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# SOCIO-ECONOMIC ASSESSMENT OF THE PROPOSED BEAUFORT SEA MARINE PROTECTED AREA

## Final Report

Submitted to:

**Fisheries and Oceans Canada**
Box 1871
Inuvik NT X0E 0T0

Submitted by:

**Kavik-AXYS Inc.**
PO Box 2320
Inuvik, NWT X0E 0T0

In association with **Gustavson Ecological Research Consulting**

Written by:

Rosaline Canessa
Marcy Sangret
Kent Gustavson
Allison Peacock
Michael Fabijan

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KAVIK-AXYS Inc.

# EXECUTIVE SUMMARY


## INTRODUCTION

The world's largest summering stock of beluga whales congregate in the Beaufort Sea. The Beaufort Sea Beluga Management Plan aims to protect these beluga populations, their habitat and traditional harvesting by the Inuvialuit. The areas afforded maximum protection under the plan are designated Zone 1(a) areas and defined as 'Traditional Harvesting/Concentration Areas'. The three Zone 1(a) areas, namely Shallow Bay, Kugmallit Bay, and the vicinity of Kendall Island, together comprise approximately 140,00 ha of shallow (less than 2 m), warm brackish and highly turbid waters at the head of the Mackenzie Delta. The Zone 1(a) areas are currently an Area of Interest (AOI) under consideration as a marine protected area (MPA) under the *Oceans Act*. As part of the MPA candidacy process specified in the *National Framework for Establishing and Managing Marine Protected Areas*, the Beaufort Sea Integrated Management Planning Initiative (BSIMPI) Working Group initiated assessments of the ecological, social, cultural and economic environment of the proposed MPA, as well as of the technical merits of the proposal. Each of these assessments is presented in a separate report. The report contained herein is the Socio-economic Assessment. It provides a baseline description of current human use activities and cultural values in the area and identifies potential socio-economic impacts of various MPA scenarios incorporating the Zone 1(a) areas.

The socio-economic assessment was conducted using a combination of in-person interviews with community members in Inuvik, Aklavik and Tuktoyaktuk, telephone discussions, primarily with government officials and industry representatives, and a literature review of published reports, statistical documents, industry studies and websites. The interviews with hunters, trappers, elders and community members were particularly instrumental in describing the history of the beluga harvest and its social and cultural significance. The economic valuation focused on describing marketed and non-marketed direct use values; those actually involving current or recent physical use of the AOI by humans. The economic evaluation provides an indication of the extent of the 'values at risk' given a prohibition of elimination of specific uses.

## COMMUNITIES, GOVERNMENTS AND OTHER STAKEHOLDERS

The AOI is located in the Inuvialuit Settlement Region (ISR) established in the 1994 Inuvialuit Final Agreement (IFA). The ISR is the homeland of the Inuvialuit in the Beaufort Sea, the Mackenzie River Delta, the Yukon North Slope and the Arctic islands. There are three communities within the AOI. Inuvik, situated on the East Channel of the Mackenzie River Delta, is the regional administrative centre for the territorial government and the Inuvialuit and Gwich'in land claims. The Inuvialuit and Gwich'in have traditionally hunted and fished in the area, and continue to engage in their traditional cultural and subsistence pursuits on the land. However, Inuvik's local economy has been dominated by petroleum and service industries during the 1970s and 1980s, and again with the current resurgence of petroleum activity in the region. The hamlet of Tuktoyaktuk is situated at the northern end of the Tuktoyaktuk peninsula on the shore of Kugmallit Bay. While, Tuktoyaktuk's traditional economy based on whaling and fur trapping has fluctuated with the Distant Early Warning line stations and petroleum industry, today, over 75% of households in the community still rely on the land for hunting and fishing. Transportation and petroleum industries, and increasingly guided recreation and tourism, provide wage-earning employment. Aklavik is situated on the shore of the Peel Channel on the west side of the Mackenzie River Delta. While it was once the major community in the Delta, today it is the smallest of the three communities

owing to the relocation of a majority of its residents to the present-day Inuvik in the 1950s. The economy is primarily subsistence based including trapping, hunting, whaling and fishing.

The IFA established a co-management system involving a number of Inuvialuit and Inuvialuit-government council and committees such as Hunters and Trappers Committees, Inuvialuit Game Council, Inuvialuit Reginal Corporation and Community Corporations, Inuvialuit Land Administration, Wildlife Management Advisory Council (NWT), Wildlife Management Advisory Council (North Slope), Fisheries Joint Management Committee, Joint Secretariat, Inuvialuit Renewable Resources Committee. These organisations along with Elders and Youth Committees, Community Economic Development Organisation, federal government agencies (*e.g.*, Fisheries and Oceans Canada, Indian and Northern Affairs Canada, Environment Canada, Parks Canada, Department of National Defense, National Energy Board, NWT and Yukon territorial governments, environmental regulators (*e.g.*, Environmental Impact Screening Committee, Environmental Impact Review Board, Canadian Environmental Assessment Agency) and the Beaufort Sea Integrated Management Initiative all share responsibility for management of the natural resources, land use an marine-based activities within the ISR. In addition to these regulatory/management agencies other organisations have an interest in the AOI, namely:

- Petroleum companies, *e.g.*, AEC West Ltd., Devon Canada, Anadarko Canada Corporation, SunCor Energy Inc., Imperial Oil Resources;
- Tourism Operators, e.g., Arctic Nature Tours, Ookpik Tours, Uncommon Journeys, Arctic Tour Company, Beaufort Delta Tours, Kendall Island Whale Watching Tours, Aklavik Tours;
- Transportation, *e.g.*, Beaufril Air, Aklak Air, Arctic Wings Ltd, Canadian Helicopters, Highland Helicopters, Stage Air, Northern Transportation Company Ltd, E. Grueben's Transport;
- Research, *e.g.*, Aurora Research Institute, territorial governments, Canadian Wildlife Service, Fisheries and Oceans Canada, Prince of Wales Northern Heritage Centre, universities; and
- Conservation, *e.g.*, World Wildlife Fun, Canadian Parks and Wilderness Society, Canadian Arctic Resources Committee.

## BASELINE SOCIO-ECONOMIC ASSESSMENT

*Traditional Uses*

The Inuvialuit are the primary users of the AOI for fishing, hunting and camping. These activities are much more than subsistance economic pursuits; they are integral to the Inuvialuit culture offering tremendous social benefits, reconnection with the land, continuance of cultural traditions and strengthening of family and community bonds. All three Zone 1(a) areas are important fishing areas throughout the year for the Inuvialuit from Inuvik, Tuktoyaktuk and Aklavik. The main species harvested are broad whitefish and inconnu.

While the history and cultural significance of the beluga hunt to the Inuvialuit has not been fully documented, extensive traditional knowledge is held by elders and there are many references to the use of areas by ancestors going back generations. The Inuvialuit rely heavily on whales as a food staple to supplement their winter diets. It is customary for the hunter to share the harvest among family, friends and elders. The Zone 1(a) areas are extremely important relative to other areas in the region. An estimated 95% of the beluga harvest is conducted in the Zone 1(a) areas, primarily in July and August. The harvest of beluga is limited to the number of whales

required to cover subsistence needs amounting to one or two whales per family annually. Other marine mammals harvested include ringed seals and bearded seals.

Furbearers such as polar beats, grizzly bears, caribou, Artic and red fox, wolves, wolverines and lynx are also harvested in the vicinity of the AOI, predominantly in the Shallow Bay and Kugmallit Bay Zone 1(a) areas. Caribou are the most important furbearers harvested year round and are a highly valued food source to the people of Inuvik, Tuktoyaktuk and Aklavik.

Important nesting and breeding habitat, and, hence harvesting areas for birds overlap all three Zone 1(a) areas. Geese, especially lesser snow goose, but also Canada goose and white-fronted goose are a very important food source in the spring and fall in all three Zone 1(a) areas.

While the predominant values of harvesting are social, cultural and subsistence food, it is possible to estimate the economic contribution of the harvest based on production values to give an indication of the economic scale of harvesting:

**Annual Gross Imputed Value Estimates of Subsistence Harvests**

| Region | Gross Imputed Value (2000 dollars) | |
|---|---|---|
| | Lower Estimate | Upper Estimate |
| Kugmallit Bay | $338,000[1] | $750,000 |
| Kendall Island | $88,000 | $206,000 |
| Shingle Point | $88,000 | $188,000 |
| **Total** | $514,000 | $1,144,000 |

*Archaeological and Historical Values*

There are numerous known archaeological sites, including busial sites, campsites, villages and whaling stations, in the vicinity of the Zone 1(a) areas particularly around Shallow Bay and Kugmallit Bay. In addition, the Kittigazuit National Historic Site, located in the Mackenzie Delta 30 km southwest of Tuktoyaktuk, is recognised for the significance and abundance of archaeological resources which remain as evidence of a former Inuit settlement and whaling centre.

*Protected Areas*

Kendall Island Migratory Bird Sanctuary located on the outer margin of the Mackenzie Delta was established n 1961 to provide long-term protection to the colony of lesser snow geese, as well as the staging and breeding grounds of many migratory waterbird and shorebird species. Ivvavik National Park and Herschel Island Territorial Park are in the vicinity of the Zone 1(a) areas.

*Research and Education*

Prompted by the inherent wealth of biota and the implications of petroleum exploration, the AOI and surrounding area has been the subject of numerous geological, biological, oceanographic archaeological studies in the past 30 years. Part of Garry Island is a Scientific Research Reserve for studying permafrost.

*Petroleum Exploration and Production*

Since the mid-1960s petroleum companies have been interested in tapping into the large volumes of oil and gas resources in the Beaufort-Mackenzie Basin resulting in thousands of seismic lines shot including 111 of which intersect the Zone 1(a) areas. The Kendall Island Zone 1(a) area is surrounded by significant hydrocarbon discoveries and several exploration licenses. The significance discoveries within and adjacent to the Kendall Island Zone 1(a) area total approximately 15,270 $10^3m^3$ recoverable oil and 13,740 $10^6m^3$ marketable gas valued at approximately $4.3 billion and $1.5 billion respectively. Exploration licenses surround and clip the Kugmallit Bay Zone 1(a) area to the north, west and south. The significant discoveries within and adjacent to the Kugmallit Bay Zone 1(a) area total approximately 880 $10^3m^3$ recoverable oil and 4590 $10^6m^3$ marketable gas valued at $0.25 billion and $0.50 billion respectively. There are no existing exploration or significant discovery licenses neat the Shallow Bay Zone 1(a) area.

Current interest in Arctic petroleum exploration and development is focused on onshore development. In addition, future development of these resources is highly contingent upon the selection of a pipeline route to transport the product south. Nevertheless, several offshore exploration licenses were issued in the vicinity in 2000 and winter seismic work was recently conducted.

*Mining*

There are no mining interests in the immediate vicinity of the AOI.

*Tourism*

Tourism is the third leading export of the NWT and is continuing to grow. The most important tourism activities in the Mackenzie Delta region are observing wildlife, hiking, rafting, sports hunting and fishing, visiting whaling, hunting and fishing camps, boating and attending community cultural events. No tourism operator presently conducts boat tours in the Zone 1(a) areas, although several operators have take tourists to family camps near Kendall Island and whale watching near the boundary of the Kugmallit Bay Zone 1(a) area. Several companies that cater to tourists use the Shallow Bay and Kugmallit Bay Zone 1(a) areas as transportation corridors. Charter air companies also traverse these zones en route to other destinations. Although there are no plans, underway by operators to use the Zone 1(a) areas for tourism without the full consent of the Inuvialuit, there remains, however, some interest in exploring opportunities for “appropriate” tourism focused on beluga whale watching.

There is insufficient information to estimate net economic tourism benefits in the vicinity of the AOI.

*Transportation*

The primary local marine transportation route supplying the coastal communities is through Kugmallit Bay passing through the Zone 1(a) area. Fixed-wing and helicopter companies chartering to government, industry, local residents and tourists fly over the Zone 1(a) areas mostly during the summer. Winter charters primarily cater oil and gas exploration activities. There is insufficient information to estimate the economic transportation benefits in the AOI.

*Summary*

The table below summarises and compares the socio-economic values of each of the Zone 1(a) areas. While it is difficult to make comparisons among different socio-economic sectors, one can apply a comparative relative scale. From a socio-economic (not ecological) perspective, Kendall Island offers the least conflict between the greatest development pressure, petroleum exploration and development, and the greatest socio-cultural values, traditional harvesting. While all three Zone 1(a) areas are important sites for beluga harvesting, Kendall Island's harvesting values are moderated by its distance from communities and comparatively less fishing, furbearer harvesting and bird harvesting. Based on the information available, the Kendall Island Zone 1(a) area also has fewer known archaeological sites, although this may be a result of research effort rather than inherent historic value. In addition, the area around the Kendall Island Zone 1(a) area offer greatest petroleum production potential.

**Summary of Socio-Economic Values in the AOI**

| Socio-economic Sector | Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|---|
| Fishing | High | Moderate | High |
| Marine Mammal Harvesting | High | High | High |
| Furbearer Harvesting | High | Moderate | High |
| Bird Harvesting | High | Moderate | High |
| Archaeology | High? | Moderate | High |
| Protected Areas | Low | High | Moderate |
| Research and Education | ?? | ?? | ?? |
| Petroleum | Low | High | Moderate |
| Mining | Low | Low | Low |
| Tourism | ?? | ?? | ?? |
| Transportation | Moderate | Low? | High |

SCENARIO ANALYSIS

Because activity in the Zone 1(a) areas is limited, at least voluntarily by the Beaufort Sea Beluga Management Plan (BSBMP) guidelines, the scenarios of different activity restrictions focus on allowing a greater degree of activity. The intent of the scenario analysis is to predict the consequences of management options and indicate the benefits that could be lost of gained. The chosen scenarios comprise:

A. *Oil and gas driven scenario*. This development scenario assumes that identified resources adjacent to and within Zone 1(a) areas are extracted (*i.e.*, directional drilling is permitted to extract oil and gas from within the candidate MPA areas).
B. *Tourism and recreation driven scenario*. Water-based tourism is permitted to continue unhindered.
C. *Combination (oil and gas; tourism and recreation) of development*. Both water-base tourism and oil and gas development are allowed to proceed as defined in the previous scenarios.

In describing how the resource values may change with corresponding changes to management regulations and guidelines, one has to describe not only the current economic values associated with individual economic activities, but also the links between these activities and between the activities and the marine environment in the Zone 1(a) areas. The following table suggests a simple, explicit framework for examining the direct impacts of possible management policies and guidelines. In the table, the first column identifies the four separate development scenarios. The first row identifies the three primary sectors that will be affected by the management policies associated with each of the four development scenarios – that is, each scenario may result in changes to marine harvesting, oil and gas production, and tourism and recreation. The set of possible management policies are determined through consideration of the management objectives for the area as described in BSBMP. Possible alternative futures that are consistent with BSBMP, as well as those that represent an alteration of BSBMP plan, are described.

**Framework for Considering the Direct Impacts of Various Policy Scenarios on Economic Uses within Zone 1(a) Areas**

| *Economic Activity* → <br> *Scenario* ↓ | Marine Harvesting | Oil and Gas Production | Tourism and Recreation |
|---|---|---|---|
| **Base case** | $169,000-$632,000 net annual value maintained | $26.5 billion-$112.5 billion gross available "in ground" less $6.6 billion | Growth in sector reliant on use of areas outside of Zone 1(a) areas |
| **Oil and gas driven scenario** | $140,000-$528,000 net annual value "at risk" | $26.5 billion-$112.5 billion gross available "in ground" | Potential negative impact (magnitude unknown) |
| **Tourism and recreation driven scenario** | Potential negative impact (magnitude unknown) | No impact, unless activities restricted in favour of tourism development | Growth at rate that is determined by industry (*i.e.*, reduced restrictions) |
| **Combination (oil and gas; tourism and recreation) of development** | $140,000-$528,000 net annual value or more "at risk" | $26.5 billion-$112.5 billion gross available "in ground" | Growth in sector reliant on ability to avoid "use overlap" with oil and gas development |

INFORMATION AND KNOWLEDGE GAPS

While there is extensive information available on resources and activities in the Beaufort-Mackenzie region (Eddy 2001 provides an excellent information source), the time frame of the current project did not permit sufficient time to extract detailed information relating to the three Zone 1(a) areas under consideration as a MPA from which a reliable economic assessment can be conducted value. The socio-economic assessment could be refined with additional information as summarised in table below.

**Summary of Data Gaps**

| Discipline | Description | Priority | Source |
|---|---|---|---|
| **Traditional Use** | The history of the beluga hunt, so central to the Inuvialuit way of life, has never been documented (Day, pers. com.). | High | ▪ extensive discussions with elders as a means of more comprehensively articulating its significance<br>▪ traditional use |
| **Marine Harvesting** | Current data from the harvest study are not available as protocols for the third-party use of these data have not been developed. These data would be useful in providing a more accurate estimate of the total annual beluga harvest, the number of harvester, as well as locational information. | High | ▪ Inuvialuit Harvest Study (once 3rd party protocols are established) |
| **Oil and Gas** | Production schedule would be needed to more accurately assess net values. | Moderate | ▪ petroleum companies |
| **Transport** | Value of cargo, comparative air freight costs, fuel costs, etc. would be needed to more accurately assess net values. | Moderate | ▪ transport companies |
| **Tourism** | There is presently no means of determining independent tourist use of the Zone 1(a) areas. Several people indicated that cruise ships from Russia, China, Germany, etc. are seen traveling through the area *en route* to Alaska, but did not have any details on where they went or how often. While of interest in predicting regional tourism trends and the possibility of unguided tourists in the Zone 1(a) areas, information on the number and travel patterns of independent tourists would be virtually impossible to collect. Further, the number of independent tourists is known to be low based on anecdotal information. | Low | ▪ cruise ship traffic may be available through the Coast Guard |

## MANAGEMENT IMPLICATIONS OF MPA DESIGNATION

*Management Objectives*

Management direction, including boundary delineation and restrictions on human activities, for a MPA are generally developed in accordance with the overall objectives of the MPA. At this stage in the process, these have not been specifically and comprehensively defined for the Beaufort MPA under consideration. Nevertheless, by virtue of identifying the three Zone 1(a) areas as defined in the BSBMP, the intent is to provide legislative authority to protecting beluga and fish habitat in support of maintaining healthy populations for subsistence harvesting including whaling. While throughout the course of the study there was a general consensus that protecting the area and the whales was beneficial, some interviewees commented that allowing beluga whales to be harvested within the MPA appeared to be contrary to protection objectives.

*Boundary Delineation*

The AOI for the proposed Beaufort Sea MPA is defined as the thee Zone 1(a) areas specified in the BSBMP. The following factors should be taken into account in delineating the MPA boundary:

- core protection areas with stricter human use restrictions surrounded by a buffer zone where limited and controlled activities could take place which do not compromise the inherent management objectives;
- designating one or two of the Zone 1(a) areas as an MPA based on the contribution of each to the management objective and the degree of conflict in values;
- applying different restrictions to each of the three Zone 1(a) areas;
- applying temporal restrictions during critical periods for beluga and other marine species;
- the foreshore and upland extent of the boundaries to protect the ecological values from terrestrial impacts.

*Existing Management Direction*

Management direction for the proposed MPA may be derived from existing plans, regulations and guidelines. For example, current management direction as specified in the Beaufort Sea Beluga Management Plan guidelines and the IFA include:

- all subsistence hunting and fishing would be allowed to continue as it does at present;
- the oil and gas industry should not be permitted to explore for resources within or on the shores of any Zone 1 waters nor produce hydrocarbons or construct/operate any type of facility;
- the main shipping channel through Kugmallit Bay should remain accessible to shipping traffic;
- subsistence hunting takes priority over tourism activities;
- water-based tourism and related activities are not permitted within the Zone 1(a) areas; and
- no mining activities (*e.g.*, gravel removal) should be permitted within or on the shores of any Zone 1(a) waters.

These guidelines represent a status quo scenario that is generally consistent with the spirit and intent of MPAs under the *Oceans Act.* The guidelines, if adopted in whole or in part, could provide a firm basis for the

development of a management plan for a regulated MPA. However, results of this socio-economic overview have indicated that there is some interest among stakeholders of deviating from the existing management direction as expressed in BSBMP. Potential options for a MPA are discussed in more detail below. Final decisions regarding permissible uses and management prescriptions must be determined through further consultations among the Inuvialuit, regulatory agencies and other stakeholders.

*Activities in the MPA*

The negative and positive impacts of MPA designation on various socio-economic sectors are summarised in the table below. Beyond the intended benefits of protecting beluga populations, habitat and traditional harvesting, MPA designation could also provide a research focus for biophysical and archaeological studies. These opportunities can be enhanced by embarking on a Traditional Use Study of the area, co-ordinating the research permitting process and establishing a forum for communicating and sharing research results. However, MPA designation may also serve to attract visitors and potentially intrusive research which will need to be monitored. Depending on the level of restrictions, MPA designation may also alienate some economic activities such as petroleum exploration and production, tourism and transportation. The petroleum industry could face a loss of investment in exploration and communities could lose employment opportunities. Tourism growth would have to be reliant on areas outside the MPA for growth. The transportation industry may be curtailed by lack of access or increased cost of circumventing Zone 1(a) areas. Negative impacts on these industries could be mitigated by permitting winter-seismic activity, directional drilling, whale watching from shore or in months other than July and August, and low overflight restrictions during July and August. However, given that two of the three Zone 1(a) areas are within direct transportation marine and air corridors, transportation restrictions (e.g., through trips only, no stopping, minimum flight altitude) would be difficult to enforce.

**Summary of Socio-Economic Impacts, Mitigation and Enhancement Options of an MPA**

| Socio-economic Sector | Negative Impact | Positive Impact | Mitigate/Enhance |
|---|---|---|---|
| Subsistence Harvesting | | ▪ Protected resource<br>▪ Continuation of traditional use | |
| Archaeology/ History | | ▪ Less disturbance to archaeological sites<br>▪ Opportunities for further studies | ▪ Traditional Use Study |
| Protected Areas | ▪ Could serve to attract more visitors | ▪ Beluga sanctuary<br>▪ Node in MPA network | ▪ Monitoring |
| Research and Education | ▪ Impact of intrusive research | ▪ Provides a research focus<br>▪ Opportunities for public education | ▪ Monitoring<br>▪ Co-ordination of permitting process<br>▪ Forum to communicate of research results |
| Petroleum Exploration and Production | ▪ Loss of investment (compensation issues)<br>▪ Loss of employment<br>▪ Loss of revenue | ▪ Reduced impact on beluga | ▪ Winter seismic activity<br>▪ Directional drilling |
| Mining | - | - | - |
| Tourism | ▪ Restriction of activity<br>▪ Growth reliant on areas outside Zone 1(a) | ▪ Reduced impact on beluga<br>▪ Reduced intrusion on traditional harvesting | ▪ Whale watching except July and August<br>▪ Whale watching from onshore<br>▪ Enforcement |
| Transportation | ▪ Lack of access<br>▪ Additional cost of circumventing Zone 1(a) area | ▪ Reduced impact on beluga | ▪ Low overflight restriction s July and August<br>▪ Enforcement |

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## Acronyms

| | |
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| AOI | Area of Interest |
| ARI | Aurora Research Institute |
| BSBMP | Beaufort Sea Beluga Management Plan |
| BSIMPI | Beaufort Sea Integrated Management Planning Initiative |
| CAPP | Canadian Association of Petroleum Producers |
| CARC | Canadian Arctic Resources Committee |
| CCG | Canadian Coast Guard |
| CEAA | Canadian Association of Petroleum Producers |
| CPAWS | Canadian Parks and Wilderness Committee |
| CWS | Canadian Wildlife Service |
| DFO | Fisheries and Oceans Canada |
| DND | Department of National Defence |
| EIRB | Environmental Impact Review Board |
| EISC | Environmental Impact Screening Committee |
| FJMC | Fisheries Joint Management Committee |
| GNWT | Government of the Northwest Territories |
| IFA | Inuvialuit Final Agreement |
| INAC | Indian and Northern Affairs Canada |
| ISR | Inuvialuit Settlement Region |
| MPA | Marine Protected Area |
| MWA | Marine Wildlife Area |
| NEB | National Energy Board |
| NMCA | National Marine Conservation Area |
| NWT | Northwest Territories |
| RWED | Department of Resources, Wildlife and Economic Development (GNWT) |
| WMAC(NWT) | Wildlife Management Advisory Council (NWT) |
| WMAC (North Slope) | Wildlife Management Advisory Council (North Slope) |
| WWW | World Wildlife Fund |

# PREAMBLE

This introductory piece provides background for the three assessment reports prepared to assist in the evaluation of establishing a Marine Protected Area (MPA) in the Mackenzie Delta-Beaufort Sea Region. It is comprised of six sections as follows:

1. *The Regional Context:* focuses on the estuarine environment and the beluga which summer in the area.
2. *Management Planning Processes:* reviews economic development interests and their relationship to beluga management interests in the context of *The Western Arctic Claim The Inuvialuit Final Agreement* and *The Beaufort Sea Beluga Management Plan*.
3. *Integrated Management:* discusses the relationship of economic development interests to beluga management interests from the perspective of management options available under the *Oceans Act*.
4. *Economic Development and Beluga Management:* summarizes beluga management in the context of hydrocarbon exploration interests.
5. *Evaluating the BSBMP Zone 1 (a) area as a Potential MPA:* reviews legislative criteria used to evaluate proposed MPAs, the purpose of the three assessment reports and how they will be used to evaluate the proposed area against these criteria.
6. *Next Steps*

**1. The Regional Context**

The Inuvialuit Settlement Region (ISR) lies in the Canadian Western Arctic region. Created with the signing of the Inuvialuit Final Agreement (IFA) in 1984, the ISR covers 906,430 km$^2$. It includes four distinct geographic regions: the Beaufort Sea, the Mackenzie River Delta, the Yukon North Slope and the Arctic islands. The Mackenzie Delta includes lake, wetlands and river channels covering about 35,000 km$^2$. The population of the region is about 10,000 people.

The marine environment of the ISR includes a permanently ice-covered region, a seasonally ice-covered region, and a coastal area influenced by the mixing of saltwater and freshwater from the Mackenzie River. The continental shelf of the Beaufort Sea is quite narrow, nowhere exceeding 150 km offshore. The average depth on the shelf is less than 65 m, and ranges from around 10 m in the Mackenzie Delta to 600 m around Amundsen Gulf. The shelf seas and ice edges provide food for the Inuvialuit and other top predators. The Beaufort Sea marine region has a large population of polar bear, ringed and bearded seals, the largest summer feeding population of bowhead whales, and perhaps the world's largest summering stock of beluga whales.

The beluga that move into ISR waters every summer form part of a larger population that winters in the Bering and /or the East Siberian Sea. Each spring the population separates into several stocks that migrate to summering areas ranging from Bristol Bay on the Alaskan West Coast, to the eastern Beaufort Sea. The beluga move widely throughout the Beaufort Sea, ranging into Amundsen Gulf and into Viscount Melville Sound far to the north. Scientists have observed that individual beluga return to the Mackenzie Delta estuary in successive years. Their unique tolerance for freshwater is thought to indicate an important physiological dependence on particular sites. Both hunters and scientists have observed beluga rubbing themselves on sandbars to remove dead skin. The warmer waters of the estuary accelerate the rate at which the molt occurs. Hunters have observed beluga feeding in these areas.

**2. Management Planning Processes**

The Mackenzie Delta-Beaufort Sea region is rich in non-renewable hydrocarbon resources. During the 1960s and 1970s the Inuvialuit sought to find ways to balance industry and conservation interests. In 1977 the Report of the Mackenzie Valley Pipeline Commission recommended that comprehensive land use planning be undertaken to address resource use conflicts identified during the Commission's hearings. The Commission also recommended that part of the area of West Mackenzie Bay should become a beluga sanctuary.

In 1983 the Task Force on Northern Conservation was established to provide advice to the Department of Indian Affairs and Northern Development (DIAND) on the development and implementation of a comprehensive conservation policy for northern Canada. One year later it tabled recommendations emphasizing the need for marine conservation management and planning initiatives, and the need for a comprehensive network of land and/or water areas subject to special protection, taking into account local knowledge and uses of the area. The IFA signed in the following year provided legislative support to those recommendations.

The three goals of the IFA are:

a. *to preserve Inuvialuit cultural identity and values within a changing northern society;*
b. *to enable Inuvialuit to be equal and meaningful participants in the northern and national economy and society; and*
c. *to protect and preserve the Arctic wildlife, environment and biological productivity.*

The Inuvialuit Regional Corporation (IRC) was given responsibility for the management of the compensation and benefits received by the Inuvialuit pursuant to this Agreement. The Inuvialuit Game Council (IGC) was given responsibility to represent the collective Inuvialuit interest in wildlife. The Fisheries Joint Management Committee (FJMC) was given the responsibility to assist Canada and the Inuvialuit in administering the rights and obligations relating to fisheries under this Agreement and to assist the Minister of Fisheries and Oceans of Canada in carrying out his responsibilities for the management of fisheries. The Wildlife Management Advisory Council (NWT) with representation from Canada, the Government of the Northwest Territories and the Inuvialuit, was created to give advice to the appropriate minister on request, on all matters relating to wildlife policy and the management, regulation and administration of wildlife habitat and harvesting in the Western Arctic Region.

In 1988, the Inuvialuit Renewable Resource Conservation and Management Plan (IRRCMP) was prepared by the Wildlife Management Advisory Council (NWT) and the FJMC. This plan lays out a long-term strategy for the conservation and management of fish and wildlife in the Inuvialuit Settlement Region. At this time, efforts initiated earlier by the Department of Fisheries and Oceans (DFO) toward the development of a beluga management plan were still underway. When the Beaufort Sea Beluga Management Plan (BSBMP) was completed three years later, responsibility for the Plan was transferred to the FJMC. Parties to the Plan include the FJMC, the six community Hunters and Trappers Committees (HTCs) and DFO. Consistent with the themes and goals of the IRRCMP, the purpose of this plan is to ensure the responsible and effective, long-term management of the beluga resource by the Inuvialuit and DFO.

In order to accommodate the needs of both the industrial and the subsistence economy, authors of the plan classified the estuarine and marine waters into four management zones. The first is a protected area zone [Zones 1(a) and (b)], which places strict limits on the types of activities allowed. Zones two and three allow for

development that will not adversely affect the beluga or their habitat. Zone four is used to classify international waters and beluga management issues here are an international responsibility.

**3. Integrated Management**

Management issues addressed under the BSBMP include the following: oil, gas and mining exploration, production and related development including dredging, drilling, seismic and sounding surveys, island/camp maintenance, vessel movements, helicopter and fixed-wing flights, and ice-breaking, shipping routes, port development, possible future commercial fisheries development, contaminant levels in marine waters and mammals, a developing tourism industry, a myriad of regulators, transboundary issues, subsistence hunting practices, and traditional values closely related to the beluga harvest, and climate change.

With the passage of the *Oceans Act* in 1997, Canada became one of the first countries in the world to make a legislative commitment to a comprehensive approach for the protection and development of oceans and coastal waters. To reinforce this approach, the *Oceans Act* calls for wide application of the precautionary approach to the conservation, management and exploitation of marine resources. It also recognizes the significant opportunities offered by the oceans and their resources for economic diversification and the generation of wealth for the benefit of all Canadians, particularly those in coastal communities. To achieve these commitments, the *Act* calls on the Minister of Fisheries and Oceans to lead and facilitate the development of plans for integrated management.

The concept of integrated management as it is being applied across Canada involves the comprehensive planning and management of human activities to minimize conflict among users. It is a collaborative approach that cannot be forced on anyone. It is a flexible and transparent planning process that respects existing divisions of constitutional and departmental authority, and does not abrogate or derogate from any existing Aboriginal or treaty rights.

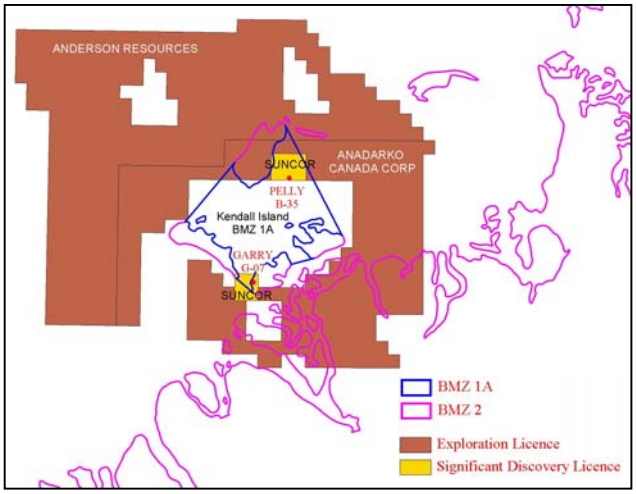
In 1999 the IRC, the IGC, the FJMC, DFO, and industry represented by the Canadian Association of Petroleum Producers (CAPP) agreed to collaborate on the development of integrated management planning for marine and coastal areas in the ISR. This agreement is called the Beaufort Sea Integrated Management Planning Initiative (BSIMPI). The BSIMPI Senior Management Committee (SMC) is composed of the interest groups which formed the Initiative. This Committee seeks to guide the development of a management planning process for ocean-related activities in the Beaufort Sea. One of its first actions was to form a Working Group to implement effective collaboration on ocean management efforts. Representation on the Working Group reflects that of the SMC, with the addition of a member from DIAND.

**4. Economic Development and Beluga Management**

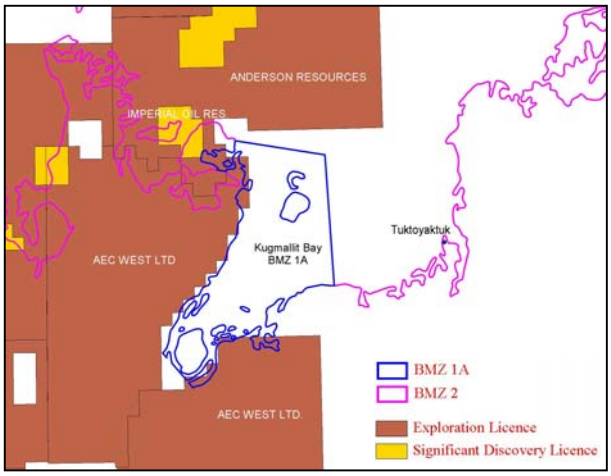
There is significant potential for offshore oil and gas production in the Beaufort Sea - Mackenzie Delta region. There are currently eleven Exploration Licences, one Production Licence, and thirty-two Significant Discovery Licences in the ISR offshore area. The area covered by these licences is 10,096 $km^2$.

The extent of the three areas in the Zone 1(a) being considered for a Marine Protected Area is as follows: Mackenzie Bay at 1,160 $km^2$; the Kendall Island area at 193 $km^2$; and Kugmallit Bay at 363 $km^2$. The total area of the three is 1,716 $km^2$. They are identical with the areas zoned as 1(a) in the BSBMP.

Exploration and Significant Discovery licences overlap with the Kendall Island and Kugmallit Bay Zone 1 (a) areas. In the Kendall Island area, three companies are affected. A small portion of Devon Canada's 903 km$^2$ Exploration Licence (issued 2000, expiry 2009) falls within the Zone 1(a) area, as does a larger portion of Anadarko Canada Corps 679 km$^2$ Exploration Licence (issued 2000, expiry 2009).




Suncor Energy Inc. has two Significant Discovery Licences (SDLs) that fall within the Zone 1(a) area. The two licences represent 29 km$^2$ out of a total 47 km$^2$ of Suncor's Significant Discovery Licences in the Mackenzie Delta (issued 1998). The licenced area near Pelly Island contains an historic abandoned gas well (Pelly B-35) on an Artificial Island. Another gas well, Garry G-07 also noted as historic, occurs in the second SDL area falling within the Kendall Island Zone 1(a) area.




Oil and gas interests in the Kugmallit Bay Zone 1(a) area are found to overlap along the edge of the zone. For the most part, Exploration Licences held by Anderson Resources (issued 2000, expiry 2009) and AEC West Ltd. (issued 1997, expiry 2006) are affected, however, this may be due to the scale of mapping and the use of grid and section numbers to delineate licence areas. Imperial Oil Resources SDL (issued 1990) also overlaps with the northwest corner of the Kugmallit Bay Zone 1(a) area.[1]

Exploration and development of hydrocarbon resources in the Mackenzie Delta-Beaufort Sea will lead to a large increase in ship movement and barge traffic through the region. During periods of intense activity in previous decades it was not uncommon to see an average of 100 vessels of all types in Kugmallit Bay at any given time--including barges, platforms, and supply vessels. Dredging activity will increase. The shorebases that will be built to support offshore activities are known to produce localized impacts on the marine environment. For example,

[1] The Oil and Gas Rights data were downloaded from http://www.ainc-inac.gc.ca/oil/act/Lan/dig/index_e.html. Measurements for lease areas in the data were provided as Hectares. However, the projection parameters used to calculate the area were not provided. In order to provide a comparison of the relative areas under consideration, new area measurements were calculated using the Lambert Conformal Conic Projection; Spheroid Clarke 1866; Central Meridian = –135; Reference Latitude = 49; Standard Parallel 1 = 77; Standard Parallel 2 = 49; False Easting = 0; False Northing = 0.

Tuktoyaktuk Harbour and McKinley Bay acted as staging areas for offshore drilling that was carried out in the Beaufort Sea during the 1970s and 1980s. Studies have shown that some of the highest hydrocarbon concentrations in the Arctic occur in Tuktoyaktuk Harbour and McKinley Bay. These hydrocarbons appear to originate primarily from chronic fuel spills and runoff from work-yards[2].

Beluga summering in the Beaufort Sea travel through areas where oil and gas production and transportation activities are proposed for the future. They concentrate in areas where mining (gravel removal), deep water port development, and shipping could affect water regimes, water quality and food availability. Such activities could affect beluga either directly (underwater noise, oil spills) or indirectly (changes in stability or integrity of ice, timing of breakup, chronic hydrocarbon contamination of food species).

Considering the magnitude of possible development scenarios, members of the FJMC and Inuvialuit beneficiaries expressed concern regarding the absence of legally enforceable mechanisms available under the BSBMP. Another management concern is the lack of scientific knowledge that could be used to assess the relative sensitivity of marine mammals and their habitat to disturbance by various activities in the Zone 1(a) areas. A related concern that has been raised pertains to the maze of legislation and regulation which currently governs management decision-making processes in the region. Industry and others have requested simplification of the regulatory process.

It was in this environment of opportunity for major economic development, a very complex regulatory structure, and the desire to protect traditional land values that the SMC was formed. SMC members acknowledged during their first meetings that addressing both the conservation and development interests in the BSBMP Zone 1 (a) areas was a high priority. The question they posed was whether the three Zone 1 (a) areas should be protected under a single regulation through the establishment of a Marine Protected Area.

Conducting an evaluation of the merits of establishing an MPA in the Zone 1 (a) areas, and providing recommendations to the SMC was the first major task assigned to the Working Group. It began its work early in 2001.

**5. Evaluating the BSBMP Zone 1 (a) areas as a potential MPA**

Section 35 (1) of the *Oceans Act* defines an MPA as an area of the sea…(that) has been designated for special protection for one or more of the following reasons:

- the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats;
- the conservation and protection of endangered or threatened marine species, and their habitats;
- the conservation and protection of unique habitats;
- the conservation and protection of marine areas of high biodiversity or biological productivity; and
- the conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister of Fisheries and Oceans.

[2] AMAP, 1998. AMAP Assessment Report: Arctic Pollution Issues. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. xii+859 pp.

As specified in the *National Framework for Establishing and Managing Marine Protected Areas*, the BSIMPI Working Group initiated assessments of the ecological, social, and cultural environment of the proposed MPA, as well as of the technical merits of the proposal. The purpose of these assessments is to provide information needed to evaluate the proposed MPA against the stated criteria for an MPA. They are described below.

1. The Ecological Assessment assesses:
    - whether the proposed MPA complies with the reasons for MPAs stated in the *Oceans Act;* and
    - the ecological merits of the proposal and their relative significance.

2. The Social and Economic Assessment addresses:
    - how the establishment of an MPA will affect human activities in and around the proposed MPA; and
    - how the social and economic benefits of the MPA can be enhanced or the costs reduced.

3. The Technical Assessment provides information for administrative and management purposes including:
    - whether the proposed MPA is feasible from a management and technical perspective;
    - a review of appropriate boundaries of the proposed MPA; and
    - whether there is public and stakeholder support.

**6. Next Steps**

Draft copies of the three assessment reports were reviewed by the BSIMPI Working Group (WG) in January 2002. All three reports have been revised in accordance with the advice received. They will serve to initiate discussion at a joint meeting of the BSIMPI WG and the FJMC in March 2002 in Edmonton. These discussions will lead to the development of the recommendation to be taken to the SMC in response to the question posed: Should the three Zone 1 (a) areas be protected under regulation through the establishment of a Marine Protected Area?

The rationale supporting the recommendation and next steps will also be formulated at this meeting.

# 1.0 INTRODUCTION

## 1.1 Background

The areas referred to as Zone 1(a) in the Beaufort Sea Beluga Management Plan (BSBMP) are being assessed as a potential marine protected area (MPA) under the *Oceans Act* (Figure 1). These zones are defined Traditional Harvesting/ Concentration Areas, in which belugas are harvested by Inuvialuit from Inuvik, Tuktoyaktuk and Aklavik (FJMC 2001). The BSBMP calls for these Zone 1(a) areas to be treated as protected areas and includes guidelines for the conservation of beluga whales and their habitat. In the absence of regulatory authority, these guidelines are being followed on a voluntary basis. Designation of this Area of Interest (AOI) as a MPA will provide the regulatory authority to enforce these guidelines and other conservation measures. Further discussions with the Inuvialuit regarding the candidate MPA led to the formation of a Senior Management Committee and a Working Group to implement the Beaufort Sea Integrated Management Planning Initiative (BSIMPI) with the initial task of assessing the BSBMP Zone 1(a) areas as a potential MPA.

Canada's *Oceans Act* defines MPAs as legally-designated areas designed and managed (1) to conserve and protect the ecological integrity of marine ecosystems, species and habitats, and (2) to contribute to the social and economic sustainability of coastal communities by providing for uses which are compatible with the reasons for designation (Fisheries and Oceans Canada 1998, 1999). Coastal areas have long being sought after for socio-economic opportunities such as subsistence and commercial harvesting, resource exploration, research, transportation, recreation and tourism. In current MPA practice, it is generally desirable to consider the continuation of such activities within and adjacent to MPAs where such activities can be managed to meet conservation principles and the objectives of sustainable development. MPA designation, however, may also require management of human use through some level of restriction or limitation on the types, timing, locations and scope of activities (Crosby 1994). These decisions can be facilitated by assessing the relative significance of these activities in the proposed MPA areas by documenting, describing and quantifying the historical, current, and potential social, economic and scientific values of a candidate MPA (Bunce *et al*. 2000, Cesar 2000, Kelleher and Kenchington 1992, Kelleher *et al.* 1997, Phillips 1998).

A socio-economic assessment of the proposed area can inform:

- boundary delineation;
- how establishment of the MPA will affect human activities such as fishing uses, community uses, aboriginal interests, economic and transportation uses, and cultural, recreational and tourism values and uses in and around the area (Fisheries and Oceans Canada 1998);
- the appropriate degree of protection based on the types and levels of use that should be permitted or prohibited;
- feasible options and recommended strategies for managing human uses so that the appropriate degree of protection is ensured; and
- how the socio-economic benefits of the MPA can be enhanced or the costs reduced (Fisheries and Oceans Canada 1998).

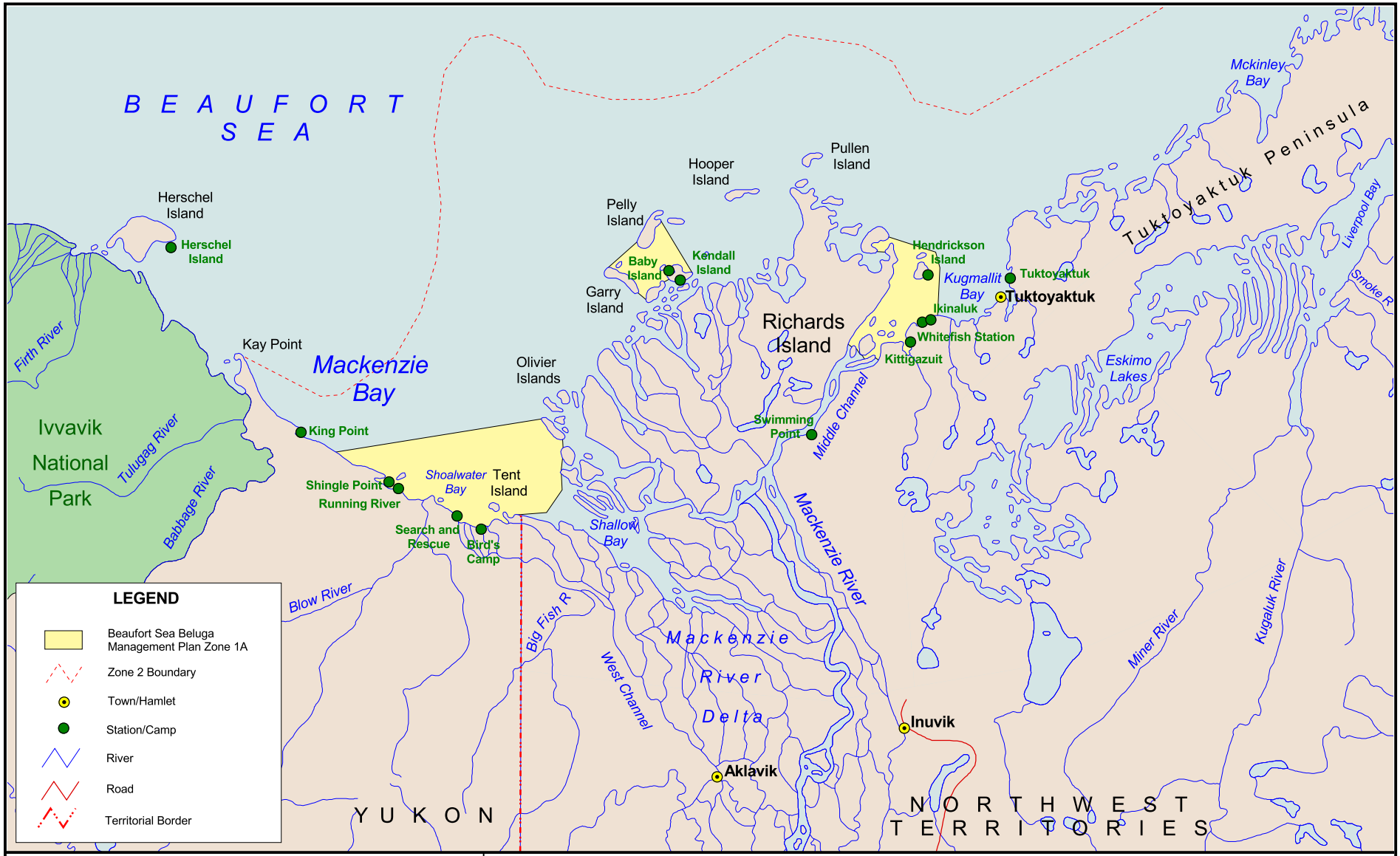



**Figure 1.**
**Beaufort Sea MPA Area of Interest**
**Regional Study Area**

Data Sources:
Beaufort Sea Beluga Management Plan:
Tourism Guidelines
Fisheries and Oceans Canada

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Additionally, the socio-economic assessment will provide information needed to identify effective means of sharing management responsibilities for the Beaufort Sea MPA.

The socio-economic assessment is one of three studies currently being undertaken for the candidate MPA in the Beaufort Sea. After completion in January, the socio-economic, ecological and technical assessments will be reviewed by a joint meeting of the FJMC and BSIMPI Working Group. This review will lead to one or more recommendations to the Senior Management Committee for their comment and/or decision. If the recommendation is favorable to having these areas become a MPA, and the recommendation is accepted by the Senior Management Committee, further consultations will occur and a management plan will be developed for the potential MPA. After consultations and the approval of a management plan by the Senior Management Committee a regulatory impact assessment will be completed by the federal government prior to the areas being designated as a MPA.

## 1.2 Objectives

The main purpose of the socio-economic assessment is defined in three project objectives:

1. provide a general socio-economic baseline description of that part of the ISR that will potentially be affected by the proposed Beaufort MPA;
2. identify the potential socio-economic impacts of the proposed MPA on human activities in and around the proposed MPA and provide information on how the socio-economic benefits of the MPA can be enhanced or the costs reduced; and
3. summarise the findings of the socio-economic assessment in a report.

## 1.3 Study Area

### *1.3.1 Detailed Study Area*

The AOI for a MPA comprises the three Zone 1(a) areas as defined in the BSBMP (Figure 2). Together they encompass approximately 140,000 ha of shallow (less than 2 m), warm, brackish and highly turbid waters at the head of the Mackenzie Delta (FJMC 2001). The western most Zone 1(a) area comprising 936,300 ha, is located in Shallow Bay between Bird Camp and Shingle Point (hereafter referred to as Shallow Bay). The central area is bounded by Garry Island, Pelly Island and Kendall Island and occupies 168,000 ha (hereafter referred to as Kendall Island). The easternmost area is located in 308,000 ha of Kugmallit Bay, west of Tuktoyaktuk, south from Summer Island, to the entrance of the Mackenzie River (hereafter referred to as Kugmallit Bay).

### *1.3.2 Regional Study Area*

While the AOI is the three Zone 1(a) areas, it is important to recognise the regional context of the proposed MPA since activities in adjacent areas may have implications for the MPA. In turn, management guidelines and restrictions within the MPA may influence activities in the surrounding area. The regional study area encompasses the Mackenzie Delta and the three main communities: Inuvik, Tuktoyaktuk, and Aklavik (see Figure 2). The three Zone 1(a) areas are surrounded by a Zone 2 designation known as the Mackenzie Estuary and Tuktoyaktuk Peninsula.

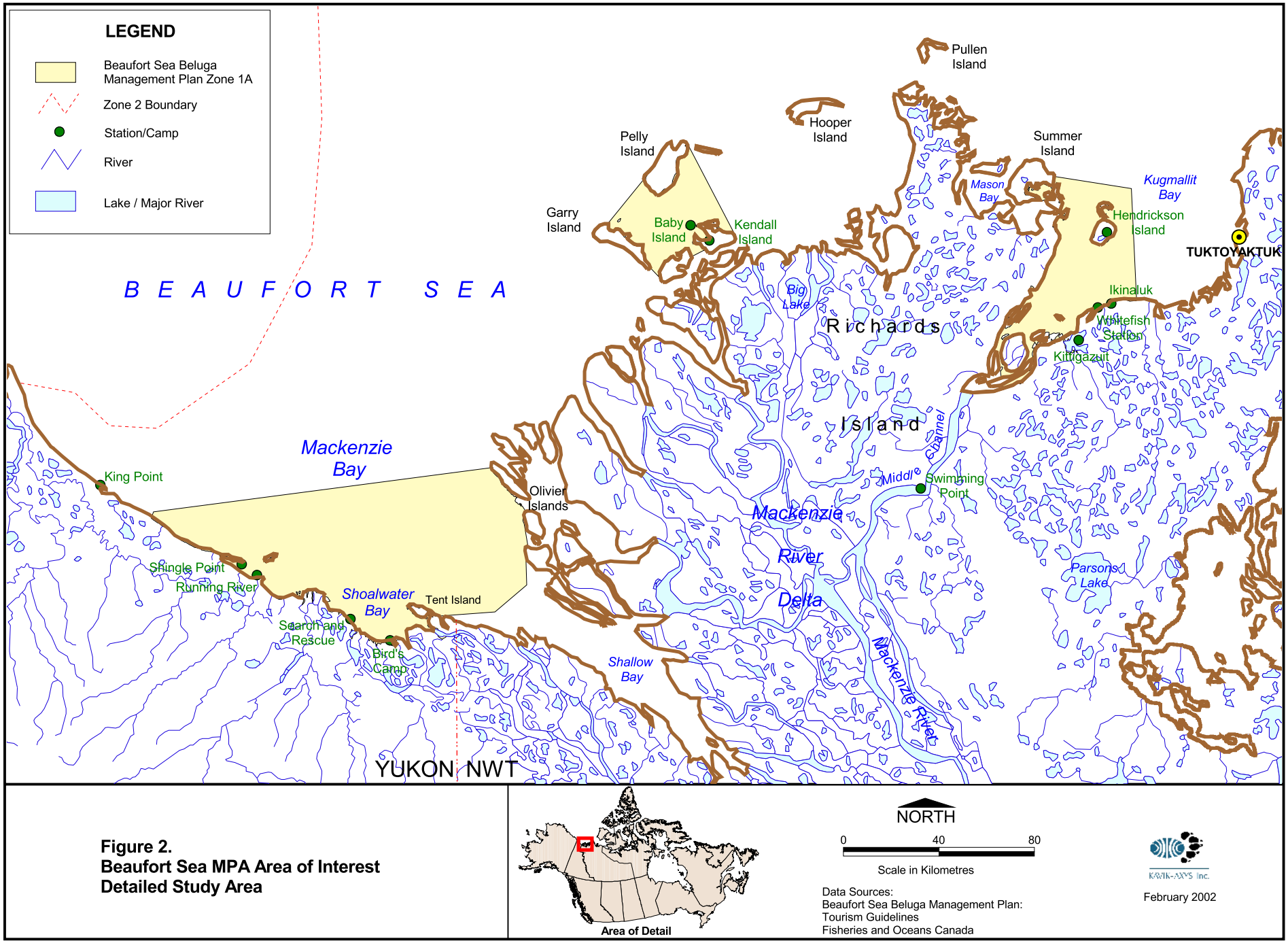


**Figure 2.**
**Beaufort Sea MPA Area of Interest**
**Detailed Study Area**

## 1.4 Methods

In-person interviews, primarily with community members, were conducted over a one-week period in Inuvik and in Aklavik in November 2001 and telephone discussions, primarily with government officials and industry representatives, were conducted throughout the course of the project. Interview protocols covering traditional use, oil and gas exploration and development, transportation, tourism operations, and science and research were developed as guidelines for discussions (APPENDIX A). Those with experience in a particular theme were asked relevant questions. For examples, hunters, trappers, elders and community representative were asked the question set relating to traditional use. Petroleum company representatives were asked the question set related to oil and gas exploration and development. There was no protocol applicable to some government representatives interviewed. Instead, these interviews were more informal, focusing on general knowledge of existing uses and sources of additional information or contacts.

The interviews proved valuable for the collection of primary information and data regarding human uses in and around the Zone 1(a) areas. Interviews focused on extracting information about the types and levels of past, present and proposed future uses of the AOI as well as the interviewees' opinions about the social, cultural and/or economic values and benefits of their activity in relation to the AOI. The interviews were conducted with Inuvialuit hunters, trappers and community members, tourism and industry representatives, and government representatives. Although a traditional use study was beyond the scope of this socio-economic overview, interviews with local Inuvialuit hunters, trappers and elders were used to gather information about the history of the beluga harvest and its social and cultural significance. However, more focused interviews with elders from the three communities would be required to more fully document the extensive amount of traditional knowledge.

In addition to interviews, a literature search was conducted to gather additional socio-economic information. This included published reports, statistical documents, industry studies and websites. Previous analyses of economic values available for other similar regions and for similar economic activities in other regions were also incorporated.

Complete lists of reference material and personal communications are presented in Section 7.0.

The economic valuation focused on describing marketed and non-marketed direct use values; those actually involving current or recent physical use of the study area by humans. This included both the economic values that businesses and other commercial operations generate, as well as the benefits that individuals enjoy from the use of the study area. (see APPENDIX B for a discussion on economic valuation).

A key objective of the economic valuation is to explicitly link the baseline economic values associated with the AOI to known types, extent and patterns of use. It is then possible to examine potential changes in the baseline values associated with losses and gains in specific uses given different possible designation and management scenarios. In essence, the economic evaluation supports decision making by indicating the extent of the 'values at risk' – that is, the economic benefits that could be lost or gained given a prohibition or elimination of specific uses. For all uses, the information provides an indication of their relative importance.

It is important to emphasise that there are methodological limitations to the types of economic values we are able to quantify (in monetary terms) in this economic valuation. For example, in some cases there was insufficient information relevant to the three Zone 1(a) areas to economically quantify the direct use values. In addition, no attempt was made to estimate non-use values. Specific information was augmented where possible by applying information from similar regions and for similar activities in other regions. Sufficient information was available to economically evaluate harvested living marine resources, oil and gas exploration and production, and tourism and recreation uses. Other activities, such as transportation and research, are described qualitatively. The use of more qualitative methods should not imply that these values do not exist or are not important. Care should be exercised in the interpretation of this report to ensure that the economic values we do not estimate are not downplayed simply because the information was not available. For example, social values such as cultural, heritage and spiritual values associated with the study area are not conducive to quantification but can, nonetheless, be extremely important. In this report, social values are presented in qualitative description.

Section 2.0 of the socio-economic report describes the key community, government, industrial, commercial and scientific stakeholders in and around the AOI. The baseline socio-economic assessment is presented in Section 3.0. Section 4.0 presents three alternative scenarios for managing human use. Information gaps are identified in Section 5.0. The report concludes in Section 6.0 with some management implications emanating from the socio-economic assessment.

# 2.0 COMMUNITIES, GOVERNMENTS AND OTHER STAKEHOLDERS

## 2.1 Communities

### *2.1.1 Inuvik*

Inuvik (Inuvvik) is situated on the East Channel of the Mackenzie River Delta (see Figure 1). The Inuvilauit and Gwich'in have traditionally hunted and fished in the area. The community itself was established in 1956 as 'Aklavik East Three' in response to flooding and erosion in Aklavik. Inuvik flourished in the 1970s and 1980s with the growth of the petroleum industry. Conversely, the economy suffered with the decline of the petroleum industry and closure of the Canadian Forces Base in the late 1980s. Today, Inuvik with a population of over 3000 people (1996 census) is the regional administrative centre for the territorial government and the Inuvialuit and Gwich'in land claims. Subsistence harvesting of animals and plants remains important to the Inuvialuit and Gwich'in people who reside in this area. The petroleum and service industries are strong mainstays of the local economy. Inuvik is accessible by air and by road year round except during break up and freeze up. In winter months, ice roads provide a link to Aklavik and Tuktoyaktuk (Community of Inuvik *et al*. 2000; http://www.assembly.gov.nt.ca/MewNWT/Inuvik.html).

### *2.1.2 Tuktoyaktuk*

The hamlet of Tuktoyaktuk(Tuktuujaartuq) is situated at the northern end of the Tuktoyaktuk Peninsula on the shore of Kugmallit Bay (see Figure 1). The area has been used by the Inuvialuit for thousands of years. During the early 20th century influenza epidemics decimated the Inuit whaling population and, shortly after, the area was populated by Alaskan Dene and Herschel Island residents. The town grew in the 1950s with a decline in fur trapping and an increasing role in the re-supply of Distant Early Warning (DEW) line stations. Further growth was prompted by oil and gas exploration in the 1970s and 1980s making Tuktoyaktuk the largest western arctic coastal community. Employment was severely affected by the decline of the oil and gas industry in the 1980s. Today, over 75% of households in the community of approximately 1000 people (1996 census) still rely on the land for hunting and fishing, while maintaining wage-earning employment in the transportation and petroleum industries. Guided recreation and tourism during winter and summer provide limited but increasing employment opportunities. The community is accessible by air from Inuvik, and by ice roads in the winter months. Barges transport food and supplies in the summer (Community of Tuktoyaktuk *et al*. 2000; http://www.assembly.gov.nt.ca/MewNWT/Tuktoyaktuk.html).

### *2.1.3 Aklavik*

Aklavik (Aklaqvik) is situated on the shore of the Peel Channel on the west side of the Mackenzie River Delta (see Figure 1). Shortly after its original settlement, Aklavik became an important gathering place and regional center and by 1920 was the major community in the Delta. Serious flooding and erosion in the 1950s prompted the federal government to relocate its administration offices and staff to Inuvik, and as a result the population in Aklavik began to decline. Nevertheless, many residents chose to remain in Aklavik, from which the slogan "never say die" emanated. Today, the Aklavik community is home to approximately 700 people (1996 census), primarily Inuvialuit and Gwich'in. The economy is primarily subsistence based including trapping, hunting, whale

harvesting and fishing, although trapping for furbearers in particular has declined in recent years. Local retail businesses, transportation, arts and crafts, tourism, and mineral and gas exploration also contribute to the local community. The community is accessible by air from Inuvik, and by ice roads in the winter months. Barges transport food and supplies in the summer (Community of Aklavik *et al*. 2000; http://www.assembly.gov.nt.ca/MewNWT/Aklavik.html).

#### *2.1.4 The Inuvialuit Settlement Region and Inuvialuit Final Agreement*

The AOI is located in the ISR, the homeland of the Inuvialuit in the Beaufort Sea. In 1984 the Inuvialuit and the Canadian federal government signed the Inuvialuit Final Agreement (IFA), a comprehensive land claim agreement. The IFA has three basic goals (DIAND 1984; Section 1):

(a) to preserve Inuvialuit cultural identity and values within a changing northern society;
(b) to enable Inuvialuit to be equal and meaningful participants in the northern and national economy and society; and
(c) to protect and preserve the arctic wildlife, environment and biological productivity.

The IFA granted the Inuvialuit unprecedented and substantial co-management responsibilities for marine mammals, fish and wildlife through agencies such as the FJMC, the Wildlife Management Advisory Councils (WMAC (NWT) and WMAC (North Slope)), and the Inuvialuit Game Council (IGC) (DIAND 1984). The IFA also required that local communities have a substantial say in what types of activities, including traditional harvesting, industrial activities, and recreational activities, can occur within their traditional harvesting areas (and particularly within privately owned lands as per Section 7(1) a and 7(1)b of the IFA). As a result of the IFA and its associated regulations and responsibilities, the establishment of the Beaufort Sea MPA will be set within the regulatory context of the ISR.

### 2.2 Governing and Advisory Bodies

#### *2.2.1 Inuvialuit Organisations*

Hunters and Trappers Committee (HTC) and Inuvialuit Game Council (IGC)

The IFA established a system of co-management involving a number of Inuvialuit and Inuvialuit-government councils and committees. Each of the ISR communities (Aklavik, Inuvik, Tuktoyaktuk, Paulatuk, Holman, Sachs Harbour) has a Hunters and Trappers Committee (HTC). HTC membership is drawn from Inuvialuit community residents. The HTCs advise on local renewable resource interests, allocate local harvest quotas, write bylaws, appoint members to the IGC, and provide harvest information to the co-management bodies. The IGC is responsible for, the collective Inuvialuit interest in renewable resources, appointment of Inuvialuit representation on co-management bodies and any other Canadian bodies affecting renewable resources within the ISR, allocates community hunting areas and quotas, and provides advise to government and co-management bodies.

Inuvialuit Regional Corporation and Community Corporations

The Inuvialuit Regional Corporation (IRC) was established to receive the lands and financial compensation under the IFA and is directly controlled by the Inuvialuit population. The subsidiaries in which it invests include the Inuvialuit Development Corporation, Inuvialuit Investment Corporation, Inuvialuit Land Corporation and

Inuvialuit Petroleum Corporation. Each Inuvialuit community has a community corporation, which controls the above-mentioned corporations in protecting the financial compensation for the benefit of future Inuvialuit.

Inuvialuit Land Administration

The Inuvialuit Land Corporation (ILC) holds title to the Inuvialuit lands received under the IFA which total 56,000 $km^2$ including 8000 $km^2$ with sub-surface rights to oil, gas and minerals. The Inuvialuit Land Administration manages and administers access to Inuvialuit private lands by screening development proposals (Figure 3).

Inuvialuit Harvest Study Management Committee

The Inuvialuit Harvest Study Management Committee is composed of the WMAC (NWT), WMAC (North Slope), FJMC, representation from RWED, CWS, DFO and three Inuvialuit appointees from the IGCI. The committee is currently focused on finalising the ten-year data report and developing 3rd party protocol to release harvest study data.

Elders and Youth Committees

Elders and youth committees are established under the community corporations to provide the elders and youth with a forum to provide input.

Community Economic Development Organisation

The Community Economic Development Organisation (CEDO) promotes and provides a broad range of support service to enhance Inuvialuit economic development. The organisation is community driven to assist in the development of a stable economic base. CEDO assists both Inuvialuit community organisations and individuals by providing business development, human resource and financial services. CEDO acts as an advisory and advocacy body.

### *2.2.2 Federal Government*

Federal government agencies that regulate or are involved in resource or human use management, or other aspects relating to the establishment of a MPA in the study area are: Fisheries and Oceans Canada, Indian and Northern Affairs Canada, Environment Canada, Parks Canada, the National Energy Board and the Department of National Defense.

Fisheries and Oceans Canada

DFO is mandated to protect and conserve marine and freshwater resources and habitat, establish fishery management plans, develop conservation and protection policies and implement programs to provide for the sustainable use of Canada's marine resources. Under Canada's *Oceans Act,* DFO is responsible for identifying potential marine protected areas (including: unique habitats; endangered or threatened marine species and their habitats; commercial and non-commercial fishery resources including marine mammals; and marine areas of high biodiversity or biological productivity), presenting management plans for marine protected areas to the federal cabinet, drafting federal legislation or regulations, if required, to implement the protected area, and taking a coordinating and overseeing role for established marine protected areas in Canada. DFO, Parks Canada and Environment Canada (Canadian Wildlife Service) all share mandated responsibilities to create protected areas in the marine environment. DFO leads in the development and implementation of a national system of marine protected areas and incorporates the different programs of the three departments.

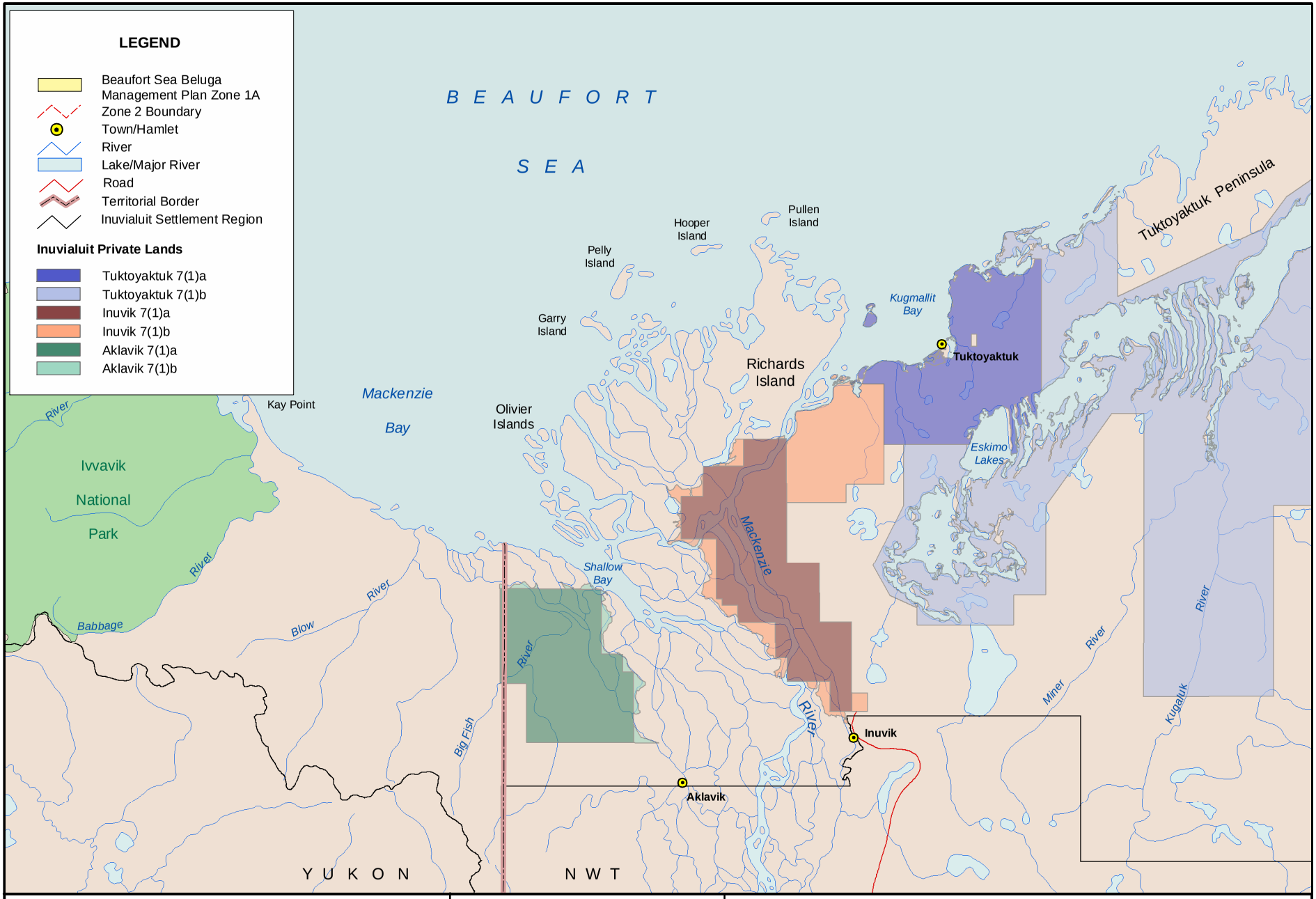


**Figure 3.**
**Inuvialuit Private Lands**


NORTH

0 30 60 120 180

Kilometers

Data Sources:
Beaufort Sea Beluga Management Plan:
Tourism Guidelines
Fisheries and Oceans Canada

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Management of the Beaufort stock of beluga has been carried out under several federal acts and regulations, including the *Fisheries Act*, which is the responsibility of DFO. Within this act are Beluga Protection Regulations that prohibit intentional harassment of beluga whales. DFO participated in the development of the BSBMP and has representatives who sit on the FJMC to fulfill the department's responsibilities under the IFA (see Section 2.2.4).

The Canadian Coast Guard (CCG) is under the jurisdiction of DFO and is responsible for safe harbours, waters and waterways, producing reliable navigational charts and maintaining an extensive system of navigational aids and marine communication. They manage and regulate marine transportation and have a fleet that provides icebreaking, aids to navigation, rescue, safety and environmental response services.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada (INAC) has two mandates: Indian and Inuit Affairs, and Northern Affairs. In Indian and Inuit Affairs, INAC's primary role is to support First Nations and Inuit in developing healthy, sustainable communities, and in achieving their economic and social aspirations. This includes overseeing the implementation of settlements and promoting economic development. In Northern Affairs, INAC is responsible for managing natural resources, protecting the environment and fostering leadership in sustainable development. INAC administers issuance of surface and subsurface rights in Arctic offshore lands.

Environment Canada

Environment Canada's mandate is to preserve and enhance the quality of the natural environment. Environment Canada has legislative authority to establish marine protected areas and they regulate land activities that may affect marine protected areas in the offshore. Environment Canada's major focus is protecting major marine and nearshore areas for wildlife, research, conservation and public education. The Canadian Wildlife Service and the Canadian Environment Assessment Agency are both under the regulatory mandate of Environment Canada and play a role, either direct or indirect, in the implementation and/or maintenance of MPAs.

The Canadian Wildlife Service (CWS), under the jurisdiction of Environment Canada, is the national wildlife agency of the federal government. Their mandate includes the protection and management of migratory birds and nationally important wildlife habitat, endangered species and research on nationally important wildlife issues. CWS establishes migratory bird sanctuaries, identifies key migratory bird habitat sites and is responsible for granting permits for migratory bird research (see Section 2.3.4). The establishment of Marine Wildlife Areas (MWAs) is the responsibility of CWS, although none has been established to date. MWAs are intended to protect nationally significant habitats, especially for migratory birds, but also for other wildlife for the purpose of wildlife research, conservation and interpretation (Fast *et al*. 1998).

Parks Canada

Parks Canada's mandate is to protect and present nationally significant examples of Canada's natural and cultural heritage and foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations. Under this mandate, Parks Canada identifies and establishes National Marine Conservation Areas (NMCA), National Historic Sites and National Parks.

The NMCA Program is a national system of marine protected areas to represent the full range of Canada's marine ecosystems found within the Atlantic, Arctic and Pacific Oceans, and the Great Lakes (Parks Canada 1995). NMCAs will be managed for sustainable use and may contain smaller zones of high protection. NMCAs will be protected from such activities as ocean dumping, undersea mining, and oil and gas exploration and development. MPAs designated under other federal programs may be considered as part of the NMCA plan if conservation objectives are similar.

The National Historic Site component of Parks Canada is responsible for Canada's program of historical commemoration, which recognizes nationally significant places, persons and events. National Parks are a countrywide system of representative natural areas of Canadian significance. They are protected for public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations.

Protected areas within and adjacent to the AOI are described in Section 3.1.3.

The National Energy Board

The National Energy Board's (NEB) mandate is to promote safety, environmental protection and economic efficiency in the Canadian public interest while respecting individuals' rights within the regulation of pipelines, energy development and trade. They regulate the construction and operation of interprovincial and international pipelines, the tolls and tariffs of interprovincial and international pipelines, the construction and the operation of international power lines, the exports of oil and electricity, the exports and imports of natural gas, and the exploration and development of oil and gas resources in non-Accord frontier areas. The NEB grants permits for many of the activities involved in oil and gas exploration and development, including the drilling of wells and seismic activities.

Department of National Defense

The Department of National Defense (DND) has the mandate to formulate and manage all aspects of defense policy, defend Canada and Canadian interests and values while contributing to international peace and security. Canada's principal defense roles are defending Canada and defending North America in co-operation with the United States. The mandate to defend Canada is achieved through monitoring and controlling activity within Canada's national territory, airspace and maritime areas of jurisdiction, assisting other government departments in achieving various national goals, maintaining a national search and rescue capability, and assisting in national emergencies. The mandate to defend North America is achieved through protecting the Canadian approaches to the continent in partnership with the United States, particularly through the North American Aerospace Defense Agreement, maintaining the ability to operate effectively at sea, on land, and in the air with the military forces of the United States in defending the northern half the Western Hemisphere.

### *2.2.3 Territorial Governments*

The territorial governments of NWT and Yukon have various responsibilities for the well-being of people and the management of resources on land and offshore. Several government departments within each territory has regulatory responsibilities or legislative and program mandates that apply to activities that presently or may potentially occur in offshore areas and on lands adjacent to the proposed protected area, and would therefore have an interest in its establishment and management.

NWT Territorial Government

The Government of the Northwest Territories (GNWT) recognizes that sustainable development of resources is essential to the long term economic, cultural and social well being of northern residents. The Department of Resources, Wildlife and Economic Development (RWED) is mandated to promote economic self-sufficiency and growth through the sustainable development of natural resources and the creation of economic opportunities in the NWT, on behalf of the territorial government. Of the core RWED functions, those relating to environmental protection, minerals, oil and gas, tourism, wildlife management are the most relevant to the proposed MPA.

- **Environmental Protection** – Programs are aimed at protecting and enhancing the environmental quality in the north. Working closely with federal, aboriginal and municipal agencies, the Environmental Protection Division works to control the discharge of contaminants and reduce their impacts on the natural environment. These impacts can transcend into marine environments through the transport of contaminants via rivers and streams.
- **Minerals, Oil and Gas** – This division develops and implements strategies to encourage and attract non-renewable resource development in the NWT, and advises on the geological potential, industrial activity and potential opportunities associated with mineral, oil and gas exploration on land and offshore.
- **Parks and Tourism** – The Parks and Tourism Division provides for the development, operation, and maintenance of public tourism facilities such as parks, visitor centres, interpretive displays, and promotional signs. It also has responsibility for licensing tourism guides and outfitters, and providing information and advice to enhance tourism products in the NWT.
- **Wildlife Management** – The principle mandate of this division it to protect wildlife species through research, conservation programs, and partnerships with harvesters, stakeholders, residents and other governments. Some of their activities, such as research, occur within the Zone 1(a) areas. This division works closely with co-management boards and advisory bodies such as WMAC (NWT) (see Section 2.2.4).

Government of Yukon

Three Yukon government departments oversee land uses occurring in the Yukon North Slope and particularly in the areas south of the Shallow Bay Zone 1(a) area.

- **Environment** – The Yukon Department of Environment is responsible for managing and protecting Yukon's natural environment in a sustainable, comprehensive and integrated manner. Their programs and services include fish and wildlife management and conservation, territorial parks and protected areas, habitat and environmental protection, hunter and environmental education, the regulation of hunting, fishing, trapping, and the delivery of wildlife viewing programs.
- **Tourism** – In partnership with the private sector, interest groups, aboriginal governments and other government departments, the Yukon Tourism Department aims to stimulate and sustain economic growth and employment opportunities by promoting development and growth of the tourism sector. Their responsibilities also include licensing and providing information to guides and outfitters.
- **Energy, Mines and Resources** (as of April 1, 2002) - The department's responsibilities will be to responsibly manage Yukon's natural resources and ensure sustainable resource and land use and

> to promote investment in the responsible development of Yukon's natural resources. The department, on behalf of the Yukon government, is proceeding to enter into negotiations with the Federal government that will lead to the development of a shared offshore oil and gas management regime. In the interim, while the shared offshore regime is being developed, the department through its membership on an Offshore Committee, will review and make recommendations on all offshore oil and gas matters subject to federal ministerial decisions.

On November 19, 1998 the *Canada-Yukon Oil and Gas Accord Implementation Act (Bill C-8)* was passed which transferred the management and administration of the Yukon's onshore oil and gas resources from the federal government to the Yukon government. The management and regulation of the development and conservation of oil and gas is now governed by this territorial legislation, which replaces the *Canada Petroleum Resources Act* and the *Canada Oil and Gas Operations Act* in the Yukon. The *Yukon Oil and Gas Act* was developed jointly with Yukon First Nations, pursuant to a January 1997 Memorandum of Agreement to develop a common regime. In order to allow Yukon to exercise its new responsibilities, new legislative powers will be included in the *Yukon Act*, namely in relation to:

- exploration of oil and gas;
- the development, conservation and management of oil and gas, including the rate of primary production;
- oil and gas pipelines;
- the raising of money in respect of oil and gas in the territory; and
- the export of oil and gas.

There will also be new provisions that will be added to the *Yukon Act* to allow the federal government to continue to exercise its other responsibilities and will allow the Governor in Council to take back the administration and control of oil and gas in any lands in the Yukon in order to settle aboriginal land claims.

### *2.2.4 Joint Management Committees*

Each of the above organisations has a specific mandate for resource management in the ISR. However, it is recognised that partnerships and cooperation are required to achieve integrated management. Towards this aim several joint management committees have been established, namely the BIMPI and three committees established by the IFA, WMAC (NWT), the WMAC (North Slope), and the FJMC (FJMC).

Beaufort Sea Integrated Management Initiative

BSIMPI is a collaborative process between the Inuvialuit, government and industry to undertake integrated management planning in the Beaufort Sea. Two organisations were established for the management of BSIMPI, a Senior Management Committee (SMC) and the BSIMPI Working Group (WG). The SMC guides the integrated management planning process through the BSIMPI WG. The SMC has five members: Chairs of the FJMC, IGC and IRC, and a senior representative from DFO and Canadian Association of Petroleum Producers (CAPP). The WG has six members and an independent Chair. Members include one representative from each of the board or committees of the FJMC, IGC and IRC, plus a representative each from INAC, DFO and CAPP. Administrative, technical and communication support is provided through the BSIMPI Secretariat, which consists

of Regional DFO Oceans staff and the Chair of the BSIMPI WG. The interest of other organizations, governments and communities is far larger than what is represented in the SMC and BSIMPI WG. The BSIMPI Secretariat's major function is to engage these other interested parties so that their issues, recommendations can be brought into the process as well as keeping these parties informed of BSIMPI activities and progress.

The principles of BSIMPI are:

- recognition of rights under the IFA;
- respect for the view of all parties;
- commitment to building consensus;
- use of local, traditional and scientific knowledge; and
- adoption of transparent, timely and coordinated procedures.

Wildlife Management Advisory Councils (NWT and North Slope)

WMAC (NWT) and WMAC (North Slope) were established by the IFA with the mandate to advise ministers on wildlife policy, the management, regulation and administration of wildlife, habitat and harvesting, and wildlife related issues of park planning and management. In consultation with the IGC and RWED, the councils set quotas for Inuvialuit harvesting governed by preferential harvesting rights to Inuvialuit based on sustainable harvest levels and exclusive harvesting rights on Inuvialuit private lands.

Fisheries Joint Management Committee

FJMC was established to "assist Canada (DFO) and the Inuvialuit in administering the rights and obligations relating to fisheries under this Agreement and to assist the Minister of Fisheries and Oceans of Canada in carrying out his[her] responsibility for the management of fisheries" (DIAND, 1984, p. 29). Among other areas, the FJMC, is responsible for allocating subsistence quotas for fish and marine mammals and preventing conflict with Inuvialuit activities.

Joint Secretariat, Inuvialuit Renewable Resources Committee

The Joint Secretariat Renewable Resource Committees (Joint Secretariat) was set up to provide administrative and technical support to the IGC, HTCs, and the co-management groups. Coordination of the Inuvialuit Harvest Study, Beluga Monitoring Program, Geographic Information Services, and a library are also provided.

### *2.2.5 Environmental Regulators*

Environmental Impact Screening Committee and Environmental Impact Review Board

Environmental assessment in the ISR is the mandate of the Environmental Impact Screening Committee (EISC) and the Environmental Impact Review Board (EIRB). The structure of both groups is similar. One membership is appointment from each of the Yukon, Northwest Territories, and Canadian governments. Three Inuvialuit members are appointed by the IGC. A committee chair is appointed by the Government of Canada with the approval of the Inuvialuit. Development proposals, which require environmental assessment, first go to the EISC where one of three decisions can be made (DIAND 1984; Section11(13)):

(a) the development will have no such significant negative impact and may proceed without environmental impact assessment and review under this Agreement;
(b) the development could have significant negative impact and is subject to assessment and review under this Agreement; or
(c) the development proposal has deficiencies of a nature that warrant a termination of its consideration and the submission of another project description.

If the development is deemed to have the potential for a significant negative environmental impact then it can be referred to the EIRB or other competent review body. The EIRB project review is carried out in public such that anyone with an interest in the project may make a presentation to the review panel. The EIRB determines if a development should proceed and under what conditions. Mitigative and remedial measures can be suggested along with an estimate of the potential liability based on a worst case scenario. The Environmental Impact Screening and Review process is initiated by any activity that requires a permit. No permits may be issued until the screening and review processes are complete. Allowable developments within a MPA would still be subject to the IFA screening and review process.

Canadian Environmental Assessment Agency

The Canadian Environmental Assessment Agency (CEAA) has the mandate to provide Canadians with high-quality environmental assessments that contribute to informed decision-making in support of sustainable development. CEAA provides leadership and serves as a centre of expertise for federal environmental assessments. It is responsible for the overall administration of the federal environmental assessment process and is headed by the President who reports directly to the Minister of the Environment. CEAA is mandated by the following instruments:

- the *Canadian Environmental Assessment Act* and its accompanying regulations;
- the Canada-Wide Accord on Environmental Harmonization and bilateral harmonization agreements with provincial governments that set out mutually agreed on arrangements for environmental assessment; and
- international agreements containing environmental assessment provisions to which Canada is a party.

The primary roles of the Agency as defined by the *Canadian Environmental Assessment Act* are to:

- administer the federal environmental assessment process established by the Act and its regulations;
- provide administrative and advisory support for environmental assessment review panels, comprehensive studies and mediators;
- promote the uniformity and harmonization of environmental assessment activities across Canada at all levels of government;
- ensure opportunities for meaningful public participation in the federal environmental assessment process;

- promote sound environmental assessment practices in a manner consistent with those established in the Act;
- promote or conduct research and development on environmental assessment matters; and
- encourage the development of sound environmental assessment techniques and practices.

## 2.3 Industry and Science Interests

### *2.3.1 Resource Exploration and Extraction*

Oil and Gas

Eleven major oil and gas companies hold an interest in the vicinity of the AOI:

- AEC West Inc.;
- Devon Canada (formerly Anderson Exploration);
- BP Canada Energy Co.;
- Anadarko Canada Corporation;
- Burlington Resources Canada;
- PetroCanada;
- Shell Canada;
- Chevron Canada;
- Conoco-Phillips;
- SunCor Energy Inc.; and
- Imperial Oil Resources.

CAPP is an industry association for Canada's upstream petroleum industry. CAPP represents 150 companies that explore, develop and produce most of Canada's natural gas and crude oil and also has 120 associate member companies that provide a wide range of services that support the upstream oil and natural gas industry. CAPP's mission is to enhance the economic well-being and sustainability of the Canadian upstream petroleum industry in a socially, environmentally and technically responsible and safe manner.

Detailed information on petroleum exploration and production is found in Section 3.2.1.

Mineral Extraction

The ILC, as per the IFA, holds mineral rights in the ISR. The IFA contains provisions for the reservation of granular and sand resources for community needs (DIAND 1984).

Other Resources

The Mackenzie Valley Land and Water Board regulates the use of land and waters and the deposit of waste through the Mackenzie Valley. Their jurisdiction is outside the Zone 1(a) areas, but starts at Inuvik and Aklavik and is included from a regional perspective.

### 2.3.2 Tourism

Capitalising on the regions culture, landscape and wildlife viewing opportunities, tourism is a growing industry in the Mackenzie Delta region and throughout the Arctic. Most land- and water-based tours are conducted by licensed Inuvialuit guides and outfitters, while air tours are conducted by pilots of charter planes. Some independent tourism use by independent outfitters also occurs. The extent of tourism operations in the AOI is described in Section 3.2.3.

The following companies have been identified as having a past or present interest in tourism in the vicinity of the Zone 1(a) areas:

- Arctic Nature Tours (Inuvik);
- Ookpik Tours (Tuktoyaktuk);
- Uncommon Journeys (Whitehorse);
- Arctic Tour Company (Tuktoyaktuk);
- Beaufort Delta Tours (Inuvik);
- Kendall Island Whale Watching Tours (Inuvik); and
- Aklavik Tours (Aklavik).

With the exception of Inuvialuit recreational use (see Section 3.1.1), due to their distance from communities, it is unlikely that independent recreational use occurs in the vicinity of the Zone 1(a) areas except, perhaps, for summer boat trips along the Mackenzie or along the coast *en route* to Herschel Island or Ivvavik National Park.

### 2.3.3 Transportation

Eight privately-owned companies were identified as providing transportation services in the vicinity of the three Zone 1(a) area. These companies are based in Inuvik and provide basic supply or charter services for government, industry and locals, with a small amount of tourist charter services. For information on companies which provide tourism transportation services, please refer to Section 2.3.2. Further details on transportation activities are found in Section 3.2.4.

There are six air charter companies, one marine transportation company and road transportation company that conduct business in the vicinity of the Zone 1(a) areas. These main transportation companies are:

<u>Air-Based Companies</u>

- Beaudril Air
- Aklak Air
- Arctic Wings Ltd.
- Canadian Helicopters
- Highland Helicopters
- Stage Air

Marine-Based Companies

- Northern Transportation Company Ltd.

Road Transportation Companies

- E. Grueben's Transport

### *2.3.4 Research*

Several organisations and sectors have an interest in research and education in and around the Zone 1(a) areas. All research in the NWT and Yukon, including physical, social and biological sciences, archaeological studies, and research in indigenous knowledge must be licensed (ARI 1998). Depending on the research subject, a researcher is required to obtain at least one of the following permits: wildlife research permit; archaeologists permits; or scientific research license. The main permitting agencies are territorial and federal governments, the Aurora Research Institute (ARI), and the Prince of Wales Northern Heritage Centre.

The interests of these and other agencies in the Zone 1(a) areas are discussed below. Research projects formerly and presently occurring in the study area are described in Section 3.1.4.

Territorial Government

Research studies on land animals (any species of terrestrial vertebrates including polar bears and migratory birds) or wildlife habitats, including research activities conducted by territorial government staff, require a wildlife research permit by either the NWT or Yukon governments. Territorial government staff have an interest in studying and monitoring wildlife on lands adjacent to the Zone 1(a) areas and, in the winter, also conduct some research within the Zone 1(a) areas, namely polar bear studies.

Federal Government

Research conducted on migratory birds or any research within migratory bird sanctuaries or designated wildlife areas requires a permit from CWS. Scientific research conducted offshore, including oceanographic research or studies in marine plants and animals, requires a permit from DFO.

Aurora Research Institute

Licensing under the *Northwest Territories Scientists Act* is handled by the ARI in Inuvik. ARI is responsible for: issuing scientific research licenses and coordinating research; promoting communication between researchers and communities; promoting public awareness of the importance of science, technology and indigenous knowledge; fostering the recognition and use of traditional knowledge; making scientific and traditional knowledge available; and supporting or conducting research which contributes to the social, cultural and economic prosperity of NWT residents (ARI 1998). ARI maintains a database of research activities that have been permitted to occur in the NWT and, as such, provides a source of information about research permits issued for work conducted in and around the Zone 1(a) areas.

Prince of Wales Northern Heritage Centre (NWT)

Under the NWT Archaeological Sites Regulations, research studies in archaeology require a permit that can be obtained from the Prince of Wales Northern Heritage Centre. In additional to licensing, the Prince of Wales Northern Heritage Centre supports and conducts archaeological research in many areas of the NWT.

Other Research Interests

In addition to the agencies above which regulate, oversee and in some cases conduct research in the study area, there are several other agencies and sectors that have an interest in research-related activities.

**C. S. Lord Northern Geoscience Centre (CSLNGC)** – This is a multi-agency centre with the mandate to undertake geoscience studies in the Northwest Territories. The CSLNGC is a co-operative venture between the Minerals, Oil and Gas Division of RWED, the NWT Geology Division of Indian and Northern Affairs Canada (INAC), and, the Geological Survey of Canada.

**Inuvialuit Social Development Program (ISDP)** – The ISDP has provided funding for, and prepared educational materials about, several studies on the archaeology and history of the Inuvialuit including traditional uses such as beluga hunting.

**Academia** – Studies in a variety of disciplines have been conducted in the region by researchers from various academic institutions. Universities that are presently involved with research activities in the region are University of Manitoba, Carlton University, University of British Columbia and the University of Sussex.

**Conservation Organisations –** Conservation agencies such as the World Wildlife Fund (see Section 2.3.5) have supported research on a variety of topics, for example, marine wildlife populations and their use of areas such as the Zone 1(a) areas. Conservation organisations have also funded studies to develop consumptive use guidelines and codes of conduct for wildlife and tourism in the Arctic.

**Oil and Gas Industry** – Baseline studies of land and marine environments have been conducted in and around the Zone 1(a) areas in support of oil and gas exploration and development. Although no oil and gas activities are presently occurring within the Zone 1(a) areas, several studies have occurred in adjacent areas.

### *2.3.5 Conservation*

World Wildlife Fund

The goal of the World Wildlife Fund's (WWF) Marine Program is to create a representative network of marine protected areas for Canada by 2010. In the Beaufort Sea, WWF has an interest in seeing areas such as the Zone 1(a) areas adequately protected for the high ecological values which they contain. Additionally, the WWF is presently fundraising to support their participation in the Beaufort Sea integrated marine management and conservation planning work that DFO has initiated with local partners. As a fundamental approach for areas like the Beaufort Sea, WWF supports the prior planning of industrial activity and other uses so that subsequent development activity can proceed in a sensitive manner. They also support an integrated ecosystem approach to MPAs that would allow human uses to be assigned to appropriate areas within the Beaufort Sea and reserve core areas such as the three beluga Zone 1(a) management zones as full MPAs, within the broader seascape context (P. Ewins, Pers. Comm.).

Canadian Parks and Wilderness Society

The Canadian Parks and Wilderness Society (CPAWS) actively supports the creation of marine protected areas in the Arctic. Their two northern branches, in Yellowknife and Whitehorse, have been working with government agencies, other non-government organisations, and stakeholders to identify ecologically sensitive areas in need of protection while recognising economic, social and cultural land use requirements. CPAWS has recently put forward guiding principles for oil and gas development in the north that emphasises integrated planning and the creation of protected areas before development occurs.

Canadian Arctic Resources Committee

The Canadian Arctic Resources Committee (CARC) is a citizens' organisation comprising over 5000 members from across Canada and around the world. The organisation, funded mainly by individuals and private foundations, brings together people who share a common interest in the north.

# 3.0 BASELINE SOCIO-ECONOMIC ASSESSMENT

## 3.1 Cultural and Social Values

### *3.1.1 Traditional Uses*

For thousands of years the Inuvialuit have occupied and used the region in and around the AOI. Oral history and archaeological evidence provide descriptions of settlements, gathering places, whaling centres, seasonal camps, hunting, trapping and fishing.

Today, the Inuvialuit continue their traditional cultural and subsistence pursuits on the land. These activities are primarily for subsistence harvesting and are an integral part of a mixed subsistence economy (see below). In addition to subsistent values, harvesting in the Zone 1(a) areas offers tremendous social benefits. The value and importance of "just being out on the land" was reinforced throughout the interview process with Inuvialuit hunters and trappers. According to one interviewee "It's a tradition and it's a working holiday". Another interviewee stated that although the hunt is hard work, he would not miss it citing the health benefits, relief of day-to-day stress, and the reconnection with the land as important factors in this decision. Annual trips to whaling camps are also opportunities to spend time with family, friends, and extended families comprised of the occupants of nearby camps. One interviewee noted that there are more activities where people are being taken out to learn cultural experiences. For example, elders are taken to camps for one to two weeks and teach children to prepare whales and how to survive on the land. As one interviewee commented, "I have two young boy and 30 years from now I would like to see them doing what I do on the land right now". In addition, many Inuvialuit just go out touring for the day, but are always prepared for hunting.

Each of the Zone 1(a) areas are designated Management Category 'E' defined as: "Lands and waters where cultural or renewable resources are of extreme significance and sensitivity. There shall be no development on these areas. These lands and waters shall be managed to eliminate, to the greatest extent possible, potential damage and disrution. This category recommends the highest degree of protectin in this document [Community Conservatin Plan]" (Community of Aklavik *et al*. 2000, Community of Inuvik *et al*. 2000, Community of Tuktoyaktuk *et al*. 2000). Hunters from Tutoyaktuk naturally use the Kugmallit Bay Zone 1(a) area more than the other two areas although they will travel as far as Shallow Bay for goose hunting in the fall (Table 1). Similar information is not available for Inuvik and Aklavik hunters.

**Table 1. Use of the AOI by Tuktoyaktuk Harvesters (Community of Tuktoyaktuk *et al*. 2000)**

| Kugmallit Bay | Kendall Island | Shallow Bay |
|---|---|---|
| Spring: Fish, Goose, Caribou<br>Summer: Fish, Caribou<br>Fall: Fish, Goose, Caribou, Seal<br>Winter: Fish, Caribou | Spring: Goose<br>Summer: Goose | Fall: Goose |

Subsistence Fishing

All three Zone 1(a) areas are important fishing areas throughout the year for the Inuvialuit from Inuvik, Tuktoyaktuk and Aklavik. Community of Aklavik *et al*. 2000; Community of Inuvik *et al*. 2000, Community of Tuktoyaktuk *et al*. 2000). However, from the available information it was not possible to discriminate among the communities in terms of their fishing effort or the relevant importance of the Zone 1(a) areas. For example, the exact locations of fishing camps along the coast for the communities of Inuvik, Aklavik and Tuktoyaktuk are confidential (Eddy 2001). It is known, however, that Shallow Bay is an important traditional fishing area for residents of Inuvik and is also vital to the people of Aklavik as they set fish nets there throughout the year (Community of Aklavik *et al*. 2000; Community of Inuvik *et al.* 2000). The Inuvialuit Harvest Study 1987-1992 indicates that Kugmallit Bay is likely subject to more fishing than either Shallow Bay or Kendall Island areas although Shallow Bay supports a slightly greater diversity (Table 2). Fishing in the Beaufort Sea is subsistence-based rather than commercial although some people sell fish for about $100-$200/barrell according to one interviewee. Local interview information indicates that 100-300 fish may typically be harvested by each family in the study area. One hunter attributed reduced catches to increased boat and plane traffic, and harbour dredging. He noted that in the 1970s and 1980s, a single seine sweep in Tuktoyaktuk harbour could fill two boats. Not until the last four or five years have the numbers started to return.

**Table 2. Key Fish Species Harvested in the AOI (Fabijan *et al*. 1993)**

| Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|
| Arctic char | Arctic cisco | Arctic cisco |
| Arctic cisco | Broad whitefish | Blue/Pacific Herring |
| Blue/Pacific Herring | Inconnu | Broad whitefish |
| Broad whitefish | Lake whitefish/crooked backs | Burbot/loche |
| Burbot/loche | Pike/jackfish | Inconnu |
| Dolly Varden char | | Lake whitefish/crooked backs |
| Inconnu | | Least cisco/big-eyed herring |
| Lake whitefish/crooked backs | | Pike/jackfish |
| Least cisco/big-eyed herring | | |
| Pike or jackfish | | |
| Saffron cod | | |

Broad whitefish (*Coregonus nasus*) is the primary migratory fish species sought in the subsistence fishery, and is used for human and dog-team consumption (Chang-Kue and Jessop 1991, 1997 as cited in Eddy 2001). Semi-anadromous populations of the fish, *en route* to spawning locations, migrate through the Mackenzie Delta and the lower Mackenzie River during the late summer and early fall. Adults feed and overwinter in the nearshore coastal regions of the Beaufort Sea and Tuktoyaktuk Peninsula including all the Zone 1(a) areas (Chang-Kue and Jessop 1991, 1997 as cited in Eddy 2001, p.52).

Lake whitefish (*Coregonus clupeaformis*) (local common name humpback or crooked back) are also taken in the subsistence fishery. The juveniles of anadromous populations spend the summer in the coastal habitats near the mouth of the Mackenzie River, while the adults occupy the delta lake systems. The juveniles overwinter in the channels, while adults overwinter in the delta and inner estuary including Shallow Bay, Kendall Island and

Kugmallit Bay Zone 1(a) areas (MacMillan *et al*. 1992 as cited in Eddy 2001). Lake whitefish tend to have more parasites than broad whitefish, and consequently, are harvested less by local fishermen (e.g., Community of Tuktoyaktuk *et al.*, 2000).

For inconnu (*Stenodus leucichthys*) (local common name coney), whose anadromous populations do not move far from the river and channel mouths of the Mackenzie River, there is a subsistence fishery in the autumn and winter. Catches are reportedly used primarily to feed dog teams (Chang-Kue and Jessop 1991 as cited in Eddy 2001, p.56).

Dolly Varden char (*Salvelinus malma*),[3] is another very important food source to the Inuvialuit communities particularly in Shallow Bay. The anadromous species summer in estuarine and nearshore areas of the Beaufort Sea. Spawning and overwintering occur in freshwater (Everett et al. 1997,Gillman et al. 1985 as cited in Eddy 2001).

Subsistence Harvesting (Marine Mammals)

The harvesting of marine mammals, by the indigenous peoples of Canada dates back to prehistoric times and has been central to their livelihoods. The Inuvilauit Harvest Study 1987-1992 data indicate that Shallow Bay is subject to more harvesting of a variety of marine mammal species (Table 3). Beluga have been the predominant catch in the western Arctic although a limited hunt of bowhead whales has recently been revived under the IFA (High North Alliance 1997).

**Table 3. Key Marine Mammals Harvested in the AOI (Fabijan *et al*. 1993)**

| Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|
| Beluga whale<br>Bowhead whale<br>Bearded seal<br>Ringed seal | Beluga | Beluga<br>Ringed seal |

The history and cultural significance of the beluga hunt to the Inuvialuit has not been fully documented although extensive traditional knowledge is held by elders. All of the Inuvialuit members interviewed for the study indicated they had been involved with beluga hunting and associated activities (*e.g.*, camping and fishing) in and around the Zone 1(a) areas since childhood, and there were many references to the use of areas by ancestors going back generations. In communities such as Tuktoyaktuk, nearly everyone who lives in the community has some ties to the beluga hunt. While the Zone 1(a) areas have typically attracted harvesters from the nearest communities, historically, in some years, Inuvialuit from all across the settlement region would congregate in one of the known beluga harvest areas to hunt.

The harvest of beluga whales by Inuvialuit from Inuvik, Tuktoyaktuk and Aklavik is focused within the three Zone 1(a) areas (see Figure 2). The zones are located near seasonal hunting camps located along the shores of Shallow Bay, used predominantly by Aklavik harvesters (four primary camps, including Shingle Point), Kendall and Baby Islands, used predominantly by Inuvik hunters (two primary camps), and Kugmallit Bay, used

[3] Considered to be Arctic char (*Salvelinus alpinus*) east of the Mackenzie River.

predominantly by Inuvik and Tuktoyaktuk harvesters (five primary camps) (FJMC 2001, Community of Inuvik *et al*. 2000, Harwood *et al*. 2000). These camps have a long history of use by families. Archaeological evidence all along the coast, including old gravesites and whale bones, attest to this historical use and point to important seasonal camping areas, such as Kittigazuit, that was centred around whaling. According to one interviewee who recalls stories of historic whaling activity, at the time when Kittigazuit was an active camp, the Inuvialuit were harvesting 100 whales per day.

Prior to the use of motorboats, groups of kayaks were used to surround and drive whales into shallower waters where they would be hunted. Care would be taken to perform the hunt during low tide so that whales that were not taken could get back to deeper waters during high tide. Historically, the hunt was coordinated among many hunters who each shared in the harvest. With the introduction of faster boats, whales could successfully be hunted in smaller hunting parties. However, it remains customary for the hunter to share the harvest among family, friends and elders, reinforcing the kinship and community ties upon which indigenous cultural practices and beliefs are built (High North Alliance 1997). As one interviewee put it, "If people ask, we just give it to them".

The Inuvialuit rely heavily on whales as a food staple to supplement their winter diets. A portion of the beluga meat (or muktuk) is consumed at the camps while the remainder is normally prepared and stored for use throughout the winter. Generally, whales harvested are butchered on site and the meat is taken back to communities. The meat may be transported raw in pails. Alternatively, it may be prepared on site by drying, curing or cooking the meat or it may be drained then frozen raw using ice. Harvesters from Tuktoyaktuk have the opportunity to tow the whale and prepare it within the community. Before people had freezers, fish were preserved using oils from the belugas or stored in holes in ice or ice houses. One elder recalls that all parts of the whale were utilized including the stomach lining as a sack to transport fish and meat back to the communities. Oils from whales were also used in bread. Blubber was used to feed sled dogs. The bone and teeth may be used for equipment or for traditional art (High North Alliance 1997). Some elders continue these practices.

The Zone 1(a) areas are extremely important relative to other areas in the region; according to one interviewee, “you can set your watch to the return of the belugas to these areas”. Whales may be hunted further to the east at different times of the season but an estimated 95% of the beluga harvest is conducted in the Zone 1(a) areas. Those interviewed for this study did not feel there had been a significant change in the harvest over the last generation although annual harvests may vary due to factors such as weather or the number of Inuvialuit able to participate in the hunt for any given year. During the course of the whaling season, the intensity of the harvest is also variable. For example, fewer whales may be taken after calving since hunters avoid harvesting females with calves. The Inuvialuit generally believe the beluga population to be healthy.

The harvest of beluga is limited to the number of whales required to cover subsistence needs and interviewees reported "just going for one whale" (FJMC 2001). Most landings occur over a six-week period during July and August, although occasionally landings are made in late June and early September (Weaver 1991, Harwood *et al*. 2000). It is estimated that, from the shores of the Beaufort Sea (including from hunting camps in the study area and along the Yukon coast) an average of 111 beluga per year were harvested during the 1990s, down from an average of 132 in the 1970s and 124 in the 1980s (Eddy 2001, Harwood *et al*. 2000). Of those harvested during the 1990s, 92% were taken from the Mackenzie Delta (including 17% by Aklavik residents,

35% by Inuvik residents and 40% by residents of Tuktoyaktuk) (Eddy 2001, Harwood *et al*. 2000). In a 1987 survey of beluga landings in the three areas that approximately correspond to the three Zone 1(a) areas, Weaver (1991) estimated that 78% of landings came from Kugmallit Bay, 9% from the Kendall Island area, and 13% from the Shallow Bay area. This distribution was somewhat different from previous years. The share of total landings from 1980 through 1987 was 65.4% (Kugmallit Bay), 18.2% (Kendall Island), and 16.4% (Shallow Bay area) (Weaver 1991).

Ringed seal are harvested for their pelts, which are used for handicrafts and clothing and some are used for human consumption and dog food (Eddy 2001, Community of Aklavik *et al*. 2000, Community of Tuktoyaktuk *et al*. 2000). Ringed seal (*Phoca hispida*) are present throughout the year in the Beaufort Sea and hunted from February to May and from August to the middle of October on shorefast ice and stable offshore ice (Eddy 2001, Community of Tuktoyaktuk *et al*. 2000). Aggregations of ringed seal occur offshore from the Tuktoyaktuk Peninsula in an area that corresponds to the winter location of the Bathurst polynya (Harwood 1989 as cited in Eddy 2001). The southern and western extent for winter seal harvesting touches upon the northern edge of the Kendall Island Zone 1(a) area near Pelly Island (Community of Tuktoyaktuk *et al*. 2000). Most of the Kugmallit Bay Zone 1(a) area is a key fall harvesting area (Community of Tuktoyaktuk *et al*. 2000). Seals have also been harvested in the Shallow Bay Zone 1(a) area. Bearded seals are also harvested for clothing and, to a lesser degree, for food (Community of Tuktoyaktuk *et al*. 2000).

Subsistence Harvesting (Furbearers)

Inuvialuit Harvest Study 1987-1992 data indicate that Kugmallit Bay is likely subject to more furbearer hunting than Shallow Bay. Only caribou are hunted near Kendall Island (Table 4).

Polar bears are harvested from the Shallow Bay and Kendall Island Zone 1(a) areas between December and May for fur and, occasionally, for food (Fabijan *et al*. 1993, Community of Aklavik *et al.* 2000, Community of Tuktoyaktuk *et al*. 2000). One hunter reported that Pullen and Hooper islands are popular polar bear hunting areas.

Grizzly bears are harvested for their fur in the Shallow Bay and Kugmallit Bay areas. The grizzly bear hunt is regulated by the establishment of co-management plans and community hunting areas. The hunt takes place two times yearly, with spring harvesting occurring from April to June, and summer hunting happening from the middle of August to the end of September (Community of Tuktoyaktuk *et al*. 2000).

Caribou, which are hunted year round, are a highly valued food source to the people of Inuvik, Tuktoyaktuk and Aklavik. They have also been historically used as a source of clothing and tools (Community of Inuvik *et al*. 2000, Community of Tuktoyaktuk *et al*. 2000). One hunter reported selling caribou to other communities at $150/caribou. The Cape Bathurst caribou herd's range partially overlaps the Kugmallit Bay Zone 1(a) area (Community of Tuktoyaktuk *et al*. 2000). For the past two years, sports hunts for caribou have occurred along the west side of Kugmallit Bay on Richards Island. One Tuktoyaktuk hunter reported that while caribou used to be present around town, in more recent years hunters have to travel a greater distance. Moose, primarily hunted in Shallow Bay, offer an alternative food source when caribou are unavailable (Community of Tuktoyaktuk *et al*. 2000).

Arctic and red fox are traditionally harvested for their fur from Shallow Bay and Kugmallit Bay areas between November and April. Wolves, found predominantly in the Husky Lakes region, and wolverines are hunted for their fur and to help maintain a balance of nature (Community of Tuktoyaktuk *et al*. 2000), but have also been harvested in the Shallow Bay and Kugmallit Bay Zone 1(a) areas (Fabijan *et al*. 1993). Kugmallit Bay Zone 1(a) area has traditionally been used as a harvesting ground for lynx which are valued for their fur and as a source of food (Community of Tuktoyaktuk *et al*. 2000, Fabijan *et al.* 1993).

**Table 4. Key Furbearers Harvested in the AOI (Fabijan *et al*. 1993)**

| Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|
| Arctic fox | Caribou | Arctic fox |
| Caribou | | Caribou |
| Grizzly bear | | Grizzly bear |
| Moose | | Lynx |
| Polar bear | | Muskrat |
| Red fox | | Red fox |
| Wolf | | Wolf |
| Wolverine | | Wolverine |

Subsistence Harvesting (Geese and Waterfowl)

Important nesting and breeding habitat, and hence, harvesting areas for birds overlap all three Zone 1(a) areas. Birds are generally harvested from the beginning of May to the end of June and the month of September (Community of Aklavik *et al.*, 2000). Kugmallit Bay appears to be subject to more bird harvesting than the other two Zone 1(a) areas (Table 5).

**Table 5. Key Birds Harvested in the AOI (Fabijan *et al*. 1993)**

| Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|
| Canada goose | Snow goose | Canada goose |
| Snow goose | White-fronted goose | Snow goose |
| White-fronted goose | Brant | White-fronted goose |
| Mallard | | Swan |
| Oldsquaw | | Mallard |
| Scoter | | Meganser |
| | | Scoter |
| | | Wigeon |
| | | Ptarmigan |

Geese, especially lesser snow goose, but also Canada goose and white-fronted goose, are a very important food source in the spring and fall in all three Zone 1(a) areas, and down from these birds are traditionally used in pillows and blankets (Community of Tuktoyaktuk *et al.* 2000). Spring goose harvesting areas include the whole Tuktoyaktuk Peninsula and Husky Lakes region and much of the Mackenzie River Delta and Richards Island, overlapping with the Kugmallit Bay and Kendall Island Zone 1(a) areas (Community of Tuktoyaktuk *et al*. 2000).

Key areas for summer goose harvesting area include the entire Kendall Island Zone 1(a) area and the Kugmallit Bay Zone 1(a) area in the region of Summer Island and Mason Bay (Community of Tuktoyaktuk *et al*. 2000). Key areas for fall goose harvesting include the eastern half of the Shallow Bay Zone 1(a) area and much of the Kugmallit Bay Zone 1(a) (Community of Tuktoyaktuk *et al*. 2000). Shallow Bay is also a key staging area for the greater white-fronted geese (Community of Inuvik *et al.* 2000).

Mallard duck and old squaw duck are harvested in the Shallow Bay Zone 1(a) area during spring and fall (Community of Inuvik 2000, Fabijan *et al*. 1993). Scoter duck and ptarmigan are harvested in the Shallow Bay and Kugmallit Bay Zone 1(a) areas (Community of Inuvik 2000, Fabijan *et al*. 1993). Kugmallit Bay Zone 1(a) area is a reported harvesting area for brant and tundra swan and widgeon duck (Fabijan *et al*. 2000).

Economic Values

Berkes and Fast (1996) provide summaries of subsistence economy estimates for Inuit, focusing on the Hudson's Bay region. For northern Quebec Inuit communities, harvests of meat range from 234-410 kg per capita per year (Berkes and Fast 1996). Usher (1989, as cited in Berkes and Fast 1996) estimated that aboriginal hunters in the Northwest Territories harvested on average 1000-1500 kg of meat and fish annually per family, with an imputed value of $10,000 to $15,000.[4] This is the equivalent of approximately $12,500 to $18,750 in 2000 dollars.[5]

Using the harvest distribution estimates of Weaver (1991) for the 1980s and assuming an average of 122 whales harvested per year in all three Zone 1(a) areas (mean annual harvest, 1970s through 1990s), then the distribution of annual harvests is estimated as:

- 80 whales/yr from Kugmallit Bay;
- 22 whales/yr from Kendall Island; and
- 20 whales/yr from Shingle Point.

Local interviews indicate that, on average, two or three whales are harvested per family[6]. Thus, the number of families supported from each Zone 1(a) is estimated as:

- 27-40 families by Kugmallit Bay;
- 7-11 families by Kendall Island; and
- 7-10 families by Shingle Point.

Summing for all three regions, approximately 40-60 families are supported by subsistence harvests. Multiplying the range of imputed values in 2000 dollars ($12,500-$18,750) with the range of families supported in each

[4] Imputed value is the local cost of purchasing an equivalent amount of meat.

[5] The Consumer Price Index increased by 25% from 1989 to 2000 in Yellowknife, NWT (Bureau of Statistics, Government of the Northwest Territories; http://www.stats.gov.nt.ca/statinfo/PricesIncome/prices/cpi/annual_data/HistCPI.html)

[6] Detailed and longterm harvest studies have been undertaken however, we do not have access to that data as third party agreements for use of the data have not been established.

zone, one can derive a rough annual gross imputed value estimate for all subsistence harvest (assumed to include whale, fish, seal, geese and waterfowl) (Table 6).

**Table 6. Annual Gross Imputed Value Estimates for Subsistence Harvests**

| Region | Gross Imputed Value (2000 dollars) | |
|---|---|---|
| | Lower Estimate | Upper Estimate |
| Kugmallit Bay | $338,000[1] | $750,000 |
| Kendall Island | $88,000 | $206,000 |
| Shingle Point | $88,000 | $188,000 |
| **Total** | $514,000 | $1,144,000 |

[1] $12,500/family x 27 families; [2] $18,750 x 40 families

Local interview information also permitted an estimate of the net value or benefit of subsistence use – strictly in terms of the production value associated with the catch itself (Table 2). For labour, it was assumed that each hunter spends an average of two weeks each year on the land, and that each hunter could potentially earn a wage of $1800 during that time if they were not hunting (*i.e.*, this is the opportunity cost of labour).[7] Total 'start up' capital equipment costs for each hunting party are estimated to be approximately $20,000 (including the purchase of two boats with engines, fishing and hunting gear, and other equipment). Assuming a 10% discount rate, this is an equivalent annual capital cost of $2000. Operating expenses (*i.e.*, food and gas) for one hunting party (about three people) to capture two or three whales are estimated at $1000. Thus, total expenses (economic claims on production) associated with subsistence harvesting are approximately $8400 per hunting party (*i.e.,* this is what must be 'spent' for the harvest for one family). Assuming the distribution of families supported by each Zone 1(a) area as previously described, net value estimates (Table 7) are derived by subtracting the total expenses for a region from the annual gross imputed value estimates presented in Table 6.

**Table 7. Annual Net Value Estimates for Subsistence Harvests**

| Region | Annual Net Value (2000 dollars) | |
|---|---|---|
| | Lower Estimate | Upper Estimate |
| Kugmallit Bay | $111,000[1] | $414,000[2] |
| Kendall Island | $29,000 | $114,000 |
| Shingle Point | $29,000 | $104,000 |
| **Total** | $169,000 | $632,000 |

[1] $338,000 - ($8400/family x 27 families) [2] $750,000 - ($8400 x 40)

This estimation is admittedly rough, but does provide some information regarding the economic scale of the activities. To give some indication of the sensitivity of the estimates, a doubling of the assumed cost of labour in

[7] Annual average weekly earnings in NWT in 1998 was $865, which is approximately $890 in 2000 dollars (see Ministry of Indian Affairs and Northern Development, 2000. *Northern Indicators 2000*. Ministry of Public Works and Government Services, Ottawa).

the study area (from $900 to $1800 per week) would reduce the total annual net value by more than half.[8] There is a notable lack of information regarding the value of subsistence harvests in the Canadian Arctic. Gaining a better estimate of net values requires fairly detailed knowledge of the economic costs associated with the activities, the investments in capital equipment required, the time spent, and the corresponding amount harvested. Within the confines of the present study, such information was not readily forthcoming.

It must also be emphasised that the above estimate only considers production values, and not utility values associated with traditional land use activities. In other words, it does not consider the value of the social and cultural experience described above. Attempts have been made to estimate social and cultural values of activities such as sport fishing (see Fisheries and Oceans Canada 1995), however, given the strong social and cultural ties of the Inuvialuit to the land compared to the average sport fisherman, use of these data to estimate utility values of subsistence activities in the AOI may not be appropriate.

### *3.1.2 Archaeological and Historical Values*

There are numerous known archaeological sites in the vicinity of the Zone 1(a) areas (Figure 4). Between King Point and Trent Island near the Shallow Bay Zone 1(a) area there are over ten archaeological and heritage sites along the shore, including four archaeological sites at Sabine Point and four locally-identified heritage sites between Shingle Point and Running River (Dickens *et al*. 1987). There are two archaeological sites and four locally-identified heritage sites on Kendall Island (Dickens *et al*. 1987). Three burial sites lie within or immediately adjacent to Zone 1(a) area (Prince of Wales Northern Heritage Centre 2002). The shores of Kugmallit Bay have a comparatively high density of archaeological sites including nine burial sites, six campsites, three isolated finds, two villages and one whaling station (Prince of Wales Northern Heritage Centre 2002).

In addition, the Kittigazuit National Historic Site (also referred to as 'Kitigaaryuit'), located in the Mackenzie Delta 30 km southwest of Tuktoyaktuk, is recognised for the significance and abundance of archaeological resources which remain as evidence of a former Inuit settlement and whaling centre. The first detailed inventory of cultural features at this site resulted in the recording of approximately 190 graves, 17 sod house ruins, and the foundation of a Hudson's Bay Company store and related buildings. Also located on the east channel of the MacKenzie River at Cache Point on Richards Island is the earliest known Inuvialuit beluga hunting site in the Mackenzie Delta region. Three of four excavated houses on the site were occupied during a fairly brief period, probably between about 500 and 600 years ago. The artifacts and animal bones from the houses are currently being studied to form a more detailed picture of early Inuvialuit life in the Mackenzie Delta region.

[8] Using an opportunity cost of labour of $1800 per week assumes that this is the average income forsaken by subsistence hunters during the time they are on the land (i.e., they are trained and employable for jobs they chose not to take during that time). Actual revised estimates for the total annual net value = (-)$78,000 to $297,000.

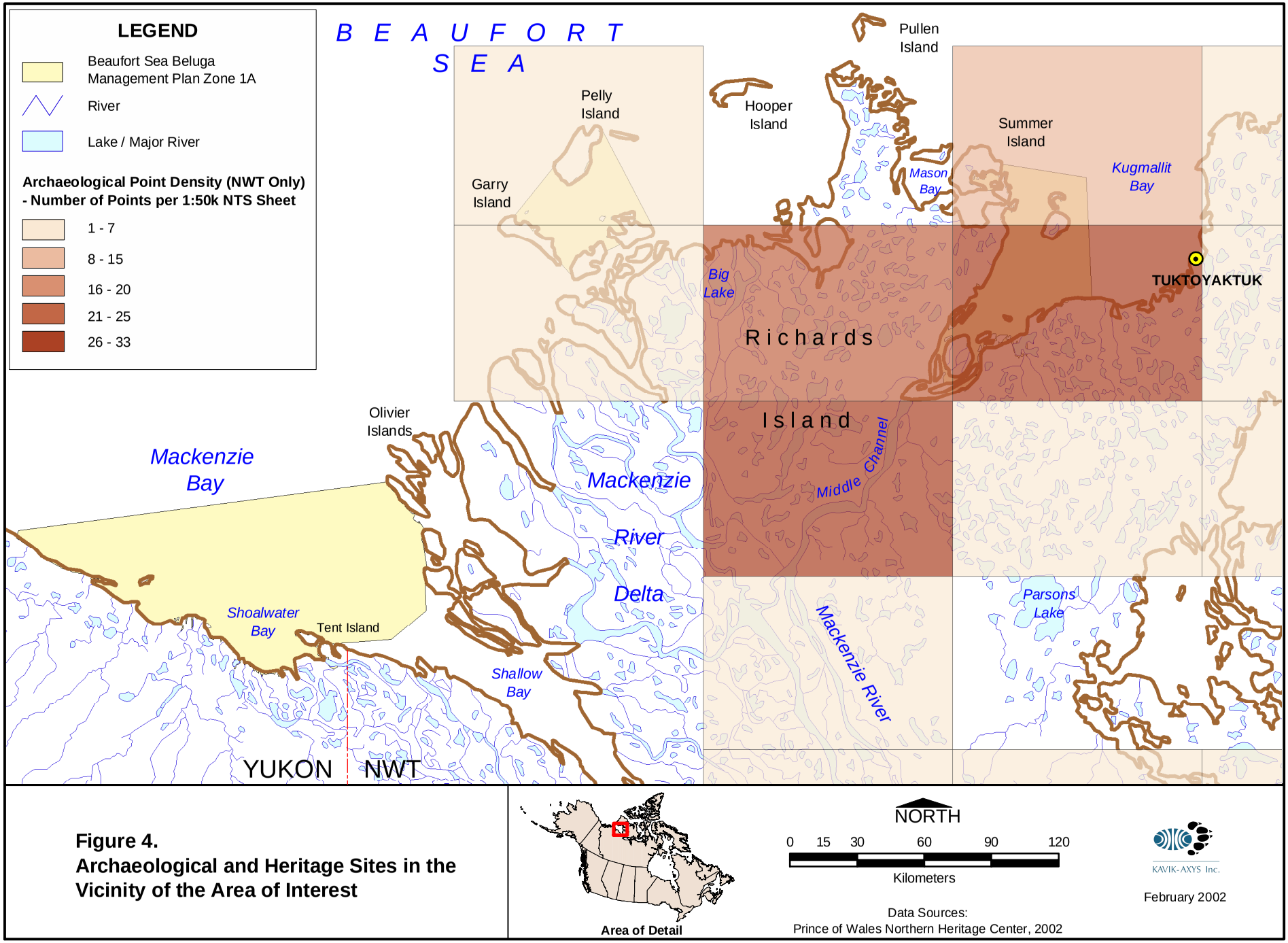


**Figure 4.**
**Archaeological and Heritage Sites in the Vicinity of the Area of Interest**

### 3.1.3 Protected Areas

There are numerous protected areas currently in the vicinity of the AOI and throughout the ISR.

The Kendall Island Migratory Bird Sanctuary, located east of Mackenzie Bay on the outer margin of the Mackenzie Delta, was established in 1961 to provide long-term protection to the colony of lesser snow geese, as well as the staging and breeding grounds of many migratory waterbird and shorebird species. Management of the sanctuary is such that no activity that could harm migratory birds or their habitat is allowed, except when authorized by a permit issued by the CWS. Such a permit outlines various restrictions on the timing, location and intensity of the proposed activities so that negative impacts on birds are minimized.

In addition to Kittigazuit National Historic Site (see Section 3.1.2), Parks Canada has designated Pingo Canadian Landmark Site as a National Historic Site. Just to the west of the AOI is Ivvavik National Park (see Figure 1). Parks Canada staff do not use the Zone 1(a) areas except in transit *en route* from Inuvik to Ivvavik National Park about four times per year. There are currently no national marine conservation areas in the Beaufort Sea, but three representative marine areas have been identified: Cape Bathurst Polynya, Yukon North Slope and Western Banks Island.

Herschel Island Territorial Park, located offshore of Ivvavik National Park, protects a wide variety of arctic flora and fauna including nesting birds and numerous species of wildflowers. The surrounding marine areas support salt- and freshwater species of fish, ringed and bearded seals, and transient beluga and bowhead whales. Polar bears use Herschel Island for foraging and calving during the winter and spring prior to migrating in the early summer to the permanent ice pack about 150 km north of the island. Once home to more than 1500 people, and possibly the first point of commercial contact between the Inuvialuit of the Western Arctic and European whalers, Herschel Island contains many historical buildings and artifacts. The island was abandoned in the early 1900s during a flu epidemic. Today, several charter companies operator tours to the island.

### 3.1.4 Research and Education

Biophysical Research

Prompted by its inherent wealth of biota and the implications of petroleum exploration, the AOI and surrounding area has been the subject of numerous geological, biological and oceanographic studies, in the past 30 years. Data for Illisarvik, a drained lake on Richards Island, have been collected for the past 20 years while permafrost conditions on Garry Island have been monitored for 30 years. Biophysical research-related activities occurring in the vicinity of the Zone 1(a) areas between 1996 and 2001 are summarised in APPENDIX C.

Regionally, the study area has repeatedly been surveyed by CWS as part of population studies for migratory waterfowl with the greatest intensity of study in the 1970s and 1980s. The Zone 1(a) areas are known staging areas in the spring and fall, although the primary staging areas are further offshore.

DFO conducts research throughout the Beaufort Sea on topics such as fisheries stock assessments, marine mammal studies, and oceanographic processes. Research is also conducted in the western arctic as part of Northern Contaminants Program under Indian and Northern Affairs Canada. Specific to the Zone 1(a) areas,

studies near Kendall and Baby islands in 2000 and 2001 focused on the collection of stock-specific data for the Beaufort Sea beluga (L. Harwood, DFO, pers. comm.).

Social and Archaeological Research

Several archaeological studies have been undertaken in the vicinity of the Zone 1(a) areas.

An archaeological assessment was undertaken in 2001 on the north shore of Richards Island in the vicinity of the Kendall Island Zone 1(a) area. Archaeologist Elisa Hart accompanied a seismic reconnaissance crew working for Veritas DGC Land of Calgary, to locate known heritage sites on or near proposed developments related to two seismic programs. Precise GPS readings were taken for each site found and those in close proximity to developments were staked.

The Kittigazuit (Kitigaaryuit) National Historic Site (see Section 3.1.2) and its surrounding area, was the site of archaeological inventory work between 1995 and 2000. This work has been sponsored by the Inuvialuit Social Development Program (ISDP) and has been undertaken under the direction of archaeologist Elisa Hart. During the 2000 season researchers discovered that major impacts are occurring from erosion and the thawing of permafrost. More detailed studies on the impacts of coastal erosion at Kitigaaryuit were conducted by Steven Solomon of the Geological Survey of Canada in August 2001. Oral historical research, conducted by the ISDP, is underway to document the history of Kitigaaryuit and the experiences of those who once lived there.

The earliest known Inuvilauit beluga hunting site at Cache Point was surveyed by Max Friesen, an archaeologist from the University of Toronto, between 1996 and 1999 as part of the Qilalugaq Archaeology Project. During the three years of the project, the Cache Point site was mapped and four houses were completely excavated, including entrance tunnels, middens and kitchen structures.

In 1998 the ISDP conducted an oral history and archaeology project at a former Royal Canadian Air Force and United States Air Force Loran navigation station. The station, code named Yellow Beetle, was also referred to as Kittigazuit. It was located on the east channel of the Mackenzie River about 12 km west along the coast from the old village of Kitigaaryuit. Construction started in 1947 and the Loran system operated from 1948 to 1950. In 1998, funding from the Department of National Defense was provided to ISDP to document the experiences of the Inuvialuit who worked at the station and to obtain a collection of artifacts that could be used in an exhibit on its history. Information from elders and a former meteorological technician who worked at the station, together with archival documents, are being used to write a report on the history of the station.

Research Facilities

Part of Garry Island is a Scientific Research Reserve for study of permafrost phenomena. In 1963, Dr. J.R. Mackay of UBC erected a small cabin, 12' x 8', that is accessible by foot or helicopter only. The cabin is used in summer and winter by Dr. Chris Burns and his research party, but is left unlocked for use by others in the case of emergency. The cabin has no power supply or cooking facilities, and water is either collected from an ice wedge trough or snow is melted. There is no regular maintenance of the building. A second research facility in located near Illisarvik Lake on Richards Island near the Kugmallit Bay Zone I(a) area.

Education

The only known formal educational use of the Mackenzie Delta region is the periodic documentation of historic and cultural features. Some of the efforts of the ISDP have been discussed above. In another example, a film crew from the Inuvialuit Communications Society joined archaeological crew on site at Cache Point in 1999 to record the researchers' findings.

## 3.2 Industry and Commerce

### *3.2.1 Petroleum Exploration and Production*

The Beaufort-Mackenzie Basin possesses large volumes of discovered oil and gas resources, with high potential for future discoveries. It is estimated that total discovered petroleum resources are between 186 $x10^9m^3$ and $349x10^9m^3$ of marketable gas and between $93x10^6m^3$ and $229x10^6m^3$of recoverable oil (NEB 1998). Exploration in the Beaufort-Mackenzie Basin began in the mid-1960s, with the majority of exploration drilling occurring between 1970 and 1989. During this period, thousands of seismic lines were shot and a total of 183 exploration wells and 66 development wells were drilled. Approximately 700 seismic lines were shot within a 10-mile radius of the Zone 1(a) areas and 111 of these intersect the Zone 1(a) areas. All but two of these were shot prior to 1978 and two were shot in 1985 in the Kugmallit Zone 1(a) area. More recently, seismic lines have been shot around the Zone 1 (a) areas particularly around Kugmallit Bay (Figure 5). Seismic work resulted in 53 'significant discoveries' (*i.e.*, a field for which at least one zone in the discovery well demonstrated sustainable flow) – including 20 gas, 13 oil, and 20 oil and gas (NEB 1998). Of the total wells drilled in the area, approximately 20 are located within a 10 miles radius of the Zone 1(a) areas (Figure 6). There are 59 licenses in the general region, although not all of these are presently active. Ten new exploration parcels were nominated during summer 2000 and the IRC recently put some of their subsurface lands out for bids, resulting in four parcels being allocated to three different oil and gas companies (Brackman 2000). In addition, four parcels of IRC subsurface lands have recently been allocated (Brackman 2000). Recently, within the Mackenzie Delta-Beaufort Sea region, no oil or gas fields have been developed, other than the onshore Ikhil field (Brackman 2000). There is one production facility operating in the Canadian Arctic at Norman Wells on the Mackenzie River.

The Kendall Island Zone 1(a) area is surrounded by significant hydrocarbon discoveries, and several Exploration Licenses (EL) and Significant Discovery Licenses (SDL) (Figure 6). Suncor Energy Ltd. owns two SDLs overlapping the area. SDL28, east of Pelly Island, was awarded in 1988, covers 1809 ha and contains an abandoned gas well (PELLY B-35) on an artificial island. SDL25, southeast of Garry Island, was also awarded in 1988, covers 1216 ha, and contains a suspended gas well (GARRY G-07) (Gal 2002). In addition, SDL15, covering 304ha and owned by Chevron Canada is entirely land based on the island to the southwest of Kendall Island. The island also contains an abandoned well (Upluk M-38). Other petroleum discoveries in the area include Nipterk (oil-gas) to the south, Nesterk (gas) to the northwest, Adgo (ADGO F-28, oil-gas) to the southwest, Garry (GARRY P-04, gas) to the south and Taglu (gas) to the southeast (Gal 2002). A small portion of Anderson Resources EL (issued 2000, expiry 2009) falls within the Zone 1(a) area around Pelly Island, as does a larger portion of Anadarko Canada Corps EL (issued 2000, expiry 2009). Anderson Resources conducted a seismic program in their ELs in 2001. The significant discoveries within and adjacent to the Kendall Island Zone 1(a) area total approximately15,270 $10^3m^3$ recoverable oil and 1,740 $10^6m^3$ marketable gas (Table 8).

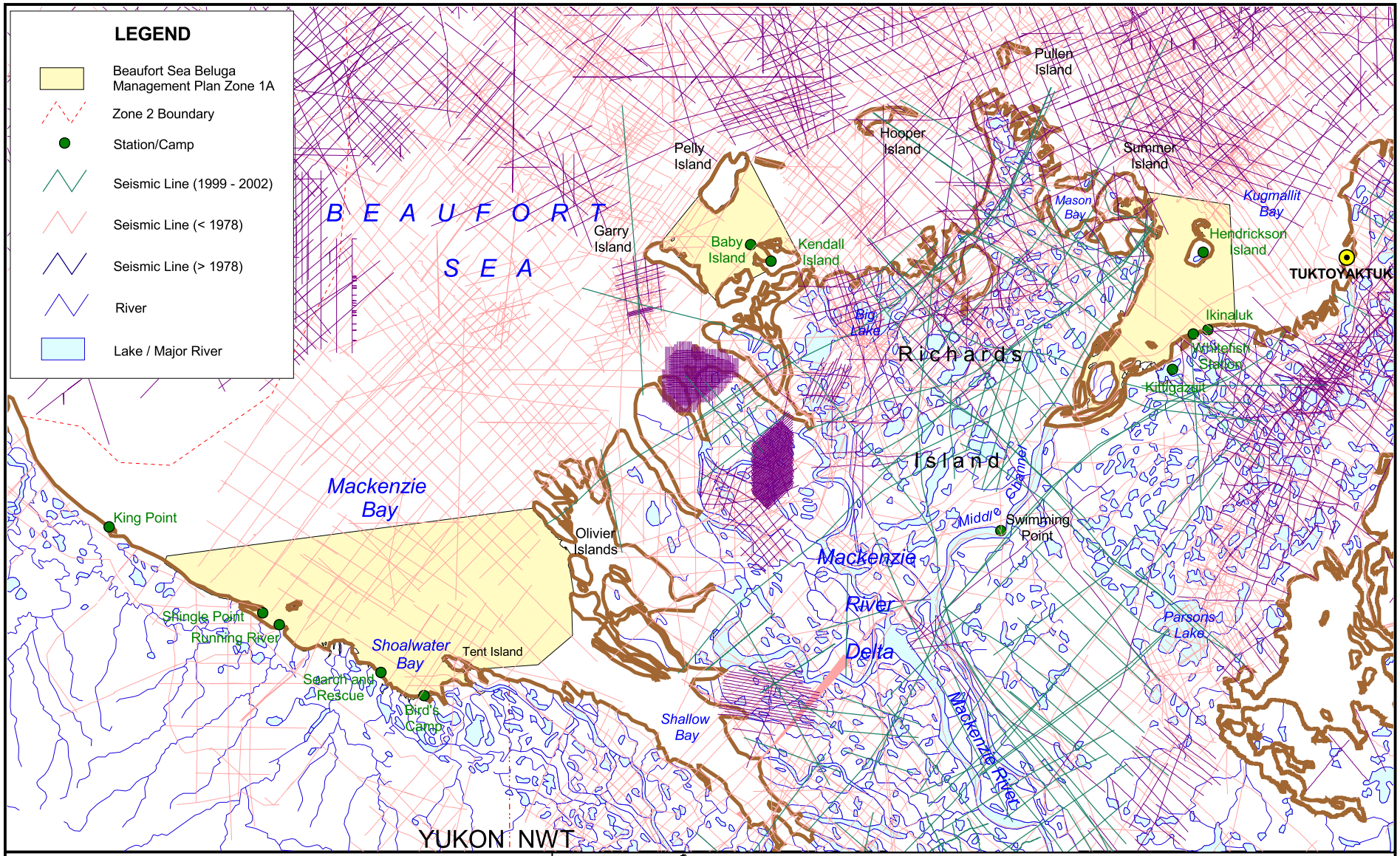


**Figure 5.**
**Seismic Lines in the Vicinity of the Area of Interest**

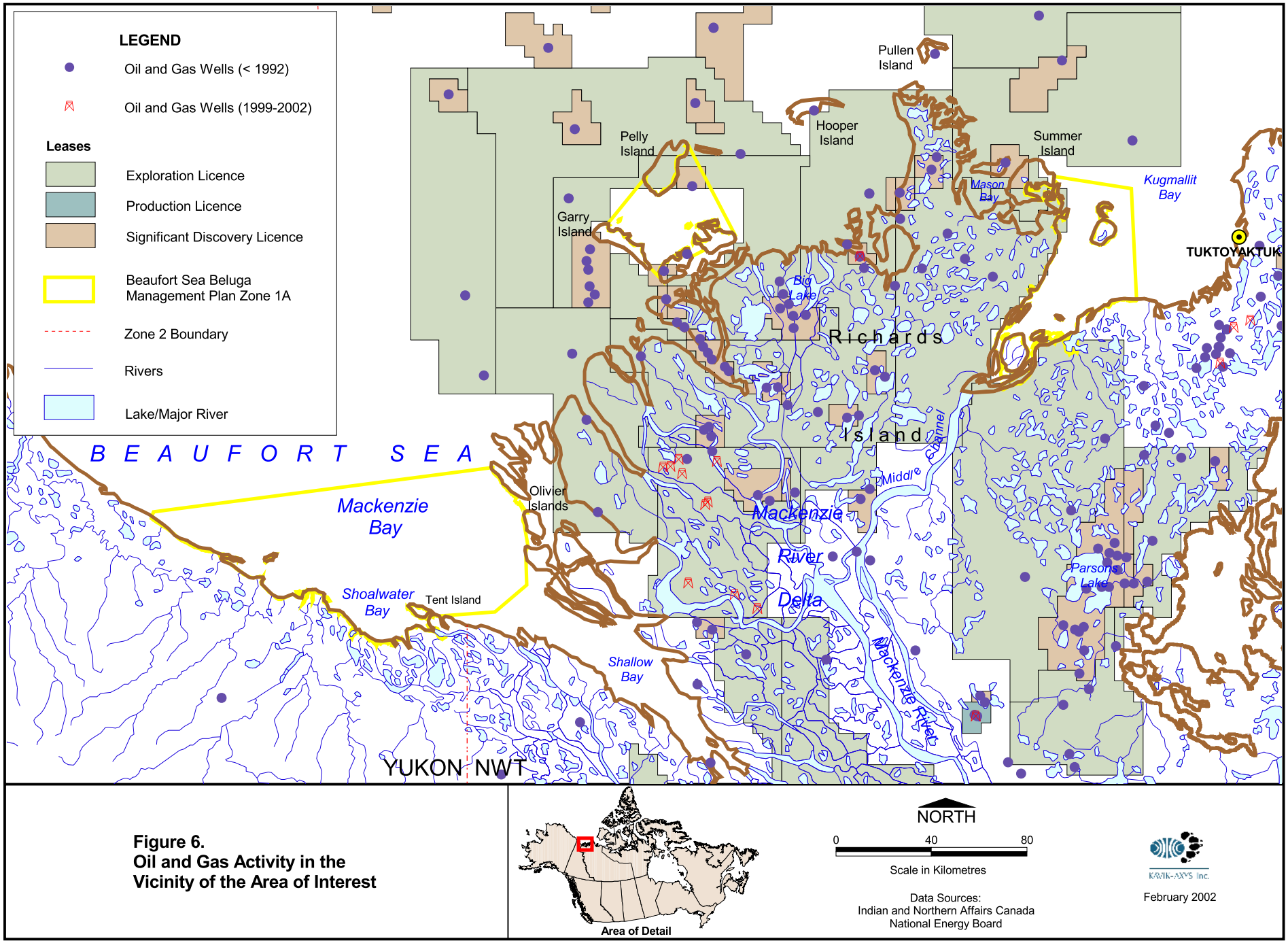


**Figure 6.**
**Oil and Gas Activity in the Vicinity of the Area of Interest**

**Table 8. Volume Estimates for Significant Oil and Gas Discoveries Adjacent to the Area of Interest (NEB 1998)**

| Zone 1a Area | Field | Mean Volume Estimate of Recoverable Oil ($10^3m^3$) | Mean Volume Estimate of Marketable Gas ($10^6m^3$) |
|---|---|---|---|
| **Kendall Island** | ADGO F-28 | 6,183.35 | 3,205.84 |
| | GARRY S. P-04 | 9,085.20 | 7,291.42 |
| | GARRY N. G-07 | 0 | 291.87 |
| | PELLY B-35 | 0 | 2,948.23 |
| | *Total* | *15,268.55* | *13,737.36* |
| **Kugmallit Bay** | HANSEN G-07 | 687.49 | 4,593.91 |
| | TUK Tert. J-29 | 195.88 | 0 |
| | *Total* | *883.37* | *4,593.91* |

Exploration licenses owned by Anderson Resources (issued 2000) and AEC West (issued 1997) surround and clip the Kugmallit Bay Zone 1(a) area to the north, west and south. In addition, Imperial Oil Resources owns SDL92 (issued 1990) on the northwest corner of the area. This SDL includes drill hole HANSEN G7 drilled in 1986. Other petroleum discoveries in the area include Ivik (oil) to the northwest and Tuk (oil-gas) to the southeast (Gal 2002). The significant discoveries within and adjacent to the Kugmallit Bay Zone 1(a) area total approximately 880 $13^6m^3$ recoverable oil and 4590 $10^6m^3$ marketable gas (Table 8).

There are no existing ELs or SDLs near the Shallow Bay Zone 1(a) area.

The BSBMP guidelines state that "The oil and gas industry should not be permitted to explore for resources within or on the shores of any Zone 1 waters nor produce hydrocarbons or construct/operate any type of facility" (FJMC 2001). The oil and gas industry has abided by these guidelines and do not enter the Zone 1(a) areas for any of their exploration activities. Nevertheless, the oil and gas industry has expressed interest in conducting seismic explorations within Zone 1(a) areas.[9]

Oil and gas related activities that are currently being conducted or are planned in the region for the future comprise seismic activities and a small amount of exploration drilling. Several of the seismic programs that have been conducted during the 2000/2001 winter season border on both the Shallow Bay and Kugmallit Bay Zone 1(a) areas.

Both seismic and drilling programs are currently being conducted during the winter months, when whales are not present in the area. Some seismic programs have been carried out during the summer months, but the oil and gas companies appear to be restricting these programs to the winter months to ensure that they is no interference with the whales. During the winter 2000/2001 season, three separate companies conducted 2D

[9] Inuvialuit – DFO – Industry Steering Committee on Integrated Management Planning for Oceans in the Western Arctic (IMP Steering Committee), Minutes of Meeting, 9-10 November 2000, Mackenzie Hotel, Inuvik, MWT.

seismic activities and one test well was drilled, approximately 20 kilometers away from the Shallow Bay Zone 1(a) area. There are other activities related to oil and gas exploration, including the construction of access roads and setting up of temporary camps. There are no camps within the three Zone 1(a) areas. Eight camps used for the 2000/2001 season and two camps (plus five alternative camps) proposed for the 2001/2002 season lie within a 16 kilometer radius of the Kugmallit Bay Zone 1(a) area (Figure 7). One ice road has been proposed that also borders this zone. Further exploration activities are planned for the winter 2001/2002 including more 2D seismic, some 3D seismic and potentially the drilling of more test wells. If seismic programs indicate a potential reservoir, then an exploratory well is drilled to test the quality of the potential reservoir. The decision to take the next step in full development depends on the success of the testing of the exploration well(s) and ultimately the likelihood that a pipeline will be built to transport the product south.

The potential exists for an extension of the Norman Wells oil pipeline to the Mackenzie Delta, although for this to become economically feasible, several of the existing onshore discoveries in the delta would need to be developed and produced (Brackman 2000). There are currently two oil and gas consortia which are assessing the feasibility of building a pipeline routes from Prudhoe Bay and the Mackenzie Delta.

The Producers Group, which consists of Imperial Oil Resources, Conoco Canada, Shell Canada Limited and ExxonMobil Canada have recently completed feasibility studies and have made the decision to begin preparing the regulatory applications needed to develop onshore natural gas resources in the Mackenzie Delta, referred to as the project definition phase. A Mackenzie Valley route would likely follow the Mackenzie River beginning around Inuvik and running south. It is the shortest route to southern markets. . The pipeline would be anchored by nearly six trillion cubic feet of natural gas at the Taglu, Parsons Lake and Niglintgak gas fields, and would be accessible to other existing and future natural gas discoveries in the Mackenzie Delta and Mackenzie Valley regions. It has been estimated that the Mackenzie Valley Pipeline could have a throughput of about one billion cubic metres per day, able to carry up to 2.5 billion cubic feet of gas per day. In October 2001, the Producers Group and the Mackenzie Valley Aboriginal Pipeline Corporation (MVAPC), representing the aboriginal peoples of the Northwest Territories, signed a memorandum of understanding to guide future work on economic and timely development of a Mackenzie Valley Pipeline. This pipeline itself is well south of the Zone 1(a) areas, but having a route for the transportation natural gas would likely result in an increase in oil and gas activities in the Mackenzie Delta and Beaufort Sea.

The North American Natural Gas Pipeline Group (NANGPG) is a consortium of BP, Phillips Petroleum Co. and Exxon Mobil Corp. who initiated the Alaska Gas Pipeline Project. This consortium is currently assessing two routes for a natural gas pipeline from Prudhoe Bay, Alaska and the Mackenzie Delta, Northwest Territories (NWT) to the lower 48 states. The two options under consideration comprise the "Over the Top Route" through the Beaufort Sea and the Alaska Natural Gas Transportation System (ANGTS) route.

The “Over the Top” route would originate in the Prudhoe Bay area and routing eastward to a landfall in Canada, either on the mainland east of Ivvavik National Park (formerly Northern Yukon National Park) or on Richards Island in the outer Mackenzie Delta. The pipeline would then proceed to Inuvik or connect with a spur from Inuvik and proceed south following a similar route as the proposed Mackenzie Valley Pipeline. The offshore portion of the pipeline would consist of a large diameter pipeline, with no compressor stations, buried offshore to the Mackenzie Delta, then a pipeline to carry both Alaska gas and Canadian gas to the southern markets. The

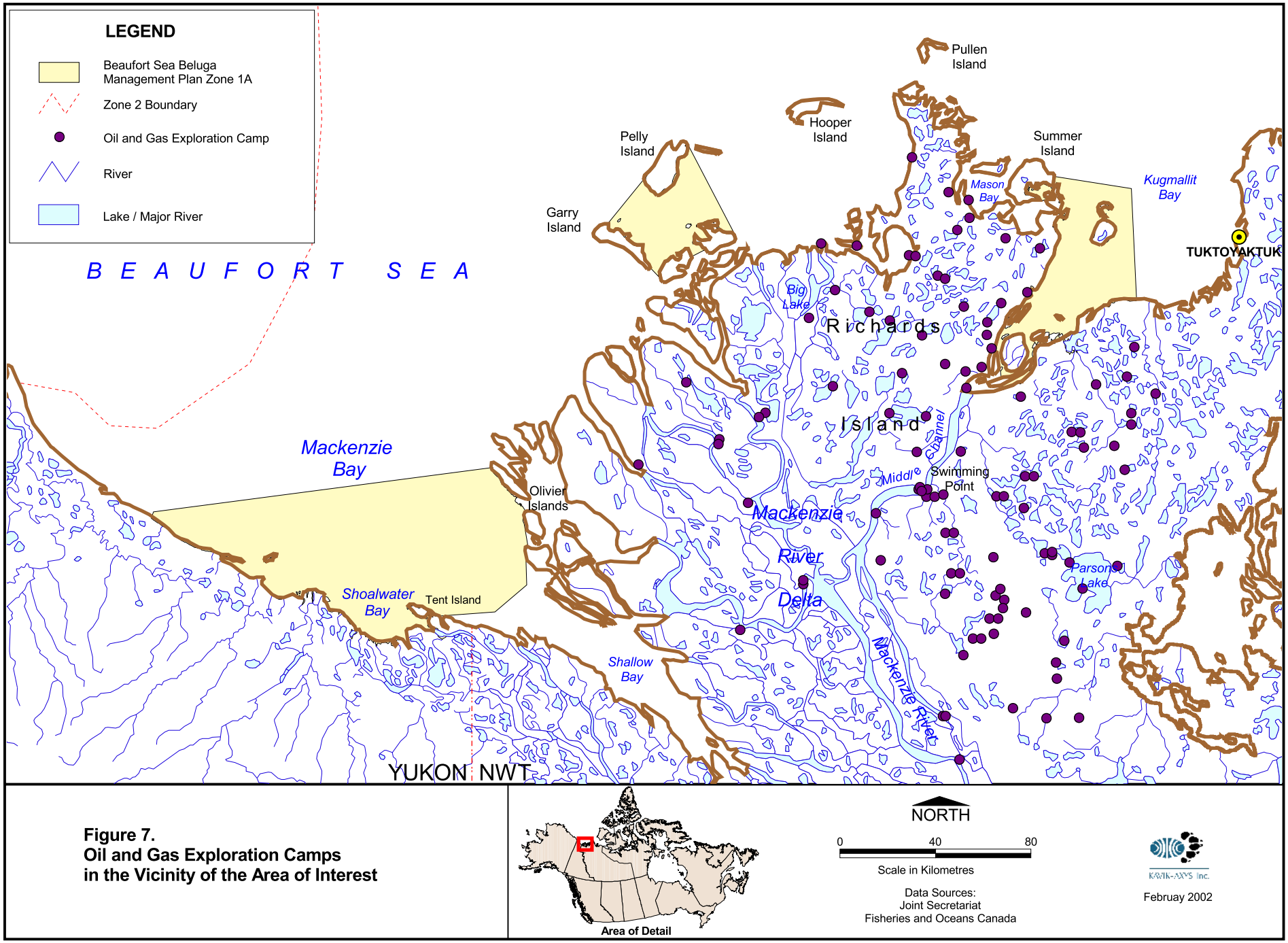


**Figure 7.**
**Oil and Gas Exploration Camps in the Vicinity of the Area of Interest**

offshore portion would require 350 to 400 mile of pipe to be buried in approximately 40 feet of water in a trench sufficiently deep to provide sufficient soil cover depth for ice scour protection. There several different alignments being considering for the "Over the Top" route and depending on the route chosen the pipeline may infringe on the Shallow Bay Zone 1(a) area.

The ANGTS alignment runs from Prudhoe Bay along the Alaska Highway through the southwest corner of the Yukon and then proceeds through the northeast corner of British Columbia, across Alberta and Saskatchewan and then into the United States. This onshore route would not have a direct impact on the Zone 1(a) areas other than to bring increased oil and gas exploration and development to the Beaufort Sea area.

It is the general consensus of those companies interviewed for the socio-economic study that future development is highly contingent upon the selection of a pipeline route, and that a decision to proceed with development of one of the proposed routes could heavily sway oil and gas related activities in the region. One company also indicated that if the route selected is too far away from their license area, they may not continue with exploration and development plans.

Assessing the reservoir potential of the Zone 1(a) areas would be the first stage in development if these areas were opened up to oil and gas activities. The same exploration procedures as are currently being used would be used in the Zone 1(a) areas, such as exploration seismic and test drilling, to determine the potential of the area prior to making a decision to proceed into a development stage. Development would then proceed if a reservoir of sufficient size and quality was identified. There is currently little interest in the Zone 1(a) areas as they are offshore areas and companies are focusing on developing on-shore areas, which are cheaper and easier to develop, before moving offshore. Offshore areas could be of interest further in the future and may play a role in a long-term plan that would see areas being slowly and steadily developed to ensure a steady flow of gas well into the future. One company, whose explorations license borders the Kugmallit Bay Zone 1(a) area, indicated that they would like access to this area to conduct a winter seismic program. The reservoirs that they are currently exploring within their license may extend into the Zone 1(a) area and conducting a seismic program within this area would allow them to get a better picture of the exact location and size of the surrounding reservoirs.

Economic Value

Based on the 1998 estimates for the total volume of oil and gas discoveries in the Mackenzie Delta and Beaufort Sea, the gross value of the oil is approximately $26.0 billion to $64.1 billion (assuming an average 2000 oil price of $280/$m^3$), and the gross value of natural gas is approximately $20.5 billion to $38.4 billion (assuming an average 2000 natural gas price of $110/$10^3 m^3$).

Using the above average prices, the value of the oil and gas discoveries immediately adjacent to the Kendall Island Zone 1(a) and the Kugmallit Bay Zone 1(a) can be estimated (see Table 8). For Kendall Island, the value of the oil is approximately $4.3 billion and the value of the natural gas is $1.5 billion. For Kugmallit Bay, the value of the oil is approximately $0.25 billion and the value of natural gas is $0.50 billion.

Actual production of oil and gas in the Mackenzie Delta and Beaufort Sea area will be highly dependent on the development of a pipeline. Until more detailed information is available on the costs associated with acquiring

production, as well as the production schedule (*i.e*., how much is extracted each year), a reasonable estimate of net values will not be possible (see ARC Financial Corporation 2001 for estimates of operating costs and total costs of finding, developing and acquiring production for the industry). The gross value estimates provided here are total "in the ground" values. When or if oil and gas extraction takes place, actual annual gross and net values will be a fraction of the above dollar amounts, determined by the amount produced each year

### *3.2.2 Mining*

The ILC, as per the IFA, holds mineral rights in the ISR. The ISR is a relatively unexplored area in terms of mineral potential and the only active mining interests are presently located outside the AOI at Darnley Bay. Known deposits of iron, coal, copper, lead and zinc exist within the Mackenzie Estuary area, but have yet to be developed (MDBSRLUPC 1991). In the IFA provisions are made for the reservation of granular and sand resources for community needs (DIAND 1984). Sand and gravel supplies within the southern Beaufort Sea and Mackenzie Delta region are generally in short supply. Demands for sand and gravel include community requirements, maintenance and upgrading of transportation facilities, military activities and the oil and gas industry. Marine deposits of gravel are found northwest of Herschel Island and north of Cape Bathurst (MDBSRLUPC 1991).

BSBMP states that "No mining activities (*e.g*., gravel removal) should be permitted within or on the shores of any Zone 1a waters." (FJMC 2001).

### *3.2.3 Tourism*

Tourism is important economically for the territorial governments and the Inuvialuit. It is the third leading export of the NWT and is continuing to grow. The most important tourism activities in the Mackenzie Delta region are observing wildlife, hiking, rafting, sports hunting and fishing, visiting whaling, hunting and fishing camps, boating and attending community or cultural activities. Tours typically run May to September. Interviews indicate that Herschel Island gets approximately 150 tourists per year. Cruise ship tours, small boat tours of the Mackenzie Estuary, kayaking and flight tours have been increasing in popularity in recent years. Three cruise ships currently utilise offshore waters of the ISR – the Russian ship *Kaptain Khlebnikov*, the German ship the *MS Haneseatic*, and the US ship the *Frontier Spirit* (Eddy 2001). At least one of these ships brings tourists to the mainland by helicopter and zodiac boat (Fast *et al*. 1998). Cruise ships do not enter the Mackenzie River or estuary areas due to insufficient water depth. Local interviews indicate that there are a total of four to six cruise ship visits per year. The primary tour route of kayakers is along the Yukon North Slope to Kaktovik, stopping at the whaling camps of Running River and Shingle Point, as well as Herschel Island (Eddy 2001).

Plans are underway to route a portion of the Trans-Canada Trail between Inuvik and Tuktoyaktuk. The present route follows an existing winter road and traverses near the eastern shores of Kugmallit Bay. Once developed, the trail has the potential to attract adventure tourists. A plaque commemorating the trailhead has already been erected at Tuktoyaktuk.

BSBMP speaks extensively to tourism activities. In recognition of the priority of the ongoing subsistence beluga harvest, water-based tourism and related activities are not permitted within the Zone 1(a) areas. HTCs have also prepared tourism guidelines for their respective hunting areas. Additional provisions pertaining to tourism include:

- subsistence hunting takes priority over tourism activities;
- HTCs will designate areas to be used for whale watching/tourism within the ISR;
- tourism operators must have written agreement with the appropriate HTC; and
- specific guidelines are provided covering harassment, timing of activity, tour length, photography, use of aircraft and protection of the environment (FJMC 2001).

Although these are not regulatory restrictions, no tourism operator presently conducts boat tours in the Zone 1(a) areas. Two operators have in the past taken tourists to visit family camps near the Kendall Island Zone 1(a). One Tuktoyaktuk-based tour company has taken visitors to the boundary of the Kugmallit Bay Zone 1(a) area to view whales.

Several companies that cater to tourists use the eastern and westernmost Zone 1(a) areas as transportation corridors. Charter air companies that cater to tourists traverse the Shallow Bay and Kugmallit Bay Zone 1(a) areas *en route* to other destinations. Several flights per day, for example, may fly over the Shallow Bay Zone 1(a) area in the summer taking visitors between Aklavik and Herschel Island Territorial Park. One tour operator leads a dogsled tour of up to three people (plus guides) along this same route over land and sea ice. Two dog sled tours are conducted in April: the first trip originates in Aklavik destined for Herschel Island; the later trip uses the same route to take a second group of tourists from Herschel Island to Aklavik. Both legs involve winter camping.

In addition to traditional tourists, other users who travel through these areas (*e.g.*, oil and gas workers, researchers, business people and government staff) may also be perceived as tourists in the sense that they may be travelling similar routes and experiencing similar benefits as tourists although their reasons for travelling through the area may differ from the more traditional traveller.

Although there are no plans underway by operators to use the Zone 1(a) areas for tourism without full consent of the Inuvialuit, there remains, however, some interest in exploring opportunities for "appropriate" tourism that is focused on beluga whale watching. The Zone 1(a) areas, and their use for traditional pursuits, could potentially be successfully marketed to tourists interested in viewing marine mammals and birds, and observing cultural activities. Establishment of a MPA would enhance the attractiveness of the areas to tourists. One interviewee suggested that whale watching tours could be conducted within the Zone 1(a) areas in early September after the beluga harvest has concluded and while the chance of seeing whales is still possible. Another interviewee suggested the construction of a base camp outside the Zone 1(a) boundary that would be used only by tourists to minimise disturbance to hunters at traditional camps. According to one company, if tourism were allowed to take place in the Zone 1(a) areas, the number of tourists would be low, probably less than a dozen per year, and the operations would be of smaller scale, using Inuvialuit guides. Beluga hunters, however, have concerns about opening the doors to tourism. The principal concerns are disturbance to whales and/or hunters, and the potential for negative publicity that may result from tourists photographing the hunts.

Economic Value

Economically big game and trophy hunting are the largest single tourism products in the north. There are descriptions of economic and northern development issues related to arctic tourism (*e.g.*, Hinch 1995, Marsh

and Staple 1995). For example, Dressler (1999) presents an analysis of stakeholder perspectives related to tourism development in the arctic. However, economic analyses are not available and there are no data describing the level and locations of tourism use in the Mackenzie Delta Region. It is estimated that the whole of the Arctic region including Nunavut receives between 5000 and 8000 tourists per year (D. Zimmerman, pers. Comm.). The largest tourism company in the region, Arctic Nature Tours, sells tour packages, which are in turn contracted to independent guides. The company books approximately 2500 tourists per year.

There is insufficient information to estimate net economic values (*i.e.*, tourism benefits that may be accrued if tourism activities were permitted in the Zone 1(a) areas). Furthermore, given the dominance of one tourism operator, concerns over maintaining confidentiality arise.

### *3.2.4 Transportation*

There are three main types of non-government transportation companies that are based out of Inuvik: a barge company, fixed-wing air charter companies; and helicopter charter companies. The majority of these companies conduct business within the Zone 1(a) areas, although many are infrequent users. The primary local marine transportation route is through Kugmallit Bay, passing through the Zone 1(a) area. Northern Transportation Company Limited (NTCL) operates a coastal community supply vessel through the east channel of the Mackenzie Delta, as well as through Kugmallit Bay every other day between 1 July and 1 October (Fast *et al*. 1998). Barge traffic consists of ten river tugs that push/tow on average six linked barges. They primarily transport bulk petroleum products, dry cargo and supplies to communities, defense installations, and oil and gas exploration sites. On average, vessels with barge tow would transit the Kugmallit Bay Zone 1(a) area approximately two to three times per week during the summer.

The fixed-wing and helicopter companies charter to government, industry, local residents,, tourists or a combination. The frequency of travel through the Zone 1(a) areas also varies, but generally ranges from one flight per week to two flights per day during the summer season. There is very little winter charter work, other than in support of oil and gas exploration activities. The destinations of these air charter companies vary from company to company and year to year depending on their clientele. Herschel and Kendall islands, however, seem to be reasonably consistent destinations. A typical flight path to Herschel Island passes through or near the Shallow Bay Zone 1(a) area. Servicing and maintenance of the communication towers at Tuktoyaktuk and Swimming Point and related activities on Garry and Pollen islands are conducted via air charter. One company travels to Garry and Pollen islands six times per year each.

There has been little change to the size or nature of barge and air charter companies in the recent past, other than an increase in tourism over the last 20 years and the recent upsurge in oil and gas related activities. Most of the companies interviewed indicated that alternate routes, to avoid the Zone 1(a) areas, were possible. Marine vessel traffic, however, must follow a registered route that can not be altered.

According to the BSBMP guidelines “All shipping activities (including dredging) should be confined to designated routes and areas. Passage through or close to Zone 1a outside of designated routes, even if it’s the shortest route, should be avoided from break-up to 15 August.” In addition, the guidelines specify that “No port development should be allowed within or on the shores of any Zone 1(a) waters” (FJMC 2001).

Economic Values

Further information was not available from which to estimate economic values associated with transportation activities. It would be particularly beneficial to be able to estimate the value of the use of the Zone 1(a) waters by the marine transportation sector (*i.e.*, through Kugmallit Bay). However, there was no public secondary information available relating to the economic value of the use. Further, given the dominance of one company, confidentiality concerns again arise. Any changes in marine navigation routes or in seasonal uses that are considered as part of MPA designation, nonetheless, should consider the impacts on this sector and the activities associated with them.

### *3.2.5 Military and Coast Guard Activities*

The northern component of DND, Canadian Forces Northern Areas, maintains a military base at Yellowknife. Inuvik is the location of a Forward Operating Line (FOL) for aircraft support and was previously a major military base (Capt. B. Saunders, pers. comm.). Currently, Inuvik is periodically used for land-based military and flight training exercises and the only infrastructure remaining at the base is hangars for six aircraft (Capt. B. Saunders, pers. comm.).

The Distant Early Warning (DEW) line was constructed across Canada's Arctic in 1955 as part of the North American Air Defense (NORAD) System. In 1988 the DEW line was partially deactivated and ceased operation (Eddy 2001). Along the coast of the Mackenzie Estuary are the remains of two stations, at Shingle Point and Tuktoyaktuk. Clean-up and decommissioning of these sites is ongoing, with specific attention to limiting environmental contamination, particularly of PCBs. A military waste site is located near the Tuktoyaktuk station, with several other sites further inland. The DEW Line system was replaced and modernized under an agreement signed by Canada and the United States in 1985. Within Canada, this system is operated by the Canadian military and is made up of nine automated long range radar sites and 32 unmanned short range radar sites and four manned logistical sites located near shore along the Northwest Passage route (Capt. B. Saunders, pers. comm.). None of these sites is within the detailed study area.

The Coast Guard moves through the region three times per season to maintain navigational buoys (involving setting, checking and retrieving) (Fast et al. 1998).

## 3.3 Summary

Table 9 summarises and compares the socio-economic values of each of the Zone 1(a) areas. While it is difficult to make comparisons among different socio-economic sectors, one can apply a comparative relative scale. From a socio-economic (not ecological) perspective, Kendall Island offers the least conflict between the greatest development pressure, petroleum exploration and development, and the greatest socio-cultural values, traditional harvesting. While all three Zone 1(a) areas are important sites for beluga harvesting, Kendall Island's harvesting values are moderated by its distance from communities and comparatively less fishing, furbearer harvesting and bird harvesting. Based on the information available, the Kendall Island Zone 1(a) area also has fewer known archaeological sites, although this may be a result of research effort rather than inherent historic value. In addition, the area around the Kendall Island Zone 1(a) area offer greatest petroleum production potential.

**Table 9. Summary of Socio-Economic Values in the AOI**

| Socio-economic Sector | Shallow Bay | Kendall Island | Kugmallit Bay |
|---|---|---|---|
| Fishing | High | Moderate | High |
| Marine Mammal Harvesting | High | High | High |
| Furbearer Harvesting | High | Moderate | High |
| Bird Harvesting | High | Moderate | High |
| Archaeology | High? | Moderate | High |
| Protected Areas | Low | High | Moderate |
| Research and Education | ?? | ?? | ?? |
| Petroleum | Low | High | Moderate |
| Mining | Low | Low | Low |
| Tourism | ?? | ?? | ?? |
| Transportation | Moderate | Low? | High |

# 4.0 SCENARIO ANALYSIS

## 4.1 Description of Scenarios

The scenario analysis is intended to provide a general prediction of the consequences of management options by looking at changes in baseline uses and economic values due to potential prohibitions or elimination of activities, as well as the introduction of new activities into the areas of interest (e.g., tourism and oil and gas). The results will provide an indication of the benefits that could be lost or gained.

BSBMP provides guidelines for the management of industrial development and tourism. Specific zones are designated for protection, including the Zone 1(a) areas that define the proposed Beaufort Sea MPA. BSBMP lists the activities that are to be prohibited or controlled within these zones. This management plan is used to help specify the scenarios considered in this analysis.

Muir (1997), in her legal analysis of the IFA, concludes that a marine protected area established under Canada's *Oceans Act* would not interfere with the Inuvialuit harvesting rights as defined by the IFA. Furthermore, because of the vital link, it is assumed that the designated transportation corridor through Kugmallit Bay would be maintained. Thus, for all scenarios, it is assumed that neither of these activities will be directly affected by MPA designation.

Because activity in the Zone 1(a) areas is limited, at least voluntarily, the scenarios focus on allowing a greater degree of activity. The chosen scenarios comprise:

A. *Oil and gas driven scenario*. This development scenario assumes that identified resources adjacent to and within Zone 1(a) areas are extracted (*i.e*., directional drilling is permitted to extract oil and gas from within the candidate MPA areas).
B. *Tourism and recreation driven scenario*. Water-based tourism is permitted to continue unhindered.
C. *Combination (oil and gas; tourism and recreation) of development*. Both water-base tourism and oil and gas development are allowed to proceed as defined in the previous scenarios.

The oil and gas driven scenario assumes that all identified oil and gas resources, including those within and adjacent to the proposed Kugmallit Bay and Kendall Island MPA sites (see Table 3), are permitted for development. Although not necessarily within the Zone 1(a) areas, the close proximity of oil and gas development does place the associated marine harvesting values at risk. It is beyond the scope of this paper to provide an assessment of the level of risk involved, but unintentional impacts from accidents or disturbance of living marine resources (e.g., beluga whales) from exploration, drilling, extraction and transportation, represent potential risks. With oil and gas development, there are also potential negative impacts on the tourism and recreation sector. Specifically, negative impacts could be felt due to the sites and noises associated with development, or more indirectly with a general increase in the industrialisation of the region.

The tourism and recreation driven scenario assumes that water-based tourism operators are able to continue to use the Zone 1(a) areas *en route* to other destinations, as well as use the areas themselves as part of the

tourism product. The latter would require relaxation of the current BSBMP guidelines in the MPA Management Plan. Increases in the levels of current uses, while remaining in conformity with the BSBMP guidelines, have the potential to have a negative impact on marine harvesting activities. This is highly dependent, however, on the specific permitting granted, given the discretionary latitude provided. At this point in time, any impacts are speculative. The oil and gas sector would not be impacted by policies aimed at promoting the tourism and recreation sector, unless such policies restricted oil and gas production in favour of tourism and recreation.

With a combined oil and gas/ tourism and recreation development scenario (*i.e.*, policies designed to specifically favour the expansion of both sectors), the greatest risks to marine harvesting values come mainly from oil and gas development as previously described. Also, the extent of any conflicts between tourism and the oil and gas sector will be determined by their abilities to avoid "use overlap" (*i.e.*, competition for the same environmental space).

### 4.2 Assessment of Scenarios

In describing how the resource values may change with corresponding changes to management regulations and guidelines, one has to describe not only the current economic values associated with individual economic activities (*i.e.*, marine harvesting, resource exploration and production, tourism and recreation), but also the links between these activities and between the activities and the marine environment in the Zone 1(a) areas. The relationships are largely unknown. For example, port development and shipping could affect the beluga directly with noise generation and pollution, but the likelihood and strength of the effects remain in question (*e.g.*, FJMC 2001, p.9).

Table 10 suggests a simple, explicit framework for examining the direct impacts of possible management policies and guidelines. In the table, the first column identifies the four separate development scenarios. The first row identifies the three primary sectors that will be affected by the management policies associated with each of the four development scenarios – that is, each scenario may result in changes to marine harvesting, oil and gas production, and tourism and recreation. The set of possible management policies are determined through consideration of the management objectives for the area as described in BSBMP (FJMC 2001). Possible alternative futures that are consistent with BSBMP, as well as those that represent an alteration of BSBMP plan, are described.

There has been interest expressed by the oil and gas industry to conduct winter seismic work through the Zone 1(A)s to get a clearer picture of the resources in the area. If conducted during the winter, the effect on marine harvesting would be minimal. It would only increase the economic value of the oil and gas production if the seismic work identified more reserves. At this point, it is not possible to answer this question.

The economic activity baseline conditions reported in this study are undoubtedly different from past conditions and will likely change in the future. Changes will occur whether or not the area is designated as an MPA, being dependent on a wide variety of influences, not simply the existing local management regime.

When considering various policy scenarios for management, specific direct impacts on economic uses should not be the only consideration. Changes in the levels of one activity may, over time, positively or negatively affect

other uses. This would likely result through intermediate changes in the baseline ecological conditions (*e.g.*, an increase in oil and gas activity may lead to an eventual decrease in marine harvesting).

**Table 10. Framework for Considering the Direct Impacts of Various Policy Scenarios on Economic Uses within Zone 1(a) Areas**

| *Economic Activity* → <br> *Scenario* ↓ | Marine Harvesting | Oil and Gas Production | Tourism and Recreation |
|---|---|---|---|
| **Base case** | $169,000-$632,000 net annual value maintained | $26.5 billion-$112.5 billion gross available "in ground" less $6.6 billion | Growth in sector reliant on use of areas outside of Zone 1(a) areas |
| **Oil and gas driven scenario** | $140,000-$528,000 net annual value "at risk" | $26.5 billion-$112.5 billion gross available "in ground" | Potential negative impact (magnitude unknown) |
| **Tourism and recreation driven scenario** | Potential negative impact (magnitude unknown) | No impact, unless activities restricted in favour of tourism development | Growth at rate that is determined by industry (*i.e.*, reduced restrictions) |
| **Combination (oil and gas; tourism and recreation) of development** | $140,000-$528,000 net annual value or more "at risk" | $26.5 billion-$112.5 billion gross available "in ground" | Growth in sector reliant on ability to avoid "use overlap" with oil and gas development |

Note: The gross economic value and net annual value figures cannot be compared or weighed on equal terms as their meanings are different. The values in the figure are provided simply as indicators.

## 5.0 INFORMATION AND KNOWLEDGE GAPS

While there is extensive information available on resources and activities in the Beaufort-Mackenzie region (Eddy 2001 provides an excellent information source), the time frame of the current project did not permit sufficient time to extract detailed information relating to the three Zone 1(a) areas under consideration as a MPA from which a reliable economic assessment can be conducted value. The socio-economic assessment could be refined with additional information as summarised in Table 11.

**Table 11. Summary of Data Gaps**

| Discipline | Description | Priority | Source |
|---|---|---|---|
| **Traditional Use** | The history of the beluga hunt, so central to the Inuvialuit way of life, has never been documented (Day, pers. com.). | High | ▪ extensive discussions with elders as a means of more comprehensively articulating its significance<br>▪ traditional use |
| **Marine Harvesting** | Current data from the harvest study are not available as protocols for the third-party use of these data have not been developed. These data would be useful in providing a more accurate estimate of the total annual beluga harvest, the number of harvester, as well as locational information. | High | ▪ Inuvialuit Harvest Study (once 3rd party protocols are established) |
| **Oil and Gas** | Production schedule would be needed to more accurately assess net values. | Moderate | ▪ petroleum companies |
| **Transport** | Value of cargo, comparative air freight costs, fuel costs, etc. would be needed to more accurately assess net values. | Moderate | ▪ transport companies |
| **Tourism** | There is presently no means of determining independent tourist use of the Zone 1(a) areas. Several people indicated that cruise ships from Russia, China, Germany, etc. are seen traveling through the area *en route* to Alaska, but did not have any details on where they went or how often. While of interest in predicting regional tourism trends and the possibility of unguided tourists in the Zone 1(a) areas, information on the number and travel patterns of independent tourists would be virtually impossible to collect. Further, the number of independent tourists is known to be low based on anecdotal information. | Low | ▪ cruise ship traffic may be available through the Coast Guard |

# 6.0 MANAGEMENT IMPLICATIONS OF AN MPA DESIGNATION

## 6.1 Management Objectives

Management direction, including boundary delineation and restrictions on human activities, for a MPA are generally developed in accordance with the overall objectives of the MPA. At this stage in the process, these have not been specifically and comprehensively defined for the Beaufort MPA under consideration. Nevertheless, by virtue of identifying the three Zone 1(a) areas as defined in the BSBMP, the intent is to provide legislative authority to protecting beluga and fish habitat in support of maintaining healthy populations for subsistence harvesting including whaling. While throughout the course of the study there was a general consensus that protecting the area and the whales was beneficial, some interviewees commented that allowing beluga whales to be harvested within the MPA appeared to be contrary to protection objectives.

## 6.2 Boundary Delineation

The AOI for the proposed Beaufort Sea MPA is defined as the thee Zone 1(a) areas specified in the BSBMP. The following factors should be taken into account in delineating the MPA boundary:

- core protection areas with stricter human use restrictions surrounded by a buffer zone where limited and controlled activities could take place which do not compromise the inherent management objectives;
- designating one or two of the Zone 1(a) areas as an MPA based on the contribution of each to the management objective and the degree of conflict in values (see Table 9);
- applying different restrictions to each of the three Zone 1(a) areas;
- applying temporal restrictions during critical periods for beluga and other marine species;
- the foreshore and upland extent of the boundaries to protect the ecological values from terrestrial impacts.

## 6.3 Existing Management Direction

Management direction for the proposed MPA may be derived from existing plans, regulations and guidelines. For example, current management direction as specified in the Beaufort Sea Beluga Management Plan guidelines and the IFA include:

- all subsistence hunting and fishing would be allowed to continue as it does at present;
- the oil and gas industry should not be permitted to explore for resources within or on the shores of any Zone 1 waters nor produce hydrocarbons or construct/operate any type of facility;
- the main shipping channel through Kugmallit Bay should remain accessible to shipping traffic;
- subsistence hunting takes priority over tourism activities;
- water-based tourism and related activities are not permitted within the Zone 1(a) areas; and
- no mining activities (*e.g.*, gravel removal) should be permitted within or on the shores of any Zone 1(a) waters.

These guidelines represent a status quo scenario that is generally consistent with the spirit and intent of MPAs under the *Oceans Act.* The guidelines, if adopted in whole or in part, could provide a firm basis for the development of a management plan for a regulated MPA. However, results of this socio-economic overview have indicated that there is some interest among stakeholders of deviating from the existing management direction as expressed in BSBMP. Potential options for a MPA are discussed in more detail below. Final decisions regarding permissible uses and management prescriptions must be determined through further consultations among the Inuvialuit , regulatory agencies and other stakeholders.

### 6.4 Activities in the MPA

The socio-assessment has described qualitatively and quantitatively, where possible, the human activities in the AOI and the values they represent to the Inuvialuit and broader community. The key activities taking place in and around the AOI are beluga harvesting, oil and gas exploration, tourism and transportation. In addition, the Mackenzie Delta region represents an important research area. It is understood that beluga harvesting will not be compromised by MPA designation. However, specific issues and implications relating to the other activities need to be addressed.

Oil and Gas

Subject to pipeline routing opportunities and priority for onshore development, the oil and gas industry has expressed an interest in conducting seismic explorations in the Zone 1(a) areas. In the event that interest and feasibility of offshore exploration become more prominent, several options exist:

- permit winter seismic exploration prior to MPA designation. However, Inuvialuit hunters and others who strongly endorse a strict protection of environment, fear that the evidence of a viable reservoir would present added pressure for extracting those resources; and
- explore the feasibility of directional drilling from outside the Zone 1(a) areas (dependent on seismic work).

Both these options would require modifications to the current BSBMP guidelines.

Tourism

Tourism, and in particular, ecotourism is a growing industry in the Arctic as travellers seek more exotic and 'adventurous' experiences. While water-based tourism does not currently take place within the three Zone 1(a) areas, tourists are transited *en route* to other destinations. Control of this transit and associated implicit tourism needs to be examined. Additionally:

- further consultation with hunters is required to determine whether or not tourism activities would be appropriate in the Zone 1(a) areas. There is currently mixed feelings about tourism use of these areas in the months outside of the main beluga hunting season. There is, however, almost unanimous support among those interviewed that tourism use should be restricted while the hunt is in progress. A code of conduct for tourism, and a means to communicate to tourists and guides information about the MPAs, would be needed if tourism is permitted; and

- the permitting process for guides/operators should be coordinated – there are presently several permitting agencies such as territorial governments and INAC (for camps). If a MPA is established, likely a federal permit will also be required.

The implications on tourism of an established MPA will depend upon the types of tourism, if any, that may be permitted. Globally, MPAs are known to attract tourists interested in viewing and experiencing the values for which the areas have been protected be they oceanographic, biological or cultural. A MPA in the Beaufort Sea, although a remote destination by most standards, could potentially be successfully marketed to tourists. The economic benefits of an enhanced tourism product, although not quantifiable at this time, would likely be felt by local tour operators and business in key communities that would act as staging areas for tours. The effects of not having an MPA, or of restricting tourism use within the MPA, would be equivalent to the current scenario that is guided by BSBMP and which prohibits all tourism activity within the Zone 1(a) areas.

Transportation

The impact of overflights on the beluga whales was raised during the course of the project. There was a general feeling from the air charter companies that air traffic did not affect beluga whales and there should be no need to reroute air traffic. This potential impact needs to be more closely examined, including the possibility of imposing minimum altitude restrictions over Zone 1(a) areas, maximum number of flights, and controls on noise impacts (*e.g.*, due to different engine types). Concern was also raised about marine traffic causing whales to leave the area. However, it was also noted that whales generally return to the area after a short period of time. It is beyond the scope of this study to assess the environmental impact between marine traffic and whales. If studies are conclusive then options for modifying the shipping lane, particularly through Kugmallit Bay could be explored.

Research and Education

The Beaufort-Mackenzie region is a rich site for biophysical and archaeological research opportunities. Continuation of research within a MPA requires several considerations:

- there will be a need to maintain access to the lands adjacent to the Zone 1(a) areas for maintenance of communications sites and research facilities. Air traffic in general will need to be controlled and managed; and
- coordination of permitting processes, and means of communicating information about the MPA, should be considered for research activities.

Summary of socio-economic impacts, mitigation and enhancement options of an MPA

The negative and positive impacts of MPA designation on various socio-economic sectors are summarised in Table 12. Beyond the intended benefits of protecting beluga populations, habitat and traditional harvesting, MPA designation could also provide a research focus for biophysical and archaeological studies. These opportunities can be enhanced by embarking on a Traditional Use Study of the area, co-ordinating the research permitting process and establishing a forum for communicating and sharing research results. However, MPA designation may also serve to attract visitors and potentially intrusive research which will need to be monitored. Depending on the level of restrictions, MPA designation may also alienate some economic activities such as petroleum exploration and production, tourism and transportation. The petroleum industry could face a loss of investment

in exploration and communities could lose employment opportunities. Tourism growth would have to be reliant on areas outside the MPA for growth. The transportation industry may be curtailed by lack of access or increased cost of circumventing Zone 1(a) areas. Negative impacts on these industries could be mitigated by permitting winter-seismic activity, directional drilling, whale watching from shore or in months other than July and August, and low overflight restrictions during July and August. However, given that two of the three Zone 1(a) areas are within direct transportation marine and air corridors, transportation restrictions (e.g., through trips only, no stopping, minimum flight altitude) would be difficult to enforce.

**Table 12. Summary of Socio-Economic Impacts, Mitigation and Enhancement Options of an MPA**

| Socio-economic Sector | Negative Impact | Positive Impact | Mitigate/Enhance |
|---|---|---|---|
| **Subsistence Harvesting** | | ▪ Protected resource<br>▪ Continuation of traditional use | |
| **Archaeology/ History** | | ▪ Less disturbance to archaeological sites<br>▪ Opportunities for further studies | ▪ Traditional Use Study |
| **Protected Areas** | ▪ Could serve to attract more visitors | ▪ Beluga sanctuary<br>▪ Node in MPA network | ▪ Monitoring |
| **Research and Education** | ▪ Impact of intrusive research | ▪ Provides a research focus<br>▪ Opportunities for public education | ▪ Monitoring<br>▪ Co-ordination of permitting process<br>▪ Forum to communicate of research results |
| **Petroleum Exploration and Production** | ▪ Loss of investment (compensation issues)<br>▪ Loss of employment<br>▪ Loss of revenue | ▪ Reduced impact on beluga | ▪ Winter seismic activity<br>▪ Directional drilling |
| **Mining** | - | - | - |
| **Tourism** | ▪ Restriction of activity<br>▪ Growth reliant on areas outside Zone 1(a) | ▪ Reduced impact on beluga<br>▪ Reduced intrusion on traditional harvesting | ▪ Whale watching except July and August<br>▪ Whale watching from onshore<br>▪ Enforcement |
| **Transportation** | ▪ Lack of access<br>▪ Additional cost of circumventing Zone 1(a) area | ▪ Reduced impact on beluga | ▪ Low overflight restriction s July and August<br>▪ Enforcement |

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Traditional Use

Aviugana, Donald. Secretary Treasurer, Aklavik Hunters and Trappers

Binder, Richard. Inuvik Hunters and Trappers Committee, Inuvik

Carpenter, Larry. Wildlife Management Advisory Council (NWT) and Inuvialuit Harvest Study Management Committee, Inuvik

Day, Billy. Inuvialuit Elder, Inuvik Hunters and Trappers Committee, Inuvik

Gordon, Danny C. Director, Alkavik Hunters and Trappers

Gruben, Charles. Director, Tuktoyaktuk Hunters and Trappers Committee

Kasook, Pat. Director, Aklavik Hunters and Trappers

Pokiak, Frank. Tuktoyaktuk Hunters and Trappers Committee, Tuktoyaktuk

Smith, Duane. Chair, Inuvialuit Game Council, Inuvik

Oil and Gas Exploration and Development

Butcher, Delona. Chevron Canada, Calgary

Buzan, Larry. Senior Landman, New Ventures, Unconventional Reservoirs, Burlington Resources Canada Ltd. Co., Calgary

Collier, David. General Manager, Frontier, Shell Canada, Calgary

Hunt, John. Senior Advisor, Stakeholder Relations, Environmental Health and Safety and International, PetroCanada, Calgary

Jefferies, Rob. Anadarko Canada, Calgary

Lewis, Patti. SunCor Energy Inc., Calgary

Luckasavitch, Rick. Imperial Oil Resources, Calgary

MacEachern, Bruce. Environmental Health and Safety, AEC West Ltd., Calgary

Meyer, Rod. BP Canada Energy Co., Calgary

Millman, Peter. Devon Canada (formerly Anderson Exploration), Calgary

Plesuk, Brian. Conoco-Phillips, Calgary

Scott, Ian. Canadian Association of Petroleum Producers, Calgary

Taylor, Tim. Team Leader, Technical and Project Support, Environmental Health and Safety and International, PetroCanada, Calgary

Transportation

Craig, Mike. Base Manager, Canadian Helicopter, Inuvik

Dalton, Ken. Base Manager, Aklak Air, Inuvik

Falsness, Carl. President, Arctic Wings Ltd., Inuvik

Hagen, Willard. Beaudril Air, Inuvik

Knott, Roger. Stage Air, Inuvik

Hladun, Doug. Base Manager, TransNorth Helicopters, Inuvik

Lewis, Jason. Base Manager, Highland Helicopters, Inuvik

Maher, Tom. Canadian Coast Guard, Hay River

Newmark, Russell. E. Grueben's Transport, Inuvik

Whitlock, Greg. Manager, Environment & Regulation, Northern Transportation Co. Ltd., Inuvik

Tourism

Cournoyea, John. Regional Tourism Officer, RWED, Inuvik

Kisoun, Gerry. Inuvialuit Hunter and Tourist Guide, Inuvik

Venaas, Judith. Regional Tourism Officer, RWED, Inuvik

Zimmerman, Dennis. Manager of Inuvialuit Tourism, Invuialuit Development Corporation, Inuvik

Science and Research

Branigan, Marsha. Wolf/Bear Biologist, RWED, Inuvik

Dickson, Lynn. Canadian Wildlife Service, Edmonton

Hart, Elisa. Inuvik. Archaeological Consultant to Inuvialuit Social Development Program

Harwood, Lois. Stock Assessment Biologist, Fisheries and Oceans Canada, Inuvik

Hines, Jim. Senior Biologist, Canadian Wildlife Service, Yellowknife

Larter, Nick. . Biologist, RWED, Inuvik

Latour, Paul. Habitat Biologist, Canadian Wildlife Service, Yellowknife
Stephenson, Sam. Fisheries Management Biologist, Fisheries and Oceans Canada, Inuvik
Wall, Jim. Manager, Scientific Services, Aurora Research Institute, Inuvik.

Regulatory/Management
Baetz, Conrad. Resource Management Officer II, DIAND, Inuvik
Clarkson, Peter. Mayor of Inuvik
Fehr, Alan. Superintendent, Western Arctic Field Unit, Parks Canada, Inuvik
Korec, John. National Energy Board (NEB), Calgary
Saunders, Bob. Captain, Department of National Defense, Yellowknife
Snow, Norm. Executive Director, Joint Secretariat, Inuvialuit Renewable Resources Committees, Inuvik
Staples, Lindsay. Chair, Wildlife Management Advisory Council (North Slope), Whitehorse
Taptuna, Fred. Permit Officer, Fisheries and Oceans Canada, Hay River
Thiesenhausen, Katherine. Resource Person, Wildlife Management Advisory Council (NWT), Inuvik
Walker, Robert. Resource Management Officer III, DIAND, Inuvik

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## APPENDIX A. Interview Protocols

The following questions were used as a guidelines for discussion. Interviewees were asked questions based on their experience in the area and expertise.

Date of Interview: Interviewer: In Person/Phone

Name: Organisation:

**BACKGROUND AND PREAMBLE**

Fisheries and Oceans Canada in partnership with the Inuvialuit are assessing the areas referred to as Zone 1a in the Beaufort Sea Beluga Management Plan (BSBMP) as a potential marine protected area. These three Zone 1a areas are all located within the Mackenzie River estuary. The BSBMP calls for these Zone 1a's to be treated as protected areas. Currently these areas are being treated by the regulatory agencies as protected but this is on a voluntary basis as the BSBMP has no regulatory powers. The Fisheries Joint Management Committee (FJMC) has requested DFO to assess these three Zone 1a areas for protection under the Oceans Act.

Further discussions with the Inuvialuit led to the formation of a Senior Management Committee and a Working Group to implement the Beaufort Sea Integrated Management Planning Initiative (BSIMPI) with the initial task of assessing the BSBMP Zone 1a's as a potential Marine Protected Area.

The Oceans Act defines a MPA as an area, which has been designated for special protection for one or more of the following reasons:

a) the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats;
b) the conservation and protection of endangered or threatened marine species, and their habitats;
c) the conservation and protection of unique habitats;
d) the conservation and protection of marine areas of high biodiversity or biological productivity; and
e) the conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister (of Fisheries and Oceans).

The overall assessment of the potential MPA is being conducted through three assessment studies. These are ecological, socio-economic and technical assessments.

After completion of the assessments in January, these reports will be reviewed by a joint meeting of the FJMC and BSIMPI Working Group. This review would lead to one or more recommendations to the Senior Management Committee (SMC) for their comment and/or decision. If the recommendation was favorable to having these areas become a MPA and the recommendation was accepted by the SMC then further consultations would occur and a management plan developed for the potential MPA. After consultations and the

approval of a management plan by the SMC a regulatory impact assessment would have to be completed by the Federal Government prior to the areas being designated as a MPA.

If one or more of the three Zone 1a's were to become a MPA, the management plan would be required to be consistent with the Inuvialuit Final Agreement (IFA). All subsistence hunting and fishing would be allowed to continue as it does at present. Also the main shipping channel through Kugmalit Bay would still be accessible to shipping traffic.

As part of this process, the Beaufort Sea Integrated Management Planning Initiative (BSIMPI), which is overseeing the planning for this proposed MPA, has directed Kavik-AXYS to undertake a socio-economic assessment of the proposed MPA and surrounding area. The objective of the socio-economic assessment is to provide a general description of current uses in the study area and to evaluate potential socio-economic impacts of the proposed MPA, specifically:

- How would the establishment of a MPA affect human activities in and around the proposed MPA?
- How can socio-economic benefits of the MPA be enhanced or the costs reduced?

You are being asked to participate in this interview because of your knowledge regarding a specific type of activity in the proposed Beaufort Sea Marine Protected Area. When answering the questions, please keep in mind that we are asking you to respond with knowledge regarding your own use of the area, but also knowledge of the whole of the activity (i.e., all individuals or organizations involved).

The information you provide will be held strictly confidential and will only be reported by aggregating with other information so that the source of information can not be determined.

*NB*

1. *Interviewers should recognize that most interviewees will have been asked similar questions during other studies. Interviewers should bring copies of the Community Conservation Plan and ask if it is still valid or what updates need to be made, or additions need to be included.*
2. *Not all these questions are relevant to each interviewee. Select the set of questions that is most relevant to the interviewee. After which, ask the interviewee if they are familiar with any of the other activities covered in this survey for which they would like to contribute some information.*
3. *These questions can also be used for telephone interviews, in which case the interviewee can be asked to send (email or fax preferred) the relevant information to answer the questions.*

## Part A – HUMAN USE

### Traditional Uses

(See note 1 above regarding Community Conservation Plans)

1. Do you hunt or fish in the area?
2. Which species do you harvest?
3. Which areas do you **mainly** use (on map)?
4. How often do you hunt/fish in these main areas?
5. Which other areas do you use **less frequently** for hunting/fishing?
6. How often do you hunt/fish in these secondary/other areas?
7. What other sites (e.g., camps, caches) do you use for hunting/fishing?
8. How many people generally join you in your hunting/fishing party?
9. How long have you been hunting/fishing in the area?
10. How important are these areas relative to other areas outside the study area?
11. Please describe how your hunting/fishing varies between seasons, i.e., does the activity take place throughout the year? Are there certain areas which are used in particular seasons? (on map)
12. How much do you harvest in a year?
13. What types of equipment and gear do you use? What other supplies do you require (e.g., fuel)? Can you estimate the total cost of your equipment and supplies on an annual basis? Do you purchase your equipment and supplies locally?
14. Have you noticed a change in harvest (hunting or fishing) in recent years?
15. What do you use the catch for, e.g., food, trade, clothing?
16. Other than food that you consume, are there other **social** or **economic** benefits that you receive from your harvesting activities?
17. Do you or your community engage in activities other than hunting or fishing in the study area? If so, where and what kind of activities (on map)?

18. Do you feel that other activities presently occurring in the study area affect your subsistence harvesting (see list below)? If so, how and to what degree do they affect your harvesting?

    a. oil and gas;
    b. mining for sand and gravel;
    c. transportation;
    d. tourism; and
    e. science and research.
    f. other _____

19. Do you feel that other activities presently occurring in the study area bring economic benefits to the community (see list below)? Why or why not?

    a. oil and gas;
    b. mining for sand and gravel;
    c. transportation;
    d. tourism; and
    e. science and research.
    f. other _____

20. Do you have anything you would like to add or any additional comments regarding your traditional use of the area?

## Oil and Gas Exploration and Development

1. What is the oil/gas potential of the Zone 1 Area?

2. Are there any oil/gas tenures in the Zone 1 Area or in the vicinity of the area? If so,

    a. Where are they located (coordinates preferably)
    b. What is the status of each tenure?
    c. For what commodity is the tenure?
    d. How much has been produced to date and what is the estimated future production?
    e. What is the method of extraction? (please be specific about the activities, i.e., drilling from artificial island or land, etc.)
    f. How and by what route is the product or commodity transported?
    g. Who owns the tenure?

3. If the Zone 1A areas were available for development, describe the estimated/proposed scope of oil/gas activity in the Zone 1a areas, including:

    a. Type/range of operations;
    b. The location of operations;
    c. Primary equipment used;
    d. Size and frequency of the operations;
    e. Seasonality of use; and
    f. Organisations involved.

4. If the Zone 1 A areas were to remain closed, could you suggest any measures or alternatives that could be used to mitigate the impacts of a regulated closure on your operations?

5. Are there any plans for future exploration and/or development in areas adjacent to the Zone 1A areas? If so,

    a. What plans are being considered?
    b. Where would they occur?
    c. When would they occur and for how long?
    d. What exactly would be involved directly and indirectly with moving ahead with exploration and/or development plans?

6. In general terms, describe the current scope of oil/gas activity in the **region**, including:

    a. Type/range of operations;
    b. The location of operations;
    c. Primary equipment used;
    d. Size and frequency of the operations;
    e. Seasonality of use; and
    f. Individuals involved.

7. Describe the recent history of the oil and gas activity in **region,** including:

    a. Changes in the type/range of operations;
    b. Changes in the location of operations;
    c. Changes in the size and frequency of operations; and
    d. Changes in the organisations involved.

8. Do you have anything you would like to add or any additional comments regarding oil and gas activities in the area?

## Transportation

1. What types of vessels/aircraft travel through or close to the study area?

2. What is their purpose in the area?

3. What is their typical origin and destination?

4. How many vessels/aircraft travel through the area per day (shipping density)?

5. How often do these vessels/aircraft travel through the area and do they make any stops in the vicinity of the study area? What are the seasonality constraints?

6. Are there any alternative routes for these vessels/aircraft? Are there any related activities associated with the passage of these vessels? (e.g. additional small boat traffic from cruise ships, training activities for Canada Coast Guard, SAR or the military, etc.)

7. Describe the recent history of the activity in the study area, including:
   a. Changes in the type/range of operations;
   b. Changes in the location of operations;
   c. Changes in the size and frequency of operations; and
   d. Changes in the individuals involved.

8. Do you have anything you would like to add or any additional comments regarding transportation activities in the area?

## Tourism Operations

1. What types of tourism use occur in the study area (on map)?

2. Do you presently use the study area for tourism or have you used the area in the past? If yes, please provide specific details on this use, including:
    a. length of time operating in study area;
    b. size of company (in terms of staff, offices);
    c. types of activities offered;
    d. locations of use (using map);
    e. number and frequency of trips;
    f. duration of trips;
    g. mode(s) of transport;
    h. equipment used; and
    i. number of clients (per trip and per year).

3. If a user, what key factors, features or values (e.g., landscape, culture, wildlife, accessibility, etc.) influence your use of this area?

4. Are you planning to use the area in the future for your tourism operations? If yes, please provide locations and specific details to the extent that you are able (see above, question 2).

5. Please describe how your activity varies between seasons?, i.e., Does the activity take place throughout the year? Are there certain areas which are used in particular seasons?

6. Are you aware of, or do you perceive, any conflicts between the different types of tourism occurring? If yes, please elaborate.

7. Are you aware of, or do you perceive, any conflicts between tourism use and other types of activities occurring (e.g., oil and gas, traditional fishing, beluga harvest, or research activities)? If yes, please elaborate.

8. Describe the recent history of the activity in the study area, including:
    a. Changes in the type/range of operations;
    b. Changes in the location of operations;
    c. Changes in the size and frequency of operations; and
    d. Changes in the individuals involved.

9. Do you have anything you would like to add or any additional comments regarding tourism uses in the area?

## Science and Research

1. Are you aware of any science or research use occurring within the marine study area or in adjacent areas?

2. What types of science or research studies have occurred or are occurring in the study area?

3. Do you / your organization presently use the study area for science or research activities, or have you used the area in the past? If yes, please provide specific details on this use, including:
    a. how long you have been conducting research (duration of study);
    b. topic(s) of research;
    c. location(s) (using map) for each distinct study;
    d. number and frequency of research trips;
    e. duration of trips to study sites;
    f. mode(s) of transport;
    g. base of research (e.g., communities or research camps); and
    h. the number of researchers on each trip.

4. Are you planning to use the area in the future, or might you consider using the area in the future for science or research studies? If yes, please provide specific details to the extent that you are able (see above).

5. Use maps to denote known current or planned areas and types of science or research activities.

6. Why is your research conducted specifically in the area(s) noted? (Prompt for specific reasons such as location of study subject, accessibility, source of funding, etc.)

7. What types of equipment and gear do you use? What other supplies do you require (e.g., fuel)? Can you estimate the total cost of your equipment and supplies on an annual basis? Do you purchase your equipment and supplies locally?

8. How do you perceive science and research contributing to the social or economic well-being of the people in the ISR?

9. If results of studies are available (and are relevant to socio-economic use), could we receive a copy of the results?

10. Describe the recent history of the activity in the study area, including:
    a. Changes in the type/range of operations;
    b. Changes in the location of operations;
    c. Changes in the size and frequency of operations; and
    d. Changes in the individuals involved.

11. Do you have anything you would like to add or any additional comments regarding science and research activities in the area?

## PART B – ECONOMICS

*Note: Focus on this question should be on uses which occur within, or traverse through, the Zone 1A study area.*

Preamble: We have asked you a number of questions regarding your use of the study area. To complete a socio-economic study we also require information on economic benefits of the activities in which you participate. Please remember that any responses you provide are treated as confidential and will not be reported in any way that might identify you or your operations.

1. Would you be willing to discuss questions of an economic nature, i.e., costs and revenues?

If yes, ask questions 2 and 3 informing the interviewee that if they do not have the information available at the time of the interview, they can provide it at a later time by phone or in writing (Note: stress time constraints of project and need to receive information as soon as possible).

2. For **marketed** direct uses of the study area, describe:
   a. The gross annual revenues generated (for your use, if not all users involved);
   b. Recent changes in the gross annual revenues;
   c. Any costs to operations that are unique to the use of the area; and
   d. Recent changes in cost structure.

3. For **non-marketed** extractive uses of the study area, describe:
   a. The total annual harvest;
   b. Recent changes to the annual harvest that have affected the economic benefits received from this activity;
   c. Any costs to activities that are unique to the use of the area; and
   d. Recent changes in cost structure.

## PART C – CONCLUDING QUESTIONS

1. Do you think it is worthwhile to continue with the process of assessing whether or not the Zone 1A areas should be designated as a Marine Protected Area?

2. We are talking to groups/organizations X,Y,Z. Do you think we have missed anyone? If yes, could you provide specific details about how we can contact these individuals?

3. Do you have any other comments at this time?

## APPENDIX B. A Primer on Economic Valuation

Recently, interest has focused on describing economic uses and quantifying the economic values associated with marine protected areas (MPAs) (*e.g.*, Phillips 1998; Bunce *et al*. 2000; Cesar 2000). There are three broad options regarding the approach for an economic analysis – any one or a combination of these may be employed.

1. document the characteristics of the activities (*e.g.*, structure of the economic activities, economic linkages, frequency and extent of use, use patterns);
2. explore the economic impacts associated with the current use of the study area (*e.g.*, the gross financial revenues generated, the value added to the larger economy by the activities, and the direct and indirect employment attributed to the use of the area); and
3. more specifically examine the economic benefits associated with the use of the environment by estimating net values.

Total economic value includes marketed and non-marketed direct use values, indirect use values, potential use values and non-use values.

Marine environment valuation studies have focused not simply on use values, but more broadly on identifying:

- the values attributed to tourism and recreation, harvested products, education and research (information values);
- ecological functions or services (*e.g.*, biodiversity maintenance, ecological support of harvested products);
- existence (utility from knowing the marine system exists in a given state or condition, although there is no actual or potential use of the environment); and
- optional uses (the value of a potential benefit or having the option to use the environment in the future) (*e.g.*, see review by Cartier and Ruitenbeek 2000).

Specific approaches to valuation and the selection of methodologies should be driven by the specific policy or management questions, the types of values that one wishes to quantify, and the socio-economic and environmental context of the study site.

Quantifying direct use values that are marketed is a matter of estimating the net production values associated with the economic activities (*e.g.*, commercial fishing, resource extraction, wildlife watching tours). In addition to the market value information, it is also desirable to quantify utility or indirect use values (consumer surplus) – that is, the value to the consumer above the costs to purchase. Quantifying indirect use values can be more problematic, often because there is little known about the linkages between the environment and the economic activities it indirectly supports. Potential use benefits and non-use benefits can also be methodologically difficult to quantify. Option and existence values are often estimated through:

- the creation of hypothetical markets (*i.e.*, values revealed through contingent valuation surveys);
- the examination of surrogate markets (*e.g.*, differences in property prices related to attributes of the environment); or
- other behaviours that reveal the value of the benefits (*e.g.*, the value of the time one is willing to forsake to visit and enjoy the environment).

All methodologies currently available for estimating option and existence values have notable deficiencies and should be chosen to fit the specific study context.

## APPENDIX C. Biophysical Research in the Vicinity of Zone 1(a) Beluga Protection Areas, 1996-2001 (ARI 2001)

| Year | Lead Researcher & Agency | Approximate Locations | Title | Description |
|---|---|---|---|---|
| 1996 | Burn, C.R.<br>Carleton University | Richards Island (Illisarvik), Garry Island | Investigation of Ground Ice Development in Sediments of the Mackenzie Delta Area | Continuation of nearly 20 years of investigations of ground ice conditions at Illisarvik on Richards Island. A series of benchmarks was installed to monitor how the ground deforms around ice wedges as they expand and contract each year. |
| 1996 | MacKay, J.R.<br>University of British Columbia | Garry Island, Illisarvik, pingo 20 km west of Tuktoyaktuk and Paulatuk | Permafrost Studies: Western Arctic Coast | Continuation of studies on the origin of permafrost and processes that helped to create the present geocryoloigic environment. On Richards Island, the study focused on pingos, their origin, growth and stability. |
| 1996 | Melling, H.<br>Institute of Ocean Sciences | Offshore Beaufort Sea | Ice Thickness Topography Study - Beaufort Sea | Ice measurements were made by untended instruments operating beneath the sea throughout the year. Surveys of water properties were also conducted at 15 selected sites in the offshore using a ski-equipped Twin Otter as a flying laboratory. |
| 1996 | Chiperzak, D.<br>Fisheries and Oceans Canada | Shingle Point, Coney Lake, outer Mackenzie River Delta, and Mackenzie River (Aklavik) | Inconnu Anchor Tagging and Radio Tagging Migratory Study | A total of 34 inconnu were fitted with radio transmitters at four locations including fourteen that were fitted at Shingle Point. Fish were tracked primarily with fixed-wing aircraft to determine their movements. |
| 1996 | Forbes, D.<br>Bedford Institute of Oceanography | Tuktoyaktuk Peninsula, Richards Island, modern Mackenzie Delta front | Coastal Impacts of Climate Change | Field work was performed from the Alaska border to the Tuktoyaktuk Peninsula and included sites in the outer Mackenzie Delta. The program consisted of surveys of the beach and nearshore using a |

| Year | Lead Researcher & | Approximate | Title | Description |
|---|---|---|---|---|
| | | | | combination of high resolution GPS and echosounding systems which allowed the development of a 3-D picture of the shape of the beach. |
| 1997 | Reimer, K. Environmental Services Group | Komakuk Beach (BAR-1), Nicholson Peninsula (BAR-4) | Delineation of Komokuk Beach and Nicholson Peninsula | An environmental delineation of the BAR-4 radar site and Komakuk Beach (BAR-1) was conducted. The study was undertaken to provide an up-to-date estimate of the volume of soil to be remediated prior to issuing specification for remediation of the site, and to determine PCB content of paint at the site. |
| 1997 | Burn, C.R. Carleton University | Richards Island (Illisarvik), Garry Island | Investigations of ground ice development in sediments of the Mackenzie Delta area. | Continued investigations of ground ice conditions at Illisarvik on Richards Island. A geophysical survey of the drained lake bed was also initiated to investigate changes since a similar survey in 1982. |
| 1997 | MacKay, J.R. University of British Columbia | Garry Island, Illisarvik, pingo 20 km west of Tuktoyaktuk, and Paulatuk | Permafrost Studies: Western Arctic Coast | Two weeks of field work were carried out along the coast to the west and east of Tuktoyaktuk in association with C. Burn of Carleton University. Samples were collected at the top of permafrost to determine the ice (water) content. At Garry Island, mearsurements on the growth and deformation of ice wedge polygons were extended to more than 30 years. |
| 1998 | Burn, C.R. Carleton University | Richards Island (Illisarvik), Garry Island, Inuvik area | Permafrost Investigations: Western Canadian Arctic | Field investigations were conducted at Illisarvik, a drained lake on Richards Island, to study the growth of a small pingo which appeared in 1995, 17 years after the lake had drained. Also examined the doming up of pond ice in |

| Year | Lead Researcher & | Approximate | Title | Description |
|---|---|---|---|---|
| | | | | the lake bottom which occurs every winter. |
| 1998 | Murton, J.<br>University of Sussex | Liverpool Bay and Eskimo Lakes area | The Origin of Deformed Massive Ice, Pleistocene Mackenzie Delta | Geological field work to study massive underground ice and sediment that have been deformed beneath a glacier that previously covered this region. |
| 1999 | Kovalench, S. | Beaufort-Mackenzie Delta | Geographic Information Systems (GIS) Range Management Feasibility Study for Kunnek Resource Development Corporation | N/A |
| 2000 | Riseborough, D.<br>Carleton University | | The Influence of Snowcover on the Ground Surface Temperature in Permafrost | N/A |
| 2000 | Nagy, J.<br>NWT RWED Wildlife Division | | Cape Bathurst Caribou Study | N/A |
| 2000 | Branigan, M.<br>NWT RWED Wildlife Division | | | N/A |
| 2000 | Riseborough, D.<br>Carleton University | | The Influence of Snowcover on the Ground Surface Temperature in Permafrost | This study attempts to understand and predict how cold the ground surface gets in the winter under snow. |
| 2001 | Burn, C.<br>Carleton University | Richards Island (Illisarvik), Garry Island, Inuvik area | Permafrost Investigations in Western Arctic Canada | At Illisarvik, the research team will investigate heave of the lake bottom and growth of permafrost in the drained lake. Changes in the ground due to uplift, associated with the growth of a pingo, and sideways movements due to the growth of ice wedges, will be measured. Air, ground, and lake water temperatures will also be measured. |
| 2001 | Riseborough, D.<br>Carleton University | | The Influence of Snowcover on the Ground Surface | This study will attempt to understand and predict how cold the ground surface gets in |

| Year | Lead Researcher & | Approximate | Title | Description |
|---|---|---|---|---|
| | | | Temperature in Permafrost | the winter under snow. |
| 2001 | Murton, J.<br>University of Sussex | Tuktoyaktuk coastline | Arctic Sand Sheet Development | The project objectives are to establish the natural controls on, and timing of, aeolian sand sheet development during the last glacial-interglacial cycle in the Tuktoyaktuk Coastlands. |
| 2001 | Blasco, S.<br>Bedford Institute of Oceanography | Beaufort Sea | Evaluation of New Technologies for Environmental Impact Assessment in the Offshore, Canadian Beaufort Sea | This project will evaluate new technologies that could prove effective in assessing the environmental impact of offshore pipelines on the renewable resources of the Beaufort Sea. The Coast Guard vessel *CCGS Nahidik* will be used as a research platform to conduct offshore surveys in the Beaufort Sea. A regional grid of survey lines which were first surveyed in the1980s will be resurveyed. |
| 2001 | Nagy, J.<br>NWT RWED Wildlife Division | Large area in the western arctic south of Tuktoyaktuk | Cape Bathurst Caribou Study | Movement of female caribou of the Bathurst Herd. |
| 2001 | Branigan, M.<br>NWT RWED Wildlife Division | North-eastern Mackenzie Delta | Assessment of Grizzly Bear and Black Bear population Size | Obtain current estimates of the number of grizzly and black bears in the NE portion of the Mackenzie Delta. Assess the potential for use of DNA capture techniques to estimate numbers of grizzly and black bears in the NE portion of the Delta. |
| 2001 | Komers, P.<br>Inuvialuit Environmental & Geotechnical Inc. | North-eastern Mackenzie Delta | Biophysical Survey of Baseline Data for Plant Communities and Animals | Map vegetation communities and wildlife habitats in the region, including bird communities, using GIS remote sensing and spatial modelling. Ground truthing and mapping analyses based on satellite imagery. |
| 2001 | Lois Harwood | Baby Island or Kendall Island | Beaufort Sea Beluga: Reproduction – Year 2 | Collect stock-specific data for the Beaufort Sea beluga. Collect reproductive tracts |

| Year | Lead Researcher & | Approximate | Title | Description |
|---|---|---|---|---|
| | | | | from females, on site, for five summers. Blood, tissue and organs for contaminants, genetics and disease studies will be collected concurrently. These items will be analysed and reported separately. |