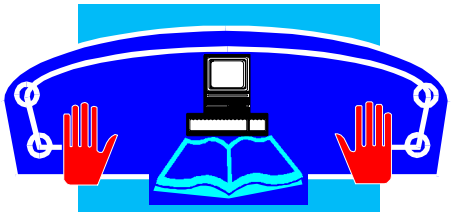

Guidelines For The Preparation Of An Environmental Impact Statement - The Beaufort Sea Hydrocarbon Production Proposal

Date of Report: 1982

Author: Canada - Environmental Assessment Review Office

Catalogue Number: 6-1-57

February 1982

Guidelines for the Preparation of an Environmental Impact Statement

The Beaufort Sea Hydrocarbon Production Proposal

BEAUFORT SEA ENVIRONMENTAL ASSESSMENT PANEL

Canada

Environmental Assessment Review

GUIDELINES FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

THE BEAUFORT SEA HYDROCARBON PRODUCTION PROPOSAL

BEAUFORT SEA
ENVIRONMENTAL ASSESSMENT PANEL

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THE BEAUFORT SEA HYDROCARBON PRODUCTION PROPOSAL

GUIDELINES FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

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1. INTRODUCTION

1.1 Background

The Environmental Assessment and Review Process (EARP) of the Government of Canada requires that proposed federal programs and activities that are likely to have significant environmental or socio-economic effects, be submitted to an Environmental Assessment Panel for review before any decision is made to proceed. The Panel, formed under the authority of the Minister of the Environment, reviews an Environmental Impact Statement (EIS) and other relevant documents. An important feature of such a review is that it includes opportunities for public input.

The Beaufort Sea Hydrocarbon Production Proposal was referred by the Minister of Indian Affairs and Northern Development to the Minister of the Environment, in July 1980 for a Panel review. The Department of Indian Affairs and Northern Development (DIAND) is the "initiator" and the "proponents" are Dome Petroleum Limited, Gulf Canada Resources Inc. and Esso Resources Canada Limited. In referring the proposal, the Minister of Indian Affairs and Northern Development indicated that the Panel review was to consider both the environmental and socio-economic effects north of 60° N latitude of hydrocarbon production in the Beaufort Sea and transportation routes to southern markets.

Consistent with the Minister's letter of referral, these Guidelines are being issued by the Panel to DIAND as a basis for the preparation of an Environmental Impact Statement (EIS) by the proponents on their Beaufort Sea Hydrocarbon Production Proposal. Changes in these Guidelines can only be made by the Panel.

In keeping with the objectives of the federal Environmental Assessment and Review Process, this proposal has been referred for a Panel review in the early planning stage. The EIS, therefore, should address environmental and socio-economic issues associated with a proposal for hydrocarbon production in the Beaufort Sea-Mackenzie Delta area and alternate modes of transportation to southern markets (tanker, pipelines or both). Project and site specific details, as they are developed, will be reviewed and assessed by other mechanisms at appropriate times.

DIAND and the proponents are expected to observe the intent of, rather than the letter of, the Guidelines and to make every effort to identify and describe all significant environmental and socio-economic effects likely to arise from the proposal, even for situations not explicitly identified in these Guidelines. Both desirable and adverse effects should be identified and discussed.

It is possible . . .

It is possible that these Guidelines include matters which, in the judgement of the proponents, are not relevant or significant to the proposal. If such matters are omitted from the EIS, this should clearly be indicated so the public and government agencies will have the opportunity to comment upon this judgement. Where the Panel disagrees with the proponents' statements in this regard, it may require additional information from the proponents.

1.2 The Proposal

The Guidelines apply to the proposal as submitted by the proponents. (See Dome-Gulf -Esso document entitled "Hydrocarbon Development in the Beaufort Sea - Mackenzie Delta Region" dated June, 1981)

1.3 General Features of the EIS

1.3.1 The EIS should be an easy to read document. The Panel believes that one of the most important elements of the EIS review will be broad public participation by both lay readers and specialist reviewers and this dual aspect should be incorporated into the preparation of the EIS.

1.3.2 Detailed scientific and technical material, of interest primarily to specialist reviewers, should be referenced and included where appropriate. Reports and documents, not readily available to the public, upon which key conclusions are based should be cited and made available in a timely manner to specialist reviewers. Published literature should be referenced where contentious material is involved. Although not a requirement, reviewers would be assisted if the names and expertise of persons responsible for important sections of the EIS were given.

1.3.3 A zone approach to presenting material in the EIS is recommended to help communities focus on those portions of greatest interest to them. In view of the administrative entities of the Yukon and Northwest Territories, flexibility is encouraged in the zone approach. It may be desirable to have a separate zone for the Yukon. The recommended zones for the description of the existing biophysical and socio-economic environment and assessment of developmental effects, are:

Zone I . . .

Zone I - Beaufort Sea and adjacent coastal areas. This zone should include Amundsen Gulf as the eastern boundary and extend west to the Alaska/Yukon border. It should encompass all potential areas of production and transportation in the Beaufort Sea and should include the coastal (including the Yukon coast) and Mackenzie Delta areas that may be affected by offshore and onshore activities, by shore-based marine terminals, and by shore-based support facilities and activities.

Zone II - Terrestrial areas north of 60°. This zone should encompass potential pipeline and transportation corridors (including the Mackenzie River).

Zone III - Tanker routes. This zone should encompass potential tanker routes and adjacent land areas in Canada north of 60° and outside of Zones I and II.

1.3.4 A preliminary production and transportation proposal including alternative plans to the year 2000 should be described. In developing the proposal, and in assessing the associated environmental and socio-economic effects, the consequences of variations in the proposal should be considered. In describing the proposal, hydrocarbon exploration activities taking place concurrently with production should be included.

1.3.5 Socio-economic issues should be incorporated into the development of the sections on physical and biological effects in addition to their separate treatment in the socio-economic effects section.

1.3.6 The following scientific issues and their implications should be discussed thoroughly in the EIS:

1.3.6.1 Major oil spills: probability, clean-up capability, impact potential

1.3.6.2 . . .

1.3.6.2 Major chemical spills: probability, clean-up capability, impact potential

1.3.6.3 Adequate protection for social values and significant natural and cultural resources

1.3.6.4 Cumulative effects of impacts.

1.3.7 Emphasis should be given to ecological processes. These processes should be defined and the proposed developments analyzed to show how they might affect these processes.

1.3.8 Important knowledge deficiencies should be specified and remedial steps indicated.

1.4 Organization of the EIS

1.4.1 Overview: this should be suitable for review by the general reader. It should capture, in brief, the possible environmental and socio-economic effects of the proposal and the efforts that will be made to enhance desirable effects and to avoid and mitigate adverse effects.

1.4.2 Background: this section should contain information on the proposal including preliminary production and transportation plans, with alternatives, and the rationale for preferred choices.

1.4.3 Baseline description of the existing environment: physical, biological, and socio-economic. In this section emphasis should be placed on those features and processes likely to affect significantly and be affected significantly by the proposed development.

1.4.4 Impact analyses: this section should be the focus of the EIS. It should include an analysis of significant issues, impact predictions, mitigationand compensation measures; enhancement of desirable effects; monitoring; knowledge deficiencies, and research needs.

1.4.5 Summary: a separately published document for each zone should complement the Overview (Section 1.4.1)

and should summarize . . .

and should summarize the major environmental and socio-economic effects for Zones I, II, and III (Section 1.3.3).

1.5 Responsibilities of the Proponents

The responsibilities of all proponents must be clearly identified in the EIS, including proponents of associated projects relevant to the proposal.

2. Contents of Environmental Impact Statement

2.1 Overview

The Overview should allow a reader to obtain both a concise idea of the contents of the EIS and to focus on items of specific interest. It should be understandable and in a format that can be used by the public, extracted directly for publication by the news media or used by those who want quick appraisal of the situation.

The Overview is to be published as a separate document. It should briefly describe the proposal and the existing environmental and socio-economic setting, the major environmental and socio-economic effects and the measures to be implemented for avoidance, mitigation, compensation or enhancement. Additionally, the significance of any residual environmental or socio-economic effects should be discussed and any recommended monitoring programs described. Aspects of the proposal that might stimulate public concern should be described with particular clarity. The Overview should also clearly identify knowledge deficiencies and the limitations they impose on the EIS.

Because of the widespread interest in the Beaufort Sea hydrocarbon production and transportation proposal, the vast scope of the proposal and the broad range and complexity of the issues involved, the EIS, and in particular the Overview, is expected to be widely circulated and read. Therefore, the Panel believes it is of the utmost importance that the Overview be carefully prepared and readily understood.

2.2 Background

2.2.1 The Proposal

This section should include a description of the Beaufort Sea hydrocarbon production and transportation proposal.*

*As defined by the proponents, the Beaufort Sea hydrocarbon production and transportation proposal is for Production and transportation of Beaufort Sea hydrocarbon resources. Within this proposal are various alternatives for production and transportation components.

This proposal should be based on the best projections of the likely scope and progress of development.

Other reasonable modes of production and transportation considered in the development of the proponents' proposal should be described and reasons given for their rejection. Possible alternatives in the proponents' proposal should be discussed, particularly where such alternatives may lead to significant differences in predicted impacts. The alternatives of tankers vs pipelines should be addressed in depth.

Restrictions placed on the proposal by existing or proposed special use areas, such as the northern Yukon, should be discussed.

Ongoing exploration activities taking place at the same time as actual production should be described along with the production and transportation components of the proposal.

The proponents should also discuss how they view the question of need or demand for the production and transportation of oil and gas from the Beaufort Sea.

2.2.1.1 General Layout

The EIS should include suitable maps in appropriate scale showing the location of potential and proposed major facilities in relation to easily recognizable geographic features and human settlements. Maps should also be provided showing the potential and proposed routes of ice-breaking tankers and pipelines.

In addition, all components of proposed development, and how they relate to one another as development progresses, should be described, using suitable illustrations.

2.2.1.2 Construction

The following are some of the items that should be covered in the EIS:

a) the location, method and timing of construction

b) the types . . .

b) the types, **approximate** quantities, **location, timing and method of acquisition of construction materials and** services

c) projected manpower requirements by location (numbers, types, skills, recruitment area and timing)

d) the **number, type and** skill level requirement of employment positions which over time could be filled by local people/ northerners

e) projected manpower training requirements and proposed site(s) and timing of training

f) management of imported labour to minimize adverse impacts on communities and maximize community benefits

g) location and other information, including traffic projections, on temporary and permanent access roads

h) air traffic requirements associated with construction including size and projected locations of air fields, size and numbers of aircraft and frequency of flights

i) location, size, duration and services of construction camps, operational camps and staging areas

j) expected quantities and characteristics of toxic **wastes, debris, effluents and emissions, including** noise **caused by or attributable to construction**

k) locations, methods and timing of construction, and dredging requirements for any harbours and marine terminals, river channel supply routes, approaches and so on.

1) information on telecommunications facilities, planned or needed.

2.2.1.3 Operation **and Maintenance . . .**

2.2.1.3 Operation and Maintenance

The following are some of the items that should be covered in the EIS:

a) important timing and other commissioning details

b) operational methods of the proposed production and transportation systems

c) a general description of the operation and maintenance of the offshore production platforms or islands

d) manpower requirements by location (numbers, types, skills, recruitment area and timing)

e) projected manpower training requirements and proposed site(s) and timing of training.

f) management of imported labour to minimize adverse impacts on communities and maximize community benefits

g) numbers and features of all marine vessels, including ice-breakers, supply vessels and other support vessels and of ice-breaking tankers **to be used to transport oil and gas. Information on tankers should include their** manoeuverability, **abilities to withstand** collision with **ice and pressures of converging** ice, their abilities **to navigate throughout the proposed transportation season and abilities to avoid, control and** clean up spills in the event of hull damage (differentiate **between** proven and untested capabilities). Descriptions of operation, maintenance and navigational practices for all vessels should also be provided, including the methods for collecting, treating and disposing of pollutants such as bilge water and sewage

h) location and requirements of navigational facilities along the tanker routes

i) information on . . .

i) information on operational , surveillance and maintenance practices for overland pipelines including procedures for oil spill clean-up.

j) other information concerning drilling and production systems **such as** certification **and inspection requirements, performance history, capacity, blow-out prevention** (B.O.P.) equipment and procedures, design against environmental threats such as moving ice, ice scour, storms, and so on, navigation and communications equipment and qualifications of personnel. Special attention should be given to new and innovative designs (e.g. to reduce noise levels) of systems and equipment and their reliability

k) proposed methods for handling or disposing of the gas obtained during oil production, such as **re-injection,** flaring, transportation, and so on

1) proposed methods for the treatment and disposal of **industrial water and produced waters (water extracted** during **processing of oil and gas)**

m) **information concerning the operation and maintenance of on-shore facilities including oil and gas storage facilities,** dry dock facilities, ship mooring and transfer facilities, housing, roads, air-strips, water supply, waste disposal, and other ancillary service features directly related to the proposal

n) information concerning the operation and maintenance of sub-sea gathering and pipeline systems

o) information on support craft (air and water) with respect to environmental threats (for example, storms, wind, wave, currents, fo9 and ice and icinq conditions), navigation and communication equipment ar d qualifications of crews

P) information on search and rescue facilities

q information on . . .

q) information on acquisition of materials and **services**

r) information on systems **for detecting, identifying and tracking ice formations**

s) **storage, treatment and disposal of waste or toxic substances** used or generated during all phases of operation and maintenance. Identify potential air, land or water contaminants and outline mitigative methods to avoid health hazards to humans and animals and degradation of the environment

t) sewage treatment and disposal facilities and practices

u) solid waste gathering, storage and disposal facilities and practices

v) sources of water and the uses to which such water is to be put

w) information on accommodation of operational staff

x) information on risk analysis for all major production and transportation components, singly and within overall development scenarios with the inclusion of possible future fail safe devices

y) information on telecommunications requirements and facilities planned or needed.

2.2.1.4 Environmental Hazard Prediction Systems

Describe surveillance and prediction systems planned to provide adequate information about weather, ice, sea-state, and so on, and indicate how these systems will be integrated with and operated within existing and proposed observation and prediction systems.

2.2.1.5 Abandonment . . .

2.2.1.5 Abandonment

The following are some of the items that should be covered in this section:

a) equipment and facilities, both onshore and offshore, that will be removed or abandoned temporarily or permanently, how and when these will be removed, to where they will be removed, and how and when the area will be reclaimed, stabilized or otherwise secured

b) information on the storage or ultimate disposal of any contaminant stored or otherwise contained in the area

This section should also include a discussion of the possibility of an early total abandonment of all production activities in addition to a phased and more orderly abandonment.

2.2.2 Associated Projects and Proposals

Identify all other projects and development proposals (including hydrocarbon transportation systems) that may affect or be affected by the Beaufort Sea hydrocarbon production and transportation proposal and which in turn may cause environmental and socio-economic concerns. Discuss the interrelationships of such associated projects with each other and with the Beaufort Sea proposal in terms of their environmental and socio-economic effects. State whether these concerns fall within the jurisdiction of DIAND, the proponents, others or some combination of jurisdictions. Consideration of associated projects and proposals should include, but need not be limited to, the following: the Mackenzie Delta Gas Gathering System, transportation in the Mackenzie Valley, the Mackenzie Highway, the Arctic Pilot Project, the Dempster Pipeline Project, production and transportation of barite from the Yukon, the Alaska Highway Gas Pipeline Project, the Polar Gas Pipeline Project, Lancaster Sound Drilling, the Norman Wells Oilfield Development and Pipeline Project and northern communications projects such as MSAT Mobile Satellite Program.

2.3 Description of . . .

2.3 Description of the Existing Environment

The intent of this section is to describe the baseline environment and the biological, physical and socio-economic processes at work, with emphasis placed on those elements that are likely to be significantly affected. However, it should not provide a lengthy, in-depth description of all aspects of the existing physical, biological and socio-economic environment. The criteria used to specify "significance" should be defined.

The description of the environmental and socio-economic setting must provide the foundation of the impact predictions, including a general but thorough treatment of physical/ biological variability between seasons, fluctuations between years, and predicted trends over the next 5, 10 and 20 years. The proponents should judge the uncertainty (probability) and causes of any predicted/recorded environmental variables associated with ice breakup, storm tracks, ocean circulation, seabird populations, nutrient recycling, coastal erosion, river freshet, etc., which place severe limitations on the validity of impact predictions.

The description of the existing environment should include consideration of physical, biological and socio-economic effects that have occurred to date resulting from hydrocarbon exploration activities.

2.3.1 Physical Environment

Significant aspects of the physical environment should be described. Attention should be directed to processes and natural changes likely to occur within the anticipated service life of the proposed development.

The following general categories of information should be addressed:

a) climate and air quality

b) sea ice including types, location, characteristics, movements, break-up and freeze-up patterns

c) geological and geomorphological setting and history, including seismic history and risk

d) oceanographic information including water movements, *storm* surges, wave climates, and chemical oceanography

e) coastal zone . . .

e) coastal zone geomorphology

f) submarine and terrestrial permafrost, submarine pingo-like features, permafrost genesis and evolution

Further specific details for this section are included in Appendix A.

2.3.2 Biological Environment

This section should discuss the ecological processes and their role in the stability, productivity, variability and resiliency of the following communities of plants and animals:

a) micro-organisms
b) aquatic vegetation
c) terrestrial vegetation
d) zooplankton
e) benthos
f) fish
g) mammals
h) birds
i) sensitive species.

Further specific details for this section are included in Appendix B,

2.3.3 Socio-economic Environment

This section should include a description of the existing social environment (including related economic factors) for each community that would be affected by the proposal. Inter-community and inter-zone relationships and ties should also be discussed. The importance of northerners' input to this section cannot be stressed enough.

A description of the following general categories of socio-economic information-should be included:

a) demographics
b) social and cultural history and existing patterns
c) services and facilities
d) local business and industry

e) land and . . .

e) land and resource use, including fishing and hunting of mammals and birds
f) employment
g) education and training
h) cost of living
i) energy use
j) transportation and accommodation facilities for employees and/or trainees.

An overview discussion of the relevant social and economic dislocations, problems and benefits resulting from the interaction of the native and non-native cultures and life-styles should be included.

The present social and economic state of each of the communities should be analyzed and discussed. A prediction of socio-economic conditions to the year 2000 in the absence of the proposed development should be made.

Further specific details for this section are included in Appendix C.

2.4 Impact Analysis, Enhancement, Mitigation and Compensatory Measures and Monitoring

This section should provide the focus for the entire Environmental Impact Statement within the conceptual framework identified in Sections 1.3.5, 1.3.6, 1.3.7 and 1.3.8. It should include a comprehensive discussion of potentially significant physical, biological and socio-economic effects. The enhancement of desirable effects and the avoidance and mitigation of adverse effects should be considered. Compensation of adverse effects should also be considered.

The rating system used to determine the significance of the effects should be described in sufficient detail for the reader to understand the conclusions reached.

Estimates of cumulative environmental and socio-economic effects, in accordance with the proposal, should be given. All estimates of effects, both short-term and cumulative should be based on the most recent information. The extent

and significance of knowledge gaps should be identified, particularly where **such deficiencies affect Predictions** of impact. " **Needs** for further research or data collection to improve prediction capabilities and understanding shou d be identified. '

Potentially significant effects in the coastal waters of A aska and Greenland associated with transportation shou d be described and discussed. This should recognize that possible effects in these areas cannot be examined by the Panel to the same degree of detail as those effects occurring inside Canadian jurisdiction. Adverse effects on the North Labrador coast resulting from tanker activities in South Davis Strait **north of 60 should also be described.**

Potentially significant effects arising from exploration activities during the period of production should be included in the overall assessment of effects.

Potentially significant effects should be analyzed and discussed in terms of predicted qualities, quantities and values and should be identified in the design, construction, operation and maintenance and abandonment phases of the proposal.

In addition to the identification of significant effects, **an** investigation and discussion of options and measures to avoid, minimize, mitigate or compensate for harmful effects and to enhance beneficial effects, should be included. Residual adverse effects remaining after all mitigation and compensatory measures have been considered should be identified. Plans for surveillance and monitoring of effects should also be detailed.

2.4.1 Effects on the Physical Environment

Potential effects on the physical environment and of the physical environment on the proponents' proposal are to be identified and thoroughly analyzed. Emphasis shall be placed on those effects that are deemed to be significant.

Describe areas of influence or impact (air, sea, land) for each major production component and for selected development alternatives.

Net impacts after . . .

Net impacts after proposed mitigative measures should account for regional differences in weather, ocean circulation, ice cover, permafrost and so on.

The physical environment to be addressed should include, but should not be limited to, the following general categories and specific issues

2.4 1.1 Ice

- Consequences of disrupting the integrity of the landfast ice in winter and spring in the Beaufort Sea, Amundsen Gulf and through the Archipelago, as well as other disruptions to the natural ice regime

- possibility of artificial islands anchoring or modifying the ice further offshore and the possible effects on marine mammals, hunting and fishing

  effects of ice pressure and ice scouring on artificial islands, sub-sea pipeline gathering systems and sub-sea well head structures

- effects of ice on ice-breaking tanker traffic and of ice-breaking tanker traffic on ice regime

- physical effects of spilled oil on and under sea, lake and river ice

- need for adequate ice information, weather and sea-state reporting and forecast systems.

2.4. 1.2 Climate

- Effects on operating and emergency procedures of extreme climatic conditions

  effects of operations on local climates, for example, ice fog

- effects on . . .

effects on construction and operation activities of possible long term climatic changes and vice versa.

2.4.1.3 Permafrost

- Stability of well bores and well completions in areas of sub-sea permafrost

  stability of structures founded on permafrost, both on land and beneath the sea

- the likelihood and consequences of the growth or degradation of permafrost resulting from construction and abandonment of any structure or facility (such as an artificial island for production, processing or support purposes).

2.4.1.4 Water and Air Quality

- Changes in water quality resulting from oil or gas spills

- changes in water quality resulting from liquid and solid waste disposal and increased water use for human consumption and industrial purposes

  changes in air quality resulting from emissions from incinerators, gas processing plants, generator plants, vehicles and pumping stations

  effects of particulate air emissions on snow and ice melt characteristics

  chronic water pollution resulting from normal construction and operation activities, including dredge spoil.

2.4.1.5 Others . . .

2.4.1.5 Others

- Potential effects due to increased noise levels in the marine and terrestrial environments

- effects resulting from the borrow and disposal of construction material associated with the building of offshore islands, pipelines, roads and so on

  effects of river pipeline crossings, bridges and other similar structures on **river regimes, including the possibility of** long **term sedimentation and erosion problems**

- tundra degradation resulting from on-**shore operations, including pipeline construction**

  effects of major fires, including forest fires, associated with **or on the development (including the immediate area surrounding it and ancillary facilities). Describe** fire prevention, detection and suppression during construction, operation and abandonment of the proposal

  effects of the choice of marine transportation corridors for **deep draft vessels including tankers** in terns of adequately surveyed and charted waters, with particular emphasis on the Mackenzie Shelf

  effects of ongoing sea-bottom and river dredging on water depths and the need to update hydrographic charts. Also discuss the responsibility for and timing of adequate charts and their updates for arctic marine shipping

2.4.2 Effects on the Biological Environment

Potential effects on plant and animal communities and their key components should be identified and thoroughly

analyzed, particularly . . .

analyzed, particularly **for each major development component** such as Arctic Production and Loading Atolls, deep draft harbours, etc. The accumulative and synergistic effects with other development components should also be identified and analyzed. Emphasis should be placed on those effects, both beneficial and adverse, that are deemed to be significant. This section should **include potential effects on ecological interrelationships among the major species or groups of species and impacts on ecological** processes.

Man too must be considered **in the analysis of the effects on the biological environment since man counts on the animals** for **food and the animals and man both count on the land, the sea and the air.**

The biological environment to be addressed should include, but should not be limited to, the following general categories and specific issues.

2.4.2.1 Major Spills (see also Section 1.3.6.1)

- The proponents should choose several hypothetical spill locations within each production and transportation zone **for different seasons of the year. Differences** in the dispersion and effect of the spill should be described **for different spill** sources such as oilwell blowouts, tanker spills, pipeline breaks and so on. Whenever possible, the hypothetical spills, trajectories and impact predictions should be chosen to reflect any major geographical variabilities within zones and include preferred or high risk locations such as Tarsiut and McKinley Bay, Prince of Wales Strait and Lancaster Sound.

- In discussing hypothetical spills, the following should be considered:

  - effects of a major marine oil spill *on* birds, marine mammals, fish and other marine and terrestrial animal and plant life

  - effects of a major oil spill, for example, resulting from the rupture of an overland pipeline, on the freshwater and terrestrial biological environment

effects of a . . .

- effects of a major gas loss.

2.4.2.2 Offshore Operations

- Effects on marine life of construction and operational activities associated with harbour development, artificial island construction, undersea pipelines, large scale dredging programs, etc.

2.4.2.3 Onshore Operations Including Pipelines

- Effects of onshore construction and operation activities, including noise, on fish, mammals and birds, and their habitats

- effects of upland and coastal activities, particularly relating to the construction and operation of pipelines and the use of overland transportation routes such as the Dempster Highway on behaviour and productivity of caribou, grizzly bears and other terrestrial mammals.

2.4.2.4 Tanker Operations

- Effects of ice-breaking operations, including noise and the creation of open water areas, on the natural movements and migrations of marine and other animals such as whales, seals, polar bears, and sea birds

- **effects of ice-breaking operations on the natural movements of man and terrestrial animals** such as caribou and musk-oxen crossing frozen channels and straits between islands.

2.4.2.5 Pollution Effects

- Short and long term effects on the biological environment resulting from liquid and solid waste disposal practices and air emissions including a discussion of the rates and amounts of disposed/ spilled pollutants and their fate in the particular

environments in which . . .

environments **in which they may be disposed of or spilled**

chronic pollution effects on the **food chain and dependant higher animals resulting from discharges to the environment of substances** such as drilling fluids and formation cuttings, produced water, process cooling water, ballast water, rig washwater and minor fuel spills.

2.4.2.6 Others

- Loss **of upland, foreshore and sub-sea fish and** wildlife habitat resulting **from all aspects of** construction and operation **activities**

- effects of improved access **and increased human** populations **on fish and wi** dlife due to greater **recreational and commercia** hunting and **fishing**

effects of wage employment on hunting habits and wildlife resource use in general.

2.4.3 Risk Analysis, Probability and Clean-Up Measures

Because of the major environmental concerns arising from the possibility of a major spill of oil or gas or other pollutants, a detailed analysis of this type of potential impact, including worst case scenarios, should be prepared. The discussion should include:

2.4.3.1 Risk Analysis and Probability

(Note: Some of the material requested in this section may be more appropriately covered in Section 2.4.2.1.)

In the event of a major spill (well blow-out, ruptured pipeline or tanker accident), estimate the type, flow rate and duration of gas and oil (or gas condensate or produced waters) likely to be released. Identify the probable physical state of the spilled Beaufort Sea hydrocarbon (e.g., surface slick, mousse, emulsion, sub-surface droplet, sheen, tarballs, interaction with ice). Include a

discussion of the . . .

discussion of the risks associated with the proposal and areas considered sensitive to oil pollution. The probability of episodic and chronic spills of various sizes and types during production, storage or transportation should be estimated and detection methods described. Estimates of, and methodology to determine, maximum, undetected losses should also be included. Similar information should be provided for other potential pollutants.

This exercise should include instances of spills from undersea and overland pipelines.

2.4.3.2 Clean-Up Measures

The risk analysis outlined above should be used to:

a) describe and estimate the capabilities and limitations of any countermeasures that may be undertaken to control pollutants including oil on the sea surface (with or without the presence of ice), beneath the surface, at the sea-land interface and on land. Discuss the capability and probability of readily stopping or controlling episodic spills at source

b) discuss the capability, timing and logistics of drilling a relief well (include the availability of equipment) and alternatives to a relief well

c) present a model to predict scenarios for the trajectory and dispersion of oil on the surface of the ocean using oceanographic and meteorological inputs taking account of the presence of sea ice where applicable. Discuss the limitations (spatial and temporal) of the model, and the data basis used for defining and testing the model. Attention should also be given to the problem of subsurface transport and deposition

d) describe the organization, logistics and technology required to track, contain and clean

up a spill involving oil, gas condensates and other pollutants for various scenarios of seasons and weather. Include scenarios for worst possible weather or ocean conditions. The following factors should be taken into account where applicable:

- notification procedures and chain of command

- roles and responsibilities of industry and government personnel including government responsibility centers and established reporting procedures

- interface with existing or proposed contingency plans (company, agency, territorial, national and international)

- personnel and equipment requirements (provide an inventory and location for the necessary communicate on, containment, clean up and disposal equipment)

- time required for effective action

- method of estimating the trajectory and dispersion of the gas in the atmosphere in the case of sour gas

  identification of critical biota at risk in an oil spill and measures proposed to deflect wildlife populations from approaching oil

- describe measures to remove oil from birds and mammals contaminated by oil

e) discuss by season the behaviour of gas and oil and produced water escaping from a well blowout or pipeline rupture at the bottom of the sea, oil or gas from a tanker, or from an overland pipeline. Include in the discussion:

  - estimates of how much gas and oil might remain on the sea floor or in the water column through dissolution or change of state

  - methods of estimating the trajectory and dispersion of the gas and oil while in the water column

ultimate fate of . . .

- ultimate fate of the oil, including times for biodegradation, or other disposition

f) describe the training program for field personnel and proposed contingency response exercises

g) possible measures under way to increase the effectiveness of presently existing spill control and clean up measures

h) provide information on the ultimate disposal for recovered pollutants including oil and oily waste

i) outline links between proponents' contingency plan and existing government contingency plans

j) describe hazard prediction and communication systems

2.4.4 Effects on the Socio-Economic Environment

All potential effects on the social environment (including related economic factors) should be identified and thoroughly analyzed. Emphasis should be placed on those effects that are deemed to be significant. As in Section 2.3.3, the importance of northerners' input to this section cannot be stressed enough.

Identify how and to what extent input from concerned individuals, public groups and communities has been obtained by the proponents in preparing this section. Plans for continued consultation to obtain future input from these people should also be provided.

Social and economic trends as they would be without the proposed development and as they would be affected by development should be discussed. In addition, should development proceed, projected effects for each community and their interrelationships with other communities should be analyzed. If new communities are to be established, for example at King Point, reasons for the establishment of these communities should be given and the effects on existing communities should be discussed.

The socio-economic . . .

The socio-economic environment to be addressed should include, but should not be limited to, the following general categories and issues:

2.4.4.1 Demographics

effects of development on short and long term population dynamics, including increases and/or decreases in population, and changes in population distribution by age, sex and ethnic origin

2.4.4.2 Social and Cultural Patterns

effects of a major employment base away from the communities on family and community stability

effects of development on community quality of life, life-styles and social patterns; also effects on cultural aspirations of northerners

effects of development on social stability, alcohol and drug problems, crime and violence, marital and family problems and health problems

effects of dependence on a wage based economy resulting from large-scale development as opposed to a more traditional hunting and trapping based economy

2.4.4.3 Services and Facilities

effects of development on community social and institutional services such as: health care, social assistance programs, police and fire protection, recreational facilities, schools and the need for additional services to meet development related demands. Discussion should centre on the division of responsibilities between the various levels of government and industry in providing community infrastructure and services

effects of development on community services such as: housing, water supply, sewage and solid waste disposal, roads, and power generation and

distribution, and on...

distribution, and on the need for additional services to meet development related demands

- effects of development on local and regional transportation facilities and services

- effect of development on existing telecommunications services and on need for and provision of new telecommunications facilities and services

2.4.4.4 Local Businesses and Industries

- plans for early notification and encouragement of local business opportunities

- capability and opportunities for local businesses to take part in business opportunities created by development

2.4.4.5 Land and Resource Use

- effects of development on current or projected land use management plans

- development related short and/or long term land use needs near communities which could affect future land use planning

- short and long term development effects on the renewable resource base including a discussion of local perceptions of effects on this base

- potential for competition between this development, other developments and local needs for non-renewable resources in short supply or difficult to obtain

2.4.4.6 Employment, Education and Training

effects of development related demand for labour on the local, regional and territorial labour force; consider job occupations and skills, project and rotational schedules, duration of jobs, location of jobs, numbers of jobs, and wages

- effects of . . .

effects of competition between development related job requirements and manpower required by existing businesses, institutions and traditional activities

- effects of development employment on the local labour force's income levels and distribution, and the degree to **which this may change life-styles and economic activity**

- access by northerners to job opportunities resulting from development

- equity of remuneration and other benefits for northerners as compared to imported labour

- adequacy of training opportunities available to enable northerners to take advantage of development job openings

- union involvement in employment activities and the effect on local employment and business opportunities

- describe proposed plans for transportation and accommodation of trainees

2.4.4.7 Energy Use

- discuss the potential effects of development on community energy supply and cost

2.4.4.8 Health, Safety and Search and Rescue

- describe employee and public safety measures for potentially hazardous conditions, e.g., evacuation of an artificial island

identify and describe plans for search and rescue procedures and facilities

- describe plans for the provision of medical services for employees. Also describe plans, if any, for assistance with community health care services

- identify and describe . . .

- identify and describe plans for dealing with any toxic substances generated by development activities which could adversely affect the health of residents of nearby communities.

2.4.4.9 Others

- effects of development on areas of archaeological, historical or cultural importance

effects of the proposal on the native land claims process and of the land claims process on the proposal. Also describe the proponents' policies, if any, with respect to land claims negotiations. Problems and opportunities presented by the land claims issue should be discussed.

2.4.5 Impact Management

The identification and extent of technical and social measures, including employee environmental and local cultural education programs, that are considered essential in avoiding, mitigating or compensating for adverse effects and enhancing positive effects, should be clearly delineated. The potential for effectiveness of each proposed measure should be discussed. It may be difficult, in some cases, to define these relevant actions before development takes place. In such cases, the proponents should identify what should be monitored to determine if mitigation or enhancement is required and to some extent the feasibility of those measures. Approximate relative costs should be provided where possible.

The proponents should also discuss the relevant current knowledge of specific mitigation, compensatory or enhancement measures through specific monitoring or research programs. Knowledge gaps should be identified and the role that industry considers to be its responsibility in filling these gaps should be discussed.

2.4.6 Monitoring

A program designed to monitor possible environmental and socio-economic consequences of Beaufort Sea oil and gas production and transportation should be described. Proposed monitoring mechanisms and scope of the program should be included. The EIS should identify the types of information that will provide a suitable

baseline for subsequent . . .

baseline for subsequent monitoring and assessing the utility and limitations of an effective monitoring program based on the availability (or lack of) certain information. In addition, plans for incorporating information from monitoring **programs into project operations and plans** for monitoring the effectiveness of enhancement, mitigation and compensation measures should be outlined. Types of project impacts that may require monitoring should be identified. The proponents should also comment on their perceptions of the various responsibilities of both government and industry associated with monitoring all facets of the proposal. Statements on existing and desirable regulatory mechanisms related to project monitoring should be considered.

Plans for evaluating the results of the monitoring program should be discussed, including plans for amending the monitoring program in reaction to these evaluations.

2.5 Summary of Impacts by Zone for Community Review

The purpose of this summary is to provide the residents of the affected communities with a clear, concise summary of the full EIS, presented on a zone by zone basis. It should be a **separate document for each zone. It should be written in plain, non-technical language and should include an** Inuit **and** Dene language translation. The zones to be used for this document are to include at least the three zones outlined in Section I.

The summary should briefly describe the proposal and, on a zone by zone basis, the existing environmental and socio-economic setting, the major beneficial and adverse environmental and socio-economic effects associated with the proposal, the proposed mitigation, enhancement and compensatory measures, and the proposed monitoring programs. Those aspects of the proposal and associated effects which are likely to be of greatest interest and concern to the communities should be highlighted. Also, an indication of possible participation by the respective residents **in various activities associated with the proposal should be included.**

2.6 Appendices

The appendices should include lists of references cited, lists or reports prepared in support of the EIS, lists of field data used to describe the physical, biological and socio-economic environment and to undertake impact analysis. Reports and documents not readily available to the public upon which key conclusions are based should be cited and made available to the Panel upon request. Additional copies of this information must be made available at the same time for public perusal at locations to be determined.

Appendices . . .

Appendices

3, APPENDICES

Appendix A: Outline of Specific Components to be Included in the Description of the Existing Physical Environment

As mentioned in Section 2.3.1, this appendix is a more detailed listing of components of the physical environment that should be included in that section of the EIS. In discussing the physical environment, the guiding principle should be the relevancy to the proposal, the scientific issues (Section 1.3.6), and the concerns relating to development.

A.1 Climate and Air Quality

a) Regional climatology - climatic zones and main features.

b) Mean and extreme temperatures; frequencies and deviations of temperature and windchill ranges that may have significant effects on operations; values for various return periods.

c) Wind and atmospheric stability related to the concentration and dispersion of airborne pollutants and to the formation of ice fog; wind velocity, frequency, direction and duration of critical wind speeds.

d) Monthly mean and extreme precipitation, potential for the accumulation of ice or snow on structures as a result of precipitation or freezing spray.

e) Probability of significant ranges of low ceilings and risibilities associated with fog, ice fog, cloud, precipitation or blowing snow as factors influencing operational efficiency or emergency procedures.

f) Arctic night-day regime including hours of daylight and darkness at various times of the year.

g) Extreme storms relative to security of drilling and production systems, support craft (air or water) and on-shore facilities.

h) Frequency of occurrence of combined events that impact on off-shore operating limits.

i) Details of the establishment of weather sea-state and sea-ice reporting and prediction systems and their integration with relevant physical oceanographic data.

j) Types and levels of air pollutants and existing air quality for the region.

k) Probable nature and . . .

k) **Probable nature and extent of climatic change during the lifetime of the project.**

1) Duration and adequacy of the information base on climate. This should include the weaknesses and data gaps, especially for the design data **needs, and the proposals to overcome these deficiencies.**

A.2 Sea Ice

a) The various types of ice to be encountered (e.g. landfast ice, pack ice, ice islands, icebergs).

b) State, characteristics and motion of sea-ice in the Beaufort Sea and the Northwest Passage, including consideration of lifting force, strength, pressure, bearing capacity, extent, growth, break-up, freeze-up and jamming.

c) The circulation of ice off the western Arctic shores, known as the Beaufort Gyre; other ice movement patterns in the Beaufort Sea, the Northwest Passage, Baffin Bay, and north-west Atlantic Ocean.

d) Average and extreme extent of open water areas after break-up; average and extreme lengths of ice-free season.

e) Variability of the preceding ice and open water conditions.

A.3 Geology

a) Geomorphological **and geological settings and** geologic history of the region including:

i) surficial geology with geotechnical considerations, and the delineation of potential areas for seabed engineering development in the Beaufort Sea and along transportation corridors.

ii) bedrock geology, including hydrocarbon reserve potential and tectonic history

b) Surficial and engineering geology with **reference to properties pertinent to each distinct engineering structure (well-head completion, production platform, pipeline, etc.). Aspects to be described should include:**

i) distribution and thickness . . .

i) distribution and thickness of submarine surficial sediments, the texture, structure and morphology of these sediments

ii) geotechnical properties of submarine surficial sediments (e.g., shear strength, sediment stability under static and dynamic conditions, pore pressure)

iii) seabottom features requiring special engineering considerations such as: erosional channels, unconformities, boulder fields, gas charged sediments, shallow and deep permafrost, gas hydrates, geopressures (possible gas and water), pingos, mud volcanos, diapirs, aggregate (sources and volumes)

c) The spatial distribution of features associated with dynamic processes, and the magnitude and frequency of occurrence of these processes including: faulting, slumping, sediment dynamics (transport, erosion, deposition, sedimentation rates, consequences of dredging), seabed dynamics (bottom currents and wave action effects), coastal zone dynamics and sensitivity.

d) Seismic history of the region and an assessment of seismic risk.

e) Provisions for monitoring long term seabed/structure interaction (i.e., instrumentation to assess creep, permafrost degradation and aggravation, seismic risk, artificial island erosion, etc.).

A.4 Oceanography

a) Spatial and temporal variability of surface, sub-surface, and near-bottom currents, including mean and seasonal flows, tides, inertial period motions, upwelling areas, oceanic fronts and so on as they relate to concentration and dispersion of pollutants.

b) Wave climate including extreme values as they relate to structural integrity, disruption of operations, contingency planning, storm surges.

c) Ice scouring with particular reference to the frequency and depth of scours and the relationship between water depth and scour distribution.

d) Sea surface and ...

d) Sea surface and sub-surface temperatures and profiles.

e) Chemical oceanography including but not limited to salinity, dissolved oxygen, nutrients, trace metals, hydrocarbon levels, and water quality and suspended solids.

f) The **Mackenzie River and Delta and their inter-relationships with the Beaufort Sea, including the effects of fresh water and silt inputs to the Beaufort Sea, and the effects on marine current patterns.**

A.5 Coastal Zone

Describe the geomorphology of the coastal zone including estuaries and immediate hinterlands of all areas including the Yukon Coast, with particular reference to the Mackenzie estuary and delta potentially affected by marine oilspills and land based aspects of the proposal (including overland pipelines and permanent or temporary roads). Geomorphic processes (e.g. , shoreline and coastal processes, slumping, etc.) as affecting the proposed development or being adversely affected so as to cause problems, should be included.

A.6 Permafrost

Describe the occurrence of continuous and discontinuous permafrost terrain in the coastal area affected by the proposal and along the proposed pipeline corridors. The occurrence of sub-sea permafrost in the production areas should also be discussed. The dynamic aspects of permafrost and susceptibility to change should be considered. Such descriptions should include the temperature regime ice-content, degree of ice-bonding, texture, lithology and relevant geotechnical parameters of permafrost materials that occur adjacent to proposed engineering works. For sea-bed permafrost, description of the geotechnical response of permafrost to bottom founded structures, including pipelines, production well-bores and well-head completions should be provided, particularly where such structures will be in immediate association with permafrost materials.

Appendix B: Outline of Specific Components to be Included in the Description of the Existing Biological Environment

The biological environment should be described in terms of community associations and their components in various key habitats with emphasis placed on the ecological processes influencing their stability, productivity, variability and resiliency.

In describing the biotic components of the communities, key factors in their life requirements should also be described such as habitat, food, seasonal distributions and movements and natural population limiting mechanisms. The sensitivity of the communities and species being considered and their vulnerability to man induced changes to their natural circumstances should be discussed.

In addition to the above, when describing the biotic components of communities, the following should be considered and discussed:

a) Micro-organisms

- distribution and abundance of indigenous microbiota, with special reference to oleoclasts and their effectiveness relative to specific hydrocarbon components

b) Aquatic Vegetation

- species composition, distribution, abundance and production on a seasonal basis

c) Terrestrial Vegetation

species composition, distribution, their significance to man or essentiality within the communities

d) Zooplankton

species composition, distribution, abundance on a seasonal basis

evaluation of biomass on a seasonal and geographic basis, including an analysis of the degree of variation

e) Benthos

species composition, distribution and abundance on a seasonal basis in areas likely to be affected by the proposal , together with susceptibility to oil contamination.

f) Fish

seasonal distribution and abundance of marine, anadromous and fresh water eggs and larvae

seasonal distribution . . .

- seasonal distribution and abundance of **juvenile and adult marine, anadromous and fresh water** fish

- fisheries (marine, anadromous and fresh water species) with emphasis on seasonally important areas and fish densities, migration behaviour, spawning requirements and sensitivities to disturbance

9) Mamma 1s

- population size of marine mammals (including polar bear) and land mammals that could be affected by the proposal

- designation of areas important to any species, for example, nursery, feeding, calving, migration, wintering, etc.

h) Birds

seasonal distribution, movements and abundance of bird populations

- location and population estimates of seabird colonies

- identification and details of Spring and Fal migration patterns

identification and details of nesting, breed ng, feeding and over-wintering areas

identification of environmental features affecting the timing of nesting and breeding and migration of the various species of birds

i) Sensitive Species

- the identification of any species which may be affected by the proposal and that act as important food resources for other cohabiting species

identification of species that at present are of direct value to society such as those that may be considered rare or endangered or important for subsistence, scientific, commercial or recreational use

j) Historic Trends . . .

j) Historic Trends

historic trends in the use of the affected area by animal populations, including those of direct and indirect importance as well as those endangered by man's activities

k) Biological Systems

sensitivity of ecological processes to natural and man induced disturbances and their resiliency to change

- predevelopment levels of potential environmental contaminants in the physical environment, and in selected indicator species

- the sensitivity of biological systems to pollutants which may result from the proposal.

Appendix C: Outline of the Specific Components to be Included in the Description of the Existing Socio-Economic Environment

As mentioned in Section 2.3.3, this appendix is a more detailed listing of coinponents of the social environment (including related economic factors) that should be included in that section of the **EIS:**

C.1 Demographics

- population of communities and zones
- population distributions by age, sex and ethnic background
- birth and death rates

  migration patterns

C.2 Social and Cultural History and Existing Patterns

- cultural history of the region in total
- historical background of each of the communities

  community social patterns, attitudes and life-styles

  residents' perceptions of and aspirations **for each community's** development

  community reactions to local issues and projects occurring in the community, or the region in total

  role of hunting and fishing

C.3 Services and Facilities (including discuss on of who supplies these)

- community housing types and availability
- health and welfare services including alcohol prevention and treatment facilities
- leisure and recreational opportunities

  community infrastructure
- transportation facilities and services
- police services
- telecommunications facilities (both satellite and terrestrial)

C.4 Local Businesses . . . .

C.4 Local Businesses and Industry

- basis of community economic activities

  ownership and control of community businesses

- description of local businesses and industries in terms of current levels and types of activity specifically outlining the types and costs of services offered by these businesses

C.5 Land and Resource Use

present use of non-renewable resources and use and sustainability of renewable resources

local attitudes in respect to land use and resource management

description of the areas used for resource harvesting activities, indicating specific areas used for harvesting individual species, including wildlife and fish, seasonality of harvesting activities, hunting, fishing and other resource harvesting and travel routes used in reaching various harvesting locations

discussion of the real and imputed values, including cultural values, of renewable resource harvesting in terms of harvests by individual and family units on a full and part time basis. Indicate utilization of species harvested. Discuss local sharing patterns. Discuss the costs associated with renewable resource harvesting

local attitudes towards non-renewable resource development

C.6 Employment

- employment opportunities in the communities and the region in total

- levels of employment and unemployment by age, sex, and ethnic background

- levels of income by age, sex and ethnic background

- description of resident labour forces for each area, their skills and current employment patterns

C.7 Education and Training

- levels of education and training and skills by age and sex

- availability of job related training programs

C.8 Cost of Living . . .

C.8 Cost of Living

- present cost of living factors for affected communities

C.9 Energy Use

community energy sources, consumption patterns and costs

C.10 Transportation and Accommodation Facilities for Employees and/or Trainees

- description of existing arrangements