# Mackenzie Valley Highway Extension: Scoping, Existing Information and the Regulatory Regime

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**GNWT**

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# 1. EXECUTIVE SUMMARY

## 1.1 Introduction

At present the communities of Tulita, Deline, Norman Wells and Fort Good Hope can only be reached by road in the winter, and the only all weather road to Tsiigehtchic and Inuvik is the Dempster Highway via the Yukon. The concept under consideration is an 804 km extension of the Mackenzie Highway north from Wrigley to the Dempster Highway, with a possible 105 km side route to Deline. This report is one of four related studies being conducted by the Government of the Northwest Territories (GNWT) Department of Transportation (DOT) to see if, from a range of perspectives, it makes sense to link these communities with an all weather road. The other studies include a benefit–cost analysis, engineering and financing.

At this time such an extension is only a concept to be evaluated, not a formal project proposal. The purpose of this Mackenzie Valley Highway Extension (MVHE) study was to:

- Undertake, and report on, community and other stakeholder consultation to scope issues;
- Collate existing information on the project area and evaluate its likely usefulness in a future environmental impact assessment (EIA) process, should the extension become a firm project;
- Examine regulatory requirements for the project; and
- Identify information gaps and make recommendations on future work that would be needed to fill those gaps to meet EIA needs.

## 1.2 Environmental Issue Scoping

'Scoping' involves a preliminary identification and analysis of issues that may have to be assessed during an environmental assessment. Through environmental scoping, communities along the proposed MVHE were given a preliminary opportunity to identify and discuss issues

surrounding the construction and operation of the highway. Environmental scoping sessions (public meetings) were held in Fort Simpson, Wrigley, Tulita, Deline, Norman Wells, Fort Good Hope, Colville Lake, Tsiigehtchic and Inuvik. In addition, Elders were interviewed regarding their traditional knowledge, and other technical experts and stakeholders were consulted.

During community scoping sessions the majority of participants were more interested in discussing whether they were for or against the project, rather than covering specific environmental or social issues. The economic benefits that could accrue to a community through training and employment opportunities were foremost in their minds. Communities generally favour construction over approximately a 10 year period using the 'community construction approach'. Their belief in the potential for the MVHE to stimulate the regional economy in terms of resource development and the tourism industry was emphasized. However, many participants did raise concerns about social and environmental impacts of the project.

Communities within the Mackenzie Valley (Fort Simpson, Wrigley, Tulita, Norman Wells, Fort Good Hope, Tsiigehtchic and Inuvik) support the extension for the resource industry and tourism business that could be generated. It is recognized that along with greater access could come social problems related to alcohol and drugs, but most communities are confident that they are more capable of planning for and dealing with these negative effects than they were in the 1970s. The main environmental concerns regarding improved access include various potential negative effects on fish and wildlife habitat and populations.

Residents of Colville Lake have mixed feelings about the MVHE, (because of concerns about social impacts on their community and concerns that people from Fort Good Hope will benefit the most) and cannot readily agree to the project without knowing the opinions of other communities. Elders in Deline were firmly opposed to a spur road linking their community with a highway through the valley, largely because of the perceived negative social impacts to traditional activities. However, neither Deline nor Colville Lake residents expressed opposition to an all-weather highway linking other communities down the Valley. Some residents of Tsiigehtchic prefer an alternate alignment southwest of the Mackenzie River so as to avoid impacts on the Travaillant Lake area that lies northeast of the Mackenzie. A strong message from the scoping sessions is that DOT should commit to future community consultations on all aspects

of the project if it becomes a reality, with respect to training and employment for construction, and traditional knowledge with respect to route alignment and stream crossings.

In addition to the public meetings that many Elders participated in, an attempt was made to interview three Elders in each community with respect to their traditional knowledge (TK). Elders remember previous pipeline and highway projects and the social impacts they had on Mackenzie Valley communities, and do not want the impacts to be repeated. They see an opportunity for short-term employment and training benefits, but are concerned about the long-term. They have many concerns about impacts of the MVHE on their traditional life, and feel that increased access would bring an increase in drugs and alcohol. They have more specific concerns about impacts on fish and wildlife habitat, and traditional burial sites.

Consultations with government technical authorities, co-management bodies, and non-governmental organizations tended to focus on the possible direct impacts on the ecosystem, and the mitigation measures necessary to minimize these effects. Moose, caribou and bears are wildlife species of concern, considering the possible influence the MVHE could have through mortality related to collisions, legal and illegal harvesting, and through disturbance. Increased access to fish resources and the cumulative effects of disturbance to streams crossed by the highway, are also issues of concern. The Mackenzie Valley is valuable migratory and breeding habitat for songbirds, waterfowl and raptors. Technical authorities provided a number of suggestions for minimizing potential impacts to these species, particularly during the construction phase of the MVHE.

### 1.3 Existing Data Collection

It is important to maximise the use of existing information, to efficiently plan for environmental impact assessment (EIA) of the MVHE project. A bibliographic database was created for the study area by means of searches of both electronic and conventional written information sources. Disciplines covered included socio-economic, historical/cultural and biophysical discipline areas. To be included, references needed to be of relevance to the MVHE corridor and address issues pertinent to the development of an EIA for the road. After editing out inappropriate citations, the database comprised just under 1200 records. The database is provided in printed form as an appendix to this report and also as an electronic database searchable by key words.

Records were ranked as to their utility to help with preparation of an EIA; classes were high, medium, low and indeterminate. Criteria for ranking references varied by discipline, but in general more useful references were focused on the potential development corridor and were not too old. The following details summarize the information found:

- One hundred and eighty-three references contained relevant socio-economic information; of these 148 also overlapped with other discipline areas. Only 35 were ranked as of high use for EIA purposes.

- Three hundred and ten historical/cultural references are included in the database, 125 of which also included information on other areas. Thirty-four were deemed of high use for EIA purposes.

- Biophysical references were the most common, with 768 biophysical only references and 150 including information on other disciplines. Four hundred and ten of the biophysical only references were classed as of high use in EIA preparation.

A selection of key references were reviewed in more detail, especially those related to the previous road and pipeline corridor planning in the Mackenzie Valley during the 1970s and 1980s, plus more recent reports. These references, plus abstracts for other citations, were used to gauge the adequacy of existing information for EIA needs, as detailed in Section 6 of this report.

### 1.4 Regulatory Regime and Environmental Impact Assessment

The regulatory and environmental impact assessment regime in the NWT has evolved in recent years with the settlement of some land claims and the proclamation of the *Mackenzie Valley Resource Management Act* (MVRMA).

Various acts and regulations require a proponent to obtain permits for field studies conducted in support of the environmental impact assessment. The major part of the regulatory regime however, comes in to play with the EIA process. Once approval for the project is received the proponent would require a number of authorizations, permits or licences.

These include a water licence for the use of water and discharge of waste, as well as for the installation of bridges or culverts if the watercourse is more than 5m wide. Conditions of the water licence include criteria required for drinking water, for the discharge of water, and for abandonment and restoration. Permission is required under the Fisheries Act and the proponent is responsible for identifying the habitats potentially affected by the project, assessing the potential for each fish species of concern and developing mitigation alternatives. An approval must also be received from the Canadian Coast Guard for the placement of any structure that may interfere with navigation, such as a bridge or culvert, in a navigable water.

Land use permits for Crown and First Nations lands are issued for short term construction activities (five years or less, with possibility of extension for up to two more years) by the Gwich'in and Sahtu Land and Water Boards and, after Part IV of the MVRMA is proclaimed, the Mackenzie Valley Land and Water Board. These permits would contain operating conditions that the proponent must adhere to, as well as dealing with reclamation issues. A number of land use guidelines are produced by the Department of Indian Affairs and Northern Development (DIAND) on topics such as reclamation, access roads and trails, and pits and quarries. In addition to a land use permit, quarry activities also require a quarry permit if located on Crown land. On Sahtu or Gwich'in owned land, the First Nations are entitled to compensation for construction materials obtained from their land. GNWT, Municipal and Community Affairs (MACA) currently issues land use and quarry permits for Commissioner's Land, although this process currently is subject to negotiation with the land and water boards.

Cultural resources are protected by the permits required to conduct a study, by the need to conduct an assessment of the historical potential of a site during an EIA, as well as by terms and conditions applied to land use permits.

The EIA conducted for the project, if it is proposed, would proceed under the MVRMA. Under this regime, the first stage of EIA is preliminary screening. This is usually conducted by the land and water boards, but the permitting authorities (e.g. Fisheries and Oceans (DFO), DIAND, Natural Resources Canada (NRCan)) may also conduct a screening although this is unlikely if their concerns are given due consideration by the land and water board(s). The proponent must demonstrate that it has permission of the land owner to proceed with the development. The project is also checked against any land use plans to ensure conformity. The preliminary

screeners must decide if the project might cause significant adverse environmental effects or public concern. If so, the project is referred to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) for environmental assessment (EA). The scope of this project, and public interest associated with it, makes it likely that the MVHE would be referred for environmental assessment.

The MVEIRB would conduct the environmental assessment and make its decisions based on the preliminary screening report, information supplied by the proponent, public input, as well as expert advice the MVEIRB may seek. The MVEIRB may ask the proponent to prepare an environmental assessment report, according to terms of reference supplied by the Board, if the information provided at preliminary screening is not adequate to conduct the environmental assessment. The MVEIRB has several options for a decision on the environmental assessment. If the MVEIRB is satisfied the development produces no unacceptable impacts or significant public concern, it would likely recommend conditional approval of the project. If significant adverse environmental effects are likely or there is significant public concern, MVEIRB may send the project for environmental impact review. If likely impacts are very severe the project could be rejected.

Environmental impact review involves the formation of a review panel appointed by the MVEIRB. The review panel functions under terms of reference set by the MVEIRB in consultation with the responsible minister and the Gwich'in, Sahtu and Deh Cho First Nations. An environmental impact statement may be requested of the proponent by the review panel if the information already provided is not sufficient to conduct the review. This decision may involve public input. The review panel is required to consider additional matters to those considered during the environmental assessment including the purpose of the development, alternative means of achieving this purpose, and the need for follow-up programs. The panel would either recommend project approval (likely with mitigation measures) or that the project be rejected. Unless serious issues arise during the review, it is likely the review panel would recommend project approval under the condition that appropriate mitigation measures are identified and adopted. The federal minister may adopt the review panel's recommendation (with or without modifications) or reject it. Modifications to or rejection of the recommendation requires the minister to consult with the review panel.

During all stages of environmental impact assessment, decision makers are directed by the MVRMA's guiding principles (laid out in Part V of the Act), and by the requirement to not cause unacceptable significant adverse environmental impacts, or harm the social, cultural and economic well-being of residents and communities of the Mackenzie Valley.

## 1.5 Information Gaps and Needs

In this Section the adequacy of existing information is compared against expected EIA requirements. Recommendations are then provided as to future studies needed to fill data gaps.

Biophysical references were sub-divided into a number of disciplines to identify information gaps. Those disciplines were climate, geology/soils, hydrology, water quality, fisheries, vegetation/wildlife habitat and wildlife.

It is anticipated that there is sufficient climate data available to meet the requirements for an EIA. An assessment of the potential effects of climate change on the road should also be conducted though, to ensure that the road is best designed to meet any potential changes in snow fall, stream flows and distribution of permafrost.

The geology/soils reports provide varying levels of information, in some cases quite detailed while in others too general to have any direct applicability. Due to the age of some of the studies, 25 years or more, there may well have been ensuing changes to the vegetation cover in some areas that in turn may have affected active layer dynamics and, therefore, which construction techniques might be appropriate. It will still be necessary to compare data with a specific proposed alignment and plan appropriate field programs to acquire geotechnical, soil and terrain data for sections of the route covered either inadequately or not at all in the existing sources.

There were a number of relevant hydrological studies identified that were completed in the 1970s for a proposed highway in the Mackenzie River valley. These studies are good baseline reports, but the hydrology analyses need to be updated with more recent data for accurate modelling that would be needed for design and mitigation purposes. In addition, the data available on stream morphology and geotechnical information needs to be reviewed in detail, to identify any data gaps that may exist for each finally proposed stream crossing.

Baseline information on water bodies would be collected as a component of the Fisheries and Aquatics baseline study. Much existing water quality information appears to be adequate. Total suspended sediments (TSS) and field measurements (pH, conductivity and temperature) are recommended as part of fisheries investigations. Water quality data would be included as baseline information against which to gauge the efficacy of mitigation, through monitoring programs. Monitoring would likely be an important part of project planning.

While much existing fish biology information is relevant for EIA purposes, a more important need is to address potential concerns regarding fish habitat. Field studies can be implemented that will efficiently address data gaps with an emphasis on habitat for key species. Due to the large amount of existing literature for the Mackenzie River and its tributaries, an exhaustive field program to fill these gaps would not be necessary.

Much of the available information on vegetation and wildlife habitat is from the early 1970s and thus is not current. Updated information is required that would accurately reflect today's conditions. Satellite imagery and linkage to ongoing mapping initiatives such as in the Sahtu (Sahtu GIS Project), would be one cost-effective means of mapping the vegetation along the potential road routes. Development of habitat models for key wildlife species could then be conducted so that quantitative assessments of the effects of alternate road routes on wildlife habitat could be completed. The wildlife habitat maps produced could then be ground-truthed through a stratified survey for key wildlife species.

Information available for wildlife is discussed for birds, ungulates, carnivores and for wildlife harvesting. Some more current route specific information on wildlife habitat and wildlife populations is required to update available data. More community and regulatory consultation should occur to aid in the selection of key wildlife species of concern. Once the species have been selected, habitat maps for each key species should be developed through the use of habitat models and a vegetation map interpreted from satellite imagery, as just described. The road routes could then be analyzed in terms of habitat quality. Some surveys for key species should be conducted, stratified by habitat quality, to verify the models. Particular attention should be paid to habitats considered to be of exceptionally high quality (e.g., important migratory bird sites). Alternate routing to avoid such areas should be considered in the assessment.

Socio-economic topics were grouped for further analysis, as demographics, resources and economics and community services. Demographic data are available, but they should be compiled and analyzed on both regional and community levels. These data form the basis against which to assess both potential positive and negative impacts from the project. The most current data come mainly from the 1996 Canadian census. Analysis of existing resources and economics data is needed to draw an accurate portrait of the Mackenzie Valley economy. This would be necessary as a prelude to quantifying potential project impacts and approaches to mitigation of negative effects and optimization of benefits. Emphasis will be on communities directly on the road route, however additional communities such as Inuvik and Fort Simpson also need to be considered for regional effects analysis. All this data may be obtained from Statistics Canada and the NWT Bureau of Statistics, which have compiled raw data, often at the individual community level. An inventory of existing services and infrastructure may be assembled through recourse to data available from community-based agencies and various GNWT departments. These data are required to allow for a full impact and mitigation analysis for the project. The community wellness study needs to be considered in relation to the monitoring program that should be developed to evaluate the appropriateness and efficacy of the social, economic and cultural mitigation strategies that are implemented.

The last area evaluated concerned historical/cultural sites and traditional knowledge (TK). Because heritage resources are finite and most susceptible to the direct affects of development, accurate information about the location of disturbance zones is one of the most important information needs for an EIA. Maximum use can be made of mapped known sites, both for mitigation and for planning additional field studies. A comprehensive consideration of landscape potential is an important information need in planning effective EIA level studies for archaeology. This would entail compilation of detailed topographic and ecological information for the proposed development corridor, as well as development of systematic criteria for prediction of landscape potential. These data, as well as analysis of the landscape associations of known sites, would permit stratification of the development zones into areas considered to have varying degrees of potential for the occurrence of heritage resources. This would allow planning of effective assessment strategies, focusing on areas warranting greater attention while omitting areas of low potential. It is expected that much of the development zone would have limited potential, especially in low, water saturated or featureless terrain. Just as for key wildlife species, use of a GIS based predictive model that incorporates heritage potential, along with other

environmental concerns, may be the most appropriate planning tool for evaluating the potential effects of the Mackenzie Highway Extension, for structuring EIA related field investigations and for comparative assessment of alternate routes.

Existing TK data are more frequently being mapped on land claim-based GIS systems in the Mackenzie valley. In addition some communities have experience of working on timely focused TK studies to allow mitigation of potential effects of recent oil and gas exploration. A comprehensive understanding of regional traditional land use patterns and of the project related concerns within local communities is an important information need for an EIA. It would be important to use maximally existing information, however even here its interpretation will require community input. In addition it has been accepted practice to involve Aboriginal community representatives in collecting scientific data for an EIA, including archaeology, wildlife and possibly vegetation studies. Provisions for direct participation in EIA studies should be made.

## 1.6 Conclusions

- There is strong support for the Mackenzie Valley Highway Extension from communities in the Valley that would be linked by the project.

- A spur road to Deline was firmly opposed by that community, but they did not object to the main route in the Mackenzie Valley.

- Residents of Tsiigehtchic are divided regarding the preferred route. Many prefer an alternate alignment southwest of the Mackenzie and would like to discuss that option with residents of Fort Good Hope.

- Full community involvement in subsequent project planning and detailed EIA planning is a priority for all communities.

- A slower community construction approach, over approximately a 10 year period, is generally favoured to maximize community training and employment benefits.

- Much information exists for the project area, some of which, especially in biophysical subjects, would have direct relevance in preparing an EIA, should the project be formally proposed. Even more of the existing information will help in planning focused studies to fill information gaps for the EIA process.

- The new regulatory regime under the MVRMA for an EIA and subsequent permitting has been described. The scope of the project and level of public interest in it, suggest that it would be referred for environmental assessment after initial preliminary screening.

- The amount of new studies required to investigate issues and propose adequate mitigation, varies by discipline. Recommendations are given on the nature and amount of work needed in biophysical, socio-economic and cultural - archaeological areas. Meaningful integration of TK into the EIA process will be necessary.

# 2. INTRODUCTION

## 2.1 Background: The 1970s

The Mackenzie Highway, or Highway 1, begins at the Alberta-NWT border and turns northwest at Enterprise towards and down the Mackenzie Valley. For a number of years Highway 1 terminated at Fort Simpson.

In the spring of 1972 the federal government announced that the Mackenzie Highway would be extended from Fort Simpson to the Dempster Highway, which was then under construction. Public Works Canada (PWC: the federal department then responsible for highways in the NWT) took charge of the project. Over the next 4 years a multitude of studies were completed on the entire length, and specific sections, of the proposed highway extension. These included extensive survey work, geotechnical investigations, environmental studies, and bridge and culvert design studies. Pre-engineering and design work was completed to the 'ready to go to tender' stage for most of the highway extension.

Actual construction began from Fort Simpson in 1972, but PWC ceased construction in 1977 after completion of only 210 km of highway, at a point about 18 km south of Wrigley. PWC mothballed the project, consolidating all of the design work for the remainder of the extension into a volume of Provisional Contract Packages that could be used in the future if the project was reactivated.

In 1989 GNWT Department of Transportation (DOT) took over responsibility for maintenance, operation and reconstruction of existing highways in the NWT. The federal government remains responsible for new road construction. With these new responsibilities and considering its role in promoting economic development in the NWT (which is related to infrastructure development), the GNWT reviewed the status of the Mackenzie Highway extension and updated cost estimates for completion. GNWT took on the responsibility for completion of the remaining 18 km section to Wrigley, which opened for traffic in the summer of 1994.

## 2.2 The Existing Highway and Winter Road System

The existing all-weather Highway 1 extends 690 km from the Alberta-NWT border, and ends at Wrigley (see map on following page). It crosses the Liard River near Fort Simpson and the Mackenzie River about 84 km northwest of Fort Simpson. Both crossings utilize ice-bridges in winter and ferries in summer, with temporary disruptions in service frequently occurring during freeze-up and break-up.

The all-weather Highway is supported by a winter road system north of Wrigley. This extends down the Valley to Tulita, Norman Wells and Fort Good Hope, a total distance of 482 km. In addition there is a lateral 105 km winter road into Deline. The winter road system is constructed annually. Opening and closing dates have varied considerably, but now the road generally opens about mid January and closes mid March. Stream crossings tend to be a limiting factor, and DOT has been attempting to increase the length of the winter road season by installing culverts and permanent bridges at stream crossings.

## 2.3 The Concept for Extension of the Highway

At present the communities of Tulita, Deline, Norman Wells and Fort Good Hope can only be reached by road in the winter, and the only all-weather road to Tsiigehtchic and Inuvik is via the Dempster. DOT is conducting studies to see if it makes sense to extend the all-weather Mackenzie Highway north from Wrigley to the Dempster, with a possible side route to Deline.

At present the extension is only a concept, DOT has not formally proposed construction of the extension, nor has government made a political commitment to build it. (note: this is one of three concepts presently under consideration by DOT, the others being: the Slave Geologic Province Transportation Corridor; and the Inuvik-Tuktoyaktuk road).

In 1990 DOT published its *Northwest Territories Transportation Strategy* which contained the stated goal:

*" To ensure the safe, accessible and reliable movement of people and goods to meet the economic, social and political need of the people of the Northwest Territories and Canada."*

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**LEGEND**

- EXISTING ALL WEATHER ROAD
- WINTER ROAD
- PROPOSED ALL WEATHER ROAD

0 50 100 150 200km

SCALE 1:5,000,000

DIGITAL MAP OF NORTHWEST TERRITORIES FROM:
SELECTED MINERAL DEPOSITS OF THE NORTHWEST TERRITORIES,
DEPARTMENT OF ENERGY, MINES AND RESOURCES, MINERAL
INITIATIVES 1991 TO 1996, REVISED OCTOBER, 1996.

**REFERENCE**
INFORMATION MANAGEMENT GROUP, DIAND (Sept. 5/1997)

Golder Associates

# CONCEPT FOR AN ALL WHEATHER ROAD EXTENTION FOR THE MACKENZIE VALLEY

| DRAWN: BGM | APPROVED: | DATE: 12 FEB. 1999 |
|---|---|---|
| PROJECT: 982-2293.2020 | | FIGURE: 1 |

The 1990 strategy covered a wide range of marine, air and surface transportation initiatives. It confirmed government interest in completion of the extension of the Mackenzie Highway from Wrigley to Inuvik, with the following rationale:

*"The route could slightly improve access to areas of high mineral potential along the NWT-Yukon border…In the oil and gas sector, a Mackenzie valley highway would likely help stimulate exploration activity and would certainly reduce the costs of pipeline construction and operation. It would also shorten the distance and reduce costs for road resupply of Mackenzie Delta/Beaufort Sea exploration and development.*

*"This route is regarded as showing high potential for tourism development. The link would create a loop from the Yukon and Alaska via the Dempster Highway. This would attract a share from these two market areas and boost the overall tourism traffic.*

*"The main attraction for renewable resources would be access to the forest resources of the valley. The construction of the route would provide considerable training and employment opportunities for the smaller, less developed communities in the region. It would also further fuel the economies of Yellowknife, Hay River, Norman Wells and Inuvik. Living costs would be reduced for all valley communities north of Wrigley."*

In 1995 DOT published *Northwest Territories Highway Strategy Update, 1994* to summarize accomplishments since 1990, and to reflect current government priorities. One of the three objectives in the update was "Building New Transportation Corridors for Economic Development," and the proposed infrastructure for accomplishing this objective again included the Mackenzie Valley Highway. It stated that:

*"Construction of the Mackenzie Highway from Wrigley to Inuvik and Tuktoyaktuk must not be undertaken as a mega-project. The main objective is local employment, with work in several locations on an on-going basis. Work must begin now, and not wait for an oil or gas pipeline to materialize."*

*"The extension of the Mackenzie Highway from Wrigley to Inuvik and Tuktoyaktuk must be proposed to the federal government as a joint Canada-Northwest Territories employment-creation initiative."*

In 1998 DOT began preparatory work to evaluate the feasibility of the extension. A *Preliminary Planning Workshop on the Mackenzie Valley Highway Extension Project* was held in Norman Wells June 9, 1998. It brought together stakeholders with a cross-section of interests to discuss the opportunities and challenges associated with the project. Participants supported construction of the extension, while identifying concerns about respecting provisions of land claims, the need to maximize community opportunities for training and employment, and both environmental and socio-economic impacts. One outcome of the work was formation of a Stakeholder Advisory Committee to provide ongoing advice to DOT on key issues related to the road development and the proposed studies.

The basic DOT concept was to complete an 832 km all-weather extension of Highway 1 from Wrigley to the Dempster, with a possible 105 km all-weather lateral road from Junction to Deline, at a total estimated cost of between $400 and $500 million. Two options were advanced for the 'level of service' to be studied: one with a design speed of 60 km per hour; the other with a design speed of 80 km per hour. The main differences in these two options are that the faster road would require slopes that are less steep, allow for longer stopping distances, and need more gravel, sand and shale for the road base. The two options proposed for crossing the Bear River was a bridge or ferry/ice bridge. All other stream crossings would be by bridge or culvert. The alignment would be similar to that identified by PWC in the 1970s (and endorsed in the Gwich'in and Sahtu land claims) while allowing for the possibility of realignment based on further studies and consultations. Studies initiated by DOT to evaluate the concept included:

1. Benefit-Cost and Regional Impact Analysis: Mackenzie Highway Extension;

2. Mackenzie Highway Extension 1999 Engineering Update;

3. Environmental Scoping, Existing Data Collection and Regulatory Requirement Identification (this study); and

4. Financing Options Study for the Mackenzie Valley Highway Extension.

## 2.4 Environmental Overview

The Mackenzie Valley study area is the lower portion of the Mackenzie River basin, the largest river system in Canada, with a total drainage area of approximately 1,766,000 square kilometers, including portions of Yukon Territory, British Columbia, Alberta and Saskatchewan. The basin is rich with non-renewable resources and renewable resources, with many valued ecosystem components (VECs).

The Mackenzie Valley is carved out of the Western Cordillera, largely formed of soft sedimentary rocks interspersed with hard metamorphosed igneous rocks. Over geologic time erosion has created an extensive 'foothills,' or Interior Platform, through which much of the Mackenzie River flows. The Mackenzie Valley Highway Extension (MVHE) would traverse portions of both the Interior Platform and the Western Cordillera. Much of the Valley is covered by coniferous boreal forest, dominated by white and black spruce. Areas of sandy soils can support pines, aspen and tamarack.

The Mackenzie River and its tributary streams support extensive fish habitat and fisheries resources. Important species include trout, whitefish, Arctic grayling, cisco, and inconnu. The River and larger streams are important for migration and the streams, even very small streams, provide important spawning habitat. The alignment of the proposed extension crosses many streams in areas of significant fish habitat.

Wildlife resources of the study area are especially significant. Moose are found throughout the area, with willows along the river providing prime habitat. Small populations of woodland caribou are prevalent, and the range of the Bluenose caribou herd extends close to northern portions of the Mackenzie River. Wolves inhabit areas where moose and woodland caribou are found, and they follow the migratory Bathurst caribou. Both grizzly and black bears occur within the area. Furbearers especially populate the marshes and wetlands. The Mackenzie Valley is an extremely important corridor for migratory waterfowl.

## 2.5 Issues Related to Road Development

The purpose of this document is to provide DOT with a summary of environmental scoping exercises (Section 3), relevant existing data (Section 4) and regulatory/environmental assessment requirements (Section 5). If the extension from Wrigley to the Dempster is proposed, the proponent would need to judge what areas to focus on during the planning phase and for the purposes of environmental impact assessment; an understanding of the impacts related to all weather road development in the Mackenzie Valley is also required for this purpose. This, along with scoping, knowledge of the information already available, and an understanding of the information regulators require would help the proponent chose where to spend resources on research and assessment of impacts from highway construction (Section 6). This section briefly outlines what are likely to be the major impacts resulting from construction of an all weather highway and provides some context to the discussion of issues in the chapters on scoping, regulatory requirements, and existing information.

### Socio-economic

A number of significant impacts may result due to increased access to communities. Some communities may experience direct economic benefits as new service needs are created. Job creation, increased commercial sector and support service sector activities, and economic multiplier effects through increased spending and employment are possible. Direct economic benefits may include:

- increased tourism revenue;
- increased employment during construction and on-going maintenance;
- new business and job creation through increased demand for support services; and
- increased local spending and tax revenue as a result of new job creation.

This increase in access, however, may also result in a number of negative social and economic impacts. Potential negative socio-economic impacts related to road construction in the valley may include:

- increased drug/alcohol use/abuse - related social disruption as a result of abuse;

- increased demand for social and health care services;
- increased demand for housing (potential housing shortages);
- increased out-migration from remote communities; and
- increased in-migration of workers to communities during road construction and a subsequent loss or diminishment of jobs for local workers.

**Historical/Cultural**

Historical and cultural resources are fragile, non-renewable and highly susceptible to damage because they are generally located on or near the ground surface. Damage to these resources is permanent and irreversible.

Development projects both directly and indirectly impact historical resources. Direct impacts occur during construction and operations stages of development projects and are a direct result of these activities. Indirect impacts occur as a result of development, but are not directly related to it, and can take place outside direct impact zones. For example, highway projects of this nature can result in increased use of surrounding areas, thereby resulting in unaccounted for surface disturbance, and can lead to an increased possibility of vandalism or accidental impact.

Direct impacts to historical resources could result from a number of activities associated with the MVHE project such as:

- right of way preparation resulting in forest clearance and stripping;
- cut and fill operations associated with road bed construction;
- preparation for and extraction of granular material and other fill required for construction from areas outside the main development zone;
- bridge construction;
- construction of ancillary features as may be needed, such as approaches to other roads, rest stops and so forth; and
- unregulated vehicle activity outside of development zones, especially under frost free conditions.

Protection of historical resources during development projects can usually be managed to acceptable levels through application of existing legislative requirements. The earlier historical resource concerns are included in the planning process, the more effective management would become. Indirect impacts on historical resources may result from the development, through an increase in the frequency and intensity of commercial and recreational land use in the region. These effects are difficult to predict and manage.

The direct cultural effects of the project may be numerous and would require specific consultative study. These could include disturbance of cultural resources as a result of the above mentioned development activities. Other direct effects may include disruption of traditional practices in the vicinity of development zones both during and after construction, as well as short and long-term changes in existing cultural patterns as a result of improved access between local communities and with larger centres to the south.

The indirect effects of the project may also be complex and numerous. These effects may be linked with changes in social and economic realms. Assessment of the overall cultural effects of the project would require comprehensive studies that include direct involvement of communities throughout the region at design, execution and evaluation stages.

**Biophysical**

Roads can have direct and indirect impacts on the biophysical environment. Direct impacts include the physical disturbance of landforms, soils, permafrost, vegetation, fish/wildlife habitat and other resources as a result of clearing and construction activities. Injury or death to wildlife due to vehicle-wildlife collisions, the potential barrier effect of roads to wildlife movements, and the effects of changes to hydrology, sedimentation rates, permafrost, roadside dusting, and salt or other chemicals in run-off can be considered to be direct impacts.

Indirect impacts may include the effects of increased access to an area, which can lead to increased hunting and fishing (legal and illegal) pressure, the effects of disturbance on wildlife, and the effects of increased development along the road (induced development).

*Direct Impacts*

The location of roads and borrow pits from which road materials are extracted can impact many resources. Alternative route locations should be considered in assessments. Direct impacts due to site clearing and river crossings should be minimized by avoiding valued or sensitive areas.

Engineering design should ensure that landslides and slumps would not occur during or following construction. Erosion downstream of the road bed should be controlled through proper design and the use of appropriate structures. The road should be engineered such that impacts to surface water flow are minimized.

Roads, especially if the road base is high or higher than the surrounding landscape, can deter movement of animals such as caribou; appropriate road design can reduce this impact.

Vehicle - wildlife collisions may impact local wildlife populations. Reduced speed limits, direct line of sight, clearing of vegetation in the right of way, and warning signs can all help to alleviate this impact.

*Indirect Impacts*

Indirect impacts may include the effects of increased hunting and fishing, and the increased development that a new road brings. New industry, roadside commercial developments, and communities may be attracted to the area due to the new access. Vehicles can also result in disturbance to animals. Therefore, roads should be constructed away from critical nesting, calving or rearing habitats.

Monitoring of the effects of new roads, such as sedimentation in streams, blockage in surface water flow, wildlife deaths and impacts on local and regional fish and wildlife populations should be conducted.

# 3. ENVIRONMENTAL ISSUE SCOPING

## 3.1 Background

'Scoping' is a preliminary identification and analysis of issues that may have to be assessed during the environmental assessment. Generally, as in the case of this study, scoping is initiated prior to a proponent applying for permits or licences that would trigger the environmental assessment process. Therefore, environmental scoping is not the same as environmental assessment. Rather, it is the consultation and background research needed to identify issues that a future environmental assessment may need to address.

The initial issue scoping for this study covers both environmental and socio-economic concerns, to:

- determine whether or not communities in the area want the proposed extension;
- identify environmental concerns related to the project;
- identify socio-economic, cultural and other concerns related to the project;
- gather and incorporate preliminary traditional knowledge related to the project; and
- initiate discussions with all interested stakeholders, including relevant organizations, councils, aboriginal organizations, groups, regulatory bodies and government departments.

## 3.2 Scoping/Consultation Methodology

Environmental issue scoping was carried out in 4 different ways. Community consultations (1) were carried out primarily through holding a scoping session, or public meeting, in each of the communities, and also through one-on-one discussions. Technical consultations (2) were carried out through interviews with a cross-section of other stakeholders. Traditional knowledge (3) of the environment and related issues was gathered through interviews with elders. Background research (4) was carried out to document issues already identified by previous reports and workshops.

An information package was prepared by the consulting team to assist with environmental issue scoping. The package includes a 4-page newsletter of information on the extension, a map, and a comment form.

Community liaison workers were retained through contracts with community organizations, and trained at an orientation workshop. They assisted in preparations for each community scoping session to identify community concerns related to the possible extension of the Mackenzie Highway, and distributed copies of the Information Package. Scoping sessions were held in Fort Simpson, Wrigley, Tulita, Deline, Norman Wells, Fort Good Hope, Colville Lake, Tsiigehtchic and Inuvik. The scoping session agendas called for the discussion of three separate areas of concern, environmental, socio-economic, and cultural. Representatives of the consulting team and DOT attended all sessions to make presentations, answer questions, and to document community issues. Reports were prepared and community issues were entered into a database. Appendix I contains the database of community issues.

Technical scoping consultations with other stakeholder organizations and technical specialists took place on a one-to-one basis. These included consultations with a range of organizations government departments, and key individuals. Reports were prepared and the resulting issues were entered into a database. Appendix II contains the database of other stakeholders' issues.

The traditional knowledge component was organized through a contract with the Dene Cultural Institute, which prepared an interview guide and participated in the orientation workshop held in Norman Wells in February, 1999 to assist in training Community Liaison Workers. Three elders were interviewed in each community, and interview reports were forwarded to the Dene Cultural Institute for preparation of an overall traditional knowledge report (provided as Appendix III). Issues identified by elders were added to the database (Appendix I). The exception is the community of Deline. During the community consultations, the residents stated that they did not feel that further interviews were required as the message from the community was presented clearly at the public meeting.

The issues database includes a description of each concern and is searchable by all words entered. The team determined the relevance of issues to an environmental assessment by analyzing concerns using a 'weighted ranking matrix.' This technique was used to identify the key issues

likely to be faced by decision-makers in the event of an environmental assessment. The result is a prioritized list of issues that have the greatest potential to cause real adverse effects and/or are of most concern to the public.

## 3.3 Community Consultations

### 3.3.1 Main Themes

Through environmental scoping, communities along the proposed MVHE were given the opportunity to identify and discuss issues surrounding the construction and completion of the highway (see Appendix I). From these discussions, various issues were found to be prevalent in all or most of the communities.

If the construction of the MVHE occurs, residents would like the primary point of hire to be from within their communities. It is felt the construction would provide ample opportunity for both jobs and training and residents feel it is necessary they are involved at all stages in order for the local area to benefit fully from this project. This includes consultation before the actual construction begins in order to map out the best route for the road - avoiding important archaeological and heritage sites.

To prevent a boom-and-bust type economy, residents believe that a project lasting between approximately 10 years would benefit the long term development of local economies. This time frame would allow the DOT and others involved to complete the necessary scoping, meet required regulatory legislation and provide more longer term jobs. It was suggested that the period leading up to the MVHE could be used as a training phase for area residents; this would help ensure jobs do not go only to those with prior experience.

The MVHE would connect with the Dempster Highway near Inuvik, thus creating a loop between the Northwest Territories and the Yukon. Many residents thought this route would serve as an attraction for tourists driving in the north, possibly creating increased development and business opportunities in previously secluded communities. Extending MVHE construction time would likely allow communities to develop tourism businesses and facilities along the highway.

One of the main issues raised was the possible negative social impacts that may result from an all weather link into the communities. With more traffic entering and leaving the communities, many residents fear possible increased access to both alcohol and drugs. Regardless of this, many of the communities also believe that they are strong enough and have, or would develop, committees and organizations to deal with these potential problems.

For centuries, hunting, trapping and fishing have been a way of life for the residents of this area and there is widespread fear that wildlife and fish populations would be threatened by the increased road access created by the MVHE. Residents feel it is important to have regulations to protect hunting and fishing resources. However, it is recognized that even with these in place enforcement may be difficult.

### 3.3.2 Fort Simpson (March 3rd, 1999)

Residents of Fort Simpson strongly support the MVHE (and the loop it will create with the Dempster Highway) and believe it would boost tourism and trade in the area. One participant defined the project as “a road to human resources” (as opposed to a road to mineral resources) and considered that it makes more sense to serve the interest of people rather than mineral interests. The community feels this highway would serve a broader population base than the one proposed through the Slave Geological Province.

Fort Simpson is a service centre that is well positioned for numerous spin-off benefits from the highway, and many services that left the community in recent years could return. Residents suggested DOT take a regional development approach to road construction to help offset what is seen as the disproportionate role of Yellowknife in the economy of the NWT.

Residents feel DOT should opt to build the faster (i.e. higher speed) highway as few people would want to drive at 60 km/h. With memories of the poorly designed Liard “Trail”, it’s suggested that the MVHE be built “right” to take advantage of the scenery. It was noted that commercial traffic to Inuvik would make their own Mackenzie Valley Highway vs. Dempster Highway decisions based on road conditions.

Fort Simpson Metis are concerned about the potential impact on heritage sites and want assurances that such sites would be studied further if the extension becomes a project proposal.

The opinion expressed by residents is that it is best if communities benefit from training and employment associated with construction over a number of years, but that construction not take too long. DOT should find a "happy medium" of time to complete the MVHE. It is felt that a 10 year construction period would give people time to develop tourism facilities along the route. Training is important and local companies, such as Liidlii Kue Construction, could work with community corporations to build the road, instead of contracting the work to outside companies.

Residents noted that the upkeep of winter roads is an expensive yearly cost. This money would be better spent on an all weather road.

### 3.3.3 Deline (March 8th, 1999)

Deline residents are not opposed to the MVHE, if other Mackenzie Valley communities want it. It's recognized that an all weather road could bring increased business opportunities to the community, greater employment and make traveling to visit friends and family in other communities easier.

However, there are concerns (particularly among Elders) that an all weather road joining the Mackenzie Valley Highway to Deline could threaten traditional values. Community Elders want to have more control over possible negative impacts before considering an all weather road into Deline. The following concerns were raised:

- imported consumer goods would still be expensive;
- rising crime rates due to increase of non-local traffic;
- traditional way of life and values would be threatened;
- children would be "lost" and would hitch-hike south;
- experienced/trained people would get all the tourism/road construction jobs; and
- negative impacts on fish and wildlife.

Therefore, community Elders are opposed to an all weather road into Deline. People want to maintain traditional values and lifestyle, and believe that this access road would create negative social impacts. They believe residents want to focus on other things, such as implementing the land claim agreement and self-government negotiations. Deline residents would respect the wishes of Valley communities regarding the MVHE, and would accept the decisions made providing there is no access road into Deline.

### 3.3.4 Tulita (March 9th, 1999)

Tulita residents support the MVHE, as they believe it would provide significant community benefits through employment, resource development, and tourism.

Residents have concerns about negative social influences that could accompany the highway but feel that, unlike in the 70s, a land claim is in place to assist with these issues and the community has matured and now has a wellness committee to deal with such issues. There is a need to anticipate and plan for the social problems that would occur, and put money into developing programs to deal with them. There is concern about what people will do when the project is over and they have no jobs.

The Sahtu has tremendous potential to grow as a tourist area, and residents believe the highway would help to stimulate this part of the economy. The recent construction of the hotel in Tulita is based partly on that potential. Although tourism takes longer to develop than oil & gas economies, residents feel it is a more stable industry and other service industries would develop and benefit from this long term development.

Increased access to hunting is a concern as people from other regions may travel to hunt in the area. The MVHE is similar in scale to the Enbridge pipeline and would have the same issues such as stream crossings, erosion and impacts on the community. There would be negative impacts on wildlife and fish which residents feel can be dealt with as the project develops. Communities and Elders would have to be consulted if the highway is constructed on a different alignment than the winter road to ensure protection of cultural and heritage resources. In general, people would like to see more details on the exact route of the MVHE. DOT was told to be sure

to hold consultations with Elders, land corporations, bands and boards throughout the life span of the project.

Residents feel construction has to be a long-term project, perhaps eight to ten years. There has to be a long-term commitment, with long-term benefits for communities. Government should look at community development, including training, employment, and long-term benefits for tourism, the oil & gas industry, and others, in conjunction with planning for the highway. Residents recognized that the Sahtu region has to get behind the MVHE politically, and develop related strategies for economic development and tourism.

Residents feel there needs to be a long-term government commitment to extending the highway all the way to the Dempster. In terms of a construction approach, residents feel it is best to concentrate on the southern portion of the highway between Wrigley and Tulita first.

### 3.3.5 Norman Wells (March 11th, 1999)

Residents of Norman Wells strongly support the extension, and a bridge (not a ferry) across the Great Bear River. It would provide an all weather road to Inuvik and easier access to Sahtu mineral, oil & gas resources, and harvested resources, and it would stimulate tourism. The timing is right, now that the land claim is settled it would be easier to build the road with many partners. Sahtu Land Corporations may be willing to help finance it if they can get similar return on their money to what they get now.

Residents told the panel that they felt all communities should have a fair and equal opportunity to benefit from construction, which should start from each community and work outwards. They thought winter road improvements should continue whether there is a decision to build an all weather road or not and that the federal government should be lobbied to provide funding for the MVHE. This project also would have positive impacts on Hay River and Yellowknife, which should work in favour of getting funding.

They felt if construction is done quickly there may be a boom and bust cycle in communities. They would prefer that it be built a little slower to get more people working over a longer period of time, perhaps eight years. Norman Wells also would need plans to deal with social problems,

training, and tourism. Environmental concerns were expressed, but they felt these issues can be dealt with through the renewable resource councils and board.

The people discussed the possible closure of the Dempster Highway in the winter, but felt this would not have much impact on tourism (tourist traffic on the "loop" would mostly be in summer) and it would ensure that the MVHE was used to supply freight to Inuvik in winter.

Participants pointed out that it is necessary for community leaders and residents to put political support behind this project and the time to do that is now. They believe the real potential in the Sahtu is natural gas and industry is currently interested in developing this potential, including building a gas pipeline. Given this, residents suggested that industry may be interested in being a partner in financing a highway that would reduce pipeline costs.

### 3.3.6 Wrigley (March 29th, 1999)

Wrigley residents expressed conditional support for the extension, as they feel that land claims should be settled prior to construction. There is no land claim agreement in the Deh Cho, and the road should not move northward without the people being fully involved and receiving benefits and compensation. They received few benefits when the highway came to the community, and people don't want to see that happen again. It is up to people in the community to decide what they want.

The community should receive compensation for access provided by the highway through traditional lands; such compensation could fund social and economic development, before road construction begins. They need certainty about a date when construction would begin, and three years to prepare for it and get training. They are concerned about social impacts, but feel that most of the social problems are behind them. There also is some concern about opening up access to traditional hunting grounds.

The community noted that a lot of planning needs to be done before construction starts. The benefits of tourism won't develop until the community decides what it wants and plans for it. Construction should proceed outwards from each community over a long period of time. A 10 to 15 year construction period would ensure training and employment opportunities.

The community would like to take over the DOT camp and equipment at Wrigley, and be a partner during construction, but they need to negotiate this. Young people need training and employment. The community may form a partnership with a construction company in Fort Simpson or Tulita.

### 3.3.7 Tsiigehtchic (April 12th & June 14th, 1999)

*April 12, 1999*

At the first scoping session participants indicated support for the extension, while focusing their attention on alternative alignment issues. There is great concern in the community about Travaillant Lake and other fishing lakes in that area. This is the most important traditional use area for Tsiigehtchic residents, and there are concerns about the highway with respect to access, pollution, and impacts on traditional use and archaeological sites.

Some participants suggested a realignment of the highway southwest of the Mackenzie River to completely avoid the Travaillant Lake area, while others said they did not want it coming through their community. It was suggested that a shorter southwestern alignment would save enough money to build a bridge across the Mackenzie to the east of Tsiigehtchic.

The possibility of a pipeline being constructed adjacent to the highway also was discussed and, since the pipeline would have to be northeast of the river, options in the Travaillant Lake area were reconsidered. It was suggested that their preferred alignment might be south of the proposed alignment, closer to northeast side/bank of the Mackenzie River. Tsiigehtchic would like an opportunity to speak with Fort Good Hope about the road.

As a number of key community people were not present, it was decided that another community meeting was needed to further discuss options for alignment of the highway.

*June 14, 1999*

Tsiigehtchic residents raised the Travaillant Lake subject again during the second scoping session to indicate the significance of this area. This lake is an important traditional use area and the environmental implications of the MVHE are “huge,” according to residents. There is also concern that Inuvik residents (who continually use the Travaillant Lake area now) would have

even greater access if the MVHE is constructed. Elders are worried that the rivers and lakes would be damaged as a result of the highway project and feel this issue is too serious to make a decision after just two meetings.

The need for support from Fort Good Hope residents for a MVHE route southwest of the Mackenzie River was expressed and it was recommended that a cross-community meeting be arranged to discuss this. Most elders prefer this southwestern route and one resident suggested it would facilitate the finding of new gravel sources. Other residents voiced preference for a route northeast of the river, while saying that “the community needs to talk more to agree on one way, instead of saying this way and that way.”

With the effects of the Dempster highway on the community fresh in people’s minds, it was recommended that the possible social impacts of the MVHE be examined. Although people want jobs (and some voiced frustration with community stalling, and even suggested that land claim money should be used to build the highway), it was stressed that this development needs to "happen properly.” Residents were reminded of the short-term jobs created during oil and gas developments, which haven’t helped in the long-term development of the community.

Even though Gwich’in people have yet to develop policies and procedures for administering their lands, the Gwich’in people’s concerns should be heard, unlike during the planning for a highway during the 1970s. “The land is the only thing we have, so people don’t take land use issues lightly. People want to know that they have a say about lands they selected during land claim negotiations, and about how they would benefit the community.”

Residents feel they need to know more about the highway and about oil and gas exploration – for instance, where are the capped wells and how is the gas going to be extracted and linked up to a pipeline?

It was suggested that the Dempster be closed during the winter and a winter road be built between Tsiigehtchic and Fort Good Hope to give people an idea what the highway would be like. Finally, it was suggested that it might be a good idea to bring Fort Good Hope and all the user groups together in Tsiigehtchic, to add to the consultations.

### 3.3.8 Inuvik (April 14th, 1999)

Inuvik residents support extension of the highway while maintaining a healthy skepticism that it would be built. Increased tourism potential from tourists doing the "loop" is a big attraction, and there could be better prices for goods coming from Edmonton. Many Gwich'in have relatives in the Valley and Yellowknife, and would use the highway to visit. People who need medical/dental care in Yellowknife would have better access.

It was recognized that the MVHE route could result in decreased transport costs of bringing goods from Edmonton, but that could result in winter closure of the Dempster Highway. It also could have negative impacts on barge traffic and on some Inuvik businesses.

It was felt that small communities (farther up the Valley) that don't get traffic now would receive benefits, but there also would be social impacts. The community felt that people might be better prepared for social impacts now that land claims are settled and they are learning how to deal with social problems and control their economy.

Potential impacts of the project on Bluenose caribou and the economy could trigger the Inuvialuit screening process. Some residents thought the main environmental concern would be the increased hunting access to Bluenose caribou winter range in the vicinity of Travaillant Lake. One participant from RWED thought the preferred alignment, from a wildlife perspective, would be as close as possible to the Mackenzie River.

The proposed alignment for a connection to the Dempster Highway looks good, as it is on higher ground. Residents noted that there is a smooth esker that goes for about 50 km from the turnoff which may be an excellent route for the highway. According to members of the community, an alignment closer to Tsiigehtchic through the Puzzle Lakes area would be very wet and difficult.

DOT is already building bridges along the winter road and participants urged people to push for that to continue. The MVHE is a training and employment opportunity that should involve the whole community. It was felt that the project needs leadership and vision regarding long-term benefits, not just a short-term cost/benefit approach. There is an increasing "mood to build" and residents said "we just need to find the dollars."

### 3.3.9 Fort Good Hope (April 20th, 1999)

Residents of Fort Good Hope support the extension, and their Land Corporations might consider contributing land claim money to help finance it. It is felt that a bridge across Great Bear River, rather than a ferry, would save money in the long run.

It is felt that a road would bring many positive impacts, but it also would bring problems such as drugs, alcohol and related social problems. The community should start planning now and put in preventative measures to avoid such problems. It was suggested a healing camp be built with easy access to the road.

Residents pointed out that different families use the land along different parts of the alignment. It is important to talk with each family to find out how the land is used.

Although there is general support for the road, it should be an environmentally sound project and the community does have environmental concerns; particularly with respect to their fishing lakes (Yaltea and adjacent lakes). There are other areas where special care would be required, including the Rabbit Skin (Hare) River crossing, Thunder River where there is considerable erosion, around Loon River, and near Little Chicago where there are cabins. Moose habitat, caribou migrations, fish creeks, and pollution from fuel spills are of concern. Residents feel the road should stay away from the Mackenzie River.

Access to fishing lakes and hunting areas is an issue, as well as the potential removal of artifacts. Although the highway would bring more southern hunters, it would benefit community hunters by providing easier access to their camps.

It was pointed out that the development of oil and gas fields near Colville Lake and across the river from Fort Good Hope would be assisted by the presence of a road. There are also minerals in the area.

Fort Good Hope feels the road should be built using a community construction approach, with training and employment opportunities being very important. Training should occur so the community can build the road, and that training should be done within the community.

The Mackenzie Valley Highway is the best option (of those presently under consideration) since a lot of dollars go through Norman Wells and a road would benefit further development. Government should look to oil companies for financial support. Generally residents feel it is time to stop talking about the road and build it.

The existing winter road opens too late and closes too early. DOT should start by working on keeping the winter road open longer.

### 3.3.10 Colville Lake (April 22nd, 1999)

Colville Lake residents have mixed feelings about the MVHE. Although a spur road to Colville Lake is not part of the present concept, participants understandably wanted to discuss the pros and cons of improved road access to their community. A road down the Valley and a winter road to Colville Lake could bring prices down.

Elders are worried about any winter road coming into Colville Lake because it would bring in alcohol and drugs. If a highway is built in the Valley, then residents felt it might be extended to Colville Lake sometime in the future, which Elders are completely against.

A road would have an impact on fishing lakes. Every year there are problems with creeks along the winter road. There is a need for local input to the design of roads, culverts and stream crossings, as many engineers do not know the land.

Residents are concerned that the people of Fort Good Hope get all the construction jobs. There are few people in Colville Lake with construction experience, and only experienced people would get the jobs. It was suggested that training should take place in the community so that people would have an opportunity to get jobs.

Colville Lake residents can't readily agree with the highway because they don't know the opinions of other communities and feel that all affected communities should sit together and talk about it. It was suggested that information be requested from the Delta to find out how their communities changed when the Dempster Highway was built. An opinion from Wrigley was also

requested. A regional meeting would help to provide DOT with an answer, but not in Norman Wells where there are bars.

## 3.4 Other Stakeholder Concerns

### 3.4.1 Introduction

This section summarizes the key issues that arose during scoping consultations with government technical authorities and non-governmental organizations (see also Appendix II). It describes concerns and comments about potential environmental impacts of an extension of the Mackenzie Highway that were described by the people interviewed. The nature of scoping is inclusive; the issues described below may not necessarily arise during construction and operation of the highway, if it is to be built, but should be considered for inclusion in an environmental impact assessment of the project. Although this section focuses on concerns, many of these are related to the need for specific mitigation measures. Where this is the case, it has been indicated in the text.

### 3.4.2 Environmental Issues

#### 3.4.2.1 Mammals - General

Much wildlife movement occurs perpendicular to the Mackenzie River, along the tributary valleys, and the road would likely cross routes used by wildlife. The highway extension might cause fragmentation effects if it acts as a barrier to wildlife movements, which depends partly on the intensity of traffic.

Collisions with wildlife could be a problem. Calcium chloride, used for dust suppression along roads, is a wildlife attractant, and this could increase the numbers of collisions with wildlife. Design of wide shoulders and cleared rights of way may help.

There is also concern about the effects of dust on vegetation and changes to habitat value, timing of habitat use around the road, and the impacts of this on wildlife.

### 3.4.2.2 Carnivores - General

In the barrens, eskers play an important role as denning habitat of carnivores (including wolves, wolverine and fox). If this is the case in the project area, the use of eskers as sources of construction and maintenance material may be an issue. There is concern that this would be difficult to assess because there has been little research on carnivore denning habitat in the project area. If eskers are important denning habitat, the impacts of their use in road construction should be assessed.

### 3.4.2.3 Bears

Both grizzly and black bears occur within the highway extension area. The grizzly bear is listed as a vulnerable species in the NWT. Concerns include potential bear - human conflicts, poaching, habitat loss due to displacement, and loss of potential denning habitat due to the use of granular material for road construction and maintenance.

The corridor proposed for the MVHE has a history of “problem” bears. There is concern that increased access would create more bear - human encounters. This leads to more killed bears by wildlife managers as well as issues of human safety. Construction and maintenance camps, visitor campgrounds, and other developments along the extension would generate food waste that would attract bears. As hunting of caribou increases with improved access, caribou gut piles may also attract bears. With food available, bears (particularly black bears) become increasingly habituated to the presence of humans, and can become “problem” bears. While grizzly bears are less likely to habituate to people, they would still be attracted by food and food waste. This leads to more potential encounters between people and bears.

Management of “problem” bears usually involves their relocation or death. This can have significant effects at the population level for both black and grizzly bears, but particularly for grizzly because of their low population densities and low reproductive rates. Preventative actions include proper waste management (such as electrical fencing around dumps and campgrounds and bear-proof garbage bins) and managing behaviour of people using the area (including bear awareness training for all crews and contractors involved with the road).

There is concern that commercial poaching of bears for gall bladders would increase with easier road access. This is a serious problem at the national level and is very difficult to manage. Although not known to be a problem in the project area at present, increased access could make commercial poaching more likely.

There is concern that bears in the area have been studied very little. Habitat usage and population levels of both grizzly and black bears in the area are not known. An assessment of likely impacts on bears would be seriously constrained by knowledge gaps.

#### 3.4.2.4 Furbearers

Access provided by the highway extension could change trapping patterns causing adverse impacts on furbearer populations. At present, trap lines radiate primarily from communities. With linear access along the length of the highway, trap lines would reach many areas not currently trapped. This may be ecologically beneficial if it lowers trapping pressures in some areas that are over-trapped, or may be a problem if sensitive populations are exposed to new trapping pressures. Assessment of the effects of the highway on trapping should examine both the fluctuating populations of furbearers and the fluctuating market value of fur as it relates to trapping pressure.

Opportunistic encounters may increase poaching of more valuable furbearers. By bringing people into more contact with furbearers, chance encounters with commercially valuable species are more likely. Likelihood of poaching in these encounters would probably be related to market values.

#### 3.4.2.5 Caribou

Bluenose and woodland caribou live within the project area. Bluenose caribou use parts of the area seasonally, while woodland caribou are year-round residents in the area. Caribou are the major subsistence species harvested in northern parts of the route. There is concern about increased harvest and poaching that would likely accompany improved access. There is also concern about the likelihood of indirect exposure leading to more hunting, as people on the road follow tracks of animals that have crossed the road.

The road area intersects the winter range of a group of the Bluenose caribou herd. Current research indicates that the Bluenose herd is actually composed of a few genetically distinct groups, and it appears that the potential impacts of the road on the Bluenose herd would not be spread throughout the herd, but would be concentrated on the west group of the herd. The closer to the Mackenzie River the road goes, the less it would intrude on Bluenose caribou habitat.

The population effects of increased mortality from increased hunting (by both community members and visitors to the area) on Bluenose and woodland caribou may be an important issue, and should be assessed. Other issues include the effects of the road on Bluenose and woodland caribou movements (which would likely depend on frequency and type of traffic using the road) and loss of habitat both under the road footprint and due to avoidance of the surrounding area (as a behavioural response to disturbance). There is concern over the cumulative impact of the road in combination with all other human activities on the Bluenose herd.

Woodland caribou typically are found in forested areas along the extension route, and range as far north as Tsiigehtchic. They are typically distributed in small groups, and may be susceptible to over-hunting with increased access from the highway which may concentrate hunting on smaller numbers of animals. Very little is known about the ecology of woodland caribou in the area. Population, range, rutting areas, calving grounds, habitat preferences and movement patterns are largely unknown in the project area. There is concern that these uncertainties would make it difficult to make predictions about the impacts of the project on woodland caribou and thus accurately assess the effects of the highway extension. There is thought to be a major woodland caribou calving ground along the Bear River.

#### 3.4.2.6 Moose

Moose live throughout the MVHE area, and are the major subsistence species harvested in the southern two-thirds of the route. The willow areas along the Mackenzie River are prime moose habitat. Moose have been studied in detail in three small study blocks along the route, but little information is available about moose outside of these study areas. These studies would not produce conclusions for at least two years. Although overall moose density is thought to be low, certain areas are crucial for winter population concentrations, and it is critical that these areas are identified and avoided by the highway extension.

Although the re-growth of vegetation from recent burns along the Mackenzie Valley provides excellent moose browse, moose numbers do not appear to be rising. Hunting seems to be the main factor affecting these numbers. There is concern about the effects of increased moose hunting and opportunistic poaching along the MVHE. Collisions with vehicles along the roadway are another issue of concern, particularly as moose are dark in colour and are active during low light hours. The road should be designed for good line-of-sight to reduce the number of collisions.

#### 3.4.2.7 Wolves

There are two types of wolves in the area: resident wolves primarily hunting moose and woodland caribou, and transient wolves following the Bluenose herd. There is concern that effects from increased access and hunting pressure on these prey species would cause negative impacts on both populations of wolves. There is also concern about the effects of the project on wolf denning habitat.

#### 3.4.2.8 Fish and Aquatics

The impacts of suspended sediment and sedimentation on spawning and rearing habitats are thought to be key concerns, as are the effects of stream crossings on fish movements (especially on the rare bull trout). The extension would cross many rivers and streams, and the effects on downstream fish habitat are a concern. Major crossings would require bridges and it was suggested during community scoping sessions they be designed with long-term high water levels in mind, so that abutments are kept away from river banks even when water levels are high.

There is concern that all of the following mitigation measures be considered in the assessment and implemented accordingly:

- silt barriers or silt fences for suspended sediment;
- rip-rap, silt fences, or a combination of the two for stabilizing banks before vegetation is re-established;
- stockpiling areas for construction materials;
- barging of materials across rivers; and

- seasonal timing of construction to minimize impacts.

The effects of crossings required during construction before the superstructure of bridges are in place was another issue of concern. The extension would cross many small streams, which are highly diverse and cumulatively play an important role as spawning habitat for the small fish species that harvested species depend upon. The cumulative impact of all the river and stream crossings is a concern. There is also concern that culverts are often ineffective because they are designed for hydrology, without considering the needs of fish. Culverts used in crossings should be large enough not only for the necessary volumes of water, but also to permit slow enough flow so that fish can swim up them. Culvert placement should also be low enough so that a wide part of the culvert is still submerged even when water levels are low. There is also concern that ice blockage would make culverts impassable for fish.

The effect of increased fishing associated with better access is also a concern. If access to Great Bear Lake increases as a result of a road to Deline or Tulita (a short flight from Deline) there would be increased pressure on fish populations due to increased fishing. The large fish prized by recreational anglers are not common and play an important role in maintaining fish populations. Increased fishing in rivers and lakes adjacent to the MVHE would also require more management.

There is concern that current surveys of fish habitat are needed for each river and stream crossing along the route. There was also concern about the need for spill management plans for highway operation and proper storage of potential contaminants during construction.

#### 3.4.2.9 Songbirds

The Mackenzie River forms an extremely important corridor for migratory songbirds. Concerns regarding migratory songbirds are based on habitat loss, and an assessment should analyze forest types to determine cumulative losses of specific habitat types. Particularly important for migratory songbirds is old growth white spruce forest, associated with rivers.

### 3.4.2.10 Waterfowl and Wetlands

The project area is an extremely important corridor for migratory waterfowl, and contains numerous wetlands that are sensitive breeding and staging grounds. It was suggested that the road should stay well back of the banks of the Mackenzie River to avoid nesting and staging grounds of geese and swans. The route should avoid wetlands wherever possible, and aircraft, if used to support construction camps, should also be minimized over wetlands during construction, particularly during May (the most sensitive time of year). Construction activity in general should be minimized in May. Where the road does pass near wetlands, the surrounding vegetation should be protected.

Areas to avoid include the following:

- the area around Bracket and Kelly lakes (a major waterfowl staging area);
- the Rengling River complex between Travaillant Lake and the Dempster Highway (a perched permafrost basin with a high density of wetlands);
- the east end of Chick Lake, south of Fort Good Hope (a high density nesting area);
- Oscar Lake; and
- post-glacial lakebed habitat on the Mackenzie River.

The highway may impede groundwater and surface flow, and could change the hydrology of area wetlands. There is concern that the studies of potentially affected wetlands conducted in the 1970s were not detailed enough and new studies are needed.

A specific concern is with scoters that occur within the project area. Scoter populations appear to be stressed and in decline.

### 3.4.2.11 Raptors

Concerns were expressed regarding peregrine falcons (anatum subspecies) and rough-legged hawks. Peregrine are classified as a threatened species (COSEWIC 1999). The main issue regarding peregrine is disturbance during nesting. Many peregrine nesting sites are known, and

would best be avoided by 5 km. If this is impossible, seasonal activity restrictions should be implemented. These restrictions should be individualized for each nest site.

Access to nests is another issue. Some peregrine nests are on low mud banks. Poaching of young peregrine for sale to falconers has been a problem in the past and would likely increase with better highway access.

#### 3.4.2.12 Permafrost

There is concern that the road should be designed with broad enough temperature parameters to withstand the effects of global warming on this region of discontinuous permafrost. The road base should be of sufficient thickness to prevent thawing and slumping of permafrost. Regular compaction of the road surface during construction may also be necessary. The potential for gullies as a result of permafrost disturbance should be considered and mitigated, particularly around river banks.

#### 3.4.2.13 Potential Protected Areas

There is concern that the highway extension could have an adverse ecological effect on protection worthy areas. Land use planning boards within the Gwich'in and Sahtu regions are in the process of identifying areas for protection, for ecological and cultural reasons. A notable example of this is the area between Travaillant Lake and the Mackenzie River. There is concern that land use planning boards be included in route planning to avoid land use conflicts.

#### 3.4.2.14 Fire

The potential for the extension to lead to more frequent fires because of increased human presence is a concern in both construction and operational phases of the MVHE. It was also noted that the road could be useful in the control of small fires, and might help to protect gas developments. Wider road shoulders would reduce fire hazard.

#### 3.4.2.15 Dust

There is concern that lichen would be killed and plant species close to the road would change due to increased dust. Dust would also change the albedo and reflectivity of the snow, causing earlier melting and earlier plant growth. This could change the seasonal distribution of wildlife, bringing them closer to the road in early spring and making them more accessible to hunting. Dust control measures should be available in case they are needed, and should be suitable for the type of gravel used.

#### 3.4.2.16 Granular Resources

There is concern about the impact of granular resource extraction, the available stores of gravel and their habitat value. There is a need to re-evaluate existing gravel pits in terms of available resources. There are fewer readily accessible granular resources near Inuvik, which would make it more necessary to blast, quarry and crush rock to make gravel. There is concern about the ecological effects of this quarrying and blasting. Mitigation measures to deal with these effects, such as recontouring, stabilizing, and reclamation, are usually included in pit management plans.

#### 3.4.2.17 Other Environmental Issues

There is also concern about the following issues:

- the indirect ecological effects of tourism related developments and the effects of increased back-country access on wilderness, including the Canol Trail;
- the effects of the extension in contributing to greenhouse gas emissions;
- the potential of the extension to introduce invasive plant species to the region; and
- the effects of the highway extension on boreal chorus frog and wood frog populations.

### 3.4.3 Socio-Economic and Cultural Issues

#### 3.4.3.1 Demands on Infrastructure

Both physical infrastructure and service infrastructure can be expected to show the effects of the development of the MVHE, particularly resulting from the potential in-migration resulting from better access to communities. Municipal and territorial infrastructure such as roads, airports, power, waste and sewage disposal, community policing, education and child care facilities, health facilities, recreation facilities would all potentially have greater demands placed on them. New residents and businesses would expect and demand higher levels of infrastructure.

The need for monitoring wildlife and enforcing regulations along the road year round will also increase the resources the territorial government needs to apply to these activities.

#### 3.4.3.2 Community Wellness and Quality of Life Issues

There are a number of potential concerns related to community wellness and quality of life that depend on the pace of development, the degree of local hiring, the management of construction crews and other factors. Potential impacts include a change in community cohesiveness and homogeneity, due to workers leaving the community to build the road and a decrease in the use of traditional languages, often associated with work at industrial sites.

For isolated communities, increased contact with the outside world has the potential for increases in diseases including STDs, as well as unwanted pregnancies. Often construction camps consist largely of single, young males and communities may perceive these camps, if not kept relatively isolated from these communities, as threats to the wellness of the community.

Adaptation for local workers to a new way of life may bring stresses both to the individual and their families. The results may be family violence, drug and alcohol use, marriage breakdown, child abandonment or neglect, suicide, and psychological breakdown.

Other changes to the community may come through changes to recreational and traditional land use, directly related to access provided by the road. The availability of individuals working on

the road to participate in traditional land use activities, such as community hunts, may have cultural impacts and as well as impacts on the perceived quality of life of the individual.

#### 3.4.3.3 Economic Issues

Changes to the economy would likely result from the MVHE and depend on a number of factors. An analysis of the economic costs and benefits of the highway will assist in focusing the environmental impact assessment of the project.

Potential changes include more businesses in sectors such as tourism, or workers trained during the construction of the road starting their own contracting companies. Impacts should also be expected on unemployment and social assistance rates and rates of participation in the wage economy.

Commodity prices may change, depending on the efficiency with which commodities can be supplied via the new highway.

The size of the wage economy may increase if workers are locally hired. The size of the traditional economy may also change but there does not appear to be conclusive studies showing whether it would decrease or increase. Changes in land use may affect businesses servicing tourism or recreation activities.

With better access to new areas, changes in the number and origin of people participating in activities related to the traditional economy, such as hunting and trapping, may cause land disputes. Hunting from the road may also result in issues of public safety.

Potentially, the MVHE will impact the capacity of people through training, increasing skill levels and education, although the construction of the road is finite and can not sustain all workers during its operation phase.

### 3.4.3.4 Prioritization of Issues

To provide some suggestion of priority issues resulting from consultations with government authorities and non-government organizations, a weighted ranking matrix was used. A weighted ranking matrix is a simple tool to provide partially objective analysis of the potential impacts of a development. In this case, five criteria were used:

1. Duration: how long would the effects of the impact last?
2. Area: how wide of an area would be effected?
3. Magnitude: would the impact cause a small or large effect?
4. Certainty: how certain is it that the effect would occur?
5. Concern: how concerned is the public about the effects?

For each issue, each of these criteria were provided a rating between one and five, with one being the lowest and five being the highest, based on professional judgment and experience. The product of each ranking formed the total score for each issue. It should be noted, however, that this ranking may change as new information is collected during the planning and environmental assessment stages of the development. Concern, for instance, is a fairly mobile criterion that may change dramatically with additional consultations with community residents, technical experts, other interested members of the public and information gained through further studies. These tools are only partially objective as the judgment and experience of the individual(s) determining the ratings play a large role in determining the results.

The issues that received the highest ranking are related to the increased mortality to caribou and moose due to increases in hunting, poaching and animal-vehicle collisions. Sedimentation at stream crossings from construction activities and the effects this would have on fish habitat was also ranked highly, both in terms of the effects on individual streams and the cumulative impacts to fish habitat from these activities. The effects on the social conditions (e.g., family violence, drug and alcohol use, marriage breakdown) of individuals and families resulting from adaptation stresses received a high ranking.

**Table 3.1**
**Weighted Ranking Matrix of Issues-Effects of the MVHE**

| Issue | Duration | Area | Magnitude | Certainty | Concern | Total |
|---|---|---|---|---|---|---|
| increased caribou mortality- hunting, poaching, collisions | 5 | 2 | 4 | 4 | 3 | **480** |
| increased moose mortality- hunting, poaching, collisions | 5 | 2 | 4 | 4 | 3 | **480** |
| sedimentation at stream and river crossings | 2 | 2 | 4 | 4 | 5 | **320** |
| adaptation stresses leading to increased drugs & alcohol use, family violence, marriage breakdown, child neglect, etc. | 4 | 2 | 3 | 3 | 4 | **288** |
| cumulative impacts of construction at stream crossings | 2 | 2 | 4 | 3 | 4 | **192** |
| disturbance of moose winter habitat by construction and operation | 5 | 1 | 5 | 2 | 3 | **150** |
| bear / human conflicts | 5 | 1 | 3 | 2 | 4 | **120** |
| effects of increased trapping access | 5 | 2 | 3 | 2 | 2 | **120** |
| wildlife / vehicle collisions | 5 | 2 | 2 | 3 | 2 | **120** |
| effects of construction and operation on peregrine nesting | 4 | 1 | 3.5 | 2 | 4 | **112** |
| increased fire frequency | 3 | 3 | 3 | 2 | 2 | **108** |
| effects of increased fishing pressure on fish populations | 5 | 2 | 2 | 2.5 | 2 | **100** |
| effects on permafrost | 3 | 2 | 2 | 2 | 4 | **96** |
| conflicts with potential protected areas | 5 | 1 | 3 | 2 | 3 | **90** |
| cumulative effects of development on caribou | 5 | 2 | 2 | 1 | 4 | **80** |
| bear gall bladder poaching | 5 | 2 | 2 | 2 | 2 | **80** |
| change in community cohesiveness and homogenity | 2 | 2 | 2 | 2 | 4 | **64** |
| effects of construction on wetland hydrology | 5 | 1 | 3 | 2 | 2 | **60** |
| change in quality of life with decreasing traditional land use | 3 | 1 | 2 | 3 | 3 | **54** |
| secondary impacts of tourism developments | 4 | 1 | 2 | 2 | 3 | **48** |
| effects of construction on waterfowl staging and breeding grounds | 2 | 2 | 4 | 1 | 3 | **48** |
| demands on physical and service infrastructure from in-migration | 4 | 2 | 3 | 2 | 1 | **48** |
| increased poaching of furbearers | 5 | 2 | 2 | 2 | 1 | **40** |
| effects of increased backcountry access on wilderness | 5 | 3 | 1 | 2 | 1 | **30** |
| wildlife habitat fragmentation | 5 | 3 | 2 | 1 | 1 | **30** |
| impacts on denning from esker use | 4 | 1 | 3 | 1 | 2 | **24** |

| Issue | Duration | Area | Magnitude | Certainty | Concern | Total |
|---|---|---|---|---|---|---|
| effects of granular resource extraction-crushing and quarrying | 2 | 2 | 2 | 3 | 1 | **24** |
| introduction of invasive alien plant species | 5 | 3 | 3 | 0.5 | 1 | **22.5** |
| effects of increased access on peregrine nests | 5 | 1 | 3 | 1 | 1 | **15** |
| health effects from contact with construction camps | 2 | 1 | 2 | 1 | 3 | **12** |
| social issues related to caribou | 5 | 1 | 1 | 2 | 1 | **10** |
| effects of habitat loss on migratory songbirds | 5 | 1 | 1 | 2 | 1 | **10** |
| effects of accidental spills on fish habitat | 3 | 1 | 1 | 1 | 2 | **6** |
| effects of construction and operation on amphibians | 3 | 1 | 1 | 1 | 2 | **6** |

## 3.5 Traditional Knowledge Interviews

### 3.5.1 Background and Introduction

As part of this study, the Dene Cultural Institute (DCI) was contracted to carry out a Traditional Knowledge (TK) scoping exercise to gather baseline information from individuals living in the area of the proposed MVHE route. To follow is a summary of the results of the study. The full report is provided in Appendix III.

Leaders in each region selected the community organizations which would then chose the elders to be interviewed, organized the public meeting and hired the community liaison worker to interview the elders. Training of the community liaison workers was conducted by DCI in Wrigley and DCI also prepared the training interview guide which would be used by the workers during the interviews with elders. The guide included instructions on interviewing techniques, ethical research guidelines and prior consent authorization forms, a map of the proposed highway extension and a newsletter which was used to inform community residents about the development proposal. Elders who participated in the one-to-one interviews did so voluntarily.

### 3.5.2 Purpose

The purpose of the environmental scoping was to identify Traditional Knowledge (TK) issues and concerns related to proposed extension of the Mackenzie Valley Highway. People now living along the proposed highway extension route, as well as some who have lived there in the past, were interviewed.

### 3.5.3 Traditional Knowledge Scoping Results

People from seven communities along the proposed highway extension route were interviewed: Colville Lake, Tsiigehtchic, Inuvik, Fort Good Hope, Wrigley, Tulita and Norman Wells. Several elders who had attended the public meeting in Deline felt that, as their opinions had been expressed at that meeting, they would not consent to individual interviews. The interview results from Tulita were lost. Although the community interviewers had specific questions to ask participants, some elders chose not to respond to some questions because of lack of sufficient information or understanding. Consequently, the summary of information which follows does not represent all communities nor answers to all the questions. In total, 21 people, aged 53 to more than 80 years old, were interviewed.

#### 3.5.3.1 Transportation of Goods

Six people were in favor of the highway extension because it was thought it would result in a decrease in cost of goods in the communities. A further six people commented that the cheaper road travel might result in reduced airfares.

#### 3.5.3.2 Employment and Training

Most of the elders who participated spoke about the training opportunities and long-term jobs they feel the community people should receive as a result of the highway extension. They remember past developments (pipeline and highway) and the short-term jobs, which were available while the development was underway. However, once the project was complete, the long-term jobs did not go to community people. They worry about the effects of the development "boom" on the people and communities and how unskilled community people will not benefit if

training is not an integral component of the project. A few participants said they preferred things to stay as they were because they do not trust any development, which they believe will have a negative impact on people and communities.

#### 3.5.3.3 Accessibility, Traditional Life and Culture

There was no general agreement by the people interviewed about whether the highway extension would have positive or negative effects on the traditional life of the communities concerned. Approximately a third, or a little more, expressed their concerns that the highway would increase the amount of travel out of the communities, leading to a loss of their culture, language and traditional way of teaching and passing knowledge between generations. Generally, they felt the highway extension would have a negative impact on the practices of living a traditional way of life. They were also worried about the long-term effects of the increase in traffic, the number of highway accidents and deaths and the potential for youth to disappear or be kidnapped like they hear about in news from 'the south'. Three elders expressed their concern about the route of the highway extension because gravesites of their people are in the area of the road development.

However, an approximately equal number thought the highway extension might have positive impacts on the traditional life of the communities affected. They said better access would allow more people to visit each other and meet more often for spiritual gatherings. The highway extension might also help community people get back to the land and practice traditional ways of living.

#### 3.5.3.4 Substance Abuse

Five elders, about 20 % of the sample, were concerned the highway extension would bring with it an increase in alcohol and drug usage in the communities. They thought this increase would lead to an increase in crime, family problems and highway accidents.

#### 3.5.3.5 Environmental Impacts

A third of those interviewed were concerned about the environmental impacts of the highway extension on the fish, caribou, the land generally and the people. However, about half as many

elders felt that what happened with the Dempster Highway showed this highway would not have much impact on the caribou. Some participants thought an increase in traffic would increase the amount of garbage on the roads and in the rivers and wondered what long-term effects this would have on the people.

#### 3.5.3.6 Community Consultation

Some of the elders (about a fifth) said more discussion at the community level, amongst leaders, elders and community members, is necessary before the approval of this project. (One person thought this issue should be discussed before the planning is complete.) Nearly as many as thought there should be more discussion said they wanted discussion on alternate routes for the extension rather than the one proposed. A few indicated that their knowledge and experience of past developments resulted in their not trusting this project.

# 4. EXISTING DATA

## 4.1 Introduction

The purpose of this section of the report is to identify literature and data sources pertaining to the area of the potential Mackenzie Valley Highway Extension corridor between Wrigley and Tsiigehtchic. This section provides a summary and analysis of existing literature and data sources that were searched in order to compile a bibliographic database of information relevant to the potential extension of the Mackenzie Valley highway. A description of the methods used to survey and capture information is provided, along with a summary of the information captured, and an analysis of the relevance of the information collected for use in any future environmental impact assessment relating to the possible extension of the road.

Appendix V contains a list of electronic databases that contain data relevant to the MVHE. Appendix VI is a list of references for literature relevant to the MVHE and is also available as a database on disc using ProCite software[1]. This chapter is intended as an accompaniment to these two appendices that have been constructed and described in this chapter.

## 4.2 Methods

### 4.2.1 Literature Search and Compilation

The reference database created for this project was compiled from a number of existing sources in the NWT and from across Canada. Key data sources, databases, libraries, government departments, and research institutions were identified at the outset of the project as potential sources of bibliographic information. Electronic searches of these data sources were conducted based on a set of key search terms developed for this project. Once references were collected and reviewed, an analysis was conducted to identify key information gaps and to eliminate irrelevant citations which did not meet either the search criteria or the standard for relevance set for the project.

[1]. The reference database was developed using ProCite software. In ProCite, the database file (named MVRoad.pdt) can be searched for any word or phrase contained in a record. Instructions on how to fully access this database are given in Appendix IV (titled Using ProCite).

References were grouped into one of the following three categories: socio-economic, historical/cultural, or biophysical. For the purposes of this review, the corridor was assumed to be a band approximately 20 km on either side of the Mackenzie River, and the study area region encompassed the Mackenzie River watershed upstream of the Mackenzie Delta to approximately Fort Simpson.

References from the Mackenzie Delta were included in the database as they could be useful in considering cumulative effects. Similarly, references from studies conducted within the Liard River valley were included if they were related to road issues. Lastly, references outside of this corridor were included if they were likely to contain regional information of relevance.

#### 4.2.1.1 Data Sources

The data sources searched to create the reference database included key territorial and federal government department libraries, electronic databases and scanning services, university libraries, and research institutions. These sources were chosen based on their relevance to the project, and their potential to provide information coverage across the broad information categories defined for the database – socio-economic, historical/cultural and biophysical. The final list of data sources consulted for this phase of the project is presented below.

*Government*

- Government of the Northwest Territories (GNWT), Department of Resources; Wildlife and Economic Development (RWED), Yellowknife;
- Department of Indian Affairs and Northern Development (DIAND), Yellowknife;
- Department of Fisheries and Oceans (DFO), Yellowknife;
- Environment Canada, Yellowknife;
- GNWT, Department of Transportation, Yellowknife; and
- National Energy Board (NEB), Calgary.

*Institutes / Universities*

- Arctic Science and Technology Information System (ASTIS), Arctic Institute of North America (AINA), Calgary;
- University of Calgary;

- University of Alberta;
- Boreal Institute, Edmonton;
- Circumpolar Institute, Edmonton; and
- Dene Cultural Institute, Hay River.

*Electronic Databases*

- ABSearch;
- Biological Abstracts (BIOABS); and
- SOCIOFILE.

*Non-bibliographic Databases*

A number of databases of electronic data exist for socio-economic, historical/cultural and biophysical parameters. These are provided in Appendix V.

*Summary*

The range of information found in these sources was extensive. The bibliographic database created from these sources contains the following:

- journal articles;
- reports – government, industry, private, published and unpublished;
- books;
- theses and dissertations;
- conference proceedings;
- maps;
- briefings;
- file consolidations; and
- hearing submissions.

Although each of the sources chosen did provide considerable information coverage across each of the broad information categories, a number of inherent weaknesses both within and between each of the systems were evident. Among these were the following key deficiencies:

1. Most government departmental library catalogues have evolved over time with little

strategic planning at the outset or internal consistency with respect to cataloguing standards. While most libraries now follow Library of Congress cataloguing standards, most departmental library catalogues searched have incorporated older hard-copy catalogue files transferred to electronic format usually without updating standards. It was difficult locating information consistently within those libraries, as terms may not have always captured the information intended.

2. One of the primary means for locating citations using electronic databases is to match key search terms to key words associated with each record. However, inconsistent use of key words in BIOABS and ABSearch made it difficult to consistently locate citations based on key words

3. Not all documents maintained by government libraries are contained within their electronic catalogue. Searching library catalogues does not allow for location of all records. For example, both RWED and the Canadian Wildlife Service (CWS) (Environment Canada) maintain separate hardcopy listings for internal reports. This deficiency was caught during our initial review for gaps, and these lists were subsequently obtained from RWED and CWS and entered into the database.

4. Incomplete cataloguing of records, particularly at government libraries, makes some information either of no use in a database or of indeterminate use for processes such as EIAs. Some library catalogues, most notably DIAND, contained a number of incomplete citations. In some cases, these citations contained no more than a file number or file name. Such incomplete records were eliminated from the final database as their utility could not be determined.

#### 4.2.1.2 Key Search Terms

The following search terms were used to locate bibliographic citations from each of the data sources listed above. These terms were developed in order to meet the following criteria:

1. Terms must be able to locate relevant information within each of the three broad information categories – socio-economic, historical/cultural, and biophysical.

2. Terms must be able to locate a broad range of sub-categories of information within each of these broad categories.

3. Terms must attempt to address the considerable variability inherent within and between each of the data sources.

A test of the efficacy of the search terms was conducted through a brief initial search of the Arctic Science and Technology Information System (ASTIS) database maintained by the Arctic Institute of North America (AINA). The final list of key search terms used is presented below:

- Mackenzie Valley
- Mackenzie Highway
- Mackenzie River
- Mackenzie Basin
- Mackenzie AND environment(al)
- Mackenzie AND impacts
- Mackenzie AND wildlife
- Mackenzie AND vegetation
- Mackenzie AND aquatics
- Mackenzie AND fisheries
- Mackenzie AND development
- Mackenzie AND social
- Mackenzie AND economic
- Mackenzie AND community
- Mackenzie AND cultural
- Mackenzie AND archaeology

Due to the variability of the data sources that were searched to create this bibliographic database, a considerable amount of irrelevant information was initially obtained. As well, a number of gaps in the coverage of information were identified during an initial review of the database. In order to address these initial deficiencies, two additional activities were undertaken.

First, the information obtained was evaluated and sorted according to general criteria for its applicability for use in EIA processes. The general evaluation criteria used to cull irrelevant material were twofold:

1. Citations should be of geographic relevance to the proposed route through the Mackenzie Valley.

2. Citations should address general issues pertinent to the development of a road that may need to be addressed in an EIA process.

General issues in each of the three broad categories of information contained in the database that were used to evaluate bibliographic references are presented in Table 4.1.

**Table 4.1**
**Issues of Relevance Used to Evaluate References**

| Information Category | Potential Issues of Relevance |
|---|---|
| **Socio-economic** | Impacts on local economies |
| | Impacts on regional / Territorial economies |
| | Trans-boundary issues |
| | Economic benefits to northerners |
| | Economic benefits to Aboriginal peoples / communities |
| | Impacts on traditional land use |
| | Implications of unresolved Aboriginal title to land |
| | Local / Aboriginal participation in project planning and management |
| | Impacts on families / social structures |
| | Impacts on local infrastructure |
| | Monitoring socio-economic impacts |
| **Historical/Cultural** | Use of traditional knowledge |
| | Impacts on cultural / historical / archaeological resources |
| | Impacts on Aboriginal language / culture and identity |
| **Biophysical** | Impacts on water quality |
| | Impacts on hydrological regime |
| | Impacts on noise and air quality |
| | Impacts on permafrost / ice |
| | Impacts on soils |
| | Impacts on geology / landforms |
| | Impacts from solid waste |
| | Impacts on vegetation |
| | Impacts on terrestrial wildlife |
| | Affects of human / wildlife interactions |
| | Impacts on aquatic species |
| | Impacts on human health |
| | Impacts on biodiversity |
| | Cumulative effects |
| | Monitoring programs |

In order to address gaps observed in the coverage of documentation obtained through electronic database searches, a number of key reports that covered socio-economic, historical/cultural and biophysical studies were also reviewed. Relevant citations from the bibliographies to these reports were included in the database. The reports and studies reviewed include the following:

1. The Mackenzie Basin Impact Study (MBIS) Final Report (Cohen 1997).

2. The Beaufort Region Environmental Assessment and Monitoring Program (BREAM) Final Report (BREAM 1992).

3. Handbook of North American Indians – Smithsonian Institution (Helm 1981).

4. Bibliographies provided by:

   - Prince of Wales Northern Heritage Centre Archives and Databases – Yellowknife;
   - Canadian Museum of Civilization – Ottawa;
   - Dene Cultural Institute – Fort Good Hope; and
   - Gwich'in Social and Cultural Centre – Tsiigehtchic.

### 4.2.2 Ranking of Reference Relevance

#### 4.2.2.1 Socio-economic

From a socio-economic perspective, the ideal reference will:

- provide socio-economic data that are less than three years old;
- deal directly and in detail with the Mackenzie Valley;
- provide comparative data;
- provide insight into appropriate study methodologies; and
- assist in the identification of socio-economic issues that are of current concern to Mackenzie Valley residents.

The value of each reference was ranked according to the following scale:

- **High:** meets all five identified criteria, or is critical to understanding the current transportation proposal;

- **Medium:** meets three or more identified criteria in a way that contributes significantly to the current study;

- **Low:** meets no more than two of the identified criteria, and then only peripherally; and

- **Indeterminate:** value cannot be determined with current knowledge of reference.

#### 4.2.2.2 Historical/Cultural

In the area of historical resources and concerns the ideal reference should provide some or all of the following information:

- concrete information on known historical resources in proximity to the proposed development corridor;

- results of in-field examination or systematic terrain analysis that would help to establish the historical resource potential of the terrain within the development corridor;

- regional level information that would provide a comparative context for resources in the study area; and

- historical information that is fundamental to understanding the history or prehistory of the region and would be needed for development of a comprehensive baseline setting section for the EIA report.

The value of each reference was ranked according to the following scale:

- **High:** meets the first two criteria in relating directly to the area surrounding the proposed corridor;

- **Medium:** provides significant regional level information as indicated by the third and fourth criteria and would be useful for EIA preparation;

- **Low:** generally relevant information from more distant areas that relate to potential EIA issues in a peripheral sense; and

- **Indeterminate:** value cannot be determined with current knowledge of reference.

In the area of cultural resources and concerns, ideal references would provide information in the following areas:

- traditional land use information from areas in direct proximity to MVHE including resource use patterns, harvest statistics, place names and significant sites;

- cultural information for the aboriginal communities in the development area that would assist in defining cultural issues that are of current concern; and

- key historical records on the aboriginal groups in the development area that would assist in establishing patterns of cultural response to changing conditions and are fundamental to understanding current issues and concerns.

The value of each reference was ranked according to the following scale:

- **High:** provides cultural information that is of direct relevance to the area surrounding the development corridor (criterion 1);

- **Medium:** provides significant regional level information as indicated by the second and third criteria and would be useful for EIA preparation;

- **Low:** generally relevant information from more distant areas or greater than 10 years in age and which relate to potential EIA issues in a peripheral sense; and

- **Indeterminate** value cannot be determined with current knowledge of reference.

#### 4.2.2.3 Biophysical

Biophysical references were classified as to their relevance for EIA purposes based, in part, on the following matrix:

| Relevance | Decade | New Data Collected | Location |
|---|---|---|---|
| Low | 1970s or earlier | no | Beyond regional (e.g., Mackenzie Delta) |
| Moderate | 1980s | yes | Regional (Mackenzie River watershed, upstream of Delta) |
| High | 1990s | yes | Within 20 km of Mackenzie River, upstream of Delta |

Only two of the possible three criteria (decade, new data collected and location) had to be met for the reference to be assigned the relevance score. For example, a study was assigned a high relevance if new data were collected within 20 km of the Mackenzie River, even if the data was collected in the 1970s. Such data were considered to be of high relevance to any future impact assessment as it would provide information on historic baseline conditions. A high relevance score, however, does not mean that additional data do not need to be collected. It is likely that 20 year old data would have to be updated to properly conduct an impact analysis.

Broad overview and guideline documents were ranked using a separate system. Any such documents that were related to highway development were assigned a high relevance; oil and gas related reports were assigned a moderate relevance; and all other reports were assigned a low relevance.

Another exception to the above matrix was the consideration of reports detailing traditional knowledge studies. All such reports were assigned a high relevance.

In some cases the reports did not fall neatly into a particular relevance category, so professional judgment was used to assign the best relevance score. Finally, references for which there was insufficient information to assign a relevance ranking were assigned an indeterminate category.

## 4.3 Results

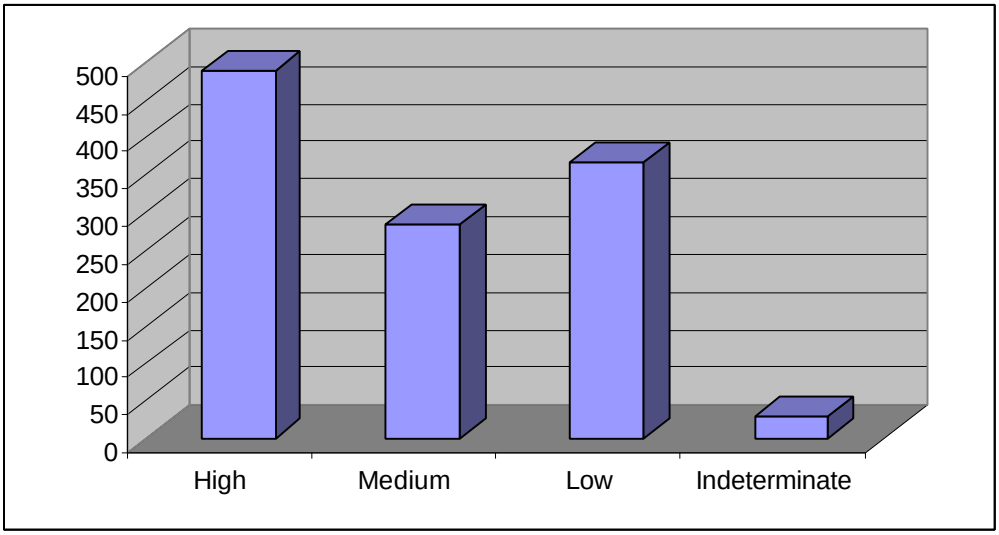
### 4.3.1 Relevance of Existing Databases

Existing databases on socio-economic, historical/cultural and biophysical parameters (Appendix V) were ranked according to their relevance using the same criteria as described in Section 4.2.2. A total of 33 databases were recorded. Of these, some 11 were ranked as being of high relevance, 9 of moderate relevance and 13 of low relevance.

### 4.3.2 Relevance of the Existing Literature

The bibliography produced for this study is provided in Appendix VI and on disk in ProCite software. A total of approximately 1,200 references were obtained during the search. Of these, some 489 were ranked as being of high relevance, 285 of moderate relevance and 367 of low relevance (Figure 4.1). Only 29 references were assigned to the indeterminate class.

**Figure 4.1**
**Summary of Relevance of all References**



#### 4.3.2.1 Socio-economic

The bibliography indicates that socio-economic issues in the Mackenzie Valley have rarely been studied since the Berger Inquiry conducted over twenty years ago. This is not surprising given the moratorium on development that Berger recommended.

Most of the existing data that would be useful to determine feasibility and potential impacts of the MVHE come from one of three sources:

- those dealing with specific economic activities (such as the viability of the Mackenzie Delta whitefish fishery);

- those related to the settlement of comprehensive land claims, most notably the Gwich'in, Sahtu, and peripherally, the Inuvialuit Land Claim Agreements; and

- statistical information maintained by Statistics Canada and the GNWT.

Each of these primary sources has a number of strengths and weaknesses. First, although some of the information available on economic activity in the region is relatively recent, not all economic sectors appear to be adequately or equally covered. Second, information collected in land claim areas may not be collected for areas outside of settled land claims, such as the northern Deh Cho region. Finally, the best source for information on housing, employment, income distribution, and population demographics is that collected by Statistics Canada and the GNWT. Information for specific communities or specific correlation between variables can be obtained by special request, and represent the best sources of readily available socio-economic information. This information is not included in this database.

In summary, primary baseline socio-economic data or special "data runs" of existing and recent statistical data would most likely be required for any future EIA.

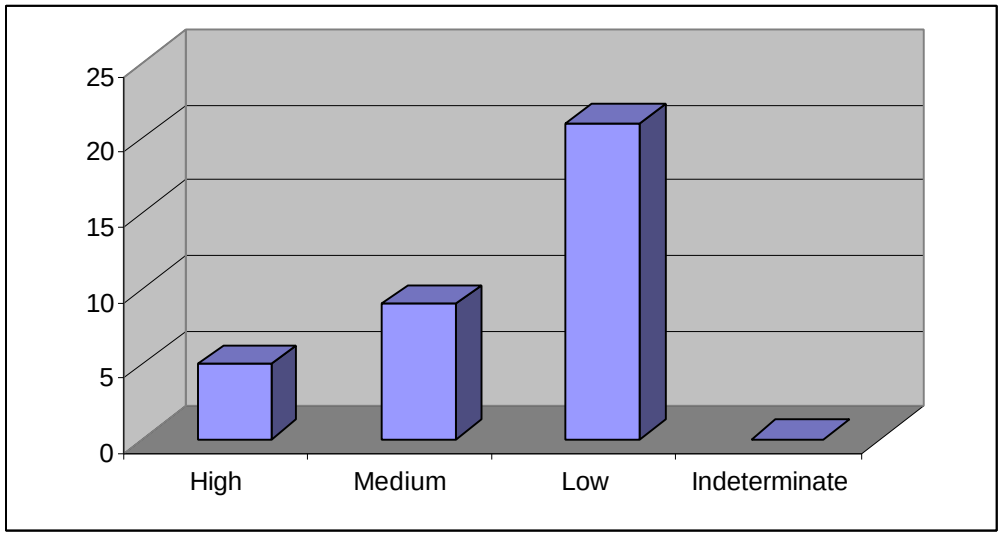
The total number of references containing relevant information on socio-economic issues and conditions captured in the database is 183, with 148 of these records containing information that overlaps with either bio-physical or cultural information areas. A breakdown of records found

based on ranked relevance is presented in Table 4.2, while a graph of the distribution of the relevance of the socio-economic references is provided in Figure 4.2.

**Table 4.2**
**Summary of the Relevance of Socio-economic References**

| Category | Total Records | High | Medium | Low | Indeterminate |
|---|---|---|---|---|---|
| Socio-economic only | 35 | 5 | 9 | 21 | 0 |
| Overlap with other areas | 148 | 29 | 56 | 62 | 1 |

**Figure 4.2**
**Summary of the Relevance of Socio-economic References**




References that were ranked of high relevance included:

- Northwest Territories Transportation. Northwest Territories transportation agenda. Yellowknife: Northwest Territories Transportation; 1993; 97-03062. 1 fiche 19 p. This strategy document for NWT transportation identifies ten major objectives which should be pursued and the resources which should be found to achieve them. The objectives are listed and described by transportation mode: road (highway upgrading, Mackenzie Highway extension, Arctic Coast transportation corridor, local access roads), air (upgrading of airports, improvement of air navigation systems), marine

(improvement of local marine facilities and marine supply systems), and objectives common to all modes (improvement of transportation safety, increasing local involvement). For each objective, the document presents the background, progress made since 1990, current needs and deficiencies, accomplishments proposed, and action plans.

- Woods, G. Cost benefit study for extension of Mackenzie Highway. Hull, Quebec: Indian Affairs and Northern Development. 1983

#### 4.3.2.2 Historical/Cultural

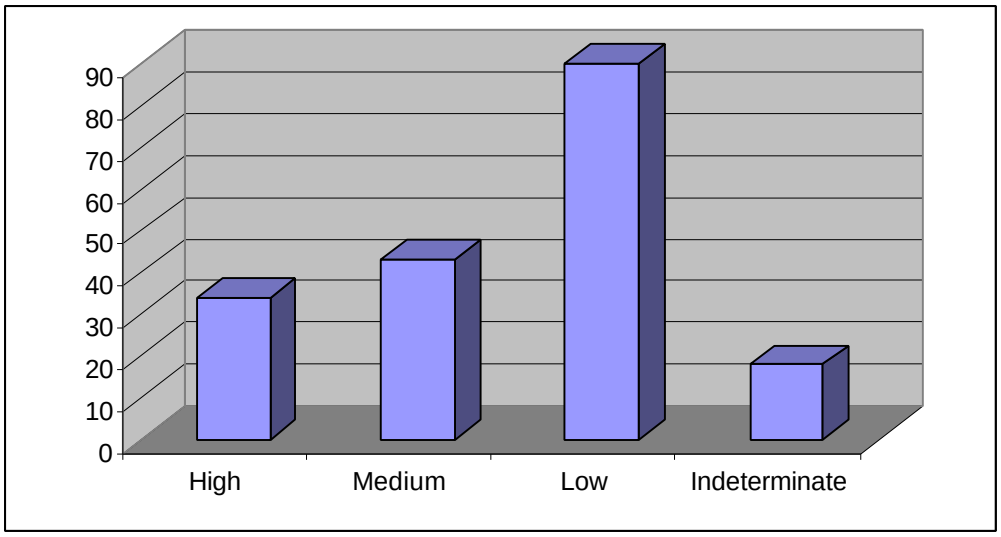
A total of 185 historical and cultural references were found during the literature review. References were found to cover an extensive time range from as early as 1789 to the present, and encompass an extremely wide range of subject matter.

Of the references included in this listing 34 were ranked as being of high relevance for the impact assessment process, 43 were ranked as having a moderate relevance, and 90 were considered to have a low relevance (Table 4.3 and Figure 4.3). Eighteen were classified as indeterminate. A total of 125 historical/cultural references were found to overlap with other areas.

**Table 4.3**
**Summary of the Relevance of Historical/Cultural References**

| Category | Total Records | High | Medium | Low | Indeterminate |
|---|---|---|---|---|---|
| Historical/cultural only | 185 | 34 | 43 | 90 | 18 |
| Overlap with other areas | 125 | 26 | 45 | 50 | 4 |

**Figure 4.3**
**Summary of the Relevance of Historical/Cultural References**




In historical terms, references considered to have perhaps the greatest relevance were considered to be those associated with studies undertaken for the formerly proposed Mackenzie Valley pipeline and those completed more recently for the Northern Oil and Gas Action Program (NOGAP). In cultural terms, the relatively recent traditional land use and oral history studies conducted by the Dene Cultural Institute and the Gwich'in Social and Cultural Institute, as well cultural studies completed for the Mackenzie Valley Pipeline and Northern Pipelines, Task Force on Northern Oil Development are perhaps the most relevant references for EIA preparation.

In order to fully appreciate the impacts of the MVHE, and because there is not a lot of specifically relevant background data on this type of project, detailed local historical resources impact assessments would be necessary to meet legislative requirements. Reference review alone cannot be considered equivalent to this level of study.

Due to the differences between the possible impacts of this project and previously proposed energy developments, new consultative work with local committees would be needed to ensure a comprehensive assessment of the possible cultural impacts of the project. Existing studies can be used as background and can assist in defining significant issues and historical trends for this work.

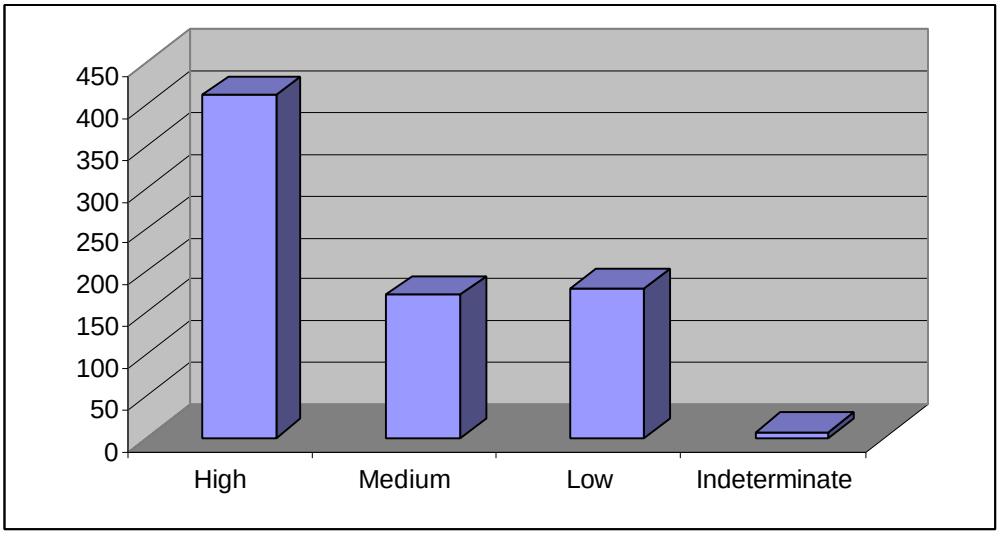
#### 4.3.2.3 Biophysical

A total of 768 biophysical references were found during the literature review. References from the 1950s up to 1998 were found to cover a wide range of biophysical disciplines. Four hundred and ten references were ranked with high relevance to the impact assessment process, 171 were ranked moderate relevance and 180 were ranked low relevance (Table 4.4, Figure 4.4). Seven were classified as indeterminate.

**Table 4.4**
**Summary of the Relevance of Biophysical References**

| Category | Total Records | High | Medium | Low | Indeterminate |
|---|---|---|---|---|---|
| Biophysical only | 768 | 410 | 171 | 180 | 7 |
| Overlap with other areas | 150 | 36 | 50 | 61 | 3 |

**Figure 4.4**
**Summary of the Relevance of Biophysical References**




A number of mapped biophysical products are available for the road corridor, including maps of geology, soils, permafrost, vegetation and wildlife habitat. It is likely, however, that the vegetation and wildlife maps would have to be updated for an EIA.

A number of mapped biophysical products are available for the road corridor, including maps of geology, soils, permafrost, vegetation and wildlife habitat. It is likely, however, that the vegetation and wildlife maps would have to be updated for an EIA.

Many reports also detail the results of investigations of aquatic and terrestrial biophysical components, such as climate, water quality, water flows, fish and fish habitat, vegetation, wildlife populations and habitat. Resource use (hunting, fishing, trapping) has also been investigated in numerous studies. Many of the studies are related to the assessment of the Mackenzie Valley Gas Pipeline Project that was assessed in the 1970s; others are related to the more recent assessment of the Norman Wells to Zama pipeline (1980s). Although uncommon, some traditional resource use studies have been conducted in the Mackenzie River valley and would be useful in preparing an EIA.

## 4.4 Conclusion

A large volume of information has been documented for the study area. As discussed, many citations will either be of direct relevance to a future environmental assessment report or will help in the planning of studies to fill data gaps. This is especially so for biophysical references. The difficulties discussed in connection with finding relevant citations from bibliographic databases means that additional useful material over that cited here, no doubt exists. However, this data collation has been extensive enough to allow for a meaningful gap analysis in Section 6.

# 5. REGULATORY REQUIREMENT IDENTIFICATION

## Glossary

The environmental impact assessment process of the *Mackenzie Valley Resource Management Act* (MVRMA) is distinct from other national, territorial or provincial EIA processes, and the Act uses terminology in a distinct way. This glossary is intended to avoid confusion by clarifying the meaning of terms commonly used exclusively in the Act but defined differently elsewhere. This glossary will also expand on the few acronyms used in this document.

| | |
|---|---|
| Environmental Assessment | The second stage of the environmental impact assessment process under the MVRMA. |
| Environmental Impact Review | The third stage of the environmental impact assessment process under the MVRMA |
| Environmental Impact Review Panel | A panel appointed by the MVEIRB to conduct an environmental impact review. |
| Gwich'in and Sahtu Land and Water Boards | Regulatory authorities dealing with land and water permits in the Gwich'in and Sahtu Settlement Areas. |
| Mackenzie Valley | The Northwest Territories, excluding the Inuvialuit Settlement Area and Wood Buffalo National Park. |
| Mackenzie Valley Land and Water Board: | Regulatory authority dealing with land and water permits in the unsettled claim areas and wherever there is a transboundary development. |
| Mitigation and Remediation Measures | Measures that reduce or eliminated adverse impacts, or restorative measures that repair adversely affected components. |
| MVEIRB: | The Mackenzie Valley Environmental Impact Review Board, responsible under the Mackenzie Valley Resources Management Act for all environmental impact assessment following preliminary screening. |
| MVRMA: | *The Mackenzie Valley Resource Management Act*, a piece of legislation that includes an environmental impact assessment process for the Mackenzie Valley. |

Preliminary Screening: The first stage of the environmental impact assessment process under the MVRMA.

## 5.1 Introduction

When planning any new development, attention should be given to the regulatory regime and the environmental impact assessment (EIA) process which regulates the development. The proponent must meet the requirements of the body conducting EIA, as well as provide required information to the regulatory authorities issuing authorizations in order to receive project approval. This section is intended to clarify the likely regulatory regime and environmental impact assessment process necessary should the MVHE go forward.

This section will:

- identify the regulatory authorizations required for the construction of the highway extension;
- identify the relevant EIA regime and describe its current state;
- describe the relevant EIA processes within the regime;
- predict the likely course of an environmental impact process for the MVHE;
- identify the relevant EIA requirements; and
- advise the proponent on how to meet the requirements of the EIA and regulatory processes in order to attain project approval in a timely manner.

The information in this section is based on a review of relevant land claims, Acts, regulations, operational procedures and guidelines, as well as discussions with and reviews by regulatory and EIA bodies.

The regulatory and environmental assessment regime in the NWT has evolved in recent years with the settlement of land claims and passage of new legislation. Regions within the NWT differ in their jurisdictional responsibilities for the management of renewable resources, requiring knowledge of the provisions of land claims as well as federal legislation. For the extension of the highway, the *Mackenzie Valley Resource Management Act* (MVRMA) will guide the environmental impact assessment process. At the time of writing, Part IV of the MVRMA concerning the Mackenzie Valley Land and Water Board, has not been proclaimed. This review

of the regulatory and EIA regime is written under the assumption that the entire Act will be proclaimed if and when the proponent decides to proceed with the extension of the highway.

## 5.2 Regulatory Regime

If the MVHE is proposed, a number of permits, licences and other authorizations will be required during construction and operation of the road. Field studies conducted to provide baseline information for an environmental impact statement and regulatory permit applications would require specific research permits (in particular, scientific research permits under the *NWT Scientists Act*, *Wildlife Act*, *Northwest Territories Act* – Northwest Territories Archaeological Sites Regulations, and a fisheries research licence under the *Fisheries Act*). A guide to research licensing entitled *Doing Research in the Northwest Territories: A Guide for Researchers* is produced by the Aurora Research Institute. For the purposes of this report, the authorizations required for the construction phase of the Mackenzie Valley Highway extension are the focus, as this is the period with the most intense activity.

To review the regulatory regime for the extension of the Mackenzie Valley Highway, a number of assumptions have been made about the nature of the construction activities required, in order to determine the authorizations that are necessary. It is assumed these activities would include:

- blasting;
- quarrying;
- use of heavy equipment;
- establishment of construction camps;
- building bridges;
- culvert installations; and
- right of way clearing.

The Preliminary Screening Requirement Regulations of the MVRMA detail the federal and territorial acts and regulations that would trigger preliminary screening of the development under the Act. These regulations would provide some guidance as to the authorizations required for road development and should be consulted prior to development. Further guidance can be found through a document prepared by the Mackenzie Valley Land and Water Board Working Group,

currently in draft form, titled *Authorizations Generally Required to Develop a Project in the Mackenzie Valley*.

Application for a water licence or a land use permit is often the first authorization that the proponent applies for in the regulatory process that would trigger EIA. They are, however, only two of several authorizations that may be required and that would trigger preliminary screening. The processes to obtain water licences and land use permits, as well as other authorizations, are described in the following sections. Table 5.1 summarizes the required authorizations. Appendix VII is a compilation of applicable acts, regulations and guidelines.

The proponent should be aware that the regulatory authorities would decide, once they have reviewed the construction approach, whether or not more than one of each of the authorizations is required. This decision depends largely on the location of construction activities and over what time period they occur.

#### 5.2.1.1 Acts and Regulations for the Aquatic Environment

#### 5.2.1.2 Water Licence under the Northwest Territories Waters Act

Under the MVRMA the *Northwest Territories Waters Act* still applies. For the use of water and discharge of waste, a water licence will be required for the construction of the road. Some of the construction activities that would normally require a water licence are: water use and sewage disposal by construction camps, and sediment deposited in streams from bank and stream bed alteration during construction of bridges or culvert crossings.

Under Schedule IV of the Northwest Territories Waters Regulations, a licence is not required for a bridge or culvert if the watercourse is less than 5 metres wide at the ordinary high water mark at the point of construction. If the watercourse is more than 5 metres wide a type "B" licence is required. For stream crossings, the application for a licence must be accompanied by:

- cross-sections and elevations of stream crossings;
- a description of the bed and banks of the watercourse; and
- any available data on the water flow of the watercourse.

For water used by construction camps, the application must include:

- a plan showing the location of the camp;
- an indication of the approximate capacity of the camp; and
- a plan of the intended water or sewage system, showing cross-sections and elevations.

For the deposit of waste (any substance that would degrade or alter the quality of water), the application must include:

- location, rate, timing, frequency, and duration of deposit;
- anticipated constituents of the deposit and their concentrations;
- methods proposed for storage and treatment; and
- an assessment of the qualitative and quantitative effects on the waters into which the waste is to be deposited.

Water licences also deal with the handling and storage of petroleum products and hazardous materials, such as may be required for blasting. The licence application must be accompanied by:

- a plan for the safe handling, storage, and disposal of these materials; and
- a contingency plan for their containment and clean up in the event of a spill.

If the activities and impact are within the Sahtu and Gwich'in regions, application is made to the respective land and water boards. In areas of unsettled land claims or if the effects of the activity are in more than one region, application is made to the Mackenzie Valley Land and Water Board (until Part IV of the MVRMA is proclaimed, application would be made to the NWT Water Board). A water licence typically contains guidelines developed for both the protection of aquatic life and the protection of humans consuming water, that the proponent must meet.

For drinking water the *Guidelines for Canadian Drinking Water* (published by Health Canada) are the criteria required under the *Public Health Act*. Aquatic life is protected under the *Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG)*. One of the most probable impacts to fish habitat generated by road construction is the generations of suspended

material in the water column, measured as Total Suspended Solids (TSS). The CWQG defines an ambient TSS guideline of 10 mg/L for the protection of aquatic life.

Depending on the extent and timing of the construction, the land and water boards may also require the proponent implement an Aquatic Effects Monitoring Program (AEMP) designed to monitor, evaluate and manage the effects of road, bridge and culvert construction on aquatic life.

Abandonment and restoration issues are often conditions of water licenses in the NWT (land use permits may also apply abandonment and restoration conditions). The licence application must include plans for the reclamation and abandonment of the construction project. DIAND is revising a series of guideline publications; one of these, *Reclamation Guidelines for Northern Canada*, deals with erosion prevention techniques, revegetation, and other abandonment issues.

#### 5.2.1.3 Permission under the Fisheries Act

The *Fisheries Act* prohibits the harmful alteration, disruption or destruction of fish habitat unless it is authorized under the *Act.* Under the Department of Fisheries and Oceans' (DFO) *Policy for the Management of Fish Habitat*, DFO strives to achieve conservation by ensuring that the current productive capacity of existing habitat is maintained by applying the guiding principle of no net loss. Under this policy, unavoidable habitat alterations are balanced by development of new habitat.

When the construction project is assessed, DFO determines the impacts on fish and fish habitat. If the project, with standard mitigation, produces no significant residual impacts, a "letter of advice" is issued to the proponent. If it were determined habitat alterations would occur after mitigation, one or more "authorizations" would be required under the Fisheries Act to comply with the habitat protection provisions. Measures to compensate for the habitat that would be altered become conditions of the authorization issued to the proponent.

The proponent is responsible for identifying the habitats potentially affected by the project, assessing the potential for each fish species of concern and developing mitigation alternatives in the form of a habitat compensation plan, which is reviewed and approved through negotiations

with DFO. Consultations with the department suggested that DFO is becoming more stringent with bridge crossings and would likely require an authorization.

DFO has also set guidelines protecting fish from exposure to shock waves caused by the use of explosives. If blasting causes shock waves exceeding these guidelines in an adjacent water body, the proponent must apply for permission under the Fisheries Act for the use of explosives.

#### 5.2.1.4 Approval Under the Navigable Waters Protection Act

The Canadian Coast Guard, under DFO, is the agency responsible for enforcing the *Navigable Waters Protection Act* and its regulations. Under the Act, an approval must be obtained for the placement of bridges, dams or pipes or for any structure that may interfere with navigation if it is to be constructed in, on, over, under, through or across any navigable water. The Coast Guard would assess the site, the structures being built, the plans for the work, and the body of water. In addition, construction must be commenced within six months and completed within three years after receiving approval, or within a further period the Minister may approve.

### 5.2.2 Acts and Regulations for the Terrestrial Environment

#### 5.2.2.1 Land Use Permit Under the Mackenzie Valley Land Use Regulations (MVRMA) or Territorial Land Use Regulations (Territorial Lands Act)

The MVRMA establishes the Sahtu and Gwich'in Land and Water Boards (and the Mackenzie Valley Land and Water Board, once Part IV is proclaimed). These boards have jurisdiction for all uses of land for which a permit is required under MVRMA regulations. Application for land use permits are made to each of these boards when a use of land is to take place, and is likely to have an impact, within the respective settlement areas. Once Part IV of MVRMA is proclaimed, if the activity or the effects are outside of these regions or extend across more than one region, the Mackenzie Valley Land and Water Board receives the application. The Mackenzie Valley Land Use Regulations outline the types of permit and the activities they encompass, and also specify the types of conditions that may be attached to the permit. Type "A" permits apply to larger operations, while Type "B" permits are issued for smaller operations.

Until Part IV of MVRMA is proclaimed, in areas of unsettled claims, the *Territorial Lands Act* and Territorial Land Use Regulations are still in force. Short-term (two years or less) land use permits to conduct activities on Crown land are administered by DIAND. The Regulations outline the types of permit and the activities they encompass. All activities related to land use are included under a single permit, to which operating conditions are usually attached. Class "A" permits cover larger operations, while Class "B" permits are issued for smaller operations.

DIAND produces guidelines for various land use activities:

- *Reclamation Guidelines for Northern Canada* assist contractors and operators with erosion control and land restoration.

- *Environmental Guidelines: Access Roads and Trails* provide land use guidelines for planning, development, operation and abandonment of access road and trails in the NWT.

#### 5.2.2.2 Quarry Permit Under the Territorial Quarrying Regulations (Territorial Lands Act) and the Mackenzie Valley Land Use Regulations (MVRMA)

Under the Territorial Quarrying Regulations (*Territorial Lands Act*) a quarry permit is required when using construction material from a pit or quarry on Crown land. Application is made through DIAND, which also issues the permit. The permit authorizes the extraction of a specified volume of material. Pit or quarry operations also require a land use permit from DIAND or the appropriate land and water board to conduct the quarrying operations (see section 5.2.2.1). DIAND produces *Environmental Guidelines: Pits and Quarries* as a guide to developing and operating pits and quarries.

On Sahtu or Gwich'in owned lands, permission is required from the relevant land corporation in the Sahtu and the Gwich'in Land Administration in the Gwich'in region. The Gwich'in and Sahtu First Nations are entitled to compensation for construction materials obtained from their lands. The MVRMA requires the Gwich'in and Sahtu First Nations supply and permit access to construction material when, in the opinion of the land and water board, an alternate source is not available in the surrounding area.

#### 5.2.2.3 Commissioner's Land Act and Regulations

The *Commissioner's Land Act* allows the territorial government to permit activities on Commissioner's lands. At the time of writing, permits for land use are issued through the GNWT's department of Municipal and Community Affairs (MACA). The MVRMA, however, allows for the land and water boards to issue land use permits. MACA and the land and water boards are currently in negotiations on how this process will be administered in the future.

#### 5.2.2.4 Permit Under the Explosives Act

Natural Resources Canada administers the *Explosives Act*. Under the *Explosives Act* permits are required for blasting, manufacture of explosives, overnight storage of explosives or daily use storage at a work site.

### 5.2.3 Acts and Regulations for Cultural Resources

#### 5.2.3.1 Permit Under the Northwest Territories Archaeological Sites Regulations (Northwest Territories Act)

Studies in archaeology require an archaeologists permit. Administered through the Prince of Wales Northern Heritage Centre, the Northwest Territories Archaeological Sites Regulations, under the *Northwest Territories Act*, govern the issuance of permits to conduct archaeological studies; these are mandatory for all archaeological investigations either for research purposes or in conjunction with developments. The Prince of Wales Northern Heritage Centre produces a document titled *Guidelines for Developers for the Protection of Archaeological Resources in the Northwest Territories* that discusses types of development, studies and reporting procedures required.

#### 5.2.3.2 Terms and Conditions of Land Use Permits under the Mackenzie Valley Land Use Regulations (MVRMA) or Territorial Land Use Regulations (Territorial Lands Act)

Within the Sahtu and Gwich'in settlement regions of the Mackenzie Valley, and in unsettled regions once Part IV of MVRMA is proclaimed, the Mackenzie Valley Land Use Regulations

provide for the protection of known archaeological sites and provide a course of action to be taken if a site is discovered during operations. These are often part of the terms and conditions of land use permits.

Until Part IV is proclaimed, outside of settlement regions, on Crown land, the *Territorial Land Use Regulations* provide for the protection of known archaeological sites, outline a course of action to be taken if a site is discovered during operations and are often part of the terms and conditions of land use permits. The regulations allow the Prince of Wales Northern Heritage Centre to require inventory and assessment for historical resources to take place prior to granting a land use permit.

**Table 5.1**
**Major Authorizations, Permits, Licence, or Approvals Required for Construction of the Extension of the Mackenzie Valley Highway**

| AUTHORIZATION, PERMIT, LICENCE, APPROVAL | ACT and/or REGULATION |
|---|---|
| **Aquatic Environment** | |
| Water Licence | *Northwest Territories Waters Act* |
| Fisheries Authorization or Letter of Advice | *Fisheries Act* |
| Approval for Constructing Works in a Navigable Water | *Navigable Waters Protection Act* |
| **Terrestrial Environment** | |
| Land Use Permit | *Mackenzie Valley Land Use Regulations (MVRMA) or Territorial Land Use Regulations (Territorial Lands Act)* |
| Quarry Permit | *Territorial Quarrying Regulations (Territorial Lands Act) or Mackenzie Valley Land Use Regulations (MVRMA)* |
| Land Use Permit (on Commissioner's Land) | *Commissioner's Land Act and regulations* |
| Explosives Permit | *Explosives Act* |
| **Cultural Environment** | |
| Archaeologist's Permit | *Northwest Territories Archaeological Sites Regulations (Northwest Territories Act)* |

## 5.3 The MVRMA Assessment Regime

If the proponent proposes the MVHE, the environmental impact assessment for it would be conducted under the MVRMA. The MVRMA specifies authorities and responsibilities for EIA

throughout the Mackenzie Valley, establishes the Mackenzie Valley Environmental Impact Review Board (MVEIRB) as the agency responsible for environmental assessment and review, establishes the Sahtu and Gwich'in Land and Water Boards as preliminary screening and permitting authorities within their respective regions, and establishes the Mackenzie Valley Land and Water Board for preliminary screening and permitting in areas of unsettled land claims or when more than one jurisdiction is affected.

The *Canadian Environmental Assessment Act* would not be the overarching piece of environmental impact assessment legislation applied to the extension. The *Canadian Environmental Assessment Act* (CEAA) no longer applies to the Mackenzie Valley (sec. 116, MVRMA), except under specific circumstances (the assessment is referred to the Canadian Environmental Assessment Agency by the federal minister after considering the report of the MVEIRB, or under certain transboundary panel conditions).

The MVRMA is not entirely binding at the present time. The section empowering the Mackenzie Valley Land and Water Board (Part IV) is not yet proclaimed. At present, the Mackenzie Valley Land and Water Board is not yet a board, but a working group. As will be described in more detail below, this has some affect on the preliminary screening stage of the process, but not on the environmental assessment or environmental impact review stages of the environmental impact assessment process.

This description of the EIA process will explain considerations that are relevant until the Act is fully proclaimed, but will focus primarily on the process that will be relevant after it is fully proclaimed. There are two reasons for this: first, the part of the Act that is not yet official does not make a significant difference to the later stages of assessment, and as this document will describe, these are likely to be the most important stages of the process for the highway extension; second, full proclamation is expected soon and it is unlikely that the extension would be proposed before then.

### 5.3.1 The Overall Process

There are three separate parts to the environmental impact assessment process under the MVRMA. These are, in the order that they occur: 1) preliminary screening; 2) environmental

assessment; and 3) environmental impact review. Various bodies have different responsibilities during the process. These stages are progressive, depending on the decisions made during the assessment process (see Figure 5-1). An environmental impact review can only follow an environmental assessment, which would only follow preliminary screening. Each stage is built on the previous one, takes into consideration the information from the previous stage, and deals with issues not resolved by the previous stage. For these reasons, the range of considerations diminishes at each stage.

#### 5.3.1.1 Most Likely EIA Process Scenario

This section will focus on the EIA process that the highway extension is most likely to follow if proposed. The actual course of the EIA would depend on decisions made at different stages by regulators and boards during the assessment process. Where there are uncertainties in the process, this document would describe the basis for decisions that would influence the course of the EIA and would describe the likelihood of different EIA scenarios. This would be based on knowledge about the development, the requirements of the Act, regulations, and guidelines, and key informant interviews held with the responsible authorities.

## 5.4 Preliminary Screening

Preliminary screening is the first stage of the EIA process. No federal or territorial body can issue any authorization (such as a licence or permit) without following the environmental impact assessment process required by Part Five of the MVRMA (s.118 (1)). When the proponent applies to authorities for the necessary permits, those authorities will, according to section 124 of the Act, conduct preliminary screening. Preliminary Screening determines if there is a need to advance to the next stage of the process - the environmental assessment.

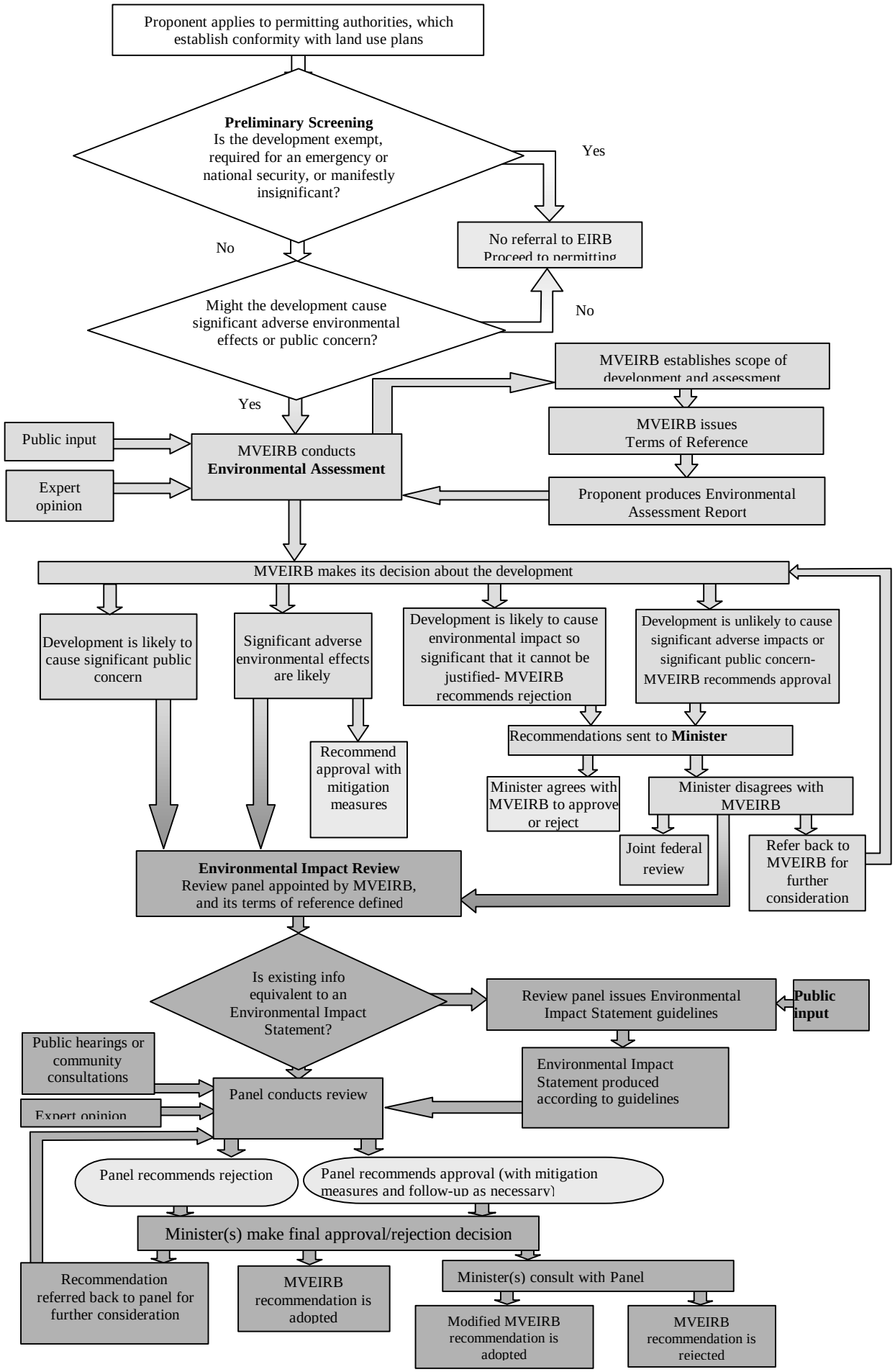



**Figure 5.1: Flowchart of the Environmental Impact Assessment Process under the MVRMA**

It is a certainty that the MVHE will undergo preliminary screening, as required by Section 124 of the MVRMA, for a number of reasons. The extension would not be an exempt development according to the MVEIRB Exemption Regulation. It satisfies the legal definition of a development under the MVRMA, which defines development as "any undertaking, or any part of an undertaking, that is carried out on land or water and… wholly within the Mackenzie Valley…" (s.111). Also, if proposed, the extension of the Mackenzie Highway would involve many activities that require permits and authorizations. Since the MVRMA (s.124) requires preliminary screening of non-exempted developments that need permits, it is certain that the highway extension would undergo screening if proposed.

### 5.4.1 Groups Conducting Preliminary Screening

Two groups of permitting authorities are responsible for conducting preliminary screening. These are the land and water boards and government authorities (both federal and territorial). This section will briefly describe the involvement of different bodies, and their likely roles in the screening of the Mackenzie Highway extension.

#### 5.4.1.1 Screening by the Mackenzie Valley Land and Water Board

The Mackenzie Valley Land and Water Board is created by the MVRMA to serve as the permitting authority for developments that occur within the Mackenzie Valley, but not entirely within any one settlement area. For these developments, the Mackenzie Valley Land and Water Board is responsible for conducting preliminary screening or coordinating preliminary screening among the permitting authorities. By the time the extension is proposed, the Mackenzie Valley Land and Water Board would likely conduct a preliminary screening, or co-ordinate other permitting authorities in conducting their preliminary screenings.

If the Mackenzie Valley Land and Water Board is not in place when and if the highway extension is proposed, the screening would be conducted independently by individual permitting authorities. They could each conduct their own screening, but may choose not to if a screening is being done by either of the Sahtu or Gwich'in Land and Water Boards. The MVEIRB would review the screening decision(s). In the case of the highway extension it would probably choose,

on its own motion, to conduct an environmental assessment even if a screening body makes no referral to the MVEIRB.

#### 5.4.1.2 Screening by Federal and Territorial Authorities

The following list indicates the federal and territorial authorities that would most likely be involved in preliminary screening.

- Dept. of Fisheries and Oceans (Canada);
- Dept. of Fisheries and Oceans, Coast Guard (Canada);
- Indian and Northern Affairs Canada;
- Environment Canada;
- Natural Resources Canada;
- Resources, Wildlife and Economic Development (GNWT);
- Education, Culture and Employment (GNWT);
- Health and Social Services (GNWT); and
- Municipal and Community Affairs (GNWT).

Each of these authorities has its own legislation regulating the development of the extension. After the Mackenzie Valley Land and Water Board is created, it would assume the responsibility for issuing land use and water permits. Until that time, DIAND and the NWT Water Board would continue to issue land use permits and water licences, respectively, for Crown land outside the Gwich'in and Sahtu regions and other permitting authorities would continue to have preliminary screening responsibilities.

#### 5.4.1.3 Preliminary Screening by Gwich'in and Sahtu Land and Water Boards

Since the route of the highway includes lands in the Sahtu and Gwich'in settlement regions, as well as in areas with unsettled land claims, the Mackenzie Valley Land and Water Board would issue land use and water permits. In settlement areas, any other authorities that give permits regarding the use of land and water and the deposit of waste must consult the regional Land and Water Board, which cannot issue a permit until the EIA requirements are met (MVRMA sec. 52

(2), sec.62). An application for a permit will invoke a requirement to conduct preliminary screening (MVRMA sec. 124 (1)).

The Gwich'in and Sahtu Land and Water Boards would require proof that the developer has the consent of landowners, if the road crosses privately owned lands. In the Sahtu Settlement Area, land ownership is decentralized to district and community levels. The Sahtu Land and Water Board would require proof of permission from the three district Land Corporations responsible for land ownership - the Deline Land Corporation, the Tulita District Land Corporation and the K'ahsho Got'ine Lands Corporation. These three District Land Corporations would consult with community based Land Corporations for their consent. In the Gwich'in Settlement Area, the Gwich'in Tribal Council is the one land owning body, and it has established the Gwich'in Land Administration. The Gwich'in Land and Water Board would require the consent of the Gwich'in Land Administration before issuing permits.

#### 5.4.1.4 Interrelationships of Preliminary Screeners

Under the current regime, preliminary screening may be done independently by each permitting authority. According to the MVRMA (sec.124 (3)), in a case such as this where more than one body is required to screen, "any of them may consult the others, adopt another's report or participate in a joint preliminary screening", and, if a land and water board is involved, "the others are not required to conduct a preliminary screening". They may choose to do so, but it is unlikely that they would if the land and water board duly considers their concerns in the preliminary screening.

The information provided should reflect the issues during the screening. These are described in the MVEIRB document entitled "Environmental Impact Assessment in the Mackenzie Valley: Interim Guidelines". Section 5.8 further describes the type of information required during an environmental impact assessment.

In many cases, the level of detail in the information provided by the proponent at the preliminary screening stage is less than it is if the EIA moves to more rigorous levels of examination (environmental assessment or environmental impact review). It is, however, recommended that the proponent consider submitting a thorough environmental assessment report at the preliminary

screening stage. For reasons explained in Section 5.5.3, this would facilitate the entire EIA process. There is a risk that once the highway extension is referred to MVEIRB for environmental assessment, the Review Board would not accept the proponent's report as adequate and would produce a terms of reference for the proponent to produce a different report. Consulting with the staff of the MVEIRB at an early stage about the requirements of the report can reduce this risk, and help the proponent plan for the work and studies needed for an environmental assessment report. In addition, consultations with residents in the regions of the highway extension would help focus the report on important issues, and the consultation conducted should be described in any preliminary screening submission to the MVEIRB.

### 5.4.2 Assessment in the Inuvialuit Settlement Region

Although the project would not occur in the Inuvialuit Settlement Region (ISR), it may cause environmental effects on the ISR. These might include socio-economic effects arising from increased access to the region and effects on the Bluenose caribou herd resulting from increased hunting access in winter ranges and habitat displacement. Because of transboundary concerns such as these, the highway extension would involve authorities in the ISR in transboundary assessment. The MVRMA does not apply to the Inuvialuit Settlement Region. Impact assessment requirements for the ISR are described in the Inuvialuit Final Agreement, which empowers the Environmental Impact Screening Committee (EISC) and the Environmental Impact Review Board (EIRB).

The project would be screened by the EISC, as required by the Inuvialuit Final Agreement (13(7)). This screening would determine whether the project may cause significant negative impacts on the ISR, with a particular focus on present and future wildlife harvesting. If so, the EISC would refer the project to the EIRB for an environmental impact review, unless the EISC is of the opinion that another body is already conducting an adequate environmental review. If the development were referred to the EIRB, the proponent would submit an Environmental Impact Statement to the EIRB. A Review Panel would be designated by the Chair of the EIRB, and would most likely conduct a Standard Public Review according to Section 14 of the EIRB Operating Procedures.

The extension of the Mackenzie Highway would most likely not be referred to the EIRB, provided that the MVEIRB assessment is considered adequate by the EISC. If the MVEIRB and the EISC/EIRB ensure that the major Inuvialuit concerns are adequately addressed by the MVRMA assessment, the Inuvialuit authorities would refer the assessment of the project to the MVEIRB, in accordance with the Inuvialuit Final Agreement requirements (13(9)).

### 5.4.3 Conformity with Land Use Plans

At the present time, the Sahtu Land Use Planning Board (established under Article 25.2 of the Sahtu Dene and Metis Comprehensive Land Claim Agreement) is preparing a land use plan for the settlement areas. The Gwich'in Land Use Planning Board (established under Article 24.2 of the Gwich'in Comprehensive Land Claim Agreement) has recently had the land use plan for the Gwich'in settlement area approved. Under Article 46 of MVRMA, any authority issuing a permit relating to the use of land or waters or the deposit of waste must do so in accordance with the applicable land use plans. Generally, the permitting authority refers the activity to the land use planning board and the board determines whether an activity is in accordance with a land use plan. This should be done before a permit is issued. If these plans have not yet been completed, the authority conducting screening may wish to check with the same Boards to confirm that the proposed development fits into current planning.

As these land use plans are currently being developed, it is in the interests of DOT to keep in contact with the planning boards to ensure, to the extent possible, that the plans would be compatible with the possible route of the MVHE. At a minimum, before applying for permits and licences, the proponent should consult with planning boards to determine if the proposed work conforms with approved or draft land use plans.

### 5.4.4 The Preliminary Screening Decision

In conducting the preliminary screening, the authority should answer the following question (s.125 (1)(a)): *Might* the extension cause significant adverse environmental effects and/or cause public concern?

This decision would be made based on the information provided about the development, and on the preliminary screener's knowledge of the existing conditions. Preliminary screeners have the option of holding public hearings, but are not required to. If the screener is a Land and water board(as it probably would be), it is empowered to require all government bodies to produce any documents or information in their possession that it feels could be helpful to its determination.

If the preliminary screening bodies decide during their screening that the extension might cause significant adverse environmental effects or public concern, then they are obligated to submit the development to the MVEIRB for environmental assessment. If any preliminary screener submits the development to the MVEIRB, it would conduct an environmental assessment. It does not matter whether the application is referred by only one or by all of the screening bodies. It would only take one referral to the MVEIRB from any screening body to trigger an environmental assessment.

Preliminary screeners would write a report containing the reasons for their screening decisions. This report would go to the MVEIRB, the proponent, any other preliminary screeners and regulators. It would also be publicly available.

Regardless of the results of screening, the MVEIRB may choose to move the proposal to the next stage, even if no preliminary screening body refers the development to the MVEIRB, so long as it concludes that impacts or concerns merit an environmental assessment. The MVEIRB may conduct an environmental assessment on its own motion due to issues of special environmental concern according to Section 126 of the MVRMA.

Much of the information that the proponent would be expected to compile for an environmental assessment would be helpful during preliminary screening. As described in section 5.5.3, the proponent should have this information ready at the screening stage.

### 5.4.5 Likely Outcome of Preliminary Screening

It is virtually certain that the agency responsible for preliminary screening would determine that the proposed development might cause a significant adverse environmental or socio-economic effect. The reasons could be the scale of the development, the many stream crossings involved,

the social importance of wildlife in the area, and so on. These considerations do not mean the extension would cause a significant adverse environmental effect, but only that the possibility exists. It is also possible there might be public concern over the proposal.

## 5.5 Environmental Assessment

The second stage of the EIA process of the MVRMA is called an environmental assessment. It would be conducted by the MVEIRB if preliminary screeners refer the highway extension to it, or if the MVEIRB decides to conduct an environmental assessment on its own motion. An environmental assessment is more rigorous than preliminary screening, and would be based in part on an environmental assessment report, which would include the information submitted in the development proposal prepared in application for permits, on the preliminary screening report, and on other information.

### 5.5.1 Jurisdiction and Transboundary Considerations

The highway extension and its effects would occur in Gwich'in and Sahtu regions, in the Deh Cho region (where claims are not yet settled), and potentially in the Inuvialuit settlement region. Due to these transboundary considerations, the Mackenzie Valley Land and Water Board would be involved. Otherwise, this would not influence the process *as a transboundary consideration* during the MVEIRB's environmental assessment. Although the Gwich'in and Sahtu Settlement Areas are distinct regions, they are both under the jurisdiction of the MVRMA. The number of members of MVEIRB appointed by these First Nations is defined by Section 112 of the Act, and is predefined, irrespective of the fact that the Mackenzie Highway extension will involve both Gwich'in and Sahtu settlement areas.

There is limited provision in the MVRMA for environmental assessments to occur jointly with jurisdictions outside of the Mackenzie Valley. Under s.128 (4), on completion of the environmental assessment, the MVEIRB's report shall identify any area outside the Mackenzie Valley in which the development is likely to have a significant adverse impact or to be a cause of significant public concern and specify to the extent to which that area is affected. If this is the case, it may enter into a joint panel or examination (MVRMA s.140 (2)), as described in Section 5.7.2.

There is, however, a provision for co-operation with other jurisdictions. If during the environmental assessment the MVEIRB, finds that the development might have a significant adverse impact on the environment in a region outside the Mackenzie Valley, it must advise the authority responsible for EIA in that region and request its co-operation in the conduct of the assessment (s.140 (1)). There is no set process for how this co-operation should take place; presumably it would be negotiated between the MVEIRB and the EIA authority of the other region.

### 5.5.2 Considerations of the MVEIRB

In conducting an environmental assessment, the MVRMA obligates the MVEIRB to conduct environmental assessments "in a timely and expeditious manner" (s.115). It is also required to have regard to "the protection of the environment from the significant adverse impacts of proposed developments" (s.115a) and "the protection of the social, cultural and economic well-being of residents and communities in the Mackenzie Valley"(s.114b). This applies to all processes of the MVEIRB.

When conducting an environmental assessment, in addition to the above factors, the MVEIRB is required, at a minimum, to consider the following (as stated in MVRMA s.117 (2)):

- a) the impact of the development on the environment, including the impact of malfunctions or accidents that may occur in connection with the development and any cumulative impact that is likely to result from the development in combination with other developments;

- b) the significance of any such impact;

- c) any comments submitted by members of the public in accordance with the regulations or the rules of practice of the Review Board;

- d) where the development is likely to have a significant adverse impact on the environment, the imposition of mitigative or remedial measures; and

- e) any other matter, such as the need for the development and any available alternatives to it, that the Review Board or any responsible minister, after consulting with the Review Board, determines to be relevant.

The MVEIRB would make its decision based on the report from the preliminary screening, an environmental assessment report from the developer, public input, and any other information the Board deems relevant to the environmental assessment. The MVEIRB may also request assistance from experts at its discretion.

### 5.5.3 The Environmental Assessment Report

Once an environmental assessment has begun, the MVEIRB would make a decision on the scope of the information required, whether or not the information submitted by the proponent during preliminary screening is adequate to conduct the environmental assessment, and, if not, sets terms of reference for the proponent's environmental assessment report. The Board would do a conformity analysis of the environmental assessment report against the terms of reference.

The outcome of the environmental assessment would depend, in part, on the environmental assessment report submitted by the proponent. It is the proponent's responsibility to conduct the relevant studies and produce and distribute the environmental assessment report.

The information required for the environmental assessment report should be prepared early, in consultation with the MVEIRB, and submitted during preliminary screening. Although it is not legally required by the preliminary screening authority, that authority would require much information about the development nonetheless, and it is very likely that an environmental assessment report would eventually be needed if the Mackenzie Highway extension is proposed. Having the information ready early would facilitate preliminary screening, and would speed up the overall process. (Section 5.8 of this document describes what information should be included in the environmental assessment report.)

There are many reasons to provide the relevant information early:

- The MVEIRB would not make a decision on the extension until it is satisfied that it has enough information to fulfill its responsibilities. If the MVEIRB does not have enough information to do this, it would request more, which may delay a decision and cause scheduling and resource difficulties for the proponent.

- The more focused and complete the environmental assessment report, the less chance of the proposed development requiring an Environmental Impact Review, the next stage in the process.

- If the MVEIRB is not provided with the information needed to make their decision, it would request the information, lengthening the time needed to complete the environmental assessment process. If the MVEIRB wants information that has not been submitted, it has all the subpoena powers of a superior court, and can order any federal or territorial government department to produce any documents and provide any information in its possession.

The MVEIRB would also be looking for evidence of the extent and effectiveness of community consultations undertaken by the proponent, as part of the MVEIRB's determination whether or not to hold its own consultations.

There is also the remote possibility, if screeners are fully satisfied that the development has received careful consideration and is very well planned with all necessary mitigation measures, that the preliminary screeners would not refer the development to the MVEIRB for an environmental assessment. If documentation submitted for preliminary screening satisfies authorities that the extension might not cause significant adverse environmental effects or public concern, they would not refer the development to the MVEIRB. This could happen if the authorities conducting preliminary screening determine that the planning of the extension reflects the issues identified by thorough scoping and that proposed mitigation measures are sufficient. This may be demonstrated by submitting the same information needed for an environmental assessment report at the stage of preliminary screening.

### 5.5.4 Possible Outcomes

The environmental assessment can lead the MVEIRB to one of five decisions:

1. No significant adverse environmental effects- Recommend that development proceeds to permitting.

2. Significant adverse environmental effects are likely and a review panel should conduct an Environmental Impact Review.

3. Significant adverse environmental effects are likely but mitigable, and if the appropriate mitigation measures are implemented, conditional approval of the development can be recommended.

4. Significant public concern is likely and an Environmental Impact Review should be conducted (unless the responsible federal ministers refer it to a joint review under the Canadian Environmental Assessment Act).

5. The likely adverse environmental impact of the project is "so significant that it cannot be justified (s.128 (1)(d))", and rejection of the proposal with no further assessment is recommended.

The MVEIRB would produce a report containing recommendations on the environmental assessment, and distribute it to the Minister of Indian Affairs and Northern Development, to preliminary screening bodies, to the proponent and to any other referring body (MVRMA sec.128 (2-4). The Minister may accept MVEIRB's report. If the report is rejected (sec.130b), the Minister may choose to refer the development to an Environmental Impact Review even if the MVEIRB does not recommend it ((s.130a). The Minister may also consult with the Minister of the Environment and set up a joint review under the Canadian Environmental Assessment Act, if it is determined this would be in the national interest (s.130c).

## 5.6 Predicted Outcome of the Environmental Assessment

The outcome of the environmental assessment is difficult to predict, because it depends on many variables. The outcome would depend largely on how well the proponent prepares its environmental assessment report.

If the MVEIRB is satisfied that the development produces no unacceptable impacts or significant public concern, it would likely recommend conditional approval (under MVRMA 128b(ii)). This is only possible if there is no significant public concern, and if:

- the MVEIRB is satisfied the important issues have been identified through a thorough scoping process and, if necessary, by public input and expert opinion during the MVEIRB's environmental assessment;

- the MVEIRB is satisfied the proponent has conducted an accurate assessment with sound predictions and evaluations of their significance; and

- the issues have been sufficiently addressed and the residual effects of the development are acceptable.

The following actions would facilitate this decision:

- The proponent should be diligent in early scoping and community consultation to reduce uncertainties during the environmental assessment process;

- Where information is lacking in order to do an assessment of the impacts of the highway extension, the proponent should carry out baseline studies;

- The proponent should focus the environmental assessment report on the key issues identified, and assess them thoroughly;

- The proponent should consider the issues identified and design the highway extension to address these issues where possible; and

- Where adverse impacts cannot be avoided by design of the highway extension, the proponent should focus on identifying effective mitigation and remediation options to deal with any significant adverse impacts, including a suitable monitoring, evaluation and management program.

## 5.7 Environmental Impact Review

An Environmental Impact Review is the third and final possible stage of the environmental impact assessment process of the MVRMA. It involves the formation of a Review Panel by the MVEIRB to investigate any relevant issues that were unresolved by the environmental assessment and require further public examination. An environmental impact review would involve the submission of an Environmental Impact Statement by the proponent and public consultations or community hearings (MVRMA sec.134a-e).

### 5.7.1 The Review Panel

The review panel is appointed by the MVEIRB, and has a minimum of three members, one of whom is the chairperson. These members may be, but are not necessarily all, members of the MVEIRB. Technical experts may be appointed to the panel by the MVEIRB. Because the highway extension would be developed predominantly within Sahtu and Gwich'in settlement areas, at least two members of the review panel would be members nominated to the MVEIRB by First Nations (MVRMA 132(4b)). Most likely one should be a Gwich'in nominee and the other a Sahtu nominee.

The review panel would follow a Panel Terms of Reference set by the MVEIRB in consultation with responsible ministers and Gwich'in and Sahtu First Nations.

### 5.7.2 Joint Review and Transboundary Considerations

There are three instances when a joint review with a jurisdiction outside of the Mackenzie Valley may happen:

1. following the completion of the environmental assessment stage, MVEIRB's report identified areas outside the Mackenzie Valley on which the development is likely to have a significant adverse impact on the environment (s.128(4));

2. when the federal minister has ordered a review, and has identified areas outside the Mackenzie Valley on which the highway extension is likely have a significant adverse impact on the environment (s.130(2)); or

3. when a regulatory agency has ordered a review, and has identified areas outside the Mackenzie Valley on which the highway extension is likely to have a significant adverse impact on the environment (s.131 (3)).

In these cases, the MVEIRB may enter into an agreement with the EIA authority in the region outside the Mackenzie Valley that is likely to be adversely affected. This agreement may provide for co-ordination of the EIAs conducted by the two authorities, or a joint panel may be established to conduct the environmental impact review. The MVRMA does not provide guidance on how a joint panel process should work.

In the case of the MVHE, the Inuvialuit Settlement Area and the Yukon Territory are other areas to which this may apply because of the possibility of negative socio-economic impacts that might arise as an indirect result of greater access.

There is a possibility that the regulatory agencies in the Inuvialuit Settlement Area, Nunavut and the federal government may be involved due to the potential cumulative effects of this development on the Bluenose caribou herd. The herd's range includes parts of the development area[2], the Inuvialuit Settlement Area, Tuktu Nogait National Park, and the western tip of Nunavut around Bluenose Lake. The likely effects of the extension would not necessarily be sufficient to cause a joint assessment with these jurisdictions under MVRMA section 140(2). The recently screened Ikhil Pipeline Project was reviewed under Inuvialuit, COGOA and CEAA legislation in 1997 (Golder Associates 1997). That project had more direct potential impact within the herd's range than the MVHE is likely to cause, yet the Ikhil process was completed without the involvement of other jurisdictions that share the Bluenose herd with the Inuvialuit.

At the present time, the Nunavut Impact Review Board does not yet have a detailed process for transboundary assessment. Both the Inuvialuit Final Agreement and the Canadian Environmental Assessment Act contain specific transboundary provisions.

[2] Specifically, a major subgroup of the Bluenose herd winter along the Bear River and on the north side of the Mackenzie between Tsiigehtchic and Fort Good Hope. This is the edge of their range.

### 5.7.3 The Environmental Impact Statement

The review panel may request an Environmental Impact Statement (EIS) from the proponent. The panel would first consider all existing assessment documents for the highway extension, including the environmental assessment report prepared by the proponent during the previous environmental assessment stage. If the review panel determines that the existing environmental assessment report by the proponent is equal to an environmental impact statement, the panel would not require the proponent to produce an EIS. The MVEIRB may involve the public in determining whether or not existing documents are sufficient substitutes for an EIS. If no EIS is needed, the panel can begin public hearings and consultations.

If an EIS is required, the review panel would conduct its own research and produce a Terms of Reference for the proponent outlining the requirements of the EIS. The draft EIS guidelines may be subject to public review prior to being finalized.

The review panel should consider all the factors that the MVEIRB was legally required to consider during environmental assessment (MVRMA sec.117 (2)). In addition to those considerations, an environmental impact review is required to consider the following (sec.117 (3)):

- the purpose of the development;
- alternative means, if any, of carrying out the development that are technically and economically feasible, and the impact on the environment of such alternative means;
- the need for any follow-up program; and
- the capacity of any renewable resources that are likely to be significantly affected by the development to meet existing and future needs.

It is recommended that this information be included in the environmental assessment report required in the previous stage.

### 5.7.4 Predicted Outcome of an Environmental Impact Review

There are two major outcomes for an environmental impact review. The panel would either recommend development approval (possibly with mitigation measures) or would recommend the development proposal be rejected. The outcome of an environmental impact review would depend on whether the review panel is satisfied that the MVHE would not cause unacceptable significant adverse environmental impacts and would not harm the social, cultural and economic well being of residents and communities in the Mackenzie Valley. The decision of the panel can be expected to reflect the guiding principles of Part Five of the MVRMA (sec.115).

Unless completely unanticipated serious issues arise, it is likely that an environmental impact review of the Mackenzie Valley highway extension would recommend development approval under the condition that appropriate mitigation measures are identified and adopted. This is due to the nature and location of the development. Highway developments in general are not new or experimental types of developments, their general impacts are reasonably well understood and can probably be acceptably mitigated, and the proposed route is partly developed at present (as a winter road).

This prediction is based on the following conditions:

1. Suitable mitigation measures can be identified. This assumes that once the potential impacts of the extension have been identified, the proponent would identify mitigation measures that can be relied upon to effectively reduce or eliminate significant adverse environmental impacts.

2. No major “surprise” issues arise. Although the possibility exists that, due to site specific conditions, the extension would cause serious unacceptable residual effects after mitigation, this is considered unlikely. Thorough and early scoping decreases the risk that such an issue would arise unexpectedly later in the assessment process.

### 5.7.5 Federal Government Decision

Based on the report of the review panel, the DIAND Minister and other responsible federal ministers may adopt the panel’s recommendations (with or without modifications) or reject the panel’s recommendations. If the federal government does not adopt the panel’s recommendations, it should refer the report back to the panel for further consideration. In order

to modify or reject the panel's recommendations, the government must first consult the review panel. The federal government would identify any new issues that influence its decision, and would draft a report describing reasons for decisions. This report would be distributed to all government and regulatory bodies affected by the decision.

## 5.8 Environmental Assessment Report Contents

This section describes what should be included in an environmental assessment report on the highway extension. It is based on the requirements of the MVRMA, the MVEIRB's document *Environmental Impact Assessment in the Mackenzie Valley: Interim Guidelines* (1999) and professional standards of practice. The contents of the environmental assessment report may be formally guided by the MVEIRB in a Terms of Reference document. The Terms of Reference can be drafted by the proponent and submitted to the MVEIRB for approval.

The environmental assessment report should contain all the information needed by the MVEIRB to make an informed decision about this development, in accordance with its legal responsibilities, while excluding information that is not directly relevant to that decision. To do this, the scope of the environmental assessment report should appropriately address the important issues associated with the highway extension. The prediction and evaluation of impacts in the environmental assessment report should reflect the issues that have been identified through community consultation and scoping sessions.

To meet the environmental assessment requirements of the MVRMA, the environmental assessment report should include the prediction of likely impacts, an evaluation of their significance, and descriptions of mitigation and remediation measures that the extension would involve.

### 5.8.1 Assessment Scope

In every EIA, the footprint of a development and its area of impacts make up the main assessment boundaries. For cumulative effects, however, broader boundaries apply. The MVEIRB has the authority to decide which elements of the highway extension would be assessed. It is

recommended that the proponent discuss this with the staff of the MVEIRB. Whatever is decided as the scope of the assessment, should be clearly stated in the environmental assessment report.

The report should describe the consultations that have occurred. This would provide the MVEIRB with an understanding of why the assessment deals with the issues that it does, and would ensure that the MVEIRB is fully aware of the level of public participation and technical consultation that has already occurred early in the Mackenzie Highway extension planning process.

The environmental assessment report should summarize and prioritize the issues that arose during community, public, and technical consultation, to demonstrate that the environmental assessment report is focused on the most important issues. It would also demonstrate the proponent's commitment to early issue identification and community consultation.

### 5.8.2 Project Description

Before impacts can be predicted, it is necessary to know what activities the highway extension would involve. This should include details about activities involved in the construction and operation of the extension, describing what would be involved, where it would happen, and when it is planned to occur. The project description should provide a complete picture of all the elements and activities considered to be within the scope of the highway extension development. Some things which may be included are the description of the route; physical description of camps and other infrastructure and their surroundings, the use of water and the handling of waste water, the location of all quarrying sites, transportation methods, equipment being used, fuel storage, explosives storage, etc.

Because environmental scoping for the extension is being conducted appropriately early in the development, the design of the extension is able to incorporate environmental considerations. The project description should outline how this was done. The document should explain how environmental considerations affected the highway extension during the design process.

In addition, a description of the purpose for extending the Mackenzie Highway and why it is needed, the proponent's performance record and descriptions of any available alternatives to the extension that would achieve the same goals should be provided.

### 5.8.3 Existing Environment

Documentation of existing conditions is necessary to make meaningful predictions. It is essential that the conditions described are relevant to the issues identified during scoping. The boundaries of the study area for which conditions are described should reflect the potential geographic and temporal scope of the relevant effects of the extension.

The existing information is not just a snapshot inventory of the current biophysical conditions. Fluctuations in baseline conditions over time should be identified, along with the range of fluctuations, so that it can be understood how representative current conditions are. Also, the ecological interrelationships of ecosystem components should be emphasized, along with the associated uncertainties where there is not clear understanding of ecosystem inter- (and intra-) dependence. As well, as dictated by the issues identified in scoping, the existing socio-economic and cultural conditions should be documented. These are linked with one another, and with ecological conditions. These linkages should be identified where relevant.

Traditional knowledge can be a very useful source of information on existing and past ecological conditions, as well as their social and cultural linkages, and should be incorporated into the environmental assessment document.

### 5.8.4 Prediction of Impacts

Prediction of potential impacts should be based on knowledge of the activities involved in the highway extension and understanding of existing conditions. The predictions themselves should be done by appropriate specialists (e.g. aquatic specialists for aquatic impacts, socio-economic specialists for socio-economic impacts, etc.). However, even though predictions would mostly be made by technical specialists, they should be described clearly, so that they are readily understandable to the public and to the MVEIRB. All uncertainties should be indicated. Note

also that traditional knowledge may be useful in predicting social, cultural and environmental responses to change.

In addition to predicting and describing the potential impacts that are likely to result from the development, the MVRMA (117(2a)) specifies that the environmental assessment report should also describe the impacts of accidents or malfunctions, and cumulative impacts.

### 5.8.5 Cumulative Effects Assessment

The environmental assessment report should predict the effects of the development on "the big picture", to include an account of what the effects of the highway extension would be in conjunction with the effects of all past, present, and reasonably foreseeable future developments, because this is the only way to address the overall "on-the ground" environmental effects of development in general on each valued ecosystem component. In order to do this adequately, the assessment should identify the valued ecosystem components about which there is concern, identify all other developments that may affect those components, and predict the combined effects of the highway extension in combination with other developments. This can be integrated into all stages of the assessment.

The focus of the cumulative assessment may not be limited to the valued ecosystem components identified in the rest of the environmental assessment report, because for some valued ecological components, the only concerns may be cumulative.

Next, the proponent should identify other past, present and future developments that may impact on the same valued ecosystem components affected by the highway extension, such as:

- Developments that involve similar types of activities (e.g. stream crossings) should be considered carefully because they may produce similar types of effects that might compound those of the highway extension.

- Nearby developments, such as oil projects at Norman Wells, have some of the same components as the highway extension and might contribute cumulatively to its effects.

- Distant developments may also cause impacts that may act in combination with the effects of the highway extension if they affect the same individual valued ecosystem components. For example, the highway extension might act in combination with the Bennett Dam on the Peace River to cause cumulative effects on the Mackenzie River.

Because cumulative effects assessment requires the consideration of past, present and future human activities, the proponent would have to consider relevant future developments that could cause cumulative effects on valued ecosystem components:

- The proponent should meet with the MVEIRB to ensure that expectations about the scope of future projects to be included in the cumulative effects assessment are clear.

- The Sahtu and Gwich'in Land Use Planning Boards should be consulted to help identify future developments that can be foreseen around the highway extension.

- Outside of settlement areas, consultations with DIAND and other agencies likely to be involved in major developments may be useful in identifying relevant future developments.

Once the valued ecosystem components relevant to cumulative effects assessment have been identified, and the other human activities that are likely to influence those same components have been determined, the cumulative effects of the highway extension in conjunction with other human activities should be predicted. This prediction should follow a method that is identified by subject specialists as most appropriate for each individual ecosystem component studied (as long as the method reflects the range of different activities that could act in conjunction to cause an impact).

Beyond its broader and deeper scope, cumulative impact assessment for the MVHE would be similar to non-cumulative impact assessment. The significance of both types of impacts should be clearly established (as described below), and mitigation measures should be designed to eliminate or reduce the degree of both kinds of adverse impacts and to maximize desirable impacts (Section 5.8.6).

**Significance of Impacts**

The environmental assessment report should evaluate the significance of the predicted impacts (MVRMA sec.117 (2b). This should involve a weighing of many factors. Questions to be addressed by the proponent in evaluating the significance of each impact should include:

- What is the importance of the impact to affected persons?
- What is the geographical scope of the impact?
- How long would the effect last, and with what frequency would it occur?
- How great would the magnitude of the impact be?
- How essential is the affected ecosystem component to overall ecosystem health?
- What is the certainty of the impact? What is the likelihood of the impact occurring, and how great is confidence in mitigation measures?
- Is the impact adverse or beneficial?
- Is the impact reversible?

The significance of all impacts within the scope of the assessment (including cumulative impacts) should be evaluated. The significance of predicted residual impacts after mitigation and remediation measures should also be clearly described.

### 5.8.6 Mitigation and Remediation Measures

According to the MVRMA (sec.117 (2d)), the MVEIRB is required to consider the effect of mitigation and remediation measures. Where potential significant adverse environmental impacts are predicted from the Mackenzie Highway extension, any feasible mitigation measures should be described in the environmental assessment report.

The report should describe:

- the mitigation or remediation measures;
- which potential impacts the mitigation or remediation measure is intended to address;
- what the mitigation or remediation measure would do- that is, how much of the problem would it solve?

- timing of these measures;
- basis for confidence in the measures;
- consequences of applying or not applying mitigation measures;
- how new is the technology involved in the mitigation or remediation measure;
- accounts of uses of the measure in other developments and the success of those uses; and
- the effects of mitigation measures on impact significance, to determine what the residual impact is likely to be.

Note that since cumulative effects would involve the effects of the MVHE in combination with other developments, more mitigation options exist for cumulative effects than for mitigating the effects of single developments. In addition to mitigating the effects of the highway extension that contribute to cumulative impacts, cumulative effects mitigations can also involve managing the effects of other developments to result in acceptable combined impacts.

### 5.8.7 Other Relevant Matters

The MVRMA (sec.117 (2e)) enables the MVEIRB to take into consideration any other matters that it deems relevant to the environmental assessment.

The report should include follow-up plans for monitoring, evaluation and management of uncertain impacts. The MVEIRB may also consider follow-up as a mechanism for checking environmental performance and for verifying the accuracy of impact predictions and the adequacy of mitigation measures.

The MVEIRB would also want the following included in the environmental assessment report:

- an executive summary (in all relevant languages);
- a list of references for information sources; and
- a list of authorizations, permits and licenses required.

## 5.9 Summary and Conclusions

This development is likely to be referred by preliminary screening authorities to the MVEIRB, which would conduct an environmental assessment on it, and may further conduct an environmental impact review.

The outcome of the environmental assessment would depend largely on how well the proponent prepares its environmental assessment report, if the extension causes significant public concern, and whether the likely residual environmental effects of the fully mitigated development are considered acceptable by the MVEIRB.

It is recommended that the proponent:

- check with land use planning boards at an early stage to ensure the project conforms with and draft or final land use plans;
- prepare information at a preliminary screening stage to address questions that would arise at the environmental assessment stage;
- focus the environmental assessment report on the key issues identified in scoping consultations with residents, technical experts and the MVEIRB, and assess them as well as possible;
- where impacts can not be adequately assessed because of insufficient information, conduct baseline studies;
- consider the issues identified and design the highway extension around them where possible; and
- where adverse impacts cannot be avoided by design of the highway extension, focus on identifying effective mitigation and remediation options to deal with any significant adverse impacts.

# 6. ADEQUACY OF EXISTING INFORMATION

## 6.1 Introduction

A great deal of environmental information exists on the Mackenzie Valley, including the Mackenzie Valley Highway Extension (MVHE) area. A necessary task, therefore, is to review available information and determine its adequacy to assessing environmental effects of a highway extension considering advances in environmental assessment methodology in the last couple of decades, and the current regulatory scenario as just described. The adequacy of the existing information for an assessment of the MVHE is discussed in this section. The literature search (see Section 4) provided the key references reviewed and summarized.

Environmental assessment usually includes bio-physical, socio-economics, and cultural/archaeological components or disciplines, so for each of these the following topics are discussed:

- Existing Information;
- Information Requirements; and
- Information Gaps and Recommendations to Fill Gaps.

As much of the existing information for the study area comes from previous 1970s assessment work for a Mackenzie highway and various pipelines, the existing information for each category is first described mainly from these sources. Included in the existing information review is a brief summary of the community concerns for each category (see Section 3 for a complete summary of community concerns). For example, what issues related to road development are of concern for wildlife? Would construction of bridges result in increased sediment levels downstream of the crossings? Would all weather road access to communities lead to over harvesting of game species? Would improved access lead to unacceptable social effects? Information that would be required for an EIA of the new road, considering current assessment practices within the NWT and legislative requirements, is then described. Finally, information gaps, and recommendations regarding the most appropriate methods to fill those gaps, are presented.

### 6.1.1 Background Environmental Documents

A number of multi-disciplinary reports are included in the reference database (Appendix VI) and are reviewed briefly here. They are also referenced in the discipline sections as appropriate.

- The Mackenzie Highway Environmental Overview Study, Volumes I and II, was prepared for DIAND (Renewable Resources Consulting Services 1973) and it summarizes the methods and results of an early EIA on the extension of the Mackenzie Highway. It covers permafrost, terrain, fisheries, wildlife, vegetation, climate and aesthetics. Research involved consultations with expert authorities, an aerial survey of the northern half of the route, mapping of sensitive areas and a matrix-type analysis of issues. The issues identified in these volumes are many of the same ones identified during current scoping.

- Lombard North Planning Ltd. (1972) present the results of an Environmental Impact Study and Route Selection Report for Mile 550 to 725 of the Mackenzie Highway. This is an environmental assessment of the Mackenzie extension ranging in area from Tulita to Fort Good Hope. It contains many small-scale maps of geology, drainage, vegetation, fish and wildlife, land use, archaeology, climate and views. The geology maps may be helpful, but the others are questionable, as they are based on little information (i.e., no field work), and do not account for any uncertainties. The partial list of suspected archaeological sites and ecologically sensitive areas may be useful to a future EIA.

- Environment Canada's 1976 report *Environmental Design for Northern Road Developments* is a useful guide about integrating assessment with project design that reviews aspects of road construction that would be relevant to an EIA on the Mackenzie Highway. Also useful in this document is a detailed review of mitigation measures.

- Kemper et al. (1977) describe the results of empirical studies on the impact of the development of the Mackenzie Highway on selected surrounding wetlands, and surveys a total of 12 wetlands as far north as Tulita. It provides a baseline

description of hydrology, vegetation, aquatic macro-invertebrates and waterfowl typical of wetlands in the study area. This report may be very valuable, considering that environmental assessments often suffer a lack of baseline information.

- A 1986 report on the Mackenzie Environmental Monitoring Project (LGL Ltd. and Environmental Research Associates, ESL Ltd., ESSA Ltd. and P.J. Usher Ltd.) describes results for the first year of the program, evaluating 25 impact hypotheses about a range of Valued Ecosystem Components (VECs). Although many of the conclusions seem to overlook potentially important uncertainties, the linkage diagrams remain relevant and would therefore be useful to future assessments of a highway extension.

- The Athabasca Seasonal Road Environmental Impact Statement (Athabasca Seasonal Road Steering Committee 1996) is a good, thorough and concise EIA of a northern road. Although the road is in another area, and is not for an all-season road, it is a valuable reference for the Mackenzie Highway, because of similar types of concerns and potential for similar mitigations. Appendix B.4 is a good example of the type of fish habitat background information necessary for meaningful assessment (Athabasca Seasonal Road Steering Committee 1996).

- The Mackenzie Valley Cumulative Impact Monitoring Inventory is a recent initiative designed to track all ongoing monitoring activities in the valley. The inventory is required as part of the Gwich'in and Sahtu Dene / Metis Comprehensive Land Claim Agreements, and Section 6 of the Mackenzie Valley Resource Management Act. The inventory is housed in a digital database that includes electronic databases and published compendiums that include information about the Mackenzie Valley and descriptions of monitoring projects related to the Gwich'in and Sahtu Settlement Areas and the Mackenzie. The inventory is available from the Aurora Institute, Inuvik. The individual references are included also in the master database for this report.

## 6.2 Biophysical Resources

The biophysical resources of the study area are discussed under the following discipline headings: climate, geology, soils, permafrost and terrain, hydrology, water quality fisheries and aquatics, and wildlife.

### 6.2.1 Climate

#### 6.2.1.1 Existing Information

A number of automatic weather stations are located within the Mackenzie Valley (Environment Canada, ongoing). These collect a variety of weather data, including air temperature, relative humidity, wind speed and direction, solar radiation, rainfall, snow depth and water or soil temperatures.

Harry and Parent (1980) report on climatic effects in the Mackenzie Delta as part of the Liard River Hydroelectric Project. Reference is made to data obtained at five relatively long-term climatological stations located at Aklavik, Inuvik, Ft. McPherson, Norman Wells and Tuktoyaktuk. Data was obtained between 1966-1975.

Lawford (1994) documents knowns and unknowns in the hydroclimatology of the Mackenzie River Basin. His paper examines the seasonal and annual links between meteorological and hydrological factors in the basin. Analyses presented are based on hydrometric and climatological records for the Mackenzie River Basin for the period 1973 to 1990.

The Mackenzie Basin Impact Study on climate change (Environment Canada 1993) reviews existing baseline climate data for the basin as a whole. The existing climate data is considered to be inadequate because of differences between data sets, but interpolation between various datasets, within a geographical information system was used to improve the existing data. The study investigated the potential effects of four different hypothetical climate change scenarios on the environment and socio-economics of the region.

#### 6.2.1.2 Information Requirements

Information on baseline climatic conditions is required for the assessment. Implications of climate on the construction of northern roads include the amount of snowfall and thus clearing that should take place, the design of bridges and culverts to accommodate peak flows in the spring, and the distribution of permafrost. Climate change could affect all of these factors.

#### 6.2.1.3 Information Gaps and Recommendations to Fill Gaps

It is anticipated that there is sufficient climate data available to meet the requirements for an EIA. An assessment of the potential effects of climate change on the road should be conducted to ensure that the road is designed to meet any potential future changes in snow fall, stream flows and distribution of permafrost.

### 6.2.2 Geology, Soils, Permafrost, Terrain

#### 6.2.2.1 Existing Information

**Highway Construction**

A brief description of the geology, topography and permafrost along the proposed Mackenzie Highway route from Ft. Good Hope to the Dempster Highway (mile 725 to 931) is provided in Schultz International Ltd. (1972). This report also mentions some specific sensitive areas to avoid, and analyzes alternative routes. A series of detailed maps of terrain and permafrost are provided. Slaney and Co. Ltd. (1972a) describe general surficial geology issues, particularly surface icing, and a handful of specific locations where special engineering considerations are needed because of soil conditions, for miles 335 to 346, 415 to 448 and 500 to 550 of the then proposed Mackenzie Highway route. A further report by Slaney and Co. (1972b) provides a map analyzing geoterrain from a permafrost perspective for the 70 kms south of Tulita. Slaney and Co. Ltd. (1973) maps in some detail the surficial geology and granular resources along the proposed Mackenzie Highway route from Fort Simpson to Tulita (miles 346 to 395).

The particular challenges of dealing with permafrost during development of transportation projects are further discussed in Zoltai and Pettapiece (1973). The report identifies potentially

troublesome terrain and local conditions that may present difficulties during construction. The area covered in this field survey overlaps the northern section of the proposed highway (southern boundary at 66°N).

Underwood, McLellan and Associates Ltd. (1973) report on subsurface soil conditions for the proposed Rainbow Creek Bridge at mile 472 of the Mackenzie Highway, NWT. This report forms part of the overall geotechnical investigation that was conducted from mile 450 to 550, and deals specifically with the design of the bridge abutments and piers and approach fills and cuts. Thirteen test holes were drilled between December 1972 and January 1973. Representative samples of existing subsoils were taken, which were then subjected to standard lab classification procedures. Other reports are available that cover miles 436 to 546.

A geotechnical investigation of the Mackenzie Highway from mile 544 (Big Smith Creek) to 635 (Bosworth Creek) was conducted between December 1972 and March 1973 for the Dept. of Public Works (Hardy and Associates 1973). Geotechnical field and lab work was conducted, including air photo interpretation, terrain evaluation, drilling and sampling, field lab testing, borrow computation, and evaluation of data. Terrain and soil maps at a scale of 1" to 1000' are included in the seven volume report. Other reports cover other sections of the highway in a similar manner. Similarly, the Department of Public Works (1975) provides a geotechnical investigation report of mile 725 (Ft. Good Hope) to mile 936 (junction with the Dempster Highway). Field work was carried out during the winter of 1973/74 on this section of the proposed highway. The report covers field and lab work pertaining to subsoil conditions along the route, including permafrost distribution and the extent of ground ice; location and evaluation of potential borrow sources and evaluation and recommendations for stream crossing design.

Stability of the terrain along the Mackenzie River is described in two reports. Detailed river bank stability maps are included in a report by Code (1973). The area surveyed covers the length of the Mackenzie River from Fort Simpson to Fort Good Hope and portions of the Carcajou, Mountain, Liard, Hare Indian Rivers and the River Between Two Mountains. The maps key the type of river bank by geologic age, type of soil/parent material, mode of erosion and the typical slope characteristics. An inventory of the landslides in the vicinity of the Mackenzie River between Fort Simpson and Fort Good Hope is provided in McRoberts and Morgenstern (1973). This survey does not represent an exhaustive inventory but provides the location (by mile

number) and description of many of the slides, flows and falls in the area. Maps showing the locations of all the slides accompany this report. Photographs and sketch plans of the largest slides (named) are also provided.

Penner et al. (1974) reports on thermal conductivities determined for some fine-grained soils obtained from potential borrow pit areas along the proposed route of the Mackenzie Highway in May 1973. Soils were sampled south of Inuvik, at Norman Wells, at Lake of Two Mountains and near Ft. Simpson. A total of 10 samples were taken.

Egginton (1993) summarizes available information to date on slope stability and climate, summer thaw depths and ground temperatures within the Mackenzie Valley and other interior areas south of the Beaufort Sea. A map showing the distribution of landslides in the Mackenzie Valley and adjacent mountainous areas is provided.

**Pipeline Construction**

Hayhoe and Tarnocai (1993) report on the effect of site disturbance on the soil thermal regime near Fort Simpson. This study quantifies the soil temperature differences between a grass site, a disturbed forest site on a pipeline right of way, and an adjacent undisturbed forest site. Climatological data from the former weather site at Fort Simpson covering 1958 to 1969 inclusive were used, as well as data from the Norman Wells pipeline soil temperature sites at Manner's Creek (south of Ft. Simpson) from May 1988 through September 1991.

**Other**

The Geological Survey of Canada, Terrain Sciences Division, Ottawa maintains a database of boreholes within the Mackenzie Valley (Mackenzie Valley Geotechnical Database 1999). The database contains records for 11,447 boreholes. The boreholes are almost evenly distributed along the Mackenzie Valley corridor, except for the most southern region.

### 6.2.2.2 Issues and Information Requirements

Issues related to these sub-disciplines include the direct loss of soils, changes to permafrost and implications to the road and the immediate environment; soil contamination through spills; slope

stability and the influence of mass movements; erosion; and visual impacts to landscapes. The supply of aggregates for the construction of the road would also be a key issue, as would the management and reclamation of the borrow pits. Impacts related to the operation of the road would also have to be considered in the EIA.

Data on bedrock geology, surficial geology and topography need to be described for the study area. The nature and distribution of soils need to be described and attention should be paid to the distribution of permafrost. Thorough information on the susceptibility of the route to landslides and other disturbances is required, as are detailed descriptions of subsoil conditions for the entire route.

#### 6.2.2.3 Information Gaps and Recommendations to Fill Gaps

The reports discussed above provide varying levels of information, in some cases quite detailed while in others too general to have any direct applicability. Due to the age of some of the studies, 25 years or more, there may well have been ensuing changes to the vegetation cover in some areas that in turn may have affected active layer dynamics and, therefore, which construction techniques might be appropriate. There may also be other changes along the proposed route in areas noted as having landslide potential - generally these are along watercourses – which may influence bridge location. It is also likely that the global literature on construction in permafrost environments may outline more appropriate road building techniques than the cited sources (i.e., due to 20 plus years of added experience). If so, a re-evaluation of the risk and hazards outlined in these older reports may be in order.

The following activities are required to complete an EIA:

- acquire copies of all the cited literature in order to assess whether or not the level of detail is sufficient for specific route selection and construction planning purposes;

- determine stream crossing locations to see whether existing data on geotechnical conditions is applicable;

- recommend appropriate field programs to acquire geotechnical, soil and terrain data for sections of the route covered either inadequately or not at all in the existing sources;

- acquire the most up-to-date delineation of continuous and discontinuous permafrost, and aggregate resources (for road bed construction); and

- review recent literature on road construction techniques in permafrost environments to determine applicability of recommendations made in the cited reports re: construction limitations (e.g., road icing potentials).

It is important to note that information on geology, soils, permafrost and terrain is essential not only to highway design and construction, but also to mitigate impacts. Collaboration between environmental assessment work and engineering design would achieve the greatest effect as:

- significant impacts identified through the environmental impact assessment process can be reported back to designers who can avoid or minimize these problems wherever possible; and

- improved design can be reflected in more accurate impact predictions.

Moreover, collaboration during design and environmental assessment through the above steps may reduce costs associated with these project elements.

### 6.2.3 Hydrology

#### 6.2.3.1 Existing Information

Most hydrological studies of the Mackenzie River Basin were conducted in the 1970s in preparation for both gas developments and the possible extension of the Mackenzie Highway. Davies (1974) presents data on the hydrology of the area in 1973, looking at stream flow and water levels, suspended sediments, ice thickness and water temperature. This is described for several streams entering the Mackenzie River. Jasper (1977) and Jasper and Anderson (1977)

conducted hydrological research with the intention of evaluating the effectiveness of culverts as mitigation measures at stream crossings. This involved comparing stream flow levels from 1973 to 1976 in an attempt to establish flow rates for culverts (finding that culverts were not generally as effective for fish passage as thought, with excessive flow rates and inadequate estimates for flooding events). In *Northern Highways Hydrology Studies, Mackenzie River Basin*, Anderson and Grey (1978) look at snow cover, surface icing, snowmelt and snowmelt flooding, seasonal runoff and suspended sediment from approximately 12 locations along the Mackenzie River, and describe separately their results for taiga and tundra sites. This work was based on field research from 1973-1977. More current flow statistics for the Mackenzie River are published in *Mackenzie River Forecast: Annual Report 1994* (Jasper 1995). This report describes flow levels at a few sites along the section of the Mackenzie adjacent to the highway extension route. Similar information is available for 1993. Environment Canada maintains a database on river flow rates and lake water levels for many of the lakes and rivers in the Mackenzie Valley (Environment Canada, ongoing).

#### 6.2.3.2 Information Requirements

To determine potential hydrologic impacts of the proposed highway on streams and rivers, the following information is required:

- estimates of stream or river flows for the return period chosen for highway design (this is generally 50 to 100 years);

- morphologic characteristics of each stream or river channel so that scour can be predicted and any potential morphologic impacts determined - typical data required for each crossing would be: bed sediment size, river channel geometry (cross section, slope, etc.), sinuosity, historical erosion patterns (historical air photo analysis), ice conditions and debris history of the stream; and

- geotechnical studies for the foundations of each bridge and large culvert to determine the feasibility of various types of crossings at each location as well as sources of materials (riprap and select gravel fill) for construction.

#### 6.2.3.3 Information Gaps and Recommendations to Fill Gaps

As noted above, a number of studies identified were completed in the 1970s for a proposed highway in the Mackenzie River valley. These studies are good baseline reports but the hydrology analyses need to be updated with more recent data for accurate modeling that might be useful in design or mitigation. In addition, the data available on stream morphology and geotechnical information needs to be reviewed in detail to identify any data gaps that may exist for each stream crossing.

Recommendations for filling the identified data gaps are as follows:

- update the previous hydrology to include data (stream flow, precipitation, evaporation, etc.) from the past 20–25 years - this would significantly improve the accuracy of estimates;

- review the existing morphologic information available for each stream crossing - it is likely that some of the stream information collected in the 1970s may be used in a new analysis and a review would determine the amount of additional data needed to be collected in the field; and

- review the geotechnical information available for each proposed bridge and large culvert crossing to determine if additional data is required to confirm feasibility of various alternatives.

### 6.2.4 Water Quality

#### 6.2.4.1 Existing Information

Reeder (1973) described the general characteristics of water quality in the Mackenzie Basin. Data from 1960-1971 is summarized and data for 1972 based on 23 water quality stations along the Mackenzie River and its tributaries is provided. Supplemental information to this report based on data collected in 1973 is provided in Reid et al. (1974). In that study, each of the proposed pipeline crossing sites (total of 38 sites) was visited during July 1973. The implications

of that study for pipeline and road development in the Mackenzie Basin are discussed and recommendations are made. Prior to these studies, only preliminary water quality information for the Mackenzie Basin was available.

A summary of federal/provincial water quality data pertaining to the Mackenzie River is presented in a report by Inland Waters Directorate of Environment Canada (1981). This report contains statistical summaries of water quality data for 448 river and lake stations sampled by federal and provincial agencies, including 33 stations between Inuvik and Fort Simpson. The publication was intended primarily as a reference of water quality data and forms the basis for the Mackenzie River Basin Committee report described below.

A comprehensive assessment of water quality data collected in the Mackenzie Basin is provided in a report by Environment Canada (1985). This report describes the general state, seasonal and spatial trends of many physical, chemical, nutrient, metal and organic contaminant parameters of the major sub-basins of the Mackenzie River basin. It also recommends changes to the present monitoring design and strategy to reflect current requirements and water quality issues. Within the Mackenzie River sub-basin, three sites were selected for water quality data interpretation: one is south of Inuvik, one is near Norman Wells and one is near Wrigley.

The NWT-Nunavut Aquatic Quality Network (1999) maintains a database of monthly to seasonal water quality data and annual to biannual sediment quality data for a variety of sites along the Mackenzie River.

#### 6.2.4.2 Community Concerns

Several communities stated that water pollution was one of their concerns. The local fishing resources were also noted as being of high value to many communities.

#### 6.2.4.3 Information Requirements

The level of information required would depend on the potential for the highway and other projects cumulatively affecting water quality in surface water bodies. As discussed, the greatest potential impact is expected to be potential increases in suspended sediment loading associated

with increased erosion and dust. It should be noted that potential effects are likely to differ between construction and operation, and that mitigative measures would differ correspondingly. For the construction phase, estimates of the changes to water quality should be assessed. Based on the assumption that assessment needs to address the potential effects of routine use and maintenance of the road as well as accidents and other upset conditions, a list of information requirements is provided below:

- inventory or estimation of materials to be hauled along road;
- probability of spills and accidents involving loads that would have a high potential to impact water quality;
- deposition of fugitive dust emissions;
- vehicle de-icing practices and volumes of materials used;
- salting/sanding, if conducted, and other relevant road maintenance;
- baseline description of physical, environmental and biological properties of water bodies along the road; and
- potential human use of water bodies.

#### 6.2.4.4 Information Gaps and Recommendations to Fill Gaps

Baseline information on water bodies would be collected as a component of the Fisheries and Aquatics baseline study. Much existing water quality information appears to be adequate. TSS and field measurements (pH, conductivity and temperature) are recommended as part of fisheries investigations. Water quality data should be included as baseline information against which to gauge the efficacy of mitigation, through monitoring programs. Accident and upset information would be generated as part of a risk assessment that would provide relevant information to each discipline. Inventories or estimation of materials hauled on the road would be provided as part of the Project Description. Deposition of fugitive emissions would be estimated as part of the Air Quality Section. Vehicle maintenance and de-icing practices, and road maintenance, salting and sanding would be provided as part of the project description. Potential human use of water bodies would be identified as part of the socio-economic impact assessment.

### 6.2.5 Fisheries and Aquatics

#### 6.2.5.1 Existing Information

A number of studies that investigated the impacts of highway and pipeline construction on aquatic resources have been conducted since the 1970s. Although some of these studies were not conducted on the routing of the Mackenzie Valley Highway extension, the issues and results discussed are directly relevant for an environmental impact assessment of the extension. The main issues concerning impacts to fish and aquatics are direct loss of habitat at stream and river crossings; increased sediments in streams and rivers from construction activities, increased erosion from roadside cuts; changes in flows due to alteration of drainage; accidental spillage of pollutants; and blockage of fish movements. Additional community concerns are listed below.

**Highway Construction**

One of the most comprehensive fisheries studies was conducted along the route for the proposed Mackenzie Highway (Mile 300 to 550; F.F. Slaney and Co. 1974). Basic information is provided in this document for each of the 103 creeks and streams crossed by the then proposed right-of-way. This information includes physical and chemical properties of the streams and either the potential for fish or the number of each fish species caught. The potential for fish was based on the stream physical characteristics (e.g., substrate, temperature, depth, and accessibility to the Mackenzie River). This information is quite comprehensive and recommends areas of potential future studies. The information in the report highlights where future studies should focus their efforts. Recommendations to minimize the impact of construction on aquatic resources are also described for each of the watercourses.

Additional guidelines for the protection of fish resources during highway construction and operation are presented in Dryden and Stein (1975). Topics include hydrological design, fish passage requirements and culvert and bridge design. The scheduling of construction and techniques for minimizing disturbance of streambeds are also discussed. Distribution maps for northern pike, humpback whitefish and longnose sucker are provided for the Mackenzie River and some tributaries. Some life history information (i.e., age and size at maturity) and the critical culvert velocities for these species are also provided.

**Pipeline Construction**

Multi-year studies looked at the effects of northern pipeline construction on the fish resources of the Mackenzie Valley. One study reports the results from 77 sampling stations set up along much of the Mackenzie River and some of its tributaries (Dryden et al. 1973, Jessop et al. 1974). Volume 1 of Stein (1973) presents species composition, length-weight relationships, age and growth characteristics and food habits of the more abundant species. This information provides an index of the relative sensitivity of each species to disturbance due to pipeline construction. The timing and location of spawning and migration are discussed for some species. Thirty-four species of fish were caught and species distribution maps (i.e., locations of capture) are provided. Of these 34 species, nine were identified as sensitive to disturbance. Impacts of pipeline construction and recommendations for future work are provided. These data are directly relevant to considering potential impacts of road construction at water crossings. They also help with the identification and planning of still needed fish habitat assessments.

Volume 2 (Dryden et al, 1973) provides additional information on 50 of the 75 sites discussed in Volume 1. Along with the number of each fish species captured and an assessment of the fish resources, this volume includes a stream-by-stream engineering analysis of riverbank stability with respect to potential stream crossings by either pipeline or highway. Another progress report was written in 1974 to include data from the third year (Jessop et al. 1974). The final results from the four-year study are summarized in two volumes (Environment Canada 1972). Volume 1 includes summaries of the distribution, abundance, stomach contents analysis and life history information for each fish species and recommendations for the protection of fish resources. Volume 2 provides detailed tables on the size, age, growth, sex ratios and food habits for game species and the most abundant non-game species, fish contamination and water chemistry results, and the basic physical characteristics, maps and number of each fish species caught for each tributary.

Another more recent study (Fernet, 1987) looked at the effects of pipeline water crossings on the water quality and physical characteristics of streams. The study area overlaps the proposed Mackenzie Valley road from Norman Wells to Wrigley, although the actual locations of the stream crossings may not be the same as those proposed. Detailed monitoring was performed for 34 stream crossings over four years (1984-1987). An additional 187 minor water crossings were also studied. The major concerns and recommendations are discussed. A photograph and water

crossing evaluation form is provided for each of the major water crossings. Although crossing techniques would be different for a road rather than a pipeline, many of the issues and data requirements are very similar, which means many sections of these reports remain relevant.

Fish surveys for Arctic cisco were conducted more recently along the Peel, Arctic Red, Mountain, Carcajou and Liard Rivers over a three-year period (1985-1988, Dillinger et al. 1992). Not all rivers were sampled every year. The results indicate that the distribution, migration and spawning activities of Arctic cisco in the tributaries of the Mackenzie River system cover a larger area than previously reported in studies in the 1970s. Results are discussed for each river system. This information suggests that additional surveys may be required to determine the present distribution of other fish species. However, for EIA purposes such surveys would only be needed for proposed MVHE crossings, where no work has been conducted in recent years, and where high or moderate fish habitat is identified.

Additional information regarding the chemical and physical effects of pipeline construction on water quality and invertebrate and fish species is provided in Aquatic Environments Ltd. (1977). Although none of the four studies in this report was conducted in the area of the proposed Mackenzie Valley Road, most of the information is directly relevant for pipeline development in northern areas. Two of the studies in this report describe the potential physical impacts of gas pipeline construction on streams and aquatic resources and provide guidelines to minimize these impacts. In general, road construction has many of the same impacts common to pipeline development, therefore, these guidelines can be used to determine some of the issues of concern for the proposed road project, and establish mitigative measures.

**Other**

A database on fish and fish habitat within the Mackenzie Valley is available from the Gwich'in Renewable Resource Board (1999) in Inuvik.

#### 6.2.5.2 Community Concerns

Increased access to lakes used by the communities was a common concern of valley residents (see Section 3). Fishing is one of the most important traditional uses of the land. Potential project related pollution is also a concern. Tsiigehtchic residents expressed a concern about

impacts to the fisheries resources of Travaillant Lake and other lakes in their region. Fort Good Hope residents are concerned about increased access to Yaltea and other lakes, while residents of Colville Lake also are concerned about the potential over-fishing of the lakes in their area.

#### 6.2.5.3 Information Requirements

Specific information is required on the quality of fish habitat at and adjacent to each crossing. Adequate information on species present is required to be able to evaluate the site as fish habitat, for all life cycle stages and seasons. These data would confirm the acceptability of the route and guide the development of suitable crossing techniques. Water quality data are needed as a benchmark for monitoring studies.

#### 6.2.5.4 Information Gaps and Recommendations to Fill Gaps

The highway and pipeline studies discussed above provide excellent historical information for the fish resources in the MVHE area. However, due to the age of the studies, the results would often be used as a benchmark for measuring population changes and a guide for future studies. Also, due to the age of many of the studies, it is reasonable to assume that some features of the streams may have changed. Should the proposed highway crossings occur along the same streams, a re-evaluation might be completed only based on recent photographs, although site visits would provide more conclusive information. Information presented in Stein (1973) suggests that age/class composition, size, food habits, age/growth characteristics and sex ratios of the more abundant species are well documented. The authors also feel that the list of fish species present in the main stem of the Mackenzie River and the lower reaches of the main tributaries are complete. However, several information gaps in knowledge exist, particularly the location of spawning grounds.

While much existing information is relevant, for EIA purposes, a more important need is to address potential concerns regarding fish habitat. Field studies can be implemented that would efficiently address data gaps with an emphasis on habitat for key species. Due to the large amount of existing literature for the Mackenzie River and its tributaries, an exhaustive field program to fill these gaps would not be necessary. An assessment of fish habitat would include habitat mapping and photographing of key habitat features. Some additional fish collection may be

required to augment existing data. This information, along with available fish community and life history information, should be used to determine habitat usage by various species and life stages at each crossing location. Once habitat use has been established, possible impacts from construction activities can be determined and mitigation measures can be developed at crossings as necessary.

### 6.2.6 Vegetation/Wildlife Habitat

Issues related to vegetation and wildlife habitat include the direct loss of vegetation and rare plants during construction; indirect loss or change due to impeded drainage, increased erosion, dust/salt, slumping or other effects; and increased potential for pollution from spills, dust and dust suppressants, and road run-off.

#### 6.2.6.1 Existing Information

**Highway Construction**

A series of comprehensive studies of vegetation, landform and permafrost were conducted in the Mackenzie Valley in the early 1970s to facilitate the development of a terrain sensitivity classification. Crampton (1973) produced detailed maps of landscape-permafrost features through aerial photo interpretation and ground-truthing. These maps cover the entire Mackenzie Valley and delineate the geology, land regions (climatic zone), land district (parent material) and landscape systems. The land systems are landscape units of vegetation-landform patterns that have significance in terms of the presence or absence of permafrost and the thickness of the active layer. These classification units are ranked according to the susceptibility of the terrain to damage from construction, with special references to depth of the active layer, slope and texture. These rankings also appear on the maps. Stereograms of the landscape units are also provided.

Complementary to the above reports, Forest Management Institute (1974) describes 14 vegetation types classified based on aerial photographs. Colour maps (1:500,000) were prepared and printed separately but were not available for review. At the time this report was written, the maps were available from the authors. The survey focused on a 15 to 35 mile corridor along the Mackenzie River and extended beyond the length of the proposed highway, from Fort Simpson to Fort McPherson.

**Other**

RWED (1999) maintains summaries of forest inventory data for the Mackenzie Valley and other regions of the NWT. They also have a selection of Landsat images that are used in support of forest management operations.

**Wildlife Habitat**

A series of small scale maps show beaver, muskrat, bear and moose habitat, important waterfowl areas and "visual resources" (scenic views) for the entire length of the Mackenzie Highway extension (Renewable Resources Consulting Services 1973b). Since the methodology section is not available, the reliability of this information cannot be established, but the habitat maps suggest a qualitative analysis based on expert opinion rather than results of detailed surveys. These may be somewhat useful as general guides but they need to be evaluated and updated, particularly because there is no way to gauge uncertainties. At the bare minimum, updating would have to reflect new research, especially by RWED, and fluctuating baseline conditions. Updating would allow proposed and alternate routes to be assessed in terms of disturbance to habitat of selected important wildlife species. Selection of species would be decided through stakeholders, including regulatory consultation.

The 1973 *An Inventory of Wildlife Habitat of the Mackenzie Valley and the Northern Yukon* (Watson et al. 1973) provides a general habitat inventory for moose, caribou, Dall's sheep, arctic fox, muskrat, beaver, waterfowl and raptors, ranking habitat into categories. Seven volumes of maps are included in a supporting document. This could be useful to an EIA, but cannot be deemed an authoritative source of information until it has been evaluated in terms of background changes since the research was done. Small to very large alterations to habitat can occur over time, and natural events like fire can drastically change the use of an area by wildlife.

Much of the existing habitat data for the project area is described in the general environmental studies that occurred in the early 1970s. *IBP Ecological Sites in Subarctic Canada* (Beckel, ed. 1975) is a document that describes protection-worthy sites in the subarctic. Of the 81 sites, three are downstream from the highway extension area and five are in the Mackenzie Mountains immediately west of the project area. The *Inuvik Inuvialuit Community Conservation Plan* (Community of Inuvik 1993) lists culturally and ecologically important areas (all outside of the

Mackenzie extension area), provides a summary of general information on biology and research priorities for major species, and describes some environmental policy and procedures for the area.

More recent wildlife monitoring projects by RWED provide information on a number of wildlife species in the study area, including Bluenose caribou, moose and furbearers (Nagy, Veitch, Popko pers. Comm.). With the development and expansion of GIS systems in the settled land claim areas of the Mackenzie Valley, these data are now being mapped in relation to vegetation, burn history and other habitat components. These data would be important in the production of habitat use models for the road EIA, as outlined in the information gaps section below. The possibility of producing more innovative predictive models for caribou movement has been demonstrated on the tundra for the Diavik mine EIA (Diavik Diamond Mines Inc. 1998). However, as discussed more below, barrenground caribou overlap little with the MVHE and it is likely that more conventional habitat evaluation procedures (HEP) would be appropriate for quantifying habitat utility for woodland caribou, moose and other wildlife present, that do not exhibit regular large-scale migration patterns.

#### 6.2.6.2 Information Requirements

Up to date vegetation and wildlife habitat mapping is required to ensure that the road is routed through the least sensitive areas, and surveys for rare, threatened or endangered plants would be required during the growing season. It is anticipated that much of the mitigative planning with respect to wildlife species would be through information on the wildlife habitat potential of Ecological Land Classification (ELC) units and appropriate routing.

#### 6.2.6.3 Information Gaps and Recommendations to Fill Gaps

Most of the available information on vegetation and wildlife habitat is from the early 1970s and thus is not current. Extensive areas have been burnt since that time; impacts to vegetation, wildlife populations or habitat use by wildlife may not be accurately assessed if existing information fails to indicate this. Updated information is required that would accurately reflect today's conditions. Satellite imagery and linkage to ongoing mapping initiatives such as in the Sahtu (Sahtu GIS Project), would be one cost-effective means of mapping the vegetation along the potential road routes. Development of habitat models for key wildlife species could then be

conducted so that quantitative assessments of the effects of alternate road routes on wildlife habitat could be completed. The wildlife habitat maps produced could then be ground-truthed through a stratified survey for key wildlife species (see the following section).

### 6.2.7 Wildlife

#### 6.2.7.1 Existing Information

Existing information for wildlife is described in turn for birds, ungulates, and furbearers and carnivores. The section ends with a summary of existing wildlife harvest data.

**Birds - Highway Construction**

Fyfe and Prescott (1973) summarized data on endangered raptor breeding territories near the Mackenzie Highway route, collected by the Canadian Wildlife Service during 1973. The study centered on the proposed route from mile 297 to 972 and included approximately 5 miles on either side of the route. Coverage was described as intensive north of Norman Wells, and superficial between Ft. Simpson and Norman Wells. The report summarized data from both aerial and ground surveys. Data gaps were noted regarding estimates of nesting phenology, particularly in the arrival and departure dates for all raptor species. General and specific recommendations are made including reference to highway mileage. Maps at a scale of 1:250,000 indicate locations of sensitive and critical sections for raptors. Although data for this report was collected almost 3 decades ago, the information in it is useful for future impact assessment because raptors characteristically tend to breed in the same spot, or close to it, year after year. Arrival and departure dates would be useful to ensure to mitigate possible disturbance of nesting raptors during construction but is provided elsewhere (Matthews 1989, see below).

LGL Ltd. (1973) evaluated the construction phase mitigation measures for wetlands suggested for the Mackenzie Highway extension by Shultz International Ltd. (1972), through investigating short-term impacts of a comparable highway (the Dempster Highway) on waterfowl. The study found no significant short-term impacts in terms of numbers or distribution, and concluded that the mitigation measures for wetlands prescribed by Schultz were adequate for waterfowl. Another study published in 1974 by LGL, entitled *Bird Distribution and Populations Ascertained*

*through Aerial Survey Techniques, 1972,* used aerial surveys to look at the distribution and numbers of waterfowl in the Mackenzie River and of bald eagles on selected lakes.

Slaney (1974a) reports on the results of aerial surveys of waterfowl along the Mackenzie Highway route from mile 300 to 550, as part of a wildlife study for the Dept. of Public Works. Data was collected in 1973/1974. Again, such baseline information may be useful in an environmental assessment of the highway extension.

**Birds - Pipeline Construction**

Ground transect surveys for waterfowl and terrestrial birds were conducted at 24 sites on or near the proposed route of a natural gas pipeline in the Mackenzie Valley, from the Beaufort Sea to south of Fort Simpson (Chapter 4, Gunn et al. 1974). The area surveyed overlaps the length of the proposed Mackenzie Valley Road. The survey covered large samples of the major habitats that occur along the proposed pipeline route to determine habitat preferences of each species. This study supplemented surveys conducted in the previous two years in the same areas and lists the species observed at each site. However, the number of each species is not included in the report. Maps of the transect locations, descriptions and photographs of the habitat types, and unusual observations are noted in the appendices. Results indicate that bird densities were higher in 1974 than in 1972. This study highlights the year to year variability in bird abundance that needs to be considered when assessing habitat suitability of the project area.

Numerous bird studies were also conducted along the Mackenzie Delta, the Arctic coast in the Yukon and Alaska and south of Wrigley (LGL Limited 1974a, b, c; LGL Limited 1977). Some sections of these reports are useful for issue scoping as they relate to pipeline and other development concerns in the north. In addition, several bird survey studies (Chapters 4 to 6, LGL 1977) sampled areas that overlap the proposed highway route. This report provides historical information on bird species/habitat associations and abundance. Some chapters in these reports also include experimental studies investigating the effects of disturbance (i.e., aircraft and helicopter noise, simulated gas compressor noise, human disturbance) on the distribution and behaviour of some bird species. These results can be used to develop mitigation measures during highway construction and operation.

A report on field surveys conducted for the Norman Wells Pipeline Project Raptor Monitoring Program, 1980-1988, is provided in Matthews (1989). Data was collected by Interprovincial Pipe Line Ltd. in 1980 and 1981, and by the Dept. of Renewable Resources from 1983-1988. Location includes experimental raptor nesting areas along the pipeline route from Ft. Simpson to Norman Wells (within 3.2 km of the route) and in a control area northwest of Norman Wells (between Norman Wells and Ft. Good Hope). Data collected included nest occupancy, productivity, nesting phenology, and behaviour. Company compliance with raptor protection measures and their effectiveness is also documented. Raptor nest surveys are still being carried out by RWED in the Mackenzie Valley and data are made available to project proponents to aid in mitigation planning (Popko pers. Comm.).

**Birds - Other**

McCormick and Shandruk (1986) conducted a survey of trumpeter swans in the southern Mackenzie River. Although the northern boundary of the study was at Wrigley, the southern extent of the highway extension, the study notes habitat associations for swans with wetlands on floodplains adjacent to rivers.

Alexander et al. (1991) used published and unpublished reports and personal communications to identify 80 key habitat sites for migratory birds in the NWT, 5 of which fall within or near the proposed road corridor. These areas are: the Mackenzie River Delta, the Lower Mackenzie River islands (between Ft. Good Hope and the confluence of the Tree River), the middle Mackenzie River islands (between Redstone River to north of Oscar Creek), Brackett Lake and the southeastern Mackenzie Mountains (including Carlson Creek area). No field data was collected at these sites. In addition to descriptions of each area, information is presented on biological value, sensitivities and potential conflicts.

**Ungulates – Highway Construction**

Issues related to wildlife include: impacts to wildlife habitat (discussed under vegetation and habitat, above), sensory disturbance due to noise and other factors, wildlife – vehicle collisions, interactions of wildlife with accidental spills, blockage of wildlife movements and increased hunting and trapping pressure.

A proposal for an EIA on the Mackenzie Highway Extension describes some study objectives for ungulates (distribution, movements and particularly sensitive areas such as wintering areas) that are still relevant (Renewable Resources Consulting Services 1973a).

Moose habitat usage, based on aerial surveys, track transects and browse surveys conducted in 1972/1973 is presented for mile 300 to 550 of the Mackenzie Highway, as part of a wildlife study conducted for the Dept. of Public Works (Slaney 1974a). One hundred person days were spent obtaining this moose habitat data.

*Studies of Mammals along the Proposed Mackenzie Valley Gas Pipeline Route* (Renewable Resources Consulting Services Ltd. 1976) contains some relevant information collected mostly from fixed wing surveys of the area of the Mackenzie due south of Travaillant Lake area. Other studies in the same document describe tracking research on moose and furbearers around the Ft. Simpson area, and the movements of the Bluenose caribou herd.

Eccles and Duncan (1987) summarized the results of a wildlife monitoring program to assess the effects of pipeline construction and operation on the abundance, distribution and local movements of wildlife within the Norman Wells to Zama oil pipeline corridor. Field data was collected between November 1983 and May 1987. Ungulate studies included identification of major habits, browse utilization measurements and aerial surveys for moose, as well as track observations. Data were collected from experimental sampling areas immediately adjacent to pipeline activities, and from control areas in comparable habitats. Data collected during construction and post construction were also compared. Such comparisons provide useful information on which to base impact predictions.

**Ungulates – Other**

As noted above, good recent data exist for Bluenose caribou seasonal distribution and they overlap little with the project. Historically Bluenose animals have not gone south across the Mackenzie River, south of Inuvik. In recent years they have not gone much south of Caribou and Travaillant Lakes (Nagy pers. Comm.). These data provide a good baseline against which to monitor post-project trends. Such monitoring would likely continue to be conducted by government. A main concern would be related to increased harvesting along the far north of the highway if they did move across in winter. There would likely be a need for equivalent highway

hunting regulations as occur on the Dempster Highway. The existence of finalized land claims and well-developed co-management regimes would facilitate such regulation. The proposed route is clear of the range of the Porcupine Caribou Herd (Porcupine Caribou Management Board 1997).

Woodland caribou are year-round residents that range widely on both sides of the Mackenzie River. They are not migratory over long distances and can be seen anytime throughout their range. Their winter range is primarily mature open black spruce-lichen forest, usually in areas with numerous scattered small lakes. However, as the winter progresses, snow depths would influence the availability of forage at lower elevations, and caribou would have a tendency to move into the subalpine, where wind action makes forage more available. The western population of woodland caribou is listed as Vulnerable by COSEWIC (1999). Enough information likely exists to produce a habitat model relevant for the study area.

Good baseline data on moose populations is available for the Norman Wells area. Brackett et al. (1985) conducted the first systematic survey of moose in the Mackenzie River delta, valley and tributaries in February and March 1980. A strip transect survey was conducted in the delta and total count surveys were carried out in the Mackenzie Valley and its tributaries, including the Mackenzie River from Point Separation to about Brackett Lake, and the Peel River from Aklavik to the Caribou River. Jingfors et al. (1987) used a stratified block survey technique to survey aerially for moose in two areas near Norman Wells and Fort Good Hope in November 1984. Data collected included abundance, early winter distribution, density, population composition, calf survival, cow:calf ratios, and twinning rates. Survey results indicated that more information on yearling recruitment and adult survival rates is needed to determine factors that maintain moose populations in the NWT at apparent low densities. The same method was used by Latour (1992) to survey a similar area in November 1989. Between November 1985 and November 1988, a study of moose movements, productivity and survival was conducted by Stenhouse et al. (1995) in essentially the same study area. The latter study involved radio-collared moose. Veitch et al. (1996) surveyed the same area in November 1995 to obtain population size and harvest rate data, as well as productivity and population composition data. These data would facilitate producing a habitat model against which to have project planning and mitigation decisions.

**Furbearers and Carnivores - Highway Construction**

A 1970s proposal for an EIA on the Mackenzie Highway extension describes some study objectives for carnivores (distribution, movement and particularly sensitive areas such as den sites) that are still relevant (Renewable Resources Consulting Services 1973a).

Renewable Resources Consulting Services Ltd. (1974) conducted research into furbearers along proposed gas pipeline routes, which overlap with the highway extension area from about 50 km south of Fort Good Hope to Wrigley. This document rates furbearer habitat and examines harvests in 1971. More recent studies such as Latour et al (1994) provide habitat use information that would aid in model preparation for marten and other species.

**Furbearers and Carnivores - Pipeline Construction**

Eccles and Duncan (1987) report on Wildlife Monitoring Studies conducted along the Norman Wells to Zama Oil Pipeline from 1984-1987 to assess the effects of pipeline construction and operation on the abundance, distribution and local movements of wildlife, including furbearers, within the pipeline corridor. Studies included identification of major habitats and furbearer track density surveys. Data were collected from experimental sampling areas immediately adjacent to pipeline activities and from control areas in comparable habitats. Data collected during construction and post-construction were compared, which again helps somewhat in making impact predictions with respect to a road.

**Harvest Surveys**

Chalmers (1990) presents results of a resident big game hunter harvest survey for the NWT for 1989/90 conducted by the then NWT Dept. of Renewable Resources (now Resources, Wildlife and Economic Development). The survey summarizes harvest data for caribou, black bear, moose, Dall's sheep, mountain goat, upland gamebirds, wolf, wolverine and waterfowl, and is based on a mailed questionnaire. Data includes tag sales, and reported and estimated harvests for most species. Data is summarized by administrative region in most cases, although harvest data for waterfowl and upland game birds is summarized by community. DRR has conducted an annual survey since 1981.

Renewable Resources Consulting Services Ltd. (1974) examined furbearer harvest records along the proposed gas pipeline routes for 1971.

Nagy and Fraser (1993) report the composition of the annual caribou harvest for 1992 by Fort MacPherson residents. Post land claim settlement harvest surveys are also underway in both Gwich'in and Sahtu areas.

Data based on returns from outfitted hunters in the Mackenzie Mountains, NWT from 1979-1990 is analyzed by Latour and MacLean (1994). Included are summaries of horn/antler measurements for Dall's sheep, woodland caribou, moose, and mountain goats, pelt length for wolves, location of kill, days hunted per species, and horn annulations for sheep. The authors note a paucity of demographic data for each species.

All of the above studies provide baseline information which would assist predicting the effects of increased hunting on these species, which is one of the concerns frequently recorded at the scoping sessions.

**Community Concerns**

Inuvik residents are concerned that the road would allow hunters to access the Bluenose Caribou Herd's winter range near Travaillant Lake. The preferred alignment for the road would be as close as possible to the Mackenzie River, which would mitigate this potential impact. Fort Good Hope residents expressed concern with respect to loss of moose habitat, obstruction of caribou migrations, pollution, and the effects of increased hunting. On the other hand, they noted that the road would benefit community hunters.

### 6.2.7.2 Information Requirements

Requirements include information on wildlife species composition, distribution, relative abundance, movements, habitat requirements and general life history parameters for the study area. Special emphasis should be placed on endangered, rare, threatened and vulnerable species, plus other species important to aboriginal peoples. Areas of critical or sensitive habitats should be identified, as should the seasonal habitat use patterns (e.g., calving, rearing, nesting areas) and seasonal movement corridors.

#### 6.2.7.3 Information Gaps and Recommendations to Fill Gaps

Some more current route specific information on wildlife habitat and wildlife populations is required to update the historical information described above. More detailed community and regulatory consultation should occur to aid in the selection of key wildlife species of concern. A semi-quantitative key species selection process would be useful to ensure that the selection is transparent to all. Once the species have been selected, habitat maps for each key species should be developed through the use of habitat models and a vegetation map interpreted from satellite imagery (see the previous section). The road routes could then be analyzed in terms of habitat quality. Data sets available, but not used in model building, could sometimes be used to verify the models. Some surveys for key species should also be conducted, stratified by habitat quality. Particular attention should be paid to habitats considered to be of exceptionally high quality (e.g., important migratory bird sites). Alternate routing to avoid such areas should be considered in the assessment.

Surveys should also be conducted for rare, threatened and endangered species. The habitat requirements for these species should be reviewed, and the most likely areas surveyed to determine if they are present. Again, mitigation would be by making correlations to community types and avoiding them as much as possible, rather than by fine route adjustments around locations where such species are seen during sampling.

## 6.3 Socio-economics

Construction of an all-weather road along the Mackenzie Valley would have a significant impact on the social, economic and cultural condition of residents in adjacent communities. The MVRMA states that environmental assessments shall consider “the social, cultural and economic well-being of the residents and communities of the Mackenzie Valley.” It is therefore necessary to identify and assess all potential socio-economic impacts, whether direct, indirect or induced. In addition, other socio-economic concerns raised by community residents should be considered equally within the overall planning process. This is a much broader definition of socio-economic impacts than obtained under CEAA regulations, especially as it relates to community perceptions of probable change. Accordingly, an EIA should address the project’s impact on:

- population growth;
- the labour market;
- community services and infrastructure; and
- traditional cultural values.

Although plentiful data exists for each of these topics, little analysis is available for communities that might be affected by construction of an all-weather road. Consequently, detailed analysis of existing data would be required to produce a socio-economic report that meets the provisions of MVRMA. In this, the socio-economic study differs markedly from the other components of the environmental impact assessment.

As is the case with all components of the environmental impact assessment, the socio-economic component would comprise the following sequential stages:

- issues scoping;
- baseline data collection;
- impact prediction;
- development of mitigative strategies; and
- design and implementation of a monitoring process.

The first three areas have essentially been the subject of this report, at a preliminary scoping level. Residents of communities possibly affected by this project should continue to be consulted during all stages of the socio-economic assessment.

### 6.3.1 Demographic characteristics

#### 6.3.1.1 Existing Information

This section of the socio-economic impact assessment describes the local people in terms of standard demographic variables. Because of the 20 year moratorium on development that resulted from the Berger Inquiry, demographic data for the Mackenzie Valley have not been analyzed recently. Of the 183 socio-economic references captured in this study's database, for example, only 12 are less than five years old and none of those is directly relevant.

#### 6.3.1.2 Community Concerns

During the community consultation that has taken place there has been no concern expressed about the collection of baseline demographic data. While direct reference to such data collection would be unusual, its need is implied in all the comments that emerged on social, economic and cultural concerns. These are discussed below.

#### 6.3.1.3 Information Requirements

Baseline demographic data are required for each potentially affected community in the Valley. Such data include:

- population statistics;
- ancestry;
- age distribution;
- language;
- educational levels; and
- literacy rate.

Such data are plentiful for Mackenzie Valley communities and may be obtained from various territorial and federal government sources, most particularly the NWT Bureau of Statistics and Statistics Canada.

#### 6.3.1.4 Information Gaps and Recommendations to Fill Gaps

Available demographic data should be compiled and analyzed on both regional and community levels. These data form the basis against which to assess both potential positive and negative impacts from the project. Positive impacts would include ability to meet hiring needs during construction; potential negative impacts could be increased pressure on day care centres to allow mothers to work. The most current data comes mainly from the 1996 Canadian census. Both Statistics Canada and the Northwest Territories Bureau of Statistics have data on:

- community population estimates;

- vital statistics;
- marital status;
- family status;
- language;
- aboriginal identity; and
- education.

Estimates of community populations by age, sex and ethnicity are currently being compiled by the Bureau of Statistics. Data on most demographic variables are also available from previous federal censuses for comparative purposes. It is recommended that the 1996 data be compiled for the Mackenzie Valley communities as part of the baseline data collection against which monitoring would occur.

### 6.3.2 Resources and Economics

#### 6.3.2.1 Existing Information

The resources and economics section of the socio-economic impact assessment deals with how people in the Mackenzie Valley earn a living and how their earnings are subsequently re-distributed throughout the regional, territorial and national economies. It also addresses the transition from traditional economic pursuits, such as hunting and trapping, to a wage-based economy.

There is very little contemporary analysis of commerce and economic activity in the Valley, and that which does exist is narrowly focused. For example, as noted above, Chalmers (1990) presents data from a resident big game hunter harvest survey of the NWT in 1989/90. The data include tag sales and reported and estimated harvests for most species. This information is summarized by administrative region in most cases, although harvest data for waterfowl and upland game birds is summarized by community.

As also noted above, data based on returns from outfitted hunters in the Mackenzie Mountains, NWT from 1979 to 1990 has been analyzed by Latour and MacLean (1994).

Finally, Stewart (1996) provides a review of the status and harvest of fish stocks in the Gwich'in Settlement Area. This report, which is current to 1995, reviews information on fish stocks that are harvested for subsistence, commercial sale and sport in the GSA. Information is summarized by community, water body and species. The author notes that there are few data available on subsistence harvests in the Gwich'in area. The information is specific to Aklavik, Inuvik, Ft. McPherson and Tsiigehtchic.

#### 6.3.2.2 Community Concerns

Community consultation during 1999 for this study, has shown a high level of support for construction of an all-weather road through the Valley, principally because of its economic spin-offs. Local people believe that better access to the Valley would result in more oil, gas and mineral exploration and development, increased tourist activity, and a lower cost of living.

Communities such as Fort Simpson, Norman Wells, Wrigley, and Inuvik stress that a project like this would be deemed a success only if it occurs over a decade or more, offers local residents ample training and employment opportunities, and is supported regionally. A slow approach to planning with adequate time to consider the important linkages to education and training, is very important.

At the same time, some residents have registered significant concern about the impact that a growing wage economy would have on the continuation of traditional pursuits. This sentiment is perhaps most pronounced in Deline, where residents have clearly stated their opposition to construction of a side road to their community, believing that it would have an unacceptable impact on the traditional way of life. It would be important to work with communities to find ways to mitigate impacts from all aspects of the project on traditional values.

#### 6.3.2.3 Information Requirements

Data on the relationship between natural resources and economic activity are essential to understanding how residents of individual communities currently earn a living. Only by knowing the ways in which residents use those resources, and the degree to which they are dependent on

them, is it possible to assess the impact that a new road may have on local livelihoods, the standard of living, and traditional ways of life. Data are needed on:

- labour force participation;
- wage employment;
- income from traditional pursuits;
- government assistance; and
- training and education programs.

For the most part, the data on which to base this analysis would come from relevant territorial government departments. For example, the 1994 Labour Force Survey produced by the NWT Bureau of Statistics remains the best overall summary of employment in the Northwest Territories. In addition, it would be necessary to develop projections of the wider economic impacts of road construction in terms of the Gross Domestic Product and direct and indirect taxation.

#### 6.3.2.4 Information Gaps and Recommendations to Fill Gaps

Analysis of existing data is needed to draw an accurate portrait of the Mackenzie Valley economy. This would be necessary as a prelude to quantifying potential project impacts and approaches to mitigation of negative effects and optimization of benefits. Emphasis would be on communities directly on the road route, however additional communities such as Inuvik and Fort Simpson also need to be considered for regional effects analysis. All this data may be obtained from Statistics Canada and the NWT Bureau of Statistics, which have compiled raw data (often at the individual community level) for such variables as:

- personal income tax;
- labour force activity - occupation, industry, type of work, place of work and community;
- household income;
- household expenditure;
- mobility;
- consumer prices;

- territorial gross domestic product;
- business investment;
- public capital expenditures;
- inter-provincial and international trade;
- wholesale and retail trade;
- small business profiles; and
- sector-specific activities.

### 6.3.3 Community Services and Infrastructure

#### 6.3.3.1 Existing Information

The community services and infrastructure section of the socio-economic impact assessment would deal with the ability of Valley communities to cope physically and psychologically with change. Abundant raw data of this sort exists at the community level although, once again, little current analysis is available.

#### 6.3.3.2 Information Requirements

Two kinds of information are required:

- an inventory of existing services and infrastructure by community; and
- an analysis of the adequacy of those services and that infrastructure in relation to the projected impacts of road construction.

#### 6.3.3.3 Community Concerns

Valley residents fully expect that a new road would bring significant social change with it. Substance abuse, family violence, prostitution, gambling and loss of traditional values are among the key concerns. An increase in the incidence of these social stresses would have an impact on demand for community services, particularly in the areas of physical health, cultural wellness and protective services. In addition, a significant influx of workers could also strain existing transportation, housing, utilities, recreational and educational resources.

#### 6.3.3.4 Information Gaps and Recommendations to Fill Gaps

An inventory of existing services and infrastructure may be assembled through recourse to data available from community-based agencies and various Government of the Northwest Territories departments. These data are required to allow for an impact and mitigation analysis for the project. With respect to social services and issues, information specific to each community is available on:

- health services;
- law enforcement;
- income security;
- alcohol and other drug use; and
- suicide rates

An NWT *Help Directory* (1998), which identifies health and social assistance agencies and organizations, is also available. In addition, in 1995 the NWT Department of Health and Social Services prepared a *Strategic Plan for Health and Wellness* that documented each community's preferred lifestyle objectives. At least one follow-up study was done (1996 to 1997) to assess the degree to which each community's aspirations were met and through what means.

The community wellness study needs to be considered in relation to the monitoring program that should be developed to evaluate the appropriateness and efficacy of the social, economic and cultural mitigation strategies that are implemented.

## 6.4 Cultural/Archaeological

### 6.4.1 Archaeological, Historical and Cultural Sites

#### 6.4.1.1 Existing Information

Heritage resource inventory studies within the Mackenzie River Basin have been undertaken essentially with two different objectives. Studies beginning in the 1950s and extending through the early 1970s were conducted for research purposes and tended to focus on nearby fish lakes

(e.g., Millar 1968) or on tributaries (e.g., Clark, 1975). However, some sites along the main river were recorded (MacNeish 1955). Most of the studies conducted after 1970 focused on proposed developments particularly those related to identification of a transportation corridor along the river and more recently, with development of oil and gas reserves in the Beaufort Sea.

Of most relevance for the potential MVHE are the studies associated with Mackenzie Corridor undertaken between 1971 and 1974 and, to a lesser extent, those completed for the NOGAP project between 1987 and 1991.

Millar and Fedirchuk (1974) present the results of field surveys conducted in relation to a previously considered highway corridor along the east edge of the river between Fort Simpson and its junction with the Dempster Highway east of Arctic Red River. The report incorporates some earlier work and provides a listing of sites that might be affected by development. Survey for this project was not limited to the right of way, but included a one half mile zone on either side of the centreline. Sixty-six prehistoric and 65 historic period sites were identified and some were assessed by test excavation.

In a report entitled *Preliminary Archaeological Study, Mackenzie Corridor* (Final Report 1975), Cinq-Mars provides an additional summary of survey work completed to evaluate the archaeological potential of the broadly defined Mackenzie Valley Pipeline Corridor. During this three year study, the following areas were more specifically investigated: the Porcupine River basin, portions of the Yukon coastal plain, segments of the eastern, western and southern Mackenzie Delta, the Travaillant Lake area, the Lower Keele river drainage area, and extensive segments of the Mackenzie River between Camsell Bend and Ft. Good Hope. Cinq-Mars notes that a number of important segments of the corridor have been left unexplored. His conclusions suggest that most of the Corridor area conceals a high degree of prehistoric cultural diversity and complexity extending through a sizable length of time and that further study is required.

Fedirchuk (1981) provides a useful summary of heritage resource concerns and distributions in relation to the then proposed, Mackenzie River pipeline corridor. Listed are a series of 224 sites recorded in the proposed development corridor which include the sites identified in previous highways studies. Their character and topographic associations are briefly discussed. However, it is noted that much of the terrain within the 30 km corridor has not been systematically

investigated and cannot be accurately evaluated in terms of its potential for heritage resources or the impacts that might be associated with development. She concludes by indicating that despite the relatively large number of extensive surveys conducted along the Mackenzie River valley, neither the sequence of cultural development nor the nature of prehistoric use of this region is adequately understood.

The NOGAP program completed in the early 1990s (Pilon 1994) involved survey and excavations intended to allow more effective regulation of energy development in the Beaufort Sea. Included in the program were field studies and a predictive assessment of an area in the Peel Plain Lowlands along the lower Mackenzie between the Travaillant and Rengleng Rivers. The character and location of 25 sites are discussed and the high quality of the archaeological record in this region is recognized. While the study is not directly related to this potential highway expansion, they are useful baseline information to consider during planning for high potential areas to survey for this project.

#### 6.4.1.2 Information Requirements

As already stressed, heritage resources are fragile non-renewable resources that are generally situated on or near the ground surface. Occasionally they are preserved in more deeply buried contexts, depending of the sedimentary history of the landforms in which they occur. Heritage resources are susceptible to damage as a result of any activity that disturbs the surface; this damage is permanent and irreversible. Indirect impact to historical resources that lie outside direct impact zones may occur as result of the increased commercial and recreational activity that would accompany the improved access this project would provide.

Potential development corridors would be reviewed by the PWNHC and, considering the scale of the project, it is almost certain that an Historical Resources Impact Assessment (HRIA) would be required as an EIA component. The studies necessary to complete these requirements must be undertaken under a permit issued by that agency and would entail field studies as well as comprehensive reporting. If significant resources are identified in potential impact zones and avoidance is not feasible, mitigative studies consisting of surface collection, mapping and/or excavation may be required before development approval is given. If an extremely significant resource is identified, permanent avoidance may be necessary

Studies completed to date in the vicinity of the MVHE have defined a number of known heritage resources that would require consideration in relation to any alignment that is selected. In baseline studies, these sites would require mapping to define their relationship to potential impact zones as well as discussion of their significance. If the selected alignment were to correspond with areas previously examined, it is anticipated that the concerns identified in those studies would remain and would have to be considered.

Previous heritage studies undertaken in relation to the Mackenzie Valley Corridor in the early 1970s invariably mention the fact that much of the area remains unexamined; broad zones were considered and focus was placed on locales presumed to have high potential. A comprehensive consideration of the entire route would be required as a basis for the suggested HRIA. In addition, heritage studies undertaken in the 1970s tended to focus efforts on visual inspection of existing exposures such as are present along stream and river banks and lake shores. Subsequent studies in forested environments have demonstrated the potential of other landform types as well as the utility of subsurface testing as a site discovery technique. Even in areas previously examined, responsible regulatory agencies may consider those early efforts insufficient to meet modern requirements. It is envisaged that a sampling plan based on high potential sites along the proposed alignment would be agreed to with regulatory agencies in advance.

In consultative scoping sessions conducted in the community of Tsiigehtchic, residents mentioned concerns within the community for the integrity of archaeological sites in association with development of the highway, especially in the Travaillant Lake area (see Section 3). At similar meetings in the community of Fort Good hope, concerns were raised in relation to removal of artifacts as a result of improved access throughout the region.

#### 6.4.1.3 Information Gaps and Recommendations to Fill Gaps

Because heritage resources are finite and most susceptible to the direct affects of development, accurate information about the location of disturbance zones is one of the most important information needs to ensure an effective HRIA. If a preferred alignment or series of alternate alignments can be specified, efforts can be focused in these areas. This would serve to increase the accuracy of the assessment as well as the confidence with which impact evaluations can be made.

Up-to-date information on known resources is a potential information gap. This can be quickly remedied, as all recorded archaeological sites are filed in an accessible central database in Ottawa. Minor modification would be needed to convert this information for application in digitally based analyses. As well, original field notes relating to the locations and character of previous studies need to be obtained to incorporate in to the field assessment strategy.

A comprehensive consideration of landscape potential is an important information need in planning effective HRIA level studies. This would entail compilation of detailed topographic and ecological information for the proposed development corridor as well as development of systematic criteria for prediction of landscape potential. These data, as well as analysis of the landscape associations of known sites, would permit stratification of the development zones into areas considered to have varying degrees of potential for the occurrence of heritage resources. This would allow planning of effective assessment strategies, focusing on areas warranting greater attention while omitting areas of low potential. It is expected that much of the development zone would have limited potential, especially in low water saturated or featureless terrain. Just as for key wildlife species, use of a GIS based predictive model that incorporates heritage potential, along with other environmental concerns, may be the most appropriate planning tool for evaluating the potential effects of the MVHE, for structuring EIA related field investigations and for comparative assessment of alternate routes.

The potential presence of resources of significance to local aboriginal communities represents an important information gap. Given the sporadic and regional nature of traditional land use studies, it would be important to conduct prior consultation with these communities to enable incorporation of information on significant cultural resources such as graves, cabins, trails and so forth in the assessment plan.

### 6.4.2 Traditional Knowledge

#### 6.4.2.1 Existing Information

The GNWT Traditional Knowledge Policy defines traditional knowledge (TK) as “knowledge and values which have been acquired through experience, observation, from the land or from spiritual teachings, and handed down from one generation to another”.

Various TK studies have taken place in the last few decades within communities that might be affected by development of the MVHE. These have been sporadic and have been undertaken either for general research purposes or in recognition of the needs of specific communities to record this information for the benefit of future community members. Examples of the latter include: the Dene mapping project (1972-1989), the Fort Good Hope Dene Language Program (1979-1981), and the Gwich' in Language and Cultural Project undertaken in the 1990s. In a few cases, studies have been undertaken to identify concerns with proposed development projects. Examples of these would include studies undertaken for the Berger inquiry (1977) and those completed for Canadian Arctic Gas (1971-1976). Examples of more recent studies are provided below.

Johnson and Ruttan (1993) report on a pilot project conducted in Fort Good Hope and Colville Lake, NT, from 1989-1992, to document traditional Dene environmental knowledge. Research focused on ecology of important big game and fish species. Information was collected on habitat and habitat relationships, interspecific relationships, life cycles and reproduction, population dynamics, migration and movements, parasites and diseases, and traditional and modern management, for each species. Some information was recorded on maps. The information is not in a database therefore is not readily accessible to potential users. Recommendations for future TK studies and training programs are included.

As previously noted, Stewart (1996) provides a review of the status and harvest of fish stocks in the Gwich'in Settlement Area. This report, which is current to 1995, reviews information on stocks of fishes that are harvested for subsistence, commercial sale and sport in the GSA. Information is summarized by community, waterbody and species. Quotas are given for each species by number and by weight. The author notes that there are few data available on subsistence harvests in the Gwich'in area. The information is specific to Aklavik, Inuvik, Ft. McPherson and Tsiigehtchic. A Gwich'in Harvest Study was initiated in 1995 and will continue for five years.

Laraque (1997) summarizes TK initiatives and activities undertaken or commissioned by the NWT Dept. of Resources, Wildlife and Economic Development between 1994 and 1997, organized by regional areas. No actual data is presented. Additionally, Greer (1996) has

provided a bibliography of sources related to archaeology, history, oral history, traditional cultural and land use patterns for the Gwich'in settlement area.

The traditional use of the Travaillant Lake area using trails and place names of the Gwichya Gwich'in from Arctic Red River is documented by Andre and Kritsch (1992). This report is based on oral history research (60 interviews) carried out in Arctic Red River and Inuvik, on trails, place names, campsites and resource use in the Travaillant Lake area. 1:50,000 and 1:250,000 maps were compiled and interviews were taped.

The Gwich'in Renewable Resource Board (1999) in Inuvik maintains the Gwich'in Ecological Knowledge Database which was developed to help document Gwich'in Traditional Knowledge.

The Sahtu GIS Project is continually adding to TK mapped information both from the 1970s and from more recent studies.

Small directed TK studies are also being conducted to help mitigate impacts to traditional land use by recent oil and gas exploration projects. An example would be studies by Norman Wells and Tulita in Golder Associates (1998).

#### 6.4.2.2 Community Concerns

In preliminary consultation conducted with the Aboriginal communities in the vicinity of the Mackenzie Highway Extension, concerns for negative effects on traditional lifestyle were raised by members of the communities of Deline, Tsiigehtichic, Inuvik, Fort Good Hope and Colville Lake. In addition, the community of Fort Good Hope raised concerns for the direct effects of development where residents expressed the need to talk directly with the families that use the land along different parts of the alignment.

#### 6.4.2.3 Information Requirements

TK generally refers to the knowledge held by Aboriginal peoples which has been acquired over the centuries as a result of continuous contact and experience with the land and its resources. It is holistic and cannot be compartmentalized or separated from the people who hold it. It is also an

authority system that sets out rules for governing the use of resources, a way of life that is rooted in spiritual health, culture and the language of the people. It should also be recognized that much of the available information is rapidly disappearing with the loss of Elders. Conducting traditional knowledge studies can be an effective means of gathering meaningful information that can be used to help determine potential impacts related to the Mackenzie Highway Extension.

Since TK is often called upon in negotiating land claims, there is often a reluctance to release traditional knowledge into the public domain. Moreover aboriginal informants often express concerns about separating traditional knowledge from its cultural context or from the broader system of knowledge that gives it meaning and value. Consequently, it has been increasing recognized that the TK, including traditional land use (TLU) information, is the property of those that hold that information. When this information is shared with the public for planning purposes, it has become common practice to acknowledge this ownership and the ultimate use of the information by prior agreement with individual informants. Ownership is also acknowledged by community retention of the base data accumulated and by restriction of access to that information.

Conducting effective TK studies is a complex undertaking that requires close co-operation between the proponent and local communities and would require the full participation of Aboriginal communities. In addition, concerns frequently raised by aboriginal communities identify compressed time frames established by proponents as a major detriment to provision of comprehensive TK/TLU and to its effective incorporation in development plans. Conversely to be useful in helping mitigate potential impacts on traditional land use and traditional values, TK studies have to be focused and timely to serve their purpose in an EIA context.

#### 6.4.2.4 Information Gaps and Recommendations to Fill Gaps

A comprehensive understanding of regional traditional land use patterns and of the concerns within local communities for potential loss of TK is an important information gap. It would be important to use maximally existing information, however even here its interpretation would require community input. Early, open, timely and regular communication between the proponent and local communities is fundamental to a mutually beneficial arrangement and to on going and

positive relationships. It is essential to make direct overtures to each community in the development area, including those that would experience indirect effects.

The direct effects of development of the MVHE represents an important information gap to families that maintain a traditional lifestyle on lands that would be affected. Community consultation should involve efforts to identify directly affected users. Their concerns need to be addressed through direct contact that is timely and open. These efforts would be facilitated by concrete identification of preferred and alternate route alignments.

As indicated above, traditional land use and ecological knowledge studies have been sporadic throughout the region. Although some excellent summaries exist, comprehensive TK/TLU studies do not exist for each community that might be affected. Some initial TK information has been acquired during this study (see Appendix III and Section 3.5.3). The need to undertake such focused studies represents an important part of the EIA process, which is augmented by the fact that much of the available relevant information is rapidly disappearing with the loss of the Elders who hold that information. Both the direct and indirect effects of improved access in the region of the project would be best addressed by a continuing program of specific TLU/TK studies.

The following steps are recommended to implement an effective program of TLU/TK studies:

- ensure early involvement of communities in any study program (as has been occurring);
- establish protocols for both accessing existing information and the gathering of new TK and how it would be incorporated into the Environmental Assessment process;
- allow sufficient time for communities to review, understand and participate in processes and studies;
- ensure use of TK meets community and proponent expectations and meets recognized intellectual property protection guidelines;

- ensure communities are provided with appropriate information regarding the scope, intent, value and potential impacts of the development;

- ensure reasonable and appropriate timelines for TK studies; and

- ensure that all affected communities are informed and have an opportunity to participate if they so choose.

In addition it has been accepted practice to involve Aboriginal community representatives in collecting scientific data for the EIS, including archaeology, wildlife and possibly vegetation studies. Provisions for direct participation in EIA field studies should be made.

## 6.5 Summary

The literature review revealed that there is a considerable amount of useful information available that would be pertinent to an EIA for an extension of the Mackenzie Valley road. While most of the information is from studies conducted in the 1970s, it is quite comprehensive in many cases and forms a good baseline for that time period. In addition recent studies have been occurring in a number of disciplines. Any future EIA should make good use of all these data. Most disciplines, however, would require more focused recent data in order that an EIA can be conducted. The existing data described in this report should be reviewed and assessed thoroughly prior to obtaining additional information.

# 7. SUMMARY AND CONCLUSIONS

## 7.1 Conclusions

Communities within the Mackenzie Valley (Fort Simpson, Wrigley, Tulita, Norman Wells, Fort Good Hope, Tsiigehtchic and Inuvik) support the highway extension, for the resource industry and tourism business that could be generated. It is recognized that along with greater access, could come social problems related to alcohol and drugs, but most communities are confident that they are more capable of planning for and dealing with these negative effects than they were in the 1970s. The main environmental concerns regarding improved access include various potential negative effects on fish and wildlife species and their habitat.

Residents of Colville Lake have mixed feelings about the MVHE, because of concerns about social impacts on their community and concerns that people from Fort Good Hope will benefit the most. They cannot readily agree to the project without knowing the opinions of other communities. Elders in Deline were firmly opposed to a spur road linking their community with a highway through the valley, largely because of the perceived negative social impacts to traditional activities. However, neither Deline nor Colville Lake residents expressed opposition to a main all-weather highway linking other communities down the Valley. Some residents of Tsiigehtchic prefer an alternate alignment southwest of the Mackenzie River so as to avoid impacts on the Travaillant Lake area that lies northeast of the Mackenzie. A strong message from the scoping sessions is that DOT should commit to future community consultations on all aspects of the project if it becomes a reality, with respect to training and employment for construction, and traditional knowledge with respect to route alignment and stream crossings.

It is important to maximize the use of existing information, to efficiently plan for environmental impact assessment (EIA) of the MVHE project. A large volume of information has been documented for the study area. Many citations will either be of direct relevance to a future environmental assessment report or will help in the planning of studies to fill data gaps. This is especially so for biophysical references. The difficulties discussed in connection with finding relevant citations from bibliographic databases, means that additional useful material over that cited, no doubt exists. However, the data collation has been extensive enough to allow for a

meaningful gap analysis, and recommending what additional data will be required to meet regulatory needs.

The regulatory and environmental impact assessment regime in the NWT has evolved in recent years with the settlement of a number of land claims and the proclamation of the *Mackenzie Valley Resource Management Act* (MVRMA). The EIA conducted for the project, if it is proposed, would proceed under the MVRMA. In Section 5 we have provided an overview of the various permits that would be required and the jurisdictions responsible for issuing those permits. Section 5 also provides a road map for the EIA process. It is likely that preliminary screening by agencies responsible for permit issuance would result in referral to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) for subsequent more detailed environmental assessment (EA). Should any significant issues or concerns remain unresolved after the EA, an Environmental Impact Review would be conducted, including the formation of a project-specific review panel.

In Section 6 a gap analysis was conducted to gauge the adequacy of existing information, against expected EIA requirements. Recommendations were then provided as to future studies needed to fill data gaps. Biophysical references were sub-divided into a number of disciplines to identify information gaps. Those disciplines were climate, geology/soils, hydrology, water quality, fisheries, vegetation/wildlife habitat and wildlife.

The other subjects reviewed were socio-economics and cultural / archaeological resources, including traditional knowledge (TK). The amount of new studies required to investigate issues and propose adequate mitigation, varies by discipline. Recommendations are given on the nature and amount of work needed in all areas. Meaningful integration of TK into the EIA process will be necessary. Recommendations are provided on how to work towards an effective TK program focused on this project.

## 7.2 Summary

- There is strong support for the Mackenzie Valley Highway Extension from communities in the Valley that would be linked by the project.

- A spur road to Deline was firmly opposed by that community, but they did not object to the main route in the Mackenzie Valley.

- Residents of Tsiigehtchic are divided regarding the preferred route. Many prefer an alternate alignment southwest of the Mackenzie and would like to discuss that option with residents of Fort Good Hope.

- Full community involvement in subsequent project planning and detailed EIA planning is a priority for all communities.

- A slower community construction approach, over approximately a 10 year period, is generally favoured to maximize community training and employment benefits.

- Much information exists for the project area, some of which, especially in biophysical subjects, would have direct relevance in preparing an EIA, should the project be formally proposed. Even more of the existing information will help in planning focused studies to fill information gaps for the EIA process.

- The new regulatory regime under the MVRMA for an EIA and subsequent permitting has been described. The scope of the project and level of public interest in it, suggest that it would be referred for environmental assessment after initial preliminary screening.

- The amount of new studies required to investigate issues and propose adequate mitigation, varies by discipline. Recommendations are given on the nature and amount of work needed in biophysical, socio-economic and cultural - archaeological areas. Meaningful integration of TK into the EIA process will be necessary.

# Appendix I Community Issues Environmental Scoping Database

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| | Elders from interviews | socio-cultural | Concern was expressed about the route of the highway extension because gravesites of their people are in the area of the road development. |
| | Elders from interviews | socio-cultural | Better access would allow more people to visit each other and meet more often for spiritual gatherings. The highway extension might also help community people get back to the land and practice traditional ways of living. |
| Colville Lake | community leaders | socio-cultural, economic | While the cost of groceries might decrease if a winter road was built to Colville Lake, alcoholism would increase. |
| Colville Lake | community leaders | socio-cultural | Policies are needed to prevent drugs and alcohol from reaching Colville Lake if a road is built. |
| Colville Lake | community leaders | socio-cultural | If a highway is built down the Mackenzie, then in the future it is more likely that it will eventually extend to Colville Lake. This would lead to more alcohol and drugs. |
| Colville Lake | community leaders | general | Elders are totally against the road. |
| Colville Lake | community leaders | economic | A road would make it possible to truck in goods from Fort Good Hope and Norman Wells, and would reduce the costs of groceries, fuel and airfare. |
| Colville Lake | community leaders | socio-cultural | Road users should be searched for drugs and alcohol |
| Colville Lake | community leaders | socio-cultural | A border-type crossing could be set-up to search for drugs and alcohol at the start of the highway extension. |
| Colville Lake | community leaders | socio-cultural | A road to Colville Lake will not happen, but there is still concern about drugs and alcohol coming from the extended Mackenzie Valley highway. |
| Colville Lake | community leaders | economic | Increased tourism may not be a good thing, because Colville Lake Lodge only hires experienced outfitters, and most locals are not experienced. |
| Colville Lake | community leaders | economic | Jobs will only go to those with experience, and most people here do not have that. |
| Colville Lake | community leaders | general | Colville Lake and Fort Good Hope often cooperate, and a group meeting with both communities would be helpful. |

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| Colville Lake | community leaders | socio-cultural | The young people who want the highway do not know their own culture enough to recognize the risks that the road would pose. The decisions of the elders are the important ones. |
| Colville Lake | community leaders | biophysical | Wildlife is the main concern of elders. |
| Colville Lake | community leaders | economic | Colville Lake would probably not get many jobs from the extension. Fort Good Hope would probably get most of the jobs arising from the road. |
| Colville Lake | public | economic | Training is necessary if Colville Lake community members are to get employment from the extension. |
| Colville Lake | community leaders | general | All communities should meet collectively to decide on this. |
| Colville Lake | community leaders | socio-cultural | There is no way to control the influx of drugs and alcohol if the road is built. |
| Colville Lake | community leaders | biophysical | The road would affect fish lakes. |
| Colville Lake | community leaders | general | Someone from the Delta should be invited to Colville Lake to describe the effects of the highway that was built there. |
| Colville Lake | community leaders | general | Each community should send a delegation to the Dene National Assembly to discuss this. |
| Colville Lake | public | economic | If a road was developed down the Mackenzie, the economic benefits to Colville Lake wouldn't be that great, because goods would still need to be flown in from Fort Good Hope. |
| Colville Lake | public | general | A winter road to Colville Lake should be considered. |
| Colville Lake | community leaders | economic, socio-cultural | Opportunities for training and jobs are important, particularly as younger people are losing their land skills. |
| Colville Lake | community leaders | economic, socio-cultural | Even if this road does have economic benefits, there are social problems that must be considered. |
| Colville Lake | community leaders | socio-cultural | People from Wrigley could be a good information source on social changes from when they were connected to the highway. |

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| Colville Lake | community leaders | biophysical | Every winter the roads cause problems with creeks. This road could also affect creeks. |
| Colville Lake | community leaders | biophysical | Local input is needed in the design of culverts, roads and stream crossings. |
| Colville Lake | community leaders | general | Elders need time to discuss this issue amongst themselves. |
| Colville Lake | community leaders | general | In future visits, consultations should be combined with other communities. |
| Colville Lake | community leaders | general | A meeting of all regional communities, using a round-table approach, would help to clarify the positions of communities. |
| Colville Lake | community leaders | general | Fort Good Hope would be a good place for a regional meeting on the extension. |
| Colville Lake | community leaders | socio-cultural | A winter road to Colville lake would bring more alcohol into the community. |
| Deline | community leaders | socio-cultural | There is concern about impacts to Dene customs and beliefs, family distribution. |
| Deline | public | socio-cultural, economic | Funds are more urgently needed for health services. The road is lower priority. |
| Deline | community leaders | socio-economic, biophysical | There would be adverse impacts on land users and other adverse social impacts if the extension is built. |
| Deline | community leaders | socio-economic, biophysical | No to the road to Deline because of social impacts and effects on hunting, fishing and harvesting. |
| Deline | community leaders | socio-cultural, biophysical | No to road; concern with reactions of other communities to Deline's opposition to road. |
| Deline | community leaders | general | Consultations should be held with community as a whole, not with individuals |
| Deline | public | socio-cultural | The long-term impact of increased access on traditional values is a concern. |

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| Deline | public | economic | The positive economic benefits of road are unlikely. It is not likely to reduce the cost of living. |
| Deline | community leaders | socio-cultural, economic | There is mistrust of government working with the community due to past experiences. |
| Deline | public | socio-cultural | There is a risk of negative social impacts to traditional land users. |
| Deline | public | economic | There will be fewer overnight tourist visits as access to Deline improves |
| Deline | public | socio-cultural | The road would introduce new opportunities, but would negatively affect traditional ones. |
| Deline | public | socio-cultural | There is concern that more youths would leave Deline if access was better. |
| Deline | public | socio-cultural | The road could increase crime. |
| Deline | public | socio-cultural, economic | DOT should wait until land claim is fully implemented |
| Deline | public | socio-cultural | There is concern over adverse social impacts to trappers |
| Deline | public | socio-cultural, biophysical | There is concern over adverse social impacts, plus impacts on fish and wildlife. |
| Deline | community leaders | socio-cultural | There is concern over adverse cultural and social impacts. |
| Fort Good Hope | public | biophysical | As described in the Sahtu Agreement and MVRMA, Fort Good Hope has a role to play in cumulative impact monitoring which must not be overlooked. |
| Fort Good Hope | co-management body | general | By conducting this public consultation early, DOT makes it easier for the Sahtu Land and Water Board to do its job. |
| Fort Good Hope | community leaders | biophysical | Environmental concerns, and effects on fishing in particular, should be carefully considered when planning the road. |
| Fort Good Hope | community leaders | socio-cultural | The road is supported but must provide for training and employment of local people. |
| Fort Good Hope | community leaders | economic | Metis in Fort Good Hope might consider contributing land claim money to support the extension. |
| Fort Good Hope | community leaders | socio-cultural | The road should be built using community construction |

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| Fort Good Hope | community leaders | biophysical | The road must be environmentally sound. |
| Fort Good Hope | community leaders | socio-cultural | Most of the population of Fort Good Hope is under 40 years old, and the road could particularly benefit them. |
| Fort Good Hope | community leaders | biophysical | Moose habitat, caribou migration and fish creeks should be protected through careful construction and use of good mitigation measures. |
| Fort Good Hope | community leaders | socio-cultural | A road will bring both benefits and costs. For example, the price of goods may go down, but there may be more drugs, alcohol and social problems. The community will have to learn to adapt. |
| Fort Good Hope | community leaders | economic | The presence of the road could encourage development of the oil and gas fields near Colville and across the river from Fort Good Hope. |
| Fort Good Hope | community leaders | biophysical | Specific sites will need extra environmental measures. For example, the Thunder River, north of Little Chicago, has erosion problems. |
| Fort Good Hope | public | economic | The road is a good idea that would reduce the cost of living. |
| Fort Good Hope | public | general | Bridges would be cheaper than ferries at the river crossings. |
| Fort Good Hope | public | Economic, socio-cultural | Training and employment opportunities are very important. |
| Fort Good Hope | public | economic | There are minerals besides oil and gas in the area. The extension could help develop these, |
| Fort Good Hope | community leaders | economic | The Mackenzie extension is the best of the road strategies under consideration by DOT. Oil and gas money from the area goes to government, and a road will increase this. |
| Fort Good Hope | public | economic | Oil companies will benefit from the road, and should therefore support it. |
| Fort Good Hope | community leaders | economic | The road could stop at Fort Good Hope until the money is found to complete it. |
| Fort Good Hope | community leaders | biophysical | There are good fishing lakes and trapping areas north of Fort Good Hope that should not be made accessible. |

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| Fort Good Hope | community leaders | biophysical | There is an area 50 mi. north, off the Loon River, which the road should avoid. |
| Fort Good Hope | community leaders | biophysical | The road should not go near Yaltea and other lakes north of Fort Good Hope. |
| Fort Good Hope | public | economic | There is concern over the availability of federal funding. |
| Fort Good Hope | public | economic | The road is a good idea, but funding seems uncertain. |
| Fort Good Hope | community leaders | general | Fort Good Hope does not need more consultation, it needs a road. |
| Fort Good Hope | public | biophysical | It is important to keep the road away from the river and the surrounding game, to avoid conflicts with caribou migration. |
| Fort Good Hope | public | biophysical | There is concern about pollution from spills and accidents. |
| Fort Good Hope | public | socio-cultural, biophysical | Caribou and heritages site are top issues. Old camps along the river will require special protection to keep visitors from taking artifacts. |
| Fort Good Hope | public | biophysical | The extension should not go near Yaltea and other fishing lakes. |
| Fort Good Hope | public | biophysical | There is concern that wildlife could abandon the area when disturbed by the extension. |
| Fort Good Hope | public | socio-cultural, economic | It would be great not to have to fly everywhere. The price of goods would likely drop. |
| Fort Good Hope | community leaders | biophysical | Creating too much hunting access for strangers (particularly southerners) would be a problem. |
| Fort Good Hope | public | economic | The extension would cut costs to communities, especially Fort Good Hope and Colville Lake. |
| Fort Good Hope | public | socio-cultural | With planning, the community will be ready to prevent the social problems that the extension will bring (drugs and alcohol, especially). Preventative measures and healing camps (like the one outside of Ft. Simpson) will help |

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| Fort Good Hope | public | socio-cultural | Different families along the route use the land, and should be consulted about uses to find the best route alignment. |
| Fort Good Hope | community Leader | socio-cultural | The road is a good idea, but the social impact (drugs and young people leaving) is a worry. |
| Fort Good Hope | community Leader | biophysical | Keep the road away from fish lakes. |
| Fort Good Hope | community Leader | biophysical | The road will not have major effects on caribou. |
| Fort Good Hope | community Leader | socio-cultural | There is little trapping in the Fort Good Hope Area, and not much employment either (although the road could provide employment). |
| Fort Good Hope | community Leader | economic | Sahtu land corporations want the road, and have been putting land claim money into it for some time. |
| Fort Good Hope | industry and business | economic | The winter road from Fort Good Hope to Norman Wells opens too late and closes too early. DOT should be focussing on extending the winter road season. |
| Fort Good Hope | public | biophysical | The road is not wanted, because the extension would create possible cumulative concerns. |
| Fort Good Hope | public | economic | The road should be built, for easier access to communities, for tourism, for jobs and to lower the cost of living. |
| Fort Good Hope | public | economic | The road should be built to increase employment, reduce the cost of goods, and improve access to southern goods year-round. |
| Fort Good Hope | public | economic | The extension is critical for the people of the Sahtu region! It will lower the cost of goods and of travel to other regions of the NWT, which is now so expensive that it is practically impossible for many people. |
| Fort Good Hope | public | economic, socio-cultural | Current costs of goods and travel are very high, and often unavoidable. The road would lower the cost of medical travel. |
| Fort Good Hope | public | socio-cultural | The extension would help attract teachers and nurses to small communities. |
| Fort Good Hope | public | socio-cultural | Residents would benefit from access to cultural, medical, recreational and economic endeavors. |

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| Fort Simpson | industry and business | economic | The road would be very beneficial for the economy (trade and tourism). It would be a road to human (renewable) resources, and could establish Fort Simpson as a regional center. |
| Fort Simpson | | socio-cultural | There are many important Metis heritage sites along the Mackenzie. These must be identified and studied prior to an extension proposal. |
| Fort Simpson | industry and business | economic | Many indirect benefits of an extension would be valuable to Fort Simpson, and many services that left in recent years would likely return with the road. |
| Fort Simpson | industry and business | economic | There is concern that this highway extension is in competition with the SGP corridor. This road would serve a broader population. There should be a plebiscite to decide. |
| Fort Simpson | industry and business | economic | There is concern that a private / public partnership would result in toll roads, which could reduce economic benefit. |
| Fort Simpson | industry and business | general | The proposed route is likely to cause a conflict between developers and land claim organizations. |
| Fort Simpson | community leaders | socio-cultural, economic | Scoping should include social and economic considerations, and not just ecological ones. |
| Fort Simpson | industry and business | general | By building the extension, DOT would be demonstrating a regional approach to development, offsetting the economic focus on Yellowknife. |
| Fort Simpson | community leaders | general | The 80km/h road should be designed, because few people would limit themselves to 60km/h |
| Fort Simpson | industry and business | economic | Fort Simpson completely supports any road because of economic benefits. |
| Fort Simpson | industry and business | socio-cultural, economic | Construction should extend over a fairly long period, to allow for full training and employment benefits. |
| Fort Simpson | industry and business | economic | Scenery should be a major factor in road design to fully realize tourism potential. |
| Fort Simpson | industry and business | economic | By building the highway well, operation and maintenance costs will be lower. Highway conditions will influence whether commercial operators use the extension or the Dempster. |

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| Fort Simpson | community leaders | economic | Fort Simpson tourist attractions have always been under-promoted. The highway extension and circle route will make a big difference to tourism. |
| Fort Simpson | community leaders | socio-cultural, economic | Development should occur over a ten year period to give people time to prepare tourism facilities along the route. |
| Fort Simpson | industry and business | economic | Construction should be done by communities, with joint ventures between community businesses and community corporations. |
| Fort Simpson | industry and business | economic | Training would be an important benefit of the highway. |
| Fort Simpson | industry and business | economic | An all weather road with a circle route would be good, in order to avoid the repeated costs of winter road construction. |
| Fort Simpson | public | socio-cultural, economic | The extension should be built. The NWT should have roads to human resources, not mineral ones. Linking people would stimulate the economy. How many communities would benefit from a road north of Yellowknife? |
| Fort Simpson | public | general | 100% in favour of a well-thought out road via Fort Simpson. Environmental and land claim concerns exist, but are not overwhelming. |
| Fort Simpson | public | general | The extension is a good proposition, but must be designed to maximize resource harvesting while minimizing impact on wildlife, habitat, and culturally significant areas. |
| Fort Simpson | public | general | The diamond industry could be served most efficiently by access up the Mackenzie extension and then across Great Bear Lake than by an SGP corridor. |
| Inuvik | co-management body | biophysical | Road alignment looks good, as it is on higher ground. Southerly route through Puzzle Lake is wet and would make construction difficult. |
| Inuvik | government | biophysical | The main environmental concern would be opening up Bluenose caribou herd winter range to hunting (as occurs from Dempster for the Porcupine herd. |
| Inuvik | government | biophysical | Bluenose have not historically gone south of the Mackenzie, and in recent years have not gone far past Caribou and Travaillant Lakes. |

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| Inuvik | government | general | The best alignment from a wildlife perspective would be as close as possible to the Mackenzie. Woodland caribou would be more common in this area than further north, but are not likely to be of much concern. |
| Inuvik | co-management body | general | The community construction approach is similar to the work of improving the winter road. |
| Inuvik | industry and business | general | There is concern over the cost of groceries. |
| Inuvik | co-management body | economic | There is concern that the extension could impact business in Eagle Plains. |
| Inuvik | public | Socio-cultural, economic | Tourism would benefit from having a loop of the Mackenzie and Dempster highways. |
| Inuvik | industry and business | economic | The barging business in the delta could be affected by the extension. |
| Inuvik | public | socio-cultural | The extension would make it easier for Gwich'in to visit their families in Yellowknife. |
| Inuvik | co-management body | socio-cultural, economic | The highway would make medical services in Yellowknife more accessible. |
| Inuvik | co-management body | economic | Inuvik business could suffer from people leaving to shop elsewhere. |
| Inuvik | co-management body | economic | By taking the road through many communities, tourism dollars would be better distributed. |
| Inuvik | industry and business | economic | The extension could lead to cheaper goods from Edmonton. |

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| Inuvik | co-management body | economic | The extension could be very beneficial if it is cheaper than the Dempster for trucks to use. |
| Inuvik | co-management body | biophysical | A smooth ridge runs for 50km from the proposed connection to the Dempster. This could be a good route (the speaker supports this even though he runs a trapline there). |
| Inuvik | co-management body | biophysical, economic | Potential impacts on the Bluenose caribou and economy could trigger the Inuvialuit Environmental Impact Screening Committee, but there is no legislation for joint proposal review. There are provisions for reciprocal seats, |
| Inuvik | public | socio-cultural, economic | Tourism dollars will help small communities, but they will be accompanied by social impacts. |
| Inuvik | co-management body | socio-cultural | Now that land claims are settled, people are better prepared to deal with social problems. |
| Inuvik | community leaders | economic | The Inuvik-Tuktoyaktuk road should be a higher priority |
| Inuvik | community leaders | economic | Tourism potential is the major attraction for Inuvik |
| Inuvik | community leaders | economic | The economic benefits would serve the Yukon also. |
| Inuvik | community leaders | economic | The route on the map, connecting to the Dempster close to Inuvik, is better than the one connecting closer to Tsiigehtchic. |
| Inuvik | community leaders | economic | A large hovercraft is still being considered by some. |
| Inuvik | community leaders | economic | Support for the highway extension has grown over the past year. The highway would lead to long-term benefits. |
| Norman Wells | industry and business | economic, socio-cultural | There is support for road and interest in other design options (lower speeds) |
| Norman Wells | government | socio-cultural | There are safety concerns related to speeding. |

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| Norman Wells | industry | biophysical | There is concern about the relative environmental costs (spills, sediment) of 60 Vs 80 km/h on fish and water. |
| Norman Wells | community leaders | economic, socio-cultural | Supports road, building bridge across the Bear River, constructing outward from each community, exploring financing option of partnership with land claim groups |
| Norman Wells | co-management body | economic, socio-cultural | The extension should be built from "link to link", not from one end to another. The winter road also needs improvements to winter road. |
| Norman Wells | co-management body | economic | The federal government should fund the extension. |
| Norman Wells | co-management body | economic | The possible winter closing of Dempster highway. may affect tourism benefits of the Mackenzie extension. |
| Norman Wells | community leaders | economic | If the Dempster highway closes in winter, it would make Mackenzie extension more beneficial. |
| Norman Wells | industry and business | economic, socio-cultural | The extension would lead to economic diversification and community growth |
| Norman Wells | industry and business | economic | The extension would economically benefit Yellowknife and Hay River |
| Norman Wells | co-management body | economic, socio-cultural | Use local services and construct slowly, allowing communities time to adapt. Community based approach is beneficial. |
| Norman Wells | co-management body | socio-cultural, economic | The healthier economy that comes from greater accessibility would reduce social problems |
| Norman Wells | industry and business | socio-cultural, economic | Focus on training, avoid quick construction and the related boom-bust cycle. |
| Norman Wells | | biophysical, economic | New construction technologies should be considered when planning the road. |

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| Norman Wells | community leaders | socio-cultural | concern over increased drug and alcohol use with road, wants social mitigation planned in advance. |
| Norman Wells | community leaders | economic | construction over next ten years would be good timing for development of gas industry |
| Norman Wells | community leaders | economic | There is considerable potential for development of the tourism industry in the Sahtu region. |
| Norman Wells | community leaders | biophysical | Environmental impacts can be mitigated via land claim mechanisms |
| Norman Wells | co-management body | general | Norman Wells generally supports the road idea. |
| Norman Wells | | economic | People would prefer an all weather road to the hovercraft service being discussed by DOT. |
| Norman Wells | co-management body | economic | The extension would lead to the benefit of lower commodity prices |
| Norman Wells | public | socio-cultural | The extension is strongly encouraged. With the influx of people to claimed areas, the extension would make it easier for people to meet and get together. |
| Norman Wells | community leaders | economic | The Council of the Town of Norman Wells unequivocally supports the extension, a vital infrastructure requirement in the sustainable development of the Sahtu region. Council believes it must be made a priority for federal and territorial governments. |
| Norman Wells | community leaders | general | Although a hovercraft may be useful, it is no substitute for a highway. |
| Tsiigehtchic | community leader | biophysical, socio-cultural | Travaillant Lake is an important traditional use area. Fishing done here and concern that rivers and lakes will be damaged due to the highway. |
| Tsiigehtchic | community leader | biophysical, socio-cultural | Increased access by people from outside the region to traditional use areas. |

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| Tsiigehtchic | community leader | general | Tsiigehtchic needs support of Fort Good Hope on a route south of the Mackenzie River. Elders can trace best route on map based on knowledge of people who have used the land. |
| Tsiigehtchic | community leader | socio-cultural | Need to look at the social impact a highway will have on the communities. |
| Tsiigehtchic | community leader | general | Community needs to know more about the implications of highway development including implications for oil and gas development. |
| Tsiigehtchic | community leaders | biophysical, socio-cultural | Community wants extension south of Mackenzie River, between Fort Good Hope and Tsiigehtchic, to shorten route and avoid Travaillant Lake area (traditional fishing area). |
| Tsiigehtchic | community leaders | socio-cultural | People do not want the highway to pass directly though Tsiigehtchic, because of the traffic and people it would bring. |
| Tsiigehtchic | community leaders | | DOT could build brides across the Mackenzie and Arctic Red a few miles east of Tsiigehtchic. |
| Tsiigehtchic | public | socio-cultural | Extension would enable closer contacts with friends and family in southern areas of the Mackenzie Valley |
| Tsiigehtchic | public | biophysical | By building south of the Mackenzie, the many freshwater streams around Travaillant Lake would be less affected. |
| Tsiigehtchic | community leaders | socio-cultural | Employment from the project should be directed to the community, which would help many social problems. |
| Tsiigehtchic | community leaders | biophysical | The highway could increase outsider access and fishing pressure on Travaillant Lake area. If route was to stay north of the river, changes would be needed. |
| Tsiigehtchic | community leaders | biophysical | A route north of the river on drier ground nearer to the Mackenzie would make construction easier and avoid opening up fishing at the Travaillant Lake area. |
| Tsiigehtchic | community leaders | economic | The extension could present many benefits, including tourism and better priced goods. It would also help support the ferry system with more cars and longer shifts. |
| Tsiigehtchic | community leaders | biophysical | Protecting fishing areas around Travaillant Lake is a priority |

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| Tsiigehtchic | community leaders | biophysical | There is concern about the potential effects of spills on rivers. |
| Tsiigehtchic | community leaders | | The CN line could be a potential route for the road and the oil and gas pipeline |
| Tsiigehtchic | public | biophysical | Travaillant Lake area is swampy and would need lots of gravel to fill. Other routes would be more sensible. |
| Tsiigehtchic | public | | DOT should consider taking the highway west from Norman Wells or Fort Good Hope to reach the Dempster north of Eagle Plains instead of through the northern Mackenzie Valley. |
| Tsiigehtchic | public | socio-cultural | There are many significant archaeological sites in the Travaillant Lake area, heavily used by the Gwich'in for thousands of years. |
| Tsiigehtchic | public | biophysical | The Travaillant Lakes area contains many good fishing lakes. |
| Tsiigehtchic | community leaders | general | Proposed route is good until past Travaillant Lake, where the extension would be better connected to the Dempster close to Tsiigehtchic south of the Rengleng River. This would reduce the risk of spills near fishing lakes north of Travaillant lake. |
| Tsiigehtchic | public | general | If extension closes for two months a year at the Bear River, it would be less useful. To avoid closures, ferries should not be relied upon. Also avoid going south of the Mackenzie for this reason. |
| Tsiigehtchic | public | economic | Year-round road access to Yellowknife would be a major benefit. Tourism would bring about opportunities for employment (e.g. guiding). The control of access to Gwich'in lands also brings opportunities. |
| Tsiigehtchic | public | general | A slower community-based approach would give communities more time to prepare for the changes an extension would bring. |
| Tsiigehtchic | community leaders | general | A pipeline is more likely to arise along a highway extension than along an undeveloped route. Keeping the road south of the Travaillant Lake area could prevent a pipeline from being developed in sensitive fish habitat. |
| Tsiigehtchic | public | socio-cultural | The decision to have more tourists and traffic should be up to Tsiigehtchic. It could adversely affect the character of the community. |

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| Tsiigehtchic | community leaders | biophysical | The Travaillant Lake area is a very important and productive fishing area. |
| Tsiigehtchic | public | general | If freight can be transported via the Mackenzie highway, the Dempster has a greater chance of winter closure. |
| Tsiigehtchic | public | general | A 60km/h highway would be a driving hazard and should not be considered. |
| Tsiigehtchic | community leaders | general | The route north of the river might be worth supporting, but the community needs to think it through for themselves. |
| Tsiigehtchic | community leaders | general | Tsiigehtchic and Fort Good Hope people should meet to discuss the extension. |
| Tsiigehtchic | community leader | economic | We need to get people working and the highway will give them the opportunity to work. We should use our land claim money to help build it. |
| Tsiigehtchic | community leader | economic | People needs jobs but development has to happen properly. |
| Tsiigehtchic | public | general | We need to talk more in the community and with Fort Good Hope to decide which route should be used. |
| Tsiigehtchic | community leader | economic | Prices of commodities and the cost of getting to centres that have commodities adds to cost of living in the community. Might decrease if the highway went through the community. |
| Tsiigehtchic | community leader | socio-cultural | Increased population in Tsiigehtchic means we have to think about the basic needs of people. |
| Tulita | co-management body | biophysical | Increased hunting and fishing access would make resources harder to manage and lead to more harvesting pressure. |
| Tulita | public | economic | The extension could bring tourism benefits |
| Tulita | co-management body | economic | Tourism is a major part of the land use plan, a sustainable substitute for trapping. The extension would bring benefits of better tourist access |
| Tulita | government | economic | Tourism benefits could include taking tourists on side trips on rivers along the extension. |

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| Tulita | co-management body | general | The highway is needed. |
| Tulita | industry and business | general | When preparing the EIA, check Ikhil Pipeline EIA issues for applicability |
| Tulita | industry and business | economic | Long-term government commitment is needed, along with planning and consultation to maximize community benefits. |
| Tulita | industry and business | socio-cultural, economic | Construction over an 8-10 year period would give most social benefits. |
| Tulita | co-management body | socio-cultural | Ongoing consultation should occur throughout construction. |
| Tulita | co-management body | economic | There is a need for long-term jobs in Tulita after construction is finished. |
| Tulita | community leaders | economic | Secondary industry (e.g. tourism) will be a benefit that will outlast the construction |
| Tulita | co-management body | economic | The road will bring many positive economic benefits |
| Tulita | co-management body | socio-cultural | There is a need to plan and mitigate social problems that the road will bring. |
| Tulita | co-management body | biophysical | The Bluenose caribou herd does not use highway area much |
| Tulita | co-management body | socio-cultural | Community consultation is needed to mitigate impacts on heritage sites |

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| Tulita | co-management body | socio-cultural | Land claim agreements contain clauses that will help protect heritage sites |
| Tulita | co-management body | general | The Protected Area Strategy may influence highway alignment |
| Tulita | industry and business | socio-cultural | Trap lines and areas used by wildlife should be determined before detailed road design. |
| Tulita | government | socio-cultural | Ongoing consultations with elders should occur. Visit elders one on one because they don't always attend meetings. |
| Tulita | community leaders | economic | Start building from south to north at Wrigley. That would immediately extend the winter road season. |
| Tulita | community leaders | socio-cultural | Consultation and mitigation are needed for the social impacts that would arise. Training should be a major part of it. |
| Tulita | community leaders | general | Construction should start at southern end of road and extend north. |
| Tulita | co-management body | economic | There should be a plan to link financing of the extension with financing of tourism infrastructure |
| Tulita | industry and business | socio-cultural, economic | Adverse social impacts can be mitigated, and economic benefits of the extension would be major. |
| Tulita | co-management body | socio-cultural, economic | There is a need to plan in a way that links economic development with highway development. |
| Tulita | industry and business | socio-cultural | The social benefits of better access to education could be significant to Tulita. |
| Tulita | industry and business | biophysical, socio-cultural | When traditional knowledge work is done, consult on site specific experience along various sections of the route |
| Tulita | community leaders | biophysical, socio-cultural | There are concerns over increased access to lands by people from other areas |

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| Wrigley | community leaders | socio-cultural, economic | Community should be empowered to choose whether or not they want the road. |
| Wrigley | community leaders | general | Outstanding disputes with government and industry over lands and resources should be settled before development. |
| Wrigley | community leaders | socio-cultural, | Training and employment for youth would help to compensate Wrigley for impacts of the road. |
| Wrigley | community leaders | economic | Cost of living did not drop as predicted when Wrigley was connected to last highway, and will not drop this time. |
| Wrigley | community leaders | socio-cultural, economic | Tourism benefits could be major, but require planning at the community level. |
| Wrigley | community leaders | socio-cultural, economic | The economic and social benefits of the road should be planned to trickle down to the grass-roots level. |
| Wrigley | public | economic, socio-cultural | Construction should occur over a 10-15 year period, to maximize training and employment. |
| Wrigley | community leaders | general | There is concern over the lack of land claim agreement for Deh Cho. Treaties must be settled before development |
| Wrigley | community leaders | socio-cultural | The community wants training and employment from the road |
| Wrigley | community leaders | socio-cultural | Wrigley wants clear date for when construction will begin, and wants three years of preparation and training time. |
| Wrigley | community leaders | economic | Wrigley wants from $3-20 million for social and economic development before government builds the road |
| Wrigley | community leaders | economic | As beneficiaries, industry should provide funding for the road |
| Wrigley | community leaders | general | The community would like to own the highway camp and equipment, and to be the main player during highway construction |
| Wrigley | community leaders | general | The alignment of extension should not necessarily follow winter road route |
| Wrigley | community leaders | general | The last highway brought social problems and no economic benefit. Compensation is important this time. |

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| Wrigley | community leaders | biophysical | The road would increase outside access to traditional hunting grounds. Wrigley should be compensated for this. |
| Wrigley | community leaders | biophysical | The road itself is less of a problem to wildlife than the hunting it will cause. Hunting must be controlled. |
| Wrigley | public | socio-cultural | Year round access is not important to me. Drugs and alcohol are already in the community, but the extension may create jobs, which will benefit the community. |
| Wrigley | public | economic | An all-weather road will bring in more people and jobs, and help the community grow in both population and industry. Communities will benefit from the road. |
| Wrigley | public | socio-cultural, economic | The extension would help people in communities reach one another, would encourage tourism and employment, and would benefit small business. |
| Wrigley | public | general | Land claim negotiations will work themselves out, and should not prevent the highway. |
| Wrigley | community leaders | biophysical, socio-cultural | A highway extension tot he north of Wrigley will affect wildlife, cultural heritage sites, fish spawning and fish migration habitat. |
| Wrigley | community leaders | socio-cultural | Wrigley has enough social problems, and does not need the additional ones the extension would bring. |
| Wrigley | community leaders | | Wrigley is good as it is. It should be up to the community, not the government, to decide whether or not a highway extension is built to the north. |
| Wrigley | public | economic | There is concern over funding. |

# Appendix II Other Stakeholders Environmental Scoping Database

| Stakeholder | Organization | Stakeholder Category | Issue Category | Issue |
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| | | Government | wildlife | There may be a woodland caribou calving ground on the Bear River. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | Potential protected areas should be considered during routing. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | There is a noteworthy potential protection-worthy area near Little Chicago, southwest and west of Travaillant Lake. This was identified by the Gwich'in Land Use Planning Board, and proposed by the Heritage Board of Canada. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | There is a noteworthy potential protection-worthy area near the Lower Ramparts and Thunder River on the east side of the Mackenzie. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | This road may contribute cumulatively to impacts on the Bluenose herd. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | A highway extension should be community driven, with each community having a major say in the project. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | Woodland caribou should be studied as part of the assessment. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | Road design should avoid staging routes of migratory birds, such as the one near the Bear River. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | Streams and tributaries are important spawning areas, and require proper bridges and culverts. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | Grizzly are in the area, are classified as vulnerable, and cannot tolerate disturbance, displacement or stress. |
| Carpenter, Bill | WWF | NGO | parks and wilderness | The assessment should involve the technical experts of the Gwich'in and Sahtu co-management boards, and not just their executives. |

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| Carrierre, Suzanne | RWED | Government | birds | The effects of increased hunting access on waterfowl should be considered. |
| Carrierre, Suzanne | RWED | Government | birds | Ducks will continue to nest near the road. The vegetation surrounding wetlands should be protected during construction to encourage this. |
| Carrierre, Suzanne | RWED | Government | birds | The productivity of wetlands can change with influxes of nutrients associated with road construction. The proportion of dabbler ducks to diving ducks may change in response. |
| Carrierre, Suzanne | RWED | Government | birds | Scoters are under stress and possibly in decline. They are found in the extension area. |
| CPAWS | CPAWS | NGO | wildlife, fish | The effects of increased hunting and fishing access should be assessed. |
| CPAWS | CPAWS | NGO | birds | Bracket Lake is a major waterfowl staging area. |
| CPAWS | CPAWS | NGO | general | If access leads to more big game hunting, then the nature of tourism in the area would change. |
| CPAWS | CPAWS | NGO | parks and wilderness | It is essential that the design and routing of the extension does not preclude potential protection-worthy areas, including those that may be included in land use plans. |
| CPAWS | CPAWS | NGO | parks and wilderness | It is important to avoid the precedent of roads going through protected areas. |
| CPAWS | CPAWS | NGO | general | There has been little research in the project area, and shortages of background ecological data are likely to constrain impact prediction. |
| CPAWS | CPAWS | NGO | wildlife, birds, fish, vegetation | There is little information on endangered species in the project area. |

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| CPAWS | CPAWS | NGO | vegetation, habitat | The potential for the road to introduce alien invasive plant species should be looked at, both in terms of road users and reclamation and revegetation measures. |
| CPAWS | CPAWS | NGO | wilderness, fish, wildlife | The effects of increased recreational access to the interior of mountains by airplane from communities on the highway should be assessed. |
| CPAWS | CPAWS | NGO | fish, wildlife | Even without a side branch to Deline, access to Great Bear Lake would increase, and hunting and fishing pressures there would increase. |
| CPAWS | CPAWS | NGO | wildlife | Unlike park users, it is harder to manage the behaviour of road users (e.g. waste management) which could lead to more human-bear encounters. |
| CPAWS | CPAWS | NGO | birds, wildlife | Habitat fragmentation effects of the extension on upland breeding birds and wildlife could be significant. |
| CPAWS | CPAWS | NGO | wildlife | Impacts of construction on reptiles and amphibians should be studied. |
| CPAWS | CPAWS | NGO | birds | Peregrine information is not current, and past surveys may not be an adequate information base for assessment. |
| CPAWS | CPAWS | NGO | socio-economic | Current and potential camping areas should be considered during routing. |
| Ditz, Karen | DFO | Government | fish and aquatics | DFO's major concerns are water crossings and fishing pressures. |
| Ditz, Karen | DFO | Government | fish and aquatics | Minor water crossings can be culverted, but big crossings will need major bridge structures. |
| Ditz, Karen | DFO | Government | fish and aquatics | The footprints of bridge abutments should be kept minimal. To do this, bridge length should be based on long-term high water levels, to keep abutment structures away from riverbanks in most years. |

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| Ditz, Karen | DFO | Government | fish and aquatics | The effects of highway construction on fish spawning and migration habitat should be considered, and whether fish passage will be obstructed. This should be considered independently for each crossing. |
| Ditz, Karen | DFO | Government | fish and aquatics | Consider the number of crossings during bridge construction before the superstructure of the bridge is in place. |
| Ditz, Karen | DFO | Government | fish and aquatics | Are silt barriers adequate to control suspended sediment, or are silt fences needed? |
| Ditz, Karen | DFO | Government | fish and aquatics | Time the construction of each crossing to avoid sensitive times. Winter may be the best option. |
| Ditz, Karen | DFO | Government | fish and aquatics | Will silt fences, rip-rap, or a combination be needed after construction until vegetation is re-established on banks? |
| Ditz, Karen | DFO | Government | fish and aquatics | Will major crossings need barging of construction materials across rivers? |
| Ditz, Karen | DFO | Government | fish and aquatics | Assessment should determine if stockpiling areas would be needed for construction materials at major crossings. |
| Ditz, Karen | DFO | Government | fish and aquatics | Increased access will increase fishing pressures and could affect population structures, particularly in big lakes such as Great Bear Lake. This may require more management and new limits. |
| Ditz, Karen | DFO | Government | fish and aquatics | More current fish surveys are needed. |
| Halliwell, Doug | DOE | Government | fish and aquatics | Shallow oil and gas deposits could pollute surface waters if deposits are exposed by bridge construction. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | The project area is very important for migratory birds |

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| Kaye, Dave | Ducks Unlimited | NGO | birds | Linear developments such as a highway extension can interrupt hydrology between wetlands. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | The Ringling River complex between Travaillant Lake and the Dempster Highway is a perched basin of permafrost with a high density of wetlands that should be avoided. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | South of Fort Good Hope at the east end of the Chick Lake Area is a high density nesting area. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | Post-glacial lakebed habitat on the Mackenzie is very important for waterfowl breeding and staging. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | Avoid the Oscar Lake area, a very important waterfowl area. |
| Kaye, Dave | Ducks Unlimited | NGO | birds | Potential spills, dumping and pollution of wetlands and rivers are concerns. |
| LaTour, Paul | CWS | Government | birds | The major concern regarding waterfowl involves impacts on wetlands. The Mackenzie River area sees huge movement of birds seasonally, and its wetlands are very important staging and breeding areas. |
| LaTour, Paul | CWS | Government | birds | An EIA should break down forest types in the area to enable cumulative assessment of losses of specific habitat types. |
| LaTour, Paul | CWS | Government | birds | Old growth white spruce forest, which is associated with rivers, is particularly rare and important habitat for many migratory songbirds. The road should avoid any such stands. |
| LaTour, Paul | CWS | Government | birds | There is insufficient information about habitat specifications of many bird species. |
| LaTour, Paul | CWS | Government | wetlands | Potentially affected wetlands should be investigated in more detail than earlier studies (70s) have done. |

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| LaTour, Paul | CWS | Government | fish and water | State-of-the-art mitigations at stream crossings are necessary to avoid downstream effects on tributaries. |
| LaTour, Paul | CWS | Government | birds | The road should stay well back of the banks of the Mackenzie because geese and swans nest and stage on islands in the river. |
| LaTour, Paul | CWS | Government | birds | Comprehensive surveys of endangered species should be conducted throughout the area before route selection is finalized. |
| LaTour, Paul | CWS | Government | birds | Research on wood frog and boreal chorus frog should precede construction (in light of global frog losses). |
| LaTour, Paul | CWS | Government | birds | May is the most sensitive month for waterfowl, and activity should be minimized then. |
| LaTour, Paul | CWS | Government | birds | Anatom peregrine and rough-legged hawk are significant raptor concerns. |
| LaTour, Paul | CWS | Government | birds | Potential effects on woodland caribou should be considered. |
| LaTour, Paul | CWS | Government | birds | The route should avoid the entire area around Bracket to Kelly Lakes, because this is a major waterfowl staging area. |
| LaTour, Paul | CWS | Government | birds | If the route avoids wetlands, construction should pose no problem to waterfowl, provided also that there is little aircraft activity. |
| Lowe, George | DFO | Government | fish and aquatics | A permanent road may involve less ongoing disruption of fish habitat than the winter road, which requires work twice yearly. |
| Lowe, George | DFO | Government | fish and aquatics | Impacts of an extension would likely be similar to those of the Ft. Simpson to Wrigley development. |

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| Lowe, George | DFO | Government | fish and aquatics | The Trout River has not experienced increase in fishing activities that are significant to fish stocks since the highway made it accessible. |
| Lowe, George | DFO | Government | fish and aquatics | Management measures could address many of the problems associated with increased fishing access to rivers. |
| Lowe, George | DFO | Government | fish and aquatics | Fishing pressures are more likely to come from nearby communities within the region than from visitors from outside the region. |
| Lowe, George | DFO | Government | fish and aquatics | Crossings are the most important fisheries consideration. They should be located downstream of spawning habitat. |
| Lowe, George | DFO | Government | fish and aquatics | Increased management could mitigate many of the issues associated with increased fishing pressure. |
| Lowe, George | DFO | Government | fish and aquatics | It would be a socio-economic benefit to increase access to Aboriginal food fisheries and small scale commercial enterprises. |
| Lowe, George | DFO | Government | fish and aquatics | Spill management plans for highway operation and proper storage of contaminants during construction would be needed. |
| Lowe, George | DFO | Government | fish and aquatics | Bridges are generally better for fish than culverts. Culverts are often ineffective because of flow volumes and placement problems. They also need more maintenance. Culverts should be over-sized. |
| Lowe, George | DFO | Government | fish and aquatics | There is tremendous diversity in the types of streams entering the Mackenzie in the area. |

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| Lowe, George | DFO | Government | fish and aquatics | Cumulative impact on smaller streams may be more important than major crossings- more diversity, richness and fish numbers. These are very important to prey species for food fish. |
| Lowe, George | DFO | Government | fish and aquatics | Bull trout is a rare species, occurring from Tulita south. This is the edge of its range. |
| Malick, Steven (Enbridge) | | Government | permafrost | Removing trees through the right-of-way could increase the amount of permafrost thaw. |
| Matthews, Steve | RWED | Government | general | consult past environmental assessments, such as the road up to Wrigley and the Norman Wells pipeline. |
| Matthews, Steve | RWED | Government | wildlife, fish and aquatics | The extension would increase harvesting access, and trapping, fishing and hunting pressures along the route would rise. There are many examples of the effects of increased fishing pressure resulting from access in Alberta. |
| Matthews, Steve | RWED | Government | wildlife | Much wildlife moves from uplands to lowlands, perpendicular to the river, and this road would intersect these movements. When people see tracks at the road, they follow them by snowmobile and hunt. |
| Matthews, Steve | RWED | Government | birds | Peregrine (threatened) and other raptors may be affected by access to habitat. |
| Matthews, Steve | RWED | Government | birds | Peregrine nesting habitat ranges from inaccessible cliffs to mud banks. Poachers have stolen young in this area before, and increased access would likely result in more poaching. |
| Matthews, Steve | RWED | Government | birds | Many peregrine nesting sites are known, and would be best avoided by 5km. If this is not feasible, then seasonal activity restrictions (e.g. overflight restrictions) are the next best option. |

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| Matthews, Steve | RWED | Government | birds | Mitigation measures should be tailored to each raptor nest site- based on specific details (e.g. height, aspect, etc…). |
| Matthews, Steve | RWED | Government | wildlife | There are many bears in the area, and the potential for commercial poaching for gall bladders may be high. |
| Matthews, Steve | RWED | Government | wildlife | Grizzly is listed as a vulnerable species, and may occur in the area of the extension. |
| Matthews, Steve | RWED | Government | wildlife | Bear-human conflict will increase as use of area increases (construction camps, tourism developments). Killing problem bears could significantly reduce the bear population. (4 comments) |
| Matthews, Steve | RWED | Government | granular resources, wildlife | The impacts of granular resource extraction should be studied. Are there natural stores? Are they important habitat? What effect would blasting and crushing have on wildlife in areas without natural gravel sources? |
| Matthews, Steve | RWED | Government | birds | Snow geese nest on the artificial islands around Norman Wells. |
| Matthews, Steve | RWED | Government | vegetation | Potential impacts of introducing invasive species should be considered. |
| Matthews, Steve | RWED | Government | permafrost | Permafrost effects should bear in mind the effects of global warming and of fire reducing insulating forest cover. |
| Matthews, Steve | RWED | Government | vegetation, wildlife | Habitat assessment is needed for areas that may be developed. |
| Matthews, Steve | RWED | Government | parks and wilderness | The benefits and costs of increased tourism should be considered, including the effects of increased backcountry use on wilderness. |
| Matthews, Steve | RWED | Government | wildlife | Very little is known about bears, moose or woodland caribou in the project area. |

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| Matthews, Steve | RWED | Government | wildlife | Increased access to trapping areas might dilute the effects of trapping. |
| Matthews, Steve | RWED | Government | fish and aquatics | Aquatic concerns include crossings, stream habitat, over-wintering habitat and fishing pressures. |
| Mulders, Robert | RWED | Government | wildlife | Both grizzly and wolverine are categorized as vulnerable and are found in the project area. |
| Mulders, Robert | RWED | Government | wildlife | Increased hunting access is a wildlife issue. |
| Mulders, Robert | RWED | Government | wildlife | Vehicle collisions with wildlife should be considered. |
| Mulders, Robert | RWED | Government | wildlife | Over the long term, and depending on the intensity of traffic, the road could act as a barrier to wildlife movements and produce fragmentation effects. |
| Mulders, Robert | RWED | Government | wildlife | The effects of road construction on denning habitat should be assessed. |
| Nagy, John | RWED | Government | wildlife | Intrusion of the extension on the range of the Bluenose herd should be a major issue. The herd seldom crosses the Mackenzie, and the closer the extension is to the river, the less intrusive it would be. |
| Nagy, John | RWED | Government | wildlife | The potentially affected subgroup of the Bluenose Herd calves around Tuktu Nogait and winters around Fort Good Hope and Colville Lake. |
| Nagy, John | RWED | Government | wildlife | Woodland caribou range as far north as Tsiigehtchic. |
| Nagy, John | RWED | Government | wildlife | Numbers and ranges of both black and grizzly bears in the area are unknown. |
| Nagy, John | RWED | Government | wildlife | More caribou hunting will lead to more gut piles, which will attract more bears. |
| Nagy, John | RWED | Government | wildlife | Key moose winter ranges need to be identified. |

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| Nagy, John | RWED | Government | wildlife | There are few wolverine in the northern part of the route. |
| Nagy, John | RWED | Government | wildlife | Increased poaching (both opportunistic harvest and commercial) of ungulates, bears and furbearers will be a problem and require increased patrols. |
| Nagy, John | RWED | Government | wildlife | A Bluenose web site will be published in June. IPL overflights have been conducting regular wildlife observation and could be an information source for the assessment. |
| O'Brien, Chris | Ecology North | NGO | general | All needs for maintaining ecological integrity must be understood before development (both existing conditions and ecosystem functioning) if assessment is to be meaningful. |
| O'Brien, Chris | Ecology North | NGO | general | Studies of local ecology at all trophic levels may be required. |
| O'Brien, Chris | Ecology North | NGO | fish and aquatics | Each stream that needs crossing should be studied in detail. |
| O'Brien, Chris | Ecology North | NGO | fish and aquatics | The cumulative effect of many small stream crossings should be considered. |
| O'Brien, Chris | Ecology North | NGO | general | The impacts of tourism could be significant. |
| Paul Latour | CWS | Government | wetlands | There is little information on the distribution of wetlands throughout the project area. |
| Richard Popko | RWED | Government | wildlife | With regeneration from recent fires, the stage is now set for a major moose population increase over the next 5-20 years. |
| Richard Popko | RWED | Government | wildlife | Moose have low overall density in the area, but some particular spots are crucial for winter concentrations. Extension must avoid these areas. |

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| Richard Popko | RWED | Government | wildlife | Although moose population should be rising, harvesting pressure is probably what is keeping the population low. Increased road access could radically increase this pressure. |
| Richard Popko | RWED | Government | wildlife | Little info is available about moose outside of three study blocks. Also, Sahtu harvest study is about 2 years from producing results. |
| Richard Popko | RWED | Government | wildlife | Road design should consider line of sight to avoid collisions with moose. |
| Richard Popko | RWED | Government | wildlife | No denning habitat knowledge exists for wolves and wolverine in the area. |
| Richard Popko | RWED | Government | wildlife | Wolves from the arctic are unlikely to enter project area, but resident wolves hunt moose and may be affected by an extension. |
| Richard Popko | RWED | Government | wildlife | If marten fur prices rise again, increased trapping access would be an issue. At present, trap lines radiate like spokes from communities, but would probably come directly off the extension. (2 comments) |
| Richard Popko | RWED | Government | wildlife | Poaching of large mammals would increase with access-ungulates for food, bear gall bladders, fur (depending on fur markets). More opportunistic poaching could result from more access and encounters. (3 comments) |
| Richard Popko | RWED | Government | wildlife | Regional GIS maps give good record of fire history, which may be useful for the assessment. |
| Richard Popko | RWED | Government | wildlife | The area around the highway extension has a history of bear problems. |
| Richard Popko | RWED | Government | wildlife | Waste must be managed along the route to avoid attracting bears. This includes the garbage of highway users and construction crews. (4 comments) |

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| Richard Popko | RWED | Government | wildlife | Electrified fencing should be considered for camps. |
| Richard Popko | RWED | Government | wildlife | The Bluenose herd may be two or three genetically distinct groups, and impacts from a road would be focussed on the west group. |
| Richard Popko | RWED | Government | wildlife | Increased caribou hunting will lead to increased subsistence use, and will bring in people from other communities within the region to the Deline area. |
| Richard Popko | RWED | Government | wildlife | Hunting access, trespassing and private land conflicts will be more frequent with development of the extension. |
| Richard Popko | RWED | Government | wildlife | Even if no extension goes to Deline, more people from other communities will use the winter road to Deline for hunting access if there is an all-weather road to Tulita. |
| Richard Popko | RWED | Government | wildlife | Woodland caribou are in small groups, making them more susceptible to over-hunting. Extension goes through their range. |
| Richard Popko | RWED | Government | wildlife | Public safety on roads during hunting season is an issue, and a no-shooting zone along roads may be necessary. |
| Richard Popko | RWED | Government | wildlife | There is little known about woodland caribou populations, range, movements, habitat preferences, calving grounds or rutting areas. (There may be a major calving ground on the Bear River). (2 comments) |
| Richard Popko | RWED | Government | wildlife | Moose are the major subsistence species around Tulita, Norman Wells and Fort Good Hope. |
| Richard Popko | RWED | Government | wildlife | Willow areas along the Mackenzie River are particularly good moose habitat |
| Rivard, Paul | RWED | Government | fire | A highway extension would help to stop or control many fires, and could add protection for gas developments. |
| Rivard, Paul | RWED | Government | fire | More camps will lead to more frequent fires. |

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| Rivard, Paul | RWED | Government | fire | Even once a roadway is constructed, barging may be cheaper than road transport for oil companies. |
| Rivard, Paul | RWED | Government | fire | The extension would improve access to commercial timber, but most harvesting is done in winter, and there is a winter road already. |
| Rivard, Paul | RWED | Government | fire | Better access would likley increase backountry use of the Canol Trail. |
| Rivard, Paul | RWED | Government | fire | Wider road shoulders would prevent more fires. |
| Robinson, Juanita | RWED | Government | socio-cultural | Community quality of life changes such as changes in recreational and traditional land use as workers are not available to participate in community traditional events. |
| Robinson, Juanita | RWED | Government | economic | Increased demand on physical and service infrastructure from in-migration to communities from better access. |
| Robinson, Juanita | RWED | Government | socio-cultural | Change to community cohesiveness and homogeneity due to workers leaving the community to build the road and a decrease in use of traditional language. |
| Robinson, Juanita | RWED | Government | socio-cultural | Health issues, such as STDs and unwanted pregnancies, resulting from contact with largely young male construction crews, may be concerns of some communities. |
| Robinson, Juanita | RWED | Government | socio-cultural | Adaptation stresses may result in family violence, drug and alcohol use, marriage breakdown, child neglect and other social effects |
| Sparling, Jim | RWED | Government | vegetation | Dusting along the corridor could have an effect on plants within 100m, killing lichen, changing species composition and affecting habitat value of that area. |
| Sparling, Jim | RWED | Government | dust | By changing albedo (reflectivity) dust will melt snow around the highway faster, causing earlier plant growth. |

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| Sparling, Jim | RWED | Government | dust | Dust control measures must be suitable, and should depend on emission factors for the particle size of dust expected (based on the type of gravel). |
| Sparling, Jim | RWED | Government | wildlife | Calcium chloride is used as a dust suppressant, and is also an attractant for wildlife. This may increase the risk of collisions, and also increase hunting access. |
| Sparling, Jim | RWED | Government | atmosphere | The effect of the road on climate change should be considered in terms of changes to greenhouse gas emissions that will result from the project, both by road users and as compared to current transportation alternatives. |
| Sparling, Jim | RWED | Government | atmosphere | The effect of climate change on the road should be considered, in terms of warming trends and permafrost. The road should be engineered for a suitably broad range of climatic variability. |
| Traynor, Steven | DIAND | Government | granular resources | An EIA for the extension should consider the effects of borrow pits for gravel, and provide mitigation measures for their recontouring, stabilization and reclamation. |
| Traynor, Steven | DIAND | Government | atmosphere | Dust control measures should be available for use on an "if needed" basis. |
| Traynor, Steven | DIAND | Government | granular resources, heritage resources | If eskers are used, heritage cultural resources should first be evaluated. |
| Traynor, Steven | DIAND | Government | granular resources | The existing gravel pits should be re-evaluated in terms of available resources. |
| Traynor, Steven | DIAND | Government | granular resources | Closer to Inuvik it will be more necessary to quarry and blast rock to make gravel. |

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| Traynor, Steven | DIAND | Government | permafrost | Permafrost will require a two meter base to prevent thawing and slumping of the ice-rich layer. Regular compaction of the layer during construction will help, but the frequency of this will vary seasonally. |
| Traynor, Steven | DIAND | Government | permafrost | The potential for gullies as a result of permafrost disturbance should be considered and mitigated. |
| Traynor, Steven | DIAND | Government | permafrost | The project design should incorporate a broad range of temperature parameters to anticipate effects of possible global warming on permafrost. |

# Appendix III Traditional Knowledge Report

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# Traditional Knowledge Baseline Information Report On the Mackenzie Valley Highway Extension

## Prepared by:

**Traditional Knowledge Program**
**Dene Cultural Institute**
**Yellowknife, NWT**

## For:

**GeoNorth and Golder Associates**
**Yellowknife, NWT**

**Date: September 16, 1999**

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# 1. BACKGROUND AND INTRODUCTION

The Department of Transportation (DOT) of the Government of the Northwest Territories (GNWT) awarded a contract to GeoNorth Limited and Golder Associates to conduct an Environmental Scoping and Data Collection Study for the proposed Mackenzie Valley highway extension. With this in mind, GeoNorth Limited contracted the services of the Dene Cultural Institute (DCI) to carry out a Traditional Knowledge (TK) scoping exercise for the gathering of baseline information from individuals living in the area of the proposed Mackenzie Valley highway extension route.

Political leaders from each region identified the preferred organization in each community for consultation regarding the Study. GeoNorth Limited then negotiated a small contract with each community organization to cover the costs of the public meeting and TK interviews with elders. Through this process each community organization selected their own community liaison worker and identified the elders to be interviewed.

Prior to the start of gathering information, a training session for Community Liaison workers was held in Wrigley, NWT. The TK Research Director of the DCI prepared a training interview guide for the Community Liaison workers to use during the gathering of information. This package included instruction on interviewing techniques, guidelines to conducting ethical research and a prior consent authorisation form. The training package included a map of the proposed highway extension and an information newsletter as a way of informing the public about the proposed Mackenzie Valley highway extension.

With the conclusion of the training session, community liaison workers began the TK scoping sessions on a one-to-one basis. Contacts were made and individuals who participated did so voluntarily, and they began to speak about issues and concerns on the proposed extension of the Mackenzie Valley highway.

# 2. PURPOSE

The purpose of the environmental scoping was to identify Traditional Knowledge (TK) issues and concerns related to the proposed extension of the Mackenzie Valley highway from people who are and have lived along the proposed highway extension route. This information is intended to aid departmental officials of the DOT in their decision-making process.

# 3. TK SCOPING RESULTS

A total of twenty-one (21) individuals from seven (7) communities (Colville Lake, Tsiigehtchic, Inuvik, Ft. Good Hope, Wrigley, Tulita, Norman Wells) along the proposed Mackenzie Valley highway extension route participated in the TK scoping exercise. Participant's ages ranged from fifty-three (53) years to plus eighty (+80) years. Some chose not to respond to specific questions because either they did not have enough information and/or they did not have sufficient understanding of the highway extension plan to respond. The interviews from Tulita were misplaced, and not received by GeoNorth or DCI, so results could not be included in this report. The many elders who attended the public meeting in Deline firmly stated that their message had been delivered at the meeting, and that they did not want the community liaison worker to conduct further TK interviews.

The TK scoping issues and concerns are summarised and categorised according to the responses received in regards to the proposed Mackenzie Valley highway extension, as follows:

## 3.1 TRANSPORTATION OF GOODS

- 6 participants indicated that the highway extension would be good for the people and communities because the cost of transporting and buying goods would be less.
- 6 participants indicated that it would be cheaper to travel by road, which might reduce airfares.

## 3.2 COST OF DOING BUSINESS

- No comments received.

## 3.3 EMPLOYMENT & TRAINING

- 2 Elders remember past pipeline and highway extensions and the problems associated with that development. Once the project was completed, most of the jobs that remained were given to people not living in the North. Community people were out of jobs and left out of long-term employment opportunities.
- Most of the Elders who participated are concerned about the jobs that will remain when the highway is complete. They indicated that employment during construction would be very good for the people, however, they are concerned about the effects this may have on future generations.
- 2 participants appear to be very concerned about the people and the communities when the extension is complete. Who will have jobs when the extension is complete? What will happen when people no longer have any money?
- 4 Elders who participated want to know what employment and training opportunities will come from the proposed highway extension? Elders are not just looking at short-term but long-term employment and training opportunities so that community peoples will have something to fall back on once the extension is complete.
- 2 Elders are concerned that the unskilled may be left out, and want to know what can be done to help community people who lack the training and education but want to work on the highway extension.

## 3.4 ACCESSIBILITY

- 5 participants indicated that the highway would offer better access to communities. They felt that opening up access would allow more people to visit each other and meet more often for spiritual gatherings.
- 3 elders indicated that by having road access this might help community people to get back to the land and continue to practice traditional ways of living.

- 5 participants indicated that with the extension of the highway, there would be an increase in highway accidents and deaths.
- 1 participant is concerned for the safety of the youth, especially when you here news from the south about disappearances and kidnappings.

## 3.5 MONEY AND JOBS FROM TOURISM

- 2 participants felt that there would be an increase in money in the communities, however, from past experiences once projects were completed, the money and jobs were gone.
- 3 participants felt things should stay as they are, and do not trust any development that will have a negative impact on people and communities

## 3.6 BRING PEOPLE TOGETHER

- 3 elders said that the highway extension would bring communities together.
- 3 participants felt that the highway extension would help younger people get back to the land to learn and continue to practice traditional ways of living off the land.

## 3.7 TRADITIONAL LIFE

- 3 participants indicated they did not agree with the project, and felt that the highway extension would have a negative impact on the people and communities. The highway extension would affect the practices of living a traditional way of life.
- 3 participants are afraid that the traditional way of teaching and passing knowledge from generation to generation will be destroyed if the highway is extended. Their ancestors did not have to write this knowledge on paper because they shared through teachings, stories and practices. This way of life could be destroyed.
- Most of the participants are concerned that more people will travel out of the communities more frequently and this will lead to a loss of their culture and language.

- 3 participants said that they are concerned about the increase in traffic and what long-term effect this will have on communities and people.

## 3.8 SUBSTANCE ABUSE

- 5 participants are concerned that with the highway extension there would be an increase in drug and alcohol usage in the communities.
- Elders are concerned that an increase in drugs and alcohol will lead to an increase in crime, family problems and highway accidents.

## 3.9 ENVIRONMENTAL IMPACTS

- 8 participants are concerned about the environmental effects that the highway extension will have on the fish, caribou, land and the people.
- 4 Elders did not feel that the highway extension would have much impact on the caribou as indicated from past experience with the Dempster highway.
- Some of the participants felt that an increase in traffic would increase the garbage on the roads and in the rivers, and question the long-term effects that this will have on people.

## 3.10 TRADITIONAL BURIAL SITES

- 3 elders said they are concerned about the highway extension route because gravesites of their people are in the area of the road development.

## 3.11 COMMUNITY CONSULTATION

- A few of the participants indicated that they lacked trust about this project based on past development.
- 4 participants indicated that further discussion is required amongst the leaders, community people and Elders before any highway extension is approved.
- 3 participants want to discuss alternate expansion routes other than what is proposed.

- 1 participant said that an issue like this highway expansion should be talked about before all the planning is complete.

# 4. APPENDICES:

# Appendix IV Using ProCite

## A1.1 Use of ProCite

The reference database was developed using ProCite software. In ProCite, the database file (named MVRoad.pdt) can be searched for any word or phrase contained in a record.

Each record in the database has 45 fields (Appendix III). However, not all of the fields are used for each record. Which fields are filled out depends upon the parent database from which the reference came. Also, as some parent databases were entered in capital letters, references that came from those databases are capitalized.

The database can also be searched for any of the three disciplines (socio-economic, historical/cultural, biophysical), and searched or sorted according to the relevance of the reference (high, medium, low, indeterminate). The discipline designations appear in the "(45) Keywords" field. The relevance ranking for each record can be found in the "(37) Availability" field in each record and appears as one of the columns in the main window. Records have also been assigned to a relevance group so that each group can be viewed or searched separately.

The most common database tasks that could be employed by the user are described in the remainder of this section.

### *A1.1.1 Viewing*

To change the font in the main window:

- go to View; Configure Record List, and then under Layout, choose the font and click OK.

To move quickly through the database:

- use the scroll bar on the right hand side; clicking below the box in the scroll bar will move the records down one page.

To view the details of a particular record:

- double-click on the record;
- close the record by clicking on the ✕ in the top right corner;
- while in the view record format, you can move between consecutive records by clicking on the arrows on the toolbar at the top;
  ( |◂ = go to first record; ◂ = go to previous record; ▸ = go to next record; ▸| = go to last record).

To view records by relevance ranking either:

- sort by clicking on the Relevance column header (see Sorting); or,
- go to the drop down menu called Show in the upper left corner, click on Groups, then click on any of four groups (high, medium, low, indeterminate); to go back to all records, choose All Records.

To change the fields which are viewed in the main window:

- go to View, Configure Record List, and then, under Layout, choose the fields to view (up to six) and assign any column headers you like.

To adjust column widths:

- place the cursor on the division between the two headers, hold down the mouse button and drag in either direction.

### *A1.1.2 Sorting*

- references can be sorted simply by clicking on the column heading in the main window. The first click sorts by ascending order according to the column heading. Click again on the same column heading, and the database will be sorted in descending order.

### *A1.1.3 Searching:*

- references can be searched for any word contained in the record or within a particular field.

To search for a word or phrase:

- go to Select on the toolbar and click on Search.

To search the entire record:

- type in any word or phrase in the Search for window.

To search for a phrase:

- enclose the phrase in quotes (i.e. “search phrase”).

To search particular fields:

- click on the Fields button and click on one of the options; then add an operator (from the Operator button) and type in the search word or phrase.
- additional searches can be confined to assigned groups or previous searches – go to the drop down menu called Look in; choose and click on the Search button again.

### *A1.1.4 Marking Records:*

To choose particular references to be printed, saved or exported, mark or unmark records as below:

- click on the record and then on the box on the left;
- to mark or unmark all records: go to Edit; Select All; then Select, Mark Highlighted Records or Unmark Highlighted Records;
- in both the above cases, you can use the buttons on the toolbar at the top (e.g. ☒).

### *A1.1.5 Printing Records:*

- the entire database or selected records can be printed or saved in bibliographic format.

To print:

- go to File, Print Bibliography; then to print all records as is, click on the Print button.

To change the output style:

- go to the Output Style drop down menu and choose one of the options; the changes will automatically appear on screen.

To print only selected records or groups:

- go to the Show drop down menu and choose one of the options.

NOTE: printing the bibliography directly from ProCite is restricted to the fonts within the database: to print in a consistent font, save the bibliography (click on the Save button, choose a directory and name, and save); if you use WordPerfect, you can save in the WordPerfect format. If you use Word, save in *.rtf format then open in Word. Go to Edit, Select All and choose your font.

# Appendix V List of Electronic Databases

Data can also be found in electronic databases available through the (a) federal and (b) territorial (GNWT) governments. The following tables summarize the name, content, location and relevance of these databases.

*a) Federal Government*

| Name of dataset | Primary purpose | Description | Contact | Notes | Relevance |
|---|---|---|---|---|---|
| HYDAT Water Survey, 1996 | To record surface water and sediment data for Canadian sites; 1900 to 1996 for most stations | Database contains daily, monthly, and/or instantaneous information for streamflow, water level, suspended sediment concentration, sediment particle size, and sediment load data for over 2900 active stations and some 5100 discontinued sites across Canada | Environment Canada; Climate Information Branch of the Atmospheric Environment Service | CD-Rom available; interim release of the 1996 HYDAT CD-ROM (version 96-1.04 Interim); final version was due in fall 1998 | High |
| | | | | | |
| Canadian Monthly Climate Data and 1961-1990 Normals; 1994 | To record climate data for Canadian sites | Data from over 6900 observing sites across Canada. The values are monthly averages for each month in which a complete set of observations is available, as well as the 1961-90 Canadian Climate Normals. Normals are average values calculated for this thirty-year period for stations with at least twenty years of records in 1961-1990 period. There are up to 134 different climate parameters for each site, depending on its observing program. | Environment Canada | CD-Rom comes with software; converts data for use with spreadsheets, text editors or other software; runs on MS-DOS or compatible systems | Medium |
| | | | | | |
| Canadian Daily Climate Data; 1996 | To record climate data for Canadian sites | Data from over 6900 observing sites across Canada. There are up to 134 different climate parameters for each site, depending on its observing program. | Environment Canada | CD-Rom comes with software; converts data for use with spreadsheets, text editors or other software; runs on MS-DOS or compatible systems | High |
| | | | | | |
| Envirodat Data Archive | National Environmental database system for storing, updating and retrieval of information | The information is collected from a variety of environmental monitoring projects carried out by federal, provincial, and other government and non-government organizations. Much of the historical information stored in the database comes from a predecessor, NAQUADAT, the previous National Water Quality Database, which contains mostly water quality data. Whereas more recent information comes from a wider variety of environmental media including biota, air, soil etc. | Alain Caillet; Environment Canada; Climate and Water Information Branch (CWIB) maintains and updates the software | Envirodat database is still at its developmental stage and is not ready to handle data retrieval requests, however the system is ready for assigning and distribution of new codes used in the ENVIRODAT system | Low |

| Name of dataset | Primary purpose | Description | Contact | Notes | Relevance |
|---|---|---|---|---|---|
| | | | | | |
| National Climate Data Archive of Canada | To record climate data for Canadian site | Archive contains official records of weather (and some related) observations in Canada dating back as far as 1839 for the earliest observations. Readings each hour of temperature; humidity; wind speed and direction; atmospheric pressure; cloud types, amounts, and heights; and occurrence of rain, snow, thunderstorms, and other types of weather have been observed mainly at airports (up to 800 locations). These observations are taken and used in real time (right away) mainly in support of aviation and weather forecasting operations. Volunteer climate observers record daily temperature and precipitation (include people observing in their backyard, and participating volunteer agencies such as hydro utilities, universities, and agricultural research sites). The National Climate Archive contains once or twice-daily observations of maximum and minimum temperature, and rainfall and snowfall amounts for almost 10,000 locations in Canada. | Environment Canada | OracleTM database Some of these records exist on paper, microfilm and microfiche, but the vast majority are stored in digital, computer database files | Low |
| | | | | | |
| Wellsite and seismic line locations | | Record of all wellsite and seismic line locations | National Energy Board<br>444 Seventh Avenue S.W. Calgary Alberta T2P 0X8<br>Phone: (403) 292-4800 Telecopier: (403) 292-5503 | | High |
| | | | | | |

## *b) Territorial (GNWT): Departments and Agencies*

| **Information, Program Tracking Systems and Analytical Reports** | | | | | | |
|---|---|---|---|---|---|---|
| Name of Dataset or Report | Primary purpose of dataset or Report | Description | Location | Type of dataset /<br><br>Frequency of collection | Restriction to Access:<br><br>Confidentiality<br>Control of data<br>Conditions of use | Relevance |
| **Environmental Protection** | | | | | | |
| NWT Ambient Air Quality Database | To archive information and analyze trends on ambient air quality data collected by RWED | Database of ambient air quality data collected at various locations (Yellowknife, Iqaluit, Snare Rapids, Daring Lake and Nanisivik) including sulphur dioxide, dust (TSP), arsenic, lead, nitrate, sulphate, acidic precipitation and ground level ozone | Environmental Protection Service - RWED | Micro-based Quattro-Pro system<br><br>Period of data – 1977 to present | Tabulation available from RWED, no external electronic access | Low |
| **Forest Management** | | | | | | |
| Seasonal Forest Fire Weather | Support forest management operations | data base written in WeatherPro file format exportable to several common formats Department fire weather stations | RWED-Forest Management | PC<br><br>Ad Hoc, Continuos | Standard only. | Low |
| AES meteorological Information Service (airport and automatic wx data) | Support forest management operations | data base written in a weird file format<br>AES weather stations - copyrighted | RWED-Forest Management | PC<br>Ad Hoc, Continuous | Restricted to use by RWED only, under an agreement with AES. | Low |
| AccuWeather (Charts, Satellite Images, Station and upper air data) | Support forest management operations | Graphics and text files<br>Contract purchase - copyrighted | RWED-Forest Management | PC<br>Ad Hoc, Continuous | Restricted to use by RWED (re-broadcast) | Low |
| Forest Fire History | Support forest management operations | ARC/INFO file formats;<br>Attributes are in data base file format<br>Department data gathering | RWED-Forest Management | PC<br>Ad Hoc, Seasonally | Standard only. | Low |
| Values-at-Risk | Support forest management operations | Data Base, maps, and, photographs<br>Department data gathering and private information supplied by owners | RWED-Forest Management and Regions | Mainframe – Data<br>PC – Graphics<br>Maps, Photos | Some of this data may be classed as exceptions to disclosure | Medium |
| TM LANDSAT Vegetation Maps | Support forest management operations | ARC/INFO file formats<br>Landsat data modified by Department data management systems | RWED-Forest Management Hay River, Fort Smith, and Regions | PC<br>Ad Hoc, Continuous | Standard only. | High |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Information, Program Tracking Systems and Analytical Reports** | | | | | | |
| Forest Inventory Data | Support forest management planning and economic development | Private databases and hard copies – summaries are provided in National reporting systems<br>Gathered under Departmental survey | RWED-Forest Management Hay River, Fort Smith, and Regions | PC<br>Ad Hoc, Continuous | May require restriction – some agencies classify as private information | High |
| **Parks and Tourism** | | | | | | |
| TOEAD –<br>Tourism Operator & Establishment Database | List of tourist operators and establishments operating in the western NWT. | Database of operator name; company name; address, phone, fax, e-mail; business location; type of operation; major/minor products and/or services provided; license information. | RWED<br>Parks & Tourism | Micro-based, Microsoft Access system<br><br>Continuous collection and updating | Most of the information is publicly available – although the actual company name or number and license information may not be. | High |
| **Wildlife and Fisheries** | | | | | | |
| Raptor (Banding) | Datasets details banding and other information related to NWT raptors | Fields include banding number, sex, species, community and date of capture. | DW Hartt (Chris Shank)<br>Wildlife and Fisheries | PC, Access 97, ad hoc | Contains confidential raptor site data; released by Director, Wildlife and Fisheries | High |
| Raptor<br>(Descal) | Dataset details raptor site descriptions and detailed location fields | Fields include site number and description, longitude, latitude, utm and date of visitation. | DW Hartt (Chris Shank)<br>Wildlife and Fisheries | PC, Access 97, ad hoc | Contains confidential raptor site data; released by Director, Wildlife and Fisheries | Medium |
| Raptor<br>(Visit totals) | Dataset details | Fields include site number, community observer, species, egg totals and date of visitation. | DW Hartt (Chris Shank)<br>Wildlife and Fisheries | PC, Access 97, ad hoc | Contains confidential raptor site data; released by Director, Wildlife and Fisheries | Medium |
| NWT Fur Harvest Returns. | To provide NWT fur harvest reports. | NWT fur sale prices and quantities are tracked by community, region, NWT total, Year, number of trappers, for 14 species | Within department. | PC/Excel 97/ Access 97<br>Annual collection in Sept./Oct. | Confidential as per individual harvesters names. | High |
| Land Use Activity | To maintain current records of land use activities for environmental assessment | Database of land use permits, land leases and misc land uses. | Wildlife and Fisheries | PC, Continuous collection | Reports and tabulations available | High |
| Grizzly Bear Harvest | To maintain current records of grizzly bear harvests | Database of grizzly bears harvested. | Wildlife and Fisheries | PC, Continuous collection | Access restricted as contains hunters personal information | Low |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Information, Program Tracking Systems and Analytical Reports** | | | | | | |
| Wildlife Diseases | To maintain current records of reports of diseases in wildlife | Database of reported disease cases and diagnoses. | Wildlife and Fisheries | PC, Continuous collection | Tabulations available within published reports | Low |
| Small mammal abundance | To maintain current records of small mammal surveys | Database of numbers and species captured during annual small mammal surveys | Wildlife and Fisheries | PC, Annual | Tabulations available within published reports | Medium |
| Hare turd counts | To maintain current records of hare abundance | Database of relative abundance of hares based on counts of fecal pellets | Wildlife and Fisheries | PC, Annual | Tabulations available within published reports | Medium |
| Caribou carcass composition | To maintain records of caribou carcass measurements | Database of anatomical and physiological measurements taken from harvested caribou | Wildlife and Fisheries | PC, Ad hoc | Tabulations available within published reports | Low |
| Wolverine carcass composition | To maintain records of wolverine carcass measurements that are used for harvest assessment. | Database of age, sex, anatomical and physiological measurements taken from harvested wolverine. | Wildlife and Fisheries | PC, Continuous collection | Tabulations available within published reports | Low |
| Furbearer carcass composition | To maintain records of furbearer carcass measurements that are used for harvest assessment. | Database of age, sex, and measurement taken from harvested lynx and marten | Wildlife and Fisheries | PC, Continuous collection | Tabulations available within published reports | Low |
| ITEX | To maintain current records of phenology of tundra plants | Database of date of first bud growth, leaf emergence, flowering for various plant species at ITEX sites | Wildlife and Fisheries | PC, Annual | Tabulations available within published reports | Low |
| NWT Resident Hunter Survey | Records level of wildlife harvesting by NWT Resident Hunters | Two main tables, one named Harvest and another Tags. Used to estimate total wildlife harvest by the Resident Hunter segment of the NWT hunting public. | Wildlife and Fisheries | PC based. Updated annually from information received back from mailed out questionnaires. | Available to whomever requests it. | High |
| NWT Wildlife Research Permits issued | Records basic information on Wildlife Research Permits issued each year. | Flat file table (WRPALL) of information on WRPs issued by the Wildlife and Fisheries Division. | Wildlife and Fisheries | PC based. Updated after calendar year end. | Available to whomever asks for it. | Medium |
| **Non-renewable Resources** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Information, Program Tracking Systems and Analytical Reports** | | | | | | |
| Mineral Initiatives: 1991-96 Canada/NWT Economic Development Agreement | Mineral Deposits and Petroleum Resources of the Northwest Territories | CD-Rom details the locations and type of mineral deposits and petroleum resources; includes maps | Digital Products of the Mineral Initiatives Office; Energy Mines & Petroleum Resources (GNWT) | EMPR Open File 9601; v. June 1996 | Available to whomever asks for it. | Medium |
| **Socio-economic** | | | | | | |
| T-Stat GNWT Bureau statistics | Maintaining responsibility for territorial government's statistical programs | Contains statistical information and community profiles in the areas of health, economy, justice, labour, education, income and demography | NWT Bureau of Statistics Yellowknife, NT. 873-7147 www.stats.gov.nt.ca | On-line and queriable. Derived from Statistics Canada data | Publicly available | High |
| Community Wellness in Action | Reports on community wellness organized by region and community | Reports available for 1996-97 and 1997-98 for Keewatin, Deh Cho, South Slave and North Slave regions | NWT Dept. of Health and Social Services. Yellowknife, NT www.hlthss.gov.nt.ca | Report available in PDF format on-line | Publicly available | Medium |

# Appendix VI Reference Database Citations

**These citations are derived from the ProCite database. This listing may have errors in the format of the listings due to the way the database stores and outputs information in reports. Some edits were made to this reference list to improve readability. For the complete citation the best source of information is the ProCite database provided on CD and accompanying this report.**


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# Appendix VII Applicable Acts, Regulations, Guidelines And Agreements

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Arctic Waters Pollution Prevention Act. Department of Indian Affairs and Northern Development.

Canada Water Act. Comprehensive Resource Management Regulations. Environment Canada.

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