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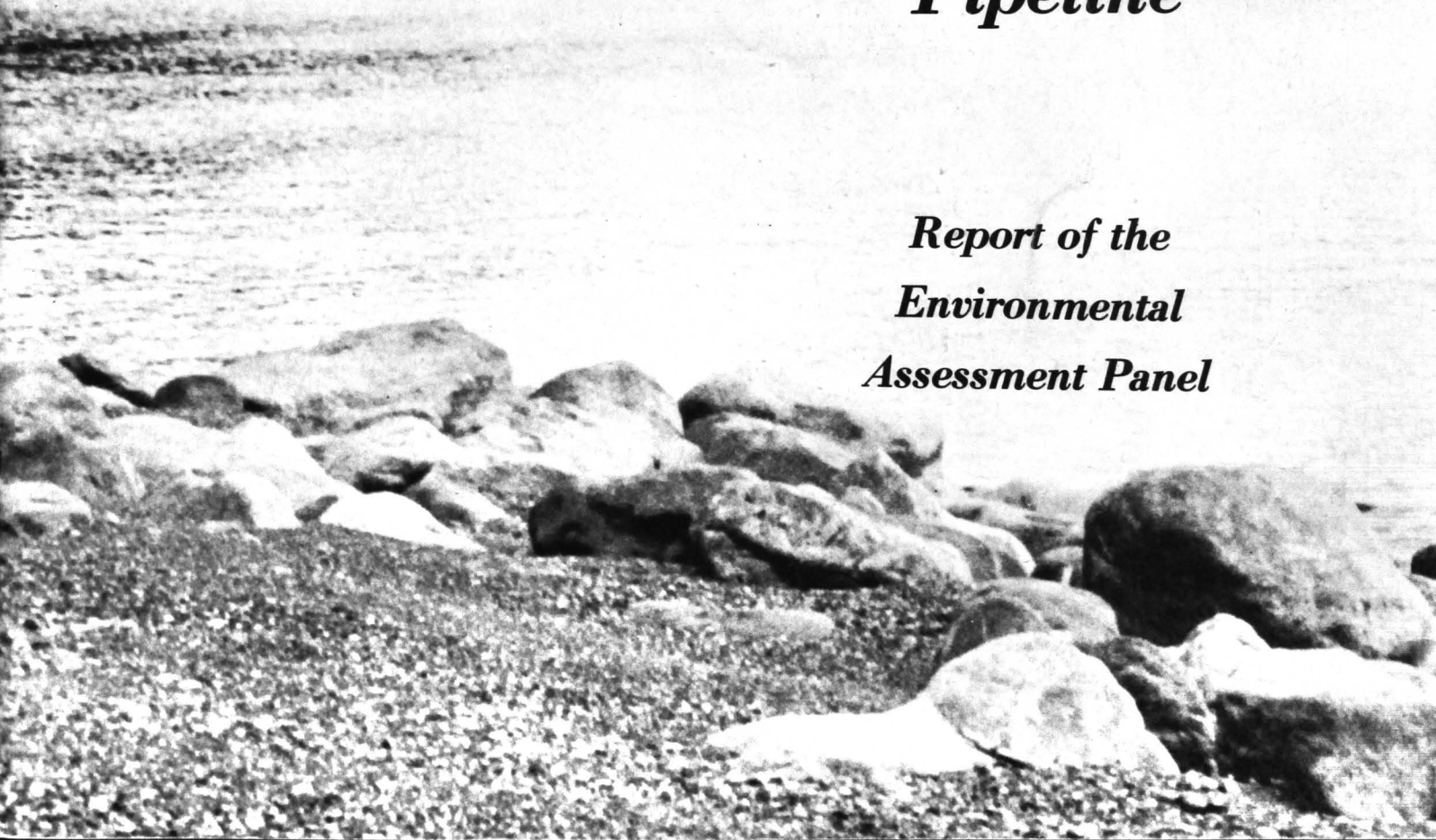
Alaska Highway Pipeline

Report of the Environmental Assessment Panel



ALASKA HIGHWAY PIPELINE

INTERIM REPORT

OF

THE ENVIRONMENTAL ASSESSMENT PANEL

TO

THE HONOURABLE ROMEO LEBLANC

MINISTER OF FISHERIES AND THE ENVIRONMENT

July 27, 1977

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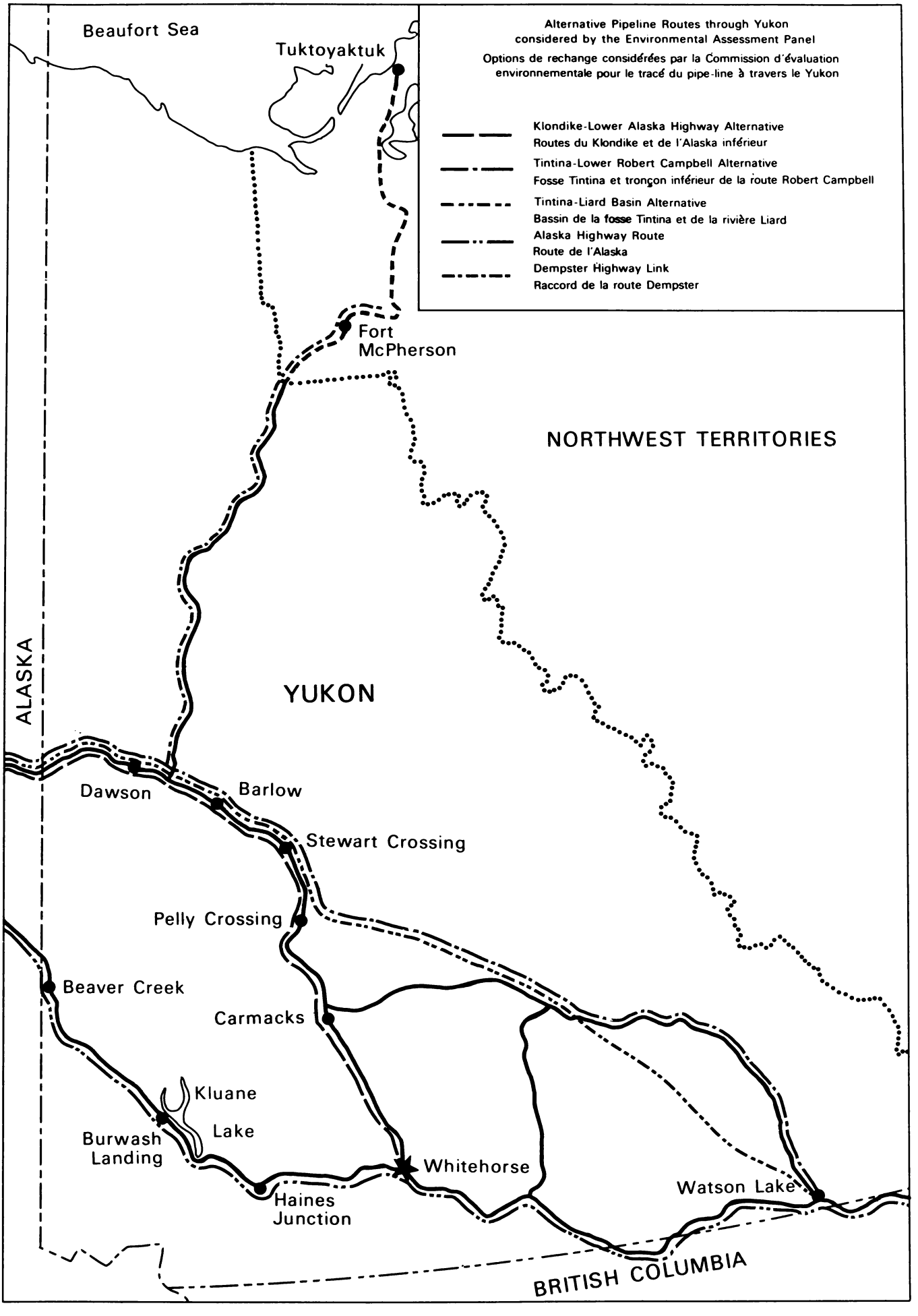
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Fort McPherson
NORTHWEST TERRITORIES
ALASKA
YUKON
Dawson
Barlow
Stewart Crossing
Pelly Crossing
Beaver Creek
Carmacks
Kluane Lake
Burwash Landing
Whitehorse
Haines Junction
Watson Lake
BRITISH COLUMBIA

I. INTRODUCTION

The Alaska Highway Pipeline project, as proposed by Foothills Pipe Lines (Yukon) Ltd., involves the construction of a 48-inch, buried, gas transmission pipeline and ancillary structures in southern Yukon. The pipeline is part of the larger system intended to carry natural gas from Alaska to the lower 48 States. The Canadian portion of the system would pass through Yukon, British Columbia, Alberta and Saskatchewan. The proposed route within Yukon is approximately 513 miles long and roughly parallels the Alaska Highway from Beaver Creek (Yukon-Alaska border) in the north, to Watson Lake (Yukon-British Columbia border) in the south. The line is designed for an initial throughput of 1.6 billion cubic feet per day and a maximum throughput, with additional compression, of 3.4 billion cubic feet per day.

On August 30, 1976, Foothills Pipe Lines (Yukon) Ltd. applied to the National Energy Board for a certificate of public convenience and necessity to construct the pipeline as described. The Board studied the route and the proposed Mackenzie Valley Pipeline routes and issued its report on July 4, 1977.

Mr. Justice Thomas R. Berger heard evidence on an alternative Alaska Highway corridor during his hearings on the Mackenzie Valley energy corridor. The first volume of his report, "Northern Frontier, Northern Homeland", was published in May 1977.

On August 30, 1976 Foothills Pipe Lines (Yukon) Ltd. applied to the Minister of Indian and Northern Affairs for a grant of interests in lands in Yukon for a right-of-way on which to build the proposed Alaska Highway pipeline.

The bulk of the Yukon portion of the proposed route passes through territorial lands which, under the Territorial Lands Act, are administered by the Minister of Indian and Northern Affairs. Because the project requires the granting of a right-of-way through federally administered lands, and because the project has the potential for significant environmental impact, it was referred to you by the Minister of Indian and Northern Affairs on March 21, 1977 for an assessment of the environmental impact. An Environmental Assessment Panel, with the following membership was established:

Dr. H. M. Hill, Chairman

Mr. C. E. Wykes

Mr. B. J. Trevor

Dr. D. S. Lacate

Dr. O. L. Hughes

Mr. L. B. Chambers

The normal procedure for environmental impact assessment, under the federal Environmental Assessment and Review Process, is the establishment of an Environmental Assessment Panel which issues formal guidelines for the preparation of an environmental impact statement. The Panel then initiates a technical review of the statement and makes recommendations to you concerning project implementation. In this case, however, the federal govern-

ment is facing major decisions on competing pipeline proposals in the fall of this year. The short lead time available made a normal environmental assessment of the project impossible at this time. Instead, you instructed the Panel to review existing data, seek public and professional opinion and submit an interim report to you by August 1, 1977. It was understood that, if the proposal is still a contender after decisions on competing proposals are made, the formal assessment and review procedure would apply.

These terms of reference were broadened subsequently to include consideration of the potential environmental impact, not only of a pipeline along the proposed route as it appears in the application to the Minister of Indian and Northern Affairs, but also of alternate routes and the possible Dempster lateral. Finally, the Panel was instructed to hear information on the comparative environmental impacts of the Mackenzie Valley and Alaska Highway routes.

The Minister of Indian and Northern Affairs also appointed a Board of Inquiry under the Chairmanship of Dean K. Lysyk to identify and report on socio-economic impacts. The Environmental Assessment Panel, therefore, has examined only selected socio-economic impacts of the proposed Alaska Highway Pipeline and only to the extent that they affect or are affected by environmental factors.

II. PANEL PROCEDURES

DATA REVIEW AND ANALYSIS

The requirement for the Environmental Assessment Panel to file an interim report by August 1, 1977 necessitated a significant departure from procedures normally followed in panel operations. On the understanding that the report would be regarded as preliminary, the usual guidelines for the preparation of an Environmental Impact Statement were not issued at this time. Instead the Panel was instructed to review existing data as supplied by the proponent, Foothills Pipe Lines (Yukon) Ltd., and data available through other sources. In line with these instructions, the Panel sought out any available information published or unpublished, from the federal government, private research organizations, interest groups, individuals, other inquiries and task forces and, corporations, other than the proponent, that have conducted research into northern pipelines. A bibliography of information sources is available under separate cover.

Shortly after the establishment of the Panel, panel staff began a review of available data to discover obvious deficiencies and areas in which the information supplied would have to be clarified. Requests for clarification or additional information were forwarded to the proponent on a continuing basis, and answers supplied have become part of the Panel record.

Additionally, panel staff and panel members visited selected sites along

the proposed right-of-way for both orientation and first-hand experience with areas highlighted in the application. Members of panel staff also held discussions with numerous officials and individuals who have had extensive experience in the North and especially along the proposed route. Such sources included officials of the federal and territorial governments.

All information gathered from these sources and through data analysis was directed to the Panel through regular staff reports.

With the expansion in the terms of reference of the Environmental Assessment Panel, the Panel was confronted with the task of evaluating and assessing environmental impacts of possible alternate pipeline routes, including a possible Dempster lateral, for which there was very little baseline environmental data. The Panel, therefore commissioned an environmental consulting firm to conduct an independent overview comparison of alternate routes within Yukon. A multi-disciplinary team examined the alternatives and compared these corridors in terms of their relative environmental impacts. Lacking adequate baseline data, the team chose to conduct an evaluation using a numerical rating as a basis for the comparison of potential environmental impacts. In addition, the Panel in examining both the route as proposed and possible alternates, called upon a wide range of independent knowledge and experience by inviting persons with specific expertise to appear before it.

Finally, the Panel was instructed to examine the proposal for a Mackenzie Valley pipeline not only for the purposes of general environmental com-

parison but also as a source of additional information that might be useful to the Panel in evaluating the Alaska Highway proposal. A study group, with representatives from the Department of Indian and Northern Affairs, Department of Fisheries and the Environment and a consulting firm was established for this purpose, and reported its findings.

PUBLIC PARTICIPATION

The federal Environmental Assessment and Review Process calls for the involvement of the public in the review and evaluation of the project. In this case the shortness of time and the general lack of comprehensive data determined the characteristics of the public participation program. Every effort was made by the Panel and its staff, both through substantial local advertising and personal contact, to present maximum opportunity for all interested individuals to make their opinions known to the Panel. Additionally, public information and documentation centres were established in Whitehorse and in five other communities along the highway.

While the Panel did visit Alaska Highway communities within Yukon, the Panel regrets that it was unable to visit those communities likely to be affected if an alternate route or Dempster lateral is constructed. However, a representative of the Environmental Assessment Panel travelled with the Lysyk Inquiry to record and refer expressed environmental concerns from those communities not visited by the Panel.

PUBLIC HEARINGS

Five separate hearing phases took place, all of which included substantial

opportunity for public involvement:

1. Preliminary Meeting: May 12, 1977

   At this meeting the Panel was introduced, its terms of reference and method of operation were explained, and all available information was made public.

2. Community Visits: May 30 - June 3, 1977

   During this week, the Panel visited the following communities along the Alaska Highway:

   Watson Lake

   Upper Liard

   Swift River

   Teslin

   Haines Junction

   Destruction Bay

   Burwash Landing

   Beaver Creek

   Informal meetings were held in each community to allow those local residents who would not be able to attend hearings in Whitehorse, to express their concerns.

3. Formal Public Hearings: June 13 - June 17, 1977

   Formal public hearings were held in Whitehorse during which the Panel accepted oral and written expressions of environmental concern. Wide ranging concerns were identified.

4. Formal Public Hearings: July 5 - July 11, 1977

   During this hearing phase, the major concerns identified for the

Alaska Highway proposal in the June hearings and by the Panel and its staff were examined in greater depth. Experts having pertinent knowledge were invited to be present by the Panel, by local interest groups, or by other governmental and non-governmental organizations.

5. Formal Public Hearings: July 12 - July 14, 1977

Opinions and concerns were heard relative to possible alternate routes and to the Dempster lateral. During this session also, the Panel heard information on the comparative environmental impacts of the Mackenzie Valley and Alaska Highway proposals.

TRANS-ALASKA PIPELINE VISIT

Following completion of the hearings, the Panel visited Glennallen, Anchorage and Juneau in Alaska, in order to view parts of the completed Trans-Alaska Oil Pipeline, and for discussion with state and federal officials who had been responsible for approval of final design of that pipeline, and for surveillance of the construction.

III. PHYSICAL AND ENGINEERING CONCERNS

GEOTECHNICAL ASPECTS

Issues

Probably no single issue received more attention during the public hearings than the potential environmental effects associated with a buried gas pipeline passing through areas containing permafrost. Although the entire route proposed for Yukon lies in the zone of discontinuous permafrost it was generally agreed that the most serious problems would likely be encountered in the ice-rich soils of the most westerly 100-mile section of the route.

Based on available data including the results from a limited drilling program the proponent plans to operate a chilled line no further than the first compressor station located at approximately Mile 40. This is a change from the original application (42-inch diameter line) in which chilled gas would have been run to approximately Mile 100.

Discussions and expert testimony centered around the relative importance of environmental problems resulting from the operation of a chilled line (gas below 0^{o}C.) through this area compared with the heated gas mode over the remainder of the route. With a chilled line, frost accumulation could result in heaving of the pipe while a warm line could result in degradation of the surrounding permafrost. Both approaches could disrupt surface and groundwater drainage. Erosion and mass soil movements

in steeper terrain might also occur. Also, it was noted that the ponding of water upslope of the chilled line could occur resulting in possible degradation of permafrost and/or drainage changes. In permafrost terrain encountered by a warm line, extensive ponding of water could develop along the right-of-way and, in extreme cases the right-of-way could develop into a main watercourse. The integrity of the pipeline could be affected necessitating emergency repairs. This activity could cause further environmental impacts especially on such sensitive terrain.

The other major concern identified to the Panel was the possibility of pipeline rupture due to seismic activity and related environmental impacts. The proposed pipeline route is known to pass through earthquake-prone areas, particularly the Shakwak Trench running northwest from Haines Junction. The possibility exists that an earthquake or tremor could direclty rupture the line, or could initiate processes such as landslides or slumping which would eventually lead to pipeline rupture. Such pipeline failures could be quite extensive and result in possible explosions and fires with associated environmental effects. In other cases, the pipeline may retain its integrity but require extensive maintenance and realignment.

Mitigative Measures

The operation of the line in a chilled mode to the first compressor station is, according to the proponent, a plan to mitigate against excessive thaw settlement along that portion of the route. The proponent indicated that the chilling cut-off point was largely influenced by the location of the

compressor station at Mile 40 and further stated that chilling was really only required over the first five or ten miles of the route. Other mitigative measures suggested for running the chilled line through permafrost terrain included the use of insulation around the pipe, bedding with frost-stable material and, in extreme problem areas, relocation of the pipeline.

In sloping terrain where the warm line traverses permafrost the proponent intends to give special attention to the amount and quality of bedding and backfill material, longitudinal and cross-pipe drainage design and rechanneling of drainage where necessary. In flat terrain no special mitigative measures were proposed.

On ice-rich soils which would be susceptible to damage by pipelining activities, the proponent's plans call for winter operations on snow or ice roads. Some disagreement was evident concerning the availability of sufficient snow over the time period required for such construction. The options of trucking in snow from surrounding areas or utilizing snow-making machines were discussed.

Along the Shakwak fault zone, the proponent proposes special ditching procedures and placement of aggregate bedding material to allow for lateral and vertical displacement of the pipe without causing a rupture. Consideration is also being given by the proponent to installing automatic valves on either side of faults.

Information Deficiencies

The Panel was advised during the hearings that the proponent had limited knowledge of the occurrence, distribution and nature of permafrost along the proposed route. Except for drill records associated with the construction of the Alaska Highway, terrain interpretation from aerial photographs, and reconnaissance field tours, the data base was limited to the results from a preliminary drilling program. In the sensitive permafrost areas west of Burwash this drilling program involved less than one hole per mile.

The Panel was further advised that knowledge on the local distribution patterns of permafrost, the depth of the active layer and frozen ground, ice content, freeze/thaw potential, local surface and groundwater drainage and other geothermal aspects was inadequate for an assessment of the environmental impacts.

Data were supplied to the Panel on the occurrence of larger seismic shocks in the area of the proposed pipeline route. However, the need for monitoring lower levels of seismic activity was identified. Furthermore, with the present level of information the proponent was not able to precisely locate where the line crosses individual faults within the Shakwak fault zone or, indeed, how many fault crossings are involved.

Conclusions

The Panel accepts the proponent's contention that, at the present level of

knowledge, predictions of thaw settlement for the warm pipeline mode are more reliable than predictions of frost heave for the chilled mode. Therefore, from the point of view of pipeline integrity, operation in the warm mode is the more conservative engineering design.

However, from the environmental viewpoint, severe damage could occur from either mode. In the warm pipeline case severe degradation could result in large areas of settlement causing ponding of water, erosion, siltation and aesthetic problems.

For the chilled mode, extensive repairs to the pipeline because of a rupture could lead to major environmental damage. Also, interruption of groundwater and sub-surface drainage due to the formation of a frost bulb may cause extensive changes in drainage patterns with resultant erosion and siltation.

Very detailed soils information will be required for engineering design and the establishment of environmental criteria in ice-rich permafrost areas. In the case of the Trans-Alaska pipeline drill holes with a 50 foot spacing did not always provide adequate data for engineering design of a buried mode. The proponent advised that such severe problem areas would be avoided by re-routing.

The Panel concludes that, because of the wide geographic distribution of very sensitive terrain, re-routing may not be feasible and that a buried mode using all known mitigative measures may not prevent unacceptable consequences of thaw settlement.

The Panel further concludes that a pipeline could only be constructed across ice rich permafrost areas of the proposed Alaska Highway route if extensive and detailed soils information was first obtained, if adequate mitigative measures could be developed and strictly applied, and if an elevated mode was utilized where adequate mitigative measures could not be developed. Such mitigative measures would have to prevent significant changes in drainage patterns, significant increases in erosion or significant aesthetic impacts.

In regard to seismic problems the Panel agrees that present technology is adequate for design purposes. It would be necessary, however, to further evaluate the Shakwak fault zone in order to determine the most suitable design. The rare possibility of a major seismic movement causing a rupture of the pipeline further dictates that shut-off valves be located at suitable points.

WATER CROSSINGS

Issues

The proposed pipeline route in Yukon involves a variety of water crossings. The proponent has identified six of these as major river crossings on the basis of design discharge (20,000 cfs or greater), scour depth of the river bed (five feet or greater), width of the river at proposed crossing (500 feet or wider) and the gradient of the river.

Some of the rivers, particularly the glacier-fed ones originating in the

Kluane Mountain Range and flowing across the proposed route, are high energy systems which have highly variable flow rates and are prone to flash flooding, constantly changing channels and deep scour depths (up to 20 feet in the larger rivers). The glacier-fed rivers are also subject to rare, exceptional floods due to the sudden release of water from glacier-dammed lakes. In contrast, the more easterly rivers are slower flowing, have better defined channels and are not subject to such drastic changes in flow.

Environmental concerns associated with river crossings were identified for both construction and operation phases of the project. The former include: direct interference with fish spawning, migration and overwintering, and possible deleterious effects of siltation on fish and fish habitat; the latter includes siltation due to bank erosion or to emergency repairs (necessitated by actual rupture or threat of rupture of the pipeline) and the possibility of gas leaks particularly under ice cover. Levels of concern were shown to be related to seasonal timing of construction, maintenance or emergency repairs.

Mitigative Measures

The proponent's approach to water crossings is in accordance with normal pipelining practice. The proposal is to use thicker walled pipe and to bury the line under major water crossings below the maximum scour depth over sufficient width to allow for channel movement. These major river crossings will be the responsibility of a special crew; for smaller streams, the pipe will be buried under the stream bed as part of mainline

construction. It is not proposed to install valves at either side of the crossings. The proponent has indicated that, if necessary and where possible, the location of crossings will be moved to minimize environmental effects. The proponent has further indicated that where possible, construction activities at particular crossings would take place in the season which would be the least environmentally damaging.

Information Deficiencies

The proponent has tentatively identified the locations of all major water crossings and has undertaken preliminary water crossing design. Studies are being conducted on the biological characteristics of the major water systems involved. At the time of the hearings, however, there were insufficient data available for the presentation of detailed plans and expected impacts.

It was pointed out to the Panel that only the larger water systems have received any attention. Field data, including information on scour depths, channel movements and bank characteristics have been collected for a few of these. Very little reference, however, was made to the design approach and environmental planning for the numerous smaller crossings which may have greater environmental importance.

The results of some preliminary laboratory experiments concerning the toxicity of the gas to fish were presented. The interpretation of the results was open to question and, in particular, doubt was expressed

about the relevance of aquarium studies to oxygen-depleted waters under winter ice cover.

One of the main information gaps identified related to the seasonal timing of construction activities at each of the major water crossings. In most cases insufficient data were available to determine whether or not a "time window" existed and would minimize the impacts of construction activities on fish and their habitat. In the western section of the route the limited "time window" available is further restricted by the formation of aufeis (buildup of ice in stream beds). Similarly the Panel was advised that more data are required to determine whether the introduction of oxygen-depleting organic loads into streams would be a problem.

Conclusions

The Panel notes the inadequacy of biologic, hydrologic, and soils data required to design and schedule all water crossings and their approaches.

The Panel concludes that, with proper planning the environmental impacts can be minimized to acceptable levels in most cases. However, in those cases where the environmental impacts cannot be minimized to an acceptable degree special designs will be required.

EROSION CONTROL

Issues

The Panel was told that construction of the pipeline will involve con-

siderable disturbance to vegetation and surface soil along the proposed right-of-way as well as on the access roads and at, or near, associated facilities.

According to the proponent's statements, the first 15 miles of the pipeline would be constructed in winter, using snow and ice roads. Trees and large shrubs would be removed over the width of the right-of-way, but the vegetation mat would be preserved except above the pipeline ditch. The construction of the remainder, 95 miles of which is scheduled for conventional winter construction, would involve clearing, grading and removal of the vegetation mat. The Panel was advised that the environmental impacts from such disturbances could include major soil movements in steep terrain, wind and water erosion, and erosion of riverbanks all of which could lead to siltation with resultant impacts on aquatic fauna. The Panel was also advised that unstabilized grade and sidehill cuts may be impossible to revegetate.

Mitigative Measures

Mitigative Measures proposed by the proponent are primarily directed towards long-term stabilization of surface conditions over or near the pipeline. The proponent estimated that a properly implemented revegetation program would adequately stabilize about 95% of the proposed route in Yukon with the remainder being stabilized by mechanical means. The proponent also intends to avoid cut banks and steep slopes as much as possible.

Information Deficiencies

During the hearings, data and study deficiencies were identified which relate to the proposal by the applicant to use native species for revegetation. It was charged that a complete plan for revegetation is required at this time especially in light of the fact that extensive induced revegetation by native species for erosion control is not a proven method.

Conclusions

The Panel accepts the basic proposals of the proponent in reference to erosion control as being feasible for most of the route. However the Panel is not convinced that techniques for stabilization of slopes in ice-rich permafrost and sandy soils are sufficiently developed at this time. The proponent must carry out a very detailed investigation of such soils with a view to developing techniques that will prevent erosion and allow for adequate right-of-way maintenance.

For the ice-rich permafrost areas the Panel further concludes that construction techniques must be utilized that will allow the maintenance of the existing vegetation mat.

ANCILLARY STRUCTURES

Issues

Associated with the pipeline there are a number of structures, facilities and activities which the Panel was advised, could have significant environmental impacts.

Access Roads - Permanent access roads will be required to all compressor stations. In addition, access roads from the Alaska Highway to the right-of-way will be required approximately every five miles. If improperly located, these roads could have negative environmental impacts on sensitive or unique terrain, wildlife populations and their habitat, as well as on watercourses and fish habitat. Such roads could also provide public access to wilderness areas thus increasing pressures on fish and wildlife.

Borrow Pits - The proponent estimates total granular material requirements would be in the order of 2.3 million cubic yards. The material would be obtained from existing borrow pits to the extent possible. Issues identified to the Panel included the aesthetic impacts of new or expanded pits and the requirements for restoration following abandonment. Also, the Panel was advised that the proponent may have seriously underestimated granular material requirements.

Compressor Stations - The proponent plans to construct seven main line compressor stations in Yukon. The 38,000 H.P. compressors would be driven by turbines using natural gas from the line. The number of stations would double if the line reaches ultimate capacity of 3.4 billion cubic feet per day. Concerns were expressed about the location of stations, noise

levels, noxious emissions, ice-fog formation and aesthetic impact.

Construction Camps and Material Storage Areas - There are six major construction camps planned for the Yukon portion of the line, each housing approximately 800 men. Of the additional 13 material storage areas proposed, seven will be located at compressor station sites. Issues raised included possible environmental impacts of obtaining necessary water supplies, processing and disposal of sewage and solid wastes and possible exploitation and harassment of fish and wildlife populations.

Storage and Use of Toxic Materials - The proponent advised that the building and operation of the line will involve the use of hydrocarbons and other toxic materials. The Panel was told that some of these could have serious environmental consequences, particularly if introduced into natural water systems. The safe transportation, storage and disposal of such materials were identified as important issues.

Mitigative Measures

Proposed and possible mitigative measures include:

1. Locating access roads to avoid damaging fish and wildlife habitat and to minimize access to wildlife populations.

2. Locating compressor stations to avoid sensitive wildlife and recreation areas and to avoid potential ice-fog problems.

3. Locating construction camps where adequate water supplies are available and where sewage disposal will have no undue environmental impacts.

4. Planning the safe transportation and storage of toxic materials.

5. The preparation and implementation of comprehensive contingency plans to deal with spills of toxic materials.

Information Deficiencies

It was stated that insufficient information was available to predict probable environmental impacts associated with various facilities and structures. In general the proponent had not proceeded past the preliminary design stage for these. The following specific deficiencies were identified to the Panel:

1. The location and extent of access roads had not been determined nor had measures been described for abandonment.

2. The number, location and size of borrow pits had not been determined nor had restoration plans been developed.

3. The formation and extent of ice-fog to be expected near compressor stations had not been adequately forecast.

4. Contingency plans for toxic material spills had not been developed.

5. Site specific environmental impact studies had not been undertaken in relation to the proposed facility locations.

Conclusions

The Panel concludes that the above deficiencies can and must be adequately addressed by the proponent in order that the Panel may complete the environmental review.

PIPELINE INTEGRITY

Issues

A number of concerns were identified relating to pipeline monitoring, testing procedures, safety precautions and contingency plans in case of system failure. The most extensive monitoring and testing of the system will occur during the first few months of operation when it will be operated at reduced pressure. Initial procedures will involve hydrostatic testing of pipeline sections as they are completed. Plans are to test one-to-four mile sections using about 400,000 gallons of water per mile.

Environmental concerns were raised about the withdrawal and discharge of such large volumes of water. The undesirable transfer of aquatic organisms between drainage basins could also occur.

The proponent intends to use methanol to dry the pipe following hydrostatic testing. The Panel was advised there could be some adverse impacts on aquatic fauna if methanol was introduced into lakes and streams.

Concern was expressed to the Panel that major ruptures through propagating fractures could occur with possible resulting explosions and fire. Such an event could have a direct impact on people and wildlife. Forest fires could also result. Furthermore, the necessity for immediate repair operations would materially add to the potential for damage to terrain, vegetation, fish and wildlife populations.

Mitigative Measures

The major methods identified by the proponent for reducing the impacts related to the above issues are as follows:

1. Operating the pipeline at a reduced pressure until the integrity of the system is assured.

2. Shutting down the system in the event of a rupture and isolating the damaged section using valves installed at various intervals.

3. Retrieving and reusing methanol to the greatest extent possible, followed by proper disposal.

Information Deficiencies

Information deficiencies that were identified during the hearings include:

1. Details on the locations and operation of valves were not available.

2. Details on the method of disposal of methanol were not provided.

3. Locations of suitable water withdrawal and discharge areas were not identified.

4. Contingency plans to deal with events such as major ruptures, explosions and fires had not been developed.

Conclusions

The Panel concludes that information to correct the deficiencies outlined above is required in order that the Panel may complete the environmental review.

IV. BIOLOGICAL CONCERNS

FISHERIES

Issues

The increased siltation of fish spawning and nursery areas during pipeline construction and operation was considered to be a major issue. The Panel was advised that the primary causes of increased siltation during the construction phase would be construction of access roads, grading and ditching of the right-of-way and crossings of streams and lakes. There was also a concern that during the operational phase, increased siltation may result from frost heave and thaw settlement, improperly stabilized slopes, erosion on the right-of-way and repair and maintenance activities. It was further pointed out that siltation may decrease the survival rate of eggs and emergent fry and may also degrade spawning habitats and that the construction of water crossings could physically interrupt spawning and migration, destroy eggs present in the stream beds, and destroy existing spawning grounds and other fish habitat.

It was suggested that the anticipated major influx of people during the construction phase of the pipeline could result in the over-exploitation of fish stocks, particularly along the Alaska Highway. Moreover, the Panel was advised that there was insufficient knowledge of the life histories and current exploitation rate of fish along the proposed route. Such knowledge would be required in order to predict the effects of increased exploitation.

The Panel was informed that significant water quality impairment could occur during the construction phase of the pipeline, particularly in the most westerly portions of the proposed route. The possible reduction of dissolved oxygen to critical levels, due to the introduction and subsequent decomposition of organic materials, could seriously reduce the percentage survival of overwintering fish. In addition it was noted that the discharge of wastewater from construction camps could degrade water quality in small receiving streams.

Mitigative Measures

The Panel received advice that development of mitigative measures for construction of water crossings requires the definition of a "time window" when impacts on fish would be minimized as referred to under WATER CROSSINGS. If a suitable "time window" cannot be defined, mitigative measures could include relocation of proposed water crossings or construction of aerial crossings.

Other mitigative measures relative to stream and lake crossings include:

1. Control of erosion on approaches.
2. Limiting equipment movement in the stream beds.

The Panel was advised that protection against over-exploitation could be achieved by the adoption and enforcement of suitable regulatory controls. The overloading of small streams with organic matter could be minimized through proper handling of organic material exposed during pipeline construction and through the location of camps on suitable receiving waters.

Information Deficiencies

In appearing before the Panel, numerous persons expressed their belief that the proponent had gathered insufficient information on which to base the design and scheduling of water crossings. Approximately 80 water crossings were identified as being of concern. Similarly, the Panel was advised that there were a lack of baseline data on the location, use and extent of spawning, rearing and overwintering areas at and downstream from proposed water crossings. Salmon, lake trout, whitefish and grayling were of particular concern.

Conclusions

The Panel is of the opinion that with proper scheduling and construction techniques, the pipeline could be constructed with minimal damage to fish. However, in order to determine proper scheduling and construction techniques further site specific data on fish, their habitat and their food chains, will be required.

Proper management of fish populations could be achieved through the enforcement of appropriate regulatory controls.

WILDLIFE

Issues

The Panel was advised that a major wildlife issue would be the displacement of wildlife during the construction phase of the pipeline project. It was noted that certain wildlife species such as Dall's Sheep and caribou are sensitive to construction activities and to aircraft overflights to the

extent that they may change their utilization of an area or permanently abandon it. Similarly, there is a potential to adversely affect raptor populations along the route because they are highly sensitive to disturbance by humans and aircraft. Falcons are of particular importance because they are an endangered species. Nesting sites are apparently one of the major limiting factors in falcon productivity, therefore preservation of any such sites is vital to their survival.

Concerns expressed about increased exploitation and lack of baseline data on wildlife and waterfowl populations were similar to those expressed about fisheries. The Panel was advised that over-exploitation might be controlled through proper enforcement of adequate regulations. It was stated that there were insufficient existing staff to carry out proper enforcement.

Finally, concern was expressed that there could be interference with furbearer habitat and traplines, leading to some hardship for trappers.

Mitigative Measures

The Panel was advised of mitigative measures that could be taken to minimize detrimental impact on vulnerable wildlife and waterfowl populations along the existing Alaska Highway corridor. Comprehensive construction schedules could take advantage of "time windows" in seasonal habitat utilization. This could avoid conflicts during construction. It was recommended to the Panel that detailed identification of critical areas and timing sensitivities should be undertaken as an integral part of developing construction schedules. It was further recommended that, in

remote areas aircraft maintain an elevation of 1,000 feet generally, and 2,000 feet over especially sensitive areas.

Information Deficiencies

The Panel was informed that major deficiencies exist in knowledge concerning wildlife and waterfowl populations and their critical habitats that could be affected by the proposed pipeline. Of special concern were the locations of nest sites of rare and endangered raptors. Furthermore, little is known of the interactions of wildlife with construction activities. The Panel was also told that information is deficient on the furbearer harvest for traplines which could be affected.

Conclusions

The Panel concludes that through the identification of critical wildlife and waterfowl habitat, development of appropriate mitigative measures including re-routing around sensitive areas and the timely scheduling of construction, the effects on wildlife and waterfowl can be held to acceptable levels.

The Panel is of the opinion that over-exploitation can be avoided through the proper enforcement of adequate regulations.

V. UNIQUE AND SENSITIVE AREAS

Concern was expressed to the Panel about the impact of the proposed pipeline on a number of areas generally regarded to be unique or especially sensitive. These include:

International Biological Program (IBP) Sites

IBP sites are proposed at a number of locations in Yukon. The pipeline right-of-way passes close to some of these, and in certain instances intersects them. As a result, the very value and intent of the sites may be destroyed. One of the proposed IBP sites, Duke Meadows, would be crossed by the pipeline at its southerly end. The uniqueness of this area is related to its vegetative cover.

Sheep Mountain

Sheep Mountain, located in Kluane National Park, provides year-round habitat and is the site of a mineral lick for about 200 Dall's Sheep. This species is known to be highly intolerant of disturbance. Furthermore, the area is of special importance within the Park. It is also the location of a cabin of historic value. There is particular concern for the aesthetic effect of a pipeline located on the mountain. Several unique plant species occur on Sheep Mountain and on the adjoining Slims River delta.

Ibex Pass

The Ibex Pass area supports populations of Dall's Sheep, grizzly bears and raptors. Each of these is intolerant of human activity to varying degrees.

There is in addition, a sport fishery in the area. According to the present plan a compressor station and a construction camp will be located in the vicinity. There is concern over the effects of construction and operation activities on wildlife and fish in the area and over the increased access which a pipeline right-of-way might create.

Mt. Michie-Squanga Lake

The Mt. Michie-Squanga Lake area was said to be a woodland caribou wintering and calving area, highly sensitive to construction activity, and to hunting pressure resulting from increased access. Squanga Lake itself supports a unique species of whitefish, the spawning grounds of which would be endangered by the pipeline construction and operation. This species of whitefish would also be threatened by the inadvertent introduction of strongly competitive species. In addition, the area contains raptor nesting sites and valuable populations of aquatic furbearers.

Pickhandle Lake

The Pickhandle wetlands complex supports large and sensitive populations of aquatic furbearers and waterfowl. It is used as a staging and rearing area by waterfowl and as such is very susceptible to disturbance at certain times of the year.

Mitigative Measures

By way of mitigation, the proponent is considering changing the proposed pipeline routing for the Sheep Mountain, Pickhandle Lake, Ibex Pass and

Mt. Michie-Squanga Lake areas. He is proposing to revegetate using native species in the Duke Meadows, Sheep Mountain and Slims River areas.

Conclusions

The Panel concludes that detailed environmental assessments of the proposed and alternative routings for the Sheep Mountain, Ibex Pass, Mt. Michie-Squanga Lake, and Pickhandle Lake problem areas are required in order to determine acceptable routings. Where possible, proposed IBP sites should be avoided and, if crossed, care should be taken to preserve their unique characteristics.

VI. OTHER ISSUES

Aesthetics and Recreation

The Panel heard frequent references to the disturbing visual appearance of the right-of-way after pipeline construction. It was suggested to the Panel that National Parks, vistas generally, and scenic beauty were of public concern, therefore the proponent must take aesthetics into active consideration in developing his final designs.

The Panel was advised that most of the campgrounds along the Alaska Highway are located immediately adjacent to the Highway, and would suffer from increased noise and dust levels due to increased highway traffic associated with pipeline construction. The pipeline as presently aligned passes directly through three campgrounds. The capacity of existing campgrounds could be severely overtaxed if pipeline construction increased demand for camping facilities. This escalation in the use of existing facilities could result in degradation or even destruction of recreational values.

Conclusions

In the opinion of the Panel, the proponent has made little attempt to evaluate the probable impact of the proposed pipeline on aesthetic values.

The Panel concludes that the proponent must undertake a systematic assessment of probable aesthetic impact and develop a comprehensive approach to

the mitigation of such impact in order that the Panel may complete the environmental review.

The Panel also concludes that the pipeline should be located to avoid existing campgrounds as far as possible, especially those with special scenic or recreation values. Where the pipeline must pass through or near campgrounds, alternate campgrounds should be developed.

Proposed Regulatory Agency

At the hearings the Alaska Highway Pipeline Panel* stressed the need for a single regulatory agency to develop and enforce the numerous required environmental protection measures. It was their opinion that "if the government is not ready to control the pipeline, the pipeline should not be built". Also put forward were eight principles which, it was proposed, should apply to the protection measures. Quoted from the submission, the principles are:

"First, the natural environment is a Canadian heritage for use and enjoyment by future generations. Controls should reflect our job as trustees of that heritage.

Second, pipeline development should not impose unfair burdens on particular individuals or groups.

Three, the pipeline company shall assume responsibilities for minimizing social and economic problems resulting directly or indirectly from project activity. For example, increased cost of highway maintenance, loss of regional transportation carriers to communities.

* An independent organization funded by Foothills Pipe Lines (Yukon) Ltd.

Four, decisions on appropriate management programs be made in consultation with the communities ultimately affected by the project.

Five, wherever possible, payment for damages should be in kind, rather than in dollars.

Six, the public, both northern and southern has a right to know what planning, organization and execution mechanisms for control is developed and it should have a means of monitoring the success of them.

Seven, government and particularly the federal government is fundamentally responsible for ensuring the foregoing principles are met.

Finally, we conclude that if a proper management system, which embodies these principles is not in place before construction, the project should not be allowed to proceed."

Conclusions

The Panel recognizes that only general environmental criteria will be developed in this environmental review. In the opinion of the Panel, detailed environmental criteria will be absolutely necessary for the proponent to be able to develop acceptable final designs. These criteria must be developed by appropriate agencies and an effective mechanism to coordinate the complete process of criteria development, design approval and project surveillance and monitoring must be developed without delay, should a decision be made to construct a pipeline.

VII. ASSOCIATED DEVELOPMENTS

There are a number of major projects planned or contemplated for Yukon in the foreseeable future. Opinions expressed before the Panel suggested that these projects could conflict with the proposed pipeline schedule or add to the environmental implications of the latter. These are briefly discussed below.

Shakwak Project

The Shakwak Project involves the rebuilding and paving of 322 miles of the Haines Road and the Alaska Highway. Construction on the Alaska Highway portion of this ten year project could potentially conflict with planned pipeline construction. Construction is scheduled to begin in 1978. Environmental impact studies undertaken in accordance with the Environmental Assessment and Review Process will also satisfy the requirements of the U.S. National Environmental Protection Act.

The major issues raised at the hearings are outlined below:

1. The construction activities of the two projects could result in extended disruptions to the environment, particularly at major water crossings.
2. The granular material requirements of the two projects could lead to the opening of new borrow pits.
3. The two labour forces could cause a further increase in resource exploitation.

Alaska Highway Reconstruction

The Federal Department of Public Works (DPW) has plans for rebuilding and paving portions of the Alaska Highway in Yukon not covered by the Shakwak Project. Specific long range plans are detailed in a report published in 1966.

According to the proponent and a spokesman for DPW, interaction between pipeline and highway construction is not uncommon and experience has shown that no serious problems are likely to arise. The proponent further stressed that highway crossings normally involve deep burial, tunnelling rather than trenching and the use of heavy-walled pipe. Furthermore, since a government permit is required for any road crossing, adequate consultation and pre-planning is assured.

Hydroelectric Developments

Compressor stations along the pipeline route require large quantities of energy. At present they are designed to be powered by natural gas from the line. The proponent, however, is considering a design that would facilitate a change to electrical power if such an energy source became available.

During the hearings it was stated that the proponent had discussed, with the Northern Canada Power Commission (NCPC), possibilities of powering the compressors by electricity. This would require 200-350 megawatts and would, therefore, necessitate the construction of a major hydroelectric development and associated transmission lines.

NCPC indicated that approximately 40 potential hydroelectric sites have been identified in Yukon. Five or six of these are considered as probable developments over the long term. NCPC staff were familiar with the proposed pipeline route and could foresee no conflicts with the probable hydroelectric developments, such as flooding of the line or re-routing due to dam construction.

The Panel was advised that the environmental impacts of a major hydroelectric project and associated transmission lines could be much more significant than those associated with the pipeline itself.

Conclusions

Although the Department of Public Works did not foresee any major difficulties in the logistics of integrating the construction activities of the pipeline and the two highway projects, it was apparent that there had been very little dialogue between personnel of the projects. The Panel was not convinced that planning was adequate to minimize the environmental consequences arising from the construction overlap of these major projects.

The Panel concludes that environmental impacts associated with a spinoff hydroelectric development should be evaluated before it is decided to power the pipeline with electrical energy.

VIII. OTHER POSSIBLE PIPELINE ROUTES

GENERAL

The original terms of reference for the Panel were expanded by you to allow the Panel to hear information on possible routes within Yukon for transporting Alaska gas as well as the implications of a gas pipeline to link the Mackenzie Delta with the southern Yukon mainline, via the Dempster Highway.

At the request of the Panel, an independent consultant compared the southern Yukon routes and offered advice on the environmental implications of the Dempster Highway link. The Panel also heard advice from other interested parties.

ALTERNATIVES FOR TRANSPORTING ALASKA GAS THROUGH SOUTHERN YUKON

The consultant noted that the environmental data for the Alaska Highway route exceeded that available for the other alternatives. The consultant evaluated selected physical and biological components of the environment from the point of view of sensitivity to impact, importance to ecosystem function, significance to human values, and rarity. The limited data base for the comparison and the absence of specific alignment proposals limited the depth of analysis that could be undertaken. Mitigation measures were not discussed in particular, however, in the opinion of the consultant the comparison is valid because mitigative measures would be applicable to all the alternatives analyzed. The consultant advised that

there did not appear to be any environmental concerns of sufficient magnitude to rule out any individual corridor.

In response to questions from the Panel during hearings the consultant agreed that there was only a narrow spread between ratings assigned to the alternative routes. However, the consultant ranked the various alternatives in the following order: the Klondike corridor, the Alaska Highway, the Tintina Trench-Robert Campbell Highway corridor and the Tintina Trench-Liard River corridor. These routes are illustrated on the accompanying map.

Following completion of the hearings, the consultant informed the Panel that upon further refinement a clear cut route preference could not be identified.

Klondike Highway

Advice to the Panel on this route identified such concerns as a negative visual impact along the 60-Mile Highway west from Dawson where the route would follow ridge crests in alpine tundra terrain, and the formidable Yukon River crossing near Dawson. Also of concern is the preservation of the historic abandoned placer workings along the Klondike River. The environmental issues along the portion of the route from Whitehorse to Watson Lake are not restated here. It was also stated that this route had the potential for conflict with hydroelectric development.

Tintina Trench

The Panel was advised by the consultant and others that the issues of principal concern were the presence of nesting raptors, woodland caribou, sheep and goat populations, and moose winter habitat. It was noted that the Tintina Trench-Liard River route would provide the greatest amount of access to formerly inaccessible areas and that the potential for degradation was therefore probably greatest. The fisheries impacts for the Tintina Trench routes were estimated to be less than for other routes.

It was suggested that along the Tintina Trench for 110 miles northwest from Faro, either of two alignments could be selected. The first, along the valley floor would involve numerous river crossings and possible fisheries degradation. The second, on the sideslope of the valley could create engineering and aesthetic problems. There would be a lack of road access for portions of these routes thus creating extremely serious problems when emergency repairs are required.

This route also has a potential for conflict with future hydroelectric development. In addition, the concerns expressed for alpine tundra on the 60-Mile road, the technically difficult crossing of the Yukon River and preservation of the historic placer workings in the Klondike River apply equally to the Tintina Trench routes.

Conclusions

The Panel wishes to point out that insufficient data are available at this time to draw any definite conclusion from a comparison of alternate routes

in southern Yukon.

For the proposed Alaska Highway route the Panel has reservations about mitigative measures being effective for the ice-rich permafrost and Sheep Mountain areas. For the Klondike Highway route the Panel is concerned about the aesthetic impact along the 60-Mile Highway and the crossing of the Yukon River. Additionally for the Tintina Trench routes the Panel has concerns for the amount of access that would be provided to presently inaccessible highly productive wildlife areas.

DEMPSTER LATERAL

The Dempster lateral is not an alternative to the Alaska Highway route. It is a possible route by which Mackenzie Delta gas could be transported to connect with any southern Yukon route.

The Panel was advised that geologic data were sufficient for preliminary assessment but that data for other environmental factors were insufficient to fully identify environmental impacts. The major potential geological problems noted were existence of permafrost along much of the corridor length, seismic activity in the Richardson Mountains, and a shortage of suitable granular material sources north of the Ogilvie Mountains.

The potential for bank instability at water crossings, ponding, interruption of groundwater flows, creation of aufeis, and increase of river sediment loads were identified as possible problems. There is a serious deficiency of hydrologic, sedimentalogic,soils and groundwater information.

In order to identify and evaluate potential environmental impacts and mitigative measures, it was recommended to the Panel that future investigations should include gauging of major streams, establishment of river sediment regimes, evaluation of the effects of the Dempster Highway crossings on rivers, and monitoring of groundwater regimes under a variety of permafrost conditions. It was estimated that three to five years would be required for such a program.

The wildlife issues identified at this time related to the well-being of the Porcupine caribou herd, Dall's Sheep, grizzly bears and nesting populations of raptors. Of these the Porcupine caribou herd received the greatest emphasis. It was recommended that studies of at least two years duration would be required to determine the distribution, behaviour and habitat requirements of wildlife populations.

The Panel was advised that the environmental impact of the construction and use of the Dempster Highway is not fully known and that the effects on the caribou, in particular, may be of greater magnitude than those associated with pipeline construction and operation. The Panel was further advised that the Dempster Highway area is a traditional hunting and trapping area for native peoples.

The Panel was advised that data on fish were lacking and it was estimated that two year's seasonal data would be required to obtain basic stream inventory information relating to distribution and sensitivity of spawning, overwintering and rearing areas in major drainages, and information on

the sensitivity of alpine headwater streams to disturbance.

Sensitive tundra plant communities, the presence of many rare and unique vegetation types, the presence of the proposed International Biological Program reserve between North Fork Pass and the Chapman Lake area, and the feasibility of revegetation and restoration of tundra plant communities were also identified as matters of concern.

It was recommended to the Panel that studies should be accelerated or initiated to assess the success of revegetation in test plots along the Dempster Highway, to survey the natural revegetation success along the Dempster Highway, to determine the distribution of rare or unique vegetation types or species, and to study the potential effects of gaseous emissions from compressor stations on lichens. The Panel received estimates that a minimum of three years would be required to evaluate these problems.

Conclusions

The Panel notes that the National Energy Board, in referring to a northern Yukon segment of the proposed Mackenzie Valley pipeline, stated that it was concerned that, if such a segment was built, it would likely have irreversibly detrimental effects on the Porcupine caribou herd. This proposed segment would pass through the herd's calving grounds.

The Panel has equally strong concerns about a pipeline in co-existence with the Dempster Highway, passing through the herd's winter range and transecting

the migratory routes of the caribou.

The Panel is also concerned about the environmental impact of this route in relation to the construction of a pipeline in ice-rich permafrost areas.

The Panel is unable to state whether a pipeline built along the Dempster Highway would have no unacceptable environmental impacts and concludes that a considerable amount of data must be collected before an assessment of this route and a comparison with any other possible route for the transportation of Mackenzie Delta gas can be undertaken.

An assessment of the environmental impacts that have and will result from the construction and operation of the Dempster Highway is a necessary prerequisite to any assessment of a pipeline route along the highway.

IX. COMPARISONS OF THE ALASKA HIGHWAY AND THE MACKENZIE VALLEY ROUTES

The Panel was instructed to hear information on the comparative environmental impacts of the Mackenzie Valley and the Alaska Highway proposals. The benefit of hearing the comparison was that many lessons learned through the Mackenzie Valley review were pointed out to the Panel. It should be stressed that most of the comparative studies were prepared under restrictive time constraints; some were based on a subjective analysis of environmental impacts; and in many cases, they lacked the benefit of extensive baseline data.

Four relevant comparative studies were tabled at the Panel hearings. These are summarized below:

1. The Alaska Highway Pipeline Panel, an independent organization funded by Foothills Pipe Lines (Yukon) Ltd., issued a report dated June 1977. They used a ranking system based on an evaluation by specialists of various environmental components. The study showed that the proponent's proposed route is strongly preferred over the Canadian Arctic Gas Pipeline Limited route by a ratio of 1.4 : 1.0. The report did not include the Dempster lateral which could alter that ratio, although spokesmen at the hearings would not estimate by how much. Except for potential impact on fisheries where there was a ratio slightly in favour of the Mackenzie Valley route, all sub-ratios determined for the physical, biological and human environments favoured the Alaska Highway route. Although the preference ratio was greatly influenced by the

relative weights assigned to the environmental components by the specialists, it was generally felt at the hearings that the expert opinion of a different group would not reverse such a well-defined preference.

2. A report completed in May 1977, by P. J. Rennie and a group of Canadian Government environmental specialists favoured the Alaska Highway/Dempster route over the Mackenzie Valley route proposed by Canadian Arctic Gas Pipeline Limited. Their comparison was also based on an appraisal of available data and the alternatives were ranked according to environmental sensitivities based on a wide range of factors. The results indicated a general preference for the Alaska Highway/Dempster route although some of the experts had serious reservations about the possible effects on the Porcupine caribou herd. The report concludes with the statement: "For the western Arctic, the environmental objections to a Mackenzie Valley route are strongly and widely manifested, and especially so if a northern Yukon section is included. In contrast, the so-called 'Alcan' route, along the Alaska-Canada Highway, has far fewer environmental difficulties, and is clearly preferred and by a wide margin by all environmental specialists. This preference still holds if a spur line is added to the Alcan route via the Dempster Highway route."

3. A terrain sensitivity ranking system developed by S. C. Zoltai and other Canadian government scientists was applied to the proposed western Arctic pipeline routes and their report on the resultant

ranking was submitted to the Panel. The system was based on a seven-class rating with classes 4-7 indicating sensitive permafrost terrain that was subject to serious impacts from surface disturbance. Although the system used is generally descriptive and not suitable for detailed route analysis, the results did indicate the Mackenzie Valley route had a much higher proportion of sensitive permafrost terrain.

4. Geo-Analysis Ltd., a consultant contracted by the Department of Indian and Northern Affairs undertook a comparative study of selected terrain and geotechnical characteristics along the proposed Alaska Highway (excluding the Dempster lateral) and Canadian Arctic Gas Pipeline Ltd. (cross-delta) routes.

The study showed that compared to the Alaska Highway route, the Mackenzie Valley route traverses 408 more miles with soils that are highly frost susceptible. Also, soils which contain a high percentage of ground ice occupy 192 more miles along the Mackenzie Valley than the Alaska Highway route. The extent of unstable slopes is greater along the Alaska Highway route, whereas erosion potential is slightly greater along the Mackenzie Valley route. The occurrence of surface or near-surface bedrock is about the same along both routes. There is a slightly higher potential for icing along the Mackenzie Valley route. The seismic risk is much higher along the Alaska Highway route where the seismicity rating is high along a total of 216 miles.
The Mackenzie Valley (cross-delta) route does not traverse any high seismic risk terrain.

Conclusions

The Panel agrees with the general conclusion that for the transportation of Alaska gas to southern markets, the Alaska Highway route is environmentally preferable to the Mackenzie Valley routes.

X. GENERAL CONCLUSIONS AND RECOMMENDATIONS

The Panel has identified several possible significant environmental impacts related to the construction and operation of the proposed pipeline along the Alaska Highway. The Panel concludes, however, that the proposed pipeline can be constructed and operated in an environmentally acceptable manner subject to the following conditions:

- that environmental planning is properly carried out,
- that suitable re-routing or other solutions be found for the unique and sensitive problem areas and,
- that the environmental problems associated with the ice-rich permafrost areas be overcome through re-routing, effective design and the development of adequate mitigative measures.

The Panel notes that an elevated mode, which was not addressed at the hearings, might provide an alternative to burying a pipeline in ice-rich permafrost areas.

In addition to the Alaska Highway corridor the Panel considers a corridor following generally along the 60-Mile Highway from the Yukon-Alaska border to Dawson, along the Klondike Highway to Whitehorse, then along the Alaska Highway to the Yukon-British Columbia border near Watson Lake to be potentially acceptable environmentally for construction of a gas pipeline.

The Panel notes that the possible Tintina Trench routes discussed at the

hearings, and shown on the accompanying map, would traverse areas presently inaccessible by road and would constitute unnecessary intrusion into wilderness areas. The Panel does not rule out the possibility of utilizing a corridor following the above alternative to Carmacks then the Robert Campbell Highway to the Yukon-British Columbia border.

The Panel notes that the routes through Dawson would avoid significant areas of ice-rich permafrost and would also avoid those unique and sensitive problem areas associated with the western section of the proposed Alaska Highway route.

The Panel considers it unlikely that all environmental problems have been identified for the alternate corridors described above, and concludes that they would require further study to demonstrate their acceptability.

The Panel concludes that the environmental information base for the Dempster link is not sufficient to offer any opinion on environmental acceptability at this time, and that the environmental impacts of the construction and operation of the Dempster Highway must be determined as a prerequisite to developing an environmental impact assessment for the possible pipeline.

The Panel concludes that a southern Yukon pipeline route is environmentally preferable to a Mackenzie Valley route for transporting Alaska gas south.

Should a decision be made to continue planning for the transportation of Alaska gas south through the southern Yukon, the Panel recommends that:

1. The Environmental Impact Statement for the proposed southern Yukon route be completed based upon Environmental Impact Statement guidelines to be issued by the Panel.

2. An environmental control mechanism be established immediately to co-ordinate design criteria development, design concept approvals, final design approvals and monitoring and surveillance. (The Panel is not so concerned that one agency be established but that an effective co-ordination be established so that conflicting controls, duplication of effort and time wastage are avoided and environmental protection is assured).

3. An environmental impact assessment of the construction and operation of the Dempster Highway be undertaken immediately.

4. A co-operative industry-government baseline data program specifically pertinent to environmental impact assessment of the pipeline including its effect on fish and wildlife resource utilization, be implemented immediately. Research into frost heave and thaw settlement problems should also be carried out on a co-operative basis.

5. Where advanced planning is required for the re-establishment or relocation of public facilities such as highways, recreational areas and campgrounds affected by the proposed pipeline, this planning commence immediately.

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A C K N O W L E D G E M E N T

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