D. Mackenzie Valley Highway Extension

D.1 Consultations

An initial Stakeholder Workshop was held in Norman Wells on June 8, 1998. The workshop was attended by approximately 60 stakeholders and generated considerable discussion on the need-for, and benefits-of, an all-weather road.

A meeting with the Sahtu Secretariat and the Sahtu Regional Land Corporation Presidents was held on November 12, 1998. The group reviewed the Terms of Reference for Environmental Scoping and Benefit Cost Studies. The Terms of Reference were also sent to other stakeholders invited to participate on the Advisory Committee.

In December the Department established an Advisory Committee for this project consisting of 25 individuals representing a wide variety of interest groups and organizations. The Department has kept this committee informed of the status of projects, and held a meeting on March 17, 1999 in Norman Wells. A list of the committee members is provided below.

- Sahtu Secretariat Incorporated, Ruby McDonald,
- Deline Land Corporation, Raymond Taniton,
- Fort Good Hope Metis Nation Local #54 Land Corporation, Wilfred McNeely Jr.,
- Ayoni Keh Land Corporation (Colville Lake), Wilbert Kochon,
- Yamoga Land Corporation (Fort Good Hope), John Louison,
- Tulita Land and Tulita District Land Corporation, Gordon Yakeleya,
- Fort Norman Metis Local #60 Land Corporation, Eddie McPherson Jr.,
- Ernie McDonald Land Corporation (Norman Wells), Winter Lennie,
- Gwich'in Tribal Council, Richard Nerysoo,
- Town of Inuvik, George Roach,
- Charter Community of Arctic Red River, Grace Blake,
- Village of Fort Simpson, Norman Prevost,
- Deh Cho First Nation, Mike Nadli,
- Fort Simpson Chamber of Commerce, Andrew Gaule,
- Pehdzeh Ki Dene Council (Wrigley), Tim Lennie,
- Hamlet of Tulita, Bertha Lennie,
- Tulita Dene Band, Frank Andrew,
- Charter Community of Deline, Raymond Taniton,
- Deline Dene Band Council, Raymond Taniton,
- Town of Norman Wells, Frank Pope,
- K'asho Got'ine Charter Community Council (Fort Good Hope), Charlie Barnaby,
- Imperial Oil, Reg Wisener
- NWT Construction Association, Richard Bushey,
- NWT Trucking Association, Ray Anderson
- Norman Wells and District Chamber of Commerce, Kevin Diebold

Formal public consultations were undertaken as part of the Environmental

Scoping Study. Public meetings were held in the communities noted below.

C Fort Simpson – March 3, 1999
C Deline - March 8, 1999
C Tulita – March 9, 1999
C Norman Wells – March 11, 1999
C Wrigley – March 29, 1999
C Tsiigehtchic – April 12, 1999
C Inuvik – April 14, 1999
C Fort Good Hope – April 20, 1999
C Colville Lake – April 22, 1999

Key stakeholder consultations were also undertaken as part of the Benefit Cost Analysis and Financing studies. These were held both in-person and by telephone.

D.2 Studies Undertaken

Summaries of the following four studies undertaken by the Department on the Mackenzie Valley Highway Extension are attached.

- Environmental Scoping Study
- Engineering Update Study
- Benefit Cost and Economic Impact Analysis
- Financing Study

D.3 Executive Summary of the Environmental Scoping Study Mackenzie Valley Highway Extension

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.

D.4 Summary of the Engineering Update Study Mackenzie Valley Highway Extension

MACKENZIE HIGHWAY EXTENSION
WRIGLEY TO THE DEMPSTER HIGHWAY

1999 Engineering Update

Prepared by
Highways and Engineering Division
Department of Transportation

June 1999

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INTRODUCTION

The primary purpose of this study was to update or develop cost estimates for the extension of the Mackenzie Highway from Wrigley to the Dempster Highway and for an access road from Deline to the Mackenzie Highway near Tulita, as shown on Figure 1.

This study is only one of a number of studies undertaken by the Department of Transportation for the completion of the Mackenzie Highway. Other studies which were undertaken include Environmental Scoping and a Benefit/Cost Analysis. The studies will be used for further planning and decision making with respect to the Department's overall Transportation Strategy.

PREVIOUS WORK

The original plan by Public Works Canada was to complete the construction of the Mackenzie Highway from Fort Simpson to the Dempster Highway in a four year period from 1972 to 1976. Although construction did not proceed past a point south of Wrigley, a tremendous amount of engineering and environmental work was done over the entire length of the highway. Pre-engineering and design was basically completed to the "ready to go to tender stage" for most of the highway.

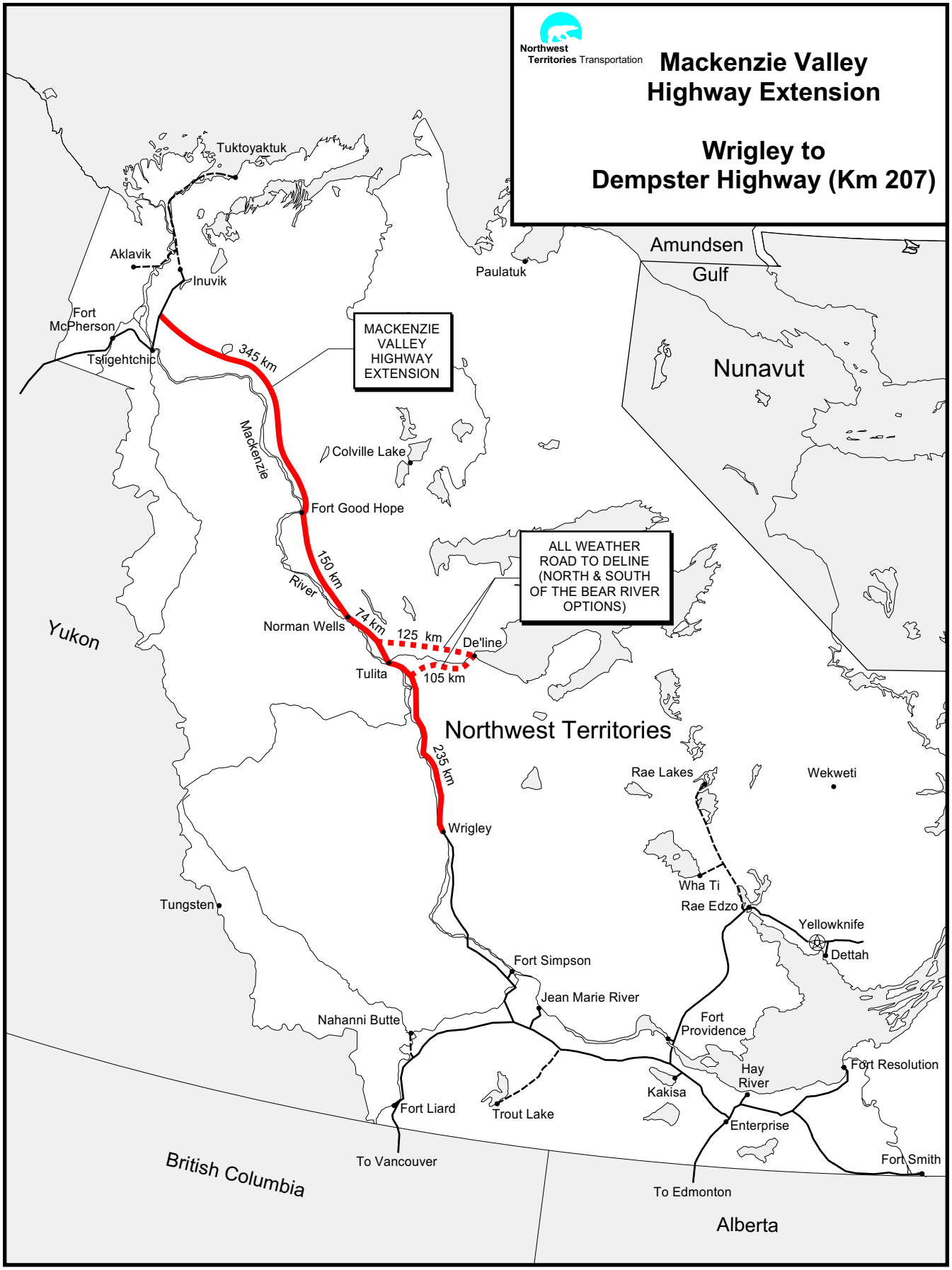
More background and a summary of the Public Works Canada work, along with "updated cost estimates" was presented in a brief 1989 report by the Department of Transportation entitled *Mackenzie Highway, Wrigley to Inuvik Extension***.** This report is included in its entirety, with the exception of the pocket map, as Appendix B of this study.

DESIGN STANDARDS

For this study, design standards and resultant cost estimates were developed for two types of all-weather highways; a 60 kilometres per hour highway and an 80 kilometres per hour highway. The design parameters and the design cross sections that were selected for the two types of highway are shown in Table 1.

Calling one a 60 kilometres per hour highway is a bit of a misnomer. In reality, the allowable speed limit would be 80 - 90 kilometres per hour over approximately 95% of the highway with 60 kilometres per hour speed zones through sections of high local relief where the requirements for the vertical alignment and appropriate sight distances have different design parameters..

The main difference in the two designs is the roadtop width. With the 10.0 metre roadtop, the 80 kilometres per hour highway could accommodate the additional granular base required for an asphalt surface without further embankment widening, while the 60 kilometres per hour highway with a roadtop width of 8.4 metre would require widening in order to upgrade to an asphalt surface.

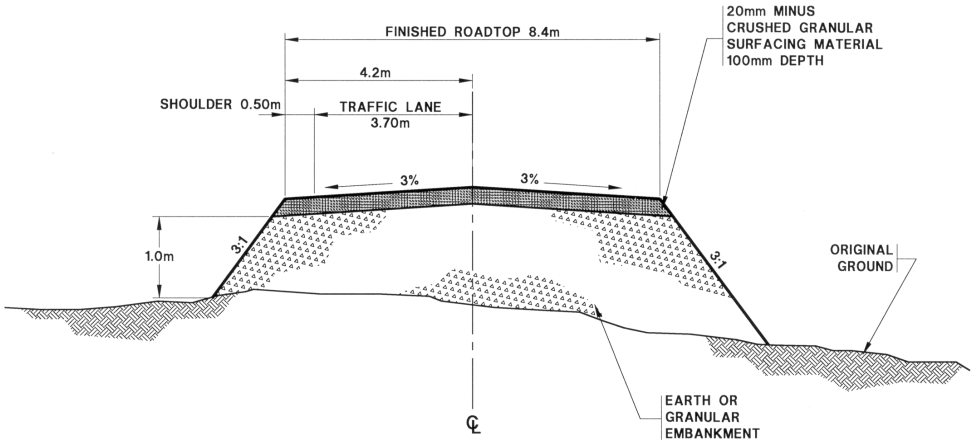

Northwest Territories Transportation
Mackenzie Valley Highway Extension
Wrigley to Dempster Highway (Km 207)
Tuktoyaktuk
Aklavik
Inuvik
Paulatuk
Amundsen Gulf
Fort McPherson
Tsiigehtchic
345 km
MACKENZIE VALLEY HIGHWAY EXTENSION
Nunavut
Mackenzie
Colville Lake
Fort Good Hope
150 km
River
ALL WEATHER ROAD TO DELINE (NORTH & SOUTH OF THE BEAR RIVER OPTIONS)
Yukon
Norman Wells
74 km
125 km
De'line
Tulita
105 km
Northwest Territories
235 km
Rae Lakes
Wekweti
Wrigley
Wha Ti
Rae Edzo
Tungsten
Yellowknife
Dettah
Fort Simpson
Jean Marie River
Nahanni Butte
Fort Providence
Hay River
Fort Resolution
Kakisa
Fort Liard
Trout Lake
Enterprise
Fort Smith
To Vancouver
To Edmonton
British Columbia
Alberta

With the possible exception of the Great Bear River at Tulita, single lane, timber or steel deck bridges are proposed for all stream or creek crossings. These would be similar to the existing bridges on the highway between Fort Simpson and Wrigley.

TABLE 1
DESIGN PARAMETERS AND PRELIMINARY CROSS SECTION

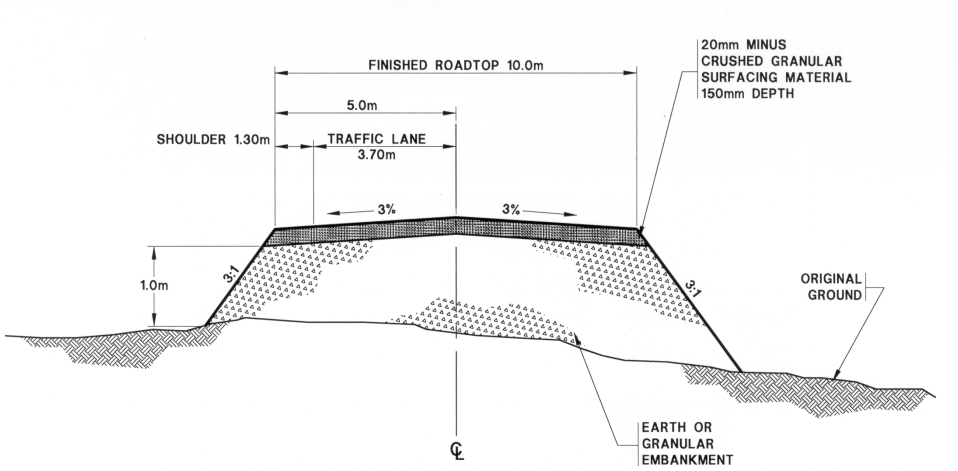
Design Standard	60Km/hr	80Km/hr
Horizontal Alignment		
Min. Radius (m)	120	230
Min. Stopping Sight Distance (m)	85	140
Vertical Alignment		
Sag 'K' Value	20	30
Crest 'K' Value	20	40
Maximum Gradient (%)	10	8
Cross Section		
Roadtop Width (m)	8.4	10.0
Granular Base Course/Surfacing(mm)	100	150
Subgrade Width (m)	9.0	10.9
Minimum Embankment Fill (m)	1.0	1.0
Side Slope Ratio	3 to 1	3 to 1

Figure 2 - TYPICAL DESIGN CROSS SECTION (60 km/hr Design)



60km/hr DESIGN CROSS-SECTION

Figure 3 - TYPICAL DESIGN CROSS SECTION (80 km/hr Design)



80km/hr DESIGN CROSS-SECTION

BASIS OF COST ESTIMATES

The unit cost estimates (per kilometre costs, bridge and culvert costs and engineering costs) which are used in this report were derived, as much as possible, from average costs associated with similar recent highway projects undertaken by the GNWT. These projects include the reconstruction of the Yellowknife Highway (No.3) to Yellowknife, completion of the Mackenzie Highway (No.1) to Wrigley and reconstruction work on the Dempster Highway (No.8). The cost estimates are based on preliminary quantity estimates developed from the Table 1 design parameters and probable construction costs for a project through this area over an eight (8) to ten (10) year construction period based on standard GNWT contracting policies.

These cost estimates do not include any royalties or land acquisition costs that may be payable to First Nation Land Claimant groups. The highway alignment traverses three First Nation Settlement Land areas and any royalty costs for borrow material (if payable) would add substantial costs to the project for this borrow material (general embankment fill and base granular materials).

Embankment Construction Cost Estimates

The estimated per kilometre embankment construction costs provided below for each of the highway sections take into account the variations in accessibility, borrow availability, availability of granular material for surfacing and general topography and terrain types encountered within the sections linking the communities. Embankment construction costs include embankment construction, minor drainage structures (small diameter culverts) and ditching and granular (gravel) surfacing.

Embankment Construction Section	60 km/hr	80 km/hr
• Wrigley to Tulita	$325,000/km	$400,000/km
• Tulita to Norman Wells	$300,000/km	$375,000/km
• Norman Wells to Fort Good Hope	$325,000/km	$400,000/km
• Fort Good Hope to the Dempster	$400,000/km	$500,000/km
• Deline Access (north side of Great Bear River)	$325,000/km	$400,000/km
• Deline Access (south side of Great Bear River)	$275,000/km	$350,000/km

Structures (Bridges/Culverts) Cost Estimates

The following bridge and culvert costs were used for estimating the cost of the structures required for each section of highway.

Bridge/Drainage Structure	Costs
• Single Span, single lane bridges up to 70 m	$14,000 /m
• Single Span, single lane bridges 71m to 100m	$17,000 /m
• Double span, single lane bridges up to 200 m	$6,000,000 /ea
• Great Bear River bridge at Tulita	$12,000,000
• Culverts 1.5 m to 2.4 m diameter	$150,000 /ea
• Culverts 2.5 m to 4.5 m diameter	$300,000 /ea

The above costs do not include design and other associated engineering costs.

Engineering Cost Estimates

Engineering costs for highway construction include all costs associated with geotechnical investigations, preliminary/topographic surveys, highway design, bridge design, contract preparation and construction supervision and administration. Experience in the Northwest Territories and other jurisdictions has shown that these combined costs typically amount to 8 - 12 percent of the project capital costs. In this study, a figure of 10% has been used for the 60 kilometres per hour design and 9% for the 80 kilometres per hour design.

ESTIMATED CONSTRUCTION COSTS

This section provides the estimated construction costs for each of the inter-community sections of highway and a brief description of some of the factors that affect the construction costs in each section.

Wrigley to Tulita

From the existing Hodgson Creek bridge at Wrigley, the alignment closely follows the Mackenzie River all the way to Tulita for a length of 235 kilometres.

A total of about 13 bridges (in addition to the three bridges already installed under the Winter Road Improvement Program) will be required on this section of highway linking Wrigley to Tulita. The longest bridge would be across the Blackwater River with a required length of approximately 200 metres. This would be similar to the existing bridge across the Willowlake River south of Wrigley. Up to 20 large diameter (>1.5 metres) culverts may also be required at minor stream crossings along this section of highway.

Because of the large number of creek and river crossings, a number of barge landing sites may have to be utilized for summer access to construction zones both for embankment construction and bridge construction.

Borrow sources for this section of highway vary from clay to granular material with some of it coming from right of way cuts (roadway excavation). Minor amounts of shale and sandstone could also be utilized between the Saline River and Big Smith Creek.

Winter construction of the embankment will be required between Big Smith Creek and Tulita, a distance of approximately 60 kilometres, due to the high moisture content of the available borrow material. This section will also require capping with higher quality granular borrow after embankment settlement occurs.

The estimated cost of construction for this 235 kilometre section is as follows:

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$76,375,000	$94,000,000
• Bridge and Culverts	$27,000,000	$27,000,000
• Engineering	$10,335,000	$10,890,000
TOTAL:	**$113,710,000**	**$131,890,000**
Average Cost per Kilometre:	**$484,000**	**$561,000**

Tulita to Norman Wells

This is the shortest of the inter-community links with a distance of only 74 kilometres between Tulita and Norman Wells. The alignment is fairly direct between the communities and is approximately 10 kilometres away from the Mackenzie River at the farthest point.

On this section, the embankment would be constructed from a combination of limestone, shale and clay borrow. In order to access the Tulita end of the section during the summer, a three kilometre access road would have to be constructed from a barge landing site

about 1.5 kilometres north of the mouth of Great Bear River. The north end could be accessed from the existing road to the limestone quarry near Norman Wells.

Four or five bridges and an equal number of large diameter culverts are required at creek crossings between Tulita and Norman Wells. One of the bridges (Vermillion Creek) was completed in early 1999 and a second bridge will be completed at Canyon Creek in early 2000 as part of the on going Winter Road Improvement Program. Not included in the above is the major crossing required at the Great Bear River near Tulita.

A bridge across the Great Bear River would need to be approximately 400m long and it is doubtful if a single lane bridge would be suitable for such a length in such close proximity to the community. At the very least, it is expected that a separate pedestrian walkway with adequate guardrails would be required. Further engineering studies and community consultation will be required to determine the appropriate bridge design for this location.

The estimated cost of construction for this section is as follows:

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$22,200,000	$27,750,000
• Bridge and Culverts	$6,000,000	$6,000,000
• Great Bear River Bridge	$12,000,000	$12,000,000
• Engineering	$4,020,000	$4,120,000
TOTAL:	**$44,220,000**	**$44,870,000**
Average Cost per Kilometre:	**$598,000**	**$674,000**

An alternative option, which must be assessed in more detail, is that of establishing ferry crossing facilities for the Great Bear River. Ferry crossing facilities at the Great Bear River would reduce the capital cost by approximately $7,000,000, however, the trade off would be seasonal road closures in the spring and fall and an approximate additional $500,000 in annual operating costs.

Norman Wells to Fort Good Hope

The alignment distance between Norman Wells and Fort Good Hope is 150 kilometres. The route follows along the Mackenzie River from Norman Wells until the river veers to the west at about the halfway point. From that point, the alignment stays at approximately 25 kilometres east of the Mackenzie River until they converge again near Fort Good Hope.

Available borrow material for this section consists of sand, gravel and limestone with some clay north of Norman Wells and gravel, shale, clay and limestone south from Fort Good Hope. The alignment can be accessed from the existing roads at Norman Wells, but at

Fort Good Hope, construction would have to start with building the 3 kilometre access road from the community to the highway alignment.

Nine or ten bridges are required between Norman Wells and Fort Good Hope in addition to the existing bridge at Bosworth Creek, just north of Norman Wells. The largest one would be approximately 100 metres long over the Donnelly River which is 55 kilometres south of Fort Good Hope.

The estimated cost of construction for the total of 153 kilometres of road required for this section is as follows:

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$49,725,000	$61,200,000
• Bridge and Culverts	$8,000,000	$8,000,000
• Engineering	$5,775,000	$6,230,000
TOTAL:	**$63,500,000**	**$75,430,000**
Average Cost per Kilometre:	**$415,000**	**$493,000**

Fort Good Hope to the Dempster Highway

From Fort Good Hope, it is 345 kilometres to the proposed junction with the Dempster Highway 65 kilometres south of Inuvik. The alignment parallels the Mackenzie River for about two thirds of the way and then continues on to the Dempster Highway as the river turns and flows in a westerly direction towards Tsiigehtchic.

The north half of this section would be constructed almost entirely of shale borrow and the south half would be constructed from a combination of granular, shale and clay borrow materials. Access for construction would be from the Dempster Highway, Fort Good Hope and a potential central barge landing site on the Mackenzie River which would require construction of a 1.0 - 1.5 kilometre access road to the highway alignment.

Only five bridges and a few large diameter culverts are required over the 345 kilometre distance between Fort Good Hope and the Dempster Highway. The Hare Indian River near Fort Good Hope is the largest water crossing and will require a bridge in the order of 150 - 200 metres long.

The estimated cost of construction for this section of highway is as follows:

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$138,000,000	$160,000,000
• Bridge and Culverts	$8,500,000	$8,500,000
• Engineering	$14,650,000	$15,165,000
TOTAL:	**$161,150,000**	**$15,165,000**
Average Cost per Kilometre:	**$467,000**	**$532,000**

Deline Access to the Mackenzie Highway

An access road from Deline to the Mackenzie Highway would be 125 kilometres long, if it were located entirely on the north side of the Great Bear River, or, only 105 kilometres long if it was located on the south side of the Great Bear River. Locating the road on the north side would avoid the need to cross the Great Bear River near Deline, where it flows out of Great Bear Lake. However, the shorter distance and lower per kilometre construction costs associated with the south side route appear to more than offset the additional cost of constructing a bridge across the river near Deline.

Cost estimates are provided below for both routes:

North Side (125 kilometres)

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$40,625,000	$50,000,000
• Bridge and Culverts	$3,000,000	$3,000,000
• Engineering	$4,365,000	$4,770,000
TOTAL:	**$47,990,000**	**$57,770,000**
Average Cost per Kilometre:	**$384,000**	**$462,000**

South Side (105 kilometres)

Construction Activity	60 km/hr	80 km/hr
• Embankment Construction	$28,875,000	$36,750,000
• Bridge and Culverts	$3,000,000	$3,000,000
• Great Bear River Bridge (200m)	$6,000,000	$6,000,000
• Engineering	$3,790,000	$4,120,000
TOTAL:	**$41,665,000**	**$49,870,000**
Average Cost per Kilometre:	**$397,000**	**$475,000**

SUMMARY OF CONSTRUCTION COST ESTIMATES

The estimated construction costs for all of the sections are summarized below:

Road Section	60 km/hr	80 km/hr
• Wrigley to Tulita	$113,710,000	$131,890,000
• Tulita to Norman Wells	$44,220,000	$49,890,000
• Norman Wells to Fort Good Hope	$63,500,000	75.430,000
• Fort Good Hope to the Dempster	$161,150,000	$183,665,000
• Deline Access (South Side)	$41,665,000	$49,870,000
TOTAL:	**$424,245,000**	**$490,725,000**
Average Cost per Kilometre:	**$465,000**	**$538,000**

Depending on the design selection, the total cost for construction of the Mackenzie Highway extension and access road from Deline would be somewhere between 400 and 500 million dollars. It should be pointed out that the 60 kilometres per hour design could be changed to an 80 kilometres per hour design with an 8.4 metre roadtop for an additional cost of only about five percent. Such a road would still require widening if it were to be upgraded (changes to speed limits) and asphalt surfaced in the future.

OPERATION AND MAINTENANCE COSTS

The estimated annual maintenance costs for the Mackenzie Highway extension and Deline access road are somewhat dependant on the selected highway design. It will cost more to maintain a 10.0 metre wide roadtop than it will to maintain an 8.4 metre roadtop. Based on maintenance costs for various sections of the existing NWT Highway System, the basic annual highway maintenance costs (excluding bridges and large diameter culverts) for this study are estimated to be $9,000 per kilometre for the 8.4 metre roadtop and $9,500 per kilometre for the 10.0 metre roadtop. The annual maintenance costs for bridges and large diameter culverts are estimated to be an additional one percent of the initial capital cost of the structures.

The total annual estimated maintenance costs for the sections of highway are as follows:

Highway Section	60 km/hr	80 km/hr
• Wrigley to Tulita	$2,385,000	$2,502,000
• Tulita to Norman Wells	$846,000	$883,000
• Norman Wells to Fort Good Hope	$1,457,000	$1,534,000
• Fort Good Hope to the Dempster	$3,190,000	$3,363,000
• Deline Access (South side)	$1,035,000	$1,087,000
ANNUAL TOTAL:	**$8,913,000**	**$9,369,000**
Overall Average Annual Cost per Kilometre:	**$9,773**	**$10,273**

IMPLEMENTATION AND SCHEDULING

As mentioned previously, the cost estimates developed for this study were based on standard GNWT contracting policies and an eight (8) to ten (10) year construction period. This is considered to be the optimum time period for the efficient distribution of work and utilization of available resources.

However, in order to maximize local and northern economic benefits, a longer construction period may be more appropriate. In a 1992 report entitled *Implementation Plan for the Mackenzie Highway Extension*, the department recommended a 20 year construction period as the optimum time frame for maximizing economic benefits.

A discussion on a Community Based Construction Approach to improve the winter roads within the Sahtu Region is included as Appendix ‘A’. Under this approach, the emphasis would be entirely on providing long term local economic/business opportunities and employment and training through a low level of annual funding distributed between the four Sahtu communities, Wrigley and communities in the Inuvik Region (Fort McPherson, Tsiigehtchic and Inuvik) and not on completing the road within a reasonable time frame.

The end objective would be to, firstly , extend the winter road operation period then complete a low standard all-weather road that would link the Sahtu communities to the Deh Cho Region and beyond.

Should the GNWT elect to proceed with construction of this highway extension project using the standard GNWT Public Tendering process, the first most probable area of construction activity would be on the Wrigley to Tulita section. The same approach, as mentioned in the Community Based Construction options, of extending the winter road operation period into the Sahtu Region would be employed. This will involve constructing bridges and culvert installations at major river and stream crossings. Once this river and stream work has been completed, the all-weather road embankment construction activities could then be distributed between the communities of Wrigley, Tulita and Norman Wells. The first priority would be to provide an all-weather road link from Wrigley to Norman Wells. A winter road from Fort Good Hope to the Dempster Highway could also be opened up during the same period of this construction activity. Once the all-weather road reaches Norman Wells, all-weather road embankment construction activity could be distributed between the communities of Norman Wells, Fort Good Hope and the Inuvik Region (Fort McPherson, Tsiigehtchic and Inuvik). The last area for construction would be the access road from the community of Deline, which will be dependant on the community's desire to have an all-weather road into their community.

Regardless of the selected construction time frame or construction approach, which will likely be more dependant on available funding than anything else, a minimum of one year of lead time would be required for pre-engineering and design and preparation of contract documents for the first construction location.

D.5 Executive Summary of the Benefit Cost and Economic Impact Analysis Mackenzie Valley Highway Extension

FINAL REPORT

BENEFIT-COST AND REGIONAL ECONOMIC IMPACT ANALYSIS: MACKENZIE HIGHWAY EXTENSION

Submitted to

Department of Transportation

by

Nichols Applied Management
Management and Economic Consultants
Edmonton **Calgary**

April, 1999

EXECUTIVE SUMMARY

Extending the Mackenzie Highway north from Wrigley is a long-term objective of the Department of Transportation. This report discusses the findings of an economic evaluation and regional economic impact analysis of the construction and operation of a 482 km extension to Fort Good Hope and a 832 km extension all the way to the Dempster Highway. A 105 km spur from just south of Tulita to Deline is incorporated in the study as an option, recognizing the current opposition to the road in that community.

The study uses cost estimates developed by the Department of Transportation, assuming a conventional public tender construction approach (60 km/hour design standard, ten-year construction period). It also addresses a Community Construction Approach to the project in which the highway will be built in small increments over an extended period.

Study Methodology

The study, undertaken by Nichols Applied Management, relies on the following sources for inputs:

- key respondent interviews and a review of Department of Transportation files to identify the benefits and costs of the proposed project; and
- an analysis by the Department of Transportation of the estimated project costs.

It uses two related but distinct analyses to assess the project. They are:

- a benefit-cost analysis, which determines the economic viability of the project from the perspective of the territorial economy; and
- a regional economic impact analysis, which focuses on the economic benefits to the region.

The study's discussion of the organizational implications of the Community Construction Approach builds upon the results of a workshop conducted by the study team with northern-based education and community development experts.

Project Benefits

Key respondents identified a range of project benefits. They are listed below:

- Prices in the Mackenzie Valley communities of Tulita, Norman Wells, Fort Good Hope, and Deline are expected to decrease as transportation and storage costs are reduced.

- Tourism expenditures are expected to increase when the Mackenzie Highway forms a loop with the Dempster Highway, stimulating visitor numbers and causing visitors to stay longer in the Northwest Territories.

- People, businesses, and public sector organizations including the health system in the Mackenzie Valley communities will have increased access to Fort Simpson and points beyond. This will likely mean an increase in operating efficiencies. Individuals are expected to travel more frequently between the communities, reducing their isolation.

- The Department of Transportation will not have to maintain the winter road between Wrigley, Fort Good Hope, and Deline.

- Oil and gas companies exploring the region will face reduced transportation costs and avoid "stand-by" costs for equipment now barged up and idled until freeze-up.

Some identified benefits were not further quantified because no ready market value estimates were available. These include the anticipated increase in the quality and variety of goods available in Mackenzie Valley communities and the increased access for hunters and trappers.[1]

[1] Since the release of this report, there has been a significant increase in oil and gas activities in the Sahtu and Mackenzie Delta. This development was not anticipated in this report. The reader is cautioned that the conclusions drawn in this report does not reflect this new development.

Project Costs

The Department of Transportation developed a preliminary construction cost estimate. Other costs are incurred as well because additonal money will have to spent to realize some of the benefits. The costs are listed below:

- The construction cost of the road between Wrigley and Fort Good Hope is estimated at $220 million. The cost of extending it to the Dempster Highway and to Deline is estimated at $160 million and $40 million, respectively.
- Maintenance of the all-weather road is estimated at $10,000 per kilometre or between $2.2 million and $4.4 million per year, depending on the project configuration.
- The tourism industry will need to spend money to supply the products desired by visitors. This includes the cost of restaurant meals, tour operator supplies, wholesale groceries, and bulk fuel.
- Increased mobility implies costs, including additional ground transportation costs and increased accidents.

Some costs were not quantified because no market values are available. These include the cost of increased hunting and trapping pressure and possible impacts of the road on wildlife migration patterns.

Benefit-Cost Analysis

The benefit-cost analysis compares the discounted benefits and costs of the Mackenzie Highway Extension. The discounted benefits need to be greater than the discounted costs for the project to be economically viable. A benefit-cost ratio of one or larger and a positive value of the net present value of the difference between the costs and benefits indicates economic viability.

The benefit-cost ratio of the project, assuming a 7.5% discount rate, is estimated at 0.16 for all scenarios. The estimates of the present value of the benefits (net of the present value of the costs) range from minus $173 million to minus $285 million.

	Wrigley to Ft Good Hope		Wrigley to Dempster Highway	
	With Deline	Without Deline	With Deline	Without Deline
	7.5% Discount Rate			
Net Present Value ($'000)	($197,000)	($173,000)	($285,000)	($267,000)
Benefit-Cost Ratio	0.16	0.16	0.16	0.16

This result is in line with other assessments of the economics of the Mackenzie Highway and similar roads. A 1983 study of the completion of the Mackenzie Highway to Wrigley places the benefit-cost ratio at 0.2, using a 10% discount rate. A 1990 study of The Mackenzie Highway Extension to the Dempster Highway, conducted in support of the 1990 Transportation Strategy Update, calculates a benefit-cost ratio of 0.45, using a 3% discount rate. Finally, a recent study of the Inuvik to Tuktoyaktuk road estimates the benefit cost ratio of that road project at 0.26, using a 7.5% discount rate.

The results of the benefit-cost analysis indicate that the Mackenzie Highway Extension is not viable from a strictly economic perspective. This result is confirmed by an analysis of the sensitivity of the results to changes in the underlying assumptions. Increasing the benefits and reducing the cost by an arbitrary 25% and including potential cost savings associated with the production of as yet unfound oil reserves raise the benefit-cost ratio to 0.41.

However, many public investments in infrastructure and programs are made on the basis of social rather than economic considerations. The regional economic impact analysis looks at the project from a regional development perspective, focusing on redistributing economic activity and benefits among regions.

Regional Economic Impact Analysis

The project will generate employment and income benefits to the region in the following ways:

- local hiring of construction workers and project spending on wages, materials, and equipment during construction;

- increased local hiring of maintenance workers and spending on wages, materials, and equipment for the maintenance of the all-weather road as compared to annual spending on the ice road; and

- increased tourism spending accruing to local operators and their suppliers.

These regional construction impacts are related to project scope and are estimated at:

- between $41 to $85 million of business and labour income; and

- between 1,250 and 2,360 person-years of on-site labour.

These economic impacts accrue to the region over the 10-year construction period. The project could also provide additional training positions for persons interested in equipment operations and the heavy duty mechanics trade.

The ongoing road maintenance will also provide economic benefits. These depend on the project scope and are estimated at:

- between $1.4 million and $2.8 million per year in additional business and labour income; and

- between 26 and 55 additional person-years of employment per year.

The anticipated increase in tourism will increase the employment opportunities in the region.

Seen from a regional perspective, the project strengthens the local economy by providing additional business and labour income and by creating additional jobs. This is significant for the Mackenzie Valley communities, where unemployment levels are high.

Assuming that the project is financed from outside the study area, the employment and income benefits will be without cost to the region. This means that the project will lead to a redistribution of income within the Northwest Territories or, if financed by the federal government, within Canada. The redistributive effect of the project is reduced if it is financed in part by regionally-based organizations. In that case, the project would likely pre-empt other investment in the region.

Community Construction Approach

It is possible to construct the road not as a short-term construction project, but as a long-term regional development initiative. The Community Construction Approach, defined as $1 million per year construction projects in each of the five Mackenzie Valley communities, shifts the focus from road building to long-term economic development. This approach has the following annual economic impacts:

- additional business and labour income estimated at $1.8 million; and
- additional employment estimated at nine on-site person-years.

The Community Construction Approach would provide:

- a modest stimulus to the regional economy; and
- some training opportunities for local people, especially if a way can be found to deliver the appropriate trades training in the region.

The Community Construction Approach would not place any undue stress on the labour market of the region and would provide some training positions for equipment operators and heavy-duty mechanics.

Organizational Considerations

Constructing the road using a Community Construction Approach implies that the Department of Transportation (DOT) would need to extend its range of activities to include community consultation, education, and economic development, which are the focal points of this approach.

An alternative is for DOT to build a partnership with claims organizations and other government departments, and maybe other organizations, such as cultural institutes, industry, and literacy groups. This has several advantages, such as:

- increased ownership of the project by the affected communities;
- access to existing channels for community consultations; and

- increased likelihood for maximization of education and economic development benefits.

The recent experience with the Nunavut Unified Human Resources Development Strategy (NUHRDS) suggests that the partnership be formalized by the creation of an independent project office or secretariat, which brings together representatives of the participating claims organizations and government departments.

Conclusion

The construction of the Mackenzie Highway Extension road can be a tool for regional economic development. It provides income and employment opportunities during construction and operation and will contribute to the further development of the tourism industry in the region.

The project is not attractive from a strict economic perspective. Its strengths are in the redistribution of wealth rather than in creating it.

D.6 Executive Summary of the Financing Study Mackenzie Valley Highway Extension

FINAL REPORT

HIGHWAY FINANCING STUDY

Submitted to

Government of the Northwest Territories
Department of Transportation

by

Nichols Applied Management
Management and Economic Consultants
Edmonton **Calgary**

August 1999

EXECUTIVE SUMMARY

This study of highway financing in the Northwest Territories (NWT) is part of the 1998/1999 Highway Strategy Initiative of the Department of Transportation of the Government of the Northwest Territories (GNWT). The results of this study and others undertaken as part of the initiative will be used to develop project concepts, information data bases, and to further the plan for advancing new road projects.

The study approaches financing of the Inuvik to Tuktoyaktuk Road and the Mackenzie Valley Highway Extension in two ways. First, it provides an overview of financing and revenue-generating options used in Canada and the U.S. and discusses their applicability to the situation in the NWT. Second, it gives an overview of currently available programs that could be used to reduce the total highway construction costs and reports on the discussion with regional claims organizations regarding their potential involvement in the projects.

Traditional Highway Financing

Most highway construction in Canada is done using public tenders, financed out of provincial government budgets. This approach to highway construction would imply an annual construction budget of between $10 million and $80 million for five to 10 years to build the $100 million Inuvik to Tuktoyaktuk Road or the $220 million to $400 million Mackenzie Valley Highway Extension. The cost of the latter project depends on its final configuration. Such commitments are well beyond the capacity to the Department of Transportation, which has a total annual budget of $66 million, $17 million of which is allocated to the highway construction, mostly rehabilitation of existing roadways.

There is limited capability in the NWT to finance the projects by issuing debt. The size of the NWT economy limits the ability of the GNWT to repay debt. In addition, the GNWT does not have a history of debt issuance and repayment, reducing the likelihood of success of any forays into the capital or debt markets.

Financing Alternatives

Other jurisdictions in Canada and the US have tried new ways of infrastructure financing and have explored new or enhanced revenues associated with highway projects. They are summarized in the following table, which also discusses their applicability to theNWT.

Summary of Financing and Revenue Generating Alternatives	
Source of Capital/Revenue	**Applicability to NWT**
Private Equity/Debt	Limited. Projects have a very limited ability to provide the desired rate of return on the private investment.
Grant Anticipation Revenue Vehicle	Very limited. DOT funds for highway construction are committed in the near and intermediate terms.
Gaming Revenue	Very limited. Only $100,000 in licensing fee income flows into general revenue.
User Tolls	Very limited. Low utilization of roads.
Shadow Tolls	Limited. GNWT budget insufficient to provide payments to compensate private sector developers.
Registration Fees	Very limited. Low number of vehicles in the NWT. Used mostly in urban or densely populated areas.
Parking Charges	Very limited. With a few exceptions, no parking charges are levied in the NWT. Used mostly in large urban areas.
Area Licensing/Permit	Very limited. Designed to reduce congestion, which is not an issue in the NWT.
Fuel Tax	Limited. A 10% increase in all fuel taxes would raise not more than $0.7 million per year.
Sales Tax	Limited. Potential to generate revenue is offset by the low level of public acceptance.
Motor Vehicle Property Tax	Very Limited. Low revenue potential due to the limited number of cars.
Special Assessment District/ Tax Increment Funding/ Offsite Levy	Very Limited. Low traffic volumes will limit the likely development along the highways.
Development Agreement	Limited. The oil and gas industry, which is likely the most active industry in the area in the near and medium term, is not dependent on a road.

The information in the table supports the conclusion that the projects will not be built using a public tender approach without considerable infusion of public money. In this regard, there are a number of reasons for federal involvement, including the federal mandate for economic and resource development and the federal responsibility for new highway construction in the NWT.

Community Construction Approach

The Community Construction Approach phases the construction over 30 years or more, reducing the annual construction costs to $2million to $4 million. It is a way in which some new Department of Transportation money can jumpstart the projects. The projects can then beused to present training and business development opportunities for local area people and businesses.

The Community Construction Approach provides possibilities for using existing training and business development programs to augment the annual Department of Transportation contribution. Programs that may be used as part of the Community Construction Approach include:

Summary of Programs	
Program	**Selected Services**
Business Credit Corporation (RWED)	• Loans to business enterprises. • Loan guarantees and business bonds.
Business Development Fund - (RWED)	• One-time assistance with business planning/development costs. • Assistance with the acquisition or development of capital goods. • Venture capital assistance. • Assistance to upgrade business skills.
Training-on-the-Job (ECE)	• 80% of trainee's gross salary to a maximum. • Tuition reimbursements to a maximum.
Working Together (ECE)	• Up to $5/hr (or 90% of minimum wage) for a student or youth worker. Maximum contract: one year.
Building and Learning Strategy (ECE)	• Training costs for trainees. • Wage subsidy to the contractor.
Skills for Work (ECE)	• Training costs for trainees. • Wage subsidy to the contractor.
Apprenticeship Training Program (ECE)	• Wage subsidy for apprentices over a three-year period. The maximum subsidy is reduced as the apprentice gains experience and becomes more productive.
Employment Insurance Training (ECE/HRDC)	• Training allowance of $675/week. • Additional support is available for tuition, transportation to the place of instruction and childcare.
Indian Management Assistance Program (DIAND)	• Wage subsidy for a university student who works for an aboriginal groups in a managerial role during the summer months.
Business Opportunity Fund (DIAND)	• One-time funding to the aboriginal group desiring to undertake an appropriate business venture.
Aboriginal Human Resources Strategy (HRDC)	• Employment programs that reflect and serve Aboriginal needs at the local labour market level. • Local board accepts and evaluates proposals for training and labour market development programs.

There may be options for future private sector involvement in training and labour force development through benefit agreements. This option is very dependent on further resource development in the region.

There are several limitations to this approach, including:

- training programs tend to subsidize only part of the wage costs incurred and wage costs account for only about one-third of construction costs;
- training budgets are constrained and often include a geographic distribution of program expenditures;
- the eligibility of the project work forces for training assistance will reduce over time as their training levels increase; and
- only one program that assists with the purchase of equipment was identified and none that help with equipment operating costs.

These observations notwithstanding, the Community Construction Approach offers opportunities for regional economic development.

Claimant Groups

The affected claimant groups will need to be involved in the projects. The proposed highways cross Inuvialuit, Gwich'in and Sahtu lands and the claims organizations represent the people who will most benefit from the highway projects. They are also the major source of investment capital in the region.

Discussions conducted as part of this study indicate an interest by the claims organizations to be part of the projects. The exact nature of their involvement will need further discussions, but possibilities include resource royalty waivers and equity participation.

Conclusion

Building the Inuvik to Tuktoyaktuk Road and the Mackenzie Valley Highway Extension using a traditional Public Tender Approach will require substantial new public money. This suggests that the GNWT

should continue to work with its provincial counterparts to ensure that the federal government meets it's mandate for economic and resource development and responsibility for new highway construction in the NWT.

Short of that, The Community Construction Approach is an alternative in which the Department of Transportation can jumpstart the projects, using some additional highway construction funds. The projects can then provide a vehicle for local access to existing government training and business development programs, creating regional economic development with a highway construction focus.

The department will need to continue to work with the claimant groups to explore their role in more detail. Showing a government commitment to a sustained economic development process using highway construction as a focus may be an inducement for claims groups to enter into the discussion. Any equity participation by these groups may augment and enhance the government-sponsored construction activity. It could also replace it, with the public funds then allocated to shadow tolls to compensate investors.

The Community Construction is not incompatible with the Public Tender approaches. With a modest budget reallocation, the Community Construction Approach can be initiated in the near term. It can be scaled up if claims groups become actively involved. Then, if changes in the fiscal situation of Canada and the NWT will allow new public investment in infrastructure, the Community Construction Approach can be superseded by the Public Tender Approach.