid drowning of the Arctic coast and preservation of coastal features.

### (2) Seafloor Features

**Permafrost:** Permafrost exists in the study area (Figure VI.C-8). By strict definition, permafrost is soil that remains below 32 degrees Fahrenheit (0 degrees Celsius) for 2 or more years. Recorded bottom temperatures at the Liberty area are below 32 degrees Fahrenheit (0 degrees Celsius), thereby making all sediments permafrost. Bonded permafrost is soil cemented with visible ice. Unbonded permafrost is loose soil or sediments below freezing. Geotechnical data indicate that bonded permafrost is encountered in sediments at or very near the surface onshore (Dinter, Carter, and Brigham-Grette, 1990). Exposure to temperatures below freezing during lower sea-level stands created several thousand feet of permafrost. Offshore, the bonded permafrost drops off rapidly but rises again in some areas and near barrier islands (Bruggers and England, 1979).

Geotechnical studies found bonded permafrost within 20 feet (6 meters) of the seafloor at several locations in Stefansson Sound and Foggy Island Bay (Bruggers and England, 1979). The occurrence and extent of permafrost offshore still is not well known. Bonded permafrost offshore appears to be related to the presence of overconsolidated, low-permeability silts and clays of the Flaxman Member of the Gubik Formation. These silts and clays form a barrier to the infusion of salt water that would lower the thaw point and cause ice to melt (Duane Miller and Assocs., 1997).

### (3) Seafloor Sediment

#### *(a) Boulders and Gravel*

The seafloor in the extreme western part of the study area is mantled with coarse-grained sediments—gravel, cobbles, and boulders (Figures VI.C-6 and -7). The Boulder Patch, an area containing more than 25% boulders, forms a critical biological habitat for kelp and associated benthic marine organisms (Dunton, Reimnitz, and Schonberg, 1982; Coastal Frontiers Corporation, 1998). Figure VI.C-7 shows concentrations of sediment coarser than 2 millimeters in diameter in the central Beaufort Sea, including the study area. Boulder deposits are common in the North Slope and are part of the Flaxman Member of the Pleistocene Gubik Formation. Boulder deposits on the seafloor show the area is probably a remnant of the Arctic Coastal Plain. The barrier islands from Camden Bay to Reindeer Island in the west are remnants of the Arctic Coastal Plain; their cores consist of sediments from sources outside the Brooks Range.

#### *(b) Holocene Soft Bottom*

Muds consisting of Holocene marine clays, silts, and sands cover the seafloor in the eastern part of the study area. On side-scan sonar records (Watson Company, 1998a,b; 1999), these deposits exhibit fresh small-scale ice gouging and some hard targets, possibly representing erratic boulders (Figure VI.C-6).

#### *(c) Ice Gouges*

Ice gouging is intense and almost pervasive on the shallow Beaufort Sea shelf (less than 164 feet [50 meters]) (Figure VI.C-9) (Barnes and Rearic, 1985, 1986; Barnes, Rearic, and Reimnitz, 1985; Barnes, McDowell, and Reimnitz, 1977; Wolf, Reimnitz, and Barnes, 1985). However, ice gouging is sparse in the study area of Foggy Island Bay (Watson Company, 1998a,b; 1999; Arctic Geoscience, Inc., 1997; Blanchet et al., 2000; Coastal Frontiers Corporation, 1998). Modern ice gouging is confined to discontinuous, sparse, narrow, and shallow features (Figure VI.C-6). Foggy Island Bay is protected from the large ice masses responsible for major ice gouging in other parts of the Beaufort Sea by the outlying barrier islands and by floating shorefast ice, which blocks most drift ice from entering the bay. The presence of biological habitats in the Boulder Patch is due to the protection from ice gouging.

There are large ice gouges in the study area, but they appear to be old (Figure VI.C-6). They are partly or completely filled with marine sediments. Side-scan sonar images show they have little or no relief and that their expression is due to textural differences between the infill sediments and the surrounding seafloor. These older gouges are even in the Boulder Patch, but do not seem to have recently affected the distribution or texture of these seafloor deposits. The gouges may be many hundreds, if not thousands, of years old and are preserved because there are no modern large-scale ice-gouging events and sedimentation rates are low.

### (4) Subsurface Features

#### *(a) Buried Channels*

In the extreme eastern part of the study area, channels underlie the Holocene marine unit. These channels are cut into the Pleistocene unit and exhibit infill and overbank features (Figure VI.C-10). The channels trend generally north and may be extensions of the Canning or Sagavanirktok rivers onto the paleo-Arctic Coastal Plain.

#### *(b) Lagoons*

Possible lagoon features are present in the eastern part of the study area and are expressed on seismic profiles as slight, filled-in depressions with a higher-amplitude reflector at their base (Figure VI.C-11). This reflector is discontinuous and may represent buried organic material within the lagoon. Cores in the area (Duane Miller & Assocs., 1997, 1998) suggest such deposits are present (Dinter, Carter, and Brigham-Grette, 1990).

#### *(c) Permafrost*

Diffractions in seismic-reflection data may originate from ice-bonded sediments or ice lenses in the deeper (more than 1,000 feet [300 meters]) stratigraphic section.

#### *(d) Other Features*

Possible ice/sand-wedge, strudel-scour, ice-gouge, and small stream-cut features are visible on some records (Figures VI.C-11 and VI.C-12), usually more toward shore. These relict features are covered over or filled in by Holocene deposits and they are usually no more than 3-6 feet (1-2 meters) below the seafloor.

## 2. Marine Water Quality

Foggy Island Bay is located off the central part of the Alaskan Beaufort Sea coast between the deltas of the Sagavanirktok and Shaviovik rivers (Map 1); these deltas are located in the western and eastern parts of the bay, respectively. The Kadleroshilik River flows into the central part of the bay. Coastal waters, consisting of a mixture of sea- and freshwaters, may be transported through Foggy Island Bay in a westerly direction, when winds are blowing from the east and through the bay in an easterly direction, when winds come the west (SectionVI.C.5); during the open-water season, the winds are mainly from the east. The winds also influence the amount of mixing between the different watermasses along the coast—strong, sustained winds are more effective in mixing than light, variable winds. The characteristics of the coastal waters vary with the year, season, location (bay, delta), wind (direction, speed, persistence), river discharge, amount of solar heating, and characteristics of the terrestrial and marine coastal environment.

The quality of the marine aquatic environment is determined by water's physical and chemical characteristics. The constituents of the water mainly are composed of naturally occurring substances but may include manmade substances—pollutants. The naturally occurring substances are derived from the atmospheric, terrestrial, and other aquatic (freshwater and marine) environments. The waterborne and airborne substances entering the marine environment may include pollutants.

Because of limited municipal and industrial activity along the coast, most contaminants occur at low levels in the Beaufort Sea. However, sediment particles (fine enough to be suspended), trace metals, and hydrocarbons are introduced into the marine environment through river runoff, coastal erosion, atmospheric deposition, and natural seeps. The rivers (Colville, Kuparuk, Sagavanirktok, and

Canning) that flow into the Alaskan Beaufort Sea remain relatively unpolluted by human activities.

## a. Pollutants

The principal sources of pollutants entering the marine environment include discharges from industrial activities (petroleum industry) and accidental spills or discharges of crude or refined petroleum and other substances.

Pollutants may be classified as physical, chemical, and biological. Physical pollutants include suspended solids. Suspended solids may inhibit photosynthesis, decrease benthic activity, and interfere with fish respiration.

The chemical pollutants include organic and inorganic substances. The decomposition of organic substances uses oxygen and, if enough organics are present, the concentration of oxygen could be reduced to levels that would threaten or harm oxygen-using inhabitants of the water column. The measure of oxygen-depleting substances is the biochemical oxygen demand. Some of the organic substances, such as oil (crude or refined), can have a wide variety of sublethal and lethal effects on marine organisms; these effects can impair subsistence, recreational, or commercial uses of the marine biological resources. The discharge of soluble inorganic substances may change the pH or the concentration of trace metals in the water, and these changes may be toxic to some marine plants and animals.

Biological pollution may cause (1) waterborne diseases by adding viruses, protozoa, or bacteria to the receiving waters or (2) excessive biological growth—eutrophication—by increasing the concentration of nutrients, nitrogen and/or phosphorus, in the waters; eutrophication also occurs naturally. The presence of coliform bacteria in the water is considered an indication of fecal contamination.

## b. Regulatory Control of Pollutants

The principal method for controlling pollutant discharges is through Section 402 (33 U.S.C. § 1342) of the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act of 1972, which establishes a National Pollution Discharge Elimination System (Laws, 1987). Under Section 402, the Environmental Protection Agency or authorized States can issue permits for pollutant discharges, or they can refuse to issue such permits if the discharge would create conditions that violate the water-quality standards developed under Section 303 (33 U.S.C. § 1313) of the Clean Water Act. The Clean Water Act, Section 403 (33 U.S.C. § 1343), states that no National Pollution Discharge Elimination System permit shall be issued for a discharge into marine waters except in compliance with established guidelines. The guidelines require a determination that the permitted discharge will not cause unreasonable degradation to the marine environment (40 CFR 125.122). Unreasonable degradation of the marine environment means (1) significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities; (2) threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms; or (3) loss of aesthetic, recreational, scientific, or economic values, which is unreasonable in relation to the benefit derived from the discharge.

The latest information on water-quality standards for the Environmental Protection Agency is available in the most recent edition of 40 CFR (paragraph 131) or at the agency's internet website (www.epa.gov). State of Alaska water is available in the most recent version of 18 AAC 70 or at the Alaska Department of Environmental Conservation website (www.state.ak.us/dec/).

## c. Characteristics

Our present knowledge about the characteristics of the Beaufort Sea, at least in part, is due to the discovery and development of oil and gas resources of Alaska's North Slope, exploration activities along the coast and offshore, and development and production offshore in State waters.

Oil and gas activities in the U.S. Beaufort Sea began over about a 10-year period from 1965-1975. During this time, the first oil and gas lease sale that included offshore areas was held in 1965 (State of Alaska Sale 14), and exploration well drilling in State waters began in 1975 from Niakuk Island. Leases in Federal waters of the Beaufort Sea were offered for the first time as part of in the Joint Federal and State Sale Oil and Gas Lease Sale BF in 1979. From 1981-1997, 34 exploration wells have been drilled on 25 prospects in Federal waters of the Beaufort Sea. The first Beaufort Sea production began in State waters in 1989 from the Endicott field, which was discovered in 1978. Production is scheduled to begin in 2001 from the Northstar field, which was discovered in 1984. Development of the Liberty Prospect, discovered in 1983, is being planned.

In addition to research studies of individual investigators, the MMS Environmental Studies Program was initiated in 1973 to support the Department of the Interior's offshore oil and gas leasing program. In 1975, an interagency agreement between the Bureau of Land Management and the National Oceanic and Atmospheric Administration established the Outer Continental Shelf Environmental Assessment Program; the Bureau of Land Management managed the offshore oil and gas leasing program until the MMS was formed in 1982. In Alaska, this program primarily conducted baseline studies on continental shelf and adjacent coastal areas. These studies included the physical and chemical characteristics of the seafloor and overlying marine waters in the Beaufort Sea. Monitoring studies were conducted to provide information on changes in environmental characteristics relative to the baseline data from OCS oil and gas activities. Information from these studies was presented in a series of Outer Continental Shelf Environmental Assessment Program reports and at synthesis and information update meetings.

The Beaufort Sea Monitoring Program was initiated in 1984 to develop and implement a monitoring program for evaluating potential impacts of anticipated offshore oil and gas exploration and production activities on the Beaufort Sea continental shelf. This program was designed to detect and quantify temporal changes in the concentrations of metals and hydrocarbons in sediments and in animal tissues and to relate such changes to potential sources.

The first phase of the Beaufort Sea Monitoring Program resulted in a 3-year (1984, 1985, and 1986) study of 39 nearshore stations and 10 shoreline peat and river stations to define the baseline geochemical characteristics of the nearshore Beaufort Sea (Boehm et al., 1987). The analysis of replicate sediment samples for barium, chromium, lead, copper, zinc, vanadium, and cadmium showed a wide range of concentrations within the study area (Harrison Bay to Camden Bay). Generally higher concentrations of metals were associated with finer grained sediments and were located near areas where the major rivers discharge into the Beaufort Sea. For sediments with similar grain-size characteristics, annual variations of metal concentrations generally were small at each station. Data indicated that river sediments and peat contribute to the hydrocarbon character of the marine sediments. The hydrocarbon composition of the sediments is more similar to the river sediments than to the shoreline peat deposits.

The second phase of the Beaufort Sea Monitoring Program was conducted in 1989. A group of 49 stations were sampled; 39 of the stations had been sampled during the 1984-1986 period. Regional means for the 1989 trace-metal data were in close agreement with the data from 1984-1986 (Boehm et al., 1990). There was excellent agreement between the composition of saturated hydrocarbons (alkanes) in the sediment samples from 1984-1986 and 1989. This result indicated that no petroleum hydrocarbons attributable to recent drilling or production inputs were detected at any locations. The concentrations of polynuclear aromatic hydrocarbons found in the sediments sampled in 1989 did not differ significantly from the concentrations in the sediments sampled in 1984-1986. Regional differences in polynuclear aromatic hydrocarbons concentrations were observed, but the differences were attributed to differences in depositional processes rather than inputs of local pollutants.

In 1997, Naidu et al. (2001) sampled nearshore Beaufort Sea surface sediments to determine if there were any significant changes in the concentrations of selected trace metals and hydrocarbons as a result of ongoing oil and gas development between the Colville and Canning rivers. Of the 21 stations sampled, 20 were at the same locations occupied as part of the Beaufort Sea Monitoring Program that was mentioned in the previous paragraphs.

The Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA) program was developed to monitor potential impacts from oil and gas development and production activities in the nearshore Beaufort Sea area. The purpose of the program is to further develop baseline environmental conditions prior to oil and gas development and production activities, assess impacts from these activities and provide information needed in postleasing decision to help minimize these impacts. The program is designed to detect and quantify long-term changes in the concentrations of metal and hydrocarbons in sediments and animal tissues. During Phase I (1999-2000), physical, chemical and acoustical measurements were made near the Northstar development site and near the proposed Liberty development site. Samples also were collected at a number of previously sampled Beaufort Sea Monitoring Program sites.

A sediment-sampling program was undertaken in April and May 2001 as part of a baseline collection survey to support Environmental Protection Agency and U.S. Army Corps of Engineers permit activities associated with the Liberty Development Project (URS Corporation, 2001). The Environmental Protection Agency and U.S. Army Corps of Engineers have not promulgated guidance for environmental evaluation of dredging activities specific to Alaska. However, the Environmental Protection Agency, Region 10 directed that the chemical sampling, testing, and interpreting guidelines developed for assessing the acceptability of dredged material for disposal in the Lower Columbia River Management Area be used (Lower Columbia River Management Area, 1998). The sediment samples collected as part of this sampling program were analyzed for grain size, chemical-of-concern (ammonia as nitrogen, total organic carbon, total volatile solids, sulfides), metals, and polycyclic aromatic hydrocarbons.

### (1) Turbidity

#### *(a) Summer - Open Water*

Satellite imagery and suspended-particulate-matter data suggest that in general, turbid waters are confined to waters less than 16 feet (5 meters) deep and do not extend seaward of the barrier islands. Turbidity is caused by fine-grained particles suspended in the water column. These particles come from rivers discharging into the marine environment, coastal erosion, and resuspension by wave action of particles deposited on the seafloor. Seafloor sediments in Foggy Island Bay include a heterogeneous mixture fine sand-, silt-, and clay-size particles—particles less than 0.250 millimeter (0.01 inch) in diameter. The turbidity resulting from the floods, along with other factors, blocks light and measurably reduces primary productivity of waters shallower than about 40 feet (12 meters).

In mid-June through early July, the shallow inshore waters generally carry more suspended material, because runoff from the rivers produces very high turbidity adjacent to the river mouths. Deltas at the mouths of rivers indicate deposition of riverborne sediments. Total suspended solids in the Sagavanirktok River channels in 1985 (mid July through mid September) ranged from 0.2-30.0 milligrams per liter (U.S. Army Corps of Engineers, 1987). Maximum values corresponded to midseason river discharge peaks following large rainfall events in the Brooks Range. The highest levels of suspended particles in the Sagavanirktok River discharge occur during breakup: values ranged from 63-314 milligrams per liter for 1971-1976 (U.S. Army Corps of Engineers, 1993).

Coastal erosion rates vary annually and seasonally. In Foggy Island Bay, the coast is eroding at a rate of about 4-10 feet (1.2-3 meters) per year (Grantz and Mullen, 1992, as reported in BPXA, 1998a).

Wave action resulting from prevailing winds and storms during the open-water season resuspends unconsolidated river-delta and seafloor sediments, which increases the turbidity in shallow inshore areas. The presence of ice during open water limits wave action and decreases turbidity.

In the summer (August) of 1999, as part of the ANIMIDA project, the concentrations of suspended particulate matter at various depths in the water column were determined in situ with a turbidity sensor and from water samples collected from stations in the vicinity of the Endicott development island, the Northstar island (development project), and in Foggy Island Bay in the vicinity of the proposed Liberty Island (Boehm et al., 2001). In situ turbidities were measured in nephelometric turbidity units. The amounts of suspended sediments in the water samples were determined by (1) filtering the water and weighing the particulate matter retained on the filter (this technique measured the total suspended sediments in the sample) and (2) passing the water through a turbidimeter (this technique measured the turbidity of the water in nephelometric turbidity units). Boehm et al. (2001) reported a good correlation between the two laboratory techniques and, for ease of comparison, values of the total suspended-sediment concentration, reported in milligrams per liter, are about twice the turbidity reported in nephelometric turbidity units. (Comparison of the in situ and laboratory measurements of turbidities is more difficult, because the former measures turbidities along a vertical path with a width of less than 1 centimeter, whereas the latter measures turbidities from a water sample collected over a depth of about 1 meter.)

Total suspended-solids measurements ranged from 2.9-119 milligrams per liter; turbidity measurements ranged from 1.8-64.5 nephelometric turbidity units (Boehm et al., 2001); in-situ measurement of turbidity ranged from 2.4-85.5 nephelometric turbidity units. Variations in the values of suspended particulate matter were due mostly to variations in wind speeds. In addition, the data associated with collecting suspended-particulate matter showed, in general, that the turbidity in the water column increased with depth and the current speeds decreased with depth. In situ turbidity in the surface layer, water depths of 0.5-0.7 meters, ranged from 2.5-63 nephelometric turbidity units; in the bottom layer, water depth of 1.7-10.5 meters ranged from 4.4-85.5 nephelometric turbidity units. Current velocities ranged from 4.4-51 centimeters per second. In general, the current velocities were higher in the upper part of the water column and decreased with depth.

Figure VI.C-16 shows these variations with time (changes in wind speed) and water depth at a station located about 4.4 kilometers south of the Northstar island. Measurements of water-column temperature, salinity, turbidity, total suspended sediments, and current velocities were taken on August 18, 25, and 27, 1999. The first set of measurements was taken when winds were less than 5 knots. In general these measurements show: (1) salinities and turbidities slightly increase with depth; (2) temperatures decrease slightly with depth in the upper 2.5 meters and then increase; and (3) currents slightly increasing in velocity from 19.6 to 21.0 centimeters per second between the depths of 1.5 and 2.1 meters and below this interval to a depth of 3.9 meters, decreasing in velocity to 6.6 centimeters per second.

The second set of measurements were taken after an interval when the winds had been blowing at speeds greater than 25 knots. Compared to the August 18 data, temperatures have decreased about 3-4 degrees Celsius, salinities have increased about 0.5-3 physical salinity units, turbidities have increased about 15-20 times, and current velocities have increased about 1-8 centimeters per second. The profiles for August 25 show: (1) a slight decrease in temperatures with depth; (2) a slight increase in salinities with depth; (3) a decrease in current velocities from 33.0 to 17.1 centimeters per second between depths of 1.1 and 3.6 meters; and (4) a decrease in turbidities from 52.434.8 nephelometric turbidity units in the upper 1.7 meters of water and an increase in turbidities to 85.5 nephelometric turbidity units at a depth of 3.6 meters.

The set of measurements taken on August 27 show water temperatures rising, salinities in the upper part of the water column decreasing, and turbidities and current velocities decreasing.

The amount of suspended sediment in the water column during sampling on August 18, 25, and 27 is estimated to be 30, 500, and 300 grams per square meter, respectively (Boehm et al., 2001).

The August 1999 data suggest under relatively calm conditions, winds less than 5 knots, turbidity or total suspended-solid concentrations might be less than 3 nephelometric turbidity units or 5 milligrams per liter, respectively. For winds greater than 25 knots, turbidity or total suspended solid concentrations could exceed 80 nephelometric turbidity units or 100 milligrams per liter, respectively. Boehm et al. (2001) also note that turbidity may be about two-times lower in offshore waters, depths greater than 10 meters, than in shallower, nearshore waters, and a near-bottom nepheloid layer with a 50-300% increase in turbidity may be observed.

The range of metal concentrations in the suspended sediments is shown in Tables IV.C-3b and 3c.

Concentrations of metals in a sample of suspended sediments from both the Colville and Sagavanirktok rivers are shown in Table IV.C-3b and 3c. The rivers are sources of particulate matter found in the waters and sediments of the Beaufort Sea. The concentrations of metals in seafloor sediments are shown in Table VI.C-3.

#### *(b) Winter - Ice Covered*

In the winter, the amount of suspended sediments under the sea ice ranged from 2.5-76.5 milligrams per liter along the pipeline route for the proposed Liberty Project (Montgomery Watson, 1997, 1998). Total suspended solids in the water from beneath the ice in Gwydyr Bay ranged from 7,480-26,920 milligrams per liter and from off Stump Island ranged from nondetectable to 885 milligrams per liter (Montgomery Watson, 1996; as reported in US. Army Corps of Engineers, 1998); Gwydyr Bay is located west of the Sagavanirktok River.

In April 2000 as part of the ANIMIDA project, the concentrations of suspended-particulate matter at various depths in the water column under about 2 meters of ice were determined from water samples collected from stations in the vicinity of the Endicott development island, the Northstar island (development project), and in Foggy Island Bay in the vicinity of the proposed Liberty Island (Boehm et al., 2001). The amounts of suspended sediments in the water samples were determined by the same laboratory methods as described in Section IV.C.2.c(1)(a) for samples collected during the summer. Total suspended-solids measurements ranged from 0.14-0.58 milligrams per liter; turbidity measurements ranged from 0.15-0.70 nephelometric turbidity units (Boehm et al., 2001). These concentration ranges were lower than the concentrations of suspended-particulate matter in the water column in August 1999.

During backfilling of the Northstar pipeline trench in April 2000, suspended-sediment samples were obtained from two sites west of the pipeline at distances of about 200 and 300 meters. The total suspended solids from these samples ranged from 0.35-2.01 micrograms per liter, and the turbidity ranged from 0.20-1.35 nephelometric turbidity units.

The range of metal concentrations in the suspended sediments under the ice is shown in Tables IV.C-3b and 3c. The concentrations of barium, cadmium, chromium, copper, lead, and zinc in the suspended sediments under the ice are greater than were the concentrations of these metals in the suspended-sediment samples collected during the summer in the Beaufort Sea and in the Colville and Sagavanirktok rivers (Section VI.C. 2.c(1)(a)).

Currents during the April 2000 sampling period generally were from the northwest or southeast and tended to follow the bathymetric contours (Boehm et al., 2001). Most of the currents tended to be tidally influenced with diurnal shifts in direction. Current velocities ranged from 1-4.6 centimeters per second.

The concentrations of particulate matter in ice cores were determined from seven stations located in the vicinity of Endicott, Northstar, and the proposed Liberty Island site. The total suspended-sediment concentrations in these ice cores ranged from 1.25-248 milligrams per liter (Boehm et al., 2001). In general, the concentrations of particulate matter decreases with depth in the ice core. Ice forms on the surface of the water and traps any suspended-particulate matter present in the water. The amount of suspended-particulate matter depends on meteorological and oceanographic conditions at the time. Storms in late fall could result in higher concentrations of suspended-particulate matter than if conditions were calm during freezeup. When the surface freezes, the generation of waves and currents in response to winds decreases and there is less energy in the water column. As the energy decreases, the capability of the water to retain particles in suspension lessens. Settling of particles decreases the concentration in the upper part of the water column. As the ice forms deeper in the water, the concentrations of suspended-particulate matter have decreased and there is less material to entrap in the ice.

### (2) Dissolved Oxygen

Dissolved-oxygen levels in the Beaufort Sea usually are at or near saturation. Cold climate waters, such as those in the Beaufort Sea, generally contain more oxygen than warmer climate waters because of the greater solubility of oxygen in colder waters. Oxygen can be added to the sea in the upper layers by adsorption of air and in the layer where light penetrates by photosynthesis. Oxygen can be lost from the sea at the surface by exchanges with the atmosphere and in all depths during respiration of plants and animals and the decomposition of organic matter by bacteria.

During the open-water period, dissolved-oxygen levels in the Beaufort Sea range from about 8-12 milligrams per liter (Woodward-Clyde Consultants, 1981).

During winter-ice cover, respiration of oxygen continues, but atmospheric exchange and photosynthetic production of oxygen cease. During ice formation, dissolved oxygen is excluded from the ice into the water column. Dissolved-oxygen concentrations in the water under the ice (1) around West Dock ranged from 9-12 milligrams per liter during

February-May, (2) off Oliktok Point ranged from 11.8-13.1 milligrams per liter during April 1987 (U.S. Army Corps of Engineers, 1998), and (3) along the proposed Liberty pipeline route ranged from 7.6-13.2 milligrams per liter during March 1997 (Montgomery Watson, 1997, as reported in BPXA, 1998a).

During the ice-covered period, oxygen concentrations in areas with unrestricted circulation seldom drop below 6 milligrams per liter (URS Greiner Woodward Clyde, 1998a). In areas of reduced circulation or high respiration, further depletion occurs. Such basins sometimes turn anoxic before spring breakup. Brine drainage during ice formation generates some vertical circulation.

Biological oxygen demand measured under the ice in March 1998 along the proposed Liberty Development Project pipeline route was less than 1 milligram per liter (detection limit) (Montgomery Watson, 1998). The colder water temperatures limit decomposition and consequent oxygen demand throughout the water column in winter. Chemical oxygen demand would be minimized because of the low water temperatures, which reduce chemical reaction and the high, near or above saturation, levels of oxygen in the water.

### (3) Hydrogen Ion Concentration (pH)/Acidity/Alkalinity

The acidity/alkalinity of the waters is determined by the concentration of hydrogen ions and is expressed as the pH. Possible pH values range from 1-14. A pH value of 7 indicates a neutral water, values less than 7 indicate acidity, and values greater than 7 indicate alkalinity. The pH of seawater generally ranges from 7.8-8.2 and freshwater from 6-7. Some pH values from waters in the central part of the Beaufort Sea are shown in the following:

| Area | Open Water | Under Ice |
|---|---|---|
| Prudhoe Bay[1] | 7.8-8.2 | 6.8-7.9 |
| Oliktok Point[2] | 7.5-7.7 | 7.6-8.0 |
| West Dock[1] | 8.0-8.2 | 7.9-8.1 |

[1] U.S. Army Corps of Engineers (1998)
[2] Kinnetic Laboratories, Ltd. (1987), as reported in U.S. Army Corps of Engineers (1998)

### (4) Trace Metals

#### *(a) Past Studies*

Trace-metal concentrations in the Beaufort Sea sediments and waters are shown in Table VI.C-3a. The Effects Range-Low and -Median concentrations have been included in the table to provide some way of indicating what the concentration could mean in relation to a benthic habitat. The Effects Range-Low is defined as the concentration of a substance in the sediment that results in an adverse biological effect in about 10% of the test organisms. Effects Range-Median is defined as the concentration of a substance that affects 50% of the test organisms (Long and Morgan, 1990). For general application, the criteria have been used as follows: adverse biological effects are "rarely" observed when metal or polynuclear aromatic hydrocarbons concentrations are less than the Effects Range-Low, "occasionally" observed when the metal or polynuclear aromatic hydrocarbons concentrations are between the Effects Range-Low and Effects Range-Median, and "frequently" observed when concentrations are greater than the Effects Range-Median (Boehm et al., 2001). Most trace-metal concentrations are less than the Effects Range-Low concentrations; some concentrations are greater than the Effects Range-Low concentrations but less than the Effects Range-Median concentrations, and a few trace-metal concentrations are greater than the Effects Range-Median concentration. (For the trace metals analyzed in the ANIMIDA and Beaufort Sea Monitoring Program projects, effects range values have been developed for antimony, arsenic, cadmium, chromium, copper, mercury, nickel, lead, silver, and zinc.)

Observed geographic variations in the trace-metal concentration were attributed to grain-size distribution and organic content, with higher trace-metal concentrations in finer sediments. The major rivers—Canning (except for mercury), Sagavanirktok, Kuparuk, and Colville—are thought to be major natural sources for the trace metals in the Beaufort Sea coastal sediments.

The nearshore Beaufort Sea sediments come from erosion in the floodplains of the rivers that discharge into the Beaufort Sea and erosion of beaches and bluffs along the coast and on the barrier islands. Boehm et al. (1990) noted that the concentrations of a number of specific trace metals in the sediments were comparable with the average concentrations in the continental crust—the primary source material for marine sediments. The specific trace metals were barium, chromium, lead, zinc, and vanadium. Barium, chromium, lead, and zinc frequently are present in drilling fluids at concentrations significantly greater than in sediments. Vanadium frequently is present in crude oils in concentrations greater than in sediments. Concentrations of these metals that are above background levels could indicate contamination from drilling muds or oil spills.

As part of the Beaufort Sea Monitoring Program, the trace metals in nearshore sediments were analyzed to determine if there were any changes in their concentrations between samples collected in 1984-1986 and samples collected in 1989, and whether any changes could be related to oil and gas development; the results of these studies were reported by Boehm et al. (1987, 1990). Boehm et al. (1990) noted the regional means of trace-metal concentrations for the 1989 data were in close agreement with the 1984-1986 data. Along the Beaufort Sea coast, there are regional differences in the trace metal concentrations in the fine fraction (silt-and clay-size particles) of the sediments, but these differences are related to differences in the depositional processes. The mean concentration of barium, 840 micrograms per gram, in west Harrison Bay was higher than in other regions, where the mean ranged from 620-710 micrograms per gram. The mean concentration of chromium in west and east Harrison Bay was 140 and 106 micrograms per gram, respectively, while mean concentrations in other regions ranged from 82-94 micrograms per gram. Also, the mean concentrations of copper (28 micrograms per gram) and vanadium (192 micrograms per gram) in east Harrison Bay were higher than in other regions, where mean concentrations of copper ranged from 20-24 micrograms per gram) and vanadium from 150 to 160 micrograms per gram.

The concentrations of the trace metals in the sediments sampled in 1997 (Naidu et al., 2001) (Table VI.C.3f) are similar to the concentrations observed by other studies (Tables VI.C.3a, 3b, 3c, and 3e). Naidu et al. (2001) noted the concentrations of barium and vanadium were higher in the samples collected in 1997 compared to earlier samples, but the reasons for the differences are unknown. (See the following section VI.C.2.b(4)(b) for a discussion of barium in the nearshore Beaufort Sea sediments.) The levels of barium and vanadium are below or comparable to the values reported for unpolluted nearshore marine sediments (Naidu et al., 2001).

***(b) Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA)***

Beaufort Sea sediments were again sampled in August 1999 as part of the ANIMIDA Program and analyzed for metals (Boehm et al,, 2001). The sampling program included sampling 15 stations that were part of the Beaufort Sea Monitoring Program. Six of the Beaufort Sea Monitoring Program stations were in Foggy Island Bay, the site of the proposed Liberty development project; five stations were located near the site of the Northstar development project; and four stations were located between the two projects. In addition, 12 stations were sampled around the site of the proposed Liberty Island and 15 stations around the Northstar island.

In addition to the suite of nine metals analyzed in the past as part of the Beaufort Sea Monitoring Program (Table IV.C-3a), nine additional metals were analyzed (Table IV.C-3c).

The concentrations of the metals in the marine sediments are shown in Tables VI.C-3b and 3c. In general, the concentrations are comparable to the concentrations of those metals that have been analyzed in the past (Table VI.C-3a). Also, all the concentrations are below known Effects Range-Median concentrations, and most are below known Effects Range-Low concentrations.

Naturally occurring levels of trace metals in the surface sediments vary with sediment grain size, organic carbon content, and mineralogy (Boehm et al. 2001). In general, sediments consisting mainly of fine-grained (silt- and clay-size) particles contain more organic carbon and trace metals than sediments in which sand-, gravel- and larger-size particles predominate. Compared to coarser grain particles, fine-grain particles have a larger active surface area available for adsorption of matter containing organic material or trace metals. The relationship between grain size and organic carbon content for samples from ANIMIDA stations is shown in Figure VI.C-17 . The relationship between metals, as represented by aluminum, and grain size, is shown in Figure VI.C-18. Aluminum, or iron, can be used to normalize other metal values to offset variations caused by differences in grain size, organic carbon content, or mineralogy (Boehm et al., 2001). Aluminum is rarely introduced into the environment by anthropogenic process.

Normalizing metal concentrations with aluminum can be done to indicate possible contamination from past events or identify potential sources of contamination and contaminated sites in the future. This technique was used by Boehm et al. (2001) to indicate possible contamination of marine sediments in the Beaufort Sea.

Normalizing barium concentrations with aluminum provides an example of this technique (Boehm et al., 2001). Barium is found in the earth's continental crust in relatively high concentrations (the average is 584 micrograms/gram) (Wedepohl, 1995, as reported in Boehm. et al., 2001); by comparison, the average concentration of copper in the continental crust is 25 micrograms/gram. Concentrations of barium in the 1999 sediment samples ranged from 173-753 micrograms per gram; copper concentrations ranged from 4.0-46.9 micrograms per gram. Barium is a component of the naturally occurring mineral barite, and this compound is used in drilling muds. In the past, drilling muds have been discharged into the Beaufort Sea and could be discharged accidentally in the future.

Figure VI.C-19 shows normalizing barium using aluminum in the diagrams showing concentrations of aluminum versus barium. Figure VI.C-19a shows plots of aluminum versus barium for samples from Beaufort Sea Monitoring Program stations along the Beaufort Sea coast from west of the Northstar island to east of the proposed Liberty Island site. Figures VI.C-19b and 19c show plots of aluminum versus barium from Beaufort Sea Monitoring Program stations in Harrison Bay and from stations around the Northstar island and the proposed Liberty Island site. In the figures, a 99% prediction interval has been drawn on a trend line determined from linear regression. This interval presents a way to define the natural geochemical background for barium; this technique provides a way to identify the background for other trace metals. Any positive deviation in barium above the upper prediction limit suggests contamination from an anthropogenic source such as a drilling mud. The trends shown in Figure VI.C-19a suggest that no discernible anthropogenic barium inputs can be detected from these Beaufort Sea Monitoring Program stations.

In Figure VI.C-19b, barium concentrations from three stations in the western part of Harrison Bay are above the 99% prediction level. In the past, drilling mud was discharged into Harrison Bay. Barium in samples from four stations shown in Figure VI.C-19c lie above the 99% prediction level. Three of these stations have barium concentrations similar to values from the Kuparuk River.

Boehm et al (2001) normalized other metal concentration with aluminum; these metals are part of the group listed in Tables VI.C-3b and 3c. Plots for aluminum versus both chromium and vanadium did not show any discernible anthropogenic inputs of these metals. Plots for aluminum versus copper, lead, cadmium, silver, arsenic, antimony, nickel, mercury, and cobalt showed anomalous values for these metals at a station located about 1.5 kilometers west of West Dock in Prudhoe Bay. Compared to all the stations sampled in 1999, the station near West Dock had the highest concentrations for all these metals except antimony. This site is near an area of high construction and development activity. As noted in Section VI.C.2,c(5(b), the sediment from this site also had higher total saturated hydrocarbon and polynuclear aromatic hydrocarbon concentrations than any of the other sites sampled.

One way to evaluate potential trace-metal contamination in sediments, and possible effects on biota, is to compare the sediment values with Effects Range-Low and Effects Range-Median values developed by Long and Morgan (1990) for sediment-sorbed contaminants (Section VI.C.2.c(5)). All the metal concentrations in the sample from the site west of West Dock, except for nickel and mercury, are below the Effects Range-Low for the respective metals; the concentrations for nickel and mercury were below the Effects Range-Median.

Plots for aluminum versus zinc showed an anomalous value for a site about 6 kilometers northeast of Endicott. Plots for aluminum versus lead showed an anomalous value for a site about 6 kilometers north of West Dock. Plots for aluminum versus cobalt showed an anomalous value for a site about 5 kilometers northeast of the proposed Liberty Island site. The zinc concentration at the site northeast of Endicott was slightly above the Effects Range-Low concentration but less than the Effects Range-Median concentration. The concentration of lead at the site north of West Dock was less than the Effects Range-Low value. Effect range guidelines have not been developed for cobalt.

In addition to the station and trace-metal concentrations described in relation to normalizing with aluminum, trace-metal concentrations for a number of stations in the ANIMIDA sampling area were above the Effects Range-Low values but less than the Effects Range-Median values. However, these concentrations were within the background concentrations.

#### *(c) Liberty Project*

Metals concentrations were determined in the sediments collected at 15 sites in Foggy Island Bay in April and May 2001 (URS Corporation, 2001); the metals analyzed are shown in Table VI.C-6e. At four of the sites, only the surface sediments were sampled. At the other 11 sites, core samples were taken. Four cores were from transects along both the Proposed Liberty Pipeline (Alternative I) and Proposed Eastern Pipeline (Alternative III.A) and three cores from a transect along the Proposed Tern Pipeline (Alternative III.B); The proposed pipeline routes are shown in Figure II.C-5. The core lengths ranged from about 13.5 to 17 feet.

In general, the concentrations of the metals in the sediments collected as part of the 2001 study (Table VI.C-6e) are similar to the concentrations of metals collected as part of the ANIMIDA study (Section VI.C.2.(c)(4)b) and Tables VI.C-6b and 6c)); for the ANIMIDA study, samples were collected in the central Beaufort Sea area that included Foggy Island Bay. However, the range of metal concentrations shown in Table IV.C-6e indicates some of the sediment samples had metal concentrations greater the those found in the ANIMIDA samples; these metals are lead, cadmium, arsenic, and manganese. Also, concentrations of mercury, nickel, iron and silver were greater the those found in the ANIMIDA samples from Foggy Island Bay. Most of these higher concentrations were from core samples taken at depths greater than 3 feet below the surface. Also, several of the higher metal concentrations were from a sample at a depth of 0 to 0.7 feet in the core.

The concentrations of the metals in the in the surface and core samples from Foggy Island Bay are below the screening levels for those metals where such levels have been determined (Table IV.C-3e). Screening levels identify chemical concentrations at or below which there is no reason to believe that dredged material would result in unacceptable adverse effects due to toxicity measured by sediment bioassays used (Lower Columbia River Management Area, 1998).

Except for lead and nickel, the concentrations of the trace metal in the sediments are less than the Effects Range - Low; lead and nickel concentrations are less than the Effects Range - Medium.

### (5) Hydrocarbons

Crude oil is composted mainly of hydrogen and carbon with minor amounts of sulfur, nitrogen and oxygen; heavy metals such as vanadium also may be present. These elements form a variety of hydrocarbon compounds. Crude oil and coal are complex mixtures of saturated, polynuclear aromatic and other hydrocarbons. Saturated hydrocarbons, paraffins and naphthenes, are the most common constituents of crude oil.

The hydrocarbons analyzed in the Beaufort Sea sediments included total resolved and unresolved saturated hydrocarbons (n-C9 through n-C40), polynuclear aromatic hydrocarbons, and triterpanes. Polynuclear aromatic hydrocarbons are composed of organic compounds from fossil fuels (coal and petroleum), biogenic processes, and pyrogenic or combustion sources. Pyrogenic sources include incomplete combustion of fossil fuels (internal combustion engine), other organic matter such as wood (forest fires) or trash and volcanic activity. Pryogenic polynuclear aromatic hydrocarbons are found in the atmosphere and widespread environmental contaminants. Triterpanes are derived from petroleum or biogenic sources.

#### *(a) Past Studies*

The hydrocarbons in the nearshore Beaufort Sea sediments come mainly from biogenic (terrestrial plants) and petrogenic (fossil fuels) sources (Boehm et al., 1990). Some of the hydrocarbons also come from pyrogenic sources. The biogenic and petrogenic hydrocarbons reach the nearshore as suspended-particulate matter in the rivers or are eroded from coastal deposits of sediments that include peat. The rivers flow through a variety of terrains that include tundra, coal and shale outcrops, and natural petroleum seeps. Rivers are the main major source of petrogenic and biogenic hydrocarbons. Coastal peat contributes significantly to the accumulated saturated hydrocarbons and less to the polynuclear aromatic hydrocarbons in the marine sediments. There are regional differences in the polynuclear aromatic hydrocarbon concentrations in the sediments, but these differences are related to differences in the depositional processes rather than local pollution.

As part of the Beaufort Sea Monitoring Program, the hydrocarbons in nearshore sediments were analyzed to determine if there were any changes in the hydrocarbon composition between samples collected in 1984-1986 and samples collected in 1989, and whether any changes could be related to oil and gas development; the results of these studies were reported by Boehm et al. (1987, 1990). Boehm et al. (1990) reported excellent agreement between saturated hydrocarbon composition in the sediments between the two periods, which indicated that no petroleum hydrocarbons attributable to recent drilling or petroleum production activities were detected at any location. Also, the concentrations of polynuclear aromatic hydrocarbons in the sediments sampled in the 1989 period did not differ significantly from those sampled in the 1984-1986 period. The samples from both periods showed there were significant amounts of petrogenic polynuclear aromatic hydrocarbons in all sediments. The analysis of the constituents indicates the petrogenic polynuclear aromatic hydrocarbons come from fossil (coal and oil) sources; most of the particles eroded from these sources were carried to the marine environment by rivers, but some may have come from the coastal erosion.

Studies of hydrocarbons in Beaufort Sea sediments by Shaw et al. (1979), Shaw (1981), Kaplan and Venkatesan (1981), and Venkatesan and Kaplan (1982) are summarized in Boehm et al. (1987). The characteristics of the saturated hydrocarbons in the nearshore sediments indicated the most prevalent source was terrigenous plant material; most of this material would have been carried to the marine environment as suspended matter in the rivers. The presence of certain indicator hydrocarbons—cadalene, retene, and simonellite—in many of the samples indicated early diagensis of plant material, possibly including peat, contributed to the polynuclear aromatic hydrocarbons in the sediments. The sediments also contained polynuclear aromatic hydrocarbons of petrogenic origin, but these hydrocarbons were not identified as coming from known sources such as the oil seep in the Cape Simpson area, Prudhoe Bay crude oil, or Mead River coal. In the offshore sediments, the saturated hydrocarbons mostly came from higher plants and the polynuclear aromatic hydrocarbons were of pyrogenic origin. The characteristics of the pyrogenic aromatic compounds indicated long-range transportation of combustion products rather than local sources.

The hydrocarbons in the sediments sampled in 1997 (Naidu et al., 2001) consist of a mixture of organic matter of marine and terrestrial origin. The total saturated hydrocarbons range from about 201-12,498 nanograms per gram and are largely characteristic of biogenic sources. The low molecular weight saturated hydrocarbons are derived mainly from marine sources, and the high molecular weight saturated hydrocarbons come mainly from plant waxes in the coastal peats and possibly from coal residues. The polynuclear aromatic hydrocarbon assemblages in the sediments are very similar to those observed in coastal peats and river sediments. The concentrations of total polynuclear aromatic hydrocarbons range from about 21-2,185 nanograms per gram.

#### *(b) Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA)*

##### *1) Total Organic Carbon*

The total organic carbon content of the sediments sampled in 1999 as part of the ANIMIDA Program ranged from 0.01% in the sandy sediment near the Northstar island to 3.42% in the mud-rich sediment near the proposed Liberty island site (Boehm et al., 2001). The mean concentration was 0.62%. Total organic content in these samples is typical of arctic shelf sediment. The variation in the total organic content of the surficial sediments is related to grain size, as discussed in Section VI.C.2.c(4) and shown in Figure VI.C-17.

##### *2) Saturated Hydrocarbons*

For most Beaufort Sea stations, the total saturated hydrocarbon concentrations are low, ranging from 0.21-16 milligrams per kilogram (Boehm et al., 2001). These hydrocarbons are a mixture of terrestrial plant waxes with lower levels of petroleum hydrocarbons.

Samples of river sediments and peat have total saturated hydrocarbon values of 5.8-36 milligrams per kilogram and 21-32 milligrams per kilogram, respectively (Table VI.C-3d). Sediments were sampled in the Colville, Kuparuk, and

Sagavanirktok rivers. Peat samples came from areas along the Colville and Kuparuk rivers. The composition of saturated hydrocarbons in the river and peat samples were similar to the composition in Beaufort Sea surficial sediments. This similarity indicates a common source of saturated hydrocarbons for river sediments and nearshore surficial sediments.

The highest total saturated hydrocarbon value, 50 milligrams per kilogram, for this suite of samples was found at the station west of West Dock in Prudhoe Bay (Boehm et al., 2001). As noted in Section VI.C.2.c(4)(b), the sample from this station contained high concentrations of metals and indicated contamination from an anthropogenic source.

The saturated hydrocarbon pattern for a station located in Foggy Island Bay, about 2 kilometers east of the proposed Liberty Island site is characteristic of diesel fuel (Boehm et al., 2001). The pattern suggests slight weathering, and this would indicate a recent contamination.

*3) Polynuclear Aromatic Hydrocarbons*

Polynuclear aromatic hydrocarbon levels are within the range of values reported from previous studies in the Beaufort Sea and other areas (Boehm et al., 2001). The polynuclear aromatic hydrocarbons in most of the sediment samples were derived from petrogenic/fossil fuel (petroleum and coal), biogenic (perylene), and pyrogenic sources.

Perylene is abundant in Beaufort Sea surficial sediments, often it is the most abundant polynuclear aromatic hydrocarbon compound. It is a naturally occurring compound formed during early diagensis of biogenic hydrocarbons in sediments. The relative abundance of perylene in river sediments is equal to or greater than in Beaufort Sea surficial sediments. This relationship suggests the rivers as a source of hydrocarbons in nearshore sediments. Perylene may be found in trace amounts in crude oil.

In general, the distribution of polynuclear aromatic hydrocarbon compounds in the samples is similar and characterized by the presence of a suite of unweathered petroleum compounds similar to the distribution in North Slope crude oil. The distribution of polynuclear aromatic hydrocarbon compounds in the sample from the site east of the proposed Liberty Island shows an increase in the abundance of 2- and 3-ring petroleum polynuclear aromatic hydrocarbons, which indicates diesel contamination at the site.

The station located west of West Dock had the highest polynuclear aromatic hydrocarbon concentration, 2,700 microgram per kilogram. As noted in Section VI.C.2.c(4)(b), this site also had a higher concentration of a number of the trace metals than did other sites. The high polynuclear aromatic hydrocarbon concentration indicates possible hydrocarbon contamination. The source of this contamination is discussed later in this section in the part where the triterpane components of the sediments are described.

Boehm et al. (2001) noted an increase in the ratios of pyrogenic to petrogenic polynuclear aromatic hydrocarbons between the samples collected from the same stations in 1989 and 1990; the mean ratios were 0.038 in 1989 and 0.096 in 1999.

Total polynuclear aromatic hydrocarbon values for the stations samples in 1999 are much lower than the Effects Range-Low, 4,022 micrograms per kilogram (Long and Morgan, 1990); this includes the station west of West Dock. Boehm et al. (2001) noted that polynuclear aromatic hydrocarbon concentrations in the sediments sampled did exceed the Effects Ranges-Low for the 13 individual polynuclear aromatic hydrocarbon compounds for which these values have been developed. Boehm et al. (2001) concluded that the polynuclear aromatic hydrocarbon concentrations in the study area sediment are not likely to pose an immediate ecological risk to marine organisms in the area.

*4) Triterpanes*

Triterpane distribution indicates the organic compounds in the Beaufort Sea surficial sediments are derived from petroleum or biogenic sources (Boehm et al., 2001). Many of the ANIMIDA samples contain trace levels of a triterpane indicating the presence of a non-North Slope post-Cretaceous/Tertiay petroleum source; this triterpane is absent in North Slope crude oil. The origin of the triterpane is unknown but may be associated with river input. Triterpanes in Colville River sediments have the same mixture of petroleum hydrocarbons and recent organic matter that has been found in many surficial sediment samples. This similarity suggests that petroleum and coal-bearing particles and peat eroded from the banks of the Colville River and its tributaries may be part of the mix of particles in the surface sediments. Boehm et al. (2001) note that the dominant current transport regime is from east to west. Thus, rivers to the east of the study area also may be contributing petroleum and biogenic hydrocarbons.

Recent biogenic triterpanes in the Kuparuk and Sagavanirktok River sediments have a different distribution than those in Colville River sediments. This distribution indicates some of the hydrocarbons in the two rivers is derived from immature, recent hydrocarbon sources such as coal. Sediments with the same triterpane distribution pattern in the Kuparuk and Sagavanirktok river sediments have been found in sediments to the west of the Sagavanirktok River Delta and near the mouth of the Kuparuk River. Sediment sample sites near the mouth of the Kuparuk River include the site west of West Dock that contains concentrations of metals that are above background levels and saturated and polynuclear aromatic hydrocarbon data indicating petroleum hydrocarbon contamination at this site. The triterpane distribution pattern may indicate that coal particles, possibly from the Kuparuk River, may be one of the sources of hydrocarbon enrichment.

The distribution pattern of triterpanes at the site in Foggy Island Bay east of the proposed Liberty Island is characteristic of a petroleum source (Boehm et al., 2001). Other (saturated hydrocarbon and polynuclear aromatic hydrocarbon) data indicate diesel oil contamination. The triterpanes also indicate the presence of a petroleum product "heavier" than diesel, such as No. 6 fuel oil or crude oil; triterpanes usually are removed from diesel fuels during the distillation process.

### *(c) Liberty Project*

#### *1) Total Organic Carbon*

The total organic carbon content of the sediments sampled in 2001 as part of the Sediment Quality study ranged from 0.8-4.04 % for the surface samples and 0.22-14.7% for the core samples (URS Corporation, 2001). Total organic carbon levels tended to increase as the percentage of fine-grained particles increased. The variation in the total organic content of the sediments is related to grain size as discussed in Section VI.C 2.c(4).

#### *2) Polycyclic Aromatic Hydrocarbons*

Samples from cores collected in Foggy Island Bay in 1997 and 1998 were analyzed for semivolatile and volatile polycyclic aromatic hydrocarbons (PAH's) (Montgomery Watson, 1997, 1998). The core sites were located along proposed pipeline routes. Two routes, one to the southwest and the other to the southeast, went from Liberty Island to the shoreline in the southern part of the bay; the third route went in a northwesterly direction to Endicott. No PAH's were detected in the 11 cores obtained in 1997; samples from these cores were taken at depths of 1 and 8 feet. However, five semivolatile PAH's were detected in the 4 cores obtained in 1998; the cores were sampled at depths of 1, 3, and 9 feet (PAH's were detected in only 13 of the 70 core samples analyzed). (The detection limits for the 1998 samples were several tens of times more sensitive than for the 1997 samples.) The PAH's and their concentration ranges are shown below:

**Phenanthrene:** not detected to 0.033 milligram per kilograms (33 parts per billion)
**2-Methylnaphthalene:** not detected to 0.025 milligram per kilogram (25 parts per billion)
**Benzo(a)pyrene:** not detected to 0.092 milligram per kilogram (92 parts per billion)
**Phenol:** not detected to 0.038 milligram per kilogram
**4 Methylphenol (p-Cresol):** not detected to 280 milligrams per kilogram

For phenanthrene and 2-methylnaphthalene in the core samples, the concentrations were within the range observed in the surface sediments (Section III.C.2.l(2)(a); for benzo(a)pyrene the concentrations observed in the cores were greater than in the surface sediments. The concentrations of phenanthrene, 2-methylnaphthalene, and benzo(a)pyrene in the cores are less that the Effects Range - Low for each PAH (Section III.C.2.l(2)(a)). Thus, it appears that the PAH's observed in the cores came from natural sources. Dispersion likely would reduce the concentration of any PAH's introduced into the water column by pipeline trenching and backfilling operations or disposal of unused material excavated from the trench. Neff (1985) notes the relative PAH concentrations in sediments almost always are greater by a factor of 1,000 or more than those in the water column.

Most of the concentrations of individual polycyclic aromatic hydrocarbons found in core samples along three proposed pipeline routes (Figure II.C-5) are low -- below the screening levels in *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (Lower Columbia River Management Area, 1998); screening levels are defined in Section IV.C.2.b(4)(a). The core samples were analyzed for 18 PAH's. The most abundant PAH's in the samples were phenanthrene, 2-methylanphthalene, chrysene, and naphthalene. The PAH's and their concentration ranges are shown below (screening levels are shown in parenthesis:

**Phenanthrene:** not detected to 52 micrograms per kilograms (1,500 μg/Kg)
**2-Methylnaphthalene:** not detected to 52 micrograms per kilogram (670 μg/Kg)
**Chrysene:** not detected to 22 micrograms per kilogram (1,400 μg/Kg)
**Naphthalene:** not detected to 28 micrograms per kilogram (2,100 μg/Kg)

Six of the other polycyclic aromatic hydrocarbons analyzed had concentrations that ranged from not detected to 14 micrograms per kilogram; screening levels for these compounds ranged from 540-3,200 micrograms per kilogram (URS Corporation, 2001). The presence of the remaining eight PAH's either could not be detected or their concentrations were within a low range that was influenced by the detection method and the amounts were presented as estimates; these estimates ranged from 5.3-11 micrograms per kilogram.

Phenanthrene, 14 micrograms per kilogram, was the only PAH detected in surface samples (URS Corporation, 2001). The sample site was about midway along the proposed Liberty pipeline route.

The Effects Range - Low concentrations for the PAH's noted above are as follows (parts per billion [micrograms per kilogram], respectively (Long and Morgan, 1990)):

Phenanthrene - 225 parts per billion
2-Methylnaphthalene - 65 parts per billion
Benzo(a)pyrene - 400 parts per billion
Chrysene - 400 parts per billion
Naphthalene - 340 parts per billion

*3) Other Substances*

The surface samples were also analyzed for pesticides, PCB's, semivolatile organic compounds, and selected volatile organic compounds. The presence of these substances either could not be detected, which occurred for the majority of the samples, or their concentrations were within a low range that was influenced by the detection method and the amounts were presented as estimates.

## 3. Air Quality

The existing air quality of the entire North Slope of Alaska is superior to that set by the National Ambient Air Quality Standards and Alaska air-quality laws and regulations. Concentrations of regulated air pollutants are far less than the maxima allowed. The Environmental Protection Agency calls this an attainment area, because it meets the standards of the Clean Air Act. The Prevention of Significant Deterioration program of that Act places additional limitations on nitrogen dioxide, sulfur dioxide, and total suspended particulate matter. Table VI.C-4 lists the ambient air-quality standards for the Liberty Project, and Table VI.C-5 lists measured air pollutants at Prudhoe Bay.

Over most of the onshore area adjacent to the Liberty Project, there are only a few small, scattered emissions from widely scattered sources. The only major local sources of industrial emissions are in the Prudhoe Bay/Kuparuk/Endicott oil-production complex. This area was the subject of monitoring programs during 1986-1987 (ERT Company, 1987; Environmental Science and Engineering, Inc., 1987) and from 1990 through 1996 (ENSR, 1996, as cited in U.S. Army Corps of Engineers, 1999). Five monitoring sites were selected—three deemed subject to maximum air-pollutant concentrations and two deemed more representative of the air quality of the general Prudhoe Bay area. The more recent observations are summarized in Table VI.C-5. All the values meet the State and Federal ambient-air-quality standards. The results demonstrate that most ambient pollutant concentrations, even for sites subject to maximum concentrations, generally meet the ambient-air-pollution standards. This is true even if we assume the baseline Prevention of Significant Deterioration program concentrations (determined on a site-specific basis) to be zero, limiting the allowable increase in concentrations.

Although the measurements do indicate that the air-quality standards are being met, some pollution nevertheless has occurred. Hattie Long stated. " We get a lot of yellow haze out of Prudhoe all year long…since the time that the haze started hovering over Nuiqsut" (Long, as cited in U.S. Army Corps of Engineers, 1996).

During the winter and spring, winds transport pollutants to arctic Alaska across the Arctic Ocean from industrial Europe and Asia (Rahn, 1982). These pollutants cause a phenomenon known as arctic haze. Pollutant sulfate due to arctic haze in the air in Barrow—that in excess of natural background—averages 1.5 micrograms per cubic meter. The concentration of vanadium, a combustion product of fossil fuels, averages up to 20 times the background levels in the air and snowpack. Recent observations of the chemistry of the snowpack in the Canadian Arctic also provide evidence of long-range transport of small concentrations of organochlorine pesticides (Gregor and Gummer, 1989). Concentrations of arctic haze during winter and spring at Barrow are similar to those over large portions of the continental United States, but they are considerably higher than levels south of the Brooks Range in Alaska. Any ground-level effects of arctic haze on the concentrations of regulated air pollutants in the Prudhoe Bay area are included in the monitoring data given in Table VI.C-5. Model calculations indicate that less than 10% of the pollutants emitted in the major source regions is deposited in the Arctic (Pacyna, 1995). Maximum concentrations of some pollutants, sulfates and fine particles, were observed during the early 1980's; observers measured decreases at select stations at the end of the 1980's (Pacyna, 1995). Despite this seasonal, long-distance transport of pollutants into the Arctic, regional air quality still is far better than standards require.

## 4. Climate and Meteorology

Meteorological conditions primarily control the characteristics of Foggy Island Bay. Air temperature, precipitation, and wind speed and direction are the most important. Air temperature controls when river ice breaks up and how much heat transfers between the atmosphere and the water. Precipitation controls the timing and amount of freshwater input. Winds control the mixing and distribution of the water's physical properties by moving the water.

The onshore area next to the Liberty Project is within the Arctic Coastal Zone (Zhang, Osterkamp, and Stamnes, 1996). The Arctic Coastal Zone has cool summers and relatively warm winters because it is near the ocean. Precipitation is lowest in this region, and more than 50% falls as snow. Table VI.C-6 summarizes the climatic conditions for the Arctic Coastal Zone.

### a. Air Temperature

Monthly average air temperatures for the Liberty area rise above freezing only in June, July, and August. Even during these months, air temperature on any day may vary from near 0-20 degrees Celsius. July typically is the warmest, with an average air temperature onshore of about 7-9 degrees Celsius and offshore of 4-6 degrees Celsius. December through March usually are the coldest months.

Table VI.C-7 shows air temperatures at Tern Island for February through May 1987. Average temperatures for February and March are -30 and -28 degrees Celsius, respectively.

## b. Precipitation

Summer rainfall is infrequent and averages less than 30 millimeters per month (Hummer, 1990, 1991). Occasional late-summer rainstorms can increase the amount of seasonal and annual rainfall. Although rainfall usually is light during the short summers, heavier rainstorms occasionally occur, most commonly in the foothills. Summer precipitation, generally greatest in July and August, is 114 millimeters at Sagwon (U.S. Department of Agriculture, 1996).

Snow cover on the North Slope begins from late September to early October and disappears from late May through the middle of June (Zhang, 1993; Zhang, Stamnes, and Bowling, 1996). The timing of snowmelt varies mainly with changes in the incoming longwave radiation (Zhang, Bowling, and Stamnes, 1997).

## c. Winds

Wind speed and direction control coastal oceanographic conditions. Winds affect ice distribution, current speed and direction, vertical and horizontal mixing of watermasses, and wave action. The dominant wind direction in the open-water season is easterly to northeasterly. Easterly winds typically are more persistent in the early season (June and July). As the open-water season progresses, westerly winds are more frequent. Average wind speeds during the open-water season are near 5 meters per second in Stefansson Sound. Wind speeds above 8 meters per second fully mix the vertical column of water in Stefansson Sound.

Meteorological data from Tern Island during February through May show wind speeds ranging from 0-14 meters per second, with an average of 4-6 meters per second (Table VI.C-7). The dominant wind direction during the ice-covered season is westerly.

Vincent Nageak stated: “It is difficult to find a leeward side among any of those three groups of islands…so we usually go to Foggy Island for protection (V. Nageak, as cited in Shapiro and Metzner, 1979). Regarding Cross Island, Archie Ahkiviana states: “And then this high wind, we were down at Cross Island about a couple of years ago. We couldn’t go off the island even though we’d gotten all our quotas in, ‘cause of the high wind.” and “Well, there’s just too much high winds, You know we go inside the Cross – those barrier islands.” (A. Ahkiviana, as cited in USDOI, MMS, 2001b). Archie Ahkiviana stated at the public hearing of the Liberty draft EIS: “We have been observing very high strong winds nowadays at Cross Island. A very strong East wind blew over the Winch Shack which was 16’ x 24’ and was completely destroyed; and a second building 9’ x 40’ trailer was destroyed and was found blown over to the lagoon at Cross Island. These strong winds have recently been observed. The Nuiqsut whalers regard these very strong winds unusual and blame this on global warming and climatic changes. These incidents happened in the fall of 1999” (A. Ahkiviana, as cited in Alaska Eskimo Whaling Commission, 2001).

**For More Information on Meteorology:** The EIS’s for MMS Sales 124, Sale 144, and the Northstar Project discuss the regional meteorology of the Beaufort Sea (USDOI, MMS, 1990a, 1996a; U.S. Army Corps of Engineers, 1998). BPXA discusses meteorology in the Environmental Report for the Liberty Development Project (BPXA, 1998a). The Endicott Environmental Monitoring Reports from 1986 through 1990 discuss meteorology at Endicott (Hummer, 1990, 1991; Cover, 1991; and Walter, Horgan, and Cover, 1991 and 1992).

# 5. Oceanography of Foggy Island Bay

Foggy Island Bay is within Stefansson Sound. Stefansson Sound is defined from the Return Islands to Brownlow Point. A series of offshore barrier islands separate Stefansson Sound from the offshore Beaufort Sea. The barrier islands are low sand and gravel features less than 8 feet in elevation. The larger islands have some sparse vegetation. Between the islands are shoals and bars that are awash.

## a. Seasonal Generalities

In the early summer, the ice melts and rivers break up and overflow the sea ice. Open water occurs next to the Sagavanirktok, Kadleroshilik, and Shaviovik river deltas and is mostly river water and ice meltwater. This water is brackish, meaning a mixture of fresh- and saltwater. Cold marine water lies adjacent to or below this surface layer (Colonell and Niedoroda, 1988).

By midsummer, the open-water area becomes large enough for wind to mix and circulate the water. The nearshore brackish water mixes to form a coastal watermass with a range of intermediate temperatures and salinity whose distribution is determined primarily by the wind.

By late summer, freshwater discharge generally is low, and air temperatures fall. The water becomes marine and fairly uniform throughout the nearshore and offshore regions. By November, sea ice covers most of the area. Through the winter, water temperatures decrease and ice continues to form. Joseph Nukapigak stated: “...In the Arctic, nine months out of the year...we have sea ice" (J. Nukapigak as cited in USDOI, MMS, 1995a).

## b. Circulation

The open-water circulation in Foggy Island Bay depends mostly on the wind, and the wind's direction is more important than its speed (Short et al., 1990). The wind's direction and how often it changes direction control the direction of surface currents, how long watermasses remain, and the amount of mixing between different watermasses. Thomas Napageak stated: "… they both work together, the current and the wind" (T. Napageak, as cited in Dames and Moore, 1996c:7). Other controls include river discharge, ice melt, bathymetry, and the configuration of the coastline.

The two dominant wind directions are northeast and southwest (Morehead et al., 1992b). Under easterly winds, water moves to the west. Under westerly winds, common in the fall and winter, surface water moves to the east. The mean surface-current direction year-round is to the west. Vincent Nageak stated: "Foggy Island is always the place to go when strong winds start from the west because the water is shallow there. The current is always to the east" (V. Nageak. as cited in Shapiro and Metzner, 1979).

In addition to the water's eastward or westward motion, water also moves toward the shore or away from the shore. Under easterly winds, some water moves from onshore to offshore. This circulation pattern causes the gradual removal of warm, brackish water from the nearshore and replaces it with colder, more salty (marine) water. Under westerly winds, some water moves from offshore to onshore. This circulation pattern causes the accumulation of warm, less saline water along the coast and depresses the cold, saline marine water.

Brine rejection and the tide's motion control circulation under the ice. In Stefansson Sound near Foggy Island Bay, it is generally perpendicular to the shoreline to the north-northeast near the bottom. Matthews (1981) estimates a return flow to the south-southwest in the surface layer.

## c. Currents

Currents near the Liberty Project range from 0 to more than 68 centimeters per second during the open-water season (Woodward-Clyde Consultants, 1998). Drifter studies by Matthews (1979) show surface current speeds in open water up to 40-50 centimeters per second when storms pass. After January, under-ice currents generally are less than 2 centimeters per second. In November and December, maximum current speeds under ice are slightly less than 10 centimeters per second (Table VI.C-8) and mean speeds are 1-2 centimeters per second.

Matthews' (1980) under-ice observations show that salt rejection and brine formation occur as sea ice is forming. Brine forms as the season progresses from November, when only about 0.6 meters of ice is present until March, when 2 meters of ice is present. Data from a current meter indicate a pulsating density-induced current in the waters 1-2 meters above the bottom. The current flows offshore with peak current speeds about 10 centimeters per second.

In 1999, the MMS sponsored a study to investigate currents in Steffanson Sound. The study by Weingartner and Okkonen (2001) deployed three instrumented moorings in the vicinity of Liberty and Northstar for a period of 1 year. The moorings collected velocity, temperature, salinity, and transmissivity data. Figure VI.C-13 shows the time series of the currents from September 1999 to September 2000. from 1.5 meters above the Acoustic Doppler Current Profiles and wind components projected onto their principal axes. The figure shows that the currents are seasonal with significant differences between open water and landfast ice seasons. The highest speeds occur in the Arctic summer and fall. Mid-October is the period that landfast ice was established in the lagoons. Figure VI.C-14 shows the time series of currents from mid-October to the end of June. Between mid-October through June, current speeds seldom exceeded 10 centimeters per second. The currents are relatively weak, but there are events of several days' duration when current speeds averaged about 10 centimeters per second at all locations (Weingartner and Okkonen, 2001).

The annual mean current speeds range from 2-4 centimeters per second, and maximum speeds range from 82-114 centimeters per second. During the landfast-ice period, mean current speeds range from 0-2 centimeters per second, and maximum speeds range from 15-24 centimeters per second. During the open-water period, mean current speeds range from 2-3 centimeters per second, and maximum speeds range from 99-114 centimeters per second (Weingartner and Okkonen, 2001).

Archie Ahkiviana stated that the currents are very strong around Tern Island (A. Ahkiviana, as cited in Alaska Eskimo Whaling Commission, 2001). Mr. Tukle states: " With regards to Liberty, with the ocean currents that I've observed between Kaktovik, Barrow and Nuiqsut, that Liberty Project that you guys are on is one of the strongest currents I ever seen on a slope between here and Barter Island." (Tukle, as cited in USDOI, MMS, 2001a). Mr. Tukle also states: " Right between Narwhal, that's north of this Liberty Project, right on the left side of Narwhal, that's the strongest current I ever seen between her and Kaktovik. And it's directly in between – almost in between Cross Island and Narwhal. It's every – it's there every single year"(Tukle, as cited in USDOI, MMS, 2001a).

## d. Temperature and Salinity

Temperature and salinity data for open water in Foggy Island Bay show that the Sagavanirktok River influences nearshore water. After breakup, the bay has a freshwater layer that mixes to form a brackish nearshore zone. The freshwater layer has salinities of 10-15 parts per thousand.

The freshwater mixes with marine water to form a coastal watermass with salinities of 15-25 parts per thousand and temperatures of 0-9 degrees Celsius. As the summer progresses, water within the bay becomes colder and saltier (more marine) and relatively well mixed. Marine water has salinities greater than 25 parts per thousand and temperatures of 0-2 degrees Celsius.

Temperature and salinity in February 1997 under ice near the pipeline routes to the Liberty Project range from -2-0 degrees Celsius (28-32 degrees Fahrenheit) and from 21-30 parts per thousand, respectively (Montgomery Watson, 1997, 1998).

## e. Tides and Storm Surges

The semidiurnal tidal range is 6-10 centimeters near the Liberty gravel island (Matthews, 1980; Kowalik and Matthews, 1982; Morehead et al., 1992b). The level of the water changes constantly in response to the wind. Positive tidal surges occur with strong westerly winds, while negative surges occur with strong easterly winds. Roxy Ekowana stated: "Such a strong west wind…and I found out that it was also high tide" (R. Ekowana as cited in North Slope Borough, Commission on History and Culture, 1980:115). In a Northstar public meeting, Thomas Napageak relayed knowledge of the interaction between wind and water levels: "...you don't get...high tides [storm surges] on a northeast wind.... But when we've got the southwesterly wind, that's when the tide [water level] comes up." (T. Napageak, as cited in Dames and Moore, 1996c:7). Frank Long, Jr., described how a rising tide or storm surge can force water over the top of sea ice and flood river drainages: "If there's enough water that comes in, it'll bring the ice up, plus water will be flowing...up over the edge." (F. Long, as cited in Dames and Moore, 1996c:8). An example of a negative storm surge also was observed by Nuiqsut whaling captains who reported that, in 1977, the water drained out of a bay near Oliktok Point and then came back in (Dames and Moore, 1996c:3). Under the ice, tidal surges (up or down) can be ten-times larger than the tidal range and can flush up to 40% of the volume of Foggy Island Bay (Matthews, 1980).

During open water, the storm surge can be a 4-foot rise and fall at the gravel island. BPXA estimates a 100-year storm surge of 6.7-foot rise at the coastline (BPXA, 2000a). Shell Oil Company estimates a 3-foot rise at Tern Island (Woodward-Clyde Consultants, 1981).

## f. River Discharge

Three rivers drain into Foggy Island Bay—the east channel of the Sagavanirktok River, the Kadleroshilik River, and the western distributaries of the Shaviovik River.

River water is a major source of fresh, warm water to the nearshore environment and drives the circulation near the coast. River water contributes to the breakup of coastal ice in the spring. Etta Ekolook noted: "…we knew that when the Sagvagniqtuuq River breaks, it travels far out onto the sea ice" (E. Ekolook, as cited in North Slope Borough, Commission on History and Culture, 1980). Andrew Oenga comments: "When the flooding begins from the river ice break-up, it all happens very suddenly (A. Oenga, as cited in North Slope Borough, Commission on History and Culture, 1980). During most of the summer, the river water is warm (10-17 degrees Celsius). These temperatures are several degrees higher than coastal water. Only in late summer (September) does the river's water temperature fall to or below coastal water. Table VI.C-9 shows the characteristics of these three rivers.

## g. Sea Ice

Sea ice covers Foggy Island Bay for three-quarters of the year. There are wide-ranging spatial and temporal variations, but the following is a generalization:

- September: shore ice forms; the river deltas freeze; and frazil, brash, and grease ice form within Foggy Island Bay.
- Mid-October: smooth first-year ice forms within Foggy Island Bay. Thomas Napageak remarked: "...The critical months [for ice formation] are October, November, and December." (T. Napageak, as cited in Dames and Moore, 1996c:7).
- November through May: the fast ice covers more than 97% of the Liberty area.
- Late May: the Sagavanirktok, Kadleroshilik and Shaviovik Rivers flood over the nearshore sea ice.
- Early June: floodwaters drain. Sarah Kunaknana stated: "In June and July when the ice is rotting in the little bays along the coast… (S. Kunaknana, as cited in Shapiro and Metzner, 1979).
- Early to mid-July: floating and grounded landfast ice break up. The areas of open water with few icefloes expand along the coast and away from the shore, and pack-ice migrates seaward. Vincent Nageak states: "The ice all along the coast on the mainland side of these islands rots early …" (V. Nageak, as cited in North Slope Borough, Commission on History and Culture, 1980). Samuel Kunaknana stated: "The ice goes completely out after July 4 around the Colville (S. Kunaknana, as cited in Shapiro and Metzner, 1979).

The Liberty gravel island and its associated pipeline lie within the landfast-ice zone, which extends from shore to the zone of grounded ridges or shear zone.

### (1) Shear Zone

Grounded ridges first form just outside the barrier islands in about 8-15 meters of water. By late winter, they may extend beyond the 20-meter isobath. Sara Kunaknana, Elijah Kakinya, Henry Nashanknik, and Bruce Nukapigak all mention a tendency for the shear zone to form running from Cross Island to Barter Island on the seaward side of the barrier islands (Shapiro and Metzner, 1979). Henry Nashanknik stated: "These Islands [McClure and Stockton Islands] have always had ice piled around them. Sometimes in the fall, the ice would pile all around these islands and at times just the ocean side would have pressure ridges" (H. Nashanknik, as cited in Shapiro and Metzner, 1979). Walter Akpik remembers the ice conditions on Narwhal Island: "During our first winter at Narwhal Island the ice was moving and piling up so high that some of the ice broke off the top and almost hit our house. Our house was in the middle of the island and Narwhal isn't that wide"(W. Akpik, as cited in North Slope Borough, Commission on History and Culture, 1980). Jeannie Ahkivgak stated: "Where the pressure ridge's large is out beyond the barrier islands" (J. Ahkivgak, as cited in North Slope Borough, Commission on History and Culture, 1980).

### (2) Landfast Ice

The landfast ice in Foggy Island Bay generally is considered smooth. Etta Ekolook stated " The ice inside the barrier islands is smooth and remains so until it thaws out in the spring time" (E. Ekolook, as cited in North Slope Borough, Commission on History and Culture, 1980).

The landfast ice around Liberty may move several hundred meters during early winter. Shapiro and Metzner (1979), in an article on extending the observations through oral histories, reference ice motion between Narwhal Island and the coast during a storm in November or December of 1924. Bruce Nukapigak stated: " At the same time these westerly winds cause movements in the ice between the barrier island and the mainland. But this is in the fall before it gets really thick" (B. Nukapigak, as cited in Shapiro and Metzner, 1979). Otis Akivgak recalled: "Even the shoreside ice piled up so high [on Pole Island] that it was hard to drive our dog team on it" (O. Akivgak, as cited in North Slope Borough, Commission on History and Culture, 1980).

Fast ice in later winter usually moves tens of meters, but may move up to several hundred meters. Deformations take the form of pileups and rideups on the coastal and island beaches and rubble fields and small ridges offshore. As the winter progresses, extensive deformation within the landfast-ice zone decreases, as the ice in the landfast zone thickens, strengthens, and becomes more resistant to deformation. Elija Kakinya stated: "Right around Flaxman Island, on the lagoon side, that is behind the barrier islands, inward to the inland, after the ice formed and freezed it never moved or any disturbance that I can recall in that area" (E. Kakinya, as cited in Shapiro and Metzner, 1979). Jeannie Ahkivgak stated: "The ice between the barrier islands and the mainland doesn't pile up too much. Sometimes there would be small pressure ridges in there" (J. Ahkivgak, as cited in North Slope Borough, Commission on History and Culture, 1980).

By late winter, first-year sea ice in the landfast-ice zone is about 2 meters thick; out to a depth of about 2 meters, it is frozen to the bottom, forming the bottomfast-ice subzone. The remaining ice in the landfast zone is floating, forming the floating fast-ice subzone.

Bruce Nukapigak states: "When it's high tide these cracks [tidal crack] usually widen and close or even jam up when the tide goes down…There is this type of crack on both sides of McClure Islands out from the mainland to the ocean." (B. Nukapigak, as cited by Shapiro and Metzner, 1979).

The onshore movement of sea ice in the landfast-ice zone is a relatively common event that generates pileups and rideups along the coast and on offshore barrier islands. The onshore pileups often extend up to 20 meters inland from the shoreline over both gently sloping terrain and up onto steep coastal bluffs. Ice rideups, in which the whole ice sheet slides relatively unbroken over the ground surface for more than 50 meters, do not happen often; rideups beyond 100 meters are rare. In the early 1970's, Archie Brower recalled that:

> A few years ago I was travelling along the coast at Bullen Point, which is inside Maguire Island west of Flaxman Island. I saw how a garage that was about 30 feet above the water line on the coast had been destroyed by ice. I was travelling in late May, but the ice was so covered with old snow that I believe that it must have destroyed the garage in February or March of that year. Ice had piled up or near the garage from about ten feet high from the surface of the ground (A. Brower, as cited in North Slope Borough, Commission on History and Culture, 1980).

Herman Aishana also commented on the same event

> The other thing I've seen, and this was inside the Barrier Islands, over at Camden Bay – not Camden Bay, but at Bullen Point, that old DEW Line site over there – I saw that building over there demolished by ice piling up; and the garage over there [was also demolished]. Piled right into it, year. It was quite a ways off shore. It was about 100 yards or so [offshore].....And the [building] was sitting about, oh, maybe a little over ten feet above sea lever. It's amazing. Yeah it didn't wipe out the whole building, but it really made a mess out of it; it was a metal building (H. Aishana, as cited in Kruse et al., 1983a).

### (3) Open-Water Icefloes

By the middle of July, much of the fast ice inside the 10-meter isobath has melted; and some movement of the ice has occurred. After the first openings and ice movement in late June to early June, the areas of open water with few icefloes expand along the coast and away from the shore, and there is a seaward migration of the pack ice. The concentration of icefloes generally increases seaward. During summer, winds from the east and northeast are common. These winds drive the ice offshore; westerly winds move the ice onshore. Elijah Kakinya noted: “In some years when the ice goes out in spring, it isn't visible in summer. Some years the ice goes out and comes back and is visible, and hangs around all summer months” (E. Kakinya, as cited in North Slope Borough, Commission on History and Culture, 1980). Elijah Kakinya stated: “In summer months, when there is a westerly wind, you can see ice from shore. But when the wind is blowing from northeasterly, the ice always goes out...you can't see any ice from shore” (E. Kakinya, as cited in North Slope Borough, Commission on History and Culture, 1980:152). Vincent Nageak stated “…but in summer, huge ice chunks can pass the islands into Prudhoe Bay when the wind is from the west” (V. Nageak, as cited in North Slope Borough, Commission on History and Culture, 1980).

**For More Information:** From 1985-1990, the U.S. Army Corps of Engineers collected measurements of temperature, salinity, and current speeds during open water in western Foggy Island Bay as part of the Endicott Environmental Monitoring Program. The cites for these reports are: Hachmeister et al., 1987; Short et al., 1990; Short et al, 1991; Morehead et al., 1992a; Morehead et al., 1992b; and Morehead, Dewey and Horgan, 1993. The Northstar EIS nicely summarizes traditional knowledge on currents and sea ice throughout the Beaufort Sea region from Barrow to Kaktovik. The cite for this report is U.S. Army Corps of Engineers, 1999.

# SECTION VII

## REVIEW
## AND
## ANALYSIS
## OF
## COMMENTS
## RECEIVED

The contents on this page are linked to the appropriate page. Click on the item to move to the linked page.

## CONTENTS OF SECTION VII

# VII. Review and Analysis of Comments Received

## A. INTRODUCTION

### 1. Summary of Comments on the Draft EIS

During the comment period on the Liberty Development and Production Plan draft EIS, various governmental agencies, organizations, and individuals provided either letters, e-mail messages, or oral testimonies. All of the letters, e-mail messages, and testimonies were reviewed and considered in preparing responses. Of the 25 letters we received, 16 had comments that required written responses; see Section VII.B for the criteria used to determine whether or not a comment required a response. See Appendix L for a complete listing of the letters received.

We also received approximately 5,600 e-mail messages (this number does not include multiple copies of the same message sent by the same person on the same day). Most of the e-mail messages were identical to or based on one of three different form messages posted on an environmental group's internet website. Except for the multiple copies, all of the e-mail messages sent in response to the environmental group's internet website were reviewed. E-mail messages 0012, 0016, and 0082 were selected to be representative of each of three message groups, and we prepared responses to the individual comments in these messages. About 880 e-mail messages were identical or similar to e-mail message 0012, about 4,290 messages were identical or similar to e-mail message 0016, and about 450 were identical or similar to e-mail message 0082. Some of the messages contained additional information that differed from the standard text in messages 0012, 0016, and 0082. Those with additional information were reviewed further to determine if any of the additional comments required written responses (see Section VII.B). There were 121 messages (Appendix L, Table L-1) in the group providing additional information; from this group, we identified 8 additional e-mail messages that required written responses.

The letters and e-mail messages listed in Table L-1, Appendix L, but not included in Section VII.B on the list of numbered letters and messages reproduced in the EIS, included comments that expressed opposition or support for developing the Liberty Prospect, were similar to those addressed in Section VII.B, or were related to information presented in the EIS. The following is a summary of these comments that expressed (the information in the parenthesis identifies those sections in the EIS where the effects of developing the Liberty Prospect are analyzed):

- Opposed developing the Liberty Prospect or favored the No Action Alternative, Alternative II.
  (Description of No Action Alternative II, II.B.)
- Supported developing the Liberty Prospect.
  - Maintain investment in developing technologies for the arctic environment.
    (Activities We Considered in this Cumulative-Effects Analysis, V.B.)
  - Continue North Slope development processes and related jobs.
    (Activities We Considered in this Cumulative Effects Analysis, V.B; Economy, V.C.11.)
  - Risks from proposed pipeline design is minimal.
    (Pipeline Safety, II.D.3.)
  - Pipe-in-pipe design is more costly to install and repair, and the condition and integrity cannot be monitored.
    (Costs associated with installation and repair, Appendices D-2, D-4, D-5, D-5A, and D-6. Condition and integrity monitoring, U.S. Department of Transportation Letter 0144.)
  - Mining gravel from the Kadleroshilik River site would help create an overwintering habitat for fish.
    (Gravel Mine Rehabilitation, III.D.2.a(2).)
- Supported development using Combination A "Alternative."
  (Combination A, IV.D.1)
- Concerns regarding:
  - Threat to quality of life as described by Inupiat culture and subsistence activities
    (Large Oil Spills, III.C.2. h, i, and j; Disturbances, III.C.3.h, i, and j; Discharges, III.D.1. h, i, and j;

Gravel Mining, III.D.2. h, i, and j; Abandonment of the Project, III.D.6. h, i, and j.)

- Petroleum industry activities, including:
  - ***Threat of oil spills***
    (Estimates of the Chance of an Oil Spill Occurring Considering Historical Records and Oil-Spill Prevention Designed into the Liberty Project, III.C.1.d; Sizes of Oil Spill Analyzed in this EIS, II.C.1.e; Appendix A, Oil-Spill-Risk Analysis.)
  - ***Detection of pipeline oil spills***
    (Leak-Detection Systems, II.A.1.b(3)(b).)
  - ***Lack of effective oil spill cleanup activities***
    (Discussion of BPXA's Proposed Liberty Oil Discharge Prevention and Contingency Plan, III.C.1.a; Description of BPXA's Oil-Spill-Response Plan, II.A.4.)
  - ***Use of untested technologies - subsea pipeline***
    (Hydrostatic Testing, II.A.1.b(3)(a)13); Pipeline Operations, Maintenance, and Repair, II.A.1.b(3)(c); Pipeline Safety, II.A.1.b.(3).
- Threat to the environments
  - ***Marine***
    (Large Oil Spills, III.C.2.l; Disturbances, III.C.3.l; Discharges, IIID.1.l; Gravel Mining, III.D.2.m; Small Oil Spills from Liberty Facilities, III.D.3.l; Abandonment of the Project, III.D.6.l.)
  - ***Coastal***
    (The coastal environment includes the marine waters and flora and fauna that occur in and adjacent to this environment; see marine and biological resources and their habitats.)
  - ***Human***
    (Large Oil Spills, III.C.2.h, i, and j; Disturbances. III.C.3.h, i, and j; Discharges, III.D.1.h, i, and j; Gravel Mining, III.D.2.i, j, and k; Small Oil Spills from Liberty Facilities, III.D.3.h, i, and j; Abandonment of the Project, III.D.6. h, i, and j.)
  - ***Atmosphere***
    (Large Oil Spills, III.C.2.m; Disturbances, III.C.3.m; Discharges, III.D.1.m; Gravel Mining, III.D.2.n; Small Oil Spills from Liberty Facilities, III.D.3.m; Abandonment of the Project, III.D.6.m.)

- Threat to biological resources and their habitats, including
  - ***Arctic species***
    (See the following list for specific biological resources.)
  - ***Beluga whales***
    (Large Oil Spills, III.C.2.b; Disturbances, III.C.3.b; Discharges, III.D.1.b; Gravel Mining, III.D.2.c; Small Oil Spills from Liberty Facilities, III.D.3.b; Abandonment of the Project, III.D.6.b.)
  - ***Benthic organisms***
    (Large Oil Spills, III.C.2.e; Disturbances, III.C.3.e; Discharges, III.D.1.e; Gravel Mining, III.D.2.f; Abandonment of the Project, III.D.6.e.)
  - ***Birds***
    (Large Oil Spills, III.C.2.a(2) and III.C.2.c; Disturbances, III.C.3.a(2) and III.C.2.c; Discharges, III.D.1.a(2)and III.D.1.c; Gravel Mining, III.D.2.b(2) and III.D.1.c; Small Oil Spills from Liberty Facilities, III.D.3.a(2) and III.D.3.c; Abandonment of the Project, III.D.6.a(2) and III.C.6.c.)
  - ***Boulder patch communities***
    (Large Oil Spills, III.C.2.e; Disturbances, III.C.3.e; Discharges, III.D.1.e; Gravel Mining, III.D.2.f; Small Oil Spills from Liberty Facilities, III.D.3.e; Abandonment of the Project, III.D.6.e.)
  - ***Bowhead whales***
    (Large Oil Spills, III.C.2.a(1); Disturbances, III.C.3.a(1); Discharges, III.D.1.a(1); Gravel Mining, III.D.2.b(1); Small Oil Spills from Liberty Facilities, III.D.3.a(1); Abandonment of the Project, III.D.6.a(1).)
  - ***Caribou***
    (Large Oil Spills, III.C.2.d; Disturbances, III.C.3.d; Discharges, III.D.1.d; Gravel Mining, III.D.2.e; Small Oil Spills from Liberty Facilities, III.D.3.d; Abandonment of the Project, III.D.6.d.)
  - ***Planktonic organisms***
    (Large Oil Spills, III.C.2.e; Disturbances, III.C.3.e; Discharges, III.D.1.e; Gravel Mining, III.D.2.f; Small Oil Spills from Liberty Facilities, III.D.3.e; Abandonment of the Project, III.D.6.e.)
  - ***Polar bears***
    (Large Oil Spills, III.C.2.b; Disturbances, III.C.3.b; Discharges, III.D.1.b; Gravel Mining, III.D.2.c; Small Oil Spills from Liberty Facilities, III.D.3.b; Abandonment of the Project, III.D.6.b.)
  - ***Seals***
    (Large Oil Spills, III.C.2.b; Disturbances, III.C.3.b; Discharges, III.D.1.b; Gravel Mining, III.D.2.c; Small Oil Spills from Liberty Facilities, IIII.D.3.b; Abandonment of the Project, III.D.6.b.)
  - ***Vegetation***
    (Large Oil Spills, III.C.2.g; Disturbances, III.C.3.g; Discharges, III.D.1.g; Gravel Mining, III.D.2.h; Small Oil Spills from Liberty Facilities, III.D.3.g; Abandonment of the Project, III.D.6.g.)
  - ***Walruses***
    (Large Oil Spills, III.C.2.b; Disturbances, III.C.3.b; Discharges, III.D.1.b; Gravel Mining, III.D.2.c; Small Oil Spills from Liberty Facilities, III.D.3.b; Abandonment of the Project, III.D.6.b.)
  - ***Wetlands***
    (Large Oil Spills, III.C.2.g; Disturbances, III.C.3.g; Discharges, III.D.1.g; Gravel Mining, III.D.2.h;

Small Oil Spills from Liberty Facilities, III.D.3.g; Abandonment of the Project, III.D.6.g.)

- Threat to Arctic National Wildlife Refuge
(The Refuge's coastal areas are identified as Land Segments 30-38 (Map A-2 in Appendix A). Marine areas off the refuge are identified as Environmental Resource Areas 11-13 and 41-47 (Map A-2). The potential for oil to contact any of the resources described in the EIS are discussed in terms of the land segments and environmental resource areas and not the Arctic National Wildlife Refuge; for examples, see Sections III.C.2.a(1)(b)2), III.C.2.h(2)(b), and IV.C.1.c(6)(a)2)a).)
- Lack of a National Energy Policy, which should be encouraging the
(Global Climate Change and Alternative Energy Sources, III.D.10. Program- and policy-type issues [national energy policy and other energy alternatives, energy conservation, etc.] are evaluated in our 5-Year Program and EIS [USDOI, MMS, Herndon, 1996a]. The next 5-Year Program is being prepared. The draft program for 2002-2007 was announced on July 23, 2001, and the draft EIS was distributed for public comment in October 2001.)
    - development of alternative energy sources
    - development and use of renewable energy sources
    - conservation of fossil fuels
    - conservation of energy
    - development of fuel cells using coal gasification to generate hydrogen
    - use of mass transit
- Threat of global warming
(Global Climate Change and Alternative Energy Sources, III.D.10. Program- and policy-type issues [global warming, etc.] are evaluated in our 5-Year Program and EIS [USDOI, MMS, Herndon, 1996a]. The next 5-Year Program is being prepared. The draft program for 2002-2007 was announced on July 23, 2001, and the draft EIS was distributed for public comment in October 2001.)
- Threat of glaciation
(Global Climate Change and Alternative Energy Sources, III.D.10.)
- Adequacy of cumulative effects analysis
(Guiding Principles of the Analysis, V.A.3; Activities We Considered in the Cumulative-Effects Analysis, V.B; Analysis of Cumulative Effects by Resource, V.C.)
- Criticism of information posted on the Greenpeace internet website

In addition to the effects of the Liberty Development and Production Plan, Alternative I, on the resources noted above, the effects of the other alternatives; drilling and production island location and pipeline route, pipeline designs, upper island slope-protection systems, gravel mine sites, and pipeline burial depths are analyzed in Section IV.

Many of the concerns noted above also are similar to the comments noted in the e-mail messages numbered 0012, 0016, and 0082. As noted above, these messages were selected to be representative of each of three message groups, and we prepared responses to the individual comments in these messages. Although less detailed, the comments in these messages appear to be similar to the comments in the letter from Trustees for Alaska (and others); this letter is numbered 0135. Many of the issues noted above were the subject of comments in this letter and were addressed by MMS in responses to comments. For additional information on the issues, the reader is invited to review the following comments and responses:

- global warming
Comments and Responses 0135-002 through 0135-009
- national energy policy
Comments and Responses 0135-010 through 0135-011
- oil-spill risk
Comments and Responses 0135-012 through 0135-019
- Oil-spill impacts and response
Comments and Responses 0135-020 through 0135-021
- long-term effects of oil spills on bowhead whales and other marine mammals and their habitats and subsistence
Comments and Responses 0135-022 through 0135-038
- impacts of the project on terrestrial, coastal, and marine habitats
Comments and Responses 0135-039 through 0135-045
- impacts on Boulder Patch and other benthic communities
Comments and Responses 0135-046 through 0135-049
- long-term impacts to polar bears and their habitats
Comments and Responses 0135-050 through 0135-053
- impacts on eiders and other marine and coastal birds
Comments and Responses 0135-054 through 0135-066
- risk and impacts from drilling waste disposal
Comments and Responses 0135-067 through 0135-068
- cumulative impacts
Comments and Responses 0135-069 through 0135-095
- impacts of alternatives
Comments and Responses 0135-096 through 0135-098
- abandonment and restoration
Comments and Response 0135-099
- impacts of water withdrawal
Comments and Responses 0135-100 through 0135-107
- impacts of gravel mining
Comments and Responses 0135-108 through 0135-117

Public hearings were held on the draft EIS in the North Slope Borough communities of Barrow (16), Kaktovik (5), and Nuiqsut (9); in Anchorage (2); and in Fairbanks (5). The number of persons who testified at these hearings is shown in parentheses. The transcripts of these hearings are sizeable. The EIS includes only those portions of the hearing transcripts with comments that required a response. The transcripts in their entirety are available on the MMS web page at www.MMS.gov.

## 2. Changes to the EIS in Response to Comments on the Draft EIS

The Executive Summary; Sections I, II, III, IV, V, VI,VIII and IX; Appendices A, C, D-1, I-2, and K; and various tables, figures, and maps have been revised in response to comments on the draft EIS. Many of these changes represent new or additional information and were made to the appropriate text in the EIS, table, figure or map; references to the revised material are presented in responses to specific comments.

Appendix C has been revised to include new or additional information. Appendices D-7, D-8, L, and M are new. Appendix D-7 is a report from the California State Fire Marshal on double-wall pipelines. Appendix D-8 is a report on the Liberty Project gravel-source areas for evidence of bird and mammal use. Appendix L includes a list of the authors of comment letters or e-mail messages and speakers at the public hearings. Appendix M is a list of Federal, State, and local permits and authorizations for the Liberty Project.

# B. COMMENTS AND RESPONSES

All comment letters, email messages. and the hearing transcripts were reviewed by a team of MMS specialists. These staff members identified comments that required a response. We assigned tracking numbers to the comment letters in roughly the order in which they were received. Written and e-mailed comments are listed in Appendix L, Table L-1. Table L-2 in Appendix L lists the persons who spoke at the public meetings.

Comments required a response if they were substantive and suggested modifications to alternatives, including the proposed action; recommended new alternatives or mitigating measures; disagreed with analysis or methodologies; or related to the accuracy and/or completeness of the data or information.

Letters, e-mail messages, or public hearing testimony that required a response are reproduced in Section VII.B. Specific comments are identified, and responses to the comments are placed at the end of each letter, e-mail message, or oral-testimony excerpt. Comments and responses are printed in numerical order, with public meeting comments following the written comments. We have not reproduced all the comment letters or e-mail messages we received; neither have we reproduced all of the testimony presented at the public hearings. The written and oral testimony reproduced here, however, includes or is a representative summary of all the substantive comments expressed by the public. For a review of the a transcript of the public hearings, please go the MMS web page at www.MMS.gov. We also have provided a summary of other written comments for which no response is required (see Section VII.A.1). This summary is included to provide readers with a sense of the range of public sentiment on the project.

Following is a list of the groups of letters and e-mail messages that included comments for which we prepared responses based on the criteria noted above. These letters and e-mail messages have been assigned a number (for example, **0134**) and are provided, along with comment responses, in numerical order following the introduction to this section (VII.B). Following the letters and e-mail messages, we provide the public hearing comments that required responses and comments (see Section VII.A.1). Each of the public hearing documents have been assigned an abbreviation (for example, **APH** for Anchorage Public Hearing) and are provided in alphabetical order. The list of individuals who spoke at each of the public hearings is included in the Table of Contents for each the public hearings excerpts. Some comment responses refer the reader to other responses that either address the comment or provide additional information.

**Federal Agencies**
Department of Commerce
National Oceanic and Atmospheric Administration, National Marine Fisheries Service (**0134**)
Department of the Interior
Fish and Wildlife Service (**0139**)
Environmental Protection Agency
Region 10 (**0141**)
Department of Transportation
Research and Special Programs, Administration Office of Pipeline Safety, Western Region (**0144**)

**State of Alaska**
Office of the Governor, Division of Governmental Coordination (**0137**)

**North Slope Borough**
Office of the Mayor (**0132**)

**Alaska Native Organizations**
Alaska Eskimo Whaling Commission (**0130**)
Barrow Whaling Captains Association (**0145**)
Inupiat Community of the Arctic Slope (**0146**)

**Conservation Groups**
Seattle Audubon Society, Conservation Committee (**0025**)
Trustees for Alaska (**0135**) (includes Alaska Center for the Environment, Alaska Community Action on Toxics, Alaska Conservation Alliance, Alaska Wilderness League, Center for Biological Diversity, Defenders of Wildlife, Greenpeace, National Wildlife Federation, Natural Resources Defense Council, Northern Alaska Environmental Center, Sierra Club, The Wilderness Society)

**Industry**
BP Exploration (Alaska) Inc. (**0136**)

**Individuals**
Bruce Connery (**0006**)
Sergio Monteiro (**0007**)
Russell Heath (**0011**)

Alicia LaFuente (**0012**)
Tony Verzone (**0015**)
Anne Dougherty (**0016**)
Corinne Smith (**0020**)
Patrick Boyne (**0026**)
Deborah Hill (**0038**)
Lori Roy (**0058**)
Betsy Bowen (**0065**)
Sarah Jensen (**0077**)
Carla M. Blackford (**0078**)
Chesire Frager (**0082**)
Michael Wald (**0129**)

**Public Hearings**
Anchorage Public Hearing (**APH**)
Barrow Public Hearing (**BPH**)
Fairbanks Public Hearing (**FPH**)
Kaktovik Public Hearing (**KPH**)
Nuiqsut Public Hearing (**NPH**)

From: The Connerys [connerys@midmaine.com]
Sent: Wednesday, February 14, 2001 5:32 PM
To: mineral management service

**0006**

John Goll, Director
Alaska OCS Region
Mineral Management Service

Dear Sir:

I have reviewed the Liberty Draft Environmental Impact Statement and question several assessments. After reading the EIS, it became clear that many cumulative effects and government-nation wide policies were not considered regarding how this proposed development would contribute or become part of a national energy policy. **E01** For these reasons, I favor the "NO ACTION" alternative and hope you will realize this is the correct choice. **E02**

My reasons are based on the following interpretations of the EIS.

* The EIS fails to incorporate the full range of changes that have occurred in the Prudhoe Bay and north shore area over the last thirty years. Seems odd that one wouldn't acknowledge the miles of pipeline, hundreds of toxic waste pits, roads and track lakes left by development over these years...I've seen it and can't imagine these impacts aren't being noted. Although the development is offshore, existing pipelines, roads, and staging areas will be needed to construct and then transport the oil to Valdez. Another case of using a piecemeal approach in reviewing this development to that already in place and that will surely follow. **001** And where is this proposed development looked at in light of possible development in the Arctic National Wildlife Refuge? **002**

* Why are different oil spill risk assessments used for Liberty over other sites (i.e., Northstar)? Why isn't the difference explained in the EIS. **003**

* Oil spills on the coastal areas is minimalized or marginally assessed. Be honest, after the mess experienced outside of Valdez, do you really think the smallest of spills won't have an effect even if the spill is contained and cleaned (?) up? The EIS does a poor job of convincing me. **004**

* And as usual, the government and MMS have failed to show how this development is necessary if the country had a honest national energy policy...besides one that says "use more oil products". If we put as much attention in energy conservation as we do in subsidies, royalty relief, and tax breaks for oil companies we could more easily assess how this proposed development is or is not necessary given the risks to the world (global warming-no ice cap on the North Pole this past summer) and local environments. The EIS fails to include any analysis of how a similar investment of resources on the part of BP and the federal government could prepare the U.S. to become more independent of oil and have an energy policy that is both long-lasting and non-destructive of habitats for humans and critters. **005**

Thanks for the opportunity to comment.

Bruce Connery
Biologist
17 Hillcrest Circle
Southwest Harbor, Maine 04679

(This Side Blank)

**0006-E01**

The activities and resources that MMS considered for the cumulative-effects analysis are discussed in Section V as are the effects of these activities on the resources. The commenter did not provide any additional information for consideration.

The relationship between the Liberty Project and the National Energy Policy is addressed in Responses 0065-A02 and 0132-A02.

**0006-E02**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0006-001**

See Table V.B-3 for past development and infrastructure facilities, which include 7,126 acres of gravel roads, pads, and airstrips. Pipelines are in three categories: gathering lines, 197 miles; common carrier, 99 miles; and unspecified, 224 miles. Additional estimates are made for gravel-mine number and area, wells, pads, reserve-pit number and area, production centers, base and construction camps, power plants, docks and causeways, airports and airstrips, and roads and river crossings. A similar accounting is made for present and proposed development and infrastructure facilities in Table V.B-5 and for reasonably foreseeable future development in Table V.B-6b.

Overland moves and seismic activities take place only in winter, when the ground is frozen and covered with snow. A study of tundra disturbance by winter seismic surveys indicated 1-2 years after a survey, tundra disturbance was little to none for 11% of the area, low for 64%, medium for 23%, and high for 2%. After 8-9 years, recovery had reduced the disturbance level to little or none on 97% of the area, and no areas of medium or high disturbance remained. The duration of all impacts would be short term, ranging up to 5 months, and complete recovery could vary from 1 year to decades (USDOI, Bureau of Land Management and MMS, 1998:Section IV-B-4-5).

About 100 North Slope solid-waste sites for the northern region are listed by the State of Alaska, Department of Environmental Conservation, Division of Environmental Health on their website (www.state.ak.us/dec/deh/solidwaste/). These sites include municipal and camp landfills, drilling-waste disposal sites, storage sites, and treatment sites. The listing includes active, inactive, and closed sites. Some of the sites are permitted and some are not. State of Alaska regulations governing solid-waste disposal are found in 18 AAC 60. The types of substances/materials and/or activities that require a permit for disposal of solid wastes are described in State of Alaska 18 AAC 60. Permits for solid waste disposal specify site location requirements, design standards, waste restrictions, closure standards and post closure care requirements.

**0006-002**

Development of oil and gas resources within a national refuge would take congressional approval. For this analysis, it was not considered as a likely possibility in the present or reasonably foreseeable future.

**0006-003**

At the end of the Northstar EIS process, during a November 24, 1998, agency meeting, spill risk (spill rates and exposure variables) was identified as a remaining issue to be resolved (U.S. Army Corp of Engineers 2000). Agencies requested clarification of the chance of a spill occurring from Northstar, because S.L. Ross Environmental Research Ltd. (1998) used a different exposure variable than used in the Northstar draft EIS that produced a different value of the chance of one or more spills occurring. At the November 24, 1998, agency meeting, MMS and Dames and Moore were tasked with writing the Northstar Oil Spill Probability White Paper.

In the course of preparing the Liberty EIS, the MMS collected all available information on oil-spill rates and exposure variables because of the concern regarding oil spill probabilities at the end of the Northstar EIS process. We have added language to the EIS to explain the new information added between the Northstar Final EIS and Liberty draft EIS and why there are differences between the two EIS's in Section III.C.1.d(3).

The oil-spill-occurrence estimators for Liberty and Northstar contain similar information. For example, the Liberty draft EIS and the Northstar FEIS both consider the MMS Outer Continental Shelf and CONCAWE spill rates (U.S. Army Corps of Engineers, 1999:8-14; USDOI, MMS, Alaska OCS Region, 2001:III-C-9 and 10). The new information about spill rates in the Liberty final EIS are: (1) Alaska North Slope, (2) Trans-Alaska Pipeline, (3) OCS by well year and pipeline mile, (4) Department of Transportation onshore pipelines, and (5) Fleet Technology Ltd.'s detailed engineering simulations based on the four pipeline designs. This new information was considered when estimating the chance of a spill occurring from Liberty but not for Northstar.

Because the oil-spill-occurrence estimators are based on either volume of oil produced or pipeline mile/year, we expect Liberty to have a lower chance of a spill occurring than Northstar. Liberty is expected to produce less oil, and the offshore pipeline is shorter. If the oil spill rates were kept constant between the Northstar and Liberty EIS's, Liberty would have a slightly lower chance of an oil spill occurring than Northstar.

Please see Section III.C.1.d, which explains the methodology and rationale for deriving the estimated chance, from historical datasets, of an oil spill occurring and reaching the water and for evaluating relevant project information.

The *Exxon Valdez* spilled 258,000 barrels of oil in a short period of time. This size spill is more than 80 times the size of the largest spill, 2,956 barrels, we estimate from Liberty. Also, we analyze a 180,000-barrel blowout and a 200,000-barrel tanker spill in Section IX.B.

**0006-004**

We disagree with the commenter regarding a marginal assessment. The Liberty EIS considers both the impact of an oil spill and the chance of an oil spill occurring. The analyses of resources (Threatened and Endangered Species, Seals and Polar Bears, Marine and Coastal Birds, Terrestrial Mammals, Lower Trophic-Level Organisms, Fishes, Essential Fish Habitat, Vegetation-Wetland Habitats, Subsistence-Harvest Patterns, Sociocultural Systems, Archeological Resources, Economy, Water Quality, Air Quality) assume a spill occurs and analyze the impact of an oil spill, both large and small, for each of the alternatives. These analyses of an oil spill and its impact to the above topics is the bulk of the analysis in the EIS.

In general, operational spills are confined to the pad, easily cleaned up, and do not affect the environment.

**0006-005**

The purpose of this EIS is to evaluate the BPXA proposed Liberty Development Project in Foggy Island Bay, offshore the North Slope of Alaska, as required by the National Environmental Policy Act, the OCS Lands Act, and other relevant laws and regulations. Program- and policy-type issues (national energy policy and other energy alternatives, energy conservation, global warming, etc.) are evaluated in our 5-Year Program and EIS (USDOI, MMS, Herndon, 1996a). The next 5-Year Program is being prepared. The draft program for 2002 to 2007 was announced on July 23, 2001, and the draft EIS was distributed for public comment in October 2001. See Responses 0135-002 and 003 for additional information pertinent to global warming analysis in this EIS.

The MMS has determined that it is inappropriate to evaluate programmatic issues in a site-specific development EIS. For development and production projects, alternatives are developed that evaluate and compare effects of different project component designs (for example, pipeline design or upper island slope protection) or locations (island, pipeline routes, gravel mine sites); the No Action Alternative, Section II.B, evaluates the effects of not approving or going forward with the project including alternative energy and conservation options.

Neither MMS nor any of the other Federal, State, and local agencies have the authority to direct BPXA to consider or fund other alternative projects, such as alternatives that make the U.S. less dependent on foreign oil. The involved agencies can only approve, approve with modification, or deny the project; it is beyond the scope of this EIS to evaluate all of the other investment opportunities available to BPXA.

From: Sergio Monteiro [monteiroserge@yahoo.com]
Sent: Wednesday, February 14, 2001 6:25 PM
To: akeis@mms.gov
Subject: British Petroleum's Liberty oil project

**0007**

Los Angeles February 14, 2001

John Goll, Director
Alaska OCS Region
MMS, 949 E. 36th Ave., Room 308
Anchorage, AK 99508
Email: akeis@mms.gov

Dear Mr. Goll,

I am contacting you regarding the British Petroleum's Liberty oil project.

**E01** I oppose the Liberty oil project and want you to consider my views. My opposition sprung from two main roots: from general opposition to the use of fossil fuels and from faults of this project in particular. Without entering in too much detail - to save yours as well my own time, I want to briefly mention a few analysis, scientific and historical data that I want you to consider.

**A01** I urge you to take a serious look at the scientific evidence regarding global warming and climate change. I suggest that you start with the Union of Concerned Scientists. Never mind that this is a partisan organization - we all are so. Mind instead the scientific qualifications of the members of the Union of Concerned Scientists as well as their intellectual and moral integrity. The global warming / climate change is not a theory, it is a documented fact that has been backed by an unprecedented 2,000 scientists, including a good number of world wide respected scientists. We owe it to the future **A02** generations to pass on to them a livable world. A good number of the existing human activity happens near the shores and will be flooded with the rising water due to global warming. This is already inevitable as it is; we need to at least decrease the derivative of this process, to begin ameliorating it instead of accelerating the process.

**001** Regarding my second opposition to the British Petroleum Liberty project, I want to mention a few of the flaws on the environmental impact that is claimed by the company. British Petroleum estimates the oil spill risk as 1% to 6% for Liberty, while the risk for Northstar is 11% to 24%. To the best of my little research on the issue I have been unable to detect any breakthroughs in British Petroleum's technology to justify an order of magnitude improvement in the risk. Moreover, as a scientist, myself I have serious doubts on these numbers that are more often than not just pulled out of thin air. I recommend you to read the second of Richard Feynman's autobiographies "Why Do you Mind What They Say?", where Feynman analysis the problems associated with the space shuttle's risk analysis. We all know the end of that story in the early 80s. It is an important reading for people like you that has to make decisions on the Liberty oil project. It is a light reading, accessible to people of all backgrounds, and a funny one too - well, the second part of the book is not quite funny but it is enlightening at least.

Still on the environmental issue, I would like to remind you of the Exxon Valdez incident.

For these - and other reasons as well - I am of the opinion that the best alternative is the so-called Alternative II - the No Action Alternative, described in the draft plan. I support the no-action alternative and urge you to do the same.

Sincerely,

Sergio Monteiro
1325 Wellesley Ave. # 209
Los Angeles, CA 90025
(310) 442 - 9107
monteiroserge@yahoo.com

**0007-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0007-A01**

Please see Response 0135-002.

**0007-A02**

Please see Response 0135-002.

Also included at the end of Section III.D.10 is the planned corrective effort, should the integrity of the Liberty Island be threatened by any cause, including potential rising of sea level due to global warming.

**0007-001**

Please see Response 0006-003.

0011

February 17, 2001

RECEIVED
FEB 2 3 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

John Goll,
Director, Alaska OCS Region MMS,
949 E. 36th Ave, Room308
Anchorage, AK 99508

Mr. Goll,

The Liberty Draft Environmental Impact Statement...

FAILS TO ADEQUATELY ANALYZE THE RISK OF OIL SPILLS. 001

Both the likelihood and the impact of an oil spill are severely underestimated. Without adequate explanation, the estimated oil spill risk at Liberty is significantly lower than the estimated spill risk at Northstar (11 - 24 % for Northstar, 1 - 6 % for Liberty). However, the two facilities will use the same technology to drill for and transport oil, including using the as yet untested sub-seabed pipeline to transport oil to shore. In addition, the impacts of oil spills are severely underestimated. Relying on the dangerous and unproven technology of a subsea pipeline to transport oil from an artificial island to shore in the harsh climate of the Beaufort Sea threatens the fragile Arctic ecosystem with the threat of oil spills, leaks and blowouts. The Arctic Ocean is home to polar bears, endangered bowhead whales, seals and other wildlife that will be decimated by an oil spill. BP has admitted that it cannot respond effectively to an oil spill for much of the year -- an admission that makes drilling in the Arctic Ocean that much more risky and irresponsible.

FAILS TO ADEQUATELY ANALYZE THE IMPACTS OF OIL SPILLS ON THE COASTAL AND OFFSHORE RESOURCES OF THE BEAUFORT SEA. 002

Indeed, the draft plan fails to come up with any significant impact from oil spills, including the impacts an oil spill will have on polar bears, endangered bowhead whales, seals, and traditional subsistence hunting practiced by Alaska Natives for thousands of years. In the wake of oil spills and the damage they have caused in Prince William Sound, the Galapagos Islands and many other environments not half as severe as the Arctic, it is clear that the Liberty draft analysis of the impacts of oil spills is deficient.

FAILS TO ADEQUATELY ANALYZE THE FULL RANGE OF CUMULATIVE IMPACTS STEMMING FROM DRILLING FOR OIL AT LIBERTY AGAINST THE BACKDROP OF PAST AND FUTURE OIL AND GAS DEVELOPMENT ON ALASKA'S NORTH SLOPE. 003

The draft environmental impact statement concludes that no significant cumulative impact is predicted to occur as a result of oil drilling at Liberty. This analysis fails to consider the reach of oil in the Arctic in the last thirty years as the Prudhoe Bay industrial complex has sprawled for hundreds of miles in all directions, including north into the Beaufort Sea with Northstar and Liberty. The oil fields that make up Prudhoe Bay -- with their thousands of miles of pipeline, hundreds of toxic waste pits, flares and other forms of industrial disturbance -- were considered on a case-by-case basis using a piecemeal approach to development. It is this very approach that has been used to analyze cumulative impacts in the Liberty draft plan and will lead to full-scale industrialization of the Arctic -- without any real understanding of the effect of that industrial growth. 003

FAILS TO ADEQUATELY ANALYZE THE CUMULATIVE IMPACT OF LIBERTY ON OIL DRILLING IN THE ARCTIC NATIONAL WILDLIFE REFUGE. 004

The draft plan fails to account for the fact that Liberty will further establish the use of subsea pipeline technology in the Arctic, which in turn will allow BP and other oil companies to encroach even closer to the land and waters offshore the Arctic National Wildlife Refuge.

FAILS TO ADEQUATELY ANALYZE THE IMPACT OF LIBERTY ON GLOBAL WARMING. 005

The draft environmental plan dodges the entire issue by claiming there is no way to calculate the global warming impact of just one offshore oil project. It is a known fact that continued exploration and drilling off the coast of Alaska will exacerbate global warming, which has already caused the Arctic ice pack to thin by 40 percent in the last 40 years. This polar meltdown has grave implications for the polar bears, walrus, whales and other distinct Arctic species who call the pack ice "home." It is unacceptable for the Minerals Management Service to fail to analyze the impacts of Liberty on the climate given oil is the number one source of pollution that causes global warming.

FAILS TO ADEQUATELY ANALYZE THE IMPACTS OF LIBERTY ON A NATIONAL ENERGY POLICY. 006

The DEIS narrowly assumes that if Liberty is not developed, then the U.S. will have to increase imports of foreign oil. Investments in solar and other renewable forms of energy as alternatives to new oil drilling projects in the Arctic are wholly ignored. For example, the draft environmental plan conservatively estimates Liberty will cost anywhere from 364 to 744 million dollars, whereas BP's projected solar spend in the next three years is a mere 500 million. Likewise, the federal government spends billions of dollars each year on subsidies, royalty relief and tax breaks for oil companies. The draft plan also fails to include any analysis of how a similar investment of resources on the part of BP and the federal government could begin to wean the U.S. from its dependence on oil.

Sincerely,

Russell Heath
P O Box 281
Orono, ME 04473

**0011-001**

The MMS has used available information, as described in the EIS, to estimate the likelihood of oil spills and to analyze their impacts. The commenter did not provide any specific information or references that MMS could incorporate or discuss.

Differences in the estimates of oil-spill risk between Northstar and Liberty are discussed in Response 0006-003.

While neither the Northstar nor Liberty pipelines are operational, their designs are based on extensive pipeline experience onshore in arctic environments and offshore experiences in other parts of the world. Liberty is located on a lease issued from OCS Oil and Gas Lease Sale 144, and one of the stipulations requires using pipelines as the environmentally preferred transportation system. As noted in Section II.A.1.b(3), the design goal for this or any pipeline is zero discharge of oil, and it must be in compliance with U.S. Department of Transportation pipeline safety regulations. Any offshore pipeline system in the Beaufort Sea would be designed according to the codes, standards, and specifications listed in Section II.A.3. The pipeline will be hydrostatically tested before operation begins (Section II.A.1.b(3)(a)13)), have three leak-detection systems (Section II.A.1.b(3)(b)), and will be monitored by pigging (Section II.A.1.b(3)(c)) to ensure safe operations.

The effects of Liberty development on biological resources, sociocultural activities, and physical resources from a variety of activities that included accidental oil spills and planned activities such as island and pipeline construction are analyzed in Sections III and IV of the EIS. These analyses did identify potential effects in the event of an oil spill and likely effects from planned activities. This recognition included how the resource was affected, a measure of the amount of each resource affected, and how long the effect might be experienced. The Liberty Prospect is located in Foggy Island Bay, which is ice covered 8 or 9 months of the year, and oil-spill response on the ice has been demonstrated to be effective. The effectiveness of oil-spill response during broken-ice conditions and open water are addressed to in Responses 0145-012 and 0135-094.

Also, see Responses 0135-013 through 0135-019.

**0011-002**

In Sections III and IV of the EIS, the MMS analyzed the effects of Liberty development on biological resources, sociocultural activities, and physical resources from a variety of activities that included accidental oil spills and planned activities, such as island and pipeline construction. These analyses did identify potential effects in the event of an oil spill and likely effects from planned activities. This recognition included how the resource was affected, a measure of the amount of each resource affected, and how long the effect might be experienced.

In Section III, the MMS also defined what would be considered a significant effect to each of the resources. We do not expect significant impacts to result from any of the planned activities associated with Alternative I (*Liberty Development and Production Plan*) or any of the other alternatives. Some significant impacts, such as adverse effects to spectacled eiders, common eiders, long-tailed ducks, subsistence harvests, sociocultural systems and local water quality, would occur in the unlikely event of a large oil spill. In the event of a large offshore oil spill, some significant cumulative impacts could occur, such as adverse effects to spectacled eiders, long-tailed ducks, and common eiders; subsistence resources; sociocultural systems; and local water quality. However, the probability of such an event combined with the seasonal nature of the resources inhabiting the area make it highly unlikely that an oil spill would occur and contact these resources.

The commenter did not provide any criticism of the definitions used by MMS to indicate significant impacts nor was there any indication what the commenter considered to be a significant impact. Thus, we are not able to respond to any specific argument in the comment.

Also, see Responses 0135-22 through 0135-24 and 0135-039 through 0135-066.

**0011-003**

Please see Responses 0135-069 through 0135-092.

**0011-004**

Maps 3a and 3b show the known oil and gas fields between the Colville and Canning rivers, the Canning River being the western boundary of the Arctic National Wildlife Refuge. Badami, which is closer to the Refuge than Liberty, is a developed field with a pipeline that ties into the Endicott pipeline. The Liberty pipeline will connect with the Badami pipeline. Information presented in the EIS does show an expansion of development away from the Prudhoe Bay field over time, as new fields are discovered and technology and market conditions change to allow for new development. Reasonably foreseeable future development/production activities are described in Section V.B.3 of the EIS. Also, see Response 0006-002.

**0011-005**

Please see Responses 0006-005 and 0135-002 through 0135-009.

**0011-006**

Please see Response 0065-002.

0012

Alicia Lafuente
La Ripa 12 1º izda
Zaragoza, Spain
50006

Mr. John Goll
Minerals Management Service
949 East 36th Ave., Room 308
Anchorage, AK 99508

Dear Mr. Goll,

I am writing to comment on Draft Environmental Impact Statement (DEIS) on British Petroleum’s proposal for an offshore oil development in the Beaufort Sea called ‘Liberty’.

Let me state at the outset that I support Alternative 2, No Action, for the following reasons: E01

1. Global Warming: The evidence of human-induced climate change through the burning of fossil fuels is mounting up on a daily basis, and nowhere is the evidence clearer than in the western Arctic, where thinning and retreating sea ice, melting permafrost, and a host of other impacts are already being felt. If BP directed the hundreds of millions of dollars that were being spent on this project towards mass producing solar panels instead of rhetoric about ‘Beyond Petroleum’ it would truly be in the national economic and environmental interest. MMS sidesteps this issue completely in the DEIS. 001

2. National Energy Policy: The assumption in the DEIS that drilling in Alaska is going to reduce our dependence on foreign oil is shortsighted and just plain wrong. All of the oil in Alaska isn’t going to change that equation one bit until the US government puts together a plan to reduce consumption of oil. As long as consumption continues to rise, this will continue to be the case. 002

3. Risk of Oil Spills. The consequences of an oil spill in the Arctic could be severe. While the wildlife in Prince William Sound is still feeling the effects of the Exxon Valdez spill nearly 12 years later, the consequences in the much colder and fragile Arctic ecosystem could be devastating for much longer. The experience’s with spill drills associated with Northstar, BP’s other offshore development in the Beaufort Sea, are not encouraging. 003

4. Cumulative Impacts. The Prudhoe Bay oil complex is now America’s largest industrial complex. Yet there has never been a comprehensive cumulative impacts assessment, because each individual project is ‘just one more’, in a development which now covers more than 800 square miles, which pumps tons of pollutants into the air, pumps toxic chemicals into the ground, and which extracts millions of gallons of fresh water from what would be (without permafrost) a very arid ecosystem. The Liberty DEIS, like all those which have preceded, have attempted to ‘punt’ this responsibility away. No more development should take place in the North Slope’s ‘oil patch’ until these impacts have been assessed. 004

5: Potential Impacts on the the Arctic National Wildlife Refuge: Spills from the Liberty project could reach the important nearshore and coastal habitat of the Arctic National Wildlife Refuge, yet these impacts are scarcely mentioned in the DEIS. Given the ongoing national debate about the future of the coastal plain of the Refuge, I find this a significant weakness in the DEIS. 005

Thank you in advance for taking these comments into account in the preparation of the final Environmental Impact Statement for Liberty. I urge you to opt for Alternative 2, the ‘no action’ alternative.

Yours sincerely,
Alicia Lafuente

**0012-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0012-001**

Please see Responses 0006-005 and 0135-002 through 0135-009.

**0012-002**

Please see Response 0065-002.

**0012-003**

Please see Responses 0011-001, 0011-002, and 0145-012.

**0012-004**

Please see Responses 0135-069 through 0135-092.

**0012-005**

If an oil spill occurred at the proposed Liberty Island or along the pipeline, the chance of oil reaching offshore and coastal areas of the Arctic National Wildlife Refuge range from less than 0.5% to 9% within 60 days (see Tables A-12, 13, 16,18 and 19 in Appendix A). The chances of oil contacting areas in the vicinity of Liberty Island within 60 days of a spill are greater, up to 60%. The Refuge's coastal areas are identified as Land Segments 30-38 (Map A-2 in Appendix A). Marine areas off the Refuge are identified as Environmental Resource Areas 11-13 and 41-47 (Map A-2). The potential for oil to contact any of the resources described in the EIS are discussed in terms of the land segments and environmental resource areas and not the Arctic National Wildlife Refuge; for examples, see Sections III.C.2.a(1)(b)2), III.C.2.h(2)(b), and IV.C.1.c(6)(a)2)a).

RECEIVED
MAR 5 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

**0015**

February 23, 2001

Regional Director
Minerals Management Service
Alaska OCS Region, Room 308,
Anchorage, Alaska, 99508-4363.

Dear Regional Director,

I wish to submit the following comments on the Liberty Project DEIS for the proposed action by the BP Corporation.

I am very concerned about two aspects of the proposed action: 1) the effects of the proposed action on the area wildlife and natural environment and 2) the effects of the proposed action on Native Alaskan of the area.

**001**

My first concern is the effects on area wildlife and the natural environment. The DEIS states that there will be little to no effect on area wildlife. My concern is that the DEIS is not taking into account the long-term and wider picture of the environmental consequences of the proposed action. The immediate effects are justified as being "brief" and "local." The project effects should be put into the larger context of the entire North Slope development. As stated in the DEIS, the North Slope is the $16^{th}$ largest industrial site in the world. The individual effects of the Liberty project may be small or mitigateable, but the combined actions of the oil industry are having dramatic, irreversible effects on the arctic environment.

**002**

My second concern is the effects on the Native Alaskans of the proposed project area. In my view, "periodic disruption" of local social systems and displacement of subsistence species is a significant impact that has not been given sufficient consideration. The DEIS states reassuringly that "potential disturbances to subsistence resources should not displace traditional practices for harvesting, sharing, and processing these resources." Is this to suggest that is would take a complete displacement for this to be considered a major impact? The document also states "effects to subsistence resources and subsistence harvests are expected to be mitigated substantially though not eliminated." It may be possible to mitigate resources, but negative effects on sociocultural systems and loss of culture are much more difficult, if not impossible, to mitigate. Culture, in my eyes, cannot be reimbursed.

Due to the above reasons, I urge the MMS further address the long-term and bigger picture of the proposed action on wildlife, the natural environment, and the local Alaskan Native populations. Profits and economic development should not overshadow the rich natural and cultural value of the Arctic.

I hope that the MMS takes these considerations into account when making a final decision. Thank you for your time and effort.

Sincerely,

Tonio Verzone

Tonio Verzone

4101 University Drive #928
Anchorage, AK 99508

tonio@alaskapacific.edu

**0015-001**

The EIS identifies the effects of the proposed action and the cumulative effects of past, present, and reasonably foreseeable future activities and projects in Section V. Effects are expected and have been identified with respect to bowhead whales, subsistence, spectacled eiders, lower trophics associated with the Boulder Patch, polar bears, and caribou. We have made our best estimates of potential effects while recognizing that events and effects may not happen in the precise way we have portrayed. In this event, monitoring programs will be put in place to provide feedback to decisionmakers who could amend mitigation provisions, as appropriate, in the future.

**0015-002**

All analyses in the EIS were based on a range of effect levels that have been developed over a long period of time with industry, Agency, and Native stakeholders. Within this range of effect levels, "periodic disruption" is not considered to be a significant impact.

It is important to remember that since the development of the oil patch on the North Slope, local biological, social, and economic environments have undergone considerable change. Some of these changes have had a positive net effect on the Inupiat culture; others have not. The MMS believes that the potential disturbances expected from the Liberty Project would not displace the practice of subsistence, subsistence would not cease as a cultural practice, and disturbance from the Liberty Project would not be the agent of a "major" effect.

Only in a "worst-case" oil-spill situation would effects from the Liberty Project not be expected to be completely mitigated, and the chance of a worst-case spill occurring and affecting subsistence resources and practices is considered to be low.

0016

-----Original Message-----
From: Anne Dougherty [mailto:akdougherty@hotmail.com]
Sent: Wednesday, February 28, 2001 1:01 PM
To: John Goll
Subject: MMS: Support Alternative II Do Not Drill The Arctic!

John Goll,

Once again BP Amoco has asked the Minerals Management Service to allow them to build an unnecessary and ecologically harmful drilling platform. I am writing today to urge you to deny their requests to construct the Liberty platform. E01

The draft environmental impact study of Liberty is grossly flawed. The study fails to adequately analyze the impact of Liberty on global warming by giving equivocating and stating that there is no method that can adequately assess the impact of a single oil drilling platform. 001

It is a fact that oil exploration in the Arctic region will only exacerbate global warming and weaken the already thinned Arctic ice pack. Indeed, this habitat, crucial in the lives of the polar bears, walrus, whales and other distinct Arctic species who call it "home," has already been decreased by 40 percent over the past 40 years.

The DEIS also fails to adequately analyze the impacts of Liberty on national energy policy. BP Amoco and other oil companies receive billions of dollars in Federal subsidies and tax breaks each year. It is clearly in BP's interest to continue oil exploration, and encourage the U.S.'s dependence on fossil fuels at the expense of the environment and alternative energy development. 002

By investing almost double the amount in new oil exploration as it does in renewable energy, it is obvious that BP's commitment to renewable energy is mere lip service. We must broaden the U.S.'s energy policy by investing in solar and other renewable forms of energy as alternatives to new oil drilling projects in the Arctic. A01

The risks of oil spills and the impact of any spills are also grossly underestimated by the draft environmental impact study. With out adequate explanation the estimated oil spill risk at Liberty is significantly lower than the estimated spill risk at Northstar, but the two facilities will use the same technology to drill for and transport oil. 003

Relying on the dangerous and unproven technology of a sub sea pipeline to transport oil from an artificial island to shore in the harsh climate of the Beaufort Sea threatens the fragile Arctic ecosystem with the threat of oil spills, leaks and blowouts. BP has admitted that it cannot
respond effectively to an oil spill for much of the year, a fact which makes drilling in the Arctic Ocean that much more risky and irresponsible. 004

I strongly urge you to support Alternative II. Do not drill the Arctic for more oil. Drilling in the Arctic is unsafe, unsound, and unnecessary. E02

Anne Dougherty
923 Upshur Street NE
Washington, DC 20017
akdougherty@hotmail.com

**0016-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0016-001**

Please see Responses 0135-002 through 0135-009.

**0016-002**

Please see Response 0065-002.

**0016-A01**

A new National Energy Policy was prepared and issued in May 2001 by President Bush. "It envisions a comprehensive long-term strategy that uses leading edge technology to produce an integrated energy, environmental and economic policy " The policy included an increase to our energy supplies of natural gas and oil. The proposed Liberty development is consistent with the policy. This EIS focuses on a specific BPXA-proposed development on a specific lease in Foggy Island Bay offshore Alaska.

The MMS has determined that it is inappropriate to evaluate programmatic issues in a site-specific development EIS. The purpose of this EIS is to evaluate the BPXA proposed Liberty Development Project in Foggy Island Bay offshore the North Slope of Alaska, as required by the National Environmental Policy Act, the OCS Lands Act, and other relevant laws and regulations. Program- and policy-type issues (National Energy Policy and other energy alternatives, energy conservation, global warming, etc.) are evaluated in our 5-Year Program and EIS (USDOI, MMS, Herndon, 1996a). The next 5-Year Program is being prepared. The draft program for 2002-2007 was announced on July 23, 2001, and the draft EIS was distributed for public comment in October 2001.

It is beyond the scope of this EIS to evaluate solar energy and other renewable forms of energy as alternatives. See also Response 0006-005.

**0016-003**

Please see Responses 0006-003 and 0135-012 through 0135-019.

**0016-004**

Please see Response 0011-001.

**0016-E02**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

0020

-----Original Message-----
From: Corinne Smith [mailto:cls37@cornell.edu]
Sent: Monday, March 12, 2001 11:52 AM
To: AKEIS@mms.gov
Subject: COMMENTS ON THE LIBERTY PROJECT DRAFT EIS

COMMENTS ON THE LIBERTY PROJECT DRAFT EIS
12 March 2001

I received a CD copy of the DEIS and read the Executive Summary and several other portions. I commend the Minerals Management Services for the easily accessed format of the CD and the overall thoroughness of the Executive Summary. My comments relate to the analysis of the cumulative effects of oil development on the North Slope and the oil spills that will occur.

The location, magnitude, and timing of oil spills can only be estimated. The harsh arctic climate will present severe conditions with little warning and unknown frequency. My first concern with the DEIS is the apparent simplification of the long-term effects of oil spills. MMS has considered the immediate effects on individuals of different species, but the interaction of different components of the ecosystem does not appear to have been factored into the estimate of recovery time for each species. The total number of animals killed in the period immediately following the spill was estimated and the time required for the population to replenish those numbers was calculated. These impacts appear insignificant for all but the endangered species. Was the effect of loss of forage or prey considered? If fish require 5 - 7 years to recover, could the seals also recover completely in the same period of time? 001

Page 28 of the Executive Summary estimates that "up to 15% of the sound's coastline would be affected by a large spill," and that oil could remain from 5 to 10 years due to the Liberty crude's resistance to dispersion. More than one generation of seals and polar bears would be moving through this oil. The bears would regularly ingest oil as they cleaned themselves and fed upon contaminated seals. Each seal might only contain a small amount of oil, but the cumulative effect on overall polar bear health might be significant. 003

A diesel spill could impact 7 square miles of kelp beds for "several years" (p. 28, Executive Summary). What are the long-term impacts to the species dependent upon the kelp and its resident species? Again, will oil accumulate in fish, seal, bears, and whales in increasing amounts? 004

Oil spills could require up to 10 years for recovery of vegetation and wetlands in critical river delta habitats. Short-term disturbance would be magnified by cleanup efforts. Even though the immediate effects on endangered spectacled eiders might only be felt for a few months, the long-term presence of the oil could have a significant cumulative effect on populations of eiders and other fowl dependent upon these wetlands. A01

The assessment of oil spill effects on waterfowl came from a report by the US Fish and Wildlife Service (Appendix J-2). "Bird numbers and oil spill trajectories were both highly variable and the combination caused extreme variability in avian exposure estimates." The analysis illustrated the high uncertainty of predicting events in the Arctic. The Service listed several of the limitations of their study. Their analysis did not include the affects of the oil after it reached the shoreline, the affects of barrier islands or ice on spill trajectories, 005 or the long-term, secondary, or indirect effects of the oil, such as loss of prey or forage. Any of these factors could change the conclusions drawn by MMS. 005

My other concern with the DEIS is the lack of analysis of back-to-back oil spills caused by record-setting ice and weather conditions in succeeding months, seasons, or years. Clean-up from one spill may not be complete before another spill occurs. Do recovery times for species increase incrementally or exponentially in these scenarios? Yes, oil industry practices have improved in the past two decades, but oil spills in all phases of production and transportation have not been eliminated. 006

Decisions about oil development on the North Slope have reached a critical juncture. As noted on page 54 of the Executive Summary, "Liberty would contribute less than 1% of the cumulative disturbance effects on 9000 acres now affected by oil development." Each additional project may only impact a small percentage of the area already developed. But as these small areas are strung together across the Arctic coastline, the potential impact to the environment, through construction and spills, becomes greater than just the addition of the pieces. Less and less of the North Slope becomes free of potential adverse affects. Species have fewer places to re-distribute during periods of construction, operation, and recovery from oil spills. Future development may increase the range of the oil industry to the west to the NPR-A and to the east to the ANWR coastal plain. The cumulative effects of all development across the Arctic must be considered thoroughly. A02

Thank you for addressing the many potential environmental impacts of the Liberty Project and for considering my comments.

Sincerely,
Corinne Smith
6631 Round Tree Drive
Anchorage, AK 99516
cls37@cornell.edu

**0020-001**

The EIS concludes that a large spill is not expected to have short-term or long-term effects on the availability of prey food of marine mammals in the Liberty area. Marine mammals that occur in the Liberty area forage over large habitat areas that would not be affected by the spill. Reductions in potential food sources for marine mammals (fish and zooplankton) in the spill area are expected to be local, and recovery is expected to be short-term (see Section III.C.2.e Lower Trophic-Level Organisms). Thus, food- or ecosystem-related effects were not expected to be an important factor in the recovery of seals and other marine mammals. The conclusions on habitat (food source) secondary effect to marine mammals described in the EIS are that the effect is expected to be negligible to marine mammal populations (see Section III.C.2.B(1) Summary and Conclusions for Effects of an Oil spill on Seals, Walruses, Beluga Whales, and Polar Bears).

Potential chronic spill effects would affect only local bottom sediments and shoreline soils where oil fractions (polycyclic aromatic hydrocarbons) could persist. Arctic marine mammals and their prey are highly mobile, widely dispersed, and would not be exposed to polycyclic aromatic hydrocarbons in contaminated sediments or in shoreline habitats from a large spill for a sufficiently long enough time to experience theses effects.

**0020-002**

There is no comment 0020-002.

**0020-003**

The large oil spill (greater than or equal to 500 barrels) assumed to occur with Liberty development is likely to have no significant effect on the availability of food sources of seals and polar bears that forage over broad ranges of habitat in the Beaufort Sea. Thus, food-chain effects are not expected to have any influence on the recovery of seal and polar bear populations.

**0020-004**

The EIS reviews the long-term impacts to both kelp and species dependent on kelp. The EIS Executive Summary explains that "such toxicity probably would stunt the seasonal growth of kelp plants and reduce the population size of associated invertebrates for several years." A detailed assessment in Section III.C.2.e(2)(b) reviews four studies of diesel spills on kelp in the polar regions. The studies indicate that a spill of diesel fuel drifting over the Boulder Patch probably would not kill kelp but would slow the new, seasonal growth of plants in the affected area. The referenced studies by Kennicutt and others detected no bioaccumulation of hydrocarbons in kelp tissue.

Regarding species dependent on kelp, the studies concluded that slowed kelp growth probably would reduce the population size of subtidal invertebrates in the affected area for several years, but they detected very little spill-related contamination in the subtidal animals (Kennicutt and Sweet, 1992).

In contrast to these studies of subtidal animals, bioaccumulation of hydrocarbons has been observed in intertidal animals. For example, a recent study of intertidal clams affected by the *Exxon Valdez* oil spill was published by Fukuyama et al. (2000). Their study concluded that residual oil in sediments affected survival and growth rates of clams for up to 6 years after the spill. However, such data on intertidal organisms would not be relevant to the Liberty Project area because the ice cover prevents growth of intertidal organisms in the Arctic Ocean.

Information has been added to Section III.C.2.e(2)(b) about a report on an MMS Arctic Kelp Workshop. The report summarizes the statements of the workshop participants, including Dr. Ken Dunton. He explained that kelp growth from year to year varies considerably and, for example, that 1988 was a really bad year for photosynthetic carbon fixation by kelp. The reduced kelp growth probably would have led to reduced population size in species dependent on the kelp. In other words, a natural perturbation has been observed that would cause a reduced population size of invertebrates in the Boulder Patch.

Spills that reach the intertidal and subtidal zones have been observed to affect Pacific herring reproduction in areas where their spawning substrate is affected. However, it remains uncertain as to how this has affected regional herring populations. Nevertheless, the effects of such spills on herring populations were considered when estimating recovery periods.

The diesel spill is expected to rapidly disperse in the water and not accumulate in seal and bears or in their prey-food sources. Petroleum hydrocarbons that are found in diesel fuel and in crude oil are not known to bioaccumulate in food sources of marine mammals. Marine mammals that may be swimming through the spill area are likely be exposed to the spill for only a short period of time, and they are not likely to absorb the diesel oil through their skin from brief exposure to the diesel oil. Seals and other marine mammals that occur in the Beaufort Sea and some that occur in the Liberty Project area are not dependent on the local kelp beds as food sources or as important habitats. Food sources of marine mammals, such as arctic cod, are widely distributed in the Beaufort Sea. Any long-term oil effect on the kelp beds in the local boulder patches are not expected to have any effects on food sources of marine mammals.

A diesel oil spill would be relatively short lived in the marine environment, with no oil remaining after 7 days. It is unlikely that many, if any, bowhead whales would contact the spill, considering the short duration of the spill and the location of the spill inside the barrier islands. There is a 6% chance that the spilled diesel oil could reach bowhead habitat outside the barrier islands. Any contact of the spill by bowheads likely would be short-term, and any adverse effects likely would be temporary. It is unlikely that bowhead whales would accumulate oil.

**0020-A01**

Spectacled eider mortality is not likely to last only a few months, as stated in the comment. The MMS would expect recovery of any listed species to require one or more generations regardless of population status. Residual oil that remains in habitats following cleanup is more likely to result in long-term effects to prey organisms of waterfowl than directly on the birds themselves. This may result in indirect effects to various species, as discussed in the EIS. Although most species have not been tested regarding the effect of the long-term presence of oil in the environment following cleanup, it is not expected to have significant effects on most waterfowl species.

**0020-005**

The MMS used the information provided by the Fish and Wildlife Service for the analysis of effects to birds from a potential oil spill in Section III.C.2.c. The MMS considered the effects of oil and oil-spill cleanup on the beaches and shoreline. Although the Fish and Wildlife Service analysis did not includes include effects after oil reached the shoreline, the MMS analysis did; the Fish and Wildlife Service had the opportunity to comment if they felt the MMS analysis was inadequate or inaccurate, but they did not. The MMS analysis did not identify the long-term loss of prey or forage from a potential oil spill from Liberty.

**0020-006**

The MMS anticipates that there will be back-to-back small spills. We analyze the consequences of small spills of crude and refined oil to address people's concern about chronic effects from numerous small spills. For purposes of analysis, we assume the following spill sizes:

**Offshore or onshore crude oil:**

- 17 spills less than 1 barrel and
- 6 spills greater than or equal to 1 barrel and less than 25 barrels.

**Onshore or offshore refined oil:**

- 53 spills of 0.7 barrel each (29 gallons).

We assume:

- Offshore crude spills can begin anywhere on the Liberty gravel island or along the offshore pipeline.
- Small spills on the Liberty gravel island are in containment or cleaned up and do not reach the water.
- Onshore crude spills can begin anywhere along the onshore pipeline.
- Onshore or offshore refined oil spills can occur along the ice road, from barges, from helicopters, from the gravel island, or from trucks along the road system.
- Most of these spills are contained or cleaned up.

Small spills to the island or the ice surface can, in many cases, be cleaned up within hours. For spills to the island, the oil released would be collected and then any contaminated gravel would be picked up and taken to a disposal site for processing. Spills to the ice similarly would be cleaned up by collecting the free-standing product, scraping up the remaining contaminated snow, trimming and removing any contaminated ice, and taking it to a melt facility where it will be processed. Both of these spills would have minimal, if any, impact on the environment.

Initial response for small spills on water would come from the Liberty Island. The island will have two small response vessels, 2,000 feet of NOFI boom, two 2,500-gallon portable storage tanks, three skimmers, and four pumps staged for response. The on-island spill-response team will deploy the boom to contain the spread of the spill and then begin recovery operations. These activities would then be supplemented by spill-response teams from Alaska Clean Seas, if required. Alaska Clean Seas responders also would deploy boom to protect sensitive areas, if the spill presented a threat.

Shore-seal boom or a low spot in the spill area would contain a small spill to the tundra. The area would be flushed with freshwater to allow the oil to float to the surface and to limit penetration into the tundra. The liquids would be sucked up and collected by sorbent materials. To reduce or eliminate oiling of areas adjacent to the spill, in situ burning of the oiled area with weed-burning units could be conducted to eliminate residual oil.

The analysis of large oil spills does not assume that more than one spill will occur for the Proposal. The number of oil spills for the cumulative case will be greater than for the Proposal, but these are distributed over a greater geographic area and more extended timeframe. Oil spills and disturbance factors are highly unlikely to occur at the same time and place to increase the magnitude of effects. Thus, for the most part, resources are expected to have recovered from a perturbation before providing any measurable increase in cumulative effects.

**0020-A02**

As noted in the cumulative assessment in Section V of the EIS, development of the oil industry on the North Slope has grown over the past 30 years. Table V.B-3 estimates the current area covered by past development at more than 7,000 acres and, with current proposed reasonable and foreseeable projects, the total acreage in gravel roads, pads, and airstrips could exceed 9,000 acres. However, that information should be considered in a larger perspective. Those 9,000 acres produced about a quarter of the U.S. domestic production during the time period. The 9,000 acres equate to about 0.07% of the 13 million acres (9,000 acres divided by 13,000,000 acres = 0.000692) in the coastal plain on the North Slope. It is less than 0.02% (9,000 divided by 56,800,000 acres = 0.000158) of the total area of the North Slope Borough. For comparison purposes, wilderness areas in Alaska cover about 56.4 million acres, and the 16 National Wildlife Refuges in Alaska total about 77 million acres.

The cumulative case analysis in Section V of this EIS does evaluate the effects of all reasonable and foreseeable projects and provides both the readers and decisionmakers with the information they need to make informed decisions.

0025

Helen Ross [mailto:helenr@seattleaudubon.org]
Sent: Tuesday, March 13, 2001 12:54 PM
To: 'akeis@mms.gov'
Subject: BP Liberty Oil Project EIS Comment Letter

<<...>>

March 13, 2001

Mr. John Goll
Director - Alaska OCS Region
U.S. Minerals Management Service
949 E. 36th Avenue, Room 308
Anchorage, Alaska 99508

Dear Mr. Goll:

On behalf of Seattle Audubon Society's Conservation Committee and the Society's 5,000+ members, I am writing about the Draft Environmental Impact Statement on British Petroleum's Liberty oil project. Like BP's Northstar Project, Seattle Audubon Society is opposed to the Liberty project, and we support Alternative II, the No Action Alternative described in the draft plan. E01

Our organization's primary concerns focus on both short term and long term impacts of this project, including:

Perpetuating our nation's dependence on fossil fuels as a main fuel source. A01

The draft EIS makes an assumption that if Liberty is not developed, the U.S. will have to increase imports of foreign oil. This may not be the case if there was a federal energy policy that promoted alternative energy sources.
In this draft EIS, little attention is spent on solar and renewable forms of energy as alternatives to new oil drilling projects. Seattle Audubon Society believes that nothing is done to halt society's dependence on oil by approving this permit. Seattle Audubon Society supports a moratorium of new oil production permits.

Untested use of sub-seabed pipelines, oil spill danger, and oil spill clean-up E02

As we had with the Northstar Project, we had grave concerns about the potential of an oil spill associated with this project, limitations of detecting a spill, and the difficulties of responding to a spill in the Arctic. E03 We question the estimated oil spill risk at Liberty and we question why this estimate is lower than that for Northstar (11-24% for Northstar versus 1-6% for Liberty), especially since the two projects will use the same technology to drill for and transport the oil. 001 We believe that the sub-seabed pipelines remain untested in the Arctic, where weather conditions are extreme, and we believe that the estimates for a spill are very low. Sea ice, high winds, sub-zero temperatures, lengthy winter seasons, distance from the artificial island to shore, and other factors unique to the Arctic warrant a more cautious approach before permitting another project with this untested technology.

Detecting an oil spill associated with the Liberty project would be very difficult. During winter months - or most of the year - a small spill could easily accumulate to become a large spill before being detected, which would cause irreparable damage to the fragile Arctic environment. BP has admitted that it cannot effectively respond to an oil spill much of the year. This admission makes drilling at Liberty unacceptable to Seattle Audubon Society. 002

Birdlife and the ecosystems they depend on

Any oil spill caused by the Liberty project would directly affect birds and the ecosystems they depend upon. E04 Seattle Audubon Society is taking an active interest in this project specifically because of the 50+ species of birds that winter in our region and migrate to other areas beyond, as well as the resident birds of the Arctic that our members travel to study and enjoy. Some of the birds that are near and dear to the hearts of our membership are Peregrine falcons, Gyrfalcons, Rough-legged hawks, Northern Pintails, Savannah sparrows, Red-throated and Arctic loons, Semipalmated sandpipers, American Govern Plovers, Tundra swans, and Snow geese. Of particular concern are Pacific or Black brant (the Northslope supports 20% of the world's Black brant population), Spectacled and Steller's eiders (both recently added to the list of threatened and endangered species), and Ross' gulls (a species of concern with tens of thousands migrating along the northshore of Alaska and Canada). We promote the protection of birds and the ecosystems they depend upon. Therefore, we oppose any disturbances during nesting, brooding, rearing, molting, staging, and feeding in the vicinity of Liberty. E05 The negative consequences of an oil spill at Liberty will be felt far beyond the immediate vicinity of the project and far beyond the borders of Alaska. For the birds and other animals, the consequences would have national and international repercussions. E05

Expansion of development on Alaska's northslope A02

The infrastructure that has been built to support the oil industry on
the
northslope of Alaska has grown substantially over the years. Seattle
Audubon Society continues to have concerns about the impacts of this
development. Noise, buildings and other structures, people, traffic,
waste
generation, flares, etc. have negative impacts on the wildlife. With
each
permitted project there are more impacts. We believe it is time to
check
this growth; urban sprawl does not belong in such an environmentally
sensitive place and it is time to determine the cumulative impact to the
Arctic environment.

Global warning A03

When the Northstar project was proposed in 1998 and 1999, Green Peace
submitted detailed about the impacts of the project on global warning.
At
that time, we agreed with those comments. We continue to believe they
are
relevant to the Liberty project, and we request that any comments
submitted
by Green Peace for either of these projects be incorporated into this
letter
by reference.

In conclusion, Seattle Audubon Society opposes BP's Liberty project and E06
supports Alternative I, the no action alternative. Our organization
appreciates the opportunity to submit our comments about this project,
and
we request that your agency keeps us informed about this matter. Thank
you.

Sincerely,

(Helen Ross for)
Chuck Lennox
Chair
Conservation Committee
206-523-8243 ext. 13

Helen Ross, Conservation Coordinator
Seattle Audubon Society
8050 35th Avenue NE, Seattle, WA 98115
206-523-8243 ext. 13
helenr@seattleaudubon.org

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**0025-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0025-A01**

President Bush distributed the National Energy Policy in May 2001. This policy includes development of additional domestic energy, both onshore and offshore, in addition to conservation and development of alternative energy sources as a means of meeting the energy needs of the Nation. Without domestic production, imports will increase over the next 20 years.

The purpose of this EIS is to evaluate the potential environmental impacts from developing the proposed Liberty Project and to evaluate alternatives and/or mitigating measures that may reduce the environmental effects. It is inappropriate for a project-specific EIS to try and evaluate policy-level issues and alternatives. Those types of issues are evaluated in the 5-Year EIS. The Draft EIS for the 2002 to 2007 5-Year Program was distributed to the public in October 2001.

**0025-E02**

The design, construction, operation, and safety of offshore pipelines are described in Sections II.A.1.b(3), II.C.2, II.B.2, and IV.C.2.

Information about oil-spill risk is described in Sections III.C.1.d and e and Appendix A.

Information on oil-spill response and cleanup is described in Section III.C.1.a. Also, please see Responses 0132-002, 0135-094 and 0145-012.

**0025-E03**

Information about oil-spill risk is described in Sections III.C.1.d and e and Appendix A.

Information on oil-spill detection is described in Section II.A.1.b(3)(b).

Information on oil-spill response and cleanup is described in Section III.C.1.a. Also, please see Responses 0132-002, 0135-094 and 0145-012.

**0025-001**

Please see Response 0006-003.

**0025-002**

BPXA has committed to using a supplemental leak-detection system, LEOS, that will increase the probability of detecting a leak from the pipeline (Section II.A.1.b(3)(b)2)). Once the leak is detected, BPXA and their response contractor have numerous tactics and strategies to remove the oil from water and ice. During the winter, trenches would be cut into the ice over the release, and the oil would surface and be collected. Oil incorporated into the ice sheet would be mined to the greatest extent possible and removed. Oil that could not be collected during the winter would be tracked and, once the ice began to melt, this oil would surface through the brine channels and would either be collected or burned in place. See Sections II.A.4.a and b for more discussion on spill-response tactics.

**0025-E04**

The effects of a large oil spill on birds and their habitat are analyzed in Section III.C.2.a(2) and III.C.2.c.

**0025-E05**

The analysis of the effects of a large oil spill on birds and other animals are analyzed in Sections III and V. The analyses include the effects on populations of the various species. These population effects could raise national and international concerns regarding the affected species. The commenter did not indicate what the national and international repercussions might be.

**0025-A02**

Please see Response 0020-A02.

**0025-A03**

The MMS, the Environmental Protection Agency, and the Corps of Engineers all were cooperating agencies for the Northstar EIS and all three agencies adopted that EIS, which responded to the Greenpeace comments on pages L-99 through L-136. Those responses are still applicable and relevant. Because the Northstar EIS is publicly available, the responses will not be repeated in this EIS.

**0025-E06**

Please see Response 0016-E01.

**0026**

Patrick Boyne [mailto:pollux153@hotmail.com]
Sent: Tuesday, March 13, 2001 5:05 PM
To: AKEIS@mms.gov
Subject: RE: Liberty DEIS

The Draft Environmental Impact Statement for the Liberty Project was very thorough and complete. There are, however, a few more items that I would like to see addressed.

**001** My first concern is about the buried pipeline running from the island to the mainland. This pipe will be carrying heated oil through soils containing permafrost. The heat from the oil could heat the pipe, the surrounding soils and possibly the water near the ocean floor. The effects of this heating were not discussed in the DEIS. Some possible problems that could arise from this have to do with the lower level trophic organisms. This heated area may cause an off-season breeding ground for these organisms. This, in turn, may alter feeding habits of larger fishes and sea mammals. I am sure this problem (if it is a problem) has been studied at similar projects that use buried pipeline under the arctic seas. It would be beneficial to include these findings and projections in the final EIS.

**002** It is unclear as to what is to be done with the island after oil production ceases. I understand that new technologies may come about between now and the time of clean up, but I believe a general plan that outlines the procedure should be provided in the EIS.

**003** Another concern of mine is the amount of drilling and facilities on the North Slope. A look at the map in the DEIS shows a number of pipelines and different projects occurring in close proximity to each other. Each of these projects required and EIS and found little or no significant impacts on the environment, but I wonder if a combined EIS of all current projects should be assessed. It seems that individual projects may not have much impact on the environment but multiple projects together may have a significant impact.

I hope these comments are helpful and are considered in the completion of the Environmental Impact Statement for this project.

Patrick Boyne

**0026-001**

The heat from the pipeline is likely to dissipate quickly in the sediments that bury the pipeline and in the cold water above the pipeline; the pipeline would be covered with about 7 feet of sediment and gravel fill. Seafloor currents during open water and under the ice will help to dissipate any heat that might rise to the surface. If the heat did reach the seabed, it probably would affect only the infauna, such as polychaete worms. In contrast, organisms such as kelp that are attached to the seafloor surface would be affected by the water temperatures. As described in Section VI.C.5.d, the temperature of the bottom water near Liberty Island would vary seasonally, between about 2 and -2 degrees Celsius, depending primarily on the surface ice cover and flow from the Sagavanirktok River.

If the effects of heated oil cause "an off season breeding ground" for lower trophic-level organisms and, thereby, "altering the feeding habits of larger fishes" it is unlikely that such an event would benefit fish populations. Although heat from the pipeline might have some effect on the benthos, fish are highly mobile, which decreases any effect that heat from the pipeline might have on the feeding habits of marine mammals.

If heat from the buried pipes did cause some benthic fish prey species to increase, it would be in extremely small numbers and would not be sufficient to sustain increased fish numbers in the surrounding areas. Increases in water temperatures would be minor, if at all, and would dissipate rapidly. Breeding seasons of organisms are not based solely on increased habitat temperatures. Light plays a significant role as a signal for the start of a breeding season, and there should be no sudden increase in light levels by the pipeline's presence.

**0026-002**

Please see Response 0058-005.

**0026-003**

Each of these pipelines and different projects has been assessed for environmental effects in the sequence that they have occurred. The baseline of activities has increased over time, and the National Environmental Policy Act makes provision for this by requiring a cumulative-effects analysis, which is Section V in this document. In the cumulative-effects analysis, we are required to include past, present, and reasonably foreseeable future activities and the incremental contribution of the proposed activity.

0038

John Goll,

Once again BP Amoco has asked the Minerals Management Service to allow them to build a drilling platform. I am writing today to urge you to deny their requests to construct the Liberty platform.

One of the biggest concerns of any off-shore drilling initiative must be the impact of blowouts and the potential for oil to be trapped under sea ice. This region has a distinctively short food-chain, and there could be potentially devastating effects of a reduction in the krill and diatom population. 001

I strongly urge you to support Alternative II. E01

Deborah Hill

debh@unconventionalwisdom.co.nz

**0038-001**

The comment describes potentially devastating effects of a spill on the short planktonic food web in the Arctic. However, the effects of spills on planktonic food webs typically are brief (several days), as described in Section III.C.2.e(2)(1). See also the description about the probable behavior and fate of a Liberty crude-oil spill in Section A.2 of Appendix A and Response 0129-002. Because of the brief effect on plankton, the assessment is focused on the longer term effects of spilled oil on shorelines, where oil could persist for up to 10 years.

**0038-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision process.

RECEIVED
MAR 16 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

**0058**

March 10, 2001

Mr. Fred R. King
U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region
949 East 36th Ave. Room 308
Anchorage, AK 99508

Dear Mr. King

After reviewing the DEIS of the Liberty Project, I fully understand and support the need to satisfy our demand for domestic oil and the decreasing dependency on foreign oil imports. I realize that the Liberty Project's main purpose would be to recover oil from this new man made site and transport it for market. I also understand that the life expectancy of this island would serve 15 to 20 years.

This, sir, is where I would like to address my concerns and questions. I have reviewed your section on abandonment, when the site has fulfilled its purpose, and have found there are many unanswered concerns, which you feel would be better answered by a new EIS when the time comes closer to the end. To try and perceive the final out come your project will have on the surrounding environment at this time is not a probability until it has gone into effect, but once the surroundings have come to adapt to the introduction of a foreign entity into their environment you will then turn around and create new changes. 15 to 20 years is not that long of a time frame, some of the issues you might want to look into that will be effected are as follows:

**001**
1. The Spectacled Eiders: In your DEIS, you stated how fragile their existence could become with the Liberty Project. What would prevent them from becoming less fragile after they had made necessary adaptations and future generations were to be subjected to an abandonment process?

**002**
2. Seals and Polar Bears: These mammals were notated to find new hunting grounds and there would be little impact imposed upon them. What about all the reintroduction of man and machine coming back into the area to clear the site? What impact would that impose on them?

**003**
3. Disturbance of Vegetation: It is stated that very little vegetation will be disturbed and that the vegetation that was will recover in a couple of years. What about redisturbing the vegetation? Will it survive once again?

**004**
4. Natural Resources and Jobs: Local communities are to benefit from the Liberty Project. What happens when it comes time to shut down the project and many people have come to depend on these jobs and a whole new way of life?

**005**
I believe that these issues and others need to be planned and prepared for the future. I know that it is stated by the time the Project will be ready to shut down there will be new developments and inventions that will be of great benefit. I feel that the abandonment issue could be further researched. The surrounding environment will have mass changes at the installation of the Liberty Project and then at the disassembling. If the Liberty Project DEIS looked at both issues with the same amount of importance, than all that would be needed at the time of closure at this site is an updated version. The Liberty Project has made it their priority to make as little impact on the surrounding environment as possible and I know you will continue to do so with your on going research.

Thank you.

Lori Roy

Cc: Jim Brown

**0058-001**

Because the Liberty Project area is near the eastern extreme of the spectacled eider's breeding range in North America, relatively few are expected to nest in this area; thus, relatively few eiders would be found in nearshore or offshore waters following the breeding season. As a result, few would even have the opportunity of becoming adapted to the presence of Liberty Island (for example, foraging on its lee side), and adaptation might involve avoiding the island altogether. Thus, it is not expected that removing island slope-protection materials and allowing the island to erode, for example, would affect the foraging habits of more than an insignificant number of individuals who can seek comparable foraging habitat that apparently is abundant elsewhere in this region.

**0058-002**

The Liberty Project would have very local disturbance effects on marine mammals during construction of the island and pipeline. There is not likely to be any real change in marine mammal hunting grounds associated with development and, thus, there is likely to be no significant change in marine mammal hunting grounds associated with abandonment of the oil field 15-20 years later.

**0058-003**

The installation of the onshore pipeline during development would take place during the winter and, thus, it would have little effect on vegetation. Removal of the pipeline also is likely to take place during winter 15-20 years later and have a similar effect. The redisturbance of vegetation along the pipeline around the vertical support members is expected to have a similar effect on the vegetation as during pipeline installation. It is possible that this vegetation may take longer to recover from the second disturbance; however, the effect on vegetation would be very local within a few feet of each vertical support member of the onshore pipeline. Vegetation disturbed at the mine site would begin to recover after construction of the gravel island. Abandonment of the oil field would not require further disturbance of the mine site.

**0058-004**

Local communities on the North Slope would benefit only indirectly from the Liberty Project. The North Slope Borough would levy taxes on the onshore portion of the project infrastructure and pipeline, and this revenue would be used to fund Borough operations. State revenues generated from the Liberty Project also could reach the North Slope Borough. Very little local employment is expected to occur from Liberty Project development, based on the fact that Native employment in the oil patch has always run less than 1%. Workers for the project likely would come from areas other than local North Slope communities. Workers would work onsite and be staged out of Prudhoe Bay. There would be little local employment or worker interaction with local Native communities. Consequently, the ongoing subsistence lifeway is not expected to be impacted by these forces.

**0058-005**

Assuming the island is built, abandonment would be about 20 years in the future. Federal and State Agencies likely would have new and better information about the environment and new rules and regulations that would apply to abandonment. The abandonment process is described in Section II.A.1.b(8). The applicant must submit an abandonment plan that will undergo an evaluation for compliance with the National Environmental Policy Act before approval. For purposes of analysis in this EIS, MMS assumes all of the wells will be plugged and abandoned below the ocean floor and all surface structures on the islands will be removed, including gravel bags and/or steel sheetpile. All of the production facilities and material such as pipes, gravel bags, steel sheetpile, etc. will be transported from the island site during the winter over ice roads. The onshore pipeline and onshore facilities also would be removed. This material will be reused or disposed of at approved disposal sites. All of the oil will be removed from the pipeline.

In Section III.D.6, the EIS evaluates the effects of these activities on the resources. Because most of these activities take place during the winter, the effects to most resources are minimal. Whether the applicant is required to remove the cement blocks from the island, the gravel at the island site, and or the pipeline will be determined at that time. The goal of abandonment is to restore the affected environment to its original condition. The EIS has evaluated processes and possible effects from the abandonment process to a reasonable extent. To carry the analysis further would rely on "assumptions" about whether kelp and other communities have colonized the cement blocks or pipeline trench area. Those assumptions would be followed by additional assumptions about their density and use of the area by other resources, along with more assumptions about the techniques and processes that might be used to remove the remainder of the island or the pipeline. At this point, the many assumptions, not the analysis, would be driving the effects. Therefore, reliance on that analysis would not seem wise. The MMS believes it is better to state what we are quite sure will happen and then state that we will use future information, combined with future rules and regulations that are in place at the time, to determine the full extent of abandonment.

**0065**

John Goll,

BP Amoco has asked the Minerals Management Service to allow the building of a superfluous and ecologically harmful drilling platform. I write to urge you to deny their requests to construct the Liberty platform. **E01**

I understand that the draft environmental impact study of Liberty is grossly flawed. It skirts Libery's impact on global warming, with the weak argument that there is no way to assess the impact of a single oil drilling platform. **A01**

That Arctic drilling worsens global warming and further weakens the Arctic ice pack, is just plain fact. This region is home to polar bears, walruses, whales and other animals, whose numbers steadily decrease with continued human encroachment.

The DEIS also fails to really analyze Liberty's impact on national energy policy. BP Amoco and other oil companies routinely receive billions in subsidies and tax breaks. Clearly, BP benefits from oil exploration and U.S. dependence on fossil fuels - at the expense of our environment. **A02**

Since BP spends almost twice as much on oil exploration as it does on renewable energy, their commitment to alternative energy is hollow. We must invest in solar power and other alternatives, and stop new oil drilling projects in the Arctic.

Oil spills are also grossly underestimated in the study. Without sufficient explanation, Liberty's oil spill risks are stated as much lower than Northstar's, yet both will use the same drilling and transport methods. **001**

It is completely irresponsible to rely on the dangerous, unproven technology of a sub-sea pipeline to transport oil from an artificial **E02** island to shore in the Beaufort Sea's harsh climate. BP admits it cannot respond to oil spills for much of the year -- a fact that makes drilling in the Arctic Ocean even more careless and unfeasible. **E03**

I strongly urge you to support Alternative II. Stop new drilling in the Arctic. It is unsafe, unsound, and unnecessary.

Thank you.

Betsy Bowen
828 High Ridge Road
Stamford, CT 06905
USA
betsybowen@aol.com

**0065-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0065-A01**

Please see Responses 0135-002 through 0135-009.

**0065-A02**

President Bush released the National Energy Policy in May 2001. Chapter 5 of the document calls for increasing domestic energy supplies. On page 5-3 of that document (U.S. Government Printing Office, 2001), the projected need for energy will rise to 127 quadrillion British thermal units by 2020. Domestic production is expected to rise by only 86 quadrillion British thermal units. That shortfall can be made up in only three ways: import more energy (see Section IV, No Action Alternative); improve energy efficiency; and increase domestic production.

On page 5-7 of the document, "The NEP Group recommends the President direct the Secretary of the Interior to consider economic incentives for environmentally sound offshore oil and gas development...." On page 5-8, the reports notes the importance of moving forward with the development of two offshore discoveries (Northstar and Liberty).

The MMS believes the Liberty Project is consistent with this policy, including any economic incentives available to companies as encouragement. We believe the EIS realistically evaluates the potential effects of proceeding with the Liberty Project.

**0065-001**

Please see Response 0006-003.

**0065-E02**

The design, construction, operation, and safety of offshore pipelines are described in Sections II.A.1.b(3), II.A.3, II.C.2, II.B.2, and IV.C.2.a.

**0065-E03**

Information on oil-spill response and cleanup is described in Section III.C.1.a. Also, please see Responses 0132-002, 0135-094, and 0145-012.

Sarah Jensen
4101 University Dr #641
Anchorage, AK 99508
March 11, 2001

RECEIVED
MAR 2 : 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

**0077**

Liberty Project DEIS
MMS
949 East 36th Ave., Room 308
Anchorage, AK 99508

In review of the Liberty Project DEIS through an Environmental Law class at Alaska Pacific University, some personal questions have been raised:

001

1.) During the proposed project, where will the workers live and for how long? Will there be enough room on the boats (or other provided area) or will a "psudo-community" develop within the native community? Personally, I might just be imagining an abnormal influx in population for 10 to 15 years, or however long, which will serve to work the proposed project, followed by a huge drop in population as the workers and their families leave the "artificial" community, thus

002

leaving another Alaskan ghost town. How will this affect the socioeconomic structure of the village(s) over such a time period? Boom and bust is definitely an option, but is it the best?

003

2.) For the native Athabaskans who are dependent on substance ways of living, how will a 1-2 year drop or such alteration in species affect them, in both the short and the long term? If the said species becomes undesirable or unavailable, is there an alternative for them and have they been educated to a point where they are in a position to agree to the proposed project?

004

3.) The Liberty Project sounds like a good proposal, but is it absolutely really needed as of yet in our current economic and social environment?

**0077-001**

See Section III.D.5.b(1) Effects on Employment and Wages for an explanation of residency of workers. Text has been added to the EIS to clarify the question of residency of workers.

**0077-002**

Please see Response 0058-004 for a discussion of how the Liberty Project will affect the socioeconomic structure of local North Slope communities.

Also, it is not anticipated that the scope of Liberty development would be of such magnitude to trigger a local boom-bust cycle.

**0077-003**

In the short and long term, a 1-2 year alteration or loss of subsistence resources would constitute a major effect. Such an effect is expected only in the case of a large offshore oil spill. The low probability of such an event combined with the seasonal nature of the resources make such a scenario highly unlikely.

There are alternative subsistence resources, but substituting important traditional food sources with other resources is very problematic. The loss of the ability to harvest a major subsistence resource, such as the bowhead whale, would be a major impact.

The Inupiat (not Athabascan) people generally oppose oil development in the offshore environment, but they have established a dialogue with MMS on such things as developing more appropriate mitigation to protect subsistence resources and harvests. With industry, the Inupiat have developed conflict avoidance agreements that establish the best times for development to occur, so it does not interfere with subsistence hunts.

**0077-004**

The National Energy Policy and the Executive Orders issued by the President in mid-May 2001 identify and encourage the development of new energy projects, such as the Liberty, to help the Nation meet its energy needs. This EIS evaluates the effects associated with that potential development and provides the reader and decisionmakers with tools to evaluate the benefits of the project in meeting the Nation's energy needs against the potential costs to the biological and social environments. The reader, as well as the decisionmakers, must weigh the benefits against the costs and make a reasoned decision.

0078

Carla M. Blackford
PO Box 220296
Anchorage, Alaska 99522-0296

Minerals Management Service
949 East 36 th Ave., Room 308
Anchorage, AK 99508

RECEIVED
MAR 2 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

To whom it may concern:

In reference to the Liberty Project Public Hearing, I opposed the drilling of 120 million barrels of oil and gas in the Beaufort Sea. I have reviewed the environmental impact statement; the statement is for the most part complete. I reviewed the statement on CD-ROM. As I read the statement, I also went through the EA/EIS checklist. I do not believe the environmental consequences were covered adequately. **E01**

I am opposed to the drilling for a number of reasons. One, I believe the consequences to the environment are too great. **E02** Two, I do not believe 120 million barrels of oil will solve the US dependency on foreign oil. **E03** The clean up process when the rig is gone, will still show the effects of man on the environment. The agency's will say they will work with the Indian tribes. The past shows the little people lose in the end. **E04** What about an oil spill there is the 1-% chance. Are they going to have the proper clean up equipment on the island? Will the equipment be used properly? Will the equipment stay on the island? **001**

There is too much risk to the marine environment in the Beaufort Sea. We can not be sure if the drilling is going to hurt them. Do we honestly want too? I vote for the no action alternative. **E05**

Thank You

Carla M Blackford

Carla M. Blackford

**0078-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0078-E02**

The potential effects of developing the Liberty Prospect are analyzed in Section III, IV and V.

**0078-E03**

The relationship between the Liberty Project and the National Energy Policy is addressed in Responses 0065-A02 and 0132-A02.

**0078-E04**

The MMS commitment to working with the Native communities in Alaska is addressed, in part, through (1) using their knowledge (Section I.D Traditional Knowledge) in describing the environment and analyzing the potential effects of oil and gas development on the environment and (2) involving them in decisionmaking by adapting our procedures to correspond to the Executive Orders on environmental justice, Indian trust resources, and government-to-government coordination (Section I.F).

**0078-001**

BPXA will maintain spill-response equipment on Liberty Island. This equipment is intended to provide response to smaller spills on the island and to provide an initial response, if possible, in the event of a major spill until the main response equipment arrives onscene. BPXA must provide and maintain and accurate inventory of all spill-response equipment staged on the island and by their spill-response contractor offsite in their Oil Discharge Prevention and Contingency Plan. During inspections of the facility, the inspector will verify the inventory.

Under the Oil Pollution Act of 1990, operators are required to maintain a cadre of trained personnel capable of responding to a spill. Spill Response Team members are provided annual training in spill-response techniques, equipment operation, and safety. They also are required to conduct response drills to exercise all portions of their spill-response plan over a 3-year period. As the regulating authority, MMS may call announced or unannounced response drills to test the operator's readiness at any time.

**0078-E05**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0082**

Dear Mr. Goll:

I am writing to comment on the Draft Environmental Impact Statement (DEIS) on British Petroleum's proposal for an offshore oil development in the Beaufort Sea called 'Liberty'.

I support Alternative 2, No Action. We should not encourage this kind of environmentally detrimental project because **E01** **E02**

-- more use of fossil fuels promotes further damage from global warming

-- we must develop a national energy policy that reduces consumption, not increases production

-- this kind of project increases future risk of oil spills, which are devastating to the fragile Arctic ecosystem and to the Arctic National Wildlife Refuge.

Please reject the British Petroleum proposal, by recommending No Action.

Sincerely,

Ms. Cheshire Frager
33-47 165 Street
Queens, NY 11358

**0082-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and as noted in Section I.A. MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0082-E02**

For issues related to global warming see Responses 0135-002-009.

For issues related to National Energy Policy see Responses 0135-001-011.

For issues related to oil spill risk see Responses 0135-012-019 and related to ANWR see Response 0012-005.

Michael Wald
Box 106
Ester AK 99725

0129

Michael Wald
April 13, 2001

Mr. King

Please accept this letter as an addition and clarification to my oral comments submitted in
Fairbanks this winter. I would like to reemphasize my strong opposition to the proposed development at E01
Liberty. Oil development in the Beaufort Sea is inherently risky and in my view irresponsible. Spills are a
daily occurrence in North Slope oil fields and clean up off shore is nearly impossible for most of the year. E02
The ecology of the Beaufort is poorly understood but research would indicate that oil production with or
with out spills would have a serious and detrimental effect on the health of the marine environment.

The DEIS for Liberty is poorly written and fails to address many biological and geographic issues.
The DEIS also fails to address concerns of the residents of the North Slope and their subsistence and
cultural needs.

I would like to expand on a few of the inadequacies of the report. I will apologize that I am unable E03
to site specific sections of the document as the CDrom version displays only black pages and I am unable to
open any of the documents on the MMS web site. I will therefore be speaking in relatively general terms. I
am sure that you will be able to reference the appropriate literature.

The first section I will take issue with is the Ice Gauging data. The general premise of this section 001
is that Ice gauging in Foggy Island Bay is not deep and therefore the pipe depth for the proposed project is
adequate. It further assumes that a single walled pipe will be adequate. This data is inadequate in two ways.
Firstly sedimentation in the bay erases the effect of many historic ice events. Because of the limited time
line represented by the data, the data is inadequate for predicting future ice events. Without the ability to
predict ice movements we can not responsibly transport toxic and volatile substances in a marine
environment. The buried pipe could be further jeopardized as ice movements and ocean dynamics change
with the warming of the global climate. There have been a number of anomalous ice events in the arctic
basin in the past few years and evidence suggests that arctic weather patterns are changing radically. An
increase in heavy moving ice could easily rupture a single walled pipe. The final EIS should include a
greatly expanded section on ice movements and particularly ice gauging in Foggy Island Bay. The
investigation of ice dynamics must include both long term historic models. and models which account for a
rapidly changing climate. If we can not accurately forecast ice dynamics then planning for Liberty is purely
guess work.

Another section which is full of unfounded assumptions addresses under ice transport of spilled 002
oil. The DEIS asserts that oil spilled from pipes or other under ice structures will be relatively easy to
recover as it will remain in the area. This assumption is based on almost no data. To the contrary there is
mounting evidence from the Chukchi that there are powerful under ice currents capable of transporting oil
over long distances. The final EIS needs to thoroughly investigate under ice currents during all seasons. Oil
recovery techniques need to be proven 100% effective before there is an opportunity for oil to be spilled.

In addition t the above failings the DEIS contains some glaring fallacies and blatant omissions. 003
Firstly the document asserts that Bowheads would not contact spilled oil in the spring as lead systems are
always well to the north of Liberty. I would encourage you to study the satellite images from late March of
this year. A system of leads extends ESE from Point Barrow towards Prudhoe. Whales were seen passing
Barrow during this time. Belugas were also conspicuously absent from the DEIS. The assumption that they 004
are too far from development to be effected is based on poor assumptions of clean up abilities and ocean
dynamics. It should also be stated that Cetaceans will be adversely effected by development with or without 005
spills. The acoustic impacts of Liberty have been consistently underestimated. These impacts need to be
reexamined and emphasized in the Final EIS.

In summary I am very disappointed in the DEIS. It fails to adequately address many important
ecological and cultural effects of the proposed project. Spills at Liberty seem inevitable, clean up
impossible and the Beaufort irreplaceable. As a Federal Agency I hope that MMS will honor its E04
responsibility to all Americans and ensure that irresponsible and dangerous projects like Liberty will be
properly scrutinized and denied.

Thank you for considering my comments I hope to see them reflected in the Final DEIS

**0129-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate the comments and all reasonable options throughout the final EIS comment period and decision process.

**0129-E02**

The issue of daily spills and cleanup is addressed in Section III.D.3 Effects of Small Spills from Liberty Facilities; also see Appendix A. The effects of a large oil spill, which has a low probability of occurring, is addressed in Section III.C.2, the chance of a large oil spill occurring is addressed in Section III.C.1.d, and the cleanup of a large spill is addressed in Sections II.A.4 and III.C.1.a. Also see Responses 0132-002, 0135-094, and 0145-012.

**0129-E03**

This is the only complaint of this type MMS is aware of. See Response 0135-E065.

**0129-001**

This comment raises a number of individual concerns.

The first concern is that the ice-gouging prediction for Foggy Island Bay is inadequate, because historical gouges have been erased by sedimentation over the years; therefore, the predicted ice-gouge depth is inaccurate.

Sedimentation does not erase ice gouges, as wave action could, but fills in historical ice gouges. Sedimentation rates in Foggy Island Bay actually are relatively low, but gouges and scars do fill in. Although gouges and scars have been filled in by sediments, they still show up on sidescan sonar records as "scars," because the sediment fill is slightly different in texture (i.e., smaller grains than the surrounding seafloor) or of slightly different relief.

The large gouges seen on sidescan sonar records in the Liberty Project area are wide but not deep, they do not appear sharp, and are cross cut by smaller (younger) gouges. These attributes indicate older gouging from tabular, broken shorefast (first-year) ice and not by pack ice encroaching on the shoreline.

Notice to Lessees and Operators 00-A02 requires pipeline right-of-way applicants to conduct surveys along, and in the vicinity of, proposed pipeline routes. These surveys include the use of equipment that is capable of detecting historical ice gouges that have been filled in by sedimentation.

The second concern is that the available data do not represent an adequate amount of time to accurately predict future ice gouging.

Appendix C of the INTEC (2000) report, which is incorporated by reference, provides a much more detailed description of the methodology used to determine the maximum, 100-year average return period ice-gouge depth than is contained in the body of the draft EIS. Based on 2 years of site-specific data and several years of nonsite-specific studies that were conducted, the 100-year average return period ice-gouging event was calculated to be 1.36 feet deep. Because the amount of site-specific data available were limited, BPXA has assumed an ice-gouge depth of 3 feet, which corresponds to a 3,600-year average return period for design purposes.

For the EIS process, we reviewed the information provided by BPXA and decided that the methodology and value they used for maximum ice-gouge depth was reasonable. The purpose of an EIS is not to review the engineering design of a project but to identify the possible effects on the environment that a project may have. The MMS recognizes the possibility that a detailed engineering review of the pipeline design may indicate the need to require a deeper burial depth to ensure pipeline integrity. To account for this possibility, this EIS analyzes the effects to the environment that could be caused from a deeper burial depth.

A third concern is that the ice-gouging predictions do not include a component to address potential changes to ice mechanics that could occur as a result of global warming.

The present knowledge of the history of climate change and sea levels is not well known for the Arctic. As shown in Table VI.C-1, sea levels have varied greatly, but mostly to lower levels indicating glacial periods. The earth currently is in a warm period known as an interglacial period. Results of recent observations of ice thickness, temperatures, and ice-pack distribution are not an accurate measure of what is happening concerning global climate change. These measurements must be integrated with longer term climate information gained through studying the shallow offshore and onshore Quaternary geologic record to establish a more reliable history with a more accurate predictive potential.

Even if the sea level rose a foot or two higher, which is higher than even the most radical models of global warming predict for the next century, probably no significant ice gouging will occur in the Liberty area because of the presence of barrier island and shoals and floating fast ice in the winter. These features present obstacles to the movement of large ice masses into Foggy Island Bay and the Liberty Project area. The presence of the Boulder Patch community inside the barrier islands and in and adjacent to Foggy Island Bay indicates that large ice masses with keels deep enough to interact with the seafloor are not a usual feature in the Liberty area. The Boulder Patch community requires a stable, long-term environment to get established.

The most severe ice gouging is located in the area where the rotating, permanent polar icepack comes into contact with the landfast ice and creates pressure ridges. Because global warming could affect the size of the permanent polar icepack, it could have an effect on the area where the interaction between the polar icepack and the landfast ice occurs. However, this change would not affect ice gouging in the proposed Liberty Project area, because the barrier islands would continue to obstruct the movement of large ice masses with deep keels into Foggy Island Bay. Another potential source of severe ice gouging is large pieces of multiyear ice that are driven by wind or ocean currents. Changes to weather patterns, including ocean currents, which may be caused by global warming, also could affected this type of ice gouging. This potential change also would have no effect, or a very minimal effect, at the proposed Liberty Project location, because the barrier islands and the shallow areas between them will prevent large pieces of multiyear ice from entering Foggy Island Bay.

As part of the pipeline right-of-way review process, the MMS has entered into an agreement with the State Pipeline Coordinator's Office to conduct a thorough technical review of the pipeline design basis, when the applicant submits the pipeline right-of-way application. During this review, the MMS, the State Pipeline Coordinator's office, and third-party contractors with the necessary expertise will review all aspects of the proposed pipeline design to ensure that the pipeline is designed properly for its intended application. It is possible that this review could determine that the proposed pipeline burial depth is inadequate. If this happens, the applicant would be required to increase the pipeline burial depth to a safe level. The pipeline right-of-way review process and not this EIS will be the mechanism used to determine if the burial depth and other aspects of the pipeline design are adequate.

**0129-002**

The MMS very carefully considers the movement of oil under ice. A few under-ice current-meter studies were completed in the late 1970's and early 1980's. These current-meter records were either analog or the data were no longer available. The MMS specifically funded the study *Beaufort Sea Nearshore Under-Ice Currents: Science, Analysis, and Logistics* to have a solid answer regarding the nature and magnitude of under-ice currents in the Liberty area.

Understanding the under-ice currents is a necessary precursor to estimating potential effects on sensitive resources from oil spills or in the landfast-ice zone and, in particular, at the Liberty and Northstar projects. Under-ice current speed and direction are important, because currents of 10-20 centimeters per second will move spilled oil along the underside of the ice.

The objectives of the study *Beaufort Sea Nearshore Under-Ice Currents: Science, Analysis, and Logistics* were to do the following:

- Measure currents, temperature, and salinity hourly at three locations in the landfast-ice zone in the vicinities of Northstar and Liberty prospects.
- Quantify the magnitude of current variability and to describe the relationship between currents and local winds.
- Determine the vertical structure of the currents throughout the water column and how the structure changes with the development of the landfast ice through the winter and in summer, when the ice melts and rivers flood the inner shelf.

Bottom-mounted Doppler current meters were deployed at three sites in the Northstar/Liberty area in August 1999. These meters were recovered in August 2000 and provide vertical current profiles for that period. The information from this study was not available for inclusion in the draft EIS.

The time series show that the current variations are seasonally modulated, with most of the variance and the highest current speeds occurring in summer and fall. The current variance between mid-October and the end of June is a factor of 5-10 times smaller than the variance prior to and after these dates. Flow events exceeding 25 centimeters per second are common prior to mid-October 1999 and after July 1, 2000; however, between these dates, flow speeds seldom exceed 10 centimeters per second. This information has been included in the final EIS in Section VI.C.5.

Table 1 summarizes work done by various investigators regarding oil in ice behavior. Many studies investigated the spreading of oil and its fate under the surface of the ice. A brief synopsis of the spreading of oil under ice has been included in Appendix A, Section 2 Behavior and Fate of Liberty Crude Oil.

In their Technical Manual, Alaska Clean Seas identifies a number of tactics for responding to an under-ice oil spill. These tactics involve cutting trenches and sumps in the ice sheet, which allows the oil to surface and be collected by skimmers or pumps. Tactics C-11, R-13, R-14, and R-15 describe in depth the methods to be used to contain and collect oil that is beneath a solid sheet of ice.

**Table 1:** Summary of References by Study Type (Field, Lab, Anal.) and Process Addressed (Spread, Encap., Release). Multiple references that refer to the same project were reviewed together. These are grouped together.

| | Field | Lab | Anal. | Ice-Related | Spread | Encap. | Release |
|---|---|---|---|---|---|---|---|
| Al'khimenko, 1989 | X | | X | | X | | |
| Barnes et al., 1979a, 1979b | X | | | X | X | | |
| Buist and Dickins, 1983, Buist, Potter, and Dickins, 1983 | X | | | | X | X | X |
| Comfort and Purves, 1980, 1982; Comfort et al., 1983; ARCTEC Canada Ltd., 1983 | X | | | | X | X | X |
| Comfort, 1986 | X | | | | X | | |
| Comfort, 1987 | | | X | | X | X | X |
| Cox et al., 1980; Cox and Schultz, 1980; Cox and Schultz, 1981a; 1981b | | X | X | | X | | |
| Dickins, Buist, and Pistuzak, 1981; Dickins and Buist, 1981; Buist, Pistruzak, and Dickins, 1981 | X | | | | X | X | X |
| Glaeser and Vance, 1971 | X | | | | X | | |
| Goodman and Holoboff, 1987; Goodman et al., 1987 | X | | | X | X | | |
| Greene, Leinonen, and Mackay, 1977 | X | | | | X | | |
| Keevil and Ramseier, 1975; Chen, Keevil, and Ramseier, 1976a; 1976b | | X | X | | X | X | |
| Kisil, 1981 | | X | X | | X | X | X |
| Kovacs, 1977 | X | | | X | X | | |
| Kovacs et al., 1981 | X | | | X | X | | |
| Mackay et al., 1976 | | X | X | | X | | |
| Mackay et al., 1979 | | X | X | | X | | |
| Malcolm, 1979; Malcolm and Dutton, 1979 | | X | X | | X | | |
| Malcolm and Cammaert, 1981a; 1981b; Cammaert, 1980 | | X | X | | X | | |
| Martin, 1979 | X | | | | | X | X |
| Moir and Lau, 1975 | | X | | | X | | |
| Nelson and Allen, 1981 | X | | | | | X | X |
| NORCOR, 1975 | X | | | | X | X | X |
| NORCOR, 1977 | | | X | | X | X | X |
| Payne et al., 1984a | | X | X | | | | X |
| Payne et al., 1987 | | X | X | | X | | |
| Purves, 1978 | | X | X | | X | X | X |
| Puskas, McBean and Kouwen, 1987 | | X | X | | X | | |
| Rosenegger, 1975 | | X | X | | X | | |
| Topham, 1977 | | | X | | X | X | |
| Topham, 1979 Topham, 1980 | | | X | | X | X | |
| Tsang, 1979; Quam, 1978; Tsang, Chen, and Carson, 1978; Tsang and Cheng, 1978 | X | X | X | | X | | |
| Uzuner et al., 1979; Weiskopf and Uzuner, 1977 | | X | X | | X | | |
| Venkatesh et al., 1990a; 1990b; El-Tahan, Comfort, and Abdelnour, 1988 | | | X | | X | | |
| Wolfe and Hoult, 1972; 1974 | | X | | | | X | |
| Wotherspoon et al., 1985 | | | X | | X | | |
| Yapa and Chowdhury, 1989a; 1989b; 1990 | | X | X | | X | X | |

**0129-003**

The EIS states the Oil-Spill-Risk Analysis model estimated that there is less than a 0.5% chance of an oil spill from Liberty Island contacting the spring lead system (SPL 1-5) over both a 30-day period and a 360-day period during either summer or winter. With respect to an oil spill from

Liberty Island contacting the spring lead system offshore to the north of the Liberty development project, the Oil-Spill-Risk Analysis estimates that Ice/Sea Segments 8 and 9, immediately north of Liberty, each have a 1% chance of contact over a 30-day period and a 1% chance and a 4% chance of contact, respectively, over a 360-day period. Information regarding the estimated chance of contact of these ice/sea segments also is included in the EIS. These estimates for the chance of contact do not consider any cleanup effort.

**0129-004**

Beluga whales are recorded or observed rarely in offshore waters near the Liberty Project. It is very unlikely that individual whales would be exposed to Liberty development activities let alone the population. Thus, belugas were not discussed in the draft EIS analysis. During spring, ice leads open and close on a daily basis (as indicated by satellite data from the National Oceanic and Atmospheric Administration) offshore of Point Barrow and offshore of Prudhoe Bay in the Beaufort Sea. However, oil spilled during the winter is likely to remain encapsulated in the ice until meltout during the open-water season and not contact these ice leads and the whales. Most of the oil from a potential spill from Liberty is expected to contact land during the open-water season and is unlikely to contact whales migrating offshore during this season or during the ice season. Beluga whales and walruses have been added to the final EIS analysis of potential effects of the Liberty Project (Sections III.C.2.b and III.C.3.b) and the alternatives.

**0129-005**

Based on existing studies that MMS is aware of, acoustic impacts to cetaceans from the Liberty development project are expected to be minimal. Several of the studies were conducted from, and in the vicinity of, the proposed Liberty Island location. The proposed Liberty Island location is well inside the barrier islands, which greatly reduces the chance for sound to travel beyond the barrier islands into the bowhead whale migration route. Measurements of sounds from various drilling and construction activities that would be conducted at the Liberty Island location indicate most sounds are not detectable beyond 10 kilometers and, thus, would not reach the bowhead migration route. Some bowheads do move into the entrances between the barrier islands and may come close enough to Liberty Island to hear sounds from the island. These few whales are not likely to approach the island close enough to be adversely affected. Some whales also may be affected by the sealifts bringing facilities to the island. If the commenter had provided references to scientific studies that support the comment that acoustic impacts have been underestimated, MMS would have been happy to include the references in the final EIS.

Beluga whales are uncommon or rare in occurrence in the Liberty Project area. Only a few, if any, individual whales potentially could be exposed to noise coming from the Liberty Island. The vast majority of the population migrates far offshore of the Liberty Island and is very unlikely to be exposed to any noise coming from the Liberty Project area.

**0129-E04**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

0130

Alaska Eskimo Whaling Commission
P.O. Box 570 • Barrow, Alaska 99723

**COMMENTS OF THE ALASKA ESKIMO WHALING COMMISSION ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR BEAUFORT SEA OIL AND GAS DEVELOPMENT LIBERTY PROJECT**

March 21, 2001

The Alaska Eskimo Whaling Commission (AEWC) appreciates the opportunity to submit the following comments on the Draft Environmental Impact Statement (DEIS) for the Liberty Project. These comments are being submitted for purposes of the U.S. Minerals Management Service's hearings scheduled for March 20, 21, and 22, 2001. The AEWC reserves the right to submit additional comments on the Liberty DEIS prior to the close of the public comment period.

E01

The Alaska Eskimo Whaling Commission opposes the proposed Liberty Island development for the following reasons:

E02

**BECAUSE OF THE SEVERE ADVERSE EFFECTS OF OFFSHORE OIL AND GAS DEVELOPMENT, INCLUDING OIL SPILLED IN THE WATER (WHETHER CUMULATIVE SMALL SPILLS AND DISCHARGES OR A MAJOR SPILL) NORTH SLOPE OIL AND GAS DEVELOPMENT MUST BE BROUGHT ONSHORE.**

001

As with the Northstar DEIS, MMS and the Army Corps of Engineers have tried to assume away oil spill risks and damages in the Liberty DEIS. However, in its discussion of cumulative oil spill effects in the Northstar FEIS, the Corps found that with present and planned development in the arctic OCS, there is a 95.2% probability of one or more spills greater than or equal to 1,000 barrells (Northstar FEIS, p. 10-39).[1]

Therefore, according to the Army Corps of Engineers (Corps), there is a virtual 100 % chance of a serious oil spill occurring in the arctic OCS within the foreseeable future if oil production continues in the OCS as planned. With respect to other sources of pollution to the arctic marine environment, exploration and production-related activities introduce waste and "small" oil spills

[1] Given the Corps' discussion of oil spill probabilities for Northstar alone, this number can be assumed to be conservative.

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001

that seem to occur with some frequency in the OCS. Furthermore, a major oil spill in the arctic OCS, however unlikely, cannot be cleaned up. In addition, no one knows what the fate of such a spill would be, or the full extent of its impacts on the arctic marine environment. What is known, however, is that (with the exception of clean-up costs to the company) the entire impact of any of these adverse events will be borne solely by the coastal villages of Northern Alaska, including the bowhead subsistence community.

002

This growing cumulative risk is too great for our community to have to bear. Future oil production along the North Slope must be brought onshore. This can be accomplished at Liberty by building a causeway out from the spit of land southwest of the proposed Liberty site, and using directional drilling from there. This approach would keep everything on land, and the oil could be transported by a raised pipeline rather than a subsea pipeline. The AEWC is willing to consider this approach as an alternative to the current proposal. (See Attachment.)

003

**THE LIBERTY DEIS DOES NOT ADDRESS CUMULATIVE IMPACTS ON THE HUMAN ENVIRONMENT. NOR DOES IT PROPOSE ANY MITIGATION MEASURES FOR THESE IMPACTS.**

**Our Northern Alaska bowhead subsistence community receives no direct benefit from OCS oil and gas development. Yet we bear 100 percent of the environmental and social risks associated with this development, including adverse impacts to our marine, coastal, and human environments.**

These impacts are coming from many directions, including noise from industrial operations, the cumulative effects of small spills and discharges, the risk of a large oil spill, and the stress placed on our community due to these threats to our subsistence resources, lifestyle, and culture.

Because of these present and threatened impacts, oil and gas development is having an increasingly adverse impact on the human environment of our communities. As our AEWC subsistence hunters have reported and testified on countless occasions, we are bound together by our subsistence hunting culture, the center of which is the bowhead whale. As OCS oil and gas development increases in our Beaufort Sea, bowhead whales and our other subsistence resources will become less available to our community and our traditional hunting culture will be seriously threatened. Even more importantly at this time, our people's fears that oil and gas development could cause us to lose our subsistence resources, and therefore our way of life, our independence, and even our food, is taking a serious toll on our people's psychological health and quality of life.

004

At page III-A-8 of the DEIS, the Corps states that "Effects . . . would not displace ongoing sociocultural systems, community activities, and traditional practices for harvesting, sharing, and processing subsistence resources. Then at page III-C-81, the Corps states that "no resource or harvest area would become unavailable and no resource population would experience an overall decrease." However, the Corps has presented no evidence to support this statement. The map included in the DEIS, which is supposed to show Nuiqsut bowhead harvest locations in this area for 60 years, is extremely incomplete. The Corps and MMS are trying to address our concerns for the future of our culture with unfounded statements. However, these statements will not protect our communities and our subsistence. 004

In a 1988 article published in Science magazine, the respected rural sociologist, Dr. William R. Freudenburg, writing about public perception of risk from large-scale technological developments, pointed out that

> real costs are incurred . . . when societal strains are created by inequitable distributions of technological risks, or even when individuals "invest" in the psychic costs of worrying about potential disasters, whether such disasters actually occur or not.[2]

Dr. Freudenburg went on to note that

> <u>It is tempting to assume that risk management can be improved by settling scientific facts before worrying about any social implications . . ., or to assume that scientists identify "real" risks, with additional public concerns being due to misinformation or irrationality.</u> Such assumptions may cause few problems when the stakes are low, consensus is high, experience is vast, and decisions do not impose burdens on one group for the benefit of another. <u>These assumptions are clearly problematic, however, for controversies that involve high stakes, low consensus, new technologies, and unequal distributions of burdens and benefits.</u> These kinds of technological controversies are often precisely those for which the perceived-versus-real argument is pushed with the greatest passion.[3] (Emphasis added.)

It is clear that our bowhead subsistence community is not the first community to experience real, identifiable social stress and disruption as a result of being forced to bear the full burden of risk,

[2] Freudenburg, W. R., "Perceived Risk, Real Risk: Social Science and the Art of Probabilistic Risk Assessment," Science, Vol. 242, p. 44

[3] Id., p. 48.



with little or no benefit, from a potentially threatening, not fully tested activity, such as arctic OCS oil and gas development and production.

Furthermore, we are facing an increased interest in North Slope oil and gas development, both onshore and offshore, just as the North Slope Borough tax revenues from the Prudhoe Bay development have gone into steep decline. To date, the Prudhoe Bay tax revenues have provided us with some minimal resources to help us at least try to force the industry and federal agencies to take account of the impacts of OCS oil and gas activity on our bowhead subsistence hunt and culture.

However, as these revenues continue to decline, MMS must recognize that the inequitable distribution of development benefits and risks in Northern Alaska not only is leaving our bowhead subsistence community with all of the risk associated with development, but also without even minimal means to protect ourselves from those risks. This is especially true for the Liberty project, which is entirely in federal waters, and therefore will not even contribute to the North Slope Borough tax base. A01

**MMS has not taken any action to address the adverse impacts to the human environment of our communities.** 005

The above issues, among others, were noted and discussed by the Committee to Review Alaskan Outer Continental Shelf Environmental Information, established by the National Research Council in the early 1990's (the NRC Committee). The NRC Committee published the report on its work in 1994.[4] Reporting on the adequacy of information on impacts to the human environment, the NRC concluded that MMS's studies conducted in Alaska generally have not addressed changes that occur in local communities in response to "the potential" for OCS-related activities.[5] In its recommendation addressing this conclusion, the NRC Committee stated: 006

> <u>The real (and often predictable and quantifiable socioeconomic consequences of leasing and exploration-phase impacts need to be described and addressed.</u>

[4] "Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska" (National Academy Press, 1994; "the 1994 NRC Report"). This report was the result of a two-year study, requested by MMS, of the adequacy of environmental information to assess the impacts of three Alaskan lease sales planned for 1991 and 1992 in the Beaufort Sea, Chukchi Sea, and Navarin Basin. Dr. Freudenberg's 1988 publication in Science Magazine, cited above at footnote 6, was reviewed and relied upon by the NRC Committee.

[5] The 1994 NRC Report, p. 148.

MMS's influence over the magnitude and probable evaluation of these impacts will need to be assessed as well. The reasons for increased attention to this issue are pragmatic – i.e., related to successful prosecution of the leasing program – as well as scientific.[6] (Emphasis added.)

The NRC Committee went on to conclude that "There is little evidence that systematic attention has been devoted to the fact that MMS can substantially ameliorate or exacerbate" the adverse effects of these changes. Thus the NRC Committee recommended that MMS conduct a "thorough analysis of whether and how alternatives [sic; From the text, it appears that this word should be "alterations".] to subsistence activities can be mitigated." In the alternative, the NRC Committee concluded that "MMS's decision-making documents should assume 'worst-case' scenarios, i.e., that effects on subsistence may be unmitigable."[7]

The NRC Committee also noted that, even with further research, MMS cannot fulfill its obligation to manage the socio-cultural impacts that are occurring in Northern Alaska as a result of ongoing OCS oil and gas leasing, exploration, and development activity without revising its decision-making process for the siting of OCS oil and gas-related facilities, at least in Northern and Northwestern Alaska.[8] Among the items that MMS must consider in revising this process, is the need for local communities to have an "active part" in the decision-making process and to have "real control over decisions that influence risks."[9] As the NRC Committee correctly noted,

> the best (and perhaps the only) solution is for MMS, the industry, and North Slope residents to attempt to reach agreement on the controversial matters and how they should be adjusted, remedied, or mitigated – as [sic] specific times and places that various activities occur – in lieu of or concurrent with additional studies.[10]

The NRC Committee's recommendations regarding the mitigation of long-term impacts, including "cultural erosion" and over-dependence on oil and gas-related revenues, or "over-adaptation," are consistent with the recommendations that the AEWC and the North Slope

006

[6] Id.

[7] Id., p. 152.

[8] See 43 USC 1344 (a)(1); The 1994 NRC Report, p. 190.

[9] The 1994 NRC Report, id.

[10] Id., p. 194.



Borough have been making to MMS and NMFS in recent years. According to the NRC Committee: 006

> Among the obvious possibilities for mitigating those foreseeable effects (as well as for helping to create more positive effects) would be the creation of trust funds.[11]

Not one of these issues has been addressed by MMS. In the DEIS, the Corps reports that the "stipulation on Subsistence Whaling And Other Subsistence Activities" ensures that industry operators "coordinate siting and timing with subsistence whaling and other subsistence-harvest activities." (Liberty DEIS, pp. III-C-85, 86.) This statement is incorrect. No one has attempted to coordinate the siting, timing, or anything else related to the Liberty proposal with our community. We have been met with and **told** what is to happen.

Conversely, the Corps also notes that continuing oil development will disrupt our cultural activities, "even though it doesn't cause 'biologically significant" harm to a subsistence species' overall population." (Liberty DEIS, p. III-C-87.) Furthermore, according to the Corps, "some resource populations could suffer losses, or could be rendered culturally unavailable for use, causing potentially significant unavoidable effects on the subsistence harvest." (Liberty DEIS, p. III-D-25. Note that this statement contradicts the statement made by the Corps at page III-C-81 and cited above at page 2 of these comments.) 007

Again, none of these issues has been addressed, and statements by the Corps such as "effects from these sources would not displace ongoing sociocultural systems, community activities, and traditional practices for harvesting, sharing, and processing subsistence resources" are nothing more than unfounded and insulting attempts to dismiss the impacts to our community. (Liberty DEIS, p. V-49.)

**THE OPEN WATER SEASON CONFLICT AVOIDANCE AGREEMENT IS NOT DESIGNED TO ADDRESS IMPACTS TO OUR COMMUNITY FROM OCS OIL AND GAS PRODUCTION. ANY REFERENCES IMPLYING THAT THIS AGREEMENT MIGHT SERVE AS A MITIGATION MEASURE FOR OCS PRODUCTION ARE INAPPROPRIATE. THERE ARE NO MITIGATION MEASURES IN PLACE TO PROTECT OUR COMMUNITY FROM THE ADVERSE EFFECTS OF OFFSHORE OIL AND GAS PRODUCTION.** 008

[11] Id. p. 195.

The Corps states that BPXA is working with the AEWC to negotiate a Conflict Avoidance Agreement "that would cover Liberty production." (Liberty DEIS, p. III-C-86.) This statement is not true. Furthermore, the Open Water Season Conflict Avoidance Agreement is designed to address noise and traffic issues during exploration. It does not address the much more severe impacts associated with offshore production. 008

009

**THE DEIS DOES NOT ADDRESS BOWHEAD FEEDING IN THE BEAUFORT SEA.**

One extremely important issue ignored repeatedly by both NMFS and MMS is the fact that migrating bowhead whales feed throughout the Beaufort Sea. The AEWC understands that this is an inconvenient fact that the agencies would like to ignore. However, our whaling captains observe bowheads feeding as they migrate each Spring and Fall. Others have observed this as well. In addition, whales taken in all three fall bowhead subsistence whaling villages have food in their stomachs.

The following cites are taken from NMFS' current Draft Arctic Region Biological Opinion:

> Sheldon and Rugh (1995:13) report some whales feed opportunistically during spring migration, and that the lead system may serve as an important feeding area. Page 11
>
> Bowhead whales [including females with suckling calves] apparently take their time returning westward during the fall migration, . . . with some localities being used as staging areas due to abundant food resources . . . . (W. Bodfish in NSB, 1981:296; S. Akootchook in USDOI, MMS, 1995:18). Page 12
>
> Inupiat believe that whales follow the ocean currents carrying food organisms. (T. Napageak - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996: 13). . . . Bowheads have been observed feeding not more than 1,500 ft (457 m) offshore in about 15 to 20 ft (4.6 to 6 m) of water (A. Brower in USDOI, MMS, 1979: 6; H. Rexford in USDOI, MMS, 1979:16). Page 12
>
> The barrier islands all along the Beaufort Sea coast are considered by local residents as important resource to the bowhead whale for use as staging and feeding areas (M. Pederson in USACE, 1996:51). Page 14
>
> Some near-bottom feeding (evidenced by mud being brought to the surface) continued until the vessel was 3 kilometers (1.86 miles) away. . . The most



> notable change in behavior apparently involved cessation of feeding when the vessel was 3 kilometers away. Page 45 009
>
> Many aggregations of feeding whales were observed near or just shoreward of the 10 meter depth contour. (Citing survey data from the 1996 - 1998 seismic monitoring programs by Richarson and LGL.) Page 51
>
> **We do not have enough evidence to know whether or not industrial activity for several years would keep bowheads from using an area, although possible abandonment of feeding habitat may be a concern**. Page 76

Furthermore, in its1988 ARBO, NMFS noted the following.

> In the fall, both feeding and migration activities occur in the Alaskan Beaufort Sea. Certain areas appear to be regularly used for feeding and resting. . . . Bowhead whales have also been observed feeding north of Flaxman Island (Ljungblad et al. 1982), in outer Harrison Bay north and east of the Colville River plume (Ljungblad et al. 1983), and in the waters offshore of Smith Bay and east of Barrow (Braham et al. 1983, 1984, Ljungblad et al. 1985a).[12]
>
> Depending on ice conditions and proximity to freeze-up, the bowhead whales appear to alternate feeding and westward migration activities, probably stopping to feed in areas containing suitable prey. In 1985, there was evidence of feeding while whales were traveling slowly westward and at times when they remained in specific areas (Thomson 1986, 1987).[13]

From just these few references, it is abundantly clear that migrating bowhead whales feed as they move through the Alaskan Beaufort Sea. Furthermore, our bowhead subsistence captains – based on their annual observations of bowhead behavior across many generations – consider the Alaskan Beaufort Sea to be critical feeding habitat for migrating bowheads. This habitat issue is not adequately addressed in the DEIS.

**CONCLUSION**

[12] 1988 ARBO, p. 6.

[13] Id., pp. 6-7.

MMS and NMFS already have made the decision to allow Northstar to go forward without addressing their respective statutory responsibilities to protect our community, our subsistence resources, and our subsistence culture. Our community cannot allow additional oil or gas development in our arctic waters under these circumstances.

Respectfully submitted by:

Maggie Ahmaogak

Maggie Ahmaogak
Executive Director

cc: Mayor George Ahmaogak, North Slope Borough
Eugene Brower, Barrow Whaling Captains Association
Edward Itta, AEWC Vice-Chairman



*Alaska Eskimo Whaling Commission*

*P.O. Box 570 • Barrow, Alaska 99723*

**AEWC ADDITIONAL COMMENTS SUPPORTING THE TESTIMONIES OF NUIQSUT**
**March 20, 2001**

The Alaska Eskimo Whaling Commission (AEWC) appreciates the opportunity to submit additional comments supporting the testimony given by Archie Ahkiviana , AEWC Alternate Commissioner for the Village of Nuiqsut.

First of all, the Village of Nuiqsut is on record opposing Liberty Project through the testimony of Archie Ahkiviana, who is also the President of the Nuiqsut Whaling Captain's Association.

In Archie's statement, he has testified before the Minerals Management Service that the currents now are very strong around the Tern Island (Proposed site of Liberty Project) , and the North side is now deep and is used by the migrating Arctic Cisco which goes into the Kuukpik River and are caught through nets by the Subsistence hunters of the Village of Nuiqsut. **A04**

The North side of Tern Island is now so deep that even the big ships travel through the deep side of the island, and the whalers and the Inupiat workers off Endicott have on occasion sited bowhead, belugas and porpoises on the North side of the island where it is deep. **A05**

Recently, we have observed lots of pressure on the shorefast ice in front of the Barrier Islands, using as an example of past observance of "Itivagiak" POW III, where a warehouse had been reached by the "evu" pressure ice override, all the way up the bluff and reach the warehouse which was about a "1,000 feet" inland from the shoreline. This area is very shallow, but has lots of current. The prevailing wind was so strong, it pushed the ice up above the bluff, even though there are barrier islands offshore in front of POW III. This happened when there was ~~high tide with a very strong Northwest wind.~~ **A06**

We have been observing very high strong winds nowadays at Cross Island. A very strong East wind blew over the Winch Shack which was 16'x 24' and was completely destroyed; and a second building 9'x 40' trailer was destroyed and was found blown over to the lagoon at Cross Island. These strong winds have recently been observed. The Nuiqsut whalers regard these very strong winds unusual and blame this on global warming and climatic changes. These incidents happened in the fall of 1999. A new Winch Shack was rebuilt and anchored with cement blocks. **A07**

Recap of Testimony of Archie Ahkiviana of Nuiqsut to the Minerals Management Service Public Hearing on Draft EIS of Liberty Project dated March 19, 2001

Archie Ahkiviana, AEWC Alternate Commissioner for Nuiqsut
President of Nuiqsut Whaling Captains' Association



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**0130-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0130-E02**

Please see Responses 0025-A01 and 0145-A12.

**0130-001**

The cumulative case for Liberty essentially reaches the same conclusion as the Northstar Final EIS, as the commenter points out. For purposes of this cumulative analysis, we divide oil and gas discoveries into the following categories:

- **Past Development/Production:** 28 fields, with Endicott, Eider, and Sag Delta North offshore.
- **Present Development/Production:** 5 discoveries that are expected to start up within the next few years, with Northstar and Liberty offshore.
- **Reasonably Foreseeable Future Development:** 15 discoveries that might be developed within the next 15-20 years, with Sandpiper, Flaxman Island, Kuvlum, Thetis Island, Stinson, and Hammerhead offshore. Additional onshore resources (estimated 2.30 billion barrels) and offshore resources (estimated 0.45 billion barrels) currently are undiscovered.

Assuming all the above resources and reserves from past, present, and foreseeable development are developed over the life of Liberty (an estimated 15-20 years), the MMS estimates a mean spill number for the offshore Beaufort Sea of 1.09 (Appendix A, Table A-35). These offshore estimates include resources and reserves from both the State of Alaska and the Federal outer continental shelf.

The MMS classifies spills less than 500 barrels as small spills. We assume small spills occur. Table A-1 in Appendix A shows the source of spill, type of oil, size of spill(s) in barrels, and the receiving environment we assume in our analysis of the effects of small oil spills in this EIS for the Proposal, alternatives, and other analyses. The analysis of small spills and their estimated distribution is in Appendix A under B. Small Oil Spills. We analyze small spills and their impacts in Section III.D.3 Effects of Small Oil Spills from Liberty Facilities.

The timing, size, and location of the oil spill is uncertain, for we cannot predict the future with absolute certainty. The timing of a spill will be important. Spills onto or into the ice have a better chance of cleanup than those into broken ice, as the commenter points out. The location of a spill also will be important. Spills on the gravel island should be contained on the island; pipeline spills can reach the open water.

The MMS recognizes that over the long-term production of billions of barrels of oil, an oil spill could occur. The fate of Liberty oil is described in Appendix A, Section A.2. We cannot say with accuracy what the size or location of this oil spill would be. We do not bury this fact. It is analyzed in the cumulative case in Section V, and the consequences are evaluated for the decisionmaker to consider.

**0130-002**

Although the concept of using a causeway to transport oil from an offshore production island is a proven one (it has been used successfully at Endicott for more than a dozen years), there are some issues specific to the Liberty Project that cause it to be an unacceptable solution.

To fully develop the Liberty reservoir, the causeway would have to extend approximately 3 miles offshore into about 10 feet of water. Building a causeway of this size would require a tremendous amount of gravel, much more than any of the current alternatives, and would require a much larger onshore gravel mine site. It would increase dramatically the cost of the project and could make the project uneconomical. This large causeway could affect water circulation in Foggy Island Bay and adversely impact the fish migration in and around the Sagavanirktok River. The causeway could cause significant changes to the rate of shoreline erosion in the vicinity of the causeway.

Because of the controversy and concerns at Endicott, the U.S. Army Corps of Engineers, Fish and Wildlife Service, National Marine Fisheries Service, and the Environmental Protection Agency all have stated that gaining approval to construct another causeway in the Beaufort Sea would be very difficult.

**0130-003**

The Liberty EIS does address cumulative impacts on the human environment in Section V.C.9 Cumulative Effects on Sociocultural Systems and Section V.C.14, Cumulative Effects on Environmental Justice. These analyses point out that long-term effects from oil development could alter subsistence-harvest patterns, cause increases in social pathologies, and displace social systems, but that these practices would not dislodge them from the Inupiat culture—they would continue. These analyses also point out that cumulative effects in Nuiqsut could be significant. The entire discussion acknowledges the increased stress that the Inupiat are enduring because of increased oil activity on the North Slope. The MMS acknowledges the need for impact assistance to mitigate some of the real and perceived impacts of oil development on the North Slope. Representative Young's CARA bill is again being considered. Additionally, MMS, at the behest of the Alaska Eskimo Whaling Commission, is funding a sociological study to examine North Slope Native residents' perspectives on effects from offshore oil activity and any potential impacts this activity may have had on bowhead whale hunting and social traditions.

One point that should be made and that was made numerous times at the Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities, convened by the MMS in April 2001 in Anchorage, was that any realistic analysis of cumulative effects on the North Slope needs to consider both offshore and onshore effects. To date, the most obvious cumulative effects are occurring onshore; and many of the stress factors mentioned by the commenter can be associated with these onshore impacts. Until a serious monitoring program is developed onshore, causal linkages to effects from onshore or offshore sources will be problematic. The National Academy of Sciences is addressing cumulative-effects issues by conducting the study *Cumulative Environmental Effects of Alaska North Slope Oil and Gas Activities*.

The Liberty Project would be sited on blocks leased by BPXA in the Beaufort Sea Oil and Gas Lease Sale 144. The mitigating measures in place for that sale apply to these leases and include conflict resolution processes that can be convened at any time by any interested stakeholder. If the project is approved, BPXA is required to consult with the Alaska Eskimo Whaling Commission and others regarding the timing of development operations so they do not conflict with whaling practices. Other potential mitigation being considered includes a seasonal drilling restriction and an industry site-specific whale- and seal-monitoring program.

**0130-004**

The comment indicates in a few places that "the Corps states…." For the record, the referenced sections of the EIS were written by MMS. In arriving at the bottom-line impacts statements offered in Sections III.A.2 and III.C.3.h and i, MMS has tiered off of the analyses in Sections III.C.2, III.C.3, III.D, and IV and examined extensively the scientific record complied for biological and cultural resources for the region in compiling the Liberty EIS. The MMS also has consulted the extensive record of traditional knowledge available.

Based on this information, the relatively small size and scope of the Liberty Project, the seasonality of the resources involved, and the conflict resolution processes that will be in place if this project goes forward, we believe these statements about impacts to be reasonable. In the sections mentioned above, MMS is trying to address the concerns for the Inupiat culture within the context of potential effects solely from the Liberty Project. We acknowledge that impacts in the cumulative case are a different matter; see Response 0130-003.

Impacts statements are made based on the best available information. The map of the Nuiqsut bowhead whaling area is based on the best available information provided by the North Slope Borough Wildlife Management Department. We welcome any new information that the commenter could provide.

**0130-A01**

The purpose of project review is to reduce risk and, although risk can never be reduced to zero, an EIS assessment works to help decisionmakers ensure that if the project is approved, the project and the technology used to develop that project has as low a level of risk as possible. The MMS, in its project-review process, has endeavored to improve its dialogue with Native stakeholders on the North Slope. The MMS has funded long-term studies and surveys of the bowhead whale. Recently, MMS has awarded a study to examine Native residents' perspectives on effects from offshore oil activity on bowhead whaling and social traditions and has, with the urging of the North Slope Borough, developed conflict resolution processes too increase stakeholder involvement in MMS decisionmaking.

While these efforts do not solve the larger problems of an ongoing threat to Inupiat traditions from increasing development in the region and the powerful influences of modernity, such as cable television, the internet, and an increasing dependence on a wage-based economy, they do provide processes for a dialogue where compromise has often successfully been achieved. As to a potential revenue stream for the North Slope Borough, once the Liberty Project pipeline does come ashore, the landfall infrastructure and pipeline will contribute to the Borough tax base. Oil from the Liberty Project also helps keep flow capacity up in the Trans-Alaska Pipeline System, a situation that helps the North Slope Borough's tax base.

It is beneficial to have the point of this comment entered into the record of the Liberty EIS. To clarify this point somewhat, the commenter should see Section III.D-5 Economic Effects for a description of the revenues anticipated for the North Slope Borough resulting from Liberty. Ad valorem tax, which would accrue to the North Slope Borough from new onshore infrastructure associated with Liberty, is $5 million over 16 years (Table III.D-5). Additional ad valorem tax may accrue to the North Slope Borough because of increased flow from Liberty through existing pipeline infrastructure taxed by the Borough (see Section III.D-5). This is small relative to the property tax revenues the North Slope Borough has collected from onshore oil infrastructure centered at Prudhoe Bay since the 1970's. See Section VI.B.4 Description of the Affected Environment, Economy for a description of past Borough revenues. The North Slope Borough also may receive funds from the State under the Coastal Impact Assistance Program. This Program is described briefly in Section III.D-5. The funds that may accrue to the Borough under this Program also are relatively small. Also see Response 0146-017.

**0130-005**

For a statement on how MMS has addressed adverse impacts to the North Slope human environment, see Responses 0130-004 and 0130-A01.

**0130-006**

The MMS has addressed the issues raised in this comment. Since 1994, MMS has awarded two studies to look directly at changes in local Inupiat communities in response to potential OCS-related activities. An ongoing study, *Subsistence Economies and Oil Development: Case Studies from Nuiqsut and Kaktovik, Alaska,* by Sverre Pedersen et al., looks at the outer continental shelf-related effects to subsistence practices in Nuiqsut and Kaktovik. The recently awarded study *Quantitative Description of Potential Effects of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea* is to examine North Slope Native residents' perspectives on effects from offshore oil activity and any potential impacts this activity may have had on bowhead whale hunting and social traditions. This last study should indeed identify perceptions about social stress and disruption from outer continental shelf-related activities. In April 2001 in Anchorage, Alaska, MMS convened a Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities with the intention of designing a research direction that would address these same issues about sociocultural impacts and growing social pathologies on the North Slope.

For statements of the traditional importance of subsistence, see Inupiat traditional knowledge commentary in Sections II.C.2.h, Effects of Large Oil Spills on Subsistence-Harvest Patterns, III.C.2.i, Effects of Large Oil Spills on Sociocultural Systems, III.C.3.h, Effects of Disturbance on Subsistence-Harvest Patterns, and III.C.3.i, Effects of Disturbance on Sociocultural Systems. See also the Cumulative Effects and the Affected Environment sections for these resources for more traditional knowledge.

Since the 1994 National Research Council Committee Report, the MMS has worked on developing better mitigation to address impacts on subsistence resources, mainly by attaching a conflict resolution process to each piece of mitigation dealing with subsistence resources and practices. If the project is approved, MMS also requires consultation concerning a conflict avoidance agreement between the Alaska Eskimo Whaling Commission and the operator before project approval with the expectation of reaching agreement on controversial matters and how they should be adjusted to ease conflict. The MMS management has not followed the National Research Council's suggestion that decision documents assume a worst-case scenario in terms of subsistence resources and activities. We write our EIS scenarios to reflect, to the best of our ability, what actual effects are expected to occur. Normally, the resource analyses in an EIS are done assuming no mitigation other than that proposed by the company as part of the project, but this does not mean that mitigation for a particular lease sale or development could not be used to reduce effects to some degree. With the use of the Conflict Avoidance Agreement methodology, Native subsistence whale hunters generally have been successful in reaching their annual whale "take" quotas.

The MMS has taken seriously the National Research Council suggestion that MMS revise its decisionmaking process to actively involve local communities. The MMS management and staff greatly increased the frequency of visits, workshops, and meetings. The OCS Offshore Advisory Committee was formed for Sale 170 to facilitate local and regional North Slope input. Additionally, MMS management consults with local communities under the auspices of environmental justice and with local tribes under the auspices of government-to-government consultation. The North Slope Borough was invited to be a cooperating agency for this EIS. Although they declined that role, they still participated in the preparation of the Liberty EIS.

In 2001, Congress provided coastal states with a one-time award of impact assistance funds. Alaska received an appropriation of $12.2 million of which $1,939,680 will go to the North Slope Borough. Congress is presently considering legislation that would make annual impact assistance funds from MMS drilling revenues available to coastal communities.

On the issues raised in the National Research Council report on subsistence and sociocultural impacts, MMS has in some way addressed all of them to various degrees. The MMS also acknowledges that there still is more to be done.

Under the provisions of Stipulation No. 5, Subsistence Whaling and Other Activities, the MMS Regional Supervisor, Field Operations will have ongoing consultation with the Alaska Eskimo Whaling Commission and "will allow concurrent review and comment as part of the plan approval process." This stipulation adds that if consultation breaks down, the Alaska Eskimo Whaling Commission may request conflict resolution before MMS makes a final determination of the project.

**0130-007**

Again, the comment indicates in a few places that "the Corps notes…." For the record, the referenced sections of the EIS were written by MMS. The statement in Section III.C.3.i is part of the general discussion about the intricacies and importance of sharing in Inupiat life. The statement in Section III.D.7.i has been changed in text to correlate with statements made in Section III.C.3.h, which relate to potential oil-spill effects and tainting on bowhead whales. It does not contradict the statement made in Sections II.A.2.h and III.C.3.h. What MMS is trying to convey (in Section III.A.2.h and overall) is that even though there would be *disruption* to subsistence practices and social traditions, these practices would not be *displaced*, i.e., they would not cease. These cultural ways of doing would not be dislodged from the cultural but would continue. We are not trying to dismiss potential effects to the Inupiat subsistence community or insult Inupiat culture; however, we acknowledge that the way the analysis has been structured for the sake of this EIS often can seem disjointed to the reader.

**0130-008**

Once again, the comment indicates that "the Corps states…." The referenced section of the EIS was written by the MMS, not the Corps.

The Liberty Project contains a number of mitigation measures as part of the proposal. The MMS requires other mitigation measures and is considering other mitigation measures (see Sections I.H.6-8).

For example, based on mitigation already in place, particularly Stipulation No. 5, Subsistence Whaling and Other Subsistence Activities, BPXA has proposed the development of a Cooperation and Avoidance Agreement with the Alaska Eskimo Whaling Commission if the project is approved. The MMS supports this proposal. The proposal includes measures for timing construction activities so as not to interfere with the bowhead whale migration.

**0130-009**

The information in Section VI.A.1.a(1) on bowhead feeding activities in the Beaufort Sea has been revised. The MMS does not ignore the issue of bowhead whale feeding in the Alaskan Beaufort Sea. The MMS does recognize and shares the Alaska Eskimo Whaling Commission's concern about information on the feeding behavior of bowhead whales. The MMS has funded two bowhead whale feeding studies, one that has been completed with a report published in 1987 and a second study currently in process with a report expected later this year. The results of the first study were controversial, so a second study was funded. The second feeding study emphasized cooperation among local government, subsistence whalers, scientists, and MMS in the planning and execution of the study. The MMS has spent approximately $4 million dollars on bowhead feeding studies, and many of the observations of bowheads feeding in the Beaufort Sea also were from MMS-funded studies. The level of funding expended by MMS on these two bowhead whale feeding studies indicates that MMS believes the issue of bowhead whale feeding in the Beaufort Sea is an important issue.

**0130-A04**

Information from this part of the testimony has been incorporated into Section VI.C.5 Oceanography of Foggy Island Bay.

The scientific evidence shows that the vast majority of the arctic cisco inhabiting the Alaskan Beaufort Sea were carried there from Canada by westerly currents. Hence, their seasonal presence in the area of Tern Island would be expected. The number present would be expected to vary considerably depending on many factors such as wind, water currents, year class strength, food availability, and predation.

**0130-A05**

Section VI.A.1.a(1) discusses sightings of bowheads inside the barrier islands, particularly on the shoreward side of Cross Island. A reference to this comment also will be added to the text in Section VI.

**0130-A06**

The text of the past observations of Archie Brower and Herman Ashiana have been incorporated into Section VI.C.5 Oceanography of Foggy Island Bay.

**0130-A07**

Information from this part of the testimony has been incorporated into Section VI.C.4 Climate and Meteorology.

# NORTH SLOPE BOROUGH


OFFICE OF THE MAYOR

P.O. Box 69
Barrow, Alaska 99723

Phone: 907-852-2611
907-852-0200


April 13, 2001

**0132**

John Goll
Regional Director
Minerals Management Service
Alaska OCS Region
949 East 36th Avenue, Room 308
Anchorage, Alaska 99508-4363

FAX No. (907) 271-6805

Re: LIBERTY DEVELOPMENT AND PRODUCTION PLAN
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Director Goll:

The North Slope Borough appreciates this opportunity to comment on Liberty Development and Production Plan Draft Environmental Impact Statement (DEIS) prepared by the Minerals Management Service (MMS). While the multi-volume document is complex in both its organization and content, the central issues surrounding the proposed project are familiar to us. On behalf of the population which will be most affected if BP Exploration (Alaska) Inc.'s (BP's) project moves forward, and which is even now being significantly affected by its proposal and several associated concurrent planning processes, I urge you to accord these comments appropriate deference in both the modification of the DEIS and your ultimate decisions concerning the project. These comments will be in four parts; a discussion of the Borough position with respect to offshore leasing, exploration, and development, general comments on the document and key issues, comments on resource-specific and effect-specific sections of the document, and comments on the component alternatives. E01

**Borough Position on Offshore Oil and Gas Leasing, Exploration, and Development**

With a single exception, the North Slope Borough has unwaveringly opposed all oil and gas leasing, exploration, and development proposed to occur in the Beaufort and Chukchi E02



Seas for more than twenty-five years. That single exception, of course, was BP's Northstar Development Project, the first stand-alone offshore development and production project to be permitted in the Beaufort Sea. Construction of the Northstar production island, buried subsea pipeline, and other facilities now near completion just a few miles east of the proposed Liberty island site. Final Borough approval of the Northstar proposal was contained in a rezoning of the project area granted by our Assembly. That action was preceded by recommendations of approval by administrative staff and the Borough Planning Commission. Several local residents, including subsistence whalers, testified in favor of the project before the Planning Commission and the Assembly. I do not speak for those individuals or the Assembly, but can say that the application for the Northstar rezone would have been handled differently by administrative staff today, and have reason to strongly believe that the tenor of local testimony would be different as well. E02

It is reasonable to ask what has changed since the Northstar rezone was granted in December 1998. First, as MMS prepares another national 5-year OCS oil and gas leasing program, we grow increasingly frustrated by the inequity of continuing to offer for lease the sensitive arctic waters we depend upon while holding off-limits most waters offshore of the lower-48 states and the onshore acreage of the Arctic National Wildlife Refuge (ANWR), where there is no question that operations could be conducted more safely than in the Beaufort Sea. Second, recent spill response exercises associated with Northstar development have made clear what we have known all along; that industry does not have the capability to effectively respond to a spill under broken ice and other harsh arctic conditions. Third, we have come to recognize more fully the existence of ongoing cumulative effects and the threat of increasing effects on the Beaufort Sea environment and its wildlife resources, subsistence activities, and the overall well-being of our communities associated with increasing industry attention offshore, an expansion of onshore operations, and other outside forces. Each of these points will be discussed more fully below. A01

As we stated in the Borough's February 1, 2001 comments on MMS' proposed 2002-2007 OCS Leasing Program, it is our strong belief that the federal government should focus its arctic oil and gas leasing efforts on land, rather than offshore. Those comments are incorporated herein by reference. In them, we went on to say that after early mistakes, the oil industry has, with heightened agency and public oversight, greatly improved its onshore operating methods. In most cases, appropriately conditioned wintertime onshore exploratory activities can be conducted with only minimal impacts to the tundra environment, wildlife, and subsistence activities. The effects of development can similarly be mitigated to acceptable levels in most areas. Onshore oil spills can be dealt with using conventional mechanical recovery equipment, and can typically be limited in area and effect. The same cannot be said of industrial operations in the Arctic offshore environment under all conditions.

We are frustrated to see that once again most OCS planning areas offshore of the lower-48 states will remain, as they are currently, withdrawn from consideration for leasing under the proposed 2002-2007 leasing program. We are not advocating that these OCS areas be made available for leasing, but must question why they are off-limits while the Beaufort and Chukchi Sea planning areas are not. Presumably, the areas withdrawn will again not be leased for oil and gas exploration and development either because they contain resources of great sensitivity and value, and/or because the prevailing conditions within those planning areas somehow limit the ability to mitigate the potential risks of oil and gas operations. We challenge anyone to deny that the biological and cultural resources of the Beaufort and Chukchi Seas, including the endangered bowhead whale and the unique Inupiat traditional subsistence culture, are as valuable and as sensitive to disruption as the resources contained within any of the withdrawn planning areas. There also can be no question that the prevailing environmental conditions of the arctic OCS present a greater challenge for both planned industrial operations, and for crisis response. Project engineers and oil spill responders alike, must cope much of the year here with intense cold, darkness, ever-changing ice regimes, whiteouts, polar bears, remoteness from support infrastructure, and a lack of critical data on such important questions as actual oil spill response capability in broken ice conditions, and the effects of noise and oil on bowhead whales. A01

In other words, as compared with those of withdrawn planning areas, the resources of the Beaufort and Chukchi Sea are to an equal or greater degree diverse in number, unique in U.S. waters, and highly sensitive to disturbance from industrial noise and oil spills. No other area of the OCS presents a challenge for oil spill response equal to that presented by the conditions regularly found in our arctic waters. Even under unrealistically mild environmental conditions, the Alaskan oil industry has repeatedly failed to effectively cope with a simulated offshore oil spill in the Beaufort Sea.

**<u>General Comments on the DEIS and Key Issues</u>**

**Need for the Project** A02

The DEIS appears throughout to understate the risks of Liberty development and production to the Beaufort Sea and adjacent onshore environment and wildlife resources, and the subsistence activities and culture of the communities which depend upon those resources. Conversely, the need for the project is overstated. This is evident from the beginning of the voluminous document. On page I-3, it is stated that the need for the project is "to satisfy the demand for domestic oil and decrease the dependence of the United States on foreign oil imports". There is, in fact, no guarantee that Liberty development would to any extent decrease the country's dependence on foreign oil. As recently as last year, BP exported Alaskan oil to Asian markets, and did so at a time when gas prices were at record highs on the U.S. west coast. BP is a foreign company with the driving corporate interest of maximizing profits to its owners and shareholders, and it can be expected to utilize any oil produced from Liberty in furtherance of that interest. Likewise, there apparently is no particular demand for "domestic" versus foreign oil. There is simply a demand for oil. If there were truly a national policy favoring the use of domestic oil over foreign oil, there would be a ban on the export of domestically



produced oil as there had been on the export of Alaskan oil, and ANWR, with its projected vast reserves of oil, would be open to exploration. A02

**Oil Spill Response Capability**

The risk of an oil spill, and the potential adverse effects if one occurs, are key issues for agencies and the public in the review of the proposed Liberty Development Project. The extent of potential adverse effects that would result from a significant oil spill seem continuously downplayed in the DEIS. Conversely, the capability of industry to effectively respond to such a spill seems overstated. For example, in a discussion on page III-C-23 of the potential effects and response to an under-ice spill, it is stated that "oil entrained in the ice would migrate to the surface and could be cleaned up relatively easily". We question the use of the word "easily" with respect to any spill cleanup targeting the release of approximately 3000 barrels of oil under the ice. It follows that we also question the associated conclusion that an under-ice spill of that size "likely would not have much effect on bowhead whales". Recovering some of the oil through holes or trenches cut in the ice or removing oil entrained in the ice after it migrates to the surface are presented as reasonable options in the DEIS. Our intimate knowledge of actual arctic ice conditions, however, leaves us doubtful as to the effectiveness of these measures. It should be expected that much of the ice in the project area would be significantly ridged, rubbled, and otherwise uneven on the surface. We question whether recovery equipment and personnel could "easily" access surface locations in order to attempt to recover oil under the ice through holes or trenches under these conditions. We question whether oil released under the ice in late winter or early spring would have time to migrate fully to the ice surface before the ice becomes too unstable to safely support recovery equipment and personnel. We strongly disagree with the statement on page III-C-23 that "cleanup of a spill under the ice would not be affected by weather, wind, waves, etc." We cannot be sure what other environmental conditions are encompassed by the "etc.", but are certain that weather conditions which commonly occur in the project area would significantly reduce the effectiveness of a wintertime spill response. Strong winds, whiteout and blizzard conditions, dark, and extreme cold routinely restrict a variety of industrial activities, limit commercial aircraft flights, search and rescue operations, and subsistence travel, and have been the justifications for canceling scheduled spill response drills. The ability to transport equipment and personnel, and their safety enroute and onsight, must always be considerations affecting a wintertime or other spill response effort in the Arctic. 001

Repeating a pattern we have seen in every OCS lease sale EIS, we note throughout this DEIS a willingness to accept industry assurances of spill response capability without rigorous analysis. This is particularly galling in light of the failure of BP and its response contractor in spill response exercises in 1999 and last year to approach the broken-ice response capability promised in seeking and receiving Northstar authorizations. BP to Response deficiencies were noted during the Fall 1999 North Slope Response Tactics exercises. The spring and fall 2000 exercises included the deployment and operation of spill response equipment, and were designed to satisfy conditions of approval for BP's 002

002

North Slope operations, including Northstar. Along with the Alaska Department of Environmental Conservation, MMS provided primary oversight during the spring and fall 2000 exercises. Although the trials indicated significant limitations in spill response capability for the systems tested, MMS nonetheless puts a positive spin on BP's response capability in a review beginning on page II-20 of the DEIS. Only toward the end of the section is there an acknowledgement by MMS that "arctic conditions, particularly broken ice, are more challenging..." As a primary issue in the Liberty Development and Production Plan review, the demonstrated *inability* of industry to respond to a spill effectively under conditions which may exist for several months each year at the project site should be the focus of this section of the DEIS. Instead, the focus is, yet again, on what industry claims it will do to enhance response capability. The one 1999 and two 2000 spill response exercises should be fully and accurately described in the Final EIS. The December 18, 2000 report *Joint Agency Evaluation of the Spring and Fall 2000 North Slope Broken Ice Exercises* (47 pages), presented by the Alaska Department of Environmental Conservation, Alaska Department of Natural Resources, Minerals Management Service, U.S. Coast Guard, and North Slope Borough, should be referenced.

E03

We have always felt, and remain convinced, that only a very limited capability exists to recover a significant volume of oil under the broken ice conditions of freezeup and breakup, and under other extreme conditions which routinely occur in the Beaufort Sea. Since offshore exploration first began in the Beaufort Sea, industry has claimed that it could effectively respond to an oil spill under arctic conditions. MMS, the state of Alaska, and other permitting agencies accepted these assurances over our strong objections and call for realistic spill response demonstrations. At first, mechanical response systems were deemed sufficient. Then chemical dispersants were touted as being the advancement in capability which should answer our concerns. Now it seems that in situ burning or a combination of burning and mechanical cleanup is the answer. We are told that some level of ice cover is actually a good thing because it holds oil in pools and concentrates it in thicknesses sufficient for ignition. We have yet to see the series of realistic response demonstrations we began calling for so many years ago. Still, in light of the 2000 exercises, and perhaps just admitting the obvious, no one now seems willing to maintain that mechanical methods alone will provide sufficient oil removal under all arctic conditions. Dispersants and their deployment systems have been shown to be ineffective in the Arctic, and are rarely discussed today. Can you blame us for being skeptical about assurances that effective burning of a large volume of spilled oil can be achieved in the broken ice, dark, whiteout, frigid, blizzard, and other harsh conditions which routinely occur in the Beaufort Sea?

003

In 1991, concern over the adequacy of environmental information to assess planned Alaskan OCS lease sales resulted in a Congressional recommendation that MMS ask the National Research Council (NRC) to consider the question. The resulting 1994 report, *Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska,* is instructive on many points at issue in the analysis of the proposed Liberty Development Plan. On the issue of oil spill response, the report echoes our long-standing sentiment that "the performance of spill-response teams cannot be optimum if they are



003

never permitted to practice using real oil." (NRC 1994, p.7) Our bottom line belief is that if a significant volume of oil is released into the marine environment under any of the conditions listed above, or a combination of them, then a significant volume of oil will remain and be dispersed in the marine environment, and it will be our people, our culture, our resources, and our environment which will suffer the effects.

**Long-Term Effects of an Oil Spill**

004

Insufficient to no account is given to chronic effects of oil pollution following a spill. A paper in the journal "Advances in Marine Biology" (Vol. 39, October 2000) reviews the impacts of the 1989 Exxon Valdez oil spill, and notes the existence of "delayed chronic and indirect effects" on much of the Prince William Sound ecosystem. It concludes that "important avian and mammalian predators of both schooling forage fishes and shoreline invertebrates have experienced delays in recovery through chronic and indirect effects long after the initial acute impacts of the Exxon Valdez oil spill." We also know that PAH's associated with oil contaminations can be mutagenic (Diazmendez et al., 1998) and immunotoxic (Dyrynda et al., 1997). Oil contamination was found to induce adducts in the vertebrate teleost species, engendering the possibility that the DNA adducts detected in the teleosts could lead to genetic changes in these species in the future (Harvey et al., 1999). Delayed adverse effects on growth and survival support have been found in salmon exposed to PAH's as embryos that indicate the potential for population-level effects in fishes resulting from embryonic exposure to oil (Heintz et al., 2000). Such disruptions in prey populations would in turn affect ringed seals. Other potential chronic effects from an oil spill on pinniped populations include decreased efficiency and increased energetic cost associated with prey acquisition (Ben-David et al., 2000), as well as decreased nutrient absorption and alimentary tract function (Ormseth and Ben-David, 2000), all of which would likely result in delayed mortality. In addition, the C-heavy oils, in particular, have been shown to have antiandrogenic effects on mammalian cell lines, due in part to PAHs (Kizu, et al., 2000).

005

Moreover, nowhere in the DEIS are changes in community structure or species diversity resulting from an oil spill considered. Contaminants are known to alter relative species abundance. Lindstrom et al. (1999) documented that while hydrocarbon contamination did not affect total bacterial numbers, population diversity (evenness, richness, or both) was diminished even decades after a spill event. Similarly, there were significant declines in the richness and diversity of species (mostly bony fish, molluscs, and bivalves) in otter diets on the oiled area following the Exxon Valdez spill, suggesting that some effects of the oil spill on otters were delayed (Bowyer et al., 1994). Effects of such potential shifts in prey species abundance for ringed and bearded seals were not addressed in the DEIS.

**Incorporation of Traditional Knowledge**

006

We applaud MMS for its attempt to incorporate traditional and contemporary Inupiat knowledge into the DEIS. Such information appears throughout the document, and in many cases is in the form of excerpts of valuable and useful testimony provided at hearings conducted in North Slope communities. The problem is that the information is often not actually used in the analysis in any meaningful way. In contrast with often seasonal and short-term western scientific study, our traditional knowledge represents the cumulative observations and experience of people who have lived in the Arctic year-round, for their entire lives, and who possess knowledge handed down from many generations which have came before them. On page I-5 of the DEIS, you quote a statement made in the Borough's 2000 comments on the Liberty preliminary DEIS. We said then that "It is important to recognize that this knowledge, often simply referred to as 'TK', encompasses more than the vast amount of information passed down from many generations past. It also includes contemporary knowledge of events in the recent past; the size, behavior, and trends in regional wildlife populations; and experiences relating directly to impacts of industrial operations." The passage from which the quoted lines is drawn goes on, however, to question that document's incorporation of traditional knowledge. We also stated in those PDEIS comments that: 006

> As presented throughout the PDEIS, simply reporting on the "views" of North Slope communities with respect to the various potential impacts of Liberty development is insufficient. The quoted comments of North Slope residents, and so many other comments contained in agency records reaching back three decades and more, should be treated the same as the reports of western scientists. TK should be no less powerful in directing the actions of decision makers.

The problems with the PDEIS' treatment of traditional knowledge continue in the DEIS. The discussion on page III-C-81-84 regarding specific disturbance effects to subsistence resources is illustrative of the dismissive treatment of Inupiat knowledge which is prevalent throughout the document. Each of the subsections is similar in that they begin with discussions, though not significant analysis, concluding that effects will be minimal or temporary. Those conclusions are followed by the contrary testimony of local residents describing their personal knowledge of effects on those resources which have already occurred or their assessment of effects which will likely occur based on their knowledge of the resources and environment. Rather than being presented as lay opinions, these statements should be considered expert documentation no less than the reports of seasonal and/or short-term western scientific research. The cited statements are by experienced hunters and others who have spent their lives subsisting on and observing the resources of the land and water of the North Slope and Beaufort and Chukchi Seas. The testimony is culled from hundreds, if not thousands, of similar statements which have been patiently given over the past 25 years or more. All of it speaks to the sensitivity of bowhead whales, seals, birds, and other subsistence resources to noise disturbances. All of it speaks to a sensitivity greater than that which limited western scientific inquiry has yet been able to document. Sadly, some of the speakers cited have passed away since they offered the testimony referred to in the DEIS. Each of them testified at countless meetings dealing with proposed oil and gas leases and industrial operations before their passing. Scores of others like them continue to do so today. Others have stopped showing up. Their great frustration is in repeating themselves over and



over again, knowing what they say is the truth. They know that the truth of their statements has been confirmed whenever appropriate western science has been funded, designed, and conducted properly. Then they see their statements portrayed in decision documents more as opinions than as facts, if they are noted at all. The end result in this DEIS is that potential effects on subsistence resources, subsistence harvests, and the Inupiat culture grounded in the subsistence lifestyle are understated. 006

**Resource-Specific and Effect-Specific Comments**

**Lower Trophic-Level Organisms**

Toxicity to lower trophic-level organisms at the base of the marine food chain is virtually ignored. On page III-C-38, the DEIS states that in the event of a spill, "all of the oil would remain trapped under the ice and little, if any, would contact marine invertebrates." This statement is unsubstantiated and does not take into account that aside from outright toxicity from oiling, the potential exists for phototoxicity to larval and juvenile bivalves and mysids resulting from photoactivated PAHs, which can be 12 to > 50,000 times conventional toxicity (Pelletier et al., 1997). Photoxicity was not addressed in this Draft EIS, is not routinely assessed in oil spills, and is particularly a concern with heavier oils (Pelletier et al., 1997). 007

**Fish**

Page III-C-41 (1)(b)1) Fishes and Essential Fish Habitat: Again, this discussion seems a strained attempt to downplay risks. In the same fourth paragraph of this subsection, MMS first concludes that "the low concentration of hydrocarbons in the water column following even a large oil spill appears to be the primary reason for the lack of lethal effects on fish and plankton", and then in seeming conflict notes that "studies following the Exxon Valdez oil spill…concerning the effects of that spill on fish populations in Prince William Sound have been inconclusive." Also, we question the statement in the following paragraph that because "any oil trapped under floating ice would not disperse into the water, a winter offshore spill is not expected to have a measurable effect on marine fishes, or on migratory fishes overwintering in the Sagavanirktok River Delta area." We find the conclusion overly optimistic if it is based on the belief that all of the trapped oil could be removed from under or within the ice, and would not ultimately end up in the water column when the ice melts or breaks up. 008

Page III-C-79 Fishes: There is no clear analysis of the potential effects of increased turbidity associated with island construction, pipeline trenching, backfilling, and disposal of trenched spoils on migrating fish in the project area. Nuiqsut boaters noted unusually turbid water in the area during the open water season following Northstar island construction and pipeline trenching. The Final EIS should provide a more specific analysis of the potential impacts of these activities on fish. The discussion should include some detail as to the maximum volume of suspended solids which could be released into the water column, the geographic areas into which the material could be transported and 009 released, including transport on ice, the persistence of the suspended materials in the water column, and the extent to which the suspension of that volume of material, in those locations, and at those times could act as a barrier which deflects, or otherwise harms, each of the age classes of each of the fish species which utilize the area. 009

**Marine and Coastal Birds**

010 Page III-A-4, (2) Eiders, Last two sentences of this section: "Although Fish and Wildlife Service data do not show a significant decline in the coastal plain spectacled eider population, the potential exists for a significant adverse effect on this population...." This sentence is true but misleading. The data that the Fish and Wildlife Service have do not show a significant decline, but it is not clear that there is sufficient statistical power to actually detect a decline in the population of Spectacled Eiders. This sentence should be modified to reflect that a decline could be occurring but is not detectable with the current techniques or data. Changing this sentence is important because assessing added mortality from a possible oil spill is vastly different for a population that is stable versus one that is declining.

011 Page III-A-5, c. Marine and Coastal Birds, last paragraph in the first column: The sentence that states "Losses to king eiders and loons of the magnitude estimated by a Fish and Wildlife Service model, whose population growth would represent a limited capacity for population growth, would represent substantial effects" should be modified. The potential for negative impacts to King Eiders is significant, as with Long-tailed Ducks and Common Eiders. King Eiders migrate offshore in dense flocks. If a spill occurred during migration, a significant portion of the population could be impacted. This would be significant for a population that is already experiencing declines.

012 The next sentence states, "For all other species, effects are likely to be inseparable from natural variation in population numbers." This sentence should be changed. One species, Red Phalarope, could be negatively impacted by an oil spill at the population level. Red Phalaropes occur in lagoon habitats across the Beaufort Sea and Chukchi Sea coasts, especially during fall migration when they forage there extensively. An oil spill that could not be cleaned up readily could impact the birds in the area at the moment of a spill as well as the birds that move into the area after the spill. The analysis should also be changed to address the issue of not being able to measure impacts to marine and coastal birds from Liberty development when there could in fact be impacts. Because natural variation in bird populations can be great, it might not be possible to separate impacts from Liberty which do occur from natural fluctuation. Little is known about population sizes or trends of most of the marine and coastal birds occurring in northern Alaska. Given the lack of data and the great fluctuation in population size, MMS should develop a reasonable means to assess impacts from Liberty to marine and coastal birds. If an oil spill does occur, how will MMS assess and mitigate damages and attempt to recover populations?



013 Page III-C-24-25, (2) Eiders, (a) Summary and Conclusions for Effects of an Oil Spill on Spectacled and Steller's Eiders: The fifth sentence of the first paragraph discusses the aerial surveys conducted by the Fish and Wildlife Service and finishes by stating "...thus a model developed by the Fish and Wildlife Service estimates very low mortality from an oil spill for this species." This sentence is true but misleading. The surveys contribute few data and very few attempts at collecting data. The surveys cover a very limited period of time. Thus, the model would predict that the impacts from an oil spill would be few because few data were collected. The DEIS should state these model limitations. The impacts could be much greater but the model says the impacts would be few only because the data are few and the model has many assumptions that might not be valid. The same problem exists with respect to the first sentence of the last paragraph in this section, which again refers to no decline being measured in Spectacled Eider population by the Fish and Wildlife Service.

014 The last sentence of the first paragraph states that "However, substantial foraging habitat is expected to be available following the breeding season...". This sentence implies that the impacts of an oil spill may be avoided by Spectacled Eiders because they could move to other areas. There are not data available to evaluate whether eiders will move to other areas if they are disturbed by an oil spill or the activities associated with a spill response. This sentence should be eliminated.

015 The last sentence of the last paragraph says, "Steller's Eiders are not expected to occur in the Liberty Project Area". This sentence is true but there may be impacts from Liberty to Steller's Eiders. If a large oil spill occurs at Liberty, the oil could move to areas where Steller's Eiders do occur, farther to the west. This is certainly possible since the ability of industry to clean up oil in broken ice or shallow coastal habitats has not been demonstrated. Thus, spilled oil could move a great distance in the Beaufort Sea. The DEIS should more fully address the potential of spilled oil reaching areas where Steller's Eiders occur.

016 Page III-C-25, (b) Details of How a Large Oil Spill May Affect Eiders, 1) General Effects from Developing the Liberty Project, c) Oil spill Prevention and Response: The last sentence in the first paragraph states that "...specific methods would not be used if it was determined they could cause additional harm to this species [Spectacled Eiders]." This sentence is misleading and confusing. Specific methods of cleaning up oil should be decided upon before an oil spill occurs and not after the spill occurs. The methods should be evaluated for their effectiveness in cleaning up spilled oil as well as their potential for harming eiders and other resources. It is a concern that the clean-up of spilled oil might cease if the recovery techniques were found to harm Spectacled Eiders. The DEIS does not adequately address this weighing of the potential impacts of spill response against the potential impacts of halting response efforts to avoid impacts. Cessation of response efforts to minimize impacts to one resource would leave oil in the environment, to the potential detriment of other resources. The Final EIS should discuss how, when, and by whom such decisions would be made.

Page III-C-26, (b) Details of How a Large Oil Spill May Affect Eiders, 1) General Effects from Developing the Liberty Project, c) Oil spill Prevention and Response, Open-water spill: The first complete sentence on the page states "*If* a reliable system of locating eiders in a specific area can be devised, specific birds or groups in danger of oil contact could be targeted with specific hazing tactics." This is troubling. A technique for identifying and locating threatened species should be devised before Liberty is developed. Without it known whether a system can be devised, how can MMS know whether birds in danger can in fact be moved out of danger? 017

Page III-C-31, c. Marine and Coastal Birds, (1) Summary and Conclusion for Effects of an Oil Spill on Marine and Coastal Birds: The second sentence in the second paragraph states "Oil could contact flocks of king and common eiders offshore from early June to September, ...". King and Common eiders can occur in the Beaufort Sea over a greater period of time. The sentence should read "Oil could contact flocks of King and Common eiders offshore from May to October or early November (Suydam et al. 1997, 2000),...." 018

The fourth sentence in this same section contradicts another sentence in this section. The sentence discusses King and Common eiders and says "..., the relatively small losses likely to result from a spill may be difficult to separate from the natural variation in population numbers, but their populations are not expected to require lengthy recovery periods...". Several sentences later in the paragraph, it is stated that eiders and loons "...have a limited capacity for population growth...are expected to recover from oil spill mortality slowly." The prior sentence should be changed to say "...the relatively small losses likely to result from a spill may be difficult to separate from the natural variation in population numbers, and their populations are expected to require lengthy recovery periods..." 019

Page III-C-68, (2) Eiders, (a) Details on How Disturbances and Related Factors May Affect Spectacled and Steller's Eiders, 1) General Effects from Developing the Liberty Prospect, b) Increase in Predator Populations: This section is not specific with respect to the predator species referred to, and should be clarified. At the January Anchorage meeting of the National Research Council's Committee examining the cumulative effects of oil and gas activities on the North Slope, a BP official acknowledged that the oil industry had not, and perhaps would never, do an adequate job of controlling increases in predator species, including ravens, gulls, and foxes, associated with operation of oil facilities. MMS' assumption is not supported by the North Slope experience. Common Ravens are known to prey upon eiders, and could nest upon structures associated with Liberty. Gulls and foxes are often attracted to industrial facilities. There is potential for increased predation pressure on Spectacled and Steller's Eiders from Liberty Development. 020

Page III-C-74, c.(2)(b)3) Effects of Vessel Traffic: The last sentence of the paragraph carried over from the previous page states that "Because the information currently available on routes most species use during migration and other movements, behavioral response to vessels, and vulnerability to disturbance by vessels, it is difficult to estimate 021



potential effects on individuals or populations." Notwithstanding the fact that there appears to be one or more words missing from this sentence, the statement is remarkable in several respects. First, it is the one conclusion which does not seem strained in a lengthy paragraph full of mixed signals. Second, it recognizes a data gap which clearly should limit MMS's ability to assess potential impacts on marine and coastal birds from both noise disturbances and oil spills. That should be clearly stated in the appropriate sections of the Final EIS. Third, MMS again appears to strain to reach the conclusion twice earlier in the paragraph that levels of traffic during two years of construction (150 trips/summer or 1-2/day) and during both drilling and production (4-5 trips/month and 4-5 trips/summer, respectively) would increase birds' energy use "only slightly". Neither statement is supported by any citation. It seems difficult to reconcile those conclusions with the statement, with citations, tucked into the paragraph, but not expanded upon, that "Brant and canvasbacks are easily disturbed to flight." 021

Page III-C-84, 5) Birds: The first sentence of this section states "We expect no losses to marine or coastal birds detectable above natural changes in their populations, taking into account aircraft operations, construction, and vehicle traffic, vessel traffic, and oil-spill cleanup." This sentence gives us great concern and is unacceptable in the DEIS. It implies that if there are impacts to marine and coastal birds which cannot be measured on a population level, then there are either no consequences to industry or the impacts do not matter. Just because impacts to bird populations might not be measurable, on a population level, that does not mean there are not impacts or that those impacts should not be avoided, minimized, or mitigated, or a means be found to measure them. Sentences like this in the DEIS remove from industry appropriate responsibility for negative impacts to birds and other species where the impacts either cannot reliably be measured or are not on a population level. Industry and responsible agencies must find the means to measure effects on birds and other resources, or there can be no meaningful assessment of the potential impacts of Liberty development. 022

**Beluga Whales and Walrus**

Evaluation of the impacts of Liberty development on beluga whales and walrus have not been included in this DEIS. This is a shortcoming of the DEIS. For belugas, there are two stocks, the eastern Beaufort Sea stock and the Chukchi Sea stock, that could be impacted by an oil spill at Liberty. The eastern Beaufort Sea stock migrates from the Bering Sea through the Chukchi and Beaufort Seas in the spring and spends the summer in the eastern Beaufort Sea. Thus they could be impacted by a spill in the spring. In the fall, this stock migrates west along the Beaufort Sea shelf break, and thus could be impacted by an oil spill during the open water months. The Chukchi Sea stock spends part of the summer in the eastern Chukchi Sea and then moves north into the Arctic Ocean and northern Beaufort Sea during late summer and early fall. MMS does briefly mention in the DEIS that "beluga whales rarely appear in the Liberty Project area", that they are not expected to be affected by "noise or other project activities", and that impacts to Kaktovik's subsistence harvest are not expected. (Pages III-A-8, III-C-81) Nothing is mentioned about impacts to belugas themselves. Rather than being a rarity, 023

023 Nuiqsut residents have noted the regular presence of belugas in the project area. Walruses also are not tremendously abundant in the eastern Beaufort Sea, but do occur there with regularity. Individual walrus and the subsistence harvest by Kaktovik residents could be impacted by operations associated with the Liberty Project. Each of these species, and the potential effects they may suffer as a result of Liberty development should be more fully described in the Final EIS.

**Polar Bears and Seals**

024 It is repeatedly stated that seal and polar bear populations are expected to recover individuals killed by a spill within one year, and that there would be no effect on the population. (Executive Summary-17, III-C-27) However, may more animals could be affected indirectly, and there is no monitoring activity proposed to estimate these losses. In the last paragraph on page III-C-28, it is stated that cleanup efforts would include the removal of all oiled animal carcasses to prevent scavenging-associated toxicities. How this is to be accomplished or monitored is not explained. Carcass persistence and recovery rates are highly variable (Fowler and Flint, 1997), and mortality estimates are also affected by search effort (Garshelis, 1997). In such an extreme environment, carcass recovery efforts are not likely to be very successful, and could easily be disrupted by severe weather, ice, and other conditions. Also, carcasses may become trapped under the ice, and since cold temperatures will inhibit decay indefinitely, there is a high probability of oil-contaminated carcasses persisting for long periods. During that time they would be available to scavengers (bears, birds and fish).

025 On page III-C-38 it is stated that "crude oil can kill marine invertebrates from short-term exposure to high concentrations of hydrocarbons or long-term exposure to lower concentrations. Laboratory studies show that oil concentrations from 1-4 parts per million can kill adult and larval crab and shrimp after 96 hours of exposure. Large oil spills often have resulted in mortality of bivalves which are food for many species of marine birds, fishes, and mammals. Effects on bivalves can be almost immediate, but declines in numbers may continue for up to 6 years." Fukuyama et al. (2000) noted that residual oil affected survival and growth rates of clams 5-6 years following the Exxon Valdez oil spill. Large crustacean and bivalve species grow at slow rates and destruction of the larvae of these species as would occur during a spill could impact the populations for many years. Bivalves are an important food source for bearded seals, and potential declines in bearded seal populations (population estimates of which are not even available for the Beaufort Sea as is noted on page VI-22 of the DEIS) as a consequence of bivalve declines following an oil spill are not considered.

026 On pages ES-17 and III-C-28, it is stated that "a spill might affect the abundance of some prey species in local, coastal areas of Foggy Island Bay where epibenthic food such as amphipods (small shrimp) concentrate, but a spill should not greatly decrease abundant food, such as arctic cod." There is no discussion of the relative importance of these food sources to ringed seal. Ringed seal diets may vary seasonally, such that they primarily comprise amphipods at various times of the year (Siegstad et al., 1998), and would be



expected to be impacted more severely if a spill occurred during the time of year when amphipods are the predominant prey item. 026

**Bowhead Whales**

**Behaviors**

Page VI-2: it is stated that "some scientists maintain that a few bowheads swim northwest along the Chukotka coast in late spring and summer in the Chukchi Sea." In mentioning bowhead movements during spring and/or fall off Chukotka it would be appropriate to refer to at least a few of the documents produced in recent years by Chukotka people which confirm the behavior. For example (Ainana et al. 1995, 1997, 1998, 1999, 2000; Melnikov et al. 1998; Zelensky et al. 1995, 1997, 1997). 027

Page VI-2: The document should mention documentation of bowhead feeding during the spring migration, and should cite references such as those reporting stomach content data from spring harvested whales at Barrow (Carroll et al. 1987). 028

Page VI-3: There is some discussion of bowhead feeding during the fall in the Alaskan Beaufort Sea. Subsistence hunters in Kaktovik, Nuiqsut and Barrow regard the entire migration corridor as important habitat for fall migrating bowheads. Some references that document bowhead feeding in the area (from examination of harvested whales) are Carroll et al. 1987 and George et al. 1987. Recognition of the entire corridor as feeding habitat must have implications for the analysis of potential oil spill effects to the whales. The analysis must be expanded to address oil spill effects to bowheads associated not only with oiling and possible deflection, but also with loss of feeding habitat and greater likelihood of ingestion of oiled prey. 029

Page VI-3: There is sufficient subsistence hunter testimony cited to accept that bowhead whales appear with regularity within the barrier islands. Throughout the DEIS, however, potential effects to bowheads are downplayed because, it is stated, the whales do not move regularly within the barrier islands. On page III-C-61, for example, it says that "vessels and aircraft inside the barrier islands should not effect bowhead whales." This is significant recurring error in the DEIS. Recognition of the presence of bowheads within the barrier islands requires modification of all sections of the document analyzing oil spill and disturbance effects originating in that area. MMS asserts that whales will not be affected by the noise generated by Liberty construction and operations because whales will not be present in proximity to the sources of the noise. That is not true. Whales will be within the barrier islands, and we now have a relatively good understanding of whale avoidance of certain noise sources, especially seismic noise. The extent of that avoidance behavior is more fully described below. 030

Page VI-4: The text refers to a 1987 report of a 1985 and 1986 eastern Beaufort Sea bowhead feeding study, and states that the NSB Science Advisory Committee "believed there were problems in the study's design and length." It would be more accurate to say 031

031 that the NSB Science Advisory Committee found major deficiencies in the feeding study. The Committee's report indicated that the conclusions of the feeding study report were not supported by the data. The Final EIS should accurately describe this situation.

<u>Effects</u>

032 In every section of the document describing potential effects on bowhead whales, those effects are either clearly understated, stated in an overly cautious manner, or speculatively dismissed where the data are incomplete. The following comments will be specific to particular passages in the text of the DEIS. Because the document is extremely repetitive, the same comments should be taken to apply equally wherever substantially similar text appears. MMS should make the appropriate corrections in all sections where these comments indicate that they are warranted.

033 <u>Noise Effects</u> – There is extremely little discussion of the impacts of seismic activity on bowhead whales (or other resources). The document states on page III-A-4 that "no seismic activities are planned for Liberty", and never seems to make the leap in analysis to consider the effects of Liberty disturbances in combination with the ongoing open-water seismic operations which have become routine in the Beaufort Sea. It would not be unreasonable to expect that there may at times be up to four seismic operations occurring in a single season. This must be fully considered in the Final EIS. Of particular concern is the possibility of two or more seismic operations occurring during the fall bowhead migration and subsistence hunt, in combination with Liberty and Northstar effects, and perhaps multiple exploratory drilling operations as well. This is where we appear to be heading in the Beaufort Sea. It is reasonably predictable snapshot of what may be occurring in that environment in the not-too-distant future, and should receive appropriate analysis.

034 <u>Page V-16</u>: Several statements here and elsewhere in the document give a false impression of the current state of western scientific knowledge concerning noise impacts on bowhead whales. The impacts are substantially understated. Among the misrepresentations are the following (emphasis added in each case and response **bolded**):

"Inupiat whalers *have stated* that noise from *some* drilling activities, especially drilling from drillships with icebreaker support in the main migration corridor, displaces whales farther offshore away from their traditional hunting areas. Inupiat whalers also *have stated* that noise from seismic activities displaces whales farther offshore." **Hunters have not simply offered uninformed opinions regarding effects on bowhead whales and the subsistence hunt, they have observed and reported those impacts in consistent terms on numerous occasions. Their observations have been confirmed by scientific study. Bowheads were observed to begin to move to the north of the Kuvlum drillship at 19 miles (32 km) (Hall <u>et al</u>. 1993).**

035 "Bowheads have been sighted near drillships, although *some* bowheads *probably* change their migration speed and swimming direction to avoid getting close to them." **Should**



035 **indicate that a few bowheads have been spotted near drillships, most often when the ships were not actively engaged in drilling, but most whales alter their speed and direction to avoid them.**

036 "Bowheads *do not seem* to travel more than a *few* kilometers in response to a single disturbance, and behavioral changes are *temporary*, lasting from minutes (for vessels and aircraft) up to 30-60 minutes (for seismic activity)." **The statement should be deleted. Recent data suggest that bowheads will show near total avoidance of an operating seismic vessel at a radius of 20 km, and there is good evidence that a northward deflection of migrating whales avoiding seismic operations may begin at 35 km (21 miles). Some avoidance behavior could persist for as much as 12-24 hours.**

037 "In summary, the LGL and Greenridge 1996-1998 monitoring studies *found no indication* during survey efforts that the general migration corridor was farther offshore on days with seismic airguns operating compared to days without seismic airguns operating. However, aerial survey results indicated that bowheads *tended* to avoid the area around the operating source *perhaps* to a radius of *about* 20 kilometers." **Bowheads show near total avoidance of active seismic operations at 20km, and may begin avoidance behavior at 35km. Offshore displacement of the migration was seen in 1996 during seismic operations as compared to periods in the same season when no seismic operations were taking place. The 1996-1998 combined data indicate that sighting distributions tended to be farther offshore during seismic operations than at times with no seismic operations.**

038 "There was *little or no evidence* of differences in headings, general activities, and swimming speeds of bowheads with and without seismic operations. The observed 20 kilometer (12.5 miles) area of avoidance is a larger avoidance radius than *7.5 kilometers (4.7 miles)* documented *previous scientific studies* and smaller than the 48 kilometers (30 miles) *suggested* by subsistence whalers. The whales' avoidance of the seismic operations during the 1996-1998 whaling seasons *did not affect subsistence whaling*." **There is good evidence of avoidance, though more study of specific behavioral changes is needed. The 7.5 km figure is from a study by Ljungblad et al. (1985, 1986, 1988) which has been recognized as having severe problems. It is no longer a valid figure. The 48 km figure was presented at a recent MMS-conducted meeting in Barrow, and has been suggested by hunters based on their cumulative experiences and observations, and should be considered in light of their history of accuracy in describing the behavior of bowhead whales. The hunters tried to agree upon actual distances in response to continued requests by MMS personnel. The hunters *estimated* that the whales began to divert from their normal migratory path at 35 miles from an active seismic boat and that the diversion could be *as much as* 30 miles from their normal path. In using these hunter statements it is important to remember that 1) these are estimated distances by hunters on the water, 2) the 35 miles is the distance where the diversion is estimated to begin (that is, some begin to divert here and others continue further before diverting), 3) the 35 miles is not the point at which *all* are estimated to divert at once, 4) the 30 miles is the estimate as to**

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**how great the diversion can be ("as much as 30 miles"), 5) the diversion estimate is at times much less than 30 miles (10 miles, 15 miles, etc.), and 6) most of the Barrow hunters gained their experience with seismic boats during the 1980's, when industry claims that the noise sources were louder than those used in recent years. Finally, seismic operations did affect subsistence whaling in 1996-1998. Harvest of the allotted quota is not an indication that there were no impacts. Hunters have had to travel greater distances when whales have been deflected by industrial noise. This is undertaken at a greater risk and expense to the hunters, and with a greater likelihood that the meat of harvested whales will spoil before processing.**

There is perhaps no other single page in the document which more clearly reflects the problems and underlying bias of this DEIS. The material is presented in a manner which seems designed to disprove contrary conclusions (conclusions that would indicate the likelihood of effects), rather than to simply and impartially present the current state of knowledge. The problems continue on the following page, where MMS states that:

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"Behavioral studies have *suggested* that bowhead whales *may* get used to noise from *distant* ongoing drilling, dredging, or seismic operations, but they still *may* exhibit *some* localized avoidance. We do not have enough evidence to know whether or not industrial activity continuing for several years would keep bowheads from using an area, and no *documented* evidence shows that noise from outer continental shelf operations would act as a barrier to migration." **This entire passage should be deleted or explained far more fully. What does "distant" mean? What was the nature and focus of the behavioral studies referred to? Based on the recent seismic monitoring programs, bowhead whales *will* exhibit *near total* localized avoidance of seismic operations *at a distance of 20km, and possibly begin deflecting at 35km.* Large bowhead deflections have been documented in relation to 1) the Corona-Hammerhead exploratory drilling operation, 2) the Kuvlum exploratory drilling operation, and 3) the 1996, 1997, and 1998 seismic monitoring programs. The displacement evidence is now adequate to allow reasonable speculation that such displacement will continue.**

040
With recent good noise impact studies (LGL Limited and Greeneridge Sciences, Inc. 1987; Richardson 1997, 1998, 1999) we know a reasonable amount regarding bowhead impacts due to noise from a drill ship and from seismic boats. The rather clear data from these studies indicate that certain types of industrial noise do impact bowheads. For certain types of industrial noise (drill ship and seismic), the extent of impact is now known at least to some degree. For example, Richardson 1999 documents the 20 km (12.4 miles) exclusion zone around an active seismic vessel. Good evidence is also given that the northward deflection of approaching whales may begin at 35 km (21 miles) (see pages 5-59, 5-60, 5-101), and that deflected whales remain deflected until they are at least 40-50 km (24-30 miles) past the seismic boat (see pages 5-59 and 5-60 of Richardson 1999). It is important to recognize that this 20 km (12 miles) avoidance is the reaction of even the most noise tolerant whales. It is only reasonable to think that the more "noise sensitive" whales avoid an even larger area. This was seen in the 1998 data where avoidance started at 35 km (21 miles) to the east (Richardson 1999, pages 5-59, 5-



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60, 5-78, 5-101), and the deflected whales were still displaced at least as far as 40-50 km (24-30 miles) to the west of the seismic ship (pages 5-59, 5-60, 5-101).

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On page III-C-61, the DEIS states that "Barge traffic continuing into September *could* disturb *some* bowheads. Whales *may* avoid being within 1-4 kilometers of barges." The words "could", "some", and "may" should be replaced with "is likely to", "many", and "are likely to", respectively.

042
There is mention on page VI-2 that "bowheads may use cues from ambient light and echos from their calls to navigate under ice and to distinguish thin ice from multi-year ice floes (thick ice)." It is noted on page III-C-61 that "increased noise levels *could* interfere with communication among bowheads, mask important natural sounds, cause physiological damage, or alter normal behavior, such as displacing the migration route farther from shore". Rather than "could", the statement should be changed to indicate that industrial noise has been shown to displace the migration route. In addition, various behaviors, such as calling rate, swim heading, and use of a migratory path, have been shown to be changed due to seismic noise through monitoring in 1996, 1997 and 1998. The other potential effects to bowheads from increased noise levels warrant more extensive discussion in the Final EIS, particularly in the cumulative effects section.

043
<u>Oil Spill Effects</u> – Any Final EIS analysis of oil spill effects on bowhead whales, and all other marine species, must recognize the results of the 1999 and 2000 broken-ice spill response exercises described previously. These exercises clearly reveal the inability of industry to cope with spilled oil during broken-ice conditions. Oil released into that environment will remain in that environment and may be transported over considerable distances for a prolonged period, and so will pose an extended risk to the region's wildlife resources.

044
In trying to estimate likely oil contact impacts to bowheads some document authors ignore 1) direct effects data for polar bears, seals, and sea otters; and 2) the morphological and microbiological characteristics of the bowhead that are relevant (high surface area roughened spots on skin, microbes of actual or potential pathogenicity in the roughened areas of skin, very large conjunctival sac of eye, long baleen "hairs" easily broken off and swallowed, very narrow channel connecting two chambers of the stomach, etc.). The DEIS regrettably gives only passing consideration to these topics.

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For additional information regarding the ultrastructural nature of the roughened areas of skin, see Henk and Mullan 1996. For greater detail regarding oil impacts to polar bears, see Oritsland <u>et al</u>. 1981, Engelhardt 1981, Hurst 1982, Hurst and Oritsland 1982, and Hurst <u>et al</u>. 1982. For general oil spill efforts on mammals, see Engelhardt 1983, 1984, 1985, 1987. Regarding the very extensive extent of the conjunctival sac associated with a bowhead eye, see Dubielzig and Aguirre 1979, Dubielzig and Aguirre 1981, Haldiman <u>et al</u>. 1982, Haldiman 1986, Zhu 1997, and Zhu <u>et al</u>. 1998, 1999. Each of these reports should be fully and accurately described in the Final EIS.

It says on page III-C-18 that "prolonged exposure to freshly spilled oil could kill some whales, but we expect that number to be very small with such a low chance of contact." Similar statements appear throughout the document. From what is known about the impacts of oil upon polar bears, seals, sea otters and birds, and from what is known about the morphological characteristics of the bowhead, it would seem more appropriate to say that prolonged exposure "is likely" to result in the death of some bowheads. 046

The inhalation of oil vapors should be expected to cause severe impacts to the respiratory tract. The most extensive data on a marine mammal are those on the sea otter. For purposes of this analysis, it is reasonable to assume that impacts to the bowhead whale would also be detrimental, unless evidence can be provided that in other marine mammals such an inhalation of oil vapors is harmless. 047

Recent detailed study of the bowhead eye by Dr. Zhu clearly documents the extensive nature of the bowhead's conjunctival sac. Why the conjunctival sac is so large in the bowhead is not clear. Such a large conjunctival sac can obviously provide a large surface for an irritant (such as spilled oil) to contact sensitive visual structures. A03

The discussion of the potential effects of baleen fouling on page III-C-21 significantly downplays the potential threat of oiling to bowhead whales. It is inappropriate to include the assertion of the 1985 Geraci and St. Aubin study that "it appeared that the concern for oiled whales (baleen fouling) is becoming less defensible based on the low level immediate impact in Braithwaite's study and the rate of clearance of oil in this study." Their study tested baleen from four whale species which the DEIS acknowledges is functionally different from the far longer, more flexible, and more densely haired bowhead baleen. Again, the DEIS seems biased, and its text seems to reach for a desired conclusion. The document cites Braithwaite's 1983 work which reportedly "used a simple system to show a 5-10% decrease in filtration efficiency of bowhead baleen after fouling, which lasted up to 30 days." MMS does not tell us whether the "simple system" provided any meaningful simulation of the actual bowhead filtration mechanism, but goes on to admit to not knowing "how such a reduction in food caught in the baleen would affect the overall health or feeding efficiency of these whales." Then, in the same paragraph, the DEIS refers to the Geraci and St. Aubin study which found that 95% of oil adhering to the baleen (of other whale species remember) moved away within 24 hours after fouling. It does not say to where the oil "moved away". The implication of the paragraph is that the 5-10% decrease in filtration efficiency of fouled bowhead baleen is small, that most of the oil would be gone within 24 hours anyway, and that therefore, there really should be no concern about the effects of bowhead baleen fouling. The truth is that we do not know whether a 5-10% decrease in efficiency is significant. It seems likely that it would be significant if the fouling and associated decreased filtration efficiency lasted up to 30 days after fouling. 048

It also might be the case in bowheads that when the oil "moves away" from fouled baleen, it is ingested in tangles of the baleen hair. This, as we have suggested before, presents its own risks to the health of the animal. Again, bowhead baleen has long, hair



like baleen filaments that do break off with great regularity and enter the stomach. The bowhead stomach includes a narrow connecting channel that is a logical site for a gastric obstruction should the conditions be right. It requires very little thought to see how ingested tar balls (which are "sticky") could adhere to each other and/or the numerous swallowed, broken off, baleen filaments to form an obstructive mass in the narrow connecting channel within the bowhead whale stomach. 048

Other Effects - On page V-17 it says that "the low number of ship-strike injuries suggests that bowheads either do not often encounter vessels or they avoid interactions with vessels, or that interactions usually result in the death of the animals." The word "observed" should be inserted before "ship-strike". 049

**Subsistence-Harvest Patterns and Sociocultural Systems** 050

III-C-45 Subsistence-Harvest Patterns: The idea that subsistence resources would be "tainted" following a spill is raised in several sections of the DEIS. The document states that:

> If an oil spill occurred and affected any part of the bowhead whale's migration route, it could taint this culturally important resource. In fact, even if whales were available for the spring and fall seasons, traditional concerns of tainting could make bowheads less desirable and alter or stop the subsistence harvest. Tainting concerns also would apply to polar bears and seals.

In the following paragraph, it states that following a large oil spill:

> No harvest areas would become unavailable for use and all resources, except possibly bowhead whales, would remain available for use. Some resource populations could suffer losses and, as a result of tainting, bowhead whales could be rendered culturally unavailable for use. Tainting concerns in communities nearest the spill event could seriously curtail traditional practices for harvesting, sharing, and processing bowhead whales and threaten a pivotal underpinning of Inupiat culture. Whaling communities unaffected by potential spill effects are likely to share bowhead whale products with impacted villages. Harvesting, sharing, and processing of other subsistence resources should continue.

There are problems with this treatment of the concept of tainting. No definition of the term "taint" is given. Dictionary definitions indicate that it can mean to expose to a contagion; to make poisonous or rotten; or to infect or spoil. Within the DEIS it seems that the word is meant to apply to a situation in which MMS believes that though a resource is not affected by a spill, subsistence users will nonetheless not harvest or consume the resource. These passages, and others like them in the DEIS, substantially and inappropriately downplay the potential risks of an oil spill to the nutritional and

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cultural well being of our people. First, there seems to be some judgmental distinction made between "unavailable for use" and "culturally unavailable for use" which implies perhaps that there is something unique to the Inupiat culture which would prevent our people from harvesting resources which western science has deemed safe to consume. Such a distinction adds nothing to the discussion of the potential risks of an oil spill. Concerns over the tainting of a food supply following an event which puts toxins into the environment from which the food is drawn is reasonable, understandable, and prudent in all human communities. The concern is not "cultural" or in any way specific to the Inupiat people. In fact, the question has been raised whether the International Whaling Commission (IWC), which governs the Inupiat subsistence harvest of bowheads, would reduce the harvest quota following a major spill to ensure that overall mortality did not increase. There is even some concern among subsistence whale hunters that the IWC may eventually take that step as the U.S. and Russian waters through which the whales migrate become increasingly industrialized. Whether such an action is taken in advance as a precaution, or following a spill, it would have substantial cultural and nutritional impacts on our communities.

Next, it seems clear that, contrary to the second passage above, some areas would become "unavailable for use" following a major oil spill. All areas directly oiled, some zone around them, and areas used for staging and transportation corridors for spill response would certainly not be used by subsistence hunters for some time following a spill. The duration of avoidance by subsistence users would vary depending on the volume of the spill, persistence of oil in the environment, degree of impact on resources and times necessary for recovery, and confidence in assurances that resources are safe to consume.

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The DEIS discusses in several sections an account by the late Thomas Brower, Sr. of the 1944 intentional release of approximately 25,000 gallons of oil into the waters of Elson Lagoon east of Barrow by a U.S. Navy vessel attempting to free itself after being grounded on a submerged shoal. The reference to Mr. Brower's account on page III-C-46 seems another example of risks downplayed in the DEIS. He said that "for four (4) years after that oil spill, the whales made a wide detour out to sea from those islands. Those native families could no longer hunt whales during these years at that location." The tone of his statement, and the memory of the incident among others who have discussed it over the years, recalls a time of devastation and deprivation. In contrast, this brief DEIS discussion concludes with a statement that the incident reveals "that species can experience recovery from an oil spill in the arctic after 4 years." The facts of the spill and its aftermath as related by Mr. Brower have been confirmed by every elder questioned who resided in Barrow at the time. Rather than only the recollections of one late respected elder, the spill, its lethal impact on a great many animals, the suffering of those animals and other which survived, the avoidance of the area by wildlife, and the corresponding effects on Barrow's subsistence harvest, are part of the town's shared community memory and history. It was not only whales that avoided the area following the spill. Other resources were absent or appeared in reduced numbers. While bowheads returned to the area after four years, they were not observed in pre-spill numbers for



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several years beyond that. It is also important to note that those who remember this event, and those who have been told about it by witnesses, consider it significant evidence that even a relatively small spill in a defined area can have lasting effects on subsistence resources and harvests.

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Thirdly, the passages erroneously limit the species and geographic scope to which tainting concerns would apply. It makes no sense to limit concerns to bowhead whales, polar bears, and seals. Users would justifiably have concerns about the harvest and consumption of all marine subsistence resources following a spill, including beluga whales, walrus, fish, and birds. In addition, although a spill may originate at the Liberty facilities, its impacts may be felt by communities far removed from that location. First, we believe that spilled oil not cleaned up shortly after an event due to any combination of arctic conditions will be transported by currents and ice far beyond the area predicted by the model contained in the DEIS. Second, species which pass through the areas initially and secondarily oiled are utilized by communities remote from the project area. Concerns about the harvest and consumption of resources will be shared by all communities which utilize these migratory species. Bowhead whales, for instance, are harvested in the Beaufort, Chukchi, and Bering Seas by Inupiat and Yupik Eskimo communities. All would share concerns over the safety of bowhead food products, the health of the whale stock, and possible IWC subsistence quota reductions following a spill anywhere within the range of the species.

053

Page III-C-47 3): The potential effects of cleanup activities on subsistence resources and harvests are discussed, and appear to be understated. The first sentence states that disturbance to resources "potentially could increase" from oil spill cleanup activities. The second sentence states that "offshore, skimmers, workboats, barges, aircraft overflights, and in situ burning during cleanup *temporarily could* cause whales to alter their swimming direction." (emphasis added) The third sentence states that "such displacement *could* cause some animals, including seals in ice-covered or broken-ice conditions, to avoid areas where they normally are harvested or to become more wary and difficult to harvest." (emphasis added) The fourth sentence states that "people and boats offshore; and people, support vehicles, and heavy equipment onshore, as well as the intentional hazing and capture of animals *could* disturb coastal resource habitat, displace subsistence species, alter or reduce subsistence-hunter access to these species, and alter or extend the normal subsistence hunt." (emphasis added) In each case, based on the vast experience of our subsistence hunters, it is clear that if the listed equipment was employed and activities undertaken, the effects noted *would certainly* occur. Deflection of resources resulting from the combination of the spill itself and response activities would persist beyond the timeframe of a single season, perhaps lasting several years. The result would be profound effects on subsistence harvests, and the nutritional and cultural well being of subsistence users. We agree with the DEIS statement on the same page that "far from providing mitigation, oil-spill cleanup activities should more likely be viewed as an additional impact, potentially causing displacement of subsistence resources and subsistence hunters."

**Cumulative Effects**

The cumulative effects, not just of oil and gas activities, but of everything bringing change to the physical, biological, and human environments of the North Slope, to a great extent defines the quality of my life, the lives of all Borough residents, and ultimately the lives of our children and the generations which follow them. We grow very tired of being told that the potential effects of this development project, or that exploratory operation, or those lease sales are either so speculative, or incrementally so small that the risks are worth taking. On January 8th of this year, I addressed the broad issue of the cumulative effects of oil and gas activities on the North Slope in testimony before the NRC Committee studying that question. That testimony is included here as Attachment 1 and made part of these comments. Among the major points raised in those comments were that:

1) The people, wildlife, and environment of the North Slope have already been, and continue to be, adversely impacted by oil and gas activities. The Inupiat people and our traditional subsistence culture are intimately tied to, and dependent upon, healthy wildlife populations and a healthy environment. We are working with industry and agencies in developing appropriate mechanisms for requiring impact monitoring, mitigation, impact aid, and compensation. E04

2) It is essential that industry-related adverse impacts to the socio-cultural framework of our communities be quantified. These significant adverse impacts have, for too long, been ignored by industry and regulatory agencies. Our people see a link between the expanding industrial activity and the rise in socio-cultural disruption (e.g., stress, alcohol and drug abuse, reduced participation in subsistence, cultural activities, and events.). Today, it is the Borough, and only the Borough, which incurs the financial burden of dealing with all of these direct and indirect impacts of ongoing and proposed industrial activity. 054

3) Despite the many millions of dollars spent on North Slope studies, very little has been done to identify long-term impacts or impacts over the shorter term from multiple sources. We have observed long-term cumulative impacts from single causes, like changes in caribou migration patterns after construction of the Trans-Alaska Pipeline and Dalton Highway. We have also observed short-term cumulative impacts which result from multiple sources, like bowhead whales deflected farther offshore or which become more skittish and difficult to hunt after being exposed to two seismic operations occurring in their Beaufort sea migratory path in the same fall season. E05

The potential effects of multiple activities occurring simultaneously or sequentially are not considered sufficiently in the DEIS. As MMS heard during the March public hearings in North Slope communities, this is a primary concern among our residents. We expressd that concern during the review of the Northstar Project, and were told then, as we are being told now, that the contribution of an individual project to projected noise and oil spill effects is inconsequential. We do not see it that way. Our hunters are practical 055



people. They spend considerable time out in the marine environment. We share their belief that MMS and the other permitting agencies should be able to discuss the potential effects of a likely snapshot of all activities that could occur in some future operating season during the life of the Liberty Project. What would the likely impacts to subsistence harvest patterns be, for instance, during the month of September 2006, with Northstar and Liberty in production, perhaps a third development project under construction, with one exploratory drilling operation underway in deeper waters, and two seismic programs underway at the same time? These are the scenarios our residents see in their futures, and they must be considered in some meaningful fashion in the Final EIS. 055

Community Stress - The issue of community-wide stress and anxiety associated with the increasing industrialization of the marine environment is of growing concern to the Borough and other North Slope organizations. You heard eloquent testimony on this point at the March 19, 2001 public hearing on the Liberty DEIS in Nuiqsut. It is a serious and pervasive effect which tears at the social and cultural fabric of all North Slope communities, but perhaps most dramatically in that community, which has become virtually surrounded by industrial facilities. It is not only the industrial activities themselves which contribute to the ongoing effects felt in the communities, but also the continuous leasing of areas, proposed operations, document reviews, calls for comments, public hearings, community meetings, media coverage, and underlying sense that something of value is being removed from the region without appropriate compensation, which cause anxiety. The 1994 NRC report on the Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska recognized that "although changes to physical or biological systems do not occur until a project leads to physical alterations, observable and measurable alterations in the human environment can take place as soon as there are changes in social and economic conditions, which often occur from the time of the earliest rumors or announcements about a project." (p.130) The report goes on to say that "these changes have sometimes been called "pre-development" or "anticipatory" impacts, but they are real and measurable", and that "if proposals appear to pose threats, the results can include fear, uncertainty, and doubt about the potential future of the community, which can in turn motivate predictable responses, as when people take time off from work to attend meetings, to organize, or to protest." (p.131) A04

Transportation - It is not clear where vessel, vehicle, and aircraft traffic is discussed in the DEIS, or in Table V.B-8 where transportation is summarized, whether a "trip" always refers to a one-way or round-trip. If, as is presumably the case, the reference is to a round-trip, the numbers given in all cases should really be doubled to provide a more realistic picture of the effects which such traffic will cause. Obviously, each transit, both to and from the island, holds the potential for impact to resources. Each transit would be distinct, and separated in time by a significant period at the island off-loading or taking on materials, equipment, or personnel. In other words, the 150 vessel round-trips per summer during construction actually means that a ship will pass through the nearshore waters of Foggy Island Bay 300 times, or 2-4 times per day, at a time when there may be as many as 40 helicopter transits (20 "trips") each day. These numbers may, in fact, be low. It is difficult to tell from the text or table how the potential effects of traffic on 056 resources and subsistence will be mitigated. Nuiqsut fall subsistence whaling, for example, typically takes place during the first weeks of September, but may continue into October. If mitigation will include flight and vessel restrictions during that time to minimize potential impacts to bowheads and the subsistence harvest, that reduced transportation would presumably have to be "made up" at another time, with potentially greater than described impacts on other resources and the subsistence harvest of other species. 056

Water Use – Indications are that BP's water use associated with Northstar construction has greatly exceeded the volumes initially predicted and permitted. That should be acknowledged in the Final EIS and should be taken into account in your assessment of the potential effects of the water use projected for the Liberty Project. 057

**Comments on the Component Alternatives**

As you will see from the comments below, we approach the review of the component alternatives with the simple objective of reducing, wherever possible, the potential adverse impacts of the project on the North Slope onshore and marine environments, wildlife resources, and subsistence activities. Each of the selections below raises an apparent difference in perspective between the Borough and MMS. MMS may question the utility of altering some aspect of project design to address what the DEIS now identifies as insignificant impacts. In other words, you may ask whether it is valuable to seek the reduction of an insignificant effect or risk to something less than that. For us, the issue comes down to a question of confidence in the data upon which the conclusions of insignificant effects or risks are based. We have little confidence in much of the data. E06

**Island Location and Pipeline Route**

The technical and economic feasibility of a southern island location other than that arbitrarily located by MMS on the southern margin of its lease tract has not been sufficiently analyzed. There must be some point closer to shore than the identified southern island alternative where it would still, if just barely, be technically and economically feasible to proceed with the project. The Borough would advocate selection of such an alternate island site if that location were found to be in a zone within which the conditions are such that the predicted effects to some resource could be reduced. If the island could be located in the grounded ice zone, for instance, the risk of ice gouging, and therefore a pipeline rupture, and oil effects on resources, would be reduced. In addition, siting the island in shallower water and closer to shore would require the use of less gravel and a shorter pipeline. It would require less trenching, and would be farther from the Boulder Patch and the primary bowhead whale migratory corridor. Significantly, at the Anchorage public hearing on the Northstar DEIS, an official of the pipeline company which would assemble and install that pipeline stated that he viewed the project as a test, that shorter was better from that standpoint, and that the company felt it was prudent to take lessons from that effort to apply to later projects. Additional analysis is needed. 058



**Upper Island Slope-Protection System** 059

We believe that the use of steel sheetpile is preferable to the use of gravel bags for upper island slope protection. The bags proposed are touted as being better than those used before which were known to tear, float, and present navigational and other hazards in the marine environment. The proposed bags are apparently of sturdier material, and would sink if released into the water. This does solve the problem of the bags becoming floating hazards, but the new sinking bags would still end up in the marine environment if torn free. We have little confidence in the ability to maintain and track bags. Sheetpile would not require the same monitoring and maintenance.

**Gravel Mine Site** 060

We believe that where possible, it is preferable to utilize existing gravel sources rather than to disturb new areas. Both the remnant Tern Island and the Duck Island mine site offer gravel from already disturbed sources. The case has not adequately been made for an advantage of the proposed Kadleroshilik site being its creation of new fish overwintering habitat.

**Pipeline Design and Burial Depth** 061

BP has not undertaken the development of an optimized design for a double-walled pipeline system, opting instead to rely exclusively in its Liberty development proposal on a single-walled design. Independent studies of oil spill risk and probability have concluded that the probability of a spill of greater than 1000 barrels was nine times lower for double- versus single-walled pipeline designs. In light of these findings, we support development of an optimized double-walled pipeline design and selection of a burial depth appropriate to that design.

**Conclusion** 062

The North Slope Borough does not support offshore oil and gas leasing, exploration, or development. The risks to the marine environment, wildlife resources, and our traditional subsistence activities are simply too great. We prefer to see continued oil and gas operations conducted onshore, where impacts can be avoided or minimized and problems responded to using proven methods. We believe that it is inequitable to continue leasing Alaskan OCS waters while almost all of the waters offshore of the lower-48 states have been withdrawn from consideration for leasing. We believe that much of the DEIS is biased in favor of the proposed project, and downplays the risks and effects that would result from Liberty development. We have concluded that alternatives to the components of the proposed project exist which would reduce associated risks and effects. As the community which now incurs virtually all of the impacts and associated costs of ongoing North Slope oil and gas operations, we ask that these comments be accorded deference in

MMS' redrafting of the DEIS in development of the Final EIS. Thank you for considering these comments. 062

Sincerely,

George N. Ahmaogak, Sr.
Mayor

Chairman Thomas Napageak, AEWC
Maggie Ahmaogak, AEWC Executive Director
Jessica LeFevre, AEWC Counsel
Mayor Eli Nukapigak, Nuiqsut
Mayor Lon Sonsalla, Kaktovik
Mayor Jim Vorderstrasse, Barrow
Jacob Adams, President ASRC
Arnold Brower, Jr., President ICAS
Eugene Brower, President, Barrow Whaling Captains' Association
Ted Rockwell, EPA
Jeanne Hanson, NMFS
Mike Holley, Corps of Engineers
Larry Bright, USFWS
Dave Tomasko, BP

**NORTH SLOPE BOROUGH**
OFFICE OF THE MAYOR
P.O. Box 69
Barrow, Alaska 99723
Phone: 907-852-2611
907-852-0200

January 8, 2001

## STATEMENT OF THE NORTH SLOPE BOROUGH BY MAYOR GEORGE N. AHMAOGAK, SR. BEFORE THE NATIONAL RESEARCH COUNCIL COMMITTEE FOR THE STUDY OF THE CUMULATIVE ENVIRONMENTAL EFFECTS OF ALASKAN NORTH SLOPE OIL AND GAS ACTIVITIES

A05

It is a pleasure for me, as Mayor of the North Slope Borough, to provide comments to this National Research Council (NRC) Committee as it begins its study of the Cumulative Environmental Effects of Alaska North Slope Oil and Gas Activities. As you can well imagine, this topic has been of the greatest concern to North Slope residents since our region was first identified as a possible source of oil many decades before the establishment of the Borough or even the State of Alaska. Given the complexity of the subject of cumulative effects, and the need for the Committee to have an understanding of the physical, biological, and socio-economic environments of the North Slope and its adjacent waters at the outset of its work, these comments will be in several parts. First, I will provide some background on the Inupiat culture and traditional subsistence lifestyle, the history of the North Slope Borough, and the formation and work of the Alaska Eskimo Whaling Commission (AEWC). Next, I will describe our general concerns regarding oil and gas activities on the North Slope and adjacent waters. I will then provide in some detail the perspective of the impacted community on the subject of cumulative effects, including ongoing and potential future effects. Next, I will provide some suggestions to the Committee regarding how it could most effectively conduct its work and discuss the final product we hope will result from its effort. Finally, I will provide some concluding comments and a summary of the primary points we have raised.

### THE INUPIAT SUBSISTENCE CULTURE AND TRADITIONAL KNOWLEDGE

Despite relatively recent improvements in our standard of living and the introduction of a widespread cash economy, we remain a people whose lifestyle is characterized by the central importance of subsistence. Subsistence is more to us than simply hunting or gathering and eating the fish, game, and plant resources of our vast arctic homeland. Subsistence is the cooperative pursuit, harvest, processing, distribution, storage, and consumption of wild foods. It is also the utilization of materials gathered for clothing, tools, crafts, and ceremonial purposes. At the heart of our value system are fundamental relationships between the Inupiat and our environment, between each person, family, group, and community with others, and between our people and our traditions and ancestry. The significance of these relationships derives from our understanding both that we depend on each other and our environment for our survival, and that the suitability of our lifestyle in this environment is the product of the accumulation of critical knowledge and skills by our ancestors over thousands of years. We now hold this knowledge and possess these skills, and will in turn see that they are passed on for generations to come. As a father and now a grandfather, I recognize that the instruction of our youth in the great many traditions demanded by a subsistence lifestyle is among the most important aspects of the Inupiat culture.

North Slope communities are located where they are certainly not because of some western notion of convenience, but because the sites provide access to the fish and wildlife resources upon which we depend. North Slope residents harvest a variety of resources depending upon their accessibility and the season. Harvest patterns vary among communities and among individual users within communities. Subsistence harvesters must be flexible and opportunistic in adapting to changeable conditions and availability of resources. Harvested subsistence resources are typically shared within families, within communities, and between communities. In our present mixed cash/subsistence economy, it can be said that within Inupiat households subsistence resources provide the staple of meat, fish, and fowl in the diet, while income earned through employment (in those households where a person is employed) is used in support of subsistence activities, and to provide housing, heat, and other essentials.

It is difficult without qualification to assign relative values to different subsistence resources. It is obviously problematical to compare the value of a bag of fish harvested for family consumption with the pelt of a harvested wolf or wolverine which will contribute greatly to the warmth of a parka sewn for hunting and fishing. The harvesting of bearded seals is important not only because of the food they provide, but also because their skins are used to cover the umiaqs, or whaling boats, used to pursue bowheads in the spring hunt. Percentages by weight of annually harvested resources may vary dramatically from year to year. A considerably higher annual proportion of terrestrial mammals may be taken by coastal communities, for instance, in years when the bowhead whale harvest is less successful. Still, it must be said that in many ways, the communal activities associated with the pursuit, harvest, processing, and sharing of the bowhead whale are central to the Inupiat culture.

Only in very recent years have biologists and other researchers (beyond those employed by the Borough) begun to work with our residents to incorporate traditional and contemporary Inupiat knowledge into their studies. This change is largely in recognition of the fact that studies in the Arctic are typically conducted as intensive, short-term efforts as the seasons and their often-harsh conditions allow. Traditional knowledge, on the other hand, represents the cumulative observations and experience



of people who have lived in the region year-round, for their entire lives, and who possess knowledge handed down from many generations which have preceded them. Historically, Inupiat traditional knowledge has been largely ignored in environmental impact statements, environmental assessments, and other agency decision documents. Instead, these documents have relied almost totally on western scientific studies which have been of limited scope, and, at times, have been poorly conducted or reported. North Slope residents have been frustrated by what we see as a lack of respect for the information we have provided to federal and state decision makers during the planning processes for oil and gas lease sales and exploration and development projects. Recently, however, the 1999 Final Environmental Impact Statement (EIS) for the BP Northstar Development Project in the Beaufort Sea took a great leap in the right direction in its more comprehensive incorporation of and attention to traditional knowledge on the full range of subjects at issue with respect to that proposal. It is important to recognize that traditional knowledge is not only passed on relatively unchanged from generation to generation, but that it also adapts and expands in response to changes in environmental conditions, technology, and socioeconomic circumstances. As stated in the Northstar EIS, traditional knowledge includes, but is not limited to, expertise on weather, sea, river, and lake ice, currents, fish and wildlife, historic and current uses of the land and water for subsistence and other traditional activities, and the impacts of human activities on wildlife and the environment.

As the work of this NRC Committee begins, I urge you to take full advantage of the knowledge of the people who reside on the North Slope. While not all comments of local people may be relevant to the Committee's efforts, there are surely many aspects of the environmental knowledge of local people that should be considered. Especially relevant should be the long-term observations of hunters and others who have been "on the ground" (or "on the water") for most if not all of their lives, and have actually observed the animals (whales, caribou, etc.) respond to industrial activity (seismic and drilling noise, vessel and aircraft traffic, roads, pipelines, etc.).

A good and relevant example of the value and reliability of traditional knowledge concerns the impact of seismic noise on fall migrating bowhead whales. For many years, the MMS, State of Alaska, and the oil industry told the Borough and AEWC that marine seismic exploration noise had little effect upon the fall migrating bowhead whales. Their assertions were based largely upon a study done in the mid 1980's that seemed to show that bowheads only reacted to an operating seismic vessel when it was within about 4 miles (7.5 km). (see first three references on **Attachment 3**) Local subsistence hunters who were at sea in small vessels year after year saw with their own eyes that this was not true. The hunters observed and reported that fall migrating bowheads reacted to seismic noise at distances much greater than 4 miles. Whales were seen to react at distances of 10-20 miles. Frustratingly, this local first-hand knowledge, as expressed by dozens of hunters, was largely ignored because it conflicted with a "scientific study". The study was seen as "fact" and relied upon, while the reports of hunters were seen by agencies as "opinions" and dismissed.

After years of frustration, the Borough and AEWC took steps, including the threat of legal action against NMFS, to get the agency to improve the quality of required industry-sponsored seismic noise impact studies. Peer-reviewed studies conducted in 1996, 1997, and 1998 showed that the hunters were correct, and that bowheads react to seismic noise at distances much greater than the 4 miles noted by the single earlier study. The studies of 1996-1998 clearly show a profound reaction by the whales, with nearly all bowheads avoiding the working seismic ship by at least 12 miles. (see last three references on **Attachment 3**) To their credit, the agencies seem to have taken this dramatic example of the value and reliability of local knowledge to heart, and have to some extent been more receptive recently to our input and that of the AEWC and local residents. **E07**

For the purposes of this Committee's efforts, relevant local traditional and contemporary knowledge should be sought after, documented and appropriately considered along with western science. It is important to note where the two databases are consistent or complementary, and where they are conflicting. It is also most important that data gaps are identified, and research needs prioritized.

## THE NORTH SLOPE BOROUGH

The North Slope Borough was formed in 1972. It is a regional municipal government incorporated under the laws of the State of Alaska, with planning and zoning, educational, and taxing powers similar to those of a county in most of the lower-48 states. The Borough encompasses a territory of approximately 88,000 square miles of northern Alaska. The diverse lands of the Borough stretch from the shores of the Chukchi Sea on the west and northwest, to the Canadian border on the east. They reach from the Brooks Mountain Range in the south, to Point Barrow and the shores of the Beaufort Sea in the north. All of the land within the Borough lies above the Arctic Circle. The area is primarily characterized by flat to rolling, largely wetland terrain, with braided river systems stretching from the foothills of the Brooks Mountain Range to the Arctic Ocean. The region is the year-round or seasonal home to a great variety of wildlife, including migrating caribou herds collectively numbering several hundred thousand animals, millions of migratory waterfowl and shorebirds, raptors and other bird species, moose, muskox, brown bears, wolves, foxes, and other furbearers, and many anadramous, freshwater, and ocean fish species. The Beaufort and Chukchi Seas are the year-round or seasonal home to walrus, polar bear, bowhead, beluga, and gray whales, and several species of seal, as well as the invertebrate and other prey species upon which they depend.

The nearly 8000 Borough residents live in eight villages with populations ranging from approximately 230 to 4700. About three-quarters are Inupiat Eskimos. The Prudhoe Bay oil field lies within the North Slope Borough. It is the largest producing oil field in



the U.S. With the exception of a seasonal ice road between our village of Nuiqsut and the Deadhorse industrial complex serving the Prudhoe Bay and Kuparuk oilfields, there are no roads connecting our communities to each other or the rest of the state's population centers. Barrow, the Borough's largest community and the seat of the Borough government, is served by daily jet flights to Fairbanks and Anchorage. The remaining communities are served by regular flights by smaller aircraft. A property tax base that includes Prudhoe Bay, Kuparuk, and other North Slope oil facilities has generated revenues we have used to bring our residents a level of services that did not exist before the incorporation of the Borough. We are still working to bring all of our villages modern sanitation, water, housing, fire protection, education, health care, public transportation, and other services long taken for granted elsewhere in our country. Our communities maintain a mixed cash/subsistence economy that includes employment by government (primarily Borough, but also village, state, and federal), village and regional Native corporations created under the Alaska Native Claims Settlement Act, tribes, and private enterprises.

## THE ALASKA ESKIMO WHALING COMMISSION

For more than a thousand years, Inupiat and Yupik Eskimos in Alaska have regularly hunted the bowhead whale. This hunt both required and allowed the establishment of large seasonally permanent settlements on the northern and western coasts of Alaska. The large size of the whale makes it an important part of the annual subsistence harvest. The communal nature of the hunt and the sharing of harvested animals place the whale at the center of the spiritual and physical culture of the region. The bowhead whale provides life, meaning, and identity to we Inupiat and our communities. The customs and traditions of subsistence whaling are handed down from generation to generation in a process that continues today. Young boys participate in activities at whaling camps and learn the skills they will need as adults to safely and successfully harvest bowheads. Young girls assist in the provision of sealskin covers for whaling boats, food and clothing for hunters, and join in the preparation of whale products for distribution to the community after a successful harvest. Sharing of the whale with the whole community, and with other communities as well, is the traditional and highly valued practice. Not only do whaling crews and their families receive shares, but village elders and families without a hunter are also included in the distribution. At community whaling festivals, and at Thanksgiving and Christmas ceremonies, the food of the whale is shared with everyone who comes to take part. No one, resident and visitor alike, is left out.

In 1977, the International Whaling Commission (IWC) imposed a ban on the harvest of bowhead whales by Alaskan Eskimos. The Eskimo hunters were notified of the IWC's decision in June of that year. No Eskimo representative had been present when the decision was made. No one in the Native community had been properly notified of the IWC's erroneous belief that the Bering/Chukchi/Beaufort Sea population of bowheads numbered only between 600 and 2000 animals. The subsistence hunting community responded quickly with the establishment of the Alaska Eskimo Whaling Commission (AEWC) to fight the ban, organize the whaling communities, and seek management of their own subsistence hunt. At a special meeting of the IWC in December 1977, the ban was replaced by a small harvest quota. By 1981, the AEWC had entered into a cooperative management agreement with the National Oceanic and Atmospheric Administration providing for the AEWC's local oversight of the subsistence hunt. Since its inception, the AEWC has also vigorously encouraged and supported a variety of scientific studies. These studies have included documentation of the nutritional need for bowheads among whaling communities and research which has established that the bowhead population was in line with the traditional knowledge of hunters and is far greater than had been previously thought by Western science and the IWC. With this research, the AEWC has seen the bowhead harvest quota granted by the IWC rise to an appropriate level, has overseen improvements in whaling equipment and the efficiency of the subsistence harvest, and has come to be regarded as a model for cooperative management. In addition to the relationship between the AEWC and NOAA, close cooperation between the AEWC and the Borough has included a periodic census of the bowhead population and the examination of harvested whales by personnel of the Borough's Department of Wildlife Management. Beyond its management of the hunt, the AEWC also works to minimize industrial impacts to the bowhead population, its habitat, and the subsistence harvest. Importantly, the AEWC acts as a link between hunters who possess generations of accumulated traditional knowledge of bowheads and their environment, and researchers conducting studies which are of mutual interest.

## GENERAL CONCERNS AND POSITION REGARDING OIL AND GAS OPERATIONS

While it is true that taxation of the oil industry is our primary revenue source, the Borough's relationship with oil companies and the agencies which regulate them has not been without conflicts. All of the oil production in our region to date has occurred onshore or in nearshore waters connected to shore by causeways. In the early days of onshore oil exploration and production, the industry was just learning how to function in the harsh arctic environment. Many mistakes were made. Agency oversight was lax. The environment paid the price. Decades later, the tundra still shows the scars of seismic and other vehicle tracks, abandoned drillsites, and gravel mines. Hazardous waste sites await cleanup. Early pipelines, built low to the ground, block the free movement of caribou, other wildlife, and subsistence hunters pursuing and transporting game.

The good news is that the oil industry in Alaska has made vast improvements in the way it operates onshore. These changes have come with experience, with improved regulations, with more rigorous agency oversight, with better science, and with the aggressive involvement of the Borough and other concerned North Slope organizations. Today, in most locations and with proper oversight, the risks posed by onshore industrial operations are to a certain extent manageable.



Our views regarding offshore industrial operations are different. We continue to have serious concerns about the ability of the oil industry to operate safely in arctic waters. At risk are the arctic marine environment, subsistence and other wildlife resources, and the subsistence lifestyle and culture of the Inupiat people. The Beaufort Sea is a harsh working environment. It is also a unique and vulnerable ecosystem. **E08**

Borough residents have experienced the impacts of offshore oil exploration for more than two decades. We now face the potential impacts of offshore oil production. The threats posed by offshore exploration and production activities are of two primary types; noise impacts and oil spill impacts. Noise impacts to wildlife resources and to traditional subsistence harvests have occurred, and will continue to occur even when operations take place as planned. Oil spill impacts to wildlife resources and to subsistence activities could be catastrophic.

The initiation of this study by the NRC Committee is particularly timely for me and for the residents of northern Alaska who I represent. British Petroleum's (BP's) Northstar Development Project will be the first stand-alone offshore production facility constructed in the Beaufort Sea. Construction of production facilities associated with the project is nearing completion. A draft environmental impact statement prepared by the Minerals Management Service for BP's proposed Liberty Development Project in the Beaufort Sea was just released for public review last week. If BP receives the necessary permits, construction of Liberty Project facilities would begin next winter. Both projects would utilize man-made gravel islands and buried subsea pipelines for transportation of oil to shore-based facilities.

If you understand the central importance of the bowhead whale hunt among all of our subsistence activities, you should understand our great concern over the prospect of oil production facilities and operations expanding offshore into the Beaufort Sea. The noise from a single project in certain locations, or from multiple projects, has the potential to deflect whales away from their traditional migratory path. The whales could be deflected out of the reach of our hunters, or the crews will have to travel greater distances under dangerous conditions to find animals. The Borough has required, and will continue to require where our authority allows, monitoring programs associated with these offshore development projects. We hope that the responsible federal and state agencies will also require impact assessment as a required condition if projects are approved in the future. Impact assessment studies must be designed to characterize the noise generated by project facilities and operations, and to assess any impacts on wildlife resources and subsistence activities.

The devastation that would result from a major oil spill is something that no one wants to deal with. That of course means that we should do all we can to prevent a spill. It also means that the industry should have the capability to effectively deal with a spill under arctic conditions if one occurs. We have asked for years for a realistic **E09** demonstration of the oil industry's abilities to deal with a spill under the difficult conditions which exist offshore much of the time in the central Beaufort Sea. We have yet to see such a demonstration, and remain unconvinced that a significant spill could be effectively responded to in anything but near ideal conditions. Even under less than realistically harsh conditions, the oil industry has repeatedly failed in recent tests associated with the Northstar Project to effectively respond to a simulated spill in the Beaufort Sea. It is critical to remember that if a well blowout or production pipeline failure occurs in the Alaskan Beaufort Sea, it is my people, my children, my culture, and the wildlife resources we respect and depend upon which will suffer. E09

## CUMULATIVE EFFECTS CONCERNS

### Cumulative Effects are a Long-Standing Concern

The North Slope Borough, the Alaska Eskimo Whaling Commission (AEWC), our North Slope villages, various other North Slope groups, and a great many individual North Slope residents have long complained about the ongoing adverse environmental and social impacts resulting from decades of oil and gas activities on the Alaska's North Slope and in the adjacent state and federal waters of the Beaufort and Chukchi Seas. We believe that industry operators and permitting agencies should be required to consider the incremental impacts of proposed projects in combination with past, present, and reasonably foreseeable future activities when applications are submitted and permit decisions are made. The accumulation and compounding of adverse impacts in the decades since the oil industry began operating on the North Slope is not a hypothetical concept among our residents. It is a reality which has altered, and continues to alter, the daily life of our village residents. Our people have seen access to traditional subsistence hunting areas reduced, the behavior and migratory patterns of key subsistence species changed, increased incidence of cancers and other serious health ailments, disruption of traditional social systems, and vastly increased requirements in time, effort, and funding to meaningfully consider and respond to the ever-multiplying number of projects proposed in their own backyards.

Over many years, and in many forums, great concern has been expressed regarding impacts to the land, water, air, and wildlife of our region, as well as to the nutritional, cultural, and spiritual well being of our people who depend so intimately upon these resources. Over the past 25 years or more, our concerns have primarily been raised either during the planning of one of the numerous state and federal oil and gas lease sales conducted in the region, or during the review of an application for one of hundreds of federal, state, and local permits that have been issued to industry for activities during that time. These concerns have been presented verbally, in the seemingly endless series of industry-related public meetings and hearings conducted in North Slope communities and elsewhere (the preparation for which, travel to, and participation in, have been significant impacts themselves), and in writing to the



appropriate decision-making agencies, organizations, oil companies, and industry groups. Regrettably, despite raising these concerns for decades, I believe that most North Slope residents feel that our combined efforts to protect the land, water, air, wildlife, and people from the adverse effects of oil and gas activities have proven less than adequate. As industrial activity has increased over the years, and as impacts have become more visible, there has been a repeated call for a comprehensive review of the situation.

In response to the repeated call for a proper comprehensive assessment of North Slope oil and gas industry impacts, there have been some recent positive developments. One has been the series of three meetings of Borough and AEWC personnel with federal agencies regarding long-term (cumulative) industrial impacts. These three meetings (February, July, and November 2000) have involved personnel from the National Marine Fisheries Service (NMFS) and the Minerals Management Service (MMS), and have focused upon the identification and mitigation of industrial impacts to fall migrating bowhead whales and the fall subsistence hunt.

A second positive development has been another series of meetings dealing specifically with the issue of mitigation and monitoring of any impacts to bowhead whales and the subsistence harvest as a result of arctic offshore oil development. The meetings have been chaired by officials of NOAA, and have included representatives of NMFS, MMS, the State of Alaska, the oil industry, seismic operators, the Borough, the AEWC, and scientific research and consulting firms. The current focus of the effort is on addressing the AEWC request for industry to provide an assurance of some measure of compensation to affected communities should chronic or catastrophic impacts to the marine environment, affected wildlife, subsistence activities, and the socio-cultural framework of subsistence communities result from offshore oil development in the Beaufort Sea. The request is in part a recognition of the sad fact that today, more than a decade after the 1989 event, the subsistence users of Prince William Sound who were devastated by the Exxon Valdez oil spill have yet to receive any compensation for their losses. The request, supported by the Borough, is in no way a retreat from our long-standing position that all those who profit so handsomely from oil and gas leasing and development in the Alaskan Arctic should be responsible for a fair share of the costs of dealing with the impacts of industrial activities. The federal government and State of Alaska, as well as the oil industry, derive tremendous revenues from leasing and development on the North Slope, while it is our Borough residents alone who bear the risks and suffer the impacts associated with those activities.

It is important to recognize that Borough and AEWC efforts to secure an appropriate share of the benefits of oil and gas leasing and development to offset industrial impacts have been on two fronts. First, we seek a mechanism to provide necessary compensation as a form of mitigation should a catastrophic oil spill occur or long-term significant chronic impact to the environment, wildlife, or subsistence harvests be identified. That ongoing effort was briefly described above. Second, we seek an appropriate level of impact aid to offset the costs of dealing with effects which have already occurred and are ongoing. We have sought an appropriate level of impact aid for years. We have repeatedly been told by each of the federal and state agencies responsible for issuing the leases and permits which make North Slope industrial operations possible that it is not within their statutory authority to provide impact aid. Where legislative provision is made for some small measure of generated federal oil leasing revenue to be paid back to affected states, we have found the State of Alaska disinclined to share funds with our local directly affected communities. The inequity of this continuing situation should be addressed.

Our residents will tell you that anxiety over increasing offshore and onshore oil and gas activity is widespread in North Slope communities. Hunters worry about not being able to provide for their families, or the added risk and expense of doing so if game is more difficult to find and harvest. Elders who can no longer provide for themselves worry about the challenges facing younger hunters who will go to great lengths to provide them with their essential and traditional foods. Families worry about the safety of hunters who must travel farther and more often if game is not easily accessible. Many of our adult residents already lead the dual lives of wage earner and subsistence provider to their families. Still, with so precious little time to spend at leisure and with their families, they are continually faced with the need to attend industry-related meetings and hearings, and review documents, because they know that decisions will be made which can significantly affect their daily lives and those of generations to come. We all worry about contamination of the traditional foods we consume, but know that our health would suffer if we were unable to eat as we and our ancestors always have. We worry that the bowhead harvest quota we have worked so hard to secure will be reduced if the International Whaling Commission perceives a heightened threat to the population resulting from the expansion of oil development facilities into the whales' Beaufort Sea migratory path. Today, the Borough alone bears the costs of social stresses tearing at the fabric of our culture. We provide substance abuse treatment, counseling, public assistance, crisis lines and shelters, and other social service programs. We provide the search and rescue services which must respond when hunters put themselves at risk in the pursuit of scarce or less accessible game. We provide the police force which must respond to all of the kinds of unfortunate situations which arise when people and entire communities are subjected to long-term and persistent stress. We provide the biologists, planners, and other specialists who review and offer recommendations on the staggering volume of lease sale, exploration plan, and development project documents which are produced each year. We must assume the ever-increasing expense of travel to Fairbanks, Anchorage, Juneau, Seattle, and Washington, D.C., where the agencies with authority over oil and gas leasing, exploration, and development, and the subsistence resources we depend upon, conduct most of their work and make most of their decisions. **E10**



A third recent positive development is the initiation of this National Research Council (NRC) Committee study. It is our hope and expectation that this Committee's efforts will be of the highest quality, and that its report will significantly impact and guide the work of the governmental agencies that regulate oil and gas activities on the North Slope. We hope that the Committee will be solution-oriented in its work. We would like to see the responsible state and federal agencies and officials, and the oil and gas industry, acknowledge the importance of the Committee's work, and agree to put forth appropriate effort and funds to see that any recommendations offered in its final report are acted upon. At a minimum, we hope that the Committee's final report includes 1) the identification of research which must be undertaken to fill gaps in essential data, 2) the quantification of existing industry-related effects, 3) recommendations for any changes in legislation or regulations necessary to require the stronger mitigation, monitoring, impact aid, and compensation demanded by ongoing and increasing industrial activity, and 4) recognition that North Slope residents bear most of the risks of U.S. Arctic oil and gas operations, and that their input, including their traditional and contemporary knowledge, must be given full consideration in decisions potentially affecting the Arctic environment and their subsistence activities. **E11**

**Definitions**

It would seem appropriate at the outset of the Committee's work to agree upon the definition of some key terms and concepts. First, the term "cumulative effects" (or "cumulative impacts") has been used by many agencies, groups, and individuals in different ways. We believe that the Committee should adopt a broad definition of the term. Cumulative effects are defined in 40 CFR 1508.7 as effects on the environment which are expected to result "...from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions." The section goes on to add that "cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time." We believe it is critical that the definition embrace not only effects-causing actions occurring over multiple seasons or years (e.g., the loss of onshore waterfowl or caribou habitat to industrial facilities associated with multiple projects), but also multiple actions occurring within a single season or year (e.g., multiple offshore industrial noise sources within the migratory path of the bowhead whale during a single fall migration). The Borough and AEWC have been stressing that several industrial activities in a given season, such as two seismic boats operating at the same time along the bowhead's fall migratory path, can have a cumulative effect far more serious than the effect a single activity would have in that season or year.

Our concern with multiple effects-causing activities occurring in a single season or year is particularly relevant in the Beaufort Sea, as Northstar Project construction nears completion. The production island, with its associated noise, will be a fixture in the ocean for the next 15-20 years or more. The effect of the noise it generates must not be considered only in combination with other simultaneous noise-producing activities in its immediate vicinity, but also in terms of the heightened reactions it may cause in migratory species at a later time and in a distant location following exposure. A bowhead whale exposed to seismic noise in the eastern Beaufort Sea, and then perhaps Northstar noise in the central Beaufort Sea, might be expected to react more dramatically than it otherwise would to an additional noise source (like a Barrow-based subsistence hunting boat) to the west and "downstream" in its migratory path.

The geographic scope of the study must clearly be limited. If not, one could argue that North Slope oil operations have impacts down the full length of the Haul Road to Fairbanks and along the Trans-Alaska Pipeline System to Valdez, along west coast and Asian tanker routes, and even across the nation where North Slope oil is consumed, or internationally, where the burning of hydrocarbons affects global climate. It would be simple to limit the focus to impacts occurring on the North Slope. That delineation, however, ignores the consequences of North Slope impacts on migratory subsistence species to non-North Slope communities which depend on those resources. Bering Sea subsistence whaling communities, for instance, would be as affected as North Slope communities if a significant Beaufort Sea oil spill were to impact bowhead whale numbers or the harvest quota authorized by the International Whaling Commission. We believe that the scope of the Committee's study should include the entire North Slope north of the Brooks Range, and offshore state and federal waters. It should limit analysis to impacts which occur and are felt on the North Slope, with the exception that impacts on migratory subsistence species resulting in impacts on subsistence activities off-Slope should be considered to some degree.

Defining the temporal scope of the study is also necessary. A major reason to undertake a cumulative impacts study is to address concerns about possible future activities that at some point would likely adversely affect resources or human activities. If any permitting agency feels that the current level of activities is causing unacceptable impacts, then those activities should be halted. Looking to the future necessarily requires some degree of speculation about the level, location, and timing of future activities. The study must look back to the first industrial activities that took place on the North Slope as a starting point. Given that new fields today are typically projected to have production lives of 15-30 years, and that projected field lifespans are usually extended as technology improves, the study should make an attempt to forecast impacts 30-50 years into the future. At a minimum, this study should serve as a catalyst for future ongoing studies of impacts. Only with the continual assessment of impacts will it be possible for agencies to draw the line on operations when or before it becomes apparent that a resource or human activity has suffered.

### Cumulative Impacts of Most Concern

E12

As discussed above, in the marine environment the Borough and AEWC are most concerned about the ongoing and potential effects of industrial noise on fall migrating bowheads and the fall subsistence hunt. **Attachment 1** to these comments is a figure



E12

and related text highlighting what we feel are the "direct" and "indirect" mechanisms through which offshore industrial activity affects fall migrating bowheads, the fall subsistence hunt, and the social structure of our communities.

Also in the marine environment there is an ongoing concern about the long-term (cumulative) effect of causeways on fish movement. Since people are dependant upon fish that move along the coast and then up rivers, the potential effect of additional offshore construction must be considered.

On land, among our primary concerns is the displacement of wildlife, especially caribou and waterfowl, from key habitat areas as industrial facilities expand in all directions from the core complex at Prudhoe Bay/Kuparuk. We are also concerned with restrictions on the free movement of wildlife to feeding, nesting, brooding, molting, insect relief, and other essential areas resulting from an ever-expanding web of pipelines, roads, and other facilities. We recognize that the increased use of ice roads and ice drilling pads versus the former predominant use of gravel minimizes impacts to the tundra. We also have a growing concern, however, regarding the dramatically escalating use of fresh water from lakes and rivers which provide essential habitat for important subsistence and other fish species. Native allotment holders have also expressed concerns regarding restrictions on access to their traditional hunting areas, a displacement of game from those areas, and disruption of the ability to harvest resources within broader traditional hunting areas around their holdings. Historically, the ability to restrict access within industrial areas had been formal conditions of leases and development plans. Today, access has been secured, but the experience has been diminished by the presence, noise, and disruption associated with nearby, and in some cases surrounding, facilities.

Our residents are increasingly concerned about the health of the entire arctic ecosystem, including the quality of the air we breathe and the condition of the animals we consume for food. Residents of some of our communities complain of an increased incidence of respiratory ailments, and point to a more frequently visible "arctic haze" with alarm. Some subsistence foods show increasing concentrations of heavy metals and other toxins. A warming climate has already reduced the use of ice cellars dug into the permafrost for food storage in some communities, and may affect the populations of some arctic species. A reduction in sea ice cover limits the ability of polar bears to hunt seals, their primary prey. An earlier northern retreat of the polar ice pack places hauled-out walrus farther from their feeding grounds. More thorough melting of the tundra may increase the swarms of mosquitoes and flies which plague the caribou and other wildlife, as well as humans who venture inland.

### Cumulative Effects on People

E13

Since the human residents of the North Slope are an integral part of the region's environment, it is appropriate that assessing effects upon people be an important part of the Committee's work. In recent years, some community residents have reported a decline in participation in some whaling activities (hunting, landing and butchering the whale). A significant factor mentioned by some as a major cause is the socio-cultural disruption resulting from people being worried about offshore industrial activity and its effect upon the bowhead whale and the fall hunt (see again figure and text of Attachment 1). The Borough and the AEWC have asserted for several years to the responsible agencies that community-wide stress, associated with increasing industrial activity on the North Slope, and the barrage of an absolutely overwhelming number of industry-related documents to review and meetings to attend, is having ongoing socio-cultural effects. It is the Borough which now foots the entire bill for dealing with this community stress and the social disruption which is its result. The Committee should identify areas where data are urgently needed in order to properly assess the true nature and extent of long-term cumulative effects on North Slope residents. For example, it would be valuable to determine how best to quantify the extent of stress on individuals, families, and communities caused by industrial impacts upon bowhead whales, caribou, other subsistence resources, and subsistence harvest patterns and success. It is likewise essential to determine how much socio-cultural disruption (alcohol abuse, domestic violence, etc.) is related to the industry-related anxiety. The Committee should make clear, explicit recommendations as to what must be done to obtain needed information. E13

**Quality of Impact Assessment Studies**

Over the years, many millions of dollars have been spent on the North Slope on the assessment of industrial impacts. Unfortunately, many of these studies have suffered from problems of study design and/or problems associated with over- or under-interpretation of data. The Borough has long called for peer review of impact assessment studies. This peer review should apply to study design and to interpretation of data. With others joining us in lobbying efforts, the Borough was able to convince the U.S. Arctic Research Commission that there was a problem with the quality of impact assessment in the U.S. Arctic. The Arctic Research Commission, to its credit, came to acknowledge the problem. The Commission produced a brief but helpful document entitled "Improvements To The Scientific Content Of The Environmental Impact Statement Process" as issue number 4 (December 1989) of its Findings and Recommendations series. This NRC Committee should examine this brief document.

## SUGGESTIONS REGARDING THE CONDUCT OF THE COMMITTEE'S STUDY

If the final report of the Committee's effort is to be of any value, the Committee must fully engage the key stakeholders, including responsible state and federal agencies, North Slope organizations, and the public in a meaningful way in the conduct of the study. To do so, the Committee must meet with those stakeholders, and secure their acceptance of the study's design and objectives. We cannot stress strongly enough that the Committee, or more likely, a sub-Committee, must spend time in North Slope



communities. Several visits to key communities would seem appropriate. Our community of Nuiqsut, in particular, is perhaps the community in Alaska most directly and adversely impacted by oil and gas industry operations. To get a general idea of the extent to which Nuiqsut is essentially surrounded by expanding oil and gas facilities, you need only glance at the map included here as **Attachment 2**. To get a more specific and valuable idea of what it is like to be a Nuiqsut resident who must cope on the ground and on the sea with those facilities, you must spend time in Nuiqsut.

When visiting our communities, it is important that you provide sufficient time and a forum in which information can be comfortably exchanged. We would suggest spending two or more full days in a community during any visit. Our communities are small, but by no means monolithic in their views. Specific meetings should be scheduled with officials from each of the three primary administrative bodies in any community; the municipal government, tribal government, and Alaska Native Claims Settlement Act (ANCSA) corporation. You should make the attempt to meet with elders, with whaling captains, and with whaling captains' wives. In addition to a scheduled evening public meeting, we would also suggest a more informal "open house" period when interested individuals could speak with Committee members and staff. A translator should be hired to assist you at these meetings. Some communities prefer that you arrange for a translator from their community, while others prefer that you bring someone in with you. You should seek to avoid conflicts with critical subsistence periods, special community events, and regularly scheduled community meetings when scheduling your visits. The Borough can help with these and other arrangements as meetings are being scheduled.

## SUMMARY AND CONCLUSION

Again, I want to stress that while the focus of this study for most Committee members is an interesting and important academic exercise, for the Borough residents I represent, the cumulative effects of North Slope oil and gas activities are something we live with every day. I hope you will recognize that the above comments only begin to generally cover the concerns which we have raised for many years at many meetings and in many documents. The above comments can be summarized below, and should serve only as a starting point for your inquiry and analysis.

a) The people, wildlife, and environment of the North Slope are being adversely impacted by oil and gas activities. The Inupiat people and our **traditional subsistence culture** are intimately tied to, and dependent upon, healthy wildlife populations and a healthy environment.

b) As the Committee moves ahead we strongly urge you to actively seek out and give full consideration to the comments (spoken and written) of the people of the North Slope. It is time that the **traditional and contemporary knowledge** of our people be recognized and properly considered, even in instances where it seems to be a conflict with western science.

c) As the Committee gathers information and reviews existing studies, we know that you will be disappointed (as we are) at the obvious **scarcity of quality studies regarding cumulative impacts**. We hope that the Committee will call attention to this unfortunate state of affairs. We also hope that the Committee will call for the needed cumulative impacts studies.

d) The Committee should be mindful of the **quality of the impact assessment studies** it examines. As the Committee reviews the great volume of literature related to impact assessment studies, it should not assume that such studies were well designed and their data properly evaluated. This should especially apply to the Committee's review of studies where the "bottom line" finding is "no adverse effect seen". In many cases, the quality or reporting of impact assessment studies has been poor. While millions of dollars have been spent on impact assessment studies, many are misleading due to problems of design and/or data interpretation.

e) All future impact assessment studies must be subjected to good **peer review** regarding study design and data interpretation.

f) Despite the many millions of dollars spent on North Slope studies, very little has been done to identify **long-term impacts or impacts over the shorter term from multiple stressors**.

g) Much **more work is needed to identify the nature and extent of adverse impacts** to people, wildlife and the environment.

h) It is essential that **industry-related adverse impacts to the socio-cultural framework of our communities** be quantified. These significant adverse impacts have, for too long, been ignored by industry and regulatory agencies. Our people see a link between the expanding industrial activity and the rise in socio-cultural disruption (e.g., stress, alcohol and drug abuse, reduced participation in cultural events, etc.).

i) We need the Committee's help in **identifying areas where additional data are critically needed**. This is especially true of socio-cultural impacts to our people.

j) We need the Committee's help in **developing recommendations** aimed at reducing existing impacts and slowing the advance of other impacts. It

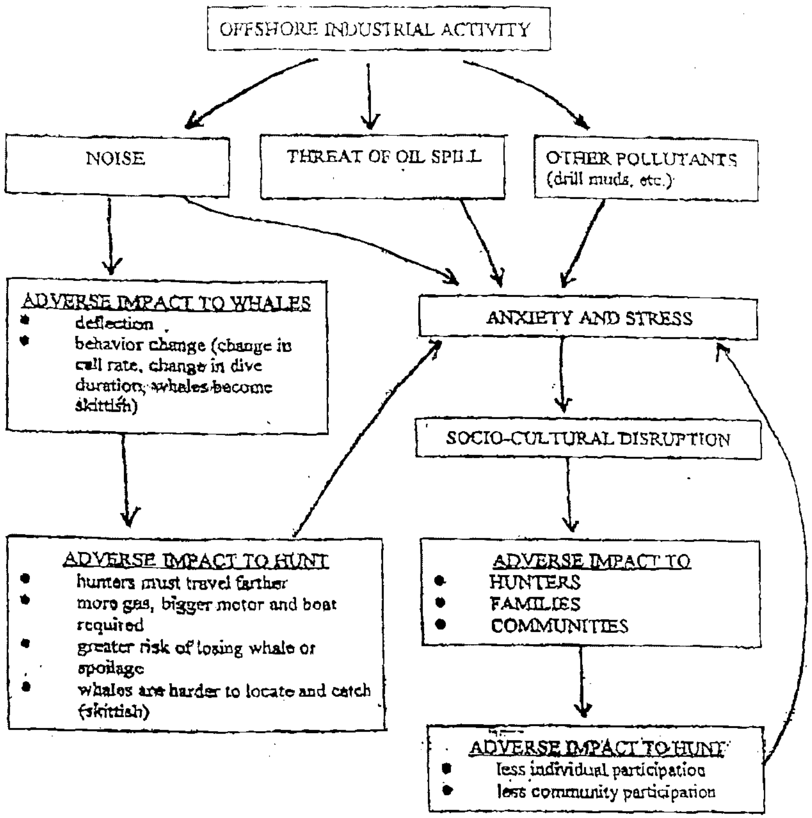


is our hope that the Committee's report will provide a blueprint for avoiding, minimizing, or providing compensation for both existing and future impacts.

As the Committee does its work we hope it will take the time needed to properly carry out its mission. We do not need another "hurried up" effort to address our problems. The existing situation calls for a good and thorough review by the Committee and a frank and detailed report. We wish you success.

Again, thank you for this opportunity to provide the Borough's input as your Committee begins its important work. I will commit to you that my Mayor's Office staff and that of appropriate Borough departments will provide as much assistance to the Committee as our resources allow over the course of the study.

Mechanisms through which offshore industrial activity has an adverse impact on fall migrating bowhead whales and an adverse impact on the Native Alaskan subsistence hunt of bowhead whales




ATTACHMENT 1

COMMENTS

1 **Offshore Industrial Activity:** has an adverse impact on fall migrating bowhead whales, their habitat, and the fall subsistence hunt resulting primarily from the following three effects:

- 1.1 noise in the water
- 1.2 the threat of an oil spill
- 1.3 other pollutants (other than oil and noise) such as drill muds and cuttings, odors, etc.

2 **Industrial Noise:** has a direct impact on fall migrating bowhead whales which in turn has an adverse impact on the Native Alaskan fall bowhead whale subsistence hunt

- 2.1 Impact to whales
  - 2.1.1 deflection from normal migratory path
  - 2.1.2 behavioral changes (changes in call rate, changes in dive duration, "skittish")
  - 2.1.3 potential loss of habitat
- 2.2 Impact to the Native Alaskan fall bowhead whale subsistence hunt
  - 2.2.1 hunters must travel farther from shore to find whales
  - 2.2.2 greater travel distance means that hunters need more gasoline, larger motors, larger boats
  - 2.2.3 the risk of losing a struck whale is greater, as is the likelihood of spoilage of some or all of the whale
    - 2.2.3.1 ice or rough seas may cause the hunters to have to cut the whale loose after it is taken
    - 2.2.3.2 meat may spoil and become unfit as food due to the greater time required for towing
  - 2.2.4 the whales are harder to find and catch due to wary or skittish behavior
  - 2.2.5 greater risk and cost in the hunt causes anxiety and stress for individuals whose role in the community it is to bring the bowhead whale to the village

3 **Noise, Oil Spill Threat, Other Pollutants Lead To:**

- 3.1 Adverse impacts to Alaskan Native subsistence society and culture
  - 3.1.1 *Anxiety and stress in* individual hunters, their families and communities due to concerns over interference with use of subsistence resources
  - 3.1.2 *Socio-cultural disruptions* to a substantial degree, are manifestations of the anxiety and stress being experienced by individuals, families and communities
  - 3.1.3 *Adverse impacts to individual hunters, their families and communities* as a result of disruptions in society and culture
- 3.2 Adverse impacts to the Native Alaskan bowhead whale subsistence hunt
  - 3.2.1 fewer individuals participating in the hunt and related activities

3.2.2 less community participation in the hunt and related activities, for example fewer people participating in the butchering of a landed whale

4 **Offshore Industrial Activity Adversely Impacts the Fall Bowhead Hunt <u>Through At Least Two Pathways</u>**

4.1 <u>Directly</u>: noise impacts displace whales and cause changes in whale behavior and these adversely affect the hunt

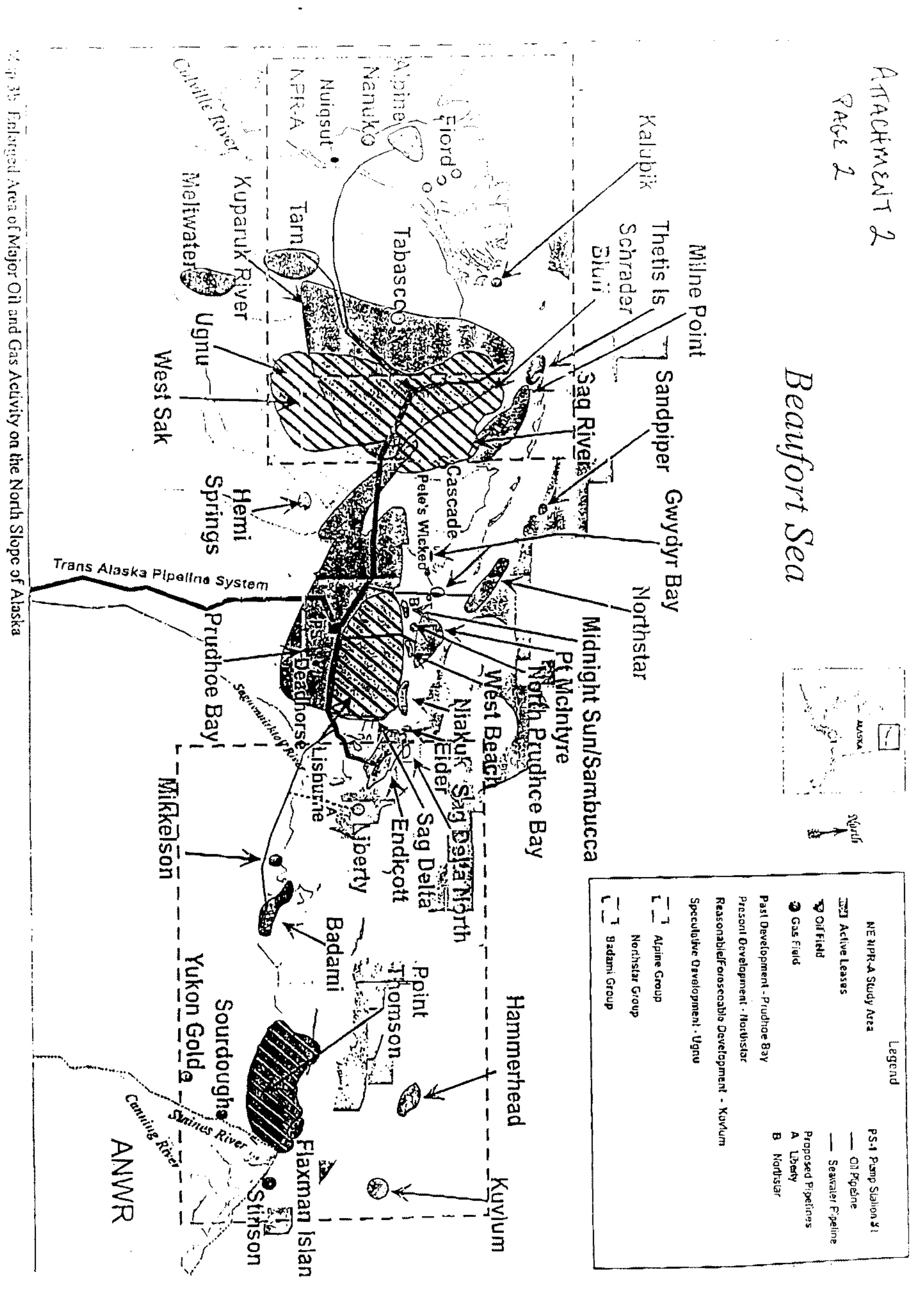
4.2 <u>Less Directly</u>:

4.2.1 anxiety and stress due to concerns over impacts to subsistence resources lead to

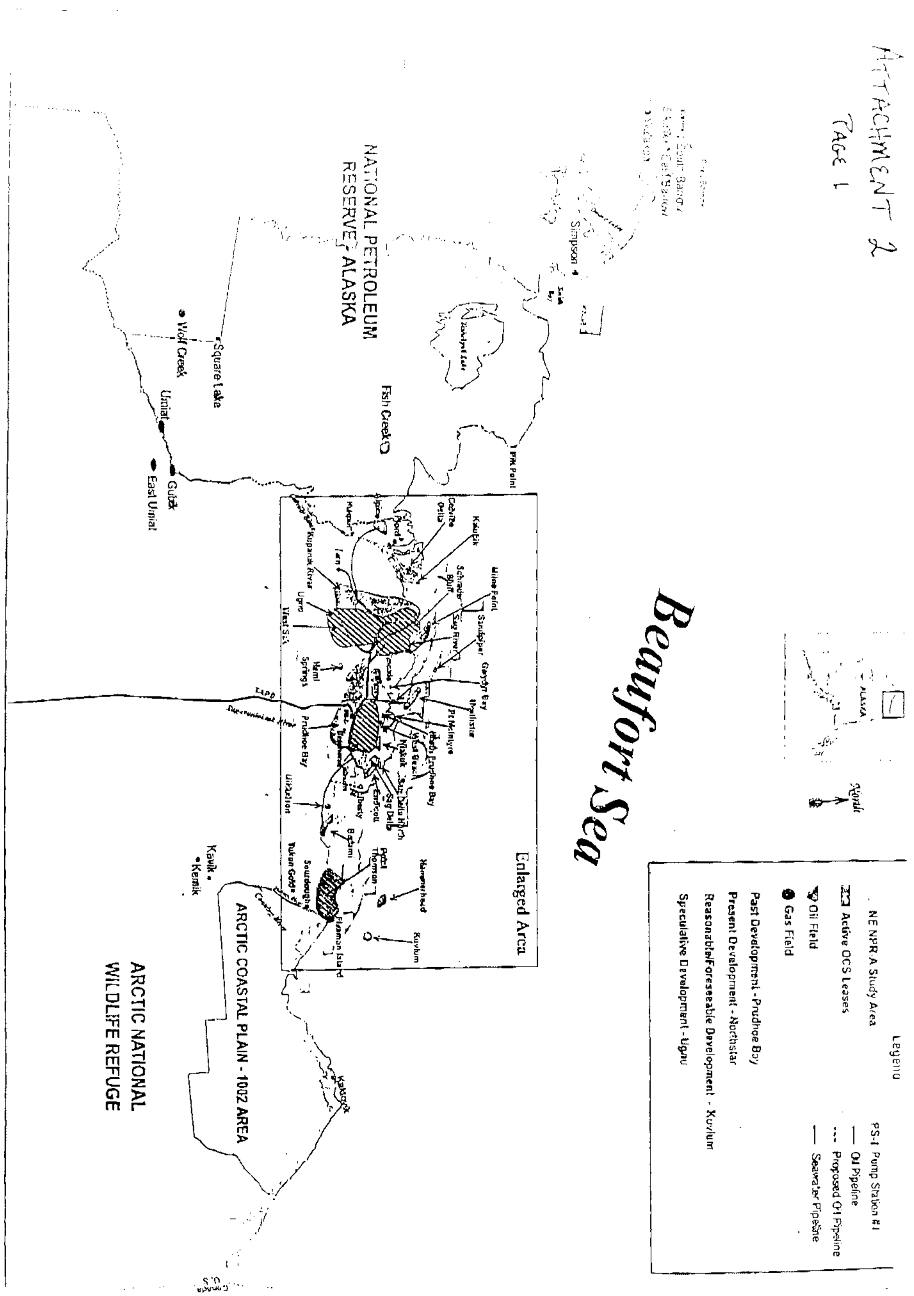
4.2.2 socio-cultural disruptions which

4.2.3 adversely affect hunters, their families and communities which

4.2.4 adversely affects the bowhead whale subsistence hunt




Map 35. Enlarged Area of Major Oil and Gas Activity on the North Slope of Alaska




Location of Oil and Gas Discoveries on the North Slope of Alaska and Federal Leases on the Outer Continental Shelf

ATTACHMENT 3

Ljungblad, D., B. Wursig, and S. Swartz. 1986. Observations on the behavior of bowhead whales (Balaena mysticetus) in the presence of operating seismic exploration vessels in the Alaskan Beaufort Sea. Present as paper #SC/38/PS1 to the Scientific Committee of the International Whaling Commission at its 1986 meeting. 45 pages.

Ljungblad, D., B. Wursig, S. Swartz, and J. Keene. 1985. Observations on the behavior of bowhead whales (Balaena mysticetus) in the presence of operating seismic exploration vessels in the Alaskan Beaufort Sea. Report prepared for U.S. Minerals Management Service, Anchorage, AK. Prepared by SEACO Inc., San Diego, CA 92106. 53 pages plus Appendix.

Ljungblad, D., B. Wursig, S. Swartz, and J. Keene. 1988. Observations on the behavioral responses of bowhead whales (Balaena mysticetus) to active geophysical vessels in the Alaskan Beaufort Sea. Arctic 41 (3): 183-194.

Richardson, W.J. (ed.) 1997. Northstar marine mammal monitoring program, 1996: marine mammal and acoustical monitoring of a seismic program in the Alaskan Beaufort Sea. LGL Report TA2121-2. Report from LGL Ltd., King City, Ont., and Greeneridge Sciences, Inc., Santa Barbara, CA, for BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD. 245 p.

Richardson, W.J. (ed.) 1998. Marine mammal and acoustical monitoring of BP Exploration (Alaska)'s open water seismic program in the Alaskan Beaufort Sea, 1997. LGL Report TA2150-3. Report from LGL Ltd., King City, Ont., and Greeneridge Sciences, Inc., Santa Barbara, CA, for BP Exploration (Alaska) Inc., Anchorage, AK, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD. 318 p.

Richardson, W.J. (ed.) 1999. Marine mammal and acoustical monitoring of Western Geophysical's open water seismic program in the Alaskan Beaufort Sea, 1998. LGL Report 2230-3. Report from LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, for Western Geophysical, Houston, TX, and National Marine Fisheries Service, Anchorage, AK, and Silver Spring, MD. 390 p.

**0132-E01**

The role of the public and/or stakeholders in the MMS decisionmaking process is described in Sections I.B.1, I.D, and III.B.1. Also see Responses 0015-001, 0130-A01, 0130-006, 132-A04, BPH 038, and NPH-A12.

**0132-E02**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0132-A01**

The MMS acknowledges the views of the North Slope Borough for leasing onshore rather than offshore. The MMS acknowledges the fact that onshore oil and gas operations on the North Slope have a longer history in the Arctic than offshore, and we acknowledge that many of the North Slope residents are more comfortable with onshore oil exploration and development than offshore. The MMS also acknowledges the harsh arctic environment on the North Slope and the concern the North Slope Borough has about any development that may adversely affect their subsistence lifestyle and culture.

The National Energy Policy was released in May 2001. It recommends opening and developing the Arctic National Wildlife Refuge as a new potential source of domestic oil and gas production. The MMS acknowledges the preference of the North Slope Borough to develop the coastal plain of the Arctic National Wildlife Refuge. However, opening the coastal plain to oil and gas activities requires congressional approval. It is beyond the authority of the agencies involved in the approval or disapproval of this project to approve or disapprove opening the Refuge. Therefore, this option is not a viable alternative for this project-specific EIS. The National Energy Policy also supports the continued development of the offshore resources in the Arctic in an environmentally safe manner. The MMS believes that all of the alternatives evaluated in this EIS can meet those goals. The MMS supports the multiple-use management of the offshore areas and is working to make offshore oil exploration and development compatible with other offshore activities, including subsistence activities.

The MMS acknowledges that the recently issued first draft of the 5-Year OCS Oil and Gas Program for 2002-2007 does not include the many areas of the OCS that have been put off limits by congressionally enacted moratoria and Executive Orders issued by former Presidents of the United States. Obviously, those areas cannot be considered for leasing as long as they are withdrawn under moratoria. The MMS does not challenge the North Slope Borough's assertion that "the biological and cultural resources of the Beaufort and Chukchi Seas, including the endangered bowhead whale and the unique Inupiat traditional subsistence culture, are as valuable and as sensitive to disruption as the resources contained within any of the withdrawn planning areas." However, MMS is committed to doing all it can to ensure that any oil and gas development on the OCS is conducted in an environmentally safe manner, with full consideration of the views and recommendations of the North Slope Borough and the villages and Native organizations of the North Slope, and with respect for and consideration of the Inupiat traditional subsistence culture.

This EIS realistically portrays the risk that an oil spill could occur and the environmental effects that are associated with oil-spill cleanup; it estimates the environmental effects of an oil spill to the resources. To be conservative, this EIS does not assume a specific level of cleanup or reduce the effects of a potential spill by assuming that part of the oil is removed by cleanup activities, even though the cleanup responses are required if a spill occurs. The MMS acknowledges that in some environmental conditions, such as during broken ice and during extreme storm events, mechanical oil-spill-cleanup success may be low. In situ burning is another cleanup tool that could be used that is very effective in certain conditions. Therefore, the EIS does not underestimate the potential effects of an oil spill. In other conditions, such as during winter, cleanup of oil either on top of the ice or entrained in the ice can be very effective.

The MMS acknowledges that preventing an oil spill is the best environmental protection. Both the design and construction of the gravel island and the subsea pipeline are required to meet high standards. The gravel island and pipeline must operate safely in the harsh environment on the North Slope. In the 5-Year Oil and Gas Program, the Secretary of the Interior must make balancing decisions that include analysis about whether certain areas of states have borne an unfair share of the leasing program. In preparing a new 5-Year Program, the Secretary develops a national offshore program, deciding where leasing should be proposed on the OCS. That decision is beyond the scope of this project-specific EIS. This project EIS also does not provide any environmental analysis pertinent to those decisions. Environmental analysis pertinent to those decisions will be covered in a separate EIS that MMS is preparing for new the 5-Year program.

This EIS evaluates the effects of the Proposal (in Section III), potential alternatives (in Section IV), mitigating measures (in Section I.H), and cumulative effects (in Section V) of proceeding with the project. The EIS treatment of cumulative effects is a substantial expansion relative to treatment of this subject in earlier MMS EIS's, based largely in response to the expressed concerns of the North Slope Borough, the Alaska Eskimo Whaling Commission, Inupiat Community of the Arctic Slope, and other organizations on the North Slope, in addition to clear expressions from individual Inupiat tribe members. Sections III and IV describe the potential effects of the Proposal and alternatives to the resources, including the bowhead whale, polar bear, and caribou, and the effects that may occur to subsistence activities and to residents on the North Slope. Section VI describes the existing environment, including unique marine areas such as the Boulder Patch. The oil industry has operated on the North Slope of Alaska since the mid-1960's and has learned to deal with the cold, dark, remoteness, and snow-whiteout conditions in addition to polar bears and grizzly bears. The MMS believes the information presented in the EIS concerning the effects of noise to whales and the effects of a potential oil spill to the resources are accurate and based on traditional knowledge and scientific information.

The EIS addresses the major issues (oil spills, noise, etc.) noted by the North Slope Borough and the effects that may occur to subsistence and to the human environment, including stress to the sociocultural systems.

**0132-A02**

We believe the EIS correctly portrays the potential risk and effects of an oil spill to the environment. Sections III.C.2 and Appendix A provide a good description of the risks and how MMS used the available data to calculate the risk of an oil spill. This information is further supplemented by the four pipeline studies that also describe risks. The effects analyses in Sections III, IV, and V assume an oil spill occurs and provide information about the effects of an oil spill to the reader. The various volumes of oil that are evaluated in this EIS are based on calculations for specific volumes of the storage tanks and pipelines proposed for the project. Together, all of this information provides the readers and decisionmakers with the best information about potential spills.

The MMS disagrees that the need for the project is overstated. The National Energy Policy that was released in May 2001 clearly states the importance of outer continental shelf development off Alaska and in the Gulf of Mexico, and from the existing leases in California. On page 5-8 of the Policy, there is a discussion of the importance of the Alaska outer continental shelf to meet the Nation's upcoming energy needs. The document goes even further to note two oil discoveries are now moving toward production. Those two projects are Northstar and Liberty.

The National Energy Policy also recommends opening the coastal plain of the Arctic National Wildlife Refuge to further exploration and development. However, that requires approval from Congress, which, to date, has not occurred.

Notwithstanding the fact that crude oil is a freely exchangeable commodity that is readily shipped around the world, each barrel of oil produced in the United States helps decrease the country's heavy dependence on foreign oil. Collectively, new domestic production can decrease, to a great extent, our dependence. Conversely, every barrel not produced domestically continues or increases our need for imports.

**0132-001**

In response to this comment, some changes have been made in the text in Section III.C.2.a(1)(b) to more accurately reflect the effect of environmental conditions on cleanup operations under the ice. The intent of the text was to state that cleanup operations under the ice are less affected by environmental conditions such as weather, wind, and waves than cleanup operations during open-water conditions.

The Oil-Spill Risk Assessment model estimates there is a 1-5% chance of an oil spill from the Liberty pipeline contacting ice/sea segments and a 15% chance of contacting Environmental Resource Area 40 over a 360-day period. Cleanup operations likely would clean up at least some of the oil. Any oil remaining after cleanup operations would be subject to weathering during the open-water season and before the fall bowhead whale migration arrived in the area. After 30 days into the weathering process, approximately 56-75% of the oil would remain (Table A-7). It is likely that most of this oil would remain inside the barrier islands. Considering this and the apparently limited effects of oil on cetaceans that have been observed during other oil spills, we believe the effects of an under-ice spill on bowheads are likely to be limited.

**0132-002**

A more complete discussion of the results of the spring and fall 2000 trials has been added to the EIS in Section III.C.1.a. Also in response to the results of these trials, BPXA has submitted an amendment to the existing Northstar spill-contingency plan implementing seasonal drilling restrictions. These seasonal drilling restrictions would prohibit the drilling of new wells and sidetrack wells from existing wells into major liquid hydrocarbon zones during recognized periods of broken ice, open water, and freezeup. BPXA will update the contingency plan to incorporate lessons learned from the 2000 trials.

**0132-E03**

Please see Responses 0132-002 and 0135-094.

**0132-003**

Alaska Clean Seas provides skimmer training with oil for their spill responders a number of times during the year in their wave tank at the Alaska Clean Seas facility. Although this does not totally simulate open-ocean conditions, it gives the spill responders a feel for the skimmer operations and how to maximize oil collection while minimizing water intake. Alaska Clean Seas technicians also have participated in research projects in Norway, where oil has been released to the ocean, and they have used prototypical broken-ice skimmers to collect it.

The MMS is working towards a full-scale oil-in-ice experiment in the arctic marginal ice zone. Our primary interest is in evaluating alternative options for oil-spill-response alternative options and supplying data to strengthen model simulations of oil-ice interactions. With MMS funding, Norwegian firm SINTEF Applied Chemistry, with considerable experience in oil-spill research, held a workshop in Anchorage in Fall 2001 as part of an effort to establish an information base upon which to make decisions regarding a full-scale experimental oil release in the arctic marginal ice zone. In subsequent meetings, it was determined that there is sufficient interest and potential funding to go forward with the project. The executive committee will issue a request for proposals from interested parties.

**0132-004**

The book *Advances in Marine Biology* mentioned in the comment includes a review by C. H. Peterson of long-term effects of the *Exxon Valdez* oil spill on shoreline biota in Prince William Sound. The part of the review about long-term effects on intertidal biota is not relevant to the Arctic, because ice yearly eliminates the intertidal biota. However, the information on subtidal biota, especially eelgrass and kelp communities, is relevant, and the assessment of lower trophic-level organisms has been updated with the information (Section III.C.2.e(2)(a)(3)).

Because the *Exxon Valdez* oil spill in Prince William Sound was almost 100 times larger than the spill assumed for the Liberty Project effects analysis, it is unlikely that comparable magnitudes of environmental damage would result from the latter spill. It is reasonable to assume that benthic food organisms in the vicinity of a spill from Liberty island or the pipeline could be affected by an oil spill. However, the areas likely affected would not be nearly as extensive as those affected by the *Exxon Valdez* spill, and comparison of video surveys of benthic habitats in several widely-separated areas of the central Beaufort Sea area suggests that there is abundant alternate habitat, at least superficially similar in appearance, available to foraging migratory waterbirds. Under these conditions of alternate food-resource availability, it is not likely that migratory waterbirds, which spend only a small proportion of the year exposed to environmental conditions in the Beaufort Sea, would experience indirect or chronic long-term effects as have some species affected by the *Exxon Valdez* oil spill, which are resident or spend lengthy periods in Prince William Sound, and whose habitat and/or prey choices were restricted considerably by the extensive coverage of the Sound by this large spill.

The "chronic" effects described in this comment would affect only local habitat areas where the oil may persist, such as in bottom sediments and shoreline soils. Arctic marine mammals and their prey are highly mobile and would not be exposed to polycyclic hydrocarbons in contaminated sediments or in shoreline habitats from a large oil spill for a sufficiently long enough time to experience these potential effects.

As pointed out in the draft EIS, the effects of an oil spill on fishes is seldom observed outside of a laboratory environment. In the majority of the cases, oil spills at sea typically have no measurable effect on fishes. It is only when the oil moves into subtidal and intertidal areas that the likelihood for adverse effects exists. At high-energy beaches having little rock armor, and where fishes are free to move about, the effects range from zero to perhaps a year for full recovery. At low-energy beaches having heavy rock armor, and where fishes are restricted to the oiled intertidal or subtidal environment, effects such as those observed in a laboratory could occur. However, to date such events appear to have been the extreme exception rather than the rule. While localized effects may continue for years in some areas due to the *Exxon Valdez* oil spill, and may be discernable at the laboratory level, the fish populations that were affected by that oil spill appear to have recovered by 1990 (Armstrong et al., 1995; Brannon et al., 1995; Peterson, 2001).

**0132-005**

Potential effects on "community structure" or species "diversity" referred to in this comment from the 258,000-barrel *Exxon Valdez* oil spill are not likely to occur from a much smaller spill of about

720-2,956 barrels (about 0.3-1.0% the size of the *Exxon Valdez* spill) assumed to occur form the Liberty Project. The following paragraphs contain resource-specific responses for bowhead whales, seals, other marine mammals, waterbirds. lower trophic-level organisms, and fish.

Considering the expected size of the oil spill, should one occur, any changes in community structure or species diversity are likely to be minimal and are unlikely to affect bowhead whales. As bowheads migrate across the Beaufort Sea, they feed opportunistically on zooplankton. The area outside of the barrier islands that potentially could be affected by an oil spill represents a very small portion of the area potentially used for feeding by bowheads.

The effects of the *Exxon Valdez* spill on river otters were studied by Bowyer et al. (1994). The animals occupied defined year-round local home ranges within shoreline habitats that were heavily oiled by the spill. These effects are not applicable to ringed and bearded seals that do not maintain local home ranges year-round but range over large areas from season to season. A large oil spill from Liberty would not contaminate a large enough area of Beaufort Sea habitat to potentially affect the "community structure" or prey-species diversity of other marine mammals in the Liberty area or in the Beaufort Sea.

The areas likely to be affected by an oil spill assumed for the Liberty Project (2,956 barrels) would not be extensive and, thus, any effects tending to decrease species diversity in local communities is expected to be restricted to a relatively small area. Comparison of video surveys of benthic habitats in several widely-separated areas suggests that there is abundant alternate habitat, at least superficially similar in appearance, available to foraging waterbirds. Under these conditions of widely available alternate food resources, it is not likely that waterbirds would experience indirect or chronic long-term effects as have some species affected by the *Exxon Valdez* oil spill that have more restricted habitat and/or prey choices.

Recent information from *Exxon Valdez* oil-spill studies has been added to the assessment of lower trophic-level organisms (Section III.C.2.e (2)(a)(3)) about the changes in community structure (species diversity). See also Response 0132-004. Lastly, no measurable changes in the community structure or species diversity of fishes are expected due to the long-term effects of an oil spill.

**0132-006**

The MMS acknowledges the problems raised by the commenter on the proper and complete use of traditional knowledge in the subsistence impacts analysis. In terms of the pages actually cited in the comment, III-C-81-84, this section deals with disturbance effects solely from the Liberty Project, taking into account the Western scientific record compiled for biological and cultural resources for the region and used in the analyses and the whole range of traditional knowledge as it is available. The scope of disturbance effects from Liberty alone would not be as extensive as much of the traditional knowledge has indicated. Liberty Island would be inshore of the Barrier Islands, which likely would deflect back much of the noise coming from Liberty activities, and Liberty Island and all the EIS island location also are well away from the bowhead migration corridor. We acknowledge that impacts from oil spills and cumulative impacts are a different matter.

The MMS is in no way trying to be dismissive of traditional knowledge and affirms the need for more collaborative efforts that involve both traditional knowledge and Western science. The North Slope Borough and the Alaska Eskimo Whaling Commission have been very instrumental in getting MMS to follow this path. The ongoing *Bowhead Whale Feeding Study* off Kaktovik, the *Traditional Knowledge Database* being compiled by UIC in Barrow, and the recently awarded *Cumulative Impacts Study of OCS Activities on Subsistence Bowhead Whaling* all are examples of a collaboration of Inupiat and Western science. Much of the mitigation in place for Liberty leases, which includes a conflict resolution process, was rewritten after an extensive dialogue with the Borough, the Alaska Eskimo Whaling Commission, and local communities. Also, based on traditional knowledge heard during the scoping process and public meetings, the use of steel sheetpile for the construction of Liberty Island was considered and analyzed as an alternative (Alternative V) to gravel bags for Liberty Island slope protection.

**0132-007**

The comment is about an unsubstantiated statement in Section III.C.2.e(2)(a)(3), describing the fate of oil under ice. The reference (Tebeau, 1987) and additional information from it have been added to the section. The comment also suggests a reference to a recent paper by Pelletier et al. (1997). The following information about the paper has been added to EIS Section III.C.2.e(2)(a)(3). Several studies with freshwater organisms have shown that sunlight makes polycyclic aromatic hydrocarbons more toxic. The recent study by Pelletier et al. (1997) showed that marine invertebrates are also affected more by polycyclic hydrocarbons under ultraviolet radiation. The enhanced phototoxicity was more obvious with heavy oils, such as Liberty crude, than with light diesel oil. The authors noted that ultraviolet radiation would not penetrate turbid coastal water. These results have been corroborated by two other studies. Shirley and Duesterloh (2001) also observed increased oil toxicity to copepods in the presence of ultraviolet radiation. Gibson et al. (2000) conclude that ultraviolet influences on food-web processes in the Arctic Ocean are likely to be small relative to the effects caused by variation in the concentrations of natural ultraviolet-absorbing compounds that enter the Arctic basin via its large rivers. A summary of this information has been added to the assessment of lower trophic-level organisms.

**0132-008**

The toxicity of oil released into the marine environment is reduced quickly by wave action and other factors. In the majority of cases, this greatly minimizes its effect on marine fishes in the area affected by a spill. It also makes it difficult to differentiate between the long-term effects of the spill on fishes and many other naturally occurring adverse influences in the marine environment. For example, the herring and pink salmon declines in Prince William Sound following the *Exxon Valdez* oil spill were found to be due to natural causes. Additional information that supports that conclusion has been added to the text.

Regarding the comment concerning oil trapped under the ice, clarification was added that during the winter, oil essentially would be trapped until spring.

**0132-009**

As discussed under in Section III.C.3.f Disturbance from Pipeline Construction and Section III.D.6.f Abandonment, trenching, dredging, and backfilling and storing excess trenching materials would increase the amount of suspended matter in the water column. As noted in the EIS, these activities are expected to displace fish temporarily from the immediate area of these activities while the activities are ongoing, and a few fish could be harmed or killed. However, none of the short-term effects due to increased turbidity are expected to continue long after the activities are completed. If there were any changes in fish migrations, they likely would occur only while the activity was ongoing and only in the localized area of the activity, and they would not be expected to have a measurable long-term effect on fish populations or migrations.

**0132-010**

The text has been revised (Section III.A.2.a(2)) to indicate that a decline in part of the coastal plain spectacled eider population could be occurring in part of the population but undetectable between individual survey years by current methodology. Such a situation negatively could affect the ability of agency managers to the determine rate of recovery from mortality caused by an oil spill.

**0132-011**

The text has been revised (Section III.c.2.c) to indicate that the vulnerability of king eiders is higher during spring migration in dense flocks.

**0132-012**

The text has been revised (Section III.c.2.c) to indicate the vulnerability of the red phalarope. The statement concerning potential mitigation procedures has been added. The remainder of the comment simply restates what is discussed in the paragraph.

**0132-013**

The referenced Summary and Conclusions section is not the appropriate place to discuss in detail the limitations of the Fish and Wildlife Service bird-oil-spill model. This is done in Section III.C.2.c. The correlation proposed by the commenter between the availability of little data covering a limited part of the year and few impacts (few birds present to be contacted by an oil spill) is not necessarily valid. If the aerial surveys were made during periods when typical (average) numbers of birds were on the water, they would fairly represent the contact potential for birds during those periods. The major problem with the model is that the modeled bird distribution probably does not accurately represent that out in the environment, which generally is more patchy than the even distribution used in the model. However, even this is a variable problem because, if the modeled oil spill covers a large area, it eventually will contact many birds, whether they are evenly distributed or clumped. The lack of Fish and Wildlife detection of any significant decline in the spectacled eider population noted by the commenter was determined by onshore nest surveys, not the offshore surveys undertaken to obtain data used in the bird-oil-spill model. The referenced sentence concerning population decline has been incorporated in a more appropriate discussion in this section.

**0132-014**

The referenced sentence implies that eiders may find food elsewhere, if food organisms in their currently occupied area are reduced by contact with oil, and not that the effects of a spill may be avoided by eiders disturbed by a spill and response activity, although that may occur by default. The sentence indicating uncertainty about whether eiders disturbed by an oil spill or response activity will move to another area has been included in Section III.C.2.c.

**0132-015**

Although small numbers of Steller's eiders have been observed onshore as far east as the Sagavanirktok River, it is unknown whether they use offshore Beaufort Sea waters and, if so, what their distribution is. Thus, it would be highly speculative to estimate how vulnerable this population might be to oil spills, particularly because the MMS Oil-Spill-Risk Assessment model estimates that the probability of oil spilled at Liberty contacting areas as far west as the Colville River Delta within 60 days is less than 3%, and beyond western Harrison Bay, it is less than 0.5% (Tables A-12, A-13). Also, after 30 days, and certainly after 60 days, oil has weathered significantly and is substantially less toxic. Wording regarding the vulnerability of Steller's eiders to oil spills has been added in Section III.C.2.a(2).

**0132-016**

The referenced sentence was not intended to imply that all oil-spill-response operations would cease if one method was found to cause additional harm to spectacled eiders. The intent was to suggest that if a tactic (hazing, for example) was resulting in more mortality than the spill, its continued use would be counterproductive to accomplishing the overall objective of saving eiders. Clarification and a reference to the Alaska Clean Seas Technical Manual (Alaska Clean Seas, 1998), which would govern spill response, has been added to Section III.C.2.a(2); a summary of response tactics is included in Appendix K of the EIS.

**0132-017**

It is unrealistic to expect that the ability to locate all spectacled eiders in a particular area of the Beaufort Sea be a requirement of developing the Liberty Project given the small probability of a spill occurring, the small population likely to be in a spill footprint, and the small probability that a spill would contact areas where eiders have been observed or tracked by telemetry in past studies. Should a spill occur, we expect that established tactics for protecting birds would be employed anywhere concentrations occurred; the focus would be on loons, sea ducks, and phalaropes, as appropriate, which would protect all species in a particular area. The referenced sentence has been modified in Section III.C.2.a(2) to indicate what general spill procedure likely would be followed.

**0132-018**

The referenced sentence has been revised to expand probable season of eider occurrence.

**0132-019**

The supposed contradiction in the referenced paragraph (Section III.C.2.c) is not evident. Obviously, the category "most species" that will not require lengthy recovery periods following relatively small losses is not intended to include loons and sea ducks whose populations are declining and/or have a limited capacity for population growth and, therefore, would recover slowly from oil-spill mortality.

**0132-020**

The referenced section regarding predators/predation has been revised (Section III.C.3.c) with an added discussion on the potential for increased predation pressure from specific predators as a result of industry presence.

**0132-021**

The paragraph in Section III.C.3.c has been revised to clarify the potential disturbance effect of vessels and lack of much pertinent information to address this issue.

**0132-022**

The referenced paragraph in the subsistence section (III.C.3.h) on disturbance has been revised to clarify the expectation of small losses concerning disturbance effects on birds in offshore areas and encourage investigation of appropriate mitigating measures.

**0132-023**

The text has been revised to include walruses and beluga whales in the EIS. Although spring lead systems do occur occasionally across the Beaufort Sea southeastwardly to the mid-Beaufort Sea, these leads shown in the National Oceanic and Atmospheric Administration image are very transitory and they close within hours or days. A spill from Liberty that might occur during the winter likely would remain encapsulated in the ice during the spring migration of belugas and not contact either the ice leads or the whales.

**0132-024**

The removal of whale carcasses, oiled or not, from Cross Island or other areas in the event of an oil spill from Liberty could be attempted to prevent polar bears from congregating in the spill area. The number of carcasses of oiled birds from a large oil spill is not expected to attract large numbers of bears. These oiled carcasses are not likely to persist for more than 1 year, because the flesh of the animal would be broken down by bacteria and invertebrate scavengers during the open-water season. Only a fraction of the birds oiled and killed by the spill are likely to reach the shoreline, where they would be available for scavenging by bears (Piatt et al., 1990). Most of the oiled carcasses would sink to the ocean bottom.

Some oiled carcasses could be entrained in the ice and persist over the winter and be available to scavenging by bears. However, the number of incidences where bears would have the opportunity to scavenge on oiled bird or seal carcasses from a large oil spill is expected to be low. The number of polar bears affected by oiled carcasses is expected to be few and not have long-term effects on the bear population. The *Exxon Valdez* oil spill had no detectable effect on brown and black bear populations, even though these bears were observed scavenging on oiled carcasses (Lewis 1993).

**0132-025**

The number of "bivalve" prey and bottom sediment habitats of bivalves potentially affected by a large oil spill is likely to be small and not affect the availability (or abundance) of these prey to bearded seals that are widely distributed in the Beaufort Sea. Bearded seals that occur in the Liberty area are transitory and do not rely on local bivalve populations. Any potential local reduction in bivalve productivity that may be related to the spill is not likely to have a measurable effect on the bearded seal population.

**0132-026**

Although amphipods may be a primary prey of ringed seals locally when the prey are very abundant, the number of amphipods potentially affected by a large oil spill is not likely to have an effect on the availability of this prey to the ringed seal population in the Beaufort Sea. Ringed seals that may be foraging on amphipods in the Liberty area where this prey abundance could be reduced during the year of the spill would forage in other areas where amphipods were not reduced.

**0132-027**

The MMS has tried unsuccessfully to locate the information cited by the North Slope Borough. We have asked the North Slope Borough for copies of the information they referenced; however, we have not yet received the information.

**0132-028**

This reference has been included in the revised discussion on feeding in Section VI.A.1.a(1).

**0132-029**

The revised discussion on feeding in Section VI.A.1.a(1) includes additional discussion on bowhead feeding during both the spring and fall migration. In many instances, bowheads appear to feed opportunistically where oceanographic conditions produce locally abundant food. The location of many of these areas appears to change from year to year. The discussion of potential oil-spill effects to the whales in Section III.C.2.a(1)(b) already considers the possibility that oil could contact important bowhead habitat and includes a discussion on the effects of oil on ingestion of oiled prey, inhalation, reduced food supply, baleen fouling, and displacement from feeding areas. The estimated chance of oil contacting areas that are important habitat to the bowhead is based on the Oil-Spill-Risk Analysis model.

**0132-030**

The text in Section VI.A.1.a(1) does, in fact, include statements from subsistence hunters about whales appearing inside the barrier islands. Specifically, the subsistence hunters refer to whales observed inside of the barrier islands near Cross Island and sometimes between Seal Island and West Dock. Thomas Brower, Sr., was less specific and referenced crews from commercial whaling ships looking for whales near the barrier islands and in the lagoons inside the barrier islands. The National Marine Fisheries Service, citing V. Nageak in the draft Arctic Region Biological Opinion (USDOC, NOAA, NMFS, 2001), stated that bowheads reportedly travel on the inshore side of Cross Island. The MMS found no references stating that bowheads travel in the vicinity of the Liberty Island location.

The MMS believes that vessel and aircraft traffic inside the barrier islands for activities associated with the Liberty Project are unlikely to affect bowhead whales. The vast majority of bowhead whales will be seaward of the barrier islands, although a few whales may enter waters inside the barrier islands. Whales observed in the entrance channels between the barrier islands and the whales reported to swim on the inshore side of Cross Island are beyond the distance at which sounds are likely to be detected. Vessel and aircraft activities would be primarily between the mainland and the island location and would not be close to the areas where whales have been reported. With the exception of noise measurements from the self-propelled barge used at Northstar, most noise from activities associated with gravel island construction, generator noise, etc., has not been detected beyond 10 kilometers. The distance from the Liberty Island location to where whales have been observed is greater than 10 kilometers. While it is possible that some individual whales could approach close enough to hear sounds associated with the Liberty Project, it is unlikely they would be adversely affected by the sounds.

In addition, this comment also referred to whales avoiding seismic noise. There is no seismic-survey activity associated with the Liberty Project.

**0132-031**

Additional wording from the North Slope Borough Science Advisory Committee report has been added to the text in Section VI.A.1.a(1).

**0132-032**

This is not a comment but a lead in to the comment that followed this paragraph.

**0132-033**

There is no discussion about seismic in the text in Section III because, as the commenter noted, "no seismic activities are planned for Liberty." The discussion about the effects from Liberty activities in combination with seismic surveys can be found in Section V.C.1.a(2). It should be noted that while it is possible that up to four seismic operations and multiple exploratory drilling operations could occur in a single season, it is highly unlikely, particularly during the bowhead whale migration.

**0132-034**

A change was made in the text in Section V.C.1.a(2). The text now states “Inupiat whalers have observed and reported that noise from some drilling activities, especially drilling from drillships with icebreaker support in the main migration corridor, displaces whales farther offshore away from their traditional hunting areas. Inupiat whalers also have observed and reported that noise from seismic activities displaces whales farther offshore.” The MMS fails to see any misrepresentations in these statements as previously worded. Nothing is said in these statements about uninformed opinions. In fact, the acoustical monitoring studies conducted in recent years specifically looked at bowhead whale avoidance of seismic operations and possible deflection of whales farther offshore, in part as a result of comments made by Inupiat whalers at the Arctic Seismic Synthesis and Mitigating Measures Workshop held in Barrow in March 1997. The next paragraph in the EIS text discusses the new information about the effects of seismic noise on bowheads. Finally, the annual peer review workshop held at the National Marine Fisheries Service marine mammal laboratory in Seattle critiques the study conducted the previous year and provides guidance for the study to be conducted in the following open-water season. Much of the guidance at that meeting is aimed at determining how far offshore whales are displaced, where the deflection point is, and where the normal migration pattern resumes.

**0132-035**

Some changes have been made in the text in Section V.C.1.a(2)(b).

**0132-036**

The statement in question in Section V.C.1.a(2) has been modified to reflect that these were earlier studies conducted in the 1980’s. A discussion of the recent studies mentioned in the comment is already included in the text.

**0132-037**

The text in Section V.C.1.a.(b) has been revised.

**0132-038**

The 7.5-kilometer distance for whales avoiding seismic operations came from studies during the 1980’s and is still valid. There were other studies besides those by Ljungblad that provided data on distances at which whales avoided seismic noise. These studies are also included in the National Marine Fisheries Service’s 2001 Arctic Region Biological Opinion. Richardson provided a brief comparison between observations from seismic studies conducted in the 1980’s and the 1996 seismic survey at the Arctic Seismic Synthesis Workshop in Barrow (USDOI, MMS, 1997a). Observations from earlier seismic studies during the summer and early autumn show that most bowhead whales interrupt their previous activities and strongly swim away when a seismic ship approaches within about 7.5-8 kilometers. At the distances where this strong avoidance occurs, received levels of seismic pulses typically are high, about 150-180 dB re 1 μPa. The surfacing, respiration, and dive cycles of bowheads engaged in strong avoidance also change in a consistent pattern involving unusually short surfacing and diving and unusually few blows per surfacing. These avoidance and behavioral effects among bowheads close to seismic vessels are strong, reasonably consistent, and relatively easy to document. Less consistent and weaker disturbance effects probably extend to longer distances and lower received sound levels at least some of the time. Bowheads often tolerate much seismic noise and, at least in summer, continue to use areas where seismic exploration is common. However, the same pattern of change in surfacing, respiration, and diving cycles sometimes has been seen in bowheads as much as 73 kilometers from seismic ships. Most of these whales were engaged in seemingly normal activities and were not swimming away from the seismic boat. However, at least one case of strong avoidance has been reported as far as 24 kilometers from an approaching seismic boat. Richardson noted that many of the observations involved bowheads that were not actively migrating. It appears that actively migrating bowheads may react in a somewhat different manner than bowheads engaged in feeding or socializing. Migrating bowheads, for instance, may react by deflecting their migration corridor away from the seismic vessel. It also should be noted that the locations where seismic operations have been conducted in recent years (generally nearshore) is different than many of the seismic surveys conducted in the 1980’s and the equipment used is different. Richardson and Malme (1993) noted that strong avoidance may occur infrequently at distances of 20 kilometers or more (Koski and Johnson, 1987), although active avoidance usually does not begin unless the seismic ship is closer than 8 kilometers.

The whaler’s testimony from the Arctic Seismic Synthesis Workshop in Barrow has been added to the text in quotes for clarification so there can be no confusion about what was said.

It is not clear why the commenter believes that seismic operations conducted in 1996-1998 did affect subsistence whaling. During the 1996-1998 bowhead hunting seasons, seismic operations were moved to locations well west of Cross Island, the area where Nuiqsut-based whalers hunt for bowheads (Miller et al., 1999). This was done under the provisions of the Conflict Avoidance Agreements established between industry and the hunters in 1996-1998. No perceived interference between seismic operations and hunting was reported either in 1998 or in 1996-1997 (Miller et al., 1999). This information has been added to the text in Section V.C.1.a(1)(b) and the statement in the text was revised for clarification.

**0132-039**

The text in Section V.C.1.a has been expanded to provide additional information. The statement was oriented towards noise from drilling and dredging activities.

**0132-040**

Information from recent studies (Miller et al., 1997, 1999; Miller, Elliot, and Richardson, 1998) is already included in the text. Additional information from these recent studies and other studies has been added to the text in Section V.C.1.a.

**0132-041**

The first statement “Barge traffic continuing into September could disturb some bowheads” is accurate as written. Barge traffic will be in the western to central portion of the Beaufort Sea and should be completed before the bowhead migration reaches that area, unless there are severe ice conditions. Although some bowheads may begin to move into the Alaskan Beaufort Sea in August, bowheads generally have not migrated to the western portion of the Beaufort Sea that early into the season. The major part of the migration typically occurs from mid-September through mid-October.

The change suggested for the second statement has been made in Section III.C.3.a(1)(a).

**0132-042**

The text referenced in this comment includes generalized statements of effects on bowheads as suggested in subtitle 1). The specific effects of industrial activities, including displacement, are discussed in Section III.C.3.a(1)(b)1a) through Section III.C.3.a(1)(b)1e). The specific effects of industrial activities associated with the Liberty Project, including displacement, are discussed in Section III.C.3.a(1)(b)2a) through Section III.C.3.a(1)(b)2d). Seismic surveys are not part of the

Liberty Development Project and are not discussed here. Seismic surveys, including recent studies showing displacement of the migration, are discussed in cumulative effects, Section V.C.1.a(2).

**0132-043**

The analysis of oil-spill effects on bowhead whales represents the expected effects on whales without the occurrence of any cleanup operations. The analysis does not take into account any oil that would be recovered through cleanup operations. Also, see Responses 0145-A02 and 0132-002.

**0132-044**

It is questionable whether studies on the effects of oil on polar bears and sea otters are pertinent and transferable to a discussion of the effects of oil on cetaceans. The effects of oil on other cetaceans likely are pertinent and a number of these studies are discussed in the text. The discussion of the morphological and microbiological characteristics of the bowhead presented in the text portrays the results of the study. Information about the conjunctival sac of the bowhead eye has been added to the text in Section III.C.2.a(1)(b).

**0132-045**

The MMS has tried unsuccessfully to locate the information cited by the North Slope Borough. We have asked the North Slope Borough for copies of the information they referenced; however, we have not yet received the information.

**0132-046**

The expected effects of spilled oil on bowheads discussed in the text is based on the Oil-Spill-Risk Analysis model's estimated chance of spilled oil contacting bowhead habitat as well as various studies on the effects of oil on cetaceans from other oil spills, including the *Exxon Valdez* oil spill. In addition, modeling studies were conducted in conjunction with the 5-year OCS lease sale schedule for 1987-1991. That 5-year schedule included two lease sales in the Beaufort Sea (97 and 124) and two lease sales in the Chukchi Sea (109 and 126). The modeling studies predicted the greatest number of contacts would occur in the Beaufort Sea, but that no encounter involved more than 1.9% of the population. Whether bowhead whales would come into contact with oil would depend on the location, timing, and magnitude of the spill, the presence and extent of shorefast and broken ice, and the effectiveness of cleanup activities. Based on studies on the effects of oil on cetaceans from other oil spills, including the *Exxon Valdez* oil spill, and the available modeling information, MMS concludes that spilled oil "could" kill some whales. The existing information does not support a conclusion that spilled oil "is likely" to kill some whales. The effects of oil on whales is not likely to be comparable to the effects of oil on birds, polar bears, and sea otters.

**0132-047**

Additional information about the possible effects of inhalation of hydrocarbon vapors to cetaceans has been added to the text in Section III.C.2.a(1).

**0132-A03**

The MMS has tried unsuccessfully to locate the information cited by the North Slope Borough. We have asked the North Slope Borough for copies of the information they referenced; however, we have not yet received the information. Therefore, we are unable to describe and discuss the detailed study about the bowhead whale eye and conjunctival sac in the EIS.

**0132-048**

There is no intent to downplay the potential threat of oiling to bowhead whales. The MMS has presented the results from pertinent studies in the text. The majority of the text written is the viewpoint of the author of the referenced study rather than the viewpoint of MMS.

The text has been changed in Section III.C.2.a(1)(b) to better reflect what the authors said in the study by Geraci and St. Aubin. The revised text uses the authors' wording: "70 % of the oil adhering to baleen plates was lost within 30 minutes. In 8 of 11 trials, over 95% of the oil was cleared after 24 hours." The authors seem to indicate that the oil was washed off the baleen plates. They did not specify that the oil ended up in tangles of baleen hair. The issue of ingestion of oiled baleen filaments is discussed in the section on effects of ingestion.

The reference to Braithewaite's (1983) work using a "simple system" is from Bratton et al. (1993), who compared Braithewaite's work and Geraci and St. Aubin's work. Although not included in the EIS text, Bratton referred to Geraci and St. Aubin's work as "a more elaborate series of experiments" that analyzed sections of baleen for "physical and chemical changes in constitution, as well as in functional capabilities, after a exposure to a variety of forms of petroleum".

Geraci (1990) described Braithewaite's study and some of the deficiencies or perceived deficiencies with the study. "Details of the experimental protocol are not entirely clear. It appears that most of the 45 or more oil-fouling tests were performed with a single sample of baleen with no information on whether control values were re-established following each successive fouling test." Geraci stated that the "water pressure was curiously low: the system was gravity fed by a constant water column of only 7.5 cm over the baleen plates." "An experimental run was considered valid only if the thickness of the oil coating remained uniform during the test. That was required for the purpose of analyzing data, and was not intended to be a realistic portrayal of a fouling pattern". It also should be noted that the baleen was placed and tested in a horizontal position, rather than in a vertical position. Considering the quality of the Braithewaite study, the statement by Geraci and St. Aubin, (1985) that the concern for oiled whales (baleen fouling) is becoming less defensible based on the low-level immediate impact in Braithwaite's study and the rate of clearance of oil in this study, appears valid.

The MMS would not argue whether or not a 5-10% decrease in efficiency of the baleen is significant. It should be noted that there was a reduction in filtering efficiency in all cases, but only when the baleen was fouled with 10 millimeters of oil (on a horizontal piece of baleen) was the change statistically different. Braithewaite appeared to think the biological consequences may not be extreme, although he cautioned that it is not known exactly how such reduction would affect an individual whale's overall health or energy acquisition. Perhaps another question of equal importance to ponder when considering the validity of this study is how accurate those numbers actually are that pertain to the decrease in efficiency.

**0132-049**

The suggested change was made to the text in Section V.C.1.a(2).

**0132-050**

No distinction was intended between Western and Inupiat perceptions of the tainting or contamination of food by an oil spill. The intent was to show the importance of bowhead whales in the traditional subsistence round. The statement "culturally unavailable for use" reflects a particular sensitivity or mistrust of tainting by Alaska Natives as it relates to water quality and subsistence resources. This sensitivity was shown following the *Exxon Valdez* spill when Western scientific testing methods showed resources to be safe yet Alaska Natives still clearly perceived contamination.

The text in Section III.C.2.h has been changed to include the concern about potential International Whaling Commission action to reduce the quota in case of a spill event to protect the bowhead population. The text also has been changed to reflect the comment that some subsistence areas indeed would become unavailable for use following a major spill.

**0132-051**

There was no intent to downplay the effects of the 1944 oil-spill event related by Thomas Brower, Sr. The text in Section III.C.2.h has been changed to stress the seriousness of this event to Barrow residents.

**0132-052**

The text in Section III.C.2.h has been changed to reflect a broader species and geographic scope to oil spill tainting.

**0132-053**

The text in Section III.C.2.h has been changed to make the description of oil-spill-cleanup effects clearer.

**0132-E04**

The potential effects of developing the Liberty Prospect are analyzed in Section III. The effects of past, present, and reasonably foreseeable oil and gas development on the North Slope and in the Beaufort Sea are analyzed in Section V. The characteristics of the human, biological, and physical environment in and adjacent to Foggy Island Bay are described in Section VI.

**0132-054**

See Responses 0130-003 and 0130-006 for discussions about the efforts to monitor and quantify adverse impacts to local communities.

**0132-E05**

The effects of pipelines on caribou movements are described in Section V.C.4.b(3). The effects of noise on bowhead whales are described and analyzed in Section III.C.3.a(1), and the effects on subsistence harvests of the bowheads are analyzed in Sections III.C.3.h and i.

**0132-055**

The MMS believes that its cumulative effects analysis does sufficiently discuss multiple simultaneous and sequential activities, and that the range of possibilities discussed is a fair snapshot for future exploration and development. A third development project in the offshore is not necessarily a "given" within the next several years, and programs have tended to become smaller in scope and closer to shore. Conflict avoidance agreements are encouraged for the operations mentioned; they likely would be in force in the month of September and likely would preclude disturbance of the magnitude hypothesized.

**0132-A04**

The Liberty EIS does address cumulative impacts on the human environment in Section V.C.9 Cumulative Effects on Sociocultural Systems and Section V.C.14, Cumulative Effects on Environmental Justice. These analyses point out that long-term effects from oil development could alter subsistence-harvest patterns, cause increases in social pathologies, and displace social systems, but that these practices would not dislodge them from the Inupiat culture—they would continue. These analyses also point out that cumulative effects in Nuiqsut could be significant. The entire discussion acknowledges the increased stress that the Inupiat are enduring because of increased oil activity on the North Slope. The MMS acknowledges the need for impact assistance to mitigate some of the real and perceived impacts of oil development on the North Slope. Representative Young's CARA bill is again being considered.

The MMS acknowledges sociocultural cumulative impacts on the North Slope and that Inupiat culture has undergone significant change. The influx of money and a changing landscape due to wage employment has added many benefits and raised the standard of living, but it also has given rise to an array of social pathologies that include increased alcoholism. However, cumulative effects are difficult to separate and, by far, most cumulative effects result from *onshore* activities as the oil patch has spread outward from Prudhoe Bay/Deadhorse.

One point that was made numerous times at a Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities convened by MMS in April 2001 in Anchorage, was that any realistic analysis of cumulative effects on the North Slope needs to consider both onshore and offshore effects. To date, the most obvious cumulative effects have occurred and continue to occur onshore although no adequate monitoring or comprehensive baseline data gathering has ever been undertaken onshore by responsible Federal and State agencies and industry. Most of the stress factors mentioned by local stakeholders can normally be associated with onshore impacts. Until a serious monitoring program is developed onshore, causal linkages to impacts from onshore or offshore sources will be problematic.

The MMS believes there is a need for a standing interagency-intergovernmental working group that includes local and regional North Slope governments, State and Federal land management agencies, and industry to consult, coordinate, design, and monitor solutions to subsistence and sociocultural cumulative impacts on- and offshore. Prospective members of such a group would be industry, the MMS, the National Marine Fisheries Service, the Fish and Wildlife Service, the Environmental Protection Agency, the Corps of Engineers, Nuiqsut, Kaktovik, and Barrow tribal governments, the Alaska Eskimo Whaling Commission, the Inupiat Community of the Arctic Slope, North Slope Borough Wildlife Management, and the State of Alaska. Such a body would better serve the concerns of subsistence hunters and lead to more balanced decisions on approaches to long-term monitoring and the proper assessment of oil activity cumulative impacts on subsistence resources and sociocultural and subsistence harvest practices. After its recent lease sale in the National Petroleum Reserve-Alaska, the Bureau of Land Management established an NPR-A Subsistence Advisory Panel and Interagency Research and Monitoring Team that includes the Bureau of Land Management, the Fish and Wildlife Service, other Federal agencies, the State of Alaska, the North Slope Borough, and local North Slope groups who meet to address local subsistence concerns. A similar but smaller offshore panel could be developed.

In its November 2001 meeting, the OCS Policy Committee discussed the possibility of the Department of the Interior determining a way to provide funding to tribal and local governments to facilitate their participation in DOI planning and decision-making processes. Without funding, these executive orders are perceived by the Native community simply as new "unfunded mandates." Funding of this nature would ameliorate some of the stress caused in small Native villages from the burden of participation in agency public process.

The recently awarded Quantitative Description of Potential Effects of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea study was developed in response to concerns raised by the Alaska Eskimo Whaling Commission and the North Slope Borough. This study will involve a systematic analysis of residents' observations and perceptions about how their lives and especially subsistence whale hunting activities have been and in the future might be affected by oil industry activities and other forces of modernity.

On April 5-6, 2001, the MMS held The Bowhead Whale Subsistence Hunt and Outer Continental Shelf Oil and Gas Activities Research Design Workshop in Anchorage. This workshop was requested by the National Marine Fisheries Service and the Alaska Eskimo Whaling Commission to better focus scientific research on the cumulative effects of outer continental shelf activity on bowhead whales and their migration, as well as the sociocultural dimensions of the subsistence whale hunt. Recommendations from the workshop identified: (1) the need for extensive funding to effectively study the complex relationship between outer continental shelf and onshore socioeconomic effects; (2) that effective monitoring is necessary to document and analyze industry and whaling activities and the many factors of change in local communities; (3) that defining and disaggregating (on- and offshore) cumulative social effects will be a difficult process; and (4) that defining the relative causal effect of any given factor—such as outer continental shelf oil and gas activity—on social problems is problematic. Participants agreed that available resources would better be applied to researching means of prevention, intervention, and treatment of social problems in North Slope Native communities.

While these efforts in themselves will not resolve the larger problems of ongoing cultural challenge to Inupiat traditions from increasing development in the region and from the powerful influences of modernity--such as cable television, the Internet, and an increasing dependence on a wage-based economy--they provide processes for information sharing and opportunities for mutual decision-making and remediation of cumulative social and subsistence impacts.

Additionally, The MMS acknowledges that participating in the EIS process takes time, and even attending public hearings has an impact on the public. The MMS cannot change the Council on Environmental Quality requirement for "public involvement" in the information presentation and decision process. However, MMS tries to ease the burden on some for the public by making this review process as efficient and conducive to public participation as possible. This includes scheduling hearings to avoid the spring and fall whaling seasons. The MMS holds hearings in each village, and the agency assumes the burden of travel, not the public. We prepare an executive summary to provide a good, comprehensive overview of the EIS, so that readers can focus on key parts rather than having to read the entire document. In response to the North Slope Borough, MMS extended the review and comment period by 30 days so these hearings would not interfere with Native celebrations. We publish the executive summary as well as the full EIS document (both printed and in CD-ROM). We accept comments at the meetings, over the Internet, and by mail. We also have meetings with elected officials from the North Slope Borough and village and tribal leaders to gather information, receive comments, and hear concerns.

While these reviews and participation in the public process require time, the agency decisionmakers and the public benefit from the efforts. The MMS is willing to explore better and more effective ways to communicate with the public to reduce the stress associated with such meetings. We have modified the structure of the hearings to allow for more two-way communication to provide immediate responses to certain questions at the meetings, rather than just holding meetings where public officials receive public testimony.

**0132-056**

The transportation figures calculated in Table V.B-8 are round trips. The figures represented in this table are a "best guess" at what logistics traffic levels will be; disruptions to the norm always are a possibility. Regarding mitigation limiting aircraft/vessel restrictions during certain times of the year, vessel movements should be so structured as to minimize effects to the environment. Once the developmental/construction phase is complete, transportation requirements for each of these projects will drop sharply. Whether there are 10-20 round trips or 20-40 transits per day during construction, the level of effect on marine and terrestrial mammals is expected to be the same. There is no evidence that similar levels of traffic associated with Northstar development had any measurable effect on seals, whales, and polar bears based on Northstar monitoring studies (Richardson and Williams, 2001). It should be relatively straightforward to mitigate the assumed worst-case scenarios for birds; that is, to route most trips around barrier islands through most of the summer, and schedule the heaviest traffic periods outside the period when most waterfowl molting and migration is underway.

**0132-057**

Please see Response 0135-087.

**0132-E06**

The MMS believes it has used the best data available to describe and analyzed the effects of the component alternatives. This analysis includes both information from the Native North Slope residents (traditional knowledge) and from engineering and scientific studies.

**0132-058**

Several commenters, including the North Slope Borough, Environmental Protection Agency, National Marine Fisheries Service, and others suggested the development of an additional island alternative and pipeline route closer to shore. The North Slope Borough suggests "such an alternative island site … be in a zone within which the conditions are such that the predicted effect to some resources could be reduced. If the island could be located in the grounded ice zone, for instance, the risk of ice gouging, and therefore a pipeline rupture, and oil effects on resources would be reduced." The North Slope Borough also states "There must be some point closer to shore than the identified southern island location where it would still, if just barely, be technically and economically feasible to proceed with the project."

During the development of the draft EIS, MMS and other Federal and State Agencies spent considerable time and effort discussing and evaluating various island alternatives. The objectives identified by the North Slope Borough essentially are the same as those used by MMS and the Interagency EIS Team to identify potential island alternatives. Generally, alternative island locations that provided benefits to other resources (for example, bottomfast ice and onshore) were found to be economically and technically infeasible. The Fish and Wildlife Service and National Fisheries Management Service suggested MMS look at an island location in 8 feet of water. This island location still would require extensive use of extended reach drilling to complete many of the wells. The rationale for why island locations requiring wells in excess of 23,000 feet are not technically feasible is provided in Appendices D-1, D-2, and D-3. Because this proposed island location would require many wells in excess of the 23,000-foot distance from the reservoir to develop and produce, MMS came to the same conclusion that this potential alternative is not technically feasible. Drilling from a location in 8 feet of water near, but not in, the bottomfast ice zone is not that different in cost from drilling from the bottomfast ice location evaluated in Section I.H.5.a(1) and the project is not economical, because it has a negative net present value of $6.92 million (Craig, 2001, pers. commun.). The MMS acknowledges the concept that a shorter pipeline can be a safer pipeline, especially for those who use pipeline miles as a basic parameter in calculating risk for pipelines. While it is possible to use the risk factor of oil spills per pipeline mile to estimate the difference in risk between a pipeline that is 3-6 miles offshore in Foggy Island Bay, that difference is very small. From an analytical base, the risk and volumes of oil essentially are the same; therefore, the effects are similar.

Section I.H.5.a Other Potential Drilling and Production Island Locations evaluated a potential bottomfast island location in 6-7 feet of water. That potential alternative was suggested for the same reasons identified by the North Slope Borough in their comment letter. It is close to shore, in shallower water, requires less gravel, is further from the bowhead whale migration route, etc. However, that island location was neither technically nor economically feasible. See Appendices D-1, D-2, and D-3 for additional information about the economic and technical feasibility of various alternatives island locations.

**0132-059**

This comment is similar to comments made by the National Marine Fisheries Service. Please see Response 0134-015.

**0132-060**

The Kadleroshilik River floodplain site was selected by BPXA as the gravel source for the Liberty Project. Mining gravel from this or any other onshore site occurs on State of Alaska land and would be subject to the conditions of State permits. Selection of the gravel mine site is a matter between the State and BPXA; Minerals Management Service regulatory authority is limited to the Federal waters part of the project area.

The reasons for not considering Tern Island as a gravel source are given in Section I.H.5.c(3) and include insufficient amount of gravel (additional gravel would have to be obtained form other sources), blasting frozen gravel, and the possibility of having to excavate the gravel in the summer, which provides a greater potential for disturbing fish and wildlife.

The Duck Island mine site is flooded and would require pumping out 600 million gallons of water. The time to remove this water is estimated to take between 120 and 400 days.

The State of Alaska, in their letter commenting on the Liberty Development and Production Plan Draft Environmental Impact Statement (Section VII, Letter 0137), noted the following:

> Using Duck Island gravel mine sited instead of the Kadleroshilik River site would delay the final rehabilitation of the Duck Island site. Besides the additional time it would take to fill that portion of the mine site deepened by 6-12 meters, approximately 15 years would be needed to replenish the estimated 600 million gallons of water that would have been pumped from the site before the additional mining could occur. Without direct intervention to fill the site following use for the Liberty project, it would likely take several decades of precipitation and snowmelt to fill the Duck Island mine site and accomplish the final site rehabilitation.
>
> Rehabilitation of the Duck Island mine site would provide additional habitat for use by waterbirds. The rehabilitation plan was designed to enhance use of the site by waterfowl. The rehabilitation of the Duck Island site could be used as mitigation for wetland habitats altered during the development of the Kadleroshilik River mine site.

**0132-061**

The MMS acknowledges the North Slope Borough's concerns about pipeline safety and the viewpoint that the double-wall pipeline design offers oil-spill-containment capability if a leak from the inner pipe occurs, if the outer pipe has maintained its integrity. Even though the engineering failure rates that were calculated from the studies and compared to each other (1.38% for single-wall pipe to 0.158% for pipe-in-pipe, which is about 9 times), they were both very small, less than 1.5%. Furthermore, these studies did not include analysis of how the double-wall pipeline system would affect smart pigging and monitoring of the pipeline integrity. See Response 0134-A02 and Sections II.E and IV.E for additional information concerning the advantages of single-wall pipelines over double-wall pipelines.

BPXA has gone far beyond what is normally required for an EIS and has conducted extensive engineering design efforts to develop four pipeline design alternatives for evaluation in the Liberty EIS. These designs were all optimized in terms of safety, constructibility, and cost. These designs, although not taken to the final engineering design stage, were advanced enough to allow for a fair and accurate analysis in the EIS. Requiring BPXA to take any of these designs to a further level of detailed engineering would serve no purpose and would not provide any significant additional information for analysis in the EIS process.

The EIS is not an engineering decision document. A final decision on pipeline burial depth will be made as part of the joint technical review of the pipeline design by the MMS and State Pipeline Coordinator's Office, which will be conducted in conjunction with the review processes for the right-of-way application. The purpose of the EIS is to provide information on, for example, the environmental effects of constructing the pipeline. The EIS evaluates the effects of pipeline burial depths and the results of removing the existing soils and then backfilling the trench. However, it is not the tool for determining the right burial depth, which requires evaluating many engineering issues in addition to the environmental effects of trenching and backfilling.

**0132-062**

The MMS acknowledges the North Slope Borough's opposition to offshore development and preference for onshore development. The MMS understands the marine environment and wildlife are important to the subsistence lifestyle of the people that reside on the North Slope. The EIS includes scoping and draft EIS comments from the people living in Barrow, Nuiqsut, and Kaktovik, along with testimony given at the hearings. The EIS also includes traditional knowledge in our analysis of effects. The MMS believes that energy development and subsistence uses, such as whaling, hunting, and fishing, can occur together in the offshore environment of the Beaufort Sea without detrimental effects; they are not mutually exclusive.

The MMS understands the North Slope Borough opinion that the Liberty EIS is biased. The MMS has tried to remove all bias from the document. The MMS is required by the OCS Land Act, as amended, to analyze the environmental effects of the BPXA-proposed Liberty Development as submitted to MMS, which we have done. This may appear biased to some, but MMS must comply with the legal requirements of the law.

The EIS identifies and explains the risks and effects associated with potential development of the Liberty Prospect and to evaluate the potential effects to the biological and human environment. The MMS disagrees that the EIS downplays the risks and effects. The EIS identifies pertinent information to the public and decisionmakers, so they can make informed decisions. If fact, the EIS process was delayed while additional pipeline studies were designed, procured, and completed. The information from those studies is included in the EIS. The MMS is responding to all comments provided on the draft EIS, including those that provide concerns, issues, or new information about alternatives evaluated in the draft EIS. When appropriate, MMS has added and modified the analysis of effects. The preference and concerns voiced by the North Slope Borough and others is included in the EIS, and that information is available to the decisionmakers who will determine whether the project is approved, approved with modification, or disapproved. The EIS fairly identifies the potential risks, impacts, and benefits to the North Slope Borough and the communities of Barrow, Nuiqsut, and Kaktovik. These are our best efforts, and we hope they meet the North Slope Borough's request for "deference."

As part of the 5-year OCS program, the Secretary of the Interior is required to look at balancing OCS leasing between planning areas and to evaluate the effects of various levels of leasing in the 5-year program. These issues are programmatic in nature and are evaluated in the various decision documents related to the 5-year program, including the 5-year draft EIS. The most recent draft program was released on July 23, 2001,and it includes proposed leasing in Alaska and the Gulf of Mexico. The 5-year draft EIS was released for public comment in October 2001. Readers interested in more information about the rationale and balance between regions being offered by MMS for offshore leasing are encourage to obtain and read those documents. These programmatic issues, however, are not appropriate for analysis in a development EIS such as Liberty.

**0132-A05**

The North Slope Borough included, as an attachment, their comments to the ongoing National Research Council project as funded by the Environmental Protection Agency for a cumulative assessment for the North Slope. These comments were provided to the National Research Council for use in preparation of their study of the Cumulative Environmental Effects of Alaska North Slope Oil and Gas Activities. The MMS found the document to have general applicability to the Liberty EIS. It was not written with specific intent for the Liberty EIS; therefore, we will respond to that document in a general nature. Most of the major points stated in that letter were identified as concerns by the North Slope Borough and others during scoping for Liberty. These concerns include potential adverse effects to subsistence resources and the subsistence lifestyle of the Inupiat people from noise and any potential oil spills. They note their concern that adverse effects to subsistence will result in adverse impacts to their cultural. They note the importance of traditional knowledge and the need for it to be included in the EIS along with knowledge and information from Western science. They note their concern that impact analysis must evaluate the cumulative effects of all projects, not just the evaluation of the current project.

The MMS clearly heard these same comments during scoping, and all the topics have been included in the EIS. The effects to subsistence activities and sociocultural effects are evaluated in numerous places in Sections III.C, III.D, IV, and IV, and they area described in Section VI. The adverse effects of a potential oil spill and noise are evaluated in Sections III.C, IV, and V. Traditional knowledge is included throughout the document. Section V is a very comprehensive analysis of past, present, and future cumulative effects.

The letter from North Slope Borough Mayor George N. Ahmaogak, Sr., is consistent with past testimony and letters stating their continued concerns and opposition to offshore oil and gas development. The letter also indicates that because they feel they bear most of the risks from any potential offshore oil spill, they should receive some type of compensation. However, only Congress can commit to provide revenue from Federal oil and gas exploration and development to local communities. There are mechanisms in place under the Oil Pollution Act 90 to provide compensation in the event of an oil spill, but the agencies involved in the permitting process do not have the authority under current law and/or budget to provide impact aid prior to a spill. This request would again require legislation and an appropriation by Congress to enact.

Some receipts from the outer continental shelf program flowed to the North Slope Borough in 2001 from some of the enacted provisions of the CARA legislation earlier introduced by Senator Murkowski.

The North Slope Borough states that they prefer onshore development rather than offshore development, which MMS has noted previously.

**0132-E07**

The effects of noise on bowheads whales are described in Section III.C.3.a(1).

**0132-E08**

The MMS is committed to developing the Beaufort Sea oil and gas resources in an environmentally safe and sound manner. The procedures and technologies used to achieve these goals are described in Sections II.A.1.c Mitigation incorporated into the Project, II.A.2 Safety Systems for Development and Production Systems and Oil-Spill Prevention, and III.C.1 Project Integrity.

**0132-E09**

We acknowledge that the demonstrations to clean up oil spills under arctic conditions that include broken ice would be appropriate. While past demonstrations have been limited in extent and/or indicated some deficiencies, steps have been taken to ensure prevention and improve response capabilities. These steps and procedures are described in Section III.C.1.a.

**0132-E10**

Stress and/or anxiety over oil and gas development are discussed in Sections III.C.2.i and V.C.9. Also, see Responses 0132-A04, BPH-A11, and NPH-A12 and A17.

The effects of North Slope and Beaufort Sea oil and gas development on subsistence activities are analyzed in Section V.C.8.

Concerns regarding individual, organizational, and/or community time to work on issues associated with oil and gas development on the North Slope and in the Beaufort Sea are discussed in Sections III.C.2.i, III.D.12, and V.C.8. Also, see Responses 0132-A04 and 0145-010.

Contamination and/or tainting of traditional foods is analyzed in Sections III.C.2.h and I, III.D.12, and V.C.8. Also, see Responses 0132-052 and NPH-A02.

The concern regarding bowhead whale harvest quotas is discussed in Section III.C.2.h. Also, see Responses 0145-A03 and 0130-006.

Concerns about providing social and community services are discussed in Sections III.C.2.i, III.C.3.i, and V.C.9

**0132-E11**

The role of the public/stakeholders in the MMS decisionmaking process is described in Sections I.B.1, I.D, III.B.1 and III.D.12. Also see Responses 0015-001, 0130-A01, 0130-006, 132-A04, BPH 038 and NPH-A12.

**0132-E12**

The role of the public and/or stakeholders in the MMS decisionmaking process is described in Sections I.B.1, I.D, III.B.1, and III.D.12. Also, see Responses 0015-001, 0130-A01, 0130-006, 132-A04, BPH 038, and NPH-A12.

**0132-E13**

Stress and/or anxiety over oil and gas development are discussed in Sections III.C.2.i, III.D.12, and V.C.9. Also, see Responses 0132-A04, BPH-A11, and NPH-A12 and A17.

Concerns regarding individual, organizational, and/or community time to work on issues associated with oil and gas development on the North Slope and in the Beaufort Sea are discussed in Sections III.C.2.i, III.D.12, and V.C.8. Also, see Responses 0132-A04 and 0145-010.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
*National Marine Fisheries Service*
*P.O. Box 21668*
*Juneau, Alaska 99802-1668*

0134

April 13, 2001

RECEIVED
APR 1 9 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

John Goll
Regional Director
Minerals Management Service
949 East 36th Avenue, Suite 308
Anchorage, Alaska 99508-4363

Re: Liberty Draft Environmental Impact Statement
COE File Number 6-981109 Foggy Island Bay 1

Dear Mr. Goll:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Liberty Development and Production Plan. Concurrently, we have reviewed the Corps of Engineers (Corps) Public Notice for the above referenced project. The Minerals Management Service (MMS) is the lead agency on this action. An Interagency Team was created to assist MMS in preparing this DEIS. The Corps and the Environmental Protection Agency (EPA) are cooperating agencies. MMS, the Corps, and the EPA have specific permits and authorizations associated with their respective statutory authorities as described in Section 1.A of the DEIS.

Therefore, in order to streamline environmental processes, NMFS is providing comments and recommendations for all these authorizations in this letter. Our comments are provided under the Fish and Wildlife Coordination Act, the Magnuson-Stevens Fisheries Conservation and Management Act, the Marine Mammal Protection Act, and the Endangered Species Act (ESA). We will also be providing separate comments and recommendations for this action in the Biological Opinion during formal consultation under the ESA.

BP Exploration (Alaska), Inc., (BPXA) proposes to produce oil from the Liberty prospect by construction of an offshore gravel island (Liberty Island), approximately five miles offshore and 1.5 miles west of the abandoned Tern Exploration Island in Foggy Island Bay in the Alaskan Beaufort Sea. In addition, BPXA proposes to construct a 12-inch common-carrier pipeline buried in an undersea trench (approximately 6.1 miles long) from offshore Liberty Island to an onshore landfall.

E01

The Beaufort Sea is a coastal and offshore ecosystem dominated by ice. NMFS trust resources of the offshore and coastal ecosystems include ringed, bearded, and spotted seals; bowhead and beluga whales, and marine and anadromous fish. In addition, due to the location of the proposed project NMFS has particular concerns on the effects of construction from the proposed Liberty Development Project on the Boulder Patch community. As with the Northstar project, NMFS' dominant concerns for the proposed Liberty project pertain to the possible adverse impacts to NMFS trust resources from the impacts due to noise and the risk of oil spills.

E02

Further development and production calls for additional offshore islands and subsea pipelines. NMFS notes that cumulative effects such as the risk of an oil spill increase over time with continued offshore development. Many of the predictions in the DEIS rely on new improvements in pipeline construction and monitoring as a result of the Northstar project. While the Northstar project's pipeline has been laid, oil production has yet to occur. Whether the pipeline will function as predicted, and whether the many fail safe mechanisms will work as predicted is unknown. Therefore, because an operational evaluation of the technologies used at Northstar is not possible, we recommend using a conservative approach when evaluating the alternatives available.

A recent series of oil-spill drills have demonstrated the oil industry's inability to adequately clean up a spill in broken-ice conditions. These practice sessions with oil-collecting skimmers and booms revealed that the equipment was not effective if 10% or more of the surface was covered with ice. NMFS is very concerned with the risks of leaks and spills associated with the proposed project and the likelihood of containing or cleaning up oil before impacts to NMFS trust resources were to occur.

A01

NMFS is concerned that with so many unknowns, the present risks associated with offshore development may outweigh the gain. We believe a broader perspective is needed to assess the ramifications of offshore versus onshore development. Therefore, we recommend alternatives be investigated to meet the needs of oil development without offshore development, and that alternatives that expand onshore development and allow development from onshore be considered.

We appreciate the opportunity to review the document and have provided both General and Specific comments in Attachment A. Attachment B is NMFS National Gravel Extraction Policy which we hope may be of additional information. Should you have any additional questions concerning this project, please contact Ms. Jeanne Hanson or Mr. Brad Smith in our Anchorage Field Office at 271-5006.

Sincerely,

Donald J. Berg

For James W. Balsiger
Administrator, Alaska Region

Attachments (2)

cc: ADEC, USFWS, ADF&G - Fairbanks
North Slope Borough (NSB) - Barrow
T. Loman, NSB - Anchorage
Joint Pipeline Office - Anchorage

**Attachment A**
**General Comments on the Liberty DEIS**

**Overview**

Our review found that MMS has prepared a very thorough analysis of the potential environmental impacts associated with the Liberty Project. Many of the discussions reach out to socio-cultural issues unique to Alaska, as well as the special sensitivities of the marine mammals of the Beaufort Sea and the Native communities who depend on them. The section on cumulative effects is particularly well written. Unfortunately, we found the largest deficiencies within the DEIS concerned the two issues which we believe are most important in weighing the benefits and environmental costs of Liberty: pipeline design and spill response.

001

The discussions of pipeline design, do not lead to a clear choice between alternatives. This may be in part because of the differing design criteria, which prevent head-to-head comparisons. Based on the information presented, we feel the risks of a single wall steel pipeline have not been fully assessed, while the benefits of a pipe-in-pipe (PIP) design have not been fully established.

002

The currently-deployed equipment and response technology for oil spills in the Beaufort Sea is not capable of recovering and removing oil during broken ice conditions. This fact was demonstrated during exercises in 2000, and reported on by a joint evaluation prepared by MMS, the U.S. Coast Guard, the North Slope Borough, and the Alaska Department of Environmental Conservation. This report found that realistic maximum response operating limits for broken ice ranged between 0-30%. Rather than re-stating this finding and describing the most probable fate and effects of a spill under broken ice conditions, the DEIS barely references these exercises, saying that the trials "demonstrate the need to revise broken ice response tactics to meet conditions unique to breakup and freeze up." Response technologies for under ice spills or in-situ burning are untested in the Beaufort Sea. We believe the information in the DEIS regarding spill response, while factual, should present a more realistic discussion of spills response under what are often some of the most extreme conditions on earth.

003

The text of this DEIS often uses the term "we" in presenting opinions or conclusions regarding the project's impacts (for example see Pg. III-D-21., Abandonment of the Project). In the section on abandonment, it appears that "we" refers to the applicant, British Petroleum, as the paragraph goes on to discuss requirements of agencies such as MMS and the Corps of Engineers. Elsewhere in the DEIS it is unclear who "we" refers to. NMFS recommends that the DEIS identify whenever a statement, opinion, or conclusion is that of the applicant. 003

**Pipeline Design**

004

The DEIS proposes two basic design alternatives for the undersea pipeline which NMFS considers viable: a single-walled steel pipe and a PIP design using either steel or high density polyethylene. A design analysis of this pipeline, the 2000 Fleet report, found the probability for a large spill associated with either alternative to be small: 1.4 percent for the steel pipe and 0.2 percent for the PIP. The benefits and deficiencies in these designs are presented in general fashion in the DEIS. NMFS does not have the expertise required to discern which of these alternatives should be adopted. Any such determinations are further complicated by the information presented in these discussions. For example, the inconsistent design/construction standards between the single wall and PIP designs make comparisons difficult (different burial depths, pipe thickness); no confidence limits were applied to the probabilities (i.e. what is the certainty that the chance for the steel pipe to leak is 1.4 percent?); and finally, no actual design for the PIP alternatives was presented; only a conceptual plan which does not address many of the positive and negative aspects associated with this alternative. For example, what is the diameter of the annulus? How large must it be to accommodate a rupture of the inner pipe? How does a larger diameter impact the buoyancy of the PIP? How would repairs take place?

A02

We note the spill probabilities for either design are small, however the consequences of a major spill in the Beaufort Sea are such that NMFS feels an inordinate degree of prevention is appropriate in the design standards for the Liberty project. Simply put, we believe the pipeline should be made as safe as possible. The PIP design has a lower spill probability associated with it, and appears to have some advantages in terms of leak detection (the DEIS suggests the atmosphere within the pipe annulus could be tested for the presence of hydrocarbons, but no such system presently exists). However, the PIP also has certain unknown or negative aspects which are not found in the single wall pipe. The single wall steel pipeline, constructed of thicker material and placed deeper into the sea floor, could be constructed with the spill probabilities now associated with the PIP design.



005

Also, the experience gained through construction of the Northstar undersea pipeline should be presented in greater detail, as it closely relates to the conditions at Liberty. Many outstanding issues/concerns could be addressed by what occurred or was observed at Northstar. For example, how well did dredged materials work as backfill?, has the pipeline experienced any movement since placement?, has the overfill experienced any erosion or settling?, were any interim repairs necessary, and why?, were ringed seals observed in the construction trench cut through the ice?

**Island Location and Pipeline Route**

E03

NMFS supports alternatives that would avoid and minimize risks to our trust resources. The DEIS presents the component alternatives of island location and pipeline route as one package. NMFS suggests that issues associated with risks of a greater length of pipe in areas subjected to ice gouging can be mitigated for with pipeline design. Therefore, NMFS recommends first the Southern Island location, and then the Tern Island location, before the proposed Liberty Island location.

E04

Compared to the Liberty Island alternative, the Southern Island location would have a smaller requirement for gravel, would be farther from the migratory routes of bowhead whales, and a greater distance from the Boulder Patch (reducing possible impacts from construction). Tern Island is in slightly deeper water than Liberty Island. However, it would require 25% less gravel than the Liberty Island alternative, because of gravel that has remained after the island was abandoned as an exploration drilling site. Tern Island would also reduce gravel needs and would be a greater distance from the Boulder Patch. However, there would not be a great difference in the distance from whale migration routes.

**Gravel Source**

006

NMFS recommends that the Duck Island mine site be used. This is an existing mine site and would reduce impacts to approximately 30 acres of riparian habitat in the Kadleroshilik River. We also recommend that MMS look at the possibility of using the gravel from Tern Island as a gravel source.

**Upper Slope Protection**

NMFS recommends the use of sheet pile be used for slope protection. This would eliminate gravel bags from entering the environment, and reduce impacts from additional gravel needs. We

recommend that we be consulted regarding methods and timing stipulations for sheetpile placement before construction. A03

**Cumulative Impacts**

The DEIS' discussion on the cumulative effects associated with the Liberty project is very well done, and presents a reasonable assessment of this difficult issue. The cumulative impacts on the Inupiat community of the North Slope are difficult to assess. However, for the last several years MMS, NMFS, the North Slope Borough, and the Alaska Eskimo Whaling Commission (among others) have been active in discussions of the cumulative impact of oil and gas development. Through these discussions, we believe the Liberty project is likely to add significantly to the cumulative social impact associated with local citizens' increasing fear that development and oil spills within the Beaufort Sea will have profound changes to their cultural values in general, and specifically to their subsistence hunting practices. This conclusion is firmly supported by the presentation of Native views concerning cumulative effects on subsistence harvest patterns presented on page V-45 of the DEIS. E05

There is little discussion of secondary or induced impacts associated with Liberty. These also contribute to the cumulative impact. These impacts include pressure to maintain a sea channel between West Dock and open waters during fall ice formation for spill response (ice breaking noise during this period may affect bowhead whales), additional spill response drills at additional locations in the Beaufort Sea to meet State and Federal response preparedness standards, increased operation of vehicles on ice associated with the Liberty project (such things as testing response equipment, biological monitoring of ice roads and other effects), and closures or restrictions on the use of firearms near Liberty which may impact subsistence hunting. 007

## Specific Comments on the Liberty DEIS

**Executive Summary**

ExSum-2., Section A .2. The Need and Purpose for the Liberty Project - NMFS questions whether the need for the project is fairly stated for this private commercial venture whose purpose could otherwise be seen as to return an economic profit to shareholders. 008



ExSum-8., Section C. 5.c. Small Oil Spills from Liberty Facilities - For the purpose of the analysis there is an assumption on spill sizes. Where does this assumption come from? Please clarify, or provide a reference. 009

ExSum-11., Section D. 1.a. Bowhead Whales - This section makes the statement "Because the main bowhead whale corridor is 10 kilometers or more seaward of the barrier islands, drilling and production noise from Liberty Island is not likely to reach migrating whales." The paragraph then goes on a sentence later to state: "Subsistence whalers have stated that noise from some drilling activities displaces whales farther offshore away from their traditional hunting areas." There should be additional discussion on studies and efforts to resolve this discrepancy. 010

ExSum-21., Section E. 2. Alternative II - No Action - This section makes a statement which leaves the reader with the impression that there are no other potential available United States oil reserves. NMFS suggests that the sentence be rewritten to say " To replace the potential 120 million barrels of oil not developed from Liberty, oil would need to be imported from other countries, or produced from other areas within the United States." 011

ExSum-26., Section E. 3.a.1.b Alternative III.A - Use the Southern Island Location and Eastern Pipeline Route - The section on Economy discusses that this alternative would generate fewer jobs, less wages and less revenue. Why this is so is not adequately explained or referenced back to the Liberty project. 012

ExSum-27., Section E. 3.a.1.c. Alternative III.B - Use the Tern Island Location and Tern Pipeline Route - The same as above. 013

ExSum-31., Section E. 3.a.2.b. Alternative IV.A - Use Pipe in Pipe System - This alternative would generate more jobs, greater wages, and greater capital expenditures than Alternative I. Why this is so is not adequately explained or referenced back to the Liberty project. 014

ExSum-32., Section E. 3.a.3.a. Alternative I Use Gravel Bags (Liberty Development and Production Plan) - This section discusses that the gravel bags to be used would be made from a polyester material that does not float. If the bag is ripped open and carried out by ice movement, it would still be lost in 015 the environment. Also, while BPXA may monitor ice events and have intentions to repair or replace the bags, it would be dependent upon weather conditions. This is always the intent at both the Endicott and West Dock causeways, but not in actual fact what happens. In addition, continued impacts from the need for gravel to repair or replace bags needs to be assessed. 015



ExSum-32., Section E. 3.a.4. Effects of Gravel Mine Sites- While the use of Tern Island as an alternative for the island location has been assessed in the DEIS, the use of Tern Island as a gravel source has not. As with other alternatives there would be both positive and negative effects. Positive effects would include a shorter haul distance, less impacts on the resources identified from both the Kadelroshik River mine and the Duck Island mine site. Negative impacts would include those that are described in the DEIS for the reclamation of the Liberty production island at the end of the life of the project. NMFS recommends that this alternative be assessed for at least partial use in the project. 016

ExSum-40., Section E. 4.b. Mitigation Required by MMS - These stipulations are rather general in nature, and not really project specific. It is not clear how some of these are considered mitigation for this project. For example Stipulation No. 2. states: "Site personnel would receive training on at least an annual basis, and the training records maintained for 5 years." What training would personnel receive? Likewise, Stipulation No. 3 states: "Pipelines are the preferred mode of transportation of hydrocarbons." While this may be the case, there is no reference to discuss this rationale. This is the BPXA proposal. Additionally, if Stipulation No. 4 applies to exploratory operations only, why is it mentioned? 017

ExSum-42., Section F. 1. Scope of Analysis. Para. 5. - This paragraph discusses the Memorandum of Agreement (MOA) between the Corps and EPA. The Corps and EPA have several MOAs. There should be a reference here. The language would lead one to believe that the MOA referenced here was specific to the North Slope of Alaska. This was not the case. This MOA was a National MOA regarding "The Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines. The section referenced here is Footnote No. 7. of that MOA. 018

Ex-sum-43., Section F. 2.a. Significant Effects Conclusion - A reference to what MMS considers "significant" should be provided. Also, the section discusses the potential for adverse effects to key resources. A reference back to where these are discussed should be provided. 019

Ex-sum-43., Section F. 2.c. Keeping Cumulative Effects in Perspective - While NMFS agrees today's oil and gas activities generally are more sensitive to environmental concerns than in the past, the conclusion that expected activities are likely to have fewer impacts than (past activities) is, at least, arguable. Today's technology also enables exploration, development, and production offshore, yet does not have the commensurate 020

020 technology to adequately respond to an oil spill under all conditions. The present level of development is also at a much higher rate than in the past, albeit with lesser individual footprints. Many environmental resources have become more limited or stressed in recent times, and might be considered more vulnerable to the effects of development.

021 Ex-sum-43., Section F. 2.d. Cumulative Effects by Resource - Regarding the statements on bowhead whales, these conclusions should be re-written to state that bowheads exposed to noise-producing activities would be likely to change their behavior by avoiding the noise source and through other behavioral reactions (breathing and surfacing rates, calling rates). These effects would normally be temporary.

**Section I**

022 Pg. I-3., Section I. B. Need and Purpose for the Project - NMFS questions whether the need for the project is fairly stated for this private commercial venture whose purpose could otherwise be seen as to return an economic profit to shareholders.

023 Pg. I-3., Section I. B.1. Goals of this EIS - Item 10; please replace the word "necessary" with the words "in support of".

024 Pg. I-15., Section I. H.5.a. Other Potential Drilling and Production Island Alternatives - Two alternatives would avoid or significantly reduce the risk of environmental impact to the Beaufort Sea; directional drilling from land or from a site within the landfast ice. Both alternatives were removed from further analysis in the DEIS. NMFS feels these alternatives present significant environmental benefits, and should be fully assessed in the NEPA document.

025 We believe these alternatives, along with either a partial or phased development of the Liberty Prospect, may be a viable option with clear benefits. The set of bottomhole locations used to compare the on-land/directional drilling alternative and the landfast ice location island alternative was limited to those proposed for Alternative 1. The DEIS should consider the viability of these alternatives for partial development of the unit. Appendix D looks at the costs of directional drilling from land, but appears to have considered the costs "required to reach the same bottomhole locations" as the preferred alternative. The comparative analysis, then, is made against the full development of the project. Partial development of the State and Federal tracts may be possible from a landfast ice or on-shore location



025 in a way which might still be very profitable. Future advancements in drilling technology may allow additional locations to be reached. NMFS also questioned Table D-1-3 in Appendix D, which appears to show the same minimum and maximum island costs as Alterative 1. This figure is surprising, given that alternative 7 would be on-land. Even the costs of pad development should fall well below that of an offshore island.

026 Pg. I-22., Section I. H.5.b.(7)(a). Ice Gouging - This section discusses minor ice gouging occurring in Foggy Bay. Please provide a citation where this information is available.

027 Pg. I-23., Section I. H.5.b.(11). Use of the Suction-Cutter Dredge as Primary Trenching Tool, para.2. - The actual pipeline dredging techniques used for the Northstar project should be presented and discussed here. NMFS does not believe a suction-cutter dredge was ever used. Also update this discussion in the fifth paragraph on page I-24.

028 Pg. I-29., Section I. H.8.a. Seasonal Operating Restrictions, para. 5. - Would the completed pipeline have to be filled with a noncorrosive liquid such as glycol, after it is constructed but prior to production from the facility?

**Section II**

029 Pg. II-4., Section II. A. 1.b.(1). Liberty Gravel Design and Construction, para.3. - This paragraph discusses the slope protection measures for BPXA's proposed island construction. The gravel bags are to made of a polyester material that would sink in seawater. This type of material is unlikely to degrade. If it sinks what would happen to it? Are there plans to retrieve a single bag? Could there be any risk of entanglement for marine mammals?

030 Pg. II-4., Section II. A. 1.b.(1). Liberty Gravel Design and Construction, para.3. - What are conductor pipes? Would the additional noise discussed only be during installation?

031 Pg. II-13., Section II. A. 1.b.(2)(d), para. 2. - Do the two spill sizes discussed, 1,580 barrels and 125 barrels, represent thresholds for the detection systems? The text here explains that the larger spill would trigger the mass balance and pressure point systems, and the 125 barrel would be below the detection point for those systems. Yet paragraph (2) in this section sets the threshold for the mass balance/pressure point systems at 97.5 barrels per day.

As we understand the DEIS, a visual monitoring program would be run whenever the LEOS system was inoperable during solid ice conditions (pg. II-11). The number of through-ice inspection holes would be determined so as to be able to detect a leak of 2,956 barrels. This volume represents a leak of 97.5 barrels per day, which is also the detection limit for the pressure point and mass balance systems. It seems then, that the visual program is unnecessary or, more realistically, should use lower threshold detection limits. 032

<u>Pg. II-20., Section II. A. 4.a. Oil Spill Response Capability</u> - This section should present the results of the spring and fall 2000 North Slope Broken Ice Exercises. A joint agency evaluation of these exercises concluded that the same broken ice tactic discussed on this page, tactic R-19, had a realistic maximum response operating limit of 0-1% in fall ice conditions, and 10-30% in spring ice. NMFS believes the equipment available on the North Slope, the spill contingency plan for Liberty, and current state of the art technologies for mechanical removal remain insufficient to contain and recover spilled oil during certain broken ice conditions. At these times in-situ burning may be the only practical tactic, and itself may have limited effectiveness depending on spill conditions. This issue distills down to a risk analysis which will be weighed against the resource damages which would occur from a large spill. The DEIS, then, should present the most realistic assessment of true spill response capabilities. We believe the demonstrated failings within response technologies should be balanced through higher demands on prevention. 033

<u>Pg. II-33., Section II. C. 3.b. Use Gravel Bags (Liberty Development and Production Plan), para.2.</u> - The section here discusses the proposed on-going maintenance program should repair or replacement of gravel slope protection bags become necessary. As NMFS previously commented, while BPXA may monitor ice events and have intentions to repair or replace the bags, it would be dependent upon weather conditions. This is always the intent at both the Endicott and West Dock causeways, but not in actual fact what happens. In addition, the continued impacts of the need for gravel to repair or replace bags needs to be assessed. 034

**<u>Section III</u>**

<u>Pg. III-A-3., Section III. A. 2.a(1). Bowhead Whales</u> 035
The statements regarding the potential impact to bowhead whales from a spill within or entering the spring lead system may significantly understate the potential harm of such an event.



Essentially all of the Bering Sea stock of bowhead whales moves through the spring leads, although many whales may also travel through the pack ice. Concentrations of hydrocarbons within the lead system could place many hundreds of whales at risk of mortality through inhalation of harmful vapors. Spill response actions could delay the migration, or cause whales to enter the pack ice with possible adverse effects (especially to calves). 035

<u>Pgs. III-C-1-4., Section III. C. 1.a(1). Discussion of BPXA's Proposed Liberty Oil Discharge Prevention and Contingency Plan</u> - See our comments above on Pg. II-20., Section II. A. 4.a. Oil Spill Response Capability.

<u>Pgs. III-C-11., Section III. C. 1.d.(4).(a). The Liberty Gravel Island, para.5.</u> - This paragraph discusses the primary cause of spills on outer continental shelf platforms and the Alaska North Slope as leaks resulting from damage to storage tanks. Since we do not yet have a database on the risks associated with offshore pipelines in the Arctic environment this discussion should reflect that lack of information. 036

<u>Pgs. III-C-14., Section III. C. 1.e.(1).(b). Sizes of Offshore Pipeline Leaks Assuming LEOS is Working, para. 3.</u> - The DEIS assumes that any remaining oil within the annulus of the pipe-in-pipe design would be removed, but goes on to state the details of this procedure are unknown. This seems to be a very important issue concerning which alternative pipe design to recommend, and should be further discussed in the DEIS. Would oil spilled in the annulus be likely to solidify before it could be (pumped?) through? Would the operator be required to shut down immediately upon detection of <u>any</u> hydrocarbons in the annulus, or would they be allowed to continue operations for smaller leaks? Would the operator be required to stop production and evacuate the inner pipe whenever the outer pipe is repaired or serviced? 037

<u>Pg. III-C-45., Section III. C. 2.h.(1). Summary and Conclusion for Effects of an Oil Spill on Subsistence-Harvest Patterns</u> - This section states that bowhead whale hunting could be affected by a spill impacting any part of the whales' migration route, and that the perception of tainting may impact the hunt regardless of contact potential. We agree with these conclusions. We believe subsistence whale hunting would also be impacted by any spill which requires the local knowledge and experience, as well as the vessels, of the local hunters (especially whaling captains). The experience of the EXXON *Valdez* demonstrated the importance of additional vessel support in remote regions of Alaska, and we would expect any significant spill, and the concern of the villages to remove the oil from the water, would mean any 038

subsistence whale hunting is almost certain to be adversely impacted by a large spill. 038

039 Pg. III-C-51, Section III. C. 2.i.(2).(b).1. Effects of an Oil Spill on Sociocultural Systems - We are pleased to see a NEPA analysis discuss the sociocultural impacts of oil spills from several perspectives. The items identified as resulting from a fear of an oil spill are very accurate, and should also be presented in the section on cumulative impacts.

040 Pg. III-D-8-10, Section III. D. 2. Gravel Mining - This section states that BPXA will need about 990,000 cubic yards of gravel for the Liberty project as they propose. It goes on to discuss the effects of the BPXA proposed alternative. There are several references to studies of gravel mining in other states such as Oregon. While there may be very little documented about the effects of gravel mining in North Slope rivers in the permafrost zone, there are several studies that have been done in Alaska and in Alaskan rivers. These may provide additional insight that the Oregon studies may lack. These studies are referenced in NMFS's gravel extraction policy which we have previously supplied to MMS, EPA and the Corps. We are providing it again as Attachment B.

041 Pg. III-D-19, Section III. D. 4. Seawater Intake - The DEIS states that there would be screens located in the intake pipe above the opening, and that these screens "(p)eriodically would be removed, cleaned, and replaced." What defines periodically, and how would this be done? Also, the DEIS should describe what, if any, procedures would be used against biofouling of this system, such as backflushing or periodic use of chemical agents.

042 Pg. III-D-19, Section III. D. 6.e.(2). Effects of Concrete Mat Removal - The DEIS states; "Unlike the scattered areas of productive habitat in the Boulder Patch, most of the underwater slope of Liberty Island is likely to be much more productive by comparison." Where is the reference to support this statement?

043 Pg. V-15, Section V. C. 1.a.(2)(a). Projects that May Affect Bowhead Whales, para.2. - The statement that activities conducted on the outer continental shelf in the Beaufort Sea as a result of previous lease sales since 1979 have not had adverse effects on the bowhead whale population is not supported. While the comment refers to population-level effect, it is certainly possible that some of the effects of noise from past sale activities had impacted enough individuals as to have caused a change within the stock, even if temporary. Some Inupiat whale hunters have stated that bowhead whales no longer occur inside the barrier islands,



and that noise from an offshore activity may cause changes within the entire migration route for that year. NMFS has no data to support these observations, however they demonstrate a few possible effects of past actions on this population. 043

044 Pg. V-16, Section V. C. 1.a.(2)(b). Effects of these projects on Bowhead Whales, para.2. - Delete the word "perhaps" in the sentence beginning "However, aerial survey results"... The last sentence here, that whales avoidance of seismic operations in 1996-1998 did not affect subsistence whaling may not be true. While quotas may have been met, there are no data presented regarding the level of effort expended or any behavioral changes in the whales which may have made them more difficult to hunt. The NMFS and Alaska Eskimo Whaling Commission are currently discussing the development of a database to assess these effects. The MMS ANIMIDA study will also provide information on this issue.

Attachment B

## NMFS NATIONAL GRAVEL EXTRACTION POLICY
## NATIONAL MARINE FISHERIES SERVICE

### I. INTRODUCTION

The National Marine Fisheries Service (NMFS) is responsible for protecting, managing and conserving marine, estuarine, and anadromous fish resources and their habitats. A national policy on gravel extraction is necessary because extraction in and near anadromous fish streams causes many adverse impacts to fishes and their habitats. These impacts include: loss or degradation of spawning beds and juvenile rearing habitat; migration blockages; channel widening, shallowing, and ponding; loss of hydrologic and channel stability; loss of pool/riffle structure; increased turbidity and sediment transport; increased bank erosion and/or stream bed downcutting; and loss or degradation of riparian habitat.

The objective of the NMFS Gravel Policy is to ensure that gravel extraction operations are conducted in a manner that eliminates or minimizes to the greatest extent possible any adverse impacts to anadromous fishes and their habitats. Gravel extraction operations should not interfere with anadromous fish migration, spawning, or rearing, nor should they be allowed within, upstream, or downstream of anadromous fish spawning grounds. The intent is to conserve and protect existing viable anadromous fish habitat and historic habitat that is restorable. Individual gravel extraction operations must be judged in the context of their spatial and temporal cumulative impacts; i.e., potential impacts to habitat should be viewed from a watershed management perspective.

The U.S. Army Corps of Engineers may require a permit for dredge and fill operations and other activities associated with gravel extraction projects under Sections 401 and 404 of the Clean Water Act, and/or Section 10 of the Rivers and Harbors Act of 1899. Under the Fish and Wildlife Coordination Act, NMFS reviews Section 10 or Section 404 permit applications for environmental impacts to anadromous, estuarine, and marine fisheries and their habitats. Gravel extraction projects not subject to Section 404 or Section 10 permits may still be reviewed by NMFS pursuant to the applicable County/State public hearing processes. The Magnuson Fishery Conservation and Management Act also addresses the effects which changes to habitat may have upon a fishery. None of the recommendations presented in this document are intended to supersede these regulations or any other laws, such as the Endangered Species Act. Rather, the policy's recommendations are intended as guidance for NMFS personnel who are involved in the review of gravel extraction projects. (See Appendix 1 for summaries of the relevant statutes.)

This Gravel Policy is subject to comprehensive biennial review and revision that will be initiated and coordinated by the Office of Habitat Conservation. Requests for specific changes or revisions requiring immediate attention should be brought to the attention of Stephen M. Waste, NMFS's Office of Habitat Conservation in Silver Spring, Maryland.



### II. SCOPE OF GRAVEL POLICY

The types of gravel extraction activities referred to in this Gravel Policy generally entail commercial gravel mining; i.e., removing or obtaining a supply of gravel for industrial uses, such as road construction material, concrete aggregate, fill, and landscaping. Gravel can also be removed for maintenance dredging and flood control. Gravel extraction often occurs at multiple times and at multiple sites along a given stream, resulting in impacts that are likely to be both chronic and cumulative. When the rate of gravel extraction exceeds the rate of natural deposition over an extended time period, a net "mining" occurs due to the cumulative loss of gravel (Oregon Water Resources Research Institute [OWRRI] 1995).

The range of anadromous fish habitats specifically addressed by this Gravel Policy include tidal rivers, freshwater rivers and streams, and their associated wetlands and riparian zones. Gravel extraction is a major and longstanding activity in rivers and streams, particularly in salmonid habitats on the west coast of the United States, including Alaska. Gravel extraction, as well as sand mining and dredging, also occurs on the northeast coast of the United States, but primarily in marine habitats such as the lower reaches of large tidal rivers, estuaries and offshore. Gravel and sand mining or dredging in the northeast generally raises different concerns than for the west coast. For example, few of the anadromous species found in the northeastern United States are bottom spawners or rely on specific habitat for their reproductive activities. Although many elements of the Gravel Policy are germane to all areas where gravel extraction occurs, the primary focus of this Policy is on west coast gravel extraction issues. Northeast coast bottom disturbance activities will be addressed in greater detail in a future policy.

This Gravel Policy addresses three types of instream gravel mining, which Kondolf (1993; 1994a) describes as follows: dry-pit and wet-pit mining in the active channel, and bar skimming or "scalping." Dry-pit refers to pits excavated on dry ephemeral stream beds and exposed bars with conventional bulldozers, scrapers, and loaders. Wet-pit mining involves the use of a dragline or hydraulic excavator to remove gravel from below the water table or in a perennial stream channel. Bar skimming or scalping requires scraping off the top layer from a gravel bar without excavating below the summer water level.

In addition to instream gravel mining, this Policy also addresses another method, which Kondolf (1993; 1994a) describes as the excavation of pits on the adjacent floodplain or river terraces. Dry pits are located above the water table. Wet pits are below, depending on the elevation of the floodplain or terrace relative to the baseflow water elevation of the channel. Their isolation from an adjacent active channel may be only short term. During a sudden change in channel course during a flood, or as part of gradual migration, small levees may be breached and the channel will shift into the gravel pits. Because floodplain pits can become integrated into the active channel, Kondolf (1993; 1994a) suggests that they should be regarded as existing instream if considered on a time scale of decades.

## III. ENVIRONMENTAL EFFECTS OF GRAVEL EXTRACTION

Extraction of alluvial material from within or near a stream bed has a direct impact on the stream's physical habitat parameters such as channel geometry, bed elevation, substrate composition and stability, instream roughness elements (large woody debris, boulders, etc.) depth, velocity, turbidity, sediment transport, stream discharge and temperature (Rundquist 1980; Pauley et al. 1989; Kondolf 1994a, b; OWRRI 1995). OWRRI, (1995) states that:

> Channel hydraulics, sediment transport, and morphology are directly affected by human activities such as gravel mining and bank erosion control. The immediate and direct effects are to reshape the boundary, either by removing or adding materials. The subsequent effects are to alter the flow hydraulics when water levels rise and inundate the altered features. This can lead to shifts in flow patterns and patterns of sediment transport. Local effects also lead to upstream and downstream effects.

Altering these habitat parameters has deleterious impacts on instream biota and the associated riparian habitat (Sandecki, 1989). For example, impacts to anadromous fish populations due to gravel extraction include: reduced fish populations in the disturbed area, replacement of one species by another, replacement of one age group by another, or a shift in the species and age distributions (Moulton, 1980). In general terms, Rivier and Seguier (1985) suggest that the detrimental effects to biota resulting from bed material mining are caused by two main processes: (1) alteration of the flow patterns resulting from modification of the river bed, and (2) an excess of suspended sediment. OWRRI (1995) adds:

> Disturbance activities can disrupt the ecological continuum in many ways. Local channel changes can propagate upstream or downstream and can trigger lateral changes as well. Alterations of the riparian zone can allow changes in-channel [*sic*] conditions that can impact aquatic ecosystems as much as some in-channel [*sic*] activities.
>
> One consequence of the interconnectedness of channels and riparian systems is that potential disruptions of the riparian zone must be evaluated when channel activities are being evaluated. For example, aggregate mining involves the channel and boundary but requires land access and material storage that could adversely affect riparian zones; bank protection works are likely to influence riparian systems beyond the immediate work area.

The potential effects of gravel extraction activities on stream morphology, riparian habitat, and anadromous fishes and their habitats are summarized as follows:

1. **Extraction of bed material in excess of natural replenishment by upstream transport causes bed degradation.** This is partly because gravel "armors" the bed, stabilizing banks and bars, whereas removing this gravel causes excessive scour and sediment movement (Lagasse et al. 1980; OWRRI, 1995). Degradation can extend



upstream and downstream of an individual extraction operation, often at great distances, and can result from bed mining either in or above the low-water channel (Collins and Dunne 1990; Kondolf 1994a, b; OWRRI, 1995). Headcutting, erosion, increased velocities and concentrated flows can occur upstream of the extraction site due to a steepened river gradient (OWRRI, 1995). Degradation can deplete the entire depth of gravel on a channel bed, exposing other substrates that may underlie the gravel, which would reduce the amount of usable anadromous spawning habitat (Collins and Dunne, 1990; Kondolf, 1994a; OWRRI, 1995). For example, gravel removal from bars may cause downstream bar erosion if they subsequently receive less bed material from upstream than is being carried away by fluvial transport (Collins and Dunne, 1990). Thus, gravel removal not only impacts the extraction site, but may reduce gravel delivery to downstream spawning areas (Pauley et al., 1989).

2. **Gravel extraction increases suspended sediment, sediment transport, water turbidity and gravel siltation** (OWRRI, 1995). The most significant change in the sediment size distribution resulting from gravel removal is a decrease in sediment size caused by fine material deposition into the site (Rundquist, 1980). Fine sediments in particular are detrimental to incubating fish eggs as blockage of interstitial spaces by silt prevents oxygenated water from reaching the eggs and removal of waste metabolites (Chapman, 1988; Reiser and White, 1988). High silt loads may also inhibit larval, juvenile and adult behavior, migration, or spawning (Snyder, 1959; Cordone and Kelly, 1961; Bisson and Bilby 1982; Bjornn and Reiser, 1991; OWRRI, 1995). Siltation, substrate disturbances and increased turbidity also affect the invertebrate food sources of anadromous fishes (OWRRI, 1995).

3. **Bed degradation changes the morphology of the channel** (Moulton, 1980; Rundquist, 1980; Collins and Dunne, 1990; Kondolf, 1994a,b; OWRRI, 1995). Gravel extraction causes a diversion or a high potential for diversion of flow through the gravel removal site (Rundquist, 1980). Mined areas that show decreased depth or surface flow could result in migration blockages during low flows (Moulton, 1980). This may compound problems in many areas where flows may already have been altered by hydropower operations and irrigation. Even if the gravel extraction activity is conducted away from the active river channel during low water periods, substrate stability and channel morphology outside the excavated area's perimeter could be affected during subsequent high water events. As active channels naturally meander, the channel may migrate into the excavated area. Also, ponded water isolated from the main channel may strand or entrap fish carried there during high water events (Moulton, 1980; Palmisano, 1993). Fish in these ponded areas could experience higher temperatures, lower dissolved oxygen, increased predation compared to fish in the main channel, desiccation if the area dries out, and freezing (Moulton, 1980).

4. **Gravel bar skimming significantly impacts aquatic habitat.** First, bar skimming creates a wide flat cross section, then eliminates confinement of the low flow channel, and results in a thin sheet of water at baseflow (Kondolf, 1994a.) Bar skimming can

also remove the gravel "pavement," leaving the finer subsurface particles vulnerable to entrainment (erosion) at lower flows (Kondolf, 1994a; OWRRI, 1995). A related effect is that bar skimming lowers the overall elevation of the bar surface and may reduce the threshold water discharge at which sediment transport occurs (OWRRI, 1995). Salmon redds (nests) downstream are thus susceptible to deposition of displaced, surplus alluvial material, resulting in egg suffocation or suppressed salmon fry emergence, while redds upstream of scalped bars are vulnerable to regressive erosion (Pauley et al., 1989). Gravel bar skimming also appears to reduce the amount of side channel areas, which can result in the reduction and/or displacement of juvenile salmonid fishes that use this habitat (Pauley et al., 1989).

5. **Operation of heavy equipment in the channel bed can directly destroy spawning habitat, and produce increased turbidity and suspended sediment downstream** (Forshage and Carter, 1973; Kondolf, 1994a). Additional disturbances to redds may occur from increased foot and vehicle access to spawning sites, due to access created initially for gravel extraction purposes (OWRRI, 1995).

6. **Stockpiles and overburden left in the floodplain can alter channel hydraulics during high flows.** During high water, the presence of stock piles and overburden can cause fish blockage or entrapment, and fine material and organic debris may be introduced into the water, resulting in downstream sedimentation (Follman, 1980).

7. **Removal or disturbance of instream roughness elements during gravel extraction activities negatively affects both quality and quantity of anadromous fish habitat.** Instream roughness elements, particularly large woody debris, play a major role in providing structural integrity to the stream ecosystem and providing critical habitat for salmonids (Koski, 1992; Naiman et al., 1992; Franklin et al., 1995; Murphy, 1995; OWRRI, 1995). These elements are important in controlling channel morphology and stream hydraulics, in regulating the storage of sediments, gravel and particulate organic matter, and in creating and maintaining habitat diversity and complexity (Franklin, 1992; Koski, 1992; Murphy, 1995; OWRRI, 1995). Large woody debris in streams creates pools and backwaters that salmonids use as foraging sites, critical overwintering areas, refuges from predation, and spawning and rearing habitat (Koski, 1992; OWRRI, 1995). Large wood jams at the head of gravel bars can anchor the bar and increase gravel recruitment behind the jam (OWRRI, 1995). Loss of large woody debris from gravel bars can also negatively impact aquatic habitat (Weigand, 1991; OWRRI, 1995). The importance of large woody debris has been well documented, and its removal results in an immediate decline in salmonid abundance (e.g., see citations in Koski, 1992; Franklin et al., 1995; Murphy, 1995; OWRRI, 1995).

8. **Destruction of the riparian zone during gravel extraction operations can have multiple deleterious effects on anadromous fish habitat.** The importance of riparian habitat to anadromous fishes should not be underestimated. For example,



Koski (1992) states that a stream's carrying capacity to produce salmonids is controlled by the structure and function of the riparian zone. The riparian zone includes stream banks, riparian vegetation and vegetative cover. Damaging any one of these elements can cause stream bank destabilization, resulting in increased erosion, sediment and nutrient inputs, and reduced shading and bank cover leading to increased stream temperatures. Destruction of riparian trees also means a decrease in the supply of large woody debris. This results in a loss of instream habitat diversity caused by removing the source of materials responsible for creating pools and riffles, which are critical for anadromous fish growth and survival, as outlined in Number 7, above (Koski, 1992; Murphy, 1995; OWRRI, 1995).

Gravel extraction activities can damage the riparian zone in several ways:
a. If the floodplain aquifer discharges into the stream, groundwater levels can be lowered because of channel degradation. Lowering the water table can destroy riparian vegetation (Collins and Dunne, 1990).
b. Long-term loss of riparian vegetation can occur when gravel is removed to depths that result in permanent flooding or ponded water. Also, loss of vegetation occurs when gravel removal results in a significant shift of the river channel that subsequently causes annual or frequent flooding into the disturbed site (Joyce, 1980).
c. Heavy equipment, processing plants and gravel stockpiles at or near the extraction site can destroy riparian vegetation (Joyce, 1980; Kondolf, 1994a; OWRRI, 1995). Heavy equipment also causes soil compaction, thereby increasing erosion by reducing soil infiltration and causing overland flow. In addition, roads, road building, road dirt and dust, and temporary bridges can also impact the riparian zone.
d. Removal of large woody debris from the riparian zone during gravel extraction activities negatively affects the plant community (Weigand, 1991; OWRRI, 1995). Large woody debris is important in protecting and enhancing recovering vegetation in streamside areas (Franklin et al., 1995; OWRRI, 1995).
e. Rapid bed degradation may induce bank collapse and erosion by increasing the heights of banks (Collins and Dunne, 1990; Kondolf, 1994a).
f. Portions of incised or undercut banks may be removed during gravel extraction, resulting in reduced vegetative bank cover, causing reduced shading and increased water temperatures (Moulton, 1980).
g. Banks may be scraped to remove "overburden" to reach the gravel below. This may result in destabilized banks and increased sediment inputs (Moulton, 1980).
h. The reduction in size or height of bars can cause adjacent banks to erode more rapidly or to stabilize, depending on how much gravel is removed, the distribution of removal, and on the geometry of the particular bed (Collins and Dunne, 1990).

## IV. RECOMMENDATIONS

The following recommendations should not be regarded as static or inflexible. The recommendations are meant to be revised as the science upon which they are based improves and areas of uncertainty are resolved. Furthermore, the recommendations are meant to be adapted for regional or local use (e.g., Alaska often has opportunities to comment through their State coastal management programs), so a degree of flexibility in their interpretation and application is necessary.

1. **Abandoned stream channels on terraces and inactive floodplain should be used preferentially to active channels, their deltas and floodplain.** Gravel extraction sites should be situated outside the active floodplain and the gravel should not be excavated from below the water table. In other words, dry-pit mining on terraces or floodplain is preferable to any of the alternatives, in particular, wet-pit mining instream, but also bar skimming and wet-pit mining in the floodplain. In addition, operators should not divert streams to create an inactive channel for gravel extraction purposes, and formation of isolated ponded areas that cause fish entrapment should be avoided. Also, all gravel extraction activities for a single project should be located on the same side of the floodplain. This will eliminate the need for crossing active channels with heavy equipment.

2. **Larger rivers and streams should be used preferentially to small rivers and streams.** Larger systems are preferable because they have more gravel and a wider floodplain, and the proportionally smaller disturbance in large systems will reduce the overall impact of gravel extraction (Follman, 1980). On a smaller river or stream, the location of the extraction site is more critical because of the limited availability of exposed gravel deposits and the relatively narrower floodplain (Follman, 1980).

3. **Braided river systems should be used preferentially to other river systems.** The other systems, listed in the order of increasing sensitivity to physical changes caused by gravel extraction activities, are: split, meandering, sinuous, and straight (Rundquist, 1980). Because braided river systems are dynamic and channel shifting is a frequent occurrence, theoretically, channel shifting resulting from gravel extraction might have less of an overall impact because it is analogous to a naturally occurring process (Follman 1980). In addition, floodplain width progressively decreases in the aforementioned series of river systems. If gravel extraction is to occur in the adjacent floodplain, it is likely that the other four river system types will experience greater environmental impacts than the braided river system (Follman, 1980).

4. **Gravel removal quantities should be strictly limited so that gravel recruitment and accumulation rates are sufficient to avoid extended impacts on channel morphology and anadromous fish habitat.** While this is conceptually simple, annual gravel recruitment to a particular site is, in fact, highly variable and not well understood. (Recruitment is the rate at which bedload is supplied from upstream to replace the extracted material.) Kondolf (1993; 1994b) dismisses the common belief that instream gravel extraction can be conducted safely so long as the rate of extraction does not exceed the rate of replenishment. Kondolf (1993; 1994b) states that this approach to managing instream gravel extraction is flawed because it fails to account for the upstream/downstream erosional effects that change the channel



morphology as soon as gravel extraction begins. In addition, Kondolf (1993; 1994b) reiterates that flow and sediment transport for most rivers and streams is highly variable from year-to-year, thus an annual average rate may be meaningless. An "annual average deposition rate" could bear little relation to the sediment transport regimes in a river in any given year. Moreover, sediment transport processes are very difficult to model, so estimates of bedload transport may prove unreliable. These problems and uncertainties indicate a need for further research.

5. **Gravel bar skimming should only be allowed under restricted conditions.** (See Section III, Number 4, for the environmental impacts of gravel bar skimming.) Gravel should be removed only during low flows and from above the low-flow water level. Berms and buffer strips must be used to control stream flow away from the site. The final grading of the gravel bar should not significantly alter the flow characteristics of the river during periods of high flows (OWRRI, 1995). Finally, bar skimming operations need to be monitored to ensure that they are not adversely affecting gravel recruitment downstream or the stream morphology either upstream or downstream of the site. If the stream or river has a recent history of rapidly eroding bars or stream bed lowering, bar skimming should not be allowed.

6. **Pit excavations located on adjacent floodplain or terraces should be separated from the active channel by a buffer designed to maintain this separation for two or more decades.** As previously discussed in Section II, the active channel can shift into the floodplain pits, therefore Kondolf (1993; 1994a) recommends that the pits be considered as potentially instream when viewed on a time scale of decades. Consequently, buffers or levees that separate the pits from the active channel must be designed to withstand long-term flooding or inundation by the channel.

7. **Prior to gravel removal, a thorough review should be undertaken of potentially toxic sediment contaminants in or near the stream bed where gravel removal operations are proposed or where bed sediments may be disturbed (upstream and downstream) by the operations. Also, extracted aggregates and sediments should not be washed directly in the stream or river or within the riparian zone.** Turbidity levels should be monitored and maximum allowable turbidity levels for anadromous fish and their prey should be enforced.

8. **Removal or disturbance of instream roughness elements during gravel extraction activities should be avoided. Those that are disturbed should be replaced or restored.** As previously stated in Section III, Number 7, instream roughness elements, particularly large woody debris, are critical to stream ecosystem functioning.

9. **Gravel extraction operations should be managed to avoid or minimize damage to stream/river banks and riparian habitats.** Gravel extraction in vegetated riparian areas should be avoided. Gravel pits located on adjacent floodplain should not be

excavated below the water table. Berms and buffer strips in the floodplain that keep active channels in their original locations or configurations should be maintained for two or more decades (as in Number 6, above). Undercut and incised vegetated banks should not be altered. Large woody debris in the riparian zone should be left undisturbed or replaced when moved. All support operations (e.g., gravel washing) should be done outside the riparian zone. Gravel stockpiles, overburden and/or vegetative debris should not be stored within the riparian zone. Operation and storage of heavy equipment within riparian habitat should be restricted. Access roads should not encroach into the riparian zones.

10. **The cumulative impacts of gravel extraction operations to anadromous fishes and their habitats should be addressed by the Federal, state, and local resource management and permitting agencies and considered in the permitting process.** The cumulative impacts on anadromous fish habitat caused by multiple extractions and sites along a given stream or river are compounded by other riverine impacts and land use disturbances in the watershed. These additional impacts may be caused by river diversions/impoundments, flood control projects, logging, and grazing. The technical methods for assessing, managing, and monitoring cumulative effects are a future need outside the scope of this Gravel Policy. Nevertheless, individual gravel extraction operations must be judged from a perspective that includes their potential adverse cumulative impacts. This should be a part of any gravel extraction management plan.

11. **An integrated environmental assessment, management, and monitoring program should be a part of any gravel extraction operation, and encouraged at Federal, state, and local levels.** Assessment is used to predict possible environmental impacts. Management is used to implement plans to prevent or minimize negative impacts. A mitigation and restoration strategy should be included in any management program. Monitoring is used to determine if the assessments were correct, to detect environmental changes, and to support management decisions.

12. **Mitigation and restoration should be an integral part of the management of gravel extraction projects.** Mitigation should occur concurrently with gravel extraction activities. In terms of National Environmental Policy Act (NEPA) regulations, mitigation includes: (1) avoidance of direct or indirect impacts or losses; (2) minimization of the extent or magnitude of the action; (3) repair, rehabilitation or restoration of integrity and function; (4) reduction or elimination of impacts by preservation and maintenance; and (5) compensation by replacement or substitution of the resource or environment. Thus, restoration is a part of mitigation, and according to the preceding definitions, the aim of restoration should be to restore the biotic integrity of a riverine ecosystem, not just to repair the damaged abiotic components. (However, see also Phase III of Section V, below.) An overview of river and stream restoration can be found in Gore et al. (1995). Koski (1992) states that the concept of stream habitat restoration as applied to anadromous fishes is based on the premise that fish production increases when those environmental factors that limit production are



alleviated. Thus, an analysis of those "limiting factors" is critical to the restoration process. Koski (1992) further states that effective stream habitat restoration must be holistic in scope, and approached through a three-step process:

- First, a program of watershed management and restoration must be applied to the watershed to ensure that all major environmental impacts affecting the entire stream ecosystem are addressed (i.e., cumulative impacts). Obviously, an individual gravel extraction project is not expected to restore an entire watershed suffering from cumulative effects for which it was not responsible. Rather, needed mitigation and restoration activities in a riverine system should focus on direct and indirect project effects and must be designed within the context of overall watershed management.

- Next, restore the physical structure of the channel, instream habitats and riparian zones (e.g., stabilize stream banks through replanting of riparian vegetation, conserve spawning gravel, and replace large woody debris). This would reestablish the ecological carrying capacity of the habitat, allowing fish production to increase.

- Finally, the fish themselves should be managed to ensure that there are sufficient spawning populations for maximizing the restored carrying capacity of the habitat.

NMFS recommends that either a mitigation fund, with contributions paid by the operators, or royalties from gravel extraction be used to fund the mitigation and restoration programs as well as for effectiveness monitoring.

13. **Habitat protection should be the primary goal in the management of gravel extraction operations.** Resource management agencies acknowledge that, under the right circumstances, some gravel extraction projects, whether commercial or performed by the agencies themselves, may offer important opportunities for anadromous fish habitat "enhancement". That is, gravel removal itself can be used beneficially as a tool for habitat creation, restoration, or rehabilitation (e.g., OWRRI, 1995). However, stream restoration and enhancement projects should be regarded with caution (see caveats on restoration and reclamation in Section V, Phase III, and OWRRI, 1995). While it is tempting to promote gravel extraction as a means to enhance or restore stream habitat, the underlying objective of this Gravel Policy is to prevent adverse impacts caused by commercial gravel extraction operations. Therefore, gravel extraction for habitat enhancement purposes done in conjunction with commercial gravel operations will not take precedence over and is not a substitute for habitat protection.

## V. OPTIMUM MANAGEMENT OF GRAVEL EXTRACTION OPERATIONS

This section outlines a simple management scenario for gravel extraction operations, with the goal of minimizing impacts to anadromous fishes and their habitats. It is organized around the three program elements outlined in recommendation 11. This general framework is intended only as an introductory guide for creating a more comprehensive assessment, management and monitoring program. Other examples can be found in the literature (e.g., Collins and Dunne, 1990; OWRRI, 1995).

Before implementing Phase I, the operators should submit plans to the appropriate Federal, State and local agencies outlining their proposed project, including locations, methods, timing, duration, proposed extraction volumes, etc. The operators should also check with their NMFS Regional offices for any region specific procedures and guidelines.

**Phase I. Prior to extraction, conduct comprehensive surveys and research to establish and document baseline environmental data, evaluate possible environmental impacts, and prescribe ways in which adverse environmental impacts are to be prevented or minimized.** Use a combination of best available technologies and methods, including field sampling and surveys, modeling, GIS technology and analyses of archival materials and historical databases; e.g., aerial photographs, maps, previous surveys, etc. Characterize and identify species distributions and abundances; identify habitats critical to fisheries management objectives and NMFS responsibilities under a variety of legislative mandates; determine the limiting environmental factors of the anadromous fish populations (see Koski 1992); calculate sediment budgets and hydraulic flow rates; predict possible changes in water quality, channel morphology, etc. Also address potential adverse cumulative impacts (see Recommendation No. 10, above) and propose a possible mitigation and restoration strategy (see Recommendation No. 12, above, and also discussion in Phase III, below). For example, from a perspective limited to abiotic factors, Collins and Dunne (1990) recommend that appropriate rates and locations for instream gravel extraction should be determined on the basis of:

a. The rate of upstream recruitment (note Recommendation No. 4, above).
b. Whether the river bed elevation under undisturbed conditions remains the same over the course of decades, or if not, the rate at which it is aggrading or degrading.
c. Historic patterns of sediment transport, bar growth, and bank erosion in particular bends.
d. Prediction of the specific, local effects of gravel extraction on bed elevations, and the stability of banks and bars. The prediction should take into account an analysis of present or past effects of gravel extraction at various rates.
e. A determination of the desirability or acceptability of the anticipated effects.

**Phase II. Monitor permitted operations and verify environmental safeguards.** Extraction rates and volumes should be closely regulated. Impacts to the river bed, banks and bars upstream and downstream of the project should be documented using bench-marked channel cross-sections and aerial photographs taken at regular intervals. Species distributions and abundances should be surveyed regularly. Water quality should be monitored. Mitigation and restoration should be an ongoing process (see Recommendation No. 12, above), with continual monitoring for effectiveness. Also, NMFS recommends that permits should have a 5 year limit and be subject to annual review and revision to protect anadromous fish and



their habitats (e.g., one element of the annual review should determine whether fishery management objectives are being met).

**Phase III. Establish and implement a long-term monitoring and restoration program.** This should continue Phase II objectives after completion of the project. A universal, prototype long-term monitoring strategy for watershed and stream restoration can be found in Bryant (1995). However, reliance on restoration should be put into proper perspective. It is important to acknowledge that there are significant gaps in our understanding of the methodology and effectiveness of restoration of streams and anadromous fish habitat affected by gravel extraction activities. Overall, restoration as a science is relatively young and experimental, and the processes and mechanisms are poorly understood. Little is known about the functional value, stability and resiliency of many so-called "restored" habitats. To date, existing regulations or plans pertaining to the mitigation and restoration of gravel extraction sites have been simplistic or vague. As an example: gravel extraction in California is regulated under the concept of "reclamation," which is derived from open-pit surface mining, such as large coal mines. Kondolf (1993; 1994b) states the concept of reclamation, as applied to open-pit mines, assumes that the environmental impacts are confined to the site; therefore, site treatment is considered in isolation from changes in the surrounding terrain.

Because reclamation does not occur until after the cessation of extraction, Kondolf (1993; 1994b) suggests that this definition treats the site as an essentially static feature of the landscape. Kondolf (1993; 1994b) argues that, while these assumptions may work for extraction operations located in inactive stream or river terraces, active channels and floodplain are dynamic environments, where disturbances can spread rapidly upstream and downstream from the site during and after the time of operation. The stream or river will irrevocably readjust its profile during subsequent high flows, eradicating the gravel pits and giving the illusion that extraction has had no impact on the channel. Kondolf (1993; 1994b) claims that a survey of bed elevations will show a net lowering of the bed, which reflects the more even distribution of downcutting (erosion) along the length of the channel. Even if the channel profile were to recover after completion of the project due to an influx of fresh sediment from upstream, habitat may have been lost in the meantime. Thus, it may not be possible to disturb one site in isolation from the rest of the ecosystem, or confine the disturbance to a single, detached location, and then subsequently reclaim or reverse the impacts. Kondolf (1993; 1994b) concludes that reclamation can be applied to gravel pits in terrace deposits above the water table, but the reclamation concept is not workable for regulating instream gravel extraction. For all of these reasons, it is important to heed Murphy's (1995) assertion that:

> The best form of restoration is habitat protection. There is no guarantee that restoration efforts will succeed, and the cost of restoration is much greater than the cost of habitat protection. The most prudent approach is to minimize the risk to habitat by ensuring adequate habitat protection.

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Rolland A. Schmitten
Assistant Administrator for Fisheries
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service



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APPENDIX 1

## SUMMARIES OF MAJOR STATUTES

The following summaries of the major statutes mentioned in this Gravel Policy, with the exception of the River and Harbor Act of 1899, were obtained from Buck (1995)[1].

### Anadromous Fish Conservation Act

The Anadromous Fish Conservation Act (16 *U.S.C.* 757a-757g) authorizes the Secretary of Commerce, along with the Secretary of Interior, or both, to enter into cooperative agreements to protect anadromous and Great Lakes fishery resources. To conserve, develop, and enhance anadromous fisheries, the fisheries which the United States has agreed to conserve through international agreements, and the fisheries of the Great Lakes and Lake Champlain, the Secretary may enter into agreements with states and other non-Federal interests. An agreement must specify: (1) the actions to be taken; (2) the benefits expected; (3) the estimated costs; (4) the cost distribution between the involved parties; (5) the term of the agreement; (6) the terms and conditions for disposal of property acquired by the Secretary; and (7) any other pertinent terms and conditions.

Pursuant to the agreements authorized under the Act, the Secretary may: (1) conduct investigations, engineering and biological surveys, and research; (2) carry out stream clearance activities; (3) undertake actions to facilitate the fishery resources and their free migration; (4) use fish hatcheries to accomplish the purposes of this Act; (5) study and make recommendations regarding the development and management of streams and other bodies of water consistent with the intent of the Act; (6) acquire lands or interests therein; (7) accept donations to be used for acquiring or managing lands or interests therein; and (8) administer such lands or interest therein in a manner consistent with the intent of this Act. Following the collection of these data, the Secretary makes recommendations pertaining to the elimination or reduction of polluting substances detrimental to fish and wildlife in interstate or navigable waterways. Joint NMFS-FWS regulations applicable to this program are published in 50 *C.F.R.* Part 401.

### Clean Water Act

The Clean Water Act (CWA) (33 *U.S.C.* 1251-1387) is a very broad statute with the goal of maintaining and restoring waters of the United States. The CWA authorizes water quality and pollution research, provides grants for sewage treatment facilities, sets pollution discharge and water quality standards, addresses oil and hazardous substances liability, and establishes permit programs for water quality, point source pollutant discharges, ocean

[1]Buck, E.H. 1995. Summaries of major laws implemented by the National Marine Fisheries Service. CRS Report for Congress. Congressional Research Service, Library of Congress, March 24, 1995.



pollution discharges, and dredging or filling of wetlands. The intent of the CWA Section 404 program and its 404(b)(1) "Guidelines" is to prevent destruction of aquatic ecosystems including wetlands, unless the action will not individually or cumulatively adversely affect the ecosystem. National Marine Fisheries Service (NMFS) provides comments to the U.S. Army Corps of Engineers as to the impacts to living marine resources of proposed activities and recommends methods for avoiding such impacts.

### Endangered Species Act

The purpose of the 1973 Endangered Species Act (ESA) (16 *U.S.C.* 1531-1543) is to provide a means whereby the ecosystems upon which endangered or threatened species depend may be conserved and to provide a program for the conservation of such endangered and threatened species. All Federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA.

### Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 *U.S.C.* 661-666c) requires that wildlife, including fish, receive equal consideration and be coordinated with other aspects of water resource development. This is accomplished by requiring consultation with the FWS, NMFS and appropriate state agencies, whenever any body of water is proposed to be modified in any way and a Federal permit or license is required. These agencies determine the possible harm to fish and wildlife resources, the measures needed to both prevent the damage to and loss of these resources, and the measures needed to develop and improve the resources, in connection with water resource development. NMFS submits comments to Federal licensing and permitting agencies on the potential harm to living marine resources caused by the proposed water development project, and recommendations to prevent harm.

### Magnuson Fishery Conservation and Management Act

The Magnuson Act requires that fishery management plans shall "include readily available information regarding the significance of habitat to the fishery and assessment as to the effects which changes to that habitat may have upon the fishery" 16 U.S.C. 1853 (a)(7).

### National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 *U.S.C.* 4321-4347) requires Federal agencies to analyze the potential effects of a proposed Federal action which would significantly affect the human environment. It specifically requires agencies to use a systematic, interdisciplinary approach in planning and decision-making, to insure that presently unquantified environmental values may be given appropriate consideration, and to provide detailed statements on the environmental impacts of proposed actions including: (1) any adverse impacts; (2) alternatives to the proposed action; and (3) the relationship between short-term uses and long-term productivity. The agencies use the results of this analysis in decision making. Alternatives analysis allows other options to be considered. NMFS plays a significant role in the implementation of NEPA through its consultative functions relating to conservation of marine resource habitats.

**Rivers and Harbors Act of 1899**

The Rivers and Harbors Act of 1899, Section 10 (33 *U.S.C.* 403) requires that all obstructions to the navigable capacity of waters of the United States must be authorized by Congress. The Secretary of the Army must authorize any construction outside established harbor lines or where no harbor lines exist. The Secretary of the Army must also authorize any alterations within the limits of any breakwater or channel of any navigable water of the United States.



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**0134-E01**

The potential effects of developing the Liberty Prospect on the Boulder Patch are analyzed in Sections III.C.2.e, III.C.3.e, and III.D. Bowhead whales are analyzed in Sections III.C.2.a(1), III.C.3.a(1); and III.D. Beluga whales and seals are analyzed in Sections III.C.2.b, III.C.3.b. Fishes are analyzed in Sections III.C.2.f, III.C.3.f, and III.D.

**0134-E02**

The types and levels of oil and gas related activities that are considered in the cumulative analysis and the oil-spill risk are described in Section V.B.

The design, construction, operation, and safety of offshore pipelines are described in Sections II.A.1.b(3), II.C.2, II.B.2, and IV.C.2.

The MMS believes it has used the best data available to describe and analyzed the effects of the component alternatives. This analysis includes both information from the Native North Slope residents (traditional knowledge) and from engineering and scientific studies.

**0134-A01**

The comment for the National Marine Fisheries Service suggests the EIS take a broader perspective and assess the ramifications of offshore versus onshore development. However, this EIS is project specific. Its purpose is to evaluate the effects of the project and reasonable alternatives to the project. However, oil resources are found where they are. The proposed project and the scope of the EIS are based on the Federal lease issued to BPXA, including the terms and conditions of the lease. It cannot be moved to an onshore location for the convenience of the EIS analysis.

Section I.H.5.a(2) of this EIS and Appendix D evaluate the potential for developing the lease from onshore and found that it was not technically and economically feasible. The reasonable alternatives that are available to BPXA and the decisionmakers for the agencies involved in the permitting process are limited to (1) approve the project as submitted, (2) approve the project as submitted with modification (selection of an alternative(s) or mitigating measure(s), or (3) disapprove. The option to develop the field at an onshore location does not exist. This suggestion is the same as the No Action Alternative in Section IV.B; therefore, no additional analysis is warranted.

It is outside the scope of a project-level EIS to evaluate and decide the merits of onshore versus offshore development. That is a policy-level decision. Furthermore, the recently released National Energy Policy (May 2001) supports both onshore and offshore development, including offshore Alaska. The 5-Year Oil and Gas Program evaluates whether offshore oil and gas development should be continued in Alaska, and what the schedule for leasing should be. The 5-Year Program EIS and not this project-specific EIS is the proper document to evaluate the environmental effects continuing leasing and development on the Alaskan outer continental shelf.

**0134-001**

The MMS disagrees with this comment. The EIS provides a fair and balanced discussion of the advantages and disadvantages of the various pipeline designs. There is sufficient information in the document for those agencies with permitting authority related to pipeline design to make an informed decision. The reason that there is not a clear choice between the different alternatives is that they all have been designed to safely transport crude oil from the proposed Liberty Island to shore and all have similar overall risks associated with them while having their own advantages and disadvantages.

**0134-002**

A discussion of the spring and fall 2000 trials has been added to Section III.C.1.a of the EIS.

**0134-003**

The Liberty EIS is intended to meet the needs and requirements of the National Environmental Policy Act for the MMS, the lead agency, and the U.S. Army Corp of Engineers and the Environmental Protection Agency, the cooperating agencies. This EIS represents all three agencies that intend to adopt the EIS. If the EIS is referring to a specific agency requirement or function, that agency is identified. The use of the term “we” in Section III.D.6 is correct and does not require modification.

**0134-004**

The four pipeline alternatives were not developed using “inconsistent design/construction standards” but were developed with input from the interagency team, which the National Marine Fisheries Service is a part of, to optimize safety, constructibility, and cost. The fact that burial depth and wall thickness varies between designs is a function of how a particular pipeline system behaves, not the application of inconsistent standards. To address the concerns of some agencies, the applicant presented designs that used the same burial depth and pipeline wall thickness as the proposed single-wall pipeline and included this as an addendum to their final report of pipeline design alternatives (INTEC, 2000). Fleet Technologies Ltd. analyzed both the original proposed designs and the designs contained in the addendum and concluded that the arbitrary modifications had negligible effects on the pipeline spill probabilities (Fleet, 2000).

Because the Fleet report indicated that the modified designs essentially were the same as the applicant’s original designs, the MMS only evaluated the original design alternatives. The INTEC (2000) and Fleet (2000) reports are summarized and the executive summaries are included in the EIS; the reports in their entirety are included by reference in the EIS.

Section 8.2 of the Fleet report contains a sensitivity analysis. The MMS chose not to summarize this information in the draft EIS, because it does not change the relative ranking of the four pipeline alternatives; it would be difficult to summarize this information in a way that would be easily understandable to the general public.

An actual design does exist for the four alternatives. The conceptual designs contain a significant amount of engineering data and analysis, far more than is needed by the decisionmakers to make an informed decision on the pipeline design alternatives. The steel pipe-in-pipe system has an inner pipe that has an outside diameter of 12.75 inches with a wall thickness of 0.500 inches and an outer pipe that has an outer diameter of 16.00 inches with a wall thickness of 0.844 inches (Section II.C.2.c of the EIS). Therefore, the annulus is 0.781 inches wide ([16.00-inch outer diameter – 2 * 0.844-inch wall thickness – 12.75-inch outer diameter]/2). Similar information is available for the pipe-in-HDPE alternative in Section II.C.2.d of the EIS.

The capacity of the annulus of the steel pipe-in-pipe system is 1,325 barrels (Section II.C.2.c of the EIS). Because the outer pipe is capable of handling the full operating pressure of the inner pipe, it will be able to contain a rupture, provided the event that caused the rupture did not also damage the outer pipe. If the outer pipe holds, it would be possible for a rupture to completely fill the annulus, but the overflow would be diverted to the production island and shore and, therefore, likely would not reach the marine environment. Similar information is available for the pipe-in-HDPE alternative in Section II.C.2.d of the EIS.

If the weight per linear foot of a pipeline system is held constant, increasing the diameter of the outer pipe would cause the pipeline to become more buoyant. The pipe-specific gravity of the various pipeline alternatives is contained in Table 2 of the Executive Summary of INTEC's pipeline alternatives report prepared for the applicant. The higher the specific gravity of a pipeline system, the less buoyant that pipeline will be.

Potential repair methods for a single-wall pipeline are briefly discussed in Section II.A.1.b(3)(c)3 of the EIS. Most of these repair methods also are available to the other pipeline alternatives. Table II.C-7 of the EIS indicates which repair methods are applicable to the various pipeline designs and how the repair method would differ, in terms of amount of excavation and duration of activity, for the various designs. Appendix E of the INTEC (2000) report contains a more detailed description of the repair options.

The EIS and/or the documents incorporated by reference already contain all of the information that this comment says is lacking; therefore, no changes to the EIS are warranted.

**0134-A02**

We acknowledge the concerns identified by the commenter and all of the permitting agencies concerning potential adverse effects from oil spills into the marine environment. The MMS agrees that requiring the appropriate design for the pipeline is key to helping reduce the risk of a potential pipeline spill. The MMS believes that all of the pipelines evaluated as alternatives in the EIS can be designed and constructed and can operate safely in the arctic marine environment. The pipeline studies provided some information to use in comparing the pipelines, but the differences were in the range of 1-2%. To perform the studies, assumptions were made; changes in the assumption can modify the outcomes by a few percentage points.

The pipe-in-pipe studies made certain assumptions concerning installation and maintenance that could lead to different conclusions. Not every defect in the manufacturing process of the pipe or in the construction may be found during the construction and installation process. A nick or ding in the pipeline's protective coating during the backfilling process may not be detected, which can lead to corrosion. A good monitoring program that uses tools such as smart pigs can find and monitor potential problems so that corrective action can be taken to prevent an oil leak. However, the periodic spacers between the two pipes and just the proximity of the two pipes to each other in a double-wall pipe can affect the accuracy of the information about the inner pipe. There is no known way to monitor the exterior pipe. Pressure tests can be used to determine if there is a leak, but they do not provide any useful information to predict what might occur. This is consistent with the information bulletin issued in October 1998 by the California State Fire Marshal, which prohibited the installation of a double-wall pipe for the jurisdictional hazardous liquid pipeline systems. That prohibition was based on "design and construction difficulties, operational and maintenance problems, risk to the public and to the environment, and economic impact." (More information can be found at their web site http://osfm.fire.ca.gov/pdf/informational/doublewall.pdf).

The U.S. Department of Agriculture, Forest Service evaluated the potential for a double-wall pipe for a proposed pipeline project in Idaho and Montana. This 10-inch diameter pipeline would run from Thompson Falls, Montana to Kingston, Idaho. The Forest Service determined that a double-wall pipe is not feasible for large-diameter, long-transmission pipelines (U.S. Department of Agriculture, Forest Service, 2000:C.7-42-43). They cite corrosion concerns, problems with cathodic protection of the carrier pipeline, and difficulty with maintenance of the carrier pipeline.

The MMS decision about which pipeline design should be included in the MMS agency-preferred alternative was based on review and advice from pipeline engineers from the MMS Alaska Region, Headquarters Office, and Gulf of Mexico Region. They concluded that a single-wall pipeline was the best and safest pipeline for this application. The MMS agency-preferred alternative pipeline design is consistent with the recommendations to the draft EIS from the State of Alaska and the U.S. Department of Transportation (Office of Pipeline Safety).

**0134-005**

The MMS is unaware of a comprehensive report detailing the lessons learned from the construction of the Northstar pipeline. The State Pipeline Coordinator's Office made continuous inspections during the construction of the Northstar pipeline, and the MMS expects to benefit from that experience during the joint technical review of the Liberty pipeline design by the MMS and State Pipeline Coordinator's Office.

**0134-E03**

Alternative III.A, the Southern Island Location and Eastern Pipeline Route, is described in Sections II.C.1.a and c, and its effects are analyzed in Section IV.C.1.d.

Alternative III.B, the Tern Island Location and Tern Pipeline Route, is described in Sections II.C.1.a and d, and it s effects are analyzed in Section IV.C.1.e.

**0134-E04**

Alternative III.A, the Southern Island Location and Eastern Pipeline Route, is described in Sections II.C.1.a and c, and its effects are analyzed in Section IV.C.1.d.

Alternative III.B, the Tern Island Location and Tern Pipeline Route, is described in Sections II.C.1.a and d, and it s effects are analyzed in Section IV.C.1.e.

**0134-006**

Please see Responses 0132-060 and 0134-016.

**0134-A03**

Please see Response 0134-015.

This alternative does not reduce the quantity of gravel needed for the island. The use of steel sheetpile actually increases the island design, because the bench area of the island needs to be increased to have a working surface for laying the concrete mats. As noted in Table II.A-1, the quantity of gravel needed for the island increases from 797,600 cubic yards to 855,000 cubic yards, a 7.2% increase in gravel needs. The EIS did not identify any significant changes that resulted from the different gravel requirements between the island slope-protection design systems.

**0134-E05**

The types and levels of oil and gas related activities that are considered in the cumulative analysis and the oil-spill risk are described in Section V.B.

Cumulative effects on sociocultural values and subsistence hunting practices that are associated with oil and gas development on the North Slope and in the Beaufort Sea are analyzed in Sections V.C.9 and 8, respectively. No additional information was provided by the commenter.

**0134-007**

1. Pressure to maintain a sea channel between West Dock and open waters.

There is no pressure to maintain an open channel between West Dock and the offshore facilities during fall freezeup conditions. This issue was raised early on in the Northstar process, and a stipulation was added to the Corps of Engineers permit limiting when they could carry out these icebreaking runs. It initially was envisioned that BPXA would have to maintain an open channel to ensure spill-response capability during this transition period. This has been changed. During operations in 1999 after the barge broke through the ice during operations, it was discovered that when the ice refroze along the barge path, it became thicker and more difficult to break through in additional runs. Nothing was gained by disturbing the ice. If there were a blowout during fall freezeup conditions and it was relatively late in the season, the barge probably would be either taken out to the spill site and allowed to freeze in place to be used as a response platform or left at the dock until the ice becomes thick enough to support work on the surface.

BPXA submitted to the Alaska Department of Environmental Conservation an amendment request for the Northstar plan proposing the removal of one spill response barge and implementing seasonal drilling restrictions barring new wells and sidetracks from existing wells into any major oil-bearing zone during breakup, open-water, and freezeup conditions. The drilling restrictions are intended to eliminate the blowout risk from development drilling. Their response scenarios during broken ice and open water would be geared towards responding to a catastrophic rupture of the subsea pipeline, which would be a significantly smaller volume requiring less equipment on the water. The Department of Environmental Conservation has approved the removal of the barge and the seasonal drilling restrictions.

2. Additional spill-response drills.

BPXA has a Conflict Avoidance Agreement with several North Slope whaling interests. If the project is approved, BPXA has committed to develop a Conflict Avoidance Agreement for this project. The agreement requires BPXA to contact the Alaska Eskimo Whaling Commission and village whaling captains before conducting vessel activities within the bowhead whale migration corridor during the migration and coordinating activities so they do not impact the whales during this time.

3. Increased operations of vehicles on the ice while testing response equipment.

There would be initial testing of spill-response equipment by BPXA to demonstrate that they can mount a spill-response effort to Liberty Island and to verify transit times; however, beyond that, the majority of spill-response training during the solid-ice season would be conducted nearshore in the West Dock area. The operator is required to demonstrate all aspects of his plan during a 3-year period, so there would be on-ice activities in the Liberty area during each 3-year period. These demonstrations probably would not be common because as stated earlier, the same activities can be accomplished at West Dock.

**0134-008**

Please see Response 0132-A02.

The only place where profit is considered in the National Environmental Policy Act is as a filter for alternatives. Because BPXA, a for-profit corporation, will be funding the alternatives, there is no reason to evaluate any alternatives where potential costs exceed potential income, because BPXA would never proceed with such a project. Therefore, an alternative where costs exceed income becomes the No Action alternative, which is evaluated in the EIS.

The Federal Government collects a royalty on production, which is based on the current market value less the cost of production. Alternatives that lower costs increase the amount of royalty collected and deposited to the Federal Treasury. Therefore, alternatives that lower costs benefit the taxpayers and BPXA shareholders.

**0134-009**

Section C.5.c of the Executive Summary was summarized from the analysis in Appendix A, Oil-Spill-Risk Analysis, Section B Small Oil Spills. The data set and the method of analysis are described in this section.

**0134-010**

There really is not much of a discrepancy here. Comments by subsistence whalers that noise from drilling activities displaced whales primarily have been in reference to drilling activities within the bowhead whale migration route. The proposed Liberty Island is not within the bowhead whale migration route but is inside the barrier islands, and it is 10 or more kilometers from the main bowhead whale migration route. Existing studies indicate that industrial sounds, such as drilling noise, are greatly attenuated at 3.7 kilometers and not detectable at 9.3 kilometers from the source. Whales outside the barrier islands would not hear these sounds from Liberty. Wording has been added to the text in the Executive Summary to clarify this.

**0134-011**

The description in the EIS is correct. Even if all of the potential new oil and gas projects in the U.S., such as the Liberty Project, were brought online in the near future, the U.S. still would need to import oil. Therefore, choosing not to produce Liberty or any domestic source is the same as choosing to import oil. To reword the sentence as proposed would mislead the public and decisionmaker(s).

**0134-012**

See Section IV.C.1.d(7) for a discussion of the effects on the economy for Alternative III.A. The text in the EIS has been supplemented to clarify the reason for a decrease in wages, jobs, and net present value.

**0134-013**

See Section IV.C.1.e(7) for a discussion of the effects on the economy for Alternative III.B. The text in the EIS has been supplemented to clarify the reason for a decrease in wages, jobs, and net present value.

**0134-014**

See Section IV.C.2.i(3) for a discussion of the effects on the economy for Alternative IV.A.

**0134-015**

The gravel bags for upper slope protection in the proposed Liberty Island design are in a different location than those that were used at West Dock and Endicott. At West Dock and Endicott, the polyester bags cover the entire slope, where they can and do contact the ice and ocean waves at sea level. If a bag is ripped and opened by ice, there is an opportunity for all or part of the bag to be washed into the water. For the Liberty Island design, the lower slope of the island (from the seafloor to 5 feet above sea level) and the 40-foot bench would be covered and protected by interlocking cement blocks. The gravel bags protect the upper slope of the island from 5 feet above sea level to about 20 feet above sea level. While ice can ride up over the cement blocks and contact the gravel bag, it is unlikely that there would be an ice event where the bags would be ripped or opened immediately followed by a wave or storm event that would wash the bags into the water. In the time between such two events, any ripped bags could be replaced. However, the EIS does acknowledge that two such events possibly could occur back to back and evaluates the possible effects. No significant adverse effects were identified in the EIS that were attributed to using gravel bags for the upper slope protection.

As indicated, the likelihood is small of an ice event that would rip and open a gravel bag(s) immediately followed by a wave event that would wash the bag(s) and gravel away. There are many locations in the Prudhoe Bay area where gravel (100 yards of gravel would provide 20 new bags) could be acquired without additional mining or adverse impacts to the environment.

**0134-016**

The reasons for not considering Tern Island as a gravel source are given in Section I.H.5.c(3) of the EIS and include insufficient amount of gravel (additional gravel would have to be obtained from other sources), blasting frozen gravel, and the possibility of having to excavate the gravel in the summer, which provides a greater potential for disturbing fish and wildlife. The commenter did not provide any new or additional information that MMS could consider in evaluating the use of Tern Island as a gravel source for the Liberty development project.

The amount of gravel available at Tern Island is not sufficient to meet the needs of the Liberty Project. Thus, another source(s) of gravel would have to be exploited, probably from onshore locations. Gravel is obtained from onshore sites on State of Alaska land and is subject to the conditions of State permits. Selection of such sites is a matter between the State and BPXA; MMS regulatory authority is limited to the Federal waters part of the project area.

**0134-017**

Stipulations 2 and 3 are required for all outer continental shelf leases, and they provide significant mitigation.

**Stipulation No. 2 Orientation Program** requires lessees and their agents, contractors, and subcontractors to attend programs yearly that provide individuals with the specific types of environmental, social, and cultural concerns that relate to the area in which they are operating. The program is required to address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. The guidance must include the production and distribution of information cards on endangered and/or threatened species in the area. The program must be designed to increase sensitivity and understanding of personnel to community values, customs, and lifestyles in the area. It also must include information concerning avoidance of conflicts with subsistence, commercial-fishing activities, and other pertinent mitigation. As proof of yearly attendance, the lessee must maintain records onsite, so they will be available for inspection by MMS inspectors.

**Stipulation No. 3 Transportation of Hydrocarbons** requires pipelines as the mode of transportation of production to shore, if it is technologically feasible and environmentally preferable. No crude oil production will be transported by surface vessel from offshore production sites except in an emergency.

This requirement greatly reduces the potential for a significant spill and chronic small spills of contaminants associated with surface transportation of production.

**Stipulation No. 4 Industry Site-Specific Bowhead Whale-Monitoring Program** applies to areas that are within or near the spring and fall bowhead whale migration path and contains specific requirements for exploratory drilling operations during the bowhead migration. This stipulation is mentioned only in context with all of the stipulations imposed for recent sales in the area. It is not applicable to the Liberty Project for two reasons: (1) it applies only to exploration and (2) because the Liberty lease does not fall within the area defined in the stipulation as being within or near the migration path. However; we still may require monitoring for Liberty.

See Appendix B, part B for the full text of these stipulations.

**0134-018**

The section was rewritten to indicate that the Memorandum of Agreement was a national memorandum regarding “The Determination of Mitigation Under the Clean Water Act Section 404 (b)(1) Guidelines.” It also identifies Footnote 7 of the Memorandum of Agreement as pertaining to the wetlands in Alaska.

**0134-019**

A reference to the threshold definition has been added to the Executive Summary and Section III.A.

**0134-020**

The statement references both onshore and offshore activities. The current rate of oil and gas activity is much lower than that associated with the development of the Prudhoe Bay oil field, adjoining fields such as Endicott, and the construction of the Trans-Alaska Pipeline System. Less oil is being produced on the North Slope, less oil is being shipped through the Trans-Alaska Pipeline, and there are fewer sealifts of equipment and production facilities. The footprint of the new operations on the North Slope are smaller in size and use ice during the winter rather than gravel roads. Even offshore, there is less exploration and seismic activity and fewer active outer continental shelf leases than during the 1980’s.

While the amount of activity in recent years has increased over that in the 1990’s, it is still much lower, than the amount of activities that occurred during the 1970’s and 1980’s.

We acknowledge that the demonstrations to clean up oil spills during broken-ice conditions have been a focus of concern by State, Federal, and local governments. However, the amount of equipment and the oil-spill-contingency plan to deal with potential oil spills that may occur during broken-ice conditions are being revised. Another option under discussion with the State of Alaska for inclusion in the oil-spill contingency plan would be the voluntary adoption by BPXA limiting drilling during periods of broken ice and open water to depths above oil-bearing prospect. This measure would eliminate the potential for large blowout spills during open-water and broken-ice conditions. The EIS also evaluates other mitigating measures, and the oil-spill-contingency plan for Liberty includes in situ burning, which can be effective in reducing oil in the water if used properly.

The population of many of the resources of concern identified during scoping, such as the bowhead whale, polar bear, and caribou have increased in numbers since the 1970’s. For other resources, such as the spectacled and Steller’s eiders, the area where oil and gas development occurs has not been identified as critical habitat. While the general statement that “Many environmental resources have become more limited or stressed in recent time, and might be considered more vulnerable to the effects of development” may be true for some species, we are unaware of information that provides a direct cause-and-effects relationship to the level of oil and gas activities on the North Slope in general, or to offshore oil and gas development in the central Beaufort Sea.

**0134-021**

The suggested change was made to the text in the Executive Summary.

**0134-022**

The need and purpose for the project are correctly stated. Please see Response 0132-A02.

**0134-023**

The suggested correction was made to the text.

**0134-024**

We acknowledge the commenter's suggestion that using a development site in bottomfast ice or onshore may provide some environmental benefits. However, the EIS should not include alternatives that are not technically or economically feasible. Options that are not technically or economically feasible become the same as the No Action Alternative because, if they are chosen by the decisionmaker, the applicant cannot go forward with the project. There is no benefit to either the readers or decisionmakers to include options that cannot be selected. Their inclusion would waste time and effort and add to the length of the document, but they would not add to the document's usefulness.

**0134-025**

The OCS Lands Act directs MMS to explore and develop the offshore oil and gas resources to meet the Nation's energy needs in an environmentally safe manner. The MMS is charged with the conservation of resources. This requires MMS to ensure that all of the oil and gas resources in the prospect are produced, not just a portion of the field. Based on the available geologic information, the well locations and plan provided by BPXA provide for the development of the Liberty Prospect. The MMS requires the development and production of all of the prospect, not just that portion of the prospect that is most profitable. If one or more production or injection wells are deleted or removed, the oil in that part of the project would not be produced. Decreasing production reduces the potential revenues even further; the costs exceed income, and this proposed alternative, in effect, becomes the No Action Alternative. A drilling and production facility includes many costs, not just for the offshore gravel island and slope-protection systems. The onshore facility would need to be constructed and transported in modules to a remote location, which is more expensive and time consuming than a barge sealift. Annual ice roads or a gravel road would need to be constructed for access. The drilling equipment and facilities, including storage area, would need to be larger to complete development of the field using all extended-reach wells. Therefore, the costs associated with constructing an onshore drilling facility are within the same range as developing the field from offshore.

**0134-026**

Additional reference material and bibliographic information on Beaufort Sea Ice Gouge studies has been added to the text in the Section C.1.c.3.c.

**0134-027**

A discussion of the actual method of trenching used for Northstar is not relevant in a section that is discussing the option of using a suction-cutter dredge. The EIS clearly states in the first paragraph of the section cited that "…BPXA eventually elected not to use a suction-cutter dredge for Northstar." The fifth paragraph on page I-24 of the draft EIS is a discussion of what was proposed, but not carried out, for the Northstar Project and does not need to be updated.

**0134-028**

After construction and installation is complete but before the pipeline is placed into service, the pipeline would be pigged and hydrostatically tested. After completion of the test, the testing fluid would be displaced from the pipeline and recovered.

**0134-029**

Please see Response 0134-015.

**0134-030**

Conductor pipes are the first string of casing used on a well. They typically are driven into the ground before drilling begins to stabilize the upper part of the hole so that when drilling begins, the circulation of the mud will not erode the soil at the surface. The additional noise would occur only while the conductor pipe is being driven. Conductor casing for all potential well slots will be driven during the same 1-2 week period. A brief description of conductor pipe has been added to Section II.A.1.b(1) of the EIS.

**0134-031**

The two numbers do represent the volume of oil that could be released at the different leak-detection thresholds. The volume of oil released is larger than the detection rate, because after an alarm is indicated and the pipeline shut in, some additional oil would be released due to the operators' response time and the depressurization of the pipeline. Section II.A.1.b(3)(d)3) of the EIS goes into more detail on the relationship between a leak-detection threshold of 97.5 barrels per day and a spill volume of 125 barrels.

**0134-032**

The BPXA Development and Production Plan includes a visual monitoring plan to detect an oil leak that would be used in the event that the proposed LEOS system has becomes inoperable during solid-ice conditions. As noted by the commenter, as long as the LEOS system is operational, there is no need to conduct over-ice monitoring. The LEOS system has not been used in the Arctic marine environment; therefore, it seems prudent to evaluate the possibility that the LEOS system could become inoperable and to describe and evaluate the potential effects. The other primary leak-detection systems are pressure-point analysis and mass-balance line-pack compensation, which are estimated to detect leaks greater than 0.15% of the flow, which would be approximately 97.5 barrels per day. If a spill occurred immediately after an over-ice inspection and leaked oil for 30 days, it could result in a spill of about 2,956 barrels. If the LEOS leak-detection system is inoperable, the concern is whether that size of spill could be detected in the next over-ice inspection. If not, it would continue to leak oil at 97.5 barrels per day. Once the properties of the Liberty oil has been determined, the hole spacing can be determined using a volume and confidence level.

Regarding the commenter's concern over the volume of use determining hole spacing, any volume of oil leak or confidence level could be used to determine the hole spacing. A very small leak, such as 1 barrel per day, would require increased hole spacing to detect, but it also would result in very little if any environmental damage, even if it lasted for 60 days. The 0.15% volume used was the basis for the calculations at Northstar to determine spill volumes and confidence levels; for consistency, the same criteria or volume and time was used for Liberty.

**0134-033**

A discussion of the spring and fall 2000 trials has been added to Section III.C.1.a of the EIS.

**0134-034**

Please see Response 0134-015.

**0134-035**

The MMS does not believe we have understated the potential harm to bowhead whales from a spill within or entering the spring lead system. Analysis dealing with the chance of an oil spill, how many whales may be affected by an oil spill, and what those effects might be is always difficult.

The effects of an oil spill on bowhead whales are unknown from the perspective of western science. As stated in Section III.C.2.a(1)(b) of the EIS, Thomas Brower, Sr. (1980) described the effects of an oil spill in 1944 on bowhead whales. He observed that bowhead whales made a wide detour out to sea when passing the Elson Lagoon/Plover Islands, the location of the spill, during their fall migration, avoiding the area of the spill. The whales normally migrated close to these islands. In addition, one can review studies on the effects of oil spills on other cetaceans and draw some conclusions. Based on existing literature on the effects of oil on cetaceans, there is no conclusive evidence that cetaceans (bowhead whales) would be killed as a result of contact with spilled oil. Geraci and St. Aubin, after conducting a number of studies on the effects of oil on cetaceans, concluded that in real life, contact with oil would be less harmful to cetaceans than they and others had proposed.

Next, the chance of an oil spill contacting the spring lead system needs to be examined. Based on the Oil-Spill-Risk Analysis model, there is a less than 0.5% chance of an oil spill from Liberty Island contacting the spring lead system over a 360-day period during either the summer or winter.

Finally, as stated in the National Marine Fisheries Service's draft Biological Opinion for the Liberty Project, several coincidental events would be necessary for impact to bowhead whales in the spring lead system. The spill would have to occur (the chance is on the order of 1% for a spill greater than or equal to 500 barrels); the spill would have to reach the spring lead system (a less than 0.5% chance over a 360-day period); the spill would have to coincide to some extent with the seasonal migration in the spring lead system (primarily April through June); and cleanup or response efforts would have had be unsuccessful.

When one considers the coincidental events necessary for spilled oil to impact bowhead whales in the spring lead system, along with the existing literature regarding the effects of spilled oil on cetaceans, the MMS believes that the conclusion in the EIS is a reasonable conclusion. The MMS believes that the likelihood that large numbers of whales would be contacted by spilled oil and be killed appears fairly limited, based on information available.

**0134-036**

Section III.C.1.d(3), first paragraph and second and last sentences, state: "Ideally, the database should include a wide range of spill volumes over a long period of time from oil developments resembling the prospective prospect. Because no databases exactly match the Liberty Project in engineering scope or location, we use the available databases, but evaluate project-specific consideration for Liberty." This statement reflects the fact that we do not have a historical database on subsea pipeline spills in the Arctic that we can use to evaluate the causes of spills. Section III.C.1.d(4)(a), fifth paragraph, discusses the causes of spills for gravel islands by looking at spill causes for outer continental shelf platforms and Alaska North Slope facilities. Section III.C.1.d(4)(b) discusses the cause of spills for pipelines by looking at causes for outer continental shelf pipelines. Sections III.C.1.d(4)(a) and (b) take the historical datasets described in Section III.C.1.d(3) and look in more depth at cause. The caveat from Section III.C.1.d(3), first paragraph and second and last sentences, still applies.

**0134-037**

For purposes of analysis, it is assumed that the oil within the annulus of the pipe can be removed and the pipeline can be cleaned and dried. The annulus for the pipe-in-pipe system could hold about 1,325 barrels and the annulus for the pipe-in HDPE could hold about 1,725 barrels. These spill sizes fall in between the 715-, 1,580-, and 2,956-barrel spills analyzed in the EIS. If all the oil were to drain into the environment during repair or cleanup of the annulus, the effects of a spill would be the same as for the single-wall pipe. We have added this statement to Section III.C.1.e(1)b.

If a double-wall pipeline were approved, the MMS would have to develop formal policies regarding procedures specifically for a double-wall pipeline. If a double-wall pipeline were installed specifically for containment purposes, any fluid in the annulus would constitute cause for shutting down and evacuating the inner pipeline. The double-wall pipeline is a system, and any failure of a component of the system is considered a failure of the system.

**0134-038**

In Section III.C.2.h(2)(a)3), under the discussion of effects of cleanup activities on subsistence resources and harvest, the text has been changed to include the suggested wording about using the knowledge and vessels of local whalers. See also Response 0130-007.

**0134-039**

The discussion of the fear of an oil spill in Section III.C.2.i.(1)(b)1) has been included in the cumulative-effects discussion.

**0134-040**

Information on the effects of gravel mining in Oregon rivers probably was not appropriate for this EIS and has been deleted; the inclusion of this information was suggested by a member of the Interagency Team. A summary of Alaska Department of Fish and Game, North Slope gravel mine guidelines and a discussion of the effects of rehabilitating these mine sites has been added to Section III.D.2.a.

**0134-041**

"Periodically" is defined as the tendency to recur at regular intervals. The BPXA *Liberty Development Project Development and Production Plan* (Revision 2) July 31, 2000, did not specify any cleaning interval, and the term "periodically" has been deleted from the sentence.

Details regarding the seawater-intake system and related discharges are described in Section III.D.1.l. Also see Appendices I-2 and I-3.

**0134-042**

The commenter probably refers to the effects on lower trophic-level organisms from the removal of concrete mats on page III-D-22 of the draft EIS instead of page III-D-19. That portion of the EIS text has been clarified on the basis of the comment. The EIS was referring to the productivity of kelp around the proposed island rather than the productivity in the center of the Boulder Patch.  The text now explains that the proposed island is located in an inshore, depositional area with only marginal kelp habitat, as shown by Figure III.C-1.  In contrast, the island slopes probably would not accumulate sediment and, therefore, would be more productive kelp habitat.

**0134-043**

As stated in the comment, the sentence in question refers to population-level effects.  No population-level effects have been documented; neither has any mortality been documented as a result of industrial activities in the Beaufort Sea.  The paragraph in Section V.C.1.a(2)(a) does, in fact, acknowledge that whales may avoid areas where seismic surveys or drilling activities are being conducted and it does acknowledge comments by subsistence whalers that whales have been displaced farther offshore.  However, the primary purpose of this section is to discuss the projects that may affect bowhead whales.  We refer the reader to Section V.C.1.a(2)(b) for a more complete discussion on the effects of these projects on bowheads.

**0134-044**

The suggested change to delete the word “perhaps” has been made in the text in Section V.C.1.a(2)(b).  The reference to the statement that whales’ avoidance of the seismic operations during the 1996-1998 whaling seasons did not affect subsistence whaling is likely true due to implementation of mitigating measures under the 1996-1998 Conflict Avoidance Agreements, as discussed in Miller, et al. (1999).  The statement in Section V.C.1.a(2)(b) has been modified to include a reference to the 1996-1998 Conflict Avoidance Agreements.

**Alaska Center for the Environment * Alaska Community Action on Toxics * Alaska Conservation Alliance * Alaska Wilderness League * Center for Biological Diversity * Defenders of Wildlife * Greenpeace * National Wildlife Federation * Natural Resources Defense Council * Northern Alaska Environmental Center * Sierra Club * The Wilderness Society**

April 13, 2001

0135

Mr. John Goll, Regional Director
Alaska OCS Region
Minerals Management Service
949 East 36th Ave., Room 308
Anchorage, AK 99508
*U.S. Mail and Hand-delivered via courier*

RE: Liberty Draft EIS

Dear Mr. Goll,

Alaska Center for the Environment, Alaska Community Action on Toxics, Alaska Conservation Alliance, Alaska Wilderness League, Center for Biological Diversity, Defenders of Wildlife, Greenpeace, National Wildlife Federation, Natural Resources Defense Council, Northern Alaska Environmental Center, Sierra Club, and The Wilderness Society provide these comments on the Liberty Development and Production Plan Draft Environmental Impact Statement (DEIS) in response to your public notice of January 12, 2001. We are writing on behalf of literally millions of supporters in the United States, tens of thousands of whom reside here in Alaska. We appreciate the availability of the DEIS at the Minerals Management Service website and through the distribution of CD-ROMs, and urge you to continue the distribution of public documents in electronic form, as well as in print, in the future. E01

The undersigned groups request the Minerals Management Service (MMS) select Alternative 2, the "No Action" alternative described in the DEIS. The "No Action" alternative is the only alternative described in the DEIS that does not pose unacceptable risks to the environment. The "No Action" alternative best meets the public interest and legal requirements, including cumulative impact assessment. E02 We request that the MMS, the Army Corps of Engineers, the Environmental Protection Agency (EPA), and other agencies deny any permits or approvals for the Liberty project. The MMS should disapprove the Development and Production Plan (DPP) because it fails to comply with the requirements of the Outer Continental Shelf Lands Act (OCSLA), as amended, and poses grave risks to the endangered bowhead whale, spectacled and Steller's eiders, polar bears, subsistence, and other exceptional natural resources in the project area. The serious harm to fish, wildlife, and the marine, coastal, and human E03



environment – including subsistence – will increase over time due to the expanded offshore development, in combination with the Northstar subsea pipeline. We are also concerned about impacts from oil spills on the coastline and lagoons of the Arctic National Wildlife Refuge. E03

Other permits that should be denied include, but are not limited to, Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the Clean Water Act (Federal Water Pollution Control Act of 1972, 33 USC 1344), and Ocean Dumping Permits under Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972. E04 We also urge the EPA to reject the National Pollutant Discharge Elimination System permit (33 USC 1251) and Underground Injection Control (UIC) Class I Industrial Well permit under the Safe Drinking Water Act (40 CFR 124A, 40 CFR 144, 40 CFR 146) based on inadequate analysis of the resources that would be potentially affected by waste disposal. We request the EPA to reject the adequacy of the DEIS for failure to comply with the Council on Environmental Quality (CEQ) guidelines (40 CFR 1500-508) and section 309 of the Clean Air Act (CAA). Neither EPA nor MMS should approve the required spill prevention, containment, and countermeasure plan (SPCC) or Oil Discharge Prevention and Contingency Plan (ODPCP) because they fail to meet the response requirements set forth by OCSLA and the Oil Pollution Act of 1990, as evidenced spill drill failures for response tests required by the State of Alaska as conditions of the Northstar ODPCP plan during 1999 and 2000. The MMS should incorporate a thorough description of the results of these drills and include the joint agency reports and the Alaska Department of Environmental Conservation compliance order as Appendices in the final EIS. 001

The analysis of alternatives in the DEIS fails to adequately assess a number of significant environmental impacts, detailed below. The impacts of Liberty are very similar to those of Northstar, and are noted in Greenpeace's comments to the U.S. Army Corps of Engineers on the Northstar DEIS, Final EIS, and to the MMS on the FEIS. Those comments are incorporated by reference, and will not be repeated. A copy of the comment letter on the DEIS can be found at http://www.greenpeaceusa.org/climate/northstarcomments.htm. A01

The DEIS fails to adequately analyze the impact of the Liberty project on global warming; fails to adequately analyze the impacts of the alternatives on national energy policy; fails to adequately analyze the risks of and impacts from the project or from potential oil spills; fails to adequately analyze the impacts of the alternatives on wildlife, including subsistence species that are relied upon by North Slope communities; fails to adequately analyze impacts of gravel mining and water withdrawal, and; fails to adequately analyze the full range of cumulative impacts on the Arctic environment, including impacts on the Arctic National Wildlife Refuge.

*Our detailed concerns follow:*

1. The DEIS fails to adequately analyze the impact of Liberty on global warming.

The DEIS places a disproportionate emphasis on the greenhouse gas emissions produced as a result of oil production activities at Liberty and other North Slope oil fields. Although oil production activities are a significant source of greenhouse gas emissions and should be included in the DEIS, the impact of this source is dwarfed by the greenhouse gas emissions that will be produced when the oil from Liberty and other North Slope oil fields is burned. In its discussion of global warming, the DEIS all but ignores the impact of the greenhouse gas emissions resulting from the consumption of oil at Liberty and other past, current and reasonably foreseeable oil fields. 002

The DEIS also fails to adequately discuss and analyze the impact of the inevitable increase of greenhouse gas emissions from the production and consumption of oil at Liberty. The DEIS predicts that regional greenhouse gas emissions resulting from North Slope oil field activities will be approximately 30 percent higher than current levels (Volume 1, page V-62), but fails to include any analysis of the impacts of this increase. The DEIS also fails to give any sense of how long it will take for North Slope greenhouse gas emissions to increase 30 percent. Moreover, the DEIS fails to discuss the impacts associated with additional greenhouse gas emissions produced as a result of burning oil produced at Liberty. It also fails to discuss the cumulative impact of burning oil from Liberty against the backdrop of current and reasonably foreseeable oil production on the North Slope. 003

The United Nation's Intergovernmental Panel on Climate Change has called for deep cuts along the lines of 50 percent reduction in greenhouse gas emissions in order to merely stabilize the amount of CO2 in the atmosphere (*see* IPCC Second Assessment Synthesis of Scientific-Technical Information relevant to interpreting Article 2 of the UN Framework Convention on Climate Change, found at http://www.ipcc.ch/pub/sarsyn.htm). A 30 percent increase in greenhouse gas emissions from regional oil production activities and the additional greenhouse gas emissions from consumption of additional sources of oil flies in the face of the IPCC's recommendations and the growing body of evidence on the cause and impacts of global warming.

The DEIS refers to the greenhouse gas emissions associated with the consumption of North Slope oil only once. The DEIS cites an Army Corps of Engineers statistic that greenhouse gas emissions from current North Slope oil 004



production activities – including shipping, refining, end product transportation and consumption – is about one percent of global fossil fuel greenhouse gas emissions. In the absence of additional discussion, the "one percent" fact cited in the DEIS is out of context and misleading. The DEIS fails to discuss greenhouse gas emissions from burning fossil fuel over time, the persistence of greenhouse gases in the atmosphere, and the impact past emissions are already having on the climate. 004

Specifically, there is no analysis of the greenhouse gas emissions produced from burning oil produced at Liberty over the 15 to 20 year lifetime of the project. The significance of greenhouse gas emissions produced over time is due to the persistence of these gases in the atmosphere. Many greenhouse gases remain in the atmosphere – and affect climate – for decades. For example, carbon dioxide has an atmospheric lifetime of 50 to 200 years. Much of the unprecedented anthropogenic global warming experienced today is a result of emissions released decades ago, and these emissions will continue to wreak havoc on the climate for decades still. 005

Global warming gases produced as a result of burning oil from the Liberty oil field – as well as other North Slope oil fields that have been or are predicted to operate for decades – will be released into the atmosphere over time, continuing to load carbon dioxide and other greenhouse gases into an atmosphere that is already laden with unprecedented levels of carbon. The DEIS fails to analyze the cumulative impact of adding yet more long-lived greenhouse gases resulting from oil drilling at Liberty and other past, current and reasonably foreseeable North Slope oil and gas projects. 006

In its discussion of global warming, the DEIS states that greenhouse gas emissions in the United States and globally can be reduced through energy efficiency, energy conservation and the development of alternative sources of energy. We agree. However, the DEIS's treatment of these alternatives to oil ends there, and fails to analyze how the investment of $364 to $744 million on yet another offshore oil drilling project in the Beaufort Sea will delay the implementation of these energy saving and climate-friendly programs and technologies. The DEIS fails to analyze how the investment of billions of dollars on new oil drilling in the Arctic will further stall and thwart the implementation of renewable energy, energy efficiency and conservation. 007

It is a known fact that continued exploration and drilling off the coast of Alaska will exacerbate global warming, which has already caused the Arctic ice pack to thin by 40 percent in the last 40 years. This polar meltdown has grave implications for the Arctic environment, including the distinct Arctic species such as polar bears, walrus, whales and seals, whose habitat and lifecycle are tied 008 inextricably to the ice. MMS's failure to analyze the impacts of Liberty on the climate is unacceptable, particularly since burning oil is the number one source of pollution that causes global warming, and in turn, global warming is effecting the Arctic at a rate not seen elsewhere on the planet. 008

009

The DEIS states that if Alaska oil and gas resources were to not be developed in the future, then oil and gas resources would have to be developed in other parts of the globe, resulting in no net reduction in greenhouse gas emissions. This is a dangerous assumption that once again assumes the U.S. will continue to burn oil at the exclusion of any meaningful shift toward renewable energy. The United States has four percent of the world's population and burns nearly 25 percent of the world's oil each year. If global warming is to be addressed in any meaningful way, then the United States must take the lead in reducing its reliance on oil and increasing its reliance on cleaner, climate-friendly forms of energy such as solar and wind. The assumption that any part of the globe can be seen as a gas station to satisfy the United State's thirst for oil should not be part of a federal environmental impact statement given all that is known about climate change.



2. The DEIS fails to adequately analyze the impacts of the alternatives on national energy policy.

The DEIS assumes that if Liberty is not developed, then the U.S. will have to increase imports of foreign oil. The DEIS fails to include any analysis of how similar investments on renewable energy could begin to wean the U.S. from its dependence on oil – be it imported or domestic. Given the fact that the United States has only three percent of global oil reserves, yet it burns 25 percent of the oil consumed globally, the problem is not one of finding more oil – as the DEIS implies – but of weaning this country off oil. True energy security and independence will come from renewable energy sources, not fossil fuels like oil and gas. 010

According to the DEIS, Liberty will cost anywhere from $364 to $744 million. BP's Northstar project was projected to cost $686 million. Contrast the dollars invested in just these two North Slope oilfields with BP's projected solar spend in the next three years: $500 million. Likewise, the federal government spends billions of dollars each year on subsidies, royalty relief and tax breaks for oil companies. "Fueling Global Warming: Federal Subsidies to Oil in the United States" produced by Industrial Economics for Greenpeace, found that the US government provided up to $11.9 billion in subsidies to the US oil industry in 1995. This excludes the cost of defending Persian Gulf oil supplies. If included, the figure rises as high as $35.2 billion.

The DEIS assumes a national energy strategy of burning oil for the foreseeable future, with no analysis of the impacts on the environment, and fails to contrast this assumption with the benefits of shifting resources toward a clean energy future that is powered by renewables. 011

3. The Liberty DEIS fails to adequately analyze the risk of oil spills.

Both the likelihood and the impact of an oil spill are severely underestimated. Without adequate explanation, the estimated oil spill risk at Liberty is significantly lower than the estimated spill risk at Northstar – but the two facilities will use the same technology to drill for and transport oil, including using the as yet untested sub-seabed pipeline to transport oil to shore. The spill risk at Northstar was estimated at 11 to 24 percent (Corps of Engineers, 1999, p. ES-117), whereas spill risk at Liberty is estimated – without justification – at one to six percent in the DEIS. It is most commonly referred to as 1% in the EIS. 012

MMS said their assumptions for oil spill risk were "a mixture of project-specific information, modeling results, statistical analysis, and professional judgement." (pA-1). In contrast, the Northstar oil spill probabilities were based on the track record from other areas (Gulf of Mexico for MMS's data that showed 24%; Europe for CONCAWE's

012

pipeline spill chance of 11%). We had concerns about those analyses because they did not take into account the unique Arctic environmental risks from sea ice, permafrost and other factors. However, they were at least based on a track record. In the Liberty DEIS, MMS has presented a variety of estimates, but then arbitrarily adjusts its prognostication to "1%" throughout the DEIS.

013

We appreciate that MMS obtained various North Slope and Canadian oil spill data bases. However, biased assumptions skewed the resulting probabilities, as most of the spills were ignored. Spills less than 500 barrels (21,000 gallons) (p.A-3) were not considered. If one is calculating the chance that there will be a spill, regardless of size, it is necessary to consider all the records. Northstar highlights this importance, as an 18,000+ gallon spill occurred there on January 16, 2001 (*see* "Drilling mud spills at Northstar site," Anchorage Daily News, Jan. 18, 2001 at E1). Even relatively small spills such as this one can have major effects on birds and other wildlife, and therefore the rate of chronic pollution is important to consider.

014

Furthermore, MMS left out North Slope spills from the Trans-Alaska Pipeline System, where there were 16,000 spills during construction from 1974-1977, and a number of large crude oil spills from the pipeline as large as 80,000 gallons (*see* Walker, D.A. 1996, Disturbance and recovery of Arctic Alaskan Vegetation), even though TAPS is an integral part of North Slope oil field production. MMS also only looked at large crude oil spills, even though more than 40 different toxic substances have been spilled on the North Slope. MMS subjectively classifies spills as "pipeline" spills and "facility" spills for the rest of what it looked at. After tossing out most of the spill data, it decided to use the 510 bbl pipeline spill (21,420 gallons) and the largest "facility" spill in the records, 925 bbls (38,850 gallons) (p.A-4). This is a sharp contrast with calculations based on U.S. OCS offshore operations where the average size pipeline spill is 16,000 bbls (672,000 gallons) and platform spill is 18,300 bbls (768,600 gallons) (p. A-4).

015

MMS took its pipeline and facility numbers derived from the data base for the years 1985-1999 due to "uncertainties" in earlier data but calculated a rate of spillage based on the total oil production from 1969-1998, 12.2 billion barrels (III-C-10). The rate should only be based on the production for the years of the spills, which would give a higher chance of a spill per amount of oil produced. MMS's number crunching showed a 5% chance of an oil spill from Liberty (4% for facility, 1% pipeline) – not the 1% figure that is laced throughout the EIS. MMS found a 15% chance of an offshore pipeline spill using the Outer Continental Shelf database (p. III-C-12). But then they "adjust it for anchorage and trawler events," to a 5% probability, and further decrease it by "best professional judgement" that engineering factor to less than 1% (p. III-C-13).

Given the way MMS selectively tossed out data on large spills that occurred on the North Slope caused by oil development, we do not think using their North Slope data results are the best available data. At the least, they should have presented the range



015

of data based on the Outer Continental Shelf data along with the other information used. Furthermore, in neither the Northstar EIS nor in this DEIS, does MMS account for the unique risk-laden conditions posed by Arctic sea ice, etc. We also believe that ice gouging and other Arctic factors pose as serious a risk as anchor dragging and trawlers as is common in the Gulf of Mexico.

016

Additionally, the environmental impacts of spills from the 168,950 gallons of tank storage for diesel and drilling wastes proposed for the island (p.III-C-11) need to be considered.

017

MMS's environmental analysis assumes that the spill risk is the same for any of the sub-sea pipeline alternatives: "We use the volume of oil produced as the basis for projecting oil spills; therefore, the chance of an oil spill is essentially the same for all alternatives evaluated in this EIS." (ES-6)

"Spill rates and the chance of occurrence of small, large, and very large oil spills are the same for the proposed Development and Production Plan, component alternatives, and combination alternatives." (ExSum-23).

Since the effects of oil spills are one of three major issues identified during the Liberty scoping process, the analysis must address differences between alternatives for this key issue. The DEIS provides some information on pipeline failures and oil spill risks for different single-wall v. double-walled pipe. For example, engineering calculations for the pipeline failure with oil released vary by orders of magnitude for the different components (*see* Pipelines(m),Table II.A-1), but MMS does not apply these rates or other such analysis to the effects analysis.

018

We are concerned that MMS has presented a biased picture of the various studies that investigated the integrity of sub-sea pipelines. While the Summary of the Pipeline Engineering Studies (p. III-B-2) describes some studies, nowhere in this section does it state the results of the C-Core (2000) study which concluded more than a 50% lower chance of oil entering the environment from a double-walled pipeline (p. 5-6). It also ignores the conclusions of the Fleet Technologies Ltd. study that double-walled pipeline design could have an oil spill probability from a major spill that is more than nine times lower compared with the single pipe design (Table 3, p. 1-iii). Although we recognize the full design engineering has not been completed, these factors should have been more thoroughly considered, and based on this information, the proposed Liberty pipeline does not appear to be best available technology. We are concerned about the effects of ice gouging, strudel scour, and pipeline buckling on pipelines, including the synergistic combination of these factors.

019

MMS has not employed all the existing information on pipeline risks in its analysis in order for the public to evaluate the proposed action relative to other alternatives. As noted elsewhere in these comments, we believe that the Liberty oil spill risk calculations and impact analyses are further flawed because among other reasons they ignore the unique ice and permafrost features of the Beaufort Sea that would affect any of the alternatives studied. 019

4. The impacts of oil spills are severely underestimated and oil companies cannot effectively respond during open water and broken ice.

First and foremost, MMS has specific obligations under OCSLA to require the DPP applicant (BP) establish a "worst case" spill scenario, and show how it would cleanup the worst case spill volume in adverse weather conditions. So far, this requirement has gone unsatisfied. Table II.A-3 gives BP's estimates for planning spill response and cleanup. These quantities do not comply with the formulas in MMS regulations, 30 C.F.R. part 254. This table should be re-worked in order to establish a "worst-case" volume discharge that is consistent with the Outer Continental Shelf Lands Act, 43 U.S.C. § 1351 and the Oil Pollution Act of 1990, 33 U.S.C. § 1321 *et seq.* Then, as required by OCSLA, BP must show how it would handle this spill volume in adverse weather. This analysis must be a part of the FEIS. 020

In addition to the legal deficiency discussed above, relying on the dangerous and unproven technology of a sub-sea pipeline to transport oil from an artificial island to shore in the harsh climate of the Beaufort Sea threatens the fragile Arctic ecosystem with the threat of oil spills, leaks and blowouts. The Arctic Ocean is home to polar bears, endangered bowhead whales, seals and other wildlife that will be decimated by an oil spill. BP has admitted that it cannot respond effectively to an oil spill in Arctic marine waters for much of the year – an admission that makes drilling in the Arctic Ocean that much more risky and irresponsible (reference: Fairbanks News Miner, December 22, 2000, "BP fails spill cleanup test in slush conditions"). E05

The DEIS mis-characterizes the inability of BP to respond in broken ice. The DEIS states "Substantial field tests were conducted in the early 1980's on existing technology. We determined that industry had demonstrated the capacity to cleanup oil in broken-ice conditions. As a result of the review of the Northstar oil-spill-contingency plan, field testing of the barge-based systems was conducted during fall 1999, summer 2000 and fall 2000. The results of these trials are currently being reviewed by Federal, State and local regulatory agencies. [III-C-3 (discussing ITL(n)] 021

The DEIS asserts that the addition of new equipment by BP "would exceed the broken ice response capability that existed during exploratory operations during the 1980s" (II-20). It is unclear why MMS is harkening to the standards in place in the 1980s. Those standards were significantly revised after the Exxon Valdez spill, for both the state and federal oil spill planning. In addition, it is unclear why MMS has failed to acknowledge



its own actions taken concerning the inadequate BP spill response capability. The January 2000, and December 2000 state-federal evaluation of BP's North Slope Broken Ice Exercises (which included MMS) determined that BP was unprepared to effectively mobilize equipment, deploy skimmers, and was insufficiently prepared to even test equipment.[1] The reports confirmed that BP is still unable to meet the response planning standards, and highlighted the need for additional testing or research and development to improve response efficiencies to meet the response planning standards required by law.[2] The DEIS should be revised to accurately reflect the status of BP's spill response capability. MMS should not sanction reliance on in situ burning as a response tool, during broken ice, since the ability to deploy fire resistant boom, and the effectiveness of this tool during broken ice has never been proven. It is unclear how the boom would be deployed, if BP has not yet successfully demonstrated any type of boom deployment during broken ice. 021

5. The long-term effects of oil spills on bowhead whales, other marine mammals and their habitats and subsistence were ignored in the Liberty DEIS.

The DEIS states that even in the event of a 7.5 billion gallon "very large" spill "few bowhead whales are expected to die, because oil weathers very quickly and exists primarily on the sea surface primarily as tarballs, which would be widely dispersed." (Vol. III, p. IX-4). There is no scientific substantiation for this statement. Scientists reported quite a different picture following the Exxon Valdez spill, yet MMS still has not incorporated the knowledge into its impact analyses. MMS has not done any scientific analysis of the potential impacts (acute, chronic, and indirect) to bowhead whales, their fall migration habitat or critical feeding areas for this DEIS. Scientists found that oil persisted in the environment fall longer than anticipated. A recent overview review of the Exxon Valdez by C.H. Peterson (2001), "The Exxon Valdez oil spill in Alaska: Acute, indirect and chronic effects on the ecosystem" (Advances in Marine Biology, 39: 1-103) concluded, 022

> *"Delays in the recovery of avian and mammalian predators of fishes and invertebrates through chronic and indirect effects occurred long after the initial impacts of the spill. Such delayed effects are not usually incorporated into ecotoxicity assessments which thus substantially underestimate impacts of a spill." (p.3)*

In its discussion of the impact of oil spills on polar bears, the DEIS relies on probabilities 023

[1] 1/18/00 Letter from DEC to BPXA re: DEC-MMS Joint Evaluation of the Fall 1999 North Slope Drills and Exercises.

[2] Joint Agency Evaluation of Spring and Fall 2000 North Slope Broken Ice Exercises Executive Summary, December 2000.

of oil contacting polar bears on seemingly definitive statistics, based on the extreme variation in oil spill models of distribution of spilled oil. While this oil spill model using trajectory overlay is a step in the right direction, the limitations of the model results need to be clearly presented in the EIS. Furthermore, the trajectory modeling relied on pipeline spills only, and ones much smaller than the worst case for a blowout lasting 30 days, or the combination of tanks, flowlines, pipeline, and daily production required of the MMS. The DEIS implies that an oil spill would have direct effects only on those bears that were oiled the year of the spill, yet it cites Brower (Volume 1, page III-C-21) confirming that oil from an actual spill on the north coast persisted for four years. There appears to be no discussion of possible long-term effects of persistent oil in the environment. There is little or no discussion on the possible effects of oil spill clean-up on polar bears (as well as other marine mammals). 023

There was no oil spill risk analysis for the fall migration of endangered bowhead whales. An overlay trajectory analysis should be done along the lines of the polar bear or eider model analyses (but for longer time frames beyond 30 days and addressing some of the limitations of those studies). MMS's Oil-Spill-Risk Analysis (DEIS Appendix A) does not analyze the fall bowhead whale migration habitat. While it shows a number of separate blocks for the marine waters offshore Liberty, this is not a bowhead whale analysis. Similarly, the "subsistence use areas" are portrayed as a number of isolated spots, not taken in their entirety for the analysis, thereby minimizing the effect. By isolating each part, the actual risk is understated. It is apparent that the migration corridor and subsistence use areas would be significantly oiled in the event of a spill from Liberty, yet this situation is ignored. Similarly, there was no trajectory analysis done for risks to the Nuiqsut subsistence use area (for hunting bowhead whales, as well as fish, seals, and other species). 024

It does not look like the oil spill risk analysis took into account the size of an oil spill, so it is uncertain whether worst-case pipeline spills, or blowouts were considered. We could not find a spill size given in either Appendix A, or Johnson et al. October 2000, Oil-Spill Risk Analysis; Liberty Development and Production Plan. The EIS only states that "the paths of 3,000 oil spills with 500 spillets each" (A-6) were run through the model, but the size of these spills is not documented. 025

No cumulative oil spill risk analysis was done that considered both Northstar and Liberty pipelines and drilling islands, chronic spills from all sources including barge traffic, or future projects. 026

We urge MMS to portray summaries of the trajectory "spillets" as they move through the Beaufort Sea for each of its analyses as was done for the polar bear and eider studies because these illustrate the risks in a more meaningful way to the public. We are also concerned that the oil spill risk trajectory analysis does not include the entire coastline (including lagoons and barrier islands) of the Arctic National Wildlife Refuge as an 027



environmental resource area for which trajectory analysis is done. 027

The Executive Summary neglects discussion of a blowout or very large tanker spill, and no comparison between alternatives is done for "very large spills" in the DEIS. The potential impacts from a 7.5 billion gallon (180,000 bbl) blowout from Liberty Island (only the BP project was evaluated) are buried in the back of the DEIS and not integrated in the alternatives analysis, or any of the other impact analysis sections. Further, these estimates were not based on a scientific analysis. MMS predicted: 028

- "Exposure of bowhead whales... may kill a few individuals." (p.IX-4) 029
- "Substantial mortality would represent a significant loss for the relatively small Arctic Coastal Plain spectacled eider population... Recovery is not likely to occur if the regional population is declining." (p.IX-6) 030
- "An estimated 2,600 ringed seals... could be exposed to the spill. This exposure could result in the death of up to perhaps a few thousand ringed seals.... (p. IX-8) 031
- "Perhaps 60-100 polar bears could be exposed to the oil spill." (p.IX-8). 032
- "In lagoon habitats, observed high densities of long-tailed ducks suggest that tens of thousands of molting individuals could be contacted by a spill sweeping over thousands of square kilometers, representing a significant loss from the population. (p.IX-9) 033
- "65% of the shoreline in Stefansson Sound" would be oiled (p.IX-12). 034
- "26% of the zooplankton that contact an oil-spill plume that resulted from a blowout would be adversely affected." (p.IX-14) 035
- "Salt marshes in the Liberty area would be inundated with oil that would kill both plants and associated invertebrates and small fishes. Complete recovery of the saltmarshes would be expected to take decades." (p.IX-14) 036
- "Effects on subsistence harvest patterns in the area around the communities of Nuiqsut and Kaktovik would be significant, because one or more important subsistence resources could become unavailable. 037

Yet the main body of the DEIS fails to come up with any significant impact from oil spills, including the impacts an oil spill will have on polar bears, endangered bowhead whales, seals, and traditional subsistence hunting practiced by Alaska Natives for thousands of years. In the wake of oil spills and the damage they have caused in Prince William Sound, the Galapagos Islands and many other environments much less severe than the Arctic, it is clear that the Liberty DEIS's analysis of the impacts of oil spills is deficient. 038

6. The Liberty DEIS fails to adequately analyze the environmental impacts of the project on terrestrial, coastal, and marine habitats due to flawed impact definitions and procedures and inadequate baseline data.

MMS's impact analysis technique is fundamentally flawed because it focuses on effects to wildlife populations and does not characterize the significance of habitat losses or degradation. The agency has drawn the highly arbitrary and subjective conclusion that "we do not expect significant impacts to result from any of the planned activities associated with Alternative I (Liberty Development and Production Plan) or any of the other alternatives" (ExSum-11). The DEIS goes on to say "some significant impacts – adverse effects to spectacled eiders, common eiders, long-tailed ducks, and local water quality – could occur in the unlikely event of a large oil spill" (ExSum-10). But it proceeds to downplay the chance of an oil spill according to its undefined "professional judgement," and therefore the expected consequences of the proposed development action. The potential for chronic and major oil spills is a real impact of the project. The law requires that MMS evaluate "changes in the quality and productivity of such environments [human, marine, coastal]" (43 U.S.C. sec. 1346(b)) – not just populations. 039

The "significance thresholds" defined by MMS (ExSum-9-10) fail to address losses of <u>habitat</u> values for fish, wildlife, and human uses such as subsistence and recreation. Both direct and indirect losses should be considered. This is a major error that needs to be corrected, especially since population perturbations may be far more difficult to monitor than habitat loss or degradation. For example, major impacts to nearshore fish habitat resulted from the cumulative effects of solid-fill causeways (Hachmeister, L.E., D.R. Glass, and T.C. Cannon. 1991. Effects of solid-fill gravel causeways on the coastal Central Beaufort Sea environment. American Fisheries Society Symposium 11: 81-96), for which the U.S. Army Corps of Engineers required retrofitting with additional breaching. Even if fish population effects could not be measured, the loss of habitat value was considered to be significant by this and other regulatory agencies. 040

MMS ignores permanent losses of benthic habitat, major degradation of the Boulder Patch, long-term disturbance to threatened and endangered species, marine mammals and birds, permanent alteration of riparian habitats from gravel mining in a river delta, and the additive contribution of this project to other oil and gas operations on the North Slope. It also fails to analyze the onshore impacts of this offshore development, other than for the gravel mine, such as how water withdrawals from lakes and ice mining from ponds and lakes to fish may affect wetlands hydrology and migratory bird habitat from, and helicopter and aircraft disturbance. As well, MMS did not consider loss of wilderness values at all. 041

Furthermore, there are legal mandates for habitat protection set forth in the Marine Mammal Protection Act, Endangered Species Act, and other environmental laws. In the DEIS, the MMS bases its conclusions regarding the significance and risk of polar bear impacts from oil spills not on the entire detailed analysis conducted by the U.S. Fish and Wildlife Service (Amstrup et al. 2000), but by a selective use of those findings (ExSum-17). 042



Evaluation of water quality impacts should consider all pollution and not ignore the impacts that occur within "mixing zones" (p. ExSum-10). A02 Similarly, the impacts of air pollution from all sources on the North Slope need to be comprehensively addressed, to address the significance of this project, in combination with past and future oil development in the region. The project-by-project permit system may not reveal the magnitude of toxic air emissions from North Slope oil development. We recommend use of terminology that the public can readily understand, rather than the "PSD" technical wording, that may not make sense to many readers. The public should be given information on the total emissions, substances that are emitted (including those that have no documentation requirements), and the type and amount of hydrocarbons of various types that are emitted. 043

MMS lacks the requisite baseline data on flora and fauna of the region to adequately assess the potential impacts of the Liberty development project and to monitor the effects of development and production on the marine and coastal environment, contrary to its legal obligations. Adequate baseline data on marine mammals, birds, fish and the benthic environment for the site project area, as well as the region, need to be addressed in this document. 044 Furthermore, information on migratory bird use at the Kadleroshilik delta where the proposed mine site would be located needs to be collected, in order to provide a meaningful analysis of alternatives (please note that we believe that using an existing mine site should be preferred). Without this information, MMS cannot make an accurate assessment of the environmental impacts, as required by the Outer Continental Shelf Lands Act (OCSLA) and MMS's implementing regulations. 045

7. The DEIS underestimates the significant impacts to the unique Boulder Patch and other productive benthic communities.

The DEIS correctly notes that the Boulder Patch in "Steffansson Sound is unique along the Beaufort Sea," and that its benthic communities are "much more abundant and diverse that elsewhere in Alaska's Beaufort Sea." (DEIS, p. VI-29). These areas contain kelp, sea anemones, sea cucumbers, sponges, snails, sea stars, crabs, clams, fish and other marine life that will be impacted by routine pollution, oil spills and leaks resulting from the Liberty project. While the EIS recognizes that "the densest part of the Boulder Patch is just west of the proposed Liberty site" (p. VI-29), the EIS fails to conduct a complete assessment of the negative impacts to its flora and fauna from sedimentation, pollution, direct and indirect habitat loss, and oil spills. 046

We are concerned that the chance of an oil spill from the Liberty Pipeline fouling the Boulder Patch is up to 48% (conditional probability; Vol. III, p. A-30) and 12% higher from the proposed project at Liberty Island than for the other gravel island alternatives 047 considered (ExSumm-6). Yet if there were to be a spill, there is not adequate baseline information to assess the post-construction consequences to the flora and fauna of this productive biological community. 047

To date, adequate baseline studies of the unique biological communities of the eastern part of the boulder patch and biologically productive areas in the exact area of the pipeline route and alternatives and Liberty Island have not been conducted. Baseline sampling must be performed over an adequate number of years in order to assess future changes as required by OCSLA and regulations. Despite millions of dollars of studies being carried out under the "ANIMIDA" program, MMS failed to conduct a pre-project baseline survey of the population densities and diversity of the flora and fauna of the marine communities surrounding the proposed gravel island, as well as in the known Boulder Patch area closest to it. 048

In the proposed project area, it required only a survey that looked for the presence of rocks, and even then too narrowly defined the Boulder Patch, so that Map 1 does not show areas that have boulders along the pipeline route (see Fig. III.C-1). The definition needs to be expanded to consider the full diversity of marine life, including flora and fauna; but even if not, the biological surveys are still deficient for the requirements of the DPP and MMS's NEPA analysis requirements. There are additional areas in Foggy Island Bay and Stefansson Sound that are biologically significant and productive, but may fall outside the definition MMS used to determine the "Boulder Patch". The summary Map 1 does not show the areas of Boulder Patch with lower densities of boulders (less than 10%) but where biological communities may still be substantially higher than normally occurs in the Beaufort Sea. 049

8. The Liberty DEIS underestimates the long-term impacts to polar bears and their habitats from many impact sources.

In addition to downplaying the impact of oil spills on polar bears, the DEIS fails to adequately analyze the impacts of other forms of industrial disturbance on this marine mammal species. Specifically, the DEIS fails to discuss the total length of time that polar bears may be affected by development, *i.e.*, from initial seismic work until all of the oil is pumped out of the field and the facility is decommissioned. 050

The DEIS does not include a discussion of the possible effects of disturbance on bears coming to fast ice and to land to den, and the relative value of such habitat for denning compared to areas that denning bears might be displaced to. 051

There is little or no discussion of direct bear-human encounters that may result from Liberty, and the resulting death of bears. Information on past encounters with oil field operations, including information on types of facilities or geographic locations with 052



greatest numbers of bears should be analyzed. 052

The DEIS also fails to discuss the impact of global warming on polar bears, as well as other ice-dependent species in the Beaufort Sea. Sea ice is retreating and becoming thinner due to global warming, resulting from the burning of fossil fuels. Liberty, in tandem with existing and future oil facilities, will exacerbate global warming by extracting yet more oil to be burned, which in turn will exacerbate global warming. It is possible that as temperatures in the Arctic continue to rise, shore-fast ice and land will become more important for polar bear denning, feeding and breeding because of sea ice retreat and thinning. This impact should be assessed and analyzed as a part of the Liberty EIS process. 053

9. The Liberty DEIS is deficient in its analysis of the impacts of the various alternatives on eiders and other marine and coastal birds.

Here we focus on eiders and other migratory birds, but our concerns in these areas also apply to deficiencies in consideration of impacts on bowhead whales, ringed seals, anadromous and marine fish, migratory birds, subsistence uses, and wilderness values.

The DEIS utterly fails to analyze impacts of the project on Steller's eiders. The DEIS concludes that Steller's eiders are unlikely to occur in the Project Area. While it is true that most recent records for the species on the North Slope are from the area to the west of the Colville River Delta, this fact is not sufficient to completely dispense with any analysis of impacts to the species and its habitats. The species has been recently documented as far east as the Sagavanirktok River. (*See, e.g.*, Stellers Eider Recovery Plan, Review Draft 12/98). There are additionally multiple historical records of the species occurring east of Prudhoe Bay. The project therefore could directly impact Steller's eiders occurring in the Project Area. The DEIS's lack of any analysis of such impacts is a major flaw. 054

Even if the DEIS's position that no Steller's eiders occur in the Project Area were true, the DEIS is still flawed in its failure to analyze the impacts of a potential oil spill on the species. The oil spill trajectories in both the polar bear and bird analysis (Appendix J) have modeled trajectories that project oil reaching areas to the west of Prudhoe Bay, well within the undisputed range of the Steller's eider. Such a spill could have significant adverse effects on the species and requires analysis. Additionally, the DEIS is inadequate in its analysis of impacts to the Steller's eider that could occur as a result of an oil spill on the transportation route for oil from Liberty and other projects on the North Slope. The majority of the world's population of Steller's eiders winter along the Alaska Peninsula. A major spill in the Gulf of Alaska would likely be transported to this region and could have devastating impacts on the species. The analysis of this issue in the DEIS is severely deficient. 055

The DEIS at least purports to analyze impact of the Liberty project to the spectacled eider. Such analysis however is legally deficient. Information contained in the DEIS on impacts to the species is often inconsistent and contradictory. The Summary of Effects section for the spectacled eider states "a model developed by Fish and Wildlife Service estimates very low mortality from an oil spill for this species." (III-A-4). The FWS model however (Appendix J) predicts as much as 9.6% of the spectacled eider population in the area could be oiled by a relatively small spill (Table 5). Moreover, the FWS study repeatedly states that for various reasons estimated impacts are likely low (*e.g.* "we underestimated the number of birds exposed to oil"; "Thus, this report underestimated the potential impact to migratory birds," etc). Yet in spite of this, the DEIS repeatedly states that impacts to spectacled eiders from oiling are minimal. The DEIS is therefore insufficient in this regard. 056

A related flaw in the analysis of impacts on the spectacled eider is the limitation of analysis of oil spills for a period of 30 days following the spill. While limits on duration analyzed for modeling purposes such as done by FWS in their report may be necessary constraints of any modeling program, that is a far cry from assuming, as the Liberty DEIS does throughout, that actual impacts are limited to 30 days from a spill. By not analyzing impacts to eiders from a spill beyond 30 days post-spill the DEIS is deficient. This assumption blatantly violates OCSLA regulations that require that the effects of an oil spill be considered for "a time period that [oil] reasonably could be expected to persist in the environment." 30 CFR § 254.26(b). Moreover, and rather deceptive, is the DEIS's reliance on probabilities of oil contacting eiders within 30 day of a spill as equating to the absolute probability of oil contacting eiders post-spill. Yet elsewhere in the DEIS, it is readily acknowledged that oil may persist in the Project Area and beyond far longer than 30 days after a spill. This flaw in the DEIS confounds the analysis of project impacts to the spectacled eider (as well as for other birds species, polar bears, bowhead whales and other marine mammals) and is therefore legally deficient under NEPA. 057

The DEIS's analysis of other impacts on the spectacled eider is equally flawed. The contention that the risk of mortality from collision with the Liberty platform is minimal (III-C-68) is based on a cursory and flawed analysis. The DEIS concludes that most eiders would be able to see and avoid the structure. This directly contradicts a statement a few lines earlier about the difficulty the birds would face in conditions of poor visibility such as fog that are common in the project location. The DEIS also completely neglects any analysis of the disorienting effects of artificial light on migrating birds and how this can lead to an increased risk of collisions. 058

The DEIS also fails to properly analyze the disruptive effects of aircraft and ship traffic associated with construction and operation of the facility. Helicopters traffic is estimated at 10-20 passes per day during the important spring breakup period when eiders and 059



other migratory birds are concentrated in the limited open water areas awaiting the availability of snow-free nest sites. Such heavy disruption could render these areas completely unusable to the species. The DEIS's conclusion that this "likely would be a minor effect" (III-C-69) is completed unsupported by the record and therefore unlawful. 059

The cumulative effects treatment of this same issue (V-19) predicts air traffic in the area to be 30-40 trips per day but provides no real analysis of the issue and its impacts on the species. The DEIS's treatment of ship traffic is similarly deficient. The estimated 150 trips per summer could force the birds to leave the important staging and foraging habitat with the barrier islands/Foggy Island Bay area. This is a significant adverse effect that is only cursorily mentioned and not analyzed at all in the DEIS. The only mention of this impact in the cumulative effects section is the single conclusory sentence stating "[t]o a lesser degree, foraging eider flocks are likely to avoid transport vessel lanes from Prudhoe Bay, the principle transshipment point." (V-19). This simply is not a legally sufficient cumulative effects analysis. These same cumulative impact concerns apply to the bowhead whale, another listed species, as well as other marine mammals and migratory birds. 060

The DEIS's treatment of king and common eiders, long-tailed ducks (oldsquaw), and other marine and coastal birds is as inadequate as its treatment of the spectacled eider. For the most part, the comments above dealing with the spectacled eider apply equally to these other species (*i.e.* failure to analyze oil spill impacts beyond 30 days, conclusion that small numbers of each species are likely to be oiled by a small spill when the FWS model estimates upwards of 30% of the birds in the area to be oiled, etc.) and are incorporated herein by reference rather than repeated. 061

A significant problem in the DEIS is the document's failure to distinguish between the differing significance of impacts to the resident and migratory populations of species that both inhabit and pass through the project area. For example, king eiders, common eiders and long-tailed ducks all nest in the project area in significant numbers. These species also nest in even greater numbers to the east of the project area in both Alaska and Canada. Virtually the entire western arctic populations of the king and common eiders migrate through the project area in spring and fall. The FWS report (Appendix J) acknowledges that large numbers of individuals of these species, much larger than the resident numbers identified in the model, could be oiled if a spill were coincident with the eider migrations. 062

Yet throughout the DEIS, the conclusion that mortality to these species is likely to be low is repeated and almost no analysis is given on impacts to migratory flocks of these species. The western arctic populations of king and common eiders have declined by 50% since the 1970s (FWS 1999). Long-tailed ducks have likewise declined by 70% in the region over the same period (FWS 1999) and are currently being reviewed by FWS for possible ESA listing. Significant oiling from a project related spill could have catastrophic impacts on these declining species yet almost no mention is made of this in the DEIS. 062

The DEIS's failure to analyze impacts to resident populations of king and common eiders is likewise flawed. The Alaska Coastal Plain breeding populations of common eiders is perhaps 3,000 birds while the king eider population is estimated at 12,000 individuals. (FWS 1999) A spill that killed a thousand individuals of these resident birds (within the range of FWS estimates) would have a significant and likely irreversible impact on these populations. Such mortality from even a small spill is not unlikely. For example, upwards of 1,600 wintering king eiders were recently killed by a small spill near the Pribolof Islands (Suydam 2000). Similar mortality is certainly possible from a spill in the project area but is discounted by the DEIS. Again, the DEIS is legally deficient. 063

The DEIS's treatment of common eiders is based on a flawed environmental baseline. No mention whatsoever is made of the August 10, 2000 storm in the Beaufort Sea. This storm resulted in likely widespread chick mortality and, perhaps more importantly, the elimination of perhaps 75% of common eider breeding habitat by stripping the barrier islands of accumulated driftwood (Divoky and Mendenhall 2000). Given that the Alaska breeding population of common eiders is already declining, this "natural" event (in actuality the storm was highly unusual and likely related to global warming induced climate change), combined with the various threats from the Liberty project as well as from other ongoing or planned oil and gas development projects on the North Slope, are likely sufficient to warrant "threatened" status under the ESA for this population. The DEIS is legally flawed for failing in any way to address these issues. 064

The DEIS is also deficient in its treatment of other sensitive bird species in the area. The FWS oil spill model does not analyze impacts to the brant. The DEIS throughout gives short shrift to this species. The relevant map in the DEIS (Map 7) shows significant brant breeding areas in the project area and within the range of projected oil spills. Given that these areas are largely within the barrier islands, a zone that the oil spill model acknowledges is particularly vulnerable to oil accumulation, the DEIS should provide much more analysis to potential spill impacts to this species. Similarly, brant are concentrated in the areas subject to disturbance by shipping and helicopter traffic 065

yet no analysis is given on these impacts on the species. While the DEIS does provide cursory treatment of impacts of the project on loons, again, the treatment is wholly inadequate. In particular, almost no analysis of impacts to the yellow-billed loon is contained in the document. This species has a small global population of which a significant portion nests on the Arctic Coastal Plain. The projected possible spill affected numbers represent a significant portion of the Alaska breeding population. Moreover, the cumulative effects section completely ignores impacts of other projects (Alpine, NPR-A leasing) that are currently underway in the heart of the species range. As with the eiders and the brant, the DEIS here does not meet NEPA standards. 066



In sum, the Liberty DEIS's treatment of eiders and other protected marine and shoreline birds is inadequate and does not meet the relevant NEPA or OCSLA standards. These same concerns apply to the impact analyses for other species of fish, wildlife, and their habitats. 066

10. The Liberty EIS fails to adequately evaluate environmental impacts and risks from drilling waste disposal.

We are concerned about the Liberty disposal well being used for "the option of disposing of third party waste from other offshore activities such as exploration drilling.... Since the complex is not connected to a road system, uncontrolled third party access is not possible. Only RCRA exempt and non-exempt non-hazardous wastes will be injected. (DPP version 2, p. A-26)." This statement is misleading, since the island will be connected by ice-road every winter. Such an open-ended permit could result in a major site for waste disposal from contractors and others throughout the oil fields, including for offshore exploratory wells that is not addressed by the EIS. BP presents no information about the volume of this additional waste that is proposed. 067

Spills related to waste disposal, even the latest "grind and inject" technique are frequent and should be addressed. Just this year there was a spill of drilling waste from a pipeline connecting the grind and inject facility to BP's waste injection well (*See* Anchorage Daily News, March 7, 2001, "BP Battles another Prudhoe Bay spill") and a drilling mud spill at a storage site at Northstar (*See* Anchorage Daily News, January 18, 2001, "Drilling mud spills at Northstar site"). We note that Alaska Department of Environmental Conservation spill records other spills at waste injection sites, including a single spill of nearly a million gallons of fresh and seawater from a surface broach of wells at DS-4 from March 17-21, 1997. We are concerned that waste injection at Liberty Island not result in contamination to waters of the Beaufort Sea whether directly or indirectly. 068

11. The Liberty DEIS fails to adequately analyze the full range of cumulative impacts.

The Liberty DEIS fails to adequately analyze the full range of cumulative impacts stemming from drilling for oil at Liberty against the backdrop of past and reasonably foreseeable future oil and gas development on Alaska's North Slope. The DEIS concludes that no significant cumulative impact is predicted to occur as a result of oil drilling at Liberty. This analysis fails to consider the reach of oil in the Arctic in the last thirty years as the Prudhoe Bay industrial complex has sprawled for hundreds of miles in all directions, including north into the Beaufort Sea with Northstar and Liberty. The oil fields that make up Prudhoe Bay – with over a thousand of miles of pipeline, 55 069 contaminated sites, 22,000 acres of direct fill and mining from the oil fields and Trans-Alaska Pipeline, more than 20 gravel mines, many flares and other forms of industrial disturbance – were considered on a case-by-case basis using a piecemeal approach to development. 069

It is this same piecemeal analysis that has been used to analyze cumulative impacts in the Liberty DEIS and will lead to full-scale industrialization of the Arctic without an understanding of the environmental impacts involved. Much of the Arctic coast in Alaska has the potential for oil and gas development. This includes state lands, the National Petroleum Reserve-Alaska, Native lands to the west, and other areas.

The DEIS fails to adequately analyze the cumulative impact of Liberty on the Arctic National Wildlife Refuge. 070 The DEIS fails to account for the fact that Liberty will further establish the use of subsea pipeline technology in the Arctic, which in turn will allow development to encroach even closer to the land and waters offshore the Arctic National Wildlife Refuge. In addition, uncontained oil spills could reach the Arctic Refuge shoreline in a matter of days, and forever damage the wilderness and wildlife resources of this unique area.

The Liberty DEIS continues in the same pattern of the Northstar EIS, of not including in 071 the category of "reasonably foreseeable," certain offshore and coastal oil exploration and development projects that were proposed – or even built – during the EIS preparation. This calls into questions the reliability of the impact analysis assumptions and procedures used for describing cumulative impact. For example, In the Northstar EIS, the McCovey and Pike proposed offshore exploratory wells were not even included (U.S. Army Corps of Engineers, 1999. Existing Development and foreseeable actions, Northstar project cumulative impact area. Fig. 10-2), nor are they portrayed in the Liberty EIS. The Northstar EIS also did not show the Meltwater oil field where a 10-mile road, pipeline, and powerlines are being constructed this winter; the Liberty EIS also does not show this as a proposed project (see Map 3a), although it was listed as "reasonably forseeable" (Table V.B-1a). It would be helpful to show where some of the roughly 50 satellite developments that may be brought on line are located around the existing North Slope fields.

It is unclear why MMS views development of the Fish Creek, Umiat, and other NPR-A 072 fields more speculative than Hammerhead or Kuvlum, located far offshore in the shear ice zone (*see* Table V.B-1a. Alaska North Slope oil and gas discoveries), given that up to 43 exploratory wells are proposed in NPR-A by BP and Phillips for the next five years. In Table V.B-1b (TAPS and future natural gas projects) the description of the Arctic Resources project is inaccurate, as right-of-way permits have not yet been applied for, nor is a formal project proposal available to the public.

MMS's basic technique for determining environmental impact (*i.e.* that Liberty and other 073



projects' impacts are proportional to the total offshore production) is fundamentally 073 flawed. The project location can result in different environmental impact. Offshore development projects such as Kuvlum, Hammerhead, Stinson and Flaxman Island would pose high risks to the coastal lagoons, wildlife and wilderness of the Arctic National Wildlife Refuge. Earthquake faults and ice gouging rates are higher off the coast of the refuge, as well, so pipeline risks may increase due to these environmental features.

We believe that the MMS should provide a number of hypothetical scenarios showing 074 onshore and offshore facilities required, and portray these on a map. This should include pipeline landfalls, offshore and onshore pipeline routes, offshore platforms/artificial islands, gravel mines, water source lakes used for ice roads, ice roads, exploratory well locations, etc. The number and geographic extent of new seismic surveys should also be shown as this activity occurs repeatedly.

The estimates of past development, including infrastructure and facilities, are 075 incomplete and not based on a scientific analysis (*see* Table V.B-3. Past Development: Infrastructure and Facilities). Without an accurate characterization of the past and present develop, we are skeptical that reasonable predictions of the impact sources from future development have been provided, yet these are fundamental to impact analysis.

Better reference citations need to be provided for all the numbers provided on Table 076 V.B-3 and Map 3C and the accuracy of this information checked:

- It is unclear whether the total estimate for gravel roads, pads and airstrips (7,126 077 acres) includes the acreage for gravel mines (1,601 acres), or reserve pits (756 acres).
- It is unclear whether Deadhorse is included in the Prudhoe Bay field numbers. 078 We urge MMS to identify the acreage for this support base separately so its continued growth can be tracked over time.
- The analysis should include a separate breakdown for the Trans-Alaska Pipeline 079 and Haul Road since these facilities are necessary for the transportation of the oil. Pamplin, W.L., Jr. (1979. Construction-related impacts of the Trans-Alaska Pipeline System on terrestrial wildlife habitats, Joint State/Federal Fish and Wildlife Advisory Team, Special Report 24, p. 46) used aerial photo analysis to determine acreage affected by gravel fill or excavation (10,900 acres by that date for the North Slope section of the system only), but substantially more gravel fill has occurred since that date, according the U.S. Army Corps of Engineers permits.

- The total length of pipelines (520 miles for gathering, common carrier, and unspecified) is a much lower estimate than information provided by the State of Alaska (Department of Natural Resources, Final Best Interest Finding, Leas Sale 75A, June 22, 1993, p. 41). 080

- The number of exploratory gravel pads and airstrips on the entire North Slope (including NPRA) should be provided. 081

- Map 3c provided by BP (1999, permitted gravel and water sources), contains incomplete information. While this map only shows 14 active and "rehabilitated" gravel mine sites, there are at least 23 on the North Slope listed by the Alaska Department of Natural Resources in their North Slope material sale contracts pit information (March 28, 2001); this does not appear to include those used for the Trans-Alaska Pipeline and Haul Road construction. Areas in the Sagavanirktok and other river floodplains that were mined in the past also are not shown. We also question the adequacy of standards, if any, for the mines shown as "rehabilitated." 082

- Not all "permitted" water sources are shown on Map 3C, as we are aware of many dozens that are not portrayed, including further to the west in the National Petroleum Reserve- Alaska. All of the lakes and rivers used as water sources, either past or present, should be shown. 083

- There should be a map and analysis of all the ice roads built across the North Slope, all that were proposed, as well as representative snap-shots for the past (like 10 years ago) and projecting 10 or more years into the future. We are concerned about how shorter ice road seasons (due to climate change) may affect use of this practice. 084

In conducting the cumulative impact analysis, MMS should evaluate past impacts, as well as present ones from other projects, and review whether the predictions made in the lease sale EIS, as well as more recent environmental analyses such as Northstar, matched the actual sources of impact. This is of concern, since BP already has "revised upward the original estimates of crew boat, barge, helicopter and vehicle over-ice transport activities associated with construction and operation of the Liberty Development" (Table 4-2, DPP, p. 6), and the frequency of such increased sources of impact need to be evaluated. 085

The following is a summary of specific concerns about the cumulative impacts analysis:

Freshwater

The Liberty DEIS fails to adequately analyze the cumulative impact of Liberty on fresh 086



water resources on Alaska's North Slope. The DEIS estimates that BPXA would use 120 million gallons of fresh water annually during the construction phases of the liberty project and 20 million gallons annually for ice roads after the initial phases of construction. The DEIS then concludes that "[c]umulative effects on water resources would not be expected, as local freshwater needs would be replaced by natural processes and no additional construction activities are expected during the construction of the Liberty project." DEIS V-12. Oil exploration and drilling operations use massive quantities of fresh water. On the North Slope alone, the industry uses 27 billion gallons annually, and presumably this number will only increase with the Liberty project. The cumulative impacts of fresh water withdrawal on fish and wildlife habitat and instream flows in the Arctic are unknown and there is no indication that any measures have been undertaken to mitigate the potentially deleterious impacts of these withdrawals. 086

Comparatively, the Northstar EIS stated that the project would use between 101 and 131 million gallons over the 15-year life of the project (p. Vol. III, Table 5.3-6). Alaska Department of Natural Resources water use records and temporary water use permits indicate that BP has already used 150 million gallons of fresh water in the first 2 years of the Northstar operation and that BP will use ten times its original estimate, or roughly a billion gallons of fresh water, over the life of the Northstar project. The discrepancy between estimates and actual usage of fresh water resources in Northstar should serve as an indication of the unreliability between prediction and application in the Liberty project. 087

The Liberty DEIS fails to adequately analyze the cumulative impact of fresh water withdrawal on fish and wildlife resources. Specifically, the DEIS is wholly lacking in any discussion of the impacts of fresh water withdrawals on fish habitat and instream flows. The DEIS simply concludes that "[b]iotic communities present within the permitted freshwater lake systems are not expected to be effected with these fluctuations in water level." DEIS V-12. BXPA's rationale for this conclusion appears to be a theory of "nature will provide" when it states that "the natural environment and the dynamics of seasonal flux are more rigorous." DEIS V-12. The DEIS acknowledges that "[s]tream flow is virtually nonexistent in the winter." The DEIS, however, fails to acknowledge that historically, water is used to construct ice roads and pads for *winter* exploration and development. Most of the fresh water on the North Slope is frozen during the winter; fish and other aquatic species depend on what little liquid water remains. Water withdrawal has significant potential ecological impacts during this season. Nowhere in the DEIS is there any discussion to the cumulative impacts of winter fresh water withdrawal in over-wintering fish habitat over the long-term. 088

Gravel Use

As noted above, there are more than twenty gravel mines already in existence on the North Slope, yet the Liberty DEIS is completely void of any discussion of the cumulative 089 impacts of gravel use. DEIS V-12. The DEIS makes no attempt to quantify gravel availability or past usage in the onshore oil fields or to evaluate past gravel extraction impacts although huge amounts of gravel been used both on and offshore as the foundation for the construction of all production and many exploration facilities. With such weak analysis of the Liberty project's impacts, and no evaluation of past or ongoing gravel extraction impacts, it is not surprising that the Liberty DEIS's analysis of freshwater use and gravel extraction provide nothing more than a soft glance – not the required "hard look" – at the cumulative impacts of these issues. 089

Air Quality

The Liberty DEIS fails to adequately analyze the cumulative impact of Liberty on air quality of the North Slope. The section devoted to cumulative air quality impacts fails to include any estimated baseline data showing air quality levels before the late 1980's and early 1990's, when monitoring programs associated with discrete projects occurred. The data that does exist shows that approximately 56,427 tons of oxides of nitrogen are emitted each year – twice the amount emitted by Washington D.C. The North Slope is also the source of annual releases of 24,000 to 114,000 metric tons of methane, a recognized greenhouse gas. The DEIS fails to analyze the Liberty emissions within this existing framework of known pollution. 090

This is most troubling because of the problem of Arctic pollutant haze, which is responsible for high concentrations of sulfate and vanadium in Barrow, which dramatically reduces visibility, and which the DEIS simply attributes to industrialized sources in Europe. DEIS VI-58. Localized sources of pollution from Prudhoe Bay have been documented by numerous scientific studies (Brooks, S.B., T.L. Crawford, and W.C. Oechel. 1997. Measurement of carbon disoxid emssions plumes from Prudhoe Bay, Alaska oil fields. Journal of Atmospheric Chemistry 27: 197-207; Jaffe, D.A., R.E. Honrath, D. Furness, T.J. Conway, E. Dlugokencky, and L.P. Steele. 1995. A determination of the CH4, Nox, and CO2 emissions from the Prudhoe Bay, Alaska oil development. Journal of Atmospheric Chemistry 20: 213-227; Jaffe, D.A., R.E. Honrath, and J.A. Herring. 1991. Measurements of Nitrogen Oxides in Barrow, Alaska during spring: evidence for regional and Northern Hemispheric sources of pollution. Journal of Geophysical Research 96 (D4): 7395-7405).

The North Slope Borough raised the haze issue with BP in April 1996, pointing out that villagers in Nuiqsut believe that the "haze traveling to the ocean and towards Nuiqsut has strong harmful affects [sic] to the community & wildlife," perhaps explaining high incidence of "asthma," "bronchitis," "cancer," and "fish … with unusual flavor."

Joseph Akpik testified during EIS scoping meetings in 1997 that "I've seen it; it's just like smog out there. The cold weather sets in from the air, and it keeps that hydrocarbon fumes coming out, and it falls to the tundra and the waterways. Now these are some



the research that never has been done, and it's affecting our caribou, and it's affecting our fish."

Without baseline estimates, however, there is no way to measure what contribution North Slope industrial sources may make to what is often generally described as "Arctic haze." 091

Vegetation

The Liberty DEIS fails to adequately analyze the cumulative impact of Liberty on vegetation. DEIS V-39-40. Simply listing the acres or square miles lost is not sufficient regarding adverse impacts. The DEIS does not contain any quantification of the types of wetlands destroyed to date, or discuss what their destruction means to other resources. This omission exists notwithstanding unexplained declines in some species of birds in an oilfield study area, and unexplained declines across the Arctic Coastal Plain for other species, including threatened spectacled and Steller's eiders and the common eider, a "species at risk." Moreover, the DEIS does not address whether an indirect and cumulative impact from wetlands/tundra destruction – the fragmentation of Arctic Coastal Plain landscape through the creation of a web of roads, pipelines and facilities spread across the Cumulative Impacts Area – may itself have long term cumulative impacts beyond direct vegetation disturbance. Additionally, the DEIS fails to address the indirect and cumulative impact from wetlands/tundra destruction on the water quality of fresh water resources on the North Slope in light of oil spill potential. Finally, the DEIS does not contain any analysis on floodplains or protection of wetlands, as required by Executive Order 11988, *Flood Plain Management* and Executive Order 11990, *Protection of Wetlands*. 092

Spills

Nearly 400 spills occur annually from oil industry activities in the North Slope oil fields and the Trans-Alaska Pipeline, according to the database for 1996-2000 kept by the Alaska Department of Environmental Conservation. Roughly 40 different toxic substances ranging from waste oil or other hydrocarbon products to acid, biocides, ethylene glycol and other toxic chemicals were reported spilled. That's an average of at least one spill every day. Pipeline and other leaks were the most common cause of spills. Over 1.3 million gallons spilled between 1996 and 2000, most commonly diesel, crude oil, and hydraulic oil. In nine years (1984-1993), there were 1,955 crude oil spills involving 376,321 gallons, 2,390 diesel fuel spills involving 464,856 gallons, 977 gasoline spills involving 131,382 gallons, and 1,360 hydraulic fluid spills involving 77,301 gallons. 093

There have been several significant spills on the North Slope already this year. 18,000 gallons of drilling muds spilled at BP's offshore drilling project Northstar on January 16, 2001. 9,000 gallons of crude oil spilled onto wetlands February 20, 2001 due to a pipeline rupture. Between 3,000 and 5,000 gallons of drilling muds spilled onto sensitive tundra from a cracked pipeline on March 6, 2001. The DEIS fails to mention or analyze this spill history. 093

The oil companies admit that they will be largely unable to clean up or contain offshore oil spills in the Arctic because of extreme weather and ocean conditions. The worst case scenario, a blowout during broken ice conditions, could have catastrophic consequences for generations. Oil companies have repeatedly failed "spill drills," tests of their oil spill cleanup plans, as containment booms broke or the boats could not even reach the spill drill site. Both state and federal oversight agencies criticized this failure, and the state entered into a Compliance Order by Consent to mitigate some of the possible effects of offshore spills (*See* Consent Order No. 00-162-50-1456, May 3, 2000, as amended, Nov. 28, 2000). Most recently, new research funded by the Prince William Sound Citizen's Advisory Council concluded that chemical dispersants, a key tool in oil spill cleanup, are largely ineffective in Alaska due to cold water and high-sulfur oil. The DEIS fails to adequately analyze both spill response and the cumulative effects of persistent oil and other contaminants in the environment given the proven impossibilities of an effective cleanup in marine areas. 094

The EIS fails to consider the cumulative effects of oil spills from Liberty, plus other offshore development (and plus all other development). MMS just looks at the portion that is Liberty, instead of this new project as one more part of a larger development that must be assessed. Further, as discussed above, MMS does not satisfy the requirements of either OCSLA or OPA 90 in its cursory and optimistic discussion of oil spills. 095

12. The DEIS "Alternatives" Analysis is Deficient

The EIS does not adequately address an impact analysis for the "no action" alternative. This is the base case against which the proposed project is measured. The DEIS fails to adequately analyze the impacts of the alternatives on wildlife, including subsistence species that are relied upon by North Slope communities. Based on the DEIS analysis as well as our knowledge of the impossibility of cleaning up a major spill during open water or broken ice, the only reasonable alternative we can endorse is "No Action." 096

The public suggested during EIS scoping that MMS evaluate the alternative of directional drilling from land, instead of using a 4-6 mile long offshore sub-sea oil pipeline to a gravel island. MMS has rejected this alternative as infeasible (see p. I-10 and Appendix D-3-2), but information from the Secretary of the Interior suggests that, 097



"with new horizontal drilling, companies make one hole and tap reserves up to 7 miles away." (Denver Post, April 5, 2001, *Norton Praises Oil Drilling Practices*). MMS confirms that at least a portion of the field may be reached by directional drilling. MMS should further examine this alternative, looking at a phased field development using directional drilling. As technological advances are made, additional portions of the field may be able to be accessed using directional drilling. 097

While MMS has presented a laundry list of "alternatives" in the DEIS, including what it terms "components alternatives" and "combination alternatives," it does not provide meaningful environmental impact analysis that elucidates the range of impact levels from the various aspects of the project, or if a better proposal would be environmentally preferred. MMS does not provide one alternative combining all the "components" it indicated may provide greatest reductions in environmental impact or risk. This includes locating the gravel island location farthest from the Boulder Patch and bowhead whale migration path, shortest subsea pipeline, least disturbance to substrate habitats, no new gravel pit and lowest gravel requirements, employing double-walled (pipe-in-pipe), burying the pipeline deeper, and "lowest risk of pipeline leak offshore" The combinations appear arbitrary (see Table IV.D-2) and it is not evident that they were even used in the impact analyses themselves. We do note that the BP's proposal is closest to the bowhead whale migration, closest to the Boulder Patch, has the longest offshore sub-sea buried pipeline, and the highest risk of a pipeline leak offshore of any of the combination alternatives shown (Table IV.D-2). Since BP has proposed using the same technology as Northstar, it makes sense for MMS to wait until the Northstar buried sub-sea pipeline and LEOS leak detection system are running and can be evaluated for effectiveness, prior to completion of this EIS for another project that involves the same untested technology. 098

13. Abandonment and Restoration is inadequately addressed

We believe that any project permit should impose environmental standards for restoration for all sites with the goal of the tundra, floodplain, and offshore environment being restored to its original condition. A draft restoration plan should be subject to public review and comment as part of the DPP EIS at this time. There should be a requirement for a final restoration plan to be circulated for public review, after project construction and operation, prior to abandonment of the project. 099

14. The DEIS fails to adequately analyze the impacts of gravel mining and water withdrawal on the environment.

Water Withdrawal

The DEIS is significantly deficient in both the identification of water sources and 100

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analysis of impacts from withdrawal of water. The DEIS identifies water sources as follows: "Map 3c identifies more than 30 different existing permitted water sources that may be used for ice-road construction and other water needs" [II-16]; and "The short ice roads would connect the island with the gravel mine on the Kadleroshilik River, with two coastal lakes used as water sources for the ice roads (see Maps 2A and 2B)." [IV-80]. None of the referenced maps identifies the lakes or sources from which the water will be withdrawn by name, number or any other identifying characteristics. Most of the water sources permitted on Map 3c are committed to other projects and cannot reasonably deemed water sources because of their distance from the project. For example, sources for Alpine, Kuparuk, Prudhoe Bay, Badami etc. cannot be used for those projects, as well as others. Maps 2A and 2B do not identify any water sources that would be used, but simply depict the ice roads. There is no ability to evaluate the impacts from water withdrawals on fish, wildlife, subsistence, hydrology or other aspects, without identification of the water sources. There is no analysis of the potential contamination of water sources from leaks or spills during withdrawal of water from the unidentified sources. The conclusions of no significant impacts from ice roads, or other water usage, are, therefore, not based on any data or other information.

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The DEIS is deficient unless it is revised to identify the specific sources anticipated for use, any existing water permits (whether they are temporary, water use permits, or certificates) and describe whether the water right is appurtenant to a particular use or project. In addition, the DEIS should describe any other users and uses to which the water from each source is being put, or is anticipated. There is no discussion of the water sources if the alternative Duck Island gravel minesite is used.

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As noted above, the Northstar project EIS seriously underestimated the water needs of the project, and the Liberty EIS has continued this problem. The calculation of a yearly water demand for ice roads is lacking information on ice road lengths. The information is limited to: "The road from the mine site to the gravel island would be about 50 feet wide. Typically, ice roads constructed on the tundra would be 6 inches thick. Offshore, the ice roads would need to be sufficiently thick to support the construction equipment that would be using the road. Typically offshore in the floating ice, the ice would be thickened to about 8 feet," and "[t]runk roads built on grounded sea ice and onshore would have a travel surface approximately 40 feet wide."

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In order to accurately calculate the water needs, there should be an analysis of the water needs for: (1) 40-foot wide trunk roads, grounded on sea ice and onshore (the number of such roads, and their length and depth should be indicated); (2) the ice road along the coast from the Endicott Causeway to the shore-crossing location in Foggy Island Bay; (3) the ice road from the gravel island to the Badami pipeline; (4) the ice road from Point Brower to the gravel island; (5) the ice roads from the Kadleroshilik River mine site to the gravel island; and (6) anticipated spur roads needed to connect major corridors. Accuracy of these calculations depends upon: the width, length, depth



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of the ice roads. In addition, information on how much of the road can be constructed with seawater, and how much with freshwater should be included. BPXA has enough experience in ice road construction to be able to provide such calculations for public review. If there are other anticipated ice roads, similar information on these should be provided. Once the total water calculation information is obtained, then the amount of water *from each source* must be identified, including: the depths of the lakes, or other sources); the amount of freezedown; the expected under ice water volume, and the presence of fish or other aquatic organisms. Only with this information can there be an accurate assessment of the impacts, and the sufficiency of water resources from each source. Finally, if ice aggregate is proposed to be used, there should be an identification of the source of the ice, the depth, and analysis of any impacts to the water source from ice removal such as in increase in depth of freezedown one ice is removed, that may affect fish or other resources.

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In addition, there is no calculation of the water estimated to be needed for ice pads. The DEIS states: "In Year 4 and following, segments of ice roads would be built to support drilling and production operations on the island. Four ice pads also are planned. Two of the ice pads are the stockpile/disposal zones 1 and 2. The Zone 2 pad is part of the ice road system used for construction of the pipeline." The sources and amount of water for these pads has not been identified or analyzed.

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The DEIS states that the gravel mine may be used as a water source. Yet there is no estimate of volume of water anticipated to be available, or the anticipated use of that water. If the water is expected to be used for Liberty, then identification of that water as a source must be included in the DEIS, and the effects of constructing such a water reservoir (including proper reservoir permits from the state or other permitting entities) should be included. The DEIS indicates that it is unclear whether the gravel mine will be suitable as a water source: "It also would be possible that the lake could be a source of water for future ice-road construction, although over time, coastal storm surges could make the lake water too brackish for this purpose." This is a significant issue. There is no analysis of the short-term or long-term impacts of introduction of brackish water into the Kadleroshilik River. It appears that there will be a significant potential for saltwater intrusion. The DEIS states that the minesite is "6-10 feet above mean sea level" and that gravel would be excavated by blasting, ripping, and removing material in two 20-foot lifts to a total depth of 40 plus feet below the ground surface" in an alluvial floodplain. That means that the lowest elevation of the minesite will be at an elevation 30 - 34 feet <u>below</u> sea level, and that saltwater intrusion is likely. The DEIS contains no information on the subsurface aquifers in the region, nor the hydrologic characteristics of the river and the river-sea interface. The DEIS summarily states "However, information indicates the Kadleroshilik River may not flow year around, therefore the ability of the lake to support fish habitat is unknown." [II-35].

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In order to approve any development in the river (whether it be a minesite, water withdrawal etc.) baseline information on the flow rates in winter, and year-round, as well as other information should be provided. This should include: information on (i) effects of the river, and any minesite development, on the nearshore brackish water habitats; (ii) downstream and upstream hydrologic impacts of minesite development and use; (iii) impacts of the gravel mine to the life cycle of the fish species present or any effects on the migration of fish species; (iv) impacts from diversion of flows to the gravel minesite; (v) effects on fish migration corridors; (vi) baseline water quality data (PH, turbidity, temperature, total dissolved solids, sediment, toxic and other deleterious organic and inorganic substances, color, petroleum hydrocarbons, oil, grease, chlorine and residues); (v) analysis of potential direct mortality of fish and aquatic resources in downstream locations as a result of flow interruption to overwintering areas; (vi) potential blockage of movement between overwintering areas; (vii) harmful changes in water quality in overwintering areas; (viii) entrainment of fish and other aquatic organisms in reservoir areas during filling; (ix) increased predation potential on fish species confined in reservoirs; (x) interruption of the migratory behavior of some fish species; and (xi) unknown effects on nearshore habitats during reservoir filling. These factors, and the hydrologic characteristics of the river should be analyzed and distributed to the public for review. If the Duck Island minesite is used, similar analysis of that site should be undertaken. 106

Finally, the DEIS water analysis disregards the North Slope Water Policy (1979). The FEIS should reference this policy, and abide by its terms. 107

## Gravel Mining

The DEIS purports to analyze two alternative component gravel mine sites: the Kadleroshilik River and Duck Island minesites. The DEIS summarily rejects the potential for alternative sources of gravel stating: "Although other abandoned gravel sources exist, none of the sources reasonably near the site are considered to be large enough, and additional testing would be required to determine if there is contamination in the gravel." [E-1-18]. Given the significant alteration of wetlands, the significant impacts to fish, wildlife (including Endangered Species) and impacts to other natural resources and processes from gravel mining, and in light of the Alaska Coastal Management Program prohibition on extraction of sand and gravel in the coastal zone unless "there is no feasible and prudent alternative to coastal extraction which will meet the public need for sand or gravel" [6 AAC 80.110] the DEIS *must* evaluate alternative sources more thoroughly. MMS must demonstrate that there is no other feasible and prudent gravel source. If additional testing of alternate sources of gravel for contamination of these alternative sites is needed, that testing should be accomplished. 108

Likewise, the rejection of Tern Island gravel needs further justification to support the conclusion that the economics, safety and timeliness prohibit the use of this source. 109



There is no cost analysis, nor indication of how much time gravel extraction from this source would take, nor discussion of the safety issues. The DEIS's summary rejection of the reuse of this gravel does not portend well for the rehabilitation and reuse of any offshore gravel island, in the future. If BP believes that removal (or reuse) of the gravel is prohibitively expensive or unsafe at this time (when BP has a need for gravel), it is unlikely that BP will want to invest the time and money to remove these gravel islands after the oil fields are depleted. This is another reason that the abandonment plans for the Liberty gravel island (including costs, methods, safety) should be provided in the EIS, rather than deferred until after the project is completed. The amount of gravel that would need to be supplemented should be identified, and the costs and impacts of supplementation should be identified. 109

The alternative of the Duck Island gravel minesite is stated as providing "less onshore noise disturbance and habitat alteration from gravel mining." This site has the added economic benefit that site rehabilitation costs would be shared. There is no calculation of the costs of rehabilitation of either site (Duck Island or Kadleroshilik River) which is essential information for calculating whether the Kadleroshilik site is more economical overall, and this information should be provided in the EIS. The DEIS states that use of the Duck Island site could delay the island construction by a year, but fails to analyze whether the addition of personnel to transport the gravel (and resultant benefits to employment and the economy) could alleviate this delay. The analysis in Table II.A-1 states that the delay would only be 30-60 days (not one year), and concludes that by using more equipment and additional personnel, this delay might be alleviated. Given the extensive analysis of added costs of Duck Island, there should be a similar economic analysis of added *savings* from using this minesite. The EIS should thoroughly analyze this alternative, prior to rejecting it for purely economic reasons. 110

The DEIS states a disadvantage of the use of Duck Island minesite would be a delay the rehabilitation of the Duck Island minesite. Information on the rehabilitation plans (timing, costs, methods) should be provided in the EIS, so that these may be balanced against the similar costs and timing for rehabilitation of the Kadleroshilik site. Given the significantly lessened impacts to fish, wildlife and natural resources (including avoiding disturbances from noise, to water quality etc.) from using the already developed Duck Island minesite, further evaluation of this site is warranted. 111

The conclusion that there will be a reduction in light to the Boulder Patch should be further explained, with data on how wide the ice road would be and whether the ice road construction and use would continue during a critical time for the Boulder Patch. The sedimentation impacts to the Boulder Patch from the Kadleroshilik River minesite should be compared to the light deprivation impacts of the Duck Island minesite. 112

Since dewatering of Duck Island minesite appears to be a major disadvantage to the 113 site, the potential use of the removed water for other projects and for Liberty should be explored. The Duck Island minesite is a reservoir now, and the use of the water for other projects (as opposed to discharging it elsewhere) should be explored. This would alleviate the need for water withdrawal from other permitted sites and have potential environmental benefits. Since water is a limited resource in winter, the examination of such a conservation-type approach is warranted. 113

The DEIS states "Other than the Alaska Department of Fish and Game reports, very little has been documented about the effects of gravel mining in North Slope rivers in the permafrost zone, especially in terms of the physical processes that shape rivers and the instream habitat used by native fishes." [These "reports" are identified as "out of print or currently unavailable." *See* DEIS III.D.-9] This is clearly an insufficient basis to analyze the gravel minesites, or make any valid conclusions about the impact of the sites identified for the Liberty project. The conclusion of ADF&G that minesites provide fish habitat and that additional fish habitat in a river system is always desirable (over keeping the system in its natural state) has never been documented. While the provision of fish habitat may result, the wholesale adoption of this concept would mean that it is always better to place gravel mines in rivers in the North Slope to create fish habitat, regardless of the river's characteristics, hydrology or other unique traits. Since ADF&G has not completed any survey of the hydrologic characteristics of the Kadleroshilik River, nor of whether the fish species present overwinter there, there should be additional documentation of the "environmental benefit" of the Alternative I (Kadleroshilik) gravel mine, particularly when the DEIS concludes "Increased turbidity and sedimentation down stream of the mine site could disturb fish or algae." 114

It is unclear why BP is seeking a permit to mine up to 2 million cubic feet of gravel, when the greatest amount needed is identified as less than 1 million cubic feet. [990,000 cf]. The EIS should identify the total gravel needed for each alternative, and BP should be required to justify its request for more than twice what the DEIS identifies as the necessary gravel. 115

The DEIS use of an Oregon study of gravel minesites with the Alaska North Slope sites is highly questionable. The DEIS concludes that regardless of the findings of that study, the gravel mine impacts are different because "the rivers in Oregon and on the North Slope of Alaska are very different in hydrology, biology, or multiple-use demand." This appears to be a "straw man" argument, that has no scientific validity in a DEIS. If the EPA is "concerned that information about rivers in other states indicates the effects of mining in North Slope rivers may be substantial" yet there has been no analysis of these effects in the North Slope (other than the provision of additional fish habitat), this is a serious inadequacy, and provides no basis for the DEIS conclusion of no significant impacts from gravel mining. Given the paucity of information on this major aspect of the Liberty project, the public should be given an 116



additional comment period after "the Alaska Department of Fish and Game will be publishing additional information early in 2001, which along with other applicable information from other states can be incorporated in the Final EIS." [III-D-9.] 116

The DEIS states that "BPXA proposes using mainly the winter seasons to construct Liberty Island and the pipelines". [Emphasis added]. Any construction that is not taking place in the winter should be specifically identified in the EIS, and the impacts of that non-winter construction analyzed. The fact that the Sagavanirktok River minesites are now having trouble with fish passage, and that BP is seeking authorization for "fish transport channels" should be discussed in the EIS. This is evidence of adverse impacts from gravel mining that should not be ignored. The analysis of the Kadleroshilik minesite should include information on the potential saltwater intrusion from constructing the minesite below the mean low water level. If the minesite is intended to be used as a water reservoir, all applicable reservoir laws must be complied with. The proximity of the minesite to the "active channel" of the river should be discussed, and the anticipated hydrologic consequences of the reservoir should be addressed. The removal of vegetation in Kadleroshilik river has unacceptable consequences, and adverse effects to wildlife. A potential reconfiguration so as to avoid the vegetation should be analyzed. 117

In conclusion, the undersigned groups request MMS and cooperating agencies take these comments into account in drafting the final EIS and in reviewing the proposed permits and authorizations for the proposed Liberty project. We reiterate our support for the "No Action" alternative in the Liberty DEIS.

Sincerely,

Jennifer B. Appi Trustees for Alaska

On behalf of:

Randy Virgin, Executive Director
Alaska Center for the Environment
807 G Street, Suite 100
Anchorage, AK 99501

Pamela K. Miller, Director
Alaska Community Action on Toxics
135 Christensen Drive, Suite 100
Anchorage, AK 99501

Mary Core, Executive Director
Alaska Conservation Alliance
750 West 2nd Avenue, Suite 109
Anchorage, AK 99501

Cindy Shogan, Executive Director
Alaska Wilderness League
122 C Street, N.W. Suite 240
Washington, D.C. 20001

Brendan Cummings, Attorney
Center for Biological Diversity
Post Office Box 40090
Berkeley, CA 94704

Robert M. Ferris, Vice President
Species Conservation
Defenders of Wildlife
1101 14th Street, NW
Washington, D.C. 20005

Melanie Duchin, Climate Campaigner
Greenpeace
125 Christensen Drive, Suite 2
Anchorage, AK 99501

J. Scott Feierabend, Regional Vice President
National Wildlife Federation
750 W. 2nd Ave., Suite 200
Anchorage, Ak 99501

Chuck M. Clusen, Senior Policy Analyst
Natural Resources Defense Council
40 W. New York Ave. NW
Washington, DC 20005

Arthur Hussey, Executive Director
Northern Alaska Environmental Center
218 Driveway Street
Fairbanks, AK 99701

Sara Callaghan Chapell, Alaska Representative
Sierra Club
201 Barrow Street, Suite 101
Anchorage, AK 99501

Allen E. Smith, Alaska Regional Director
The Wilderness Society
430 West 7th Avenue, Suite 210
Anchorage, AK 99501

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**0135-E01**

The MMS continues to work toward making our publicly available documents readily accessible.

**0135-E02**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0135-E03**

The MMS believes the Liberty Development and Production Plan complies with the regulations in 30 CFR 250.204, Development and Production Plan and, therefore, with the applicable parts of the OCS Lands Act.

The potential effects of developing the Liberty Prospect on bowhead whales are analyzed in Sections III.C.2.a(1), III.C.3.a(1), and III.D; spectacled and Steller's eiders in Sections III.C.2.a(2), III.C.3.a(2), and III.D; polar bears in Sections III.C.2.b, III.C.3.b, and III.D; subsistence in Sections III.C.2.h, III.C.3.h, and III.D; other natural resources in Sections III.C.2, III.C.3, and III.D.

The types and levels of oil- and gas-related activities that are considered in the cumulative analysis and the oil-spill risk are described in Section V.B. The effects of past, present, and reasonable foreseeable activities on fish and wildlife and the marine, coastal, and human environments (including subsistence) are analyzed in Section V.C. The commenter did not provide any additional information relating to the description and analysis in Sections V.B and C.

For issues related to the Arctic National Wildlife Refuge, see Response 0012-005.

**0135-E04**

Please see Response 0025-A03.

**0135-001**

Thank you for your comments. Your recommendations will be considered as the Environmental Protection Agency proceeds with its decisionmaking processes.

As noted in Section III.C.1.a of the EIS the BPXA Oil Discharge Prevention and Contingency Plan (BPXA, 2000b) for Liberty was developed to comply with multiple regulatory standards. These include the MMS (30 CFR 254), the U.S. Coast Guard (33 CFR 154), the U.S. Department of Transportation (49 CFR 194), and the Alaska Department of Environmental Conservation (18 AAC 75). Each agency reviews the plan to ensure compliance with their regulatory authority and responsibilities (i.e., outer continental shelf facility, offshore segment of the pipeline, onshore segment of the pipeline, and diesel storage and transfer). These reviews of the contingency plan are conducted independent of the EIS process and, depending on the agency, will have a separate public and coastal zone management review process.

The results of the drills are addressed in Response 0135-094 which notes BPXA and Alaska Clean Seas did not "fail" the trials conducted during spring and fall 2000. Had the situation actually been a spill, BPXA and Alaska Clean Seas would have been able to respond with the equipment and personnel cited in their oil-spill-contingency plan and begin recovering oil. The Oil Pollution Act of 1990 and the MMS regulations in 30 CFR 254 read "to the maximum extent practicable.…" BPXA would not have been limited to one tactic and would have had more latitude to react to actual environmental conditions than having to deal with the contrived conditions of the trials.

The results of these demonstrations indicated that the Tactic R-19A, barge-based response, is more limited in its range of applicability than presented in the Alaska Clean Sea Technical Manual. BPXA, through the imposition of voluntary seasonal drilling restrictions at the Northstar facility, acknowledges that cleanup tactics are much more limited in their applicability than previously thought and are limiting their actions, which possibly could result in a spill during periods when spill response would be more challenging. They also have revised their plans and technical manuals to more accurately reflect operational limitations.

As noted inn response 0137-003 BPXA is revising their oil-spill-contingency plan to incorporate lessons learned during the spring and fall 2000 trials, including the newly established upper operating limits.

The effects of a large oil spill are analyzed assuming no oil spill response or cleanup. Because of this, for the reasons noted above and because of the review and implementation processes discussed in Section III.C.1.a, MMS does not believe that the report, Joint Agency Evaluation of the Spring and Fall 2000 North Slope Broken Ice Exercises, mentioned, but not named, in the comment should be included as an appendix in the EIS. This report is a publicly available document that can be viewed or requested from any of the joint agencies; Alaska Department of Environmental Conservation, North Slope Borough, Alaska Department of Natural Resources, MMS, and U.S. Coast Guard. Similarly the Alaska Department of Environmental Conservation Compliance order is a publicly available document that can be viewed or requested from the agency and does not need to be attached to the EIS as an appendix.

**0135-A01**

The MMS is aware of the observation by the United Nations Intergovernmental Panel on Climate Change that deep cuts are needed in greenhouse-gas emissions to stabilize the amount of carbon dioxide in the atmosphere. However, the panel also acknowledged that a 50% reduction in carbon dioxide emissions is highly unrealistic. The Kyoto Protocol calls for much more modest reductions, on the order of 5-7% for the industrialized nations, and does not put any caps on emissions from the developing nations. The projected greenhouse-gas emissions from northern Alaska oil production and oil consumption over the next 20 years are about 1% of the current global greenhouse-gas emissions. This is about the same level as the emissions from North Slope oil production in 1996, and significantly smaller than the level in the year 1988 when North Slope oil production peaked. The proposed Liberty Project would contribute only about 1% to the carbon emissions from petroleum production in Northern Alaska.

**0135-002**

The MMS has looked seriously at the scientific evidence regarding global warming and climate change. We agree that it is a serious issue of continuing concern. We discuss this issue in Section III.D.10 of the EIS. In addition, the Council on Environmental Quality recommends addressing this issue at the program level rather than at the project level. We incorporate in the cited Liberty draft EIS section the discussion from the 5-year 1997-2002 final EIS. The 5-year programmatic draft EIS for 2002-2007was distributed for public comment in October 2001. The MMS has determined that it is inappropriate to analyze programmatic issues in a project-specific environmental impact statement.

It is true that the draft EIS emphasizes that portion of greenhouse-gas emissions produced as a result of oil-production activities at Liberty and other North Slope oil fields. This represents the portion of greenhouse gas emissions most directly related to the impacts of the Proposal on the environment of northern Alaska and the portion for which we have the most information available. As is stated in several places in the Liberty EIS, including especially Section V.C, the cumulative impacts analyzed in this EIS focus most closely on those effects and activities that are more certain and geographically closer to Liberty. We have estimated that the consumption of oil produced by the proposed Liberty Project during the year of peak production would result in a greenhouse-gas emission rate of 2.3 million tons carbon equivalent per year. This is about 0.15% of the current U.S. carbon dioxide emission rate, or 0.037% of the current global carbon dioxide emission rate from fossil fuels. If one averages the emission rate over the 20-year lifetime of the proposed project, the greenhouse-gas emission rate would be about half of the above figure. By contrast, the consumption of oil currently produced by all of the northern Alaska oil fields is estimated to result in an emission rate of 50.6 million tons carbon equivalent per year, or 0.8% of the current global carbon dioxide emission rate. We note here that if North Slope oil production and the burning of that oil were to cease, the emissions from that production and burning would presumably be replaced, at least in the short term, by very similar emissions from the burning of other oils from other locations in the world. Over the long term, some of the emissions and global warming could be eliminated by increased energy efficiency, energy conservation, and the use of alternative energy sources. All of these topics, however, involve national and global policy decisions and their implementation is considerably beyond the scope of this EIS.

**0135-003**

Please see Response 0135-002. Also, the 30% increase in greenhouse-gas emissions from regional oil production is the change when measured with respect to the 1999 emission levels. North Slope oil production peaked at 2.0 million barrels per day in 1988, dropped to 1.4 million barrels per day in 1996, and further dropped to 1.1 million barrels per day in 1999. The projected future regional oil production rate over the 2000-2020 timeframe is 1.4 million barrels per day, which essentially is the same as the 1996 rate. Thus, when one looks at the projections in a historical context, the emissions over the next 20 years would be no greater than those experienced in the 1990-2000 period.

**0135-004**

Please see Response 0135-002. Also, the 1% estimated contribution of North Slope production is based on World Bank study information incorporated by the Corps of Engineers into the Northstar EIS (Section 10.4.2.3, pages 10-27 and 10-28). We believe this to be the best relevant information currently available. The potential consequences of climate change from global greenhouse gas emissions are presented in detail in reports by the Intergovernmental Panel on Climate Change (2001a,b). An assessment of climate change impacts on the United States is given in a report by the National Assessment Synthesis Team (2000). The reports indicate that there is a wide range in the possible effects and that many uncertainties exist, especially on a regional basis. However, with the regional oil production and consumption accounting for about 1% of global emissions, the contribution to global climate change would be virtually imperceptible.

**0135-005**

Please see Response 0135-002. Also, greenhouse-gas emissions are typically expressed in units of tons of carbon equivalent, which takes into account radiative forcing of the gas and its residence time in the atmosphere.

**0135-006**

Please see Response 0135-002.

**0135-007**

Please see Responses 0135-002, 006-005, and 065-A02.

**0135-008**

Please see Responses 0135-002, 006-005, and 065-A02.

**0135-009**

Please see Responses 0135-002, 0006-005, and 0065-A02. Also, we do not state that oil and gas resources "would have to be developed in other parts of the globe...." We do state that if these Alaska oil and gas resources were not developed and used, they would presumably be replaced, at least in the short term, by other oil and gas resources from other locations in the world. We consider this to be a significant difference. We do not advocate development elsewhere; we merely acknowledge that it might very well occur, especially to meet short-term needs until increased energy efficiency, increased energy conservation, and increased use of alternative energy sources could occur. Again, these involve national and global policy decisions, and their implementation is considerably beyond the scope of this EIS.

**0135-010**

Please see Response 0065-A02.

**0135-011**

Please see Responses 0065-A02 and 0135-009.

**0135-012**

Please see Response 0006-003.

**0135-013**

The MMS classifies spills less than 500 barrels as small spills. We assume small spills occur. Table A-1 in Appendix A shows the source of spill(s), type of oil, size of spill(s) in barrels, and the receiving environment we assume in our analysis in this EIS of the effects of small oil spills for the Proposal and alternatives and other analyses. The analysis of small spills and their estimated distribution is in Appendix A, B Small Oil Spills. We analyze small spills and their impacts in Section III.D.3 Effects of Small Oil Spills from Liberty Facilities.

**0135-014**

The MMS evaluates spills from the Trans-Alaska Pipeline System (TAPS) in the cumulative case. Table A-35 shows the oil-spill-occurrence estimates greater than or equal to 500 barrels over the assumed 16-year production life of the Liberty Project from the TAPS. These oil-spill-occurrence estimates are based on the TAPS spill rate from 1985-1998. The first flow through the TAPS began on June 20, 1977, with throughput of 112 million barrels by the end of 1977. Throughput increased to almost 400 million barrels in 1978, peaked at 744 million barrels in 1988, and dropped to 440 million barrels in 1998. There have been nine crude oil spills (greater than or equal to 100 barrels) attributed to TAPS operation not including sabotage, three of which were less than 500 barrels. Six crude oil spills were greater than 500 barrels, of which five were greater than 1,000 barrels:

| | | | |
|---|---|---|---|
| 07/08/77 | 5000 barrels | Facility Explosion | TAPS Pump Station 8 MP 489.2 |

| | | | |
|---|---|---|---|
| 07/19/77 | 2500 barrels | Pipeline Leak | TAPS MP 26 (Check Valve 7) |
| 06/10/79 | 7000 barrels | Pipeline Leak | TAPS MP 166 |
| 06/15/79 | 4000 barrels | Pipeline Leak | TAPS MP 734 |
| 01/01/81 | 2500 barrels | Pipeline Leak | TAPS MP 114.6 (Check Valve 23) |
| 04/20/96 | 811 barrels | Pipeline Leak | TAPS MP 539.7 (Check Valve 92) |

Five of the six TAPS spills were in the early years of pipeline startup, 1977-1981. This is a typical spill pattern for a pipeline built in the 1970's. Based on trend analysis, the spill rate for the TAPS pipeline from 1985-2000 is 0.12 spills per billion barrels transported. This rate is used in the estimation of TAPS spills in Table A-35.

In reference to only looking at large crude spills, please see Response 0135-013. The MMS recognizes that other hazardous substances are spilled on the Alaska North Slope. The following table lists the number and quantity of hazardous substances spilled on the Alaska North Slope by Industry from 1995-2001. The majority of these spills are into containment or are cleaned up.

Hazardous Substance Spills by Number of Spills and Volume in Pounds or Barrels Reported by the Alaska North Slope Industry to the Alaska Department of Environmental Conservation from July 1, 1995 to March 30, 2001.

| Hazardous Substance | No. of Spills | Barrels (Pounds) |
|---|---|---|
| 2,4,5-T | 1 | 0.05 |
| Acid (Type Unknown) | 9 | 3.14 |
| Ammonia (Anhydrous) | 0 | 0.00 |
| Biocide | 1 | 0.95 |
| Biozan Gel | 3 | 135.88 |
| Calcium Chloride (Solid) | 3 | 0.38 |
| Cement | 5 | 21.21 |
| Corrosion Inhibitor | 34 | 539.43 |
| Drag Reducing Agent | 15 | 57.33 |
| Emulsion Breaker | 5 | 6.10 |
| Ethyl Alcohol (Ethanol) | 1 | 0.02 |
| Ethylene Glycol (Antifreeze) | 131 | 24,317.83 |
| Freon (Dichlorodifluoromethane All Types) | 1 | (6) |
| Hexylene Glycol | 3 | 3.69 |
| Hydrofluoric Acid | 1 | 0.02 |
| Methyl Alcohol (Methanol) | 89 | 590.05 |
| Other | 215 | 3,131.43 |
| Produced Water | 49 | 163.86 |
| Propylene Glycol | 16 | 170.19 |
| Seawater | 65 | 341.24 |
| Sodium Hydroxide | 1 | 0.02 |
| Source Water | 6 | 35.98 |
| Sulfuric Acid | 2 | 0.38 |
| Therminal | 5 | 4.02 |
| Unknown | 4 | 9.00 |

Please see Tables A-1 and A-2 for the spill sizes MMS assumes for analysis in the EIS. The MMS uses the Alaska North Slope record of oil spills to estimate spill sizes for the Liberty gravel island facility, because the geologic and operating conditions would be similar to those on the Alaska North Slope. The operators and facilities would be the same as those currently operating onshore. The MMS estimates the 925-barrel spill to be representative of a spill from the Liberty gravel island. For the pipeline, the estimated spill sizes are based on engineering calculations for either a rupture or a leak. The pipeline spill sizes range from 125 barrels to 2,956 barrels. They are not based on the 510-barrel pipeline spill from the Alaska North Slope. In general, the MMS does not use the mean spill sizes the commenter quoted in its environmental evaluations, because they are sensitive to outliers in the dataset. The MMS feels that the median spill size is much more indicative of an appropriate size, because it is not sensitive to outliers in the data.

**0135-015**

The commenter is mistaken about MMS "tossing out" large spills on the North Slope of Alaska, and we provide the rationale for the range of spill rates presented in Section III.C.1.d(3)(b) in this response. The MMS did use the pipeline and facility spills from 1985-1999 and production data from 1985-1999. Using the entire production database was prompted by a statement in Hart Crowser, Inc. (2000). That report states that Hart Crowser judged the Alaska oil-spill data to be comprehensive and complete. The MMS disagrees with this statement and views the data as most reliable from 1985 forward. The MMS presented the range of rates to show the reader the opposing viewpoints. The calculations in Table III.C-3d and Table A-35 use the 1985-1999 rate, because MMS has confidence in this more recent data.

**0135-016**

The prime cause of spills on outer continental shelf platforms and the Alaska North Slope is leaks from or damage to storage tanks. The last significant outer continental shelf platform spill was in 1980 from a tank overflow. The storage tanks at Liberty include a 3,000-barrel diesel storage tank, a 2,000-barrel slop-oil tank, a 5,000-barrel produced-water tank, and 17 temporary 550-barrel diesel-storage tanks, each with a capacity of 9,350 barrels total (BPXA, 2000b). because of the design and nature of the Liberty gravel island, it does not lend itself to damage of storage tanks from causes that are external to the island and that would result in a spill from a storage tank entering the ocean.

This conclusion is based on several facts. The working surface of the island is set back more than 60 feet from the water's edge. The island has a 40-foot wide bench that is 6 feet above sea level and a 24-foot wide, 8-foot high berm of gravel bags. All diesel-storage tanks at Liberty will be constructed in accordance with American Petroleum Institute Standard 650. As such, they may not be riveted or bolted and must have a cathodic protection system or other approved corrosion protection where soil conditions warrant. They must be equipped with a leak-detection system that an observer can use from outside the tank to detect leaks in the bottom of the tank. All hydrocarbon-storage tanks at Liberty will be double-wall tanks, which would contain any leaks and spills from the inner tank. The volume of this containment space is 10% of the maximum capacity of the storage tank. All tanks at Liberty will have secondary containment, as required in 30 CFR 250.300(b)(5). The permanent 3,000-barrel diesel-storage tank is located on a raised platform with a seal-welded floor and a seal-welded 6-inch high toe board providing an additional 100 barrels of containment. Secondary containment for the diesel-storage tanks consists of a diked, lined area with a total containment capacity of 550 barrels, the volume of the largest tank in the diked area. If a spill were to occur from a storage tank at Liberty, secondary containment would keep it from reaching the marine environment. If secondary containment failed, the gravel island's working surface is sloped to direct surface runoff to drainage swales located along the edges of the island surface (BPXA, 2000a:Figure 12-1). These swales direct liquids to storm-water sumps located on the north, south, and east sides of the island. Each sump has storage capacity of 7,660 gallons, with a combined capacity of 22,980 gallons. The porosity of the gravel also would work to keep oil on the island. Taking all these pollution-prevention measures into consideration, it is likely that spills from storage tanks would be contained in secondary containment or on the island itself.

**0135-017**

The commenter states that the analysis assumes spill risk is the same for the pipeline alternatives. The estimated chance of one or more spills occurring using volume of oil produced is the same for the pipeline alternatives, but this is not the "risk."

The analysis of oil spills in the EIS has two parts. The first part analyzes the effects of the estimated spill volumes, assuming that these spills occur. The second part considers what the chance is of these spills occurring. The term "risk" has several definitions, but it is most typically defined as the chance of an event and its consequences. In that sense, the spill "risk" is not the same for the alternatives. The effects analysis of oil spills from the alternatives assumes an oil spill occurs and evaluates the effects of large and small oil spills. The spill sizes are the same for most alternatives with the exception of the pipe in pipe and the pipe in HDPE, when we assume that the inner pipe ruptures and the outer pipe does not. In this scenario, we would not anticipate an oil spill to reach the existing environment, and the effects for that scenario are different than the others.

In addition to spill-size differences between the alternatives, the MMS looks at geographic differences. The MMS performs oil-spill-trajectory analyses from each of the pipeline alternatives to clarify the difference between pipeline scenarios for the effects analysis. The differences are small, because the pipeline alternatives are not geographically diverse. Because there are no physical blocks to the currents between the different alternatives, the MMS would not expect significant differences in the chance of contact from the different pipeline alternatives.

**0135-018**

The MMS believes the draft EIS does a fair and accurate job of describing the benefits and drawbacks of the various pipeline systems. The comment refers to a description of the studies that were performed and not the conclusions of these studies. See also Response 0132-061. Because C-CORE did not look at the actual pipeline-design alternatives analyzed in the EIS, the results of that study are discussed qualitatively instead of quantitatively. We did not ignore the conclusion from the Fleet study about the probability of pipeline failure. This information was clearly presented on page IV-36 (Section IV.C.2.d) of the draft EIS.

The MMS believes that the proposed single-wall pipeline design does represent the best available technology, because it provides for better integrity monitoring of the pipeline than any of the other pipeline designs, and it provides an adequate level of protection against a pipeline leak.

**0135-019**

The MMS disagrees with this comment. We have included all of the relevant information on pipeline risks in this EIS and have considered ice and permafrost concerns. We have contracted for various pipeline studies specific to operations in the Beaufort Sea that do include pipeline-risk analysis and consider ice forces and permafrost. We have included the results of these reports in our analysis in the EIS.

**0135-020**

The MMS worst-case spill volume is correct given what is known about the reservoir. According to the Oil Pollution Act of 1990, PL 101-380 § 4201. and 33 USC 1321, a worst-case discharge is defined as " in the case of an offshore facility or onshore facility, the largest foreseeable discharge in adverse weather." In 30 CFR 254.47, the MMS defines a worst-case discharge as the sum of the simultaneous discharge of the entire contents of all oil-storage tanks at the facility, the volume of oil released from a pipeline break, and the daily production of an uncontrolled blowout of the highest capacity well associated with the facility. In *Federal Register* 62-13911, where the MMS regulations 30 CFR 254 are officially implemented, the definition of the worst-case spill scenario is defined further and the intent of regulation is clarified:

> The scenario should demonstrate how you would remove, store, and dispose of the oil escaping from an uncontrolled well on a daily basis for 30 days. MMS does not intend that the rule be read to require you to demonstrate how you would respond to a 30-day total flow from the well as if it had occurred in a short period of time, as could happen in a tanker accident.

The scenarios submitted reflect the most adverse response conditions in Beaufort Sea open-water, broken-ice, and freezeup conditions.

In Section IX of the EIS, MMS analyzes the effects of a low-probability, very large, 180,000-barrel blowout oil spill.

**0135-E05**

Please see Responses 0132-002 and 0135-094.

**0135-021**

See Response 0145-012 for broken-ice response issues. In situ burning in broken-ice conditions does not depend on the ability to deploy fire-resistant boom. The ice works as a containment boom and can concentrate oil to a sufficient thickness to support combustion. In situ burning is a viable response tactic and is given due consideration in evaluating response scenarios.

**0135-022**

The volume of oil mentioned on page IX-4 of the draft EIS is 180,000 barrels, which equals 7.56 million gallons (180,000 barrels x 42 gallons per barrel), not 7.5 billion gallons as indicated in the comment. Further, the estimated chance of a spill greater than 150,000 barrels ranges from about 0.05% over a 2-year period during well drilling to 0.21% over the lifetime of Liberty for production/workover wells (Section IX of the EIS).

The expected effects of an oil spill on bowheads is based in part on the Oil-Spill-Risk Assessment estimated probabilities of spilled oil contacting bowhead whale habitat areas outside the barrier islands and also in part on the studies of effects of spilled oil on cetaceans, including studies associated with the *Exxon Valdez* oil spill. The commenter states that "Scientists reported quite a different picture following the *Exxon Valdez* spill, yet the MMS still has not incorporated the knowledge into its impact analyses." In fact, studies on the *Exxon Valdez* are incorporated into our impact analysis in the EIS. The MMS refers the commenter to Section III.C.2.a(1)(b) for a discussion of various studies on the effects of the *Exxon Valdez* spill and other spills on cetaceans. Based on existing studies, cetaceans do not appear to be affected by oil as many other marine mammals are. As Geraci (1990) stated: "It seems that unlike sea otters, polar bears, and some seals, there is no gripping evidence that oil contamination has been responsible for the death of a cetacean."

The reference to the recent overview of the *Exxon Valdez* "*The Exxon Valdez Oil Spill in Alaska: Acute, Indirect and Chronic Effects on the Ecosystem*" appears to offer little useful information in terms of possible effects of an oil spill on bowheads. The primary marine mammals discussed in the article were mammals that use shoreline habitat, such as sea otters and harbor seals, which do not provide a good comparison to cetaceans. The primary effect on killer whales discussed in the suggested reference was related to a change in feeding behavior due to a reduced availability of traditional marine mammal prey species, which is not an issue with bowheads. Delayed recovery as a result of chronic or indirect effects, as discussed for various species in the suggested reference, is less likely to be a problem for bowheads than for harbor seals and sea otters. Bowheads do not haul out along oiled shorelines, would not ingest oil as a result of preening, and would not feed on prey species in intertidal areas that may be contaminated with oil. Bowheads feed opportunistically on zooplankton as they migrate across the Beaufort Sea. The potential effects to bowheads from ingestion of oil, loss of a food source, or other possible effects as a result of an oil spill are discussed in Section III.C.2.a(1)(b). In the context of existing studies and observations on the effects of oil spills on other cetaceans, MMS believes the analysis of impacts of an oil spill on bowhead whales is based on the best data available and is adequate.

**0135-023**

The EIS assumes a large oil spill with regard to affecting polar bears (also, see Response 0135-020). The analysis assumes that all bears (based on a high density of one bear per 25 kilometers from Amstrup [2000] in Appendix J) that could be exposed to the spill within the area swept by the spill within 30 days would be killed. This was assumed regardless of the spill probabilities. The EIS assesses the potential effects of a much larger spill on polar bears in Section IX.A Effects of a Very Large Spill. The analysis of the effects of a large spill on vegetation and wetlands does assess the effects of oil persisting in the environment in coastal wetlands, with the oil contamination persisting for many years. However, this local contamination is not likely to have any detectable effect on polar bears and their prey. Effects of oil-spill cleanup on polar bears is discussed in Section III.C.2.b.

**0135-024**

The Fish and Wildlife Service requested that the MMS prepare this more specific oil-spill analysis, because they had density information for polar bears and eiders. The MMS believes that the Oil-Spill-Risk Analysis model used in the Liberty EIS to evaluate the probability of spilled oil contacting specific areas of bowhead habitat used the same spill-trajectory model and data.

Nuiqsut harvest areas are shown on Map 9. Offshore boundary segments, land segments, and environmental resources areas covered by MMS's Oil-Spill-Risk Analysis are shown in Appendix A, Maps A-1, A-2, and A-3. The information shown in these figures was considered in analyzing the effects of oil spills on biological and subsistence resources.

The Oil-Spill-Risk Analysis model used in the Liberty EIS to evaluate the probability of spilled oil contacting specific bowhead whale subsistence-harvest areas uses a number of specific environmental resource areas (and land segments) that represent primary whaling areas. If a large area is used as an environmental resource area, the probability of contact always would be 100% and, therefore, no realistic measure of oil-spill risk could be achieved. By using discrete resource areas, a realistic measure of contact can be predicted.

The impact of oil spills on the migration corridor, other subsistence-use areas, and Nuiqsut subsistence-use areas in particular, is not ignored. See Sections III.C.2.h and V.C.8 for these discussions.

**0135-025**

The simulation of oil-spill-trajectory analysis is done without regard to oil volume. The trajectory model simulates oil as a point. Page 4, third paragraph, second sentence of the Oil-Spill-Risk Analysis: Liberty Development and Production Plan states "The trajectories represent the Lagrangian motion that a particle on the surface might take under given wind, ice, and ocean current conditions." The MMS digitizes each environmental resource area, boundary, and land segment with a slightly greater aerial extent to simulate the diameter of the Lagrangian element for various spill volumes. The Oil-Spill-Risk Analysis evaluates various spill sizes, as described in Sections III.C.1.e and III.D.3.

**0135-026**

A cumulative analysis of oil spills was considered for both Liberty and Northstar in addition to all past, present, and reasonably foreseeable development on the onshore North Slope of Alaska and adjacent offshore areas. These include: (1) past development/production: 28 fields, with Endicott, Eider, and Sag Delta North offshore. (2) present development/production: 5 discoveries that are expected to start up within the next few years, with Northstar and Liberty offshore. (3) reasonably foreseeable future development: 15 discoveries that might be developed within the next 15-20 years, with Sandpiper, Flaxman Island, Kuvlum, Thetis Island, Stinson, and Hammerhead offshore (see Table V.B-1a). Additional onshore resources (estimated 2.30 billion barrels) and offshore resources (estimated 0.45 billion barrels) currently are undiscovered.

Appendix A, Table A-35 shows the cumulative oil-spill-occurrence estimates greater than or equal to 500 barrels or 1,000 barrels, respectively, resulting from oil development over the assumed 16-year production life of the Liberty Project. These estimated spill numbers, one offshore, five onshore, one Trans-Alaska Pipeline System, and nine tanker spills, were used to estimate the impacts in the cumulative case. A new trajectory analysis of Northstar was not performed. The information from the trajectory run in the Northstar final EIS (U.S. Army Corps of Engineers, 1999) was considered with the trajectory analysis of Liberty to estimate cumulative effects.

**0135-027**

Appendix A Map A-1 shows that the land segments include the shoreline of the Arctic National Wildlife Refuge. The Refuge is not an environmental resource area; it is divided into land segments that collectively can be added. We are aware that the barrier islands adjacent to Beaufort Lagoon are not included in the trajectory analysis. Land Segments 35-38 are adjacent to Beaufort Lagoon. There is a less than a 0.5% chance that a spill occurring during summer or winter would contact Land Segments 35-38 within 1, 3, 10, 30, 60, or 360 days.

**0135-028**

The analysis of impacts discusses environmental impacts that will not necessarily occur under a proposed action but that are reasonably foreseeable. The term "reasonably foreseeable" has no precise definition for spill size. We analyze an extremely large spill to provide the decisionmaker with an extreme boundary of impacts. This situation is unlikely to occur due to the Proposal; however, if it did, these would be the impacts.

The estimated chance of a spill greater than 150,000 barrels ranges from about 0.06% over a 2-year period during well drilling to 0.21% over the lifetime of Liberty for production/workover wells (Section IX of the EIS). Scandpower (2001) recently completed a blowout-frequency assessment of Northstar. This analysis modified statistical blowout frequencies to reflect specific conditions and operating systems at Northstar for the drilling process. The estimated blowout frequency for drilling into the oil-bearing zone and spilling greater then 130,000 barrels is $9.4 \times 10^{-7}$.

The volume of oil mentioned in the comment is 180,000 barrels, which equals 7.56 million gallons (180,000 barrels x 42 gallons per barrel) and not 7.5 billion gallons, as indicated in the comment.

**0135-029**

Please see Response 0135-022.

**0135-030**

The statement predicting that substantial mortality of spectacled eiders (in the highly unlikely event of a 180,000-barrel spill) would represent a significant loss to the Arctic Coastal Plain population is as accurate an estimate of effect in this circumstance as currently available information will allow. Currently, no significant population decline is apparent, and the population would be likely to recover from spill mortality.

**0135-031**

The estimate of 2,600 ringed seals is based on a recently published report on ringed seal density of 0.81 seals per square kilometer for the Beaufort Sea and the Liberty area times the area swept by the spill (Frost et al., 1998).

**0135-032**

The estimate of 60-100 bears is based on a bear density of one bear per 78-130 square kilometers and an estimated area of 7,900 square kilometers of ocean surface that could be swept by the 180,000-barrel spill within 60 days during open water. Although higher densities of bears occur onshore near whale carcasses and near ice leads during the winter, the large spill would not sweep over the same amount of ocean surface as during open-water or broken-ice conditions. Fewer bears are likely to be exposed to the spill during winter.

**0135-033**

The text in Section III and the Executive Summary has been revised to indicate that mortality of long-tailed ducks, king eiders, and common eiders at the high end of the ranges suggested would represent significant losses.

**0135-034**

Part of the reason for estimates rather than scientific references is, as explained in the Section IX introductory paragraphs, that the largest blowout spill in Federal waters to date is only 80,000 barrels. A more probable spill size would be 715-2,956 barrels, as explained in Section III.C.1.d on historical spill sizes; the effects of such a spill were based on references and were integrated into the alternative analysis (Section IV.C). In contrast, a 180,000-barrel spill is estimated to deposit up to 26,000 barrels of oil onshore (Table IX-5a), affecting up to 209 kilometers, or about 65%, of the Stefansson Sound coastline (Table IX-4). The estimates in Table IX-5a are based on an ocean-ice weathering model of Kirstein and Redding (1987). To emphasize that the numbers are estimates rather than facts, the test has been changed from "65%" to "two-thirds" of the Stefansson Sound coastline.

**0135-035**

Part of the reason for estimates rather than scientific references is, as explained in the Section IX introductory paragraphs, that the largest blowout spill in Federal waters to date is only 80,000 barrels. A more probable spill size would be 715-2,956 barrels, as explained in Section III.C.1.d on historical spill sizes; the effects of such a spill were based on references and were integrated into the alternative analysis (Section IV.C). In contrast, a 180,000-barrel spill would affect more of the planktonic community. The assessment (Section IX.A.6.e) has been clarified, and a reference to the Sale 170 EIS has been added. The assessment now clarifies that up to one-quarter of the planktonic community in Stefansson Sound would be affected for 1-2 weeks.

**0135-036**

The estimate of several decades for recovery of wetlands from the very large spill is based on published scientific literature (Nummedal, 1980; Owens et al., 1983) discussed in Section III.C(2)b) Effects of a Large Offshore Spill.

**0135-037**

We believe it is realistic to predict significant adverse effects on Nuiqsut and Kaktovik subsistence-harvest patterns from a very large spill. We fail to see why the very large oil spill is not a "scientific analysis."

**0135-038**

The MMS assumes the commenter is referring to Sections III, IV, and V of the EIS when reference is made to the "main body of the EIS." These sections analyze the effects of large oil spills, disturbances, small spills, and other activities of the key resources identified through the scoping process (Section III.A.1.a). Significance thresholds are identified in Section III.A. Based on these definitions, significant adverse impacts were found for spectacled eiders, common eiders, long-tailed ducks, subsistence harvests, sociocultural systems, and local water quality in the unlikely event of a large oil spill. The MMS does not expect any significant impacts to result from any of the planned activities associated with Liberty development (Section III.C.3).

In the event of a large offshore oil spill, some significant cumulative impacts (Section V) could occur, such as adverse effects to spectacled eiders, long-tailed ducks, and common eiders; subsistence resources; sociocultural systems; and local water quality. The potential adverse effects to other key resources (bowhead whales, the Boulder Patch, polar bears, and caribou) are of primary concern and warrant continued close attention. However, the probability of such an event, combined with the seasonal nature of the resources inhabiting the area, make it highly unlikely that an oil spill would occur and contact these resources.

The MMS believes the effects of oil spills on polar bears, bowhead whales, and subsistence-harvest patterns, as specifically referenced in the comment, have been appropriately analyzed for the various spill sizes presented in the EIS.

The analysis of the effects of a 180,000-barrel spill on seals and polar bears in Section IX.A.6.b suggests that "significant" impacts to seals and polar bears could occur. For example, it states that "recovery of polar bears could take 6-10 years."

Section III.C.2.a(1) does discuss the effects of various oil spills on cetaceans, including the *Exxon Valdez* spill. Several additional references have been added to the text. What conclusions can be drawn from these observations? As Geraci (1990) stated: "It seems that unlike sea otters, polar bears, and some seals, there is no gripping evidence that oil contamination has been responsible for the death of a cetacean." In the context of observations on the effects of oil spills on other cetaceans, MMS believes the analysis of impacts of an oil spill on bowhead whales is adequate.

Section III.C.2.h(1) does discuss the effects of various oil spills on subsistence species and traditional hunting practices. The bottom line reached is that oil tainting would produce serious impacts to bowhead whaling, and cleanup would produce serious disturbance to other subsistence species. The whole concept of tainting is discussed based on lessons learned from the *Exxon Valdez* spill, where subsistence food contamination and cultural differences in perception and communication of risk about subsistence foods became a major issue.

The analysis of cumulative effects on subsistence-harvest patterns, Section V.C 8, indicated one or more important subsistence resource could become unavailable or undesirable for use for 1-2 years, which would be a significant impact. Sources that could affect subsistence resources include potential oil spills.

**0135-039**

As noted in Section I.A of the EIS, the MMS has determined that approving the Liberty Development and Production Plan would be a "major Federal action that may significantly affect the quality of the human environment pursuant to the National Environmental Policy Act." Such an action under 40 CFR 1502.3 requires the preparation of an EIS. The analysis in the EIS for the proposed action, the Liberty Development and Production Plan, and all of the alternatives focuses on 15 classes of resources from the biological, social (human), and physical environments. The tables of contents for Sections III, IV, and V list the specific resources that are analyzed in the EIS. The biological resources include (1) individual species; such as polar bears and the endangered bowhead whales; (2) groups of species such as seals, marine and coastal birds, fishes, and the threatened eiders; and (3) vegetation and wetland habitats. The social environment includes those activities and/or events that relate to human activities such as subsistence harvests and various aspects of the social systems such as organization, cultural values, and institutions. The physical resources include marine waters and air.

The organization and presentation of the resources analyzed in the EIS are based on the results of scoping done for the Liberty EIS; MMS's experience and understanding of issues related to oil and gas development on the North Slope and in the Beaufort Sea; and the requirements of 40 CFR 1508.14, which states: "When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."

The MMS believes the effects of the proposed Liberty Development and Production Plan on the habitat of the biological resources have been addressed. The effects on habitats are analyzed as part of the analysis associated with each of the specific biological resources and as separate entities—vegetation and wetlands, oceanography and water quality, and air quality. Habitat generally means the kind of place that is natural for the life and growth of a plant or animal and includes the terrestrial environment, marine waters, and air.

The MMS assesses the significance of effects on habitats through the effects on flora (plants) and fauna (animal populations) that inhabit the terrestrial, marine, and coastal environments. Existing environmental laws, such as the Endangered Species Act and the Marine Mammal Protection Act, require MMS to assess effects on habitats as they relate to animal populations (such as bowhead whales and polar bears) that inhabit the specific environment (habitat). The MMS is not required to assess effects on habitats in isolation of the plants and animals that inhabit these environments. If there is a potential for significant degradation of a habitat, that significance can only be measured through its consequences to the plant and animal populations that inhabit that particular environment. For example the "boulder patches" in Stefansson Sound; potential effects on the boulder patches related to significance on the plants (kelp) and invertebrate fauna that inhabit the boulder patches. If the boulder patches were barren of life, they would be of no biological significance and would not be considered "habitat" because in that case, no plants or animals would be living on (inhabiting) the boulder patches.

In Section III of the EIS, we have analyzed the effects of the proposed Liberty Project on all the resources including those associated with specific habitats—vegetation and wetlands, marine waters, and air. The activities associated with the Liberty Project that could affect these resources include accidental discharges of oil and planned activities such as island and pipeline construction, gravel mining, and permitted discharges. In Section IV of the EIS, we have analyzed the effects of the alternatives on the habitats and in Section V, the cumulative effects. Furthermore, where information is available from historical development, development plans, models, or regulations, we have estimated the spatial extent of the habitat (vegetation, wetlands, marine waters and air) areas that might be affected by the development activities or events and the duration of the effect(s).

The Environmental Protection Agency, one of the cooperating agencies in the preparation of this EIS, requested that MMS include an opinion on which effects were significant. The reader is reminded that, and as noted in the first paragraph of this response, MMS has determined that approving the Liberty Development and Production Plan would be "a major Federal action that may significantly affect the quality of the human environment pursuant to the National Environmental Policy Act." To comply with the Environmental Protection Agency's request, MMS developed significance thresholds in the manner described and defined in Section III.A of the EIS. For consistency with the National Environmental Policy Act process, the significance threshold definitions are based on the use of the term "significantly," which requires consideration of both context and intensity (40 CFR 1508.27), as noted in Section III.A of the EIS.

The analysis of the potential effects of developing and producing Liberty petroleum resources is based on information from a variety of sources including the Liberty Development and Production Plan, historical oil-spill information, and traditional and scientific information about the resources of the North Slope and Beaufort Sea and social institutions of the inhabitants of the area. Determining whether or not the effects of oil spills, disturbances from planned or permitted activities, or cumulative development activities are significant is based on the analyses in Sections III, IV, and V of the EIS. To assess their significance, these effects are evaluated in terms of the significance threshold criteria that have been defined for the resources. The significance opinion is part of the summary and conclusion statement developed for each resource. Reading and understanding the detailed analysis is important to making an informed decision about the effects of developing the petroleum resources at the Liberty Prospect. Using the summary and conclusion and significant value judgement is a superficial way of looking at the potential effects of the proposed action.

The conclusion that "We do not expect significant impacts to result from any of the planned activities associated with Alternative I (Liberty Development and Production Plan) or any of the other alternatives" is based on the analyses in Sections III.C.3 and III.D of the EIS and the application of the significance threshold definitions. The analyses in these sections focus on disturbances to wildlife and their habitats based on the activities associated with constructing and operating the proposed Liberty oil- and gas-production facilities. Summaries of these analyses are presented in the Executive Summary, Section D.1, in the subsections that follow the paragraph in which the quoted statement appears. The commenter did not provide any additional information that would indicate that we (MMS) should re-evaluate and/or change our conclusions regarding the effects of planned activities.

The procedures used by MMS to assess large oil spills are described in Section III.C.1.d and Appendix A of the EIS. Compared to other offshore regions, there is very limited oil production and spill data from the offshore Beaufort Sea or any other arctic-type offshore area; Endicott is the only offshore production facility located in the Beaufort Sea with a production record. Consequently, MMS used several historical oil-spill datasets and analytical procedures to provide estimates of a large oil spill occurring during development and production of the Liberty Prospect's petroleum resources. Tables III.C.3c through 3j provide information regarding the chance of a large spill (greater than or equal to 500 barrels or greater than or equal to 1,000 barrels) occurring from the production island and from the pipeline (both onshore and offshore segments). These tables show that the probabilities of a large spill occurring from either the production platform or pipeline range from 0.002-0.15. The probability of 1 represents a 100% chance of a spill occurring; the probability of 0.15 represents a 15% chance of a spill occurring. Most of the probabilities in the tables range from 0.004-0.06, a 0.4-6% chance of a spill occurring.

Because the datasets used to develop these estimates do not fully match conditions at the proposed Liberty site, the MMS also used (1) engineering data from materials and pipeline tests conducted for the Northstar Project, (2) information about environmental conditions at the proposed Liberty site, and (3) oil-spill prevention features designed into the Liberty Project to supplement the information from the oil-spill datasets. Incorporating the engineering data, environmental information, and spill-prevention design features into estimating the risk of a large spill occurring requires the professional judgement of staff with expertise to make such assessments. As noted in Section III.C.1.d(3), the MMS concluded, based on historical spill-rate analysis and an evaluation of oil-spill prevention design features, that the chance of an oil spill greater than or equal to 500 barrels occurring from the Liberty offshore project and entering the offshore waters is on the order of 1%. As noted in the preceding paragraph, most of the chances of a large spill occurring, based on historical oil-spill datasets, ranged from 0.4-6%.

The MMS recognizes major (large) and chronic (small) oil spills could have an impact. The Liberty EIS analyzes the effects of a large oil spill in Section III.C.2 and small spills in Section III.D.3. Although MMS carefully points out the chances of a large spill occurring, it is critical to the understanding of the analysis that the reader realizes the analyses are made based on the assumptions that a spill occurs and none of the oil is removed from the environment except through natural processes, such as evaporation.

Reference was made in the comment to 43 U.S.C. 1346(b). This section of the OCS Land Act deals with environmental studies subsequent to leasing and development of an area. The section states: "Subsequent to leasing and developing of any area or region, the Secretary shall conduct such additional studies to establish environmental information as he deems necessary and shall monitor the human, marine, and coastal environments of such area or region in a manner designed to provide time-series and data trend information which can be used for comparison with any previously collected data for the purpose of identifying any significant changes in the quality and productivity of such environments, for establishing trends in the areas studied and monitored, and for designing experiments to identify the causes of such changes."

As noted in Section III.B, the Alaska Environmental Studies Program was initiated in 1974 to carry out the provisions of the OCS Lands Act and has continued to fund research studies related to the biological, human, and physical environments of the Beaufort Sea area. The list of current studies applicable to the Beaufort Sea planning area is shown in Table III.B-1 and described in Appendix F.

**0135-040**

The comment indicates that the "significance thresholds" are appropriate for population losses but fails to address habitat losses. Significance threshold definitions (see Response 0135-039) were developed for those resources analyzed in the EIS and these include definitions for threatened and endangered species (bowhead whales and spectacled and Steller's eiders) and other biological resources (seals, polar bears, marine and coastal birds, terrestrial mammals, lower trophic level organisms, fishes and vegetation-wetland habitats, water quality and air quality).

Habitat disturbances/changes are an integral part of the analysis of the potential effects of the Liberty Project on the biological resources in the EIS (see Response 0135-039). The MMS has addressed these effects both as part of the analysis of the biological resources (for example, bowhead whales, eiders, marine and coastal birds, seals, polar bears, terrestrial mammals, lower trophic-level organisms, and fishes) and the social environment (subsistence-harvest patterns and sociocultural systems) and as separate resources (vegetation and wetland habitats, water quality, and air quality). The MMS's significance thresholds do factor in potential losses of habitat as these losses are of consequence to animal populations as required by law. As noted in Response 0135-039, the selection of subjects to be analyzed in the EIS is based in part on the results of scoping done for the Liberty EIS (Section I.G of the EIS) and MMS's experience and understanding of issues related to oil and gas development on the North Slope and in the Beaufort Sea.

The analysis of the effects of the Liberty Project on lower trophic-level organisms (Sections III.C.2.e and III.C.3.e) provides an example where habitat disturbances/changes are part of the analysis of a biological resource. The main focus of the analyses in these sections is an assessment of the Boulder Patch kelp habitat and includes many other references to other habitats such as bottom sediments, intertidal and subtidal zones, shoreline sediment and biota, benthic invertebrates, plankton, macrofauna, coastal lagoons, offshore waters, community, environment, and ecosystem. Also see Response 0135-039.

As noted in Response 0135-039, where information is available from historical development, development plans, models, or regulations, we have estimated the spatial extent of the habitat (vegetation, wetlands, water, and air) areas that might be effected by the development activities or events and the duration of the effect(s). The analysis of the potential effects of the Liberty Project on the biological resources also considers the range of habitats.

The threshold significance definitions are one way of summarizing the overall effects to a particular resource, and habitat disturbances/changes that could affect the resource are part of this summarization. Habitat disturbances/changes and their effects on the resource depend on a variety of circumstances that include the spatial and temporal extent of the disturbance/change, the physiological status of individuals with a population, and the population status of the resource (species). Disturbances/changes in the habitat may vary in size, continuity, length of time, and season. Some species are more sensitive to some types of disturbances than others. The stage in the life history of members of a species influences their sensitivity to disturbances. Individuals within a species have various levels of tolerances of or adaptability to disturbances. Most of the biological resources analyzed in the EIS that potentially could be affected by the proposed Liberty Project are mobile, and their potential habitat range covers relatively large areas. The habitats and/or migration routes for polar bears, ringed seals, bowhead whales and caribou populations are shown in Figure V-4 of the EIS. The distribution of a variety of bird species in the central part of the North Slope/Beaufort Sea area are shown in Maps 6, 7, and 8. The ranges of individuals within those species that are solitary, such as ringed seals, are likely to be considerably less than the range for that particular species; other areas, outside the disturbed area are available for an individual whose habitat is disturbed. Also, many of the species migrate great distances and are present on the North Slope and/or in the Beaufort Sea only during the summer. Some species overwinter in a variety of areas and for several species, the overwintering areas are not well known.

The information in the preceding paragraph summarizes some of the factors that are considered in the analysis of the effects of the Liberty Project on the biological resources. The following example shows the interrelationships between some of these factors in an analysis. Habitat losses for some events or activities may be discontinuous and/or temporary. For example, the discontinuous area covered by a spill of up to 2,956 barrels is estimated to be up to 73-186 square kilometers. Because the spill typically is discontinuous, not all habitats included within the outermost spill boundary will be oiled, or oiled equally, if contacted. Habitats in the offshore area of interest to birds mainly include the bottom used for foraging by sea ducks, although loons will forage on fish in the water column, and phalaropes and gulls forage at the surface. Except for the area quite near the spill point, it is uncertain what proportion of prey species for these bird groups in a given area would die or the habitat become unsuitable for foraging. It is likely that proportion of suitable foraging habitat oiled would decrease as distance from the spill point increases. In addition, even the discontinuous surface area covered by a spill does not represent a very large proportion of foraging habitat available for these species, as indicated by videos along bottom transects in different areas of the Beaufort Sea. Birds would have access to apparently similar foraging habitat outside the spill zone; thus, the loss of habitat from one spill is likely to represent a small proportion of available foraging habitat.

The above provides information about how the resources were selected for analysis in the EIS, the factors that are considered in the analysis of the potential effects of the Liberty Project on the biological resources, and how disturbances/changes to the habitat are an integral part of the impact analysis affecting both populations and individuals. Given these relationships, MMS believes the threshold definitions in Section III.A.1.a of EIS are appropriate and include the effects of habitat disturbances/changes on the biological resources.

The commenter notes major impacts to nearshore fish associated with solid-fill causeways. The case brought forward by the commenter in regard to the solid-fill causeway effect on fish relates to concerns on effects of the causeway on fish populations and their movements in the Beaufort Sea. There was evidence to support a potential significant effect on fish movements. Although changes in the fish populations could not be measured, potential changes in movements through changes in salinity of the water could be measured and related to fish movements. Such a structure is not part of the Liberty Development and Production Plan.

Construction activities associated with the Liberty Project are expected to affect the marine and terrestrial environments; however, as noted in the Executive Summary, MMS does not expect the habitat disturbances associated with these planned activities to have any significant impacts. Also, some of the effects of construction activities may be mitigated by natural or planned activities. As noted in Section III.C.3.e, Liberty Island's concrete slopes from 6 feet deep to the seafloor would be colonized by kelp and other organisms that grow on hard substrates; this 3-acre portion of the concrete slope could become a home within a decade for colonies of species similar to those of the Boulder Patch area. Rehabilitation of the gravel mine site could provide overwintering habitat for fish and a summer habitat for fish and birds (Section III.D.2.a).

The effects that the Liberty Development and Production Plan might have on recreation uses was not a topic of major concern that was raised during the Liberty EIS scoping process and was not addressed in the EIS. However, as noted in Maps 3a and 3b of the EIS, the proposed Liberty Island lies within an area partially surrounded by existing oil- and gas-development facilities.

**0135-041**

Although the comment does not specifically reference the Executive Summary, the previous and subsequent comments do cite this part of the EIS and we assume this comment also is based on information in the Executive Summary. The summary provides an overview of the development plan, the issues, summaries of the effects associated with major issues (disturbances—activities associated with construction and operation—and oil spills), a description and effects of the alternatives, and cumulative analysis. The detailed analyses of the various phenomenon noted in the comment are presented in Sections III, IV and V of the EIS. The following information addresses some of these concerns.

The comment implies that MMS ignored the permanent losses of benthic habitat and degradation of the Boulder Patch. With regard to the loss of benthic habitat, the EIS states that the proposed island would cover up to 23 acres of silty mud, killing the typical benthic invertebrates (Executive Summary D.1.f and Section III.C.3.e). The latter section further explains that similar amounts of benthos were buried during construction of other gravel islands, including Tern, Duck, Endeavor, BF-37, Goose, and Sag islands. Both sections explain that this loss would not be permanent, partly because the concrete blocks in the slope-protection system would add about 3 acres of new kelp habitat.

With regard to degradation of the Boulder Patch kelp community, the same EIS sections quantify the amount of kelp that would be affected (Executive Summary D.1.f and Section III.C.3.e). Surveys have shown that there is no kelp habitat at the island site, but that there is a low concentration of kelp and kelp substrate in the pipeline corridor. The EIS sections partly conclude that trenching for the proposed pipeline would bury up to 14 acres of the marginal kelp and kelp substrate. They acknowledge also that the loss would be permanent, concluding "the effect (kelp substrate burial) would last forever," but that the level of effect would be very low, reducing kelp biomass and production less than 0.01%.

The MMS does not expect the Liberty Project to result in any permanent or long-term habitat loss or any long-term disturbance to bowhead whales. The potential effects to bowhead whales are discussed in Sections III.C.2.a(1) and III.C.3.a(1). of the EIS and in Response 0135-039.

The discontinuous area covered by a spill of up to 2,956 barrels is estimated to be up to 73-186 square kilometers. Because it is discontinuous, not all benthic habitats used for foraging by sea ducks and other species included within the boundary of a spill will be oiled or oiled equally if contacted. Except for the area quite near the spill point, it is uncertain what proportion of benthic prey species in a given area would die or the habitat become unsuitable for foraging. It is likely that the area contacted would decrease as distance from the spill point increases. In addition, even the discontinuous area covered by a spill does not represent a very large proportion of apparently similar foraging habitat available, as indicated by videos along bottom transects in the general Liberty area of the Beaufort Sea. Birds would have access to apparently similar foraging habitat outside the spill zone; thus, the loss of habitat from one spill is likely to represent a small proportion of available foraging habitat.

The comment states that the proposed Kadleroshilik River gravel mine site would be located in the river delta. This is not correct. It is located 1.4 miles upstream. Also, development of the site is not likely to destroy habitats usually termed "riparian," even though they are located in a river-drainage system. Such areas typically contain willows and other vegetation of varying height, which produces a greater diversity of habitats. This gravel island in the Kadleroshilik River primarily is covered by gravel and dry tundra habitats, which are unsuitable as nesting habitat for many aquatic species, although several shorebirds nest there or otherwise use island habitats. The site represents an extremely small proportion of available similar habitat and likely has relatively lower habitat diversity than surrounding mainland areas. Likewise, disturbance from air traffic to Liberty Island would affect a small amount of area available and could be routed away from bird concentrations.

The construction of the Liberty Island would not be a permanent loss of habitat. After the life of the oil field, the slope protection of the island would be removed and the island would be allowed to erode away naturally by the forces of ice, wind, and waves. The gravel would become part of the benthic environment. The presence of the island is not likely to have any significant habitat-loss effect on marine mammals.

Construction of ice roads to and from the Liberty Island would use saltwater to construct the roads offshore. "Ice mining" from ponds is not part of the proposed plan.

Disturbance to wildlife from helicopter traffic is expected to be very short term and not affect populations of wildlife (see Section III. 3.C Disturbances).

With regarding loss of wilderness values, we have not included the Arctic National Wildlife Refuge in the cumulative analysis, as it would not be considered a prospect for oil and gas activities until Congress passes legislation to open it to oil and gas operations. Only portions of the Refuge have been officially designated as wilderness areas (about 42%, or 8 million acre, and they are managed as such under the Wilderness Act of 1964. The 1002 area presently is not included in the wilderness designation. The approximate 1.5-million acre 1002 area was set aside in the Alaska National Interest Lands Conservation Act for investigation into its oil and gas potential. The Fish and Wildlife Service manages the area under what they call "minimal management," which is directed at maintaining the existing conditions of areas that have high fish and wildlife values or other resource values. Until Congress takes action on the future of the 1002 area, it will continue to be managed as a "minimal management area." The area outside the designated 1002 area, which extends over the Brooks range and to the Canadian border, is far removed from the oil and gas activities on the North Slope and is not expected to influence even wilderness values at this scale.

**0135-042**

The EIS includes detailed summary and conclusions of Amstrup et al. (2000) in Section III.C.2 Effects of a Large Spill on Seals, Walruses, Beluga Whales, and Polar Bears.

**0135-A02**

The Environmental Protection Agency finds that the "mixing zone" of 100 feet radius (less than 31,416 square feet and 0.7 acre) proposed for the wastewater discharges during the construction and operation of the Liberty Island project is protective of both acute and chronic toxicity and provides for the initial dilution of pollutants (sediments, turbidity, residues, dissolved salt-solids, temperature, pH, total residual chlorine, and bacteria) as a discharge stream mixing with the receiving water. The Environmental Protection Agency expects that an increase in the biomass and abundance of benthic marine life (especially mollusks) will occur in the immediate vicinity of the point of discharge at the outfall terminus in conjunction with the concentration and discharge of sediment and organic debris that results from the seawater-treatment process. Changes in the benthic environment and community will shift towards and attain natural ambient conditions within 100 feet from the outfall. The Environmental Protection Agency expects that no detectable changes will occur in the pelagic marine life within the mixing zone. The Environmental Protection Agency finds these projected effects on water and sediment quality and the marine community to be acceptable.

No changes have been made to the draft permit in response to this comment.

The effects of large and small oil spills in the water column are described and analyzed in Sections III.C.2.l and III.D.3.l, respectively. The effects of permitted discharges associated with operating a production facility are described and analyzed in Section III.D.1.l. The effects of planned island and pipeline construction activities in the water column are described and analyzed in Section III.C.3.l; these activities include dumping mined gravel and trenching and burying a pipeline.

**0135-043**

The MMS has included Section V, Cumulative Effects, in the Liberty EIS, because we also recognize the significance of this project in combination with past and future oil development in the region. In Sections V.C.1-13, we discuss the cumulative effects of all past, present, and reasonably foreseeable future projects on the North Slope of Alaska. We also include by reference a more comprehensive discussion appearing in the latest published 5-Year Leasing Program Environmental Impact Statement (for 1997-2002). The recommendation to provide information beyond that required by the Environmental Protection Agency in implementing the Clean Air Act, the National Ambient Air Quality Standards, and Alaska air-quality laws and regulations is beyond the authority of the MMS either to develop on its own or to require from companies or other entities proposing projects or activities subject to regulation.

The legally defined significance thresholds for effects to be identified as "significant" are taken from the Environmental Protection Agency's Prevention of Significant Deterioration criteria pertaining to air quality. We have simplified those definitions that appear in Section III and that are repeated in the Executive Summary.

**0135-044**

The MMS believes it has adequate baseline data to describe the environment, Section VI, and analyze the potential effects of the Liberty development project, Sections III, IV, and V. The data on the marine and coastal environment is similar to the data that has been used in EIS's for outer continental shelf oil and gas lease sales and the Northstar development project. The EIS's are based, in part, on decades of research that has been funded by the MMS Environmental Studies Program. The MMS-sponsored research has been conducted partly through the MMS/University of Alaska Coastal Marine Institute and earlier through the National Oceanic and Atmospheric Administration's Outer Continental Shelf Environmental Assessment Program. Other important sources include information based on the traditional knowledge of the Inupiat inhabitants of northern Alaska. Information also includes data on the Endicott monitoring program and site-specific surveys for the Liberty development project by several environmental consulting firms, including Coastal Frontier, LGL Ecological Research Associates, and URS Greiner Woodward Clyde. Data have been collected on the distribution, abundance, movements, and behavior of marine mammals such as bowhead and beluga whales, ringed and bearded seals, and polar bears for more than 20 years. In summary, environmental data are available from long-term, detailed, and site-specific studies of the Liberty region.

With regard to the amount of baseline data available for the impact analysis of this project, we believe that statements of effect contained in the EIS are adequately supported. Where data are absent, we have stated the types of information necessary to complete certain aspects of the analysis. It should be understood that some statements of impact rely more on the combination of logical assumptions regarding various species' typical behavior and physiology with the knowledge of, for example, oil-spill probability of occurrence, probable volume, and behavior rather than on complex modeling of numerous life-history parameters.

The MMS, National Marine Fisheries Service, the North Slope Borough, and the petroleum industry have extensively studied bowhead whales over the past 25 years. While there still may be some areas where information is unknown or incomplete, the database on bowhead whales is huge, with more information being collected each year.

The bibliography for the draft EIS contains more than 680 citations. The commenter did not provide any specific information on what types of baseline data were lacking.

**0135-045**

We emphasize that the proposed Kadleroshilik River mine site is not located in the river delta. Interpretation of a report detailing the vegetative cover of the gravel mine site suggests many of the bird species that might occur there. As suggested in the comment, the MMS has obtained survey data from that area. This new information has been incorporated into Sections IV.C.4(a)(3) and VI.A.3.

**0135-046**

The comment asserts that the EIS assessment of the Boulder Patch is not complete, failing to cover oil spills, the direct and indirect effects of sedimentation, and habitat loss. The scope of the assessment was based partly on the results of a public workshop on arctic kelp on May 12, 1998. The 40 workshop participants, including several arctic kelp investigators, recommended a few additions to previous kelp assessments, and the recommendations have been incorporated into the Liberty assessment. The assessment is divided into oil spill and disturbance sections as are all of the other assessments. The oil-spill assessment includes the effects of large and very large oil spills (Sections III.C.2.e(2)(b) and IX.A.6), the effects of a diesel fuel spill (Section III.C.2.e(2)(b)), and the effects of spill response (Section III.C.2.e(2)(c)). The disturbance assessment includes the effects of suspended sediments from island construction and maintenance (Section III.C.3.e(2)(b)(1)) and the effects of pipeline burial (Section III.C.3.e(2)(b)(2)). The latter includes both the direct effects of burial (Section III.C.3.e(2)(b)(2)(b)) and indirect effects of suspended sediments (Section III.C.3.e(2)(b)(2)(a)). Because the assessment is located in so many separate sections, the reviewers probably were not aware of all of them.

**0135-047**

The comment expresses concern about the likelihood of oil spills fouling the Boulder Patch. As explained in Sections III.C.2.e(2)(a)(2) and (3), the viscous Liberty crude in cold, arctic water probably would not mix down deep enough in the water column to affect the Boulder Patch, unless dispersants were applied to the oil. The use of dispersants would require further review and approval by the Coast Guard. Even though untreated Liberty crude probably would not affect the Boulder Patch, Section III.C.2.e(2)(b) points out that spills of diesel fuel probably would mix farther down into the water column and could affect the Boulder Patch. Diesel would be barged to the island during the summer only for initial drilling and thereafter for emergencies. The water-quality analysis (Section III.C.2.l) concludes that in the very unlikely case of a 1,283-barrel diesel spill during open water, toxic conditions would spread over about 18 square kilometers.

**0135-048**

The comment asserts that there are not adequate baseline studies of the eastern portion of the Boulder Patch. Two types of benthic surveys were conducted at the island site and along the pipeline corridors, as explained in Section VI.A.5.b. Visual survey for kelp were conducted with a remotely operated vehicle and by divers, and surveys that were conducted with a side-scan sonar would have detected any “hard substrate” or potential kelp habitat. The surveys documented marginal kelp and kelp substrate in the outer portion of the pipeline corridor, as explained in Sections VI.A.5 and III.C.3.e(2)(b)(2)(b).

Section VI.A.5 also notes that the Boulder Patch was studied intensively during the late 1970’s and early 1980’s as part of the Outer Continental Shelf Environmental Assessment Program. The studies were conducted primarily at Dive-Site 11 in a dense, central part of the Boulder Patch. The typical benthos in the southeastern part of Stefansson Sound also was studied during construction and monitoring of the Endicott causeway. The studies identified 99 taxa of marine macrobenthos, as explained in Section VI.A.5.

**0135-049**

There are three parts to this comment about the Boulder Patch. First, the comment asserts that Boulder Patch surveys were conducted for rock (kelp substrate) but not for kelp. However, surveys were conducted for both kelp and kelp substrate, as explained in Section III.C.3.e(2)(b)(2)(b). Second, the comment explains that Map 1 does not show areas of Boulder Patch with low densities of boulders (less than 10%). However, Figures III.C-1 and III.C-5 show areas with low and high densities of boulders and kelp at the proposed island location and along the pipeline routes. Third, the comment asserts that the Boulder Patch surveys did not satisfy MMS’s analysis requirements under the National Environmental Policy Act. However, the surveys were more than adequate for assessing the specific levels of disturbance due to the Proposal and alternatives. The effects are summarized in Sections D.1.f, E.3.b(1), and E.3.a(5)(b) of the Executive Summary.

**0135-050**

The analysis on the effects of a large spill does not “downplay” the impact of oil spills. The analysis assumes that a large oil spill event occurs and contacts polar bears. Also, the analysis assumes that all bears contacted by the spill are killed (see Section III.C.3.b Details on How a Large Spill May Affect Seals, Walruses, Beluga Whales, and Polar Bears). The EIS does factor in the length of time the project will expose the bears to development activities (see Section III.C.3.b under Attraction of Polar Bears to Development Facilities). The analysis discusses effects over the 15-20 year life of the project. The Liberty Project does not include additional seismic exploration activities.

**0135-051**

The EIS does discuss the potential effects of industrial activities on denning polar bears. See Section III Effects from Ice Roads.

**0135-052**

The EIS discusses bear-human encounters in Section III under Attraction of Polar Bears to Development Facilities. The oil companies have done a good job in avoiding human-polar bear encounters. Only three polar bears have been killed as a result of such encounters over the past 20 years of cumulative oil exploration and development on the North Slope and in the Beaufort Sea (Gorbics, Garlich-Miller, and Schliebe, 1998).

**0135-053**

Please see Response 0135-002.

**0135-054**

The range of the Steller’s eider has been contracting for decades; recently, it has been rare in the vicinity of the Colville River Delta and extremely rare to the east (the Steller’s eider draft recovery plan cited by the commenter notes two individuals observed through 1998), despite intensive field-survey investigations in the vicinity of Prudhoe Bay by knowledgeable investigators. The observation that historically there have been multiple sightings east of Prudhoe Bay is irrelevant. In addition, the probability of an oil spill originating at the Liberty Island site contacting areas as far west as the Colville delta within 360 days is less than 3%. Certainly, any risk to individuals of this species should be avoided, but it does not appear useful to attempt an analysis of a species where it is highly unlikely that more than one or two individuals would occur in the vicinity of an oil spill, if a spill occurred.

**0135-055**

The rationale against analyzing potential effects of the Liberty Project on Steller’s eiders in the Liberty area is presented in Response 0135-054. Potential effects on Steller’s eiders wintering along the Alaska Peninsula from any oil spills originating from tankers using shipping routes to the lower-48 states are likely to be minimal, because only a small proportion of the oil is likely to reach even the northernmost areas of eider overwintering, and this fraction would be highly weathered (less toxic and less likely to produce a coating on bird feathers). For example, less than 10% of *Exxon Valdez* weathered oil (mousse) beached in the Alaska Peninsula/Kodiak area (Wolfe, et al., 1994). Oil exiting Prince William Sound was transported to the peninsula by the Alaska Coastal Current. It is likely that a smaller proportion of more highly weathered oil would reach this area from a spill originating farther south along the tanker route that lies quite far offshore. The tanker route to Far East ports lies east of the 200-mile Exclusive Economic Zone, and any oil released from these vessels would tend to be transported by the Alaska Stream parallel to and well offshore of the Alaska Peninsula and Aleutian Islands.

**0135-056**

The Fish and Wildlife Service model-estimated proportional mortality of the spectacled eider population in the central Beaufort Sea survey area cited by the commenter calculates exposure to oil using a spill value *twice* as large as that determined by an MMS oil-spill model from spill statistics and spill-scenario characteristics, and using the most severe spill-trajectory severity. This does not qualify as a “relatively small spill,” as characterized by the commenter. The worst-case scenario could occur, but it is not what we typically would expect under average conditions. The Fish and Wildlife Service model estimates 9.6% oil exposure in an estimated average-density survey area population of 540 under maximum oil-exposure conditions, or 52 individuals. This would occur if a spill swept equally over the entire survey area, which is not a likely scenario. The survey area extends west to western Harrison Bay, where the MMS oil-spill model predicts a contact probability of less than 0.5% within 60 days. Towards the Liberty area, the probability remains less than 5% east at least as far as the Kuparuk area, less than 15% east almost to Prudhoe Bay offshore, and less than 20% east to the western Sagavanirktok River Delta. Under average bird density and average spill severity, the model predicts two individuals are likely to be exposed to a spill, which would not be a major loss from the central Beaufort Sea population. In addition, given the low numbers of spectacled eiders observed during aerial surveys over land, presumably nesting birds that would move offshore to migrate after nesting, and the highly clumped distributional pattern of this species evident from offshore surveys, it appears one could question whether 540 individuals actually would be present in the Fish and Wildlife Service survey area at any given time. This figure simply represents the best estimate that can currently be made based on the best Fish and Wildlife Service data available.

**0135-057**

The 30-day spill probabilities are used for two reasons: (1) It places the analysis of all species and spill scenarios on a comparable basis by eliminating time as a variable. (2) After 30 days, the oil has become sufficiently weathered and transformed into a mousse emulsion that it no longer represents a great hazard to birds. Beyond this point, it is not likely that birds will become oiled in the usual sense of the word. It is not practical to examine in detail potential effects of oil on birds "for a time period that it could reasonably be expected to persist in the environment," because it could be present for many years in bottom sediments, etc. There is little information available concerning potential direct effects of such oil on birds occurring in the Beaufort Sea. Nowhere does the analysis imply that the probability of a spill contacting eiders within 30 days is equivalent to postspill exposure. As noted above, beyond 30 days, oil contact is not likely to result in direct mortality.

With respect to bowhead whales, the draft EIS does analyze the possible effects of oil spills to bowhead whales over a period of time from 30 days extending out to 360 days after the spill. We refer the commenter to Section III.C.2.a(1)(b)2).

The draft EIS recognizes that hydrocarbon contaminants from the assumed crude oil spill could persist in coastal habitats, such as saltmarshes, for several years (see Section III.C.2.g(2)(b) Specific Effects of a Large Oil Spill from BPXA's Proposed Liberty Development and Production Plan). However, this local persistent contamination is not expected to have any effect on wildlife populations, including polar bears and other marine mammals in the Alaskan Arctic, or in the project area. After 30 days, the spill is expected to be weathered and dispersed to the point that it would not seriously affect polar bears and other marine mammals.

To put long-term-potential local contamination of coastal habitats into perspective, the EIS reader should know that there are natural oil seeps along the coast of the Beaufort Sea that appear to have no apparent adverse effects on wildlife populations.

**0135-058**

No contradiction is seen in stating that eiders are likely to see and avoid obstructions under normal conditions but not under conditions of poor visibility. However, the paragraph concerning the potential for collision with structures by eiders has been revised to include further qualification of circumstances. The commenter notes that the disorienting effects of artificial light should be discussed, but offers no specific references; no such information is available for eiders.

**0135-059**

Qualification has been added to the potential disturbance of spring habitat for eiders and other bird species. It is the responsibility of the Fish and Wildlife Service to address helicopter interaction with threatened spectacled eiders during the prenesting period by suggesting terms and conditions in the biological opinion for the Liberty Project. The commenter states that the draft EIS estimate of a minor effect from disturbance is "unsupported by the record and therefore unlawful"; it is not clear to what record reference is being made.

**0135-060**

As noted in the introductory part of Section V.A Cumulative Effects, the cumulative effects analyses tier from the analysis of the effects on wildlife of activities or events associated with the Liberty development project. The general effects are expected to be similar whether the activity or event occurred in the past, present, or reasonably foreseeable future.

The best available information was used in the cumulative analyses on marine mammals and on other wildlife species. Use of the best available information is considered to be legally sufficient under the requirements of the National Environmental Policy Act.

Numerous studies monitoring oil exploration and development in the Beaufort Sea have concluded that air and vessel traffic associated with those projects have had very short-term (a few minutes to a few days) effects on the distribution or behavior of individual seals, polar bears, and other wildlife species. Many of these studies have concluded that the disturbance probably had no significant effect on the individual animals that were disturbed. Although studies examining cumulative effects have not been made with particular species populations that occur in the Arctic, some studies made in other areas of Alaska have shown that marine mammals and other wildlife have habituated to cumulative air and vessel traffic. A good example is the habituation of beluga whales in Bristol Bay, Alaska. These whales feed on salmon and travel through the same waters during the same time as do many salmon-fishery vessels. The whales apparently have habituated to the intensive cumulative vessel and air traffic in Bristol Bay during the salmon season. Marine mammals, caribou, and other wildlife have shown some habituation to the cumulative disturbances associated with air and vessel traffic and other sources of disturbance by the fact that their abundances have increased during the past 20 years of oil exploration and development on the Arctic Slope of Alaska.

Supplementary information has been incorporated into the text of the referenced section discussing potential aircraft disturbance of eiders, but it should be noted that the best available information was used in the original analysis. Specific studies examining specific cumulative effects have not been made with particular species; thus, with regard to some factors, logical assumption must supplant rigorous analysis.

**0135-061**

Where appropriate, revisions made to certain statements in the eider sections of the EIS have been incorporated into the marine and coastal birds sections.

**0135-062**

The EIS acknowledges that more waterbirds could be contacted by an oil spill than estimated by the Fish and Wildlife Service bird/oil spill model, especially during the fall migration period during which birds move primarily from east to west. This results when individuals breeding in northeast

Alaska and western Canada pass through the central Beaufort Sea area, adding to the "resident" birds that move offshore in this area following their nesting period. This constraint is clearly explained in the Fish and Wildlife Service report (Stehn and Platte, 2000:Appendix J-2), and repeated in the EIS. Unfortunately, there is relatively little specific information for most species concerning numbers, routes used, and rate and timing of passage through this area. The best available information is contained in the draft EIS. Where appropriate, any new information concerning this topic has been added to the final EIS. The comment includes the term "significant" in virtually every sentence, yet does not qualify if this is used in the statistical sense, nor does it cite what sources of information were used to support these statements. Likewise, neither the assumed level of effect nor the source of information to support the statement that an oil spill could result in "catastrophic" impacts on seaducks are cited; however, the loss of several hundred king eiders is not likely to precipitate a significant decline at this population level.

**0135-063**

The loss of 232 king eiders predicted by the Fish and Wildlife Service model is not likely to precipitate a significant or irreversible decline at this population level, because these are not necessarily drawn from a "resident" population of about 20,000 (see Response 0135-062). The comment suggests that 1,000 casualties lies within the Fish and Wildlife Service modeled prediction, but a loss of this magnitude is much more unlikely than a few hundred or much less. The loss of 125-159 common eiders could represent a substantial loss to this population that is declining, and the situation likely will be further intensified as a result of probable habitat degradation from a severe storm last August. New information, including king eider mortality in the Pribilof Islands, has been added to Section III.C.2.c.

**0135-064**

The August 10, 2000, storm in the Beaufort Sea was not mentioned in the draft EIS, because major work on the document was completed shortly after this date by which time its occurrence was not widely publicized. Reference to this event has been added to Section V.C.3.b(5).

**0135-065**

Brant distribution, breeding biology, and vulnerability to oil spills and disturbance have been covered in the document. No specific information other than population estimates for numbers occupying this area (fewer than 1,000) is available to assist in predicting mortality from a spill. Some additional brant details have been added to various sections.

**0135-066**

The analysis of potential impacts on the yellow-billed loon includes the most pertinent available information. Details have been added to appropriate sections (VI, III).

**0135-067**

BPXA has proposed an injection disposal well constructed to meet Environmental Protection Agency Class I disposal standards. This type of well has the most stringent construction, operation, maintenance, and closure standards under the Underground Injection Control Program. Although the Environmental Protection Agency does not regulate this program on the outer continental shelf, MMS will ensure, through its permitting and approval process, that the well is constructed and operated in a manner similar to these stringent standards.

**0135-068**

Spills from the grind and inject operations and effects of those spills on the environment were not identified during the scoping of the EIS. An evaluation of spills on the North Slope is included in Response 0135-014.

**0135-069**

Please see Response 0139-027.

**0135-070**

The Arctic National Wildlife Refuge is not expected to contribute to the cumulative effects of the North Slope and is not expected to be affected by the Liberty Project. Caribou of the Central Arctic Herd migrate from the area of development eastward into the Refuge and have not been affected as a population. The advance of offshore pipeline technology should not threaten the coastline of the Refuge but instead could improve the state of the art to further reduce the risk of spills from this transportation source. The probability of an oil spill reaching the coastal area of the Refuge has been calculated and discussed at length in this document. In the highly unlikely event of an oil spill, and the even further unlikely event of it contacting the coastal area of Arctic National Wildlife Refuge, there is and has never been any "permanent" damage to wildlife resources from oil spills. The coastal area of the Refuge is not a unique area with respect to the biota. The offshore environment has some unique populations of marine mammals moving thorough or offshore the area, and the effects on these resources have been fully discussed in this document.

**0135-071**

Maps 3a and 3 b and Tables V.B-1a and V.B-7c have been revised to show Meltwater as a present development project.

In the Liberty draft EIS, Meltwater was listed in Table V.B-6a, Reasonably Foreseeable Future Development, as a discovery with 50 million barrels of oil and shown in Figure 3a as a Reasonable/Foreseeable Development. This designation was based on publicly available information at the time the draft EIS was being prepared. The resource estimate was part of the reserve and resource estimate used for analytical purposes in the cumulative analysis—6-14 billion barrels (Meltwater reserves are less than 1% of the total). Drilling of the first development well for Meltwater began in April 2001. The Liberty draft EIS was published 3-4 months earlier in January 2001.

The list of development projects on the reasonably foreseeable list includes only possible commercial-size discoveries and not proposed exploration wells. McCovey and Pike are sites considered for future exploration drilling, and the presence of large oil pools at these sites remains to be proven. At present, neither site has an approved exploration drilling permit. Even if drilled, most exploration wells do not discover large oil pools and they are abandoned (for example, the Warthog well drilled off the Arctic National Wildlife Refuge in 1997). The cumulative-impact analysis is focused on possible long-term effects of development projects and not on temporary activities at exploration sites. The location of satellite prospects, some of which have been proven and many others that are in conceptual phases only, are not released to the MMS or the public. The location and possible timeframe for developing the satellite fields on the North Slope is the proprietary knowledge of the individual companies.

**0135-072**

The Umiat and Fish Creek discoveries were made more than 50 years ago, and no industry group during that period has seriously considered them for development. In contrast, tracts covering Hammerhead and Kuvlum were formed into production units soon after the discovery was announced. Evaluation and feasibility studies were conducted on these units by several operators. It is likely that these offshore oil pools hold far more recoverable resources than the minor oil and gas "shows" scattered throughout the National Petroleum Reserve-Alaska. As explained previously, the reasonably foreseeable development list includes only discoveries that may be commercial to develop under the right economic conditions. The 43 well sites in the National Petroleum Reserve-Alaska are proposals for wells, not discoveries. Alternate well sites are proposed by industry to allow some flexibility in their exploration program. In fact, many of these wells probably will never be drilled. History shows that most exploration wells fail to encounter commercial-size pools. Long-term impacts associated with reasonably foreseeable development will occur only if commercial pools are discovered.

With respect to future gas projects on the North Slope, a variety of proposals are under consideration. We do not expect a formal announcement of a preferred industry plan for 6 months to a year. Right-of-way permits will be issued after studies are completed along the final proposed route.

**0135-073**

There are several aspects to the process of assessment for a development project such as Liberty in determining the effects of that project on the environment and the contribution of that project to potential effects on a resource. We determine the incremental contribution of the Liberty Project to the past, present, and reasonably foreseeable future projects. This step is required to determine the scale of the activity in an environment where other activities are occurring and are projected to occur. The more site-specific aspects are an assessment by each resource specialist with respect to the location and timing of activities with respect to each resource. These effects translate to specific relationships of the development activities affecting the resources from Liberty, adjacent sites of activity, and transportation corridors. Oil spills and disturbance issues are addressed on a site-specific basis, and ensuing mitigation is based on these findings.

**0135-074**

Hypothetical scenarios for onshore and offshore development for the reasonably foreseeable future projecting 15-20 years into the future are presented in Tables V.B-6a and V.B-6b. These include the location of the discovery, the resource estimates of these discoveries, type of resource, and projected discovery dates. Also included are pads, size of the footprint, number of wells, base camps, docks, airstrips, roads, and pipeline miles. These projections are highly speculative, and past attempts to predict the future activities have been overly optimistic. Most of these discoveries are noncommercial at this time, and many of these could remain undeveloped. The discoveries that are expected to occur are much smaller in size and have a more limited infrastructure. The industry trend is continuing to do more with less, as evidenced by the Alpine Project, making future projections less comparable with the present for assessment purposes. Scenario projections beyond the 15-20-year period would be highly uncertain and speculative at this time and would be of no realistic value to the decisionmaker.

**0135-075**

The information in Table V.B-3 is a tabulation of past infrastructure and facilities. There is no scientific analysis involved at this point other than an attempt to tabulate all of these activities as listed. The MMS agrees that an accurate portrayal of the past and present development is necessary for a reasonable prediction of the impact sources from future development. The subject categories of resource estimates, infrastructure, and facilities for past development (Tables V.B-3 and V.B-2) and present development (Tables V.B-4 and V.B-5) are believed to be a thorough and comprehensive treatment.

Since publication of the Liberty Development and Production Plan Draft EIS, Tables V.B-1a through V.B-7d have been reviewed and updated with additional publicly available information. Also, Table V.B-8c has been added, which shows some additional information regarding North Slope oil fields.

The commenter provided no specific information that could be used to characterize past and present development.

**0135-076**

Corrections to Table V.B-3 and Map 3c have been made and incorporated into the text where appropriate (see Responses 0135-077 through 084). The citations have been checked and are believed to be the most recent and best available information at this time.

**0135-077**

Table V.B-3 has been revised to include the 4,590 acres for Prudhoe Bay gravel roads, pads, and airstrips, which inadvertently had been left out of the table.

**0135-078**

The Deadhorse service area and airstrip cover only about 100 acres and are included in the Prudhoe Bay estimate of 4,590 acres of roads, pads, and airstrips (Table V.B-3). This relatively small area does not translate to meaningful effects, and it is not expected to in the foreseeable future.

**0135-079**

Table V.B-8c depicting information regarding the area covered by the Haul Road on the North Slope, is included in the EIS. Information in Section III.C.3.g(2)(a)2) indicates that about 0.0032 acres of vegetation would be disturbed per pipeline mile.

**0135-080**

The pipeline miles estimate, consisting of 520 miles of gathering, common carrier, and unspecified lines, is believed to be the more correct estimate and is consistent with the Northstar final EIS (U.S. Army Corps of Engineers, 1999) and the National Petroleum Reserve-Alaska final EIS (USDOI, Bureau of Land Management and MMS, 1998). The State of Alaska, Department of Natural Resources does not have a breakout for their Best Interest Finding Lease Sale 75A estimate of 1,137 miles of pipeline except to note that this number does not include the Trans-Alaska Pipeline System. The source and method of calculation of this earlier estimate is not known. The Department of Natural Resources did not use this number or any number of pipeline miles in their subsequent Best Interest Finding of July 1999.

**0135-081**

Information on the number of exploratory wells drilled on the North Slope and in the Beaufort Sea, and the number of airfields, is presented in Section V.B.10.b.

**0135-082**

Map 3c has been updated to show the gravel-mine sites in the oil-field area. Information on gravel-mine rehabilitation is presented in Section III.D.2.a. Section V.B.10.b has been revised to provide information on amounts of gravel used in the northern part of Alaska.

Also, see Response 0135-083.

**0135-083**

The text in Section V.C.10.a has been revised in response to this comment.

**0135-084**

The text in Section V.C.10.a has been revised in response to this comment.

**0135-085**

While revisions or updates of expected activity levels are important, the precision of the analysis, especially the cumulative analysis and the projection of the future, is not an exact science. The analysis depends more on knowledge of the activity and its effects and is less sensitive to a revision in frequency either upward or downward. The revised upward estimates of crew boat, barge, and helicopter and vehicle over-ice transport associated with construction and operations are examples that are important factors to update, but they do not translate to a level of precision in the analysis. While one set of assumptions can be revised upwards on a project, a subsequent project may be an overestimate, but that might not be known until the project activity was undertaken and completed. These updates of past activities have been included in the analysis.

The difficulty in evaluating past impact is indicated by the following example for birds. To date, there have been few attempts or opportunities to investigate past impacts on bird species from North Slope oil and gas development. Intensive surveys in the Prudhoe Bay area have indicated that some waterfowl and shorebird species are displaced by the presence of such activity, while others apparently are not affected. In general, it is impractical to attempt to evaluate what impacts bird populations may have experienced in the past, because there is little predevelopment data with which to compare current information on, for example, local population and nesting densities. However, Troy and Carpenter (1990) note that "At Prudhoe Bay it is possible to estimate the amount of tundra altered by drainage modification, dusting, and other factors. It is also possible to describe local changes in abundance or distribution of the birds, mammals, and fish." It should be noted, however, to evaluate such changes requires that we assume tundra habitats that are no longer available, for example, for nesting by particular bird species, would support the same densities as similar unaltered habitats do currently.

It would be extremely difficult at this point to evaluate whether impacts projected for the Northstar development, for example, have occurred, because this project is not even completed.

**0135-086**

The text in Section V.C.10.a has been revised in response to this comment.

**0135-087**

According to the State Department of Natural Resources and BPXA, the actual usage of freshwater for Northstar was approximately 45 million gallons for 2000 and 3.1million gallons for 2001 through May. This is a total of approximately 48 million gallons and considerably below the targeted 101-131million gallons over the 15-year life of the Northstar Project. Subtracting the initial construction usage from the high end of the estimated usage range of 131 million gallons/year leaves about 86 million gallons per year. Divide this number by the 15-year life of the field, you get about 5.7million gallons per year, which is within the present usage through May of 3.1 million gallons and should be within or approximately within the estimated range.

**0135-088**

The text in Sections V.C.10.a and V.C.6 has been revised in response to this comment.

**0135-089**

Section V.B.10.b has been revised to include additional information on the amounts of gravel used in the area north of the Brooks Range.

**0135-090**

The Liberty EIS does not contain any estimated baseline data showing air-quality levels before the late 1980's, because very little data exist on which to base any such estimates. However, as discussed in Sections V.C.13 and VI.C.3, the overall air quality on the North Slope of Alaska remains relatively pristine. The results of the air-quality monitoring in the Prudhoe Bay area, the only major North Slope source for industrial emissions, demonstrate that most ambient pollutant concentrations, even for sites subject to maximum concentrations, generally meet the ambient air-pollution standards. This is true even if we assume the baseline Prevention of Significant Deterioration program concentrations to be zero, limiting the allowable increase in concentrations.

The monitoring demonstrates that, even with the large amounts of nitrogen oxides emitted from the Prudhoe Bay and Kuparuk fields, the concentrations of those pollutants are well within the national ambient air-quality standards.

The arctic haze phenomenon was first observed in the 1950's, well before any Alaska North Slope oil development. Air samples during these episodes show high concentrations of vanadium and sulfates. Vanadium results from the burning of heavy industrial fuels. Sulfates result from the combustion of high-sulfur fuels. Neither of these activities occurs on the North Slope. The Alaska North Slope is not a significant source of sulfur dioxide. Carbon dioxide and methane emissions do not contribute to arctic haze. Emissions of nitrogen oxides in northern Alaska could contribute to some local visibility degradation. However, this should not be confused with arctic haze, which is not limited to Alaska, but occurs over large areas of the Arctic Ocean and its surrounding land masses. We believe that the analysis and conclusions presented in Section V.C.13.b remain valid and represent a fair discussion of this issue. We also believe that the small additional pollution from the Liberty Project will not change that the regional air quality still is far better than standards require.

**0135-091**

Please see Response 0135-090.

**0135-092**

The Arctic Coastal Plain is a mosaic of wetland vegetation. Previous development did not require an inventory of all the types and coverage of wetland vegetation present prior to early oil exploration and development during the 1970's; thus, it is impossible to quantify how much vegetation of each wetland community was destroyed by past development. However, the amount of vegetation destroyed by the construction of gravel pads and roads on the North Slope represents a very small fraction of any of the wetland vegetation types present on the North Slope-Arctic Coastal Plain prior to any development.

Some indication of the vegetation-wetland area that has been affected by North Slope oil and gas development is shown by the areas associated with gravel mining and fill (Section V.B.10.b). The Arctic Coastal Plain covers about 230,000 square kilometers (23,000,000 hectares), and the area between the Colville and Canning rivers is about 71,000 square kilometers (7,000,000 hectares). The area disturbed by gravel mines and fill placement is about 8,793 hectares; this is about 0.04% of the coastal plain and about 0.1% of the area between the two rivers.

Although several migratory bird species have declined in abundance on the North Slope, there is no evidence that oil development is the direct or indirect cause of these declines. Other potential causes for the declines may be present on the winter ranges of these bird species.

There is no evidence that the habitat destruction-alteration that has occurred locally on the oil fields on the North Slope has cause "fragmentation" of the Arctic "landscape" habitat. The amount of "landscape" habitat cover by roads and gravel pads is very small a fraction of the available "landscape." Places where habitat fragmentation has been demonstrated, such as in the tropical rainforest, the clearcutting of the forest over most of the landscape has indeed caused habitat fragmentation for species and species communities that require large areas of undisturbed rainforest. This environmental problem is not applicable to the very small areas of landscape cover by roads and gravel pads on the North Slope. Ongoing and future oil development on the North Slope require much smaller and fewer gravel pads than past development, and many of the new fields are not to be connected by roads to the existing Prudhoe Bay complex. Thus, the footprints of landscape covered by future oil fields will be much smaller than those of past developed oil fields. "Landscape fragmentation" is very unlikely to be a environmental problem in regard to vegetation-wetlands on the North Slope-Arctic Coastal Plain. The small amount of wetlands altered or destroyed by gravel pads and roads is not likely to have any significant effects on water quality. However, oil-development wastes and oil spills do have adverse effects on local water quality.

Executive Order 1198, Flood Plain Management, and Executive Order 11990, Protection of Wetlands, require Army Corps of Engineers permits that have been issued for past and existing oil development on the North Slope, and these permits are required for Liberty development. Flooding of river drainages on the North Slope is a natural event during spring runoff. The presence of roads and gravel pads is likely to have little effect on the floodplains of the major rivers on the North Slope.

**0135-093**

The analysis of small spills of crude and refined oils is located in Appendix A, Section B Small Spills, of the EIS. We refer the commenter to this section of the EIS for the details. This analysis does not fail to analyze the history of spills on the Alaska North Slope. We use the history of crude and refined oil spills reported to the State of Alaska, Department of Environmental Conservation and the Joint Pipeline Office to determine crude and refined oil-spill rates and patterns from Alaska North Slope oil and gas exploration and development activities for spills greater than or equal to 1 gallon and less than 500 barrels. Refined oil includes aviation fuel, diesel fuel, engine lube, fuel oil, gasoline, grease, hydraulic oil, transformer oil, and transmission oil. The Alaska North Slope oil-spill analysis includes onshore oil and gas exploration and development spills from the Point Thompson Unit, Badami Unit, Kuparuk River Unit, Milne Point Unit, Prudhoe Bay West Operating Area, Prudhoe Bay East Operating Area, and Duck Island Unit.

Please see Response 0135-014, which addresses spills of hazardous substances.

**0135-094**

See Response 0145-012 for broken-ice response issues. With regards to the effectiveness of dispersants, BPXA does not propose to use dispersants as a nonmechanical response tactic in the arctic environment. The Alaska Regional Response Team, the joint Federal/State spill-response planning organization for Alaska, does not advocate the use of dispersants in the Arctic because of the shallow waters in the Beaufort offshore and the general ineffectiveness in cold waters.

BPXA and Alaska Clean Seas did not "fail" the trials conducted during spring and fall 2000. Had the situation actually been a spill, BPXA and Alaska Clean Seas would have been able to respond with the equipment and personnel cited in their oil-spill-contingency plan and begin recovering oil. The Oil Pollution Act of 1990 and the MMS regulations in 30 CFR 254 read "to the maximum extent practicable.…" BPXA would not have been limited to one tactic and would have had more latitude to react to actual environmental conditions than having to deal with the contrived conditions of the trials.

The results of these demonstrations indicated that the Tactic R-19A, barge-based response, is more limited in its range of applicability than presented in the Alaska Clean Sea Technical Manual. BPXA, through the imposition of voluntary seasonal drilling restrictions at the Northstar facility, acknowledges that cleanup tactics are much more limited in their applicability than previously thought and are limiting their actions, which possibly could result in a spill during periods when spill response would be more challenging. They also have revised their plans and technical manuals to more accurately reflect operational limitations.

By the terms of the Federal lease sales, no drilling is permitted into untested formations during broken-ice conditions.

**0135-095**

The EIS has considered cumulative effects of oil spills from Liberty plus past, present, and reasonably foreseeable future activities for onshore, offshore, and the Trans-Alaska Pipeline System pipeline and tankers (Appendix A:A-11 through A-37). Each resource is analyzed on the basis of the past, present, and reasonably foreseeable future development. Cumulative effects of potential spills are not expected to occur within the same location or contact the same resources before recovery of the affected resources. Repetitive oil spills in a cumulative case are not expected to occur except for the case of onshore spills and tanker spills. In both cases, however, the recovery of the resources would be expected (Appendix A, Table A-35). In the unlikely event of a subsequent spill to the same resource in time and space, the recovery period would be lengthened.

**0135-096**

The MMS acknowledges the preference stated by the commenter for the No Action Alternative. The MMS disagrees with the commenter's assumption that the EIS does not adequately address an impact analysis for the No Action Alternative or analyze the impacts of alternatives on wildlife, including subsistence species.

This is a project-level EIS that evaluates the effects of permitting the proposed Liberty development, the potential effects permitting various alternative components and/or mitigating measures, and the effects of not permitting the action. In Section IV.B, the EIS properly states that the environment in Foggy Island Bay would not be impacted from construction or operational activities. It also states the potential effects associated with the lost production and continued reliance on imported oil, conservation, additional domestic production, fuel switching, and other substitutes.

The EIS does evaluate the effects of each alternative on the resources identified in the EIS. When analyzing effects of alternatives on some resources, the potential effects are either very small or essentially the same as those identified for the Proposal. For example, mining gravel during the winter from the proposed Kadleroshilik River mine site or from the Duck Island mine site would have essentially the same effect on the bowhead whale, because the bowhead whale is not present in the winter when those activities would take place. The EIS clearly identifies the level of impacts as being essentially the same, which is important information for the reader or decisionmaker. The EIS need not continually repeat the same impact; EIS analysts are encouraged to direct the reader to existing pertinent analysis.

**0135-097**

The MMS disagrees with the statement that the EIS fails to evaluate directional drilling from land. The MMS acknowledges the improvements and greater drilling distances being achieved by directional drilling. However, these "distances" were obtaining by drilling into a prospect and then "stepping out" with additional drilling, with the application of the geologic and well-drilling knowledge, and experience "learned" from drilling the previous holes in the prospect. They did not result by planning a development project that would require almost every well to exceed the current drilling record on the North Slope.

Drilling and developing the Liberty Prospect from onshore was suggested during scoping and is evaluated in Section I.H.5.a(2) of the EIS; additional information is provided in Appendices D-1and D-2. Drilling from onshore was determined to be both noneconomical (costs would exceed potential income) and technically infeasible. See Response 0134-025 for additional information about the feasibility of onshore development.

The OCS Lands Act charges MMS with the responsibility to conserve offshore oil and gas resources. Part of this conservation mandate is to develop the "whole" prospect and not just certain portions of the prospect that can be developed easily and then abandon the less desirable part. Such development results in lost resources and revenue to the Nation. The MMS has determined that the whole field cannot be developed from onshore.

Furthermore, developing only part of the reserves makes the project noneconomic. There is no reason to evaluate alternatives that, if chosen, result in "no action" by the applicant, because BPXA would never fund a development project where expected costs exceed expected revenues.

**0135-098**

The MMS acknowledges that the EIS does not evaluate every one of the possible 96 different combinations of alternatives by combining the various component alternatives. The National Environmental Policy Act Council on Environmental Quality requires an analysis of a range of alternatives, not an analysis of every possible alternative. The EIS covers the range of alternative by analyzing first the component alternatives and then providing three different combination alternatives.

The commenter suggests that the MMS wait until the Northstar subsea pipeline and LEOS detection system are running and can be evaluated for effectiveness before completing this EIS. The pipeline and LEOS system have been installed, and the LEOS system has shown that it can detect hydrogen. Production from Northstar began in late 2001, which was before any decisions regarding the Liberty Project could be made. Any information gathered from the startup and operation of Northstar can and will be used by the decisionmakers for Liberty.

**0135-099**

Please see Response 0058-005.

**0135-100**

The lakes indicated as water sources for ice roads are those that were permitted for the construction of the Badami pipeline. Presently, all freshwater needs for continuing operations at Badami are supplied from the Badami mine site, which is replenished each year by the East Badami Creek. All of the previously permitted lakes for the Badami pipeline construction would be available for the Liberty Project, as they are not being used for any other purpose. The immediate lakes are BP LAS #21622 (3 lakes), BP LAS #20601 (3 lakes), BP LAS#21622, and BP LAS#20601. These lakes are only those that are nearest the Liberty Project, but there are numerous other lakes available along the Badami pipeline identified by BP LAS numbers (BPXA, 2000a, Exhibit A). Much like the Badami operations where all the freshwater needs are met by the Badami gravel mine site, the Liberty proposed gravel mine site on the Kadleroshilik River would provide an additional major source of freshwater for Liberty operations. These permitted sources of freshwater either do not support fish or are limited to a 15% drawdown of the available water for overwintering fish.

**0135-101**

The text in Section V.C.10.a has been revised in response to this comment.

**0135-102**

See Response 0135-087 regarding the Northstar Project water needs. Ice-road widths are typically as follows: pipeline construction ice roads are approximately 250 feet either side of centerline (500 feet), gravel-haul ice roads are approximately 150 feet either side of centerline (300 feet), and standard offshore ice roads are typically 50 feet either side of centerline (100 feet). Tundra ice roads are a total of 6 inches thick, two-thirds of which is freshwater and one-third is snow (Table V.B-8a). Sea ice roads have a 6-inch freshwater cap on top of the brine ice (Table V.B-8b). Travel surfaces are approximately 40 feet and 50 feet wide, as the commenter has indicated.

**0135-103**

See Responses 0135-102 (road lengths), 0135-100 (water sources), 0135-101 (use permits), 0135-88 (fish habitat), and 0135-86 (freshwater needs).

**0135-104**

The two larger pads for gravel staging and potential gravel disposal would be approximately 3,000 feet by 2,000 feet and 6 inches thick. The two smaller material staging areas would be approximately 400 feet by 400 feet and 6 inches thick. Also as mentioned in the Development and Production Plan, there will be a drilling storage pad during the winter that is approximately 350 feet by 700 feet with a 6-inch freshwater cap.

**0135-105**

A very rough estimate of the volume of water the proposed mine site might hold could be calculated from the information presented in the discussion in Section II.A.1.b(1)(b). This information includes the surface area of 31 acres and the mine depth of 40 feet. Surface area times depth equals volume; 31 acres times 43,560 square feet per acre times 40 feet is about 54 million cubic feet, or about 404 million gallons. The actual amount of water the mine site might hold will depend on the amount of material removed from the site, and this is reflected in the surface area of the excavation and the configuration of the sides and bottom.

Whether of not the water from the flooded mine site eventually could be used for any activities associated with Liberty or other projects would depend on obtaining the State permits for its use and meeting the water-quality standards for that use. Section II.A.1.b(1)(b) has been revised to reflect the information in the preceding statement.

Intrusion of brackish water into the lower part of the Kadleroshilik River occurs in that part of the river influenced by tidal fluctuations and intrusions of marine waters as the result of winds and storm surges (Section IV.C.5). Thus, the lower part of the Kadleroshilik River is subject to fluctuations in the physical and chemical properties of the water that range from daily to frequently. The flora and fauna that inhabit this region have a tolerance for these changes. Fish can migrate to other parts of the river or to the ocean, if water conditions change and they cannot tolerate these changes. Tolerances for a range of conditions and the ability to move when fluctuations are outside the range for some animals are naturally occurring phenomena.

A discussion of the effects of rehabilitating North Slope gravel-mine sites has been added to Section III.D.2.a. Reference to this section has been added to Section III.D.2. As noted in this section, brackish-water conditions were noted in the Put 27 Mine Site in the lower part of the Putuligayuk River 6.4 kilometers upstream from the river's mouth and the Northstar Mine Site on the Kuparuk River Delta about 2.4 miles from the mouth of the river. Also, the following are noted:

- Mine sites located in areas of the floodplains subject to saltwater intrusions will become a brackish-water environment, where the water salinities are likely to vary. High salinities are likely during low stream flow and/or high waters in the marine environment due to storm surges. Low salinities are likely during the spring and late summer flood events.
- Put 27 Mine Site indicates the composition of species using the site will vary as water conditions at the site varies.
- Sampling of mines sites after rehabilitation indicated that the highest number of species were captured in the Put 27 Mine Site.
- Sampling in the Northstar Mine Site in late summer after the site was flooded in the spring showed that the water in the site had salinities similar to nearshore waters. Fish captured in the site consisted mainly of anadromous species, and several freshwater species also were present.

The statement in Section II.C.4.b has been revised to note that there are indications that the deep water in rehabilitated mine sites provides fish with overwintering habitat, as noted in Section IV.C.4.b.

The North Slope oil fields are underlain by continuous permafrost (permafrost meaning any soil, subsoil, or bedrock in which the temperature below freezing has existed continuously for a long time); because of seasonal variation in air temperature and solar radiation, a layer of surficial material overlying the permafrost (termed the active layer) thaws and freezes each year. The thickness of this layer may range from less than 1 foot to about 5 feet. The presence of permafrost precludes the presence of any aquifers that might be affected by activities associated with developing the Liberty Prospect. If freshwater aquifers were present, they could be used as sources of freshwater.

The oceanography of Foggy Island Bay is described in Sections VI.C.5.

**0135-106**

Before water can be taken from a stream/river or pond/lake, a permit must be obtained from the State of Alaska, Department of Natural Resources, Division of Mining, Land and Water either for temporary (less than 5 years) use or long-term use (granting of a water right allows a specific amount of water from a specific source for a specific use). In addition, the Alaska Department of Fish and Game, Habitat and Restoration Division is responsible for evaluating and, as necessary, conditioning activities that affect fish-bearing streams. This process provides protection for fish and wildlife resources by identifying and preventing potential impacts before they occur.

If the commenter has concerns about the parameters the State uses in its water-permitting process, these concerns should be addressed to the appropriate State agency. The MMS does not have any regulatory authority over activities that occur exclusively on State lands or in State waters.

The draft EIS considers the likely effects of the Proposal on fishes based on available information. This includes what is known about winter stream flows, effects associated with gravel mines, effects on migration and overwintering fish, and the effects of freshwater removal for the creation of ice roads. In general, most of the streams and rivers on the North Slope are frozen to the bottom in winter, have no under-ice flow at all, and would have no living fish in them during winter. The few that do have some under-ice flow and could provide habitat for overwintering fish are believed to be in areas that are not likely to be affected by the Proposal. Most of these are thought to be in the major rivers such as the Colville in the west and the Sagavanirktok in the east. However, there is no information concerning exactly where these under-ice flows are in rivers on the North Slope.

Section III.D.2 has been revised and includes a reference to Section III.D.2.a that describes some of the general guidelines for siting, design, operation, and reclamation of North Slope gravel pits; effects of gravel mining in northern Alaska streams and rivers; and the effects of reclamation/rehabilitation of abandoned mine sites.

**0135-107**

The draft EIS did not referenced the May 23, 1979, Water Management Policy, State Lands within the Colville and Canning Rivers for several reasons. This policy (2 pages) recently was determined by the Alaska Department of Natural Resources as no longer necessary and contrary to the regulations dealing with water-appropriation permits and temporary water-use permits. It was drafted more than 20 years ago, and many changes are now in place with more specific regulations developed by the State of Alaska, Departments of Environmental Conservation and Fish and Game, and the North Slope Borough. Permit applications are considered on a case-by-case basis. Still appropriate from the original policy are review by the North Slope Borough and concern for overwintering habitat of fishes. The Department of Natural Resources has not permitted the withdrawal of water from any natural rivers or streams during the winter since 1976. This restriction, while necessary at the time with limited data on winter river and stream flow, may be considered more on a case-by-case basis as data become available. Any new agreements or policies will encourage users to coordinate water withdrawals and gravel extraction with the purpose of using gravel-extraction sites as water reservoirs (State of Alaska, Department of Natural Resources, 2000).

**0135-108**

The EIS analyzes the effects of the Kadleroshilik and Duck Island mine sites in Sections IV.C.4.a and b. Although other sources of gravel were suggested, the reasons for not considering these are stated in Section I.H.5.c. It appears to MMS that the Alaska Department of Fish and Game's guidelines for selection and reclamation of North Slope gravel mines were followed in proposing the Kadleroshilik River Mine Site and in looking at alternative sources of gravel. We have not received any comments that expressed a different opinion.

The MMS is required to include reasonable alternatives and to briefly discuss the reasons why those alternatives not considered for detailed study were eliminated. Scoping provides an opportunity for the public to suggest alternatives, including feasible and prudent alternative gravel sources, and these suggestions were evaluated in the EIS. The MMS is not required to demonstrate that there are no other feasible and prudent gravel sources.

As noted in Section V.B.5 of the EIS, onshore production of North Slope oil occurs on 1.35 million acres. Gravel mines cover less than 2,000 acres (Table V.B-3), less than 0.2% of the surface area. There are some effects on fish and wildlife and their habitat during mining and after the sites have been abandoned. However, as noted in Section III.D.2.a, abandoned sites can be rehabilitated to provided fish and wildlife habitat for summer use; fish-overwintering habitat; and sources of freshwater for domestic, industrial, and construction purposes.

Obtaining gravel from onshore sites occurs on State of Alaska land and would be subject to the conditions of State permits. Selection of such sites is a matter between the State and BPXA; the MMS's regulatory authority is limited to the Federal waters part of the project area. The types of effects from obtaining gravel at other onshore sites would be similar to using the Kadleroshilik River site, and these include construction of ice roads, hauling gravel, and dumping gravel at the island location.

**0135-109**

The reasons for not considering Tern Island as a gravel source are given in Section I.H.5.c(3) of the EIS and include insufficient amount (additional gravel would have to be obtained form other sources), blasting frozen gravel, and the possibility of having to excavate the gravel in the summer, which provides a greater potential for disturbing fish and wildlife. See also Response 0134-016.

The MMS has proposed a Recovery and Reuse of Gravel mitigating measure in Section I.H.7.b of the EIS and evaluated its effectiveness in Section III.D.2.o. This mitigation would recover gravel from abandoned gravel facilities and rehabilitate those sites to useable wetland habitats in an amount equal to or greater than the area lost from gravel mining and pad construction. The permittee would be required to recover and reuse available gravel from abandoned pads, roads, and airstrips within the immediate project area and/or within the Prudhoe Bay oil-field complex and to rehabilitate the site.

The types of abandonment information suggested in the comment require estimates based on activities 15-20 years in the future. The MMS believes abandonment of an artificial island and the removal of gravel used in the construction should be decided on a case-by-case basis through a stakeholder review and approval process. Although there are no specific designs, it is possible that production islands constructed in the future or in deeper waters might be based on a mobile platform design where the structure is built outside the Beaufort Sea, transported to the site, and flooded so that it sits on the seafloor. When production from the site is finished, the structure can be raised and transported away.

Shell Western Exploration and Production, Inc.'s plan to abandon Tern "A" Artificial Island (Lease OCS-Y-0196) was approved by MMS on July 17, 1990, following a review of the plan by the joint Federal/State Arctic Biological Task Force, U.S. Army Corps of Engineers, and U.S. Coast Guard; the Environmental Protection Agency was a member of the task force. The abandonment plan specified properly abandoning all wells; removing all gravel bags, surface hardware, and other debris; and creating small hummocks on the surface to provide habitat for nesting eiders. The review and approval process did not specify removal of the gravel used to construct the island. There are many islands in the Beaufort Sea and an abandoned island provides an opportunity for some flora and fauna to use a manmade island in a manner that they would use a natural island with similar features. Over time, the island will be reshaped by waves, currents, and ice forces.

**0135-110**

The MMS has analyzed the environmental effects of using the Duck Island gravel mine in Section IV.C.4.b(9) of the EIS. It appears to the MMS that the Alaska Department of Fish and Game's guidelines for selection and reclamation of North Slope gravel mines were followed in proposing the Kadleroshilik River mine site and in looking at alternative sources of gravel. We have not received any comments that expressed a different opinion. Obtaining gravel from either the proposed Kadleroshilik River mine site or the Duck Island gravel mine involves State of Alaska land and would be subject to the conditions of State permits. Selection of such sites is a matter between the State and BPXA; the MMS's regulatory authority is limited to the Federal waters part of the project area.

While economic information may be useful for understanding some of the economic conditions associated with the gravel-mine sites, this information is not needed to analyze the environmental effects of mining, preparing a site for mining, or rehabilitating an abandoned mine site.

Gravel at either the proposed Kadleroshilik River site or Duck Island mine site would be mined in the winter, when the effects of disturbing wildlife from noises associated with the operation would be minimal, affecting only those animals, such as caribou, that might be occasional visitors to either of the sites. Dewatering the Duck Island mine would occur during the summer. Setting up the pumps and discharge lines and routine maintenance of the pumps (including starting and stopping) involves the presence of humans and equipment and operational noises. all of which could disturb any wildlife or birds that might be in the area either temporarily or seasonally.

The effect of gravel mining at the proposed Kadleroshilik River site is not expected to have any significant effect on water quality in the river. The mining will be done in the winter when the river is frozen, and the site will not be connected to the river until mining is complete. The effects of saltwater intrusion in streams and rivers and flooded/rehabilitated mine sites is discussed in Section III.D.2.a of the EIS.

Table II.A-1 presents a summary of some of the activities and events associated with each of the alternatives analyzed in the EIS; the environmental effects of these activities and events are analyzed in other parts of the EIS. The table shows the Kadleroshilik River and the Duck Island mine sites are 9 and 20 miles, respectively, from the proposed Liberty Island site and, using the same amount of equipment, the time estimated to haul gravel from the mine to the island location is 45-60 and 95-120 days, respectively. Table II.A-1 does not show any delay times. The delay is based on how much time would be needed to pump an estimated 600 million gallons of water out of the Duck Island gravel mine. An estimated 400 days would be need to pump water out of the mine site. This estimate is based on the current rate at which water is permitted to be withdrawn from the mine site.

The analysis of the environmental effects of using the Duck Island gravel mine are characterized as low for eiders, with no significant population effects; for marine and coastal birds, the effects potentially would be lower than mining from the Kadleroshilik River gravel mine; for caribou, there would be an increase in road traffic compared to the other mine site; and for fishes, there would be no measurable differences between the two mine sites. There do not appear to be significant differences between the two sites.

**0135-111**

Please see Response 0135-110.

**0135-112**

Text has been added to Section III.C.3.e(2)b)(1) to quantify the effects of ice roads on the Boulder Patch.

Text has been added to Section IV.C.4.b(5)(b)(2) on Alternative VI Use the Duck Island Gravel Mine.

**0135-113**

The use of flooded deep mine sites as a source of freshwater for domestic and industrial use and winter ice-road and pad construction is noted in Section II.C.4.

**0135-114**

Information on the effects of gravel mining in Oregon rivers probably was not appropriate for this EIS and has been deleted; the inclusion of this information was suggested by a member of the Liberty Interagency Team. A discussion of the effects of rehabilitating North Slope gravel-mine sites has been added to Section II.C.4.d. Reference to this section has been added to Section III.D.2.

Information in Section II.C.4.d includes references to a number of Alaska Department of Fish and Game reports on the results of their studies of abandoned and rehabilitated mine sites and the rivers or streams to which the rehabilitated sites are connected. The results of these studies indicate abandoned and rehabilitated mine sites are suitable for fish habitat in the summer and winter; fish captured in these sites indicates their use in the both the summer and winter.

The goals of the Alaska Department of Fish and Game guidelines for fish and wildlife restoration of gravel-mine sites were to promote voluntary measures to enhance fish and wildlife and meet industry's gravel and water needs. The studies and guidelines attempt to strike a balance between various uses of gravel mine site areas—habitat for fish and wildlife and sources of gravel and water for human needs. They do not judge which use is preferable. A summary of Alaska Department of Fish and Game guidelines for North Slope gravel mines and a discussion of the effects of rehabilitating these mine sites has been added to Section II.D.2.a.

A mine site would be isolated from the river and mining would take place in winter when the river is frozen. There may be some increase in turbidity and downstream sedimentation in the river when the mine site is connected to the river, but this effect is expected to be short term and about the same order of magnitude as increases that occur during spring and late summer floods.

**0135-115**

The volume of gravel, 990,000 cubic yards, is what BPXA estimates they will need to meet to construct the facilities based on the designs presented in the EIS. More, and perhaps less, gravel actually may be required because of differences that include changes required by Federal or State regulatory agencies (either in the size of location of a facility), allowances for imperfect construction operations involving heavy equipment (i.e., dumping gravel), emergency situations, or mining of material that cannot be used. Planning for these contingencies allows the operator to proceed without violating the conditions of the permit, if additional gravel is needed, and without having to submit another or modified permit application.

The amount of gravel required for island construction for each of the alternatives is identified in Table II.A-1. Island construction uses a large percent of the gravel required for the project.

**0135-116**

Please see Response 0135-114.

**0135-117**

The range of activities and their timing are described in Section II.A of the EIS. The effects of these activities are analyzed in Section III.C.3, the effects of disturbances on the various resources that potentially could be affected by Liberty development.

The "fish transport channels" referred in the comment are channels being constructed to provide fish an escape route to the deep-water habitat of Sag Mine Site C for overwintering (Winters, 2001, pers. commun.). Sag Mine Site C is a rehabilitated mine site connected to the Sagavanirktok River (Section III.D.2.a). The fish were trapped in pools formed by scouring and erosion during high-water events in the spring and fall at the culverts in the Spine Road crossing of the West Channel of the Sagavanirktok River. The pools become isolated during normal river stages and trap the fish. Isolation of pools in the beaded streams of the North Slope occurs naturally, and this isolation would trap any fish that remained in the pools.

The effects of saltwater intrusion in streams and rivers and flooded/rehabilitated mines sites is discussed in Section III.D.2.a of the EIS.

Hydrologic considerations are discussed in Response 0141-035.

The Kadleroshilik River mine site consists of 40% well-drained vegetated river bars, 30% partially vegetated river bars, and 40% barren gravel (Section III.D.2 of the EIS). As analyzed in this section, gravel mining at the Kadleroshilik River mine site likely would have minimal effects on the overall vegetation-wetland habitats in the project area and possibly would displace a few birds using the site for nesting or incidental purposes. Figure II.A-07b in the EIS shows the vegetation types in the proposed Kadleroshilik River mine site. It is unlikely that a plan could be developed that would meet the dual objectives of obtaining the required amount of gravel and avoiding any vegetation. Selection guidelines for gravel mine sites (Section III.D.2.a) recommend avoiding willow stands and *Dryas* terraces; neither of these areas are shown in Figure II.A-07b.

bp

BP Exploration (Alaska) Inc.
900 East Benson Boulevard
P.O. Box 196612
Anchorage, Alaska 99519-6612
(907) 561-5111

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REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

April 13, 2001

Mr. John Goll, Regional Director
Minerals Management Service
Alaska OCS Region
949 East 36th Avenue, Suite 308
Anchorage, Alaska 99508-4363

**Comments on Liberty Development and Production Plan**
**Draft Environmental Impact Statement**

Dear Mr. Goll:

BP Exploration (Alaska) Inc. (BPXA) is pleased to submit comments in response to the public notice dated January 12, 2001, on the *Liberty Development and Production Plan Draft Environmental Impact Statement* (DEIS). BPXA believes the Liberty DEIS is a comprehensive and thorough document, and we commend the Minerals Management Service (MMS) and the cooperating and coordinating agencies for their efforts. BPXA is aware of the extensive interagency consultation involved in formulation of this draft, and we believe the resulting document reflects the result of those discussions regarding the scope and format of analysis.

We believe the DEIS represents a balanced and objective assessment of the project. This assessment is based on an accurate understanding of the scope of the project, as described in our Development and Production Plan. The DEIS has identified the important issues associated with the planned development, and has analyzed them at an appropriate level of detail. Overall, we concur with the conclusions in the DEIS that most environmental impacts associated with the project will be minor and for the most part insignificant.

At this juncture in the project review, BPXA wishes to emphasize the extensive planning and engineering that have been conducted to assure a safe and reliable operation at Liberty. The design for the Liberty island, pipeline, and facilities is conservative and safe. Particular attention has been paid to design elements that mitigate potential environmental impacts. In specific:

- The island slope protection design is appropriate for water depths and wave/ice regime at the project site. At Northstar, where structural sheet pile slope protection on the upper island was dictated by site conditions. At Liberty the



proposed system of concrete mats provides structural protection, while the concrete mat bench and the gravel bags at the upper end of the slope serve to dissipate wave energy and limit ice ride-up potential. Wave tank modeling has been conducted to confirm this design, and we understand that, as part of MMS' technical obligations, the island design will have a thorough technical review under the Certified Verification Agent process.
- The proposed gravel mine site in the Kadleroshilik River floodplain is designed to minimize impacts to the river system, and is representative of other mine site designs constructed across the North Slope. These designs result in efficient extraction of gravel, minimize impacts to habitat while affording some habitat enhancement values, and create additional sources of fresh water that can be extracted with minimal effect on the environment. However, to the extent that the need for new gravel can be reduced, overall project impacts can also be further reduced. Accordingly, BPXA will initiate a re-assessment of gravel reuse options that are appropriate for the project.
- The heavy steel single walled pipeline design is the best design for this project. When all attributes of pipeline design, construction and operation (including inspection, monitoring, maintenance, and repair) are considered and weighed, we affirm that the single wall design is the most prudent, safe, and reliable choice. This decision was reached based on a number of factors, including Northstar design and construction experience, the ability to continue learning from Northstar as it proceeds into the operational phase, the extra factor of safety built into the design, the various documents and reports prepared to support the EIS analysis, an internal peer review of the proposed design, and an internal workshop/discussion forum convened specifically to consider the issue of single wall versus double wall pipe design. More information regarding BPXA's position on Liberty pipeline design is provided in Attachment 1.
- Project discharges and emissions have been minimized – most waste streams will be injected in a disposal well, and best available control technology has been applied to result in minimal air quality effects. Our process design has minimized production of greenhouse gasses from facility operation.

We have provided detailed comments on the DEIS in Attachment 2. These detailed comments address areas where we believe the impact analysis may be based on incomplete or out of date information as well as areas where we have questions on the scientific basis of the analysis. The comments also address areas of ambiguity or where clarification is required. Finally, please note that, in our comments, we have remarked on areas where we believe impacts may be overstated as well as where they are understated.

In summary, BPXA appreciates the significant time and effort the MMS and the cooperating agencies have devoted to preparing a quality DEIS. The Liberty project can be developed with limited impact, is designed and can be constructed and operated safely, and will result in significant energy production and economic and socioeconomic benefits.

If you have any questions or need additional information, please call me at 564-5490.

Sincerely,

Karen S. Wuestenfeld

Karen S. Wuestenfeld, Permitting Advisor
HSE-Alaska

Attachment

cc (w/attachment):

Mr. Michel Holley, Corps of Engineers
Mr. Ted Rockwell, U.S. Environmental Protection Agency
Mr. Rick Parkin, U.S. Environmental Protection Agency

***Attachment 1***

## BP Exploration (Alaska) Inc.

# LIBERTY DEVELOPMENT PROJECT: Position on Subsea Pipeline Design

**April 13, 2001**

# LIBERTY DEVELOPMENT PROJECT:
## Position on Subsea Pipeline Design

The purpose of this paper is to affirm BP Exploration (Alaska) Inc.'s (BPXA) selection of a single walled pipeline design for the Liberty Development Project, and to describe the factors considered in reaching this position. BPXA's permit applications for the Liberty Development Project request review and approval of an offshore subsea pipeline. The proposed design concept is for a heavy, single wall steel pipeline. This paper describes the background and history of permitting to date for the Liberty Pipeline, provides brief information on the pipeline design, explains factors considered in design selection, and provides a rationale for maintaining applications for a single wall pipeline design.

As part of the Liberty permit process, several agencies and members of the public have commented that a pipe-in-pipe (PIP) design offers environmental benefits, and should be considered for the project. Accordingly, an alternative double walled pipeline design has been evaluated in the Environmental Impact Statement (EIS) for the Liberty project.

BPXA's decision to retain a single wall design rather than adopt a PIP design is based on many complex and interrelated factors. When considering pipeline integrity and performance, the attributes of a particular mechanical design must be evaluated in conjunction with constructability and operability. The Liberty project design choice is based on confidence in the integrity of the single wall design, proven reliability in the ability to construct and install a single wall pipeline gained through Northstar, and careful consideration of operability and risk.

To assist in decision-making, BPXA convened internal committees, comprised of experienced senior design, construction and operations engineers from the worldwide BP Group, to help assure an objective and informed outcome. These processes included internal technical project peer reviews, as well as an offshore pipeline design workshop. While peer reviews are a standard internal procedure, convening company wide experts to review a specific project technical/permit issue is unusual.

Through the peer review process, technical aspects of the single wall pipeline design were thoroughly reviewed, and the design concept endorsed. Note that the scope of this review only considered the proposed project design, and did not consider alternatives. During the pipeline workshop, attributes of the proposed design as well as an alternate PIP design were considered. The pipeline workshop undertook an in-depth look at applications of BPXA PIP designs worldwide, and attributes of the Liberty single wall design. The conclusion of the workshop was to recommend retaining the proposed single wall design.

### 1. Background

Liberty project engineering began in early 1997, with increasing activity after the results of the Liberty #1 well (120 million barrels of recoverable oil) were announced in May 1997. At that time, preliminary engineering for the Northstar project was complete, a Draft Environmental Impact Statement for the Northstar project was in preparation, and technical



review of the Northstar pipeline design was ongoing through the State Pipeline Coordinator's Office.

From the outset, the Liberty project concept was to adopt Northstar design where appropriate for Liberty site conditions, and to modify the design as necessary for project-specific concerns. At the time Liberty preliminary engineering was kicked off in June 1997, there was not a significant level of public or agency concern being raised over single wall pipelines versus PIP designs. The first project application, an Application for a Pipeline Right-of-Way lease, was submitted to the Alaska State Pipeline Coordinator's Office in August 1997. The Liberty Development and Production Plan, the major project permit application, was submitted to the U.S. Minerals Management Service in February 1998.

Coincidentally, Arco Alaska Inc. filed an amended Alpine Development Project Environmental Evaluation Document in September 1997, describing a cased pipeline design for the Colville River crossing. Some agencies than queried whether the attributes of a cased river crossing design could be applied to a subsea pipeline design.

### 2. Northstar Permitting Issues

The issue of PIP as an alternative subsea pipeline design was first raised as part of the Northstar Project Draft Environmental Impact Statement comment process:

- In their letter to the U.S. Army Corps of Engineers dated August 3, 1998, the U.S. Fish and Wildlife Service (USFWS) commented that a PIP design would provide a superior leak detection system [note that BPXA subsequently incorporated the LEOS leak detection system into both the Northstar and Liberty designs]:
  *The Service requests that the Corps and BPXA review and incorporate oil leak detection technology that provides greater resolution in the amount and location of oil leaked. For example, to monitor the Alpine pipeline crossing under the Colville River, ARCO Alaska Inc. is using a double pipeline design (sales oil pipeline inside a high-strength casing pipe) with a leak detection system...The Service suggests there is no more appropriate location to utilize the most advanced leak detection system available than under the Beaufort Sea. In our view, the system designed for the Colville River crossing exceeds the proposed Northstar design in detection sensitivity and reliability, thus reducing the risk of a major oil spill event. A double-walled pipeline design needs to b e thoroughly assess for use on the Northstar project. Given that subsea pipeline technology remains virtually untested in the Arctic and the difficulties involved in North Slope/offshore oils spill containment and recovery during most of the year, it is reasonable to expect that state of the art leak detection be required.*
- The Environmental Protection Agency commented in an August 31, 1998 letter to the Corps:
  *We believe that the EIS should be revised to include an evaluation of a double-walled undersea pipeline, as it appears to be a viable technology that would provide environmental protection features that are superior to the proposed pipeline.*

BPXA submitted a comment letter to the Corps of Engineers on August 31, 1998 addressing the PIP issue, explaining why the PIP design that was considered in Northstar conceptual design was not further evaluated, the positive attributes of the proposed single wall design, and other general considerations about PIP design. Additional information regarding PIP design issues for Northstar was submitted by BPXA to the Corps in a letter dated October 7, 1998. This was followed by a series of correspondence among BPXA, USFWS, and the MMS providing additional information and comment on the PIP design concept. This was concluded with a December 12, 1998 letter from USFWS to MMS. In this letter, USFWS iterated several concerns about the adequacy of available information to discern the relative benefits of the PIP design versus the proposed single wall pipeline design. However, USFWS stated:

> *[they] will not continue to request a quantitative engineering assessment of a double wall design as part of the Northstar EIS. However, the Service remains concerned that a pipeline configuration which may offer increased protection to the environment and our trust resources will not be considered further. In review of future development proposals, the Service will advocate for evaluation of innovative techniques which could reduce risks...*

The Corps received additional comment letters from USFWS (March 10, 1999) and EPA (March 10, 1999). EPA's letter stated:

> *We believe that the evaluation of [PIP] technology should continue on a case-by-case basis for all future proposals in the Beaufort to ensure that the applicability and viability of this technology is assessed before decisions on proposed off-shore development projects are made.*

The proposed Northstar single wall pipeline design was ultimately permitted and successfully installed in the winter of 1999-2000. The Northstar gas pipeline started operation on November 12, 2000, and Northstar sales oil pipeline operation is slated for startup late in 2001.

### 3. Liberty Permit Issues

As mentioned above, the Liberty design proposal was based on the Northstar concept, adjusted as needed for site-specific and project-specific conditions. The PIP issue continued to gain in prominence through the Northstar permitting process, and with the record of concerns expressed on the Northstar pipeline, the PIP design issue became a major factor in Liberty permitting.

Early in 1999, in response to Northstar issues and Liberty concerns, MMS initiated a Technology Assessment and Research Program (TAR) study for an "Engineering Assessment of Double Wall versus Single Wall Designs for Offshore Pipelines in an Arctic Environment". MMS contracted with C-Core for this study. The purpose of the study was a generalized assessment of the issue; it was not a project-specific evaluation.

In the same timeframe MMS, in consultation with BPXA, developed a Liberty-specific program of studies designed to provide sufficient information to include an evaluation of PIP technology in the Liberty EIS. This program included three parts:

- Preparation of a conceptual engineering study of various pipeline alternatives by BPXA contractor Intec Engineering Inc. The scope of this study was defined through a facilitated interagency process; the intent was to assure an objective evaluation of alternatives at a comparable level of detail.
- Third party review of the Intec report (this was conducted by Stress Engineering Inc.).



- An independent assessment of pipeline risk (this was conducted by Fleet Engineering).

BPXA funded the Intec study; the Fleet and Stress studies were contracted by MMS using funds provided by a grant from BPXA to MMS. Pending results of the studies, BPXA requested the State Pipeline Coordinator's Office and MMS to suspend most technical review of pipeline right-of-way lease applications. Since mid-1999, technical review has been limited to review of environmental parameters affecting any design, such as strudel scour, ice keel, and other natural processes.

The DEIS contains a summary of the Intec report, the Stress review of the report, agency comments, and the final report, including response to comments. The final report determined that all pipeline alternatives could be successfully designed and installed, and the relative risk of failure, including failure that would result in release of oil to the environment, for all alternatives was low and relatively similar. On May 1, 2001, BPXA transmitted the final Intec report to MMS. BPXA's decision, based on the report conclusions, was to recommend retention of the single walled pipeline design.

This decision was based on the fact that selection of the best pipeline design alternative must be based on a balancing of multiple factors. While the secondary containment provided by pipe-in-pipe designs considered in the Intec report provides a marginal reduction in the already very small level of risk under certain circumstances, BPXA determined the pipe-in-pipe alternatives are also more complex to design, install, inspect, and repair, cost more, and are not as well understood. Based on a comparison of relative risk for each alternative, costs, and on experience with the practicalities of constructing, operating, and maintaining facilities in the Arctic, BPXA decided not to alter the Development and Production Plan proposal for a heavy single walled pipeline.

In a letter dated January 18, 2001 to BPXA from the Deputy Secretary of the Interior, the USFWS requested BPXA to:

> *proceed on the engineering design of a double-walled pipeline alternative specific to the Liberty project during the NEPA process to allow resource and regulatory agencies the opportunity to assess and determine the best pipeline alternative.*

BPXA is currently evaluating this request, and is in the process of seeking clarification of the scope of such an effort in a NEPA context. It is BPXA's understanding that the Intec/Fleet/Stress reports as well as the C-Core report were intended to provide information adequate for the NEPA process. To BPXA's knowledge, there is no obligatory requirement to develop competing designs for evaluation in an EIS, and such a request is unprecedented.

### 4. BPXA Offshore Pipeline Design Workshop

In October 2000, BPXA convened a workshop attended by an internal panel of experts to review the Liberty PIP issue and to review use of PIP designs in other BPXA projects worldwide. A representative from the C-Core study team attended to share perspectives on the TAR study, but did not participate in the entire workshop. The purposes of the proposed workshop were:

- communicate Liberty PIP issues internally

- share results and findings from recent Arctic offshore pipeline design studies
- understand bases for design of current offshore pipeline designs, both single wall and double wall designs, in Alaska, the Gulf of Mexico, and the North Sea.
- discuss selection of Liberty pipeline design

After nearly two days of technical presentations on current North Slope offshore pipeline designs, and current North Sea and Gulf of Mexico practice, the panel objectively debated the relative merits of a PIP design versus a single wall design in the Liberty application. Major findings of the panel are summarized below.

**Use of PIP Design within BP**

BPXA uses PIP designs in the North Sea and the Gulf of Mexico. In these applications, PIP is commonly used to insulate hot pipelines or to facilitate installation of bundled pipeline systems. Thus, industry use of PIP for these purposes is not innovative, but is recognized as being more complex and difficult to design, operate, and maintain. To the panel's knowledge, PIP has not been used elsewhere solely for the purpose of providing secondary containment.

**Current Arctic Offshore Design**

After review of final Northstar design and construction, and proposed Liberty single wall design, the panel concluded that LEOS should provide effective leak detection for small chronic leaks for a single walled pipeline system. LEOS is proven in over 20 years of service in other locations, and its ability to detect hydrogen samples sent through the Northstar line. Similar confidence would be expected if LEOS were installed in the annular space of a PIP system.

The panel also determined that BP's current arctic pipeline designs meet and exceed DOT Office of Pipeline Safety and industry code.

**Use of PIP in Arctic Offshore**

Based on results of the Intec, Fleet, Stress, and C-Core studies, the panel considered the use of the Intec PIP design for Liberty. The panel believed that the design could be installed in a single season, although there is a higher risk of not being able to complete construction than with a single walled pipe. The PIP design involves an increased cost of between $20-50 million, and changing to a PIP design would add at least two years to the schedule for design and construction (without regard to changes in the permitting schedule).

Based on worldwide operational experience and lessons learned, technical concerns raised by the panel included the fact that, in other known PIP applications, the outer pipe wall usually fails first. This type of failure normally can't be inspected or monitored before it happens. This failure mode would dictate shutdown of the system until a repair could be completed. The panel felt that a cathodic protection system could be developed, but regulatory issues concerning the design would have to be addressed during pipeline technical review.

There is operational experience in the North Sea clearly demonstrating that failure of the external pipe due to imposed deformation will result in strain intensification in the inner pipe, potentially leading to failure and leakage. The only likely source of structural failure of



the inner pipe alone would be from internal corrosion, which is most effectively avoided by process control.

The inner pipe could be monitored by intelligent pigging, thus providing accurate information on the inner pipe condition and predicted life. However, the inability to monitor the condition of the outer pipe for corrosion in the annulus, for example, was identified as a significant operational hazard.

The panel also evaluated repair scenarios for both systems, and raised concerns over the ability to repair a PIP design and return it to service. In the event the inner pipe leaked and released oil to the annulus, the panel felt there was considerable risk in the ability to repair the pipe and clean the annulus to the satisfaction of the regulatory agencies.

**Aspects of Both Designs**

There was an extensive discussion on the relative merits of the two designs. To help focus the discussion, BP Management challenged the panel to approach the debate by considering how to manage environmental protection with offshore pipeline design, and to consider all aspects – environmental factors, cost, operability, constructability – holistically. The panel discussion first listed possible factors in favor of selection of a PIP design, then factors in favor of the single wall design. The following table lists factors identified in the discussion:

| Select PIP Design | Retain Proposed Single Wall Design |
|---|---|
| Technically feasible and can be installed | Based on Northstar, design is defensible and expected to be approved by technical reviewers and regulators |
| Technical pipeline regulatory issues would need to be resolved | Exceeds code and has a high factor of safety |
| Offers ability to innovate, and to transfer the innovation to other areas at relatively low cost (this would be one of the first strain based PIP designs) | Change in design at this stage introduces additional risk to overall project – design, construction, operations (lesson learned from Erskine failure) |
| Would require extensive technical review | Major materials testing may not be required |
| Should be able to construct in a single season, but with increased risk | Proven construction technique on Northstar (single season) |
| Costs more | Costs less |
| It provides for built-in leak detection (in the annulus), could use LEOS system | LEOS system planned for operation |
| Should have comparable reliability to a single walled pipe | Good advance understanding of total system reliability |
| Operational philosophy would need to be developed | Operational philosophy exceeds regulatory requirements |
| Offers resistance to upheaval buckling | Liberty upheaval buckling issue effectively addressed with current design |
| Offers potential to reduce burial depth | Deeper burial required |

| Select PIP Design | Retain Proposed Single Wall Design |
|---|---|
| With monitoring, can know when either pipe fails | Can understand integrity of entire pipeline system |
| Cathodic protection system is technically possible for inner pipe | Provides cathodic protection for entire system |
| Some repair advantages (can pig out inner pipe / repair with reduced risk of release to the environment); however most repair scenarios cause increased disturbance and pose technical and regulatory concerns. | Overall, simpler to inspect and repair |
| Provides containment under certain conditions | Any leak is a release to the environment |
| Complex design | Offers design simplicity and avoids unneeded complexity |
| Responsive to resource agency concerns | Permitting issues |
| Can't monitor condition of outer pipe | Proven ability to inspect and monitor entire system |
| Can't understand total system integrity | Can transfer operational and construction experience gained at Northstar |
| Effective repair difficult and abandonment in place more likely (with associated environmental effects of constructing new pipeline) | Less complex potential repairs |
| No full scale test results are available. Experiments would be complex to design and perform, and would be costly. | Northstar full scale test results are available |

It was recognized that, for either design, failure would likely result in loss of production. Either an outer wall or an inner wall failure of the PIP system could result in shutdown (failure including either structural failure or loss of containment), as would any failure of the single wall pipe. The panel also considered the leak probabilities and risk analyses addressed in the Intec, Fleet, Stress, and C-Core reports. It was recognized that, in the unlikely event of a release of oil from either design, the environmental consequences of a spill would be similar – while some containment might provided by the annulus of a double wall system with a release to the environment, the quantities released in either case would be predicted to result in similar effects to the environment.

At the conclusion of the debate, the panel unanimously selected retention of the single wall pipe design. In reaching this decision, the panel explicitly recognized the containment value afforded by the double walled pipe system. The results of the Intec / Stress / Fleet studies show that the probabilities of a leak for both systems are similar, i.e. within the accuracy of the calculations, model, available data, and assumptions made.

The panel felt that either system could be successfully designed and expected that both designs could be successfully operated. The major concerns identified between the two systems related to inspection and operation. Members of the panel, particularly those with offshore operating experience, expressed a preference toward being able to understand total system integrity and reliability. More complex design and construction techniques can lead to unanticipated operational consequences. It was the group's opinion that real risks of failure can be best controlled through operating practices rather than mechanical design only. The



increased confidence in being able to safely operate a single walled system, combined with the other factors considered, resulted in affirmation of the proposed design.

## 5. Summary

BPXA is affirming its single wall design, rather than modifying the Liberty project to adopt a PIP design. This decision is based on consideration of the DEIS analysis, previous Liberty and Northstar agency comment, the increased factor of safety built into the design, internal design peer review, compliance with (meet or exceed) design codes, the Intec, Stress, Fleet, and C-Core reports, and internal workshop review. At this time, BPXA chooses not to make any modification in the design proposal.

Selection of the most appropriate design for the Liberty offshore project involves consideration of many complex and interrelated factors. For both alternatives, BPXA has evaluated expected pipeline integrity and performance in conjunction with constructability and operability. The Liberty project design choice is based on confidence in the integrity of the single wall design, proven reliability gained through Northstar in the ability to construct and install a single wall pipeline, and consideration of operability and risk.

*Attachment 2*

## Detailed DEIS Comments

# Executive Summary

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| Abstract | Abstract | 3 | 3rd Paragraph - ...internal monitoring systems ALONG the length of the project. | 001 |
| ExSum | ES-07 | 5 | Reference should be to INTEC (1999b). | 002 |
| ExSum | ES-07 | 7 | 0.015% should be 0.15%. | 003 |
| ExSum | ES-09 | 4 | Does this refer only to gravel bags on the island, or does it include gravel bags placed over the pipeline? | 004 |
| ExSum | ES-11 | 3 | D.1.a. Effects Summary from Construction-Bowhead Whales. Suggestion Paragraph Reconstruction (moved sentences without changing wording):<br><br>Because island and pipeline construction would occur during the winter and be well inside the barrier islands, it is not likely to affect bowhead whales. Reshaping of the island and placement of slope-protection material should be completed by mid-August, before bowhead whales start their migration. Bowhead whales are not likely to be affected by sediment or turbidity from placing fill for island construction, island reshaping before placing slope-protection material, or pipeline trenching or backfilling. Whales should not be affected by these activities, even during the migration, because the island is well shoreward of the barrier islands, and whales infrequently go there. | 005 |
| ExSum | ES-12 | 1 | D.1.c Effects Summary from Construction-Seals and Polar Bears. Clarify basis for disturbance:<br>1) Length/Area (buffer of 1 mile)<br>2) Temporal (one season)<br><br>Statement:<br>This disturbance of seals and polar bears would be local, within about 1 mile along the pipeline route, and would persist for one season. | 006 |
| ExSum | ES-13 | 2 and 4 | D.1.f Effects Summary from Construction-Essential Fish Habitat. The DEIS states that suspended sediment related to construction would "reduce Boulder Patch kelp production by up to 6% during 1 year." The "Final Report Liberty Development: Construction Effects on Boulder Patch Kelp Production" dated May 27, 1999 by URS, UT Austin, and LGL stated, "kelp productivity reductions are estimated to be 2-4% per year, which is not cumulative." (Conclusions, Page 4-1). | 007 |
| ExSum | ES-14 | 5 | D.1.j Would be appropriate to add a sentence indicating that disturbance to bowheads will be very limited because most project activities (especially after construction is completed) will be inside the lagoon, separated from the bowhead migration corridor and hunting area by barrier islands? | 008 |
| ExSum | ES-15 | 1 | D.1.n Effects Summary from Construction - Water Quality. Suggest adding sentence that describes the seasonal increase in suspended sediment and turbidity adjacent to the Sagavanirktok River mouth would mask any input from spoils left in the ocean dumping site. Thus, the maximum volume of spoils would have a negligible effect on the environment. | 009 |
| ExSum | ES-15 | 1 | D.1.n Effects Summary from Construction - Water Quality. Suggested clarification for last sentence in paragraph:<br><br>Available data from site-specific sediment chemistry studies indicate that construction activities are not expected to introduce or add any chemical pollutants. | 010 |

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| ExSum | ES-16 | | There are conflicting statements regarding Spectacled Eiders. It is stated that the FWS estimated that "just a few" eiders would be oiled by a large spill. However, it is later stated that "the overall effect of adverse factors associated with the Liberty project seriously could impact the population, particularly that segment nesting in the eastern portion of the range, and effects from an oil spill would be significant." If only a few eiders would be oiled the effects would not be significant.<br><br>(This comment applies to sections throughout the DEIS where spectacled eiders are discussed.) | 011 |
| ExSum | ES-17 | 1 | D.2.d. This reference to "declining populations" should be carefully documented throughout the EIS. Most evidence suggests or suggested possible declining Long-tailed Duck populations in Western Alaska and NW Canada. There is conflicting evidence for declining populations of Long-tailed Ducks on the Arctic Coastal Plain of Alaska (Larned et al. 1999, Eider breeding population survey, Arctic Coastal Plain, 1997-1998 vs. USFWS 1999, Population status and trends of sea ducks in Alaska). Throughout this EIS, there are references to declining populations of seaducks and marine waterfowl...it needs to be made very clear which populations are being referred to. There is some convincing evidence for declining migratory populations of King and Common eiders (Suydam et al. 2000), but far less convincing evidence for declining populations of molting Long-tailed Ducks in the nearshore lagoons in the Liberty area where an oil spill is likely to affect this species. Recent evidence from NW Canada suggests that Long-tailed Duck populations may be increasing in that area (L. Dickson, CWS, Edmonton, pers. comm. to S.R. Johnson, January 2001). | 012 |
| ExSum | ES-18 | | The size of the Central Arctic Caribou herd is stated as 18,000. The year 2000 census counted the herd at 27,128 caribou.<br><br>(This comment applies throughout the DEIS where the CAH size is noted, e.g. page IV-13.) | 013 |
| ExSum | ES-20 | 1 | D.2.n Effects Summary for a Large Oil Spill - Water Quality. The water quality summary regarding impacts caused by oil and diesel product spills describe chronic and acute concentrations and estimated durations and affected area. There is no summary regarding regulatory excedences of federal and state water quality standards. For completeness, it is recommended that regulatory levels also be presented. | 014 |
| ExSum | ES-24 | 1 | E.3.a.(1)(a)Lower Trophic. The DEIS analysis for the applicant's proposed route states that, "in relation to the large range of natural variability (for suspended sediment), all of these suspended sediment effects would be barely detectable."<br><br>The DEIS should conclude that it is anticipated that a 2-4% decrease in kelp production as a result of suspended sediment input from construction activities will have a negligible effect on the Boulder Patch kelp communities. | 015 |
| ExSum | ES-24 | 1 and 2 | E.3.a.(1)(a) Alternatives and Mitigation - Lower Trophic. The DEIS states that suspended sediment related to construction would "reduce Boulder Patch kelp production by up to 6% during 1 year." The "Final Report Liberty Development: Construction Effects on Boulder Patch Kelp Production" dated May 27, 1999 by URS, UT Austin, and LGL stated, "kelp productivity reductions are estimated to be 2-4% per year, which is not cumulative." (Conclusions, Page 4-1). | 016 |
| ExSum | ES-24 | 5 | E.3.a(1)(a). A similar comment as provided for the Executive Summary | 017 |



| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| | | | D.2.d is relevant here as well. | 017 |
| ExSum | ES-25 | 1 | E.3.a.(1)(a)Water Quality. Suggested clarification for last sentence in paragraph:<br><br>Available data from site-specific sediment chemistry studies indicate that construction activities are not expected to introduce or add any chemical pollutants. | 018 |
| ExSum | ES-25 | 1 | E.3.a.(1)(a) Alternatives and Mitigation - Water Quality. Suggest adding sentence that describes the seasonal increase in suspended sediment and turbidity adjacent to the Sagavanirktok River mouth would mask any input from spoils left in the ocean dumping site. Thus, the maximum volume of spoils would have a negligible effect on the environment. | 019 |
| ExSum | ES-26 | 1 | E.3.a(1)(b)LowerTrophic. It should be noted that regardless of a 1% or up to 6% decrease in kelp productivity is negligible. Thus, there is no difference in the effect related to kelp productivity between the applicant's proposed alternative and Alternative III.A (Southern Island/Eastern Pipeline). | 020 |
| ExSum | ES-26 | 1 | E.3.a(1)(b)WaterQuality. The paragraph is confusing. Does it mean:<br><br>Construction of the southern island in shallower water is anticipated to decrease the suspended sediments by 14% and take 3 to 5 days less to construct as compared to the applicant's proposed development. Additionally, the offshore portion of the eastern pipeline route is approximately 32% shorter than the applicant's proposed development, resulting in a reduction of 15 construction days. | 021 |
| ExSum | ES-26 | 1 | E.3.a(l)(c)LowerTrophic. It should be noted that regardless of no reduction or reductions up to 6% in kelp productivity is negligible. Thus, there is no difference in the effect related to kelp productivity between the applicant's proposed alternative and Alternative III.B (Tern Island/Tern Pipeline). | 022 |
| ExSum | ES-27 | 1 | E.3.a(l)(c)Water Quality. The paragraph is confusing. Does it mean:<br><br>Construction at Tern Island is anticipated to decrease the suspended sediments by 25% and take 15 days less to construct as compared to the applicant's proposed development. Additionally, the offshore portion of the Tern pipeline route is approximately 10% shorter than the applicant's proposed development, resulting in a reduction of 5 construction days. | 023 |
| ExSum | ES-28 | 1 | E.3.a(2)(a)LowerTrophic. The DEIS states that suspended sediment related to construction would "reduce Boulder Patch kelp production by up to 6% during 1 year." The "Final Report Liberty Development: Construction Effects on Boulder Patch Kelp Production" dated May 27, 1999 by URS, UT Austin, and LGL stated, "kelp productivity reductions are estimated to be 2-4% per year, which is not cumulative." (Conclusions, Page 4-1). | 024 |
| ExSum | ES-29 | 1 | E.3.a(2)(a)WaterQuality. Suggested clarification for last sentence in paragraph:<br><br>Available data from site-specific sediment chemistry studies indicate that construction activities are not expected to introduce or add any chemical pollutants. | 025 |
| ExSum | ES-29 | 1 | E.3.a(2)(a)WaterQuality. Suggest adding sentence that describes the | 026 |

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| | | | seasonal increase in suspended sediment and turbidity adjacent to the Sagavanirktok River mouth would mask any input from spoils left in the ocean dumping site. Thus, the maximum volume of spoils would have a negligible effect on the environment. | 026 |
| ExSum | ES-29 | 10 | It is stated that the inner pipe would be protected from corrosion by a dual layer fusion bonded epoxy. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a test procedure that will be used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". The EIS should comment on this issue. | 027 |
| ExSum | ES-30 | 12 | Clarify where excavation volumes of 673,920 cubic yards comes from. | 028 |
| ExSum | ES-30 | 2 | Clarify where excavation volumes of 557,300 and 724,000 cubic yards comes from. | 029 |
| ExSum | ES-31 | 8 | Clarify where excavation volumes of 498,960 cubic yards comes from. | 030 |
| ExSum | ES-33 | 1 | E.3.a(4)(a)LowerTrophic. The DEIS states that suspended sediment related to construction would "reduce Boulder Patch kelp production by up to 6% during 1 year." The "Final Report Liberty Development: Construction Effects on Boulder Patch Kelp Production" dated May 27, 1999 by URS, UT Austin, and LGL stated, "kelp productivity reductions are estimated to be 2-4% per year, which is not cumulative." (Conclusions, Page 4-1). | 031 |
| ExSum | ES-35 | 10 | E.3.a(4)(b). There is no information presented here on nest or bird density for the exact location where the Kadleroshilik Gravel pit would be located. Nest and bird densities on adjacent tundra does not fairly represent the diversity, distribution, and abundance of birds actually nesting on the gravel bar in the river flood plain. | 032 |
| ExSum | ES-39 | 8 | The statement the steel pipe in HDPE option would shut down if a leak occurs because the outer pipeline could not withstand the operating pressure of the pipeline, implies that the steel pipe in pipe could continue to operate and would be permitted to operate if oil leaked into the annulus. Is this implication correct? | 033 |



# Chapter I. Introduction and Results of Scoping Process

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| I | I-21 | 2 | H.5.b(4)(c). The resulting changes to immediate nearshore water quality within Foggy Island Bay is relatively benign. Larger structures including Endicott MPI and West Dock are located in sufficiently deep water that occasionally is stratified during open water conditions. During stratified conditions, the bottom waters are typically cold and saline relative to the surface waters. If the longshore currents are sufficiently strong, eddies will form on the leeward side of these larger structures and resulting in the cold and saline bottom waters to the surface.<br><br>However, it should be noted that the gravel-filled jetty considered at the Liberty Shore Crossing is only 300 ft long and situated in very shallow water (<5 ft deep). While eddy formation on the leeward side of the jetty will occur during periods when current movement parallels the shore, the resulting eddy would be small and insignificant due to the small size of the jetty. Any water quality alterations attributed to the 300 ft jetty would be negligible to biological communities. | 034 |
| I | I-22 | 3 | The design ice gouge depth has been assumed to be 3 feet. As indicated in the Liberty Pipeline Design Summary, during detailed design the design ice keel gouge depth may be reassessed based on additional ice gouge data. | 035 |
| I | I-30 | 2 | H.8.b. The DEIS states that, "winter suspended sediment concentrations may range from 2-70 micrograms per liter." The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L). All quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. | 036 |
| I | I-30 | 3 | H.8.b. The DEIS states that under ice current movement is perpendicular to the shore. Recent year-long current meter records are available from UAF-IMS, and we believe funded by MMS, illustrates that the current movements are parallel to the coast.<br><br>The DEIS states that "current speeds under ice are about 0.02-0.04 knots (1 to 2 cm/s) with maximum velocities of about 0.2 knots (10 cm/s)." Velocity measurements collected during the Endicott Development Monitoring Program (USACE) found that the average speed was 1.7 cm/s 0.03 knots) with a maximum speed of 6 cm/s (0.11 knots) within Foggy Island Bay. These measurements are summarized in Table 3-2 on page 3-11 of the Ocean Discharge Criteria Evaluation (Appendix I-3 of the DEIS).<br><br>MMS should contact Dr. Tom Weingartner (907) 474-7993 to include the latest data set in the final EIS. | 037 |
| I | I-30 | 6 | H.8.b. The DEIS reports suspended sediment concentrations as micrograms per liter. The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L). All quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. | 038 |
| I | I-30 | 7 | H.8.b. The DEIS states that, "any reduction in turbidity around the construction area that might be realized in the winter could be offset by the re-suspension of the particles in the summer..."<br><br>While fine-grained (silt and clay) sediments contained by silt curtains during winter construction could be re-suspended by currents during the summer open water season, the additional loading would be insignificant due to the large volume of suspended sediment discharged directly into Foggy Island Bay from the Sagavanirktok and to a lesser extent, the Shaviovilk rivers. Biological communities such as the | 039 |

| Section | Page | Paragraph | Comment | |
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| | | | Boulder Patch kelp community have adapted to the natural variability of elevated suspended sediments observed during the summer open water season. The volume of re-suspended sediment associated with construction activities would be insignificant. | 039 |
| Map 6 | | | Vol. II, Map 6. This map shows only 2 density categories for "oldsquaws", 0-175 birds per sq km and 176-750 birds per sq km. There is ample evidence for very high densities of these ducks along the lagoonward sides of the barrier islands (Johnson and Gazey 1992). The category 176-750 birds per square km should be broken down into at least 3 categories, e.g., 176-350, 351-550, 551-750 birds per sq km. This breakdown will more accurately reflect the true distribution and abundance of the birds. | 041 |



# Chapter II. Description of Alternatives

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| II | II-07 | 7 | (a) Pipeline Construction. It might be noted that the construction activities outlined in this section were successfully completed during the Northstar construction. | 042 |
| II | II-08 | 13 | The setback of the onshore transition point (150 feet) not only accounts for erosion rate but also ice ride up and pile up. | 043 |
| II | II-09 | 7 | In the Pipeline Design Summary, it was stated that gravel bags would be used over the pipeline to prevent upheaval buckling. However, based on the Northstar experience, it may be possible to locate pipeline props and backfill with gravel only where needed. This would need to be investigated further during detailed design. | 044 |
| II | II-11 | 1 | It may be pointed out that the leaking oil diffuses into the tube at the molecular level. | 045 |
| II | II-11 | 6 | It appears "A check of the pipeline integrity..." should read "A check of the pipeline BACKFILL integrity would occur every 5 years". | 046 |
| II | II-13 | 6 | The statement is made that if damage occurred during freeze-up, it would be possible to leave the pipeline shut in until after freeze-up to allow repair from the ice. Similarly, if the damage occurred during breakup, it may be possible to leave the pipeline shut in until open water season to facilitate repair. | 047 |
| II | II-14 | 2 | In talking about the 125 barrel per day leak, it is stated that the most probable cause of this type of containment failure is corrosion. Fleet pointed out in their report that "current pipeline coating materials and in-line inspection technology will essentially eliminate corrosion failures on the Liberty Pipeline, compared to historical results". | 048 |
| II | II-15 | 1, bullet 4 | A.1.b.(4). The DEIS states, "Up to 86,000 barrels per day of seawater would be drawn and treated at the site for injection."<br><br>The NPDES permit application states that 3,640,320 gallons per day (gpd) would be drawn from the seawater intake sump. This volume corresponds to 115,565.7 bbl US of water or 86,674 bbls of oil. Suggest that the DEIS use the 3,640,320 gpd value to remove possible confusion between bbls oil vs bbls US water. | 049 |
| II | II-16 | 3 | II.A.1.b.(3)(5)(b). The DEIS states that ice road construction would require about 120 million gallons of water per year. The DPP states that the total quantity of freshwater required for project construction is approximately 120 million gallons - this includes both construction years. | 050 |
| II | II-29 | 9 | In the Pipeline Design Summary, it was stated that gravel bags would be used over the pipeline to prevent upheaval buckling. However, based on the Northstar experience, it may be possible to locate pipeline props and backfill with gravel only where needed. This would need to be investigated further during detailed design. | 051 |
| II | II-30 | 10 | The authors of the EIS suggest that the carrier pipe of a pipe in pipe system might continue to operate if the outer casing was damaged. The load which is transferred to a buried pipeline due to soil movement (e.g. ice gouging) depends on the diameter of the pipeline. If the outer pipe is present, but not offering strength to the system, a larger load could be transferred to the inner pipe than what would be seen by the inner pipe alone. | 052 |
| II | II-30 | 4 | It is stated that the inner pipe would be protected from corrosion by a dual layer fusion bonded epoxy. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a | 053 |

| Section | Page | Paragraph | Comment | |
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| | | | test procedure that will be used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". The EIS should comment on this issue. | 053 |
| II | II-30 | 8 | In talking about secondary containment, it is stated that the outer pipe would provide secondary containment capabilities in the unlikely event of a functional failure that allows oil to escape from the carrier pipeline. It should also be noted that this is only the case if the outer pipe remains intact such as from corrosion or a weld flaw (both of which have very remote possibilities) | 054 |
| II | II-31 | 3 | Burial depth should read 6 feet. | 055 |
| II | II-31 | 3 | It is stated that the inner pipe would be protected from corrosion by a dual layer fusion bonded epoxy. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a test procedure that will be used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". The EIS should comment on this issue. | 056 |
| II | II-31 | 4 | The requirement for gravel bags over the pipe in HDPE were not presented in the Pipeline Alternatives Report. | 057 |
| II | II-31 | 8 | The authors of the EIS suggest that the carrier pipe of a pipe in HDPE system might continue to operate if the outer casing was damaged. The load which is transferred to a buried pipeline due to soil movement (e.g. ice gouging) depends on the diameter of the pipeline. If the outer pipe is present, but not offering strength to the system, a larger load could be transferred to the inner pipe than what would be seen by the inner pipe alone. | 058 |
| II | II-36 | 1 | C.4.c. The long period (400 days or 1.1 years) to dewater the Duck Island mine site could preclude the use of the General NPDES permit. The EPA could require an individual NPDES permit for this discharge due to the large volume of water and duration. | 059 |
| II | II-39 | 10 | The statement that the pipe in pipe alternative "offers secondary containment" should be clarified the pipe in pipe only offers secondary containment for some types of failures. | 060 |
| II | II-40 | 2 | The statement that the pipe in HDPE alternative "offers secondary containment" should be clarified the pipe in HDPE only offers secondary containment for some types of failures. Also, this is only if the outer casing is not damaged during pipeline installation. | 061 |
| II | II-40 | 4 | The statement that the pipe in pipe alternative "offers secondary containment" should be clarified the pipe in pipe only offers secondary containment for some types of failures. | 062 |
| II | II-41 | 2 | The statement is made that the single wall steel pipeline has a higher containment failure probability then the other combination alternatives. However, the Fleet report put the single wall steel pipeline at the same probability (0.0138) as the pipe in HDPE system. | 063 |
| II II | II-28 | 10 | It appears "A check of the pipeline integrity..." should read "A check of the pipeline BACKFILL integrity would occur every 5 years". | 064 |





# Chapter III. Effects of Liberty DPP (Proposed Action)

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| III | III-A-2 | | MMS concisely presents the "significance threshold" for water quality on page III-A-2 where it presents state water quality standards. However, if the reader missed this paragraph, federal and state water quality standards are not readily apparent in the discussion. For completeness, it is recommended that the acute and chronic concentrations be presented in the same units as federal and state water quality standards for specific chemicals-of-concern. | 065 |
| III | III-A-3 | | The DEIS reports suspended sediment concentrations as micrograms per liter. The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L). All quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. | 066 |
| III | III-A-5 | 1 | A.2.c. A similar comment as provided for the Executive Summary D.2.d is relevant here as well. | 067 |
| III | III-A-9 | 1 | A.2.I. Suggested clarification for last sentence in paragraph:<br><br>Available data from site-specific sediment chemistry studies indicate that construction activities are not expected to introduce or add any chemical pollutants. | 068 |
| III | III-B-2 | 8 | Shouldn't reviewer comments on the Fleet report be included as part of EIS? | 069 |
| III | III-C-06 | 6 | "specially formulated steel..." should read "specially formulated steel and welding procedures...". | 070 |
| III | III-C-100 | 11 | C.3.I.(2)(b)2). While the sediments found in Foggy Island Bay do not exhibit metal or hydrocarbon contamination from man-made sources, low concentrations alone do not provide sufficient proof. It is the relationship between the hydrocarbons and a physical property, such as the silt and clay fraction of the grain-size distribution. The linear trends between grain-size and the sediment chemistry chemicals-of-concern demonstrate that the sediments are void of man-made concentrations. | 071 |
| III | III-C-14 | 5 | Detection limit of 0.015% should read 0.15%. | 072 |
| III | III-C-14 | 7 | The EIS states that the most likely cause for a leak of less than 125 barrels per day is corrosion, a small defect during welding, or a manufacturers defect. It should be stated that the likelihood of any of these is very small given the pipeline monitoring program, inspection of welds, and quality procedures. | 073 |
| III | III-C-21 | 5 | C.2.a. The last sentence of paragraph, citing Bratton et al. (1993), says 'Bowhead whales have "played" with floating logs and sheens of floating dye on the sea surface, suggesting they may be able to recognize floating oil'. Recommend deleting "floating logs and", as sensory cues provided by a log are very different than those from oil. | 074 |
| III | III-C-22 | 4 & 5 | C.2.a. The latter part of paragraph 4 and most of paragraph 5 deal with contaminants not associated with oil spills. This material seems out of place in the oil-spill section; if retained there, it would be helpful if the text would clarify that these contaminants are not specifically associated with oil spills. | 075 |
| III | III-C-23 | 3 | C.2.a. 3rd last sentence in paragraph says, "If oil passed through the entrances and reached the main migration corridor, some bowheads would be affected." Suggest revising to "...some bowheads could be affected." | 076 |

| Section | Page | Paragraph | Comment | |
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| III | III-C-23 | 4 | C.2.a. Suggest clarifying that , although bowheads show avoidance responses to strong icebreaker sound, they do not necessarily react to faint sound from distant icebreaking. This was demonstrated in an MMS-funded study (not presently cited) in which icebreaker sound was projected into the water near migrating bowheads (Richardson et al. 1995b, OCS Study MMS 95-0051): Richardson, W.J., C.R. Greene Jr., J.S. Hanna, W.R. Koski, G.W. Miller, N.J. Patenaude, and M.A. Smultea. 1995b. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska--1991 and 1994 phases. OCS Study MMS 95-0051; LGL Rep. TA954. Rep. from LGL Ltd., King City, Ont., for U.S. Minerals Manage. Serv., Herndon, VA. 539 p. NTIS PB98-107667. | 077 |
| III | III-C-25 | 1 | C.2.a(2)(b)1)a). The reference should be to "LGL Ecological Research Associates, Inc., 1998", as indicated in the Bibliography section of the document. | 078 |
| III | III-C-29 | 2 | Clarify that the assessment of open water spill impacts using on-ice seal densities overestimates the number of seals in the area. | 079 |
| | | | No one knows open water densities of ringed seals. | 080 |
| III | III-C-29 | 2 | C. 2.b.(2)(b). .More recent estimates of abundance for the Liberty area are available:<br>Moulton, V.D. and R.E. Elliott. 1999. Fixed-wing aerial surveys of seals near BP's Northstar and Liberty sites, 1999. p. 3-1 to 3-39 In: W.J. Richardson and M.T. Williams (eds.), Monitoring of Ringed Seals During Con-struc-tion of Ice Roads for BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999: 90-day Report. LGL Rep. TA2349-1. Rep. from LGL Ltd., King City, Ont., and LGL Alaska Res. Assoc. Inc., Anchorage, AK, for BP Explor. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Service., Anchorage, AK, and Silver Spring, MD. 68 p.<br>Moulton, V.D., R.E. Elliott and M.T. Williams. 2000. Fixed-wing aerial surveys of seals near BP's Northstar and Liberty sites, 2000. p. 3-1 to 3-32 In: W.J. Richardson and M.T. Williams (eds.), Monitoring of Ringed Seals During Con-struc-tion of Ice Roads for BP's Northstar Oil Development, Alaskan Beaufort Sea, 1999: 90-day Report. LGL Rep. TA2428-1. Rep. from LGL Ltd., King City, Ont., and LGL Alaska Res. Assoc. Inc., Anchorage, AK, for BP Exploration. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Service., Anchorage, AK, and Silver Spring, MD. 107 p. | 081 |
| III | III-C-29 | 5 | The discussion of the analysis of the probability of an oil spill contacting polar bears needs clarification. The methodology used is difficult to determine from the summary presented here.<br>The last sentence should be reworded. It implies of loss of polar bears from the project is likely - we believe it was intended to imply that the most likely loss, estimated from the analysis, is 12 or fewer bears. | 082 |
| III | III-C-31 | 2 | C.2.c(1). A similar comment as provided for the Executive Summary D.2.d is relevant here as well. | 083 |
| III | III-C-33 | 1 | c.2.C(2)(b)2). A similar comment as provided for the Executive Summary D.2.d is relevant here as well. | 084 |
| III | III-C-34 | 3 | c.2.C(2)(b)2). A similar comment as provided for the Executive Summary D.2.d is relevant here as well. | 085 |
| III | III-C-41 | | The discussion of the effect of the Exxon Valdez oil spill on fish does not reference the extensive literature showing limited impacts (e.g., Wells et al. 1995). | 086 |



| Section | Page | Paragraph | Comment | |
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| III | III-C-43 | | General Vegetation and Wetlands. There are inconsistencies and inaccuracies in the information presented about vegetation and wetlands in the DEIS. None of these are crucial mistakes in any way, but they do detract from the scientific rigor of the document. Overall the analysis and conclusions are accurate. | 087 |
| III | III-C-44 | 1 | References and statements use oil spill effects on seagrass as a basis for the section. There are more appropriate references for oil spill impacts on coastal Arctic tundra. It is unlikely that sea grass responds in the same way that arctic salt marsh responds. | 088 |
| III | III-C-47 | 1,2 | C.2.h(2)(a)2)e). References to "oldsquaws", rather than Long-tailed Duck | 089 |
| III | III-C-47 | 4 | C.2.h. 2nd last sentence of paragraph says "In the case of a winter spill, when few important subsistence resources are present...". Suggest rephrasing to acknowledge that ringed seals are common around Liberty during the winter-spring ice-covered season (e.g., Miller et al. 1998b [not presently cited]; Link et al. 1999). The former reference is Miller, G.W., R.E. Elliott and W.J. Richardson. 1998. Ringed seal distribution and abundance near potential oil development sites in the central Alaskan Beaufort Sea, spring 1997. LGL Rep. TA2160-3. Rep. from LGL Ltd., King City, Ont., for BP Exploration. (Alaska) Inc., Anchorage, AK. 43 p. | 090 |
| III | III-C-57 | 2 | C.2.I.(2)(b). The DEIS states, "the residence time is relatively short, because the coastal water masses are transported offshore."<br>Suggested Revision:<br>During the years dominated by persistent easterly winds, the residence time is relatively short, because the coastal surface waters are transported offshore and displaced by upwelled bottom waters. Even during years characterized as mixed wind or westerly wind years, periods of easterly winds (>48 hours) serve to transport coastal surface waters offshore; however, on average, the mixing will not be as effective as the years with persistent easterly winds. | 091 |
| III | III-C-57 | throughout | C.2.I.(2)(b). The use of water mass(es)) is somewhat inaccurate as it relates to movement of spilled oil. In certain instances. it is assumed that the DEIS author means "surface waters." However, the use of watermass(es) is correct when the DEIS is conveying that the spilled oil is being advected on the surface as a slick and incorporated within the water column. As the distance increases, the dEIS should note that the differential between surface waters moving at 3% of the wind speed and at a depth of 3 meters (10 ft), the current speed is 0.9% of the wind speed.<br>Also, replace "velocity" to "speed" when the DEIS presents only the magnitude of the vector. Velocity describes direction and speed. | 092 |
| III | III-C-61 | last | C.3.a. Should insert "sources" into the following sentence: "...far beyond the distances at which the sound SOURCEs can be detected by senses other than hearing." It is inevitable that sounds would not be detected by senses other than hearing; the point here is that sound sources would be detected much farther away by hearing than by other senses. | 093 |
| III | III-C-62 | 2 | C.3.a. Should insert "components" into the following text: "...but sound COMPONENTs up to 8 kilohertz are not uncommon". Fundamental frequencies of baleen whale calls are well below 8 kHz, but calls from some species can include energy up to 8 kHz. | 094 |

| Section | Page | Paragraph | Comment | |
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| III | III-C-62 | 2 | C.3.a. In lines 4-5, suggest replacing the Richardson et al. (1985) reference with Richardson et al. (1990) [not presently in Lit Cited], which takes account of more years of data and does so in more detail: Richardson, W.J., B. Wursig and C.R. Greene Jr. 1990. Reactions of bowhead whales, Balaena mysticetus, to drilling and dredging noise in the Canadian Beaufort Sea. Mar. Environ. Res. 29(2): 135-160. | 095 |
| III | III-C-62 | 5 | C.3.a. Suggest replacing "seismic operations" and "seismic pulse" in lines 3 and 7 with "drilling or tugboat [sounds]", or some other examples that are specifically relevant to the Liberty Development. | 096 |
| III | III-C-62 | 6 | C.3.a. In 4th last line of page, replace "when the signal-to-noise ratio is 30 decibels" with "assuming that the reaction threshold is a signal-to-noise ratio of 30 decibels". | 097 |
| III | III-C-64 | 7 | C.3.a. 1. Re the Richardson et al. (1985) report cited in line 6, the published version is Richardson et al. (1987): Richardson, W.J., R.A. Davis, C.R. Evans, D.K. Ljungblad and P. Norton. 1987. Summer distribution of bowhead whales, Balaena mysticetus, relative to oil industry activities in the Canadian Beaufort Sea, 1980-84. Arctic 40(2): 93-104.<br><br>2. The conclusion by Ward & Pessah (1988) cited in the last sentence of this paragraph (to the effect that the exclusion hypothesis is likely invalid) may or may not be true, but it is not well supported by the data in their paper. | 098 |
| III | III-C-65 | 2 | C.3.a. At line 22 of this paragraph., it is stated that "Koski and Johnson (1987) reported some individually recognizable bowheads returned to feeding locations within 1 day after being displaced by boats." Those authors did not document this. However, this was documented by Richardson (ed., 1987), already cited elsewhere in the DEIS. | 099 |
| III | III-C-65 | 4 | C.3.a. The last paragraph on this page would be clearer if the word "nearby" were inserted into line 5, viz. "...noise that could disturb bowhead whales NEARBY.", and if line 6 were revised as "...reasons, THESE TYPES OF NOISE SOURCES OPERATING AT LIBERTY are not expected to affect bowhead whales." | 100 |
| III | III-C-67 | 2 | C.3.a. During Northstar construction operations in the 2000 open-water season, self-propelled barges operated alongside the island for much of the time, producing more vessel noise than had been anticipated; this has been described in a recently-distributed report (Blackwell and Greene. 2001, p. 2-1 to 2-29 [ LGL Rep. TA2429-1] In: Richardson & Williams 2001*) If such operations were to occur at Liberty, the presence of the barrier islands and shallow water between Liberty and the bowhead migration corridor will mean that little if any of this vessel sound would reach the migrating bowheads. * W.J. Richardson and M.T. Williams (eds., 2001), Monitoring of industrial sounds, seals, and whale calls during construction of BP's Northstar oil development, Alaskan Beaufort Sea, summer and autumn 2000: 90-day report. Rep. from LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA, for BP Exploration. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Service., Anchorage, AK, and Silver Spring, MD. 111 p. | 101 |
| III | III-C-67 | 6 | C.3.a. This paragraph is almost identical to the last paragraph on p. III-C-65. If repeated, the same changes are recommended here as there. | 102 |
| III | III-C-71 | 1 | C.2.b.(2)(b)4). The last sentence references the behavior of ringed seals being affected, Richardson and Williams 1999, did not assess behavioral responses of ringed seals, only the relative abundance and distribution of ringed seals relative to Northstar. | 103 |



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| III | III-C-71 | last | C.3.b. This paragraph. on "Effects of Constructing Liberty Island" on seals does not take account of recent information on construction sounds and seals during construction of Northstar during the ice-covered season in early 2000 (Richardson and Williams 2000 *) or during the open-water season in mid 2000 (Richardson and Williams 2001; reference given in earlier comment re p. III-C-67). The results showed little if any effect of the construction operation on the number of seals close to the island during spring. * Richardson, W.J. and M.T. Williams (eds.). 2000. Monitoring of ringed seals and sounds during construction of BP's Northstar oil development, Alaskan Beaufort Sea, winter and spring 1999-2000: 90-day report. Rep. from LGL Ltd., King City, Ont., and LGL Alaska Res. Assoc. Inc., Anchorage, AK, for BP Exploration. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Service., Anchorage, AK, and Silver Spring, MD. 107 p. | 104 |
| III | III-C-73 | 4 | C.3.c(2)(b)1). Delete comma between "3.1" and "long-tailed duck | 105 |
| III | III-C-75 | | It was noted that foxes could benefit from the Liberty Development by finding shelter. Caribou also use oil field structures for shelter from insects. | 106 |
| III | III-C-76 | 1 and 2 | C.3.e(1). The DEIS states that suspended sediment related to construction would "reduce Boulder Patch kelp production by up to 6% during 1 year." The "Final Report Liberty Development: Construction Effects on Boulder Patch Kelp Production" dated May 27, 1999 by URS, UT Austin, and LGL stated, "kelp productivity reductions are estimated to be 2-4% per year, which is not cumulative." (Conclusions, Page 4-1). | 107 |
| III | III-C-78 | 1 - 1st bullet | As per Gallaway, Martin, and Dunton 1999 and Ban et al. 1999 the effects of the sediment on kelp production are not cumulative. Change "another 2%" to "by 2% also." | 108 |
| III | III-C-78, IV-15,78,91 | 3 | C.3.e(2)(b)2)b). The DEIS states a 4,700 ft-long section of the corridor will be traversed where scattered bivalve shells, pebbles, and rocks (some of the rocks with small kelp plants attached) were present. Bottom coverage by these materials comprised less than 1% in most cases, and in no case was the cover greater than 2%. The EIS authors arbitrarily assumed the area had a 1% coverage of kelp and hard substrate.<br>Even though 1% is a small number, the implication that "kelp" and solid substrate suitable for kelp attachment covered this much of the bottom area is in gross error. The substrate material containing attached kelp or that was even suitable for kelp attachment was far less. Recall that most of the material was scattered bivalve shells and pebbles and there were very few rocks in the cobble size and larger range. Further, the area in question is depositional in nature (not erosional as required for kelp community development).<br><br>The 4,700-ft length of the corridor passing through the area containing the scattered shell and pebble habitat was multiplied times the trench width (132 ft), to determine that about 14 acres of this habitat would be affected. This total area is then compared to the 15,871-acre area of the Boulder Patch having >10% bottom cover by kelp and hard substrate. The 14 acres lost were divided by 15,871 acres of Boulder Patch habitat showing that the buried habitat would equal less than 0.1% of the total. These are not comparable habitats by any stretch of the imagination. The authors do acknowledge that the concentration of kelp in the Boulder Patch is more than 10 times that in the corridor such that the actual loss of kelp biomass and production would be less than 0.01% of the total (actually 14 acres would be 0.00008 of the Boulder Patch habitat). The claimed losses, albeit very small, are gross overestimates. The pipeline corridor does not contain suitable habitat | 109 |

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| | | | for kelp in terms of substrate and sedimentation dynamics.<br><br>The EIS suggests that trenching effects could be mitigated if excess quarry boulders were placed on the backfill in the outer portion of the trench. However, if this area is depositional in nature as believed, the hard substrate placed down would soon be silted over. The pipeline corridor does not constitute kelp community habitat. There will be no significant effect on Boulder Patch habitat from trenching through this zone, certainly not any effect of a magnitude requiring mitigation.<br><br>(This same section is also repeated in its entirety beginning on pages IV-15, IV-78, and IV-91; therefore the above comments to these sections also.) | 109 |
| III | III-C-81 | 7 | C.3.h Where it is stated (line 9) that "Traditional Inupiat testimony, however, affirms effects at greater distances...", it would be appropriate to note that this testimony concerned bowheads reacting to industrial activities in the open sea, not in a lagoon separated from the bowhead migration corridor by barrier islands and/or shallow water. | 110 |
| III | III-C-82 | last | C.3.h. Re the comment by H. Aishanna that Kaktovik got no whales in 1985 because of the presence of the SSDC, and the further reference to 1985 at the end of the paragraph (top of p. III-C-83), it is also noteworthy that, for an extended period in Sept 1985, the Kaktovik hunters were unable to reach the whales because of a grounded pressure ridge that prevented the whaling boats from moving very far from the village. | 111 |
| III | III-C-83 | 4 | C.3.h. See earlier comment re p. III-C-71, last paragraph -- the same new info on construction sounds and seals near Northstar in 2000 is also relevant here. Displacement of seals during Northstar construction was apparently less than anticipated based on earlier studies. | 112 |
| III | III-C-93 | | There are several instances where the DEIS mixes turbidity and suspended sediment units. Turbidity units are stated in nephelometric turbidity units (NTU), and total suspended sediment (TSS) units are typically milligrams per liter.<br><br>Concern arises with the following statement (i.e., page III-C-93, 1st paragraph):<br>"Increases in turbidity generally are expected to be considerably less than the 7,500 parts per million suspended solids..." For clarification, it is recommended that the sentence state: "Increases in suspended sediment associated with island and pipeline construction are expected to be significantly less than the 7,500 parts per million suspended solids (milligrams per liter [mg/L]) defined in this analysis as the acute (toxic) criterion for water quality." | 113 |
| III | III-C-93 | 1 | C.3.I(2)(a). The DEIS states that, "In the winter, suspended-sediment concentrations in the nearshore waters may range from about 2-70 micrograms per liter (2-70 parts per million)..."<br><br>The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L), and thus, all quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. Note: 1 milligram per liter equals 1 part per million, thus check all references that refer TSS in ppm. | 114 |
| III | III-C-93 | 1 | C.3.I(2)(a). The DEIS states that, "Suspended-sediment concentrations in the nearshore waters may range from 30 to more than 300 micrograms per liter (30-300 parts per million)..." | 115 |



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| | | | The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L), and thus, all quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. Note: 1 milligram per liter equals 1 part per million, thus check all references that refer TSS in ppm.<br><br>Note: In situ turbidity measurements collected during the 1998 open-water season study within Foggy Island Bay ranged between 0 and 82 NTU, while TSS ranged from 8 to 67 milligrams per liter (mg/L). | 115 |
| III | III-C-93 | 1 | C.3.I(1). Suggested clarification for last sentence in paragraph:<br><br>Available data from site-specific sediment chemistry studies indicate that construction activities are not expected to introduce or add any chemical pollutants. | 116 |
| III | III-C-93 | 1 | C.3.I.(1). Suggest adding sentence that describes the seasonal increase in suspended sediment and turbidity adjacent to the Sagavanirktok River mouth would mask any input from spoils left in the ocean dumping site. Thus, the maximum volume of spoils would have a negligible effect on the environment. | 117 |
| III | III-C-93 | 4 | C.3.I.(2)(a). The DEIS summarizes state water quality standards regarding turbidity for marine waters. However, it does not address sediment (settleable solids) in 18AAC70.020(2)(A-D). This should be included. Additional comments should be considered noting that 18AAC70.200 allows ADEC to grant a short-term variance for temporary activity associated with the placement of dredged or fill material affecting a specific waterbody: [citation 18AAC70.200(2)].<br><br>Also, the State of Alaska does not directly regulate activities beyond the 3-mile limit. Therefore, the DEIS should clarify where state water quality standards apply. | 118 |
| III | III-C-93 | 5 | C.3.I.(2)(a). The DEIS states, "Experiences with actual dredging and dumping operations in other areas show a decrease in the concentration of suspended sediments within a short time (2-3 hours) and distance downcurrent (1-3 kilometers [0.6-2 statue miles]) from the discharge."<br><br>1. Provide citation(s).<br>2. Are these observations related to dredge and fill operations using fine-grained sediments, or restricted to gravel-filled operations?<br>3. Where are the other areas and are these areas analogous to Foggy Island Bay? | 119 |
| III | III-C-93 | 6 | C.3.I.(2)(a). The DEIS states that, "suspended-sediment concentrations was 70 micrograms per liter (70 parts per million)...30 micrograms per liter (30 parts per million)...10 micrograms per liter (10 parts per million)..."<br><br>The typical reported total suspended sediment (TSS) concentration unit is milligrams per liter (mg/L), and thus, all quantitative values for TSS should be reviewed to assure that the correct unit of measure is used. Note: 1 milligram per liter equals 1 part per million, thus check all references that refer TSS in ppm. | 120 |
| III | III-C-93 | 7 | C.3.I.(2)(a). The DEIS states, "Turbidity formed by construction activities likely would be smaller in the winter than in the summer during open water."<br><br>Suggested statement: | 121 |

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| | | | Island and pipeline construction during winter months would probably result in lower suspended sediment discharge due to freezing and clumping of excavated material. | 121 |
| III | III-C-94 | 1 | C.3.I.(2)(a). The DEIS describes water quality sample results associated with the Northstar Development test trench. Earlier, the DEIS cited Tefrey regarding water quality sample collection during backfilling operations for the Northstar pipeline construction. The results from Tefrey's report should be included here too. | 122 |
| III | III-C-94 | 2 | C.3.I.(2)(a). For clarification and completeness, the following is suggested:<br><br>Throughout the grounded ice zone, the nearshore area of Foggy Island Bay where the sea ice is grounded or attached to the sea floor, there is very limited amounts of free water. The excavation will be in high water content sediments (mucky conditions); however, there is insufficient free water available to transport suspended sediments into the water column found below the floating landfast ice. Therefore, it is anticipated that the pipeline construction from shore to the 2 meter (6.5-ft) isobath will have negligible effect to the water quality within Foggy Island Bay. | 123 |
| III | III-C-94 | 3 | C.3.I.(2)(a). Correct Sentence: "Generally, increases in wind speed, duration, and fetch increases wave height.", replacing "or" with a comma. | 124 |
| III | III-C-94 | 6 | C.3.I.(2)(a). The DEIS estimates current speed with wind speed. It is suggested that summaries of Endicott Development Monitoring Program be included since current meters were deployed in Foggy Island Bay. | 125 |
| III | III-C-94 | 8 | C.3.I.(2)(a). Suggested Statement:<br><br>It is anticipated that excavation and fill activities associated with island and pipeline construction will not introduce elevated concentrations of trace metals or hydrocarbons. The sediments along the pipeline route and gravel from the proposed mine site do not contain elevated concentrations of trace metals or hydrocarbons. | 126 |
| III | III-C-94 | 9 | C.3.I.(2)(a). Suggested addition to first sentence:<br><br>"The nearshore Beaufort Sea sediments come from [suspended sediment associated with] river [discharge] and coastal erosion. | 127 |
| III | III-C-95 | 1 | C.3.I.(2)(a). The paragraph summarizes sediment quality data collected as part of the MMS Beaufort Sea Monitoring Program. The DEIS inadvertently reports metal (i.e. barium, chromium, copper, vanadium) in micrograms per liter. These units are not correct--the correct units should be milligrams per kilogram (mg/Kg). | 128 |
| III | III-C-95 | 2 | C.3.I.(2)(a). Verify the units nanograms per gram as presented in the DEIS are correct. | 129 |
| III | III-C-95 | 4 | C.3.I.(2)(a). Maintain consistency in units for ERL, ERM and measured PAH concentrations (i.e.., nanogram per gram vs. milligram per kilogram vs. ppb). Presenting PAH concentrations as nanogram per gram and ERL/ERM as ppb is confusing to the reader. | 130 |
| III | III-C-95 | 6 and 7 | C.3.I.(2)(a). The DEIS summarizes historical studies from the 1980's and early 1990's. However, sediment chemistry results from the ANIMIDA study are missing and should be incorporated. MMS notes the ANIMIDA study in the DEIS, however, does not include its results. | 131 |
| III | III-C-96 | 2 | C.3.I.(2)(b)1). The DEIS states, "The island is located seaward of the | 132 |





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| | | | area where the water is frozen from the surface to the seafloor in the winter, the bottomfast-ice zone; this area extends from the shoreline out to depths of about 6 or 7 feet."<br><br>Suggested Statement:<br>The island is located within the floating-fast ice area of Foggy Island Bay where maximum ice thickness reach, on average, 6.5 to 7 ft. Nearshore areas within Foggy Island Bay that are typically shallow, that is less than 6.5 ft, coincide with the grounded ice or bottom-fast ice zone. The bottom-fast ice zone is characterized by sea ice that is attached to the seafloor, with no appreciable amounts of free water observed above the seafloor. | 132 |
| III | III-C-97 | 1 | C.3.I.(2)(b)1). Expand the one sentence statement regarding deposition of sediments associated with gravel island construction by summarizing the expected thickness with the corresponding distance. | 133 |
| III | III-C-97 and III-C-98 | 7 | C.3.I.(2)(a). The DEIS summarizes hydrocarbon and trace metal sediment chemistry; however, it does not provide a concise conclusion statement that informs the reader that the sediments within Foggy Island Bay are not considered to be contaminated with hydrocarbons or metals. | 134 |
| III | III-D-08 | 7 | D.2. Gravel Mining. Suggest noting that the 22 acre gravel mine site reserve area was identified as a source for gravel in the extremely unlikely event that an emergency required the construction of an alternate island location. This need was factored into the planning process in an effort to consider all project needs and effects. | 135 |
| III | III-D-08 to III-D-13 | | The overall conclusions on impacts of gravel mining in the Kad River are consistent with known scientific fact. Assessment of effects of gravel removal in arctic rivers has been studied for several decades, but the ability to predict effects on river habitats from gravel removal is imprecise. Predicting bedload movement and how a river will respond to changes in gravel volumes within a river floodplain has been monitored in Alaska but not accurately modeled. However, based upon available information, MMS has conducted a fair appraisal of impacts of Kad River gravel mining on the river environment. | |
| III | III-D-09 | 2 | This section of the DEIS states that very little has been documented on effects of gravel mining in North Slope rivers. Please note the publications available on this subject in the previous comment. Industry has been mining gravel from North Slope rivers for several decades, and government agency scientists have monitored and studied effects of gravel mining for many years. There are about 15 mine sites that have been used as gravel sources for the North Slope oil fields, and many others for construction and maintenance of TAPS north of the Brooks Range. Relevant information should be reviewed at the Joint Pipeline Office and at Alyeska Pipeline Service Company. We encourage MMS to reevaluate this statement, and include a treatment of the available information on this subject.<br><br>Note that the Kuparuk River floodplain currently provides gravel for oil field uses, and also provides enhanced fish habitat (the Kuparuk Deadarm sites). ADF&G has assisted industry with protocols for mining gravel to enhance fish habitat at some of these sites. A great deal is known about the "...instream habitat used by native fishes..." on the North Slope. ADF&G can be contacted for this information (Dr. Al Ott or Bill Morris, Fairbanks). | 136 |
| III | III-D-09 | 2 | The statement that little is known about how a gravel mine might affect riverine processes in an arctic river is not entirely accurate. Please see | 137 |

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| | | | the previous two comments that relate to this issue. Studies of riverine processes associated with gravel mining have been conducted in several locations in the North Slope oilfields and along the TAPS. For example, maintaining the integrity of the Sagavanirktok River to protect the adjacent TAPS facilities has involved placement of in-channel spur dikes. These structures have been monitored for many years in the Sagavanirktok River. Alyeska Pipeline Service Company has studied spur dike effects on fish and habitat (see Martin et al. 1993)*. The JPO also has monitored these structures and evaluated their effects on river habitat. USGS has studied fluvial processes in various river types in Alaska (contact the Water Resources Division), and publications are available on these studies. Alyeska and other pipeline companies have experience designing pipeline crossings of arctic rivers. From these sources it is likely that existing knowledge of arctic river mechanics can be developed upon which MMS can base an assessment of the Kad River mine site.<br><br>* Martin, L.R., W.J. Wilson, R.L. Howard, and S. Kirk Waggoner. 1993. Assessment of fish overwintering and habitat conditions in the Sagavanirktok River near Trans-Alaska Pipeline milepost 47. Report for America North and Alyeska Pipeline Service Company. Prepared by LGL Alaska Research Associates, Inc., Anchorage, AK. 13 p. | 137 |
| III | III-D-09 | 2 | Regarding availability of reports on North Slope gravel mining and fisheries/habitat issues, the ADF&G has prepared many reports that are available. We encourage MMS to obtain these and cite them in the EIS. Bill Morris or Al Ott with ADF&G in Fairbanks can be contacted. If their reports are difficult to locate, BPXA will make copies available to MMS. Many of these reports document the results of studies of gravel mine sites in the oil fields of arctic Alaska and are directly relevant to addressing impacts of the proposed Kad River mine site on fish and aquatic habitat. Some of these reports include:<br><br>West channel Sagavanirktok River spine road crossing fisheries investigations, 1997-1999. Ott and Morris. 1999.<br><br>Tundra stream fish habitat investigations in the North Slope oilfields. Hemming. 1993.<br><br>Fisheries enhancement investigations in the Prudhoe Bay and Kuparuk River oilfields, 1993. Hemming. 1995.<br><br>Fisheries enhancement investigations in the Kuparuk River oilfield, 1992. Hemming. 1994.<br><br>Goose Green Gulch: fish and wildlife habitat in a former gravel mine site. Winters. 1990.<br><br>Fish and habitat investigations of flooded North Slope gravel mine sites, 1990. Hemming. 1992.<br><br>ADF&G flooded gravel mine studies since 1986 and an Arctic grayling experimental transplant into a small tundra drainage. A synthesis. Roach. 1993.<br><br>Fisheries investigations of flooded North Slope gravel mine sites, 1989. Hemming. 1990.<br><br>Limnological and fisheries investigations of flooded North Slope gravel mine sites, 1988. Hemming, Weber, and Winters. 1989.<br><br>Aquatic habitat evaluation of flooded North Slope gravel mine sites | 138 |



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| | | | (1986-1987). Hemming. 1988. | 138 |
| III | III-D-09 | 3 | The Oregon study cited here is probably relevant to channel changes in Oregon rivers, but may not be applicable to Alaskan arctic rivers. Some of the issues raised in the Oregon study are not issues in the Kad River. In Oregon, people are concerned with even very small changes in river structure and function, as these changes may affect adjacent homes, bridges, farm or grazing areas, and other structures, not to mention many species of listed threatened or endangered fish species. The Kad River issues are very different, since the fluvial processes in the Kad River, with or without mining, will not have economic or social impacts, but rather only physical or ecological effects. The Kad River likely works and reworks the gravels within its floodplain based on river mechanics principles studied by various engineers and hydrologists in Alaska. We believe that using available information on riverine processes from arctic Alaska is more relevant than using the Oregon experience to evaluate gravel mining for the Liberty project. The USGS, Water Resources Division, has reports available on behavior of Alaskan river channels and bedloads. | 139 |
| III | III-D-13 | 1 | D.2 If flooding or storm surge caused suspension of fine grained materials in the mine site reservoir area, wouldn't the reservoir then act like a sedimentation basin and allow settlement of a portion of these fines before being transported to the river system? Also, note that the mine site is likely to be flooded during spring breakup, so any suspended sediments would be discharged with peak flows rather quickly and would likely not cause a significant increase over background suspended sediment concentrations. | 140 |
| III. | III-C-62 | 3 | C.3.a. 1. In line 3 of 3rd paragraph, , delete "Kryter, 1985, as reported in". Kryter deals with humans and to some degree lab animals, but definitely not bowheads.<br><br>2. In line 10 of the same paragraph., insert "strong", viz "...whales would not likely remain close to a STRONG noise source for long." We know that they sometimes do tolerate exposure to weaker man-made noises. (3)At end of this paragraph., should either delete material on reactions to seismic vessels (not part of the proposed activity) or else add "In any event, seismic exploration is not part of the proposed Liberty Development." | 141 |

# Chapter IV. Effects of Alternatives

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| IV | | | Table IV.A-3. The table is a summary of the water quality issues by alternative. Comments related to the Executive Summary and the BPXA proposed development (Section III) should be applied to this table. | 142 |
| IV | IV-1 to IV-103 | | Water Quality comments regarding alternatives noted by comments associated with the Executive Summary and for the most part, comments associated with Section III. Thus, there are no specific water quality comments for Section IV. | 143 |
| IV | IV-10 | 1 | C.1.c(2)(a)2)1). A similar comment as provided for the Executive Summary D.2.d is relevant here as well. | 144 |
| IV | IV-101 | 6 | Clarify what is meant by "This pipeline provides some additional protection of the inner pipe from ice gouging". | 145 |
| IV | IV-102 | 6 | Clarify what is meant by "This pipeline provides some additional protection of the inner pipe from ice gouging". | 146 |
| IV | IV-13 | 1 | C.1.c.(4)(b) 1). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 147 |
| IV | IV-13 to IV-16 | Alt 1 - lower-level troph | C.1.c.(4). Effects on Lower Trophic. Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 148 |
| IV | IV-15 | 3 1st bullet | C.1.c.(4)(b) 2) b). As per Gallaway, Martin, and Dunton 1999 and Ban et al. 1999 the effects of the sediment on kelp production are not cumulative. Change "another 2%" to "by 2% also." | 149 |
| IV | IV-25 | 2 | C.1.d.(4)(b) 2). The EIS should describe where the percent reductions of 5.10 and 6.33% come from? The reductions discussed in Ban et al and Gallaway et al are not cumulative. | 150 |
| IV | IV-32 | 2 | C.1.e.(4)(b) 2). Please provide reference for the 7% and 6% reduction in kelp production. The reductions discussed in Ban et al and Gallaway et al are not cumulative. | 151 |
| IV | IV-36 | 8 | The statement that the pipe in pipe alternative "offers secondary containment" should be clarified the pipe in pipe only offers secondary containment for some types of failures. | 152 |
| IV | IV-38 | 10 | The quote from the C-CORE report suggests the annulus of a double wall pipe can be monitored for pipe degradation. More information should be provided about how this could be accomplished. | 153 |
| IV | IV-38 | 4 | C.2.c. Suggest evaluating how regulatory agencies might treat the situation where an inner pipe had leaked into an annulus. | 154 |
| IV | IV-38 | 4 | The statement that the pipe in pipe alternative "provides a secondary containment capability" should be clarified the pipe in pipe only offers secondary containment for some types of failures. | 155 |
| IV | IV-39 | 4 | The DEIS states that the pipe in pipe would provide better leak detection capability with LEOS. LEOS can detect the presence of very small amount of hydrocarbons either through direct contact with the sensory tube as a gas or a liquid, or if the gas or liquid hydrocarbon is dissolved in water. If the tube was buried exterior to a single wall pipe, | 156 |



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| | | | hydrocarbon molecules will travel through the water-soil matrix into the tube. If the tube were placed in the annulus, the tube may not come in direct contact with the hydrocarbon liquid. However, gas molecules from the hydrocarbon vapor would diffuse through the sensor tube indicating a leak. In either case, testing of the LEOS system for hydrocarbons would happen once a day. | 156 |
| IV | IV-39 | 5 | Would monitoring capabilities of the inner pipe be affected by pipe in pipe spacers? | 157 |
| IV | IV-39 | 5 | It is stated that the wall thickness pig cannot monitor the outer pipe. If one component of the system cannot be monitored, then the integrity of the overall system as a whole is not known. | 158 |
| IV | IV-39 | 5 | It is stated that there would be a CP system installed on the pipe in pipe system, but the effectiveness of this system cannot be monitored as thoroughly as a single wall pipe. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a test procedure that will be used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". | 159 |
| IV | IV-40 | 12 | The fact that the Fleet (2000) and the C-CORE report differ on the probability of a functional failure of a pipe in pipe system indicates the uncertainty in the design and use of a pipe in pipe system. | 160 |
| IV | IV-42 | 8 | Stress Engineering commented that they would expect leaks on the side of the pipe opposite to the LEOS tube to be detected sooner if confined in an annulus. In the following paragraph, they state that they would expect that any leak in the pipeline would be on the order of a 29 BOPD minimum.<br><br>LEOS can detect the presence of very small amount of hydrocarbons either through direct contact with the sensory tube as a gas or a liquid, or if the gas or liquid hydrocarbon is dissolved in water. If the tube was buried exterior to a single wall pipe, hydrocarbon molecules will travel through the water-soil matrix into the tube. If the tube were placed in the annulus, the tube may not come in direct contact with the hydrocarbon liquid. However, gas molecules from the hydrocarbon vapor would diffuse through the sensor tube indicating a leak. In either case, testing of the LEOS system for hydrocarbons would happen once a day.<br><br>Given the size of the minimum leak compared to the minimum detectable leak by the LEOS system (0.3 barrels), would there really be a faster detection if there were an annulus? | 161 |
| IV | IV-43 | 6 | It is stated that the suggested CP methods should supply adequate CP to the inner pipe. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a test procedure that will be used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". | 162 |
| IV | IV-44 | 2 | Pipeline flotation during backfilling would only be an issue with some of the designs. | 163 |
| IV | IV-44 | 5 | It is stated that the CP system would provide some benefit to the inner pipe. It was pointed out in the draft of the Stress Engineering report (p.18) that CFR 49 195.242 requires, "... a test procedure that will be | 164 |

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| | | | used to evaluate adequacy of the CP system" and "The code requirement will not be waived and therefore it makes the design of the CP system the critical issue". Stress Engineering notes, " ... the cathodic protection of the inner pipe could not be monitored". | 164 |
| IV | IV-44 | 6 | Response to the Stress Engineering concerns were submitted by BPXA May 1, 2000 and are included in the INTEC Addendum to the pipeline alternatives report (INTEC, 2000). | 165 |
| IV | IV-46 | 2 | It appears "A check of the pipeline integrity..." should read "A check of the pipeline BACKFILL integrity would occur every 5 years". | 166 |
| IV | IV-46 | 7 | The DEIS states that the carrier pipe of a pipe in pipe or pipe in HDPE system might continue to operate for a limited time if the outer casing was damaged. The load which is transferred to a buried pipeline due to soil movement (e.g. ice gouging) depends on the diameter of the pipeline. If the outer pipe is present, but not offering strength to the system, a larger load could be transferred to the inner pipe than what would be seen by the inner pipe alone. | 167 |
| IV | IV-47 | 9 | The wall thickness pig cannot determine if the outer pipe has been damaged. As the integrity of one component of the system is not known, the integrity of the pipe in pipe or pipe in HDPE system is not known. | 168 |
| IV | IV-49 | 1 and 2 | C.2.h.(1)(b) 1). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 169 |
| IV | IV-55 | 9 | It is stated that the inner pipe will be protected from corrosion by FBE. Is a CP system not required? | 170 |
| IV | IV-56 | 2 | i. (1) (b) 2). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 171 |
| IV | IV-56 | 4 | The statement should read that the alternative provides secondary containment for the case where the inner pipe leaks but the outer remains intact. | 172 |
| IV | IV-60 | 11 | It is stated that the inner pipe will be protected from corrosion by FBE. Is a CP system not required? | 173 |
| IV | IV-61 | 2 | The requirement for gravel bags over the pipe in HDPE were not presented in the Pipeline Alternatives Report. | 174 |
| IV | IV-62 | 1 | j.(6) 2). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 175 |
| IV | IV-66 | 2 | k.(5) (b) 2). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 176 |
| IV | IV-77 | 1and 2 | 4. a. (5)(b)1). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% | 177 |



| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| | | | reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 177 |
| IV | IV-78 | 2 1st bullet | 4. a. (5)(b)2) b). As per Gallaway, Martin, and Dunton 1999 and Ban et al. 1999 the effects of the sediment on kelp production are not cumulative. Change "another 2%" to "by 2% also." | 178 |
| IV | IV-86 | 3 and 4 | C.4.b. The effects of discharge of about 600 million gallons of water to the tundra or nearby small nearby streams should be evaluated.<br><br>The analysis discusses dewatering and also references use of the mine site as a water source for ice road construction. If the mine site has been dewatered, it isn't available as a water source - the water would need to be entirely removed to extract gravel. This would need to be complete by about the same time as ice road construction would begin.<br><br>If the water is available from the mine site for ice road construction, the practice of pumping and/or spraying for construction should oxygenate the water. | 179 |
| IV | IV-89 | 1 and 2 | 5. a. (2) (b) 1). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. | 180 |
| IV | IV-90 | 1 1st bullet | 5. a. (2) (b) 2) b). As per Gallaway, Martin, and Dunton 1999 and Ban et al. 1999 the effects of the sediment on kelp production are not cumulative. Change "another 2%" to "by 2% also." | 181 |
| IV | IV-97 | 2 | 5. b. (2) (b) 2). Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. Also provide reference for "two times as much sediment." | 182 |
| IV | IV-50 | 2, 1st bullet | As per Gallaway, Martin, and Dunton 1999 and Ban et al. 1999 the effects of the sediment on kelp production are not cumulative. Change "another 2%" to "by 2% also." | 183 |

H.(1) (b) 2) b

# Chapter V. Cumulative Effects

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| V | Figure V-4 | | Figure V-4 should depict the Porcupine caribou herd's calving range extending eastward into Canada, as it does in many years. | 184 |
| V | V-05 | 2 | B. Activities Considered in the Cumulative-Effects Analysis. No mention in this section on two major projects currently being considered...(1) the Over-The-Top Arctic Gas Pipeline Option, and (2) TAPS renewal. The discussion on page V-11 only considers a gas pipeline along the existing utility corridor, not the Over-The-Top option. | 185 |
| V | V-07 | 3 | B.3. Reasonably Foreseeable Future Development / Production. The same comment as provided for Chapter B, page V-5 is applicable here as well. | 186 |
| V | V-11 | 1 | B.9.6. The same comment as provided for Chapter B, page V-5 is applicable here as well. | 187 |
| V | V-13 | | It is good that the Cumulative Effects assessment recognizes that natural population fluctuations may be hard to identify and separate from anthropogenic impacts. | |
| V | V-15 | 7 | C.1. Last 2 sentences indicate that there has been little recent oil-industry interest in the Mackenzie Delta and offshore Tuk Peninsula area. Although true during the 1990s, interest in this area, including waters offshore of the Mackenzie Delta, has increased considerably. Open-water seismic exploration is planned for the summer of 2001. | 188 |
| V | V-16 | 2 | C.1. Lines 8-10 from end of long paragraph state, "There was little or no evidence of differences in headings, general activities, and swimming speeds of bowheads with and without seismic operations." Although true from a strict statistical perspective, Miller et al. (1999, p. 5-63) also concluded that the headings must have been deflected given the demonstrated offshore deflection of the migration corridor. | 189 |
| V | V-17 | 1 | C.1. 1. In lines 4-5, suggest rephrasing as "...on their fall migration, if pipeline construction in deeper water occurred during the LATTER PART OF the open-water season." | 190 |
| | | | 2. In line 10, suggest "...but they still WILL exhibit some localized avoidance..." | 191 |
| V | V-27 | 1 | 2.b.2.a. Second to last sentence, add reference MacLean,S.A. 1998. Marine mammal monitoring of an on-ice seismic program in the eastern Alaskan Beaufort Sea. Report by LGL Alaska Research Associates, Inc., Anchorage, AK for BP Exploration (Alaska) Inc., Anchorage, AK and National Marine Fisheries Service, Anchorage, AK. 16 p. | 192 |
| V | V-29 | 1 | 2.b.4.c. Statement, "There also could be local effects on harbor seals, as resulted from the 1989 Exxon Valdez oil spill."<br>This statement is not referenced, and recently published article brings previous work into question.<br>Hoover-Miller, A, K.R. Parker and J.J. Burns. 2001. A reassessment of the impact of the Exxon Valdez oil spill on harbor seals (Phoca vitulina richardsi) in Prince William Sound. Marine Mammal Science. 17(1) 111-136. | 193 |
| V | V-33 through V-35 | | The discussion on cumulative effects on terrestrial mammals contains none of the important references to the work documenting the healthy status of the herd using existing oil fields (Maki 1992, Pollard et al. 1996a, 1996b, Ballard et al. 1999, Noel et al. 1998, Cronin et al. 1997, 1998a, 1998b, 2000). | 194 |



| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| V | V-33 through V-35 | | It is stated that caribou cows with calves tend to avoid roads with traffic. It should be specified this is only during the brief calving period. During the post-calving period calves frequently occur close to, and on, roads in the oil fields. | 195 |
| V | V-44 | 4 | C.8. In last sentence, delete "except" from "hunted by North Slope subsistence hunters except opportunistically while in pursuit of more preferred subsistence resources." | 196 |
| V | V-46 | | Under caribou and other terrestrial mammals, it is stated that oil field effects on calving may occur, even though it may not be measurable. Because the level of calf production on the west (oilfield) side of the herd is higher than on the east (undeveloped) side, it would be logical to state the converse that the oil fields may enhance calf production. This view is more strongly supported by the data.<br>Ballard, W. B., M. A. Cronin, and H. A. Whitlaw. 1999. Interactions between caribou and oil fields: the Central Arctic caribou case history. In: J. Truett and S. Johnson, eds. The natural history of an oil field. Academic Press. In press.<br>Cronin, M. A., H.A. Whitlaw, and W.B. Ballard. Submitted. Northern Alaska oil fields and caribou-Addendum. Wildlife Society Bulletin.<br>Cronin, M. A., H.A. Whitlaw, and W.B. Ballard. 2000. Northern Alaska oil fields and caribou. Wildlife Society Bulletin 28:919-922.<br>Cronin, M. A., B. J. Pierson, S. R. Johnson, L. E. Noel, and W. B. Ballard. 1997. Caribou population density in the Prudhoe Bay region of Alaska. Journal of Wildlife Research 2:59-68.<br>Cronin, M. A., W. B. Ballard, J. D. Bryan, B. J. Pierson, and J. D. McKendrick. 1998a. Northern Alaska oil fields and caribou: A commentary. Biological Conservation 83:195-208.<br>Cronin, M. A., S. C. Amstrup, G. M. Durner, L. E. Noel, T. L. McDonald, and W. B. Ballard. 1998b. Caribou distribution during the post-calving period in relation to infrastructure in the Prudhoe Bay oil field, Alaska. Arctic 51:85-93.<br>Maki, A. M. 1992. Of measured risks: the environmental impacts of the Prudhoe Bay, Alaska, oil field. Environmental Toxicology and Chemistry 12:1691-1707.<br>Noel, L. E., R. H. Pollard, W. B. Ballard, and M. A. Cronin. 1998. Activity and use of active gravel pads and tundra by caribou, Rangifer tarandus granti, within the Prudhoe Bay oil field, Alaska. Canadian Field Naturalist 112:400-409.<br>Pollard, R. H., W. B. Ballard, L. E. Noel, and M. A. Cronin. 1996a. Summer distribution of caribou, Rangifer tarandus granti, in the area of the Prudhoe Bay Oil Field, Alaska, 1990-1994. Canadian Field-Naturalist 110:659-674.<br>Pollard, R. H., W. B. Ballard, L. E. Noel, and M. A. Cronin. 1996b. Parasitic insect abundance and microclimate of gravel pads and tundra within the Prudhoe Bay Oil Field, Alaska, in relation to use by caribou, Rangifer tarandus granti. Canadian Field-Naturalist 110:649-658.<br>Wells, P.G., J. N. Butler, and J. S. Hughes, 1995. editors. Exxon Valdez oil spill: fate and effects in Alaskan waters, ASTM STP 1219, American Society for Testing and Materials, Philadelphia | 197 |

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| V | V-58 | 4 and 5 | C.12.b. Because the Liberty Development does not include a causeway, suggest ending the discussion after the first and second sentence of paragraph 4. | 198 |
| V | V-58 to V-60 | all | C.12.c. The DEIS presents a water quality summary, specifically PAH distribution through time and area from the EVOS. The relevance to cumulative effects is not clear. There is no analysis that demonstrates that the action (tankering to carry Liberty oil to market) is related to other actions with individually insignificant, but cumulatively significant, impacts. An example related to marine water quality in Port Valdez could be the additional life of TAPS Marine Terminal associated with transportation of Liberty Development oil. Specific water quality issues could include chronic discharges from the TAPS Marine Terminal into Port Valdez. Another cumulative effect could be extending the service of tankers. Remember, a direct effect of the Liberty Development is reducing the rate of decline oil movement through the TAPS Marine Terminal. An indirect effect could be related to air or water pollution. A cumulative effect would be extending the life of TAPS, extending the service of tankers. Then, water quality issues regarding these facilities should be evaluated. (Note corresponding information in Table V.B-9) | 199 |



# Chapter VI. Description of Affected Environment

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| VI | VI-01 | 5 | A.1.a.(1) Bowhead Whales. The western Arctic stock bowhead whale stock is a species of concern it is not listed as an endangered species...need to clarify. | 200 |
| VI | VI-02 | 1 | A.1. In last line of paragraph 1, should be "(Woodby and Botkin, 1993)." (not Woody). Same correction need on p.29 of Bibliography. | 201 |
| VI | VI-02 | 5 | A.1. Should indicate that substantial numbers of bowheads reach the Prudhoe Bay area by early September in some years, including 2000 (Greene & McLennan, in W.J. Richardson and M.T. Williams [eds., 2001]) -- see comment on p. III-C-67 for full reference. | 202 |
| VI | VI-02 | 5 | A.1. In describing the speed of movement across the Alaskan Beaufort, it would be relevant to cite the results of the UHF radio tagging by Wartzok et al. (1990) and the satellite tagging by Mate et al. (2000). References are as follows: Wartzok, D., W. Watkins, B. Whrsig, R. Maiefski, K. Fristrup and B. Kelly. 1990. Radio tracking studies of the behavior and movements of bowhead whales in the Beaufort Sea, fall 1988-1989. p. 200-203 In: 5th Conf. Biol. Bowhead Whale Balaena mysticetus, Anchorage, AK, April 1990. Extended Abstract. North Slope Borough, Barrow, AK. 244 p. Mate, B.R., G.K. Krutzikowsky and M.H. Winsor. 2000. Satellite-monitored movements of radio-tagged bowhead whales in the Beaufort and Chukchi seas during the late-summer feeding season and fall migration. Can. J. Zool. 78(7): 1168-1181. | 203 |
| VI | VI-04 | 3 | A.1. Line 1 needs rephrasing, suggest: "Baleen from bowhead whales provides a multiyear record of isotope ratios in prey consumed during different seasons, including information about the occurrence of feeding in the Bering - Chukchi system." Note that zooplankton prey consumed in the Chukchi Sea as well as the Bering Sea has the isotopic signature of Bering carbon. | 204 |
| VI | VI-04 | 6 | A.1. Zeh et al. (2000) estimate survival (1-mortality) rates for adult bowhead whales. The reference is: Zeh, J., D. Poole, G. Miller, W. Koski, L. Baraff and D. Rugh. 2000. Survival of bowhead whales, Balaena mysticetus, estimated from 1981-98 photo-identification data. Inter. Whal. Comm. Working Paper SC/52/AS19. 10 p. | 205 |
| VI | VI-07 | | It is stated that two distinct races of Chinook salmon have evolved, stream and ocean types. These two forms are not necessarily monophyletic groups and the life history trait may be somewhat plastic. It is speculative to call them races. | 206 |
| VI | VI-22 | | A.2.c. Sentence 1. Should include the new polar bear population estimate for the Beaufort Sea. New information from Amstrup suggests population could exceed 2,500 not the earlier recorded 1,800. Information on the new population estimate has a publish date of June in the "Journal of Agriculture, Biological and Environmental Statistics." | 207 |
| VI | VI-22 | 2 | A.2.c. Para 2; last sentence; Suggest finding a recent citation for this sentence. | 208 |
| VI | VI-26 | | The actual numbers in the Central Arctic herd and the east and west parts of the herd are described by Cronin et al. (2000) and Cronin et al. (submitted) and posted below. The mention of considerable movement between the east and west parts of the herd is good, but Cronin et al. (1997) should be cited here also. It should also be noted that caribou extensively use habitats in the Prudhoe Bay, Kuparuk, and Milne Point oil fields during the calving and post-calving periods (see Pollard et al. 1996a, 1996b, Noel et al. 1998, Cronin et al. 1998a, 1998b). | 209 |

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|---|---|---|---|

TABLE 1. Census of the number of caribou in the Central Arctic herd including ranges with oil field development (Western Range), ranges without oil fields (Eastern Range), and the entire herd from 1992–2000. Census data for 1992 and 1995 are from Cronin et al. (2000) and from 1997 and 2000 are from E. A. Lenart unpublished report, Central Arctic Caribou Field Work Summary for 2000, Alaska Department of Fish and Game, Fairbanks, Alaska). 209

Caribou numbers in the CAH

| Year | Eastern Range No Oil Fields | Western Range Oil fields | Entire Herd |
|---|---|---|---|
| 1992 | 8,602 | 14,842 | 23,444 |
| 1995 | 11,766 | 6,327 | 18,093 |
| 1997 | 9,061 | 10,669 | 19,730 |
| 2000 | 12,833 | 14,295 | 27,128 |

VI | VI-30 | 3

A.5.b. Please provide reference for the 6% reduction in kelp production in one year. Previously cited references indicate 4% reduction from island construction and 2% from pipeline construction and/or stockpiles. The references state that the effects are not cumulative. 210

VI | VI-32 | 2

A.6.b. The statement referring to Cannon et al. (1991) stating that the warmer nearshore zone was an essential nursery for juvenile arctic cod may be overstated. This statement is based on study conducted between 14 July and 17 August, during the 1986 Endicott Fish Monitoring Program in the Prudhoe Bay area, when the number of juvenile arctic cod were very high compared to subsequent years (1988-1995) when the numbers of arctic cod in this area were much lower. Arctic cod, both adults and juveniles, are the probably the most widely distributed and abundant fish species in the Beaufort Sea and occur in both nearshore and offshore habitats during the open-water period (Quast 1974; Lowry and Frost 1981; Craig et al. 1982). Arctic cod are infrequent visitors to nearshore habitats during the first portion of the open-water season when waters are at their warmest and salinities are low (Craig et al. 1982). Consequently, it is more accurate to say the arctic cod, both adults and juveniles, do utilize nearshore habitats during the open-water season; however, this type of habitat is not essential for their existence. 211

Craig, P.C., W, B. Griffiths, L. Haldorson, and H. McElderry. 1982. Ecological studies of Arctic cod (Boreogadus saida) in the Beaufort Sea coastal waters, Alaska. Can. J. Fish. Aquat. Sci. 39:395-406.

Lowry, L.L. and K.J. Frost. 1981. Distribution, growth and foods of arctic cod (Boreogadus saida) in the Bering, Chukchi and Beaufort seas. Can. Field-Nat. 95:186-191.

Quast, J. C. 1974. Density distribution of juvenile Arctic cod Boreogadus saida, in the eastern Chukchi Sea in the fall of 1970. Fish. Bull. 85:185-193.

VI | VI-33 to VI-34 | all

A.6.c. Although it is true that there have been reports of arctic cisco in spawning or spawned out condition in the Colville and Chipp rivers, the evidence is overwhelming that the vast majority of the arctic cisco inhabiting the central Alaskan Beaufort Sea are carried over from Canada, as young-of-the-year (y-o-y), by westward currents generated by predominately easterly winds. This evidence includes the actual 212





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|---|---|---|---|

capture of y-o-y arctic cisco at various sites along their westward distribution in years of predominately easterly winds and their virtual absence along the coast in years that lack easterly winds. The age structure of the arctic cisco population in the central Alaskan Beaufort Sea show that if a particular year-class does not successfully transit across the coast as y-o-y fish, then that age or year-class remains missing from the population in all subsequent years. If there were a successful spawning population of arctic cisco in the Colville River then there should be no missing age-class groups because fish from this population would supply fish to fill in the blanks. The probability of this population having a series of year-class failures that exactly corresponded with the poor recruitment years of the Mackenzie fish would be small indeed. 212

VI | VI-54 and VI-55 | all

C.1.c(1)(a). The reference/citations are coded and need to be properly presented. 213

VI | VI-57 | 1

C.2.b(3). A 1998 water quality study within Foggy Island Bay measured, on average, a pH of 8.0 standard units (URS Greiner Woodward Clyde report to BPXA titled: 1998 Water Quality Sampling Program Liberty Development). 214

VI | VI-57 | 4

C.2.b.(2). Change units from 6 milliliters per liter to 6 milligrams per liter (mg/l) for the first sentence. 215

VI | VI-8 to VI-21 |

The discussion on salmon and tidewater gobies as endangered species along the Pacific coast needs some qualification. These ESA listings are based on the ESU concept (or in the case of the gob, DPS-distinct population segment). The identification of these units is arbitrary and under review by scientists. The readers of the DEIS should be aware that these listings, and the scientific assumptions behind them, are potentially flawed. 216

VI-A-1 | VI-01 | last

A.1. Last sentence on page should be rephrased to indicate that "The increase IN THE ESTIMATED POPULATION SIZE most likely is due to a combination of improved...". As presently written, it implies that the estimated 3.2% annual rate of increase is partly an artifact of improved census procedures. Our understanding is that the 3.2% figure is not biased in this way. 217

## Chapter IX. Low Probability Very Large Oil Spill Event

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| IX | IX-13 to IX-15 | all | A.6.f. 1. Much of the EIS deals with the possible effect of a major oil spill on fish and fish habitat. Although the probability of a major oil spill is exceedingly low, if there were such an event there is approximately a 20% chance that oil would reach the Endicott Causeway (Table IX-6). The EIS argues that because of the duration of toxic hydrocarbon levels and the ability of fish to avoid these areas, little direct mortality to fish is expected (Pages IX 13-14). A major spill would, therefore, be expected to have mostly sublethal effects including changes to feeding, growth, fecundity, and temporary displacement. The problem is that the Sagavanirktok Delta is (1) a major summer nursery area for juvenile Arctic cisco and broad whitefish, (2) part of a major coastal migratory corridor for adult Arctic and least cisco from the Colville River including spawning Arctic cisco on their return migration to Canada, and (3) the only exit/entry route into the Sagavanirktok River, the second largest diadromous and freshwater fish overwintering waterbody in Arctic Alaska.<br><br>The Sagavanirktok River is believed to contain one of the largest Dolly Varden populations in northern Alaska. Both juvenile and adult Dolly Varden disperse out to sea and along the coast for great distances during summer. They are also powerful swimmers that could easily avoid a contaminated area. The potential problem is that freshwater overwintering is a critical requirement for the survival of Arctic diadromous fishes and the only return route to those overwintering rounds for the Sagavanirktok population(s) is through the Sagavanirktok Delta. If the delta is compromised, it raises the question as to whether large numbers of Dolly Varden would be prevented from reaching overwintering areas. By merely blocking entry to the river, large numbers of all age classes could be placed at risk.<br><br>There also exists the possibility that even through the Sagavanirktok Delta may not be directly affected by a oil spill, contaminated coastal areas to the east could block the migration corridor of fish returning to overwintering areas in both the Sagavanirktok and Colville Rivers. Large numbers of adult least cisco from Colville River stocks disperse as far east as Point Thompson and the Canning river during summer.<br><br>The Sagavanirktok River contains a major population of broad whitefish. Juvenile broad whitefish are intolerant of saline water and their summer feeding dispersal from the Sagavanirktok River is limited to the delta. Juveniles rarely stray as far as West Dock to the western side of Prudhoe Bay. If the Sagavanirktok Delta were affected by a major oil spill, there is little escape habitat for displaced juvenile broad whitefish. Under a worst-case- scenario, most of the summer foraging the entire summer foraging habitat of young-of-the-year, age-1 and age-2 broad whitefish could be affected.<br><br>The overall point is that a major oil spill in a critical area could jeopardize greater numbers of fish and regional stocks than are projected in the EIS. This same rationale pertains to sections dealing with subsistence harvests. This issue is less important to Essential Fish Habitat since it can be reasonably argued that there are very few salmon in the Liberty or Sagavanirktok River areas.<br><br>2. There is no rationale provided explaining how recovery periods for fish populations were estimated. | 218 |



## Appendix G: Preliminary Section 404(b)(1) Evaluation

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| App. G | 1 | 2 | Notation (italics): Sentence states: "The model efforts discussed in this evaluating assume a worst case analysis of a uniform TSS concentration of 1,000 mg/L along the pipeline route." Please add: The concentration of 1,000 mg/L is a very conservative (high) estimate of initial TSS at the trench location. | 219 |
| App. G | 1 | 2 | Notation (italics): Sentence states: "The primary reason of additional data collection, advance modeling effort and additional analysis is to further evaluate and assure that the potential for adverse impacts to the Boulder Patch ......is remote."<br><br>Suggest changing to: "....further refine the already conservative model efforts described herein." | 220 |
| App. G | 19 | 2 | IV. Technical Evaluation Factors, 3. Water. The last sentence of the paragraph states "It is important to note that the estimates of TSS distribution as stated in the DEIS are based on an over simplification of potential suspended sediments that was developed to predict a worst case analysis for potential effects to the boulder patch community.<br><br>True, the estimates due depict a worst case scenario, but it is misleading to say that they are over-simplifications. Please change the word over-simplification to "conservative". | 221 |

## Appendix I: EIS Documents Prepared by or for EPA

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| App. I | 1 | | Fact Sheet. The font change substituted an 'E' for the degree symbol associated with the latitude and longitude of the facility. | 222 |
| App. I | 5 | 1 | Fact Sheet, Section 2.1. The font change substituted an 'E' for the degree symbol associated with the latitude and longitude of the facility. | 223 |
| App. I, Draft NPDES | 1 | | Draft NPDES Permit. The font change substituted an 'E' for the degree symbol associated with the latitude and longitude of the facility. | 224 |
| App. I, Draft NPDES | 4 | Table 1. | Draft NPDES Permit, I.A. Font changes have masked the units for TRC and temperature (though temperature is known to be degrees). | 225 |
| App. I, Draft NPDES | 5 | 1 | Draft NPDES Permit, I.B.1. The Liberty Development island is located in federally administered OCS waters and beyond the jurisdiction of the State of Alaska. However, the fact sheet and draft NPDES Permit require compliance with State of Alaska water quality standards. | 226 |
| App. I, Draft NPDES | 6 | 1 | Draft NPDES Permit, I.B.5. The Liberty Development island is located in federally administered OCS waters and beyond the jurisdiction of the State of Alaska. However, the fact sheet and draft NPDES Permit require compliance with State of Alaska water quality standards. | 227 |
| App. I, Fact Sheet | 13 | 1 (below table) | Fact Sheet, Section 5.2. The Liberty Development island is located in federally administered OCS waters and beyond the jurisdiction of the State of Alaska. However, the fact sheet and draft NPDES Permit require compliance with State of Alaska water quality standards. | 228 |
| App. I, Fact Sheet | 13 | Table 1 | Fact Sheet, Section 5.2. Font changes have masked the units for TRC and temperature (though temperature is known to be degrees). | 229 |
| App. I, Fact Sheet | 14 and 15 | all | Fact Sheet, Section 5.4. The Liberty Development island is located in federally administered OCS waters and beyond the jurisdiction of the State of Alaska. However, the fact sheet and draft NPDES Permit require compliance with State of Alaska water quality standards. | 230 |
| App. I, Fact Sheet | 8 | 6 | Fact Sheet, Section 3.1. Construction Dewatering: The construction of the sentence alludes to the fact that only 1 pump can be used. It is suggested that multiple pumps with a combined rate of 650 gallons per minute will be allowed for construction dewatering operations. | 231 |



## Appendix J: EIS Reports Prepared by USGS and FWS

| Section | Page | Paragraph | Comment | |
|---|---|---|---|---|
| App. J-2 | 4,13 | | References to Noel 1999 should be to Noel et al. 1999. The other two authors (p. 13) are S.R. Johnson and P.F.Wainwright, as in the Literature Cited section of this document. | 233 |

## Chapter Vol. II

| Section | Page | Paragraph | Comment |
|---|---|---|---|
| Map 6 | | | Vol. II, Map 6. The use of the term "oldsquaw" on this map is inconsistent with most of the rest of the document which refers to these birds as "long-tailed ducks". 234 |



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**0136-001**

The text in the Abstract has been revised as suggested by this commenter.

**0136-002**

Section C.4.b(3) has been revised in response to this comment.

**0136-003**

Section C.4.b(3) has been revised in response to this comment.

**0136-004**

Section C.5.f has been revised in response to this comment.

**0136-005**

The suggested rearrangement of sentences in the Executive Summary Section D.1a has been done.

**0136-006**

The "1 mile" is an estimate of the maximum distance that seals and bears may be displaced during construction activities (a local effect). There is no citation for this estimate.

**0136-007**

This comment points out differences in the conclusions of the EIS assessment and a technical report, *Liberty Development: Construction Effects on Boulder Patch Kelp Production*, on which it is based. The assessment has been corrected, incorporating a concluding statement from Section 3.2.2.1 of the report. It now explains that "sediment plumes from pipeline and island construction would reduce Boulder Patch kelp production by 2-4% per year during two consecutive growth years." The following detailed statements from the same section have been added to the subsequent paragraph:

> Kelp productivity would be reduced slightly due to winter island construction activities, but the reduction probably would be within levels of natural variation. Pipeline installation activities in Year 2 could reduce annual productivity by about 4%. In Year 3, the kelp could experience a 2% reduction in productivity during the summer growth season due to sediment disposal from Stockpile Zone 1.

The overall effect, therefore, would extend over two consecutive growth years, and about one-third would be due to the proposed location of the stockpile. The sediment-plume trajectory also is being modeled by the Corps of Engineers office in Vicksburg, Mississippi, and the EIS includes additional information.

**0136-008**

A sentence has been added to the summary statement in Section D.1.a of the Executive Summary addressing limited disturbance to bowheads, based on construction and project activities being inside the barrier islands.

**0136-009**

The suggested revision may or may not be correct. In the EIS, we have estimated the effects of suspended sediments on the Boulder Patch habitat from construction activities, but not from natural processes. Sources of naturally occurring suspended sediments, coastal erosion, river floodplain erosion, and resuspension of seafloor sediment by waves and currents are described in Section VI.C.2.c(1). Their qualitative contribution to the amount of suspended particulate matter in the water column are noted in those sections of the EIS where the effects of construction activities are analyzed (such as Section III.C.3.l(2)(a)) or described (such as Section VI.C.2.b(1)).

**0136-010**

The text in Section D.1.n of the Executive Summary has been revised.

**0136-011**

The section has been revised to clarify the relationship between the specific area referenced and the potential for significant spectacled eider mortality. Where appropriate, other sections with this wording also have been revised. The comment is not entirely true in equating the loss of a few eiders with insignificant effect; it depends on the size of the population that is losing a few eiders.

**0136-012**

The sections have been revised to clarify the location of stable versus declining sea duck populations in discussing significant impacts.

**0136-013**

The text in Section D.2.e has been changed in response to this comment.

**0136-014**

The MMS does not believe it is necessary to present a summary of regulatory information for water quality or any of the other resources analyzed in the EIS or a summary of that analysis as presented in an Executive Summary. Information about regulations that are needed to describe the project or the potential effects of the project on the various resources are noted in those sections of the EIS that describe the project and describe and analyze the effects of the project.

**0136-015**

The commenter recommends that the EIS should conclude that suspended sediments from construction activities will have a negligible effect on the Boulder Patch. Such a conclusion has not been added for several reasons. First, the EIS tries to summarize the severity of all the effects (including pipeline trenching and island construction) on the Boulder Patch rather than just one effect. Second, the EIS classifies the severity of effects only for "significant" ones, as explained in the Executive Summary Section C.7. Further, a severity classification for the Boulder Patch would be based partly on its geographic extent; as explained in the Executive Summary: "the Boulder Patch is the largest known kelp community along the Alaskan arctic coast"; therefore, it would be considered a unique resource. Please notice also that other reviewers claim that "MMS ignores permanent losses of benthic habitat, major degradation of the Boulder Patch…" and that "the DEIS underestimates the significant impacts to the unique Boulder Patch and other productive benthic communities" (see Responses 0135-041 and 0135-046).

**0136-016**

Please see Response 0136-007.

**0136-017**

Please see Response 0136-012.

**0136-018**

The text in Section E.3.a(1)(a) has been revised.

**0136-019**

Please see Response 0136-009.

**0136-020**

Please see Response 0136-015.

**0136-021**

The text in Section E.3a(1)(b) has been revised.

**0136-022**

Please see Response 0136-015.

**0136-023**

The text in Section E.3a(1)(c) has been revised.

**0136-024**

Please see Response 0136-007.

**0136-025**

The text in Section E.3.a(2)(a) has been revised.

**0136-026**

Please see Response 0136-009.

**0136-027**

Section IV.C.2.e(4) has been revised in response to this comment.

**0136-028**

Excavation volumes provided by BPXA are shown in Table II.C-3 of the EIS.

**0136-029**

Please see Response 0136-028.

**0136-030**

Please see Response 0136-028.

**0136-031**

Please see Response 0136-007.

**0136-032**

Nest and bird density for the proposed Kadleroshilik River gravel mine site are not available. No inference was made in the draft EIS that either potential gravel-mine site was comparable in bird use to adjacent tundra habitats. Data for the nearby tundra areas were included as the only quantitative means to characterize and compare the general areas surrounding the two sites from which birds might be attracted to either site.

**0136-033**

If the inner pipe of a pipe-in-pipe system leaks oil into the annulus, regardless of what the outer pipe is made of, the pipeline will not be allowed to continue to operate. One possible exception would be to allow the pipeline to operate for a short period of time to purge the inner pipe of oil.

The Executive Summary Section E.3.b has been modified to clarify this point.

**0136-034**

The text in Section I.H.5.b(4) has been revised in indicate that the effects of the 300-foot jetty are expected to be less than longer causeways.

**0136-035**

We agree with this comment. Section II.A.3 of the EIS indicates that additional and more detailed review of the engineering design basis will be undertaken as part of the right-of-way review process.

**0136-036**

Units have been revised as suggested in the comment.

**0136-037**

Current velocities have been updated as suggested in the comment.

**0136-038**

Units for suspended sediments and turbidity have been reviewed and revised where appropriate.

**0136-039**

The text in Section I.H.8.b has been revised to include the information presented in this comment.

Also, the sections in the EIS that describe the Boulder Patch communities and the effects of turbidity on these communities are cited.

**0136-040**

There is no Comment 0136-040.

**0136-041**

This comment requests additional stratification of data on the long-tailed duck. Rather than stratifying this data further, which some attributes of the dataset will not easily support, the MMS has replaced the data with that from Fish and Wildlife Service nearshore aerial surveys in 1999 and 2000. This data portrays the distribution and abundance of long-tailed ducks more accurately than the estimated density information included on the draft map. It should be noted that some areas of high long-tailed duck concentration (for example, part of Simpson Lagoon) occur outside the map boundaries and thus are not shown.

**0136-042**

There are some differences between what was done at Northstar and what is proposed for Liberty. The most notable difference is that for the Northstar pipeline, the pipes were welded up alongside the trench. For Liberty, the proposal is to weld up 3,000-foot long segments at a makeup site and transport these segments to the trench edge for final tie in. A sentence indicating that a similar construction method was completed at Northstar has been added to Section II.D.1.b(3)(a).

**0136-043**

Section II.A.1.b(1)(a) has been updated to include ice rideup and pileup.

**0136-044**

We agree that the final engineering design stage and joint technical review by MMS and the State Pipeline Coordinator's Office may indicate that gravel bags are not necessary. However, the designs prepared by INTEC indicate that they would be necessary; therefore, we assume that they will be used for our EIS analysis.

**0136-045**

Section II.A.1.b(3)(b)2) has been modified to indicate that it is molecules of oil that enter the LEOS tube.

**0136-046**

The text in Section II.A.1.b(3)(c) has been revised as suggested in the comment.

**0136-047**

Section II.A.1.b(3)(c) has been clarified to indicate that the example given is just that, an example.

**0136-048**

This sentence was removed from Section II.A.1.b(3)(d)3), because it is not well supported by the studies.

**0136-049**

The recommended change has been made to Section II.A.1.b(4).

**0136-050**

The text in Section II.A.1.b(5)(b) has been revised as suggested in the comment.

**0136-051**

We agree that the use of gravel bags needs to, and will be, investigated in more detail during the final engineering design stage and the joint review by MMS and the State Pipeline Coordinator's Office. However, the best information we have to date (INTEC, 2000) indicates that gravel mats or bags would be required for the single-wall pipeline. Because the section of the EIS referred to in this comment is based on the best available data, no changes are necessary.

**0136-052**

We agree with this comment, which is why the section referenced (Section II.C.2.c) states that "The pipeline may continue operating for a limited time until it could be repaired, if pigging and other tests show the integrity of the carrier pipeline has not been adversely affected."

The MMS also believes that the referenced section adequately addresses the concern raised by this comment, and no changes are necessary in the EIS.

**0136-053**

Please see Response 0136-027.

**0136-054**

The sentence in Section II.A.2.c, which stated the pipe-in-pipe could provide secondary containment, has been modified to better reflect that the outer pipe could provide only secondary containment if it was still intact.

**0136-055**

The burial depth noted in Section II.C.2.d has been corrected to 6 feet.

**0136-056**

Please see Response 0136-027.

**0136-057**

The INTEC (2000) report does state that gravel mounds would be required to maintain pipe stability during backfilling. Section II.A.2.d has been modified to correct and clarify this point.

**0136-058**

Please see Response 0136-052.

**0136-059**

The text in Sections II. C.4.c and IV.C.4.b has been revised to reflect the information presented in this comment.

**0136-060**

Section II.D.2.a has been modified to indicate that the pipeline "may offer secondary containment under certain circumstances."

**0136-061**

Section II.D.2.b has been modified to indicate that the pipeline "may offer secondary containment under certain circumstances."

**0136-062**

Section II.D.2.c has been modified to indicate that the pipeline "may offer secondary containment under certain circumstances."

**0136-063**

Section II.D.2.d has been modified to indicate that the probability of a containment failure is about the same for Combination Alternative B and the applicant's Proposal, and that this probability is higher than for Combination Alternatives A or C, which include a steel pipe-in-pipe design.

**0136-064**

The recommended change has been made to Section II.C.2.a(2).

**0136-065**

Increases in turbidity and hydrocarbons in the water column are the factors most likely to have significant effects on water quality. These effects are associated with island and pipeline construction and large oil spills, respectively. As noted in Section III.C.3.l(2), 7,500-parts per million suspended solids is an unofficial, acute (toxic) criterion for water quality. This value is the lowest (most toxic) $LC_{50}$ for clay or calcium carbonate reported in the National Research Council (1983) assessment of drilling fluids in the marine environment. The State of Alaska criterion of a maximum of 0.015 parts per million of total aqueous hydrocarbons in marine waters provides the readiest comparison and is used in this discussion of water quality (Section III.C.2.l(2)). The analysis considers 0.015 parts per million to be a chronic criterion and 1.5 parts per million, a hundredfold higher level, to be an acute (toxic) criterion. Exceeding these criteria was defined as a significant effect.

Available information (Section VI.C.2) indicated the seafloor sediments generally were not contaminated with trace metals or hydrocarbons. Therefore, providing information on the chronic and acute criterion for the trace metals or individual hydrocarbons was believed to be unnecessary for the analysis.

Tables VI.C.3a, 3b, 3c, and 3d present background and effects-range information on the concentrations of metals and individual hydrocarbons in the Beaufort Sea sediments. This information is presented to show that (1) past activities in and adjacent to the Beaufort Sea have not contaminated the marine environment and (2) Liberty construction activities are not expected to introduce or add any chemical pollutants to the environment.

References have been added in Section VI.C.2 to indicate where Federal and State water-quality standards can be found.

**0136-066**

Units for suspended sediments and turbidity have been reviewed and revised where appropriate.

**0136-067**

The wording in Section III.A.2.c has been revised to clarify the stigma of a declining bird population.

**0136-068**

The text in Section III.A.2.l of the EIS has been revised.

**0136-069**

The Fleet report was incorporated by reference into the EIS. Appendix F contains reviewers' comments on the draft final report, and Appendix G contains Fleet's response to comments.

**0136-070**

The recommended change has been made to Section III.C.1.c.

**0136-071**

The text in Section VI.C.2.c(4)(b) has been revised to indicate the relationship between grain size and trace metals and how normalizing trace-metal concentrations with aluminum or iron can be used to indicate human contamination of the sediments.

**0136-072**

The suggested change has been made to Section III.C.1.e(1).

**0136-073**

The text in Section III.C.1.e(1)(a) has been revised in response to the comment.

**0136-074**

Some minor rewrite of the sentence has been completed in Section III.C.2.a(1)(b)1), but the reference to "floating logs" has been left in, because it was part of the original text that was cited.

**0136-075**

The text in Section III.C.2.a(1)(b)1) has been changed to clarify that heavy metals and other contaminants discussed in that section are not specifically associated with an oil spill.

**0136-076**

The suggested change to the text in Section III.C.2.a(1)(b)1) has been made.

**0136-077**

The suggested change was made to the text in Section III.C.2.a(1).

**0136-078**

The citation for LGL Ecological Research Associates has been corrected in Section III.C.2.a(2)(b)1)b).

**0136-079**

The use of on-ice ringed seal densities may not be overestimating the number of seals in the area during open water. Feeding concentrations of seals do occur during the open-water season in the Beaufort Sea and could occur near the Liberty Project.

**0136-080**

Densities of ringed seals in open water are highly variable, as indicated by aerial surveys conducted by the Naval Ocean Systems Center and the Bowhead Whale Aerial Survey Program. Feeding concentrations of herds of ringed seals have been recorded in the tens to a few hundred seals.

**0136-081**

These estimates are very similar to the recent estimates given in the EIS and would give similar estimates on the number of ringed seals that could be affected by the large spill.

**0136-082**

The analysis (Section III.C.2.b(2)) assumes that a large spill occurs and that it contacts a number of polar bears. The conclusion is based on these key assumptions.

**0136-083**

Sections have been revised to clarify the location of stable versus declining sea duck populations in discussing significant impacts.

**0136-084**

Please see Response 0136-083.

**0136-085**

Please see Response 0136-083.

**0136-086**

Based on the references already cited in the EIS, the MMS concluded that a large oil spill associated with the Liberty Project is not expected to have a measurable effect on fish populations. Information taken from Wells, Butler, and Hughes (1995), which essentially expands on that same conclusion, was added as suggested.

**0136-087**

The text in Section III.C.2.g has been changed in response to this comment.

**0136-088**

The information on onshore tundra spills and on freshwater wetlands spills in the Prudhoe Bay area is not appropriate for assessing the effects of an offshore spill on coastal saltmarsh habitat in the Arctic. Little information is available on effects of oil on arctic saltmarshes and other shoreline habitats. The MMS believes that marine salt grasses do respond similarly to an oil spill as arctic marine saltmarshes respond.

**0136-089**

References to oldsquaw have been changed to long-tailed ducks.

**0136-090**

We acknowledge that ringed seals may be common around Liberty Island during winter and have changed the text to note this. It is important to remember that ringed seals are not hunted in this area, especially in this season, by subsistence hunters.

**0136-091**

The text in Section III.C.2.h has been revised.

**0136-092**

Section III.C.2.l has been reviewed and the text revised where it seemed appropriate.

**0136-093**

The suggested change in the text in Section III.C.3.a(1)(b)1) has been made.

**0136-094**

The suggested change was made to the text in Section III.C.3.a(1)(b)1).

**0136-095**

The published version of the Richardson reference has been included in the text in Section III.C.3.a(1).

**0136-096**

The suggested change to the text in Section III.C.3.a(1)(b)1) has been made.

**0136-097**

No change was made in the text. The author of the study assumed that a signal-to-noise ratio of 30 decibels would elicit response in roughly half of the bowheads being exposed to the noise.

**0136-098**

The published version of the Richardson reference has been included in the text in Section III.C.3.a(1). No change has been made on the reference to Ward and Pessah, because this reference represents another viewpoint on looking at the data.

**0136-099**

The reference by Koski and Johnson (1987) in the text is correct. Two recognizable whales that were photographed during behavioral observations on September 5 also were photographed 1-8 days in the same area. A better reference, which has been added to the text in Section III.C.3.a(1), is Thomson and Richardson (1987). This study reported that three individually recognizable whales traveled several kilometers away from their feeding area when disrupted by vessel activity but returned to the same feeding area the following day.

**0136-100**

The suggested changes were made in part in the text in Section III.C.3.a(1). The EIS is set up to discuss noise-related effects in general first in Section III.C.3.a(1)(b)1) followed by noise-related effects specific to Liberty in Section III.C.3.a(1)(b)2).

**0136-101**

The suggested information in the recent reference was added to the text in Section III.C.3.a(1)(b)1)d).

**0136-102**

The suggested changes were made in the text in Section III.C.3.a(1)(b)2).

**0136-103**

Richardson and Williams (1999) did assess behavioral responses of ringed seals to ice-road construction activities. See the Summary of this report in Chapter 3 pages 3-36 and 3-37.

**0136-104**

Richardson and Williams (2000; 2001) were added as cites under Effects of Constructing Liberty Island. However, in their assessment of potential effects of the monitoring study itself (as required for the Marine Mammal Protection Agency's take permits), it is difficult to separate out the effects of the study activities, particularly the effect of dogs excavating ringed seal lairs versus disturbances associated with the construction of the island and ice road.

**0136-105**

The erroneous punctuation in Section III.C.3.c(2)(b) has been deleted.

**0136-106**

The EIS notes caribou use of gravel pads and other oil-field structures for shelter from insect harassment in Section V.C.4.b(3) Effects of Disturbance on Caribou Movements and Calving.

**0136-107**

Please see Response 0136-007.

**0136-108**

Please see Response 0136-007.

**0136-109**

The comment describes two errors and a difference of opinion with the EIS assessment of effects on a section of the pipeline corridor with very low coverage of kelp. The EIS describes the kelp substrate as consisting of "boulders and suitable kelp substrate." A subsequent EIS section (Section III.C.3.e(2)(b)2)b)) provides detail from a site-specific benthic survey, explaining that the survey found "scattered bivalve shells, pebbles, and rocks, some of which were found to have small pieces of kelp." Comment 0136-109 emphasizes and recalls the marginal, scattered nature of the kelp and substrate. We agree that there are no boulders and that the kelp and substrate are marginal, so the word "boulders" has been eliminated and the word "suitable" has been changed to "marginal." The EIS states that there is "kelp and marginal kelp substrate" in this specific section of the pipeline corridor.

A second aspect of the comment objects to the EIS's quantification of the very low concentration as "1%" kelp substrate. A subsequent EIS section (Section III.C.3.e(2)(b)2)b)) provides more detail on the concentration, including a quote from the survey report. It notes that the report explains the "concentrations of these objects appeared to represent less than 1% of the sea bottom in most instances, and in no case greater than 2% (Coastal Frontiers Corp., 1998:16)." The EIS also explains that another survey found a higher concentration of kelp about 500 meters away, stating that "Figure III-C.2 shows that the distance to a portion of the Boulder Patch with a concentration over 10% is at least 1,600 feet (500 meters)." Comment 0136-109 describes the 1% average as an overestimate and "gross error." We disagree that 1% is a gross error and have kept the number as the average concentration of kelp and marginal kelp substrate in the specific section of the pipeline corridor.

The comment further describes as a gross overestimate a statement about the burial of kelp in the pipeline corridor. The EIS states "less than 0.01% of the Boulder Patch total." The comment points out that the precise number should be 0.00008%. We agree and have changed the EIS to state that burial would affect "less than 0.0001% of the Boulder Patch total."

These changes also have been made in Section IV.

**0136-110**

The text in Section III.C.3.h has been changed to reflect the fact that comments were made about noise in deeper water offshore.

**0136-111**

The text in Section III.C.3.h has been changed to reflect the comment about poor ice conditions for whaling in Kaktovik in 1985.

**0136-112**

Please see Response 0136-104.

**0136-113**

The term turbidity in this sentence is synonymous with phrases such as suspended sediments, suspended particles, or suspended-sediment concentrations. This usage is consistent with the use of the term in other parts of the summary paragraph.

The text in Section III.C.3.l has been reviewed to ensure that actual measurements of turbidity are expressed in nephelometric turbidity units and suspended particles are expressed in terms of concentrations.

**0136-114**

Units have been revised as suggested in the comment.

**0136-115**

Units have been revised as suggested in the comment.

**0136-116**

The text in Section III.C.3.l(1) has been revised.

**0136-117**

Please see Response 0136-009.

**0136-118**

The Environmental Protection Agency has addressed sediments in its fact sheet and National Pollution Discharge Elimination System permit. No changes have been made to the draft permit in response to this comment.

The text in Section III.C.3.l has been revised to include the information in this comment.

**0136-119**

Because additional information with regard to the effects of dredging are presented in the EIS, this paragraph has been deleted.

**0136-120**

Units have been revised as suggested in the comment.

**0136-121**

The text in Section III.C.3.l has been revised to include the information in this comment.

**0136-122**

The text in Section III.C.3.l(2)(a) has been revised to include ANIMIDA data from April 2000 during backfilling of the Northstar pipeline trench.

**0136-123**

The information presented in the comment is included in Section III.C.3.l(2)(b)2), where the specific effects of constructing the Liberty Pipeline are analyzed.

**0136-124**

The text in Section III.C.3.l(2)(a) has been revised as suggested.

**0136-125**

The text in this section has been revised to include a reference to Table VI.C-8a, which includes information on the currents in Foggy Island Bay from the Endicott Development Monitoring Program.

**0136-126**

The text in Section III.C.3.l(2)(a) has been revised to reflect the information presented in this comment.

**0136-127**

The sentence in Section III.C.3.l(2)(a) has been revised to more carefully describe the sources of nearshore sediments.

**0136-128**

The units in this paragraph in Section III.C.3.l(2)(a) have been revised to reflect the units noted in the citation micrograms per gram (=milligrams per kilogram).

**0136-129**

The concentrations of polyaromatic hydrocarbons were given in nanograms per gram.

**0136-130**

The units shown are those used by the authors in the documents cited. Throughout the scientific literature, values of properties are presented in various units and, until there is a mandatory standard that is universally accepted, readers are going to have to get used to seeing various units.

**0136-131**

The ANIMIDA data from 1999 and 2000 have been included in the appropriate water-quality sections throughout the EIS.

**0136-132**

The suggested revision was not made in the section and paragraph noted in the comment; however, a statement was added to the first paragraph in Section III.C.3(2)(b)2) Effects of Constructing the Pipeline regarding free water in the bottomfast-ice zone. This statement seemed more appropriate to pipeline construction than to island construction.

**0136-133**

The text in Section II.C.3.l(2)(b)1) has been revised to include the information suggested in the comment.

**0136-134**

The text in Section II.C.3.l(2)(a) has been revised to include the information suggested in the comment.

**0136-135**

The sentence in Section III.D.2 has been revised to clarify the need for identifying the 22-acre site.

**0136-136**

Section III.D.2 has been revised and includes a description of some of the general guidelines for siting, design, operation, and reclamation of North Slope gravel pits, effects of gravel mining in northern Alaska streams and rivers, and the effects of reclamation/rehabilitation of abandoned mine sites (Section III.D.2.a).

**0136-137**

Please see Response 0136-136.

**0136-138**

Section III.D.2.a has been added to the EIS. This new section summarizes the results of the Alaska Department of Fish and Game's studies of abandoned and rehabilitated gravel mine sites, and the citations include many of the references listed in the comment.

**0136-139**

Information on the effects of gravel mining in Oregon rivers probably was not appropriate for this EIS and has been deleted; the inclusion of this information was suggested by a member of the Liberty Interagency Team. The effects of gravel mining at the Kadleroshilik River mine site are analyzed in Sections III.D.2.a through m and Section IV.C.4.a and at the Duck Island mine site in Section IV.C.4.b.

**0136-140**

The text in Section III.D.2.m has been revised to reflect the information in the comment.

**0136-141**

The suggested changes have been made to the text in Section III.C.3.a(1)b)1).

**0136-142**

The summary of water-quality effects has been revised to reflect revisions made in Sections III and IV of the EIS.

**0136-143**

Although there were no specific comments for Section IV, revisions to the water-quality analysis in other sections were reviewed for their effects on the analysis in Section IV.

**0136-144**

Sections have been revised to clarify the location of stable versus declining sea duck populations in discussing significant impacts.

**0136-145**

As noted in Section II.D.2.a, Combination Alternative A used the double-wall steel pipe buried at 7 feet. All of the pipeline studies show that if the double-wall pipeline is buried at the same depth (or deeper) as the single-wall pipeline (7-foot minimal depth of cover), it provides a small reduction in risk from ice gouging. See Table II.C-5 and damage category 4.

**0136-146**

As noted in Section II.D.2.c, Combination Alternative C uses a deeper burial depth, a minimum of 11 feet of cover, which reduces the risk of ice gouging to the pipeline by a small amount.

**0136-147**

Please see Response 0136-007.

**0136-148**

Please ee Response 0136-007.

**0136-149**

Please see Response 0136-007.

**0136-150**

The comment explains that the EIS should describe the calculations for suspended sediments from the alternative scenarios. The method was the same as the one that was developed by Ban et al. (1999) for assessment of the Proposal, as indicated in Section IV.C.1.d(4)(b)2). A clearer statement has been added to that section about the similarity of the method. We agree that the effects are not cumulative; however, as explained in Ban et al. (1999), the effects are spread over two consecutive growth years. The EIS incorporates additional suspended-sediment calculations from the Corps of Engineers.

**0136-151**

Please see Response 0136-150.

**0136-152**

The paragraph referenced in Section IV.C.2 has been modified.

**0136-153**

The paragraph in Section IV.C.2.c referred to in this comment is a quote from the C-CORE report. The section quoted did not present specifics on how the annulus could be monitored for pipe degradation; therefore, nothing was included in this portion of the EIS. However, in Section IV.C.2.d of the EIS the following quote from C-CORE is presented:

> The majority of existing defect inspection, monitoring, and associated assessment methods and technologies cannot be applied to the outer pipe wall of PIP configurations. This limitation means the condition of the outer pipe cannot be readily inspected and evaluated for 'fitness of service'. As a result this represents a significant maintenance difference between PIP and single configurations (C-CORE, 2000).

These two statements apparently are contradictory and cast some doubt on the ability to monitor the system for pipe degradation.

Because both sides of the issue are presented, it is not necessary to modify the EIS.

**0136-154**

We cannot speak for the other regulatory agencies, but the MMS position is that if an inner pipe leaks into the annulus, the pipeline is no longer capable of performing its intended function and must be shut in until repairs can be made. A possible exception would be to allow the pipeline to continue to flow for a short period of time so that the crude oil could be flushed from the system. This may be allowed for two purposes: (1) to remove oil from the pipeline to limit the volume of oil that could leak from the inner pipe while waiting for repairs to be made and (2) to remove the crude oil from the pipeline to prevent flow problems caused by crude oil gelling in the pipeline.

**0136-155**

The opening sentence of this paragraph in Section IV.C.2.c has been modified to indicate that secondary containment is provided only under certain circumstances.

**0136-156**

The implication from the comment is that the annulus of a double-wall pipeline may not provide a leak-detection advantage for the LEOS system. We agree that the advantage, if any, in terms of the leak-detection capability of the LEOS system provided by an annulus cannot be determined. However, the Stress report indicates that they believe LEOS would perform better in the annulus of a double-wall system than in the soil surrounding a pipeline. In addition, the paragraph in question does not focus solely on the LEOS system and considers the possibility that other forms of annulus monitoring may provide greater leak-detection capabilities than are available with a single-wall pipeline system.

This paragraph in Section IV.C.2.c has been revised in response to this comment.

**0136-157**

In their comments on this EIS the U.S. Department of Transportation, Office of Pipeline Safety expressed concern about the effectiveness of inline inspection tools due to the interference created by the outer pipe. This concern leads to the conclusion that the inner pipe of a pipe-in-pipe system may not be able to be inspected to the same degree as a single-wall pipeline. This concern primarily would be aimed at the tool, either an ultrasonic or magnetic flux leakage pig, used to measure pipeline wall thickness and to detect pitting, gouging, or cracking. The spacers used to prevent contact between the pipes also could cause erratic readings from these tools.

Section IV.C.2.d has been modified to indicate that due to interference from the outer pipe, it may not be possible to monitor the inner pipe of a pipe-in-pipe system as effectively as a single-wall pipeline.

**0136-158**

We agree with this comment, as does the U.S. Department of Transportation, which is why we believe that there are significant operation and maintenance concerns related to double-wall pipeline systems. In addition the integrity monitoring deficiency associated with the outer wall, a double-wall pipeline also raises significant concerns about the ability of that outer wall to contain oil in the unlikely event of a leak.

We believe that our concerns with the defect-monitoring ability of the system are adequately addressed in the EIS; therefore, no changes were made to the text in response to this comment.

**0136-159**

Please see Response 0136-027.

**0136-160**

The MMS agrees that there is significant uncertainty related to double-wall pipeline systems.

**0136-161**

It is likely that there would not be any significant difference in the detection time between a LEOS tube in the annulus of a double-wall pipeline as opposed to one buried alongside a single-wall pipeline for what Stress reported as the "minimum" leak rate. The "minimum" rate calculated by Stress is nearly 100 times greater than the detection threshold of the LEOS system.

One case in which the LEOS tube in the annulus may improve leak-detection time would be if the leak occurred near the end of the retention period, just before the sample begins to be drawn through the LEOS tube. Under this situation, it might be possible for the oil being sprayed into the annulus to reach and permeate into the LEOS tube slightly sooner and, therefore, be detected one sample period sooner.

In addition, it may be possible to decrease the retention time of the LEOS tube, if it is placed in the annulus of a double-wall pipeline, which would improve the leak-detection time.

We do not believe that any changes to the text of the EIS are necessary to address this comment.

**0136-162**

Please see Response 0136-027.

**0136-163**

Section IV.C.2.f(2) has been modified to indicate that pipeline instability is a concern only for the pipe-in-HDPE and the flexible pipe alternatives. The EIS also has been modified to clarify that the gravel placed over the pipe-in-HDPE and flexible pipe alternatives is put there to prevent pipeline floatation and not upheaval buckling.

**0136-164**

Please see Response 0136-027.

**0136-165**

Appropriate portions of the applicant's responses to the issues raised in the Stress (2000) report have been included in the EIS, and the section referenced in this comment has been modified to indicate this.

**0136-166**

The suggested change has been made to Section IV.C.2.f(3).

**0136-167**

Please see Response 0136-052.

**0136-168**

We agree with this comment, but believe that the EIS adequately discusses the limitations in defect monitoring; therefore, no changes are necessary.

**0136-169**

Please see Response 0136-007.

**0136-170**

The corrosion-protection system for the inner pipe that consists of a dual-layer fusion-bonded epoxy, but not a cathodic protection system (such as anodes), comes from the designs presented by the applicant in the INTEC (2000) report. The U.S. Department of Transportation stated in their comments (Comment 0144-001) that a cathodic protection system would be required on the inner pipe of a pipe-in-pipe system. The EIS has been modified to indicate that the applicant either would have to install a cathodic protection system or seek a waiver from the Department of Transportation to construct the pipeline proposed by the applicant (Section IV.C.2.e(4) and other sections).

**0136-171**

Please see Response 0136-007.

**0136-172**

Section IV.C.2.c of the EIS has been modified to indicate that secondary containment would be provided only if the outer wall maintained its structural integrity.

**0136-173**

Please see Response 0136-170.

**0136-174**

Please see Response 0136-057.

**0136-175**

Please see Response 0136-007.

**0136-176**

Please see Response 0136-007.

**0136-177**

Please see Response 0136-007.

**0136-178**

Please see Response 0136-007.

**0136-179**

Please see Response 0136-007.

**0136-180**

Please see Response 0136-007.

**0136-181**

Please see Response 0136-007.

**0136-182**

Please see Response 0136-007.

**0136-183**

Please see Response 0136-007.

**0136-184**

Figure V-4 has been revised in response to this comment.

**0136-185**

Various North Slope gas-commercialization proposals are being considered. We do not expect a formal announcement of a preferred industry plan until late 2001. Right-of-way permits will be issued after studies are completed along the selected route. The route-selection process is likely to continue after the Liberty EIS is completed. The "Over the Top" pipeline project is a relative newcomer to the list of possible gas projects and came to our attention in the late stages of the draft EIS. No details have been released to the public regarding the "Over the Top" route, so analyses of environmental effects cannot be done.

With respect to the Trans-Alaska Pipeline System renewal, we expect very little construction activity, merely a continuation of the current operations. The impacts associated with new infrastructure will be negligible. As for the cumulative-case analysis, renewal of the Trans-Alaska

Pipeline will allow continued oil-field production and expansion of new development projects on the North Slope for several decades.

**0136-186**

Please see Response 0136-185.

**0136-187**

Please see Response 0136-185.

**0136-188**

The suggested change regarding increased interest offshore of the Mackenzie Delta has bee made in Section V.C.1.a(2)(a).

**0136-189**

The cautionary note by Miller et al. (1999) has been added to the text in Section V.C.1.a(2)(a).

**0136-190**

The suggested change has been made in the text in Section V.C.1.a(2)(a).

**0136-191**

The suggested change has been made to the text in Section V.C.1.a(2)(a).

**0136-192**

MacLean (1998) does not support the analysis in Section V that the commenter refers to. The conclusion in MacLean (1998) states that: "While it is not possible to determine the effects of BPXA's 1998 on-ice seismic program on ringed seals, it is apparent that some seals were affected." The conclusion in this report is that they do not know what the effect was.

**0136-193**

Hoover-Miller, Parker, and Burns (2001) do not suggest that harbor seals were not affected by the *Exxon Valdez* spill; they suggest that there was no clear evidence of mass mortality of harbor seals. They suggested that many of the missing seals from oiled habitats were displaced by the spill and by the disturbance associated with spill cleanup. This displacement still would be considered a local effect on harbor seals.

**0136-194**

The most recent reference, Cronin, Whitlaw, and Ballard (2000), has been added to the discussion in Section V.C.4.b on cumulative effects on the caribou of the Central Arctic Herd.

**0136-195**

The analysis in Section V.C.4.b states that caribou cows avoid roads just before calving, and cows with calves avoid roads during the calving season (Smith, Cameron, and Reed, 1994).

**0136-196**

The word "except" has been deleted from the text in Section V.C.8.b.

**0136-197**

Calf production/cow caribou is sometimes higher in the eastern (are not on the oil fields) calving area than in the western calving area (on the oil fields). The yearly differences in calving success are likely to be the result of changes in habitat conditions and not related to the oil-development activities.

**0136-198**

Section V of the EIS analyzes the cumulative effects of past, present, and future activities mainly on the North Slope and in the Beaufort Sea. The construction of causeways is part of the past activities, and their presence has some effects on the environment. Therefore, MMS believes they should be included as part of the cumulative-case analysis.

**0136-199**

Information about the effects of the Trans-Alaska Pipeline System Marine Terminal operations in Port Valdez has been added to Section V.C.12.c(4) of the EIS. A complete assessment of the effects of the marine terminal operations in Port Valdez more appropriately would be done in conjunction with the EIS that is being prepared for the Trans-Alaska Pipeline renewal license.

**0136-200**

The text is correct as written. The bowhead whale was listed as an endangered species on June 2, 1970, and remains listed as an endangered species. In addition, the National Marine Fisheries Service currently is considering designation of critical habitat.

**0136-201**

No change was made in the text or in the bibliography. It is not clear what the reader was looking at when this comment was made. The existing text in Section VI.A.1.a(1) and the bibliography already have the correct reference, Woody and Botkin (1993).

**0136-202**

Some wording related to the suggested change has been added to the text in Section VI.A.1.a(1). The report referenced in the comment was not available at the time the draft EIS was being produced.

**0136-203**

The suggested references have been added to the text in Section VI.A.1.

**0136-204**

The suggested change was made to the text in Section VI.A.1.a(1).

**0136-205**

Dr. Zeh recommended that the preliminary information presented in the working paper not be cited at this time. She indicated the information presented in the working paper SC/52/AS19 was preliminary and much has changed after further analysis of the data. Dr. Zeh is working on a paper to be submitted for publication.

A different reference on age estimates was added to the text in Section VI.A.1.a(1) (George et al., 1999).

**0136-206**

No change was made in the text. The reference to two distinct races of chinook salmon was not created by the MMS. The National Marine Fisheries Service, the agency with jurisdiction over chinook salmon, refers to the stream-type and ocean-type chinook salmon as two distinct races in *Federal Register* Notice 63 *FR* 11481 dated March 9, 1998.

**0136-207**

The text in Section VI.A.2.c Polar Bears has been changed in response to this comment.

**0136-208**

Adams, (1986) is an example of Native traditional knowledge. The particular date of the information is not that important.

**0136-209**

The text in Section VI.A.4.a has been changed in response to this comment.

**0136-210**

Please see Response 0136-007.

**0136-211**

The text in Section VI.A.6.b has been altered to clarify this point, as suggested.

**0136-212**

The text in Section VI.A.6.c has been changed to clarify this point, as suggested.

**0136-213**

The text in Section VI.C.1.c(1) has been revised.

**0136-214**

The suggested revision has been made in Section VI.C.2(b)(3).

**0136-215**

Units have been revised as suggested in the comment.

**0136-216**

No change was made in the text. The concept of designating populations or population segments as evolutionary significant units and distinct population segment was not created by the MMS. These terms were designated by the National Marine Fisheries Service and the Fish and Wildlife Service, the agencies with jurisdiction over the respective species. While the designations may be arbitrary and may be under review, the designations are being used when listing the species. The MMS is simply reporting the information as it exists for the listing of these species. For further information, we direct the reader to the various *Federal Register* notices listed and discussed in the EIS text. In addition, if the reader disagrees with the designations used by the listing agencies, we suggest the reader contact the appropriate agency.

**0136-217**

The suggested change was made to the text in Section VI.A.1.a(1).

**0136-218**

While a large oil spill may affect fishes by altering migrations, the possibility of these migrations being blocked is considered unlikely. This is due to (1) the size of the delta area; (2) the unlikelihood of oil blocking all possible migration routes; and (3) the unlikelihood of oil remaining long in areas where water movement is dynamic, such as along the Beaufort Sea coast and at the mouths of major rivers. While fishes within the influence of a large spill are likely to be affected by it, including the possibility of having their migration routes temporarily altered, sublethal effects are considered much more likely to occur.

Regarding recovery times, these were estimated based on circumstantial information contained in the cited oil-spill studies. While none of these studies estimate recovery periods for affected fish populations, they do give some indications of what recovery might be, based on invertebrate recovery periods (fish habitat and prey species) and the estimated sublethal effects on selected fish species. To our knowledge, there are no studies that address fish population recovery periods for any type of ocean spill. Southward et al. (2001) stated that sublethal effects the of the *Exxon Valdez* oil spill on pink salmon eggs lasted until 1997 in areas where their spawning gravel was oiled (see Table 9), and that there was no apparent effect on small fishes in the shallow subtidal zone detected in 1990. However, as with all other known studies, the estimated recovery periods for various fish populations that were affected by a specific oil spill were not addressed. Because the National Environmental Policy Act requires recovery-period estimates for affected populations, the estimates in the EIS were made based on the information available to date.

**0136-219**

The Corps of Engineers agrees with this comment and has added language similar to that proposed by BPXA.

**0136-220**

The Corps of Engineers agrees with this comment and has made the recommended change in text.

**0136-221**

The Corps of Engineers agrees with this comment and has made the recommended change in text.

**0136-222**

The Environmental Protection Agency apologizes for the several font substitutions noted in the applicant's comment letter and ensures that the final permit distributed by mail will not include such font substitutions.

**0136-223**

Please see Response 0136-222.

**0136-224**

Please see Response 0136-222.

**0136-225**

Please see Response 0136-222.

**0136-226**

The Environmental Protection Agency understands BPXA's comment to be a request to eliminate certain permit terms and conditions referring to Alaska Water Quality Standards in consideration of the offshore location of the permitted facility beyond the jurisdiction of the State of Alaska. The Environmental Protection Agency has revised the draft permit at Section I.B to eliminate the reference to Alaska's Water Quality Standards.

**0136-227**

Please see Response 0136-226.

**0136-228**

Please see Response 0136-226.

**0136-229**

Please see Response 0136-222.

**0136-230**

Please see Response 0136-226.

**0136-231**

Thank you for the clarification.

**0136-232**

There is no Comment 0136-232.

**0136-233**

Citation has been revised.

**0136-234**

Map 6 and Map 8 have been revised to substitute long-tailed duck for oldsquaw.

0137

June 5, 2001

Mr. Fred King
Minerals Management Service
949 East 36th Avenue, Suite 308
Anchorage, Alaska 99508-4363

Dear Mr. King:

Thank you for the opportunity to comment on the draft Environmental Impact Statement (EIS) for the Liberty Development Project. This letter represents the consolidated response of the State of Alaska. In addition to comments on the draft EIS, this letter addresses some questions that have been raised about coordination of the Alaska Coastal Management Program (ACMP) review with other state permit reviews and the review of the Development and Production Plan (DPP). The attachment to this letter includes page-specific comments on the draft EIS.

I appreciate the clarification in the April 19, 2001 from MMS Alaska Region Director John Goll to DGC Director Pat Galvin that the issuance of the DPP has not triggered the consistency review of the Liberty Project. During a meeting on March 16, 2001, MMS staff requested that I send a letter to them noting that there has been an incomplete filing under the federal Coastal Zone Management Act for the Liberty Project and that the state considers the DPP a draft document. With the assurance that the DPP does not trigger the state's consistency review, we no longer have a concern whether the DPP is considered a draft or final document.

Regarding initiation of the ACMP consistency review, the state would prefer to complete its review after issuance of the final EIS. Since our review responds to the applicant's proposal, it would be more advantageous to issue our consistency determination after issuance of the final EIS when federal agencies will have completed a review of alternatives.

It is our understanding that the applicant, BP Exploration (Alaska) Inc. (BPXA), will submit the remainder of the necessary data and information required by 15 CFR 930.60(a)(1) at a later date, possibly around the time the preliminary final EIS is completed. At this time, we are waiting for an evaluation of the possible coastal effects of the project, including associated facilities, to the enforceable policies of the ACMP. These policies include the statewide standards in 6 AAC 80 and the enforceable polices in the North Slope Borough Coastal Management Program. When we receive this consistency evaluation and an updated set of permit applications, we will work with



the state agencies to ensure the individual applications are complete before we initiate the ACMP review.

During the ACMP consistency review, the review participants will review project activities to determine if these activities are consistent with the enforceable policies of the ACMP. This review will include activities in the OCS that could affect coastal uses or resources and project activities on state lands and waters. The consistency review will be coordinated with individual state agency permit reviews as required by 6 AAC 50.010(2).

E01

As a general comment on the draft EIS, one of our reviewers noted a considerable redundancy of material throughout the document. Material could be presented or cross-referenced in such a manner to reduce the repetitiveness within the document, thereby making the information presented easier to follow and understand. Additionally, summaries within the document are often 20 to 40 percent of the total length of the subsections. These could be reduced to limit the amount of repetition found in some sections.

I have attached page-specific comments on the draft EIS to this letter. Please contact me at 465-8792 or by email at Glenn_Gray@gov.state.ak.us if you have any questions about these comments on the draft EIS for the Liberty Development Project.

Sincerely,

Glenn Gray
Project Analyst

cc: Cash Fay, BP Exploration (Alaska) Inc.
Karen Wuestenfeld, BP Exploration (Alaska) Inc.
Leon Lynch, Gary Schultz, Frank Maxwell, DNR, Fairbanks
Robert Watkins, Lydia Miner, DEC, Anchorage
Bruce Webb, DNR, Anchorage
John Kerrigan, Acting State Pipeline Coordinator, Anchorage
Tony Braden, Julie Murrell, DNR, SPCO, Anchorage
Al Ott, Jack Winters, DFG, Anchorage
Gordon Brower, NSB, Barrow
Sheldon Adams, NSB, Barrow

**Liberty Development Project**
**Draft Environmental Impact Statement**

**State of Alaska**
**Page-Specific Comments**

This attachment to the June 4, 2001 comment letter on the draft Environmental Impact Statement (EIS) provides page-specific comments from the state resource agencies.

001

*EXECUTIVE SUMMARY (e) Terrestrial Mammals (Page 18).*

The 2000 estimated population of the Central Arctic Caribou Herd is 27,000 caribou. This most recent population estimate should be used here and in other sections of the document.

002

*SECTION I.A. Introduction.*

The text refers to "State Pipeline Coordination Office" instead of the State Pipeline Coordinator's Office (SPCO). This appears to be the only incorrect citation for this office.

003

*SECTION I.G.5. Other Issues Raised During Scoping; Administrative errors or omissions in the Oil Discharge Prevention and Contingency Plan.*

The Alaska Department of Environmental Conservation (ADEC) has reviewed and commented previously (March 7, 2001 letter) on the most recent version of the Oil Discharge Prevention and Contingency Plan (plan) dated June 2000. Those comments are summarized here with additional clarification.

The Liberty Contingency Plan, dated June 2000, is considered insufficient for review at this time. The plan does not incorporate any findings from the "Joint Agency Evaluation of the Spring and Fall 2000 North Slope Broken Ice Exercises report" (dated December 18, 2000). These findings, such as lack of effective response during broken ice periods to meet the State's Response Planning Standard (RPS), revised equipment efficiencies, and realistic maximum response operating limits (RMROLs), must be addressed, along with spill prevention measures to be taken when response cannot be safely and effectively conducted.

Section 1.6.14 Response Scenarios

Blowout during freeze-up and pipeline break during breakup: These scenarios need to be revised, based on results of broken ice tests. During freeze-up, mechanical recovery is ineffective when ice coverage is greater than 1%. During breakup, mechanical recovery is effective when ice coverage is no greater than 10% (with no ice management) up to 30% (with ice management). 18 AAC 75.445(g) requires the applicable RPS be met using mechanical methods of oil control, containment and cleanup. The ice coverage



percentages for most days in the scenarios are much higher than these limits. RMROLs need to be revised. The skimmer efficiency rates used in the scenarios are not appropriate, based upon observations during broken ice exercises and findings of Lori skimmer tank tests. On March 12, 2001, BPXA submitted revised skimmer efficiencies for Lori skimmers operating in brash and slush ice, based on test tank measurements. These revised efficiencies have been received by the ADEC but not yet fully evaluated. However, revised efficiencies must be used in the scenarios for determining compliance with the RPS. 003

The plan does not clearly identify the number of personnel resources required at designated times, or from where the personnel resources will be supplied, or that these resources are sufficient in number and training to contain, control, and cleanup within 72 hours that portion of the RPS volume that enters open water. The plan must be amended to include a manpower loading table to demonstrate that trained personnel are sufficient in number to meet the applicable response planning standard and can be deployed within the time specified. An equipment-loading table must also be included, and the time to deploy and initiate recovery operations must be indicated. This table should define the equipment required for each task force so that equipment is not assigned to more than one task force. For example, if Tactic R-19A will be deployed during broken ice periods (up to 30% ice coverage), ice management will be required. This will take a number of vessels out of spill response to be used for ice management.

Section 1.6.8 Lightering, Transfer, and Storage of Oil from Tanks

Offloading of recovered product from a barge to storage on shore has not yet been satisfactorily demonstrated. This is a critical element in recovery that must support and sustain the recovery rate of on-water task forces. Scenarios need to be revised to indicate an effective and feasible method of offloading recovered liquids from storage and response barges to demonstrate the capability to sustain response operations and meet the RPS.

Section 2.1.6 Operating Requirements for Exploration and Production Facilities

Well cellars across the North Slope have a demonstrated history of chronic leak problems. The well cellar design in the plan is similar to the conventional design across the North Slope. The ADEC is currently reviewing a revised design for well cellars in the Northwest Eileen project that provides an effective containment system to address the problem of persistent spills. The proposed well cellar design at Liberty needs to ensure integrity from spills resulting from operations and maintenance.

Section 2.5.4 Visual Inspections

Weekly aerial surveys of the pipeline should continue through broken ice periods, not just "light sea ice." Surveys should be initiated at early spring breakup and continue until contiguous, landfast ice forms along the pipeline corridor.

003

Section 3.9.1 Spill Response Team Training

More detailed information is needed regarding basic types of training during first year for team members, annual minimum attendance rate, and minimum number of proficiency checks performed annually.

004

*SECTION I.H.7.a. Seasonal Operating Restrictions (Page I-28)*

This mitigation measure provides resource protection by eliminating the potential for a blowout during broken ice periods during development of the project. BPXA is prohibited from drilling the first development well into targeted hydrocarbon formations during the defined broken ice periods for the site location; drilling subsequent development wells into previously untested hydrocarbon formations during defined broken ice periods and imposition of additional restrictions will be on a case-by-case basis. The spring broken ice period commences 15 days prior to the reported early breakup date of June 28 and proceeds until the ice concentrations remain at less than 30% for a period of 48 contiguous hours and for a distance of 0.5 miles as viewed in all directions adjacent to the product facility during breakup. The fall period shall commence on the earliest date after September 15 when ice concentrations of 30% or more for a period of 48 contiguous hours for a distance of 0.5 miles as viewed in all directions adjacent to the production facility and proceed until the ice is aggregated and contiguous with shore based ice with an ice thickness of 18 inches or more in each of the four cardinal compass directions adjacent to the production facility.

Based on information presented in the *Oil Spills in Ice Discussion Paper* (December 2000), the following broken ice periods can be expected at Liberty:

| | |
|---|---|
| July 4 ± 4 days | Spring breakup starts |
| July 19 ± 10 days | Open water |
| October 4 ± 9 days | Fall freezeup starts |
| Early to mid-November | Landfast ice |

Based on these dates, the longest broken ice periods that could be expected would be July 1 to July 29, and September 25 to November 15. However, shorefast ice may break up sooner in the spring, resulting in a loss of shoreline access. In addition, greater than 18 inches of contiguous ice is required for safe on-ice operations based upon tactical information in the Alaska Clean Seas Technical Manual. Ice is typically thinner than this for several weeks prior to physical breakup. Based on this information, it is likely that effective on-ice response operations could not be safely conducted as early as April 15th in some years. Therefore, the seasonal drilling restriction dates must be established with respect to periods when reasonably effective response operations can be conducted, such as when contiguous, shorefast ice greater than 18 inches thick is present or broken ice concentrations are less than 10 percent.

Furthermore, it must be recognized that spill risks are present whenever drilling new wells. S.L. Ross Environmental Research Ltd. (1988) calculated the chance of an extremely large oil spill (greater than 150,000 barrels) from a blowout for Northstar and Liberty. Using only Liberty information, the estimated frequency of spills greater than 150,000 barrels from



004

blowouts during a drilling program, based on an exposure of wells drilled (14) is $4.62 \times 10^{-4}$, or a 0.05% chance over the 2-year drilling period (0.5 per 1000 wells drilled). The estimated frequency of spills greater than 150,000 barrels from production/workover wells based on exposure of well-years (210) is $2.10 \times 10^{-3}$, or 0.21% over the lifetime of Liberty (2.1 per 1000 wells drilled). Using historical blowout incidents on the North Slope, the spill risk for Northstar was previously calculated by the ADEC to be 1.8 per 1,000 wells drilled.[1] Additionally, the blowout rate for the OCS has been documented at 3.5 per 1,000 wells.[2] This indicates a significant risk is associated with offshore development drilling.
In light of the potential risk and response limitations imposed by seasonal ice, the proposed periods when drilling restrictions apply should be determined by the time required to complete oil spill clean-up operations and drill a relief well, as described in the contingency plan, and based upon the historical worst case estimate of break-up timing for this offshore area of approximately May 15th. This restriction should exclude the drilling of new wells or the sidetracking of existing wells during the seasonal ice periods. This restriction is reasonable and necessary to ensure the plan holder's compliance with specific temporary measures until environmental conditions improve to reduce the risk or magnitude of an oil discharge during periods of broken ice when planned spill response methods are rendered ineffective by environmental limitations consistent with the standards of 18 AAC 75.445(f). Additionally, an ice-monitoring plan should be implemented to determine at what point safe ice conditions exist for response operation to be conducted on the ice pack in the spring and fall.

As noted in the "Joint Agency Evaluation of the Spring and Fall 2000 North Slope Broken Ice Exercises report" (dated December 18, 2000), the broken ice response system is limited. Specifically, response tactic R-19A barge recovery system is valid in spring ice conditions of up to 10% coverage, or up to 30% coverage if ice conditions fall within certain parameters and ice management tactics are used to reduce ice concentrations down to 10% at the skimmer. This response tactic is effective in only trace ice coverage in the fall.

Because of these limits, BPXA has agreed to seasonal drilling restrictions outlined in the Compliance Order by Consent (COBC) dated May 11, 2000 until all remedial measures associated with the COBCs are met. Several of these remedial measures have not been met. The most significant outstanding issue relevant to Liberty is a demonstration of capability to offload a response barge laden with recovered liquids to shore, in order to ensure the capability to sustain offshore recovery efforts.

The Joint Agency Evaluation report was published at the same time as the DEIS, so the findings were not taken into account. The broken ice test results are very significant, and must be incorporated into the EIS for Liberty.

005

*SECTION I.H.8.a. Seasonal Operating Restrictions*
*This proposed mitigation would halt oil production during broken ice periods, when response capability is limited. During freezeup and breakup, all drilling and production operations*

1 Alaska Department of Environmental Conservation, "Preliminary Analysis of Oil Spill Response Capability & Policy Options for Broken Ice Seas," August 5, 1998, p. 11-12.
2 P. Skalle and A. Podio, "Trends extracted from 1,200 Gulf Coast blowouts during 1960-1996," *World Oil*, June 1998, p. 68.

*would stop. These periods would be defined by ice conditions and not by specific dates. Operations could resume after reaching solid ice cover (winter) or open water (summer). This mitigating measure is intended to reduce the potential for an oil spill by suspending operations and removing all oil from the sales-oil pipeline during broken ice conditions.* 005

This measure provides the best protection for resources during broken ice periods. As discussed above, spill response capability is severely limited during these conditions. Spill prevention is therefore the best protection during this time, and halting drilling, production, and transportation of oil during broken ice clearly would be an effective prevention method. However, the ADEC recognizes that seasonal operating restrictions pose severe economic constraints on a project and present a number of technical challenges as described in the DEIS. In addition, the risk of a potential oil or chemical spill increases in some areas of operation under this mitigation.

Alternatively, seasonal operating restrictions could be effectively addressed by adhering to the seasonal drilling regime discussed above (SECTION I.H.7.a.) and the development of the pipe-in-pipe offshore pipeline that incorporates integral discharge containment. The pipe-in-pipe system should be thoroughly investigated as an effective means of spill containment. 006

*SECTION II.A.1.b.(3)(b) Leak Detection Systems (Page II-3)* 007

Pipeline leak detection: The proposed systems (MBLPC and PPA) may not function correctly if the line is not packed and flowing in a steady state. Recent function testing of these leak detection systems has revealed the reliability and sensitivity of these systems are adversely affected by an unstable pipeline flow regime. One means of ensuring improved leak detection system performance is the incorporation of surge tanks at the production facility to aid pipeline flow stabilization and result in improved leak detection capability for these systems.

*SECTION II, Description of the Alternatives, (b) Gravel Mining Design, Operation and Rehabilitation (Page II-5).* 008

Gravel excavation from a new mine site in the Kadleroshilik River floodplain will occur in two phases over a two year period. Phase 1 will provide gravel for the production island during year 1. Phase 2 will provide gravel to support pipeline construction during year 2. Another alternative to obtaining all of the project gravel from the Kadleroshilik River site would be to obtain gravel for Phase 2 from abandoned airstrips along the Kadleroshilik River 7 to 10 miles south of the proposed new mine site. One or both of the airstrips may provide adequate gravel reserves for pipeline construction activities. Even if a single year construction season is used, part of the project's gravel could still be obtained from the abandoned airstrips.

If gravel were obtained from the abandoned airstrips rather than from the Kadleroshilik River mine site in year 2, consideration should be given to using an ice pad for overburden storage as the Phase 1 cell of the Kadleroshilik River mine site is developed in year 1. Overburden storage from the Phase 1 cell is proposed to be temporarily stored in the Phase 2 cell under the 2 year mining scenario. As the Phase 2 cell would not be developed if adequate gravel is available from the abandoned airstrips, overburden storage there from the Phase 1 cell would needlessly impact



additional habitat. Overburden temporarily stored on an ice pad could be removed and placed within the mine site during site rehabilitation with little impact to surrounding habitat. 008

*SECTION II.A.1.b.(3)(c) Pipeline Operations, Maintenance, and Repair* 009
*The DEIS states that visual surveillance flights to search for oil sheens on the water would occur weekly during open-water and broken-ice conditions. (Page II-11)*

As noted above in the contingency plan discussion, weekly aerial surveys of the pipeline should start with early breakup and continue until contiguous ice forms.

*SECTION II.A.1.b.(3)(c) 3) Pipeline Repairs* 010
*The probability of needing to repair the pipeline during its design life is very minimal, no matter which design is selected. (Page II-12).*

Six methods of repair are briefly described in this section. The DEIS notes that Appendix E of the BPXA Intec Report (2000) provides details on each repair method. The Executive Summary of the Intec report is included Appendix D-5 of the DEIS. Section 4, Operations and Maintenance Concerns, of this Executive Summary states:

> *Cleanup strategies for a potential spill would be similar for any of the pipeline alternatives. The manpower and capabilities would be in place to successfully monitor, control, and clean up any spill at any time of the year, however remote the possibility. There is a risk of a secondary spill volume during repair of alternatives with an annulus; this risk must be considered during the development of detailed repair procedures.*
>
> - *For all pipeline alternatives, there are periods (breakup and freeze-up) when a repair could not be carried out.*
> - *For alternatives with an annulus, all moisture and oil would need to be removed from the annulus during repair. Any moisture that remains in the annulus could potentially cause corrosion of the inner or outer pipe. Any oil that remained in the annulus could potentially leak out at a later time if the integrity of outer pipe, jacket, or sheath was compromised.*
> - *Not all repairs are able to return some pipeline systems to the same integrity level as originally constructed.*
>
> *For all alternatives except the single wall pipe, repair is difficult, if not prohibitive. The issues include pipe retrieval, repair splicing and annulus purging (for pipe-in-pipe and pipe-in HDPE), and long-term pipe integrity.*

We take exception to the statement that "manpower and capabilities would be in place to successfully . . . clean up any spill at any time of the year." As noted previously, recovery in broken ice conditions is virtually non-existent. In addition, the time required to clean up spills on the North Slope this winter alone have not shown that manpower and/or equipment is in place to respond successfully. Based on information provided in the DEIS, we do not foresee changes in operations at Liberty that would improve spill response to the "successful" level stated above.

In order to fully evaluate the repair methods that might be used in the event of pipeline damage, details from the Intec report should be included in the DEIS directly, rather than by reference. We must rely on the Intec evaluation, which states that repair would be difficult at best. 010

*SECTION II.A.4. Description of BPXA's Oil-Spill-Response Plan*
*The DEIS discusses Tactic R-19A in the Alaska Clean Seas (ACS) Technical Manual. (Page II-20).* 011

The DEIS uses old data in describing the recovery rates for skimmer systems deployed in this tactic. As noted above, recovery capability is greatly reduced in broken ice conditions.

*SECTION II.C.2. Pipeline Designs (Page II-27)* 012

Our primary concern is the potential for an offshore oil spill due to a pipeline failure resulting from an engineering design or integrity issue. The first defense against an offshore oil spill is a pipeline design that is proven, robust and meets or exceeds US Department of Transportation (USDOT) safety regulations.

The state commends BPXA and Minerals Management Service for supporting independent research to determine whether alternative pipeline designs could reduce the potential for oil spills. The studies indicate that the single-wall pipeline design used on the Northstar project can meet or exceed federal pipeline safety standards and code requirements, is extremely safe and low risk, and is the simplest and best understood of the pipeline design options examined. While the studies concluded that double-wall pipe mathematically decreased the total probability of a spill compared to single-wall design, this conclusion was based on the very limited data inputs available and is thus of limited validity. In addition, the studies do not appear to give adequate weight to the fact that the individual probability of an oil spill due to ice gouging and strudel scour is lower for single-wall than double-wall pipeline. We believe that these two environmental conditions present the largest design challenges for arctic offshore pipelines. Similarly, the studies do not adequately address the additional probability of failure from construction, operations, and maintenance of the more complex double-walled pipe system. 013

It does not appear that the studies considered issues related to complicated or one-of-a-kind designs. Any apparent advantage of a double-wall pipeline loses technical appeal when such design complexity, complexity of modeling stress for such designs, increased weld count, inability to monitor external pipe integrity, repair issues, clean up if a leak were to occur and other issues are considered. Consideration of all design and operations issues favors a robust single-wall design. Design considerations appear to be overshadowing operations and maintenance considerations in the EIS process, while operations and maintenance have the greatest influence on pipeline integrity according to USDOT-Office of Pipeline Safety studies. 014

The EIS correctly portrays the results of the independent pipeline studies, that double-wall pipeline design does not have measured consistent advantages related to spill risk and has clear disadvantages related to operation and maintenance activities, construction difficulty, and cost.



The DEIS descriptions of the probability of containment failure, inspection of pipeline welds, catholic protection, and the LEOS system highlights the technical challenges of the pipe-in-pipe design.

As previously discussed, effective oil recovery in spring and fall broken ice periods has not been adequately demonstrated. If the numerous design, construction, operation, and maintenance questions associated with a pipe-in-pipe system were resolved, the system could provide an enhanced spill containment measure to mitigate this response concern.

As an aside, we are concerned that the volume of technical engineering performed for the project and some terms used in the studies (such as functional, containment, and system failures) may cause confusion for some readers. We suggest that a summary of the final pipeline evaluation process be included in the EIS for the benefit of the non-technical public. 015

A detailed Best Available Technology (BAT) analysis of the pipe-in-pipe system is necessary in the Liberty Oil Discharge Prevention and Contingency Plan (C-plan), Part 4. As required by 18 AAC 75.445(k), the BAT review includes availability, transferability, effectiveness, cost, age and condition, compatibility, feasibility, and environmental impacts.

*SECTION II.C.5 Pipeline Burial Depths (Page II-36)* 016

Based on the information provided in the DEIS regarding strudel scour, ice gouging, thaw settlement, and upheaval buckling, we think the proposed 7-footminimum burial depth (trench depth varies from 8 to 12 feet) is appropriate for this project.

*SECTION III.B.2 Pipeline Design Studies (Page III-B-2)* 017

As noted above, a BAT analysis of the pipe-in-pipe system is necessary in the Liberty C-plan to address the issues of source control and leak detection. The BAT analysis will also need to evaluate the corrosion protection requirements at 18 AAC 75.080 for buried crude oil transmission pipelines.

*SECTION III.C.1.a. Discussion of BPXA's Proposed Liberty Oil Discharge Prevention and Contingency Plan (Page III-C-1).* 018

See the above discussion in Section III.B.2.

*SECTION III, Effects of the Liberty Project, Large Oil Spills, Terrestrial Mammals (Page III-C-36).* 019

This section mentions that helicopters could be used to scare terrestrial mammals away from the spill area but that poor weather may prevent use of this spill response option. It should also be noted in the discussion that depending on the areal extent of the spill area, ground-based or even water-based hazing programs could be used to keep mammals away from a spill site. These spill response components would be less restricted by weather conditions than would aerial activities. These comments are also applicable to polar bears and birds.

020

*SECTION III, Effects of the Liberty Project, Large Oil Spills, Vegetation-Wetland Habitats (Page III-C-43).*

In describing the effects of a spill to vegetation, it would be clearer to the reader if the document stated the maximum recovery times listed are contingent upon a summer spill occurring during a period of maximum thaw when both surface and subsurface plant structures would be adversely affected to the greatest degree.

021

*SECTION III.C.2.n. Effectiveness of Oil-Spill-Related Mitigating Measure on Seasonal Drilling Restriction.*
*This mitigating measure would be effective in reducing the risk of an oil spill from a blowout during broken ice, when cleanup is more difficult. The added protection to subsistence resources could lower the effects to subsistence harvest patterns and sociocultural systems. This measure would also provide some protection to water and air quality, and would reduce or eliminate the chance of a blowout spill occurring before and during broken ice periods when cleanup is more difficult and less effective. (Page III-C-59)*

This section evaluates the need for this measure including the fact that the probability of an oil spill from a blowout already is very low. The threat of a blowout is greatest when drilling in unexplored formations and encountering unexpected pressures. The proposed schedule has drilling starting in January of Year 3, and four wells would be completed prior to breakup in Year 3. Drilling activities will stop from July 15 until November 15 in Year 3. By breakup in Year 3 (this appears to be a typographical error, perhaps should be Year 4?), BPXA would have about half (11 of 23) of the wells completed. The drilling history for these wells, the chance of encountering a blowout while drilling the remaining wells would be small.

The DEIS states that this seasonal drilling restriction would delay the drilling schedule for up to 8 weeks and extend the time it takes to complete the drilling of all 23 wells. The wells could be drilled to a specified level above threshold depths and then the wells could be completed after freezeup. This potential mitigating measure would likely delay completion of drilling by 2 or more months.

The ADEC concurs with the above justification for seasonal drilling restrictions. The ADEC believes that a blowout occurring in broken ice conditions (either breakup or freezeup) would take substantially longer than 2 months to clean up. An additional 2 months is a small impact on a multi-year development schedule. Until mechanical oil spill recovery and cleanup technologies for broken ice conditions improve significantly, the ADEC will continue to recommend seasonal drilling restrictions as the most effective prevention method to address the lack of offshore response capability. However, as previously discussed in SECTION I.H.7.a., drilling into hydrocarbon zones should be suspended early enough to ensure adequate time to conduct response operations before the onset of unstable ice conditions and may not resume until ice concentrations are at 10 % or less. Similarly, in the fall, drilling must cease once contiguous slush ice forms and not resume until the development of solid ice at least 18 inches thick.



022

Page III-C-13: The text states, "The MMS and State Pipeline Coordinator's Office's engineering staffs and six third-party consultants will conduct in [extra word?] an independent review of the pipeline design and design basis." For clarification, the design basis review may require more than six third-party consultants, so it is more accurate to remove the number of consultants from the text.

023

*SECTION III, Effects of the Liberty Project, Disturbances, Effects of Disturbances on Grizzly Bears (Page III-C-75).*

This section states problem bears may have to be captured by the Alaska Department of Fish and Game (ADF&G) and transported from the oilfields. The ADF&G generally does not relocate bears as past experience has shown bears will return to the original capture area from long distances in a relatively short period of time. Furthermore, relocation may only serve to move the problem from one area to another. This section should focus instead on prevention of attraction of bears to the site, and the use of non-lethal deterrence in the event bears do frequent the site.

024

*SECTION III-D-2, Effects of the Liberty Project, Other Issues, Gravel Mining (Pages III-D-8-11).*

The DEIS proposes two alternatives as sources of gravel for the project: a new mine site within the lower Kadleroshilik River; or the existing Duck Island gravel mine site.

The DEIS attempts to compare potential effects of gravel mining within the Kadleroshilik River with effects recorded in streams within Oregon. Some of the effects described for Oregon sites are the result of mining in flowing water (generation of fines and siltation). The mine site in the Kadleroshilik River would be operated in winter under frozen, dry conditions. Some generation of sediments would occur during filling once the mine site is connected to the river, although the amount should be minor and would be transported during high flows at breakup. Considering the proposed mine site is about 1.4 miles upstream of the coast, a limited reach of stream could potentially be impacted by sediment transport.

Some minor effects to the stream will occur as the material site fills, and as previously frozen material along the connection points with the stream thaws and slumps before reaching thermal equilibrium. The gradient of the river at this location, the channel configuration and width, the system drainage area, timing of peak flows, and the proximity to the ocean all suggest there will be minimal effects to the stream system beyond the immediate proximity of the mine site.

As stated within the DEIS, and in contrast to statements attributed to Oregon studies, the ADF&G believes creation of a material site and its subsequent rehabilitation within the Kadleroshilik River floodplain can provide general ecosystem benefits by creating overwintering habitat for fish in a system where deepwater habitat is limited. Dolly Varden, broad whitefish, and ninespine stickleback would likely use and may overwinter in the site. This deep overwintering habitat may allow numbers of these fish species to increase and may increase the temporal extent that fish may be able to use this small river system.

024

Use of the Duck Island material site instead of the Kadleroshilik River site would require removal of an estimated 600 million gallons of water before additional gravel could be removed from the site. Estimates place the time to remove the 600 million gallons at between 120 and 400 days.

Using the Duck Island gravel mine site instead of the Kadleroshilik River site would delay the final rehabilitation of the Duck Island site. Besides the additional time it would take to fill that portion of the mine site deepened by 6-12 meters, approximately 15 years would be needed to replenish the estimated 600 million gallons of water that would have been pumped from the site before the additional mining could occur. Without direct intervention to fill the site following use for the Liberty Project, it would likely take several decades of precipitation and snowmelt to fill the Duck Island mine site and accomplish the final site rehabilitation.

Rehabilitation of the Duck Island mine site would provide additional habitat for use by waterbirds. The rehabilitation plan was designed to enhance use of the site by waterfowl. The rehabilitation of the Duck Island site could be used as mitigation for wetland habitats altered during the development of the Kadleroshilik River mine site.

The DEIS discusses potential disturbance to muskoxen by gravel hauling yet there are little data provided on the use of the area by muskoxen. The DEIS notes that in one year 14 muskoxen were observed in the project area. However, there is little information presented in the document that indicates the use of the area by muskoxen in winter is brief, extensive, near the proposed mine site, or distant from it. Without this information it is difficult to assess if disturbance from gravel mining is truly an issue for muskoxen.

025

*SECTION V, Cumulative Effects, (3) Effects of Disturbance on Caribou Movements and Calving (Page, V-34).*

The last sentence in this subsection appears to be misstated as it implies that if construction traffic was restricted <u>to</u> the calving and post calving periods, caribou would experience less disturbance and displacement. What the sentence should state is that activities should be restricted during these critical time periods to minimize disturbance. The discussion of roads and traffic should not be restricted to construction activities but should also include routine development and maintenance activities.

026

*SECTION IX. Low Probability, Very Large Oil Spill*
*The DEIS states that skimming systems would have a combined estimated recovery capacity of 12,950 barrels of oil per 10 hour shift in open water, and 18,060 barrels of oil per 10 hour shift in broken ice. These rates would decrease, depending on the ice concentration in the area being worked (Page IX-1).*

As noted previously, the scenario for response in broken ice is inaccurate. Broken ice tests conducted in 2000 indicate that there is virtually no recovery when ice accumulation is greater than 10% coverage, or greater than 30% coverage if ice management is used. Additionally, the practical deployment of skimming systems is dependent upon the number of response platforms capable of supporting individual skimming systems and the use of skimmers



026

appropriate for the oil and environmental conditions. The recovery capacities noted in the DEIS are greater than the capacities indicated in the response scenarios in the Liberty Oil Discharge Prevention and Contingency Plan. The combined estimated recovery capacity of all skimming systems located on the North Slope is an inappropriate and misleading assessment of capability to meet the RPS.

This concludes the State of Alaska's page-specific comments on the Liberty draft EIS.

**0137-E01**

In part, the redundancy and length of the summaries are the result of information that various reviewers of preliminary drafts of the EIS thought should be included.

**0137-001**

The text has been changed in response to this comment.

**0137-002**

The typo has been corrected.

**0137-003**

We concur with this comment. A more in-depth discussion of the spring and fall 2000 barge trials will be added to the document.

BPXA is revising their oil-spill-contingency plan to incorporate lessons learned during the spring and fall 2000 trials, including the newly established upper operating limits.

The RPS is not a Federal standard. According to 40 CFR 254.26(d)(1), operators are required to show how they will cope with the initial spill volume on arrival at the scene and then support operations for a blowout lasting 30 days. The Federal regulations stipulate that operators must describe how they will contain and recover the discharge to the maximum extent possible. Under the Oil Pollution Act of 1990 and the MMS regulations, there is no requirement for a "recovered quantity in a given period of time."

Listed skimmer efficiencies for the Lori units will be evaluated, and recovery capabilities adjusted where applicable to reflect the demonstrated recovery limits.

The MMS is evaluating the reports generated on the lightering exercises during 2000.

The MMS will consider any information that the State of Alaska, Department of Environmental Conservation may have on problems with leaks in the well cellars when approving final construction and operating requirements for the Liberty facility.

The MMS will coordinate with BPXA, the State Department of Environmental Conservation, and the Department of Transportation to determine the most effective periods for overflights of the pipeline route in broken-ice conditions.

**0137-004**

"Seasonal Drilling Restriction During Broken Ice" is analyzed in the draft EIS as a potential mitigating measure. No final decisions have been made regarding the mitigating measures that ultimately will be applied to the Liberty development project. Our analyses to date indicate that the protections provided by other stipulations; the operating regulations at 30 CFR 256; the design of the Liberty Project; and the continuing authority of MMS at any time to require either additional measures or to cessation of operations, adequately address the risks associated with the potential for oil spills associated with the Liberty Project.

Seasonal drilling restrictions, as originally formulated and used by MMS in the past, were for exploration drilling only and did not apply to development drilling. The risks associated with the drilling of development wells and subsequent production are much less than those associated with exploration drilling.

The MMS recognizes that blowouts are a serious concern. A blowout of greater than or equal to 150,000 barrels in the Beaufort Sea, although perhaps not impossible, would be extremely improbable. Two spills greater than 50,000 barrels have happened since offshore drilling began in the United States. The largest spill from a blowout in Federal waters is 80,000 barrels. After the Santa Barbara spill in 1969, significant regulatory changes were made. There have been no large (greater than or equal to 1,000 spills) from blowouts since 1971. Since 1971, no more than 450 barrels have been spilled in any one incident and approximately 1,200 barrels total have been spilled from 28 well-control incidents. Most blowouts naturally bridge; about 60% of blowouts cease within a day, while only 10% have lasted more than 7 days.

Because there have been no spills greater than 150,000 barrels in U.S. waters, we must look elsewhere for data on spills of that size. Therefore, we use worldwide data to estimate the chance of very large spills occurring. The spill information we use is based on spills from other countries that do not have the regulatory standards that are enforced on the outer continental shelf. In addition, some drilling practices used elsewhere either are not practiced here or are against outer continental shelf regulations. Some of the spills greater than or equal to 150,000 barrels are the result of acts of war. All these caveats need to be cited when discussing the statistics.

**0137-005**

This mitigating measure was not evaluated as a potential mitigating measure in the EIS, because MMS believes the risks associated with this measure are significantly greater than the very low risks associated with continuing oil-production activities through the seasonal broken-ice period.

**0137-006**

Pipe-in-pipe has been thoroughly addressed in the EIS and in the various pipeline-related studies summarized and incorporated by reference into the EIS. We reviewed all available pertinent information related to pipe-in-pipe and have determined that the increase in complexity and the reduction in integrity monitoring capabilities associated with pipe-in-pipe do not justify the small, about 1%, reduction in the chance of a spill.

All available information points to the fact that integrity monitoring is more important than pipeline design in reducing the probability of a spill. In fact, the U.S. Department of Transportation recently has enacted regulations requiring integrity monitoring for hazardous-liquid pipelines in high-consequence areas. The monitoring program proposed by the applicant calls for running wall-thickness pigs every 2 years, which far exceeds the 5-year period prescribed in the new Department of Transportation regulations.

The outer wall of a pipe-in-pipe system cannot be monitored by any current system and, therefore, cannot be relied on to provide secondary containment in the unlikely event of a leak from the inner pipe. We believe that it is not prudent to require a pipeline system that cannot be effectively monitored for integrity, especially for a very minor potential improvement in safety.

**0137-007**

The MMS agrees that the performance of the mass-balance line-pack compensation and pressure-point analysis leak-detection systems are more accurate on a pipeline that is in a steady state flow condition, and that it would be easier to achieve steady state flow if a surge tank is installed. The accuracy of the LEOS system is not affected by the flow conditions of the pipeline and should be able to detect a much lower leak rate than either of the other systems under even the most optimal operating conditions.

**0137-008**

The MMS has addressed the potential use of abandoned gravel roads, pads, and airstrips in a proposed mitigation measure (Section I.H.7.b) that would require the permittee to assess abandoned onshore gravel sites near the Liberty Prospect and/or within the Prudhoe Bay oil field and develop gravel recovery and rehabilitation plans for abandoned site(s). These plans would need to include: the location, amount, and type of gravel; the areal extent of the gravel site (size); the current owner and any ownership issues; any potential gravel contamination concerns and a proposal to deal with those concerns; the proposed timing for obtaining applicable local, State, and Federal permits; and a rehabilitation plan, including timetable. The purpose of this mitigation is to offset the reduction in wetlands that would result from onshore mining activities and gravel pad construction (for example, shore-crossing pad and pipeline tie-in pad).

None of the abandoned airstrips suggested by the State of Alaska are estimated to have sufficient gravel to meet gravel needs for installing the pipeline. If gravel were obtained from both the Pingo H. landing strip and the Kadleroshilik River landing strip, the quantity likely would be sufficient. However, there is no information available to determine whether the gravel at the sites is contaminated or not. If the gravel is contaminated, MMS would not allow the gravel to be dumped into the Beaufort Sea as select backfill for the pipeline; therefore, mining still would occur at the principle mine site. If the gravel is contaminated and unusable, the airstrips still could be cleared and rehabilitated to reduce the potential loss of habitat, but the gravel could not be used for the project. For this situation, the effects that would occur at the mine site still would be the same at those described in Sections III.D.2 or IV.C.4.b. The surface area of Pingo H. and Kadleroshilik River landing strips is approximately 25 acres (Fay, 2001), which is slightly more than the area included in first-phase mining at the Kadleroshilik River Mine Site.

Mining gravel from an onshore site would occur on State of Alaska land and would be subject to the conditions of State permits. Selection of the gravel-mine site is a matter between the State and BPXA; MMS regulatory authority is limited to the Federal waters part of the project area.

**0137-009**

Please see Response 0137-003.

**0137-010**

The MMS understands your concern with the statement in the INTEC report that spills could be successfully cleaned up any time of year. When we present this information, in the appendix of the EIS, we are not drawing any conclusions to the validity of the claim, but are merely presenting the findings of the applicant's report. In the body of the EIS we go into more detailed analysis about the effectiveness of spill cleanup and believe that the draft EIS did a fair job, based on the information available at the time, of discussing the limitations of oil-spill cleanup in the Beaufort Sea. Based on information obtained since the draft EIS was produced, we have revised the EIS to incorporate such additional information as the joint agency report on the 2000 spill drills.

We believe that the EIS provides adequate details about the various types of repair methods available to evaluate the potential impacts from these activities, and that adding additional information from the INTEC report to the body of the EIS would not add significantly to this understanding. The effects of repair activities are analyzed in Sections III and IV of the EIS for the applicant's Proposal and the alternative pipeline designs considered, respectively.

In the unlikely event of a pipeline failure, the operator would propose a very specific pipeline repair and recommissioning procedure, which would go into far greater detail than is contained in the INTEC report. This proposal would be thoroughly reviewed by the agencies that have pipeline regulatory authority. It is impossible to evaluate the effectiveness of a potential pipeline repair method without specific information about the location, type, and severity of the failure and this information would not be available until the pipeline had actually failed.

**0137-011**

New data on recovery rates for skimmer systems has been reviewed and evaluations revised as applicable.

**0137-012**

The MMS agrees with this comment. During the joint technical review of the pipeline right-of-way applications by the MMS and the State Pipeline Coordinator's office, the review team will review all aspects of the pipeline design to ensure that it is properly designed to perform its intended function.

**0137-013**

The MMS agrees that the applicant's proposed single-wall pipeline is the most appropriate design alternative for this project. We agree with the majority of concerns raised in this comment, but we also believe that pipeline integrity monitoring is a very important factor in ensuring pipeline safety. The proposed single-wall pipeline is the only design that will allow for the entire pipeline system's integrity to be monitored by the currently available technology. The other alternative designs all have components that cannot be properly monitored to determine the integrity of the component and detect problems before a failure occurred.

**0137-014**

The MMS agrees with the majority of this comment. The single-wall pipeline has a very distinct advantage when it comes to operational and maintenance concerns and provides a very safe pipeline with a low probability of failure over the expected life of the project. The pipe-in-pipe alternative may provide a slightly lower probability of a containment failure due to the potential for secondary containment provided by the outer pipe. However, due to the operational and maintenance concerns associated with pipe-in-pipe, particularly the significant reduction in integrity monitoring capabilities associated with the outer pipe, we have concluded that the secondary containment potential of pipe-in-pipe cannot be assumed. Because secondary containment cannot be relied on, the MMS believes that the independent risk analyses may underestimate the leak probability for the pipe-in-pipe alternative.

**0137-015**

The MMS agrees that the discussion on pipeline design alternatives may be somewhat confusing to nontechnical readers, but we have done our best to make it as simple as possible and still retain the necessary information that the decisionmakers will need.

Because there are multiple entities that have decisionmaking authority over pipeline design, we feel it would not be possible to come up with a single summary of the pipeline evaluation process that will be followed by the decisionmakers.

**0137-016**

Based on the limited review done so far, the MMS also agrees that the 7-foot minimum burial depth is appropriate for the single-wall pipeline design option. However, their joint technical review of the pipeline right-of-way application, the MMS and the State Pipeline Coordinator's Office will look thoroughly at all aspects of the proposed pipeline's design, including burial depth, to ensure that the pipeline is properly designed for its intended application. It is possible that this review may conclude that a different burial depth is required, but we believe that any change required would be within the scope of the effects analyzed in this EIS.

**0137-017**

The Best Available Technology analysis is not a required component for contingency plans submitted to the MMS for review.

**0137-018**

Please see Response 0137-003.

**0137-019**

Because there are no roads along the coast of the Foggy Island Bay-Liberty area, ground transportation as a means of hazing wildlife would not be feasible. It also would not be feasible along other parts of the Beaufort Sea where there are no roads. Vessel hazing of wildlife would not be feasible in severe weather and in heavy ice conditions. Depending on the time of the year, daylight hours also would be a limiting factor in the success of wildlife hazing from either the air, water, or land.

**0137-020**

The text in Section III.C.2.g(2)(a)1) has been changed in response to this comment.

**0137-021**

This mitigating measure is analyzed in the draft EIS as a potential mitigating measure. No final decisions have been made regarding the mitigating measures that ultimately will be applied to the Liberty development project. Our analyses, to date, indicate that the protections provided by other stipulations, the operating regulations at 30 CFR 256, the design of the Liberty Project, and the continuing authority of MMS at any time to require either additional measures or operations to cease, adequately address the risks associated with the potential for oil spills associated with the Liberty Project.

Seasonal drilling restrictions, as originally formulated and used by MMS in the past, were for exploration drilling only and did not apply to development drilling. The risks associated with the drilling of development wells and subsequent production are much less than those associated with exploration drilling.

**0137-022**

The suggested change has been made in Section III.C.1.4e(4)(b)2).

**0137-023**

This section does focus on measures to prevent attracting of bears to Liberty development sites, such as the proper disposal of garbage and waste and cites MMS *Guidelines for Oil and Gas Operations on Polar Bear Habitats*, which include the use of nonlethal deterrence in the event that bears do frequent the development site (Shideler, 1993). The statement about the State of Alaska, Department of Fish and Game relocating bears has been deleted from the text in Section III.C.3.d(2).

**0137-024**

Information on the effects of gravel mining in Oregon rivers probably was not appropriate for this EIS and has been deleted. Information on gravel mining and mine-site rehabilitation has been added to Section II.C.4. Section IV.C.4.b has been revised to include information about the effects of delaying the rehabilitation of the mine site.

Using the Duck Island mine site would avoid any potential disturbance of muskoxen. Although there is not a lot of information on the use of the project area by muskoxen, the draft EIS notes that the 14 sightings were along the Kadleroshilik River and some of them were very near the Kadleroshilik proposed mine site (see Map 2B). Thus, the fact that muskoxen frequent the project area during the summer as well as the winter suggests that these animals could be exposed to mining and other industrial activities associated with the Liberty Project. Therefore, the MMS believes that disturbance of muskoxen near the mine site is an issue that needs to be discussed in the EIS.

**0137-025**

The text in Section V.C.4.b(3) has been changed in response to this comment.

**0137-026**

Please see Response 0145-012.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

0139

IN REPLY REFER TO:

FWS/DFPA/BFA

RECEIVED
APR 17 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Memorandum

To: Director, Minerals Management Service

From: Deputy Acting Director K Adams APR 12 2001

Subject: Comments on Draft Environmental Impact Statement for the Liberty Project

The Fish and Wildlife Service has reviewed the Draft Environmental Impact Statement for the Liberty Development and Production Plan proposed by British Petroleum Exploration (Alaska) Inc. The BPXA proposes to produce oil from the Liberty Prospect (Outer Continental Shelf Lease Y-01650) located in the Alaskan Beaufort Sea approximately six miles north of the Kadleroshilik River. BPXA proposes to construct a self-contained production facility located offshore in 22 feet of water. Produced oil would be transported to shore via a six-mile subsea pipeline. The proposed pipeline design is single-wall steel, similar to what was used in the Northstar Project (six miles offshore of the Prudhoe Bay Oil Field). At peak production, Liberty would produce 65,000 barrels of crude oil per day.

The Service appreciates the opportunity to review the Liberty DEIS, and appreciates the extension of the comment period to provide sufficient time to review the three volumes of this document. The Service has been a participating agency in the development of the DEIS, taking a particularly active role in the review and assessment of pipeline designs and the development of improved oil spill trajectory models for use in predicting the impacts of oil spills on migratory birds and polar bears.

Liberty is the first oil and gas production facility in Federal waters of the Beaufort Sea, and only the second (Northstar was the first) to include a subsea pipeline to transport oil to shore. Because Liberty will be the first offshore production island entirely in OCS waters, it should set the standard for such facilities in the Arctic, both as a single unit and as a component of future developments planned in Federal waters offshore of Alaska's North Slope. The recommendations below, including the use of double-walled pipe, are intended to provide the safest, most environmentally responsible alternative for offshore development in the Beaufort Sea. We have also included our General and Specific Comments on the DEIS as an attachment.



FWS Recommendations for Liberty Alternatives

*Pipeline Design/Burial Depth*

Independent studies that addressed oil spill risk and probability (C-CORE and Fleet Technologies Ltd.) found that double-wall designs have an oil spill probability (for spills greater than 1000 barrels) at least nine times lower than the single-wall alternative. Based on these studies, the Service believes that double-walled pipeline designs hold the greatest promise of reducing the likelihood of a large offshore oil spill. We recommend that the double-wall design be selected as a component of the preferred alternative. We recognize that a rigorous comparison between single and double-walled pipe requires that an optimized design be developed for the double-walled option. We strongly recommend the applicant proceed on the engineering design of a double-walled alternative for Liberty (to the detailed preliminary design stage) to allow agencies the opportunity to assess and determine the best pipeline alternative. Pipeline burial depth is another important Component Alternative for Liberty, and should be analyzed and selected in conjunction with an optimized double-walled pipeline design. 001

*Island Location*

The Service recommends the Southern Island location due to a smaller requirement for gravel (as compared to the Liberty Island alternative), a greater distance from the Boulder Patch (which would reduce risks to this unique benthic community during construction), and a greater distance from the migratory routes of bowhead whales. The Tern Island location would also provide a reduction in gravel needs and a greater distance from the Boulder Patch, but would provide only minimal change in the distance from whale migration routes. In addition to the three alternatives evaluated in the DEIS, we recommend the review of an island location closer to shore in approximately 8 feet of water. According to figures provided in the Liberty DEIS, a location approximately 3 miles offshore along the proposed pipeline route would meet this criteria. This location would differ from the bottomfast ice location reviewed in Appendix D-1 by being approximately 1.5 miles closer to the Liberty reservoir. 002

*Gravel Source*

The Service recommends the existing Duck Island mine site be utilized as a gravel source to save approximately 30 acres of riparian habitat that would otherwise be eliminated by the development of the Kadleroshilik mine site. E01

*Upper Slope Protection*

We recommend that sheet pile be used for the upper slopes of the production island to eliminate the potential loss of poly bags into the marine environment. E02

We appreciate this opportunity to comment. The Service is committed to working with Mineral Management Service to ensure that we meet our respective missions and trust responsibilities by implementing the safest possible project and setting the standard for environmentally responsible development in the Beaufort Sea. If you have questions concerning our recommendations, please contact Cathleen Short, Assistant Director for Fisheries and Habitat Conservation, at 202/208-6394.

Attachment

ATTACHMENT
U.S. Fish and Wildlife Service Comments on Liberty DEIS
April 2001

GENERAL COMMENTS

Production from the Northstar Project, the first offshore development with a subsea pipeline, is estimated to begin in the winter of 2001/2002. The Service believes the safest approach to additional Beaufort Sea development would include an operational evaluation of the technologies employed at Northstar (e.g., buried subsea pipeline, LEOS leak detection) prior to completion of the Liberty Final EIS. If this is not a viable option, the lack of practical evaluation is further reason that the highest possible safety and environmental standards be implemented for Liberty. **E03**

**E04**

Our primary concern with the Liberty Project, as well as other offshore projects, is the potential for a large offshore oil spill. The Service maintains that the first, and likely only, line of defense against a large offshore spill is to employ a pipeline with the lowest possible risk of containment failure. There are three primary reasons for our concern:

1. A number of species are at particular risk of being impacted by an oil spill due largely to the fact that they concentrate in specific areas and at specific times in the Beaufort Sea, including sea ducks (primarily long-tailed ducks, and common, king, and threatened spectacled eiders), polar bears, bowhead whales, and anadromous fish (such as Arctic and least cisco). A significant number of these species could be impacted by a large offshore oil spill.

2. Recent spill drills conducted for the State of Alaska have shown that the likelihood of containing or cleaning up oil before it impacts fish, wildlife, and subsistence resources is exceptionally poor (skimmers used by the industry could not remove oil from the ocean surface if 10 percent or more of the surface was covered with broken ice).

3. Oil spill risks will increase over time with additional development. There are at least six known oil and gas prospects offshore in the Beaufort Sea between the Colville River delta and Barter Island. With onshore infrastructure spreading both east and west of Prudhoe Bay, it is not unreasonable to expect additional offshore projects will be pursued within the next twenty years, which will translate into additional miles of pipeline, additional island production facilities, and additional risks of a major oil spill from island platforms and subsea pipelines.

The Beaufort Sea is a physically demanding environment, requiring new approaches and technologies to extract resources safely. There remain areas of concern regarding risks associated with arctic offshore development, such as ice gouging and strudel scouring of the seabed (only two years of site-specific data have been collected), the behavior of backfill sediments in the pipeline trench, the effects of storm surge on sediment transport and pack ice movement, and the potential for large groups of low-flying sea ducks and shorebirds to collide with offshore production facilities. The risk of a major offshore spill from the Northstar Project was estimated at 11 to12 percent in the Northstar FEIS, whereas a similar estimate for Liberty is in the order of 1 percent. Due to the lack of experience operating production facilities in the Beaufort Sea, we believe the estimated 1 percent risk of a major oil spill provided in the Liberty DEIS may not be conservative, in that it relies on recent improvements in pipeline construction and monitoring which have yet to be proven in the Beaufort Sea. A range of 6 to 10 percent would appear to be more appropriate considering the data used to estimate risk in the DEIS (e.g., MMS OCS data and North Slope data). 003

The Service commends BPXA for their work regarding conceptual pipeline designs for the Liberty Project (conducted by INTEC Engineering, Inc.) and MMS for initiating three independent studies to evaluate alternative pipeline designs. While these studies addressed specific issues, designs or questions relative to offshore pipeline designs, all four studies recognized or concluded that double-walled pipe, with other factors such as burial depth held constant, decreased the probability of an oil spill compared to the proposed single-wall design. Furthermore, most of the concerns raised during the Northstar EIS review concerning a double-walled design (e.g., corrosion, weld inspection, annulus drying, time required for construction and installation, and cost) have been addressed by the independent studies. Based on cost estimates provided by C-CORE (2000) and BPXA, installation of a double-walled pipeline would result in a 3 percent increase in project costs for Liberty, which appears to be a reasonable cost for additional protection against a major oil spill. The pipeline work accomplished to date has addressed a number of questions, however, double-walled pipeline remains at a conceptual design stage. A01

In addition to the independent studies, a structural analysis of single and double-walled pipeline designs in arctic conditions was recently conducted by Geological Survey Canada. Publication of this work is expected in 2001, but the principal investigator, Dr. Ibrahim Konuk, reported preliminary findings in a presentation in Anchorage, Alaska on February 13, 2001. His analysis found lower levels of strain in double-walled pipe compared to single-walled during equivalent ice gouge events, and the double-walled alternative provided less potential for buckling under equivalent strudel scour or similar events that remove backfill from the pipeline trench. Overall, the analysis showed a 10X (one order of magnitude) improvement in structural response of the double-walled pipe compared to the single-walled pipe (I. Konuk, pers. comm.). While this study has not yet been published, the results present significant new data which should be considered in the Liberty EIS. 004



SPECIFIC COMMENTS

Executive Summary

ExSum-6. The Service suggests that MMS clarify the statements regarding the chance of a large spill occurring. The second paragraph of this section states that the probability is on the order of 1 percent, when the 3rd paragraph of the section states the chance of a spill ranges from 1 to 6 percent. 005

ExSum-6. (3) The Chance of a Large Oil Spill Occurring. Nearly half of this section is devoted to a description of the LEOS technology. Although LEOS is promising, a number of other issues relevant to the topic are not mentioned. This Section, as elsewhere in the document, minimizes the significance of oil spill risks with statements such as "[i]f an estimate of chance must be given for the offshore production island and the buried pipeline, our best professional judgement is that the chance of an oil spill greater than or equal to 500 barrels occurring from the Liberty Project and entering the offshore waters is on the order of 1 percent." This Section should include cautions regarding the lack of operational experience (production in particular) in the Beaufort Sea, the limits of data (2 years of site-specific) used in estimating worst case ice gouge and strudel scour events, and our limited understanding of the effects of sediment transport and storm surge on backfill material in the pipeline trench. Because of these and other uncertainties, we believe the 1 percent estimate of a large oil spill is not conservative, and may overestimate the benefits of recent improvements in pipeline construction and monitoring. We suggest these uncertainties may counter the improvements in technology, and a more conservative estimate of spill risk lies within the range (at least 6 percent) of the methods discussed in Chapter III of the DEIS (e.g., CONCAWE, MMS OCS data, North Slope data). 006

ExSum-7. The analysis of effects of a large spill has a number of assumptions including "...a spill under ice does not move significantly until the ice breaks up." The word "significantly" should be replaced with a quantitative estimate of how far the oil is expected to move, with reference to the appropriate citation. 007

ExSum-7. Cumulative Effects. The DEIS states, "...we exclude future actions from the cumulative-effects analysis, if those actions are outside the geographic boundaries or time frames established for the cumulative-effects analysis." For the sake of clarity, the Executive Summary should define these geographic boundaries and time frames. 008

ExSum-8. Small Oil Spills. Unlike the Large Oil Spill Section (see pg. ExSum-6), the DEIS does not provide the probability of a small spill. Because the probability of a large spill occurring was based on historical oil-spill rates and failure rates, can a similar analysis be conducted to calculate the likelihood of small spills (0 - 499 bbl)? It would be useful to provide a figure which depicts probability versus spill size. 009

ExSum-11. b. Spectacled Eiders. The final paragraph of this section states, "...careful selection of aircraft routes could eliminate most disturbance of nesting eiders." Map 5 illustrates eider nests based on data collected no later than 1997. If the Liberty Project is permitted, construction will occur during 2004. Will the applicant be required to update this information during this 7 year time span? 010

ExSum-12. C. Seals and Polar Bears. In paragraph 2, please change the last sentence to read: "This attraction could require deliberate hazing of polar bears; the effects of these activities by themselves are not believed to adversely affect overall polar bear abundance or distribution." 011

ExSum-12. C. Seals and Polar Bears. In paragraph 3, please change sentences 3 and 4 to read: "Low-flying helicopters could briefly disturb a few polar bears or preclude use of specific habitats by denning polar bears. The numbers of bears potentially disturbed is expected to be low; therefore, effects of these disturbances by themselves are not likely to adversely affect overall [seal or] bear abundance and distribution in Foggy Island Bay." 012

ExSum-12. C. Seals and Polar Bears. In paragraph 4, please change the last sentence to read, "The numbers of bears [and seals] potentially disturbed is expected to be low and would not by themselves be expected to adversely affect overall population abundance or distribution." 013

ExSum-17. C. Please include text from page III-C-29 which provides a description of the model used by Amstrup et al. (2000) to assess potential effects of a hypothetical oil spill on polar bears. It is important that the reader understand the assumptions and limitations of the model and factors which will affect the population's recovery rate. 014

The last sentence in the second paragraph that states "[t]he polar bear population is expected to recover this likely loss within 1 year..." should be replaced here and throughout the text with the following: "[t]he time necessary for reproduction to compensate for a loss would depend upon: 1) the sex and age of bears actually oiled; 2) the presence or absence of sustained environmental degradation; and 3) the size and sex/age composition of the subsistence harvest in the years surrounding the spill event." 015

ExSum-26. The following statements referring to the likelihood of oil reaching coastal habitats from the Tern Island location (Alternative III.B), as compared to Alternative I, appear to be contradictory or inconsistent (emphasis added): 016

> "The likelihood of a large oil spill contacting the shore in Foggy Island Bay **decrease slightly** because of the location of the island and pipeline in relation to nearshore currents. Compared to Alternative I, these differences would change impacts to the following resources in the ways described:"
>
> "Terrestrial mammals may frequent coastal habitats, and the probability of a large oil spill contacting these habitats...is **0-4 percent greater** than Alternative I."



> " The probability of a large oil spill contacting nesting or brood-rearing birds in the southern part of Foggy Island Bay is **10-20 percent lower** than for Alternative I." 016
>
> "The probability of a large oil spill contacting coastal vegetation and wetland habitats...is **0-4 percent greater** than for Alternative I.." (ExSum-27)

Because of the importance of nearshore coastal habitats to anadromous fish, migratory birds, and caribou during insect relief periods, MMS should clarify the probability of an oil spill contacting coastal habitats (shoreline or coastal marshes) relative to Alternative III.B and Alternative I. 017

ExSum-27. Economy. The sentence "[t]his alternative would result in a decrease of approximately $1.7 million in wages..." without a standard or reference point is unclear. Any reference to a decrease or increase in economic activity should be referenced to Alternative I to avoid confusion. 018

ExSum-28. (2) Effects of Alternative Pipeline Designs. Last Paragraph. MMS assumes that the impacts to numerous resources would be unchanged by pipeline design. We suggest the following language replace the last two sentences of this paragraph: 019

> *While the decision maker may consider the differences in rates, it is difficult to quantify these differences in terms of environmental impacts. Therefore, for the purposes of this analysis, MMS will assume that differences in pipeline designs do not provide measurable differences in impacts to the following resources:*

ExSum-29. Alternative IV.A. Pipe-in-Pipe System. The primary concern for fish and wildlife resources is the deleterious effects resulting from a large oil spill. Although Alternative IVa may increase the likelihood of a functional failure, the steel pipe-in-pipe alternative reduces the likelihood of a containment failure. The environmental consequences of functional failures are reduced, if not eliminated, due to the protection afforded by the outer pipe. This needs to be stated in this section regardless of the assumption that a single spill from any of these pipelines would have similar impacts on fish and wildlife. 020

ExSum-33. Spectacled Eiders. This section is confusing as written. The conclusion appears to be that mining in the Kadleroshilik River would have a greater impact to nesting spectacled eiders compared to the Duck Island gravel mine. However, the opening sentence for the paragraph contradicts this point. 021

ExSum-33. Marine and Coastal Birds. As with the previous section, the opening sentence misinforms the reader as to the conclusion. The conclusion appears to be that the Kadleroshilik River Mine Site will have a greater impact on birds than the Duck Island mine site based on the statement: "[t]he potential for bird use of the Kadleroshilik quarry site likely is substantially greater than for the Duck Island quarry site because of its undisturbed character and vegetative cover." However, the topic sentence and other statements in the paragraph appear inconsistent 022 or confusing. For example, it is unclear what is meant by the statement: "[h]owever, we would expect relatively lower densities of fewer nesting species [at the Kadleroshilik mine site] than nearby tundra areas due to the lower proportion of habitat types generally preferred by species likely to nest there." The statement that "...[t]otal nest density and total average density of individuals for 14 bird species in the general vicinity of the two sites were similar..." appears to support that the two sites are similar in their value to nesting birds. The author then concludes: "the numbers of nesting birds displaced from the Kadleroshilik area (Alternative I) is likely to be low but considerably greater than from the Duck Island site as a result of habitat disturbance." 022

This section (and elsewhere in the DEIS where this information is repeated) should be revised to more clearly address the importance of the Kadleroshilik to nesting birds. Arctic terns (*Sterna paradisaea*) and Baird's sandpipers (*Calidris bairdii*) are likely to be found nesting in dry, dwarf shrub/lichen tundra habitat and dry barren/dwarf shrub, forb grass complex, habitats which combined comprise about 50 percent (24 acres) of the proposed mine site. Avian survey data collected at the proposed mine site relative to cover classes of vegetation for the proposed mine site should be reported (see Noel and McKendrick 2000). If avian data are not available, MMS should address expected avian diversity and densities by habitat class similar to information presented for different onshore pipeline corridors (see Section IV. Effects of Alternatives). The direct loss of 24 acres of vegetated riparian wetland habitat and impacts to nesting birds should be clearly addressed in the Final EIS. 023

ExSum-35. Alternative VI - Use of the Duck Island Mine Site (sections on spectacled eiders and marine and coastal birds). Text describing expected avian impacts in these sections is relatively more straightforward and clear compared to sections on page ExSum-33. However, as stated above, the Service requests MMS identify avian species which were found to occur (or are expected to occur) in vegetated and barren gravel habitats of the 31-acre Kadleroshilik River gravel mine site. 024

ExSum-39. (b). Comparison of Effects Among Combination Alternatives. Paragraph 5 states that Combination C has the greatest pipeline length in water over 8 feet. An estimate of how much of the pipeline length is in deeper water compared to the other alternatives should be included. 025

ExSum-41. Cumulative Analysis. (These comments are also relevant to Chapter V of the DEIS) The Service has the following concerns and recommendations regarding the overall approach and complexity of the Liberty DEIS cumulative impacts analysis.

1. It is not clear what standard has been used regarding cumulative impact significance. Clarification is needed as to whether the same thresholds used for project impacts (e.g., recovery of threatened or endangered species within one generation) are being used for cumulative impacts. 026



2. The focus of the analysis of past, present and reasonably foreseeable future developments has been the relative contribution of Liberty to the total impact. We believe this is counter to the intent of NEPA and CEQ guidance regarding the analysis of cumulative impacts. NEPA states that a cumulative impact is the "impact on the environment which results from the incremental impact of the action when **added** to the other past, present and reasonably foreseeable future actions...Cumulative impacts can result from individually minor but **collectively** significant actions taking place over a period of time" (emphasis added). It is imperative to consider the collective impact of projects in the study area, particularly when the Liberty Project may itself facilitate future offshore development by virtue of added infrastructure. By summing the total of all projects, with particular regard to oil production, and then deriving the percentage of production associated with any given project, it follows that the greater the number of projects and overall impacts, the smaller the likely contribution of individual projects. This does not, however, provide a sense of what the total impacts of oil and gas development in the Beaufort Sea may look like in the near future, or how the collective level of impacts may be minimized. The intent of NEPA is to consider the overall, collective impact of area development, in addition to the impacts of the individual project. Our suggestions regarding cumulative impacts analysis are based on this view. 027

3. Two areas have been the focus of recent offshore exploration but do not appear on the list of reasonably foreseeable developments: Pike and McCovey. With recent interest in these areas, we believe they should be added to the list of reasonably foreseeable developments. 028

4. The public needs a clear, straightforward approach to the assessment of cumulative impacts. We believe such an approach would include:

   A. A summation of estimated oil spill risks associated with all foreseeable offshore projects from the Colville delta to Barter Island. Relatively little is known about the oil spill risks associated with future offshore projects, therefore, we recommend the use of conservative oil spill risk figures derived from Northstar and Liberty, and extrapolated and applied to potential projects. Sandpiper and Hammerhead would be expected to have higher risks because they are further offshore in deeper water. Thetis Island is closer to shore but in a potentially higher strudel scour zone (mouth of the Colville delta). The Stinson and Flaxman Island prospects are closer to shore and may have lower oil spill risks. Defining a conservative average for these 6 projects would be a reasonable approach. For example, the estimate was 11 to 12 percent for Northstar and Liberty 1 to 6 percent. A conservative approach would combine Northstar and Liberty estimates (total of 18 percent) and then add the 6 additional 029 reasonably foreseeable offshore projects identified in the DEIS. Applying an average risk of 6 percent to each, and adding these risks to Northstar and Liberty would provide an estimate for the total foreseeable offshore development during the 20-year life of the Liberty Project. The sum of these risks equals 54 percent, and speaks clearly of the need to reduce individual project risks as much as possible to reduce the total potential long-term risks. 029

B. Besides the threat of a large oil spill, the chronic impacts of smaller spills, wildlife disturbance, bird strike, the deflection of subsistence resources, and the potential effects on nearshore currents and anadromous fish need to be clearly and succinctly discussed in reference to all of the reasonably foreseeable offshore projects that may operate during the life of the Liberty Project. 030

C. It should be clearly stated in the cumulative impacts assessment that new offshore projects provide additional infrastructure that may allow the development of other offshore reservoirs that are not currently economical to develop. 031

D. Within the context of an estimated risk associated with reasonably foreseeable offshore development (with all the accompanying caveats and assumptions), this section needs to discuss possible mitigative factors, technological improvements, and other project design elements which could be employed to reduce the total risks. If a double-walled pipeline design could reduce risks associated with the subsea pipeline on each project by a factor of 10, this would reduce the total risk of future offshore development. 032

ExSum-43. 2. Cumulative Effects. (These comments are also relevant to Chapter V) Polar bears should be added to the list of resources which will be significantly impacted in the unlikely event of a large offshore oil spill, based on the following: 033

> The southern Beaufort Sea population increased during the 1970s and 1980s, after having declined in the 1960s as a result of excessive harvest. More recent changes in population composition, survival and recruitment indicate that the population is stable and at or near its carrying capacity (Amstrup 2000). The use of a 2.4 percent growth rate in the DEIS (which is based on a Service decision regarding incidental take) should be revised to reflect the most recent information which suggests a stable population. Barring environmental degradation after a single spill or other perturbations in the polar bear population, survival of young born in the year of the spill should prevent net changes in population size when 12 or fewer bears are oiled (see project-specific impacts). We believe this is a reasonable expectation when considering one project, and the low probability of a major incident with a single project. However, with the population near its carrying capacity, the cumulative impacts of small oil spills, hazing, disturbance and the possible disruption of food resources, in addition to a large oil spill, may not allow the population to recover within a single generation.



033

ExSum-44. Seals and Polar Bears. This section should be revised per comments provided for Page V-26. Cumulative Effects. 034

Section I. Introduction and results of Scoping

I-16. 5.a. (1). Develop the Field from an Island Located in the Bottomfast Ice. An island location in approximately 8 feet of water would provide considerable protection from ice gouge. According to figures provided in the Liberty DEIS, a location approximately 3 miles landward from the Liberty Island along the proposed Liberty pipeline route would meet this criteria. This may or may not differ significantly from the economics of the bottomfast ice location reviewed in Appendix D-1, but it appears worthy of evaluation. 035

I-26. 5.c. (3). Use of Tern Island as a Gravel Source. BPXA discarded this option early in the Liberty planning process. Please provide further information in the EIS on why the reclamation of this artificial island could not take place during the winter season. 036

Section III. Effects of the Liberty Project

III-A-4. b. Seals and Polar Bears. The sentence beginning with: "[i]sland and pipeline construction; gravel mining; and aircraft..." should be revised to read: "[i]sland and pipeline...would not <u>likely</u> affect overall distribution or abundance...." 037

III-B-2. 2a. Summary of the Pipeline Engineering Studies. Bullet 3 of this summary should be altered to match that on page ExSum-27. 038

III-C-2. a. Discussion of BPXA's Proposed Liberty Oil Discharge Prevention and Contingency Plan. This discussion, and the description of BPXA's "C" Plan in Section 2, fails to present a realistic view of oil spill clean up or containment in the Alaskan Beaufort Sea. BPXA's Plan, provided in Section 2, includes estimates of oil recovery up to 70 percent. The very low recovery rates from three spill drills in broken ice conditions during 1999 and 2000 are not discussed. We recommend the lengthy discussion regarding regulations be shortened, and a thorough discussion of the findings regarding spill exercises in broken ice conditions be included. Regardless of regulations, standards and stipulations being met, BPXA was unable to recover oil from the ocean surface during fall broken ice conditions, and could only remove limited quantities in areas of 0 to 10 percent broken ice conditions during the spring. In ice concentrations >10 percent, BPXA was not successful at removing oil from the ocean surface (See Joint Agency Evaluation of the Spring and Fall 2000 North Slope Broken Ice Exercises, Robertson and DeCola December 2000). 039

III-C-7. d. Estimates of the Chance of an Oil Spill Occurring. We recommend that sources of spills (platform, pipeline-marine, pipeline-on land), spill probabilities, and methods used to calculate spill probabilities (e.g., CONCAWE, MMS OCS data) be summarized in a table similar to Table 8-6 in the Northstar FEIS. A summary table would allow the public and resource agencies to assess and compare the types of spills, spill probabilities and the basis for these estimates. 040

III-C-27. b. Seals and Polar Bears. After meeting with MMS on October 20, 2000, the Fish and Wildlife Service (Marine Mammals Management office and the Northern Alaska Ecological Services office), in collaboration with the U.S. Geological Survey (Biological Resources Division), provided detailed comments (October 29, 2000) on potential impacts of the Liberty development on polar bears. The FWS, MMS, and USGS Regional Directorates and staff met on November 27, 2000, to review and accept text changes on pipeline design, migratory birds and polar bears, yet the DEIS continues to include text which we specifically requested be changed via written and oral communication. For example, the statement: "[t]he seal and polar bear populations are expected to recover individuals killed by the spill within 1 year, and there would be no effect on the population" has been consistently flagged as overly simplistic. In lieu of this statement, the USGS and FWS provided the following recommendation: "[b]arring environmental degradation after the spill, survival of young born in the year of the spill should prevent net changes in population size when 12 or fewer bears are oiled." While this text was included in the following paragraph, text in the preceding paragraph referring to recovery within 1 year remains misleading and confusing. The statement that the polar bear population is expected to recover within 1 year should be replace in this section and throughout the DEIS with the recommended FWS-USGS text. 041

III-C-29. b. Specific Effects of a Large Oil Spill from BPXA's Proposed Liberty Development and Production Plan:

The Service recommends MMS reformat the section as follows:

Third paragraph: Revise into two paragraphs to treat separately the two methods and results reported by MMS to estimate the number of polar bears potentially oiled. In both paragraphs, methods should be moved to the beginning (i.e., the reader should first understand how estimates were derived). 042

Delete "perhaps" in the sentence beginning "[p]erhaps an estimated 5-30 polar bears may be harmed." The sentence "[t]his estimate is based on the number of polar bears sometimes observed..." should be clarified as to whether the estimate includes bears which may forage on oiled carcasses. 043

Amstrup et al. (2000) determined that 75 percent of the 500 oil spill trajectories (2,956 bbl each) during September and October oiled $\leq 6$ and $\leq 10$ polar bears, respectively. Mean ($\pm$ S.E.) numbers of bears oiled by these spills during September and October were $3 \pm 4$ and $8 \pm 4$ bears, respectively. Because the Amstrup et al. (2000) model was based on the same size oil spill (2,956 044



bbl) used by MMS but lasted only 10 days (versus the MMS 30-day analysis) and resulted in mortality estimates which overlapped the MMS lower range estimate (5), the Fish and Wildlife Service questions the conclusion that the estimated mortality of 5-30 bears is a "severe event." "Severe" is not identified as a biological threshold in the DEIS, and the Service recommends that it be deleted from the text and replaced with "potentially significant." 044

The last sentence in this paragraph: "[t]he seal and polar bear populations are expected to recover individuals killed by the spill within 1 year, and there would be no detectable effect on the population" should be followed by a description of how recovery rates were derived and the basis for concluding that no effect to the population would occur. If a polar bear population model cannot demonstrate that the population will recover from the expected mortality within one year, the sentence should be deleted and the following sentence should be used: "Environmental degradation resulting from a 2,956 bbl oil spill is assumed to be below the level that would alter reproduction and survival of the polar bear population." 045

Fourth paragraph: It is important that the reader/reviewer understand that MMS and Amstrup et al. (2000) used the identical sized oil spill (2,956 bbl) to estimate mortalities but that MMS used a 30-day trajectory scenario whereas Amstrup et al. (2000) used a 10-day scenario. Text should be revised to report Amstrup et al.'s (2000) findings for a 2,956 bbl spill (see below). 046

Include "(see Appendix J-1)" after the citation of Amstrup, Durner, and McDonald (2000) to inform the reader that the complete analysis is provided as an appendix. 047 After the sentence beginning with "In October, the mean...", <u>delete the remainder of the paragraph and replace (here and in all sections of the EIS discussing model results) with:</u> 048

> "In 75 percent of the 5,912 bbl (2,956 bbl) oil spills during October, 12 (10) or fewer polar bears were oiled. Barring environmental degradation after the spill, survival of young born in the year of the spill should prevent net changes in population size when 12 or fewer bears are oiled. However, 25 percent of the 5,912 bbl (2,956 bbl) oil spills during October oiled 12-61 (10-51) polar bears. The time necessary for reproduction to compensate for these larger, but less likely losses, would depend upon the sex and age of bears actually oiled, the presence or absence of sustained environmental degradation, and the size and sex/age compositions of the subsistence harvest in the years surrounding the spill event. The greater the number of mature polar bears oiled and removed from the population, the longer the expected recovery time will be."

New paragraph. Add the following text that summarizes the limitations of the model developed by Amstrup et al. (2000): 050

> "Amstrup et al. (2000; see Appendix J-1) developed a statistically valid and defensible model to estimate potential mortalities of polar bears caused by a hypothetical oil spill. While mortality estimates presented in this study represent the best available information on polar bear distribution and behavior of oil in the Beaufort Sea, model assumptions may underestimate the actual number of bears oiled. The inability to accurately model oil

movement for extended periods, and difficulties in managing large oil trajectory data sets, necessitated limiting the oil spill model to a 10-day period. Thus, the model does not consider chronic or long-term environmental effects of oil persisting in the environment, including degradation of sea ice and water quality, impacts to foods and foraging habitats, or the degradation/loss of maternal denning habitat. The model also assumes the southern Beaufort Sea polar bear population size equals 1,385 animals; however, the authors acknowledge that the actual population could range from 1,000 to 2,300 animals. Oil spill trajectories are based upon individual and discreet oil spillets (fractions of an oil spill) which move through the offshore environment. The model does not include a "smearing" function or parameter to model the total area contaminated by oil. Finally, the model does not account for potential immigration of polar bears into an oiled area. In summary, the model may underestimate the total number of polar bears potentially impacted by an oil spill." 050

While the assumptions in the preceding paragraph likely underestimate potential mortalities of polar bears to an oil spill, other model assumptions may overestimate mortalities. Assumptions which may inflate mortality numbers include: 1) all bears contacting oil are assumed to die; 2) containment and recovery of oil are assumed to be absent or ineffective; and 3) the model assumes no hazing of polar bears away from spills or contaminated whale carcasses. These are clearly assumptions, however, recent spill exercises suggest that oil containment and clean up are not likely in broken ice conditions, and polar bear hazing has not been effective over large areas.

New paragraph. The following text should be included to describe the factors that could affect polar bear population recovery rates: 051

"Relative to determining the risk of oil spills to the Beaufort Sea polar bear population, the following factors must be evaluated:

*1.* *Number, age, and sex of animals oiled.* Assuming minimal environmental degradation after the spill, survival of young born in the year of the spill should prevent net changes in population size after a one-time oil spill mortality of <12 polar bears. However, adult females, the most valuable age/sex component of a population, are the most likely to be impacted by an oil spill in the nearshore environment (Amstrup et al. 1986; Amstrup and DeMaster 1988). During four aerial surveys conducted in September-October 2000 along the mainland coast and barrier islands from Cape Halkett to Barter Island, a total of 49, 73, 72, and 38 bears were observed (Schliebe et al. USFWS, unpubl. data). Of the known sex and age animals observed, 37 (76 percent), 36 (49 percent), 29 (40 percent), and 21 (55 percent) were females with dependent young. An additional 39 percent of the animals observed were of unknown sex and age but likely included a significant proportion of adult females.

Replacement of oiled, mature individuals by cubs born in the year of the spill will take 5-6 years (Amstrup and DeMaster 1988). While polar bear mortality (<12



bears) caused by the most likely spill event may be replaced with first year cubs and prevent a net change in population size, the greater the number of mature polar bears oiled and removed from the population, the more extended will be the expected recovery time and the more dependent the recovery will be upon other factors (such as the sex and age of bears actually oiled; the presence or absence of sustained environmental degradation, and the size and sex/age compositions of the subsistence harvest in the years surrounding the spill). 051

*2.* *Existing level of harvest at the time of the spill.* The primary mechanism by which individuals are removed from polar bear populations in Alaska is subsistence harvest by Alaska Natives. The North Slope Borough (Alaska) and the Inuvialuit (Canada) have agreed to a minimum subsistence harvest level of 40 polar bears to be taken per jurisdiction per year. No more than one third (n=13) of the quota may be comprised of females. 052

Between 1988 and 1998, the Alaskan harvest of polar bears averaged approximately 35 bears; however, the harvest exceeded the 40-bear quota in three years during this period. An average of 10 female polar bears were harvested per year during this 10-year period and the 13-female polar bear harvest limit was exceeded once (S. Schliebe, USFWS, unpubl. data). This information indicates that the current harvest level is below the sustainable level but varies annually, as does the number of females harvested. Additional mortality of polar bears due to human-caused or environmental perturbations such as an oil spill could push the biological removal rate beyond the population's sustainable levels.

*3.* *Environmental degradation from persistence of oil in the environment.* The distribution, abundance, behavior, and productivity of primary prey species such as ringed and bearded seals could be affected by persistence of oil in the environment. Changes in prey availability could cause polar bears to move to other, less suitable, areas to feed, which could increase nutritional stress and alter the availability of polar bears to Native subsistence hunting. Persistence of oil in the environment could also increase the likelihood of polar bears consuming oiled prey, or having to seek less suitable denning areas. It is unknown how much time would be needed for polar bear populations to return to a pre-spill distribution." 053

III-C-30. Right column; first full paragraph. A significant portion of this paragraph is repeated from Page III-C-29. The bullet statements should be revised as follows: 054

"• the number of bears likely to be contaminated would be 12 or less.

• the current growth rate of the southern Beaufort Sea population of 1,800 animals is stable (Amstrup et al. 2000). 055

• a sex ratio of 2 males:1 female for polar bears removed from the population with 056 the potential biological removal rate being about 73 bears per year (Gorbics, Miller, Schliebe 1998). 056

- an Alaskan/Canadian mean subsistence harvest of approximately 60 polar bears per year (Gorbics, Miller, Schliebe 1998). 057

- environmental degradation resulting from the 2,956 barrel oil spill is assumed to be below the level that would alter reproduction and survival of the polar bear population." 058

III-C-30. Right column, second full paragraph. Delete existing and insert the following: 059

> "Under these assumptions, survival of young born in the year of the spill should prevent net changes in population size after the one-time oiling of 12 or fewer bears. A population recovery model is required to more accurately assess recovery of the population from a potential oil spill(s). Direct and indirect impacts associated with increased offshore oil and gas development increase the probability of an offshore oil spill and the likelihood of bear/human interactions. The potential effects of any change in the distribution and abundance of polar bears as the result of increased development are currently unknown."

III-C-30. The last paragraph starting with "The Fish and Wildlife Service Proposed Rule on..." should be moved to Section V, Cumulative Effects. 060

III-C-31. The first full paragraph in the left column should be deleted as this information has been revised and provided above. 061

III-C-31(1). Summary and conclusion for effects of an oil spill on marine and coastal birds. This section does not acknowledge that Stehn and Platte's (2000) estimates of bird mortality do not include movements of migrants into the spill. For example, if a spill occurs (and is present for > 1 day) during spring or fall migration when hundreds to thousands of sea ducks migrate daily along the Beaufort Sea coast, the number of birds which may be oiled could not be realistically estimated by Stehn and Platte (2000). The estimated mortality of 1,400 long-tailed ducks should be qualified as being limited to the molting period (July-August). The same is true for the other species covered under this section. The DEIS (page III-C-34) adequately describes the limitation of the oil spill-avian mortality model (Stehn and Platte 2000); however, it is critical for the reader to understand the limitations and assumptions of this model in all sections (e.g., page III-C-31) which describe avian mortality estimates resulting from hypothetical oil spills. 062

III-C-70. b. Seals and Polar Bears:

Paragraph 2. The last sentence should be revised to read: "This attraction could require deliberate hazing of these polar bears; the effects of these activities by themselves are not expected to adversely affect overall polar bear abundance or distribution." 063



Paragraph 3. The last two sentences should be revised to read: "Low-flying helicopters could briefly disturb a few polar bears or preclude use of specific habitats by denning polar bears. The numbers of bears potentially disturbed is expected to be low; therefore, effects of these disturbances by themselves are not likely to adversely affect overall seal or bear abundance and distribution in Foggy Island Bay." 063

Paragraph 4. The last sentence should be revised to read: "The numbers of bears and seals potentially disturbed is expected to be low; therefore, effects of these disturbances by themselves are not likely to adversely affect overall ringed seal and polar bear abundance and distribution." 064

III-D-25. b. Seals and Polar Bears. The sentence should be revised to read "...<u>likely</u> affect seal and bear population abundance..." 065

III-D-28. b. Seals and Polar Bears. This paragraph should be revised as follows: 066

> "Polar bears exposed to spilled oil would likely be injured or killed. The magnitude of this injury/mortality would depend upon the size of the spill; the ability of industry and agencies to contain and recover spilled oil; the ability to haze bears away from contaminated areas; impacts to prey species; and the extent/longevity of habitat degradation. In general, the southern Beaufort Sea polar bear population is stable and would likely recover from a single spill from the Liberty facility. The rate of population recovery would depend on: 1) the sex and age of bears oiled; 2) the extent and longevity of habitat degradation; and 3) the size and sex/age composition of the subsistence harvest in the years surrounding the spill event."

Section IV. Effects of the Alternatives

IV-4. Environmental Impacts from the Most Important Substitutes - Sections: *Additional Oil Imports* and *Additional Domestic Production*. The comparison between the Liberty Prospect and alternative sources of oil lacks the required analysis for the stated conclusions. The statement "...the effects to the environment would be similar in kind to those of the Proposal but would occur in a different location" does not assess potential spill probabilities, risks, fish, wildlife and habitat resources, and environmental consequences of offshore oil development in Arctic Alaska versus development in other oil-producing regions of the world. The DEIS should acknowledge that risks associated with offshore oil development in the Arctic and the use of subsea pipelines under pack ice cannot be determined from historical data because none exist. Additionally, the document should recognize that the nearshore Beaufort Sea is used by hundreds of thousands of migratory birds, including threatened species; polar bears and other marine mammals; and anadromous fish. Furthermore, the endangered bowhead whale migrates biannually through the proposed Liberty project area. The conclusion that impacts would be similar but in a different location ignores the differences in resources and environmental conditions. The statement regarding similar environmental effects should be deleted. 067

The premise that additional oil imports from abroad impose negative environmental impacts along 068

068

trade routes is applicable to the Liberty Project which likely will also export a portion of its production. This topic may merit further discussion in the EIS.

069

IV-8. Mortality from an oil or diesel fuel spill. The spectacled eider mortality estimate of 0 during August should be qualified as: "[t]his estimate does not take into account that many of the unidentified female eiders recorded on survey transects may have been spectacled eiders nor the possibility of individuals migrating into, and landing in, a spill area."

070

IV-10. (1) Summary and conclusion for effects of a large oil spill on marine and coastal birds. The DEIS states: "Mortality from a spill contacting long-tailed ducks in lagoons or other protected nearshore areas where the entire regional population molts is estimated to exceed 1,200 individuals (equivalent to about 1 percent of the average coastal plain population) at average bird densities. Total kill potentially could exceed 10 percent of this population if oil were to contact areas of high bird density." Reference to a regional population should be dropped and high density should be defined based on the literature. Long-tailed ducks (*Clangula hyemalis*) molting in nearshore lagoon habitats (e.g., Simpson Lagoon) may be comprised of post-breeding individuals (almost exclusively males) from various breeding populations, including Interior Alaska and the Northwest and Yukon Territories. The Fish and Wildlife Service cannot define what proportion of the long-tailed duck Arctic Coastal Plain population molts in nearshore habitats nor what proportion molts within the Liberty oil spill zone. The MMS estimates of 1,200 to 12,000 long-tailed ducks which could be oiled in the event of an oil spill should not be identified as a percentage of the Arctic Coastal Plain population. It is perfectly acceptable to report the Fish and Wildlife Service surveys which estimate approximately 120,000 long-tailed ducks occur on the Arctic Coastal Plain; however, without determining the geographical origin of birds molting in nearshore lagoon habitats, it is inaccurate to report mortality estimates as proportions of the Arctic Coastal Plain population.

071

IV-10. (b) Mortality from an oil or diesel fuel spill. It is important to emphasize that the results presented by Stehn and Platte (2000) should be considered as minimum estimates of bird mortality due to turnover rates during migration. Some long-tailed ducks regain flight capacity as early as July. By late August, long-tailed ducks begin migrating at rates that are as of yet unknown. If an oil spill occurred during a period when birds are migrating, the number of individuals contacting oil could increase quickly. This is mentioned on IV-11 in regards to shorebirds, but it should be applied to long-tailed ducks and eiders as well in either the 2nd to last paragraph on IV-10, or 2nd paragraph on IV-11. This is mentioned on page IV-11 (3rd paragraph), in a list of model deficiencies following the eider section, but it merits a prominent position in the long-tailed duck mortality section, as well.

072

IV-39. C. 2.d. Pipe-in-Pipe Monitoring, Operation, and Maintenance Concerns. This and Section 2.e should be combined to discuss operational concerns, while at the same time using information from the independent studies to discuss how those concerns could be addressed. These Sections would appear more balanced if issues were discussed fully and fairly in one location.

073

IV-102. 3. Combination C. The 2nd paragraph of this section states: "[c]ombination C would



073

use the most gravel of all the alternatives." Because this alternative uses gravel from the existing Tern Island drill site, this alternative <u>would mine the least amount of gravel from an existing or new pit, and introduce the least amount of new gravel to the marine environment</u>. The 2nd to last paragraph of this section states "[c]ombination C causes the least cumulative impact on gravel resources...." This statement should be brought to the forefront of paragraph 2, and the assertion that "Combination C would use the most gravel of all the alternatives" should be removed or modified by using the underlined text above.

Section V. Cumulative Effects

074

V-18. Cumulative Effects, (b) Eiders, (1) Summary and Conclusions. In addition to mortality from direct contact with oil, this section should include statements regarding secondary impacts of an oil spill to prey species, coastal marsh habitats, shorelines of barriers island, and water quality, all of which may cause injury or mortality. While direct contact with oil can only occur when eiders are present, spilled oil in winter can negatively affect benthic and epibenthic food resources that eiders depend on when they arrive to breed, raise young, molt, and prepare for fall migration.

075

V-18. Cumulative Effects, (b) Eiders, Contribution of Liberty to Cumulative Effects. The DEIS states: "[s]ubstantially greater mortality could result from the numerous small spills that are projected for the 30-40 year life of oil and gas projects considered in this cumulative analysis." The estimated ranges of mortality inferred by "substantially greater mortality"should be provided or qualified as being unknown.

076

V-19. Cumulative Effects, (b) Eiders, (2) (b). See comment above for page V-18. Indirect, lethal and sublethal impacts to eiders caused by oil contaminating food resources, benthic sediments, shorelines, coastal marshes, and barrier islands should be included in this discussion.

077

V-26. Seals, Polar Bears, Sea Otters, and Other Marine Mammals. a. Summary and...

See comments regarding page ExSum-43. 2, and incorporate into this Section.

078

Para. 1. Delete sentences 2- 4 and replace with:

> "The Northstar EIS (Table 8-6) estimated the probability of an oil spill ≥1,000 bbl from any offshore source (offshore platform + offshore pipeline) to be 11-12 percent. The probability of a ≥1000 bbl spill (offshore platform + offshore pipeline) from the Liberty development ranges from 3.1 percent (Table III.C-3e) to 19 percent (Table III.C-3b). The additive probability of an offshore oil spill from either Northstar or Liberty during concurrent production increases the risk of significant adverse impacts to polar bears. Production and transportation of oil and gas resources from reasonably foreseeable future developments (e.g., Thetis Island, Sandpiper; Table V.B-6a) could further increase the potential for adverse effects to polar bears."

Paragraph 2. In the second and fourth sentences, add the word "detectable" prior to "effect" in both sentences. 079

Paragraph 3. Add the following text to the end of the paragraph: 080

> "Increased offshore oil and gas development will increase the probability of oil spills and increase the likelihood of bear/human interactions. The potential effects of any change in the distribution and abundance of polar bears as the result of increased onshore and offshore oil and gas development are unknown."

V-29. Cumulative Effects, (3) Marine and Coastal Birds (a). The concerns outlined above for pages V-18 and V-19 also apply to text addressing impacts to marine and coastal birds. Mortality through direct contact with oil is only one way that an oil spill may impact marine coastal birds. Invertebrate populations killed by an oil spill would reduce available food sources for the bird species that depend on them during spring staging, brood-rearing, molt, and fall staging periods. Additionally, marine birds foraging on contaminated invertebrates would likely incur direct or chronic physiological injury (e.g., affecting red blood cell counts, hemoglobin concentrations, endocrine systems, and reproductive success). Sea ducks, particularly eiders, may be particularly vulnerable to indirect impacts because they forage on molluscs, an invertebrate group which readily accumulates toxic elements of oil such as polycyclic aromatic hydrocarbons. Indirect effects are addressed in section IX (very large spill), but are equally relevant here. 081

V-30. (2) Oil Spills. First sentence of this section includes a parenthetical statement: "...(most likely number of spills is zero)...." For a spill probability less than 50 percent, the most likely number of spills is zero, regardless of whether the spill probability is 1 percent or 49 percent. Presumably, decisions regarding development would differ greatly in such situations even though "the most likely number of spills is zero" in each case. The statement serves only to distract from the issue of estimated spill probability and should be removed. The EIS should include an objective presentation of the risks associated with the proposed development, including an estimated probability that a large oil spill will occur. 082

V-46. Section d. (2). A citation and/or the population recovery model used to estimate a 7-10 year recovery period for 78 polar bears removed from the Beaufort Sea population as the result of a hypothetical oil spill should be included in the text, or the statement deleted. 083

V-1 -V-62. Cumulative Effects. The probability of a large oil spill from the Liberty development is reported to be 1-6 percent. Because this is a cumulative effects section, it would be appropriate to report the combined probability of a large oil spill occurring from all existing and proposed developments. For example, if the Liberty Project is permitted and is brought into production by 2004, it will overlap with the Northstar Project (probability of large oil spill estimated at 11-12 percent) for at least 10 years. Assuming similar production rates and engineering designs (e.g., lengths of offshore pipelines), the combined probability that one or more offshore spills will occur from one of these projects is additive (i.e., the combined probability would be 12 to 18 percent). In addition, spill probability estimates for foreseeable developments such as Sandpiper, Thetis 084



Island, and Hammerhead should be estimated and added to this figure. (See comments regarding page ExSum-41. Cumulative Analysis.) 084

Section VI. Affected Environment

VI-23. The last sentence in the second full paragraph should be revised to read: "A bilateral agreement between the United States and Russia to conserve polar bears in the Chukchi/Bering seas was signed in October 2000." 085

Section IX. Effects of a Very Large Oil Spill

IX-7. (2) Eiders. (b) Blowout During Broken-ice Conditions. In reference to exposure of post-breeding spectacled eiders to oil that was spilled during the broken-ice period, the DEIS states: "[b]y this time, the oil would have weathered and probably become a minor hazard." Although toxicity of oil decreases as it weathers, the primary cause of avian mortality from spilled oil is the direct fouling of feathers due to contact with oil (weathered or fresh) which destroys the insulation that feathers provide, leading to hypothermia and death. Furthermore, this section does not address indirect impacts to food resources, benthic sediments, or coastal nearshore habitats which will likely result in injury or mortality to eiders. The statement that weathered oil would be a minor hazard should be revised to reflect these issues. 086

IX-8. b. Seals and Polar Bears. Further explanation is needed regarding the method used to determine the level of adverse effects on polar bears and ringed seals associated with a spill of 180,000 barrels, including the projected recovery times. 087

IX-11. c. 2). Marine and Coastal Birds. Blowout During Broken-ice Conditions. See comment above regarding page IX-7. 088

IX-11. c. 2). Marine and Coastal Birds. Blowout During Broken-ice Conditions. The DEIS states "...most bird species are not expected to occupy areas of broken ice in either period unless substantial areas of open water are available." The Fish and Wildlife Service consistently observed Pacific loons (*Gavia pacifica*) and long-tailed ducks in small openings (100 $m^2$) in broken ice during offshore aerial surveys in June 2000. Spectacled eiders wintering south of St. Lawrence Island occur in polynyas and areas with >60 percent ice coverage (Petersen et al. 1999). During a 3-12 July 2000 migratory bird survey of the central Beaufort Sea, Dau and Taylor (2000) observed king eiders (*Somateria spectabilis*), common eiders (*Somateria mollisima*), glaucous gulls (*Larus hyperboreus*), and long-tailed ducks in areas of broken ice characterized by a small percentage of open water. The DEIS statement should be revised accordingly. 089

LITERATURE CITATIONS
Comments on the Liberty DEIS
April 2001


Amstrup, S. C. 2000. Polar bear, Pages 133-157 in The Natural History of an Arctic Oil Field, Development and the Biota. J.C. Truett and S.R. Johnson (Eds.). Academic Press, New York.

Amstrup, S. C., and D. P. DeMaster. 1988. Polar bear *Ursus maritimus*, Pages 39-56 in Selected marine mammals of Alaska: species accounts with research and management recommendations, J.W. Lentfer (Ed.), Marine Mammal Commission, Washington, D.C.

Amstrup, S. C., I. Stirling, and J.W. Lentfer. 1986. Past and present status of polar bears in Alaska. Wildl. Soc. Bull. 14:241-254.

Amstrup, S. C., G. M. Durner, and T. L. McDonald. 2000. Estimating potential effects of hypothetical oil spills from the Liberty oil production island on polar bears. Unpubl. Rep. U.S. Geol. Surv., Biological Resour. Div., Alaska Science Center, Anchorage. AK. 42pp.

Dau, C. P., and E. J. Taylor. 2000. Aerial population survey of common eiders and other waterbirds in nearshore waters and along barrier islands of the Arctic Coastal Plain of Alaska, 3-12 July 2000. Unpub. Rep. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 23pp.

Noel, L.G., and J. D. McKendrick. 2000. Land cover map for the Liberty mine site. BPXA report, Anchorage, AK.

Petersen, M. R., W. W. Larned, and D. C. Douglas. 1999. At-sea distributions of spectacled eiders (*Somateria fisheri*): a 120 year old mystery resolved. Auk 116:1009-1020.

Stehn, R. and R. Platte. 2000. Exposure of birds to assumed oil spills at the Liberty Project. Unpubl. Rep., U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 68pp.

U.S. Fish and Wildlife Service. 1998. Stock assessment. Polar bear (*Ursus maritimus*) Alaska Chukchi/Bering Seas Stock and Southern Beaufort Sea Stock. Unpubl. Rep. U.S. Fish and Wildlife Service, Marine Mammals Management, 34pp.


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**0139-001**

Both studies referred to in this comment concluded that the probability of a spill from either a single-wall or double-wall system was very low. The slight reduction in spill probability, approximately 1%, associated with a double-wall pipeline system does not outweigh the disadvantages associated with this system as compared to the single-wall pipeline alternative. These disadvantages include increased cost (about twice as much), increased complexity of design and construction, and reduced capability to monitor the pipeline's integrity.

The work done to date provides more than enough information to allow the agencies with decision authority over pipeline design to choose a preferred alternative. Requiring additional studies would serve no other purpose than to add unnecessary additional delay and costs to a project that has already gone far beyond what is needed to make an informed decision.

The applicant's proposed burial depth seems to be appropriate for this application. However, this and all other aspects of the pipeline design will be more thoroughly analyzed as part of the joint MMS/State Pipeline Coordinator's Office pipeline right-of-way technical review process. If this review determines that the proposed pipeline burial depth is inadequate, the applicant will be required to modify the design.

**0139-002**

Please see Response 0132-058.

**0139-E01**

The Duck Island Gravel Mine, Alternative VI, is described in Section II.C.4.c, and its effects are analyzed in Section IV.C.4.b.

**0139-E02**

Use Steel Sheetpile, Alternative V, is described in Sections II.C.3.a and c, and it effects are analyzed in Section IV.C.3.b.

**0139-E03**

The design, construction, operation, and safety of offshore pipelines are described in Sections II.A.1.b(3), II.C.2, II.B.2, and IV.C.2.

Also, please see Response 0135-098 regarding LEOS.

**0139-E04**

Information about oil-spill risk is described in Sections III.C.1.d and e and Appendix A.

The MMS believes that preventing oil spills is a critical part of any oil and gas operations on the outer continental Shelf; see Sections II.A.2, 3, and 4.

The potential effects of developing the Liberty Prospect for spectacled eiders are analyzed in Sections III.C.2.a(2), III.C.3.a(2), and III.D.1.a(2); long-tailed ducks and common and king eiders in Sections III.C.2.c, III.C.3.c, and III.D.1.c; polar bears in Sections III.C.2.b, III.C.3.b, and III.D; bowhead whales in Sections III.C.2.a(1), III.C.3.a(1), and III.D; and anadromous fish in Sections III.C.2.f, III.C.3.f, and III.D.2.g.

Estimated types and levels of future oil and gas activities on the North Slope and in the Beaufort Sea are described in Sections V.B.3 through 7. Information about oil-spill risk is described in Sections III.C.1.a, d, and e and Appendix A.

**0139-003**

For Liberty, the MMS estimates that the chance of a spill occurring ranges from 1-6% based on historical spill data. Based on looking at causal factors, pollution prevention, and other factors, the MMS estimates the chance of an oil spill occurring and entering the water is on the order of 1%. The chance of an oil spill from Northstar was estimated from spill rates calculated from historical spills from the MMS and CONCAWE databases. During the Northstar process, comments were submitted that expressed concern regarding the relevance of the MMS outer continental shelf data from the Gulf of Mexico and Pacific and CONCAWE, which is European onshore pipelines and estuary crossings to pipelines in the Arctic. Since the Northstar Final EIS was published, additional information on historical spills has been collected for Alaska North Slope production pipelines, the Trans-Alaska Pipeline, and the U.S. onshore pipelines. A comparison of spill rates by pipeline mile-year all yielded similar spill rates for pipelines operating in varying environments under different regulations. The chance of a spill occurring based on pipeline mile-year ranged from 1.1-2.1%. The pipelines with the lowest spill rate per volume transported are the Trans-Alaska Pipeline and production pipelines on the Alaska North Slope. It should be noted that for the Alaska North Slope rate, spills cannot be fully documented before 1985.

The historical spill rates do not specifically examine ice gouging, strudel scour, or other specific hazards. These types of hazards were analyzed in the pipeline failure rate.

**0139-A01**

The pipeline designs and studies that have been completed on the alternative pipeline designs are adequate for the evaluation of potential impacts in the EIS and to provide the decisionmaker(s) with the information needed to decide which pipeline design is best for the project. From the information provided by BPXA and from the other MMS studies on alternative pipelines, MMS has determined that any of the pipelines could be designed, installed, and operated safely in the outer continental shelf. All of the alternative pipeline designs, if selected, would require additional work and approval. Any pipeline selected, even the single-wall pipeline design, will need to undergo further detailed review by both MMS and the State of Alaska, State Pipeline Coordinator's Office and approval before construction. As indicated in the letter from the Department of Transportation, the selection of any alternative pipeline design would need waivers from before it could be approved and installed. However, it is premature and inappropriate to require the applicant to spend additional funds for detailed design and testing work until decisions have been made.

**0139-004**

We recognize that a double-wall pipeline is less likely to experience upheaval buckling and, due to its increased stiffness, has less strain in response to an ice-gouging event, if the pipelines are buried at the same depth. The applicant also knows this, which is why their proposed designs have different burial depths for the single-wall and double-wall pipeline designs and include the use of gravel mats over the single-wall pipeline to help prevent upheaval buckling.

The preliminary findings Dr. Konuk presented on February 13, 2001, do not seem to accurately reflect the pipeline-design alternatives analyzed in the Liberty EIS. His work assumed that the pipelines were buried at the same depth and ignored the gravel mats proposed by the applicant for the single-wall pipeline. During his presentation, Dr. Konuk stated that placing gravel mats over the pipeline or increasing burial depth would be effective ways of reducing the probability of upheaval buckling for the single-wall pipeline.

The work performed by the Geological Survey Canada essentially validates the design philosophy chosen by the applicant: to achieve similar strain levels in the pipeline that result from a given event, the pipelines would have to be buried at different depths.

Fleet included results from the Geological Survey Canada model in their analysis, and the work referenced in this comment already has been considered in the Liberty EIS. When the Geological Survey Canada report is completed, we will review it to see if there is any pertinent information that could be included in the EIS.

**0139-005**

The text has been revised to reflect that 1-6% is the chance of a spill occurring, and that 1% is the chance of a spill occurring and entering the water.

**0139-006**

This section has been reformatted to subdivide the information into sections. The description of LEOS technology has absolutely nothing to do with the calculations of the chance of a spill occurring.

**0139-007**

The text has been revised to include a section reference to Appendix A where the spreading of oil under ice is discussed.

**0139-008**

A reference to Section V.B was provided to direct readers to the cumulative-analysis section, where the geographic boundaries and timeframes are explained in greater detail.

**0139-009**

Section III.D.3 Effects of Small Oil Spills from Liberty states our assumptions regarding small spills. We do not provide a probability, because it is assumed that small spills occur. Figure A-3 in Appendix A gives the historical Alaska North Slope crude oil size distribution of small spills (1 gallon to less than 500 barrels) from 1985-1998. The distribution of spills is as follows: 33% of the spills are 3 gallons or less, 55% are 5 gallons or less, and 99% are 25 barrels or less. This distribution could be used as an ad hoc proxy for spill probability by size where one might estimate that 33% of spills will be 3 gallons or less, 55% will be 5 gallons or less, and 99% will be 25 barrels or less.

**0139-010**

The MMS has revised Map 5 to include more recent information on spectacled eider nesting and occurrence. However, such distributions change from year to year and, thus, may be only generally useful for aircraft-route planning rather than an instrument that could be used to designate an exact route for a specific period in the future. As the Fish and Wildlife Service is aware, the applicant is directed in terms and conditions of the final biological opinion that concludes interagency consultation on this project to update the Liberty C-Plan used to direct any oil-spill response. In choosing flight routes, they generally are obligated to follow safe procedures, which take precedence over all other considerations. As noted in the comment, the applicant could choose routes that may cause less disturbance to known areas of bird occurrence, and there exists an Information to Lessees associated with the original lease (Sale 144) concerning Bird and Marine Mammal Protection that suggests wildlife avoidance buffer distances and altitudes. Also, areas to the west of Deadhorse are not likely to be affected significantly by activities supporting Liberty to the east.

**0139-011**

The text in the Executive Summary has been changed in response to this comment.

**0139-012**

Helicopter traffic associated with Liberty would not "preclude the use of specific habitat by denning polar bears." Helicopters flying between Prudhoe Bay and Liberty Island by chance may fly over a polar bear. This type of event momentarily may disturb the polar bear for a few minutes at most. This level of disturbance would not have any effect on polar bear use of habitats. In perspective, the helicopter traffic/disturbance of polar bears associated with darting/tagging of polar bears by the Biological Resources Division for research is directed at the bears and is far more disturbing than any oil-industry traffic that polar bears are likely to encounter. Polar bears have been exposed to helicopter traffic on the North Slope for the past 30 years or more, and there is no evidence that this traffic has negatively affected polar bear habitat use.

**0139-013**

The phrase "by themselves" is not needed. The potential effects of Liberty consider the existing potential effects of baseline/past and existing development.

**0139-014**

The detailed description of the Amstrup et al. (2000) "model" is in Appendix J.

**0139-015**

The MMS believes that the polar bear population could sustain the one-time loss of 12 bears. The current subsistence harvest is well within the population's annual sustainable yield. The amount of "environmental degradation" that would be associated with a 2,956-5.912-barrel-spill would be local within areas where the oil would persist. The amount of habitat affected is expected to be small and have no effect on the availability of ringed seals or other prey of polar bears.

**0139-016**

The analysis of an oil spill contacting specific resources is complex, and the previous analysis has been updated to correctly state the effects to birds.

The "0-4%" greater probability (should be "less than 0-4%") of a spill from Tern Island contacting terrestrial mammal and vegetation-wetland coastal habitats (land segments). The probabilities of an oil spill from either Liberty or Tern island contacting coastal habitats of key species (anadromous fish, migratory birds, and caribou) are very similar: 11-22% for Alternative III.B Tern Island and 11-26% for Alternative I Liberty Island (see Tables A-13 and A-14: Land Segments 25, 26, and 27, and Section IV C.1.e Alternative III.B). This does not represent a sufficiently increased risk of oil-spill contact to change the analysis and conclusion on effects on terrestrial mammals and on vegetation-wetlands. The spill probabilities for other resources (marine and coastal birds) will be different depending on how close or how far they are from Tern Island versus Liberty Island. The text in the Executive Summary has been changed in response to this comment.

The values for the probability of oil-spill contact at various land segments and environmental resource areas when comparing alternatives require further qualification to avoid confusion concerning their interpretation. In comparing values for a spill at the proposed Liberty Island site (Alternative I) to the Tern Island site (Alternative III.B), the Tern site shows values 0-4% lower than the Liberty site (Tables A-12 through A-15). Comparison of assumed spills from pipelines associated with the two sites is more complex, because they occur at varying distances from the areas contacted; some are very close by, and the contact probability is very high. Comparing Liberty pipeline break 1 to Tern pipeline break 1, values range from 5% **lower** to 4% higher from the Tern pipeline (Tables A-16, A-18, A-19). Comparing Liberty pipeline break 2 to Tern pipeline break 2, values range from 2-21% lower from the Tern pipeline (Tables A-16, A-18, A-19) (with one exception where the contact probability is 80% higher from the nearshore Tern pipeline, because the break is located very close to the environmental resource area contacted). The Executive Summary and bird sections have been revised to reflect this clarification.

**0139-017**

The summary information concerning the effects of oil on key species (as identified through scoping) is provided for Alternative I and Alternative III.B. The probabilities of an oil spill from either Liberty or Tern island contacting coastal habitats of key species (anadromous fish, migratory birds, and caribou) are very similar: 11-22% for Alternative III.B Tern Island and 11-26% for Alternative I Liberty Island (see Tables A-13 and A-14: Land Segments 25, 26, and 27, and Section IV C.1.e Alternative III.B). This does not represent a sufficiently increased risk of oil-spill contact to change the analysis and conclusion on effects on terrestrial mammals and on vegetation-wetlands. The spill probabilities for other resources (marine and coastal birds) will be different depending on how close or how far they are from Tern Island versus Liberty Island. The text in the Executive Summary has been changed in response to this comment.

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**0139-018**

The sentence immediately preceding the quoted sentence reads: “Alternative III.B would generate fewer jobs…than Alternative I.” The comparison to Alternative I is stated.

**0139-019**

When the MMS looked at the available information and compared the various pipeline designs to each other, the results essentially were the same. It is incorrect to state that the MMS assumed the results.

**0139-020**

The environmental consequences of a functional failure would not be reduced “due to the protection afforded by the outer pipe.” The presence or lack of an outer pipe would have an impact only on the environmental consequences of a containment failure. The presence of the outer pipe actually can increase the consequences of a functional failure, because repairs of the pipeline would require more equipment, a larger excavation volume, and more time due to the weight and stiffness of a pipe-in-pipe system.

**0139-021**

The Executive Summary and corresponding text sections have been revised to clarify the use of the Kadleroshilik versus the Duck Island mine site as a gravel source.

**0139-022**

The Executive Summary and corresponding text sections have been revised to clarify the use of the Kadleroshilik versus the Duck Island mine site as a gravel source.

**0139-023**

The MMS staff surveyed the Kadleroshilik island area proposed as the Liberty gravel mine site from June 26-29, 2001. Information gathered during this survey, including bird species’ presence and abundance, bird use of the island, and bird densities, has been added to the appropriate EIS sections.

**0139-024**

The species more likely to occur on the Kadleroshilik island have been added to the appropriate EIS sections.

**0139-025**

For Combination Alternative C, in water depths greater than 10 feet, the length of pipe for the Tern Island route is about 5 miles, compared with 3 miles for the other combination alternatives.

**0139-026**

The same threshold of significance for a resource (Section III.A.1-3) has been applied to significant effects in the cumulative case for that same resource. See also Response 0141-019.

**0139-027**

We agree with the statement on the intent of the National Environmental Policy Act and Council on Environmental Quality. It also is correct to assume that as the base case of projects and activities increases, the incremental contribution of a new project is less. It also should be recognized that the smaller the incremental contribution of the proposed project, the more difficult it is to determine an effect from the incremental contribution of the proposed action. It is in recognition of this difficulty that the first part of the analysis is to determine an overall effect from the past, present, and reasonably foreseeable future projects, which include the proposed Liberty Project. In this case, the more projects, activities, and infrastructure, the more likely there is an effect that can be determined. The cumulative analysis attempts first to determine if there is an overall effect and, from that overall effect, determine the incremental contribution of the Liberty Project. If the overall effect is not clearly measurable, there is not going to be a measurable effect from the proposed project, in this case Liberty. The analysis of cumulative effects is complicated further by the trend in industry technological improvements such as smaller pads, fewer pads by directional drilling, less infrastructure, no roads to smaller fields, and reinjection of waste discharges. In this analysis, we have determined the overall cumulative effects to each resource and, from that assessment, made an estimate of the contribution of the Liberty Project. Contributions of perturbations from Liberty, such as potential oil spills, are more readily definable in a quantitative sense while other factors, such as disturbance or discharges, can be more difficult.

**0139-028**

The list of development projects on the reasonably foreseeable list includes only possible commercial-size discoveries, not proposed exploration wells. McCovey and Pike are sites considered for future exploration drilling, and the presence of large oil pools at these sites remains to be proven. At present, neither site has an approved exploration drilling permit. Even if drilled, most exploration wells do not discover large oil pools and are abandoned (for example, the Warthog well drilled off the Arctic National Wildlife Refuge in 1997). The cumulative-impact analysis is focused on possible long-term effects of development projects and not on temporary activities at exploration sites.

**0139-029**

A summation of oil-spill estimates for the cumulative case is provided in Appendix A in Table A-35. The estimate of the chance of oil spills occurring for the cumulative case includes past, present, and reasonably foreseeable projects for the Beaufort offshore. Past includes 28 fields, with Endicott, Eider, and Sag Delta North offshore; present includes 5 discoveries that are expected to start up within the next few years, with Northstar and Liberty offshore; reasonably foreseeable includes 15 discoveries that might be developed within the next 15-20 years, with Sandpiper, Flaxman Island, Kuvlum, Thetis Island, Stinson, and Hammerhead offshore (Table V.B-1a). Additional onshore resources (estimated 2.30 billion barrels) and offshore resources (estimated 0.45 billion barrels) currently are undiscovered. The reader is referred to Section V.B for a full discussion of development included in the cumulative case. The mean number or estimated spills for the Beaufort Sea is 1.02. This means MMS estimates 1 spill will occur due to future production in the Beaufort over the life of the cumulative case, if all the resources are developed. If this were translated to a percentage as the commenter suggests, then MMS estimates there is a greater than 99.5% chance of one or more spills occurring over the life of the cumulative case.

**0139-030**

The EIS uses scoping to identify the major issues and concerns to be evaluated and analyzed in the EIS. The Executive Summary focuses on presenting the pertinent information to the decisionmakers and public concerning these major issues. The Executive Summary rightfully focuses on the potential effects of major oil spills to key resources. The Executive Summary does not discuss and summarize effects to resources that were minor in nature. Interested readers can find the analysis of chronic small spills in Section III.D.3 Effects to Wildlife from Disturbance. The effects to fish are found in Sections III.C.2.f, III.C.3.f., III.D1.f, III.D.2.g, III.D.3.f, III.D.4, III.D.6.f, and III.D.7.f, and the cumulative effects are found in Section V.

**0139-031**

This concern also applies to onshore development, and there are a number of instances throughout the EIS where references are made to using existing infrastructure. In the cumulative analysis, MMS believes it already has addressed this concern in Section V.B.2 with the following statement: "Commonly, new planned developments will be tied into existing infrastructure, and they depend on the continued operation of this infrastructure."

**0139-032**

It is difficult to predict what technological advancements will be made, let alone the impacts these advances will have, in the future of oil and gas development on the North Slope. Because these predictions are so difficult to define, it makes more sense to assume future developments will be similar to current developments for the point of estimating cumulative impacts. This is a conservative approach to take, because environmental effects will be overestimated by not assuming any technological advancement.

Pipeline spill risk is a small component of the overall risk of a project. Reducing this risk by the factor of 10, as proposed in the comment, would not appreciably reduce the probability of a leak for the project; therefore, there would be little, if any, measurable change to the cumulative impacts.

No changes are necessary in the EIS.

**0139-033**

The MMS believes that the Beaufort Sea polar bear population would not be "significantly" affected by foreseeable cumulative development in the Beaufort Sea, and the information and uncertainties provided by the Fish and Wildlife Service do not justify adding polar bears to the "Significant Effects Conclusion."

There is no conclusive evidence that the Beaufort Sea polar bear population is near "carrying capacity." The "carrying capacity" is determined by the availability of ringed seals to polar bears. This availability is determined by ice conditions/coverage in the Beaufort Sea. Ice conditions/coverage are highly variable from year to year and season to season. Amstrup (2000) suggests that the Beaufort Sea polar bear population may be reaching "carrying capacity," and that the growth rate of the population is "low." The basis for Amstrup's speculation on the polar bear population "nearing carrying capacity" is based only on an observed reduction in numbers of young born in recent years compared to earlier years, when the population was recovering from an apparent overharvest by sport hunters. Amstrup (2000) provides no evidence that ringed seal abundance/availability has declined. The "carrying capacity" of the Beaufort Sea for polar bears is not known and varies greatly from year to year.

The discreteness of the Beaufort Sea polar bear population from the larger Chukchi Sea population is not clear. There is considerable overlap in the movements of female bears between these "subpopulations." "Non-pregnant" polar bears of the Beaufort Sea population were least faithful to feeding areas during late winter and spring (breeding season) (Amstrup et al., 2000b). These females are, thus, available to breed with males from the Chukchi population at this time. Amstrup et al. (2000b), admit that there are no geographic barriers to the movements of bears between these populations. They suggest that these "discrete subpopulations" may be maintained as a result of the general pattern of ice formation and ablation between the Beaufort and Chukchi seas. This is a weak argument for "sub-population discreteness" because of the very high variability in ice conditions in the Arctic. Thus, recruitment from the Chukchi Sea population needs to be considered in the recovery of the Beaufort Sea population from cumulative losses of bears from more than one spill.

In regard to the uncertainty of the subsistence harvest of polar bears in the Beaufort Sea, formal treaty agreements between subsistence hunters from Alaska, Canada, and Russia, in cooperation with the Fish and Wildlife Service, limit the harvest of polar bears and are assumed to prevent any overharvest in the foreseeable future.

**0139-034**

Please see Response 0139-016.

**0139-035**

Please see Response 0132-058.

**0139-036**

Additional information was added to the EIS to more clearly justify why this potential alternative was dropped from further consideration.

**0139-037**

The construction and presence of Liberty Island by itself could affect the distribution and abundance of seals and polar bears, at the most, only within a local area surrounding the pipeline and island. Any possible local displacement/habitat-use effect from Liberty alone would not extend over the Beaufort region.

**0139-038**

The text has been corrected.

**0139-039**

Please note that no oil was released into the environment during these trials. A more detailed discussion of the barge trials is included in the EIS. BPXA will be revising their oil-spill-contingency plan to reflect the outcome of the spring and fall trials.

**0139-040**

Table III.C-3j has been added as a summary table in response to the comment.

**0139-041**

Please see Response 0139-015.

**0139-042**

The MMS prefers to use the same format for all resource analyses in Section III.C with the conclusions up front.

**0139-043**

The bears concentrated at the harvest site may be oiled whether the carcasses are oiled or not. No changes have been made to the text.

**0139-044**

The MMS believes that the loss of 5-30 bears is a severe and very unlikely (a type of worst-case) event. The polar bear population is expected to recover from this loss within 1 year and not have a significant effect on the population. The Amstrup et al. (2000) model results at best represent an overestimate of the number of polar bears that could be oiled by a relatively small spill of 2,956-barrels. The model does not account for the effects that ice and freezing conditions would have on the oil during October. Much of the oil at that time could be encapsulated into the forming ice and would not be available to oil bears during the 10-day period. At the very least, the ice would inhibit the movement of the spill, and shorefast ice forming during October would prevent the oil from reaching coastal bear-concentration areas at Barter and Cross islands. The MMS believes that Amstrup et al.'s highest bear-density contours extend too far offshore from these bear-concentration areas, especially during open water in September. Data on 483 polar bear sightings of more than 1,100 bears during the past 20 years of aerial surveys by the Naval Ocean Systems Center and the Bowhead Whale Aerial Survey Program indicate that very few polar bears are seen swimming in open water, and almost all of those that have been observed in the water were very close to land. Thus, the number of bears oiled during open water is expected to be very low. If ice is present, the bears are most likely to be on the ice.

Also, the Amstrup et al. (2000) model does not appear to adjust their bear densities downward after bears are contacted by the trajectories and assumed to be killed. For example, if a trajectory killed 10 bears on the first day of the simulated run, the number of bears in the Liberty area would be fewer and, thus, the density of bears should be adjusted downward for the rest of the 10-day run.

**0139-045**

The statement that "individual bears killed by the spill would be replaced within 1 year" is based on the assumptions listed as bullets in Section III.C.2.b(2)(b) of the EIS.

**0139-046**

Amstrup et al. (2000) used both 5,912- and 2,956-barrel spills and reported similar results. The reader can refer to Appendix J for more details on the Amstrup et al. (2000) model results. The MMS used a 30-day scenario and estimated that the 2,956-barrel spill could kill three to six polar bears. This estimate is similar to the estimate given by Amstrup et al. (2000).

**0139-047**

The text has been changed to include "see Appendix J-1" after the citation of Amstrup et al. (2000).

**0139-048**

Please see Responses 0139-015 and 0139-016.

**0139-049**

There is no Comment 0139-049.

**0139-050**

Please refer to Appendix J for more details on the Amstrup et al. (2000) model results.

**0139-051**

This type of additional information on polar bears was added to the EIS in response to Fish and Wildlife Service and Biological Resources Division comments at their meeting with MMS on November 27, 2000.

**0139-052**

Please see Response 0139-051.

**0139-053**

Please see Response 0139-051.

**0139-054**

The text in Section III.C has been changed in response to this comment.

**0139-055**

Amstrup (2000) states that the growth rate for the southern Beaufort Sea population is “low”; he does not say that it is “stable” (not growing).

**0139-056**

The text in Section III.C has been changed in response to this comment.

**0139-057**

The text in Section III.C has been changed in response to this comment.

**0139-058**

The text has been changed in response to this comment.

**0139-059**

The text has been changed in response to this comment.

**0139-060**

This information is relevant to the Liberty analysis, because similar incidental-take regulations would apply to the Liberty Project.

**0139-061**

The text has been changed in response to the comment.

**0139-062**

Although the topic of vulnerability of birds moving along the Beaufort Sea coast during migration to an oil spill was covered in the draft EIS, additional qualification has been included in the summary/conclusions subsection and corresponding text section.

**0139-063**

The addition of the suggested phrase “the effects of these activities by themselves” is redundant and unnecessary.

**0139-064**

Please see Response 0139-063.

**0139-065**

The MMS believes that unavoidable disturbance from air, vessel, and ice-road traffic would not affect seal and bear abundance.

**0139-066**

Please see Responses 0139-015 and 0139-016.

**0139-067**

The comment provided in the EIS is a generalization based on fact that the U.S. imports oil, and oil development is quite similar throughout the world. The commenter is correct that the EIS does not analyze or assess the effects to resources, because there is no way for us to know whether that substitute oil would come from the Middle East, Canada, Mexico, South America, etc. The only way the EIS could make such a direct site-specific comparison would be to assume a specific location and assume oil was present and then make some analysis. The analysis would vary by assumed location, and the number of locations is limitless. However, it is reasonable and proper to state that “some” effects will occur at the site wherever the “substitute” oil is developed. It is incorrect to assume that not developing this resource in Foggy Island Bay, while the U.S. continues to import oil, will result in no “environmental” effects just because they do not happen in Foggy Island Bay. In fact, if the imported oil originates in countries that have less stringent environmental controls than the U.S., the effects to the world environment may be greater than those identified in this EIS.

The commenter is correct that there is not a long historical record of oil pipelines in the offshore arctic environment. However, oil and gas companies have worked in the Arctic for many years, and offshore oil and gas development has a long historical record, both in the U.S. and worldwide. The EIS presents this information and uses that best available data and statistics and, when necessary, professional judgement to evaluate the potential effects. The EIS represents our best assessment of the potential effects.

Foggy Island Bay is not subject to “pack ice,” as suggested by the commenter. The bowhead whale does not migrate through the Foggy Island Bay area. Some bowhead whales may feed inside the barrier islands, but their migration route is outside or north of the barrier islands.

Section VI of the EIS describes the existing environment, including descriptions of the birds, marine mammals, terrestrial mammals, fish, and other resources that live in or migrate through the area. The EIS evaluates the effects to these resources.

**0139-068**

The vast majority of oil produced on the North Slope of Alaska and transported through the Trans-Alaska Pipeline is tankered to west coast markets. For purposes of analysis, tankering Liberty oil to the west coast is reasonable and represents the most likely event, which is consistent with the guidelines of the National Environmental Policy Act Council on Environmental Quality.

**0139-069**

Additional qualification regarding the possibility that some unidentified eiders observed on Fish and Wildlife Service surveys could have been spectacled eiders has been added to the Section III and Section IV.

**0139-070**

Suggested changes to Sections IV.C.1.c(2), III.c.2.c, III.a.2.c, and the Executive Summary, concerning references to the Arctic Coastal Plain population of long-tailed ducks, including revised wording that does not characterize individuals in the estimated spill-mortality figure as birds that necessarily bred on the Arctic Coastal Plain, is incorporated into summary/conclusions and text of the EIS.

**0139-071**

The analysis of the proposed action in the EIS (Section III) notes constraints to accuracy inherent in the Fish and Wildlife Service model, including potential effects of migration and turnover rates. This precedes the discussion of potential oil-spill mortality of particular species and, thus, applies to all species treated. However, where appropriate, this aspect has been added to other sections where this topic is addressed.

**0139-072**

The layout of the EIS was specifically chosen to first present the benefits of pipe-in-pipe, then the concerns with pipe-in-pipe, and finally to provide the decisionmaker with more information to aid in the decisionmaking process. This layout provides a fair and balanced assessment of the pipe-in-pipe alternative.

To modify the EIS as suggested by this comment would create a bias in the EIS by allowing the benefits of pipe-in-pipe to remain standing on their own but bury the concerns with pipe-in-pipe in a much more detailed discussion about other pipe-in-pipe issues.

No changes to the EIS are necessary.

**0139-073**

The referenced text in Section IV.D.3 states: “Combination C would use the most gravel of all the alternatives.” Later in the same paragraph it states “Although Combination C’s Tern Island would cover about 26.8 acres [of] ocean floor, which is the largest area, it uses the gravel from the existing Tern Exploration Island; therefore, the amount of new area covered would be the smallest.” The EIS goes on to say “Combination C causes the least cumulative impact on gravel resources of the combination alternatives.” All of these statements are correct and consistent.

If the Tern Island location is chosen, it requires the largest quantity of gravel to construct the island, and it will cover the most area on the seafloor. The EIS notes that part of this requirement is met by using the existing gravel at the site, but that does not change the area of the seafloor covered by gravel; neither does it alter the total amount of gravel at the location.

The narrative in the EIS is correct and does not need to be modified.

**0139-074**

Statements concerning potential secondary oil-spill impacts on eiders have been added to Section V.

**0139-075**

The referenced statement has been revised for clarification.

**0139-076**

The referenced section in the cumulative analysis has been revised to include potential oil contamination of food resources and additional habitats.

**0139-077**

Please see Response 0139-033.

**0139-078**

The additive probability from Liberty and Northstar still is less than 50%. Thus, the cumulative analysis assumes one oil spill would occur from either Liberty or Northstar or from other projects. Detailed information on oil-spill probabilities is covered in Appendix A, Oil-Spill-Risk Analysis. The cumulative analysis assumes one spill greater than or equal to 500 barrels (see Appendix A). The suggested detailed information does not belong in the Summary and Conclusions.

**0139-079**

The text has been changed in response to this comment.

The loss of only three bears over 20 years and the local displacement of a few bears conclusively would have no effect on the population. The use of the word “detectable” is not necessary.

**0139-080**

The analysis uses information that is available and is not required to list all unknowns.

**0139-081**

Statements concerning potential secondary oil-spill impacts on eiders have been added to Section V.

**0139-082**

The statement in Section V indicating the most likely number of spills has been replaced by the estimated probability of a large spill occurring.

**0139-083**

The text has been changed in response to this comment.

**0139-084**

Please see Response 0139-029.

**0139-085**

The text has been changed in response to this comment.

**0139-086**

Additional potential effects-causing factors have been added to the discussion of the 180,000-barrel blowout spill in broken-ice conditions (Section IX.A.6.a).

**0139-087**

The method used to determine the estimated level of effects and recovery times on ringed seal and polar bear populations is given sufficiently in Section IX.

**0139-088**

Additional potential effects-causing factors have been added to the discussion of the 180,000-barrel blowout spill in broken-ice conditions (Section IX.A.6.c).

**0139-089**

Additional cited material and references have been added to the referenced text (Section IX.A.6.c(2)(b)2)).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

0141

April 18, 2001

Reply To
Attn Of: ECO-088

Ref: 98-010-MMS

Fred King
Minerals Management Service
Alaska OCS Region
949 East 36th Avenue
Anchorage, Alaska 99508

Dear Mr. King:

The EPA has completed its review of the draft Environmental Impact Statement (EIS) for the proposed **Liberty Development and Production Plan** (CEQ No. 010002) pursuant to our responsibilities and authorities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act and in our capacity as a cooperating agency on this EIS. The draft EIS evaluates a proposal by BP Exploration (Alaska) Inc. to develop and operate an offshore oil and gas production facility in the Alaskan Beaufort Sea, along with alternatives to it. The draft EIS does not identify an Agency-preferred alternative.

Based on our review and evaluation of the draft EIS and other information sources, we have assigned a rating of EO-2 (Environmental Objections-Insufficient Information) to the draft EIS. This rating, and a summary of our comments, will be published in the *Federal Register*. A copy of the rating system used in conducting our review is enclosed for your reference.

001

Our objections to the proposed Liberty project are related to the lack of analysis of the issues and concerns of the Inupiat Eskimoes as required by Executive Order (EO)12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), the potentially significant effects from leaks and spills associated with the use of undersea pipelines in the Beaufort Sea, the technological/logistical difficulties in responding to oil spills in the Beaufort, and the potential use of project components for which there are less environmentally damaging options. It is EPA's position that comprehensive environmental justice analysis must be developed in consultation with the Inupiats and included in the EIS to meet the direction of EO 12898. This analysis should clearly identify whether any disproportionately adverse effects would be borne by Native Alaskans and include mitigation and/or compensation measures available to offset such effects. We believe that there is a sufficiently high degree of uncertainty as to how undersea pipelines and other project components would withstand the severe conditions of the Beaufort, the effects of which could be significant. We believe that the EIS should include additional evaluation and design information

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related to the double walled steel pipeline alternative, as it appears to be a viable technology that would provide environmental protection features that are superior to the proposed pipeline. The EIS should also evaluate and disclose the expected effectiveness of the Liberty Oil Discharge Prevention and Contingency Plan (ODPCP) in responding to oil spills or leaks. Finally, we recommend that the Duck Island gravel mine site and steel sheetpile island protection system be selected as part of the preferred alternative, as they are less environmentally damaging than other options currently under consideration. These issues, along with others that we believe need to be addressed in the EIS, are discussed in greater detail in the enclosure to this letter.

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With regard to project schedules and next steps, we note that page 1 of the Executive Summary indicates that MMS intends to issue the final EIS in fall 2001. This date is inconsistent with our understanding of the current timeline for the EIS, which we understand is to have a final EIS available for public release no sooner than early 2002. We recommend that, once all comments on the draft EIS have been received, MMS, EPA and the Corps of Engineers meet to determine the method to be used for assessing and responding to the comments. Once the content of the comments has been assessed, and a determination of the efforts that are needed to develop meaningful responses to the comments has been made, we believe that the three agencies will be better situated to jointly establish a schedule for completing the EIS.

We are interested in working closely with Minerals Management Service in successfully resolving the issues we have identified above. I urge you to contact either Ted Rockwell in our Anchorage office (907-271-3689) or Bill Ryan in Seattle (206-553-8561) at your earliest opportunity to discuss our comments and how they might best be addressed for the project. I can be reached at (206) 553-6911.

Thank you for the opportunity to review this draft EIS.

Sincerely,

Judith Leckrone Lee
Judith Leckrone Lee, Manager
Geographic Implementation Unit

Enclosures

cc: Mike Holley, COE
Larry Bright, USFWS
Jeanne Hanson, NMFS
Tom Lohman, NSB

**EPA Comments**
**on the**
**Draft Environmental Impact Statement**
**for the**
**Proposed Liberty Development and Production Plan**

**Environmental Justice** 003

The EIS lacks the analyses and conclusions which are needed to understand whether disproportionately adverse effects to Alaska Inupiat Natives (a recognized minority) would result with the implementation of the proposed Liberty project (individually or cumulatively). Page III-C-89 of the EIS accurately identifies the intent of Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) and accompanying memorandum to "promote fair treatment of people of all races, so no person or group of people shoulders a disproportionate share of the negative environmental effects from this country's domestic and foreign programs." The appropriate analyses, however, have either not been conducted, or have been conducted in such a general manner that the results do not provide clear or meaningful results.

Consideration of environmental justice is an important element of the Federal decision making process. The key objectives of evaluating effects to minority and low-income populations pursuant to EO 12898 are to 1) identify if any potentially affected minority or low-income populations exist, 2) reach a conclusion as to whether any effects associated with a known course of action would be disproportionately adverse to those affected populations and 3) identify an appropriate course of action that would avoid or otherwise minimize or offset such effects. The EIS does not provide a clear understanding of the breadth of the issues and possible effects that is needed to develop the appropriate analyses that would meet these three objectives. Consequently, it does not present a clear finding of whether disproportionately adverse effects would be borne by Alaska Inupiat Natives (page III-C-89 states the disproportionate adverse effects on Alaskan Native that *could* result from Liberty development). For example, the EIS does a good job of presenting the comments and viewpoints of Inupiat villagers related to development on the North Slope and their lifestyle. Additionally, page III-C-87 of the EIS states that "oil development...may disrupt a community's culture, even though it doesn't cause 'biologically significant' harm to a subsistence species' overall population." These issues have not been analyzed or addressed either in the design of the proposed action (or alternatives) or as required mitigation or compensation measures.

An environmental justice analysis should be developed to analyze and respond to issues that have been identified by the Inupiat communities. Such analyses should also consider potential effects to the Gwich'in peoples, who rely on subsistence resources that may be affected by the development of Liberty (individually or cumulatively). This analysis should be developed as a stand-alone document that would be appended to the EIS with the salient points and conclusions being reported in the EIS.



The EIS must contain an adequate discussion and evaluation of the effects (existing, potential, and cumulative) on the Alaskan Inupiat culture for there to be a determination of whether there is a disproportionate amount of risks or effects being shouldered by a minority sector. The fundamental issue is the difference between a risk to increased oil production and risks to subsistence resources and Alaskan Inupiat culture. Adequate risk assessment is critically important with respect to oil spill response. There are presently no oil spill response and cleanup capabilities that have been demonstrated to be effective in the Arctic offshore environment. Consequently, a large oil spill from the Liberty project (or others in the Beaufort or on the North Slope) would likely have catastrophic effects on subsistence resources and the Alaskan Inupiat culture. When discussing and evaluating oil spill response and the risks associated with the current lack of oil spill response capabilities, it is essential that the EIS provide a clear distinction between the different types of risks and the trade-offs associated with them. For example, the EIS should provide the reader with the distinctions between the types of risks (e.g., loss of oil production, worker safety, effects on subsistence resources, sustainability of the Alaskan Inupiat culture) and an assessment of these differing types of risk. With an adequate assessment of risk in the EIS, in concert with public review and comment, it will be possible to determine what, if any, actions Federal agencies need to take to mitigate identified effects and risks. We believe this to be a fundamental objective of EO 12898. 003

The discussion on page III-C-89 of the EIS suggests that there may be some confusion about the responsibilities of the Federal government pursuant to EO 12898 and EO 13084 (Consultation and Coordination with Indian Tribal Governments). This is somewhat understandable when consultation with Tribal entities is required by both Executive Orders. The requirements to consult under each EO and the outcomes that result from those consultations should be treated as distinctly separate and this distinction should be reflected in the EIS. It appears that MMS has relied heavily on EIS scoping and public meetings and government-to-government consultations with Inupiat Tribal governments to engage the Inupiats with respect to Environmental Justice (EJ) issues (consultations related to EJ are discussed in the section related to EO 13084). This consultation with governing bodies is an important element of any EJ evaluation process, but we believe that efforts to address EJ-related issues should extend beyond these efforts. Likewise, efforts above and beyond the typical EIS process (e.g., public meetings) are warranted, particularly when potentially affected populations are non-English speakers or their culture does not rely on or is not comfortable with our established governmental methods of involvement. Such efforts should be pursued, integrated into the assessment of EJ issues, and reported in the EIS.

**Levels of Uncertainty and Risk** 004

In general, the EIS presents the results of analyses and characterizations of effects in a manner that would suggest that the conclusions related to predicted environmental (and other) effects embody a higher level of certainty or confidence than we believe exists. As the first potential project of its kind in the Outer Continental Shelf (OCS) of the Beaufort Sea, the proposed Liberty project (and alternatives) is composed of a number of components that have not been demonstrated to function or operate effectively in the harsh environment of the Beaufort

Sea. The only comparable project, the Northstar project has not yet been completely constructed, and consequently not yet been operated. Additionally, the effects of physical processes in the Beaufort (e.g., ice keel strikes, strudel scouring, thaw settlement) embody another set of uncertainties as they relate to the proposed project. Given the overall high levels of uncertainties associated with technologies being considered for construction and operation of the project, the Federal decision making for this project should embody a level of conservativism that results in a project that minimizes potential risks to environmental and social resources. In that regard, we offer the following recommendations related to project components presently under consideration: 004

- Review of the EIS reveals that there are compelling reasons to select a double walled steel pipeline over a single walled pipeline. Consequently, we recommend that double walled steel pipeline be carried forward as the selected pipeline, making it both the environmentally preferred and agency preferred alternative. We recommend that engineering design efforts be initiated for the double walled pipeline alternative to allow for a more robust evaluation of this project component. E01

- Review of the EIS reveals that there is no compelling reason to vary from the practice of using sheetpile for island containment and protection. Consequently, we recommend that sheetpile be carried forward as the selected island containment and protection method, making it both the environmentally preferred and agency preferred alternative. E02

- Review of the EIS reveals that there is no compelling reason to select the Kadleroshilik River gravel mine site over the Duck Island mine site. Consequently, we recommend that the Duck Island gravel mine site be carried forward as the selected mine site, making it both the environmentally preferred and agency preferred alternative. E03

The draft EIS (see p. III-C-7) does a reasonably good job of discussing the uncertainties associated with the manner in which MMS has estimated the chance of an oil spill occurring. This uncertainty has, however, much broader applicability to most of the analyses and impact characterizations presented in the EIS. Consequently, the EIS should be revised to provide the public and the decision maker with better understanding of the uncertainties associated with the analyses and conclusions presented in the EIS. This is especially important when quantitative analyses have been conducted and their results presented. 005

The risks of a large oil spill could have potentially catastrophic effects on the Alaskan Inupiat culture, particularly considering the present lack of demonstrated response and cleanup capabilities in the Beaufort. This should be more thoroughly discussed in the EIS. 006

**Oil Spill Response and Clean Up**

The EIS should expand the discussion of clean up response to oil spills. As presently written, the EIS does not do an adequate job of explaining what can actually be expected to be done in the event of an oil spill in winter or broken ice conditions and the consequences of this level of response. Page III-C-3 indicates that MMS had determined in the 1980s that industry 007



had demonstrated the capacity to clean up oil in broken-ice conditions, yet no information is presented related to methods and equipment that supported that demonstration. The EIS also indicates that field testing of barge-based cleanup systems has been conducted during 1999 and 2000. No information related to the findings (preliminary or final) of those tests are presented in the EIS. The EIS also indicates that historic cleanup ranged from 5 to 15 percent, based on information presented in the Sale 170 Final EIS. Review of the Sale 170 EIS reveals that the reported 5-15 % cleanup rate is based strictly on information gathered in the Gulf of Mexico, an environment devoid of the ice and winter weather conditions of the Beaufort. It is critically important that the public and the decision maker have a reasonable understanding of the potential environmental consequences associated with a large oil spill. This includes an understanding of the effectiveness of the response and cleanup systems that would be used in the event of a spill. Consequently, the EIS should be revised to explain how the existing lack of response capability is taken into consideration when determining the level of impacts to specific resources and the Inupiat culture. 007

**Significance of Effects**

The EIS fails to provide clear characterizations of whether estimated impacts associated with each alternative would be significant or not, which is one of the primary functions the EIS (see 40 CFR 1502.16). Page III-A-2 presents criteria that MMS has established to define thresholds of significant effect that, if exceeded, would represent a significant effect to specific resources. Conclusions are not presented in terms of these thresholds, nor are there clearly stated conclusions related to the significance of the effects presented. In many cases there are no apparent relationships between the thresholds and the analyses and conclusions. The analyses need to provide information that is readily comparable to the thresholds in order for the public and the decision maker to understand whether expected effects are deemed to be significant. Therefore the EIS should be revised to compare predicted results/conclusions with the significance thresholds. This will ensure that the EIS complies with the CEQ regulations direction to disclose effects and their significance. 008

Additionally, the thresholds have not been applied to the cumulative effects analysis. In order to ensure that the public and the decision maker are provided with a consistent understanding of predicted effects and their significance, the results presented in the cumulative effects chapter should be developed and presented in a manner that provides for a comparison with the defined significance thresholds. 009

The EIS does not present a clear finding of whether disproportionately adverse effects would be borne by Alaska Inupiat Natives. To satisfy the direction of EO 12898 and accompanying memorandum, the EIS should include a finding of whether there would be any disproportionately adverse effects to the Inupiats, supported by the necessary analyses. As discussed above, a stand-alone environmental justice analysis should be developed. 010

**Pipeline Design Alternatives**

We commend the efforts of both BP Exploration (Alaska) Inc. and MMS in undertaking the various pipeline design and evaluation studies that are reflected in the analyses in the EIS. While questions remain about the various design options being considered, most of the concerns raised about undersea pipelines during the Northstar EIS process and carried forward through the development of the Liberty project/EIS have been addressed in these studies. Based on our assessment of the studies conducted and the information presented in the EIS, the double walled steel pipeline alternative has been shown to be a viable means of transporting oil to the existing on-shore pipeline system.

011

One of the prime objectives of the NEPA project development process is to develop a project that minimizes risks to the environment while maintaining a satisfactory level of functionality. With regards to undersea pipeline designs, the goal is to minimize the risk of oil escaping into the environment as a consequence of a pipeline failure. The pipeline studies and the information presented in the EIS demonstrate that the double walled steel pipeline offers improved environmental protection by providing leak containment that is not provided in the proposed single wall design. This added environmental benefit would be gained at a reasonable increase in overall project costs (compared with the proposed action), particularly when considering the high degree of uncertainty of the risks associated with using undersea pipelines in

012

the Beaufort Sea. When considering the potentially significant environmental and social effects from a major oil spill and the uncertainties about estimated risks from a pipeline failure, solutions that maximize environmental protection and maintain functionality at a reasonable cost should be actively pursued and investigated. Consequently, engineering design efforts should be initiated for the double walled pipeline alternative to allow for a more robust evaluation of this project component.

013

**Upper Island Slope Protection Systems**

Based on our assessment of the information presented in the EIS, steel sheetpile affords reliable island protection and containment without any significant environmental effects or shortcomings and should be selected as the preferred alternative. The use of gravel bags for protecting the upper portion of the island provides no apparent advantages over sheetpile from the perspective of island protection and has the attendant negative aspect of the potential for the bags to enter the environment. The EIS presents little information to support the conclusions that it is unlikely that bags would be washed into the Beaufort Sea. Additionally, the EIS indicates that should torn bags be washed into the sea, these bags would sink to the bottom. The EIS presents no analysis of the ecological (or other) implications of the presence of these bags on the sea floor. MMS should pursue solutions that minimize or eliminate the risks of polluting the environment.

014

**Alternative Gravel Mine Sites**

The EIS presents no compelling information or analyses that would justify construction of a new gravel mine within the flood plain of the Kadleroshilik River when project-related gravel needs could be met at the existing Duck Island mine site (or other potential sites). The Duck Island gravel mine site could provide the gravel needed to construct any of the gravel islands under consideration without the potential significant environmental effects associated with



014

development of a new gravel mine. The EIS states that development of the Kadleroshilik River mine site would provide overwintering habitat for fish, but also indicates that there are no known fish stocks that presently use the river for overwintering purposes. We were unable to determine from information in the EIS that this approach is environmentally superior or necessary when contrasted with maintaining the integrity of an undisturbed river delta. We were also unable to locate information in the EIS that supports the conclusion that the "effects of gravel mining in the natural process and functions of the Kadleroshilik River would be short term and relatively low." As a result, the Duck Island mine site should be selected as the preferred alternative.

015

The EIS does not contain sufficient information to demonstrate that the use of the proposed Kadleroshilik River gravel mine site would comply with the 404(b)(1) Guidelines, particularly without the evaluation of additional gravel sources. As a consequence, the Corps of Engineers 404(b)(1) analysis would need to go beyond that presently contained in the EIS. In order to ensure that this EIS satisfies the NEPA compliance requirements of the Corps of Engineers (Corps), we recommend that MMS work with EPA and the Corps to incorporate into the EIS the information needed to comply with the 404(b)(1) guidelines.

016

The discussion on page I-25 be revised to include additional discussion of the potential gravel sources that BPXA has eliminated from consideration and have been characterized as being "not as environmentally sound as the proposal." Further discussion and/or analysis of the use of Tern Island as a gravel source is particularly important as its use could potentially result in a significant reduction in the amount of gravel that would need to be acquired from on-shore sources (and associated impacts). Use of Tern Island gravel would also result in a "no net increase" in the number of artificial islands in the Beaufort, which we see as an environmental benefit when one considers the development of Liberty in the context of the longer-term cumulative sense. These considerations should be factored into the consideration of the "environmental soundness" of this potential source of gravel. We recommend that they be integrated into the analyses of the EIS.

017

**Evaluation of Additional Alternatives**

Based on our review of the EIS, we recommend that the following alternatives be evaluated as part of the decision making process for the proposed Liberty project:

- <u>Delay the Implementation Schedule</u> - This alternative would evaluate the consequences of delaying the construction and operation of Liberty until data is gathered to verify assumptions made in decisions to allow Northstar to proceed as well as data on the Northstar project and any effects that may be associated construction and operation of that project. This altered schedule alternative would weigh the trade-offs associated with delaying the construction and operation of Liberty and having a better understanding of potential operational and/or environmental effects based on experience and data gathered from the Northstar project.

018

- <u>Alternative island location closer to shore than the present Southern Island location</u> - As written, the EIS does not meet the needs for alternative analysis required by section 404 (b)(1) of the Clean Water Act. This will have to be met prior to a section 404 permit decision being made and will need to be reviewed by the appropriate reviewing agencies. Therefore it should be included in the EIS. 018

019

**Cumulative Effects**

We were unable to determine, based on the information presented in the General Conclusions section of Chapter V, whether there would be any significant cumulative impacts associated with past, present, and reasonably foreseeable activities (including Liberty). While we agree that "potential cumulative effects on the bowhead whale, subsistence, spectacled eider, boulder patch, polar bear and caribou are of primary concern and warrant continued close attention and effective mitigation practices," we do not view that statement as a clear characterization of whether impacts to any or all of those resources would be significant in a cumulative sense. The EIS should be revised to clearly identify resources that are expected to be impacted significantly in a cumulative sense to provide the public and the decision maker with a clear understanding of the consequences that the Liberty proposal (in the context of other activities). The EIS should also clearly indicate if the Inupiat culture will be significantly affected as a consequence of past, present, and reasonably foreseeable activities.

The significant effects thresholds presented in Section III of the EIS have not been applied to the cumulative effects analysis. In order to ensure that the public and the decision maker are provided with a consistent understanding of predicted effects and their significance, the results presented in the cumulative effects chapter should be developed and presented in a manner that provides for a comparison with the defined significance thresholds.

**Effects from Ocean Disposal**

EPA will not be able to provide complete, final comments related to any necessary changes or additions to the EIS as it pertains to actions under the Marine Preserves, Rivers, and Sanctuaries Act (MPRSA) until after we have had the opportunity to review and understand the final report from this summer's sediment study which is being undertaken by the Corps' Waterways Experiment Station. At that time we expect to be in a position to better understand the issues revolving around ocean disposal and be able to determine what must be contained in the EIS for it to adequately meet our MPRSA and NEPA needs.

**Document Organization and Readability** 020

As currently written, the EIS contains a section "numbering" system that makes it extremely difficult to locate information referenced within the document. Additionally, we find that the page numbering system, which is very similar to the section numbering system, adds to the difficulty in locating referenced information. Also, we find the placement of figures, tables, and maps in a separate volume (which has no page numbers) makes the document difficult to review.

In order to better serve its function as a disclosure document designed to inform the public and the decision maker(s), the EIS should be reorganized to improve its readability, 021



thereby allowing the reader to more easily locate information and integrate relevant information presented in different portions of the EIS. We suggest improving the readability of the document as follows: 021

- Locate all figures, tables, and maps with the text that refers to them. Based on our extensive experience in reviewing EISs, we find this approach to be the most effective method for providing the reader with a clearer, better-intergrated understanding of the information contained in the document.
- Number pages either consecutively from the beginning of the document through to the end or only include the section and the consecutive number of the page (e.g., page III-C-17 would become page 3 - 40, representing the 40th page in section 3 (or section III if Roman Numerals must remain)
- References internal to the document should include the page number of the section being referenced. For example, the reference on page III-C-17 to section III.C.1.d would be changed to read:"...from section III.C.1.d, page 3-31..."

**Specific Comments** 022

<u>Page I-3, Need and Purpose for the Project</u>

We recommend that this section be expanded to also reflect the purpose(s)/need(s) of BPXA in proposing the project contained in the Liberty Development and Production Plan (DPP).

<u>Page I-20, Analysis of Liberty Shore Crossing</u> 023

The EIS indicates that geotechnical borings were taken along the proposed Liberty pipeline route. Were there any borings taken for the Eastern pipeline route? If not, the EIS should explain how characterizations and effects can be determined crossing locations other than the proposed Liberty crossing without those data.

Provide a map that shows where the borings were taken. Also, discuss the method of pipeline installation that is suitable based on the analysis of these borings and how that installation method relates to that proposed by BPXA. 024

Indicate how the maximum amount of thaw settlement expected (1 foot) was derived. Refer to appended material if methodology is described in one of the appendices to the EIS. 025

Identify (somewhere in the EIS) the corrective actions that <u>would be required</u> if pigging detects problems with thaw settlement. The CEQ regulations require that mitigation be identified in the EIS (see 40 CFR 1502.14(f)). 026

<u>Page I-22, Vary the Offshore Trench Depth...</u> 027

Overall, we find that this discussion does not reflect analyses related to the very reason that it was identified as a potential alternative; burying the pipeline deeper results in greater protection of the pipeline from external forces exerted by ice keels and/or strudel scour. Our reading of this section suggests that an analysis of how risk changes as a function of burial depth was not conducted. The discussion focuses on how burial depths have been "optimized" for each

027

pipeline alternative, which is useful in understanding how the burial depths presented in the EIS were derived. It fails, however, to take the analysis further by evaluating the relationship between depth and risk. Once this relationship is understood, then decisions about "reasonableness" of varying the depth of the offshore pipeline can be made. As presently written, this section is more of a discussion of what is proposed by BPXA than an objective evaluation of the effects of varying pipeline burial depth. This section should be revised to discuss the evaluation of this issue, including a presentation of relevant technical information (methodologies, data sources, assumptions).

028

The discussion should be revised to include the information that was used to conclude that varying the trench depth "is not as environmentally sound as the Proposal." Environmental "soundness" reflects more than simply a comparison of the amount of sediment that would be disturbed .

029

Page I-20, Use Horizontal Directional Drilling from a Series of Islands

Delete the first sentence as this alternative is NOT equivalent to the no action alternative. It is very different. The discussion should be revised to reflect an analysis of how expensive this approach would be and, if deemed to be unreasonable by MMS, so stated.

030

This section should be expanded to describe the nature and extent of the "environmental disturbances" that would take place at each island and describe them in sufficient detail to support the conclusion that this alternative is "undesirable." The criteria used to define "environmental soundness" need to be included in the discussion.

031

Page I-27, Mitigation and Traditional Knowledge

This discussion should clarify whether any traditional knowledge gathering efforts were undertaken specifically for the Liberty project. If so, this should be more clearly described here of elsewhere in the EIS. If not, the EIS should explain why such an undertaking was not deemed necessary and explain how the data base developed for the Northstar EIS is relevant and applicable to Liberty and this EIS.

032

Page III-C-96, Specific Effects of Disturbances...

This discussion includes a summary of an analysis conducted by Ban et al. (1999) that estimated concentrations of suspended particles from the dumping of gravel during island construction. Our review of this analysis (which is contained in Appendix G of the draft EIS) leads us to believe that a potentially significant source of sediment generated during island construction may not have been not included in the calculations, namely the disturbance and entrainment of sea bottom sediments when gravel is dumped during the initial phase of island construction. We recommend that the EIS (and appendix) be revised to ensure that this sediment source is embodied in the predicted effects on the Boulder Patch.

033

Page III-D-2, Lower Trophic-Level Organisms

The discussion indicates that the fabric proposed of use as gravel bags for Liberty would



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sink and the amount that might be "released" would be small and "would probably not affect the benthos." We recommend that the EIS be revised to include sufficient information to support such a conclusion.

034

Page III-D-10, Gravel Mining

The discussion of the effects of developing the BPXA-proposed gravel mine site in the flood plain of the Kadleroshilik River identify the potential benefit of creating overwintering habitat for fish that are presently not known to the use the river for overwintering. It is unclear to us how the development of gravel mine in a currently undisturbed river delta can be viewed as an environmental benefit, particularly considering the present lack of information related to what specific fish species have been found to use the river or a discussion of whether fish stocks are declining as a consequence of the lack of sufficient overwintering habitat. We believe that this discussion needs to be expanded to more fully discussed to potential "benefits" of developing the Kadleroshilik River mine site.

035

Page III-D-12, Vegetation-Wetland Habitats

This discussion states that "effects on hydrology would be addressed in the Corps of Engineers 404 permit process." Because an understanding of the potential effects of the proposed Kadleroshilik River mine site is necessary before a reasoned decision can be rendered with respect to mine site selection, we believe that the hydrologic effects must be evaluated and reported in the EIS.

036

Page IV-73, Alternative I - Use Kadleroshilik River Mine...

This section concludes that "the effects of gravel mining in the natural process and functions of the Kadleroshilik River would be short term and relatively low." This discussion should be expanded to include the information and analyses used to support this conclusion. We were unable to find such information if Section III.D.2 or elsewhere in the EIS.

037

Chapter VI. Description of the Affected Environment

It is critically important that the EIS include a complete description/analysis of the physical, biological, and social environments that would be potentially impacted by the proposed action and alternatives to it. Such information provides the basis for the impact assessments conducted for each of the alternatives under consideration. We find that the Section VI of the draft EIS provides a generally good characterization of the affected environment on a relatively broad scale, yet presents limited detailed information on resources potentially at risk in the immediate vicinity of the project alternatives. As an example, Map 6 presents a good depiction of Snow Goose, Spectacled Eider Sightings and Molting Old Squaw Densities between Prudhoe Bay and Badami, yet there is no corresponding site-specific information presented in the vicinity of the on-shore pipeline routes presently under consideration. Site-specific information should be presented to allow for a meaningful understanding of the specific resources being put at risk with each alternative being evaluated. We find that the lack of site-specific information related to the affected environment makes it difficult to understand the impact characterizations presented in the draft EIS. For example, in the case of the occurrence of fish in the Kadleroshilik

River, there is no information presented that indicate that any field reconnaissance has been undertaken to determine if particular fish use the river for spawning of other purposes. We believe that this type of information is critically important when the flood plain of this river is being considered as a gravel mine source as part of the proposed project. 037

We recommend that MMS consult Chapters 5 through 7 of the Northstar EIS, which provides both the broad characterization of the affected environment of the North Slope and Beaufort Sea as well as more specific information in the immediate vicinity of the Northstar proposal. We believe that this approach should be applied to the Liberty EIS. 038

We recommend that the EIS be revised to present the Affected Environment section prior to the Environmental Effects discussions. As presently structured, the draft EIS is confusing as it discusses impacts before the areas and resources potentially impacted by the alternatives are presented to the reader. 039

Appendix G, Attachment B

Page 1-5 of Attachment B states that "winnowing (of fine sediments) will be controlled by encasing the island in a geotextile fabric." We are not aware of the use of a geotextile fabric as part of the currently proposed island. We recommend that the EIS and/or Attachment B be revised to reflect the same method of island construction. If the estimates presented in Attachment B reflect the use of geotextile fabric and it is not proposed to be used, all relevant calculations should be revised and those revisions be reported in the EIS. 040

11

U.S. Environmental Protection Agency Rating System for
Draft Environmental Impact Statements
Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - - Lack of Objections

The Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - - Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - - Environmental Objections

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - - Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - - Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - - Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonaby available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - - Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

**0141-001**

The MMS believes it has done an Environmental Justice analysis; however, based on the comments from the Environmental Protection Agency, we believe we can better clarify and supplement some aspects of the Environmental Justice analysis. The text in the Executive Summary and Sections III and V reflects this clarification and supplementation. We have now included a stand-alone Environmental Justice analysis, which appears in Section III.D.12.

**0141-002**

The Executive Summary has been updated to state that the final EIS will be available in winter 2002. The MMS has continued to coordinate and exchange information, ideas, concerns, and suggestions with the cooperating agencies and the other agencies that are part of the Liberty Interagency Team. The current schedule for distribution of the final EIS is consistent with Executive Order 13212 to expedite the review of energy-related permits.

**0141-003**

The MMS agrees the analysis as presented in the EIS lacks a clear "bottom-line" conclusions to understand whether disproportionate adverse effects to Alaska North Slope Inupiat would result from the Liberty Project alone and from the cumulative case.

However, the Environmental Justice analysis, as written, has identified the principal minority or low-income Natives (Inupiat Eskimos) that potentially could be affected by Liberty development. The conclusions reached in the analysis in the draft EIS have been rewritten to respond with more specific bottom-line conclusions that specify whether "high adverse" effects are expected from disturbance sources and oil spills. The discussions of disturbance and oil-spill impacts on sociocultural systems appearing in Sections III.C.2.i, III.C.3.i, and V.C.9 are now more clearly cross-referenced, and a stand-alone Environmental Justice analysis can now be found in Section III.D.12. These sections clearly state the breadth of the issues and possible effects from the viewpoints of both Western science and Traditional Knowledge in addition to discussing existing and proposed mitigating measures that could minimize and offset development effects. Monetary compensation measures are not a part of the Executive Order for Environmental Justice.

A discussion of potential effects on the Porcupine Caribou Herd and the Gwich'in peoples is beyond the scope of this Environmental Justice analysis, as these concerns were never raised as an issue by the Gwich'in themselves in any scoping or public meeting for the Liberty Project. Moreover, the Porcupine herd and Gwich'in lands are geographically well outside the range of any potential effects from the Liberty Project. The Executive Order does not require that the Environmental Justice analysis be a stand-alone document. However, we have now consolidated the Environmental Justice analysis into a new section (Section III.D.12) rather than as a part of the sociocultural sections for ease of reading and emphasis.

In terms of risk, the sections mentioned above do identify and assess risks to subsistence resources and Inupiat Natives, especially as it applies to oil spills in Section III.C.2.i. The Environmental Justice analysis has been supplemented with a summary of the percent probabilities of a spill occurring and contacting subsistence resources and habitat and a cross-reference to the sociocultural oil-spill effects section. For a discussion on the risks to the sustainability of the Inupiat, see Sections III.C.2.i, III.C.3.i, V.C.9, and VI.B.2. The commenter is directed to the Oil-Spill-Risk Analysis discussion in Section III.C.1.

We believe that major effects could occur in the unlikely event of a large oil spill, if impacts from contamination of the shoreline, cleanup disturbance, tainting concerns (particularly to subsistence foods), and disruption to subsistence practices are factored together. We are not sure if this equates with the commenter's "catastrophic effects," as these remain undefined by the commenter. Routine activities will have minimal, if any, effect.

The MMS has a very clear understanding of Executive Order 12898 and 13084 (now replaced by Executive Order 13175), and we see no mandate that MMS consultation should extend beyond the substantial efforts already undertaken and defined in various parts of the EIS. See Sections I.D Traditional Knowledge; I.E Environmental Justice, Indian Trust Resources, and Government-to-Government Consultation; I.G Scoping Efforts; Appendix E-1 Scoping Report; and Appendix E-2 Liberty Information Update Meetings. Note also that MMS' community liaison, Albert Barros, in January 2001, was instrumental in getting a USDOI Alaska Regional Government-to-Government policy signed by all the USDOI Alaska Regional Directors.

Since 1999, all MMS public meetings regarding the Liberty EIS have been conducted under the auspices of Environmental Justice, and presentations on the Executive Order and how MMS is addressing it have been made in Barrow, Nuiqsut, Kaktovik, and Point Hope. At these meetings, Inupiat translators were provided. The Environmental Justice process followed for the Liberty Project included: (1) initial scoping; (2) Environmental Justice considerations included in local newspaper notices and local cable TV; and (3) followup meetings that included meetings specific to Environmental Justice concerns. Some meetings were broadcast over local radio. From this process, the MMS received limited interest and feedback on specific Environmental Justice criteria. Nevertheless, the MMS heard Inupiat concerns, and discussions about mitigation were conducted. Environmental Justice concerns were taken back to MMS management and worked into environmental studies, construction design options, and new mitigation measures.

Ongoing and proposed MMS studies that address Environmental Justice concerns are the recently awarded *Quantitative Description of Potential Effects of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea* study, which will examine North Slope Native residents' perspectives on effects from offshore oil activity and any potential impacts this activity may have had on bowhead whale hunting and social traditions; *Collection of Traditional Knowledge of the Alaskan North Slope* being completed by UIC in Barrow; and new studies *Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow: Past and Present Comparison to Determine Cumulative Effects*; and the *North Slope Borough Economy*. Special information update meetings have been held in Barrow and in April 2001, MMS convened in Anchorage, Alaska a Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities with the intention of designing a research direction that would address the issues of sociocultural impacts and growing social pathologies on the North Slope. See also Response 0130-009.

The use of steel sheetpile is analyzed in the EIS as an alternative in addition to gravel bags proposed by BPXA, because concerns were raised about an older type of gravel bags that historically has been a hazard to whalers. New mitigating measures being considered include a seasonal drilling restriction to reduce noise disturbance during the bowhead migration and the subsistence hunt. Regarding impact assistance funds, in 2001, Congress appropriated impact assistance funds for coastal states affected by oil and gas production. Alaska received an appropriation of $12.2 million, $1,939,680 of which will go to the North Slope Borough. Congress, in the form of portions of Representative Young's CARA bill, presently is considering legislation that would make available to coastal communities annual impact assistance funds from MMS drilling revenues. Subsistence impact funds administered by the Coast Guard under the Oil Pollution Act of 1990 legislation would be available to provide for subsistence food losses, but no escrow accounts or trust funds have been established.

See also Response 0145-012.

**0141-004**

We agree that there is uncertainty in many aspects of this development, but it is impossible to resolve all uncertainties in a timely or cost-effective manner. Some uncertainty is an inherent part of new developments in frontier areas. Nevertheless, this extensive EIS has been prepared using the best available information and is based on a significant amount of information than was used to prepare the Northstar EIS.

The applicant also recognizes that there is significant uncertainty, which is why they have chosen a very conservative design for their Proposal. Some examples of this conservatism include:

- A pipeline that is specifically designed for use in the arctic waters of the Beaufort Sea and that is more than twice as thick as normally would be required.
- A pigging program that will inspect the pipeline for loss of wall thickness and geometric changes more than twice as often as would be required by the U.S. Department of Transportation for unusually sensitive areas.
- A design ice-gouge depth that is significantly deeper than has been observed in the area or determined through statistical analysis of the available data.
- An external leak-detection system that is capable of detecting leaks of approximately 0.3 barrels of oil per day, which is checked daily to assure it is actually working to design capability.

The proposal in this comment to select a double-wall pipeline over a single-wall pipeline does not go along with the premise that "this project should embody a level of conservatism that results in a project that minimizes potential risks to environmental and social resources." Here are several reasons why selecting a double-wall pipeline for the Liberty Project would not be considered a conservative choice:

- A pipeline very similar to the proposed single-wall pipeline for Liberty has been successfully installed for the Northstar Project. No pipelines similar to the proposed double-wall pipeline have been built or installed offshore in the Arctic. This would indicate that there are less unknowns associated with the construction and installation of a single-wall pipeline in the Arctic than there are for a double-wall pipeline.
- Available inline inspection tools (smart pigs) can monitor the entire single-wall pipeline system for evidence of damage. There are no smart pigs that can effectively monitor the condition of the outer pipe of a double-wall pipeline system. Due to interference from the outer pipe, it may not be possible to monitor the inner pipe of a double-wall system as effectively as a single-wall pipeline. The decrease in monitoring capabilities reduces the confidence in the pipeline system.
- No offshore double-wall pipeline has ever been designed to provide secondary containment. Double-wall pipelines have been selected only when they fulfill a specific design function, such as providing thermal insulation. These issues indicate that a double-wall pipeline designed to provide secondary containment would be an unproven technology.

Because of the issues raised above, selecting a double-wall pipeline would not increase the level of conservatism but instead would increase the level of uncertainty. Given the potential risk to the subsistence resources and other resources of the Beaufort Sea area near the Liberty Project that could result from an oil spill, the MMS believes that a pipeline design with less uncertainty related to possible failure is preferable.

This is especially true of the later years of the life of the pipeline, given the complications inherent in installation and monitoring of the double-wall pipeline alternative relative to BPXA's proposed single-wall pipeline. Despite some views of some of its theoretical benefits, the selection of a double-wall pipeline basically would amount to an experiment. The MMS does not believe that, given the state of the art of double-wall pipelines for the purpose of containment, such an experiment in the Beaufort Sea coastal waters would be a prudent choice at this time.

The commenter also states that "[r]eview of the EIS reveals that there is no compelling reason to vary from the practice of using steel sheetpile for island containment and protection." While steel sheetpile was used for the Northstar Project outside the barrier islands, the EIS reveals no compelling reason not to use gravel bags for upper island slope protection, as proposed by the applicant for the Liberty Project inside the barrier islands. Similarly, the EIS reveals no compelling reason to select the Duck Island mine site over the applicant's proposed Kadleroshilik River mine site.

Hence, we believe that no changes are necessary to the EIS in response to this comment.

**0141-E01**

The pipe-in-pipe system, Alternative IV.A, is described in Sections II.C.2.a and c, and its effects are analyzed in Sections IV.C.2.c, d, e, and i.

**0141-E02**

Steel sheetpile, Alternative V, is described in Sections II.C.3.a and c, and its effects are analyzed in Section IV.C.3.b.

**0141-E03**

The Duck Island Gravel Mine, Alternative VI, is described in Section II.C.4.b, and its effects are analyzed in Section IV.C.4.c.

**0141-005**

As noted in Sections III.C.1.d and e, additional information about oil spills and risks can be found in Appendix A. The information provided in those sections is an accurate and full description of the oil-spill risks and a complete explanation of how MMS incorporates these risks into our modeling and environmental analysis. The MMS believes the EIS provides the decisionmaker and the public with an understanding of uncertainties associated with the analyses and conclusions. The analyses and conclusions presented in the EIS are based on the information and assumptions presented in the detailed analysis for each of the resources for each of the alternatives. Although not specifically detailed for each of the resources analyzed in the EIS, each analysis incorporates a system of data categorization and uncertainty similar to the one presented in Section III.C.1.d(1). Where information is available that allows for the results to be quantified, this has been done. As noted in Section III.C.1.d(1), a substantial portion of the problems that society must deal with falls into categories in which the following exist:

- No good data are available for the process under consideration, but good data are available for a similar process; and these data may be adapted or extended for use either directly or as part of a desegregated model.
- The direct and indirect evidence that is available is poor or incomplete and it is necessary to rely, to a very substantial extent, on the physical intuition and subjective judgment of technical experts.
- There is little or no available evidence, and even the experts have little basis on which to produce a subjective judgment.
- These are the situations that are addressed to the best of our ability in many of the analyses in this EIS, and they emphasize why reading and understanding the detailed analyses is important in making an informed decision.

The oil-spill-model results and the applicable resource maps are included in the EIS in Appendix A. Other relevant information concerning small spills (Section III.D.3), very large and very unlikely spills (Section IX), and the various studies concerning pipeline designs and oil spills can be found in Appendix D and on the MMS web page. Other analyses concerning oil spills and effects to birds and polar bears, as prepared by the Fish and Wildlife Service and the U.S. Geologic Service, can be found in Appendix J. The information and analyses provided in Sections III.C.2, III.D.3, and IX and Appendices A, D, J, and K are full and accurate descriptions of oil spills and risks.

**0141-006**

The effects of a large spill are thoroughly discussed in the EIS. To be conservative, spill effects are analyzed using the assumption that a spill is not cleaned up. See also Response 0141-003. See Sections III (especially Section III.C.2), IV, and IX for a thorough discussion of the effects of a low probability, very large oil spill.

**0141-007**

To be conservative, the EIS assumes, for purposes of analysis of effects, that oil spills are not cleaned up. Hence, existing response capability is not taken into consideration in describing these effects. We believe it would be inappropriate to factor response capability into our effects analysis.

Also, please note that a more complete discussion of the 2000 barge trials has been incorporated into the document in Section III.C.1.a of the EIS.

**0141-008**

The MMS believes it has complied with the Council on Environmental Quality regulations to disclose effects and their significance, where significance is defined in terms of 40 CFR 1508.27 and includes context and intensity. “Context” considers the setting of the Proposed Action, what the affected resource may be, and whether the effect on this resource would be local or more regional in extent. “Intensity” considers the severity of the impact, taking into account such factors as whether the impact is beneficial or adverse; the uniqueness of the resource (for example, threatened or endangered species); the cumulative aspects of the impact; and whether Federal, State, or local laws may be violated. “Severity” includes some measure of the size of the effect (number of individuals, percent of population, acres, loss of specific resources).

The thresholds are based on exceeding one or more of the parameters used to disclose (define) the significance of the effects. If impacts fail to exceed any of the thresholds, which is the case for the majority of the impacts, it is unnecessary and redundant to note they are not significant. Based on these definitions, MMS believes it has provided the decisionmakers and the public with information needed to compare the information presented in the summaries and conclusions with the threshold definitions used by MMS in this EIS to define significant. The Executive Summary and the Summary by Resources (Section III.A) clearly identify the resources that exceeded the “Significance Threshold.”

The analysis in this document uses terminology that is consistent with that definition. Impacts may be beneficial or adverse. Impacts are described in terms of frequency, duration, general scope, and/or size and intensity.

The commenter is reminded that it was at the request of the Environmental Protection Agency that the MMS included these threshold determinations of significance for each of the resources. The MMS believes that such threshold levels are not necessary to ascertain significance per Council on Environmental Quality regulations. In preparing an environmental impact statement for the Liberty Development and Production Plan, the MMS has already determined the action could have a significant effect on the environment.

A summary statement of “significant impacts to resources” has been added to the beginning of the analysis for both the component alternatives (Section II.C) and the combination alternatives (Section III.D). These summaries note that the MMS does not expect any significant impacts to results from any of the planned activities associated with the alternatives. Significant adverse impacts to spectacled eiders, common eiders, long-tailed ducks, subsistence harvests, sociocultural systems and to local water quality could occur in the unlikely event of a large oil spill for all component alternatives. These significant adverse impacts are similar to those identified for the Proposal in Section III.A.1 and to the BPXA combination alternative. Using the summary and conclusion is only a superficial way of looking at the potential effects of a proposed action and comparing the potential effects of the alternatives. Reading and understanding the detailed analysis is important to making an informed decision. The summary also notes that no new significant impacts were identified for any of the alternatives. The impacts identified to spectacled eiders, common eiders, long-tailed ducks, subsistence harvests, sociocultural systems and to local water quality also were not reduced by any alternative below the significant threshold level.

See also Response 0011-002.

**0141-009**

The information presented in Section V, the Cumulative Effects section, employs the same “model” for presenting information that is used in Sections III and IV. Additional information has been provided in Section V.C in response to this comment.

See also Response 0141-019.

**0141-010**

The text now indicates a clear effects bottom line. See also Response 0141-003.

**0141-011**

The MMS disagrees with the statements about the advantages of a steel pipe-in-pipe system for the Liberty Project. The steel pipe-in-pipe system provides only a small reduction in spill probability, about 1% according to the Fleet (2000) report, for a very large increase in costs, about 100% according to the INTEC (2000) report. The Fleet report determined that the “likely” amount of oil that would be spilled from the single-wall and pipe-in-pipe alternatives was 28 barrels and 8 barrels, respectively, over the life of the project. The INTEC report estimates the cost of the single-wall and pipe-in-pipe alternatives at $31 million and $62 million, respectively. Therefore, in order for the pipe-in-pipe alternative to make economic sense, the cost of oil-spill cleanup would have to exceed $1.5 million per barrel ($62 million-$31 million)/(28 barrels–8 barrels). The Oil Pollution Act of 1990 estimates oil-spill cleanup costs at $1,000 per barrel. The *Exxon Valdez* spill cost much less than $50,000 per barrel to clean up, including the costs of fines and actual and punitive damages. Therefore, a reasonable review of the information contained in the EIS would clearly indicate that pipe-in-pipe does not provide a significant enough improvement in environmental protection to justify the additional cost.

The other argument for pipe-in-pipe presented in this comment also does not hold up on closer examination. The commenter argues that pipe-in-pipe should be selected due to the “high degree of uncertainty of the risks associated with using undersea pipelines in the Beaufort Sea.” A double-wall pipeline such as the one analyzed in the EIS has never been installed in the Beaufort Sea, while a pipeline very similar to the proposed single-wall Liberty pipeline was successfully installed for the Northstar Project and has been used to transport natural gas to the island since November 2000. In addition, a pipe-in-pipe system cannot be monitored to the same level as a single-wall pipeline. Therefore, a pipe-in-pipe system would actually increase the uncertainty associated with a subsea pipeline, because it is unknown whether or not it can be constructed and installed properly and it cannot be monitored as effectively as a single-wall pipeline.

**0141-012**

The Environmental Protection Agency states that: "engineering design efforts should be initiated for the double walled pipeline alternative." Presumably, the Environmental Protection Agency means that BPXA should undertake such engineering design efforts. If that is the case, the MMS disagrees. We do not see the National Environmental Policy Act as a vehicle for the Federal Government to direct the project development process of a private company. We do not think the Act should be used as a process through which Federal Agencies with approval authority over some aspects of the company's project direct (or use their power to "persuade") a private company to undertake an expensive engineering design of an experimental concept that they advocate. We believe that this use of the National Environmental Policy Act is improper, was never intended, and leads to confusion by the applicant. These types of activities go well beyond the identification and assessment required by the Act and also run counter to the provisions of the OCS Lands Act.

The MMS has a mechanism for promoting new engineering concepts and ideas and eventually adopting them into our regulations. The MMS Technology Assessment and Research Program constantly accepts ideas for research. The research proposals are evaluated by MMS subject-matter experts for funding. The MMS may fund research on its own or join a Joint Industry Project. The results of the research are then evaluated to see if regulatory changes are necessary. The MMS also incorporates by reference many engineering standards into our regulations. As engineering standards are updated due to the development of new technology and reissued, the MMS evaluates the changes and normally adopts the latest version of an engineering standard.

See also Response 0139-001.

**0141-013**

In the MMS's view, the appropriate issue in comparison of Liberty alternatives should not be whether the proposed project element has an apparent environmental advantage over an alternative, but rather whether an alternative devised by Federal Agencies has an apparent environmental advantage over the proposal devised by the private company.

Both gravel bags and steel sheetpile could provide effective upper island slope protection for the proposed Liberty Island. Each alternative has its own advantages and disadvantages. There are some inherent disadvantages with steel sheetpile that this comment does not mention:

- Liberty Island constructed using steel sheetpile would require more gravel than one using gravel bags.
- Liberty Island constructed using steel sheetpile would have a larger footprint and, therefore, would disturb more of the seafloor.
- A steel-sheetpile wall for Liberty could limit the possible routes of evacuation in case of an emergency on the island.
- The steel-sheetpile wall would not dissipate wave energy as well as the proposed gravel bags.
- The steel-sheetpile wall would extend somewhat higher than the gravel bags and, thus, would pose an obstacle that likely would result in additional minor bird fatalities. While some structures on the island pose even higher obstacles, they do not present as expansive a profile as would the extra height of the steel-sheetpile wall.

An assessment of the advantages and disadvantages of gravel bags and steel sheetpile for upper island slope protection does not indicate that one alternative is clearly superior to the other. Because we cannot determine any reason why gravel bags would be unacceptable and have no basis to say that steel sheetpile is superior, we have no overall reason to select steel sheetpile as the preferred alternative.

The commenter raises a question about the ecological (or other) implications of gravel bags on the seafloor, should they be lost from the island. We see the loss of bags as unlikely, and any such effects from inert bags that may be lost to the seafloor as very small.

See also Responses 0134-A03 and 0134-015.

**0141-014**

The MMS is required to evaluate the Liberty development project Development and Production Plan and the use of Kadleroshilik River site as a source of gravel as a part of that plan. The analysis of the effects of developing a new gravel mine on the Kadleroshilik River, Section IV.C.4, did not find any significant effects as MMS has defined the term significant in Section III.A.1. The Environmental Protection Agency, as a cooperating agency in the preparation of this EIS, did not comment on the MMS definitions of significant impacts in their letter of April 18, 2001, commenting on the draft EIS (Section VII, Comment 0137). Thus, using the phrase "potential significant environmental effects associated with development of a new gravel mine" in describing the effects of developing the Kadleroshilik River site does not coincide with the definition of significant as used in the EIS to define impacts. The comment also does not provide any indication of what the Environmental Protection Agency considers to be significant effects.

There are a number of streams and rivers on the North Slope that are shallow, less than 2 meters deep throughout their course, and freeze to the bottom in the winter. The absence of unfrozen water in the streams and rivers limits most, and in some instances all, fish species from using these streams or rivers in the winter. See Section III.D.2.a for a summary of information on fish-overwintering habitats in North Slope streams and rivers and the citations of reports that include additional information. As noted in Section II.C.4.d, rehabilitation of abandoned mine sites, which includes a connection to a river or stream, enhances their use by fish for feeding and rearing in the summer and provides an overwintering habitat. The Alaska Department of Fish and Game, recognized experts on Alaska fish and game issues, are on the record as favoring the addition of overwintering habitat that would be provided by using the Kadleroshilik River mine site.

An additional consideration concerns potential use of the island by wildlife. The island was found to be mostly vegetated (Noel and McKendrick, 2000), and this was confirmed by MMS scientists who carried out bird and mammal surveys on the island and surrounding area during a 4-day period in late June 2001. No threatened or endangered species were observed. Most species observed on the island also were common in the surrounding area, as was adequate habitat where they could relocate if displaced from the island. Four male buff-breasted sandpipers were found occupying a courtship lek on the southern portion of the island. This shorebird is an uncommon breeder on North Slope coastal areas of Alaska and Canada, and one of only three species worldwide that uses such a breeding system. Leks established by males of this species do not necessarily occur in the same location in succeeding years.

There are a number of tradeoffs associated with selecting a source of gravel (Sections IV.C.4.a and b) and, in such a case, the use of a subjective term, such as superior, in expressing preference for a specific alternative may not be applicable. The proposed mine site is in the floodplain of the river. This is an area where erosion and sedimentation processes of a river system are continually changing the configuration of the channels. In addition to the disturbances that are part of a river/stream system, the natural integrity of the area is interrupted by the presence of the Badami pipeline, which crosses the Kadleroshilik River about one-half mile upstream from the proposed mine site. Given these conditions, it is not obvious that the integrity of an undisturbed river floodplain can be maintained, as implied in the comment.

The MMS's conclusion that the "effects of gravel mining in the natural process and functions of the Kadleroshilik River would be short term and relatively low" are based on the analyses that follow in Sections IV.C.4.a(1) through (10).

While MMS agrees that the needed gravel could be mined from Duck Island, such an operation would require the drainage and consequent loss of a prime source of freshwater from the existing mine. As the mine is not connected to a river or stream, natural replenishment of this source would take many years. As freshwater use on the North Slope is a growing concern, the drainage and loss of such a large prime source may not be outweighed by any advantages of use of the Duck Island mine gravel.

**0141-015**

The Corps of Engineers agrees with this comment and will work closely with the MMS, the Environmental Protection Agency, and the applicant to gain the appropriate level of information necessary to complete the required 404(b)(1) Analysis prior to completion of project review and final decision.

**0141-016**

The reasons the MMS chose not to pursue an analysis of Tern Island as an alternative source of gravel for the construction of Liberty Island are given in Section I.H.5.c(3). The comment did not provide any additional or new information about obtaining gravel from the island that the MMS could consider in re-evaluating the reasons for not selecting the island as an alternative source of gravel.

The comment expressed the view that "Use of Tern Island gravel would result in a 'no net increase' in the number of artificial islands in the Beaufort which we see as an environmental benefit when one considers the development of Liberty in the context of the longer term cumulative sense." The statement was not accompanied by any reasons why no net increase in artificial islands would be an environmental benefit. Until the receipt of the Environmental Protection Agency's comment letter on the Liberty draft EIS, the MMS was not aware of a "no net increase" concern by the Environmental Protection Agency with regard to the number of artificial/manmade islands in the Beaufort Sea.

The MMS believes abandonment of an artificial island and the removal of gravel used in the construction should be decided on a case-by-case basis through a stakeholder review and approval process. Although there are no specific designs, it is possible that production islands constructed in the future or in deeper waters may be based on a mobile-platform design where the structure is built outside the Beaufort Sea, transported to the site and flooded so that it sits on the seafloor. When production from the site is finished, the structure can be raised and transported away.

Shell Western Exploration and Production, Inc.'s plan to abandon Tern "A" Artificial Island (Lease OCS-Y-0196) was approved by MMS on July 17, 1990, following a review of the plan by the joint Federal/State Arctic Biological Task Force, the U.S. Army Corps of Engineers, and the U.S. Coast Guard; the Environmental Protection Agency was a member of the task force. The abandonment plan specified properly abandoning all wells; removal of all gravel bags, surface hardware, and other debris; and creating small hummocks on the surface to provide habitat for nesting eiders. The review and approval process did not specify removal of the gravel used to construct the island. There are many islands in the Beaufort Sea, and an abandoned island provides an opportunity for some flora and fauna to use it in a way that they would use a natural island with similar features. Over time, the island will be reshaped by waves, currents, and ice forces. This is happening with Tern Island, which has now mostly eroded to below sea level.

The residents of the North Slope have told us that the islands in the Beaufort Sea, natural and artificial, occasionally do provide sanctuary to subsistence hunters operating out of small boats in times of emergency.

The areal relationship between Foggy Island Bay and the proposed Liberty Island does not indicate that the island is a prominent feature in the bay. Foggy Island Bay covers more than 150 square miles (more than 96,000 acres). The surface area of Liberty Island is about 5.4 acres, and the maximum footprint area is 22.4 acres; these areas are 0.006% and 0.023% of the area of Foggy Island Bay, respectively. The size of the island in relation to the area of the bay indicates the island would have very little influence on the oceanography of the bay.

**0141-017**

The OCS Lands Act requires a decision within 60 days after the final EIS has been published to either (1) approve the Development and Production Plan as submitted, (2) approve it with modification, or (3) disapprove it. The MMS does not have a decision option under the OCS Lands Act to delay the project; therefore, there is no reason to evaluate the alternative. Any such delay alternative, therefore, would be equivalent to the No Action Alternative.

We also note that the process of developing the Liberty EIS began in winter of 1998. The MMS decided to delay the completion schedule for several months to provide relief to reviewing agencies and the public who also were reviewing the Northstar EIS. Most of the delay, however, was necessary to discuss and, to the degree possible, accommodate many of the numerous requests made primarily by the Federal Agencies involved in review of multiple versions of the draft EIS. Delaying the Liberty EIS, and thus the decision on approval of the project itself, to wait for data to be generated about the results of other projects that are being built, such as Northstar, is not envisioned by the National Environmental Policy Act and can become an endless process, indefinitely delaying action, which we assume the commenter would not intend.

**0141-018**

Please see Response 0132-059. No specific island location was presented by the Environmental Protection Agency. A conversation with their staff concerning this recommendation, indicated that the Environmental Protection Agency felt that an island location in bottomfast ice (5-7 feet of water) offered environmental protection and should be analyzed. The MMS analysis of candidate alternatives in water depths of less than 8 feet was included in the draft EIS and also appears in the final EIS. These candidates were found to be not technically or economically feasible; therefore, they are not evaluated further. Neither the National Environmental Policy Act Council on Environmental Conservation nor the Clean Water Act requires the analysis of alternatives that are not technically and economically feasible.

**0141-019**

The same threshold of significance for a resource (Section III.A.1-3) has been applied to significant effects in the cumulative analysis for that same resource. Appropriate statements about the significance of cumulative effects on each resource and on subsistence activities appear in Section V. The cumulative analysis has a very similar basis as the project analysis with more factors in time and space to consider. The response of the resource is estimated to be similar. Thresholds of significance are more difficult to determine for the biological and human resources. Those agencies concerned with the abiotic parameter of air and water quality have more readily defined criteria for threshold interpretation and are the basis for their regulations. The biotic world can be more challenging.

**0141-020**

We acknowledge that the issues and corresponding analysis in this EIS are complex, and that complexity is reflected in the format of the document.

There is a table of contents at the beginning of the document for the entire document and a table of contents for each section. Each section begins with a blue page to facilitate finding that section. For numbering convenience, Section III is divided into subsections (III.A, III.B, III.C, and III.D). All other sections are numbered as suggested by the Environmental Protection Agency. For the final EIS, the pages in Section III are numbered sequentially. Sequentially numbering the entire document is not feasible, because the sections are not worked on or run out sequentially.

CD-ROM versions of the draft EIS were distributed with the printed copy, which allowed users to search the whole document for key words and subjects.

The Environmental Protection Agency is the only commenter that identified any problem with the organization and format of the EIS. It is not unusual for a single commenter to disagree and suggest format changes; however, the MMS is reluctant to make substantial format changes between draft and final versions unless there appears to be a strong need (many comments on the same format issue and the suggestions are consistent). Except for the numbering sequence change to Section III, the format of the final EIS is consistent with format of the draft EIS.

See also Response 0141-021.

**0141-021**

The maps, figures, and charts were placed in a separate volume so they would be readily available for quick reference by the reader. References to any particular map, figure or chart are scattered throughout the various sections of the EIS and, if the maps etc. were inserted only where they were first referenced, the reader would have to continually leaf back through the document to find the referenced item, which would be a distraction for the reader. Reinserting particular maps, figures, and charts each time they are referenced would be redundant and would add considerably to an already huge EIS.

Adding page numbers to the maps, charts, figures, etc. also is not feasible. The camera-ready copy of these maps, etc. are run out in sequence with text sections. Paginating the maps, etc. would take too much time and increase the complexity of the task of producing a camera-ready document. The MMS believes that placing all of the maps, figures, tables, and charts in a separate volume is the most efficient way of handling this problem for this EIS.

See also Response 0141-020.

**0141-022**

The Liberty Interagency Team discussed this issue at length years ago. The Environmental Protection Agency staff participated in these discussions as a team member. We provided the MMS's rationale for the phrasing of the purpose and need statement. The Environmental Protection Agency and the Corps of Engineers suggested an approach to alternative language that the MMS then drafted. No one on the Interagency Team liked that version or made specific suggestions acceptable to the group as a whole, so we returned to our original version. Subsequently, the Environmental Protection Agency raised this issue in review of the many draft versions of the EIS but provided no specific text as a substitute.

The MMS believes the underlying purpose and need are clearly and appropriately stated. The Council on Environmental Quality Regulation 1502.13 Purpose and Need states: "The statement shall briefly specify the underlying purpose and need to which the agency is responding in the proposing alternatives including the proposed action." Furthermore, BPXA was awarded the lease, OCS-Y-01650, as the result of the Federal OCS Oil and Gas Lease Sale 144, and this grants the lessee certain exploration and development rights. These rights give them no guarantee that the project will be approved or that they will make a profit on their investment; neither are they required to drill or produce product during the primary term of their lease. If they do any exploration or development, they must comply with Federal regulations and with the stipulations on the lease.

Furthermore, BPXA is not required to provide us with statements of their purpose or goals. Any statements we might make about BPXA's "purpose and need" for this project would be based on conjecture and opinion. The OCS Lands Act requires the MMS to evaluate the Development and Production Plan's Proposal, which is Alternative I in this EIS. All other alternatives evaluated in the EIS were suggested during scoping and/or from the other agencies on the Liberty Interagency Team. They were developed to explore environmental alternatives without consideration of BPXA's goals, objectives, or purposes.

**0141-023**

Yes, borings were taken along the eastern pipeline route.

**0141-024**

Figure VI.C-1 shows the borings locations for the western alternative pipeline route. The text has been revised to include a reference to the figure.

Pipeline construction methods are briefly discussed in Section II.A.1.b(3) and are more thoroughly discussed in the INTEC report. We concur with the applicant's conclusion that through-ice construction during the winter is the most appropriate installation method for all four pipeline alternatives. The section of the EIS that resulted in this comment discusses a potential 300-foot jetty, which was scoped out, and not pipeline construction methods in general. Because pipeline construction methods are more thoroughly discussed elsewhere in the EIS and the documents incorporated into the EIS, no changes are necessary in this portion of the EIS.

**0141-025**

The EIS states that thaw-settlement values were derived from fieldwork performed by Duane Miller & Associates and laboratory work performed by Nixon Geotech Ltd. Further description of the process used to arrive at the 1-foot thaw-settlement value in the EIS would provide no useful information to the public or the decisionmakers. The reports were not included as appendices to the EIS, because they are detailed technical documents that do not provide any significant information that would contribute to the decisionmakers' decisions. This work will be thoroughly reviewed by the joint MMS/State Pipeline Coordinator's Office pipeline right-of-way technical review team before a pipeline right-of-way is granted.

As mentioned, the EIS already is a large document and getting larger with numerous requests from some Federal Agencies for the addition of more detail not central to the key issues. The MMS had originally hoped to write a concise EIS, as envisioned by the National Environmental Policy Act. At well over 10 pounds of 10-point font, the sheer volume of the EIS rapidly is approaching the point of not being readable by all but the most diligent and dedicated individuals.

**0141-026**

The activities described in this question are not mitigating measures but rather repair activities that may have to be taken in the unlikely event that thaw settlement exceeds the design standard. The information being sought already is identified in the EIS.

The EIS identifies three potential remediation options: more frequent pigging; a reduction in allowable flow rate; and excavation and repair of the pipeline. The first two options are self-explanatory, and the third is discussed and analyzed in more detail elsewhere in the EIS (Sections II.A.1.c(3) and II.C.2.a(3)). The specific remedial action that "would be required" is unknown at this time. A proper remediation plan would be developed based on the specifics of the incident. This plan would be reviewed by the agencies that have authority over pipeline operations.

**0141-027**

Information regarding pipeline burial depths is presented in the following sections of the EIS: pipeline safety, II.A.3; pipeline designs, II.C.2; pipeline burial depths, II.C.5; results of the pipeline studies, IV.C.2.b; burial depth, IV.C.2.e(1)(a).

The commenter is reminded that the information presented on page I-22 of the draft EIS is part of Section I of the EIS, which introduces the proposed project and describes the results of the scoping process. Part of this description includes alternatives for varying the pipeline burial depth. As noted in Section I.H.3.e, during scoping, several persons suggested that the pipeline be buried deeper than what BPXA proposed; this section also refers the reader to Section II.C.5 for additional information and a more complete description of the burial depth alternatives.

The purpose of the EIS is to evaluate the potential environmental effects of the proposed action and reasonable alternatives. As noted in Section I.H.3.e, the MMS, along with the State Pipeline Coordinator's Office, will evaluate BPXA's proposed pipeline design. The trench and burial depth are among the many factors that will be considered. It also was noted in Section II.A.3 that BPXA submitted a Pipeline Design Summary (*BP Liberty Project, Preliminary Engineering*) dated February 1998 to the MMS and the State Pipeline Coordinator's Office in support of the right-of-way applications. This document provided a description of the design basis for the single-wall pipelines, including operating pressures, flow rates, external loads (ice gouging), and monitoring. This technical engineering document is separate from the EIS. It also was noted in Section II.A.3 that BPXA contracted with INTEC Engineering to prepare, with input from the Interagency Team, conceptual engineering designs for four pipeline alternatives. Each of these four designs is based on the same functional, safety, and project-specific requirements. These conceptual designs are the basis for the alternatives presented and analyzed in the EIS. More detailed designs will have to be prepared for the pipeline system that is chosen for this project. The MMS and the State Pipeline Coordinator's Office will then conduct a very thorough technical evaluation of the pipeline design before making a decision on the pipeline right-of-way application. After the review is completed the MMS and the State Pipeline Coordinator's Office will decide whether to approve, disapprove, or approve with modifications our respective pipeline right-of-way applications. It was noted in Section II.C.5 that the MMS and the State Pipeline Coordinator's Office would conduct an engineering evaluation of the pipeline design, independent of the EIS process, before issuing their respective pipeline rights-of-way, which would allow construction to begin. This alternative would allow the MMS and the State Pipeline Coordinator's Office to require a deeper burial depth, should the technical analysis show a deeper depth is warranted.

The MMS believes the engineering evaluation of the pipeline design should not be part of the EIS process, and the information in the above paragraph indicates this in several places in the EIS.

**0141-028**

The ambiguous conclusion for environmental soundness has been removed from this section. In its place, we conclude that due to conditions in the project area this potential alternative, which was not selected for further analysis, essentially is no different from an effects standpoint, than the designs contained in the INTEC report.

**0141-029**

If an alternative is so expensive that costs exceed potential income, it is no longer a viable alternative and, therefore, it is equivalent to the No Action Alternative. This is consistent with the information in Section I.F.3 Basis for Formulating the Alternatives.

**0141-030**

As stated in the text, this alternative would require about six satellite gravel islands large enough to accommodate a horizontal drill rig and support equipment. The islands would need to be constructed similar to the proposed production island, they would need slope protection (cement blocks and either gravel bags or steel sheetpile) to withstand the ice and wave forces, and they would need to be similar in size to exploration islands, and the MMS estimated that the potential costs would far exceed potential income; therefore, this potential alternative was dropped from further consideration.

The MMS is somewhat perplexed as to why the Environmental Protection Agency is raising issues about this potential alternative that, in light of its merits and the Environmental Protection Agency's other comments. For instance, see Response 0141-016, which lays out their concerns for "no net increase" in the number of artificial islands in the Beaufort Sea.

**0141-031**

The MMS believes there is adequate traditional knowledge available without having to exhaust the Inupiat at this time in setting up special meetings for the purpose of gathering more. The MMS met with local tribal community members and governments to discuss subsistence issues and to gather traditional knowledge specific to the Liberty Project during scoping meetings held in the community of Nuiqsut on March 18, 1998; in the community of Barrow on March 19, 1998; and in the community of Kaktovik on March 31, 1998. The MMS held followup meetings to address environmental justice issues and gather more traditional knowledge on November 1, 1999, in Barrow; November 2, 1999, in Nuiqsut; and November 5, 1999, in Kaktovik. Public hearings on Liberty were held in Barrow on March 21, 2000; in Nuiqsut on March 19, 2001; and in Kaktovik on March 20, 2001. Furthermore, the process of scoping, information update, and public meetings gathered many comments and much traditional knowledge that has been incorporated into the EIS. The study *Collection of Traditional Knowledge of the Alaskan North Slope* being completed by UIC in Barrow, will facilitate the use of traditional knowledge sources for future analysis. Also, see Response 0141-003.

**0141-032**

We assume that the Environmental Protection Agency has an extra "not" in this comment, and we will respond accordingly. The effects of disturbing the seafloor sediments when gravel is dumped onto the seafloor and fine-grained sediments entrained in the gravel are analyzed in Section III.C.3.l(2)(b).

The comment explains that the assessment does not include information on the effects of disturbance and entrainment of sea-bottom sediments when gravel is dumped through the ice during island construction. The effects of gravel dumping through the ice was observed by Ken Dunton and other under-ice divers during construction of the BF-37 gravel island on lease OCS-Y-0191 near the proposed Liberty site (Tomil and England, 1982). The concentrations of under-ice suspended sediments were measured at a couple of distances from the island center. The following are the first two conclusions of the study:

- The concentration of suspended sediments measured at radial distances of 170 and 470 meters from the center point of OCS-Y-0191 did not increase noticeably during the first 7 days of gravel-dumpling operations. The highest concentrations of suspended sediments were within 3 milligrams per liter of ambient levels of 6.7 milligrams per liter.
- We believe that three conditions restricted the formation of a turbidity plume during island construction. There conditions were (a) low current velocities, (b) ice-bonding of fine fractions to larger gravel-size particles, and (c) the formation of silt/ice agglomerates.

The above information from Tomil and England (1982) has been added to EIS Section III.C.3.e(2)(b)(1) on the Specific Effects from Island Construction.

**0141-033**

The assessment in the EIS was based in part on the following references: Coastal Frontiers Corp., 1990, 1991, 1992, 1999, and 2000 and Fairweather E&P Services, 1994, all of which have been added to the EIS in Section III.D.1.e.

**0141-034**

Section III.D.2.a has been added to the EIS. This new section summarizes the results of the Alaska Department of Fish and Game's studies of abandoned and rehabilitated gravel-mine sites. Fish captured in the flooded and rehabilitated mine sites indicates they are using the sites as part of their summer habitat and for overwintering. Also, one of the commenters at the Barrow Public Hearing on the Liberty draft EIS noted that geese are using the mine sites. Section III.D.2.a, which summarizes the results of the Alaska Department of Fish and Game's studies of abandoned and rehabilitated gravel mine sites, has been added to the EIS.

**0141-035**

Hydrologic considerations are one of many factors that have to be considered in selecting a gravel mine site in a stream or river floodplain. Other considerations include protection and enhancement of fish and wildlife habitat, a renewable supply of gravel, and removal of extensive overburden and its rehabilitation in a non-floodplain area.

The State of Alaska has developed guidelines for gravel mining on the North Slope to ensure that site selection provides the necessary quantities and qualities of gravel at a reasonable cost while avoiding or minimizing impacts on fish and wildlife resources and their habitats. In addition, the guidelines were developed to protect known fish-overwintering habitat and provide for reclamation of sites to enhance fish-overwintering habitat and wildlife habitat in the summer.

The guidelines include steps to avoid or reduce detrimental effects on stream or river hydraulics, water quality, aquatic habitat, and biota. These steps include generally avoiding active channels of split, meandering, sinuous, and straight rivers or streams. Also, the guidelines provide for preventing changing the channel hydraulics that might lead to sudden upstream or downstream erosion of the river channel or the creation of a braided configuration. Deep instream mining may be suitable where there are low hydraulic gradients; stream banks are frozen during the peak, spring flood, and there is a possibility of creating additional fish-overwintering habitat.

Mining gravel from an onshore site occurs on State of Alaska land and would be subject to the conditions of State permits. Selection of the gravel-mine site is a matter between the State and BPXA; MMS regulatory authority is limited to the Federal waters part of the project area.

**0141-036**

Additional information has been added to in Section II.D.4.c concerning the effects on hydrology and rehabilitation of mine sites as reported by the Alaska Department of Fish and Game. The effects are considered short term, because mining activities would occur for less than 6 months during the winter construction season for 2 consecutive years. The rehabilitation of the mine site would be consistent with the 1989 Alaska Department of Fish and Game, Habitat and Restoration Division prepared preliminary guidelines for fish and wildlife restoration of gravel-mine sites (McLean, 1993). These guidelines promote measures to enhance fish and wildlife and meet industry's gravel needs. The Department of Fish and Game's research at numerous North Slope sites (Kuparuk Deadarm Mine Site, Kuparuk Mine Site B, Kuparuk Mine Site D, Sag Site C, Ott's Oxbow, Put 27 Mine Site, Badami Mine Site, ADOT/PF Deadhorse Mine Site, and Northstar Mine Site) provides information about how natural flooding and rehabilitation of the sites by humans provides habitats that fish can use for cover, feeding, and rearing in the summer and overwintering. Fish captured in the mine sites during the summer (July-September) indicates they are using the sites. Specific examples of fish using flooded mine sites in the summer include the capture of more species in the year after enhancement of the mine site than were captured before enhancement (Roach, 1993).

**0141-037**

The EIS descriptions and maps in Section VI provide the reader with an understanding of the resources in the project area, with an appropriate level of detail based on the resources and the project. Construction of all onshore facilities, including any alternative routes and locations, will occur during the winter after all of the migratory species have left the area. Very few resources, except for an occasional polar bear, musk ox, or fox, are expected to be in the area during the construction season. This general information is used to determine the potential impacts.

Much of the data available is gathered using planes and other techniques that are only as accurate as the instrumentation on the collection vehicle (plane, boat, etc.). This is the same level of information provided for and used in the development of the Northstar Project and other onshore projects on the North Slope. While the maps can be enlarged and then the area cropped down to show only a 9- or 10-square-mile area, the level of accuracy and level of information concerning where a specific mammal or bird is located has not improved. To present very small-scale maps that appear to identify very site-specific locations, such as nesting sites, is very misleading and inappropriate and clearly a misuse of data. Rather, the EIS should use the information available to identify what is known about the area and resources in the project area and, if that information points to a potential issue or area of concern, additional work may be warranted. For this EIS, the analysts did not identify any of the pipeline routes or pads needing additional resource-survey work. The MMS did send a team to the Kadleroshilik River and Duck Island mine sites in July 2001; their findings were consistent with the analysis in the draft EIS.

Based on analysis and the level of comments received from the other permitting agencies (Federal, State, and local), the level of analysis and the information provided are appropriate.

The information presented in the EIS provides the decisionmakers and the readers with a realistic idea of the types of resources using the area, along with some indication of intensity of use. None of the analyses indicated concerns that more intense surveys were needed. None of the State or Federal Agencies that manage the resources and issue permits provided comments to the draft EIS that indicated a more detailed level of analysis is needed for permitting the onshore facilities.

Also, the information presented in the EIS is appropriate to the decisions at hand. The decisionmaker need not be concerned about displacing a nesting bird from its nest or forcing a fox to abandon its kits, because the construction work will occur during the winter when the birds have migrated and the foxes have raised their young. The EIS analysis also concluded that even if some resources (birds, foxes, caribou, etc.) were displaced from a site following construction, the effects would be negligible. Even if a polar bear were to den near any activities, it would either be accustomed to the activities or it would be displaced long before its cubs are born in the spring. Either way, the EIS did not find the effect to polar bears would be significant.

The information presented on fish populations at the proposed Kadleroshilik River mine site also is the best available and appropriate. No overwintering sites have ever been identified for the Kadleroshilik River, and the river may not flow throughout the winter every year. The State of Alaska, Department of Fish and Game worked with BPXA to site the proposed gravel mine, so that it could offer fish-overwintering habitat to a river drainage that had none. If the river does not flow every year and if there are no known fish-overwintering sites, it is logical to conclude that no fish would be present during the mining operation in the winter. We have reviewed and cited the Alaska Department of Fish and Game studies in the EIS analysis. The Department of Fish and Game, who have done the most work in this area as well as in the siting the fish-overwintering habitat on the North Slope, did not suggest that any corrections or request additional analysis and information be provided.

**0141-038**

The MMS has reviewed the analyses and data presented in Chapters 5 through 7 of the Northstar EIS, and we found the quality and detail of analysis in Liberty to be equivalent. Vegetation type is described and evaluated by community (dwarf shrub, dry forb, etc.) as it is in the Liberty EIS. The amount of acreage is described primarily in whole acres as it is in the Liberty EIS. For the Northstar EIS, three large geobotanical maps depicting vegetation were presented in Chapter 6.6.1.2, but they are only referenced once in the analysis to state that the percents of vegetation appear consistent. The map in Northstar for the sea duck, snow goose, and Brant covers about 5,000 miles (60 miles by 80 miles), while the map in Liberty is smaller and covers about 1,400 miles (42 miles by 30 miles).

The maps, information, and analyses presented in the Liberty EIS are appropriate and comparable to those found in the Northstar EIS.

**0141-039**

This issue, jusrt as a number of others raised in these comments, was discussed extensively in early 1998 and several times since by the Liberty Interagency Team, of which Environmental Protection Agency staff are members. As was pointed out then, the primary benefit of the format used for the Liberty EIS is to present the most important information to the reader first. The issues that were identified are the effects of the Proposal and potential alternatives. Therefore, Section III Effects of the Proposed Action and Section IV Effects of the Alternatives are described before the existing environment. The existing environment is available in Section VI. The Environmental Protection Agency is the only commenter to suggest this modification, and the MMS is reluctant to change the document format based on the comments of a single agency, especially after this specific issue was resolved by the team so long ago. The MMS prefers to stay with the format as presented in the EIS.

**0141-040**

The Corps agrees with the comment that Attachment B should note that the proposed project differs from the theoretical analysis set forth in the document or, if the placement of geotextile fabric is included in the proposed project, that the applicant's Development and Production Plan should be updated to reflect this.

U.S. Department of Transportation
**Research and Special Programs Administration**

Western Region
Pipeline Safety

12600 W. Colfax Avenue
Suite A-250
Lakewood, CO 80215-3736

0144

CERTIFIED MAIL - RETURN RECEIPT

April 19, 2001

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APR 19 2001
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Mr. Gene Goll
Regional Director
Mineral Management Services, Alaska OCS Region
949 East 36th Avenue, Room 308
Anchorage, Alaska 99508-4363

Re: Agency Comments to the Liberty Project
Draft Environment Impact Statement

Dear Mr. Goll:

The United States Department of Transportation's, Research and Special Programs Administration, Office of Pipeline Safety (OPS) appreciates the opportunity to comment on the Liberty Development and Production Plan, Draft Environmental Impact Statement (DEIS). Our office has evaluated the portions of the DEIS that pertain to the design and construction of the proposed pipeline in the Beaufort Sea and onshore tundra environment. More specifically, the scope of our review was limited to Volume I, Section IV, 2. Effects of Alternative Pipeline Designs, and Volume III. Following is a list of items for your technical consideration and is by no means meant to be a sanction of any route or design alternative addressed in the DEIS. We hope that you will take this list under advisement and address these issues in discussions with the applicant, BP Exploration (Alaska), Inc. (BPXA).

The OPS is charged with regulating the safe and environmentally sound operation of the national pipeline infrastructure. Chapter 601, 49 United States Code give OPS the authority to issue and enforce regulations pertaining to the design, construction, operation, maintenance, and emergency planning for hazardous liquid pipelines. Pursuant to Section 60104 of Chapter 601, however, we are precluded from prescribing "the location or routing of a pipeline facility."

Even though we can not make route selection determinations for proposed pipeline projects, our industry knowledge, inspection experience, and operating history data is critical for making "well informed" routing decisions by the land owners or trustees along potential pipeline routes. In addition, our experience can help determine "value-added" design/construction enhancements not requirement stipulations typically associated with the granting of new pipeline right-of-ways.



Our office appreciates the opportunity to provide technical input for the DEIS, and is available for further consultation as your agency evaluates BPXA's pipeline proposal.

**Alternative IV. A - Use Pipe in Pipe System**

1. The steel pipe in the steel casing is considered to be a submerged pipeline. In addition to the cathodic protection system for the casing the steel pipeline would be required to have a cathodic protection system as required under 49 CFR Part 195.414. Additionally it should be noted that a new corrosion rule is due to be promulgated in the near future, 49 CFR Part 195 Subpart H, Controlling Corrosion on Hazardous Liquid and Carbon Dioxide Pipelines. This rule will have more stringent requirements for monitoring of a cathodic protection system than now exists in 49 CFR Part 195. 001

2. The steel casing in this alternative must be pressure tested to a level at or above the operating pressure of the carrier pipeline if the steel casing is to be used to contain the pipeline pressure in the unlikely event of the internal pipe failure. Under this scenario the casing would be the pipeline and as such, under 49 CFR Part 195 Subpart E, is required to be pressure tested. Additionally the casing would be required under 49 CFR Part 195.262 to have an overpressure safety device. 002

3. From Volume I, Executive Summary, Page 29, Second Column, Last Paragraph: 003

"There are approximately twice as many welds, some of which cannot be tested by both nondestructive testing methods that would be used on the other welds. While either test alone should be sufficient to determine if a weld is acceptable, each test method works differently and is better at detecting certain types of weld imperfections".

§192.234 (e) requires that all girth welds installed each day in the following locations must be nondestructively tested over their entire circumference, except that when nondestructive testing is impracticable for a girth weld, it need not be tested if the number of girth welds for which testing is impracticable does not exceed 10 percent of the girth welds installed that day:

(1) At any onshore location where a loss of hazardous liquid could reasonably be expected to pollute any stream, river, lake, reservoir, or other body of water, and any offshore area;

The PIP inherent design that leads to impracticality in inspecting the welds should be not considered a ground for getting a waiver granted.

4. From Volume III, C-Core Engineering Assessment, 5th Paragraph, Section 3.1, P. 3-1: 004

"No existing offshore double wall pipe systems have been constructed to provide secondary containment in the event of a failure of the product line."

We agree with the above statement. We also would like to add that we believe that, presently, there is no proven monitoring technology (for PIP design).

5. From Volume III, C-Core Engineering Assessment, 1st Paragraph, Section 3.5, P. 3-5: 005

"It is the opinion of the study team that double wall pipeline configurations offer moderate-to-significant operating and maintenance advantages relative to single wall pipelines".

In regards to operating and maintenance, OPS does not have experience in whether double wall has any advantages over single wall pipeline design. The statement in C-Core Section 3-1 (referenced above) provides the reason.

6. From Volume III, C-Core Engineering Assessment, 2nd Paragraph, Section 3.9, P. 3-9: 006

"The annulus can also be monitored for evidence of a leak (or even pipe degradation)".

We can not see how pipe degradation can be determined by monitoring the annulus.

7. In-Line-Inspection (ILI) the outside pipeline is not possible for the PIP alternative. We believe that the definition of "*Pipeline or pipeline system*" in 49 CFR Part 195, §195.2 applies to the outside line (eg: we consider the casing line to be a pipeline, not just a casing). Since there is no current ILI technology that can inspect the outside line, the PIP current design appears to be in conflict with 49 CFR, 195, §195.120 (a). An excerpt of the referenced code is shown below: 007

§195.120 Passage of internal inspection devices.

(a) Except as provided in paragraphs (b) and (c) of this section, each new pipeline and each line section of a pipeline where the line pipe, valve, fitting or other line component is replaced, must be designed and constructed to accommodate the passage of instrumented internal inspection devices.

Please note that the exemption of §195.120 (b)(6) does not apply for the Liberty pipeline.



8. From Stress Engineering Services Report (Volume I, Bibliograpy-24), Page 19: 008

"There are several sources for the introduction of moisture in the annulus which would have to be prevented over the lifetime of the pipeline. First during construction, snow and water must be prevented from entering the annulus. Any snow or water that enters the annulus would form puddles in the low spots in the line. There is also the risk of introducing moisture into the annulus when the supplemental leak detection system is sampling the annulus"

We concur with the above statement which emphasizes the need of an adequate CP system of the carrier pipeline. It is highly questionable whether an adequate CP system (for the inner steel line) can be designed for the PIP alternative.

9. From Volume III, Appendix D-4, Page X: 010

"Such a system could consist of a sprayed aluminum or other cathodic coating applied to the inner pipe to provide in-situ cathodic protection".

From Stress Engineering Services Report (Volume I, Bibliograpy-24), Page 19:

"This along with the potential damage of the pipe coating is the driving force behind our suggestion of a sprayed aluminum or other cathodic coating being applied to provide in-situ cathodic protection".

We do not believe that the stated corrosion prevention methodology satisfies the intend of 49 CFR 195, §195.242 (a).

10. From Stress Engineering Services Report (Volume I, Bibliograpy-24), Page 19: 011

"It should be noted that for the Colville River crossing, there was no corrosion control for the carrier pipes other than an external coating. This was done because the designers felt that the annulus could be kept dry, the condition monitored, and actions taken if moisture was detected in the annulus (Ref. Material Performance, February 2000, NACE, page 18). This is the method proposed in the INTEC report. In addition, the INTEC report states that the outer pipe for the steel pipe-in-pipe will be fitted with a cathodic protection system. If a cathodic protection system were installed on the inner pipe, the annulus could still be monitored and with the goal of keeping the annulus dry. The cathodic protection of the inner pipe would be a method of providing additional protection".

We believe that the Colville River crossing and the offshore segment of the Liberty pipeline are not analogous. The River crossing is approximately 4400 ft while the offshore segment of the Liberty pipeline is over 6 miles.

11. From Stress Engineering Services Report (Volume I, Bibliograpy-24), Page 18: 012

"Corrosion protection is going to be the most difficult aspect of installing a 6 mile long casing. If HDPE is to be used, shielding of CP protective current will occur unless an anode is provide inside of the casing. Assuming that the casing will remain without an electrolyte is not an acceptable assumption. OPS experience with PVC and HDPE casings is that eventually an electrolyte migrates into the casing and subsequently corrosion of the carrier pipe occurs because protective current cannot reach the metallic surface of the carrier pipe because of the shielding effect of the HDPE.

Filling the annulus with some sort of "inert" material has not been effective either. This material acts much the same as the HDPE in that it shields the carrier pipe from protective current of a CP system".

We generally agree with the above statements. If the annulus is filled with inert materials, the choice of CP systems for the carrier pipeline will be very limited (a sacrificial system might not provide sufficient protection).

**Alternative IV. B - Use Pipe in HDPE System** 013

12. The use of HDPE pipe to contain petroleum under operating pressures is not allowed under 49 CFR Part 195.112. Under 49 CFR Part 195.112 the only material that can be used for the construction of new petroleum pipelines is steel.

**Alternative IV. C - Use Flexible Pipe System** 014

13. The use of flexible pipe to transport petroleum is not allowed under 49 CFR Part 195.112. Under 49 CFR Part 195.112 the only material that can be used for the construction of new petroleum pipelines is steel.

**General Comments**

14. To promote the use of the latest technology and increase pipeline safety, at times, requires the application of some systems that may not meet the requirements of 49 CFR Part 195. The process available to operators who wish to pursue new technology not meeting code requirements is to apply for a waiver to specific code requirements. This waiver is applied for through the Administrator of RSPA. After careful consideration the Administrator can approve the waiver only if it is shown that the new technology will not jeopardize the safety of the pipeline. 015

15. Consideration should be made by the operator for 49 CFR Part 195 Amdt. 195-70, Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Hazardous Liquid Operators With 500 or More Miles of Pipelines). This rule becomes effective on 016



May 29, 2001, and it requires the operators of hazardous liquid pipelines to establish and implement plans to assess the integrity of pipeline in areas in which a failure could impact certain populated and environmentally sensitive areas. Typically this activity would be pigging with a magnetic flux or ultrasonic inspection tool. With a double wall pipeline the ability to run such a tool is limited because of the unpredictable signals caused by the wall of the casing. 016

If you have any questions regarding our comment on the proposed Liberty Project please contact Mr. Gerald Davis in our Anchorage, Alaska office at 907-271-6518.

Sincerely,

Christopher Hoidal, PE
Regional Director

**0144-001**

The EIS has been modified to indicate that the U.S. Department of Transportation pipeline safety regulations would require a cathodic protection system to be installed on the inner pipe of a pipe-in-pipe alternative, and that more stringent regulations on cathodic protection monitoring will be coming out soon.

**0144-002**

The EIS has been modified to indicate that the U.S. Department of Transportation would require pressure testing of the outer pipe and the installation of an overpressure safety device for the annulus.

**0144-003**

The concerns about nondestructive testing and the potential need for a waiver has been added to the appropriate locations in the EIS.

**0144-004**

The MMS agrees with this comment that there are limitations to the monitoring capability of pipe-in-pipe systems and have noted our concerns in the EIS. We cannot modify this portion of the EIS, because it is a reprinted portion of a paper prepared for the MMS by C-CORE.

**0144-005**

We appreciate the concern raised in this comment and will take the commenter's expertise into consideration during our decisionmaking process. The EIS already contains information about operation and maintenance concerns related to the poor ability to monitor the outer pipe of a pipe-in-pipe system. Therefore, no changes are necessary to the EIS.

**0144-006**

We agree with this comment and have added language to the EIS to indicate that monitoring of the annulus is only a pass/fail test and cannot detect pipe degradation.

**0144-007**

The MMS has included language in the EIS to indicate that because of the lack of an ability to inspect the outer pipe of a pipe-in-pipe system, it may not be in compliance with U.S. Department of Transportation regulations.

**0144-008**

The EIS text has been revised to address the concern about whether an adequate cathodic protection system can be installed on the inner pipe of a pipe-in-pipe system.

**0144-009**

There is no Comment 0144-009.

**0144-010**

A statement has been added to the EIS to indicate that the commenter does not believe the cathodic protection alternatives for the inner pipe of a pipe-in-pipe system, which was raised in the Stress report, would comply with the cited U.S. Department of Transportation regulation.

**0144-011**

The MMS agrees that the Alpine pipeline Colville River crossing and the proposed pipe-in-pipe system are not analogous. The Colville River crossing was not discussed at length anywhere in the EIS; it was, however, discussed in some of the documents incorporated by reference into the EIS. Because the Colville River crossing was not discussed at length in the EIS, there is no place in the main body of the EIS to incorporate this comment. Therefore our response is limited to what is written in this section.

**0144-012**

The MMS generally agrees with this comment. None of the alternatives being considered in the EIS involve filling the annulus with an inert material.

**0144-013**

The statement that only steel is allowed for new petroleum pipelines has been added to the EIS.

**0144-014**

Please see Response 0144-013.

**0144-015**

This paragraph and some additional text were added to the EIS to illustrate the U.S. Department of Transportation's waiver process.

**0144-016**

This paragraph and other information related to this topic were added to the EIS.

# Barrow Whaling Captains Association

General Delivery
Barrow, Alaska 99723

LIBERTY PROJECT 3/21/01 **0145**
DRAFT EIS

Hello, my name is Eugene Brower, President of Barrow Whaling Captains Association. The whaling association has 43 whaling captains and about 450 crewmembers here in Barrow who are registered at the Alaska Eskimo Whaling Commission office. We are one of the ten whaling villages who are federally recognized as a whaling community in the United States of America through the Alaska Eskimo Whaling Commission.

**010**

For the record, we the whalers have been testifying for the past 20 years opposing any offshore OCS activities in the Beaufort Sea. Our primary concern is the possibility of an oil spill that will affect our Marine Mammals, particularly the bowhead whale because of its great importance as a food source for our people. We are also concerned about the Department of Interior and MMS not addressing their respective statutory trust responsibilities to protect our whaling communities.

This leads me to the Draft Environmental Impact Statement on the Liberty project that is before us now. The Barrow Whaling Captains Association opposes this project based on the following: **A02** (1) The Oil industries to date have not demonstrated that they have the ability to clean-up spilled oil in broken ice conditions in the Beaufort Sea. **011** (2) Before new development is to take place the whalers requested that their concerns on the North Star project be studied. For example, since hot oil will be flowing in the pipe there should be monitoring to see if the heat affects any nearby permafrost or if the pipe expands and moves in the trench it is in. **012** (3) Another concern of great importance is the cumulative impact of industrial activity on the bowhead whale in its fall migration route and in its feeding areas in near shore waters in the Beaufort Sea. We cannot understand how offshore development can be allowed when there is no capability to clean up spilled oil during broken ice. Why is the risk ignored? If there is a problem, all of the impact will be upon the bowhead and us. Who will help us then? You know that we are worried **A03** about an oil spill. We are concerned that if there is an oil spill the anti-whaling countries at the international Whaling Commission will use the spill as an excuse to reduce our harvest quota. The anti-whaling countries at the IWC could say that they are just reducing our harvest quota as a way to help protect the bowhead population since the oil spill happened. You say the risk of an oil spill is low, but if it ever happens it will probably be used by the IWC to restrict our hunt.

**013**

Minerals Management Service, you have the authority to tell the Oil industry in OCS to select the pipeline selection criteria for use in the Beaufort Sea. So why don't you tell BP to come up with a pipe in pipe design. With double wall pipe they will have less risk of oil spill than single wall pipe. You have time to make these changes. In February 2002 the final EIS is distributed. January 2003 Island is Constructed and January 2004 the pipeline is constructed.

**E01**

Based on testimonies presented during this meeting the Barrow Whaling Captains Association Strongly opposes any Liberty Island development in the waters of the Beaufort Sea.

Thank you, for the time given to me, to make a statement on behalf of the Barrow Whaling Captains Association on the draft EIS on the Liberty Project.

Eugene Brower

## RESOLUTION OF THE BARROW WHALING CAPTAINS ASSOCIATION TO THE ALASKA ESKIMO WHALING COMMISSION MINI-CONVENTION

## RESOLUTION NO. 2001-02

Barrow, Alaska
February 20, 2001

WHEREAS, British Petroleum is planning to begin production at Northstar in the fall of 2001; and

WHEREAS, BP has asked that the U.S. National Marine Fisheries Service issue an authorization for the incidental take of bowhead whales so that BP can produce oil from Northstar during the bowhead whale migrations; and

WHEREAS, Phillips Alaska wants to do exploratory drilling in the Beaufort Sea; and

WHEREAS, BP also wants to produce oil from Liberty;

NOW THEREFORE BE IT RESOLVED that the bowhead subsistence Whaling Captains direct the AEWC Board of Commissioners and its office to inform the federal and state agencies and the oil and gas operators that they must provide insurance for our culture and traditions before any further drilling is undertaken in the Arctic Ocean. 018

Introduce: February 20, 2001

Adopted: February 20, 2001

Thomas Napageak, AEWC Chairman

Attested:

Elijah Rock, Sr. AEWC Secretary

ERRATA VERSION

The underlined language has been added to the original for clarification.
Any other change is editorial only.

## RESOLUTION OF THE BARROW WHALING CAPTAINS' ASSOCIATION TO THE ALASKA ESKIMO WHALING COMMISSION MINI-CONVENTION

## RESOLUTION NO. 2001-04 A

Barrow, Alaska
February 20, 2001

WHEREAS, the Inupiat and Yupik Eskimo people have lived in the Arctic for thousands of years and the marine mammals of the Arctic Ocean have been critical to our survival throughout all of these many centuries; ~~our Inupiat and~~ Yupik Eskimo cultures are based on subsistence hunting, especially bowhead whale hunting and other marine mammals, land animals, birds and fish; if we lose our subsistence culture, we will not be able to continue as Eskimo people or to teach our children how to be Eskimo and how to survive in the Arctic; and our subsistence culture cannot continue if we lose our subsistence hunting; and

WHEREAS, our bowhead subsistence hunt is subject to a quota set by the International Whaling Commission, which can lower our quota if they think the bowhead whale is threatened for any reason; and

WHEREAS, in recent years there has been renewed interest in developing non-living oil and gas resources in our Arctic Ocean, which is a very dangerous place, with heavy storms and ice-infested waters; while oil and gas development has brought many benefits to our communities, it also brings many risks and adverse impacts that can hurt~~are hurting~~ our traditional culture; for example, this oil and gas development work causes the bowhead whale migration to move farther out into the ocean where it is harder and more dangerous for us to hunt; and A08

WHEREAS, British Petroleum has announced that it will begin to produce oil from Northstar this year, using a sub-sea pipeline to bring the oil to shore; and this oil production and sub-sea pipeline endanger our bowhead and other marine mammal resources because of oil spill risk and because oil spilled in the Arctic Ocean cannot be cleaned up; and A09

WHEREAS, BP's oil production at Northstar is only the first production site to be placed in the migration path of our bowhead whales; BP is planning another production site at Liberty, Phillips Alaska wants to drill for oil at McCovey, less than 10 miles from Cross Island, and Exxon/Mobile wants to place a natural gas pipeline through the Beaufort Sea to Canada; and

WHEREAS, this offshore oil and gas production is a direct threat to our continued bowhead subsistence hunt and to our bowhead subsistence culture; and A10

WHEREAS, oil and gas development will last for only a few generations and our grandchildren and their grandchildren will still be here and will need their traditional subsistence skills to survive; and

~~WHEREAS, there now is renewed interest in opening the Coastal Plain of the~~ Arctic National Wildlife Refuge to oil and gas exploration and development; oil and gas production is safer onshore than in the Arctic Ocean; however, the Coastal Plain of ANWR also contains many important subsistence animals and their habitat; and while oil and gas production in ANWR is less threatening to our marine resources, it can affect other subsistence resources and still cause harm to our subsistence culture; and

WHEREAS, oil and gas development will last for only a few generations and our grandchildren and their grandchildren will still be here and will need their traditional subsistence skills to survive;

NOW THEREFORE BE IT RESOLVED that the Board of Commissioners of the Alaska Eskimo Whaling Commission and its office are hereby directed by the bowhead subsistence captains of the AEWC to work with the North Slope Borough and ~~other organizations to accomplish each of the following:~~

1. Educate the U.S. federal government, the State of Alaska, and the public about our people, our subsistence hunting practices and culture, the IWC quota, and about the oil and gas development and production that is being allowed in the dangerous, ice infested waters of the Arctic Ocean; and

2. Prohibit any offshore oil or gas drilling activity within fifty miles of Cross Island or Pt. Barrow until better scientific evidence is available to show whether~~that~~ a closer distance is safe; and A11

3. Open the Coastal Plain of ANWR to oil and gas exploration and production A12



ERRATA VERSION
The underlined language has been added to the original for clarification.
Any other change is editorial only.

on condition that an indefinite moratorium be placed on all future offshore industrial activity, and on further condition that our bowhead subsistence community, and all communities suffering impacts from the oil and gas activity, be given authority to help decide how oil and gas work is conducted in the Coastal Plain, and on further condition that our bowhead subsistence community, and all communities suffering impacts from the oil and gas activity, share in the revenues from production in the Coastal Plain; and A12

4. Create trust funds to insure our community against the loss of our subsistence due to the development of our non-living resources. A13

INTRODUCED: February 20, 2001

ADOPTED: ____________________

____________________
CHAIRMAN

____________________
SECRETARY

**0145-010**

The MMS recognizes the long history of whalers' testimony opposing outer continental shelf activities in the Beaufort Sea. At the same time, the MMS has a legal mandate to oversee development of offshore oil resources in an environmentally sound manner. A discussion of how the whalers and the MMS have endeavored to compromise can be found in Response 0130-A01.

Industry has not demonstrated the ability to mechanically clean up an oil spill in the Arctic in broken-ice conditions. This EIS evaluates a potential mitigating measure (Seasonal Drilling Restriction in Broken Ice) as a means to lessen the potential for a large oil spill during broken-ice conditions. See also Responses 0145-A02 and 0145-012.

We encourage the Alaska Eskimo Whaling Commission to propose any additional mitigation it believes to be necessary to successfully mitigate potential impacts from the Liberty Project.

The MMS has analyzed the potential effects of an oil spill on bowhead whales in Section III.C.2.a(1). This information, and concerns expressed in your comments, are available to the decisionmakers when they make the final decision regarding the project.

**0145-A02**

The spring and fall barge trials of 2000 demonstrated that oil-spill response using the barge-based system is more limited than stated in the BPXA Oil Discharge and Prevention Plan. The barge trials established limits to mechanical response equipment; however, the equipment they had was able to operate in the broken-ice conditions and would have collected oil had it been present. What the 2000 trials did not evaluate were other mechanical tactics and nonmechanical response tactics available in the spill-response toolbox. The Alaska Clean Seas Technical Manual provides a description of response tactics that can be used throughout the year. A year-round response option is in situ burning of the oil. This method of spill response is recognized as a viable and effective option for oil-spill cleanup in broken-ice conditions. To date, the Environmental Protection Agency has not allowed actual testing of in situ burning in U.S. waters, but the tactic has been demonstrated successfully in Canadian waters off the coast of Newfoundland. See also Response 0145-012.

**0145-011**

The designs for both the Northstar pipelines and the proposed Liberty pipeline recognize the possibility of pipe movement resulting from permafrost thaw along the pipeline route. The pipelines are designed to safely handle a certain amount of movement without failing, and they will be monitored on a regular basis to ensure that pipeline movement is within design limits. The pipeline integrity-monitoring program is described in detail in Section II.A.1.b(3)(c) of the EIS.

**0145-012**

We understand the Barrow Whaling Captains' Association's worries about oil spills. The spring and fall trials conducted during 2000 demonstrated that the barge-based spill-response operating limits and efficiencies are overstated in the North Slope spill-contingency plans. Oil-spill-response capabilities in broken ice do exist but at lower efficiency levels. BPXA is revising their oil-spill-contingency plans to incorporate the lessons learned during these trials to improve response planning. Alaska Clean Seas is revising their technical manuals to reflect more accurate operational limits and including new tactics for broken-ice response.

These trials evaluated only a limited number of oil-spill-response tactics and strategies. In situ burning also is a viable response tactic in broken-ice conditions, and it has the potential to significantly reduce the amount of oil on the ocean surface.

The effects of oil spills on bowhead whales area analyzed in Sections III.C.2.a(1) and III.D.3.a(1) of the EIS. The effects of oil spills on the inhabitants of the North Slope and their communities and institutions are analyzed in Sections III.C.2.h (Subsistence) and III.C.2.i (Sociocultural) of the EIS.

For a discussion of potential sources of mitigation for impacts, see Responses 0130-003, 0130-A01, 0130-006, and 0145-010.

**0145-A03**

If an oil spill occurred, it is unlikely that many, if any, bowheads would be killed. The bowhead population is healthy and has been increasing at a rate of more than 3% per year, including the loss of animals due to the subsistence harvest. The MMS believes it is unlikely that the loss of a small number of whales due to an oil spill, should that event occur, would result in a lowered quota of whales by the International Whaling Commission.

**0145-013**

The MMS regulations, 30 CFR 250.204(l)(2), which govern under what circumstances we can require modification of an applicants development and production plan states:

> The Regional Supervisor shall] [r]equire modification of the plan if it is determined that the lessee has failed to make adequate provisions for safety, environmental protection, or conservation of resources including compliance with the regulations prescribed under the [OCS Lands] Act…

We cannot require the applicant to use a different pipeline design without first making the determination that their proposed pipeline does not make adequate provisions for environmental protection. The analysis in the EIS indicates that none of the alternatives considered will cause serious irreparable harm to the environment; therefore, we cannot arbitrarily require the applicant to use a different pipeline design.

Furthermore, we have carefully assessed the advantages and disadvantages of the various pipeline designs presented in the draft EIS in selecting the MMS's preferred alternative for the Liberty Project. We have selected the single-wall pipeline for our preferred alternative. Our rationale is presented in Section II.E. A double-wall pipeline such as the one analyzed in the EIS has never been installed in the Beaufort Sea, while a pipeline very similar to the proposed single-wall Liberty pipeline was successfully installed for the Northstar Project and has been used to transport natural gas to the island since November 2000. In addition, a pipe-in-pipe system cannot be monitored to the same level as a single-wall pipeline. Therefore, a pipe-in-pipe system actually would increase the uncertainty associated with a subsea pipeline, because it is unknown whether or not it can be constructed and installed properly, and it cannot be monitored as effectively as a single-wall pipeline.

**0145-E01**

The effects of not developing the Liberty Prospect, the No Action Alternative, are described in Section IV.B of the EIS and, as noted in Section I.A, the MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0145-018**

For a discussion of potential sources of mitigation for impacts, see Responses 0130-003, 0130-A01, 0130-006, and 0145-010.

**0145-A08**

For a discussion of potential offshore impacts on subsistence whaling from the Liberty Project and from cumulative impacts, see Sections III.C.2.h, III.C.3.h, and V.C.8 and Responses 0130-003, 0130-004, 0130-A01, 0130-006.

The potential for displacement of whales farther offshore as a result of industrial activities is discussed in Section III.C.3.a(1) and Section V.C.1.a(2).

**0145-A09**

Please see Responses 0135-020 and 021.

**0145-A10**

For a discussion of potential offshore impacts on subsistence whaling from the Liberty Project and from cumulative impacts, see Sections III.C.2.h, III.C.3.h, and V.C.8 and Responses 0130-003, 0130-004, 0130-A01, 0130-006.

We do not believe that offshore oil and gas production is a threat to bowhead whales or the bowhead subsistence hunt. The Liberty Project is located inside the barrier islands, well outside and shoreward of the bowhead migration corridor. Our analysis in Section III.C.3.a(1) on the effects of noise from this project on whales and in Section III.C.2.a(1) indicate little effect to bowhead whales from this activity.

**0145-A11**

The Liberty Project is located within about 20 miles of Cross Island inside the barrier islands. For this project, deferring any oil and gas activities within 50 miles of Cross Island would be equivalent to the No Action Alternative, which is evaluated in Section IV.B; therefore, no additional analysis is needed. Adopting this alternative would eliminate any potential effects to the environment from the Liberty Project. However, most of the effects noted in the cumulative analysis (Section V) still would occur, because Liberty contributes a very small amount (about 1%) of the effects in the cumulative case. This proposed deferral alternative also would shut down development at the Endicott and Northstar locations, both of which are on State offshore leases.

**0145-A12**

Only Congress can decide to open the coastal plain of the Arctic National Wildlife Refuge to oil and gas activities, and it is outside the authority of any of the Federal Agencies involved. The suggested indefinite moratorium also would require congressional action. While the National Energy Policy supports the opening of the refuge, it also supports continued leasing and development of the offshore oil and gas field in the Beaufort Sea.

Both of these proposals are beyond the authority of the agencies involved and the scope of this EIS. If the Alaska Eskimo Whaling Commission proposal were included, it would have the same effect as the No Action Alternative (Section IV.B); therefore, no additional analysis is warranted.

The role of the public/stakeholders in the MMS decisionmaking process is described in Sections I.B.1, I.D, III.B.1, and III.D.12. Also, see Responses 0015-001, 0130-A01, 0130-006, 132-A04, BPH 038, and NPH-A12.

**0145-A13**

For a discussion of potential sources of mitigation for impacts, including impact assistance and trust funds, see Responses 0130-003, 0130-A01, 0130-006, and 0145-010.

IÑUPIAT COMMUNITY of the ARCTIC SLOPE
an IRA Regional Tribal Government

P.O. Box 934 • Barrow, Alaska 99723
Ph: (907)852-4227 1 888-788-4227 Fax: (907) 852-4246

0146

ICAS COMMENTS
Tuesday, March 20, 2001
DRAFT ENVIRONMENTAL IMPACT STATEMENT ON LIBERTY IN THE BEAUFORT SEA.

On behalf of the Inupiat people of the Arctic Slope, we welcome you to our home: Barrow, Alaska. I want to thank you for coming to take our concern with you to your decision makers, our federal government.

The Inupiat Community of the Arctic Slope, IRA opposes the proposed Liberty Island development. E01

The Inupiat Community of the Arctic Slope, IRA (hereafter ICAS) is a regional Tribal government of the aboriginal Alaska Inupiat people who have lived here before the Statehood of Alaska and before Columbus came to America in the 1500's? ICAS is comprised of the Villages of Kaktovik, Nuiqsut, Anaktuvuk Pass, Barrow, Atqasuk, Wainwright, Pt Lay, and Pt Hope. The boundary of ICAS is similar to the NSB including all lands north of the Brooks Range Mountains.

1. An oil spill not contained will have a negative impact on the subsistence way of life of the Inupiat people. E02
2. There has been no reasonable proof of capability to clean-up oil spill in the Arctic Coast of Alaska. E03
3. ICAS is impacted already adversely in its PL93-638 contracts regarding Native Allotments and Environmental Assessments to review related impacts on our subsistence territory on land and sea. E04
4. No funds are allotted to ICAS for administrative cost to address unrelated costs under its PL93-638 contracts. E05
5. Social impacts are neglected during the assessment of impacts to our residence that hunt under our ANIOLCA rights to subsistence. 014
6. Mitigations are not funded for ICAS for our Whaling deliberations when offshore activities affect the migration of bowhead whales when the oil and gas industry launches out to drill and explore for more oil. 015
7. ICAS is dealing with non-replacement of species from normal hunting areas that are not mitigated or cultivated to make available for renewable resources for subsistence hunters on land or sea. E06
8. Employment opportunities are not promised to our Inupiat people and funds are needed to train or supplement other work for our people from the oil and gas revenues. This causes social problems in view of the amount of work, employment and benefits from the oil and gas ventures on the habitat area of the Inupiat peo0ple and the renewable resource on which we depend on for nutrition and dietary needs. 016
9. The following is an outline of funds required to supplement the PL93-638 to better accommodate the impacts of oil and gas business within ICAS boundaries: 017
   a. For Realty officer with travel, lodging, and meals: 85,000.00
   b. For EPA officer with travel, lodging, meals: 85,000.00
   c. Council and administrative time and review at least 4 times per year: 75,000.00
   d. Investigations and research: 65,000.00
   e. Employment and training programs: $100,000.00 for all Villages
   f. For Fish and Wildlife management service; programs and services, research, documentations, etc: 85,000.00
   g. Administrative office and staff space, computers, etc. 65,000.00
   h. Legislative, attorney, and lobby funds 145,000.00
   i. Tribal Operations 45,000 x 8 Villages = 360,000.00
   j. Oil spill response trainees 5 ea village = 325,000.00
   k. Administrative officer assistance to MMS AO. 55,000.00
   l. Rentals and utilities plus rentals $55.00 x 24 = 1,320.00
   m. Consultant fees for socio-economic studies $15,000.00 consultant fee for habitat studies 26,000.00 consultant fees for audit, etc.
   n. Totals $1,413,070.00

This figure is configured on NSB rates at 1999 costs extracted from a 1999 budget book. ICAS needs this fund to stay in tune with current offshore and onshore oil and gas related events/activities. This funding supplement for ICAS PL93-638 contract is needed to work with MMS and the federal government's venture for oil and gas from the Arctic Slope region of Alaska.

Even this moment, we are suppressed from our daily preparations for whaling by this meeting just to accommodate MMS personnel that has come here to solicit our comments, concerns, and recommendations. E07

No one is paying my baby-sitting needs, or take over my leadership in Umiaq preparation and assisting sewing and cutting of skins. But here I am. In like manner, we divorce our PL93-638 programs and services to meet with you regarding your proposal to hinder our subsistence way of life. No thought is made to appease our troubles and adjustments for the government's venture to explore for oil and gas on land or sea. IT cannot be done that way anymore. ICAS must receive supplemental funding to man these events and monitor the oil and gas activities in the Arctic Slope. E07

The roughly 1.5 million requests to supplement ICAS Pl93-638 contract is an annual request until all oil and gas activities cease to exist in the Arctic Slope.
ICAS is responsible for co-management of wildlife resources and administration of research and studies for its membership who depend on the renewable resources for livelihood.

In acknowledging this request, the MMS-DOI will greatly enhance the day-to-day oil and gas activities. At least ICAS will know that the government is serious about its work on the environment, which we depend upon so greatly. E08

These comments are not all inclusive of ICAS concerns, but merely a flash of issues composed with best estimates found to be actual from a 1999 budget book of the NSB.

Because the DOI have not exhausted its exploration on land, there is no need to endanger marine mammals and waterfowls by offshore activities with potentials to eradicate a species, especially Canadian goose that are on the borderline of protected species. E09 We remain in the Arctic Slope to continue to mitigate or battle our concerns for our future. We pray that you will deliver these comments to the appropriate agency, Department, legislature, Senator, and the President's staff to address our supplemental needs to work on the mitigations, oil and gas activities according to the Coastal management policy that ICAS is developing as we speak.
We applaud the NSB's position and support the Alaska Eskimo Whaling Commission's comments against this Liberty project. E10

Submitted by: Arnold Brower Jr., President

Arnold Brower Jr.

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**0146-E01**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and as noted in Section I.A. The MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

**0146-E02**

The potential effects of developing the Liberty Prospect for subsistence activities is analyzed in Sections III.C.2.h, III.C.3.h and III.D

**0146-E03**

The issue of daily spills and cleanup is addressed in Section III.D.3, Effects of Small Spills from Liberty Facilities; also see Appendix A. The effects of a large oil spill, which has a low probability of occurring, is addressed in Section III.C.2, the chances of a large oil spill occurring in Section III.C.1.d and e, and the cleanup of a large spill in Section II.A.4 and III.C.1.a. Also see Responses 0132-002 and 0135-094.

**0146-E04**

The MMS is required to make the EIS's and related documents available to the public, which includes a variety of organizations, and we realize this places additional demands on those organizations with concerns about oil and gas activities. See Response 0132-A04.

**0146-E05**

See Response 0146-017.

**0146-014**

Social impacts are considered in Sections III.C.2.i and III.C.3.i, where effects from large oil spills and disturbance are discussed. Cumulative social impacts are analyzed in Section V.C.9; Alaska National Interest Lands Conservation Act subsistence criteria apply only to onshore areas. See also Response 0130-003.

**0146-015**

There are no existing laws or other mandates that allow the MMS to fund, or to require a lessee/operator to fund, such deliberations for the Inupiat Community of the Arctic Slope or any other entity. The creation of such a fund would require action of the U.S. Congress.

Also see Response 0146-017.

**0146-E06**

See Response NPH-A14.

**0146-016**

The MMS cannot provide employment incentives, but it can encourage ICAS to pursue such arrangements with BPXA, who has publicly made a commitment to local hire on the North Slope.

The MMS encourages ICAS to involve itself with BPXA's ongoing Itqanaiyagvik Program, a multimillion dollar hiring and training program designed to put more Inupiat into the oil-field workforce.

**0146-017**

Two provisions of Federal law may be sources of funds for the efforts that ICAS has listed:

Public Law 93-638, the Indian Self-Determination and Education Assistance Act, recognizes a Federal obligation to be responsive to the principle of self-determination through tribal involvement, participation, and direction of education and service programs. It directs the Secretary of the Interior, at the request of a tribe, to contract with any tribal government to carry out the services and programs the Federal Government administers for the benefit of Indians.

Public Law 93-638 does not provide for impact assistance funding; however; Congress did pass impact-assistance legislation last year in Public Law 106-553, Section 903, *Coastal Impact Assistance*. This law amends the OCS Lands Act and provides for impact-assistance funding to states with offshore oil activities. On May 17, 2001, the State of Alaska released a draft Coastal Impact Assistance Plan (CIAP). Under the Federal program, called the CIAP, Alaska will receive a one-time appropriation of $12.2 million; $7.9 million is allocated to the State and $4.27 million is allocated to eligible coastal communities. Uses of the fund must be consistent with the authorized uses in the CIAP legislation, including conservation, restoration, enhancement or protection of coastal or marine habitat, wetlands, watersheds and water quality; assessment, research, mapping and education; and implementation of Federal conservation management plans. Alaska's draft CIAP describes the State's and coastal communities' proposed uses for CIAP funds.

**0146-E07**

Concerns regarding individual, organizational, and/or community time to work on issues associated with oil and gas development on the North Slope and in the Beaufort Sea are discussed in Section III.C.2.i, III.D.12 and V.C.8. Also, see Responses 0132-A04 and 0145-010.

See Response 0146-017 regarding funds for ICAS.

**0146-E08**

See Response 0146-017 regarding funds for ICAS.

**0146-E09**

See Response 0146-017 regarding funds for ICAS.

**0146-E10**

The effects of not developing the Liberty Prospect, No Action Alternative, are described in Section IV.B of the EIS and as noted in Section I.A. MMS will continue to consider and evaluate comments and all reasonable options throughout the final EIS comment period and decision processes.

United States Department Of The Interior
Minerals Management Service
Alaska OCS Region

***EXCERPTS FROM***

**OFFICIAL TRANSCRIPT - PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR LIBERTY DEVELOPMENT AND PRODUCTION PLAN
OCS EIS/EA MMS 2001-001**

***(Responses to Testimony Comments Added)***

**Anchorage, Alaska
Thursday, February 15, 2001
7:00 p.m.**

**Minerals Management Service Panel Members**
Mr. Paul Stang, Regional Supervisor for Leasing and Environment
Mr. Fred King, Chief, Environmental Assessment Section, and Liberty Project Manager
Dick Roberts, Liberty EIS Coordinator
Ted Rockwell, Environmental Protection Agency Coordinator
Mike Holley, U.S. Corps of Engineers
Mr. Richard Carl, Recorder

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

**Table Of Contents - Anchorage**

**PUBLIC TESTIMONY OF MS. JENNA APP**

**APH-001** (Pages 21 and 22)

I'd just briefly like to touch upon several concerns that I have in reading through the document, the Draft Environmental Impact Statement, the first of which deals with, in part, a memo that I've seen from the Department of Interior directed towards British Petroleum, and it concerns the double-wall pipe. And I guess I would just encourage Minerals Management Service to pay close attention to that directive from the Department of Interior, which concludes that perhaps double-wall pipe may be the safest subsea pipeline to use.

I know that we've been through this in Northstar, but that now here's a second chance to look at it. I understand it is more expensive, but in looking at the trade-offs, in terms of impact to subsistence and the environment, I think that double-wall pipe may be the way to go, especially given the directive from the DOI.

**Response**

The letter mentioned in this comment actually does not take a position on pipe-in-pipe other than to say it looks promising, and that additional design and study efforts should be undertaken. It is the MMS' opinion that more than enough work has been completed so far for the decisionmakers to make an informed decision on the pipeline-design alternatives.

The MMS has looked at all of the information currently available and has determined that the marginal reduction in spill probability, about 1%, is outweighed by the reduction in integrity-monitoring capability inherent to a pipe-in-pipe design. The U.S. Department of Transportation has studied pipeline failures and determined that integrity monitoring is a key component in preventing pipeline failures. They recently issued regulations that require a pipeline operator to develop and implement an integrity-monitoring program to assess pipelines in high-consequence areas. Pipe-in-pipe systems cannot be monitored as effectively, due to the presence of the outer pipe, as can single-wall pipeline systems.

Because of the environmentally sensitive nature of the Beaufort Sea, we believe it is more important to have a pipeline that can be fully inspected than to compromise this inspection ability for the small reduction in spill probability that may be afforded by a pipe-in-pipe system.

**APH-002** (Pages 22 and 23)

And the environmental community, as well as, it seems, lots of folks on the North Slope, who I've spoken to anyway, have some pretty substantial concerns about the ability to clean up oil in open water and broken ice conditions.

And I would hope that this would result in either seasonal drilling restrictions or some other sort of acknowledgement that really deals with the situation given that with today's technology, it does not appear to be reasonable to expect that the oil industry can clean up oil in broken ice conditions and open water in the Beaufort Sea at this time.

**Response**

BPXA is revising its oil-spill-contingency plan to incorporate the information gained during the spring and fall 2000 barge trials.

**APH-003** (Page 23)

And I guess, lastly, I would encourage special attention be paid to the subsistence species in the area. And I know that, you know, like Northstar, the same impacts, or similar impacts, can be expected, but that I think it's really important that attention be paid to the bowhead whale data that's available and any new data that can be collected, as well as the impacts, or potential impacts, to polar bears and other marine mammals.

**Response**

Impacts from large oil spills on bowhead whales, polar bears, other marine mammals, and subsistence species are analyzed in Sections III.C.2.a, III.C.2.b, and III.C.2.h, respectively; for disturbance impacts, these same resources are analyzed in Sections III.C.3.a, III.C.3.b, and III.C.3.h, respectively; and for cumulative impacts, these resources are analyzed in Sections V.C.1, V.C.2, and V.C.8, respectively.

Additionally, an Environmental Justice analysis on the Inupiat people appears in Section III.D.12.

The MMS has tried to use the best and most recent data available on bowhead whales. In addition, any pertinent new information brought to our attention during the draft EIS review process is incorporated into the final EIS.

The MMS, in cooperation with the Fish and Wildlife Service, is concerned with potential disturbance effects on polar bears. A mitigating measure is proposed to include a 1-mile buffer around active polar bear dens to prevent disturbance from mobile industrial activities (see Section I.H.8.c). Under the Marine Mammal Protection Act aircraft, vessel, and ice-road construction and related road traffic are required to avoid or minimize disturbance of seals and polar bears.

**APH-004** (Page 24)

And then, briefly, I'd just like to touch on the format of the Draft Environmental Impact Statement. I have spoken with several folks who have found the lack of an agency preferred alternative a little bit unwieldy, and that with the many options, although that puts everything out there, it kind of feels like, for some folks, a little bit of a moving target, and it's a little bit hard to organize comments effectively. So I'd like to share that with you.

**Response**

We acknowledge the commenter's observation that the analysis of options in the EIS that includes both component alternatives and combination alternatives adds complexity to the document. After much discussion both within MMS and with the Interagency EIS Team, the approach we used for the draft EIS was a "compromise approach."the best solution. While it is complex, it deals with the range of issues and concerns that we heard from the public during scoping. We agree that it is hard to compare the effects of different island locations to pipeline designs, but some people are concerned about the island location, others about island slope protection, and others are concerned about pipeline burial depth.

When we tried to combine the various options into a limited number of combination alternatives, it was extremely difficult to determine which component(s) were causing the changes. The MMS decided the best way to evaluate the different components was to compare island locations as a set of alternatives, pipeline designs as a set of alternatives, etc. However, several members of the Interagency EIS Team requested that some representative combination alternatives be developed and analyzed.

The draft EIS did not include an agency-preferred alternative in the draft EIS, because none had been determined. The MMS wanted to put the studies information for pipeline designs and the EIS analysis out to the public and solicit responses and information from the public before identifying an agency-preferred alternative. The final EIS identifies the MMS agency-preferred alternative (see Sections II.E and IV.E).

United States Department Of The Interior
Minerals Management Service
Alaska OCS Region

***EXCERPTS FROM***

**OFFICIAL TRANSCRIPT - PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT**
**FOR LIBERTY DEVELOPMENT AND PRODUCTION PLAN**
**OCS EIS/EA MMS 2001-001**

***(Responses to Testimony Comments Added)***

**Barrow, Alaska**
**Wednesday, March 21, 2001**
**7:20 p.m.**

**Minerals Management Service Panel Members**
Mr. Paul Stang, Regional Supervisor for Leasing and Environment
Mr. Fred King, Project Manager
Mr. Albert Barros, Community Liaison
Mr. Richard Carl, Recorder
Translator services provided by Martha Hopson, Barrow, Alaska.

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

**Table Of Contents - Barrow**

**BPH-001** (Page 12)

**MR. EUGENE BROWER**: Another follow-up on the pipeline. What's the preferred pipeline that is being recommended, single pipe or the pipe-in-pipe, double-walled pipe? And following question was asked too. It's how do you handle the expansion? You know, normally, you have, on land, expansion for the pipe, and I'm not sure.....

**Response**

This comment asks two separate questions:

1. What is the preferred pipeline alternative?

The MMS' Agency-Preferred Alternative for pipeline design is the single-wall pipeline. See Sections II.E and IV.E.

2. How is pipeline expansion handled?

All pipelines that operate at a higher temperature than they were installed in will expand. For aboveground pipelines, this is accommodated by periodically including an expansion loop. For buried pipelines, whether onshore or offshore, expansion is controlled by the soil around the pipeline. The weight and friction of the soil around the pipeline will apply a force to the pipeline that will prevent the pipeline from expanding.

In general, the hotter the pipeline becomes, the more it will expand. For this reason, hotter pipelines need to be buried deeper, so that the increased weight of the soil over the pipeline will apply more force to the pipeline to prevent thermal expansion. Additionally, larger diameter pipelines have a larger contact area with the soil, and the soil will apply more force to the pipeline to prevent expansion. For this reason, larger diameter pipelines do not need to be buried as deeply as smaller ones.

**PUBLIC TESTIMONY OF MR. EUGENE BROWER**

**BPH-002** (Pages 15 and 16)

For the record, for the past 20 years we've been testifying opposing any offshore OCS activities in the Beaufort Sea. Our primary concern is the possibility of an oil spill that will affect our marine mammals, particularly the bowhead whale because of its great importance as a food source to our people. We are also concerned about the Department of Interior and MMS not addressing their respective statutory trust responsibilities to protect our whaling communities.

**Response**

The MMS acknowledges the intent of Title VIII of the Alaska National Interest Lands Conservation Act that requires the Secretary to administer a subsistence priority on public lands that includes minimizing the likelihood of irreversible or long-term adverse effects on subsistence populations and species. In addition to subsistence protection, Federal land management agencies are responsible by law to manage Native land and mineral trust resources for Native tribes. This *trust responsibility* applies to all the Federal onshore land management agencies such as the Bureau of Land Management, National Park Service, and the Fish and Wildlife Service.

We also must point out that legal challenges have affirmed that the Alaska National Interest Lands Conservation Act (and consequent "trust responsibilities") does not apply to the outer continental shelf; nevertheless, MMS believes in honoring its *trust relationship* with tribes in carrying out its management mandate of OCS lands. MMS believes in a multiple-use policy that can develop oil and gas resources on the offshore; honor its trust relationship with tribes by protecting subsistence resources and Native peoples' rights to subsistence hunting and fishing; and develop effective mitigation for project impacts.

Please see Responses 0145-010 and 0130-A01.

**BPH-003** (Page 16)

Before the new development is to take place, the whalers requested that their concerns on the Northstar project be studied. For example, since hot oil will be flowing in the pipe, there should be monitoring to see if the heat affects any nearby permafrost or if the pipe expands and moves in the trench it is in. Right now, you're just talking about some exploratory thing that they're working on now. The hot oil hasn't started flowing yet.

**Response**

It is correct that hot oil has not yet begun to flow through the Northstar pipeline. While it would be nice to have additional operational data from Northstar, and we will before the Liberty pipeline is installed, it is not a new thing to install pipelines through permafrost. The effects of warm structures, including pipelines, on permafrost are well known and can be accommodated through proper design of the structure.

Through soil borings taken along the proposed and alternative pipelines, the pipeline will encounter permafrost onshore and for a little way offshore. Analysis of these soil borings indicates that some permafrost melting and associated thaw subsidence will occur when hot oil begins flowing through the pipeline.

Thermal expansion of pipelines also is not a concern restricted to offshore pipelines in the Beaufort Sea. Any pipeline, whether it is in the Arctic or the tropics, that operates at a temperature higher than its installation temperature will expand and move in the trench. This is a well-understood design issue and can be accommodated through the proper selection of burial depth and backfill material.

To ensure pipeline integrity, the applicant regularly will run inline inspection tools (for example, smart pigs) through the pipeline to determine the current location and condition of the pipeline. This will indicate if thaw subsidence and/or thermal expansion are exceeding the design criteria. If so, remedial action can be taken to prevent a pipeline failure that could allow oil to enter the environment. Smart pigging will be done for both the Northstar pipelines and the proposed Liberty pipeline.

**BPH-004** (Pages 16 and 17)

Another concern of great importance is the cumulative impact of industrial activity on the bowhead whale in its fall migration route and its feeding areas on the near-shore waters in the Beaufort Sea. We cannot understand how offshore development can be allowed when there is no capability to clean up oil spilled during broken ice. Why is the risk ignored? If there is a problem, all of the impact will be upon the bowhead and us. Who will help us then?

**Response**

Please see Response 0145-012.

**BPH-A01** (Page 17)

You know that we are worried about an oil spill. We are concerned that if there is an oil spill, the anti-whaling countries at the International Whaling Commission will use the oil spill as an excuse to reduce our harvest quota. The anti-whaling countries at the IWC would say that they are just reducing our harvest quota as a way to help protect the bowhead population since the oil spill happened. You say the risk of an oil spill is low, but if it ever happens, it will probably be used by the IWC to restrict our hunt.

**Response**

Please see Response 0145-A03.

**BPH-005** (Page 17)

Minerals Management Service, you have the authority to tell the oil industry in OCS to select pipeline selection criteria for use in the Beaufort Sea. So why don't you tell BP to come up with a pipe-in-pipe design? With double-wall pipe, they will have less risk of an oil spill than a single pipe---single-wall pipe will. You have time to make these changes. In February 2002, the Final EIS will be distributed. January 2003, construction will begin on the construction of an island. 2004, they will start constructing the pipeline. So you have time to make these changes.

**Response**

Please see Response 0145-013.

**PUBLIC TESTIMONY OF MR. EDWARD ITTA**

**BPH-006** (Page 20) (from AEWC Resolution 2000-102)

"(2) Prohibit any oil or gas drilling activity within fifty miles of Cross Island or Point Barrow until better scientific evidence is available to show that a closer distance is safe; and…"

**Response**

The prohibition of leasing within 50 miles of Cross Island is beyond the scope of this EIS. If all oil and gas leasing, exploration, and development activities were prohibited within 50 miles of Cross Island, it would be essentially the same as the No Action Alternative, which is evaluated in Section IV.B.

**BPH-007** (Page 20) (from AEWC Resolution 2000-102)

"(3) Open the Coastal Plain of ANWR to oil and gas exploration and production on condition that an indefinite moratorium be placed on all offshore industrial activity, and on further condition that our bowhead subsistence community be given authority to help decide how oil and gas work is conducted in the Coastal Plain, and on further condition that our bowhead subsistence community and all communities suffering impacts from the oil and gas activity, share in the revenues from production of the Coastal Plain; and…."

**Response**

Please see comment 0132-A01.

**BPH-008** (Pages 20 and 21) (from AEWC Resolution 2000-102)

"(4)…create trust funds to insure our community against the loss of our subsistence due to the development of our non-living resources."

**Response**

There are no existing laws or other mandates that allow MMS to establish a trust fund or to require lessees or operators to establish a trust fund. The Oil Pollution Act of 1990 requires compensation for any loss of subsistence use as a result of an oil spill. See Response BPH-034 for more information.

**BPH-009** (Page 21)

But what I would like to just comment on now, and -- and we'll have some written comments to you before the end of the review -- or comment period is over. Like President Brower of the Barrow Whalers stated, that you, MMS, still have time to change to a double-wall design. The very preliminary information that we have and understand is that double-wall is not going to -- is going to add to construction costs for sure, we know that. But the safety factor is about, minimum, 50- to 70-percent safer, if you want to go ahead and go with it.

**Response**

The statement made in this comment is not quite correct. While it is true that the probability of a spill is about 50% (C-CORE, 2000) to 90% (Fleet, 2000) less for the pipe-in-pipe design than the applicant's proposed single-wall pipeline, this is not the same as saying it is 50-90% safer. These numbers represent failure probabilities while the reliability, or the probability that a failure will not occur, of a system better represents safety.

The reliability of the various pipeline systems can be determined by subtracting the probability of failure from 1. This results in a reliability of the single-wall pipeline system of 0.986 and reliability for the pipe-in-pipe system of 0.998; these probabilities also can be presented as 98.6% and 99.8%, respectively. Therefore, the pipe-in-pipe system is only about 1% safer than the applicant's proposed single-wall alternative.

The minor improvement in safety does not justify the reduction in integrity-monitoring capabilities inherent in a pipe-in-pipe design.

**BPH-010** (Pages 21and-22)

And a decision has been made, or it appears to be made, by BP with their in-house engineers, INTEC, that single-wall pipe is going to be just fine, and that that is the selection which I think MMS has agreed to now, in spite of our objection. And I don't know that that's true, but that seems to be where BP is coming from, that it's got to be single-wall. But when you look at it, at an overall project -- from a project perspective overall, that that double-walled pipe is only, at conservative guesses based on your production numbers, not even 3 percent of the project to begin with.

**Response**

The MMS Agency-Preferred Alternative for pipeline design is the single-wall pipeline design. See Sections II.E and IV.E.

Component cost did not play a significant role in our determination of a preferred pipeline-design alternative. Our main concerns were the probability of a failure and operations and maintenance. We did not believe that the small improvement in pipeline safety, about 1%, was enough to justify installing a system that cannot be monitored as effectively as the applicant's proposed design. It is our decision that pipeline monitoring is far more important than pipeline design in reducing the probability of a spill. Therefore, we prefer the pipeline design that allows for better monitoring.

Additionally, our regulations do not allow us to require an applicant to modify a production plan unless we determine that the applicant's proposal does not provide adequate protection for the environment. The probability of a pipeline spill is so low for any of the alternatives analyzed in the EIS, including the applicant's proposal, that we cannot say that any of them do not provide adequate environmental protection.

**PUBLIC TESTIMONY OF MS. MAGGIE AHMAOGAK**

**BPH-011** (Pages 25-26)

As with the Northstar DEIS, MMS and the Army Corps of Engineers have tried to assume away oil spill risks and damages in the Liberty DEIS. However, in its discussion of cumulative oil spill effects in the Northstar FEIS, the Corps found that with present and planned development in the Arctic OCS, there is a 95.2-percent probability of one or more spills greater than or equal to 1,000 barrels. This is quoted in the Northstar FEIS, page 10-39.

Therefore, according to the Army Corps of Engineers (Corps), there is a virtual 100-percent chance of a serious oil spill occurring in the Arctic OCS within the foreseeable future if oil production continues in the OCS as planned. With respect to other sources of pollution to the Arctic marine environment, exploration and production related activities introduce waste and "small" oil spills that seem to occur with some frequency in the OCS.

Furthermore, a major oil spill in the Arctic OCS, however unlikely, cannot be cleaned up. In addition, no one knows what the fate of such a spill would be, or the full extent of its impacts on the Arctic marine environment. What is known, however, is that, with the exception of clean-up costs to the company, the entire impact of any of these adverse events will be borne solely by the coastal villages of Northern Alaska, including the bowhead subsistence community.

**Response**

Please see Response 0130-001.

**BPH-012** (Pages 26 and 27)

This growing cumulative risk is too great for our community to have to bear. Future oil production along the North Slope must be brought onshore. This can be accomplished at Liberty by building a causeway out from the spit of land southwest of the proposed Liberty site and using directional drilling from there. This approach would keep everything on land, and the oil could be transported by a raised pipeline rather than a subsea pipeline. The AEWC is willing to consider this approach as an alternative to the current proposals that we have seen.

**Response**

Building a causeway to a production island, as was done for Endicott, has proven to be a safe and effective way to develop offshore resources in the Arctic. However, the U.S. Army Corps of Engineers has stated publicly that they will not allow any more causeways in the Beaufort Sea. Because a development involving a causeway cannot be permitted, this proposed alternative would have the same effects as the No Action Alternative.

**BPH-013** (Page 27)

The Liberty DEIS does not address cumulative impacts on the human environment, nor does it propose any mitigation measures for these impacts.

**Response**

Please see Response 0130-003.

**BPH-014** (Pages 28 and 29)

At page III-A-8 of the DEIS, the Corps states that, 'Effects... would not displace ongoing sociocultural systems, community activities, and traditional practices for harvesting, sharing, and processing subsistence resources.' Then at page, Section III-C-81, the Corps states that, 'No resource or harvest area would become unavailable, and no resource population would experience an overall decrease.' However, the Corps has presented no evidence to support this statement.

The map included in the DEIS, which is supposed to show Nuiqsut bowhead harvest locations in this area for 60 years, is extremely incomplete. The Corps and MMS are trying to address our concerns for the future of our culture with unfounded statements. However, these statements will not protect our communities and our subsistence.

**Response**

Please see Response 0130-004.

**BPH-015** (Page 31)

MMS has not taken any action to address the adverse impacts to the human environment of our communities.

**Response**

Please see Response 0130-005.

**BPH-016** (Pages 31-35)

The above issues, among others, were noted and discussed by the Committee to Review Alaskan Outer-Continental Shelf Environmental Information, established by the National Research Council in the early 1990s. The NRC Committee published the report on its work in 1994. Reporting on the adequacy of information on impacts to the human environment, the NRC concluded that, 'MMS studies conducted in Alaska generally have not addressed changes that occur in local communities in response to "the potential" for OCS related activities.' In its recommendation addressing this conclusion, the NRC Committee stated.

"The real and often predictable and quantifiable socioeconomic consequences of leasing and exploration-phase impacts need to be described and addressed."

Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska." These are the footnotes that we've provided for references that have been used to address the NRC report.

The NRC Committee went on to conclude that, 'There is little evidence that systematic attention has been devoted to the fact that MMS can substantially ameliorate or exacerbate' the adverse effects of these changes. Thus, the NRC Committee recommended that MMS conduct a 'thorough analysis of whether or how alternatives to subsistence activities can be mitigated.' In the alternative, the NRC

Committee concluded that, 'MMS's decision-making documents should assume "worst-case" scenarios,' for example, 'that effects on subsistence may be unmitigable.'

The NRC Committee also noted that even with further research, MMS cannot fulfill its obligation to manage the sociocultural impacts that are occurring in Northern Alaska as a result of ongoing OCS oil and gas leasing, exploration, and development activity without revising its decision-making process for the siting of OCS oil and gas-related facilities, at least in Northern and Northwestern Alaska.

Among the items that MMS must consider to revising this process is the need for local communities to have an "active part" in the decision-making process and to have "real control over decisions that influence risks." As the NRC Committee correctly noted, the best (and perhaps the only) solution is for MMS, the industry, and the North Slope residents to attempt to reach agreement on the controversial matters and how they should be adjusted, remedied, or mitigated as specific times and places that various activities occur in lieu of or concurrent with additional studies.

The NRC Committee's recommendations regarding the mitigation of long-term impacts, including "cultural erosion" and over-dependence on oil and gas related revenues, or "over-adaptation" are consistent with the recommendations that the AEWC and the North Slope Borough have been making to MMS and NMFS in recent years.

According to the NRC Committee.…"NRC actually is the National Research Council."...among the obvious possibilities for mitigating those foreseeable effects (as well as for helping to create more positive effects) could be the creation of a trust fund.

Not one of these issues has been addressed by MMS. In the DEIS, the Corps reports that the "stipulation on Subsistence Whaling And Other Subsistence Activities" ensures that industry operators "coordinate siting and timing with subsistence whaling and other subsistence harvest activities." This is in the Liberty DEIS, page, Section III-C-85 and 86.

This statement is incorrect. No one has attempted to coordinate the siting, timing, or anything else related to the Liberty proposal with our community. We have been met with and told what is to happen.

**Response**

Please see Response 0130-006.

**BPH-017** (Pages 35 and 36)

Conversely, the Corps also notes that continuing oil development will disrupt our cultural activities, even though it doesn't cause "biologically significant" harm to a subsistence species' overall population. This is also quoted in the Liberty DEIS, Section III-C, page 87.

Furthermore, according to the Corps, "some resource populations could suffer losses or could be rendered culturally unavailable for use, causing potentially significant unavoidable effects on the subsistence harvest." This is also quoted in the Liberty DEIS, Section III-D-25.

Note that this statement contradicts the statement made by the Corps at page, Section III-C-81 and cited above at page 2 of these comments.

Again, none of these issues has been addressed, and statements by the Corps such as 'effects from these sources would not displace ongoing sociocultural systems, community activities, and traditional practices for harvesting, sharing, and processing subsistence resources' are nothing more than unfounded and insulting attempts to dismiss the impacts to our community. These are quotes from the Liberty DEIS, page V-49.

**Response**

Please see Response 0130-007.

**BPH-018** (Pages 36 and 37)

The Open Water Season Conflict Avoidance Agreements are not designed to address impacts to our community from OCS oil and gas production. Any references implying that this agreement might serve as a mitigation measure for OCS production are inappropriate. There are no mitigation measures in place to protect our community from the adverse effects of offshore oil and gas production.

The Corps states that BP is working with the AEWC to negotiate a Conflict Avoidance Agreement 'that would cover Liberty production. This is also quoted in the Liberty DEIS, page, Section 111-C-86.

This statement is not true. Furthermore, the Open Water Season Conflict Avoidance Agreement is designed to address noise and traffic issues during exploration. It does not address the much more severe impacts associated with offshore production.

**Response**

Please see Response 0130-008.

**BPH-019** (Pages 37 and 40)

The DEIS does not address bowhead feeding in the Beaufort Sea.

One extremely important issue ignored repeatedly by both NMFS and MMS is the fact that migrating bowhead whales feed throughout the Beaufort Sea. The AEWC understands that this is an inconvenient fact that the agencies would like to ignore. However, our whaling captains observe bowheads feeding as they migrate each spring and fall. Others have observed this as well. In addition, whales taken in all three fall bowhead subsistence whaling villages have food in their stomachs.

The following cites are taken from NMFS' current Draft Arctic Region Biological Opinion:

> "Sheldon and Rugh (1995:13) report some whales feed opportunistically during spring migration, and that the lead system may serve as an important feeding area." Page 11.

On another cite, or reference, to the W. Bodfish, a North Slope Borough report of 1981:

> "Bowhead whales [including females with suckling calves] apparently take their time returning westward during the fall migration... with some localities being used as staging areas due to abundant food resources...."

Another reference we have for A. Brower in U.S.DOI MMS report dated 1979:

> "Inupiat believe that whales follow the ocean currents carrying food organisms."

Quoted by Thomas -- quoted for Thomas Napageak for a Personal Community of Nuiqsut Whaling Captains Meeting, dated August 13, 1996. Another quote for Mollie Pederson on the USACE, 1996:

> "The barrier islands all along the Beaufort Sea coast are considered by local residents as important resource to the bowhead whale for use as staging and feeding areas."

Another reference:

"Some near-bottom feeding (evidenced by mud being brought to the surface) continued until the vessels were 3 kilometers away.... The most notable change in behavior apparently involved cessation of feeding when the vessel was 3 kilometers away."

This is from a report that was also referenced to the USACE on page 45. In another one, we're citing the survey data from the 1996-1998 seismic monitoring programs by LGL, that:

"Many aggregations of feeding whales were observed near or just shoreward of the 10-meter depth contour. We do not have enough evidence to know whether or not industrial activity for several years would keep bowheads from using an area, although possible abandonment of feeding habitat may be a concern."

Furthermore, in its 1988 ARBO.... That's the biological opinion for the Arctic Region. NMFS noted the following: "In the fall, both feeding and migration activities occur in the Alaskan Beaufort Sea. Certain areas appear to be regularly used for feeding and resting.... Bowhead whales have also been observed feeding north of Flaxman Island in outer Harrison Bay north and east of the Colville River plume and in the waters offshore of Smith Bay and east of Barrow. Depending on ice conditions and proximity to freeze-up, the bowhead whales appear to alternate feeding and westward migration activities, probably stopping to feed in areas containing suitable prey. In 1985, there was evidence of feeding while whales were traveling slowly westward and at times when they remained in specific areas."

From the Thompson report of 1986 and '87.

"From just these few references, it is abundantly clear that migrating bowhead whales feed as they move through the Alaskan Beaufort Sea. Furthermore, our bowhead subsistence captains -- based on their annual observations of bowhead behavior across many generations -- consider the Alaskan Beaufort Sea to be critical feeding habitat for migrating bowheads. This habitat issue is not adequately addressed in the DEIS."

**Response**

Please see Response 0130-009.

## PUBLIC TESTIMONY OF MAYOR JIM VORDERSTRASSE

**BPH-A02** (Page 45)

And I -- it is frustrating for us to have to come here time and time again to testify against it. It's so important. And to recap what Maggie said, we've got everything to lose and, really, nothing to gain from this. And I understand BP is here, and they've done an excellent job, I've got to say. And I commend you for the job you've done, and they really are trying hard. But it seems just really foolish to us to go offshore when you got all this land onshore to develop.

**Response**

Mayor Vorderstrasse suggests that offshore oil and gas exploration and development be stopped; he favors onshore development. The National Energy Policy, issued in May 2001, recommends both onshore and offshore oil and gas development in the Arctic. The MMS manages only the offshore portion. Only Congress can open some of the onshore areas, such as the coastal plain of the Arctic National Wildlife Refuge, to oil and gas exploration. They cannot be opened by administrative order of the Secretary of the Interior or even the President. It is beyond the scope of this project, the EIS, and the decisions related to this project, to evaluate other developments onshore in lieu of approving the Liberty Project.

Also, see Response 0130-A01.

**BPH-A03** (Pages 45 and 46)

And we would just like to see this -- and we know we're not going to stop this. Eventually, the oil companies are going to develop that oil. But I'd just like to see it wait 10 or 15 years. Maybe technology will increase. Maybe by then, we'll really need that oil. When you're having to pay Saddam Hussein $90 a barrel and we've pumped all our oil out, and then when we -- now, what do we do? And this is really a concern for us. And once again, I say we got everything to lose and nothing to gain, really.

And, Mr. King, I commend you on your report. I've got to say I haven't read it all. I scanned it, and I think it's ironic that your name's King because I think of Stephen King. And I thought for the money you paid for this.....

....by God, we could have had a write -- somebody that could really write a horror story that we're going to have here if we ever have an oil spill. And it'd certainly be a lot better reading, too.

But I just would like to go on to say we would really like you to wait 10, 15 years before you develop this oil, and look on land. I think it would be very wise of you to do so. And it's so important for the folks up here to protect that ocean. With that.....

**Response**

Mayor Vorderstrasse suggested MMS stop the oil companies from developing oil in the Beaufort Sea for the next 10-15 years, so that technology could advance further. The MMS is required to make a decision within 60 days after the issuance of the final EIS. That decision is to approve the project without modification; approve the project with modifications or conditions; or disapprove the project. The suggested delay of 10-15 years is essentially the same as the No Action Alternative, which is evaluated in this EIS in Section IV.B.

## PUBLIC TESTIMONY OF MR. CHARLES HOPSON

**BPH-020** (Page 50)

Anyway, before when they write those protocols, I think the Native community should be, you know, part of the scene so there can be some corrections made on the protocol. You know, we were looking for ice way out there when we should be looking at ice around the Northstar area, around the Endicott area where the oil spill's, you know, going to be, if there is any spills. But we're out wandering off in the ocean looking for these ice conditions. It's not right. You know, we're looking at the wrong place.

**Response**

Alaska Clean Seas has prepared new tactics for response in broken ice based on the results of the spring and fall trials. They have added a new tactic that has response vessels free-skimming (operating skimmers without booms) in broken-ice conditions. This gives the vessels greater maneuverability and the ability to move to areas where oil is concentrated without having to worry about the effects of the ice on their boom. We are well aware of the extensive knowledge and experience possessed by the North Slope residents, and the MMS encourages BPXA and Alaska Clean Seas to use this traditional knowledge of arctic ice conditions to enhance their spill-response planning.

The spring and fall trials also were intended to find the upper operating limits of the barge-based response tactic. Ice conditions in and around the Northstar island did not present the ice concentrations necessary to test the upper limits of the tactic. Future trials should be conducted in the areas where the facilities are located to give a more realistic view on conditions to be expected during an actual response action.

**PUBLIC TESTIMONY OF MR. ARNOLD BROWER, JR.**

**BPH-A04** (pages 55 and 56)

ANILCA is a federal law. You folks are the federal -- representing the federal government. The federal government has a federal trust responsibility to protect aboriginal rights interests. My rights. These people's rights. The right to live, the right to subsist, the right to land, and the pursuit of happiness. Just like the American system.

Having said that, now I want to go back to my own writing here. But I just want the federal government to know that. If you can't comprehend that and use that in your statement, you are under the authority of having these hearings to elevate our concerns, our comments to the proper agency so that our agents – your -- the federal agencies can address our concerns. As Maggie stated, as Edward stated, and Eugene stated, I'm not sure if this is my fiftieth statement, and I still haven't seen one dime of benefits, fundamental fund -- supplemental funding to come to ICAS or Native Village of Barrow.

**Response**

Mr. Brower is correct in his statement that ANILCA is a Federal law and that we represent the Federal Government. However, ANILCA *does not* apply to the Federal submerged lands offshore.

As the Federal Agency charged with the management of the outer continental shelf, MMS believes that it can and should be managed for multiple-resource use. Local residents can use the offshore waters for subsistence and others, such as offshore oil and gas development, can use it if there is adequate communication and planning. The MMS acknowledges how important whaling and hunting marine mammals for subsistence purposes offshore is to the Inupiat people. The MMS also acknowledges the rights of the companies that have purchased oil and gas leases from the Federal Government to pursue the development and production of oil and gas on those leases in an environmentally sound manner.

The OCS Lands Act does not include funding for local government or Federally recognized Indian tribes. Only Congress can appropriate funds generated by the OCS Program to provide income to fund federally recognized tribes. The MMS has worked diligently on various proposals for impact assistance and revenue sharing over the last 20 years that would provide outer continental shelf receipts to State and local governments. The last Congress enacted some of the provisions of the original CARA legislation, including some funds for State and local governments. The North Slope Borough will receive part of these FY 2001 funds, which will benefit the Inupiat people on the North Slope. As of late August, 2001, appropriations for FY 2002 were still pending for these provisions. See Response 0132-A04.

**BPH-021** (Page 59)

The boundary of the Inupiat Community of Arctic Slope is north of the Brooks Range mountains. We have an unextinguished claim of 35 miles of the Arctic Ocean, yet only the federal government and the State of Alaska are pulling strings against each other of which boundary of which -- which drill rig is on their waters. These are unextinguished claims, still in court, have never been settled. Is there a kitty, for example? Can you ask me if monies have been put in escrow in the event that ICS wins these in court?

**Response**

*Edwardsen V. Morton*, 369 F. Supp. 1359 (D.C.C. 1973) was for damages related to trespass on lands of the North Slope and did not include outer continental shelf lands.

There currently are no active cases before the courts that make this claim for outer continental shelf lands, and no escrow account has been established. The claims made by the State of Alaska relate to how the boundary between Federal and State waters is drawn (where is the 3-mile line?). The State's claim did not involve title to lands beyond their 3-mile boundary but contested only from what point that boundary was drawn and the methods used to determine the 3-mile line.

In *Native Village of Eyak v. Trawler Diane Marie, Inc.*, 154 F.3d 1090 (9th Cir. 1998), the court held that the United States has sovereign control and paramount rights on the outer continental shelf. The court concluded that a claim of exclusive rights in offshore waters conflicted with the Federal Government's interests, and the Native villages could not assert exclusive rights to use and occupy the outer continental shelf.

**BPH-022** (Page 59)

Well, I just thought I'd remind you folks what's been going on in the past because aboriginal Natives pass things on from generation on down the line. They don't forget. The *Edwardson v. Morton* (ph) case, an unsettled dispute. Is there an escrow account set up for that?

**Response**

Please see Response BPH-021.

**BPH-023** (Page 60)

Number five, social impacts are neglected during the assessment of impacts to our residents that hunt under the ANILCA rights to subsistence.

**Response**

Please ee Response 0146-014.

**BPH-024** (Page 61)

Mitigations are not funded for ICAS for our whaling deliberations when offshore activities affect the migration of bowhead whales when the oil and gas industry launches out to drill and explore for more oil. Now, that is over, it's still continuing, I know, but the production, when it goes to production and we must have those supplemental funds 'cause we're going to now deal with this year to year, season to season whether these things needs monitoring, investigating by our staff or not.

**Response**

Impact-assistance legislation was passed by Congress last year in Public Law 106-553, Section 903, *Coastal Impact Assistance*. This law amends the OCS Lands Act and provides for impact assistance funding to States with offshore oil activities. On May 17, 2001, the State of Alaska released a draft Coastal Impact Assistance Plan. Under the Federal program, called the Coastal Impact Assistance Program (CIAP), Alaska will receive a one-time appropriation of $12.2 million; $7.9 million is allocated to the State, and $4.27 million is allocated to eligible coastal communities. Uses of the fund must be consistent with the authorized uses in the CIAP legislation, including conservation, restoration, enhancement or protection of coastal or marine habitat, wetlands, watersheds and water quality; assessment, research, mapping and education; and implementation of Federal conservation management plans. The Alaska's draft CIAP Plan describes the State's and coastal communities' proposed uses for CIAP funds.

**BPH-025** (Pages 61 and 62)

Employment opportunities are not promised to our Inupiat people, and funds are needed to train and supplement our other work for our people from the oil and gas revenues. This causes social problems in view of the amount of work, employment, and benefits from oil and gas ventures on the habitat areas of the Inupiat people and the renewable resources on which we depend on for our nutrition and dietary needs. So under this Public Law 93-638, funding is -- vocational and educational training are funded, but they're not funded to train for specific oil and gas related jobs. They're trained for higher education, plumbing or local things. So that has to be supplemented.

**Response**

Please see Response 0146-016.

**BPH-026** (Pages 62-64)

Now, the following is an outline of funds required to supplement the 638 to better accommodate the impacts of oil and gas business within ICAS boundaries:

For a realty officer with travel, lodging, and meals -- this was a scenario put together real quick -- $85,000. That includes the salary of an individual that's primarily going to work on these issues with oil and gas related, the cost of going to Prudhoe Bay, the cost of doing other hearings with Nuiqsut, Atqasuk, Wainwright, or Kaktovik, those related travel.

For an EPA officer with travel, lodging, meals: $85,000.

Council and administrative time and review, at least four times a year, for our Council to even address these things. We're not designed for that. They -- we estimate $75,000.

Investigations and research: $65,000.

Employment and training programs: $100,000 for all villages.

Fish and wildlife management service, programs and service, including some research and documentations, we anticipate the cost $85,000.

Administrative office, other duties as assigned related to this, space for additional employees, and computers related to that particular job: $65,000.

Legislative, attorney, and lobby funds: $145,000.

Tribal Operations: $45,000 times eight villages is $360,000.

Oil spill response trainees, five in each village: $325,000. These five villages happen to be the ones, the shoreline villages. If we want -- if we needed more personnel, we can get the other two villages from Atqasuk and Anaktuvuk Pass.

Administrative officer assistant to MMS, who is a -- who would be the Administrative Officer to oversee certain things related to the project. I know that person, like NPRA has Administrative Officer, a technical supervisor that will work with that would be salaried at $55,000.

Rentals and utilities plus all those things related to travel, other things other than the personnel, would amount up to about $2,000.

Consultant fees for socioeconomic studies: $15,000. Consulting fees for habitat studies: $26,000.00. Consultant fees for audit and others would be $25,000.

So in a quick scenario, thinking of these things for cumulative impacts, for our operations, totaled to $1.4 million as the supplemental need for ICAS to address the year-long activities, ongoing activities, related to MMS and NMFS on our offshore and on our land in the Arctic Slope. This figure is configured on North Slope Borough rates at 1999 costs, extracted from a 1999 North Slope Borough budget book. ICAS needs these funds to stay in tune with current offshore and onshore oil and gas related events and activities. This funding supplement for ICAS Public Law 93-638 contract is needed to work with MMS and the federal government's venture for oil and gas from the Arctic Slope region of Alaska.

**Response**

Please see Response 0146-017.

**BPH-A19** (Page 64)

Even this moment -- even this moment – we've altered our own activities. We are suppressed from our daily preparations for whaling by this meeting just to accommodate MMS personnel that has come here to solicit our comments, concerns, and recommendations. Some of these guys over here should be supervising cutting that ugruk skin that they're sewing for the Umiat right now. But they have to suspend that activity to accommodate your meeting. It impacts us greatly. It might look like it's not -- it doesn't, but it does. That's why it has so much social problems around here now.

**Response**

Please see Response 0132-A04

**BPH-A05** (Page 66)

We continue to oppose oil and gas offshore, just like Liberty, but I do support Maggie's comments that there is -- directional drilling can be done from a shore-based thing because it's not that far. It's not in an unreachable location, from Lib- -- the Liberty Project from a shore-based rig.

**Response**

During the development of possible alternatives for evaluation in the Liberty EIS, the MMS studied developing the field from onshore, using extended-reach drilling (see Section I.H.5.a(2) and Appendix D-3). We found the alternative to be technically and economically not feasible. The costs associated with producing the field from onshore would exceed potential revenue; therefore, it is not a viable option and, in effect, it becomes the No Action Alternative.

**PUBLIC TESTIMONY OF MR. RONALD BROWER, SR.**

**BPH-A06** (Page 75)

Any oil spill that occurs in the Arctic will spread to other countries just by the natural flow of -- in the movement of the Arctic Ocean. And I think the Naval Arctic Research Laboratories have -- in their research, have proven that time and time again in the use of ice islands that rotated around the Arctic region. They come around Barrow going to Canada, past Greenland, past Falseborg (ph) into Russia, and when they get out of Russian areas, we hop them -- hop back on them. And that tells you that these -- the ice and the movement of the Arctic Ocean is rotating frequently. So it would have an international impact.

**Response**

Russia, Canada, Greenland, Iceland, Norway, and the United States (Alaska) border on the Arctic Ocean. In the center of the Arctic Ocean is an immense area of floating pack ice several hundred miles in diameter. The pack ice moves slowly in a clockwise direction, making a complete revolution around the top of the world every 10 years. The International Arctic Buoy Programme has been coordinating the systematic deployment of sea-ice-tracking buoys in the Arctic Ocean since 1979 and carrying out the systematic processing of the ice-motion (plus sea-level pressure and temperature) data acquired. The locations of buoys are determined by satellite using Service Argos. The precision and sampling rate of buoy position are adequate to resolve the large-scale features in the field of motion.

We would not anticipate that the oil spills analyzed in this EIS would have an international impact. Based on recent studies of current measurements, an oil spill at Liberty under the ice would be unlikely to move until spring breakup. This fact allows an opportunity for the oil to be cleaned up prior to the ice entering the larger ice pack. During open water the winds and currents would disperse the oil, and weathering further degrades the oil. Some small fraction of oil may circulate through parts of the Arctic as tarballs, but it is not expected that an entire oil spill could circulate through the Arctic.

**BPH-027** (Pages 75-77)

As I look through your proposal, I notice that you anticipate, over time here, small oil spills averaging to about 29 gallons of fuel. I assume, in reading your document here, offshore or onshore oil spills, we find 53 spills equalling to 29 gallons. That's small, but when you're looking at the large oil spills, this is one of the most dangerous effects that will -- (clearing throat) excuse me -- that will impact our marine mammal systems.

And I was looking at your -- the impact on the bowhead whale, reading,

> "Some of these whales likely would experience temporary non-lethal effects, including one or more of the following symptoms...."

Reading from your document: "...oiling their skin causing irritation."

It will not just cause irritation. It will remove and eat the skin of the whale. Look at what other oil spills have done to other animals, and that should be a clear lesson. It's been proven.

I don't concern too much with inhaling hydrocarbon vapors. That is also lethal. If whales are around this oil spill, and if they're entrapped in it, whales and other marine mammals certainly will die. And there's no question. Sea otters have proven that in the *Exxon Valdez* oil spill.

Ingesting contaminated prey kills any other living form, especially if it's oil.

Fouling of whale baleen of the bowhead whale certainly will kill that animal, not only by ingestion and poison, but also by starvation.

So these are not symptoms per se as they're described here. This document minimizes the true effect to be symptoms when they are, in effect, lethal and deadly. The only symptom we're going to see is a dead animal. And I think this is very wrong to minimize the potential impacts of a large oil spill.

**Response**

The effects of spilled oil on cetaceans, addressed in Section III.C.2.a(1)(b), is based on studies of the effects of oil on cetaceans other than bowhead whales. Existing studies on the effects of spilled oil on cetaceans, including studies conducted during the *Exxon Valdez* oil spill, were unable to document mortality to whales from an oil spill. Studies during the *Exxon Valdez* spill also were unable to document any major effect on Steller sea lions. Studies indicated the effects on sea lions ranged from inconclusive to a relatively low level of effects. However, many other species, particularly birds and marine mammals with fur such as sea otters, were very adversely affected by spilled oil.

**BPH-028** (Pages 77-79)

Looking at our sociocultural systems, your description of the effects on the -- of offshore oil development, including Liberty Project, you define it as having a minimum impact. But you also, in your document, miss a very significant public law, Public Law 104-270, which is the United States Congress Alaska Natives Commission and their report. And some of their -- and this report has been remanded for implementation to AFN. And so it's from there that I'm looking at this.

Subsistence is one of the most important things up here. And in this description, I read:

> "Alaska Inupiat Natives, a recognized minority population, are the predominant residents of the North Slope Borough, the area potentially most affected by Liberty development. Inupiat Natives may be disproportionately affected because of their reliance on subsistence food, and the Liberty development may affect subsistence resources and harvest practices."

There's no question about the impact. It will. There's no "may" to that question. And I read to you from the Public Law 104-270:

> "Protecting the subsistence hunting and fishing rights of Alaska Natives and other rural residents. The right to adequate food for oneself and one's family is a human right enumerated in the universal declaration of human rights of the United Nations charter. Moreover, the protection of aboriginal practice of subsistence hunting and fishing in Alaska is now the law of the land."

And I want to reiterate that:

> "Moreover, the protection of aboriginal practice of subsistence hunting and fishing in Alaska is now the law of the land."

And it is your responsibility, in this document, to protect our subsistence lifestyle here.

As noted by the Alaska Native Commission -- this is the United States Congress Alaska Native Commission:

> "Subsistence is a critical part of the larger historical question about the status, rights, and future survival of Alaska's aboriginal peoples."

In this case, us.

> "The economic and cultural survival of Native communities is the principal reason why Congress enacted its rural subsistence priority in 1980 by articulating the federal government's traditional obligation to protect indigenous citizens from the political and economic power of the non-Native majority."

And that is Liberty in this case.

**Response**

The MMS is aware of the Alaska Native Commission Report and its findings. We believe that disproportionate adverse effects could occur from potential disturbance factors from Liberty development. We believe that disproportionately high adverse effects could occur in the unlikely event of a large oil spill when impacts from contamination of the shoreline, cleanup disturbance, tainting concerns, and disruption to subsistence practices are factored together.

The MMS respects the Inupiat right to practice subsistence hunting and fishing and will work toward identifying, adopting, and enforcing all forms of mitigation that will remediate potential development impacts from the Liberty Project. See Responses 0130-003, 0130-A01, and 0130-006 for further discussion of studies and mitigation measures that MMS is pursuing in relation to Liberty development.

**BPH-029** (Page 79)

Title 8 of ANILCA constitutes a landmark of Indian law. Such congressional action was constitutional and appropriate, and it should be applied here. You know, without a State rural subsistence statute, Alaska is out of compliance with ANILCA and the requirements of federal law because Alaska's legislature has refused for 10 years now to submit to the voters a constitutional amendment that would allow a rural priority in state law.

**Response**

The MMS acknowledges the intent of ANILCA (in the words of the Alaska Native Commission Report) "to protect indigenous citizens from the political and economic power of the non-Native majority"; we also must point out that legal challenges have affirmed that ANILCA does not apply to the outer continental shelf. The MMS, in carrying out its management mandate of outer continental shelf lands, believes in a multiple-use policy that can develop oil and gas resources on the offshore; honor its trust relationship with tribes by protecting subsistence resources and Native peoples' rights to subsistence hunting and fishing; and develop effective mitigation for project impacts. See Responses 0130-003, 0130-A01, and 0130-006 for further discussion of studies and mitigation measures that MMS is pursuing in relation to Liberty development.

**BPH-030** (Page 79)

The federal government has taken over regulation and management of subsistence hunting and fishing on all federal public lands and waters. So when you look at that, you neglect a very important role of the federal government in its trust responsibility to the Inupiat people here as the indigenous inhabitants, and it is a serious oversight which should not be overlooked in your Final EIS statement.

**Response**

The MMS believes that it has not overlooked its trust relationship with the Inupiat on the North Slope. We feel that the Liberty draft EIS contains adequate analyses of biological and cultural resources. The Environmental Justice analysis has found that disproportionate adverse effects would occur from all potential disturbance factors from Liberty development. We believe that "high adverse" effects would occur from a large oil spill when impacts from contamination of the shoreline, cleanup disturbance, tainting concerns, and disruption to subsistence practices are factored together. The MMS respects the Inupiat right to practice subsistence hunting and fishing and will work toward identifying, adopting, and enforcing all forms of mitigation that will remediate potential development impacts from the Liberty Project.

See Responses 0130-003, 0130-A01, 0130-006, and BPH-033 for further discussion of studies and mitigation measures that MMS is pursuing in relation to Liberty development.

**PUBLIC TESTIMONY OF MR. FORREST D. OLEMANN**

**BPH-031** (Page 81)

And it reminded me of the numbers that were being thrown out here, that 100 percent, 95 percent. And in reviewing some numbers that the probability of 1 percent of a large spill happening here, I think needs to be better defined as to what parameters are you dealing with? Are you dealing with a hundred years of pumping and only one spill will occur? Or are you saying that two hundred years of pumping, one spill will occur?

I think there needs to be a better definition as to what 1 percent really means. And if that 1 percent occurs, is there a plan in place to establish and formulate and implement the plan that'll put monetary damage to what that 1 percent has caused.

**Response**

There is an estimated 1% chance of an oil spill greater than or equal to 500 barrels occurring and entering the water over the Liberty Project's lifetime (15 years). This means that if the project continued forever at the same conditions, one could expect one oil spill greater than or equal to 1,000 barrels every 1,500 years.

**BPH-032** (Page 81)

And in that plan, does the monetary payments go to -- directly to the people? Does it go to the tribal governments? Does it go to the municipal governments? What is that plan?

**Response**

The effects on Federal, State, and Borough revenue are explained in Section III.D.5.b(4) under Economic Effects and in Table III.D-5 in the EIS.

**BPH-033** (Page 82)

**MR. ARNOLD BROWER, JR**.: I'm thinking in your recovery of damages for an implication like that, that he's thinking of a scenario that happened in that 1 percent, the cost of damages. One billion dollars? And if so, is that for a single year or that you will be taking away from our subsistence way of life for one year? Because the quota is lost, and we won't be able to hunt marine mammals for a year under this -- a supplemental thing, that this can be -- I don't know if you can perceive it. Are you talking damages to be addressed?

**Response**

There are subsistence impact funds administered by the Coast Guard under the Oil Pollution Act of 1990 legislation that would be available to provide for subsistence-food losses, but no escrow accounts or trust funds have been established.

In 1994, the National Research Council suggestion that the MMS set up a trust fund for subsistence and sociocultural effects mitigation, but to date there has been no agency movement on such a policy mainly because OCS Lands Act legislation does not authorize it. Nevertheless, the MMS acknowledges the need for such funds and has actively promoted impact-assistance legislation as a way to mitigate some of the real and perceived impacts of oil development on the North Slope. In 2001, Congress provided coastal states with a one-time award of impact-assistance funds. Alaska received an appropriation of $12.2 million, of which $1,939,680 will go to the North Slope Borough. Congress, in the form of Representative

Young's CARA bill, is considering legislation that would make annual impact assistance funds from MMS drilling revenues available to coastal communities.

The MMS encourages the Alaska Eskimo Whaling Commission to address its larger concerns to the Alaskan congressional delegation who more appropriately can address such issues as trust funds and impact assistance.

**BPH-034** (Page 83)

**HEARING OFFICER**: But that's when that -- the rubber meets the road, so to speak, on that. With respect to the compensation if there is a damage from -- if there is damages from an oil spill, OPA '90, the Oil Pollution Act of 1990, is the principal vehicle. And I think there are some other vehicles, and I wish I were better educated on them, but I think that's the principal vehicle by which funds can be distributed to injured parties.

But I can't answer how and to whom. I can't answer, at this point -- we'll try to get answers so that we can have them in the FEIS. I can't answer the duration issue that you raised, Arnold. But we will seek those answers and attempt to get them in the FEIS.

**Response**

Generally, claims for all costs and damages resulting from an oil-pollution incident must be presented first to the responsible party or its guarantor (the guarantor is typically the company's insurer). The responsible party and its guarantor are responsible for establishing the procedures for submitting claims directly to them. The maximum amount of liability that is required is $150 million. However, this is only the required limit of liability. Often, the responsible party has insurance that provides for a far greater amount of liability.

In addition to seeking damages from the responsible party, the Oil Pollution Act of 1990 established the Oil Spill Liability Trust Fund (OSLTF) to respond to claims. This fund maintains a balance of $1 billion. Claims for damages for loss of subsistence use of natural resources, which is recoverable by any claimant who uses the natural resources that have been injured, destroyed, or lost may be submitted to the OSTLF. Any person who incurs such damage should first submit claims to the responsible party or guarantor. Based on the actions of the responsible party or guarantor with respect to the claim, the claimant may elect to litigate against the responsible party or submit a claim to the OSTLF. Under certain circumstances, the claimant may submit a claim first to the OSTLF.

A claim for uncompensated removal costs or damages (including those that are above what may have been collected from the responsible party) may be presented to the OSTLF after it is first presented to the responsible party or guarantor and if the following apply:

- the responsible party denies liability for the claim;
- full and adequate compensation is not available; or
- the claim is not settled by payment within 90 days after the date on which either the claim was presented, or advertising for claims was begun by the responsible party or the National Pollution Funds Center.

A claim for removal costs or damages may be presented first to the OSTLF, if the National Pollution Funds Center has advertised or otherwise directed claimants to submit claims directly to the OSTLF.

For information on submitting a claim and for copies of the booklet *Claimant's Information Guide*, contact: National Pollution Funds Center; United States Coast Guard, 4200 Wilson Boulevard, Suite 100, Arlington, VA 22203-1804; telephone: 800-280-7118.

Additionally, depending on the specific circumstances, Federal economic assistance may be available from the U.S. Department of Commerce and the Federal Emergency Management Agency and others who may offer grants or loans to aid economic relief.

The U.S. Department of Commerce, Economic Development Administration was created to generate jobs, help retain existing jobs, and stimulate industrial and commercial growth in rural and urban areas of the Nation experiencing high unemployment, low income, or severe economic distress. The Economic Development Administration works in partnership with state and local governments, regional economic development districts, public and private nonprofit organizations, and Indian tribes to empower communities to plan and implement locally and regionally developed economic development and revitalization strategies.

The Federal Emergency Management Agency Public Assistance Grants also may be available for areas when a formal declaration of disaster has been made.

Claimants need to coordinate these programs with the OSLTF claims program.

**BPH-035** (Pages 83 and 84)

**MS. AHMAOGAK**: Maybe in that line, while we're in discussion of that oil spill and the compensation section of it, AEWC, with our legal counsel, have been trying to understand how OPA '90 works. You have Minerals Management, within its compensation section, has 150 million cap on each permit that you -- like Northstar, the cleanup monies that are capped into there plus your compensation of -- for persons that are damaged by the oil spill who are commercial in nature within that OPA '90.

For that reason, the AEWC and -- have requested some kind of a insurance or a trust account to be set up for a community for protection of the culture and our traditions and our -- the bowhead quotas that we have. If we're not able to feed or go harvest our bowheads, then that somehow must be addressed. And maybe that's the reason why, in our AEWC comments, we have said that conflict avoidance issues and the OPA '90 did not clearly mitigate what we actually want as an insurance bond for the whaling communities.

**Response**

Please see Responses BPH-008 and BPH-034.

**BPH-036** (Page 84)

**MR. ARNOLD BROWER, JR.**: I just want to state for the record that ICAS also adopts that – Maggie's comments on OPA '90, but we feel that 150 million is inadequate and that while we desire to have a comprehensive socioeconomic studies funds so that we can come up with a more reasonable consensus on this of the implications of what happens if there is no more quota and we are suspended from aboriginal hunting.

**Response**

Please see Responses 0146-017, BPH-008, and BPH-034.

**PUBLIC TESTIMONY OF MR. BILL TEGOSEAK**

**BPH-037** (Page 88)

And in addition to that, of course, immediately after construction of the Northstar Project, there was an addition -- there was a request by Western Geo to do some seismic activity east of the Northstar

Project. And their request to circumvent federal law to do that seismic activity was presented to the Minerals Management Service to do seismic activity and to -- even up to the point of requesting permits for incidental take of the bowhead whale. I'm sure that some of you remember that. I did express my opposition to that to Kenneth Hollingshead and asked that he submit my comments to Donna Whiting in Washington, D.C. I have never heard anything back.

**Response**

Based on the information in the testimony, the MMS believes that Mr. Tegoseak is referring to a Western Geophysical survey conducted in 1998. The survey was conducted in both Federal and State waters in three areas: in the vicinity of Thetis Island, Cross Island, and Point Thomson. Besides a Federal permit, they operated under State and North Slope Borough permits. The laws and regulations under which these permits are issued require that the seismic operator conduct the survey in a way that minimizes conflict with subsistence hunting. These restrictions affect how and when seismic operators conduct their surveys.

**BPH-038** (Pages 89 and 90)

Government-to-government relations is something which is sovereign to tribes. You and I can't sit here as paid top guns to discuss the issues of offshore activity because we are not policy makers. We're paid to do this. The policy makers are people like my tribal President here and the twelve members of the Executive Board that makes up our regional tribe. Their counterpart is a higher-level liaison than any of you sitting here can fill. Nor can Albert Barros fill that position. The counterparts happen and government-to-government relations begin to exist when two bodies agree, through policy-making decisions, on certain factors that may affect the continuation of, in this case, the Liberty Project. We don't have that authority as paid servants in this case.

So I want to make sure that when Minerals Management Service comes here and says, 'Yes, we have conducted government-to-government relationships,' I want this organization, each and every individual, and particularly you people, to understand this is not government to government. When policy decisions are made, when higher-level senior liaisons from Washington, D.C., the Department of the Interior, sits down with the regional government of the Inupiat Community of the Arctic Slope, that is government-to-government relations.

(Continued from Page 95)

The government, the sovereign tribal government of the Inupiat Community of the Arctic Slope is when the Board members convene and when your policy makers come to that meeting and we make some decisions. It doesn't happen here because if you think that this is a government-to-government relation, then you pass on the mantle of governmentship, which is basically the mantle of tribal governments onto others that are not tribal members.

**Response**

The USDOI Regional Directors in Alaska, as agents for the Secretary of the Interior, are authorized to conduct government-to-government consultations with Alaskan tribes. The USDOI bureaus in Alaska can and have entered into contracts and agreements with Alaskan tribes under the auspices of the executive order on government-to-government relations.

This is not to say that the larger policy decisions are not made in Washington, D.C. We assure ICAS that its concerns do, in fact, reach the higher levels of MMS management in Washington, D.C. At the same time, we encourage ICAS to lobby at these higher levels of government to ensure that their tribal concerns are being addressed.

**BPH-039** (Page 91)

Yes. BP provided a 15-year plan for water use in the ice road construction to the Northstar Project. And in any case, the plan, in itself, did not work simply because BP used up the State's allocation for BP, the numbers of gallons that were needed for a fifteen-year period, over a two-year period. In essence, BP will have to determine exactly how much more water is going to be used during the dur- -- during the life span of the Northstar Project.

What we are saying here is that BP has forced the State to reconsider how the State will regulate temporary water use permits and construction of ice roads. Essentially, BP did not comply with State regulations in terms of providing environmental assessments in those areas where water was extracted. That has to happen. These are State requirements; BP must comply with those. That didn't happen. So these are things that need to be discussed in terms of protecting the interest of the Arctic Ocean that our people depend on for subsistence.

**Response**

Please see Responses 0135-087, 0135-086, 0135-088, 0135-089, 0135-100, 0135-101, 0135-102, 0135-103, and 0135-104.

**BPH-040** (Page 92)

Now, if Northstar can't be cleaned up, if there is no contingency plan, how do you plan to address any spill, accident on either McCovey or Liberty? Presently, there is no cleanup plan. You don't have the technology to do this. It doesn't exist.

**Response**

BPXA has submitted an amendment to the Northstar oil-spill-contingency plan to the State of Alaska, Department of Environmental Conservation and the MMS.

**BPH-041** (Page 93)

And keep in mind that a community such as Nuiqsut was deeply offended that a subcontractor for an oil industry would request a circumvention of federal law so that seismic testing could be done right in the middle of their only whaling season during that year. I want to make sure that it's very clear that this community, that all the other eight communities, are completely against offshore activity because there is no cleanup plan. If you do have one, I want to hear about it now.

**Response**

Please see Response BPH-037.

**PUBLIC TESTIMONY OF MR. GORDON BROWER**

**BPH-042** (Page 96)

Having watched those for a number of years, and the amount of oil spills that occurs out in the oil fields is something I've seen over the time I've been in Planning. And oil spills at the -- the size ranges that are predicted to happen, 29 gallons, or another scenario of some sort, I think those are downplayed too much to try to minimize and make an acceptable EIS. When you have this kind of event on land that happens, things that you can inspect, things you can see, and a lot of them deal with human error, a lot of them deal with equipment failure, valve failure, and corrosion and stress on pipes.

**Response**

The 29 gallons the commenter cites is the mean size of a small refined oil spill on the Alaska North Slope. The draft EIS estimates there will be approximately 53 small refined spills of this mean size. In addition to refined small spills, the MMS evaluated small crude oil spills. The MMS also analyzes large oil spills of various sizes ranging from 925-200,000 barrels in the EIS.

The MMS evaluated the distribution of spills less than 500 barrels for the time period 1989-1998. For purposes of analysis, we assume the following spill sizes:

**Offshore or onshore crude oil:**
- 17 spills less than 1 barrel and
- 6 spills greater than or equal to 1 barrel and less than 25 barrels.

**Onshore or offshore refined oil:**
- 53 spills of 0.7 barrels each (29 gallons)

We use the history of crude and refined oil spills reported to the State of Alaska, Department of Environmental Conservation and the Joint Pipeline Office to determine crude and refined oil-spill rates and patterns from Alaska North Slope oil and gas exploration and development activities for spills greater than or equal to 1gallon and less than 500 barrels. Refined oil includes aviation fuel, diesel fuel, engine lube, fuel oil, gasoline, grease, hydraulic oil, transformer oil, and transmission oil. The Alaska North Slope oil-spill analysis includes onshore oil and gas exploration and development spills from the Point Thompson Unit, Badami Unit, Kuparuk River Unit, Milne Point Unit, Prudhoe Bay West Operating Area, Prudhoe Bay East Operating Area, and Duck Island Unit.

The Alaska North Slope oil-spill database of all spills greater than or equal to 1 gallon is from the State of Alaska, Department of Environmental Conservation. Oil-spill information is provided to the State of Alaska by private industry, according to the State of Alaska Regulations 18 AAC 75. The totals are based on initial spill reports and may not contain updated information. The State of Alaska, Department of Environmental Conservation database integrity is most reliable for the period 1989-1998 due to increased scrutiny after the *Exxon Valdez* oil spill (Volt, 1997, pers. commun.). For this analysis, the database integrity cannot be thoroughly validated. However, we use this information, because it is the only information available to us about small spills for the North Slope of Alaska. For this analysis, the State of Alaska, Department of Environmental Conservation database is spot checked against spill records from ARCO Alaska, Inc. and British Petroleum, Inc. All spills greater than or equal to1 gallon are included in the dataset. We use the time period January 1989-December 1998 in this analysis of small oil spills for the Liberty Project.

A simple analysis of operational small oil-spills is performed. Alaska North Slope oil-spill rates are estimated without regard to differentiating operation processes. The State of Alaska, Department of Environmental Conservation database base structure does not facilitate quantitative analysis of Alaska North Slope oil-spill rates separately for platforms, pipelines, or flow lines. The average small crude oil-spill size on the Alaska North Slope is 2.7 barrels, and the median spill size is 5 gallons. For purposes of analysis, this EIS assumes an average small crude oil-spill size of 3 barrels. The causes of Alaska North Slope small crude oil spills, in decreasing order of occurrence by frequency, are leaks, faulty valve/gauges, vent discharges, faulty connections, ruptured lines, seal failures, human error, and explosions. The cause of approximately 30% of the spills is unknown. The typical refined products that spill on the Alaska North Slope are aviation fuel, diesel fuel, engine lube oil, fuel oil, gasoline, grease, hydraulic oil, transformer oil, and transmission oil. Diesel spills on the Alaskan North Slope are 61% of refined oil spills by frequency and 75% by volume (USDOI, Bureau of Land Management and MMS, 1998).

**BPH-043** (Page 97)

And just an example, the recent oil spill at Drill Site -- or D-Pad and Drill Site 7, even Drill Site 4, the injection well, one of them -- I think D-Pad, in excess of 11,000 gallons spilled. And, you know, it's just a good thing it's onshore because you can clean that up. And the Drill Site 4 injection well, where injection wells are actively taking place to get rid of drilling muds and all that stuff and putting them down-hole, and a large amount of spilled mud and cuttings occurred again there. And in a short period of time, it's just -- to say that they're -- they do occur. These are not something that, you know, you use statistics to determine the probability of a spill to occur.

**Response**

The following two reports are examples the commenter cites. These spills are typical of small spills that occur on the North Slope of Alaska from oil and gas activities. The MMS defines small spills as less than 500 barrels. The average and mean are 3 barrels and 0.7 gallons, respectively, for the Alaska North Slope oil and gas facilities and pipelines. The MMS agrees with the commenter that we do not define statistics for small spills but assume small spills will occur from oil and gas operations. Section III.D.3 describes the number of small spills the MMS estimates and the impacts to environmental and social resources, and Appendix A describes the method for determining the numbers and sizes of small spills.

**Drill Site 7, Well #8**
*Time And Date Of Report:* 11:30 a.m. March 7, 2001
*Time And Date Of Next Report:* N/A
*Location:* BP Eastern Operating Area Facility, Prudhoe Bay
*Type And Amount Of Product Spilled:* 345-gallons of crude oil as estimated by BPX and confirmed by the Alaska Department of Environmental Conservation.
*Cause Of Spill:* The FMC valve on the well tree was badly eroded. Eight hours prior to the release, the well was shut in causing an increase in the wellhead pressure. It is assumed that this increase in pressure is what caused the thinned wall of the valve to fracture and release oil.
*Time And Date Of Spill:* BP discovered the spill at 7:40 p.m., February 19, 2001.
*Potential Responsible Party (Prp):* British Petroleum Exploration, Alaska
*Current Situation:* Most of the crude pooled around the well house and ran into the reserve pit. A much smaller unknown quantity of crude misted from the well house covering a large area of the pad in the reserve pits. Some oil misted onto impounded surface water. Pooled oil has been removed using front-end loaders and hand tools. Contaminated gravel was included in the removal. Oil that was misted on the snow was removed by hand. During well closure the well began developing head pressure after the kill fluid was injected. BPXA prepared a second kill fluid of drilling mud followed by concrete. No further well problems were noted.
*Future Plans And Recommendations:* The Alaska Department of Environmental Conservation has requested that BP submit a plan for decommissioning Well house # 8. Further cleanup will be assessed based on the sample results. BP and the Department of Environmental Conservation are continuing investigation on the development of any necessary preventive measures.

**Incident Name: GC1 Flow Line Release**
Sitrep#: 9
Spill Number: 01399905002
Ledger Code #: 14930260
*Time And Date Of Report:* 3:45 p.m., March 27, 2001.
Time And Date Of Next Report: As the situation warrants

*Location:* BP Western Operating Area Facility, Prudhoe Bay
*Type And Amount Of Product Spilled:* BP estimates 11,550 gallons of crude oil and methanol was spilled.
*Cause Of Spill:* A rupture in D86, a 6" high-pressure flow-line which runs from D pad to Gathering Center 1 (GC1). The most likely cause of the rupture is an ice plug that developed in the line due to an unexplained perimeter valve closure on December 1, 2000. It was not noticed that the valve was closed until December 5, 2000. BP believes that the line actually ruptured somewhere around that date. The release was not noticed until 2/20/01 when a contractor pumped 9450 gallons of hot crude oil and 2,100 gallons of neat (pure) methanol in the line in an attempt to melt the ice plug.
Flow lines are multiphase transport lines that carry unprocessed fluids from the drill sites to a gathering station.
*Time And Date Of Spill:* 2:25 am., February 20, 2001
*Potential Responsible Party (Prp):* British Petroleum Exploration Alaska
*Current Situation:* The spill site (35,000 square feet) consists of mostly ice and some tundra. The entire site has had the snow removed and the surface scraped. A total of 11,886 gallons of liquids (crude oil, methanol, and water) has been recovered with a vacuum truck since the cleanup began. A total of 8,581cubic yards of snow and ice has been removed. By drilling with a power auger, it was discovered that the crude methanol mix followed both vertical and horizontal cracks in the ice. BP is currently removing all ice from the spill site. Small jackhammers are being used to loosen ice under the flow-lines and an excavator will be used in the open areas. The deeper portions of the spill site (3-4 feet of ice) were not frozen into the bottom of the lake. A total of 1,344 gallons of contaminated water was removed from drill holes at the ice-lake bottom interface. As the lake bottom is exposed, it is refreezing. Soil removal is not planned at this time.
A trench has been dug with a Ditch Witch around the spill site to delineate the extent of the contamination in the ice.
*Future Plans And Recommendations:* It is expected that the ice removal will be completed by March 31, 2001. At that time an evaluation of the remaining contaminant (both visual and site sampling) will be completed. BP will submit a plan to the Alaska Department of Environmental Conservation for Lake Protection based upon the results of the site evaluation.
*Weather:* -5 degrees Fahrenheit, calm winds, hazy.
*Unified Command Personnel:* Incident Commander, Jim Chatam; Federal On-Scene Coordinator, Carl Lautenberger; State On-Scene Coordinator, Ed Meggert; Field State On-Scene Coordinator, Walt Sandel.
*For Additional Information Contact:* Tom DeRuyter, State Of Alaska, Department of Environmental Conservation (907) 451-2145.

**BPH-044** (Page 97)

And I think those shouldn't be used to downplay a scenario, even if you have alternatives. You're -- the pipe that you're going to put this in is going to be unseen. It's going to be buried in a trench. It's going to be -- you won't be able to physically inspect this pipe. There's going to be questions in the EIS concerning the pipeline route, how are you going to bury it, the depth you're going to bury it. And equal number of concerns with transition zones, from where it's stable thaw to the permafrost and the stress related to that. And some of those are factors in where a pipe can be sheared with that kind of stress load on pipes.

**Response**

This comment actually raises several concerns.

The first concern is that the pipeline will be buried and, therefore, cannot be physically inspected. It is true that the pipeline will be buried, as are the vast majority of pipelines in the world, and that it cannot be easily visually inspected. However, by using inline inspection tools (for example, smart pigs), it can be physically inspected.

There are three different tools that will be run on the proposed Liberty pipeline: a caliper pig, a geometry pig, and a wall-thickness pig. The caliper pig can determine if the pipeline has been dented or has changed its round shape. The geometry pig can determine the current position of the pipeline, which will tell if the pipeline has moved because of thaw settlement, ice gouging, strudel scour, or upheaval buckling. The wall-thickness pig can determine if the pipeline has been gouged, if corrosion pits are forming on the pipeline, or if cracks are forming in the pipeline. More discussion on the proposed pigging program for the Liberty pipeline can be found in Section II.A.1.b(3)(c)2) of the EIS.

The fact that the pipeline cannot be seen should not be a source of major concern, because the inline inspection tools can tell much more about the condition of a pipeline than the human eye can. For example, the human eye cannot detect damage on the inside of the pipeline or small cracks in the pipeline that have not penetrated through the outer wall.

The next concern deals with the selection of pipeline route and burial depth. The proposed pipeline route was chosen because it avoids the areas of highest strudel-scour risk, the areas in front of the mouths of rivers in Foggy Island Bay. The burial depth and method were chosen to address concerns related to ice gouging, strudel scour, and upheaval buckling. The pipelines in the various pipeline alternatives considered in the EIS behave differently with respect to the three concerns that govern burial depth. For this reason, some alternatives require deeper burial depth than others and/or may require using gravel backfill or gravel mounds to hold the pipeline in place. As part of the joint technical review process by the MMS and the State Pipeline Coordinator's Office of the pipeline right-of-way, all aspects of pipeline design including route, burial depth, and backfill material will be more thoroughly reviewed and, if necessary, design changes could be required.

The final concern deals with how the pipeline behaves in the area where it transitions from nonfrozen material to permafrost. This is another area where the applicant has done a significant amount of work, and the joint review team will look at it in further detail when a final pipeline design and route are selected. It is not uncommon for a pipeline to be laid partially in unfrozen soil and partially in permafrost. The forces that can be applied to a pipeline in these areas are well understood and can be accommodated through proper design, which will be looked at by the joint review team.

**BPH-045** (Pages 97 and 98)

And strudel scour is another one of those associated with deterioration of the covered pipe, where it may propose the pipeline to come up out of its trench, raised up. And I had proposed a question during one of the Liberty meetings in Anchorage. Suppose that happened, a strudel scour occurred, you're in a delta area where there's current, there's river drainages in the area that propose currents on the area to be trenching, and that you did not detect the strudel scour and the pipe was raised above maybe about two or three feet. And BP wasn't able to detect that because it was still underground in the trench.

**Response**

This comment raises concerns about the threat posed by strudel scour and the possible effects to the pipeline. This concern is being dealt with in two ways by the applicant. First, the pipeline has been routed away from river deltas to minimize the exposure to strudel scour.

Second, the applicant has several methods at its disposal to detect pipe movement. These include using sub-bottom profilers along the pipeline route to determine the amount of soil covering the pipeline and using geometry pigs to determine the position of the pipeline. Both of these methods would determine if the pipeline had moved as result of strudel scouring. The applicant has committed to conducting investigative work to determine if the pipeline has been affected by a strudel scour, if they see or suspect that a strudel scour had occurred along the pipeline route.

**BPH-046** (Page 98)

And it went unseen for the next year, and then the freeze-and-thaw cycles that occur start to create the freeze-down, you know, ice freeze down to about four or five feet over the year, and then you have the stress created from frost. You know how a pop can will freeze and can -- that kind of effect. Those are some of the concerns that would lead to the questions on the subsistence related impacts that would occur. So it's not just manmade, it's also nature in itself that proposes stress related potentials to happen.

**Response**

The pipeline will be operating at a fairly high temperature and will create a thaw bulb to a depth of 36 feet or more. Due to the large size of the thaw bulb, it is unlikely that the soil adjacent to the pipeline would refreeze due to the freeze/thaw cycle during normal operations. If the pipeline were to be shut in long enough for the soil to refreeze adjacent to the pipeline, the oil would be flushed from the pipeline and the pipeline filled with an antifreeze material, preventing damage to the pipeline due to freezing of the fluid inside.

Therefore, freezing of the fluids inside the pipeline is not a major concern. During normal operations, the soil around the pipeline would not refreeze; and during extended shutdowns, the oil in the pipeline would be replaced by an antifreeze mixture.

**BPH-047** (Pages 98 and 99)

And other factors that I was thinking about as I was listening to people make their testimonies here, and which I thought I need to come up here and talk a little bit about what I've seen out there, and there is not just the whale that's there. Provided that Liberty is inside the barrier island, the potential for oil spill exists, the migration, annual migration, of the fisheries that occur in the Colville River Delta are one of those that were of concern. The causeways made a concern of that; eventually, breaching had to occur at West Dock, East Dock for these young-of-the-year fish that spawn in McKenzie Delta and then come back as fish fry to grow up in the Colville River. Those are very vulnerable at that stage, the fish fry, because they only spawn in the McKenzie, the arctic cisco, and then harvested and grow up in the Colville Delta.

**Response**

While a large oil spill may affect fishes by altering migrations, the possibility of these migrations being blocked is considered unlikely. This is due to (1) the size of the delta area; (2) the unlikelihood of oil blocking all possible migration routes; and (3) the unlikelihood of oil remaining long in areas where water movement is dynamic, such as along the Beaufort Sea coast and at the mouth of major rivers. While fishes within the influence of a large spill are likely to be affected by it, including the possibility of having their migration routes temporarily altered, sublethal effects are considered much more likely to occur.

**BPH-048** (Pages 99 and 100)

The other questions I have are all the talk about the three-barge systems. That -- I was on those barges, the same as Charlie Hopson and some other Native whaling captains, to see the effectiveness of three-barge system that was going to be incorporated and sold as an idea to develop the Northstar, and also written into the North Slope Borough ordinance for the Northstar to be approved. And right now, the Northstar is running on a compliance order by consent, just hinging on its plan.

And that plan is very little, I think, because it's based on restricting only seasonal drilling. That plans should be based on the overall production when the oil is actually flowing underneath, that you should have a viable plan that works, not just to restrict the drilling activities in a broken ice condition. You should have a plan that works during the production phase, to be able to respond. Those are some of the concerns.

I think the Draft EIS is asking for the Native communities to give a compliance order by consent to approve a -- and listen and make comments on the Liberty Draft EIS just because there is no system at this point. The idea of selling a three-barge system, which was quoted somewhere between 30 percent and 60 percent ice coverage to be effective in cleaning spilled oil out in the Gwydyr Bay where Northstar is, and when all said and done, it's very difficult to even clean 10-percent ice conditions out there, not even being effective because machinery and all that kind of stuff being able to get out there in the first place was a problem. So I would think there are major problems with that and that you guys need to recognize that.

**Response**

Please see Response 0145-012 for broken-ice response issues.

**PUBLIC TESTIMONY OF MS. VERA WILLIAMS**

**BPH-049** (Page 109)

I was looking at the map earlier, just going with my hand, pivoting my hand. You know, as far as it could go, it seemed like words going on a straight line. It's the farthest distance, but if I moved it this way, you had less than three-quarters left over in one direction. I was trying to figure out why you'd have it at the longest length possible in the water instead of trying to go through the land, the closest. I mean, that was one area that I noticed when I looked at the map.

**Response**

There are shorter routes for the pipeline to reach shore, but the route selected by the applicant is the shortest route that avoids the strudel-scour hazard associated with crossing or coming to shore in a river delta. Because strudel scour is the major environmental hazard to the pipeline in the project area, it is prudent to select a pipeline route that avoids this hazard to the greatest extent possible.

**BPH-050** (Page 110)

And the thickness is what you talked about. And I was just kind of putting notes together and then trying to figure out, question, question, question. Diodes, pipe thickness, and then I just said is there something wrong with the zinc that's on the pipe where the diodes would be more dangerous if it was double? Or.....

(Continued from Page 111)

HEARING OFFICER: .....zincs in action with the pipe doing their cathodic protection thing, is that harmful to the environment, to species in the environment? And the other, I thought, was a question about cathodic protection of an inside versus an outside pipe issue.

**Response**

Zinc is the metal used for cathodic protection to metals in pipelines, boats, boat motors, pilings, etc., in the marine environment. In most applications, the zinc anodes are exposed to the water; however, for the Liberty Project the pipeline, including the zinc cathodes, are buried 7 feet below the surface. The pipeline will be covered with fine-grained sediments, which have a large active surface area available for adsorption of matter containing trace metals; these sediments also limit the dispersion of interstitial waters. Zinc ions that are released as a result of the cathodic reaction likely will be adsorbed by the sediments and not enter the overlying waters. As noted in Table VI.C-3e, zinc concentrations in the sediments are below the Effects Range-Low and Screening Level values. Given its low level in the sediments, the addition of zinc from the cathodes to the sediments probably will not increase the concentrations to levels that are toxic to benthic fauna. However, monitoring of the sediments overlying the pipeline could be undertaken in the future, if there are reasons to believe substances from the pipeline may be adversely affecting the environment.

**BPH-A07** (Page 114)

You know, you talked about the mouth of the river? I know there are sedi- -- you know, sediments, all types of sediments in the front of the river. Anyway, if there's an oil spill, how do you clean the oil when it starts going through the sediments?

**Response**

The cleanup of sediments would be the last phase of oil-spill-cleanup actions. There are a number of methods for dealing with contaminated sediments. One method is to physically remove the sediment by dredging or excavating. Another method would be to leave it in place and let nature clean the area, because removal activities would be more detrimental to the environment; and they also would encourage bioremediation by applying fertilizers or other nutrients to accelerate the decomposition of the oil by microbial organisms. The method selected to deal with these sediments is based on where the sediments are located, (for example, a fast-moving stream, protected beach, high-energy beach) and how heavily contaminated the area is.

The area would have to be evaluated to determine what effects the oil would have on the organisms living in the area and what effects removal actions would have on those same organisms. In areas where there is fast-running water or forceful tidal changes, it may be best to let those forces flush the sediments of the contaminant. When there are slow-moving streams and heavily contaminated sediments, removal may be the best option to limit the effects on the biota. If there are protected beaches and marshy areas, the oil would be removed as much as possible from the surface, and the organisms in the soil would break down the oil remaining in the sediments. Applying fertilizers to foster the growth of these organisms and speed up recovery of the area would assist this natural remediation. In marshy areas, a spill response can have a more devastating effect on the environment than leaving the oil in place. Efforts would be made to remove what is floating on the surface, and any oil remaining in the sediments would be left in place to degrade naturally. Response activities would tend to work the oil into the sediments and kill the roots of the plants in the area.

**BPH-051** (Pages 115 and 116)

I know earlier they talked about escrows and funds and fundings and stuff like that. You know, I think I testified about 10 to 15 years ago. I don't know which project it was. And I asked the question, if I'm hungry, how are you going to feed me? And my Uncle Eddie, Eddie Hopson, had gone back on the mike and said, 'Did you hear what she said? She's asking how are you going to feed me if the whale is gone?' I won't get satisfied with that food from the store because I'll need thousands and thousands and thousands of dollars to satisfy myself.

I know Eskimo food satisfies me right away. It stays in my body for a long time. But if I have something from the store, steaks, whatever, I'll get hungry. I mean, in another hour, I'll get hungry. I'd want to eat some more. But if I have my Native food, sometimes I won't get hungry for 10 hours. That's what I had asked. And when I heard escrow accounts, you know, what are you guys willing to do? What are you going to have them do to put an escrow account?

Are you going to have that justified enough for -- to feed the people that – there's not just us here. There's people all over. I mean, our children. I mean, our children's childrens are going to be coming, and if we don't have that -- you know, that kitty somewhere, who's going to -- our way of life won't even survive.

And MMS, I mean, it's like a big cry-out of me for someone for in the future. I mean, think about it. You're going to have to think about it. This culture's going to go pretty soon. I mean, in order to save a culture, you should respect the people also. Thank you.

**Response**

The MMS acknowledges the importance of subsistence food and the impossibility of replacing it with store-bought food. We believe that the best deterrent to any disaster is to build facilities and pipelines that will withstand the rigors of arctic ice and weather forces and to provide mitigation and conflict avoidance agreements that minimize any development impacts. Still, nothing is foolproof, and there must be contingencies for oil spills. There are subsistence-impact funds administered by the Coast Guard under the Oil Pollution Act of 1990 legislation that would be available to provide for subsistence food losses, but no escrow accounts or trust funds have been established.

In 1994, the National Research Council suggested that MMS set up a trust fund for subsistence and sociocultural effects mitigation; to date, there has been no agency movement on such a policy mainly because Outer Continental Shelf Lands Act legislation does not authorize it. Nevertheless, the MMS acknowledges the need for such funds and has actively promoted impact-assistance legislation as a way to mitigate some of the real and perceived impacts of oil development on the Slope. In 2001, Congress provided coastal states with a one-time award of impact-assistance funds. Alaska received an appropriation of $12.2 million, of which $1,939,680 will go to the North Slope Borough. Congress, in the form of Representative Young's CARA bill, is considering legislation that would make annual impact assistance funds from MMS drilling revenues available to coastal communities.

The MMS encourages the Alaska Eskimo Whaling Commission to address its larger concerns to the Alaskan congressional delegation who more appropriately can address such issues as trust funds and impact assistance.

## PUBLIC TESTIMONY OF MR. FREDERICK TUKLE, SR.

**BPH-052** (Page 121)

With regard to the Liberty and Northstar Project, one of the real strong concerns I have is these flare pits that you guys have on top of those, these rigs that you guys are building out there. When these flare pits go off on these offshore rigs, I started noticing in 1987, well, when we were -- when a whale is caught at Cross Island, what I've noticed when we were hauling our whale meat to the -- to this Endicott and to West Dock is that, consistently, these flare pits, they don't burn all the oil. When the pipeline is shut down, you guys are aware that these flare pits, you know, they shoot up. They're consistently dripping oil.

I first noticed, with my whaling captains in Nuiqsut around -- year around that that oil is consistently -- we noticed from three miles out of Endicott. There's oil consistently, year around, dripping into the vicinity of our whaling village in Nuiqsut. I've addressed this with -- I've tried to address this with BP over a period of time. And with more offshore leases occurring, I'm very concerned about these flare pits, is number one.

**Response**

Flare towers are an integral part of each offshore oil and gas platform or island for safety, so that any large unplanned emission of natural gas that may occur is burned, rather than emitted in the atmosphere where, if it were ignited, it could cause an explosion. These events can happen when pipeline or production facilities need to be shut down. These flaring operations are designed and constructed for natural gas, and no oil products or liquids are every injected into the flaring operation; therefore, oil residue cannot be created. Normally, flaring associated with the island results in total combustion and leaves no residue, which could enter the marine environment.

The design of facilities related to the flaring of gas on the Liberty Project would not allow oil to enter the environment.

**BPH-A08** (page 122)

I've whaled from Kaktovik to Nuiqsut to Barrow, and I'm one of the few people that has seen the currents along the coast. With regards to the Liberty, with the ocean currents that I've observed between Kaktovik, Barrow, and Nuiqsut, that Liberty Project that you guys are on is one of the strongest currents I ever seen on a slope between here and Barter Island. I stand with my -- our people when they talk about that there's no proven technology to clean up a spill.

**Response**

Information from this part of the testimony has been incorporated into Section VI.C.5 Oceanography of Foggy Island Bay and Section III.C.3.l.

**BPH-A09** (Page 123)

I also have very close contacts with ACS supervisors in Deadhorse. When this Northstar, they did some mock oil spill response during the winter. And I happen to know firsthand during white-out conditions, nothing was able to work. When the ACS supervisors went on scene, they didn't anticipate these white-out conditions to occur. They was not able to do anything. They were bewildered what to do, and then how to clean up this spill. The result was nobody came up with a answer to clean up this spill.

(Continued from Page 126)

These noise impacts, the gas dripping on the ocean year-around. ACS, this main group that you guys depend on for oil spills, the supervisors even admit to me -- I became friends with them -- that they have no way to clean this up. And what I'm requesting with regards to these flare pits is that before this Northstar and Liberty get on line, is they monitor what this gas is doing right in the ocean, that that has to be. It's been going on ever since Endicott started, and now they're -- now it's going to accumulate right in our area.

(Continued from Page 129)

And when I come into these meetings -- when I'm not at these meetings, I'm hunting in the Prudhoe Bay area. And with regards to these flare pits, I'm requesting that, immediately, that these flare pits be monitored. I'm very glad that I got to see, when the ocean was flat and there was absolutely no wind, that I got to see the gas dripping. From three miles out, we started noticing these spots. By the time we reached Endicott, it's a blue color of gas, consistently all year-around, dripping.

**Response**

Oil-spill response would not be possible during blizzard whiteout conditions. When weather conditions prevent human activities, tracking an oil spill by mechanical means, such as deployment of buoys in broken-ice or open-water conditions, becomes the method of choice. Once weather conditions permit outside activities, the responders would locate the beacons and return to oil-recovery operations. The Oil Pollution Act of 1990 and MMS regulations do not require that spill-response activities continue in extreme weather conditions such as hurricanes or blizzards. Because BPXA has chosen to operate in an arctic climate, they must be prepared and able to respond in all but the most extreme weather conditions.

**BPH-053** (Pages 123 and 124)

I'm very gravely concerned. I felt compelled to come up here 'cause of my 15 -- my observations of the Prudhoe Bay fields since 1973. These -- the other concern I have is these ships that supply the oil fields. There's a number of times that I've run into these ships right in the migration of the whale path. There were a good several times that while we were carrying live bombs that we've chased a whale right in front of the ship.

**Response**

Various industry companies are part of the annual open water Conflict Avoidance Agreement, and such events as that described by the commenter should not happen. Among other things, the Conflict Avoidance Agreement includes requirements for a communications network to track all vessels in the area. Based on the 2000 annual agreement, industry is required to fund a Communications System Coordination Center in Deadhorse staffed by Inupiat operators from Nuiqsut and Kaktovik. The agreement also requires industry to provide satellite telephone communications between the communications center, Cross Island, Nuiqsut, and Kaktovik. Industry must provide 8 all-channel, water-resistant VHF radios for Kaktovik subsistence-whale hunting boats plus 1 for the search and rescue boat and 12 for Nuiqsut subsistence-whale hunting boats. Industry also provides Global Positioning System units to each subsistence-whale hunting crew. The agreement requires all vessels to report to the communications center at least once every 6 hours to provide information, including location, speed, direction, and plans for movement over the next 6 hours. All vessels owned or operated by industry or their contractors are included in this requirement. In the event described in this comment, apparently either the industry vessel in question or the subsistence whale hunting vessel is not adhering to proper procedure, or the industry vessel is not under industry contract. The problem should be easily rectified if everyone reports their position as required. If this is not being done, the issue should be reported to the dispute-resolution group.

**BPH-A10** (Page 124)

When these seismic activities are occurring, I -- during the '80s, that these seismic activities that set up this Liberty field, the Northstar field, during that time when these seismic activities were occurring, we couldn't understand -- for a six-week period we were at Cross Island this one year. We couldn't understand, for some reason, why we wasn't catching those whales. And then one day, right near Flaxman Island, we ran into these buoys, these same buoys we use for our whales when we hook up the harpoon to the whale, it's attached to that float, this same kind of float.

We thought it was a whale for a while, when we ran into it at Flaxman Island. Then it occurred to us that we had absolutely no clue that these seismic operations were being conducted during our whaling time right there. Right during that time, when we spotted no whales, we went all the way to Kaktovik looking for these whales. And for about a week's period, we had no answers, and we did what we wasn't supposed to do. We went out 30 miles direct north from these seismic activities, these ship activities. And then finally, we ran into a whale six weeks later, a spooked, a totally spooked, pissed-off whale we ran into right there. And it was a direct result of these seismic operations that these oil people are conducting.

**Response**

Since the 1980's, Conflict Avoidance Agreements have been negotiated between the Alaska Eskimo Whaling Commission (for subsistence-whaling interests) and the oil companies to avoid any industry/whaling conflicts during subsistence-whaling seasons. In the 1980's, such agreements were not in place, a situation that led to the conflicts described by the commenter. No seismic activity is planned for Liberty development; nevertheless, MMS fully intends to see that such agreements are negotiated for potential conflicts from development activities.

The effects of seismic operations on bowhead whales can be found in Section III.C.2.a(1) of the EIS. That section also contains a discussion of Inupiat concerns about whales being displaced as a result of these activities.

**BPH-A11** (Pages 127 and 128)

I'm very concerned about this, these kind of -- these oil people coming in, and we're passing these concerns on the last 20 years, until our elders get burned out. To see them consistently every week, every couple of weeks, leave their families to go try to make comments at these meetings over and over and over and over. And then that's starting to happen here in Barrow, exactly what occurred in Nuiqsut. I'm looking at the same steps that's been taken to Barrow residents. I'm very surprised that Barrow residents have not rallied yet.

**Response**

Since 1995, the MMS has tried to take a more collaborative approach in its public involvement. The MMS has hired a community liaison person who spends a large part of his time maintaining contacts with local North Slope Native communities and making sure that scoping and public meetings are scheduled to not conflict with local activities. We also are now writing executive summaries to our documents that we believe make projects easier to assess. We feel this cooperative approach has lessened the stress of our public-involvement mandate, and we welcome suggestions on how to make it even better.

As an agency fully committed to consultation under the executive orders for environmental justice and government-to-government relations, the MMS believes that the USDOI needs to seriously consider an appropriation to its annual budget that provides funding to assist tribal governments with training and travel funds to assist their participation in USDOI planning and decisionmaking processes under these orders. Without funding, these executive orders are perceived as new "unfunded mandates." This would be one way of ameliorating the stress caused by agency public meetings.

**BPH-A12** (Page 128)

But now you guys, these oil people are now in Barrow's front steps. If you -- with these animals already being displaced, now it's starting to be from Cross Island to Teshekpuk that I've noticed these animals, over a period of time, going away. And then there -- right now, we're having a real hard time 'cause of the pipelines from Oliktok to Kuparuk. There's a 13-mile pipeline that's about three-feet high that, itself, already has displaced our caribous in the village. We already had a hard time with the geese already going away from these facilities. I watched these firsthand over a 15-year period, and this is what got me to move from Nuiqsut to Barrow, is observing these oil activities that's occurring.

**Response**

Oil pipelines are required to be elevated a minimum of 5 feet above the tundra to allow passage of caribou and other wildlife under the pipelines. When the Prudhoe Bay oil field was first being developed, some of the pipelines were not elevated sufficiently to allow passage of caribou. Ramps have been built along some pipelines to help caribou across over them. The Liberty onshore pipeline will be elevated 5 feet or more to allow passage of caribou and other wildlife under it.

There are several reasons that goose numbers in an area may fluctuate (natural fluctuations related to productivity, survival, disease; predation; hunting pressure; changes in distribution). While it is possible that geese could avoid nesting near a pipeline and, thereby, appear to be declining in numbers in such an area, it does not seem that their avoidance of a 13-mile pipeline alone would make it appear that the local or regional population was declining. There are several studies that have investigated the relationship between bird distributions and oil-field facilities, primarily roads and pads rather than pipelines. Most have shown that there seldom is a significant negative correlation. Without studying the specific situation, it is difficult to address the commenter's view that geese are leaving the area where he once lived.

**BPH-054** (Pages 129 and 130)

And these thousands of different birds I used to watch, from '85, they're not there no more. There's hundreds now; there's not these thousands any more that we used to see. When I tried to question these with these oil people that keep coming to these meetings, I'm starting to notice, especially the last 10 years, that they do not say anything at all. Nothing. But we're here to take comments – 'We know how we're hurting them. We know you guys go hungry. But we're just here to take your comments.'

**Response**

The commenter's personal observations regarding the decrease in numbers of birds offshore (not stated, but assume that reference is made primarily to sea ducks, the most dominant group) parallel scientific observations over the past several decades that, for example, numbers of king and common eiders passing Point Barrow during migration periods has declined by about 50%. It is not known what specific factors have caused this decline to occur. We assume the commenter, in mentioning oil-industry presence, implies that this presence is in some part responsible for the observed declines. However, common eiders nest on barrier island, and have not yet been directly affected, because production has not yet begun in offshore waters; king eiders are infrequent nesters in the Prudhoe Bay area where industrial activity has been most intense, and it is not likely that this presence could have resulted in such a dramatic population decline. A study comparing numbers of long-tailed ducks in waters off the Prudhoe Bay area and in a control area removed from sites of activity found no statistically significant difference in the numbers of ducks present. Thus, it does not appear at this point that it is possible to say with certainty that oil-industry presence is causing a decline in populations of birds commonly observed in offshore waters.

**BPH-A13** (Pages 133 and 134)

What -- I was looking at your map over there. Right between Narwhal, that's north of this Liberty Project, right on the left side of Narwhal, that's the strongest current I ever seen between here and Kaktovik. And it's directly in between -- almost in between Cross Island and Narwhal. It's every -- it's there every single year.

**Response**

Information from this part of the testimony has been incorporated into Section VI.C.5 Oceanography of Foggy Island Bay and Section III.C.3.l.

**BPH-A14** (Page 134)

And it's directly to this Liberty Project. This 22 feet that they spoke of, there's a DEW Line site that's west of this Liberty Project. A couple of years ago, one of my uncles, Archie Ahkiviana, him and his -- one of his Skidoo buddies went to this DEW Line site, and then they noticed this one-foot-thick of ice three miles inland, that that was pushed from the ice out there, and it reached up to three miles inland. And that DEW Line site, the garage that -- with its foundations, moved the whole entire building, tearing the foundations off, three miles inland. And Archie Ahkiviana, my uncle, testified to that after he came back on his snowmachine trip.

**Response**

The text of the past observations of Archie Brower and Herman Ashiana have been incorporated into Section VI.C.5 Oceanography of Foggy Island Bay.

**BPH-A15** (Page 134)

And I've watched firsthand where this Liberty Project is going up, and it's one of the most violent waves I've seen yet anywhere, that that area that this Liberty Project is in is one of the most scariest projects I've ever seen on the Slope. And it does scare the hell out of me after observing these activities ever since I was almost a baby.

**Response**

Information from this part of the testimony has been incorporated into Section III.C.3.l of the EIS.

**BPH-A16** (Pages 134 and 135)

MR. BRIGHT: And I'll just ask you one other quick question. You mentioned one of your whaling captains being lost off of, I think it was West Dock.

MR. TUKLE: Mm hmm (affirmative).

MR. BRIGHT: And the boats couldn't reach him. And I was just wondering why. Why couldn't those boats.....

MR. TUKLE: The slush that they're talking about, it's just slush water.

MR. BRIGHT: Oh.

MR. TUKLE: Was something like that. When the ice is beginning to form, that the slush is the first thing that forms before it turns to ice, near shore.

MR. BRIGHT: I see.

MR. TUKLE: The boats could not go through that. They wasn't able to break through the -- on top of that, that thin ice. They wasn't able to break through.

MR. BRIGHT: Yeah.

MR. TUKLE: They tried a number of different boats.

MR. BRIGHT: Mm hmm (affirmative).

MR. TUKLE: And these were the boats that are supposed to be used for the oil spill if it occurs. And those same boats are still over there. I just seen them a couple of months ago while I was at Prudhoe.

**Response**

A 42-foot bay-class boat is operable in solid slush ice up to about 7 inches thick. A point-class tug and the *Arctic Endeavor* barge are capable of pushing through up to 14 inches of solid slush ice. In a spill-response situation with similar conditions, these boats would not be deployed. When the ocean is transitioning to solid ice, it is better to let the oil freeze in place than to put boats in the water and stir the oil into the entire ice sheet. The slush will work to limit the spread of the oil and will hold it in place until solid-ice response can be conducted, when the ice will support personnel and equipment. The spill location will be marked with tracking beacons to help maintain the position of the oil. Also in these conditions, boom and skimmers would be of marginal value, because the slush ice effectively isolates the skimmer intake from any oil.

**BPH-A17** (Page 136)

These gravel pits that are being used to support these activities, the gravel pits, the geese, when they're migrating from the Lower 48s, from out there, they are now going to these gravel pits. They're not following their usual migration anymore. I watched that firsthand also over a period of time. So those animals over there are being displaced, is what I'm saying. And I got to see that firsthand over a period of time.

**Response**

Information from this part of the testimony has been incorporated into Section III.C.3.l of the EIS.

**PUBLIC TESTIMONY OF MR. ARCHIE AHKIVIANA**
(Excerpt read by Ms. Maggie Ahmaogak)

**BPH-A18** (Page 139)

The north side of Tern Island is now so deep that even the big ships travel through the deep side of the island, and the whalers and the Inupiat workers off Endicott have, on occasion, sighted bowhead, belugas, and porpoises on the north side of the island where it is deep.

**Response**

Although beluga whales and other cetaceans occasionally may be seen near Tern Island, their occurrence in the Liberty Project area is uncommon and is likely to involve only a few individual animals. The Beaufort Sea population itself would not be exposed to Liberty development activities and is very unlikely to be exposed a potential oil spill from the project.

For bowhead whale sightings near Tern Island, please see Response 0130-A05.

**BPH-055** (Page 154)

**MR. GORDON BROWER**: Yeah, Gordon Brower, for the record, I guess. I got a question. You talked about contracting opportunities. What about maintenance and general operations of that island? You always – there's always provisions to provide contractor opportunities, and I've never seen where it became a permanent situation for even for operational modes on these things, where the benefit is a yearly event.

**Response**

Employment and wages during operations are explained in Section III.D-5.b(1), and the effects on hire of Native people is explained in Section III.D-5.b(2).

**BPH-056** (Page 154)

**MR. GORDON BROWER:** Then the other question I wanted to ask was what kind of environment is that Boulder Patch that's in there? I'm pretty sure you've taken pictures underneath there, and there is a Boulder Patch in that vicinity, a very unusual formation. And with your observations, I don't know if it's something that you can answer, but what is in that Boulder Patch?

**Response**

The Boulder Patch kelp habitat is described in the EIS in Section VI.A.5.b. The Boulder Patch also is described in an excellent book that was published last year, *The Natural History of an Arctic Oil Field: Development and the Biota,* edited by Joe Truett and Steven Johnson and published by Academic Press. The chapter on the Boulder Patch, which includes basic information and photographs, was written by Kenneth Dunton and Susan Schonberg. Information from this recent description of the Boulder Patch has been added to the EIS.

**BPH-057** (Page 155)

**MR. GORDON BROWER:** I just wanted to find out what was the significance if there were more marine mammals in and around those areas in Boulder Patch. Is there the presence of a marine environment that's taking hold on these that would provide more opportunities for seals and stuff like that to feed and be around those areas, I would think.

**Response**

The Boulder Patch kelp communities in the Liberty area are not known to attract marine mammals. There is a greater diversity of benthic organisms in the boulder patches than in the surrounding sea-bottom habitat. However, the number of bearded seals, a species known to feed off the sea bottom, has not been recorded in large numbers in the Boulder Patch area. Soft-bottom habitats in areas outside of the Boulder Patch would yield greater biomass of bivalves and other benthic prey of bearded seals. Thus, the Boulder Patch is not believed to an important feeding area for seals. Beluga whales also have not been observed in the Boulder Patch area during 20 years of aerial surveys in the area.

United States Department Of The Interior
Minerals Management Service
Alaska OCS Region

***EXCERPTS FROM***

**OFFICIAL TRANSCRIPT - PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT**
**FOR LIBERTY DEVELOPMENT AND PRODUCTION PLAN**
**OCS EIS/EA MMS 2001-001**

***(Responses to Testimony Comments Added)***

**Fairbanks, Alaska**
**Thursday, February 22, 2001**
**6:20 p.m.**

**Minerals Management Service Panel Members**
Mr. Fred King, Chief, Environmental Assessment Section and Liberty Project Manager
Dick Roberts, Liberty EIS Coordinator
Ted Rockwell, Environmental Protection Agency Coordinator
Mr. Richard Carl, Recorder
Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

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**PUBLIC TESTIMONY OF MS. DEB MOORE**

**FPH-001** (Page 6)

The Draft EIS concludes that no significant cumulative impact is predicted to occur as a result of oil drilling at Liberty. (Cut out) at the Prudhoe Bay complex. This is a completely unrealistic approach to analyzing cumulative impacts. The results of 20 years of unanalyzed projects adds up to a major increase in noise pollution, wildlife disturbance, and chronic air and water degradation. These effects need to be properly analyzed before we proceed with another major development project

**Response**

The general conclusions are that potential cumulative effects could occur to bowhead whales, subsistence, spectacled eiders, the Boulder Patch, polar bears, and caribou. These are almost all of the major biological resources on- and offshore the North Slope. How these effects will translate in the future will depend on how well these resources are monitored and how effective the mitigation is that is in place to protect these resources. The status of these resources is a prediction of what has taken place in the past, present, and reasonably foreseeable future. Considering the massive amount of activity that has occurred over the years in some regions of the North Slope, it is not surprising that these resources become more and more important to monitor and assess. The Liberty Project is only a small component (approximately 1%) and contributes only a small measure of risk (0.07 spill out of 1.09 total offshore spills) to some of these resources. The results of 20 years of projects do not add up, in the numeric sense, because of the perturbation associated with exploration and development activities persist only a short time, and major events such as oil spills do not occur in the same time and space prior to recovery by the effected resource. Abiotic parameters such as air and water quality are more readily managed, and criteria have been established specific to the North Slope to not degrade the environment.

**FPH-002** (Page 6)

The National Research Council is currently conducting the first ever study of the cumulative impacts of Arctic oil development on the North Slope. The Northern Center believes consideration for additional on and offshore development should be postponed until the results of this study are available. It is critical for Alaskans to understand and respond to the additive impacts of development, developing oil fields such as Northstar, Alpine, Kuparuk, and other Prudhoe Bay fields, rather than blindly adding to the impacts through additional development. For this reason as well, the "no action" alternative should be chosen.

**Response**

Sociocultural effects of oil and gas activities on the North Slope were studied by the National Research Council; in their 1994 report, they suggested that more studies were not needed but there was a need for active monitoring of the ongoing and proposed activities in cooperation with the indigenous people of the area (see Response 0130-006). Some study efforts by the National Research Council have not been that productive in terms of recommendations. In an extensive study they conducted on the problem of escapement of salmon on some of the major rivers in the Pacific Northwest and conflicts with hydroelectric power, the conclusion of the report was that it was a complex problem and needed further study. Their forthcoming study, which was funded by the industry, probably will not yield a definitive answer but something more in line with their 1994 report, where development continues with a closer monitoring for potential effects and in cooperation with the Native communities. Putting everything on hold in anticipation of a definitive answer from the National Research Council study would be more appropriate if there were a well-defined effect known to be occurring. The cumulative effects possibly occurring on the North Slope are more difficult to identify and quantify and cannot be done without the continued operation of the industry that may be attributing to those potential effects. If the forthcoming National Research Council report does discover some presently unknown causative factors, industry and responsible regulatory agencies have the responsibility and authority to make the necessary corrections. A no action alternative would be based in part on the assumption that there are enough data available from past and present activities to make proper decisions on future actions, which is not the case.

**FPH-003** (Pages 6 and 7)

The Draft EIS fails to identify significant impact from oil spills, including impacts on oil -- including the impacts it would have on polar bears, bowhead whales, seals, and traditional subsistence hunting practice by the Alaska Natives for thousands of years. As was so dramatically evident following the *Exxon Valdez* spill in 1989, offshore oil spills can have devastating impacts on the wildlife and humans who rely on the coastal waters. The risk of such devastation, and especially in the light of British Petroleum's inability to adequately clean up an oil spill, are not acceptable in the Beaufort Sea. For this reason, the "no action" alternative should be chosen.

**Response**

Please see Responses 0135-022, 0135-038, and APH-003.

**FPH-004** (Page 7)

Lastly, but certainly not the least important, the Draft Environmental Impact Statement states that there is no way to calculate the global warming impact of just one offshore oil project. However, as mentioned before, additional development cannot be considered in terms of isolated projects. Liberty must be evaluated in terms of what it will add to the existing and projected burden of the oil industry's operations in the Arctic. This must include how the burning of fossil fuels obtained at Liberty will affect the overall global warming trend.

**Response**

The MMS has looked seriously at the scientific evidence regarding global warming and climate change and agree that it is a serious issue of continuing concern. We discuss this issue in Section III.D.10 of the EIS. The Council on Environmental Quality recommends addressing this issue at the program level rather than at the project level. We incorporate in Section III.D.10 the discussion from the 5-year 1997-2002 final EIS. The 5-year programmatic EIS for 2002-2007 is being prepared and also will include a discussion of this issue.

As is stated in several places in the EIS, including especially Section V.C, the cumulative impacts analyzed in this EIS focus most closely on those effects and activities that are more certain and geographically closer to Liberty. Those effects that will occur from greenhouse gas emissions that will be produced when the oil from Liberty and other North Slope oil fields is burned are more properly a programmatic concern, which is addressed in both the latest (1997-2002) and forthcoming (2002-2007) 5-year EIS's. We note here that if North Slope oil production and the burning of that oil were to cease, the emissions from that production and burning would, in the short term at least, presumably be replaced by very similar emissions from the burning of other oils from other locations in the world. Over the long term, some of the emissions and global warming could be eliminated through increased energy efficiency and energy conservation and by the increased use of alternative energy sources. All of these topics, however, involve national and global policy decisions, and their implementation are considerably beyond the scope of the present EIS.

**FPH-005** (Page 7)

In terms of climate change, the western Arctic is already known as a global hot spot since it is warming three times faster than the global average. This trend must be given adequate consideration before additional fields are developed. For this reason, the "no action" alternative should be chosen for the Liberty Project.

**Response**

Please see Response FPH-004.

The western Arctic may or may not be warming "three times faster than the global average," but we certainly are concerned about the global warming and climate change issues regardless of the exact rate at which such changes may be occurring. We believe that in consideration of the very small potential incremental contributions of the Liberty Project, and in consideration of the Council on Environmental Quality's recommendations that these issues be discussed at the programmatic rather than at the project level, that the Liberty Project does not present a significant problem with respect to these issues.

Furthermore, the United States Congress, in funding the National Academy of Sciences study of cumulative impacts, specifically prohibits the postponement of any Federal actions pending the outcome of that study.

## PUBLIC TESTIMONY OF MR. MICHAEL WALD

**FPH-006** (Page 11)

While not a scientist and not a, you know, land use planner, I read the paper and try to keep myself informed. And I read about -- you know, I've been trying to keep abreast of the Northstar, and I'm somewhat familiar with the Environmental Impact Statement for Liberty, and it concerns me greatly. It seems to not address some pretty critical issues. And I know you guys have been putting a tremendous amount of energy and effort into writing it, and I mean no personal offense, but I believe, you know, when it talks about, you know, Liberty not having a significant environmental impact on the Beaufort Sea ecosystem, I find that hard to believe.

**Response**

The EIS provides the best information and analysis we have available about the potential effects, both positive and negative, that could occur from the proposed Liberty development. In the unlikely event of an oil spill, the EIS does identify potential significant impacts to spectacled eiders, common eiders, king eiders, long-tailed ducks, subsistence harvests, sociocultural systems, and local water quality. The effects to eiders and ducks also are reduced somewhat, because these species migrate. They are present in the area for only 3-5 months each summer.

The EIS also evaluates cumulative effects, including Liberty, Northstar, and other reasonable and foreseeable projects on the North Slope. Significant adverse impacts from an oil spill could occur to spectacled eiders, common eiders, king eiders, long tailed ducks, and subsistence resources, should an oil spill occur in the cumulative case. The potential for cumulative adverse effects to the Boulder Patch and other key resources such as bowhead whales, polar bears, caribou, and subsistence are possible and should be monitored.

The analysis in the EIS accurately portrays both the benefits and costs of approving, modifying, or denying the project.

**FPH-007** (Page 11)

Deb was talking about Northstar. She also talked about the two spills at Prudhoe Bay on Tuesday, I think they were. I'm also aware of a drilling mud spill, 20,000 gallons, at Northstar recently. When I read the figure of 1 to 6 percent safety factor for Liberty, I really wonder where that comes from. It would seem to me that as much as BP may try, spills are, on some level, inevitable. And as somebody who has spent a fair amount of time on sea ice, and someone who reads the paper about the three failed spill drills when -- you know, that's 10-percent broken ice cover at a time of year when there's adequate light and moderate temperatures.

**Response**

The MMS agrees with the commenter that small spills from oil and gas operations are inevitable. The MMS assumes small spills will occur, estimates the number and size in Section III.D.3, and evaluates their impacts. Most small spills will be cleaned up. The MMS, in its analysis of large oil spills for impacts, assumes a large spill occurs and discusses the consequences of that large spill. The MMS then considers the likelihood of that spill occurring. The decisionmaker is presented with both the impacts and likelihood of a large oil spill.

**FPH-008** (Page 12)

The EIS has data talking about ice gouging in Foggy Bay. I don't trust that data. It's -- those sediments are being transported by wind and current. You know, I think the report said, you know, maximum gouge, two feet. Okay. Maybe in the past five years that's been the maximum ice gouge. Maybe Foggy Bay is well protected and there's no multi-year ice moving around and threatening a subsea pipeline in there now. When I see monumentous (sic) events like the big ice break-off in Barrow this spring, last spring in Barrow, they had unrecorded (sic) wind.

I guess my point is we don't understand sea ice. Nobody understands sea ice. And to blithely assume that sea ice will continue to do what it's done, and to assume that unproven technology from Northstar will adequately safeguard the Beaufort Sea, I, as a citizen of Alaska, am unconvinced.

**Response**

Wind and currents do move fine-grained sediment on the seafloor every summer. These sediments partially cover ice gouges and other scour depressions. However, side-scan sonar records show "scars" of older gouges even when they are filled in with sediments, because the sediments reflect sound differently than the seabed. Older, wider gouges are seen in Foggy Island Bay; they are older than 5 years, because they cross the Boulder Patch but show no disturbance of boulder distribution and associated kelp communities, which take a long time to repopulate. These large gouges still have very shallow depth of incision and probably were formed by large, tabular ice bodies resulting in shorefast ice breakoff (perhaps like the Barrow ice breakoff mentioned in the testimony).

The seaward shoals, the barrier islands, and the edge of the shorefast ice provide very effective barriers to impinging pack ice. This is seen in all areas where there is shorefast floating ice; it is not unique to Foggy Island Bay.

**FPH-009** (Pages 12 and 13)

In addition to that, I think -- so what I'm saying is that our information about sea ice is inadequate. Certainly, our information about offshore drilling technology in the Arctic Ocean is inadequate. I also think that it's very difficult to do any sort of risk assessment for near-shore Arctic environments. There really isn't any data. And if you do a literature search for North Slope science in general, personally, I can't find anything that's not funded by the oil industry. And that's not to say that science funded by the oil industry is bad science, but to me, that certainly points out at least a limited scope, and that's concerning to me.

**Response**

The MMS has paid for and sponsored a considerable amount of scientific study in the Beaufort Sea since the Alaska OCS Environmental Studies Program started in 1975. Numerous MMS-sponsored studies are cited in the draft EIS. In the Bibliography, these are listed under either USDOI, MMS; USDOI, MMS or Alaska OCS Region (or Herndon, Gulf of Mexico, etc.). Some MMS-sponsored studies are listed under the individual author(s) name(s). If there is an MMS publication number assigned to a study, that also appears in the bibliography entry. From the inception of the Environmental Studies Program in Alaska in 1975 through Fiscal Year 1999, MMS has expended more than $265 million in all Alaska OCS planning areas. A significant portion of this $265 million is for studies of the Beaufort Sea and the Inuit people of the North Slope. Many studies have Statewide applicability, including the Beaufort Sea. Also, Appendix F provides a description of the ongoing MMS-sponsored environmental studies applicable to the Beaufort Sea Planning Areas as of March 15, 2000. Also, see Response 0135-044.

The physical barriers to pack-ice encroachment nearshore are not going to change significantly enough to allow deep-keeled ice to enter the shallow-water portion of Foggy Island Bay, that is, the barrier islands, shoals, and floating shorefast ice. Any one of the parameters may change somewhat due to global climate and/or ocean changes (cooling or warming), but the combination of these have and will continue to protect the shallow-water areas from deep-keeled ice.

Many studies have been carried out on seafloor ice dynamics. The U.S. Geological Survey, the Outer Continental Shelf Environmental Assessment Program. and Marine Branch funding in the 1970's and 1980's conducted a number of ice-gouging and strudel-scour studies. In addition, site surveys collected by industry for obtaining a permit to drill have resulted in much new data (interpreted independently by MMS). A new database using these surveys is soon to be released by MMS (*Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation in a Geographic Information System (GOS) Database*).

The MMS and the State Pipeline Coordinator's Office will form a technical review team to evaluate the applicant's pipeline right-of-way application. This team will include staff from both agencies and third-party contractors with the necessary experience and expertise to ensure that all aspects of the pipeline design are thoroughly reviewed. This review will include the environmental hazards to the pipeline, such as ice gouging and strudel scour, to ensure that the pipeline is properly designed for the environment. It is possible that through this review process, the applicant may be required to modify its design.

**FPH-010** (Page 13)

Furthermore, the Arctic is a difficult place to do research. The logistics are onerous. The money is lacking. And compared to most other habitats on Earth, it's very poorly understood. And so even if I were to believe that, you know, 6-percent chance of spill, and even if spill recovery were to get up to 95-percent chance, I don't really think we know what is at stake if there was a spill. Nobody knows what the effects on benthic invertebrates are. Nobody understands what the effects on copapods (ph) are. And what are the ramifications of eiders, which are already suffering? What are the ramifications on bowhead whales? And if there are ramifications on bowheads and eiders, what is the impact on North Slope communities? And you guys will get an ear full of that, I'm sure, when you travel up there.

**Response**

The MMS estimates there is a 1% chance of a spill occurring and reaching the water. The description of the method used to reach this conclusion is located in Section III.C.1.d.

The commenter suggests that the environment is very poorly understood and, specifically, that we cannot assess spill effects on lower trophic-evel organisms, including benthic invertebrates and copepods (zooplanktonic prey of bowheads). The environmental information on these organisms is summarized in Section VI.A.5, and the effect of spills on them is assessed in Section III.C.2.e. The assessment is based partly on the effects of the *Exxon Valdez* spill and two spills in polar waters, the *Bahia Paraiso* spill in Arthur Harbor, Antarctica, and the *Nella Dan* spill on the sub-Antarctic island of Macquarie.

Current and proposed eider studies will give us a better idea of how much king and spectacled eiders use nearshore and offshore areas of the central Beaufort Sea, if there are specific areas that are important, and also that the MMS oil-spill model indicates a high probability of oil contact. The occurrence of such areas where eiders forage would suggest that specific mitigation measures to protect the benthic invertebrates that eiders feed on should be developed and implemented. Because they nest on the barrier islands and, thus, feed in nearshore areas, common eiders in particular would benefit from such development of mitigating measures. Because eiders are not a major subsistence food source (USDOI, MMS, Alaska OCS Region, 2001:VI-42), it does not appear that fluctuations in their population numbers, natural or otherwise, would have a significant effect on North Slope communities.

The potential effects of an oil spill on bowhead whales is discussed in Section III.C.2.a(1)(b).

**FPH-011** (Page 14)

There was -- and I think Deb may have mentioned this as well -- that there was -- well, what does it say here? Oh, the EIS said something like impacts on global warming could not be assessed from a one -- you know, what does one offshore thing have to do with global warming? But in another section, it said that Liberty would decrease U.S. dependency on foreign oil.

**Response**

Please see Response FPH-004.

**PUBLIC TESTIMONY OF MR. PHIL WILDFANG**

**FPH-012** (Pages 16 and 17)

We all know that any kind of meaningful response to a substantial spill or undersea pipeline rupture is impossible during most of the year when the affected waters will be covered with ice. In my opinion, the Draft Environmental Impact Study doesn't effectively address this concern or adequately analyze the impact of such spills. Polar bears, whales, and Native subsistence activities could all suffer profound and irrevocable damage as a result of a massive spill or small spills and dribbles over the months and years these projects are active.

**Response**

The EIS effectively addresses the impacts of very large spill (Section IX) and small spills (Section III.C) on polar bears and seals. The EIS recognizes that effects on polar bears from a very large spill would be profound and could take the bear population several years to recover (Section IXA.6.b Seals, Walruses, Beluga Whales, and Polar Bears).

The effects of oil spills on bowhead whales are discussed in Section III.C.2.a(1)(b).

The effects of oil spills on subsistence resources are discussed in Sections III.C.2.h (large spills), III.D.3.h (small spills), IX.A.6.h (180,000-barrel blowout spill), and IX.B.3.h (200,000 barrel tanker spill).

Oil-spill-prevention and response are described in Section III.C.1.a.

**FPH-013** (Page 17)

Much like the Texas coast, continued off and onshore drilling activities will have a cumulative impact upon the biological, aesthetic, and traditional values of this fragile environment. One well leads to another, and additional pipelines, infrastructure, and industry will be needed to support yet more extraction and transportation capabilities. Soon, lights, artificial islands, flares, waste pits, and pipelines will light up the horizon, scar the land, and foul the waters. The EIS needs to address these cumulative impacts.

**Response**

The onshore and offshore portions of the North Slope are not comparable with the Texas coast and the Gulf of Mexico. The Gulf states are more concentrated with onshore and offshore wells, because the structures are small and the access and cost effectiveness to develop are orders of magnitude less. Effects on aesthetic values are similarly less with the possible exception of the Prudhoe Bay and Kuparuk developments, which are unusually large in size and not expected to be found elsewhere. The Prudhoe and adjacent Kuparuk developments comprise only about 22 miles of coastline, or about 6% of a visible linear coastline from Barrow to Kaktovik. Subsequent discoveries and developments such as Liberty and Northstar are rare finds and are not expected to lead to future high-density development. Visual impacts are expected to be greatest within a 2-mile radius of a drill site, which is an area of approximately 8,000 acres per well site. The Liberty drill site probably typifies future drill-site density. It is approximately 6-7 miles offshore; 7-10 miles from the nearest offshore drill site, in this case the Endicott site; and more than 15 miles from the nearest onshore site to the east, which is Badami. Biological resources and traditional values have been assessed in detail with respect to oil spills, disturbance, and discharges (Section III) and in the cumulative case (Section V). It is true that in this high-cost environment the development of one well can lead to another, but the distance to the next viable structure will increase with the advent and effective application of directional-drilling technology. Future drill sites will be smaller in size and will be dismantled on completion of drilling operations. With the exception of the tundra compression and "greening," which can persist for several seasons, the Arctic, in many ways, is not a fragile environment.

**FPH-014** (Page 17)

Other issues that should also be addressed in the impact statement are the effects of Liberty on global warming, as Deb talked about, and our continued dependence upon oil as a nation. Granted, one well's contribution to global warming or energy dependency is hard to assess, but when is it time to look at these issues? We must begin to develop a national energy policy that emphasizes and encourages exploration for alternative energy sources rather than dodging the challenge by saying it's only one more well, let's go ahead and approve it.

**Response**

Please see Response FPH-004.

United States Department Of The Interior
Minerals Management Service
Alaska OCS Region

***EXCERPTS FROM***

**OFFICIAL TRANSCRIPT - PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT**
**FOR LIBERTY DEVELOPMENT AND PRODUCTION PLAN**
**OCS EIS/EA MMS 2001-001**

***(Responses to Testimony Comments Added)***

**Kaktovik, Alaska**
**Tuesday, March 20, 2001**
**7:25 p.m.**

**Minerals Management Service Panel Members**
Mr. Paul Stang, Regional Supervisor for Leasing and Environment
Mr. Fred King, Project Manager
Mr. Albert Barros, Community Liaison
Mr. Richard Carl, Recorder

Translator services provided by Ida E. Angasan, Kaktovik, Alaska.
Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

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## PUBLIC TESTIMONY OF MAYOR LON SONSALLA

**KPH-001** (Pages 17 and 18)

As long as I'm here, I'll bring up a couple of points that I had gone over today. I was reading through the EIS, and one of the things that struck me was the cumulative effects. And I know we've talked about this when we were talking about the Northstar Project, that if that was successful, then that could lead to another project, and another one, and pretty soon, there'd be a possibility that there would be a lot of these out in the ocean. And that worries people because of the possibility of noise pollution, that during the drilling phases as well as the helicopter traffic and the barge traffic during the open-water season.

**Response**

Please see Response FPH-013.

**KPH-002** (Page 18)

And as people will tell you tonight, that the more -- while there is drilling going on, and also the other noise, that it does divert the whale migration pattern. It has changed quite a bit. I know in the EIS it says that there's parts that -- it does change a bit as you go through different parts of the EIS, but it does say that the patterns seem to change but only temporarily. And from what we've talked with the hunters here, it changes pretty dramatically.

**Response**

An evaluation of the effects of drilling noise on whales is in Section III.C.3.a. Cumulative effects, including the effects of seismic surveys, on bowhead whales, is in Section V.C.1.a.

**KPH-003** (Page 18)

And so one of the mitigating measures should be that there shouldn't be any noise-making activities during whaling season that would affect the migration patterns, which is similar to what we would want to see, of course, if there was something happening on land during the caribou calving season. So, I mean, there is a similarity there.

**Response**

Mitigating measures that BPXA has incorporated into the Liberty Project design and those that are required by MMS are in Section I.H.6 and in Table I-3 of the EIS. One of the primary mitigating measures that BPXA will implement will be to develop a Conflict and Avoidance Agreement working with local subsistence users.

**KPH-004** (Pages18)

One other thing was that I had talked about -- apparently, about five years ago, from what it said in the book -- was that we are being impacted here quite a bit. We do a lot of hearings and testimonies and meetings about these kinds of things, and I had suggested some kind of funding for an impact office, a local impact office, here in Kaktovik. I haven't seen anything on that yet, but I still think it's a valid point, that if you look at these books back here, it's almost daunting.

**Response**

Please see Response BPH-024.

**KPH-005** (Page 25)

MS. TRAYNOR: What kind of revenues would be generated for the North Slope Borough from this well? I mean, taxes or is there -- besides just jobs.

**Response**

See Section III.D.5.b(4) and Table III.D-5 for effects on North Slope Borough revenue.

**KPH-006** (Page 44)

MS. TRAYNOR: I have two questions, totally different, actually. As you talked, they came up. Could this oil that is going into the ocean drill be reached from on shore?

**Response**

Drilling from shore to reach the oil pool located offshore is beyond the technical experience on the North Slope. These wells would have to be drilled between 33,000 and 38,000 feet to recover the oil in the Liberty pool, and the longest wells drilled to date have been less than 23,000 feet. Pushing the limits of drilling technology would be costly and risky from a safety standpoint. Much higher well costs would make the Liberty Project uneconomic to develop. At present, the maximum drilling radius from an island or onshore pad is about 3-4 miles. Drilling from onshore to the Liberty pool would be 6-7 miles.

**KPH-007** (Page 49)

MS. TRAYNOR: We are experiencing different weather patterns, and is that taken into consideration in planning for this island? Things are warming up, and the seas are going to rise. Is the island -- you know, what's the height of the island? And what's the effect of that deep permafrost if the seas warm up and the permafrost starts to melt?

**Response**

The working surface of the island would be 15 feet above sea level. The gravel bags that would provide the upper island slope protection would extend up to 23 feet above sea level around most of the island. The side of the island open to the dock would not have gravel bags, because this would impede access to the dock. Sea-level rises would be a rather long-term event; if the sea started to rise, precautions could be taken before the island or the facilities on it were affected.

Due to the hot oil flowing through the pipeline, any permafrost that exists along the pipeline route would be melted to a depth of more than 30 feet. This depth of thawing will extend into thaw-stable material, and any additional thawing that may be caused by warming and/or rising seas would have very little, if any, effect on the pipeline, which would be the only structure installed in or on permafrost.

Global climate change may affect sea levels. However, geological studies of past sea levels indicate that we have been in a warming period for the last 18,000 years. Seas have been rising for that long from a low stand of 90 meters below present levels. These processes are gradual compared to human lifecycles and would be detectable only over a generation of measurements. Deep permafrost is a relict feature representing the top of the Pleistocene age frozen ground. This permafrost was originally formed when the seafloor surface of Foggy Island Bay was exposed to the frigid air at lower sea levels. Since the rise in sea level and drowning of the former tundra surface of Foggy Island Bay, the combination of relatively warm water and especially salt in the water, which diffuses into clays on the sea floor, have allowed the top surface of the permafrost to slowly melt and get deeper. It has been in a stable state since 100,000 years ago and will remain so unless a drastic change in climate occurs, such as cooling and re-exposure to air or warming with a large increase in sea level. The warming scenario and rise in sea level would happen slowly, and deep permafrost would not be affected, unless the warming trend was greater than any in the last 100,000 years and the rise in sea level was larger than the largest since 100,000 years ago, when it was 10 meters above present levels. This is unlikely and is not supported by longer period cyclic climate records from geological studies.

**KPH-008** (Page 50)

MS. TRAYNOR: Well, I guess that's another question. Once you build that island there, you're going to have currents that are going to be changing and are going to be hitting into that island in different ways, and the ice floes are going to be hitting it differently. And on this island, we know what heavy weather does to banks much higher than what you're dealing with. Everything changes out there once you build that island.

**Response**

The island will be protected from the seafloor to a height of 7 feet above sea level by concrete mats that are shackled together. The mats will be 4 feet wide, 4 feet long, and 9 inches thick. From the top of the concrete mats to 23 feet above sea level, gravel bags would protect the island. Both protection systems would be inspected on a regular basis, and any damaged components would be replaced. The combination of these two island-protection systems would make the island much more resistant to ice and wave action than a bank composed only of loosely consolidated materials.

United States Department Of The Interior
Minerals Management Service
Alaska OCS Region

***EXCERPTS FROM***

**OFFICIAL TRANSCRIPT - PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR LIBERTY DEVELOPMENT AND PRODUCTION PLAN
OCS EIS/EA MMS 2001-001**

***(Responses to Testimony Comments Added)***

**Nuiqsut, Alaska
Monday, March 19, 2001
7:30 p.m.**

**Minerals Management Service Panel Members**

Mr. Paul Stang, Regional Supervisor for Leasing and Environment
Mr. Fred King, Project Manager
Mr. Albert Barros, Community Liaison
Mr. Richard Carl, Recorder
Translator services provided by Mabel Pederson, Barrow, Alaska, and Leonard Lampe of Nuiqsut, Alaska.
Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

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**PUBLIC TESTIMONY OF MR. NOAH ITTA**
(As translated by Ms. Mabel Pederson)

**NPH-001** (Pages 15 and 16)

Since then, since they used dynamite in that river, they never find no fish in that river again 'cause they were using dynamite right in the river. They were using dynamite in the river, and they disturbed the garden of where they live off of, and they were very hurt about that. They didn't – there's a lot of people that disagree with that part. And there's even some people who were even living at Barrow at that time when they were using dynamite in that river, the main river where they go fishing 'cause it's closer to Barrow. And they used dynamite in it. And there's not -- there isn't any fish in that river now.

They waited three years in order to see some fish in that river, you now, that river that they hunt, get their supplies for the river, with the fish, you know. They had to wait three years. And now it's -- there are some fish in there now. That's why he's concerned about those animals, you know, in the ocean, that they live off up until now. He's concerned about those animals, that they're going to be disturbed by the drilling or the hammering or whatever, all the noise that goes into it, you know. He's worried about that.

**Response**

To our knowledge, dynamite is no longer used in rivers. Noise from dredging, gravel mining, island construction, island reshaping, and pipeline trenching associated with Liberty are expected to have no measurable effect on fish populations. While a few fish could be harmed or killed, most in the immediate area would avoid these activities and would be otherwise unaffected.

**NPH-002** (Page 16)

He sure hates to see some drilling being done in the ocean right now, and he hates for the mammals to be disturbed because they live off of them from generation to generation. And then he opposes drilling down in the ocean while there is oil on land. He very much opposes it. He's not happy with it. Like the rest of these people here, they're not happy with it. They go far down there to -- you know, way far from their home to catch the whale, and then how far would they have to go if they -- you know, if the whales are disturbed from the drilling right now? How far do they have to go get the whale? That's what he's worried about.

**Response**

An evaluation of the effects of drilling noise on whales is in Section III.C.3.a. Cumulative effects, including the effects of seismic surveys, on bowhead whales is in Section V.C.1.a.

**NPH-003** (Page 16 and 17)

If it is very necessary for you guys to be drilling in that area, he much would -- he would like to see it be done in December, January, February. December, January, or February, that's the time that they -- he would like the drillers to be doing their work in those three months because he knows that the sea mammals come up this way to have their babies and, you know, get borne their litters, seals and polar bears. Any kind of animals that live on the ocean, that's the time they come up, is on those other months, you know, by the time they -- what you call it? -- they have their babies (laugh).

But he would be -- if it's only necessary, he would like to see you guys work on those three months, the period of time, three months. He hates to see the animals to be disturbed on those other months 'cause those animals come up to migrate to have their, you know.

(Continued from Pages 28-30)

MR. ROCKWELL: Yeah. The question was regarding the statement that Noah made about wanting to limit the drilling to three months. What I wanted to know was does he mean literally the drilling or all activity that would occur on the island, the production and everything?

TRANSLATOR: Oh, I could answer that.

MR. ROCKWELL: Boat traffic and everything else.

TRANSLATOR: I could answer that one. He hates to see any kind of activities being done other than those three months.

MR. ROCKWELL: Okay.

TRANSLATOR: In those three months, he would like to see you guys be working only on three months, but after those three months, he would like to see anything shut -- everything shut down, get everything quieted down in the ocean, you know, because the mammals are the ones that's going to be needing the quietness down there. That's where they.....

HEARING OFFICER: Noise is the main issue? Noise?

TRANSLATOR: Noise, and he's worried that there might be some oil spill. (Translation by and through Translator.)

BY MR. ITTA: Yeah. He would much rather see, if it's only necessary for you guys to be drilling down there -- if it's only necessary. If it had to be done only three months, he would like to see you guys work down there only three months at a time. That's in wintertime, December, January, and February. There's hardly no animals down there during that time. So and other than that, you know, he'd like to see everything shut down and get everything quieted down for them animals to be back around in that area.

**Response**

The commenter suggested that if the project were to proceed, that drilling should be limited to the months of December, January, and February to protect the seals and polar bears. While this proposal would provide protection to the marine mammals, it would lengthen the time needed to drill and develop the project by 8-10 years. It would increase costs, because the facilities would need to be staffed during the nondrilling month. Simultaneously, the delay significantly would decrease the value of the future product output. Such a delay would make the project uneconomical. Thus, this proposal is essentially the same as the No Action Alternative.

The commenter provided the comments in Inupiaq, which were translated for the record. We are uncertain whether the suggested prohibition was limited to just drilling or if it was being suggested for all activities. If the commenter was suggesting the prohibition of all oil and gas activities except during the months of December, January, and February, the economic results become worse; and allowing only 3 months each year to develop or produce the field would be identical to the No Action Alternative.

**NPH-004** (Pages 17 and 18)

Only thing that he don't like is that the flow of that oil out of the village of the Natives, you know, when they should get so many percentage of that money that the oil company is making out of -- you know, he would be happy if they would share some of that money with these people around here 'cause these people have been living around here seven -- since 1700 years or even more. You know, they've been living around here, and it's their land. It's their -- they are sharing with the oil company, but the oil company doesn't seem to be sharing the oil with these people.

It just flows out of here. They just let it go someplace else where the other people, you know, Lower 48 doesn't -- you know, white people make more money than these, and, you know, he would be glad if they could share a little bit more money out of that oil when they find it around here.

**Response**

See Section III.D.5.b(4) and Table III.D-5 for effects on North Slope Borough revenue.

**PUBLIC TESTIMONY OF MR. JOHNNY AHTUANARUK**
(As translated by Ms. Mabel Pederson)

**NPH-005** (Pages 20-22)

At that time, there was two other guys that was in with him. They marked the property around where they were going to -- you know, where they wanted to be hunting, or something like that. And back to the place where you guys want to put the pipe and drill down there, he knows in summertime, there's lots of fish there, and he knows they're going to be disturbed when you guys start working around in that area 'cause there's lots and lots of kakta (ph) around in that area in summertimes. Even though they come through the river, there are fish down there. That's going to be very much disturbed by drilling down there.

Wherever that pipe you guys put under the ocean floor down there, since that happened, them kakta (ph) fish, they go skinny. They are skinnier than they used to be. There is something wrong with them. It might have something to do with that pipe. It – something's making them skinny. You know, they used to be fat.

MR. LOHMAN: Is that the Northstar pipe he's talking about?

TRANSLATOR: Huh?

MR. LOHMAN: Is that the Northstar pipe that he's talking about?

TRANSLATOR: That's what.....

MR. KING: Or Alpine?

MR. LOHMAN: Or Alpine? What -- which pipe is he talking about? (Translation by Translator.)

TRANSLATOR: That pipe that's close to Prudhoe Bay.

MR. AHTUANARUK: Prudhoe Bay, passing maybe. Passing Prudhoe Bay south. (Translation by Translator.)

MR. LOHMAN: The Northstar pipe that just went in.

TRANSLATOR: Northstar.

MR. AHTUANARUK: Northstar, yeah.

TRANSLATOR: Since that one, there's -- the taste of the fish changed, and they are not fat like they used to be. Something is causing that.

BY MR. AHTUANARUK (Resuming):

Right now, the fish that they used to get down here, they used to be so healthy, so shiny, fat, more like seeping out through their skin, you know, before. Right now, they are skinny. They look sick. They are dark; they are not shiny like they used to be, you know, healthy looking. Right now, they're so skinny.

(Continued from Page 23)

MR. LOHMAN: I got a couple of questions for you, Johnny. First, have you had the same problem with the fish at any other time in the past? Before the pipeline. (Translation by and through the Translator.)

MR. AHTUANARUK: No. The fish never looked unhealthy before. That's..... (Translation by Translator.)

MR. AHTUANARUK: They started noticing the difference on the fish the past two years. This year is the worst part, you know, the look of the fish and the taste. It's worse this year. It's.....

**Response**

Fishes sometimes avoid sudden noise but typically ignore the same noise, if it is continuous over a longer period of time. Fishes appear to respond to sound waves within the range of 5-1,000 Hertz (Bell, 1990). Because the proposed activities are expected to generate noise within this range, some fishes in the immediate area may be temporarily disturbed. The noise generated by construction-related activities may stress some overwintering fishes in the immediate area of the proposed activities and, thereby, decrease the likelihood of survival for some. However, noise effects on most overwintering fishes are expected to be short term and sublethal. For this reason and because most activities are not likely to occur above overwintering habitat, these activities are not expected to have a measurable effect on overwintering freshwater and migratory fish populations.

**NPH-A01** (Page 22)

He got the same feeling as Noah, you know, while there's land, that where they could drill, while they are still finding oil in land, they should -- he hates to see the drilling done down in the ocean 'cause the land is -- they're still finding oil here in land, where they're going to disturb the mammals down there in the ocean. So he hates to see that drilling done in the ocean while they could get the -- find the oil around the land. Thank you.

**Response**

Please see Responses 0130-A01, 0130-003, and BPH-029.

**NPH-A02** (Page 24 and 25)

MR. LOHMAN: Yeah, what do they think of that? Would they stop harvesting fish or whales that had migrated through an area where an oil spill is? Let's say even – let's say there was an oil spill out in the Barter Island area. Would you hunt whales that year? (Translation by Translator.)

MR. AHTUANARUK: No. They wouldn't want to hunt around that area where there's a oil spill. They wouldn't even want to do no -- they wouldn't want to fish around that place where there's a fill -- spill. Like those first.....

MR. LOHMAN: Yeah, it's more than that. The question I'm asking, we've heard this from some people, even in Point Hope and down in the St. Lawrence Island area, that if there was an oil spill in the Beaufort Sea, they wouldn't take whales that year.

TRANSLATOR: No, they wouldn't, they say. They wouldn't want to hunt around that. It would -- I mean..... (Translation by through the Translator.)

MR. AHTUANARUK: They wouldn't want any oil spilled in the ocean 'cause they won't be whaling down near where the spill was 'cause it's very, very bad to taste the oil on any kind of a animal. It doesn't taste good at all. They wouldn't want that to happen, even to the fish.

**Response**

The MMS acknowledges the comments regarding oil tainting of subsistence resources, especially bowhead whales and fishes. They confirm the discussion of tainting in the EIS in Section III.C.2.h Effects of an Oil Spill on Subsistence-Harvest Patterns.

**NPH-006** (Page 27)

MR. LAMPE: I wanted to add a comment to Tom Lohman's -- just, you know, to elaborate a little bit more.

We're already a living example of if you would eat contaminated animals or fish. Right now, our burbot is contaminated with PCP from the contaminants in Umiat. And we're – I'd say like 60 percent of the village used to harvest burbot. Now I'd say only 10 percent, if even any 10 percent. I think only two families now go out and hunt burbot. I'm one of them, and then there's another one, and then there's a couple, maybe three or four guys that sit -- but that gives you an example that no one wants to eat contaminated fish, or even wants to risk it. But, you know, that gives you an example there.

**Response**

The effect of a large oil or diesel spill on fishes would depend primarily on the season and location of the spill, the lifestage of the fishes, and the duration of the oil contact. If an offshore spill did occur and contact the nearshore area, some marine and migratory fish may be harmed or killed. However, contaminants associated with the Liberty Project are not expected to have a measurable effect on fish populations. The MMS acknowledges the comments regarding oil tainting of subsistence fish resources. They confirm the discussion of tainting in Section III.C.2.h Effects of an Oil Spill on Subsistence-Harvest Patterns and the conclusions reached in the Environmental Justice analysis in the unlikely event of a large oil spill (see Section III.C.12).

**NPH-A03** (Pages 30 and 31)

MR. LOHMAN: Tom Lohman, for the record. I just feel like saying that. Tom Brower in Barrow once told me about an incident where a Navy ship got hung up near Nelson Lagoon on a sandbar and let go of a bunch of oil to get off the sandbar. And that people didn't see birds and fish in that area for three or four years afterward -- or whales, in the lagoon area for three or four years afterward. And since Noah mentioned the Navy ships, I wondered if he knew about that incident. (Translation by and through Translator.)

MR. ITTA: Yep, he remembers that. He knows about that.

MR. LOHMAN: And is it true they didn't see animals for -- for how long afterward? (Translation by and through Translator.)

MR. ITTA: There were lots of seals and lots of ducks and all kinds of animals that was killed by that oil they spilled in the ocean. That small portion of that oil they spilled in the ocean, that time when they just spilled it out of that ship, killed lots of seals, lots of ducks. But they seemed to come back right after they cleaned it up. That small portion of that oil got in the ocean, caused lots of animal problems. You know, they killed lots of animals on there. But then they cleaned up all summer long, but after they cleaned it up, they seemed to come back. There are still some around there, but then that oil is no good for any kind of animals in the water, any kind of water. There's -- it kills.

**Response**

The incident referred to by Mr. Lohman and confirmed by Mr. Itta regarding release of oil by a Navy vessel is noted in Sections III.C.2.a and c.

The account of the Elson Lagoon oil spill by Thomas Brower, Sr., is discussed in Section III.C.2.b(2)(a)2) Effects of a Large Offshore Spill, first paragraph.

**NPH-A04** (Page 32)

MR. ITTA: He remembers that oil, that oil spill in Valdez, and when that happened, there was hardly no small birds around here, that they never come back up here, even the pren (ph), you know, the keys (ph). The few come, but not like they used to. Lots of that killed the animals that used to come up here, too, you know. He remembers that.

**Response**

Although the species to which Mr. Itta refers are not readily discernible from the public hearing transcript, he raises an interesting point. Some portion of several waterfowl and loon populations spend the winter in or migrate through the Southcentral Alaska region affected by the *Exxon Valdez* oil spill, and it is possible that some of these birds spend the summer in the Nuiqsut area. If a substantial proportion of a particular species' population that normally summers in this area were oiled, it is theoretically plausible that this could show up as a noticeable decline in the numbers of this species returning to the area in the years following the spill. However, there are several reasons that bird numbers in an area may decline, including natural decline in productivity, lowered survival of adults or young (which could be a result of an oil spill), increased incidence of disease, increased predation, increased hunting pressure, changes in distribution for a variety of reasons (for example, decreased food or nesting habitat, increased disturbance), or a combination of these factors. Insufficient information is available for most of these factors to adequately analyze the various possibilities.

**NPH-A05** (Pages 32 and 33)

You guys have -- in this area, they have to look for the oil in the ocean. He would like to see you guys keep the ocean clean, not even a drop of oil be spilled in the ocean, 'cause even a small portion of the oil could kill lots of animals. 'Cause he very much noticed the taste of the fish, that white fish that they get from Mayorhagdak (ph), he notice the difference. They could hardly eat them now. They're so different. They don't taste like a long time ago when they were healthy. They don't taste good; they couldn't eat them. So he hates to see any oil spilled around where the animals where they live off from.

**Response**

Please see Response NPH-A02.

**<u>PUBLIC TESTIMONY OF MR. ARCHIE AHKIVIANA</u>**

**NPH-007** (Pages 33 and 34)

First of all, I'll tell you this: that I'm opposed to any kind of oil activity in the east side of Cross Island, of any kind, 'cause we had some problems when they had activity around Camden Bay area 'cause the whales were devoted -- chasing out about 25 miles. We had to go to some small island out, and we had difficult time. And I also lost my whale that year ‘cause we couldn’t tow it in ‘cause it was too far out, and we got catched in the storm in that area.

If there’s any kind of activities on the east side of this for whaling, any kind of activities on the east side of Cross Island, it would divert whale out from the coast line, from their migrating route. If there’s no activities, we get -- you know, like last year, we stayed only -- stayed out only eight days to get our quota. See, if there’s any activities in the area, we might spend two or three weeks ‘cause we have to go way out. And then trying to tow those with a small boat is very hard, I mean, very hard, especially when it’s stormy, kind of stormy, you know. But you could try to tow it, with a small boat, it’s very hard.

That area is a critical area for whales, ‘cause the small whales will go into that bay, I mean, into those -- in the inside of those Barrier Islands. We have seen them, not only whales, but we seen some belugas, porpoises that goes on that area, some -- seen some walruses up in that area, I mean, up where they go through. See, if there’s any activities in that area, we would have a hard time again whaling with our small boats. We don’t have a big ship or any kind.

**Response**

The Liberty Project would be sited on blocks leased by BPXA from Beaufort Sea Lease Sale 144. The mitigating measures in place for that sale apply to these leases and include conflict resolution processes that can be convened at any time by any interested stakeholder. Development of a conflict avoidance agreement between the Alaska Eskimo Whaling Commission and BPXA is required, and agreement by both parties on timing of development operations to not conflict with whaling practices also is a requirement. Other potential mitigation being considered includes a seasonal drilling restriction and an industry site-specific whale- and seal-monitoring program.

An evaluation of the effects of drilling noise on whales is in Section III.C.3.a. Cumulative effects, including the effects of seismic surveys, on bowhead whales, is in Section V.C.1.a. One of the primary mitigating measures that BPXA will implement will be to develop a Conflict and Avoidance Agreement working with local subsistence users to protect subsistence hunting.

**NPH-008** (Page 34)

And also, that area is critical for arctic ciscos that migrate through that area. And the peoples around here in North Slope, also the peoples in Barrow, Wainwright, you know, wherever, they depended on that arctic cisco. They liked that fish. So if there’s any kind of oil spill or activities in that area, they would divert their migrating route also. That's how come they got crossways in those -- where? -- at Endicott? They got crossways at Endicott and also at West Dock. To let the fish go through. They migrate, from what I understand, from McKenzie River.

**Response**

An oil or diesel spill, and other activities associated with Liberty, could adversely affect some marine and migratory fish. However, contaminants and activities associated with the Liberty Project are not expected to have a measurable effect on fish populations, including the migrations of arctic cisco.

**NPH-A06** (Page 35)

And then this high wind, we were down at Cross Island about a couple of years ago. We couldn’t go off the island, even though we’d gotten all our quotas in, ‘cause of the high wind. The swells were about 28 feet high. Even the seismic boat couldn’t reach us, it was so high-winded, you know. And then when the wind died down, the seismic boat went after us to pick us up off the island ‘cause we were getting low on water and food, you know, but we got a lot of whale meat and stuff.

HEARING OFFICER: Twenty-eight-foot swells were where again?

MR. AHKIVIANA: Around that area.

HEARING OFFICER: Cross Island?

MR. AHKIVIANA: Yeah. They couldn’t -- I mean, yeah. Yeah, just right by the Cross Island, yeah.

**Response**

Information from this part of the testimony has been incorporated into Section VI.C.4 Climate and Meteorology.

**NPH-A07** (Page 37 and 38)

MR. AHKIVIANA: There’s only one whale that we got, was by passing (indiscernible) that because they was so high-winded. You know? But they -- the peoples at Endicott has seen -- the Natives there? -- has seen belugas going in through there, some smaller whales, like porpoises or the right whales. And they would go out by the Northstar area.

And then we’ve begun to see some high current in that area also. On the -- at the west side of -- in between Northstar and Midway Island. If there’s ice coming in from the east side toward the west, once they hit that current, we seen them go straight down, north, northwest from that current. It’s getting noticeable. If there’s any ice coming in from the east side toward west, they don’t cross that no more, you know. Even smaller -- bigger ice. We seen them go straight that -- that current is changing somehow.

**Response**

Please see Response BPH-A18 for information on whales. Information on winds, currents, and ice from this part of the testimony has been incorporated into Section VI.C.4 Climate and Meteorology.

**PUBLIC TESTIMONY OF MAYOR ELI NUKAPIGAK**

**NPH-009** (Page 39)

There’s no turning back, but we’d like to see some stipulations done that no drilling or activities be done during our fall whaling in Cross Island. Be there no activities at all until our quota is met. And we would like to see that if this ever happened, how you going to -- what you going to do if the big oil spill happens over there? How we going to get our meat from there on? The question like this ever happens.

**Response**

Please see Responses NPH-007 and BPH-033.

**NPH-A08** (Page 39)

But Nuiqsut is the most impacted village in our North Slope. Even though we say no to Northstar, the resolution that we passed in Northstar Island, we say no to it, but our higher-ups, like the State or the North Slope Borough, override the village that is impacted. Got to change that one around. Got to start listening to the most impacted village, even though the State or MMS have the say-so in that area.

**Response**

See Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, and V.C.9 for a discussion of impacts on Nuiqsut.

The MMS is funding a sociological study to examine North Slope Native residents' perspectives on effects from offshore oil activity and any potential impacts this activity may have had on bowhead whale hunting and social traditions. This study will specifically address oil-activity impacts in Nuiqsut.

One point that should be made, and that was made numerous times at the Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities convened by MMS in April 2001 in Anchorage, was that any realistic analysis of cumulative effects on the North Slope needs to consider both offshore and onshore effects. To date, the most obvious cumulative effects are occurring onshore, although no adequate monitoring has ever been undertaken there, and many of the stress factors mentioned by the commenter can be associated with these onshore impacts. Until a serious monitoring program is developed onshore, causal linkages to effects from onshore or offshore sources will be problematic.

**NPH-A09** (Page 39)

But because this is our hunting area, AEWC just passed a resolution in their last meeting that there be no development or seismic activity 15 miles radius from Cross Island. This happened this winter, so we used to hunt. Mike Willike (ph) used to hunt right in North -- Narwhal Island. That's a few miles from Liberty. We know that area that is the high concentrations of the plankton and small fish. It is -- now, we know a few places where the whales eat on their migration path.

**Response**

No seismic activity is associated with the Liberty Project, and Liberty Island is more than 15 miles from Cross Island.

**NPH-A10** (Pages 39 and 40)

I, for one, had caught a whale two miles from Northstar Island in '97. We have seen and witnessed about hundred or so whale, bowhead whale, grey whales, feeding right in the shore -- near shore in that island. The 30-meter mark is where the zooplankton congregate, and that's where the -- shallow area where the bowhead start feeding on their way back south.

**Response**

Mayor Nukapigak's testimony about seeing a hundred or so bowhead whales and gray whales feeding near Northstar Island has been included in the text in Section VI.A.1.a.

**NPH-010** (Page 40)

I would like to see more studies on the zooplankton and also other food sources before any other development ever occur because Northstar is just a -- it just happened two years ago. We would like to see more studies on that area, of our ecological system so that we know what -- how much impact and how much adverse effects is being done in our area of where we do our hunting.

**Response**

The comment requests more ecological information on zooplankton, a basic food source for bowhead whales. The available information on Beaufort Sea zooplankton is summarized in Section VI.A.5.a. Additional information on zooplankton and bowhead foods will become available during fall 2001 before any decisions are made on the proposed Liberty development. The information will be in a scheduled report for the study entitled *Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information*.

**NPH-A11** (Page 40)

This is the stuff that we had to go through. Our way of life will never change. We're still going to keep on hunting. We're still going to keep on living the way we are. We will never change the way unless any big oil impact, like an oil spill, ever happens in our area. How much (indiscernible) capacity do you have if you develop Liberty? What kind of impact are you going to give the village if any occur, if that happens?

**Response**

Please see Responses NPH-A08, 0130-003 and BPH-033.

**PUBLIC TESTIMONY OF MR. LEONARD LAMPE**

**NPH-011** (Page 45 and 46)

How could an agency and as well as BP put up a plan like this when you have no proven method of cleaning a oil spill in the Beaufort Seas in the ice conditions? How can you give them the permission to drill in our ocean with no proven method to clean it up? Who's going to be responsible? Who's going to bring our heritage back, our livelihood, our Inupiat way? It took us thousands of years to stay alive, to prove to ourselves and the rest of the world we can stand on our own two feet.

And with a oil spill like this, that's just another blockage for us, and I don't think we can survive that. We're just going to be another lost people in this world. Like yourselves, trying to find your history, where your wagon came from. We know where we came from, and hopefully, we know where we're going, but all of this is in your hands. And how -- I'm going to ask you, How can you permit someone to drill in the ocean when there's no proven technology to clean up an efficient -- a oil spill in that kind of waters or ice conditions?

Protection agency, you're supposed to protect us, making sure that we are not vandalized like this. Or as human rights, as humans, as people, as Inupiats, you're supposed to make sure that our environment stays the same, our animals are here, our whole world stays the same for us to keep living. That's a protection agency's job, is to protect our environment and the people. And I don't understand how can you give anybody a permit to drill when you have no proven technology. They don't even know how to clean a spill out there. Even Alaska Clean Seas, been studying years and years and years, and they have no proven technology, nothing. They cannot prove how to clean a spill out here.

**Response**

Please see Response 0145-012 for broken-ice response issues.

**NPH-A12** (Pages 50 and 51)

Okay. I know, too, hundreds and thousands of dollars come off these projects to the State and to the departments, but, you know, the people that are impacted, we don't see any of that monies. I mean, maybe very little in programs, maybe the Borough in tax -- you know, taxes, with property taxes, but that's about it. And then we put up with all this impact and all this – it's more of an impact, a burden, than it is of a blessing, I think, up here.

You talk -- BP talks about jobs, how they promise all these jobs to us. We have 560 residents, and not one -- not one -- is working for British Petroleum or its contractors. Now, that gives you some kind of an idea. And they said this about Northstar. They've said this about other projects in the past. They promised us jobs, and still, we haven't seen anything or heard of anything here in the village. That always comes with projects, promises of jobs and wealth and money, but it doesn't happen on this end. Maybe on your end. Maybe in Anchorage.

We see a lot of BP workers and their children, and their children's children, going to work there in the industrial area, but not our children or ourselves. And that's a fact. I lost a job so one of them BP big boys's sons can go to work. That made me determined to go to school, to college. Said my son's going to college, so you're fired today.' So I made up my mind the next day to go to college. So we're still losing jobs today to the industrial and their sons and their family members. They promise you that they'd give us the jobs. We don't see them on this side.

**Response**

Subsistence and sociocultural impacts discussions in Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, and V.C.9 acknowledge the increased stress that the Inupiat are enduring because of increased oil activity on the North Slope. The MMS has supported impact-assistance legislation, now pending again in the U.S. Congress. The MMS has funded long-term studies and surveys of the bowhead whale; has recently awarded a study to examine Native residents' perspectives on effects from offshore oil activity on bowhead whaling and social traditions; and has, with the urging of the North Slope Borough, developed conflict resolution processes to increase stakeholder involvement in MMS decisionmaking. In 2001, Congress provided coastal states with a one-time award of impact assistance funds. Alaska received an appropriation of $12.2 million, of which $1,939,680 will go to the North Slope Borough. Congress is considering legislation that would make annual impact-assistance funds from MMS drilling revenues available to coastal communities.

The MMS cannot provide employment incentives, but it can encourage Nuiqsut to pursue such arrangements with BPXA who has publicly made a commitment to local hire on the North Slope. The MMS encourages Nuiqsut to involve itself with BPXA's ongoing Itqanaiyagvik Program, a hiring and training program designed to put more Inupiat into the oil-field workforce.

There is an imminent need for a standing interagency-intergovernmental team that includes local and regional North Slope governments, State and Federal land managers, and industry to monitor and design solutions to subsistence impacts on- and offshore. Such a body would better serve the concerns of subsistence hunters and lead to a more balanced consensus on resource decisions and on approaches to long-term monitoring and the assessment oil-activity impacts.

**NPH-A13** (Page 51 and 52)

Another thing is whales, they're very disturbed by noise, making it very, very dangerous for us. It's already dangerous enough. You know Alaska fisherman, they say, have the most dangerous job in the world. I think whalers, Inupiat whalers, have the most dangerous job. And it's not -- you know, it's not for pay, it's for food, it's for tradition. And these whales that are being bothered by noises get very intense of what's happening here. This is not normal, so they get very protective, very disturbed, especially among the young, when they have young with them.

We have heard from captains earlier tonight how they've lost their whaling crews, their whaling supplies, their whaling boats, almost their lives, because of whales that are being disturbed. And then when we approach them, they're very protective and very – 'cause they've already been disturbed. So I wanted to let you know that drilling not only impacts the wildlife and the mammals, it also impacts us. It can take our life away easily. Noises like this can take our lives away.

And I want that to be in the record, that you heard some hostile whales in the back, and that's all proven because there was drilling around those areas. And next years, or years later when there was no drilling, the whales are back to calm, the way they're supposed to be, and not so protective. But when there's noise and drilling around, they become very agitated and very protective. And our elders have told us that years and years, and that's starting to become proven methodology, or proven to us, that, you know, when we start losing ships and start losing people and crew members, hey, maybe there is some truth to this about noise disturbance disturbing whales.

**Response**

This information about disturbed whales becoming agitated has been added to the text in Section III.C.3.a(1).

**NPH-A14** (Pages 52 and 53)

We've had a lot of occurrences with near-shore -- Northstar is still too young. We haven't felt the full impacts of Northstar yet, I don't think. Sure, the company does all they can in trying to modify the rig into the animals and the -- what about the people? You know? Sure, the Alaska Whaling Commissions takes care of the whalers. What about the fishermen and the people that hunt the walrus and the arctic cisco? Those people aren't being protected.

They don't have no, you know, agreement, where there's all this agreement. They don't have none of these agreements and provisions and guardians like the whalers do. We got to think of those people as well because you're protecting one area of people and you're not protecting others. And I don't think that's fair, as a fisherman myself. You know, some people whale and some don't. And that's how people feel, that you're protecting the whalers and the whale, but you're not protecting us fisherman and people who want seals. That's how people feel.

So it's not fair among everybody that you take care of just only one group of people and not others. Even though, you know, the whalers are the most important, but there are other groups up there that need to be recognized as well that are losing their way of life or their harvesting.

**Response**

One point that was made numerous times at a Research Design Workshop for the Bowhead Whale Subsistence Hunt and OCS Oil and Gas Activities convened by MMS in April 2001 in Anchorage, was that any realistic analysis of cumulative effects on the North Slope needs to consider both onshore and offshore effects. To date, the most obvious cumulative effects have occurred and continue to occur onshore, although no adequate monitoring or comprehensive baseline data gathering has ever been undertaken onshore by responsible Federal and State agencies and industry. Most of the stress factors mentioned by local stakeholders normally can be associated with onshore impacts. Until a serious monitoring program is developed onshore, causal linkages to impacts from onshore or offshore sources will be problematic.

The MMS believes there is a need for a standing interagency-intergovernmental working group that includes local and regional North Slope governments, State and Federal land management agencies, and industry to consult, coordinate, design, and monitor solutions to subsistence and sociocultural cumulative impacts on- and offshore. Prospective members of such a group would be industry; the MMS; the National Marine Fisheries Service; Nuiqsut, Kaktovik, and Barrow tribal governments; the Alaska Eskimo Whaling Commission; ICAS; the North Slope Borough Wildlife Management; the State of Alaska; the Fish and Wildlife Service; the Environmental Protection Agency; and the Corps of Engineers. Such a body would better serve the concerns of subsistence hunters and lead to more balanced decisions on approaches to long-term monitoring and the proper assessment of oil-activity cumulative impacts on subsistence resources and sociocultural and subsistence harvest practices. After its recent lease sale in the National Petroleum Reserve-Alaska, the Bureau of Land Management established a National Petroleum Reserve-Alaska Subsistence Advisory Panel and Interagency Research and Monitoring Team, which includes the Bureau of Land Management, Fish and Wildlife Service, and other Federal agencies; the State of Alaska; the North Slope Borough; and local North Slope groups who meet to address local subsistence concerns. A similar but smaller offshore panel could be developed.

**NPH-A15** (Pages 56 and 57)

One thing that I don't see in here, and I want you to think before you answer me, how many of these meetings have you been to in the last year about Northstar, Alpine, McCovey, Liberty?

UNIDENTIFIED FEMALE SPEAKER: Two to three meetings a week.

MR. LOHMAN: A week. And that's an impact that doesn't show up on the documents. Everybody in this room would probably rather be doing something else right now.

MR. LAMPE: Monday Night Football.

MR. LOHMAN: And.....

(Laughter)

MR. LOHMAN: Well, not now. And you're all – hopefully -- are going to spend some time going and looking at this document, too, and that's something -- I'm sure there's a lot of other things you'd rather be doing.

MR. LAMPE: Yep.

MR. LOHMAN: You talked about your job. You have a job. You also need to go hunting. You need to do a lot of other things. Spend time with your daughter, who bothered me all during dinner.

MR. LAMPE: (Laugh.)

MR. LOHMAN: But that's an impact that needs to get talked about. So you don't need to lay it on the table here, but we need to talk about that, as the Borough.....

MR. LAMPE: Mm hmm (affirmative).

MR. LOHMAN: .....to a community, to start getting some handle on how much time you spend dealing with all this.

MR. LAMPE: Yeah.

MR. LOHMAN: And not just the time you spend, but the anxiety it causes. So we'll deal with that. That's all I wanted you to sit there for.

MR. LAMPE: Okay.

**Response**

Please see Response 0132-A04.

**NPH-012** (Pages 61 and 62)

(Question from the audience)

TRANSLATOR: Okay. You guys have to think about big ice groups, that no matter how deep the water is, it's always in to the bottom of the ocean, and they drag -- whatever it is they drag, that iceberg would drag that. It could go deeper than seven foot maybe, and then it's possible that that iceberg would go to that area and then drag that pipeline off that and broke it. It's possible. Because he knows there are some icebergs that -- to his knowledge, there's always icebergs that's dragging at the bottom of the ocean.

Big huge ones, so, you know, when the storms come, they grow. That's how come some of those icebergs always have sand on top of them. They've been rolling under the ocean. That's what he's afraid of.

**Response**

Pack ice contains the only ice bodies that are capable of gouging the sea floor to depths greater than about 1 meter. Shorefast floating ice occasionally generates large tabular ice bodies, and these also may gouge the seafloor in a wide path, as seen in Figure VI.C-6. However, side-scan records and underwater observations of the seafloor indicate that in sheltered bays and areas inside of the stamuki zone, even the largest ice bodies and the jumble of many ice bodies that are broken off of floating shorefast ice will not have the deep and angular keels needed to gouge to deeper than about 1 meter.

**PUBLIC TESTIMONY OF MR. JAMES TAALAK**

**NPH-013** (Pages 63 and 64)

But the one thing that stood out in my mind was all the mud and gravel that was brought up and onto the ice. You know, it must have been for about, I don't know, 20 or 30 feet from where the trench -- trenching was, on over, over the ice. And my question to them was, you know, when the ice melts, you know, how much of this gravel will be floating in the water? Because I know in the area, you know, we have seals and fish and plankton and other sorts of, you know, animals that live in the area, if that would have any effect, you know, on that life. And they said it would have some effect, but it would be minimal.

Summer came along, the ice broke up, the ice was moving out, you know, I'm going out there with the family to hunt seals, the bearded seal and ring seal. And going further east that way and seeing the ice pack out there, and probably some of the hunters saw it too out there, was, you know, blackness out where it should be white. You know. And the first thing that crossed my mind: Northstar. You know, the trenching. All the mud and gravel that was brought up as a result of the trenching at Northstar for the pipeline.

**Response**

The effects of trench material left on top of the ice is analyzed in Section III.C.3.l(2)(b)2).

Sand-, gravel- and larger size particles in the trench material left on the ice will fall rapidly to the seafloor when they melt or erode from the surface of the ice. The finer grained particles entering the water will be suspended and add to the natural background concentrations of particles in the water column.

There also are natural ways in which ice holds and/or transports sediment particles. When the water freezes, suspended particles in the water are entrained in the ice. The amount of particles entrained depends on the particle concentrations in the water. When the ice melts, these particles are released into the water and contribute to the natural background. Also, in the nearshore area, ice that freezes in contact with the seafloor captures loose particles on the seafloor. When contact between the bottomfast ice and the seafloor is broken and the ice floats away and begins to melt, the particles entrained in the bottom of the ice will enter the water column. Sand-, gravel- and larger size particles will sink to the seafloor. The finer grained particles will be suspended in the water and add to the amount of suspended material in the water.

**NPH-A16** (Pages 64 and 65)

And a trench in that area like that, where Liberty is located, you know, within the barrier islands and so much close to Cross Island, but a migratory route for some of the whales and other marine mammals, you know, if there were to be trenching out there, my fear, you know, when -- you know, if as much gravel and mud is brought out of the water, and when thaw comes around and this mud and gravel is released into the water to free-float, you know, right in the migratory route of the marine mammals, you know, I'm sure that, you know, that would cause a diversion in the migratory route, especially for the whales.

**Response**

The effects of pipeline construction (effects of sediments in the water from trenching, backfilling, and melting of ice where excess trench sediments are placed) on bowhead whale migrations are analyzed in Section III.C.3.a(1)(b)2)d).

Also, see Response NPH-013.

**NPH-014** (Page 65)

I'd also like to close by asking or saying, you said earlier that at the federal and State level, there's an acceptance process for these projects and these prospects up here on the North Slope, whether it be on land or offshore, whatever. It would be nice, you know -- you know, for a community like ours, Nuiqsut and probably Barter Island, but for communities to have -- you know, to be very much involved in the acceptance process, you know, for an oil spill contingency plan.

**Response**

The MMS welcomes input from the North Slope residents on the oil-spill-contingency plans. Prior to approval of the oil-spill-contingency plan, the MMS will consult with the North Slope tribal governments.

**<u>PUBLIC TESTIMONY OF MS. ROSEMARY AHTUANARUK</u>**

**NPH-A17** (Page 69)

Oil development also takes away from our ability to adequately interact with the youth of our communities. The traditional skills and languages are being threatened by the stresses of time and advances of technology, limiting the willingness of the youth by seeing this as old-fashioned.

**Response**

See Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, and V.C.9 for discussion of impacts on Nuiqsut social systems and institutions. See also Responses 0130-003, 0130-A01, 0130-006, and NPH-A12.

**NPH-A18** (Page 71-75)

The City of Nuiqsut has been facing a large invasion to develop the projects associated with the exploration and development of the natural resources of their area. We are trying to work with the entities that are associated with the organization and coordination of them, yet our resources are not being expanded to allow us the flexibility and demand necessary to meet the many needs that are being identified each day.

Our leaders are being stressed to the maximum, and the youth are also being impacted. The unknown impacts are yet to be identified. The rapid change in technology has prohibited this in the past, but with the information and technology available with the Internet, it has opened an avenue that is barred by cost and availability. We need to expand this accessibility to the powerful tool that has opened barred doors to many of the people now at risk. The trapper school has shown success that is created with variations to meet the needs of individuals that are at risk, and now we must focus on developing these tools to combat the problems associated with the development super-rush.

The identification of a fuel that will ignite learning and development and minds of the people of our community was a possibility that's lying dormant by lack of exposure. We are limited by the possibilities by having only cable t.v. Internet is a two-way interaction that needs to be inputted and developed as it is being used.

The library is part of the school that has a tough goal of trying to get students and education limited by the resources available to new staff that have to identify it as being available first. The community center, the teen center, the day care, and the cultural center that will soon be developed will be sites available for exposing the residents to this possibility. The luxuries that are available in Barrow are not readily available to village residents.

The North Slope Borough has exposed their workers to this tool, and the southern areas have been using this tool for quite sometime, but the reality is, it's not available to people in Nuiqsut. The possibility of creating a certification process without the costs of travel and absence from the community is the answer to the future growth of the providers necessary to fill our work force that is dependent on the many requirements to fill the needs of creating avenues to success.

During the last few winters, the activities of development have severely increased usage of the regular services provided by town. The water supply in the town's water tank has had to be refilled within a few months' period. The continuous -- the water tank used to last for a whole year until it needed to be refilled. To remedy it, they thought of using a continuous traffic of a water truck, filling the tank and delivering it to the camp, since they also were out of water.

The diesel fuel supply ran out, and how many times this year emergency shipments had to be shipped in with plane loads to provide enough heating oil. The motor gas supply also had to be supplemented with flight supply instead of the trucked amount sustained in the village with the increased demand. The local store is expanding due to the increased services demanded with the hotel that was constructed two years ago, or how many years now, which houses the oil and gas related staffing and construction guests.

The facilities at Nuiqsut, just has a clinic, the airport, the cafeteria, the post office, the retail store, the sewage lagoon, and the landfill are services that are and will be used for future related activities.

The demand for these services have only increased, but the budget has not. In fact, it has been greatly cut.

The North Slope Borough and our previous Mayor of Nuiqsut, Leonard Lampe, worked very hard to try to comment on many of the meetings that have developed over the years on all of this, but it seems like it goes into a unknown barrel because it never shows up as being responsive to our needs or our concerns.

Nuiqsut was lucky to get eight new houses built, but there are still many families, at least 20, that need houses. We have single families with -- a family with six children living in a one-bedroom trailer. We have another one living in a shack without adequate flooring, just plywood on the gravel. There are homes in which three generations live in one home. A family of twelve living in a three-bedroom house is one example.

There are funding projects that are available with the application process, and the North Slope Borough has been very successful in the recent years in acquiring some of this. But the City has had to donate this land in order to get housing projects because of many -- some of the families are behind in their payments, and that puts us low on the acceptability range because of the indebtedness.

Although a hotel is available, many relatives who move into Nuiqsut to work at the oil and gas fields may not use the hotel but stay with close friends or relatives. The hotel is filled to capacity with off-Slope workers. During the construction season in the last year, about 170 construction workers were expected to move to Nuiqsut. In the year 2000, more like 12,000 people were brought in, but it cut down in 2001 to about 200 to 600 jobs. When the project is done at Alpine, they estimate only 50 jobs for Nuiqsut residents, with over 200 jobs available at the facility.

When this influx was planned, with the dollar signs attached for the project to produce this oil, there was no further assistance given to the community to meet this invasion. The environmental effects are water quality changes; land use conflicts; chemical pollutant releases; oil spills; air quality degradation; alterations of hydrology causing a loss of fish and wildlife; noise pollution; traffic on road, dock, airstrip; sanitation and utilization construction -- and utilizes construction [sic].

**Response**

See Responses 0130-003, 0130-A01, 0130-006, 0146-016, BPH-033, and NPH-A12 for further discussion on sources for funding and assistance with social and environmental impacts.

See also Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, and V.C.9 for discussion of impacts on Nuiqsut infrastructure, social systems, and social institutions from increased oil-development activity.

**NPH-015** (Page 75)

Mitigation measures must be developed to minimize the pollution and habitat degradation; disturbance to fish and wildlife species; and subsistence uses. Tundra damages to traditional berries, such as salmon, black, and blueberries and other traditional plants used for nutritional and traditional purposes have occurred during the exploratory activities. Plants and berries take years to return to their original state after heavy activity occurring in an area where there is low snow accumulation.

**Response**

The current leases include Stipulations No.1, Protection of Biological Resources; No. 2, Orientation Program; No. 4, Industry Site-Specific Bowhead Whale Monitoring Program; and No. 5, Subsistence Whales and Other Subsistence Activities. The lease conditions require that BPXA communicate and coordinate with communities before beginning work in the area. In addition, all of the construction work is scheduled to occur during the winter months using ice roads to minimize the effects to the tundra and wildlife. The amount of onshore activities required to construct two pads and the 1.5 miles of onshore pipeline (3.2 miles if the eastern or Tern Island route is selected) is relatively small. There are no onshore or offshore exploration activities planned for this project. Construction activities would be completed in the first construction season, with the pipeline being constructed in the second season.

The Kadleroshilik River does not have fish-overwintering habitat, and it is very unlikely for winter construction using ice roads in the river bed to have any adverse effects on fish or fish habitat. In fact, if the mine site is rehabilitated and fish-overwintering habitat were created, fish would benefit from the project.

**NPH-A19** (Page 76 and 77)

Seismic activity leaves trails -- often leaves trails, leaves berms which cause safety hazards for snowmobile riders crossing traditional trails. Often there are incidents occurring in which snowmobile riders have to stop suddenly. And there was an incident in which a rider was thrown over the front of his snowmobile because this berm was hard to see in poor visibility.

Because of these oil and gas related events, Inupiat subsistence users do not hunt in areas where people, gasoline, and diesel fumes are present. Our hunters and trappers have been displaced from traditional trails, which has become harder and dangerous due to oil and gas activities and had to be redirected to avoid these traditional hunting areas. Abandoned seismic camp and human waste are present around their abandoned camping areas.

Traveling hunters have encountered the seismic lines and have to wonder whether or not they should have crossed these lines. Now they say it’s okay to cross them, but our hunters would rather not even enter an area that’s being explored. There’s so much traffic there, it’s not going to provide good hunting until there’s been snow blown over the track and the air has been dispersed so the fumes are no longer strong.

**Response**

Please see Response NPH-A14.

**NPH-016** (Page 72)

Village residents travel to Nuiqsut and participate in employment and, at this level, have some -- and in this way, at some level -- have some level of impact. Increased incidents of community social ills associated with rapid technological and social change cause problems with truancy, vandalism, burglary, child abuse, domestic violence, alcohol and drug abuse, suicide, and primarily the loss of self-esteem. This has materialized during transient employment cycles.

The influx of construction workers bring their own problems to a village impacted by oil development activities already. Historically, from past experience, we know that the incidents of alcohol and drug use increase dramatically. The North Slope Borough does not have the capability of hiring more police and emergency service personnel for the village of Nuiqsut, which has already been impacted by the Alpine field alone, let alone all of these other developments that are still bringing further impacts. Drug and alcohol use is the root of most emergency calls in the village, and thus will increase significantly during the boom/bust cycle of oil development activities.

**Response**

For a discussion of impacts on Nuiqsut social systems and social institutions, including discussion of social pathologies, see Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, and V.C.9. See also Response NPH-A18.

**NPH-A20** (Page 81)

Although statistics are not generally available, all social service agencies involved with Nuiqsut report problems of alcohol, drug abuse, domestic violence, violent crimes getting worse each year with increased development. With the limited-wage economy, the utilization of subsistence resources is a major aspect of each village's economic structure. Throughout the era of oil development in the Arctic, local residents have expressed concern that the integrity of the Inupiat culture, with its basis in subsistence use, is threatened. This issue is still the primary concern for the future activity.

**Response**

Please see Responses NPH-A15, NPH-A18, and NPH-016.

**NPH-A21** (Page 81)

I think there was a lot of people that had talked about subsistence and whaling, so I'm not going to go on into them again. A village elder stated that a family of five needs about 1,000 miles of subsistence area to feeds its family adequately for one year. This takes into account unsuccessful hunts in different seasons available for subsistence uses. This can be multiplied ten-fold now with the increased attempts to harvest with being unsuccessful now occurring to our residents.

**Response**

We acknowledge the recent changing patterns of subsistence harvests, many of them for the worse. For discussion of impacts from oil activity on Nuiqsut subsistence uses, see Sections III.C.2.h, III.C.3.h, and V.C.8.

See also Responses 0130-003, 0130-A01, 0130-006, and BPH-028.

**NPH-A22** (Pages 81 and 82)

I have heard many times, especially this last year, of hunters going out every day during our high subsistence harvests, July, maybe August, of not harvesting one caribou for their family. If we're not able to harvest and prepare our food during the season when it's readily available, it's not going to be in our ice cellars during the long, dark months of the winter.

**Response**

Please see Response NPH-A21.

**NPH-A23** (Pages 82 and 83)

One of the biggest issues that affects our community is the loss of control. In addition to the loss of subsistence opportunities, the major severe impacts result from the petroleum development in other areas of the Arctic. It is the lack of control over these events experienced by the village. Nuiqsut residents state they are the last to find out what's happening to them.

They are never asked or generally considered about the pattern or course of the industry's development. They are merely informed after major decisions are in place. They would not spend the money making these studies if they were not planning to develop them. So it's a moot issue, after the fact. You're coming for the meeting, but you're already spending the money because you know this project is happening.

This perception causes enormous social stress and tension. It is reflected in the increased community social ills, such as the alcoholism, the domestic violence, and the drug abuse. Thus, existing and potential activities further exacerbate and destabilize stress and tension resulting from almost 20 years of petroleum activities in the region.

And since development would complete the pattern surrounding our traditional whaling site, it poses the most significant and long-term adverse social and cultural impacts of all the development of the North Slope, the potential for permanent reduction and/or loss of subsistence reserves, and thus, the viability of the Inupiat way of life.

**Response**

Please see Response NPH-A08, NPH-A12, NPH-A17, and NPH-016.

**NPH-A24** (Page 84)

As well as the land where we have traditionally brought our whales up to harvest, to cut and store until we bring it to the village, if that area is damaged, we cannot bring our whales up there for who knows how long. And we would not attempt, because we do not harvest if it will be spoiled.

**Response**

We understand that oil contamination of beaches would have a profound impact on whaling, because even if the whale itself were not contaminated, it could not be brought ashore and butchered on a contaminated shoreline. See Responses 0132-050, 0132-051, 0132-052, 0132-053, BPH-028, and BPH-030.

**NPH-017** (Page 84)

When they had seismic at Oliktok during whaling, it forced the whales way off the island. But the year after, when they stopped the seismic activity, they spotted whales one mile off the island. Seismic activities with abandoned cable lines, metal parts, and other debris that ends up in the ocean leads to hazards to our whalers. There's been problems with the old sandbags that they used to use to create the islands, of getting into the props. You can't see them; they're black just like the water, and they get into the prop and have damaged outboards as well as caused troubles with people trying to get there.

**Response**

There are no seismic operations associated with the Liberty Project. However, there is a discussion on the effects of seismic surveys on bowhead whales in the cumulative-effects section in Section V.C.1.a.

The MMS recognizes that floating debris, including material from gravel bags used as slope-protection material on the gravel islands for exploratory drilling, has caused some problems, such as entanglement in boat propellers. The MMS has required industry to properly maintain the slope-protection material on the gravel islands to prevent or reduce the loss of these materials from the island. After the gravel island is abandoned, the MMS also has required industry to conduct island inspections and to implement gravel bag and filter-fabric recovery plans to remove these materials from the environment. All other debris associated with the drilling activity that is found during these inspections also is removed. These requirements generally are implemented over a 5-year period following island abandonment.

Because Liberty Island is intended for extended operations, it has been designed to use a linked concrete mat to provide the primary protection system for the island. The gravel bags that would be used would be located 7 feet above sea level and more than 50 feet from the water's edge. This combination of design features makes it unlikely that the gravel bags would be damaged and transported into the water from wave and/or ice action. The bags to be used at Liberty are made of a new material that will not float in the unlikely event that material from the gravel bags entered the water.

**NPH-A25** (Page 86)

Within my previous life as a health aide, I saw a lot of the bad. The incidence of asthma has greatly increased. When I first started as a health aide, I had one patient who was an asthmatic. Before I left my job as a health aide, there were upwards of 60 people affected with breathing disorders in this town (crying). As you can see, it causes me great pain to not be working there. But in all the years I worked there, the problems continued to get worse, and I had no support. People would try to be supportive. Leonard was my right-hand man. Without Leonard, I would have never made it. Without Abe Simmons, I would have never made it.

**Response**

Similar concerns were voiced by Elder Bessie Ericklook as early as 1979; the problems with air quality and village impacts noted by Nuiqsut residents are discussed in more detail in Sections III.D.1.h(4), III.D.1.m(5), and VI.C.3. Because of the distance of the Liberty Project to Nuiqsut (approximately 90 miles) and the relatively small size of the project in comparison to the Prudhoe Bay complex, the MMS believes that the Liberty Project would have essentially no effect on air pollution in Nuiqsut. Because no local, State, or Federal health agencies have ever studied the village for health effects related to air pollution, air-quality concerns resulting from oil-development activities in the region remain unresolved in the community.

**PUBLIC TESTIMONY OF MR. MARK HELMERICKS**

**NPH-018** (Pages 97 and 98)

TRANSLATOR: You said something about wanting to burn that spill on the ice. Right?

MR. HELMERICKS: Yes.

TRANSLATOR: That still leaves the film, the smell, and the ashes and the soot on the ice. How you going to get rid of that?

MR. HELMERICKS: Well, that's an excellent question, and that probably cuts to the heart of the reason why burning is controversial, because it.....

TRANSLATOR: That's 'cause smoke just doesn't go up in the air. There's some on the ground that's not.....

MR. HELMERICKS: That's right. It doesn't.....

TRANSLATOR: And those chemical part is left on the ground when you burn something. The most dangerous part is left on the ground when you burn something. Just the smoke goes just up in the air, but the dangerous part is on the ground. So how do you get rid of that?

**Response**

A main part of all in situ burn responses is collection of the residue after the oil has been burned. On solid ice, this would be done by hand initially to get the material on the surface of the ice. After the surface residue is removed, other equipment would be brought in to remove any remaining residue embedded in the ice. If a burn is conducted on the water, the residue tends to float and can be collected by means of nets, strainers, oil sorbents, and viscous-oil skimmers.

**FURTHER PUBLIC TESTIMONY OF MS. ROSEMARY AHTUANARUK**

**NPH-A26** (Page 102)

I wanted to add about -- you had talked about fishing and if we had been impacted. This is Rosemary Ahtuanaruk again. When there has been offshore activities and causeways were built and islands were built, it does affect our fishing. The sediment affects the way the fish move along the ocean. They go into the rivers, and we harvest them there. But when there's a lot of problems, because like you're pouring gravel in there, it changes everything, and the salinity and all that kind of junk is all affected.

**Response**

The effects of Liberty Island and pipeline construction on fish and water quality are analyzed in Sections III.C.3.f and III.C.3.l, respectively. Although construction of a causeway is not part of the Liberty Development and Production Plan, the effects of causeways are analyzed/described in various sections of the EIS that includes subsistence use of fish (Section III.C.2.h(2)(b)4)), bowhead whales (Section V.C.1.a(2)(b)), eiders (Section V.C.1.b(2)(c)1)), water quality (Section V.C.12.b(2)), and benthos (Section VI.A.5.b).

**NPH-A27** (Pages 103 and 104)

They're very, very mind-boggling how much one whaler feeds, let alone all of the welders [sic] -- whalers in unison. It's the same thing as one hunter putting out a fish net. It doesn't feed just Nuiqsut, one family. It may feed ten families plus how many families in other villages because they'll send stuff to them.

**Response**

We acknowledge the importance of sharing and the pivotal role whaling captains play in sharing the whale catch with the entire community. Sharing is discussed in detail in Sections III.C.2.h, III.C.2.i, III.C.3.h, III.C.3.i, V.C.8, V.C.9, VI.B.1, and VI.B.2.

**NPH-019** (Page 104)

The fish has changed. Our elders have talked about the taste, the quality of their fish. Arctic cisco is a very oily fish, but you cook the fish and they've got a yellowish appearance to the meat that was never there before. Even my fish. I was very appalled.

**Response**

An oil or diesel spill could adversely affect some marine and migratory fish. However, contaminants and activities associated with the Liberty Project are not expected to have a measurable effect on fish populations. The MMS acknowledges the comments regarding oil tainting of subsistence-fish resources. They confirm the discussion of tainting in Section III.C.2.h Effects of an Oil Spill on Subsistence-Harvest Patterns and the conclusions reached in the Environmental Justice analysis in the unlikely event of a large oil spill (see Section III.C.12).

## FURTHER PUBLIC TESTIMONY OF MR. LEONARD LAMPE

**NPH-A28** (Pages 109 and 110)

What if a spill occurs like that? When you're saying it's too dangerous for a man to go out on the ice, are we going to really do that? Because this was supposed to be an exercise like the real thing. The real deal. They told us everything -- alarms, put on our stuff, put on our gear, go outside and do the whole works. Then they said, 'Oop, Stage 3. No men allowed out on the ice. Unstable conditions out there.'

If a oil spill occurs, are we going to go through that? It's unsafe for you, spill team, to be out there, so stay in here until the ice conditions are safe? Because the exercise we went through was supposed to be the real deal. And I'm scared, if that was the real deal and they wouldn't allow us out on the ice 'cause the ice conditions, is that going to happen on the real deal, the real thing? If there's a real occurring spill, they're going to say ice stages are too dangerous for you to be out there, nobody's allowed out there? Thanks.

**Response**

In any response situation, human safety is the paramount concern in dispatching people and equipment to the scene. In a situation where ice conditions become too unstable to mount a safe response, other techniques would be used to deal with the oil. In cases where oil has pooled on the surface of unstable ice, an in situ burn could be initiated with a helitorch suspended from a helicopter. Responders also would deploy tracking buoys that will remain with the oil as it moves through the ice, so when conditions again permit a response effort they can deploy boats and equipment to the sight.

# SECTION VIII

## COORDINATION

## AND

## CONSULTATION

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## CONTENTS OF SECTION VIII

# VIII. Coordination and Consultation

## A. DEVELOPMENT OF THE PROPOSAL

On September 8, 1996, at the Outer Continental Shelf Lease Sale 144, British Petroleum Exploration and Oil, Inc., was the high bidder for Lease Number OCS-Y-01650 (Figure II.A-18) in the Beaufort Sea. The lease is composed of parts of four outer continental shelf blocks, with the largest block being Official Protraction Diagram NR 06-03, block 6820. On October 3, 1996, BP Exploration, Alaska (BPXA) became the designated operator. They began exploration activities the winter of 1996-7, and on March 31, 1997, they completed the exploration well. After announcing a successful discovery, BPXA began planning for the next step, development and production. In January 1998, BPXA submitted a Development and Production Plan to the Minerals Management Service (MMS).

On February 23, 1998, the MMS initiated the scoping process by publishing (63 *FR* 9015) a Notice of Intent to Prepare an Environmental Impact Statement (EIS) for the proposed Liberty Plan. The MMS deemed the Plan submitted under 30 CFR 250.34(f) on February 19, 1998.

The MMS received written scoping comments from the following organizations and individual:

- U.S. Department of Energy
- State of Alaska, Division of Governmental Coordination
- Greenpeace, et al.
- U.S. Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance
- Alaska Public Campaigns and Media Center
- David von den Berg
- Petersburg Energy LLC

Scoping meetings were held in Nuiqsut (March 18, 1998), Barrow (March 19, 1998), Anchorage (March 25 and April 8, 1998), Kaktovik (March 31, 1998), and Fairbanks (April 1, 1998). Comments were received from 82 individuals who attended one or more of the scoping meetings.

In October and November 1999, MMS held a series of information update meetings in the same communities where we held scoping meetings in early 1998. The purpose of these meetings was to provide information on the status of the EIS and to gather additional information about environmental issues and concerns. The minutes of those meetings and a list of attendees at the meetings can be found in Appendix E.

## B. DEVELOPMENT OF THE EIS

During preparation of this production and development EIS, the public; Federal, State, and local agencies; and industry were consulted to obtain descriptive information, to identify significant effects and issues, and to identify effective mitigating measures and reasonable alternatives. We also incorporated information such as traditional knowledge from past pre-sale EIS's for the Beaufort Sea Planning Area. All of the information received has been considered in preparing this EIS. Scoping and public hearing information can be found in Section I.G and Appendix E.

A Liberty Interagency Team was created in spring 1998 to discuss a broad range of issues related to the development and content of the Liberty EIS. The Liberty Interagency Team has participation from five Federal Agencies (Minerals Management Service, Fish and Wildlife Service, U.S. Army Corp of Engineers, National Marine Fisheries Service, Environmental Protection Agency); two State of Alaska Agencies (State Pipeline Coordinator's Office and the Division of Governmental Coordination), and the North Slope Borough. The Interagency Team met periodically during the EIS preparation process. A description of the various agencies' roles and permitting authority is provided in Section I.A. Scoping and EIS alternatives were major issues of discussion for the Liberty Interagency Team.

## C. LIST OF CONTACTS FOR THE EIS

The following are the major Federal, State, and local government agencies; academic institutions; members of the oil and gas industry; special-interest groups; other organizations; and private citizens who were contacted during the preparation of this EIS or past Beaufort Sea EIS's and were sent copies of the draft EIS for review.

**Federal - Executive Branch - Departments**

Department of Commerce
- National Marine Fisheries Service

Department of Defense
- U.S Army Corps of Engineers

Department of Energy

Department of the Interior
- Alaska Resource Library
- Fish and Wildlife Service, Fairbanks Ecological Services

Department of Transportation
- Research and Special Programs, Administration Office of Pipeline Safety, Western Region
- U.S. Coast Guard, Waterways Management Directorate

**Federal - Administrative Agencies and Other Agencies**

Environmental Protection Agency
- Region 10

**State of Alaska**

Department of Environmental Conservation
- Division of Air and Water Quality
- Division of Spill Prevention and Response

Department of Fish and Game

Department of Natural Resources
- Division of Oil and Gas
- Joint Pipeline Office

Office of the Governor
- Division of Governmental Coordination

**Local Governments, Native Organizations, and Libraries**

Alaska Eskimo Whaling Commission
Alaska Resource Library
Barrow Whaling Captains' Association
City of Barrow
City of Kaktovik
City of Nuiqsut
Inupiat Community of the Arctic Slope
North Slope Borough
- Office of the Mayor
- Planning Commission
- Planning Department
- Wildlife Management

**Special-Interest Groups**

Alaska Center for the Environment
Alaska Community Action on Toxics
Alaska Conservation Alliance
Alaska Wilderness League
Center for Biological Diversity
Defenders of Wildlife
Greenpeace
National Resources Defense Council
National Wildlife Federation
Northern Alaska Environmental Center
Seattle Audubon Society, Conservation Committee
Sierra Club
The Wilderness Society
Trustees for Alaska

**Petroleum Industry**

BP Exploration (Alaska), Inc., Health, Safety, and Environment Department

**Associations, Companies, and Other Groups**

Alaska Public Radio
Alaska Cable Network - Fairbanks
Anchorage Daily News
Arctic Sounder
Barrow Cable
Fairbanks Daily News-Miner
KBRW Radio
Petroleum News Alaska
Prime Cable - Anchorage

**Individuals**

Abrams, Julene
Adams, Duncan
Ackerman
Ahkiviana, Archie
Ahlers, Loren
Ahmaogak, Lawrence S.
Ahmaogak, Maggie
Ahmaogak, Myrna
Ahnupkana, Marjorie
Ahsogeak, Bart
Ahtuanaruk, Rosemary
Ahtuangaruak, Jonny
Aiken, Johnny
Aishanna, Herman
Aishanna, M
Akootchook, Berdell
Akootchook, Clarice
Akootchook, Daniel
Akootchook, George
Akootchook, Isaac
Akootchook, Susie
Akpik, Abel
Akpik, Joseph
Albert, Tom
Aldrich, Jim
Allison, Phil
Andersen, Sally

Angasan, Ida
App, Jenna
Arey, Ned
Athans, Marego
Audi, Walt
Barnes, Ron
Bingham, Charles
Blackford, Carla M.
Bowen, Betsy
Bowers, Peter
Boyne, Patrick
Bradner, Tim
Brower, Archie
Brower, Arnold, Jr.
Brower, Arnold, Sr.
Brower, Charles
Brower, Eugene
Brower, Harry, Jr.
Brower, Ronald
Brower, Ronald H., Sr.
Burglin, Cliff
Burnell, Karen
Butler, Geoff
Callaghan, Sara
Carl, Cindy
Combs, Jane
Connery, Bruce
Cook, Tom
Core, Mary
Crawford, Karen
Daniels, Janet
Done, Kathleen
Dougherty,Anne
Dreggs, Della
Driggs, Della
Duchin, Melanie
Dunham, Jon
Ellsworth, John
Evans, Thomas
Farley, Katie
Fay, Cash
Frager, Chesire
Franklin, Luke
Foster, Michael
Gatt, Peter
George, Craig
Goldstein, Norm
Gordon, Evelyn M.
Gordon, Leonard
Gordon, Susan
Gray, Glenn
Hageman, Drew
Hanley, Peter
Hannamen, Karl
Hanson, Jeanne
Harcharek, Jana
Heath, Russel
Helmericks, Mark
Hepa, Taqulik
Higgs, Bill
Hill, Deborah
Hopson, Charles
Huff, Maria
Ialesk, Kenneth
Ipalook, Alice
Ipalook, Lloyd
Itta, Edward
Itta, Mollie
Itta, Noah
Izquierdo-Rodriguez, Maribel
Jensen, Anne
Jensen, Sarah
Johnson, Walt
Judkins, Thersa
Kanayurak, Fred
Kasak, Virginia
Kayotuk, Melvin
Kayotuk, Roland
Kinglow, Paul
Kohler, Don
Kreith, Judy
Kunaknana, Sarah
LaFehr, Ed
LaFuente, Alicia
Lampe, Doreen
Lampe, Leonard
Landers, Jim
Larson, Al
Leavitt, Steve
Lew, Moon
Lewis, Jim
Long, Christopher
MacLean, Edna
Mann, Frances
Marble, Jay
Marz, Stacey
Milenski, Emerson
Miller, Pamela A.
Miner, Lydia
Mobley, Mark
Monteiro, Sergio
Moore, Deb
Morkhill, Ann
Napageak, Thomas
Neakok, Charles
Nelson, Kristen
Nukapigak, Dora
Nukapigak, Eli
Nukapigak, Isaac
Nukapigak, Joseph
Nukapigak, Lucy
Nukapigak, Ruth
Nusungi, Emily
Obermeyer, Theresa

Obie, Tukli
Okakok, Rex
Okakok, Rex A., Sr.
Olemann, Forrest D.
Opstat, Erik
Oviok, William
Paskvan, Charles
Pederson, Mabel
Peetook, R.E.
Potter, Simon
Reeder, Larry
Rexford, Fenton
Rice, Dan
Rice, Don R.
Richardson, Debby
Ringstad, John
Ritzman, Dan
Rorbe, Claudy
Rockwell, Ted
Rosenberg, Caryn
Roy, Lori
Ruthven, Chris
Schullinger, Sallie
Shedlok, Marlo
Shields, Mary
Sielak, Eunice
Sielak, George
Sloan, Richard
Smith, Corinne
Sonsalla, Lon
Sousa, Pat
Spiess, Ben
Stange, Jay
Stern, Annie
Strong, Gabe
Surlu Richard
Svett, Pam
Sykes, Jim
Taalak, James
Taylor, Eric
Tegoseak, Bill
Thompson, Sharon
Tichotsky, John
Traynor, Marilyn
Tukle, Fred, Sr.
Tukle, Frederick
Tukle, Richard
Verzone, Tony
Vorderstrasse, Jim
Wald, Michael
Weger, Mary
Wildfang, Phil
Williams, Don
Williams, Vera
Williams, Waska, Jr.
Wuestenfeld, Karen
Yang, Harris

## D. CONTRIBUTING MMS AUTHORS AND SUPPORTING STAFF MEMBERS

Elinore M. Anker, Technical Publications Writer-Editor
Stan Ashmore, Cartographer
Arlene M. Bajusz, HQ Technical Publications Editor
Albert Barros, Community Liason
Christy Bohl, Environmental Protection Specialist
Michael Burwell, Socioeconomic Specialist
Robin Cacy, Public Affairs Specialist
Phyllis Casey, Senior Mineral Leasing Specialist
Jim Craig, Geologist
Jackie Durham, HQ Technical Publications Editor
Raymond R. Emerson, Special Staff Assistant
John Goll, Regional Director
Donald J. Hansen, Wildlife Biologist
Dirk C. Herkof, HQ Meteorologist
Dennis Hinnah, Petroleum Engineer
Tim Holder, Socioeconomic Specialist
Ken Holland, Marine Biologist
Joel Hubbard, Wildlife Biologist
Tina Huffaker, Information Services Specialist
Fred King, Supervisory Environmental Specialist
Jody Lindemann, Technical Publications Writer-Editor
Paul Lowry, Physical Scientist
Cathy McFarland, LAS Secretary
Ida Menge, GIS Technician
Kyle Monkelien, Petroleum Engineer
Charles Monnett, Wildlife Biologist
Tom Murrell, Petroleum Engineer
Thomas Newbury, Oceanographer
Richard Newman, Oceanographer
Kristopher Nuttall, EAS Secretary
Mazelle O. Parker, EIS Specialist
Richard Pomeroy, Records Assistant
Timothy J. Redding, HQ Program Analyst
Richard W. Roberts, Oceanographer and EIS Coordinator
Dave Roby, Petroleum Engineer
Beverly Sires, Minerals Leasing Specialist
Caryn Smith, Oceanographer
Paul Stang, Regional Supervisor, Leasing and Environment
Dennis Thurston, Geophysicist
John Tremont, Geographer
George Valiulis, HQ EIS Project Officer
Jeff Walker, Regional Supervisor, Field Operations
Frank Wendling, Marine Biologist

## E. MEMBERS OF COOPERATING AND PARTICIPATING AGENCIES

Larry Bright (Fish and Wildlife Service)
Lloyd Fanter (Corps of Engineers)
Katie Farley (State of Alaska, State Pipeline Coordinator's Office)

Jeanne Hansen (National Marine Fisheries Service)
Mike Holley (Corps of Engineers)
Joyce Kelley (Environmental Protection Agency)
Mike Letourneau (Environmental Protection Agency)
Judith Lee (Environmental Protection Agency)
Tom Lohman (North Slope Borough)
Sally Marquis (Environmental Protection Agency)
Rick Parkin (Environmental Protection Agency)
Theodore Rockwell (Environmental Protection Agency)
William Ryan (Environmental Protection Agency)
Brad Smith (National Marine Fisheries Service)
Pat Sousa (Fish and Wildlife Service)
Nicholas Targe (Environmental Protection Agency)
Eric Taylor (Fish and Wildlife Service)
Mary Weger (Corps of Engineers)

# SECTION IX

## LOW PROBABILITY
## VERY LARGE
## OIL-SPILL EVENT

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# IX. Low-Probability, Very Large Oil Spill

A very large oil spill is an issue of concern to everyone. We define a very large oil spill as greater than or equal to 150,000 barrels of oil. A very large oil spill is a low-probability event with the potential for very high effects. In this section, we analyze the potential effects to resources of an oil spill from a blowout at the proposed Liberty gravel island in the Beaufort Sea and from a tanker accident in the Gulf of Alaska. Very large spills happen infrequently, and we have limited data for use in our statistical analysis and predictive efforts.

The largest spill from a blowout in Federal waters is 80,000 barrels. One other spill greater than 50,000 barrels has happened since offshore drilling began in the United States. Because there are no spills greater than 150,000 barrels in U.S. waters, we must look elsewhere for data on spills of that size. Therefore, we use worldwide data to estimate the chance of very large spills occurring. The spill information we use is based on spills from other countries that do not have the regulatory standards that are enforced on the outer continental shelf. In addition, some drilling practices used elsewhere either are not practiced here or are against outer continental shelf regulations.

Internationally from 1979 through 1996, five oil-well blowouts greater than or equal to 10 million gallons (238,000 barrels) have occurred (*Oil Spill Intelligence Report, International Oil Spill Statistics, 1996*, Cutter Information Corp., 1997). Five of the blowouts greater than 10 million gallons mostly were the result of either war or drilling practices that oil companies do not now use and may not use under MMS regulations in the United States. During this same time period, there were roughly 470 billion barrels of oil produced worldwide (*BP Statistical Review of World Energy, 1997*, and earlier issues). These data provide a rate of about 0.01 blowouts greater than or equal to 10 million gallons per billion barrels produced. If this rate is applied to the Liberty Project, the estimated probability of one or more oil spills of 10 million gallons (238,000 barrels) is 0.001, or 0.1%.

S.L. Ross Environmental Research Ltd. (1998) calculated the chance of an extremely large oil spill (greater than 150,0000 barrels) from a blowout for an average of the Northstar and Liberty projects using worldwide spill frequencies. We use the following Liberty information to calculate frequencies: 16 wells, 14 oil producers and 2 gas injectors , a 16-year production schedule; and a drilling schedule of 5 wells the first year, 10 the second, and 1 the third. The estimated frequency of spills greater than 150,000 barrels from blowouts during a drilling operation, based on an exposure of wells drilled into the formation (16) is $6.24 \times 10^{-4}$, or a 0.06% chance over the 2-year drilling period. Using only Liberty information, the estimated frequency of spills greater than 150,000 barrels from production/workover wells based on exposure of well-years (244) is $2.44 \times 10^{-3}$, or 0.21% over the lifetime of Liberty.

Scandpower (2001) recently completed a blowout-frequency assessment of Northstar. This analysis modified statistical blowout frequencies to reflect specific conditions and operating systems at Northstar for the drilling process. The estimated blowout frequency for drilling into the oil-bearing zone and spilling greater than 130,000 barrels is $9.4 \times 10^{-7}$.

As noted in Section II.A.4, the revised Oil Discharge Prevention and Contingency Plan prohibits the drilling of new wells or sidetracks from existing wells into major liquid-hydrocarbon zones at its drill sites during the defined period of broken ice and open water (BPXA, 2001). This period begins on June 13 of each year and ends with the presence of 18 inches of continuous ice cover for one-half mile in all directions from the Liberty island. This drilling moratorium eliminates the environmental effects associated with a well blowout during drilling operations in the Beaufort Sea during broken-ice or open-water conditions.

Although the drilling prohibition during broken ice and open water reduces the chance of a blowout, it is not completely eliminated during the time the field is producing oil and, as noted in the following section, the State of Alaska requires the greatest possible discharge that could occur from a blowout as a planning standard. Thus, this EIS evaluates the potential effects of a very large oil spill.

The other type of very large oil spill we analyze is a tanker spill. Two very large tanker spills have occurred in U.S. waters, the *Burma Agate* near Galveston (247,500 barrels) and the *Exxon Valdez* in Prince William Sound (258,000 barrels) (Anderson, 1994, pers. commun.; Wolfe et al., 1994).

We also evaluate the potential effects associated with BPXA's Oil Discharge Prevention and Contingency Plan (BPXA, 2000b) for cleaning up a blowout spill (see Appendix K). That Plan is described in Section II.A.4 and in Section III.C.2. This section evaluates the two following contingency-plan scenarios.

For a **blowout in open-water**, containment and recovery involves using ocean boom for containment and both weir and oleophilic (oil-attracting) skimming devices for recovery. The tactics discussed also require using minibarges for storage, support vessels, tugs, and workboats.

This scenario calls for one barge-skimmer system and three skimmer systems deployed from bay-class workboats. These four systems would have a combined estimated recovery capacity of 12,950 barrels of oil per shift (10 hours). These systems could be deployed and operational at the Liberty site within 12 hours of the spill. Shoreline recovery of oil would be initiated on day two of the spill, and daily recovery capacity would be increased to 26,700 barrels per day (20 hours).

For a **blowout in broken-ice during freezeup**, containment and recovery involves using ocean boom for containment and oleophilic (oil-attracting) skimming devices for recovery. The tactics discussed also require using minibarges for storage, support vessels, tugs, and workboats.

This scenario calls for two barge-skimming systems and four skimming systems deployed from bay-class workboats. These four systems would have a combined estimated recovery capacity of 18,060 barrels of oil per shift (10 hours). These recovery rates would decrease, depending on the ice concentrations in the area being worked. The actual effectiveness of the cleanup effort would be constrained by the weather, wind, wave, and ice conditions at the time of the spill.

These scenarios are based on an examination of the actual environmental conditions found at the site and represent a reasonable effort to consider the average conditions that can occur during cleanup activities. The effects from oil-spill-cleanup activities are evaluated in Sections III and IV.

As ice coverage increases, tactics would be modified to maintain a safe operation. Specifically, small boats would be placed on ice-reinforced barges for transportation. As ice concentrations increase, the oil spill would be tracked using buoys. Operations would continue using in situ burning, when oil concentrations are adequate to support burning, or when ice conditions allow over-ice or open-water recovery to start. Oil entrained in the ice during freezeup conditions would be collected or burned when the oil migrated up through the brine channels in the ice during breakup conditions in the spring.

In Sections IX.A and B, we analyze the potential effects to resources from a very large blowout spill in the Beaufort Sea and a very large oil tanker spill in the Gulf of Alaska.

**Note:** BPXA has revised their oil-spill-contingency plan to more accurately reflect recovery efficiencies in breakup and freezeup ice conditions borne out in the spring and fall 2000 broken-ice barge trials (BPXA, 2001). The analysis presented in this section is based on recovery rates presented in the spill-contingency plan submitted with the Development and Production Plan. Once the revised plan has been submitted, these scenarios will be revisited and assumptions and effects reevaluated based on the new information.

# A. EFFECTS TO RESOURCES FROM A 180,000-BARREL BLOWOUT OIL SPILL

We analyze the potential effects of a spill of 180,000 barrels from the Liberty gravel island on sensitive resources in the Beaufort Sea region; see Section IX. We derive this spill size from BPXA's estimate of greatest possible discharge. Computer model runs simulating a blowout by S.L. Ross Environmental Research Ltd., Dickens and Associates, and Vaudrey and Associates (1998) estimate that 20% of the oil would evaporate in the air.

BPXA estimates a 15,000-barrel flow rate per day for 15 days, totaling 225,000 barrels. Approximately 20% of the volume is lost through evaporation, this amount equals 45,000 barrels. An additional 3,400 barrels remain on the gravel island (BPXA, 1999). A total of 176,600 barrels reaches the water or ice. For purposes of analysis, we round this number to 180,000 barrels.

BPXA provided an estimate of the greatest possible discharge that could occur from a blowout in the *Oil Discharge Prevention and Contingency Plan, Liberty Development Area, North Slope, Alaska* (BPXA, 2000b); a revised Oil Discharge Prevention and Contingency Plan was submitted in November 2001 (BPXA, 2001). The State of Alaska requires this estimate for a response planning standard under 18 AAC.75.430.

## 1. Blowout Assumptions

We assume a blowout would occur from the Liberty gravel island and release crude oil into the environment for 15 days. The three general environments into which the oil would discharge are solid ice, broken ice, and open water.

The following blowout assumptions are from modeling (S.L. Ross Environmental Research Ltd., Dickens and Associates, and Vaudrey and Associates, 1998). A blowout spill rises into the air at an average rate of 500 barrels per hour (BPXA, 2000b). Oil droplets fall to the gravel island and surrounding area. Approximately 20% of the 225,000 barrels evaporates into the air, leaving 180,000 barrels on the island's surface and surrounding area (Tables IX-1 and IX-2).

Within 15 days from the start of the spill:
- 3,400 barrels remain on the gravel island,
- 86,600 barrels drain from the island into the environment, and
- 90,000 barrels fall to the surrounding environment at a rate of 10,000-12,000 barrels a day.

Of the oil falling to the surrounding environment:
- 84% of the oil falls out approximately 4,500 feet from the source within a 975-foot wide area, and
- 16% of the oil falls out approximately 13,000 feet from the source within a 2,000-foot wide area.

## 2. Behavior of a Blowout Oil Spill in Solid Ice

Oil would drain from the gravel island to the solid sea ice and would fall to the solid sea ice in a scattered pattern. No oil would enter open water. Alaska Clean Seas estimates it would take 122 days to recover the oil from the blowout after the flow is stopped (Alaska Clean Seas, 1998).

There would be little or no change in the oil's physical properties at very low temperatures and when buried under a snow cover. Blowing snow would tend to combine with pooled oil, until the oil is effectively saturated with snow crystals. The oil would not penetrate the ice surface.

## 3. Behavior of a Spill in Broken Ice

Broken ice occurs in the Beaufort Sea during fall freezeup and spring breakup. This scenario assumes that oil would drain from the gravel island into broken ice and would fall to the broken ice in a scattered pattern. The ice would contain the oil somewhat and reduce spreading. Unless the oil is frozen into the ice, the evaporation rate would not change. Dispersion and emulsification rates are lower in broken ice than in open water.

### a. Fall Freezeup

During fall freezeup, the oil would freeze into the grease ice and slush before ice sheeting occurs. Winds and storms could break up and disperse the ice and oil until the next freezing cycle. These freezing cycles can be hours or days. Before freezeup, the oil could move at rates of 5 nautical miles per day (S.L. Ross Environmental Research Ltd., Dickens and Associates, and Vaudrey and Associates, 1998).

In late spring and summer, the unweathered oil would melt out of the ice at different rates, depending on whether it is encapsulated in multiyear or first-year ice and when the oil was frozen into the ice. In first-year ice, most of the oil spilled at any one time would percolate up to the ice surface over about a 10-day period. About mid-July, the oil pools would drain into the water among the floes of the opening ice pack. Thus, in first-year ice, oil would be pooled on the ice surface for up to 30 days before being discharged from the ice surface to the water surface. The pools on the ice surface would concentrate the oil, but only to about 2 millimeters thick, allowing evaporation of 15% of the oil, the part of the oil composed of the lighter, more toxic components of the crude. By the time the oil is released from the melt pools on the ice surface, evaporation has almost stopped, with only an additional 4% of the spilled oil evaporating during an additional 30 days on the water. Tables IX-3a and IX-3b show specific estimates of the fate of a spill into broken ice. Table IX-4 shows our estimate of the length of coastline oiled.

### b. Spring Breakup

For purposes of analysis, we assume that a spill during spring breakup would have the same effects as an open-water spill. At spring breakup, the ice concentrations are variable. With high concentrations of ice, oil would spread between icefloes. As the ice concentrations eventually decrease to less than three-tenths, the oil on the water behaves as an open-water spill, with local oil patches temporarily trapped by the wind against floes. Oil that is on the icefloes would move with the ice as it responds to nearshore currents (S.L. Ross Environmental Research Ltd., 1998).

## 4. Behavior of Spills in Open Water

This scenario assumes oil would drain from the gravel island into open water. Oil also would fall to open water adjacent to the gravel island. The oil would move with the currents and the winds. The fate of an open-water spill is shown in Tables IX-5a and IX-5b. Table IX-4 shows our estimate of the length of coastline oiled.

## 5. The Chance of an Oil Spill Contacting Resources of Concern

We estimate how much oil would reach specific shorelines or other environmental resources from the conditional probabilities for a spill from the Liberty gravel island. For a full discussion of the Oil-Spill-Risk Analysis model and how we derive the oil-spill modeling simulations and supporting tables, see Appendix A.

Table IX-6 summarizes the conditional probabilities that a spill starting at the gravel island would contact individual land segments or environmental resources within 1, 3, 10, 30, and 360 days during summer or winter.

### a. Summer Open-Water Spill

For spills starting in the summer months (July through September) after 30 days, the general transport of oil from Liberty Island would be in a radius outward. Generally, higher chances of oil contact would be to the west and north of the Liberty gravel island. Generally, environmental resource areas outside a 30-mile radius from the Liberty gravel island have less than a 10% chance of contact.

### b. Winter Broken-Ice Spill

For spills starting in the winter months (October through June) and melting out into open water after 360 days, the general transport of oil would be to the west and north from the Liberty gravel island, similar to the summer pattern. The pattern of contact to the east has lower percentages, with most of the area contacted having a 1% chance or less outside a 30-mile radius of Liberty.

## 6. Analysis of Impacts to Each Resource from a 180,000-Barrel Blowout Oil Spill

### a. Threatened and Endangered Species

#### (1) Bowhead Whales

##### *(a) Summary and Conclusion for Bowhead Whales*

Most individual bowhead whales exposed to spilled oil are expected to experience temporary, nonlethal effects. Whales may suffer baleen fouling or irritated skin or sensitive tissues, or they may ingest oil or oil-contaminated prey. Exposure of bowhead whales to a very large oil spill may kill a few individuals. However, few bowhead whales are expected to die, because oil weathers very quickly and exists on the sea surface primarily as tarballs, which would be widely dispersed.

If a large oil spill occurred during September and October, oil-spill-cleanup activities could disturb bowhead whales during their fall migration. There is no information available regarding bowhead disturbance from oil-spill-cleanup operations, but noise disturbance to bowheads from vessel and aircraft traffic involved with cleanup activities likely would be similar to that already described in Section III.C.3. Most oil-spill-cleanup work probably would occur inside the barrier islands, because the spill model indicates that spilled oil has a relatively low probability of reaching areas outside of the barrier islands. Some whales may be disturbed by vessel or aircraft traffic and displaced seaward, if cleanup activities occurred outside the barrier islands or in the channels between the barrier islands during the whale migration. Oil-spill-cleanup activities likely would be ongoing for several seasons and likely for more than 1 year.

##### *(b) Details on How an Oil Spill from a Blowout Might Affect Bowhead Whales*

A 180,000-barrel oil spill resulting from a blowout is assumed to occur at Liberty Island (Table IX-2). We estimate that one or more blowouts of this size would have a 0.1% chance of occurring over the lifetime of the Liberty Project. For a winter spill, about 87,000 barrels would remain in the slick after 30 days (Table IX-3a). For a spill in the open water, about 60,000 barrels would remain in the slick after 30 days (Table IX-5a).

Probabilities in the following discussion are conditional probabilities estimated by the Oil-Spill-Risk Analysis model (expressed as percent chance) of a large spill contacting environmental resource areas where bowhead whales may be present in areas outside the barrier islands within 30-360 days (Table IX-6). The model estimates less than a 0.5-16% chance of a spill starting at Liberty Island contacting important bowhead whale habitat (environmental resource areas or ice/sea segments) within 30 days and within 360 days during the summer season. Of the ice/sea segments, Ice/Sea Segment 11 has the highest chance (8%) of total contact over both a 30-day period and a 360-day period during the summer. The model estimates a 15% chance that this oil would contact important bowhead whale habitat (Environmental Resource Area 39) within a 30-day period and a 16% chance of contact within a 360-day period during the summer. During the winter, the chance of contact to Ice/Sea Segment 10 ranges from a 2% chance of contact over a 30-day period to a 5% chance of contact over a 360-day period, respectively. Environmental Resource Area 39 has a 3% chance of contact over a 30-day period and a 15% chance of contact over a 360-day period. Environmental Resource Area 40 has a 2% chance of contact over a 30-day period and a 16% chance of contact over a 360-day period. Environmental Resource Areas 39 and 40 have the highest chance of contact in this group. There is less than a 0.5% chance of an oil spill from the Liberty Island contacting the spring lead system (SPL 1-5) over both a 30-day period and a 360-day period during either the summer or winter. The chance of an oil spill from the offshore portion of the pipeline (PP1) and the nearshore portion of the pipeline (PP2) contacting ice/sea segments, environmental resource areas, and spring lead systems referenced above is the same as or less than from Liberty Island and, therefore, is not analyzed here.

An oil spill in the spring ice-lead system is a major concern for bowhead whales. In this spill scenario, such a spill is not likely to occur. The fall migration through the Beaufort Sea generally occurs in relatively open water, and the spill would not be continuous over the entire area. It is unlikely that the spill would impede the migration. Migrating whales could contact oil, but this contact likely would be brief. Before the fall migration, some of the spill would weather and some toxic hydrocarbons would evaporate and not cause potential breathing problems to bowheads. Remaining oil likely will form into relatively thick mats of oil that will emulsify rapidly in wave action. Liberty crude oil readily forms emulsions, even when fresh, and the emulsions formed are very stable (Ross, 1998). Liberty crude oil is expected to emulsify within about 6 hours (Ross, 2000). Bowheads have been observed feeding north of Flaxman Island (near Ice/Sea Segment 6) in some years. If emulsified oil is present, bowheads could ingest it while feeding. The effects of oil contacting bowheads would be the same as for the Proposal (Alternative I), with most individuals experiencing temporary, nonlethal effects. Whales may suffer baleen fouling or irritated skin or sensitive tissues, or they may ingest oil or oil-contaminated prey. Exposure of bowhead whales to a very large oil spill may kill a few individuals. However, few, if any, bowhead whales are expected to die, because oil would be weathered and primarily be in the form of fairly widely dispersed water-in-oil emulsions on the sea surface.

#### *(c) Effects of Oil-Spill Prevention and Response*

Lessees are advised by the MMS that they must be prepared to respond to oil spills that could occur as a result of offshore oil and gas exploration and development activities. BPXA submitted an Oil Discharge Prevention and Contingency Plan (BPXA, 2000b) to the MMS for approval when they submitted the Liberty Development and Production Plan. The contingency plan was developed for site-specific operations at Liberty based on the type, timing, and location of the proposed activity. General aspects of oil-spill prevention and response, an inventory of available equipment, and containment/cleanup methods for four seasonal scenarios are summarized in Section II.A.4. Oil-spill prevention and response strategies and methods would be used to mitigate significant oil-spill impacts, but specific methods would not be used if it was determined they could cause additional harm to the species.

The contingency plan includes detailed scenarios that outline the equipment, response tactics, and logistics necessary to clean up these volumes of oil under different environmental conditions—open water, solid ice, and broken ice. The scenarios describe a set of specific response tactics (a description of how oil would be contained and recovered) that would be used. Each tactic is based on a specific type and number of systems that include containment boom(s), oil skimmers, and vessels needed to contain and recover a specific volume of oil. These tactics include open water, solid ice (both over and under), broken ice (freezeup and breakup), the shoreline, and onshore cleanup and recovery. The tactics also address the storage, tracking and surveillance, in situ burning of oil, shoreline cleanup, wildlife and sensitive area response, disposal, and logistics.

Bowhead whales would be migrating through the Beaufort Sea offshore of the Liberty Project during the fall. If a blowout occurred during the open-water period or the broken-ice period in the fall, some bowheads may be displaced temporarily from an area due to the large numbers of personnel, equipment, vessels, and aircraft conducting oil-spill-cleanup operations. Containment and recovery involves ocean-containment booms, storage barges, weir and oleophilic skimming devices, and support tugs and boats. The capability of this equipment to clean up spilled oil and estimated recovery rates are discussed in Section II.A.4. The estimated recovery rates are based on the estimated capacity of the equipment under optimum conditions. It is not likely this rate of recovery would be realized. The actual effectiveness of the cleanup effort would be constrained by the weather; wind, wave, and ice conditions; equipment failure; and human error.

Various response tactics could be beneficial in protecting bowhead whales during a large oil spill. For example, one of the tactics proposed for the containment and recovery of higher concentrations of oil near the source of the release during open water (Tactic R-19 in the Alaska Clean Seas Manual [Alaska Clean Seas, 1998]) would use two weir-type skimmers, and two 1,500-foot sections of open-ocean boom deployed from the surface of a deck barge. Two workboats would be used to establish the necessary boom configuration, and a tug would be used to maneuver the barge. This tactic is estimated to achieve a combined recovery rate of 427 barrels per hour (8,540 barrels of oil per day, based on two 10-hour shifts). Using a combination of tactics identified in Table 1-6 of BPXA's contingency plan (BPXA, 2000b), the combined estimated recovery capacity is 12,950 barrels of oil per 10-hour shift. As noted earlier, this estimated recovery is based on the estimated capacity of the equipment under ideal conditions, and it is not likely that this rate of recovery would be realized.

To address broken-ice conditions, the preceding tactic would be modified to include using an ice-reinforced barge and two additional boom/skimmer systems (Tactic R-19A). These systems would be deployed either from behind the deck barge or to either side of the barge, depending on the ice concentrations. These two systems can add an estimated additional 434 barrels/hour to the original 427 barrels indicated above. This system is sensitive to the amount of ice found in the recovery area. Efficiencies for containment are decreased by 30%, 60%, and 80% as ice concentration increases by 30%, 50%, and 70%, respectively. This system has the added advantage that, in the event conditions become unsafe due to ice concentrations, the boats could be loaded on the deck barge for safe passage through the ice.

Using a combination of tactics identified in Table 1-6 of BPXA's contingency plan (BPXA, 2000b), the combined estimated recovery capacity is 18,060 barrels of oil per 10-hour shift.

It is difficult to assess the effectiveness of these cleanup and response tactics in protecting bowhead whales. Response efforts to preclude oil from getting through entrances between the barrier islands and reaching the bowhead's main migration corridor would be very effective at protecting bowheads. If cleanup and response efforts were successful, no oil would reach bowhead habitat outside the barrier islands. If cleanup and response efforts were not successful and little or no oil was cleaned up, the chance of oil contacting bowhead habitat outside the barrier islands would be the same as described above without any cleanup response. If cleanup and response efforts were partially successful, the most likely scenario, the amount of oil on the water would be reduced and likely would cover a smaller area. If oil passed through the entrances and reached the main migration corridor, some bowheads would be affected. It is likely that fewer bowheads would be exposed to oil as a result of cleanup operations than without cleanup operations. Oil-spill-cleanup activities likely would be ongoing for several seasons and likely for more than 1 year. The effects of oil on bowhead whales would be as described in Section III.C.2.a(1).

Oil-spill-cleanup activities during September and October could disturb bowhead whales during their fall migration. There is no information available regarding bowhead disturbance from oil-spill-cleanup operations, but noise disturbance to bowheads from vessel and aircraft traffic involved with cleanup activities likely would be similar to that already described in Section III.C.3.a(1). Most oil-spill-cleanup work probably would take place inside the barrier islands, because the spill model indicates that spilled oil has a relatively low probability to reach areas outside of the barrier islands. Some whales might be disturbed by vessel or aircraft traffic and displaced seaward, if cleanup activities took place outside the barrier islands or in the channels between the barrier islands during the whale migration. Oil-spill-cleanup activities likely would be ongoing for several seasons and likely for more than 1 year. The icebreaking barge, the *Endeavor*, could be used if a spill occurred during broken-ice conditions in October. Information regarding how far noise could be heard from this vessel conducting icebreaking operations is not available. If this vessel were to be used before the end of the bowhead whale fall migration, it is possible some migrating whales could hear the noise. It is likely the shallow water with ice cover and the presence of the barrier islands greatly would reduce the amount of noise reaching migrating whales. Considering this likely reduction in noise levels, the low chance of an oil spill, the very narrow window of time in October that the use of an icebreaking vessel might affect whales, and the relatively low chance that oil would reach bowhead habitat outside the barrier islands, there is a low probability that whales would be affected by cleanup activities.

### (2) Spectacled and Steller's Eiders

#### *(a) Summary and Conclusions for Spectacled and Steller's Eiders*

The 180,000-barrel blowout oil spill in open water assumed for this analysis is expected to cause spectacled eider mortality if females with recently fledged young contact stranded oil in coastal habitats along the extensive shoreline that may be oiled, or flocks of adult eiders or females with young feeding in lagoons and offshore waters are contacted by a spill sweeping over thousands of square kilometers. Substantial mortality that could result from such a large spill would represent a significant loss for the relatively small Arctic Coastal Plain spectacled eider population, requiring many generations for recovery. Recovery is not likely to occur if the regional population is declining at a significant rate.

A winter spill released from the ice in spring could contact eiders concentrated in open water near the Sagavanirktok or other river deltas. Death of food organisms from oiling could adversely affect the ability of juvenile eiders to develop as rapidly as they would normally or might delay the accumulation of fat reserves for migration in any individuals. Any mortality from such indirect effects would be additive to the loss of oiled individuals. Although Fish and Wildlife Service survey data do not show a significant decline in the coastal plain spectacled eider population, the potential exists for a significant adverse effect from an oil spill on this population, particularly that segment nesting in the eastern portion of the range.

Steller's eiders are not expected to be in the Liberty Project area.

#### *(b) Details on How an Oil Spill from a Blowout Might Affect Spectacled Eiders*

If a 180,000-barrel oil spill occurred at Liberty Island and entered offshore waters (the volume falling on the island and surrounding area after about 20% of the 225,000-barrel blowout evaporates), it could contact 322 kilometers (200 miles) of coastline within 30 days, if there is no oil-spill response (Table IX-4). This distance is equivalent approximately to the coastline from Camden Bay to western Harrison Bay. About 36,000 barrels of oil are expected to go ashore within 30 days, and the discontinuous slick could sweep over an area of 5,700 square kilometers (Table IX-5b). An estimated 4,100 barrels of the spill would become mixed with bottom sediments. We estimate that one or more blowouts of this size would have a 0.1% chance of occurring over the lifetime of the Liberty Prospect development.

#### *1) Probable Effects on Spectacled Eiders*

From early June to early July (males) and late June to early September (females or females with young), flocks of eiders may be present in coastal lagoons and offshore waters (Troy Ecological Research Assocs., 1995b, 1999), or females with young have moved through coastal habitats to the open sea after the young have fledged. Realistic values currently are unavailable for densities of spectacled eiders present in this area during any given period that would allow the estimation of potential mortality from oil-spill contact. However, if a spill sweeping over the large area indicated above contacted some of these flocks, or broodrearing females with young came into contact with oil along the 322 kilometers (200 miles; Table IX-4 ) of coast where oil is likely to contact or become stranded, mortality is expected to occur. A spill occurring in winter and released from the ice in spring could contact concentrations of eiders in open water near the Sagavanirktok and other river deltas. For the spectacled eider, with a relatively small regional population and low productivity, the loss that could result from such a spill of perhaps tens of locally nesting individuals plus an unknown number of migrants would represent a significant loss. Because there is no clear population trend in the coastal plain population, and there is a lack of certain data required to model population fluctuations, an estimate of recovery time from such a loss currently would be speculative. Also, losses may be difficult to separate from natural variation in population numbers (see the discussion in Section III.C.2.a(2), Threatened and Endangered Species, Eiders, Population Effects). If a spill of this size occurred in August or September there is a potential for small numbers of Steller's eiders that nest on the western Arctic Coastal Plain to be contacted while staging in the western Beaufort Sea. This is likely to represent a small proportion of both the coastal plain and world population.

Oil contacting or mixed into bottom sediments and mudflat areas, or affecting species-rich foraging areas such as boulder patches, is expected to kill substantial numbers of the eider's food organisms. It is difficult to determine the actual effect that such indirect effects as a decline in food organisms would have on bird populations. Decreased food availability might adversely affect the ability of juvenile birds to develop as rapidly as they would normally or might delay the accumulation of fat reserves for migration in any individuals. Any mortality from such indirect effects would be additive to the loss of oiled individuals.

#### *2) Effects of Oil-Spill-Prevention and Response*

General aspects of oil-spill prevention and response are summarized in Section II.A.4, and effects are discussed in Section III.C.2.a(2).

##### a) A Blowout During Open-Water Conditions

Despite the potential for effective spill containment, recovery, and cleanup under ideal weather conditions, these may not exist during a spill incident, and some eider habitats in the Liberty area and to the west are likely to be contacted by oil. Most detections of satellite-tagged spectacled eiders have been in or offshore of Harrison Bay, or outside or offshore of western Simpson Lagoon where the Oil-Spill-Risk Analysis model estimates the chance of contact by spilled oil within 30 days in summer is less than 5% (Environmental Resource Areas 14-20, and 48-50). However, despite the low probability of contact, these areas would need to be surveyed for eider presence to plan a response strategy. If the spill is not contained before reaching these areas, the most effective response may involve hazing.

Although spectacled eiders apparently spend little time in nearshore coastal habitats, females with broods may occupy them briefly before moving to offshore staging areas. Containment, recovery, and cleanup activities for a large spill are expected to involve hundreds of workers and numerous boats, aircraft, and onshore vehicles operating over an extensive area for more than 1 year. The presence of such a workforce is likely to act as a general hazing factor, displacing any eiders from the immediate area of activity, perhaps within a few kilometers, which potentially might be viewed as a positive result, given birds' extreme vulnerability to oil in the environment. If a reliable system of locating eiders in a specific area can be devised, specific birds or groups in danger of oil contact could be targeted with specific hazing tactics.

Currently, no important specific foraging areas for eiders are identified in the Liberty area, and displacement away from the area is not expected to significantly affect their development (juveniles) or ability to accumulate fat to fuel migration. Displacement by cleanup activity of females with broods from coastal habitats may have a negative effect, if it prematurely forces them into the offshore marine environment where the high salinity could increase stress on the ducklings, which have relatively low salt tolerance (USDOI, Fish and Wildlife Service, 1996). Disturbance of nesting spectacled eiders by onshore cleanup activities is not expected to significantly affect eider productivity. There appears to be little tendency for this species to nest near the coast (Troy Ecological Research Assocs., 1999), where there is the highest probability of disturbance by cleanup activity. Because of low nesting density, few nesting birds are likely to be displaced and potentially lose their clutches or broods to predators as a result of disturbance by cleanup operations. Helicopter support traffic and human presence probably would be the most disturbing factors associated with oil-spill-cleanup activity. If their presence forces eiders from a marine area where oil contact is imminent, it may be considered a positive factor. However, overland flights and off-road personnel activity during the nesting season may displace females from their nests or broods and result in egg or duckling losses. During the nesting season in early June to early September, an effort should be made to route air traffic over areas where there is a low probability of eider nesting, and spill-cleanup personnel should not enter inland areas except on established roads.

Prompt containment and removal of oil from offshore areas, accompanied by hazing tactics targeting high-use areas, is likely to result in a substantial reduction of spectacled eider mortality from a large oil spill. Cleanup also would decrease the amount of oil available for uptake by bottom-dwelling organisms that are the principal food of eiders. This could reduce the potential for oil uptake by eiders and associated adverse physiological side effects, although the benefit of this indirect effect on the eider population is likely to be minor.

b) A Blowout During Broken-Ice Conditions

Containment and oil recovery following a blowout spill that enters the marine environment under broken-ice conditions at meltout or freezeup is expected to be less effective than for an open-water spill. Although under these conditions the area covered by the spill would be smaller than a spill in open water (3,200 versus 5,700 square kilometers, Tables IX-3b and IX-5b), spectacled eiders are not expected to occupy areas of broken ice in either period, unless areas of open water are available. Even after spring melting provides areas of open water, most arriving spring migrants likely would occupy overflow areas off river mouths. Those are available earlier and are near nesting areas; the greatest benefits may result from containment and cleanup in such areas. In this season, the hazing effect of cleanup activity or actively hazing birds out of areas that oil is expected to enter may be counterproductive, because there are few alternative habitats that flushed birds can occupy. If most spectacled eiders arrive in the area via overland routes (Troy Ecological Research Assocs., 1999), the benefit of spill containment and cleanup would be minimal, until they begin reentering the marine environment following breeding. By this time, the oil would have weathered and is expected to have become a decreasing plumage-fouling hazard. Indirect adverse effects resulting from the intake of contaminated prey organisms may be higher under broken-ice than open-water conditions, because reduced cleanup capability would provide a longer interval for exposure and uptake by such organisms. Entrapment of large quantities of oil in coastal marsh and adjacent habitats could present a hazard to departing males following breeding and females with young following nesting as they move to offshore waters. In fall, spectacled eiders are not likely to be present in numbers beyond late September, and oil present in broken ice at this time is not expected to contact eiders. Likewise, cleanup activity at this time is not expected to disturb eiders.

## b. Seals, Walruses, Beluga Whales, and Polar Bears

### (1) Summary and Conclusion for Seals, Walruses, Beluga Whales, and Polar Bears

A 180,000-barrel blowout oil spill could result in the oiling of several hundred to a few thousand ringed seals and a number of bearded seals and polar bears. A small number of beluga whales and maybe a few walruses could be exposed to the spill and may be affected from the exposure.

The recovery of seals and polar bears could take perhaps 3-4 years and about 6-10 years, respectively. The recovery of walrus and beluga whale populations is expected within 1 year of the spill.

### (2) General Description of How an Oil Spill from a Blowout Might Affect Seals and Polar Bears

The potential effect of a 180,000-barrel oil spill on ringed and bearded seals and polar bears could be severe (see the discussion of the general effects of oil on these marine mammals in Section III.C.2.b). Within 30 days of the oil's release from sea ice, about 20% (36,000 barrels) of the oil would contact coastline from the Endicott Causeway east to Bullen Point in the Badami area (Table IX-3a). A substantial portion of the ringed seal pupping habitat in the shorefast ice off Foggy Island Bay could be exposed at least partially to an oil spill at the end of the pupping season in June. Small numbers of walruses and beluga whales that may be present in nearshore waters may be exposed to the spill and may be affected from the exposure.

An estimated 0.81 ringed seals per square kilometer could be contaminated by the spill (average overall seal density for central Beaufort Sea-Liberty area in 1998 as reported by Frost and Lowry [1999]). With the spill sweeping over 3,200 square kilometers within 30 days, an estimated 2,600 ringed seals (0.81 x 3,200) could be exposed to the spill. This exposure could result in the death of up to perhaps a few thousand ringed seals through inhalation and absorption of toxic hydrocarbons in the oil, fouling the seals' fur. This loss of ringed seals could take at least 3-4 years for an estimated resident population of about 40,000 to recover (about 6.5% of the population lost to the spill and assuming an annual recruitment of about 2%).

About 1-2% of the oil spill is estimated to contact seal and polar bear ice-front habitats offshore from the Endicott Causeway east to Bullen Point during winter (represented by Ice/Sea Segments shown in Maps A-2 and A-3 in Appendix A and in Table IX-6). Several thousand ringed and bearded seals, perhaps 60-100 polar bears, a few walruses, and small numbers of beluga whales could be exposed to the oil spill (assuming a bear density of 1 bear per 78-130 square kilometers and a total surface area of 7,900 square kilometers is swept by the discontinuous oil slick within 60 days; Table IX-3b).

Assuming that all ringed and bearded seals, walruses, beluga whales, and polar bears exposed to the oil died because of absorption (through the skin), inhalation, and/or ingestion of toxic hydrocarbons in the oil, these losses could take seal populations about 3-4 years and polar bears perhaps 6-10 years to fully recover. The recovery of walrus and beluga whale populations is expected within 1 year of the spill.

The estimated recovery of polar bears assumes an annual sustainable biological removal of 76 bears per year and a subsistence harvest of 58.8 bears per year. If the population increases by 18 bears per year, 100 bears could be replaced within 5-6 years. However, if more females than males are lost to the spill, or other factors such as food availability were affected, the recovery could take longer, possibly 10 years.

#### (3) General Effects of Oil-Spill Prevention and Response

##### *(a) A Blowout During Open-Water Conditions*

The response plan (BPXA, 2000b) assumes an optimum oil-recovery capacity of 12,950 barrels per 10 hours using one barge-skimmer system and three skimmer systems deployed from bay-class workboats. Daily oil-recovery capacity could increase to 26,700 barrels per day. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions.

Some of the 180,000-barrel oil spill is likely to oil seal, walrus, beluga whale, and polar bear habitats in the Foggy Island Bay area. Hundreds of workers, many boats, and several aircraft operating in the area for cleanup probably would displace some seals, polar bears, and small numbers of walruses and beluga whales from oiled areas and temporarily stress others. These effects may occur during 1 or 2 years of cleanup; however, we do not expect it to greatly affect seal, walrus, beluga whale, and polar bear behavior and movement beyond the area oiled by the spill or after cleanup.

Cleanup efforts should include the removal of all oiled animal carcasses to prevent polar bears from scavenging on them. Oil-spill-contingency measures that include the hazing by aircraft of wildlife away from the oil spill could reduce the chances of polar bears entering coastal waters where there is an oil slick. However, such hazing may have to be repeated to prevent polar bears from entering the oiled water or oiled shoreline area after the aircraft has left. Poor weather conditions would prevent this contingency measure from being effective.

The tactics for responding to spills in broken ice and pack ice could help, including the strategies for tracking oil in pack ice and in situ burning of oil on ice. However, poor weather conditions would prevent this contingency measure from being effective. The response plan discusses the importance of timely salvage of oiled carcasses and the required State and Federal permits. Poor weather and remote locations would lessen the effective removal of oiled carcasses.

The effectiveness of the oil-spill-response plan in preventing or reducing oil effects on seals and polar bears will be determined by efforts to prevent the oil from reaching open leads in the ice and coastal habitats. In situ burning of oil could help to reduce the risk of oil contact to these habitats. However, the effectiveness of in situ burning of the oil is determined by weather conditions at the time of the spill. Poor weather would prevent burning of the oil and could drive the oil into coastal areas. The cleanup of oiled shoreline in Prince William Sound had very mixed results. Cleanup operations often contributed to the oil damage to shoreline habitats and intertidal feeding areas.

##### *(b) A Blowout During Broken-Ice/Freezeup Conditions*

The response plan assumes an optimum oil-recovery capacity of 18,060-barrels per 10 hours using two barge-skimmer systems and four skimmer systems deployed from bay-class workboats. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions. Some of the 180,000-barrel oil spill is likely to oil seal, walrus, beluga whale, and polar bear habitats as described above under the open-water blowout scenario and have about the same level of cleanup effectiveness. The formation of shorefast ice during freezeup conditions is expected to reduce the amount of oil reaching coastal habitats compared to the amount of habitat oiled under the open-water scenario.

### c. Marine and Coastal Birds

#### (1) Summary and Conclusion for Marine and Coastal Birds

A 180,000-barrel oil spill, assumed for analysis, occurring in the open-water season is likely to result in the loss of thousands of broodrearing and young waterfowl and shorebirds, if they contact stranded oil along a substantial proportion of the 322 kilometers (200 miles) of affected shoreline. In lagoon habitats, observed high densities of long-tailed ducks suggest that on some occasions, tens of thousands of molting individuals could be contacted by a spill sweeping over thousands of square kilometers, representing a significant loss from the regional population. Likewise, contact of substantial numbers of postbreeding common eiders in the vicinity of barrier islands or Ross' gulls in the vicinity of Point Barrow, August through September, could result in significant losses.

A winter spill entering the environment after the ice melts in the spring could contact loons and other migrant waterfowl concentrated in open water near river deltas. Mortality of prey organisms could decrease the availability of food and adversely affect the ability of young waterfowl and shorebirds to develop as rapidly as they would normally or the ability of individuals to accumulate fat reserves for migration; this would be additive to the population effects of losses of oiled individuals.

### (2) Details on How an Oil Spill from a Blowout Might Affect Marine and Coastal Birds

The 180,000-barrel oil spill at Liberty Island, assumed for analysis, entered offshore waters, 322 kilometers (200 miles) of coastline are expected to be contacted within 30 days (Table IX-4). This distance is equivalent approximately to the coastline from Camden Bay to western Harrison Bay. Within 30 days, about 36,000 barrels of oil is expected to come ashore, and the discontinuous slick could sweep over an area of 5,700 square kilometers (Table IX-5). There would be a 9% chance of contact at the Howe Island snow goose colony and an 11% chance of contact by a winter spill after 6 months. An estimated 4,100 barrels of the spill would become entrained in bottom sediments. We estimate that one or more blowouts of this size would have a 0.1% chance of occurring over the lifetime of the Liberty Project.

#### *(a) Probable Effects of a Large Spill*

In mid- to late summer, up to 3,200 broodrearing/young brant, 2,000 broodrearing/young lesser snow geese, tens of tundra swans, and thousands of shorebirds are present in Beaufort Sea shoreline habitats, and many tens of thousands of long-tailed ducks and large numbers of king and common eiders are present in coastal lagoons and offshore waters (Johnson, 1994a,b; Johnson and Gazey, 1992; Johnson and Noel, 1996; Noel, Johnson, and Wainwright, 2000; Noel and Johnson, 1996; Stickney and Ritchie, 1996; Stickney et al., 1994; Troy, 1995). A spill during this period could result in mortality exceeding a few thousand individuals, if broodrearing waterfowl or shorebirds contact stranded oil along a substantial proportion of the 322 kilometers (200 miles) of affected shoreline. In lagoon habitats, long-tailed duck densities averaging 40-275 birds per square kilometer (Noel, Johnson, and Wainwright, 2000) suggest that when large concentrations of molting individuals are present, tens of thousands could be contacted by a spill sweeping over the large area indicated above, representing a significant loss proportion of the regional population. Significant losses also would be experienced by postbreeding common eiders concentrated near barrier islands and in lagoons. A spill of this size is estimated to travel 200 miles (the approximate distance to Point Barrow) in 30 days (Table IX-4), if there is no oil-spill response. Thus, if such a spill occurred in August or September, it could reach the area east of Point Barrow to Tangent Point, where Ross' gulls gather to feed in large numbers (thousands) each September and October (Divoky et al., 1988). If a substantial proportion of this concentration were contacted and killed, it could represent a significant loss for this species whose world population probably does not exceed 50,000.

A spill occurring in winter and released in spring could contact loons and other migrant waterfowl concentrated in open water near river deltas. For species such as the yellow-billed loon, with relatively small populations and low productivity, this could represent a significant loss. Because there is no clear population trend in the coastal plain population, and there is a lack of certain data required to model population fluctuations, an estimate of recovery time from such a loss currently would be too speculative to be meaningful. Also, losses may be difficult to separate from natural variation in population numbers (see the discussion in Section III.C.2.a(2) Threatened and Endangered Species, Eiders, Population Effects).

Oil entrained in bottom sediments and mudflat areas, or affecting species-rich foraging areas such as boulder patches, is expected to result in mortality of potential prey organisms of waterfowl and shorebirds. The actual effect on bird populations of such indirect effects on food organisms is difficult to determine. Presumably, decreased food availability would adversely affect the ability of young to develop as rapidly as they would normally or the ability of individuals to accumulate fat reserves for migration; this would be additive to the population effects of losses of oiled individuals.

#### *(b) Effects of Oil-Spill Prevention and Response*

General aspects of oil-spill prevention and response, an inventory of available equipment, and containment/cleanup methods for four seasonal scenarios are summarized in Section II.A.4. Most spill-response equipment is stored in Deadhorse (Alaska Clean Seas), but some is kept on Egg Island outside Gwydyr Bay. Oil-spill prevention and response strategies would be used to mitigate significant oil-spill impacts, but specific methods would not be used if it was determined they could cause additional harm to bird species.

##### *1) A Blowout During Open-Water Conditions*

Despite the potential for effective spill containment, recovery, and cleanup under ideal weather conditions, these may not exist during a spill incident and some loon, waterfowl, shorebird, and seabird habitats in the Liberty area and to the west are likely to be contacted by oil. Recent aerial surveys (Fischer, Tiplady, and Larned, 2001; Larned, Platte, and Stehn, 2001; Stehn and Platte, 2000) recorded substantial numbers of loons, waterfowl, and seabirds from Mikkelsen Bay west to Harrison Bay. In this area, the probability of contact by spilled oil varies from 60% near Liberty Island to less than 5% in Harrison Bay and Simpson Lagoon, where some of the most substantial concentrations of these species were recorded. Although some species exhibited concentrations in Harrison Bay and Simpson and other lagoons, as a group, this suite of species was surprisingly widespread in its offshore distribution, ranging from the coastal shoreline to 50 kilometers offshore. If a large spill is not contained before reaching these areas, the most effective response may involve hazing; however, this tactic is expected to meet with variable success, depending on the particular species occupying a given area.

Containment, recovery, and cleanup activities for a large spill are expected to involve hundreds of workers and numerous boats, aircraft, and onshore vehicles operating over an extensive area for more than 1 year. The presence of such a workforce is likely to act as a general hazing factor, displacing birds from the immediate area of activity, perhaps within a few kilometers, which potentially may be viewed as a positive result given birds' extreme vulnerability to oil in the environment. If a reliable system of locating bird concentrations in a specific area can be devised, specific birds or groups in danger of oil contact could be targeted with specific hazing tactics.

Species occurring in the Liberty area vary considerably in their use of marine habitats, resulting in varying vulnerability to cleanup activities. For example, molting long-tailed ducks primarily occupy protected lagoons where they could be severely disturbed, if these areas became the focus of intensive cleanup efforts. Because there are relatively few comparable alternative habitats in which to molt, there could be an adverse effect on their ability to complete the molt on a normal schedule if they were displaced to less favorable habitats. However, displacement of molting birds away from an area of potential oil contact may be considered a positive effect of cleanup activity that could offset the adverse effects of displacement to a lower quality area. Displacement of loons, king and common eiders, postmolt long-tailed ducks and other sea ducks, and glaucous gulls occupying offshore waters is not expected to significantly affect their ability to accumulate fat to fuel migration, because there is abundant similar habitat they may occupy, although the availability of high-quality foraging habitat in the Beaufort Sea currently remains unknown. Likewise, displacement of shorebirds from oiled coastline is expected to have a similar effect. Displacement by cleanup activity of female waterfowl with broods from coastal habitats may have a negative effect if it prematurely forces them into the offshore marine environment where foraging may be more difficult for the ducklings, and other stresses may increase. Disturbance of nesting sea ducks by onshore cleanup activities is not expected to significantly affect their productivity. There appears to be little tendency for most of these species to nest near the coast, where there is the highest probability of disturbance by cleanup activity. Because of low nesting density, few nesting birds are likely to be displaced and potentially lose their clutches or broods to predators as a result of disturbance by cleanup operations. Helicopter support traffic and human presence probably would be the most disturbing factors associated with oil-spill-cleanup activity. If their presence forces ducks from a marine area where oil contact is imminent, it may be considered a positive factor. However, overland flights and off-road personnel activity during the nesting season may displace females from their nests or broods and result in egg or duckling losses. During the nesting season, early June to early September, an effort should be made to route air traffic over areas where there is a low probability of waterfowl nesting, and spill-cleanup personnel should not enter inland areas except on established roads. Lesser snow geese nesting on Howe Island, brant nesting colonies along the coast, and both species broodrearing in coastal habitats are likely to be disturbed by summer cleanup activity in nearby areas.

Prompt containment and removal of oil from offshore areas, accompanied by hazing tactics targeting high-use areas, is likely to result in a substantial reduction of sea duck and shorebird mortality from a large oil spill. Cleanup also would decrease the amount of oil available for uptake by bottom-dwelling organisms that are the principal food of sea ducks and shorebirds. This could reduce the potential for oil uptake by these species, and associated adverse physiological side effects, although the benefit of this indirect effect on their populations is likely to be minor. Removal of oiled bird carcasses from beaches would eliminate a source of oiling for scavengers such as glaucous gulls and common ravens.

*2) A Blowout During Broken-Ice Conditions*

Containment and oil recovery following a blowout spill that enters the marine environment under broken-ice conditions at meltout or freezeup is expected to be less effective than for an open-water spill. Although under these conditions the area covered by the spill would be smaller than a spill in open water (3,200 versus 5,700 square kilometers, Tables IX-3b and IX-5b), some bird species are not expected to occupy areas of broken ice in either period unless areas of open water are available. However, Pacific loons, long-tailed ducks, king eiders, common eiders, and glaucous gulls have been observed in small areas of open water available under these conditions (Dau and Taylor, 2000; USDOI, Fish and Wildlife Service, 2000, unpublished data). Even after spring melting provides areas of open water, most arriving spring migrants likely would occupy overflow areas off river mouths, because those are available earlier and are near nesting areas. The greatest benefits may result from containment and cleanup in such areas. In this season, the hazing effect of cleanup activity or actively hazing birds out of areas that oil is expected to enter may be counterproductive, because there are few alternative habitats that flushed birds can occupy. For sea ducks arriving via overland routes, the benefit of spill containment and cleanup would be minimal until they begin reentering the marine environment following breeding. By this time, the oil would have weathered and is expected to have become a decreasing plumage-fouling hazard. Indirect adverse effects resulting from intake of contaminated prey organisms may be higher under broken-ice than open-water conditions, because reduced cleanup capability would provide a longer interval for exposure and uptake by such organisms. Entrapment of large quantities of oil in coastal marsh and adjacent habitats could present a hazard to departing males following breeding and females with young following nesting as they move to offshore waters. In fall, beyond late September, most sea ducks and other waterfowl and shorebirds are not likely to be present in great numbers, and oil present in broken ice at this time is not expected to represent a hazard. Long-tailed ducks are more at risk until later in the fall than most other species. Likewise, cleanup activity at this time is not expected to disturb these species.

## d. Terrestrial Mammals

### (1) Summary and Conclusion for Terrestrial Mammals

A 180,000-barrel blowout oil spill, assumed for analysis, would oil coastal habitats used by caribou, muskoxen, grizzly bears, and arctic foxes. Central Arctic Herd caribou are the most likely to encounter oil from this spill. Caribou would be most exposed to the oil when some of them enter coastal waters to seek relief from insects. Several hundred caribou and small numbers of muskoxen, grizzly bears, and arctic foxes could come in direct contact with the spill and suffer injury or death. However, recovery of these populations is expected within 1 or 2 years.

### (2) General Description of How an Oil Spill from a Blowout Might Affect Terrestrial Mammals

If this large spill occurred during the summer, when Central Arctic Herd caribou were in the marine waters seeking relief from mosquitoes, several hundred caribou could be oiled and suffer injury or death from the spill. However, the population is expected recover within 1 or 2 years.

If this spill contacted shorelines used by grizzly bears, arctic foxes, and muskoxen, small numbers of these species could ingest oiled food items and suffer injury or death. However, probably only a small number of animals would be harmed. There probably would be no effect to grizzly bear, fox, and muskoxen populations.

If a 180,000-barrel spill occurred during winter, shorefast ice would prevent the oil from reaching the shore. During late spring and summer, some of the oil would melt out of the ice as fresh oil and could oil the shore. Caribou in the area could be oiled if they are in the water. The effects on caribou, muskoxen, grizzly bears, and arctic foxes would be similar to those from a summer spill.

The potential effect of a 180,000-barrel pipeline oil spill on caribou likely would be limited to caribou groups occurring during the spring and during the insect-relief periods in coastal waters near shorelines with extensive oil contamination. Although the oil spill would contact shoreline from Bullen Point west to the Endicott Causeway, the majority of the coastline contamination would occur between the causeway and Tigvariak Island (Land Segments 25-28; Map A-1 in Appendix A and Table IX-6).

Heavily oiled caribou might die from absorption and/or inhalation of toxic hydrocarbons. Several hundred Central Arctic Herd caribou could die from the oil spill. This loss would represent a short-term effect, with population recovery likely to take place within 1 or 2 years.

Caribou and muskoxen that ingest contaminated vegetation could suffer anorexia (significant weight loss) and aspiration pneumonia, leading to the death of affected mammals. The spill could harm a small number of grizzly bears and arctic foxes through ingestion of contaminated prey or carrion that they find along the shoreline. However, such losses are not expected to affect populations on the Arctic Slope. Oil-spill-cleanup activities are likely to scare many of these animals away from the spill area, reducing the number of animals coming in contact with the oil.

### (3) General Effects of Oil-Spill Prevention and Response

#### *(a) A Blowout During Open-Water Conditions*

The response plan (BPXA, 2000b) assumes an optimum oil-recovery capacity of 12,950 barrels per 10 hours using one barge skimmer system and three skimmer systems deployed from bay-class workboats. Daily oil-recovery capacity could increase to 26,700 barrels per day. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions.

Some of the 180,000-barrel oil spill is likely to oil coastal habitats occupied by herds or bands of caribou and muskoxen during the insect season. Hundreds of workers, many boats, and several aircraft probably would displace some caribou, muskoxen, grizzly bears, and foxes during cleanup operations in the spill area. These activities are not expected to affect the behavior and overall movements of these populations. Oil-spill response measures that include the hazing of wildlife away from the oil spill could reduce the chances of caribou entering coastal waters where there is an oil slick. However, such hazing may have to be repeated to prevent caribou from entering the oiled water during the insect season. The response plan discusses the importance of timely salvage of oiled carcasses and the required State and Federal permits (Alaska Clean Seas Tactics W-1 and -4). However, poor weather may prevent the timely removal of oiled carcasses. These carcasses are likely to be scavenged by arctic foxes, grizzly bears, and possibly polar bears, resulting in the loss of some foxes and bears due to ingestion of oil with the carcasses.

The effectiveness of the oil-spill response plan in preventing or reducing oil effects on terrestrial mammals will be determined by efforts to prevent the oil from reaching coastal habitats. In situ burning of oil could help to reduce the risk of oil contact to coastal habitats. However, the effectiveness of in situ burning is determined by weather conditions at the time of the spill. Poor weather would prevent the burning of the oil and could drive the oil into coastal areas and onto the shoreline. The cleanup of oiled shoreline in Prince William Sound had very mixed results. Cleanup operations often contributed to the oil damage to shorelines and intertidal areas.

#### *(b) A Blowout During Broken-Ice/Freezeup Conditions*

The response plan assumes an optimum oil recovery capacity of 18,060-barrels/10 hours using two barge-skimmer systems and four skimmer systems deployed from bay-class workboats. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions. Some of the 180,000-barrel oil spill is likely to oil coastal habitats of terrestrial mammals as described above under the open-water blowout scenario and have about the same level of cleanup effectiveness. The formation of shorefast ice during freezeup conditions is expected to reduce the amount of oil reaching coastal habitats compared to the amount of habitat oiled under the open-water scenario.

## e. Lower Trophic-Level Organisms

### (1) Summary and Conclusion for Lower Trophic-Level Organisms

This very large oil spill assumed for purposes of analysis could contact all of the Stefansson Sound coastline. It could have lethal and sublethal effects on coastal and benthic communities within the affected area. The recovery of seasonal invertebrates would be expected within 2 months, but fractions of the oil might remain in shoreline sediments for up to 10 years.

### (2) Details on How an Oil Spill from a Blowout Might Affect Lower Trophic-Level Organisms

This analysis considers the effects of an assumed 180,000-barrel oil spill at Liberty Island and entering offshore waters on lower trophic-level organisms during the summer and winter months. The specific effects of petroleum on lower trophic-level organisms are discussed under the Proposal (Section III.C.2.e). The oil spill is assumed to last for 15 days following a blowout on Liberty Island. The spill would adversely affect some lower trophic-level organisms by exposing them to petroleum-based hydrocarbons. To stay in perspective, the estimated effects of the oil spill are compared to those estimated for the 125-2,956-barrel oil spill assumed for the Proposal.

#### *(a) Kelp and Other Marine Plants*

Large-scale effects on marine plants from oil spills have been observed in the intertidal and subtidal zones of other regions. Due to the predominance of shorefast ice in the affected area, there is no resident marine flora in waters less than 6 feet deep. Therefore, no effects are expected on marine plants in these waters. The oil spill also is not expected to have any measurable effect on subtidal marine plants (such as those of the Boulder Patch area), because they live below the zone where toxic concentrations of oil can reach them.

#### *(b) Coastal and Benthic Marine Invertebrates*

Large-scale effects on marine invertebrates from oil spills have been observed in the intertidal and subtidal zones of other regions. There are limited intertidal and nearshore subtidal zones in the Beaufort Sea. Instead, it is a highly disturbed area that is seasonally recolonized by a small number of opportunistic fauna during the summer (about 3 months). The nearshore area does support a few resident and many nonresident benthic invertebrates (amphipods, mysids, copepods, clams, snails, crab, and shrimp), which are fed upon by vertebrate consumers during the summer. If contacted by surface oil, these invertebrates are likely to die or be sublethally effected.

Table IX-5a indicates that 26,000 barrels of oil would contact the shoreline within 10 days, or roughly 20 times that of the spill assumed for the Proposal (1,313 barrels). If oil contacts shoreline segments that have a 1% or greater chance of contact, about 3.5 times as much shoreline would be affected as with the spill assumed for the Proposal, or about 209 kilometers of shoreline (Table IX-4). Based on the above, the oil spill could contact all of the Stefansson Sound coastline.

The recovery of seasonal benthic invertebrates would be expected within 2 months, after water quality in the nearshore water column returns to prespill conditions and other opportunistic marine invertebrates move into the area. Oil incorporated by wave action into shoreline bottom sediments is expected to remain there for several years. In the areas where bottom sediments are heavily oiled, some lethal and sublethal effects could occur each summer, when seasonal benthic invertebrates return to those areas. However, this is not expected to affect a measurable percentage of the seasonal benthic invertebrate population in Stefansson Sound. The recovery of resident benthic invertebrates would be expected within 5 years, but it could require up to 10 years in areas where water circulation is significantly reduced. Oil mixed into shoreline bottom sediments would have the greatest effect on resident benthic fauna, because they are not seasonally restocked from deeper waters as are seasonal fauna. Subtidal marine organisms deeper than 2 meters (including those of the Boulder Patch area) are not likely to be affected, because they live below the zone where toxic hydrocarbon concentrations can reach them.

Other lower trophic-level organisms likely to be contacted by oil in the water column are the plankton. These include phytoplankton, zooplankton (copepods, euphausiids, mysids, and amphipods) and the larval stages of marine invertebrates such as annelids, mollusks, and crustaceans. Because of similarities in habitat use and distribution, the percentage of marine-invertebrate larva contacted by floating or dispersed oil is likely to be similar to that expected for plankton. The method of assessment is the same as the one used in the Sale 170 EIS (USDOI, MMS, 1998:IV-B-8). During the winter/spring (about 10 months), the very large oil spill probably would not have a measurable effect on plankton, because few are present during this time and oil would not be dispersed in the water column. However, effects are likely to occur during the summer when plankton are abundant. Hydrocarbons would be mixed down through the water column, affecting perhaps half of the planktonic organisms. The area of Stefansson Sound, outside of the shallow shoreline areas that were assessed above, is estimated to be 2,600 square kilometers. Within 10 days of a spill, the discontinuous area affected by it is estimated to be 1,370 square kilometers (Table IX-5b), or about half of the sound. To summarize, a very large oil spill probably would affect half of the planktonic organisms in about half of the sound, or a total of about one-quarter of the Stefansson Sound plankton. Because of their wide distribution, large numbers, and rapid rate of regeneration (12 hours), there would be only a temporary, local effect on the planktonic community, The recovery of the community would be complete within 1-2 weeks (the estimated flushing time for Stefansson Sound).

### (3) Oil-Spill Prevention and Response

The Alaska Clean Seas technical manual identifies sensitive sections of the Beaufort Sea coastline on which oil might persist for a decade, including some within the project area (Alaska Clean Seas, 1998:Index Sheets 1 and 2). The most sensitive types of shoreline, such as river deltas and sheltered lagoons, are listed clearly in the manual as "areas of major concern" (Alaska Clean Seas Tactic W-6). The manual also describes several tactics for protecting sensitive sections of the coastline. Intertidal and exclusion booms would be used along the shoreline in marshes and inlets. Deflection booms would be used to divert oil to sections of the coastline that are less sensitive or more suitable for recovery; the oil would be collected by booms and pumped by skimmers to local storage tanks. The shorelines that might be contaminated, as a result of diversionary booming, would be flushed to remove oil from the shore zone.

Some lower trophic-level organisms on the shorelines would be adversely affected by these and other response tactics. Spill responses that would use mechanical tilling for aeration and remediation of shoreline sediments might affect these organisms, and spill responses that use chemicals on oiled shorelines would affect the organisms, as acknowledged by Tactics SH-8 and 11. Spill responses that involve in situ burning would affect the organisms on shorelines, especially on relatively dry shorelines. The tactics for chemical treatments include warnings to avoid chemical use on cobble shorelines where there could be deep penetration, which would help to mitigate impacts. Further, all of the shoreline tactics note that Unified Command approval would be required for any shoreline cleanup, which would avoid unnecessary effects on lower trophic-level organisms.

Use of dispersants on a spill near the Boulder Patch would mix the oil farther down into the water column and could affect the kelp community. However, the use of dispersants is not essential to the Liberty Development and Production Plan and Oil-Discharge Prevention and Contingency Plan; their use would require further approval by the Coast Guard.

## f. Fishes and Essential Fish Habitat

### (1) Fishes

#### *(a) Summary and Conclusion for Fishes*

The likely effects on fishes due to a 180,000-barrel oil spill, assumed for analysis, primarily would depend on the season and location of the spill, the lifestage of the fishes (adult, juvenile, larval, or egg), and the duration of the oil contact. Due to their very low numbers, no measurable effects are expected on fishes in winter. Effects would be more likely to occur from an offshore spill moving into nearshore waters in summer, where fishes concentrate to feed and migrate. The probability of an offshore oil spill occurring and contacting nearshore waters is low. If an offshore oil spill did occur and contacted the nearshore area, some marine and migratory fish might be harmed or killed. However, it would not be expected to have a measurable effect on fish populations, and recovery of the number of fish harmed or killed would be expected within 5 years

#### *(b) Details on How an Oil Spill from a Blowout Might Affect Fishes*

**A Very Large Blowout Oil Spill is More Likely to Affect Fishes in Summer.** Due to their very low numbers and wide area of distribution, no measurable effects are expected on fishes in winter. Effects would be more likely to occur from an oil spill moving into nearshore waters in summer, where fishes concentrate to feed and migrate. Based on the Oil-Spill-Risk Analysis model (Table IX-6), the nearshore areas of highest oil-spill risk include Land Segments 25-27 (an 11-13% chance of contact).

The probability of a 180,000-barrel oil spill occurring at Liberty Island, entering offshore waters, and contacting the nearshore area is low. However, if it did occur, some marine and migratory fish might be harmed or killed. The number affected would depend on the size of the area affected, the concentration of petroleum present, the time of exposure, and the stage of fish development involved (eggs, larva, and juveniles are most sensitive). If lethal concentrations were encountered, or sublethal concentrations were encountered over a long enough period, fish mortality would be likely to occur. However, mortality due to petroleum-related spills is seldom observed outside of the laboratory environment. This is because the zone of lethal toxicity is very small and short lived under a spill, and fishes in the immediate area typically avoid that zone. Mortality would be expected only in cases where fishes were somehow trapped in a lethal concentration and could not escape. Because this would be very unlikely outside of the laboratory environment, little to no mortality due to lethal concentrations would be expected. For these reasons, a 180,000-barrel oil spill is expected to have mostly sublethal effects (for example, changes in growth, feeding, fecundity, and temporary displacement) on the marine and migratory fish that are affected by it. Juvenile fish (for example, arctic cod), which are common in the nearshore area during summer, or nearshore spawners (for example, capelin) are among those most likely to be adversely affected. Some fish in the immediate area of a spill may be killed; however, it is not expected to have a measurable effect on marine and migratory fish populations. Recovery of the number of fish harmed or killed would be expected within 5 years. Oil-spill cleanup activities are not expected to affect fish populations.

#### *(c) Effects of Oil-Spill Prevention and Response*

Oil-spill-cleanup activities, whether on ice or for oil entrained in the ice, are not expected to adversely affect fish populations. It is possible that a containment boom could trap some oil in a shoreline area and temporarily contaminate that area long enough to affect fishes or their food resources. In general however, reducing the amount of oil in the marine environment is expected to have a beneficial effect on fishes, because it reduces the possibility of hydrocarbons contacting them and their food resources. The extent of that benefit would depend on the actual reduction in the amount of oil contacting fish and their food resources, as compared to that of not reducing the amount of contact.

### (2) Essential Fish Habitat

#### *(a) Summary and Conclusion for Essential Fish Habitat*

Essential fish habitat for salmon in Alaska could be adversely affected by a 180,000-barrel oil spill in a variety of ways. However, oil is not likely to come in contact with salmon spawning habitat or measurably affect individual salmon in the Liberty area following an oil spill caused by a blowout. If spilled oil concentrated along the coastline at the mouths of streams or rivers to which salmon seek access, the potential movements of a small number of salmon could be disrupted during migrations. Potential prey could be adversely affected. About one-quarter of the zooplankton that contact an oil-spill plume that resulted from a blowout would be adversely affected, but zooplankton populations would be expected to recover within months. If oil from an offshore spill moved into nearshore waters where potential prey fish concentrate, some individuals might be killed or experience sublethal effects including changes in growth, feeding behavior, fecundity, movements, and displacement from preferred habitat. Potential habitat could be adversely affected. Saltmarshes in the Liberty area could be inundated with oil that would kill both plants and associated invertebrates and small fishes. Complete recovery of the saltmarshes would be expected to take decades. The quality of water in essential fish habitat for salmon is likely to be degraded to hydrocarbon levels above State and Federal criteria at a regional level (greater than 1,000 square kilometers ), but effects are not expected to persist for longer than a year. Salmon prey and prey habitat could be adversely affected further by oil-spill-response and cleanup activities.

#### *(b) Details on How an Oil Spill from a Blowout Might Affect Essential Fish Habitat*

The specific effects of petroleum on components of essential fish habitat are described elsewhere in sections discussing the effects of spilled oil on specific resources, including lower trophic-level organisms (i.e., zooplankton and marine algae, Section III.C.2.e); fish (Section III.C.2.f); wetlands (Section III.C.2.g); and water quality (Section III.C.2.l).

In the event of a very large offshore oil spill, it is possible that much of the coastline of Stefansson Sound could be oiled, with probabilities of oil contact on individual beach segments ranging from 0.01-0.27 (Table IX-6). Although Stefansson Sound is classified as essential fish habitat for salmon in Alaska, salmon are not believed to be present in significant numbers and are not known to spawn in any of its streams or rivers. Although located about 100 kilometers west of Liberty Island, shoreline adjacent to the numerous channels of the Colville River, which apparently hosts small, intermittent runs of chum and pink salmon, has a slight possibility of being oiled: 2% within 360 days of a summer spill and 1% within 360 days of a winter spill.

The most likely potential threat to individual salmon would be if spilled oil came in contact with spawning areas or concentrated in migratory pathways. However, salmon are not believed to spawn in the intertidal areas or the mouths of streams or rivers anywhere in the Beaufort Sea. Therefore, contact between spilled oil and spawning areas is very unlikely. If spilled oil concentrated along the coastline at the mouths of streams or rivers to which salmon seek access, the potential movements of a small number of salmon could be disrupted during migrations. If a very large offshore oil spill occurred, large areas of potential offshore salmon habitat are likely to underlie the resulting oil slick. Salmon are not expected to be present in the immediate vicinity of the Liberty development, where hydrocarbon concentrations in the water column may exceed the acute criterion for several days after the oil is spilled (Section

IX.A.6.l). Small numbers of salmon may swim through the oil-spill plume in the more western portion of the affected area, near the Colville River. However, they are not likely to be measurably affected, because oil penetrating the water column likely would be weathered and dispersed due to wave action and, thus, have relatively little toxicity.

The potential prey of salmon in the Beaufort Sea include zooplankton and small fish. Individuals of these species could be affected by oil from a very large spill directly (lethally or sublethally) or indirectly. Zooplankton (copepods, euphausiids, mysids, and amphipods) may be contacted by surface or dispersed oil, if the oil spill plume passes through their habitat. We have estimated that under those circumstances, about one-quarter of the individuals might be affected. Because of their wide distribution, large numbers, and rapid rate of regeneration, the recovery of plankton would be expected to take a few weeks to 2 months (see Section IX.A.6.e). If oil from an offshore spill moves into nearshore waters where potential prey fish concentrate, some individuals might be killed or experience sublethal effects including changes in growth, feeding behavior, fecundity, movements, and displacement from preferred habitat. Juvenile fish that are common in the nearshore area during summer (for example, arctic cod), or nearshore spawners (for example, capelin) are those most likely to be affected. Recovery of affected fish populations would be expected to take a few years (see Section IX.A.6.f).

Vegetation potentially important to salmon and their prey primarily includes the benthic algae community and that in estuarine and wetland habitat. Due to the predominance of shorefast ice in the Liberty area, there is no resident marine flora in waters less than 6 feet deep. Therefore, no effects are expected on marine plants in those waters. Crude oil likely to reach benthic marine plants, such as macro-algae inhabiting the Boulder Patch, likely would be weathered and dispersed due to wave action and, thus, have little toxicity; and little effect would be expected on those organisms (see Section IX.A.6.e). Estuarine and wetland habitat potentially are important to salmon and their prey. A 180,000-barrel oil spill likely would extensively oil shorelines from the Endicott Causeway east along the shore of Foggy Island Bay. Saltmarshes in this and adjacent areas could be inundated with oil that would kill both plants and associated invertebrates and small fishes. Complete recovery of the saltmarshes would be expected to take decades (see Section IX.A.6.g).

The quality of water in the essential fish habitat for salmon is likely to be degraded to hydrocarbon levels above State and Federal criteria at a regional level (greater than 1,000 square kilometers), but effects are not expected to persist for longer than a year (see Section IX.A.6.l).

#### *(c) Effects of Oil-Spill Cleanup Activities on Water Quality*

The Alaska Clean Seas technical manual identifies sensitive sections of the Beaufort Sea coastline, such as marshes and inlets, where oil might persist for a decade or longer, including some within the project area (Alaska Clean Seas, 1998:Index Sheets 1 and 2). Deflection booms would be used to attempt to divert oil to sections of the coastline that have been classified as being less sensitive for collection and recovery. Contaminated shorelines would be flushed to remove oil from the shore zone. Some organisms that are potential salmon prey, or prey habitat, would be killed or otherwise adversely affected by this and other response actions. Other potential response actions that could adversely affect salmon prey and prey habitat during beach cleanup include the use of mechanical tilling for aeration and remediation of sediments; application of chemical dispersants or fertilizers, especially those containing surfactants; and in situ burning. Using dispersants on a spill near the Boulder Patch would mix the oil farther down into the water column and could affect local kelp and fish.

## g. Vegetation-Wetland Habitats

### (1) Summary and Conclusion for Vegetation-Wetland Habitats

The 180,000-barrel oil spill would extensively oil shorelines from the Endicott Causeway east along the shore of Foggy Island Bay. Saltmarshes in this area could be inundated with oil that would kill both plants and invertebrate species in the marshes. Complete recovery of the saltmarshes could take several decades.. However, the local persistence of oil in coastal wetlands is not expected to have significant effects on the distribution and abundance of plant species (vegetation-wetlands) in the region.

### (2) General Description of How an Oil Spill from a Blowout Might Affect Vegetation-Wetland Habitats

Coastal wetland from the Sagavanirktok River Delta east to about Flaxman Island could be contaminated with oil. Within 30 days of release of the spill from the sea ice, about 20% (45,000 barrels) of the oil would contact coastline from the Endicott Causeway east to Bullen Point in the Badami area (Table IX-5a). Most of the oiled shorelines would be within Foggy Island Bay and along the Endicott causeway. Coastal saltmarshes located between the Kadleroshilik River and the eastern part of the Sagavanirktok River Delta would be the most oiled by the spill. Saltmarsh habitat on Tigvariak Island and coastal marshes near the mouth of Shaviovik River east along the coast of Mikkelsen Bay also would be oiled to some extent.

### (3) General Effects of Oil-Spill Contingency and Response

#### *(a) A Blowout During Open-Water Conditions*

The response plan assumes an optimum oil-recovery capacity of 12,950-barrels per 10 hours using one barge-skimmer system and three skimmer systems deployed from bay-class workboats. Daily oil-recovery capacity could increase to 26,700 barrels per day. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions.

Some of the 180,000-barrel oil spill is likely to oil wetland saltmarsh habitats along the coast of Foggy Island during the summer open-water season. Cleanup operations would remove some of the oil from the shoreline, particularly on gravel shorelines such as the Endicott causeway, where absorption booms could be effective in oil recovery. However, the cleanup of contaminated/oiled saltmarshes would be difficult. Oil removal by mechanical means would alter or destroy vegetation, and flushing techniques could drive some of the oil into marsh sediments and soils.

The tactics that rely on the use of mechanical equipment on marshes might cause significant adverse impacts. Spill responses that use mechanical tilling for aeration and remediation of shoreline sediments might lead to erosion/accretion and effects on biota. Spill responses that use chemicals on oiled shorelines would affect biota. Spill responses that involve in situ burning would affect shoreline biota, especially relatively dry shoreline biota.

The effectiveness of the oil-spill contingency and response plans in preventing or reducing oil effects on vegetation-wetlands will be determined by efforts to prevent the oil from reaching coastal habitats. In situ burning of oil could help to reduce the risk of oil contact to vegetation-wetland habitats. However, the effectiveness of in situ burning of the oil is determined by weather conditions at the time of the spill. Poor weather would prevent burning of the oil and could drive the oil into coastal areas and on to the shoreline. The cleanup of oiled shoreline in Prince William Sound had very mixed results. Cleanup operations often contributed to the oil damage to shorelines and intertidal areas.

The use of fertilizers or other additives to oiled marshes may enhance biodegradation of the oil, but cold temperatures in the Arctic would lessen the effectiveness of these techniques. Oil contamination of saltmarshes is likely to persist for several years after cleanup activities have ended.

#### *(b) A Blowout During Broken-Ice/Freezeup Conditions*

The response plan assumes an optimum oil-recovery capacity of 18,060 barrels/10 hours using two barge-skimmer systems and four skimmer systems deployed from bay-class workboats. However, the effectiveness of oil recovery is expected to drop dramatically under poor weather conditions. Some of the 180,000-barrel oil spill is likely to oil wetland saltmarsh habitats as described above under the open-water blowout scenario and have about the same level of cleanup effectiveness. The formation of shorefast ice during freezeup conditions is expected to reduce the amount of oil reaching coastal wetland saltmarshes compared to the amount of wetlands oiled under the open-water scenario.

## h. Subsistence-Harvest Patterns

### (1) Summary and Conclusion for Subsistence-Harvest Patterns

Overall effects from a very large oil spill on subsistence-harvest patterns in the area around the communities of Nuiqsut and Kaktovik would be significant, because one or more important subsistence resources could become unavailable. This would result from their

- displacement,
- undesirability for use from contamination or perceived tainting,
- reduced numbers or their pursuit becoming more difficult because of increased hunter effort, and
- increased risk or cost for a period of 1-2 years.

Biological effects to subsistence resources might not affect species distributions or populations, but disturbance could extend the subsistence hunt in terms of miles to be covered, making more frequent and longer trips necessary to harvest enough resources in a harvest season. The loss of waterfowl populations to oil spills would cause harvest disruptions that would be significant to subsistence hunters who regard the spring waterfowl hunt to be of primary importance. In the event of a large spill contacting and extensively oiling habitats, the presence of hundreds of humans, boats, and aircraft would increase the displacement of subsistence species and alter or reduce access to subsistence species by subsistence hunters.

### (2) Details on How an Oil Spill from a Blowout Might Affect Subsistence-Harvest Patterns

#### *(a) Bowhead Whales*

Exposure of bowhead whales to a very large oil spill may result in lethal effects to a few individuals, with the population recovering to prespill population levels within 1-3 years. However, because oil would become weathered, primarily in the form of tarballs on the sea surface, and the tarballs would be fairly widely dispersed, mortalities of bowhead whales are not expected.

#### *(b) Seals and Polar Bears*

The very large oil spill could result in the oiling of several hundred to a few thousand ringed seals along with a number of bearded seals and polar bears. The recovery of seals and polar bears could take perhaps 3-4 years and about 6-10 years, respectively.

#### *(c) Caribou and Other Terrestrial Mammals*

The very large oil spill would oil coastal habitats used by caribou, muskoxen, grizzly bears, and arctic foxes. Caribou would be most exposed to the oil when some of them enter coastal waters to seek relief from insects. Several hundred caribou and small numbers of muskoxen, grizzly bears, and foxes could come in direct contact with the spill and suffer injury or death. However, recovery of the populations is likely to occur with in 1 or 2 years.

#### *(d) Fishes*

The likely effects on fishes due to a 180,000-barrel oil spill primarily would depend on the season and location of the spill, the lifestage of the fishes (adult, juvenile, larval, or egg), and the duration of the oil contact. Due to their very low numbers, no measurable effects are expected on fishes in winter. Effects would be more likely to occur from an offshore spill moving into nearshore waters in summer, where fishes concentrate to feed and migrate. The probability of an offshore oil spill occurring and contacting nearshore waters is low. If an offshore oil spill did occur and contacted the nearshore area, some marine and migratory fish might be harmed or killed. However, it would not be expected to have a measurable effect on fish populations, and recovery of the number of fish harmed or killed would be expected within 5 years.

#### *(e) Birds*

In mid- to late summer, up to 3,200 broodrearing/young brant, 2,000 broodrearing/young lesser snow geese, tens of tundra swans, and thousands of shorebirds are present in shoreline habitats, and many tens of thousands of long-tailed ducks and large numbers of eiders are present in coastal lagoons and offshore waters. A spill during this period could result in heavy mortality involving thousands of individuals, if broodrearing waterfowl or shorebirds contact stranded oil along a substantial proportion of the 200-mile affected shoreline. In lagoon habitats, long-tailed duck densities averaging 134 birds per square kilometer suggest that when large concentrations of molting birds are present, tens of thousands could be contacted by a spill sweeping over the large areas indicated above, representing a substantial proportion of the regional population. A spill that occurred in winter and released in spring could come in contact with loons and other migrant waterfowl concentrated in open water near river deltas. For species such as the yellow-billed loon with relatively small populations and low productivity, this could represent a significant loss requiring many generations for recovery.

### (3) Analysis of Effects of an Oil Spill from a Blowout

Based on conditional probabilities, a very large blowout oil spill could threaten subsistence-harvest patterns, because the oil spill could contact subsistence-resource and harvest areas important to Nuiqsut and Kaktovik. How much oil reaches specific shorelines or other environmental resources is estimated from the conditional probabilities. A very important consideration is that this spill is both very large and of a very long duration. In such cases, the interpretation of conditional probabilities must change. The probabilities in Table IX-6 should be taken as representing what percentage of the spill would contact an individual land segment or environmental resource area rather than how likely that contact would be.

For purposes of analysis, we analyze a 180,000-barrel oil spill resulting from a platform blowout. Approximately 20% of the oil volume evaporates into the air, leaving 180,000 barrels in the water (Tables IX-1 and IX-2). This size spill is considered to be a high-effect, low-probability event and is estimated to have a 0.1% chance of one or more blowouts of this magnitude occurring over the lifetime of the Liberty Project. For a winter spill, approximately 63,000 barrels would remain in the slick after 60 days (Table IX-3a). For a spill in the open water, approximately 39,000 barrels would remain in the slick after 60 days (Table IX-5a).

Oil-spill contact in winter could affect polar bear hunting and sealing. Bird hunting, sealing, whaling, and the ocean netting of fish could be affected by a spill during the open-water season. The conditional probabilities express the percent chance of an oil spill starting at the Liberty gravel island contacting a particular resource area within 3, 10, 30, 60, and 180 days. The Oil-Spill-Risk Analysis model estimates a 3-26% chance that a very large oil spill in summer would contact subsistence resource and whaling areas within 60 days. The 26% chance of contact occurs in the Stockton Islands (Environmental Resource Area 60), with a 16% chance in the whaling area offshore Cross Island (Environmental Resource Area 29), 15% at Narwhal Island (Environmental Resource Area 58), 15% in the Narwhal/McClure islands whaling area (Environmental Resource Area 58), 14% in the Maguire Islands (Environmental Resource Area 61), 12% at Tigvariak Island (Environmental Resource Area 59), 8% at Cross Island (Environmental Resource Area 56), 5% in the Kaktovik whaling area (Environmental Resource Area 47), and 3% at Flaxman Island (Environmental Resource Area 62). The model estimates a 0-5% chance that a very large oil spill in winter will contact subsistence resource and whaling areas within 180 days. The 5% chance of contact occurs at Midway Island (Environmental Resource Area 55), with 4% at the Narwhal/McClure islands whaling area (Environmental Resource Area 58), 3% in the whaling area offshore Cross Island (Environmental Resource Area 29), and 1% in the Stockton Islands (Environmental Resource

Area 60), and the Maguire Islands (Environmental Resource Area 61) (see Table IX-6 and Maps A-2 and A-3).

Land Segments 18 through 27 (from Oliktok Point to Tigvariak Island; see Map A-1) historically included subsistence-harvest areas used by Nuiqsut subsistence hunters to harvest caribou, waterfowl, marine fishes, polar bears, and small furbearers; however, hunting more recently appears to take place nearer to the community. Land Segments 32 through 35 contain Kaktovik harvest areas for caribou, waterfowl, fishes, and seals. Conditional probabilities of a spill in summer originating at the Liberty gravel island and contacting these land segments range from 0-18%. The 18% chance occurs to Land Segment 26, directly onshore of the Liberty Island, with 9% in Land Segment 25, 4% in Land Segment 27, 2% in Land Segments 33 and 34, and 1% in Land Segments 32 and 35. The majority of the coastline contamination would occur between the Endicott causeway and Tigvariak Island (Land Segments 25-28, Table IX-6). In summer, the chances of oiling generally are higher to the east and north of the Liberty gravel island; in winter the general movement of oil is to the west of the gravel island with the highest chances of contact over boulder patch areas and on the Endicott causeway.

Because bowheads migrate through the Beaufort Sea during June, biological effects on bowhead whales from the exposure to massive amounts of spilled oil could result in lethal effects to a few individuals, with the population recovering in 1-3 years. By this time, spilled oil will have weathered and would appear in the form of tarballs that are widely dispersed on the sea surface. It is possible, although not very likely, that Nuiqsut and Kaktovik would not be allowed to harvest the bowhead whale as the bowhead migration moved east through the Beaufort Sea the following fall. It also is possible that while the bowhead whale harvest might not be curtailed, the quota could be reduced for less than 2 years, resulting in significant effects on the bowhead whale harvests of Barrow, Nuiqsut, and Kaktovik by making the bowhead less available for use or undesirable for an extended period.

Lethal biological effects on seals, polar bears, and fishes would result from a very large oil spill. Population changes in abundance and/or distribution of many of these species would require up to one or two generations for recovery to their former status. Bearded seal harvests at Nuiqsut and at Kaktovik are not likely to occur at all for that season, because the oil would be spilled during the primary harvest period. In following years, harvests would be expected to occur in greatly reduced numbers. Marine and coastal birds would have been harvested during the spring, but Nuiqsut and Kaktovik fall harvests could be reduced. Nuiqsut and Kaktovik fish harvests, particularly in river delta areas and along the coast, would be expected to be available but in reduced numbers for 1 year. It also is likely that for all subsistence resources, there could be reluctance to harvest any marine resources because of perceived tainting from oil.

### (4) Effects of Cleanup Activities on Subsistence Resources and Harvests

Disturbance to bowhead whales, seals, polar bears, caribou, fishes, and birds potentially could increase from oil-spill-cleanup activities. Offshore, skimmers, workboats, barges, aircraft overflights. and in situ burning during cleanup could cause whales to temporarily alter their swimming direction. Such displacement could cause some animals, including seals in ice-covered or broken-ice conditions, to avoid areas where they are normally harvested or to become more wary and difficult to harvest. Nearshore, workers and boats, and onshore, workers, support vehicles, heavy equipment, and the intentional hazing and capture of animals could disturb coastal resource habitat, displace subsistence species, alter or reduce subsistence hunter access to these species, and alter or extend the normal subsistence hunt.

BPXA's Oil Discharge Prevention and Contingency Plan (BPXA, 2000b) includes a series of four scenarios for cleaning up oil in open water, solid ice, and broken ice. These scenarios identify logistics, equipment, and tactics for the various cleanup responses. Spill cleanup would reduce the amount of spilled oil in the environment and tend to mitigate spill effects. In the case of a winter spill, when few important subsistence resources are present, cleanup is likely to be fairly effective in dealing with a spill before migrating whales and other species return to the area during breakup and the open-water season. The response plan includes specific provisions for not only the communication of information about spill responses to local communities, but also the input of community considerations through an Incident Management System. The inclusion of information on community considerations is described on the Situation Status Summary. Before production begins, BPXA must provide MMS with the contact and description of the process through which claimants (particularly Native subsistence users) would file a claim for costs and damages from oil-spill removal (pursuant to 30 CFR 253 Subpart F). BPXA also must provide the MMS; the North Slope Borough; the Alaska Eskimo Whaling Commission; and the Native villages and tribal governments of Nuiqsut, Kaktovik, and Barrow; and Inupiat Communities of the Arctic Slope with a plan for long-term coordination with local communities and subsistence users.

Far from providing mitigation, oil-spill-cleanup activities more likely should be viewed as an additional impact, potentially causing displacement of subsistence resources and subsistence hunters (see Impact Assessment, Inc., 1998).

## i. Sociocultural Systems

### (1) Summary and Conclusion for Sociocultural Systems

The effects of a very large oil spill on sociocultural systems would cause chronic disruption to sociocultural systems for a period of 1-2 years, with a tendency for additional stress on the sociocultural systems but without a tendency toward the displacement of existing institutions.

### (2) Details on How an Oil Spill from a Blowout Might Affect Sociocultural Systems

A very large oil spill would affect sociocultural systems in a number of ways. First, overall effects on subsistence-harvest patterns could be significant because one or more important subsistence resources could become unavailable, undesirable for use, or available only in greatly reduced numbers for a period of 1-2 years. Any perceived disruption of the bowhead whale harvest from oil spills or from actual or perceived tainting of the meat anywhere during the bowhead inmigration, summer feeding, and outmigration could disrupt the bowhead hunt for an entire season, even though whales would not be rendered unavailable. In the event of a large spill contacting and extensively oiling habitats, the presence of hundreds of humans, boats, and aircraft present for oil-spill cleanup activities would increase the displacement of subsistence species and alter or reduce access to subsistence species by subsistence hunters. High effects levels on subsistence-harvest patterns could cause disruptions that could lead to a breakdown of kinship networks and sharing patterns and increased social stress in the community. Participating in the oil-spill cleanup, as local residents did in the *Exxon Valdez* oil spill in 1989, could cause residents to (1) not participate in subsistence activities, (2) have a surplus of cash to spend on material goods as well as drugs and alcohol, and (3) not seek or continue employment in other jobs in the community (as oil-spill-cleanup wages are higher than average). Indications are that the sudden, dramatic increase in income earned from working on cleaning up the *Exxon Valdez* spill and being unable to pursue subsistence harvests because of the spill caused a tremendous amount of social upheaval. This was particularly revealed with increases in depression, violence, and substance abuse (Picou et al., 1992; Cohen, 1993; Picou and Gill, 1993; Fall, 1992; Impact Assessment, Inc., 1990c; Fall and Utermohle, 1995; Human Relations Area Files, Inc., 1994).

A disruption of the kinship networks (i.e., social organization) could lead to a decreased emphasis on the importance of the family, cooperation, and sharing. Multiyear disruptions of subsistence-harvest patterns, especially to the bowhead whale, an important species to the Inupiat culture, could disrupt sharing networks, subsistence-task groups, and crew structures and could cause disruptions of the central Inupiat cultural value: subsistence as a way of life. These disruptions also could cause a breakdown in sharing patterns, family ties, and the community's sense of well-being and could damage sharing linkages with other communities. Other effects might be a decreasing emphasis on subsistence as a livelihood, with an increased emphasis on wage employment, individualism, and entrepreneurism. Effects on the sociocultural system, such as increased drug and alcohol abuse, breakdown in family ties, and a weakening of social well-being, could lead to additional stresses on the health and social services available. Effects on the sociocultural systems described above would be for 1-2 years, with a tendency for additional stress on the sociocultural systems but without tendencies toward displacement of existing institutions.

### (3) Effects of Cleanup Activities on Sociocultural Systems

If a large oil spill occurred, employment for oil-spill response and cleanup could disrupt subsistence-harvest activities for at least 1-2 harvest seasons and disrupt some institutions and sociocultural systems. Most likely, it would not displace institutions. If a large spill contacted and extensively oiled coastal habitats, the presence of hundreds of humans, boats, and aircraft would displace subsistence species and alter or reduce access to these species by subsistence hunters. Cleanup of a 180,000-barrel spill could generate approximately 3,000 jobs for 1-2 years, declining to zero by the third year following a spill (see Economy, Section IX.A.6.k). This dramatic employment increase could have sudden and significant effects, including inflation and displacement of Native residents from their normal subsistence-harvest activities by employing them as spill workers. Cleanup is unlikely to add population to the communities because administrators and workers would live in separate enclaves, but cleanup employment of local Inupiat could alter normal subsistence practices and put stresses on local village infrastructures by drawing local workers away from village service jobs.

BPXA's Oil Discharge Prevention and Contingency Plan (BPXA, 2000b) includes a series of four scenarios for cleaning up oil in open water, solid ice, and broken ice. These scenarios identify logistics, equipment, and tactics for the various cleanup responses. Spill cleanup would reduce the amount of spilled oil in the environment and tend to mitigate spill effects. The response plan includes specific provisions for not only the communication of information about spill responses to local communities, but also the input of community considerations through an Incident Management System. The inclusion of information on community considerations is described on the Situation Status Summary. Before production begins, BPXA must provide the MMS with the contact and description of the process through which claimants (particularly Native subsistence users) would file a claim for costs and damages from oil-spill removal (pursuant to 30 CFR 253 Subpart F). BPXA also must provide MMS, the North Slope Borough, the Alaska Eskimo Whaling Commission, and the Native villages and tribal governments of Nuiqsut, Kaktovik, and Barrow, and Inupiat Communities of the Arctic Slope with a plan for long-term coordination with local communities and subsistence users.

Far from providing mitigation, oil-spill-cleanup activities more likely should be viewed as an additional impact, causing displacement of subsistence resources and subsistence hunters and employment disruptions (see Impact Assessment, Inc., 1998).

## j. Archaeological Resources

### (1) Summary and Conclusion for Archaeological Resources

The greatest effects to onshore archaeological sites would be from cleanup activities resulting from accidental oil spills. The most important understanding from past cleanups of large oil spills is that the spilled oil usually did not directly affect archaeological resources (Bittner, 1993). The State University of New York at Binghamton evaluated the extent of petrochemical contamination of archaeological sites as a result of the *Exxon Valdez* oil spill (Dekin, 1993). Researchers concluded that the three main types of damage to archaeological deposits were oiling, vandalism, and erosion, but fewer than 3% of the resources would suffer significant effects.

### (2) Details on How an Oil Spill from a Blowout Might Affect Archaeological Resources

Following the *Exxon Valdez* spill, the greatest effects came from vandalism because more people knew about the locations of the resources and were present at the sites. Known and previously undiscovered archaeological sites in the Liberty Project area also would be vulnerable to vandalism. This type of damage increases with added population and activities during cleanup. Some workers directly disturbed archaeological sites during cleanup. However, effects from the *Exxon Valdez* cleanup were slight because the work plan and techniques changed as needed to protect archaeological and cultural resources (Bittner, 1993). To help protect archaeological sites during oil-spill cleanup, we can use various mitigating measures including avoidance (preferred), consulting on and inspecting the site, onsite monitoring, site mapping, scientifically collecting artifacts, and promoting awareness of cultural resources (Haggarty et al., 1991).

Two studies of the numbers of archaeological sites damaged by the *Exxon Valdez* spill had similar findings. In the first study by Mobley et al. (1990), of 1,000 archaeological sites in the area affected by the *Exxon Valdez* oil spill, about 24 sites (less than 3%) were damaged. In the second study by Wooley and Haggarty (1993), of 609 sites studied, 14 sites (or 2-3%) suffered major effects.

The significance of an archaeological site is more important than numbers of sites disturbed. Disturbing 20 archaeological sites that contain no significant or unique information may not be as harmful as disturbing one very significant site. However, after the *Exxon Valdez* spill, the Advisory Council on Historic Preservation declared all archaeological sites were to be treated as if they were significant and eligible for the *National Register of Historic Places* (Mobley et al., 1990).

## k. Economy

### (1) Summary and Conclusion for the Economy

In the event a very large oil spill occurred (180,000-barrels), the subsequent cleanup would generate approximately 3,000 jobs for 1-2 years, declining to zero by the third year following the spill. Disruptions to the harvest of subsistence resources would affect the economic well-being of North Slope Borough residents primarily through the direct loss of subsistence resources. See Section IX.A.6.h for the effects on subsistence-harvest patterns.

### (2) Details on How an Oil Spill from a Blowout Might Affect the Economy

In the event a very large oil spill occurred (180,000 barrels), it would generate approximately 3,000 cleanup jobs for 1-2 years, declining to zero by the third year following the spill. The 180,000-barrel spill is about two-thirds the size of the 240,000-barrel *Exxon Valdez* oil spill in Prince William Sound. That spill generated 10,000 cleanup-related jobs for 1 or 2 seasons that declined to zero by the fourth year following the spill. Two thirds of 10,000 is approximately 6,500 jobs. However the Beaufort Sea, its shoreline, the characteristics of a potential spill from Liberty, and current cleanup capabilities on the North Slope are different from the *Exxon Valdez* oil spill in Prince William Sound in 1989. These differences would reduce the 6,500 figure by approximately more than half, resulting in 3,000 jobs.

A blowout release occurs over an extended period of time, 15 days or more. The volume released is 15,000 barrels a day. Equipment staged on the North Slope has sufficient capacity to contain, control, and recover this amount of oil on a daily basis as required by Alaska Statue 18 ACC 430. Personnel also are readily available on the Slope to respond almost immediately (within the first 12 hours) and begin recovery operations. The location of the spill is known. Spill-response equipment, such as exclusion boom and other response supplies, already have been positioned at key locations around the North Slope. Responders would go immediately to those locations and deploy the equipment to protect sensitive environments from contamination.

The shoreline along the Liberty development area is vastly different from that of Prince William Sound. Shorelines are composed primarily of sand and mud, which can readily be removed with heavy equipment, low-pressure washing, or in situ burning. Fewer personnel are required to go out and wipe down rocks. There is a huge industrial infrastructure in place to process and dispose of collected oil and wastes as generated, thereby reducing personnel required for waste management.

The *Exxon Valdez* release essentially was an instantaneous release of over 240,000 barrels of oil into the environment. There was considerable delay before a response was mounted, which allowed the oil to come in contact with the shore more rapidly than it would on the North Slope. Cleanup of a shoreline, especially one where there are heavily cobbled beaches, is very labor intensive.

A very large oil spill could adversely impact the subsistence lifestyle of the North Slope Borough economy. Because a significant segment of the Borough's economy depends on subsistence resources, a loss of those resources would translate into a substantial decline in noncash household income. Because there are limited job opportunities in the North Slope Borough, substitution of market activities for nonmarket activities would be limited. The exception to this would be jobs in cleanup activities; some residents might find work cleaning up the spilled oil.

## I. Water Quality

### (1) Summary and Conclusion for Water Quality

During open water in the summer, petroleum hydrocarbons from 180,000 barrels of oil entering the waters of Foggy Island Bay could exceed the 1.5-parts per million acute-toxic criterion during the first several days of a spill in an area less than 290 square kilometers (112 square miles) and the 0.015-parts per million chronic criterion for several months in an area of about 14,000 square kilometers (5,405 square miles). This amount of oil in the water when broken sea ice is present could exceed the 1.5-parts per million acute-toxic criterion for more than 3 days in an area greater than 160 square kilometers (62 square miles) and the 0.015-parts per million chronic criterion for several months in an area of about 7,900 square kilometers (3,050 square miles).

A large spill of crude oil significantly would affect water quality by increasing the concentration of hydrocarbons in the water column to levels that greatly exceed background concentrations. However, the chance of such a large spill occurring is low. Also, regional (more than 1,000 square kilometers [386 square miles]), long-term (more than 1 year) degradation of water quality to levels above State and Federal criteria because of hydrocarbon contamination is very unlikely.

### (2) Details on How an Oil Spill from a Blowout Might Affect Water Quality

Assumptions associated with a 180,000-barrel blowout on Liberty Island are noted in Section IX.A. The analysis of the effects of this spill on water quality does not consider the effects that oil-spill-cleanup measures could have in reducing the volume of oil that has been released into the water column.

The characteristics of a 180,000-barrel oil spill during broken-ice and open-water conditions are shown in Tables IX-3 and IX-5, respectively. Based on these characteristics, the estimated concentration of oil dispersed in the water column for broken ice

- after 3 days is estimated to be 3.89 parts per million (assuming a 3.0-meter [10-foot] dispersal depth),
- after 10 days is estimated to be 0.47 parts per million) (assuming a 6.1-meter [20-foot]dispersal depth),
- after 30 days is estimated to be 0.14 parts per million) (assuming a 10-meter [33-foot] dispersal depth), and
- after 60 days is estimated to be 0.06 parts per million) (assuming a 15-meter [50-foot] dispersal depth.

The estimated concentration of oil dispersed in the water column for a summer spill

- after 3 days is estimated to be 1.77 parts per million (assuming a 3.0-meter [10-foot] dispersal depth),
- after 10 days is estimated to be 0.58 parts per million) (assuming a 6.1-meter {[20-foot]dispersal depth),
- after 30 days is estimated to be 0.11 parts per million) (assuming a 10-meter [33-foot] dispersal depth), and
- after 60 days is estimated to be 0.04 parts per million) (assuming a 15-meter [50-foot] dispersal depth.

The high concentrations of oil associated with estimating dispersal in the water column may represent an upper range of concentrations of dispersed oil reached during the first several days following a large spill. The hydrocarbon concentration in the water column under broken-ice conditions during the first 3 days is greater than the 1.50 parts per million that was assumed to be the acute criterion (Section III.C.2.l). After day 10, the concentrations would be less than the acute criterion but greater than the chronic criterion, 0.015 parts per million (Section III.C.2.l), even after 60 days. In open water, the hydrocarbon concentrations would be less than the acute criterion after 3 days but would remain greater than the chronic criterion for more than 60 days. Both the summer and broken-ice concentrations of oil that are estimated to be dispersed in the water column after 30 days, 0.11 and 0.14 parts per million, respectively, are greater than petroleum hydrocarbons concentrations of 0.001-0.006 parts per million that were observed in Prince William Sound 21-41 days after the *Exxon Valdez* oil spill. The estimated concentration of dispersed oil in the water 30 days after both the summer and broken-ice/meltout spills is greater than 0.015 parts per million and indicates a relatively long period of time, perhaps several months or more, before dilution of the dispersed oil reduces the concentrations below the chronic criterion. Applicable ambient-water-quality standards for marine waters of the State of Alaska are noted in Section III.C.2.l.

The effect water depth has on dispersion of hydrocarbons is shown in Tables III.C-5. The circulation in Foggy Island Bay primarily is wind driven. The circulation patterns generally transport water out of the bay though the opening between the barrier islands. This water is replaced by water coming in from the Beaufort Sea. The travel times shown in Table II.C-7 indicate a watermass containing spilled oil could begin leaving Foggy Island Bay a day or two after a spill. The timing mainly depends on the wind velocity, persistence, and direction. Seaward of the barrier island, water depths increase with distance from the islands and water depth becomes less of a factor in limiting dispersion than it was in Foggy Island Bay.

As the watermass containing the spilled oil passes through the barrier islands and into the Beaufort Sea, the rate of dispersion probably will increase because of greater water depths and the effect the wind has on the water because of the greater fetch (the distance over which the wind blows). The time for the concentration of dispersed oil to go below the chronic criterion, 0.015 parts per million, will be less in the Beaufort Sea than in Foggy Island Bay.

#### (3) Effects of Oil-Spill-Cleanup Activities on Water Quality

Oil-spill-cleanup activities are not expected to affect water quality by adding any new or additional substances to the water. Removing oil from the environment would help reduce the amount of oil that gets dispersed into the water. However, the amount of oil removed depends on environmental conditions during cleanup operations. As the oil is removed, the amount contributing oil to dispersion decreases and, as the oil is dispersed, the concentration decreases. The effect of removing oil would be to reduce the concentration in the water relative to the amounts estimated in the above analysis for a given time interval or given area.

### m. Air Quality

#### (1) Summary and Conclusion for Air Quality

A very large oil spill could cause an increase in the concentrations of gaseous hydrocarbons (volatile organic components) due to evaporation from the spill. The effects would be low.

#### (2) Details on How an Oil Spill from a Blowout Might Affect Air Quality

Sources of air pollutants related to outer continental shelf operations are accidental emissions resulting from gas or oil blowouts, evaporation of spilled oil, and burning of spilled oil. Typical emissions from outer continental shelf accidents consist of hydrocarbons (volatile organic compounds); only fires associated with blowouts or oil spills produce other pollutants, such as nitrogen oxides, carbon monoxide, sulphur dioxide, and particulate matter. (See supporting materials and discussions in Section IX.B.3.m. That section discusses the effects of a very large spill from a tanker, but the effects of a spill from a blowout would be essentially the same as those from a tanker spill.)

#### (3) How Cleanup of a Very Large Blowout Oil-Spill Event from the Liberty Project Might Affect Air Quality

BPXA's Oil Discharge Prevention and Contingency Plan (BPXA, 2000b), emphasizes that BPXA will mechanically contain and clean up oil spills to the maximum extent possible. This cleanup of a very large oil spill would require the operation of some equipment, such as boats and vehicles. Emissions from their operation would include nitrogen oxides, carbon monoxide, and sulphur dioxide. BPXA also discusses in that contingency plan their decision process for in situ burning. They have requested an Alaska Department of Environmental Conservation open-burn permit to conduct in situ burning of potential spills of crude oil. If some spilled oil should be burned, the burning would release pollutants. Please see the discussion in Section IX.B.3.m for further details.

#### (4) Effects of Accidental Emissions

A discussion of the effects of a gas blowout or oil fire associated with an accidental spill is contained in Section IV.B.12(3) of the Final EIS for Sale 144 (USDOI, MMS, 1996a), which we incorporate here by reference. Soot is the major contributor to pollution from a fire. This soot, which would cling to plants near the fire, would tend to slump and wash off vegetation in subsequent rains, limiting any health effects. We expect accidental emissions to have little effect on onshore air quality.

# B. EFFECTS TO RESOURCES FROM A 200,000-BARREL TANKER OIL SPILL

## 1. Assumptions

We analyzed the environmental impacts of a low probability, high effects, very large tanker spill along the Trans-Alaska Pipeline System Tanker Route in the Gulf of Alaska/Yakutat Planning Area Oil and Gas Lease Sale 158 (USDOI, MMS, Alaska OCS Region, 1995). We use that information to analyze a very large tanker spill that we estimate might occur from cumulative oil production on the North Slope of Alaska. We estimate the mean number of tanker spills from Liberty is 0.12. For estimates of the chance of one or more tanker spills occurring from oil production at Liberty, please see Table A-35 in Appendix A.

We analyze the potential effects of a catastrophic spill of 200,000 barrels on representative areas of sensitive environmental, social, and economic resources in the Gulf of Alaska. For purposes of analysis, this very large oil spill is assumed to occur along the tanker route in the Gulf of Alaska. The offshore area between Dry Bay and Lituya Bay was chosen as a spill point for this analysis based on the diversity of exposed sensitive environmental resources from an oil spill in this area (Figure IX-1a). The selected area is affected by a 200,000-barrel hypothetical spill with characteristics identified in the following scenario.

## 2. Tanker-Spill Scenario

A hypothetical tanker spill occurs along Tanker Segment T6 with onshore winds in summer (Figures IX-1a and b). The 70,000-dead-weight-ton tanker releases 200,000 barrels of Alaska North Slope-like crude oil. Weather conditions hamper cleanup activities in the first 10 days and the oil is washed ashore, contacting the coastline within 10 days and affecting the exposed portion of the area within 30 days after its release.

Figures IX-2a and b graphically present the estimated conditional probabilities (expressed as percent chance) that an oil spill starting at Tanker Segment T6 in the summer season would contact individual land segments, sea segments, and environmental resource areas within 3, 10, and 30 days, assuming that a spill equal to or greater than 1,000 barrels occurs along Tanker Segment T6 (USDOI, MMS, Alaska OCS Region, 1995).

The hypothetical 200,000-barrel spill occurs approximately 60 kilometers due east of the coast between Dry Bay and Lituya Bay along Tanker Segment T6. The current regime in the vicinity of this hypothetical 200,000-barrel spill is characterized by the flow of the Alaska Current and the Alaska Coastal Current. These currents move the oil spill to the north and west along the Gulf of Alaska.

## 3. Analysis of Impacts to Each Resource from a 200,000-Barrel Tanker Oil Spill

Within 10 days during summer, the Oil-Spill-Risk Analysis from Sale 158 estimates oil-spill contact to Kayak Island, Cape Suckling, the area adjacent to Bering Glacier and Kaliakh River (Land Segments 68, 69, 70, and 71), and the area from the Yahtse River to Yakutat Bay (Land Segments 74, 75, and 76) from a spill occurring along Tanker Segment T6 (Figures IX-1b and 2b). By the end of day 30, the Oil-Spill-Risk Analysis estimates contact to Gore Point and the Pye Islands (Land Segments 56 and 58) and from Elrington and Latouche Island to Cape Fairweather (Land Segments 61 through 80) from a spill occurring along Tanker Segment T6 (Figures IX-1b and 2b).

During summer by the end of day 10, the Oil-Spill-Risk Analysis estimates oil-spill contact to Environmental Resource Areas 5 through 8 from a spill occurring along Tanker Segment T6 (Figures IX-1a and 2a). By the end of day 30, the Oil-Spill-Risk Analysis estimates oil-spill contact to Environmental Resource Areas 5 through 15 and 18 and to Sea Segments 1 and 2 from a spill occurring along Tanker Segment T6 (Figures IX-1a and 2a).

Using the oil-weathering model of Kirstein, Payne, and Redding (1983), the mass-balance estimates from the *Amoco Cadiz* oil spill (Gundlach et al., 1983) and the *Exxon Valdez* oil spill (Wolfe et al., 1993), and Table IX-7, a qualitative mass balance for a hypothetical oil spill of 200,000 barrels is presented in Table IX-8. Approximately 30% of the oil is dispersed into the water column. A large component, approximately 28%, comes ashore. Approximately 30% of the oil is lost to the atmosphere due to evaporation. After 60 days, the oil (7,000 barrels) represented by the slick is no longer visible as a coherent slick and is in the form of tarballs and tar particles suspended in the water column.

As stated in the mass balance, approximately 55,000 barrels would be onshore after 60 days. The approximately 55,000 barrels of oil is estimated to landfall portions of the shores of the northern Gulf of Alaska and Prince William Sound, based on the Oil-Spill-Risk Analysis results discussed above from a spill along Tanker Segment T6.

Theoretical calculations of slick size from a hypothetical spill of 200,000 barrels were investigated using the equations of Ford (1985) and Kirstein, Payne, and Redding (1983). Table IX-7 shows the estimated areal extent of a continuous thick slick and a discontinuous slick through time.

### a. Endangered and Threatened Species

#### (1) Endangered Whales

##### *(a) Summary and Conclusion for Endangered Whales*

The overall effects on endangered whales from exposure to a very large oil spill are expected to be low. Some whales could experience temporary, nonlethal effects, but no mortalities are expected.

##### *(b) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Endangered Whales*

It is assumed that a 200,000-barrel tanker spill occurs offshore approximately 60 kilometers due east of the coast between Dry Bay and Lituya Bay along Tanker Segment T6 (Figures IX-1a and 1b) in the summer. Exposure of endangered whales to spilled oil is not expected to occur. Only small numbers of endangered whales are expected to be present in the area adjacent to the hypothetical spill or in areas contacted by the hypothetical oil spill. There is a slightly higher potential that humpback whales would be exposed to spilled oil, because humpback whales may be present in the Kayak and Middleton islands (environmental resource areas) area. No effects on the humpback whale population from the *Exxon Valdez* oil spill were documented (Dahlheim and Loughlin, 1990). In related studies, Loughlin (1994) did necropsies on three gray whales, one minke whale, and three harbor porpoises (none of which are endangered) after the *Exxon Valdez* oil spill. He found no indication of the cause of death and could not link the cause of death directly to the spill. He observed the carcasses of 26 gray whales, but he attributed this large number to the search efforts coinciding with the whales' northern migration and focusing on the area near the spill. Few fin, sei, blue, right, or sperm whales are expected to be exposed to spilled oil. The estimated conditional probability (expressed as percent chance) of spilled oil contacting Sea Segment 1 (16%) is relatively low. For whales that may be in the vicinity of Environmental Resource Area 8 (Kayak Island) or 11 (Middleton Island) (Figure IX-1a), the chances of contact are slightly higher (19-20%) (Figure IX-2a). A few whales may be exposed to spilled oil, resulting in temporary nonlethal effects, but no mortalities are expected. The overall effects of exposure of endangered whales to a very large oil spill are expected to be low.

### (2) Steller Sea-Lion

#### *(a) Summary and Conclusion for the Steller Sea-Lion*

Steller sea-lions exposed to a large oil spill most likely would experience temporary, nonlethal effects, but exposure could result in lethal effects on some animals, particularly if haulouts on Kayak and Middleton islands were heavily oiled. No major rookeries are located in the hypothetical spill area.

#### *(b) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Steller's Sea-Lions*

The very large oil spill discussed in this analysis could contact Steller sea-lion haulouts on Kayak and Middleton Islands but is not likely to contact any major rookeries. There are no major rookeries in the hypothetical spill area, and the estimated chance of spilled oil contacting a major rookery adjacent to the spill area is low (0.5-5% or lower). The highest estimated probabilities (expressed as percent chance) for environmental resource areas (Figures IX-1a and 2a) are a 20% chance of spilled oil contacting Environmental Resource Area 8 (Kayak Island) and 11 (Middleton Island) within 30 days in the summer. If such a spill occurred, several hundred or more adult and subadult sea lions could be exposed to spilled oil and could experience various degrees of oiling. Heavily oiled individuals may experience physiological problems and elevated stress that could intensify any other debilitating problems, potentially causing death. Even if the spill stays at sea, oil is expected to contact some adults in pelagic waters, resulting in nonlethal effects.

No changes in sea lion distribution, abundance, mortality, pup production, or other potential effects were attributed to the *Exxon Valdez* oil spill (Calkins and Becker, 1990), although the population's continuing decline may have masked some effects. Calkins et al. (1994) tried to measure effects of the *Exxon Valdez* oil spill on sea lions. Sea lions were seen swimming in or near oil slicks, oil was seen near numerous haulout sites, and oil-fouled rookeries were observed at Seal Rocks and Sugarloaf Island in the Gulf of Alaska. The authors tried to detect effects both at the individual level and at the population level. Sixteen sea lions were collected and 12 were found dead during response and cleanup efforts. Tissues taken from some of these animals were tested for toxicological effects. Toxicant levels were not consistently high enough to confirm contamination. The study showed that some sea lions that were exposed to oil were metabolizing and excreting metabolites of aromatic hydrocarbons into the bile. At the population level, data collected on premature pupping showed significantly higher premature pupping ratios at a haulout site nearer the oil spill compared to a haulout site farther away. However, overall pup abundance was not shown to have been significantly affected by the spill. None of the data presented or analyzed in this study provided conclusive evidence of an effect of the *Exxon Valdez* oil spill on Steller sea-lions. Zimmerman, Gorbics, and Lowry (1994) flew aerial and photographic surveys on the days following the *Exxon Valdez* spill. They estimated that 5-10% of the animals at oiled sites appeared to be oiled and none appeared to be debilitated. The number of animals at oiled sites did not appear to decrease relative to unoiled sites. Based on these observations, the preliminary conclusion was that Steller sea-lions were not being acutely affected by the oil spill. Later, during collection and disposal of dead animals, cleanup crews found only small numbers of dead sea lions. An estimated six aborted sea lion fetuses were found, but it is not known if this is abnormally high because there were no baseline data. During the first 4 months following the spill, 14 more dead sea lions were found, but several of these were judged to have died before the spill. These studies suggest relatively low effects of an oil spill on sea lions.

Overall, Steller sea-lions exposed to a very large oil spill most likely would experience temporary, nonlethal effects; however, exposure could result in lethal effects on some individuals, particularly if haulouts on Kayak and Middleton islands were heavily oiled. No major rookeries are located in the hypothetical spill area.

### (3) Short-Tailed Albatross

#### *(a) Summary and Conclusion for the Short-Tailed Albatross*

Mortality of short-tailed albatrosses would be very low, but any losses could require a lengthy period for recovery.

#### *(b) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Short-Tailed Albatross*

Only a few short-tailed albatrosses would be likely to occur in the northeast Gulf of Alaska area over the 15-year Liberty production period. Because of the expected rare occurrence of this species in the area and the relatively low probability of spilled oil contacting their habitat, it is expected that exposure to spilled oil would not occur. The effects of a large oil spill are expected to be negligible.

### (4) Steller's Eider

#### *(a) Summary and Conclusion for the Steller's Eider*

Mortality of Steller's eiders resulting from a tanker spill in the Gulf of Alaska would be very low, but any losses could require a lengthy period for recovery.

#### *(b) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Steller's Eiders*

The several thousand Steller's eiders that overwinter in the Kodiak Island area are at low risk of contact if a large oil spill occurred in the Gulf of Alaska. The probability of contacting eider habitats in most of this area within 30 days is less than 5%. It is likely that only small numbers of this eider would be killed, but even small losses could require a lengthy recovery period as a result of factors that have caused this species' threatened status.

## b. Sea Otters, Fur Seals, Harbor Seals, and Cetaceans in the Gulf of Alaska

### (1) Summary and Conclusion for Sea Otters, Fur Seals, Harbor Seals, and Cetaceans

The potential total loss of sea otters to the 200,000-barrel tanker oil spill (perhaps 1,500-2,000 individuals) likely would take more than 5-10 years for total recovery, while the potential loss of harbor seals (perhaps about 200 individuals) likely would take perhaps 2-5 years for recovery, depending on the population status at the time of the loss and other unrelated factors adversely affecting the regional population. Potential loss of northern fur seals to the spill (perhaps 2,000-3,000 individuals) is expected to take less than one generation (probably 1 year) for recovery. The potential loss of cetaceans (10-20 individuals in a family group, such as a killer whale pod) could take perhaps 10 years or more; but such a loss to a population of whales or porpoises is expected to take about 1 year for the population to recover.

### (2) General Description on How a Tanker Oil Spill Might Affect Sea Otters, Fur Seals, Harbor Seals, and Cetaceans

This analysis assumes that a 200,000-barrel tanker spill occurs offshore Cape Fairweather along the Tanker route from Valdez (Tanker Segment T6) during the summer with onshore winds (Figure IX-1). Within 10 days, the spill is estimated to have swept over a discontinuous area of 1,737.5 kilometers (Table IX-9); and a portion of the spill is estimated to have contacted sea otter, harbor seal, and nonendangered cetacean habitats within Yakutat and Icy bays (Environmental Resource Areas 6 and 7, respectively); sea otter and harbor seal habitats near Kayak Island (Environmental Resource Area 8); and northern fur seal habitat in the Fairweather Ground (Environmental Resource Area 5), as shown in Figures IX-1a and 2a. Sea otters within Yakutat Bay and near Kayak Island are expected to be exposed to the spill and to suffer substantial losses (perhaps several hundred animals) to the local populations from hypothermia, oil inhalation, and ingestion. Total recovery is estimated to take 5-10 years or more, based on studies of the *Exxon Valdez* oil spill.

Assemblages of harbor seals in Yakutat and Icy bays and near Kayak Island are expected to be exposed to the spill, and a number (perhaps several hundred or more) of them are likely to become oiled and absorb petroleum hydrocarbons through their skin and suffer physiological/toxic stress that might lead to the death of a number of oiled seals (perhaps 100-200 animals). Recovery from this loss would take place within perhaps 2-5 years, depending on the population status at the time of the loss and other unrelated factors adversely affecting the regional population. Groups of northern fur seals (perhaps a few hundred to a few thousand) migrating through the northern gulf in the Fairweather Ground are likely to be exposed to the spill in this offshore habitat. Several hundred to a few thousand fur seals are likely to become oiled and to suffer hypothermia due to oiling of their fur, and many or most of the oiled fur seals are assumed would be killed by this exposure to the spill. Recovery of the Pribilof Islands northern fur seal population (more than 800,000 seals) is expected to take place within 1 year through population recruitment.

Within 30 days after the spill, more of the oil is expected to contact Kayak Island habitats of sea otters and harbor seals as well as Yakutat and Icy bays. Some of the oil is estimated to contact sea otter and harbor seal habitats near Montague and Hinchinbrook islands (Environmental Resource Areas 12 and 10, respectively) and along the lower Kenai Peninsula (Environmental Resource Areas 13 and 14), and to contact offshore habitats of northern fur seals and cetaceans southwest of Kayak Island (Sea Segment 1) westward to Portlock Bank (Sea Segment 2 and Environmental Resource Area 18), as shown in Figures IX-

2a and 2b. Rafts of sea otters and assemblages of harbor seals along the gulf coast side of Montague and Hinchinbrook islands and along the lower Kenai Peninsula are likely to be exposed to part of the 200,000-barrel spill and to suffer some losses (such as several hundred sea otters and perhaps 100 or fewer harbor seals). At 30 days, the spilled oil is expected to be very dispersed and at least partly weathered, with much of the toxic components lost; thus, the losses of harbor seals and perhaps sea otters to oil contact at this stage of the spill are expected to be fewer than losses during the first 10 days of the spill.

Groups of northern furs seals migrating and feeding in offshore habitats southwest of Kayak Island and in Portlock Bank are likely to have some exposure to the spill within 30 days. This exposure is expected to result in the oiling of some fur seals (perhaps a few hundred to a few thousand animals). The assumed loss of most, if not all, of these fur seals would be due to hypothermia from the oiling and reduced thermal insulation.

Cetaceans within Yakutat Bay, such as the harbor porpoise, Dall's porpoise, and killer and gray whales migrating along the coast between Yakutat Bay and Kayak Island at the time the spill contacts these habitats, might encounter oil on the surface of the water when breathing and resting. These encounters are not expected to result in mortalities unless the cetaceans encounter a very large, continuous oil slick of fresh, highly toxic oil from the spill and, consequently, inhale lethal amounts of toxic fumes. This would result in the death of highly exposed whales or porpoises. The number of cetaceans lost to such possible encounters is expected to be few (probably fewer than 10 animals). If such losses occurred in a family group of killer whales, recovery could take 10 years or more. However, overall populations of killer whales, porpoises, and other cetaceans in the gulf are likely to replace the loss of 10-20 individuals within 1 year.

Cetaceans that might encounter oil from the spill within offshore habitats, such as Fairweather Ground or Portlock Bank, are not expected to suffer any lethal exposure to the spill, because the oil is expected to be highly dispersed in these offshore habitats and quite weathered when encountered in the Portlock Bank area.

## c. Marine and Coastal Birds

### (1) Summary and Conclusions for Marine and Coastal Birds

The effect of exposure of marine and coastal birds to a 200,000-barrel oil spill in the Gulf of Alaska between April and September is expected to seasonally affect the yellow-billed loon, pelagic cormorant, harlequin duck, Aleutian tern, Kittlitz's murrelet, and bald eagle most severely, causing mortality of many hundreds of these marine birds and tens of eagles. A spill approaching Middleton Island could contact 10,000 or more murres, kittiwakes, and auklets. Recovery from either of these scenarios could require multiple generations, and species that are declining are not expected to recover while that situation continues.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Marine and Coastal Birds

Within 10 days a 200,000-barrel tanker spill off Cape Fairweather along Tanker Segment T6 (Figure IX-1a) is estimated to have swept over a discontinuous area of 1,737.5 square kilometers (Table IX-9). After 60 days, the area of continuous slick is estimated to be 21 square kilometers. A portion of the spill, which is assumed to occur between April and September, is expected to contact habitats that are used during spring and early fall migration periods by a variety of marine and coastal birds and in summer by murres, murrelets, auklets, gulls, terns, and waterfowl. These lie within Yakutat and Icy bays and near Kayak Island (Environmental Resource Areas 6, 7, and 8) and in the Fairweather Ground and Middleton Island areas (Environmental Resource Areas 5 and 11), as shown in Figure IX-1a.

Oil-spill mortality in coastal areas adjacent to the spill area is likely to involve overwintering loons and grebes, cormorants, sea ducks, marbled and Kittlitz's murrelets, pigeon guillemots, gulls, and bald eagles. Based on proportional estimates from *Exxon Valdez* spill data (Ford et al., 1991; Piatt et al., 1990) and season of occurrence, and assuming equal contact in all habitats, the following approximate carcass recoveries would be expected from a spill in winter/early spring: 337 loons, 382 grebes, 674 cormorants, 1,190 sea ducks, 494 murrelets, 494 guillemots, 539 gulls, and 25 bald eagles. For any of these estimates, actual mortality may be three- to tenfold greater because of failure to recover most carcasses. Effects are expected to be most severe in species such as the yellow-billed loon, pelagic cormorant, harlequin duck, Kittlitz's murrelet, and bald eagle, where even modest losses represent a large proportion of the local or, in some cases, Alaskan populations. Greater mortality in species such as the marbled murrelet and pigeon guillemot, while locally serious in terms of loss to slowly reproducing species, is not expected to represent as severe a loss because of their substantial Alaskan populations. Recovery from this level of mortality for species whose populations are stable or increasing could require multiple generations, and species that are declining are not expected to recover while that situation continues.

Mortality in late spring is expected to include larger numbers of migrant waterfowl and shorebirds. Northwest of the spill area the Copper River Delta in particular, while not as likely to be contacted, could suffer catastrophic losses to several populations (potentially 10,000-50,000 individuals of western sandpiper, dunlin, dusky Canada goose are present) during the spring-migration period, requiring lengthy periods for recovery. Offshore seabird densities in spring average about 88 birds per square kilometer, with the potential for tens of thousands of fatalities if the spill swept an area of several hundred square kilometers or more. Recovery from such losses is expected to require multiple generations.

After departure of overwintering and southern-latitude migrants, spill mortality in summer is expected to include cormorants, arctic and Aleutian terns, murrelets, guillemot, puffins, and bald eagles in these coastal areas; recovery periods are not likely to change greatly, but substantial mortality at the large Aleutian tern colony near Yakutat would be expected and could represent a serious loss for this species with its relatively small world population. Offshore, a spill occurring and contacting primarily the Middleton Island area in summer is expected to cause substantial murre mortality and losses of kittiwakes and rhinoceros auklets (potentially 10,000 or more individuals; Gould, Forsell, and Lensink, 1982). Recovery here also is expected to require multiple generations. A spill moving into offshore areas could contact many tens of thousands of southern-hemisphere shearwaters present in large flocks during summer, but recovery of this abundant seabird probably would occur rapidly.

Summer density of the marbled murrelet in the immediate vicinity of Yakutat Bay ranges from 0.65-1.36 birds per square kilometer, declining to less than 0.31 per square kilometer beyond 50 kilometers offshore and most of the area northwest of the bay. The potential spill associated with Trans-Alaska Pipeline traffic is expected to cover a discontinuous area of 7,211 square kilometers after 30 days (Table IX-9), suggesting that murrelet mortality could total up to many hundreds of individuals. Supporting estimates of potential mortality of this magnitude, murrelets retrieved following the *Exxon Valdez* oil spill totaled about 780 (includes natural mortality), probably representing 10-30% of the total murrelet deaths during this period (Piatt et al., 1990); potential mortality values must be decreased somewhat because the size of this potential spill is 77% of the *Exxon Valdez* spill. Although murrelets have a low productivity, the large size of the eastern gulf population suggests that such mortality would be recovered within relatively few generations. Offshore average seabird densities in summer are somewhat less than in spring (69 birds/square kilometer), but mortality would not be expected to be less because of the loss of some eggs and/or young through contact with oiled adults.

## d. Terrestrial Mammals

### (1) Summary and Conclusion for Terrestrial Mammals

The potential loss of river otters (perhaps 50-100 individuals) and contamination of intertidal habitats from the 200,000-barrel tanker spill is estimated would take more than 1 year to recover (probably 3 years or more), while the potential loss of brown and black bears (perhaps 40 individuals) is estimated would take 1-2 years. Neither moose nor Sitka black-tailed deer are likely to suffer mortalities or other effects from the 200,000-barrel oil spill, assuming that it occurs during the summer.

### (2) General Description of How a Large Tanker Spill in the Gulf of Alaska Might Affect Terrestrial Mammals

This analysis assumes that a 200,000-barrel tanker oil spill occurs offshore Cape Fairweather along Tanker route from Valdez (Tanker Segment T6 during the summer with onshore winds; Figure IX-1b). Within 10 days, the spill is estimated to have swept over a discontinuous area of 1,738.5 square kilometers (Table IX-9), and a portion of the spill is estimated to have contacted coastline habitats of terrestrial mammals from Yakutat Bay westward to Kayak Island (Land Segments 68-71 and 74-76), as shown in Figures IX-1b and 2b. River otters and brown and black bears frequenting the shoreline of Yakutat Bay westward to Point Manby/Cape Sitkagi to near Icy Bay, and frequenting shoreline habitats from Cape Yakataga/Cape Suckling to Kayak Island, are expected to encounter oil from the spill along the beach and in intertidal habitats. Some river otters (perhaps more than 50) are likely to be oiled by the spill or to ingest oil from consuming oiled prey and oiled carrion. A number of river otters (perhaps more than 50) are likely to be killed by the spill, with total recovery of the local population and intertidal habitats taking more than 1 year (perhaps 3 years or more).

Brown and black bears that frequent the above oiled shoreline habitats are likely to ingest oiled prey and oiled carrion, with perhaps 20-30 bears affected. Assuming that all the bears that ingest oiled food items are killed, total recovery of brown and black bear populations and local habitats is expected to take more than 1 year (perhaps more than 3 years). Although moose that occur along the shoreline of oiled shoreline habitats (Yakutat Bay/Kayak Island) may encounter oil on the beaches and mudflats while foraging on willow and other browse, they are not likely to ingest oiled intertidal vegetation during this time of the year and, thus, are not expected to ingest oil-contaminated vegetation and suffer mortalities or other adverse effects.

Within 30 days the 200,000-barrel oil spill is estimated to contact terrestrial mammal coastal habitats from Cape Fairweather westward to Montague Island and coastline areas on the lower Kenai Peninsula (Land Segments 56, 58, and 80-61, respectively), as shown in Figures IX-1b and 2b. More oil from the spill is expected to contact river otter and brown and black bear coastal habitats from Yakutat Bay to Kayak Island, and the spill is estimated to oil other habitats along the coast of the Copper River Delta, on Hinchinbrook and Montague islands, and along the southern coast of the Kenai Peninsula. Some additional river otters (perhaps 100-200 individuals) and black and brown bears (perhaps 10 individuals) are likely to come in contact with oil on the beaches and intertidal mudflats and to ingest oiled prey or carrion. By 30 days, however, the beached oil is expected to be quite weathered and far less toxic than the oil that reaches the coast within 10 days; thus, fewer bears and river otters (perhaps 10 bears and fewer than 50 otters) are expected to suffer lethal doses of oil from ingestion of contaminated food sources. These additional losses of river otters and bears and contamination of habitats are estimated to recover within about 1-2 years.

Although the coastal habitats of Sitka black-tailed deer on Montague and Hinchinbrook islands are expected to be oiled by the 200,000-barrel oil spill, black-tailed deer are not likely to be directly exposed to the oil, because they generally do not forage on kelp and other intertidal vegetation during the summer season, when the spill is assumed to occur. Thus, Sitka black-tailed deer are not expected to suffer mortalities from the spill.

## e. Lower Trophic-Level Organisms

### (1) Summary and Conclusion for Lower Trophic-Level Organisms

The 200,000-barrel oil spill is estimated to harm 1-10% of the plankton in the proposed  area. Recovery is expected to take 1 or 2 days for phytoplankton and up to 1 week for zooplankton. The spill also is estimated to harm about 40-50% of the intertidal and shallow subtidal marine plants and invertebrates in the  area. Recovery of these communities is expected to take 2-3 years in high-energy habitats and up to 7 years in lower energy habitats. Less than 5% of the subtidal benthic populations in the  area are expected to be affected.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Lower Trophic-Level Organisms

The 200,000-barrel oil spill would expose some lower trophic-level organisms to petroleum-based hydrocarbons.

The effect of petroleum-based hydrocarbons on phytoplankton, zooplankton, and benthic organisms ranges from sublethal to lethal. Where flushing times are longer and water circulation is reduced (for example, bays, estuaries, and mudflats), adverse effects are expected to be greater; and the recovery of the affected communities is expected to take longer. Large-scale effects on plankton due to petroleum-based hydrocarbons have not been reported. Assuming that a large number of phytoplankton were contacted by an oil spill, the rapid replacement of cells from adjacent waters and their rapid regeneration time (9-12 hours) would preclude any major effect on phytoplankton communities. Observations in oiled environments show that zooplankton communities experience short-lived effects due to oil. Affected communities appear to recover rapidly from such effects because of their wide distribution, large numbers, rapid rate of regeneration, and high fecundity. Large-scale effects on marine plants and invertebrates due to petroleum-based hydrocarbons have not been reported. The sublethal effects of oil on marine plants include reduced growth and photosynthetic and reproductive activity. The sublethal effects of oil on marine invertebrates include adverse effects on reproduction, recruitment, physiology, growth, development, and behavior (feeding, mating, and habitat selection).

The 200,000-barrel spill is assumed to occur offshore. It is also assumed that a portion of it (an estimated 30,000 barrels) will contact the shore within 10 days and cover a discontinuous surface area on the water of about 1,737 square kilometers. Hence, the 200,000-barrel spill would substantially increase the amount of oil contacting the gulf shoreline and surface waters. For this reason, oil from the 200,000-barrel spill is likely to remain in the affected shoreline sediments longer.

Regarding the shoreline most likely to be contacted, the Oil-Spill-Risk Analysis estimates that the conditional probability (expressed as percent chance) of an oil spill contacting the shore within 10 days ranges from 1-4% for 9 eastern land segments (Land Segments 68-76). Conditional probabilities (expressed as percent chance) west of this are less than 0.5%. The Oil-Spill-Risk Analysis estimates that the conditional probability (expressed as percent chance) of contact within 30 days ranges from 1-8% for 27 land segments (Land Segments 7-76). However, the 30-day conditional probability (expressed as percent chance) of oil contacting the shore is generally lowest west of Resurrection Bay (1-3%) and highest east of Cape Saint Elias (2-8%). Hence, a majority of the oil from the 200,000-barrel spill that would be washed ashore is expected to contact shoreline areas from Cape Saint Elias east to Icy Bay. A much smaller amount of extremely weathered oil is expected to contact some shoreline areas to the west of Cape Saint Elias.

Based on the above, this analysis has assumed that the 200,000-barrel spill would contact about 40% more gulf shoreline, and 300% more surface water, with about three times as much oil. Within the area, all of the above differences are estimated to increase effects on marine plants and invertebrates in the intertidal area by about 40%, and to increase effects on plankton in open-water areas by about 300%. However, these increases are expected to have little effect on recovery times in the Gulf of Alaska. This is due primarily to the high rate of hydrologic exchange in open-water areas and the amount of heavy wave action in most intertidal areas.

Based on these estimates and assumptions, the 200,000-barrel oil spill is estimated to have sublethal and lethal effects on 1-5% of the phytoplankton and zooplankton populations in the area. Recovery is expected to take 1 or 2 days for phytoplankton and up to 1 week for zooplankton.

The total percentage of plankton affected could increase to about 10% if many embayments were contacted by the spill. Recovery within the affected embayments is expected to take 1-2 weeks. Most marine plants and invertebrates in subtidal areas are not likely to be contacted by an oil spill (contact estimated at less than 5%). The 200,000-barrel oil spill is estimated to harm about 40-50% of the intertidal and shallow subtidal marine plants and invertebrates in the area. Recovery of these communities is expected to take 2-3 years in high-energy habitats and up to 7 years in lower-energy habitats.

## f. Fishes

### (1) Summary and Conclusion for Fish

The effects on fishes from a 200,000-barrel oil spill are not expected to cause population-level changes. The assumed 200,000-barrel oil spill is estimated to affect less than 0.3% of the offshore marine fisheries resources and less than 5% of the adult salmon resources in the area. However, these conservatively estimated losses would not be detectable using standard fisheries-population-assessment methods.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Fishes

The assumed 200,000-barrel oil spill from a tanker accident that occurs in the southern portion of the area during the summer would adversely affect pelagic, semidemersal, and demersal fish that inhabit these waters. The adverse effects, ranging from sublethal to lethal in the event of contact by oil, would not, however, reach any appreciable number of fishes. The 200,000-barrel oil spill would not reach any large ocean area with persistent toxicity (Malins, 1977). These factors, when compared with the large regional fish populations, the seasonal migratory behavior of many species, the low densities within a given habitat, and the wide distribution of the populations over this region and within the area, would cause only a very small percentage of a population to be contacted by the assumed 200,000-barrel spill.

Salmon smolt and fry would be at risk during summer. Salmon have economic importance and are abundant over much of Alaska. Salmon smolt and fry would be transiting the coastal area during this time. As revealed by the studies of the *Exxon Valdez* oil spill in Prince William Sound, pink salmon fry would suffer reduced growth due to the metabolic cost of depurating a spill-related hydrocarbon burden (Wertheimer et al., 1993; Carls et al., 1993), and the slower growth of juvenile pinks may have caused an incremental reduction in survival to adulthood. Small numbers of smolt from other salmon species would also be contacted. The coastal areas that are oiled, however, do not represent a large segment of the salmon-spawning habitat or migration routes; for example, in Prince William Sound, a relatively small segment of pink salmon streams was oiled by the *Exxon Valdez* spill. In three salmon-management districts with 209 identified spawning streams, 29 (14%) actually were on oiled shorelines (Maki et al., 1993). A 200,000-barrel oil spill in offshore waters would have the potential to contact fewer of the larger number of pink salmon-spawning streams and, given the depth at which salmon fry and other salmon usually migrate, perhaps less than 1% of the migrants would be at risk from a 200,000-barrel oil spill.

Pacific herring would also be adversely affected by a 200,000-barrel oil spill because their eggs are laid within the littoral zone, and the resulting larvae and fry spend their first summer in shallow coastal waters before moving offshore in the fall. The number of herring larvae and juveniles that would be affected is indeterminate. However, given the size and distribution of herring populations in the Gulf of Alaska and the limited coastal area contacted, there probably would not be a large-scale loss of herring from a 200,000-barrel oil spill.

Some semidemersal fishes might be injured by contact with a large oil spill; but given their usual habitat in deeper waters, only the limited, low-concentration water-soluble fractions of the oil would reach these depths where it is no longer at concentrations toxic to semidemersal fishes (Kineman, 1980). During summer, some pelagic larvae and juveniles of semidemersal fishes might be at the surface but at comparatively low densities because the pelagic zone where they occur extends to 50 meters in deeper waters. Larvae and juveniles are also widely distributed. For these reasons, no appreciable number of larvae or juveniles of semidemersal fishes would be adversely affected by the spill.

Demersal fishes, well offshore and at depth, are not likely to be contacted or affected by the oil spill. Those demersal species with pelagic larvae and juveniles might be affected in the immediate zone of the oil spill, but the numbers so affected would not comprise large numbers of the total populations. This is because densities per square meter of seawater do not range above units of tens, while egg complements of most demersal species range in the thousands (Bakkala, 1975).

Laevastu et al. (1985) assessed the potential effects of a 240,000-barrel oil spill on eastern Bering Sea fishes. They estimated that less than 0.3% of yellowfin sole eggs and larvae would be killed (yellowfin sole were used as an indicator species for all demersal and semidemersal fishes in the study). Laevastu et al. also estimated that a *maximum* 13% mortality of outmigrating smolt could occur and that this could translate into a 5% loss in returning adults. Because these estimated losses are significantly lower than measurement errors (20-90%) associated with assessing changes in stock size, the authors concluded that a "…tanker accident would have no quantifiable effect on the offshore fishery resources in the eastern Bering Sea." While the eastern Bering Sea and the Gulf of Alaska are physiographically different, they support similar biotic (fish) communities that would be affected by spilled oil in similar fashions. While the Laevastu et al. (1985) results are not directly transferable to the Gulf of Alaska, they provide a conservative estimate of the level of effects that can be expected.

## g. Coastal Vegetation-Wetland Habitats

### (1) Summary and Conclusion for Vegetation-Wetland Habitats

The main potential effects on vegetation and wetland habitats include oil-fouling, smothering, asphyxiation, and poisoning of plants and associated insects and other small animals. In this case, complete recovery of moderately oiled wetlands of the Yakutat Bay area west to Kayak Island would take perhaps 10 years or longer. A second main effect is the disturbance of wetlands from cleanup activities. Complete recovery of heavily oiled coastal wetlands from these disturbances and oil could take several decades.

### (2) General Description of How a Large Tanker Spill in the Gulf of Alaska Might Affect Coastal Vegetation-Wetland Habitats

This analysis assumes that a 200,000-barrel tanker oil spill occurs offshore Cape Fairweather along Tanker route from Valdez (Tanker Segment T6 during the summer with onshore winds; Figure IX-1b). Within 10 days, the spill is estimated to have swept over a discontinuous area of 1,738.5 square kilometers (Table IX-9), and a portion of the spill is estimated to have contacted coastline habitats including some wetlands from Yakutat Bay westward to Kayak Island (Land Segments 68-71 and 74-76), as shown in Figures IX-1b and 2b. Some wetland habitat located along shoreline of Yakutat Bay westward to Point Manby/Cape Sitkagi to near Icy Bay, and along shoreline from Cape Yakataga/Cape Suckling to Kayak Island, is expected to be oiled from the spill.

## h. Subsistence-Harvest Patterns

### (1) Summary and Conclusions for Subsistence-Harvest Patterns

Subsistence harvests in the 200,000-barrel-spill case would be reduced or substantially altered by as much as 80% in Cordova for at least 1 year and, to a lesser extent, for selected subsistence resources 3-4 years beyond. Lesser effects could be experienced in Yakutat because of its greater distance from the offshore tanker route.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Subsistence-Harvest Patterns

The effects on subsistence-harvest patterns would be comparable to the effects from the *Exxon Valdez* oil spill of 1989, because both tanker spills would have occurred at similar times and would be of approximately the same size. The primary difference between the two incidents is in the geography of the spills, which makes Yakutat more instantaneously subject to contact. The annual round of harvest activities for Yakutat indicates that some harvests, such as for harbor seal, salmon, and marine invertebrates, could have begun. The instantaneous nature of the event would not permit opportunistic “stocking up” of available resources. Using experience from the *Exxon Valdez* spill as a gauge, effects on subsistence-harvest patterns for the residents of Yakutat and Cordova—especially for intertidal resources and some fish species—would be expected to last for at least 4 years.

This analysis assumes that a 200,000-barrel tanker oil spill occurs offshore Cape Fairweather along Tanker Segment T6 during the summer with onshore winds (Figure IX-1b). Within 10 days, the spill is estimated to have swept over a discontinuous area of 1,738.5 square kilometers (Table IX-9), and a portion of the spill is estimated to have contacted coastline habitats from Yakutat Bay westward to Kayak Island, as shown in Figures IX-1b and 2b. Within 30 days, the 200,000-barrel oil spill is estimated to contact the entire coastline associated with the Yakutat and Cordova subsistence-harvest areas.

## i. Sociocultural Systems

### (1) Summary and Conclusions for Subsistence-Harvest Patterns

The community of Cordova is expected to undergo severe individual, social, and institutional stress and disruption in the year of the 200,000-barrel spill that would last at least 4 years thereafter. Lesser effects could be experienced in Yakutat because of its greater distance from the offshore tanker route.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Sociocultural Systems

The location of the 200,000-barrel spill off Cape Fairweather suggests that spill effects on Yakutat would be instantaneous, with little time to prepare, and could be expected to last at least 4 years. Individuals and communities that depend on income from commercial fisheries would experience stress and anxiety from debt burden, income shortfalls, litigation, and fear for the future should the fisheries they participate in or depend on in other capacities be shortened or terminated due to the accidental spill.

Considerable stress and anxiety also would be expected over the loss of subsistence resources, contamination of habitat, fear of the health effects of eating contaminated wild foods, and the need to depend on the knowledge of others about environmental contamination (Fall, 1992; McMullen, 1993). Individuals and the communities of Yakutat and Cordova would be increasingly stressed during the time needed to modify subsistence-harvest patterns by selectively changing harvest areas, if available. Associated culturally significant activities, such as the organization of subsistence activities among kinship and friendship groups and the relationships among those that customarily process and share subsistence harvests, would be modified or would decline as well.

The 200,000-barrel-spill case also would be expected to affect individuals and institutions in ways similar to the experience from the *Exxon Valdez* spill. As shown by that spill, some individuals found a new arena for pre-existing personal and political conflict, especially over the dispensation of money and contracts. In the smaller communities, cleanup work produced a redistribution of resources, creating new schisms in the community (Richards, No date). Many members of small communities were on the road to sobriety prior to the spill; but after the spill some people began drinking again, producing the re-emergence of numerous alcohol-related problems, such as child abuse, domestic violence, and accidents, that were there before (Richards, No date).

Institutional effects included additional burdens being placed on local government, disruption of existing community plans and programs, strain on local officials, difficulties dealing with the spiller, community conflict, disruptions of customary habits and patterns of behavior, emotional effects and stress-related disorders, confronting environmental degradation and death, and violation of community values (Endter-Wada, 1992). Postspill stress resulted from this seeming loss of control over individual and institutional environments as well as from secondary episodes such as litigation, which produced secrecy over information, uncertainty over outcomes, and community segmentation (Smythe, 1990; Picou and Gill, 1993). Attempts to mitigate effects met with a higher priority placed on concerns over litigation and a reluctance to intervene with people for fear it might benefit adversaries in legal battles (Richards, No date).

This analysis assumes that a 200,000-barrel tanker oil spill occurs offshore Cape Fairweather along Tanker Segment T6 during the summer with onshore winds (Figure IX-1b). Within 10 days, the spill is estimated to have swept over a discontinuous area of 1,738.5 square kilometers (Table IX-9), and a portion of the spill is estimated to have contacted coastline habitats from Yakutat Bay westward to Kayak Island, as shown in Figures IX-1b and 2b. Within 30 days the 200,000-barrel oil spill is estimated to contact the entire coastline associated with the Yakutat and Cordova subsistence-harvest areas.

## j. Archaeological Resources

### (1) Summary and Conclusion for Archaeological Resources

The expected effect on onshore archaeological resources from a large oil spill is uncertain, but data from the *Exxon Valdez* oil spill indicate that less than 3% of the resources within a spill area would be significantly affected.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Archaeological Resources

The 200,000-barrel oil spill would affect archaeological resources by creating surface-disturbing activities resulting from emergency shoreline treatment. Following the *Exxon Valdez* oil spill, Exxon developed and funded a Cultural Resource Program to ensure that potential effects on archaeological sites were minimized during shoreline treatment (Betts et al., 1991). This program involved a team of archaeologists who performed reconnaissance surveys of the affected beach segments, reviewed proposed oil-spill treatment, and monitored treatment. As a result of the coastline surveys, hundreds of archaeological sites were discovered, recorded, and verified. This resulted in the most comprehensive archaeological record of Alaskan coastline ever documented.

Although a number of sites in the *Exxon Valdez* spill area were vandalized during the 1989 cleanup season, the large number of Exxon and government-agency archaeologists visible in the field may have lessened the amount of site vandalism that may have occurred (Mobley et al., 1990).

The Dekin (1993) study found that small amounts of petroleum hydrocarbons may occur in most archaeological sites within the study area. This suggests a low-level petroleum contamination that had not previously been suspected. Since the researchers found no evidence of extensive soil contamination from a single definable source (i.e., the oil spilled from the *Exxon Valdez*), they "…now add the continuing contamination of soils from small and large petroleum spills in areas where present and past land use coincide" (Dekin, 1993). Vandalism was found to have a significant effect on archaeological site integrity but could not be tied directly to the oil spill (Dekin, 1993).

### (3) Oil-Spill Cleanup

Effects to archaeological sites as a result of oil-spill cleanup would be the same as those discussed in Section III.C.2.j.

## k. Economy

### (1) Summary and Conclusion for the Economy

A very large spill of 200,000 barrels would create effects similar to those experienced with the *Exxon Valdez* spill.

Short-term employment could reach or exceed 10,000 people, along with price inflation above 25% during the first 6 months of the cleanup operation. Long-term economic effects would be minimal.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect the Economy

The most relevant historical experience of a tanker spill in Alaskan waters is the *Exxon Valdez* oil spill of 1989, which spilled 258,000 barrels. This spill generated enormous employment that rose to the level of 10,000 workers directly doing cleanup work in relatively remote locations. Smaller numbers of cleanup workers returned in the warmer months each year following 1989 until 1992. Numerous local residents quit their jobs to work on the cleanup at often significantly higher wages, which generated a sudden and significant inflation in the local economy (Cohen, 1993). Anecdotal information indicates that housing rents in Valdez in 1989 increased from 25% in some cases to sixfold in others, and inflated rents continued into 1990. Prices of food and other goods increased only slightly, because people could drive to Anchorage to purchase them (Henning, 1993, pers. commun.). Research shows that no data on inflation were gathered in a systematic way during the *Exxon Valdez* oil spill, although most observers agree that there was temporary inflation.

The number of cleanup workers actually used for a very large oil spill of 200,000 barrels would depend to a great extent on what procedures are called for in the oil-spill-contingency plan, how well prepared with equipment and training the entities responsible for cleanup were, how efficiently the cleanup was executed, and how well the coordination of cleanup was executed among numerous responsible entities. A very large oil spill of 200,000 barrels resulting from activity associated with the Liberty Project could generate about the same number of workers associated with the *Exxon Valdez* spill—or 10,000 cleanup workers at the peak of the cleanup effort. Housing for cleanup workers would likely be located outside of Yakutat in some type of temporary enclave, such as those developed during the *Exxon Valdez* spill. Based on experience from the *Exxon Valdez* oil spill, all communities proximate to the oil-spill-cleanup effort could experience temporary increases in wage rates and a shortage of housing, which could cause significant housing-rent increases.

The same economic effects would occur whether the spill was in the Gulf of Alaska or further south along the Canadian or U.S. west coast bordering on the Pacific Ocean.

## I. Water Quality

### (1) Summary and Conclusion for Water Quality

Water quality would be reduced from good (unpolluted) to polluted by the presence of hydrocarbons from a large (200,000-barrel) spill. This type of spill significantly would affect water quality by increasing the concentration of hydrocarbons in the water column to levels that greatly exceed background concentrations. However, such an oil spill has a relatively low probability of occurring. Contamination (the presence of hydrocarbons in amounts greater than 15 micrograms per liter) would be temporary (last for about 2 months or more) and affect an area between 10,000 and 20,000 square kilometers.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Water Quality

Accidental oil spills would add substances that may be foreign to or increase the concentration of constituents already present in the water column of the northeastern Gulf of Alaska. In general, the added substances may cause sublethal effects in some marine organisms, if concentrations are greater than the chronic criteria and lethal effects if concentrations are greater than acute criteria. This analysis considers 15 micrograms per liter to be a chronic criterion and 1,500 micrograms per liter—a hundredfold higher level—to be an acute criterion for total hydrocarbons.

The effects of a very large, 200,000-barrel oil spill on water quality are based on the amount of oil dispersed into the water column; the characteristics of the oil spill are noted in Tables IX-7, 8, and 9. The concentrations are simply estimated from the amount of oil dispersed into the water column for each time interval by assuming that (1) the extent of the discontinuous area estimated for the surface extends into the water column; (2) the depth of mixing is 2 meters after 3 days, 7.5 meters after 10 days, and 15 meters after 30 days; (3) the concentration of the dispersed oil is uniform in the "mixed" watermass; (4) other processes, except sedimentation, affecting degradation of oil or removal of oil from the water column are neglected; and (5) the weight of a barrel of oil is 314.26 pounds.

The waters of the northeastern gulf are stratified in the summer; vertical mixing in the surface layer may be limited to the upper 20-25 meters. For depth-of-mixing estimates, it is assumed that the oil will be dispersed into the water column to a depth equivalent to the mean monthly significant wave height of 2 meters. At the end of 10 days, the oil is assumed to have dispersed to a depth of 7.5 meters. At the end of 30 days, the oil is assumed to have dispersed to a depth of 30 meters. The depth of mixing during the first day is assumed to be 1 meter. Table IX-8 shows the estimates of the amount of oil remaining in the water and removed by sedimentation and evaporation for time intervals from 1-60 days.

For a 200,000-barrel spill, the estimated concentrations of oil dispersed into the water column are shown in Table IX-9. The high concentrations of oil associated with estimating dispersal in the water column may represent an upper range of dispersed-oil concentrations reached during the first several days following a large spill; these concentrations are greater than the total hydrocarbon acute criterion of 1,500 micrograms per liter that was used to evaluate the effects of a 29,000-barrel spill and smaller spills. Between 10 and 30 days after the spill, concentrations of dispersed oil are within the range of concentrations reported for tanker spills of 0.18 and 1.6 million barrels of oil (National Research Council, 1985; Gundlach et al., 1983). The amount of dispersed oil in the water after 30-60 days emphasizes the time it would take before the oil is reduced to concentrations that are below the total hydrocarbon chronic criteria—15 micrograms per liter—and eventually disappears from the water. Dilution rates associated with permitted discharges suggest that the dispersion rates of oil droplets in the water column may be greater than those estimated for this spill.

## m. Air Quality

### (1) Summary and Conclusion for Air Quality

Concentrations of criteria pollutants would remain well below Federal air-quality standards.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Air Quality

Under this analysis, a 200,000-barrel oil spill would affect onshore air quality. Emissions would result from evaporation and burning of the spilled oil.

Evaporation of spilled oil is a source of gaseous emissions. Modeling predictions of hydrocarbon evaporation (Payne et al., 1984a,b; Payne, 1987) from a 200,000-barrel slick over 30-day periods estimate that 56,000 barrels, or 7,817 tons, of hydrocarbons would evaporate. Because approximately 10% of gaseous hydrocarbons are nonmethane volatile organic compounds, 781.7 tons of volatile organic compounds would be lost to the atmosphere. The movement of the oil slick during this time would result in lower concentrations and dispersal of emissions over an area several orders of magnitude larger than the slick itself.

In situ burning is a preferred technique for cleanup and disposal of spilled oil in oil-spill-contingency plans. For catastrophic oil spills, in situ burning may be the only effective technique for spill control.

Burning could affect air quality in two important ways. Burning would reduce emissions of gaseous hydrocarbons by 99.98% and slightly increase emissions, relative to quantities in other oil and gas industrial operations, of other pollutants. If the oil spill were ignited immediately after spillage, the burn would combust 33-67% of the crude oil or higher amounts of fuel oil that otherwise would evaporate. On the other hand, incomplete combustion of oil would inject about 10% of the burned crude oil as oily soot, plus minor quantities of other pollutants, into the air. For a 200,000-barrel spill, setting fire at the source could burn up to 85% of the oil, with 5% remaining as residue or droplets in the smoke plume, in addition to the 10% soot injection (Evans et al., 1987). Clouds of black smoke from a 360,000-barrel oil-spill tanker fire 75 kilometers off the coast of Africa locally deposited oily residue in a rainfall 50-80 kilometers inland. Later the same day, clean rain washed away most of the residue and allayed fears of permanent damage.

Coating portions of the ecosystem in oily residue is the major, but not the only, potential air-quality risk. Recent examination of polycyclic aromatic hydrocarbons in crude oil and smoke from burning crude oil indicate that the overall amounts of polycyclic aromatic hydrocarbons change little during combustion, but the kinds of polycyclic aromatic hydrocarbon compounds present do change. Benzo(a)pyrene, which is often used as an indicator of the presence of carcinogenic varieties of polycyclic aromatic hydrocarbons, is present in crude-oil smoke in quantities approximately three times larger than in the unburned oil. However, the amount of polycyclic aromatic hydrocarbons is very small (Evans, 1988). Investigators have found that overall, the oily residue in smoke plumes from crude oil is mutagenic but not highly so (Sheppard and Georghiou, 1981; Evans et al., 1987). The Expert Committee of the World Health Organization considers daily average smoke concentrations of more than 250 micrograms per cubic meter to be a health hazard for bronchitis.

Large fires create their own local circulating winds—toward the fire at ground level—that affect plume motion. In any event, soot produced from burning oil spills tends to slump and wash off vegetation in subsequent rains, limiting any health effects in the very short term. Accidental emissions are, therefore, expected to have a low effect on onshore air quality.

## n. Commercial Fisheries

### (1) Summary and Conclusion for Commercial Fisheries

Based on the assumptions discussed in the text, adjusted *Exxon Valdez* spill loss estimates, and the average annual value of the Gulf of Alaska commercial fishery, the 200,000-barrel oil spill is estimated to result in economic losses to the gulf commercial-fishing industry ranging from 37-64% per year for 2 years following the spill.

### (2) Details on How a Large Tanker Spill in the Gulf of Alaska Might Affect Commercial Fisheries

The 200,000-barrel oil spill would affect the Gulf of Alaska commercial-fishing industry by exposing it to petroleum-based hydrocarbons. The 200,000-barrel spill would substantially increase the amount of oil contacting shoreline and open-water commercial-fishing grounds. Because more shoreline would be contacted with more oil, oil from the 200,000-barrel spill likely would remain for a longer period in shoreline sediments. Within the Gulf of Alaska area this is not expected to result in additional closures because any large spill is large enough by itself to close northeastern gulf commercial fisheries. However, once the spill was northwest of the Trans-Alaska Pipeline System tanker route (the predominant direction of ocean currents), there would be substantially more oil moving out of the area from the 200,000-barrel spill. Hence, the oil from the 200,000-barrel spill is likely to enter and more strongly affect the commercial fishing grounds within portions of Prince William Sound and farther west toward Resurrection Bay. Due to the greater presence of oil in these areas, more fishery closures are expected with a 200,000-barrel spill that moves outside of the tanker route.

The estimated economic effect of a 200,000-barrel oil spill on the gulf commercial-fishing industry is based on what occurred during the larger (258,000 barrels) *Exxon Valdez* oil spill and a smaller (4,000 barrels) spill, and depends primarily on the highly variable *Exxon Valdez* spill cost estimates (ranging from $9-43 million/year for 2 years). The value of the gulf commercial fishery (Prince William Sound to Cape Fairweather) is estimated at $75-$200 million per year, depending on the price per year and numbers caught. Hence, in any 2-year period when the value of the northeastern gulf commercial fishery is estimated to be about $75 million per year, a 2-year loss of about $9 million per year represents a 12%-per-year loss for 2 years. A 2-year loss of about $43 million per year represents a 57%-per-year loss for 2 years. In a 2-year period when the annual value of the northeastern gulf commercial fishery is estimated to be closer to $200 million, a 2-year loss of about $9 million per year represents a 5%-per-year loss for 2 years, whereas a 2-year loss of $43 million per year represents a 22%-per-year loss for 2 years.

Because the occurrence of a large oil spill (200,000 barrels) would preclude any knowledge of what the commercial fishery would have been worth (due to closures), the value of the commercial fishery at the time of the 200,000-barrel oil spill is assumed to be the estimated average annual value of the gulf commercial fishery. In terms of the estimated average annual value (about $125 million), a 2-year loss of about $9 million per year represents a 7%-per-year loss for 2 years, whereas a 2-year loss of about $43 million per year represents a 34%-per-year loss for 2 years. These estimates are the same as for large spill because, as indicated above, any large oil spill is large enough to close the same amount of commercial fishery within the area. However, if it is assumed that the oil from the 200,000-barrel oil spill also moves outside and northwest of the area, additional closures are expected from Prince William Sound to Resurrection Bay. It is estimated that these additional closures would further reduce the value of gulf commercial fisheries (excluding Kodiak and Cook Inlet) by about 30% for 2 years. Hence, estimated gulf commercial fishing losses due to the 200,000-barrel oil spill are estimated to range between $45 million (7+30 = 37%) and $80 million (34+30 = 64%) per year for 2 years following the spill.

Thus, based on loss estimates from the *Exxon Valdez* spill and the estimated annual value of the northeastern gulf commercial fishery, the 200,000-barrel oil spill could result in an economic loss to the northeastern gulf commercial fishing industry of 12-57%-per year for 2 years. However, in terms of the estimated average annual value of the northeastern gulf commercial fishery, the 200,000-barrel oil spill is more likely to result in a loss of about 7-34% per year for 2 years within the area. Additional closures northwest of the area are estimated to increase this loss to between 37% and 64% per year for 2 years following the spill. Compensation to the commercial-fishing industry for participating in the cleanup of an oil spill is likely to exceed these economic losses by several orders of magnitude.

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**The Department of the Interior Mission**

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

**The Minerals Management Service Mission**

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.

20 Years of Service to America

MMS

Minerals Management Service

1982-2002