EXHIBIT 15

OCS EIS/EA
MMS 2004-028

Environmental Assessment

Proposed Oil and Gas Lease Sale 195 Beaufort Sea Planning Area

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Submarines are highly valued platforms for a variety of oceanic research in part because they are relatively quiet, enabling the use of active and passive acoustic technologies for a variety of studies. Information about the response of bowheads to resting or transiting submarines is not available to MMS.

In conclusion, some of the research ships that have previously made trips into the range of the bowhead are likely to do so again in the future and there may be additional research cruises that could impact the whales. We refer the reader to the baseline section for more discussion on past research activities involving ships. All large research ships that are active in the range of the bowheads during periods when they are present have the potential to cause noise and disturbance to the whales, potentially altering their movement patterns or other behavior. However, available evidence does not indicate such disturbance will have a significant effect on this population over the approximate life of the project, even when added to the effects of other effectors.

VI.C.4. Climate Change (also referred to as Global Warming and Climate Warming)

In the multiple-sale EIS, we concluded that:

> Climatic change in terms of global warming should not be measurable, as any trends in global warming are on a greater scale than 10-15 years and would not be measurable in this shorter timeframe. If ice roads were to experience a shorter season of supportive cold temperature, the operations would be suspended accordingly or supported by helicopter similar to the roadless development sites.

However, climate change is increasingly a subject of concern for residents of the Arctic. Investigation of climate change and potential biological and physical effects is rapidly increasing. Thus, in this section, we expand the timeframe of our climate change analyses to the life of the project (about 30 years) and consider recently available information regarding potential impacts of climate change that could impact bowhead whales.

The IUCN /Species Survival Commission (IUCN/SSC) (IUCN, 2003) concluded that a workshop by the IWC in 1996

> "placed the issue of climate change, including ozone depletion, firmly on the cetacean conservation agenda.... Effects of climate change are complex and interactive, making them analytically almost intractable. This workshop report acknowledges the difficulties in establishing direct links between climate change and the health of individual cetaceans, or indirect links between climate change and the availability of cetacean prey...."

We do not attempt to make direct links or to make predictions about whether continued warming will occur, and if it does, what the rate and pattern of change will be. In the following, we provide a short summary from a few highly credible summaries of available information on climate warming and on predictions related to potential climate-warming-related changes that could result in effects on this population of bowhead whales. These sources are the International Panel on Climate Change (IPCC, (2001a,b, the SEARCH SSC (2001), Tynan and DeMaster (1997) and the International Whaling Commission (1997).

In 2001, the IPCC published detailed, synthetic and summary reports on the topic of climate change. The IPCC (2001b:2) uses the term climate change to refer to "any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the Framework Convention on Climate Change...."

In this document, our usage of the term is the same as that defined by the IPCC.

We excerpt some findings from two key documents produced by segments of this committee that may be especially relevant to understanding cumulative impacts on bowhead whales:

The IPCC produced a summary, entitled *Climate Change 2001: Synthesis Report Summary for Policymakers*, "approved in detail at IPCC Plenary XVIII," which "represents the formally agreed

findings. They point out that many of the robust findings have to do with the existence of a climate response to human activity and the direction of the response. Many of the uncertainties are related to quantification of either the timing and/or magnitude of the response.

The report of the Working Group I of the IPCC (IPCC, 2001b) further concluded that:

- Since 1861, the global average surface temperature (which is the average of near surface air temperature and sea surface temperature) has increased. Over the 20th century, the increase has been 0.6+0.2° C.
- "It is likely that there has been about a 40% decline in Arctic sea-ice thickness during late summer to early autumn in recent decades and a considerably slower decline in winter sea-ice thickness" (IPCC (2001b:4).
- Average global sea level rose between 0.1-0.2 meters during the 20th century.
- In the 20th century, it is very likely that there was a 0.5-1% increase in precipitation per decade over most mid- and high latitudes of the Northern Hemisphere continents.
- It is likely that there has been an increase in cloud cover and an increase in the frequency of heavy precipitation events in the mid to high latitudes.
- Since the mid 1970's, warm episodes of the El Niño-Southern Oscillation (ENSO) phenomenon) have been more intense, persistent and frequent compared to the previous 1000 years.

At the request of the White House, the National Research Council (National Research Council, 2001:vii) identified "areas in the science of climate change where there are the greatest certainties and uncertainties". In answer to the question of whether climate change is occurring and, if so, how, the National Research Council (2001:3) wrote that:

> Weather station records and ship-based observations indicate that global mean surface air temperature warmed between about 0/4 and 0.8 C...during the 20th century...the warming trend is spatially widespread and is consistent with an array of other evidence...in this report. The ocean....has warmed by about 0.05 C...averaged over the layer extending from the surface down to 10,000 feet, since the 1950s.

They concluded that

> The IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue. The stated degree of confidence in the IPCC assessment is higher today than it was 10, or even 5 years ago, but uncertainty remains....

The National Research Council (2001:3) concluded that: "The predicted warming is larger over higher latitudes than over low latitudes, especially during winter and spring, and larger over land than over sea."

Atmospheric temperature increases due to global warming may be more pronounced in the Arctic region than in geographic areas closer to the equator (Peters and Darling, 1985; Peters, 1991). Heavy precipitation events are projected to become more common in the Arctic with flooding events likely to increase in frequency, and sea-levels are expected to rise (Walsh, 2003; Gough, 1998).

The Study of Environmental Arctic Change (SEARCH) is a broad, multiscale, interdisciplinary program aimed at understanding the environment of the Arctic in the future. The SEARCH Science Steering Committee (SSC) (2001:30-31) concluded that

> The recent arctic ...changes, specifically changes in the area and thickness of sea ice, can also profoundly impact arctic marine transportation....: Greater access and longer navigation seasons may be possible in Hudson Bay, the Chukchi and Beaufort seas, and along the Russian Arctic coast in present sea ice trends continue...it is conceivable that surface ships in the future will not have to confine their operations to the arctic marginal seas.... If changes result in opening significant new navigation routes, the size of the shipping industry could be changed several fold. International ship traffic may become substantial if the Northern Sea Route and Northwest Passage are open for longer periods of time. The greatest economic impact of changes in ice conditions may not be in shipping per sea, but in making new areas economically feasible to develop....

> significant reduction in the thickness of arctic sea ice...and...winter multiyear ice...suggest the possibility of shipping in the central Arctic Ocean sometime during the 21st century. It is significant to note that at the end of the 20th century nuclear and non-nuclear icebreakers (from Canada, Germany, Russia, Sweden, and the U.S.) have made summer transits to the North Pole and operated throughout the central Arctic Ocean.... Thus it is conceivable that surface ships in the future will not have to confine their operations solely to the arctic marginal seas.

Vincent, Gibson, and Jeffries (2001) reported a decrease in pack ice thickness by 27% from 1867-1999 in the Canadian high Arctic with the collapse of the Ellesmere Ice Shelf (90% reduction). The prediction that ice cover and ice thickness will continue to decrease in the Arctic is uncertain. Analysis of ice thickness from six submarine cruises from 1991-1997 showed no trend towards a thinning ice cover (Winsor, 2001).

There has been recent environmental change along the Northern Sea Route (across the north of Eurasia) that could alter shipping between northern Europe and Asia. Global interest in this route resulted in a comprehensive study, called the International Northern Sea Route Programme (INSROP) that confirmed that the European Union and Russia are collaborating on programs to better link their areas using Arctic shipping, and that technological and environmental challenges are no longer absolute obstacles to commercial shipping. SEARCH SSC (2001:30) states that: "Continued sea ice reductions will no doubt influence the initiation of transportation studies similar too INSROP for the Northwest Passage, the coasts of Greenland, the Alaskan Arctic coast and other regional seas."

Increased shipping could have substantial effects on development in the Arctic, making new areas economically feasible to develop (SEARCH SSC, 2001). SEARCH SSC (2001:31 states that:

> A substantial change in the open water season for the Beaufort Sea – from 60 to 150 days (Maxwell, 1997) – can potentially reduce the costs associated with offshore oil and gas exploration and production.... Shipping access to the large oil and gas reserves in the Barents and Kara seas will be substantially improved if regional warming of the Russian Arctic continues...."

Thus, potential effects include increased development in the Beaufort and Chukchi seas. However, it is important to note that all of the aforementioned potential changes in shipping are dependent on continued warming and reductions in sea ice.

The Office of Naval Research (2001) reported that climate warming in the Arctic is likely to result in the northward migration of subarctic species of marine mammals and an increase in commercial-fishing activities into the Chukchi and Beaufort seas, where operations have been minimal in the past.

Significant reductions in the thickness of arctic sea ice (Rothrock, Yu, and Maykut, 1999) and winter multiyear ice (Johannessen et al., 1999) have been reported. In 1998, record sea-ice retreat was observed for the Beaufort and Chukchi seas (Maslanik, 1999).

If substantial increases in shipping were to occur that placed more ships in waters inhabited by bowheads, increases in adverse effect to bowheads also might occur due to shipping-related noise and disturbance, vessel strikes, and pollution. Quantification of such potential changes are not possible at this time due to the level of uncertainty about changes that might occur over the course of the proposed project and the shipping industry's response to greater cross-Beaufort transiting opportunities, when they to occur.

We conclude that the potential effects of global warming on this population of bowhead whales are somewhat uncertain. We have identified some potential changes that, in turn, potentially could have adverse impacts on bowhead whales, were they to occur. However, we are aware of no information that indicates such change over the course of the next 30 years could have a significant adverse impact on bowheads. There is no evidence suggesting that many of the changes that could occur, such as changes in timing of migrations and shifts in distribution, would be associated with adverse effects on these whales. In Shelden et al.'s (2003) response to Taylor's statements regarding the expectation of future downward trends in abundance based on what he termed "available evidence" regarding global warming, they point out that Taylor did not provide citations supporting this claim. Shelden et al. (2003:918-919) state that:

> Although available data do indicate that the Bering Sea environment is changing (e.g., Angel & Smith 2002), we are aware of no evidence that environmental changes will be detrimental to the population in the foreseeable future. In fact, our review...on this issue suggests that climate change may actually result in more favorable conditions for BCB bowheads.

Appendix I

Speculative Effects in the Context of Arctic Climate Changes

Precipitation in the Arctic has increased 15% in the past 40 years, and there is a trend toward an earlier spring melt (AMAP, 1997). Permafrost degradation and thermokarsting is expected to continue to cause forest damage, roads and buildings to sink, riverbanks to erode, and alterations in tundra vegetation. Warmer temperatures on Alaska's North Slope are promoting the growth of dwarf birch, alder, and willow shrubs (Schneider, 2001).

Some local observations of change on the North Slope are summarized in Section IV.F.8.n(1)(e)11)c) of the Northwest NPR-A IAP/ EIS (USDOI, BLM and MMS, 2003). The following are excerpts from the NPR-A EIS:

> In Barrow, Eugene Brower, President of the Barrow Whaling Captains Association related: "Last year the ice went over the horizon and stayed over the horizon all summer. We would have to go over 20 or 30 miles just to hunt seals" (Talbott, 2000).
>
> At Barrow, the break up of sea ice is much earlier than it used to be, occurring now in June rather than July; sea water freezes only from the top rather than also on the bottom as it use to (Huntington, 2000).
>
> Inupiat in Barrow have had ice cellars drip water for the first time in memory, and in Katovik, a robin built its nest in town in 2003. (There is no word in the Inupiat language for robins.) The banks of the Okpilak River—"Okpilak" means "river with no willows"—are now crowded with willows. Salmon are arriving in Kaktovik where there were almost no salmon a generation ago. Ninety two-year-old Nora Agiak observes: "The weather is different, really different... We're not getting as many icebergs as we used to. Maybe the world moved, because it's getting warmer" (AMAP, 1997; Groat, 2001; Kristof, 2003).

Many similar observations of recent warming for other arctic regions are contained in the Northwest NPR-A EIS and the Arctic Climate Impact Assessment (ACIA) (www.acia.uaf.edu). The latter document is being drafted by an international group, including several employees of the FWS and National Oceanic and Atmospheric Administration. Some MMS employees have attended ACIA meetings and reviewed drafts of the assessment; even though MMS is aware of the arctic assessment, it does not agree with all of the preliminary findings. For example, the assessment describes the recent warming as very unusual, but on a longer time scale of evolutionary or geological time the recent warming trend is probably not the largest or warmest during the last millennium (Soon and Baliunas, 2003). Because of such changes in the arctic ice cover, the following sections assess the effects on each resource of proposed Sale 195 in the context of projected climate changes during the life of the field (about 3 decades).

Climate-Change Projections. Projections of changes in the arctic ice cover are included in a study for the U.S. Global Change Research Program, a study for which the Department's United States Geological Survey was a participating agency (Center for Global Change and Arctic System Research, 1999). Projections also are included in a report on the Arctic Ocean for the Office of Naval Research (Office of Naval Research, 2001). Most of the Navy projections are included in Appendix A of the report, entitled *The Arctic Ocean and Climate Change: A Scenario for the US Navy*. We are aware of the projections and have used the projections for the life of the field (about 3 decades) in our assessments, but we consider the results to be theoretical and uncertain. The Council on Environmental Quality (CEQ) guidelines for the National Environmental Policy Act address the use of theoretical approaches to assessments in 40 CFR 1502.22. The guidelines specify that, when an agency is evaluating effects with such information, the agency shall include warnings about it. Therefore, we start this assessment with an acknowledgement that climate-change information is relevant to the MMS decision about proposed Sale 195; and that while many recent observations of change are consistent with climate-change theories, the projections for the next few decades are theoretical and uncertain.

For subsistence-harvest patterns and sociocultural systems, the multiple-sale EIS concludes generally in Section V.A.6 that: "Potential cumulative effects on...subsistence (and) sociocultural systems...would be of primary concern and warrant continued close attention and effective mitigation practices."

A factor of increasing concern is the potential for adverse effects on subsistence-harvest patterns and subsistence resources from global climate change. The CEQ bases its guidance on the National Environmental Policy Act (NEPA) regulations, which mandate that all "reasonably foreseeable" environmental impacts of a proposed Federal action have to be considered in the NEPA assessment. The CEQ considers that there is adequate scientific evidence (for example, in the *Second Assessment Report* by the Intergovernmental Panel on Climate Change [IPCC]) indicating that climate change is a "reasonably foreseeable" impact of greenhouse gas emissions (CEQ, 1997; IPCC, 2001a).

Permafrost thawing is expected to continue to damage roads and buildings and contribute to eroding coastlines and increase building and maintenance costs. The cost of shifting buildings, broken sewer lines, buckled roads, and damaged bridges already has caused $35 million worth of damage in Alaska annually. In Kotzebue, the local hospital had to be relocated, because it was sinking into the ground (ARCUS, 1997). Sea-level rise and flooding threaten buildings, roads, and power lines along low coastlines in the Arctic and, combined with thawing permafrost, can cause serious erosion. Kaktovik's 50-year-old airstrip has begun to flood because of higher seas and may need to be moved inland (Kristof, 2003). Shore erosion in Shishmaref, Kivalina, Wainwright, and Barrow in Alaska and Tuktoyaktuk at the mouth of the MacKenzie River in Canada has become increasingly severe in recent years, as sea-ice formation occurs later, allowing wave action from storms to cause greater damage to the shoreline. Eventually, some of these communities will be forced to relocate.

The duration of ice-road usefulness in the Arctic already has diminished by weeks and has led to an increased need for more permanent gravel roads. However, gravel roads are more prone to the effects of permafrost degradation, thermocarst, and consequent settling that increases maintenance costs (Nelson, 2003a,b). Gravel roads also contribute to the fragmentation of landscapes and habitats that can lead, through time, to reduced species' productivity. Such an impact on species is a threat to subsistence livelihoods.

Continuing sea ice melting and permafrost thawing could threaten subsistence livelihoods. Typically, peoples of the Arctic have settled in particular locations because of their proximity to important subsistence food resources and dependable sources of water, shelter, and fuel. Northern peoples and subsistence practices will be stressed to the extent that

- settlements are threatened by sea ice melt, permafrost loss, and sea-level rise;
- traditional hunting locations are altered;
- subsistence travel and access difficulties increase; and
- game patterns shift and their seasonal availability changes.

Large changes or displacements of resources are likely, leaving little option for subsistence communities: they must quickly adapt or move (Langdon, 1995; Callaway, 1995; *New Scientist*, 2001; Parson et al., 2001; AMAP, 1997; *Anchorage Daily News*, 1997; Weller, Anderson and Nelson, 1998; IPCC, 2001a). Great decreases or increases in precipitation could affect local village water supplies, shift the migration patterns of land mammals, alter bird breeding and molting areas, affect the distribution and abundance of anadromous and freshwater fishes, and limit or alter subsistence access routes (particularly in spring and fall) (AMAP, 1997). Changes in sea ice could have dramatic effects on sea mammal migration routes and this, in turn, would impact the harvest patterns of coastal subsistence communities and increase the danger of hunting on sea ice (Callaway, 1999; Bielawski, 1997). Between 1980 and 2000, three sudden ice events caused Barrow whalers to abandon their spring whaling camps on the ice lead (George et al., 2003; National Assessment Synthesis Team, 2000; Groat, 2001).

The potential effects of the lease sale are assessed within the context of climate change. If a major effect due to climate change were to occur, MMS would require changes to exploration or development/production designs and activities.

Summary for Subsistence-Harvest Patterns: If the present rates of climate change continue, changes in diversity and abundance to arctic flora and fauna could still be significant; but at the same time, these impacts "cannot be reliably forecast or evaluated" and "positive effects such as [1] extended feeding areas

With regard to climate change, specifically, the multiple-sale EIS concluded that:

> Climatic change in terms of global warming should not be measurable, as any trends in global warming are on a greater scale than 10-15 years and would not be measurable in this shorter timeframe. If ice roads were to experience a shorter season of supportive cold temperature, the operations would be suspended accordingly or supported by helicopter similar to the roadless development sites.

However, climate change is increasingly a subject of concern for residents of the Arctic. Investigation of climate change and potential biological and physical effects is rapidly increasing. Thus, in this section, we expand the timeframe of our climate change analyses to the life of the project (about 30 years) and consider recently available information regarding potential impacts of climate change that could impact bowhead whales.

Potential effects to bowhead whales related to climate change/climate warming could include:

- increased noise and disturbance related to increased shipping;
- increased interactions with commercial fisheries, including increased noise and disturbance, incidental take, and gear entanglement;
- decreases in ice cover with the potential for resultant changes in prey species concentrations and distribution; changes in subsistence-hunting practices that could result in smaller, younger whales being taken and, possibly, in fewer whales being taken; and
- more frequent climatic anomalies, such as El Ninos and La Ninas, with potential resultant changes in prey concentrations.

In the following, we provide a short summary from four highly credible summaries of available information on climate warming and on predictions related to potential climate-warming-related changes that could result in effects on this population of bowhead whales. These sources are the IPCC (2001), the NRC (2002), Tynan and DeMaster (2001), and the IWC (1997). We highlight which statements from this literature are based on observations (for example, observations of warming or ice-cover changes) and which are based on predictions. We also note where there is apparently broad agreement within the scientific community, and where there is some or a high level of uncertainty about key predictions.

The effects on bowheads in the context of climate change are assessed further in Appendix C, Section VI.C.4. We conclude that the potential effects of global warming on this population of bowhead whales are somewhat uncertain. However, we are aware of no information that indicates such change, over the course of the next 30 years could have a significant adverse impact on bowheads. There is no evidence suggesting that many of the changes that could occur, such as changes in timing of migrations and shifts in distribution, would be associated with adverse effects on these whales. In Shelden et al.'s (2003) response to Taylor's statements regarding the expectation of future downward trends in abundance based on what he termed "available evidence" regarding global warming, they point out that Taylor did not provide citations supporting this claim. Shelden et al. (2003:918-919) state that:

> Although available data do indicate that the Bering Sea environment is changing (e.g., Angel & Smith 2002), we are aware of no evidence that environmental changes will be detrimental to the population in the foreseeable future. In fact, our review...on this issue suggests that climate change may actually result in more favorable conditions for BCB bowheads.

Relatedly, Taylor argued that there will be downward trends in basic life history parameters as a function of global warming. Shelden et al. (2003) responded that Taylor did not list which life-history parameters he was referring to and did not provide the factor that he believed would result in the change of each parameter. They pointed out that members of the IWC's Scientific Committee had "tested extensively" the robustness of BCB bowheads, including changes in key population parameters.

Perhaps the greatest potential adverse effect to bowhead whales associated with global warming could occur if the predictions that the Northwest Passage may become ice free for significant lengths of time prove accurate, opening sea routes across the Beaufort Sea. For example, with respect to the Northwest Passage, Andre Maillet, the head of Arctic icebreaking operations for the Canadian Coast Guard is quoted in the Boston Globe (Nickerson, 2000) as saying: "The waters are opening, this is not science fiction.... Whether it's a few years away or a couple decades, the passage is going to become a vital commercial

I.2.e(2) Fishes and Essential Fish Habitat

The following are some general findings concerning climate change and arctic fisheries in the IPCC, 2001b Report.

> A warmer climate will create a more pluvial runoff regime as a greater proportion of the annual precipitation is delivered by rain rather than snow and a flattening of the seasonal runoff cycle occurs. Enhancement of winter flow will mean streams that currently freeze to their beds will retain a layer of water beneath the ice. The effects of changed drainage patterns and active-layer detachments (Dyke, 2000)—increasing sediment-nutrient loads in lakes and rivers—will alter biological productivity in aquatic ecosystems considerably (McDonald et al., 1996). Primary productivity of Arctic aquatic systems also should be boosted by a greater supply of organic matter and nutrients draining from a more biologically productive terrestrial landscape (Schindler, 1997; Hobbie et al., 1999). This will be beneficial to invertebrates and fish populations.
>
> Warming will lead to a shortened ice season and thinner ice cover. For large northward-flowing rivers (for example, the Mackenzie River), this could reduce the severity of ice jamming in spring, especially if the magnitude of the peak snowmelt that drives breakup also is reduced (Beltaos and Prowse, 2000). Reductions in the frequency and severity of ice-jam flooding would have a serious impact on northern riparian ecosystems, particularly the highly productive river deltas, where periodic flooding has been shown to be critical to the survival of adjacent lakes and ponds (Marsh and Hey, 1989; Prowse and Conly, 1998). (Such lakes and ponds may serve as habitat to freshwater and diadromous fishes of the Alaskan arctic region.)
>
> Ice edges are biologically productive systems, with diatoms and other algae forming a dense layer on the surface that sustains secondary production. Of concern as ice melts is the loss of prey species of marine mammals, such as Arctic cod and amphipods, that are associated with ice edges (Tynan and DeMaster, 1997). The degree of plasticity within and between species to adapt to these possible long-term changes in ice conditions and prey availability is poorly known and requires study. Regime shifts in the ocean will impact the distribution of commercially important fish stocks. Recruitment seems to be significantly better in warm years than in cold years, and the same is valid for growth (Loeng, 1989). The distribution of fish stocks and their migration routes also could vary considerably (Buch et al., 1994; Vilhjalmsson, 1997).

I.2.e(2)(a) Arctic Cod and Cryopelagic Fishes

The arctic cod is a pivotal species in the arctic food web, as evidenced by its importance to other marine fishes, sea birds, and marine mammals. In arctic regions, no other prey species compare with arctic cod in abundance and energetic value (Finley, Bradstreet and Miller, 1990.). The distribution and diet of arctic cod vary with ice conditions (Frost and Lowry, 1984); Crawford and Jorenson, 1993) and (relatively) large numbers of fishes can occur locally, especially in areas of marginal ice zones (Andriashev, 1970). Cryopelagic fishes such as arctic cod are adapted to feed under the ice where they consume crustaceans associated with the ice undersurface and adjacent water column (Lønne and Gulliksen, 1989). Tynan and DeMaster (1997) state:

> The placement and orientation of the mouth of arctic cod suggests an adaptation to under-ice feeding (Dunbar, 1981). In Admiralty Inlet (Northwest Territories, Canada), hydroacoustic surveys of fish recorded the highest densities immediately below landfast sea ice (Crawford and Jorgensen, 1990). The distributions of fish, presumably arctic cod, were associated with layers of zooplankton…behaviors of arctic cod that lead to the formation of large aggregations are probably quite crucial to the foraging of higher vertebrates.

Tynan and DeMaster (1997) emphasize that it is difficult to predict how arctic cod may be redistributed in a warmer Arctic. Because their life history is closely linked to sea ice, they speculate that regional changes in the extent of sea ice may lead to redistributions of arctic cod, and consequently to redistributions of marine mammals. They further state:

> In the High Arctic, the base of the food chain consists of ice algae rather than phytoplankton (Alexander, 19950. Many species of copepods reproduce under the ice before the phytoplankton bloom and feed on sedimenting ice algae (Drolet et al., 1991). Large *Calanus* copepods, together

indeed 'push these limits' and attempt to establish market influence sooner than natural conditions permit.

I.2.e(2)(c) Summary of Climate Change Effects

Climate change (warming) in the region will likely alter habitat and the diversity, distribution, and abundance of fishes. If climactic warming continues in the region for another 3 decades along the same warming trend as documented for the last 40 years, we may observe significant changes in the diversity, distribution, and abundance of fishes in the Alaskan Beaufort Sea. Although a significant change may not be realized during the lifetime of the Proposed Action, the change appears to be already taking place, as evident by the range changes exhibited by several Pacific salmon species. Regime shifts in the ocean from regional climate change will impact the distribution and abundance of various fish populations. The underlying mechanisms that account for changes in population sizes are poorly understood, particularly because plankton production and trophic interactions may be extensively altered by changes in climate. Shifts in oceanic circulation associated with global or regional climate warming are likely to affect the migration routes of some fishes. Some species are likely to become more widespread and/or abundant (for example, Pacific salmon), whereas other species are likely to become less abundant or modify their distribution. Arctic cod may be redistributed in a warmer Arctic. Since their life history is closely linked to sea ice, regional climate warming may change the extent of sea ice and cause arctic cod to decline in abundance or redistribute accordingly. If more frequent straying of Pacific salmon into Arctic waters occurs, the impact on indigenous salmonids (for example, arctic char and Dolly Varden) should be closely monitored. Regional climate change is likely to bring additional fishing activity to the Arctic, particularly in the Barents Sea and Beaufort/Chukchi region where commercial operations have been minimal in the past. Oil spills associated with the Proposed Action or other hydrocarbon leasing activities may interact and modify effects attributed to climate change on fish populations.

The introduction of non-native, invasive species into aquatic environments of the Beaufort Sea (chiefly nearshore and marine waters) is a concern as vessel traffic increases in the region, however, it appears premature to specify what non-native, invasive species might be capable of colonizing the harsh environmental conditions present in the region. If climate warming of the region continues, such colonization by invasive species introduced by vessels may become more likely. Hence, fish habitat in the region is expected to be increasingly modified, and fish populations are anticipated to be increasingly adversely impacted by ever-increasing human activities in the region.

I.2.e(3). Air Quality and Other Resources

We are aware of no projected climate changes that would influence the effects of OCS Sale 195 on air quality, vegetation and wetlands, or terrestrial mammals. With respect to lower trophic-level organisms, which includes the kelp community in the Boulder Patch, the multiple-sale EIS concluded generally in Section V.A.6 that "Potential cumulative effects on the...Boulder Patch...would be of primary concern and warrant continued close attention and effective mitigation practices." As summarized in Section I.2.C above, the projected climate changes include reduction in the summer ice cover and changes in nearshore surface seawater. Reduction in the summer ice cover and any changes in the optical transparency of nearshore seawater might influence slightly the growth of kelp. So, we still conclude that the potential cumulative effects on the Boulder Patch kelp community would be a primary concern.

Conclusion: Partly because of projected climate changes, we still conclude that potential effects on polar bears and Boulder Patch kelp habitat would be a primary concern. We identify ringed seals and other ice-dependent pinnipeds as additional resources of primary concern. Therefore, we conclude that the potential cumulative effects on polar bears, seals and other ide-dependent pinnipeds would be of primary concern and would warrant continued close attention and effective migration practices.

I.2.f. Environmental Justice

Alaskan Inupiat Natives, a recognized minority, are the predominant residents of the NSB, the area potentially most affected by Sale 195 exploration and development. Effects on Inupiat Natives could occur

disturbance, and disruption of subsistence practices are factored together. One or more important subsistence resources would become unavailable or undesirable for use for 1-2 years, a significant adverse effect.

Because the occurrence of a large oil spill is unlikely, attaining a level of significant effect also is unlikely. These conclusions and updated levels of effect on subsistence-harvest patterns, sociocultural systems, and Environmental Justice would be the same as in the multiple-sale EIS. Factoring in potential climate-change impacts suggests potential adverse impacts even without a large oil spill. We still conclude that potential effects on subsistence and sociocultural systems would be significant, warrant continued close attention, and effective mitigation practices. Also, we still conclude that potential environmental justice effects would focus on the Inupiat communities of Barrow, Nuiqsut, and Kaktovik within the NSB; such impacts would be considered disproportionately high adverse effects on Alaska Natives.

Local Water Quality: We conclude that the effects of Sale 195 on water quality in the context of climate change would probably be similar to the effects that are summarized in EA Section IV.E.2.c.

Bowhead Whales: The best available information on past, current, and reasonably foreseeable anthropogenic actions on the Western Arctic stock of bowhead whales supports the conclusion that it is unlikely that there would be significant cumulative impacts on the Western Arctic stock of bowhead whales over the lifetime of the proposed project. The incremental contribution of Sale 195 to the effects likely would be small. While there is uncertainty about the exact level and nature of potential effects that presently may be associated with, or that could result from, particular activities or effectors, available data indicate that this population is robust and is increasing at a healthy rate. It is highly unlikely to become extinct over the next 100 years (Shelden et al., 2001). This population also is highly regulated and relatively well monitored. Whatever adverse effects it currently is or historically has suffered from human activities, there is no indication such effectors currently have important adverse effects on this population. There are multiple regulatory tools available to adequately protect this population from many of the potential adverse human-related effects.

Most effects are not expected to be additive or synergistic, as many of the potential effects would be expected to occur in different areas and, by chance, affect different individuals. However, we acknowledge some uncertainty about this conclusion. If certain activities were clustered in their space (for example, shipping and offshore petroleum development both increase in the area of the Beaufort Sea offshore of the Mackenzie River where bowheads commonly aggregated to feed in the summer), there could be additive or synergistic effects on this population. This would be particularly true if there is a threshold level of noise/disturbance that causes bowheads, or some key component of the bowhead population, to avoid an area that otherwise would hold benefit to them. We still conclude that this population is of primary concern and, thus, warrant continued close attention and effective mitigation practices.

Other Resources: With regard to other marine mammals, the overall effects (mainly from one oil spill assumed for this analysis) is the potential loss of perhaps up to 10 polar bears and a few hundred seals and walruses, and small numbers (probably fewer than 10) of beluga and gray whales. In the likely case, pinnipeds, polar bear, and beluga and gray whale populations are expected to recover within 1 year, assuming only one large spill (greater than or equal to 1,000 bbl) occurs. Potential oil spills along the tanker route to the U.S. west coast could have a long-term (more than one generation or perhaps 5-10 years) effect on sea otters and perhaps harbor seals and other marine mammals. Noise and disturbance in the Beaufort Sea Planning Area is expected to briefly and locally disturb or displace a few seals, walruses, beluga and gray whales, and polar bears. A few polar bears could be temporarily attracted to the production island, with no significant effects on the population's distribution and abundance. Potential global warming and resulting arctic climate change could have adverse effects on the distribution and/or abundance of ice-dependent marine mammals, especially polar bears and pinnipeds (ice seals and walruses) in the Alaskan Arctic. The contribution of Sale 195 is expected to be about 2-4% of the local short-term disturbance and habitat effects on pinnipeds, polar bears, and beluga and gray whales (based on 0.46-Bbbl/11.5-Bbbl oil reserves in Table V-12 of the multiple-sale EIS). The Proposed Action for Sale 195 likely would contribute about 17% of cumulative offshore spills. The estimated mean number of cumulative offshore spills is 0.65, but the most likely number of offshore spills is zero (USDOI, MMS, 2003a).

Protection Act. Disturbance of marine mammals could be determined to constitute a "taking" under the Act.

- Information to Lessee No. 9 Information on Polar Bear Interaction. Lessees are advised to conduct their activities in a manner which will limit potential encounters and interaction between lease operations and polar bears.

Further, geological and geophysical (seismic) exploration is conducted on the ice during winter, when no changes are predicted for the ice cover. Regardless, the MMS permits for seismic exploration include mitigation that might further reduce harmful encounters between humans and polar bears or ringed seals during offshore operations. In the case of polar bears, seismic permit applications usually explain that the operator and the Fish and Wildlife Service have prepared a Polar Bear Interaction Plan. The plans generally specify that all waste/garbage will be incinerated to keep human/polar bear interactions to a minimum. Additionally, the operator's plans usually note that, if polar bears are sighted, employees must stay inside, and that the sighting would be reported to the Fish and Wildlife Service.

Conclusion: In light of these effects and mitigation, we reviewed the general conclusions about cumulative effects in the multiple-sale EIS (in Section V.A.6). Part of the general conclusion is that: "Potential cumulative effects on the bowhead whale, subsistence, sociocultural systems, spectacled eider, boulder patch, polar bear, and caribou would be of primary concern and warrant continued close attention and effective mitigation practices."

Based on the assessment in this appendix, we have identified ringed seals and other ice-dependent pinnipeds as additional resources of primary concern due to the speculative effects of Arctic climate change.