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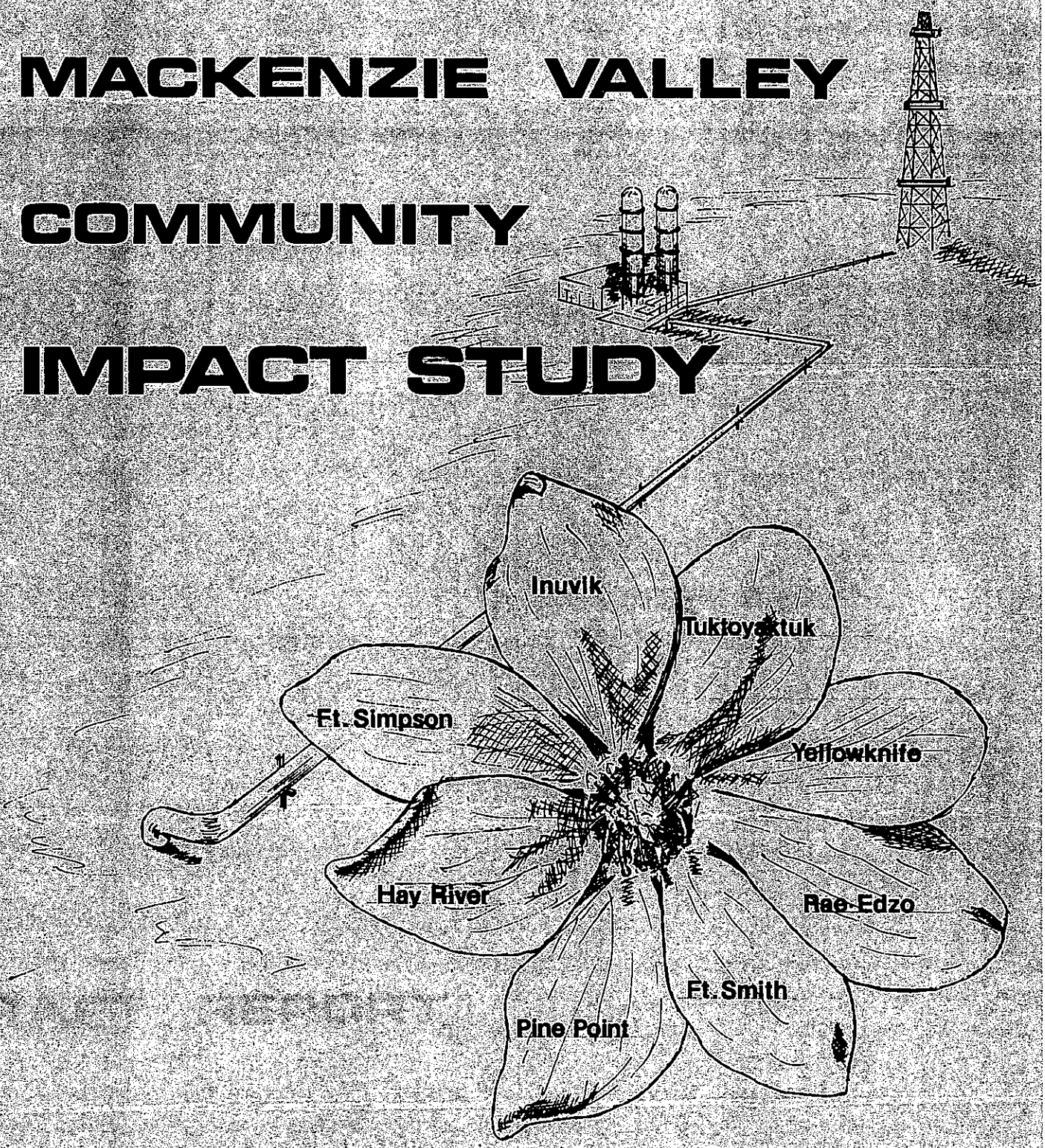
MACKENZIE VALLEY COMMUNITY IMPACT STUDY



Northwest Territories Association of Municipalities

Stanley Associates Engineering Ltd.
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LETTER OF TRANSMITTAL

May 15, 1975

File: 1246-1-1-1

Northwest Territories Association
of Municipalities
P.O. Box 1529
YELLOWKNIFE, N.W.T.
KOE 1HO

Attention: Mr. D. Reesor,
Executive Director

Dear Sir:

We are pleased to submit herewith our Mackenzie Valley Community Impact Study. This document is intended primarily as a "working paper" for the use of the Association and its Member Municipalities. A synopsis of this report has been prepared for submission, by the Association, to the Berger Inquiry.

We have enjoyed the opportunity of working with yourself, the Association Executive, and all the Municipal Councils throughout the past months, and look forward to a continuing association.

Respectfully submitted,

Stanley Associates Engineering Ltd.

J. M. Lainsbury, P. Eng, M.C.I.P.
Director of Planning

JML/lb

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SECTION 1.0

INTRODUCTION

This report is the outcome of studies undertaken for the Northwest Territories Association of Municipalities (NWTAM) and is intended to provide to the Assocation and its member municipalities an indication of the magnitude and nature of impact that might be anticipated as a result of the construction and operation of the proposed Mackenzie Valley Gas Pipeline. The report is further intended to voice the concerns of the municipal councils relative to pipeline construction and operation. Finally, this report is intended to provide recommendations relating to those actions which might be considered in order to minimize the negative aspects, and maximize the positive aspects of anticipated municipal impact.

In accordance with the terms of reference established, this report is limited to detailed consideration of those aspects of pipeline impact which relate to areas of direct municipal responsibility. Other aspects of impact relating to areas of Territorial responsibility are dealt with in less detail.

This report is based largely upon information supplied by Canadian Arctic Gas Pipeline Ltd. (CAGPL) and by the municipalities. Project staging and employment projection are taken from the CAGPL submission to the National Energy Board and the Department of Indian Affairs and Northern Development. A detailed bibliography of source material is appended to this report.

At the request of Inquiry counsel, no public meetings have been held with the communities involved in this report. Structured workshop meetings were held with each municipal council, at which time pipeline-related community concerns were identified, and tactics developed to deal with such concerns. To the extent that each council is representative of its respective community, then the results of those workshops can be considered as a reflection of community response.

In generating estimates of "impact cost", such costs have been considered as representing the difference between "normal" growth conditions based upon extrapolation of historical trends, and "accelerated" growth conditions based upon the more rapid growth rate associated with pipeline construction and operation.

This report presents all of the pertinent information, analysis and recommendations relative to the foregoing. A synopsis of this report will be prepared for submission to the Berger Inquiry on behalf of the NWTAM.

SECTION 2.0

IMPACT PARAMETERS

This section is intended as an overview of the relevant pipeline-related events and circumstances which are expected to be operative during the period under study. It is these events and circumstances that will provide the basic elements which will impinge upon the subject communities, resulting in a predictable impact which this study is designed to evaluate.

Generally, the impact anticipated will be reflected most directly by population change, the magnitude of which will vary from community to community dependent upon their geographic position relative to projected focal points of pipeline-related activity.

The magnitude of population change in any community will be effected by the policies of CAGPL relative to construction camp location and operation, and relative to logistical plans for pipeline operation and maintenance. Population change will be further influenced by pipeline-related activities, such as the construction and operation of gathering systems and gas processing plants in the Mackenzie Delta.

2.1 CAGPL POLICIES[1]

The nature and magnitude of municipal impact anticipated as a result of pipeline construction, operation and maintenance will be a direct reflection of the implementation of current CAGPL policy relating to several aspects of community demand. The relevant policy positions of CAGPL are reiterated below. It is assumed throughout this report that these policies will be implemented.

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1 **Regional Socio-Economic Impact Statement**, CAGPL Section 14.c pages 34 – 40.

2.1.1 **"Location of Camps:**[1] – To ensure that communities close to the pipeline route do not suffer adverse impacts and disruption as a result of an influx of southern workers during pipeline construction, the Applicant will locate construction camps on the right-of-way, well removed from communities and settlements. Camps will be self-sufficient, and adequate on-camp facilities will be provided. As a practical matter, the relative isolation of camps will be reinforced by the absence of casual transportation. To the extent that interactions might occur, the Applicant will co-operate with community representatives to ensure proper planning and appropriate two-way controls.

Firearms will not be permitted, and alcohol will be controlled in the construction camps."

2.1.2 **"Housing:**[2] – The Applicant is fully aware of the fact that a housing policy that is appropriate to the realities of any major development program, particularly in areas in which there is already a problem in terms of the quantity and the quality of housing, has important implications in terms of employee morale, the efficiency of the labour force and the impact of the development on the local community.

During the construction phase, all employees will be provided with on-site camp accommodations. In the operations phase, housing will be required for permanent employees, and the Applicant will ensure that its actions are consistent with the **Guidelines** and that it does not exacerbate the housing problem that presently exists.

The pipeline project can be expected to yield significant indirect benefits in the area of housing. Increased incomes will make it possible for larger numbers of northern residents to afford suitable accommodations. Further, the Applicant's direct actions, related to the provision of housing for pipeline personnel, can be expected to stimulate the housing construction industry and enhance the industry's ability to meet overall housing requirements in an increasingly efficient and economical manner.

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1 **Regional Socio-Economic Impact Statement**, Section 14.c (CAGPL), page 37.

2 IBID, page 37.

A responsible corporate attitude dictates that involvement in employee housing, particularly in a remote and relatively undeveloped area, should accommodate itself to defined or developing needs. Such an accommodation is also necessary in terms of the transportation of employees to points of departure from which they can reach their residences during leave periods or in off-seasons, should they choose not to live at their base of activity.

It is the intention of the Applicant to make such accommodations and to respond to the defined needs of employees and the interest of the communities to the extent that they can be reasonably anticipated or as they develop."

2.1.3 "**Recreation Facilities:**[1] – Northern residents want more recreational facilities in their home communities. Northern residents were asked what they would like to do in their community which they cannot do now, and what further opportunities and facilities are needed. An overview of the responses reveals that a dominant recognized need is in the category of recreation -- movies, dining and dancing, more sports, playgrounds, swimming, skating rinks and community recreation halls.

As previously noted, construction camps will be self-contained, which includes the provision of appropriate recreation facilities; the shortage of recreational facilities will not be made more acute as a result of pipeline construction activities.

The Applicant recognizes that, during the operations phase, the presence of pipeline staff and their families will intensify the demand for recreation facilities. Furthermore, the Applicant believes that the stability of its work force will be at least partly dependent on the provision of appropriate facilities for sports, amusement, and cultural activities. It is important to the Applicant, therefore, to ensure that pipeline employees have access to such facilities.

The Applicant does not intend, however, to engender disparities. The policy will be to work with community representatives to provide appropriate recreation facilities. The Applicant will not provide or administer such facilities for the sole use of its employees, but will work with others to provide for the needs of the total community, and thereby for its own employees and their families."

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1 IBID, page 38.

2.1.4 **"Applicant Use of Public Facilities and Services:**[1] – During construction, the Applicant and its contractors will provide self-contained work camps. During the operations phase, the Applicant will work with the appropriate levels of government in planning necessary public facilities and services, including sewers and water, power, roads, fire protection and emergency health care. The intention will be to supplement existing services so as to assist or benefit communities as a whole."

2.1.5 **"Gas Supply to Communities:**[2] – The Applicant will not own any natural gas and does not intend to build, own or operate any natural gas distribution facilities in the Yukon or Northwest Territories. The Applicant recognizes, however, a responsibility to ensure that natural gas can be made available to communities if this reflects the wishes of the residents. The Applicant will install valves and fittings at appropriate points in the proposed pipeline to facilitate the future construction of distribution facilities to serve communities. Further, the Applicant will co-operate with communities and industries that wish to acquire natural gas and will assist in the planning and development of gas distribution facilities. To this effect, the Applicant is completing studies of the technical and economic feasibility of gas supply for northern communities in the study region, which it will shortly make public and available to the communities and to other governmental units for their planning."[3]

2.2 PIPELINE EMPLOYMENT

On the assumption that CAGPL policy relative to construction camp location will be operable, then one can assume no extraordinary growth pressures upon the valley communities due to pipeline construction. Exceptions are those municipalities which have been designated by CAGPL as administrative and operating centres, and the Town of Hay River which will experience substantial growth pressures resulting from its role as a trans-shipment centre.

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1 IBID, page 38.

2 IBID, page 39.

3 A report entitled, **Impact of Proposed Arctic Gas Pipeline on Energy Costs in Northern Communities**, dated September, 1974, has been subsequently released by CAGPL on November 14, 1974.

Permanent pipeline employment by 1983 is estimated as follows:[1]

Inuvik	Division Staff	9
	District Staff	70
Norman Wells	District Staff	66
Fort Simpson	District Staff	63
	TOTAL	**208**

Permanent employment related to Delta Gas industries is expected to total 785 by 1983. The anticipated impact of the foregoing is discussed in detail in the following section.

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1 **Regional Socio-Economic Impact Statement**, CAGPL, Section 14.c, Table 4.3.

SECTION 3.0

COMMUNITY ANALYSIS

In order to predict the population impact of pipeline activities upon the existing communities certain assumptions are necessary to clarify the interaction between regional activities and the communities. Figure 3-1 shows the possible relationship between the region and the communities as to their share of the population increase over the Pre-pipeline, Pipeline, and the Post-Pipeline periods. The degree to which individual communities will be protected against the "boom-bust" cycle, so typical in the north's history, will depend largely on the construction camp policies put into practice by the pipeline company and the producing companies. Canadian Arctic Gas Pipeline Ltd. has stated that they intend to pursue a policy of "isolation" for construction camps as noted in Section 2.1.1 of this report.

The success of implementing such an isolation policy will determine the division between that portion of the regional population increase which will reside in the communities and that that portion which will reside in camps located on the pipeline right-of-way, at the drilling sites, and at the gas plant sites on Richards Island and at Parsons Lake. (See Figure 3-2.) By confining, as much as possible, the temporary work force to the construction camps and rotating crews to and from the job site through Edmonton and Calgary, the boom and bust cycle on the existing communities can be minimized.

High impact communities will likely receive almost all of the permanent population increase in the region due to pipeline and pipeline-related activities. The relationship between such a community and the rest of the region with regard to population increase may be represented by the high impact population curve in Figure 3-1. This curve assumes a pre-pipeline growth rate in the community of 5 percent. The region's population will increase dramatically due to the construction of the pipeline. A relatively small percentage of total regional population increase will be due to the creation of permanent jobs. The majority of people employed in the permanent jobs will become residents of those urban centers designated by the Applicant as operating and administrative headquarters. After the construction force peaks, the number of operations personnel will increase and eventually predominate in the region as the pipeline nears completion. During the Post-Pipeline period the pipeline construction force will disappear from the region and impacted communities will be left with a permanent population increase. This increase will result from the staff left

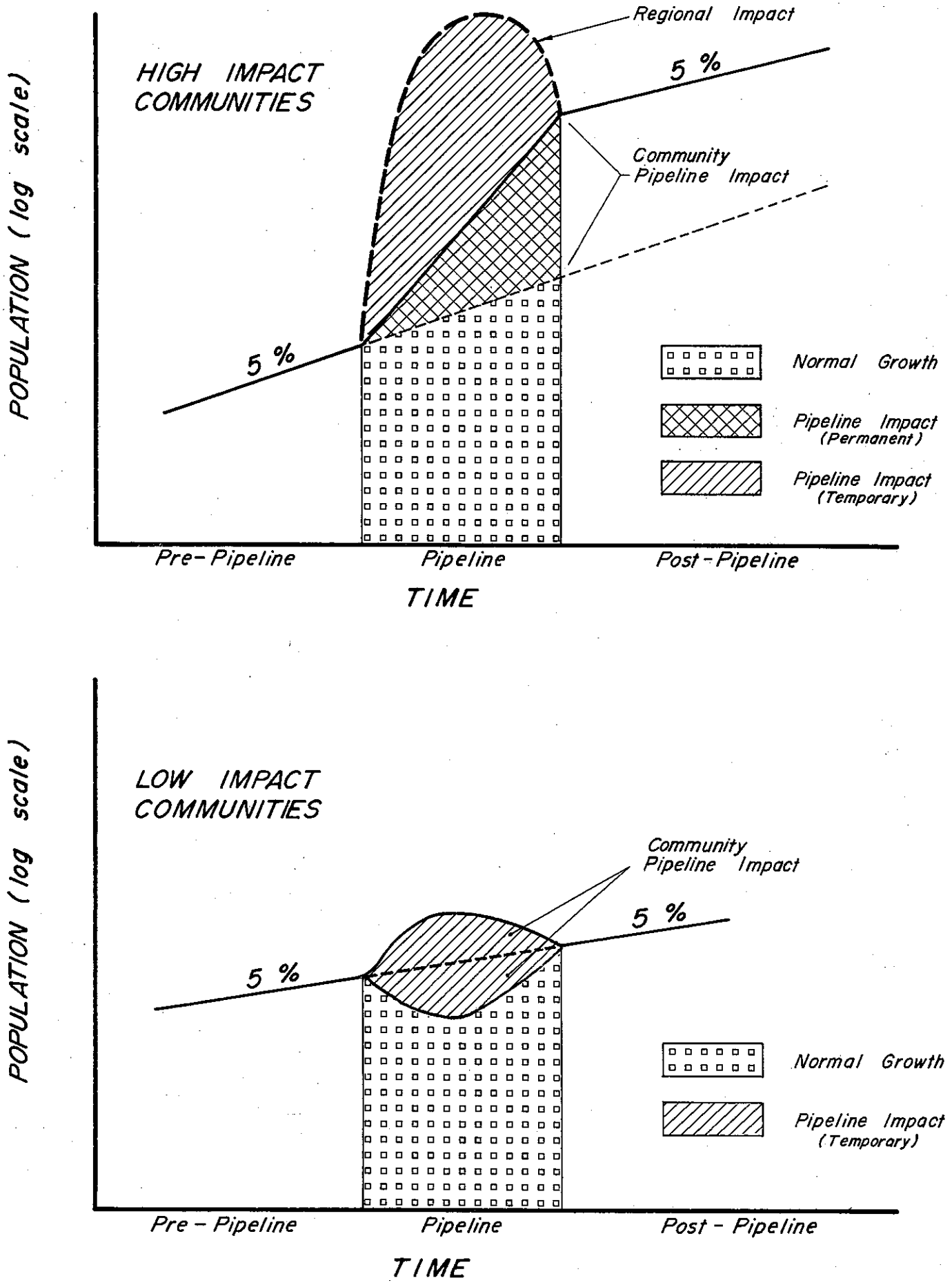

FIGURE 3-1 : TYPICAL POPULATION GROWTH CURVES

behind to operate the pipeline and gas plants, and to further explore for additional gas reserves as older fields become depleted. These communities will then likely return to more normal growth rates in the Post-Pipeline period.

On the other hand, the low impact communities might experience a population impact as a result of the pipeline in two quite different ways. These low impact communities will be largely native communities. In communities where the residents are generally in favour of gaining employment on the pipeline, the population of that community may actually decrease over the pipeline construction period. In a community in which the native people are not in favour of participating in a wage economy, the growth rate of the community could remain unchanged. Results of an attitude survey[1] have shown a tendency for the Indian community to reject the wage economy in favour of a traditional one and for the Eskimo community to want to participate partially in the wage econmy.

It is the intent of this section in the report to discuss the normal population growth trends in each of the subject municipalities. From this base the estimated magnitude of pipeline impact will be added to give the total population growth which might be anticipated by each community. This section will also present the identified community concerns which are specific to each community. Concerns of a more universal nature are discussed in Section 5.0.

In order to facilitate considerations of projected regional activities as they relate to the urban centres, the following discussion is presented within the framework of four geographic sub-regions: the Lower Mackenzie Delta, the Central Mackenzie, the Upper Mackenzie and the Great Slave.

3.1 THE LOWER MACKENZIE/DELTA SUB-REGION (Figure 3 – 2)

The Lower Mackenzie/Delta Sub-Region is predominately a vast flat area consisting of transitional forest. Pre-1965 development in this area consisted of government and military activities in association with the traditional economy of the native peoples, both Indian and Eskimo. Community supplies were transported into the region via the Mackenzie

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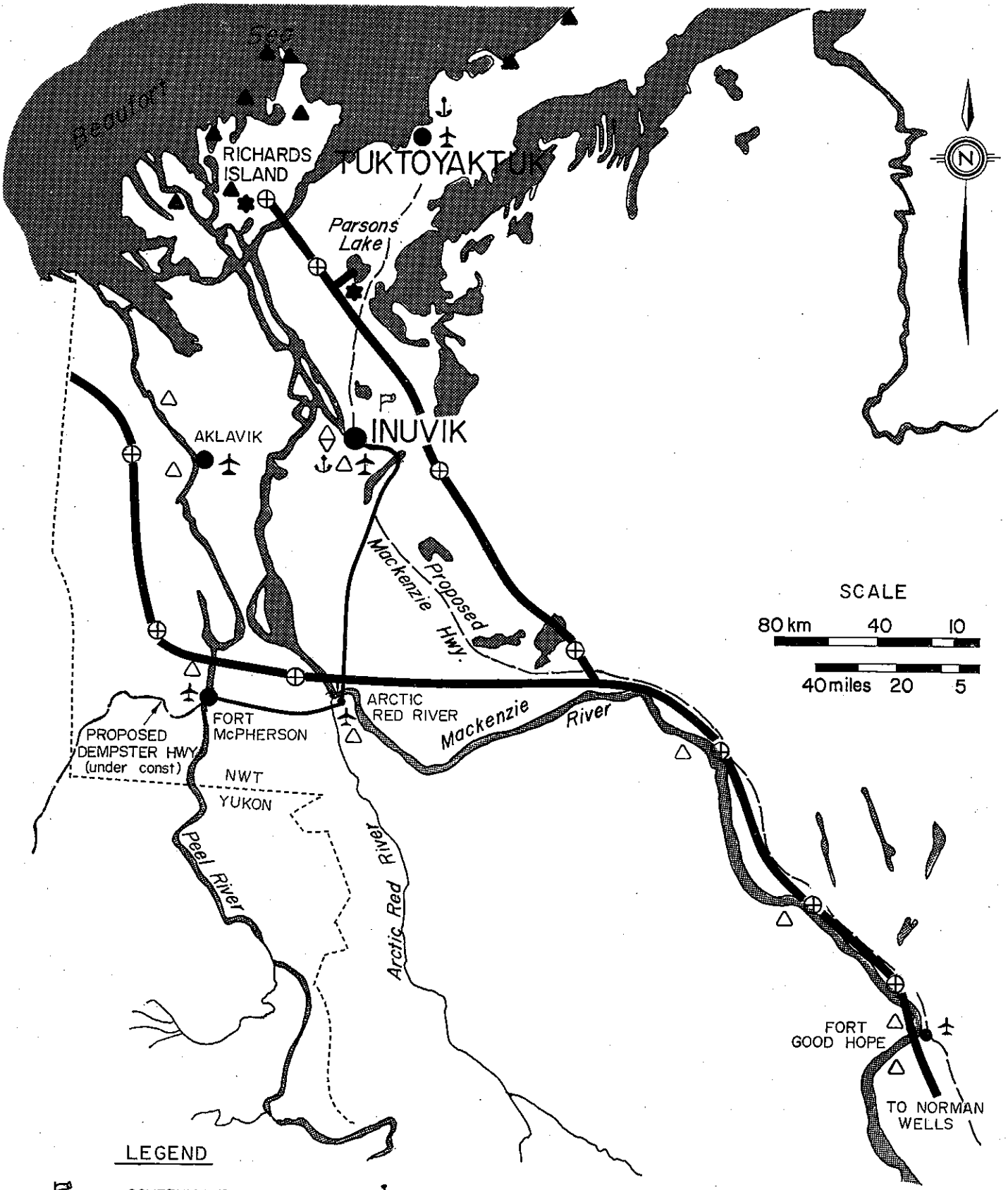
1 **Forth, T.G. et al, Mackenzie Valley Development Implications for Planners Government of the N.W.T.,** 1974, p. 122 – 123.



Stanley Associates Engineering Ltd.
Consulting Engineers and Planners

LOWER MACKENZIE / DELTA SUB-REGION

(AFTER C.A.G.P.L. & VAN GINKEL)

FIGURE 3-2

River in the summer shipping season and year round by means of aircraft. Energy needs in the region have been mostly supplied from the oil refinery at Norman Wells.

Since the drilling of B.A. – Shell – IOE Reindeer D-27 on Richards Island on July 9, 1965 this region has undergone many changes as a result of stepped-up petroleum exploration to justify a Mackenzie Valley Pipeline.

Because of the fragile Arctic ecology in this permafrost region, construction activities are restricted to the winter period. The overall logistics of carrying out an exploration program for oil and gas has necessitated the shipment of pipe and supplies down the Mackenzie River during the summer shipping season. Individual rigs have been serviced during the winter drilling season by aircraft and/or winter roads, primarily out of Inuvik as the central staging area.

The petroleum exploration effort in the Arctic Islands and Beaufort Sea Petroleum Province has placed additional tonnage loads on the Mackenzie Valley Marine Transportation System, accelerating the development of the Port of Tuktoyaktuk as a transhipment point between the Mackenzie barge system and ocean-going freighters. Following the oil discovery of the Atkinson Point H-25 field on January 15, 1970, additional fields were discovered in 1971 and 1972. Among these discoveries are the gas fields of Taglu and Parsons Lake. Latest estimates of proven reserves in these two fields have been calculated by Canadian Arctic Gas at 2.67 trillion cubic feet of gas for the Taglu field, and 2 trillion cubic feet for the Parsons Lake Field. Other discoveries in the Delta Region have been assigned proven reserves of 1.8 trillion cubic feet.

In summary, the Canadian Arctic Gas on-shore estimates in the Mackenzie Delta, have been calculated to be 6.5 trillion cubic feet (to December 1974). The remaining potential of the on-shore and off-shore areas is in excess of 50 trillion cubic feet according to industry spokesmen.[1]

Based on the work of Lerand, Kunst and Gilbert; McCrossan and Porter compiled a table of oil and gas reserves for the different petroleum provinces of Canada. The following table is a summary relative to their findings in the Mackenzie Valley area.

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1 **"Canadian Arctic Gas Files Final Submissions to NEB"**, Oilweek, January 27, 1975, page 5.

TABLE 3.1

Estimates of Ultimate Petroleum Potential[2]

Sedimentary Basin	Ultimate Recoverable Oil Potential (billion barrels)	Ultimate Recoverable Gas Potential (trillion cubic feet)	Qualitative Rating
Fort Simpson – Hay River Region			
Tathlina (Eastern)	.5	.5	Poor
(Western)	.75	11.2	Fair
Regional Total	**1.25**	**11.7**	
Inuvik Region			
Anderson Plain	1.4	1.4	Poor
Peel Plateau	1.2	7.3	Fair
Mackenzie Basin	8.0	64.0	Excellent
Regional Total	**10.6**	**72.7**	

The Mackenize Basin contains ultimate recoverable oil potential of 8 billion barrels and an ultimate recoverable gas potential of 64.0 trillion cubic feet. This petroleum province, compared with the rest of Canada, has a qualitative rating of excellent. Deduction of 6.5 trillion cubic feet, proven to date by drilling, from the estimated 64.0 trillion cubic feet of recoverable gas potential for the Mackenzie basin, indicates that a potential of 57.5 trillion cubic feet remains undiscovered in the Mackenzie basin. Continued petroleum exploration and development activity in the Delta region will secure Inuvik's position as a petroleum industry supply and logistics centre in the foreseeable future.

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1 From: **Future Petroleum Provinces of Canada**, Canadian Society of Petroleum Geologists, June 1973, McCrossan, R.G. (Editor).

3.1.1 Community Role and Function Within the Region

The primate centre within the Lower Mackenzie Delta Sub-Region is the Town of Inuvik. Between 1961 and 1971 the Town grew from a population of 1,248 to 2,672. This growth was mainly due to Inuvik being designated as a government regional administrative centre witin the N.W.T. In addition, Inuvik has served as a major distribution point in the Delta for some community supplies and services. A docking facility has been established with a major bulk fuel storage depot in the Town. With the accelerated activity due to petroleum exploration in the region, Inuvik has experienced considerable winter activities in the form of crew changes and the establishment of well servicing companies within the Town. Additional government personnel have been required as a result of these activities. Education and hospitalization services have been centered in Inuvik as well.

Inuvik is surrounded by a number of satellite communities, namely Tuktoyaktuk, Aklavik, Fort McPherson, and Arctic Red River. Fort McPherson and Arctic Red River will be linked this year with Inuvik by a portion of the Dempster Highway. Access between Inuvik and Aklavik is by air transport and winter road. Tuktoyaktuk is linked to Inuvik via an air route, a winter road, and the Mackenzie barging system. As mentioned previously Tuktoyaktuk serves as an Arctic port and plays an important role in the transhipment of goods between the inland Mackenzie River and the Arctic Ocean transportation systems.

3.1.2 Assumptions Relative to the Future Role of Communities In the Lower Mackenzie/Delta Sub-Region

In order to project the probable growth pattern of communities in the Lower Mackenzie/Delta Region, a number of assumptions must be made based on currently available information. The assumptions are stipulated below:

1) Inuvik will continue to be the dominant centre in the region and activities of an urban nature will be concentrated in Inuvik.

2) The Hamlet of Tuktoyaktuk will continue to serve as the northern Arctic port for the Mackenzie River Marine Transportation System and it may also serve in the future as a staging area for the Beaufort Sea petroleum exploration effort.

3) It is assumed that Canadian Arctic Gas Pipeline Ltd. will be able to pursue their policy of locating construction camps on the right-of-way, well removed from communities and settlements, and that the camps will be self-sufficient with adequate on-camp facilities.

4) It is also assumed that the policy in assumption No. 3 will be followed in relationship to the construction of the Delta Gas industrial plants, the construction of field gathering lines, and the drilling of new wells.

5) The native communities of Aklavik, Fort McPherson, and Arctic Red River will experience very little population change as a result of pipeline activities.

Based on the foregoing assumptions, Sections 3.1.3 and 3.1.4 describe the anticipated growth patterns for the member municipalites of Inuvik and Tuktoyaktuk, respectively.

3.1.3 Town of Inuvik

3.1.3.1 Population

The population of the Town of Inuvik has grown from a 1961 population of 1,248 to a 1971 population of 2,672 persons.

Between the years of 1961 and 1966 the population growth rate was in the order of 10% per year. During the five year period between 1966 and 1971 population increased at an average rate of 5% from 2,040 to 2,672. It is extremely difficult to estimate the population of the Town between census years owing to the transient population component as a result of petroleum and transportation activities in the region. It has been estimated that the 1975 permanent population component in the Town of Inuvik ranges between 3,500 and 4,000 persons.

The cultural composition of the population is estimated as Eskimo 25%, Indian 5% and others 70%.

The future impact of pipeline activities on the population of Inuvik has been analyzed by reviewing previous population projections and evaluating their validity. Three independent population projections have been recently published by Gemini North and Makale, Holloway & Associates Ltd. Gemini North prepared a social impact study on the Mackenzie Valley for the Government of the Northwest Territories in May of 1973 in which specific communities were studied, including Inuvik. One year later, in March of 1974, Gemini North also completed a series of reports on the socio-economic impact of the pipeline on the sub-regions along the Mackenzie Valley for Canadian Arctic Gas Pipeline Ltd. Makale, Holloway & Associates Ltd. produced an update to their population projection in the General Plan for the Town of Inuvik in October of 1973.

The results of these studies are presented in summary form and are prefaced by their general assumptions as follows:

a) **Gemini North (N.W.T. 1973)**

Assumptions:

1) A 4% or 5% increase per year was used. The percentage increase was determined by analysis of changes in the population over the last few years.

2) Some of the communities have shown no increase over the last few years; these are not projected to increase in the years to 1980. If births exceed deaths in these communities, as expected, it is anticipated the difference will be netted out due to out-migration to other communities.

3) Certain select communities such as Inuvik, Norman Wells, Fort Simpson and Hay River are expected to be major centres of activities related to resource and highways development. Towards the end of the decade Inuvik, Fort Simpson and Norman Wells are expected to have a permanent population increase due to operations of the gas pipeline. The estimates for these communities reflect the estimated permanent employment created in the operations phase of a gas pipeline. To this direct pipeline employment was applied a family multiplier of 3.5, the average family unit size, plus an induced employment multiplier of 1.00, plus their families at 3.5 each.

4) Not included in these estimates are population increases due to increased tourism and sporadic developments such as mining town developments which may occur in the study region during the time-span of this study.

5) The figures are also net of transient construction workers imported from south of the of the 60th parallel since these will have little permanent impact in terms of population.

Resultant Population Projection:

The predicted population of the Town of Inuvik between the years 1975 and 1980 due to natural increase, net migration and oil and gas activities has been estimated by Gemini North as follows:

Year	Population of Inuvik
1975	4,067
1976	4,351
1977	5,356
1978	5,682
1979	6,031
1980	6,404

b) **Makale, Holloway & Associates Ltd.** (Inuvik General Plan, October 1973)

Assumptions:

1) Population project based on rate of natural increase and migration from the Mackenzie Delta.

2) Population project does not include oil and gas activities and resulting growth.

Resultant Population Project:

Year	Population
1975	3,449
1976	3,901
1977	3,991
1978	4,083
1979	4,177
1980	4,273
1981	4,692

c) **Gemini North (CAGPL, March 1974)** Projection for the Lower Mackenzie Sub-Region

Assumptions:

1) Assumes zero participation of northerners in new permanent employment opportunities.

2) Each migrant employee is assumed to support a total family of 2.5 persons.

3) Induced employment multiplier of 0.2 is used.

Resultant Population Projection:

Year	Regional Permanent Population Increase
1981	2,083 (Impact) + 7,899 (Natural Increase) = 9,982
1983	2,308 (Impact) + 8,389 (Natural Increase) = 10,697

d) **Stanley Associates Engineering Ltd.** (NWT Association of Municipalities, 1975).

It is concluded that the basic assumptions behind the study done by Gemini North in 1973 for the Northwest Territories Government and that done for the Applicant in 1974 are inconsistent. Specifically, a different family size was assumed in the two studies (3.5 for NWT and 2.5 for the Applicant), and also substantially different induced employment multipliers[1] were assumed in the two studies (1.0 for the NWT and 0.2 for the Applicant). In both the studies the impact of the pipeline upon the Mackenzie Delta Sub-Region has been underestimated. The 1973 study only considered the impact of the operations phase of the pipeline and excluded the impact of the stepped-up exploration effort both on-shore

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1 Induced Employment Multiplier = $\frac{\text{Employment in Non-Basic Sector}}{\text{Employment in Basic Sector}}$

off-shore, the construction and operation of the Delta Gas Plants, and the continued gathering line construction and gas field maintenance. In the 1974 study, all aspects of direct, indirect, and induced pipeline employment were considered including the Delta Gas industrial activities. However, the induced employment multiplier was severely discounted from the 1973 study assumption from 1.0 to 0.2. Based on research by Gemini North in their 1974 study, an historical induced employment multiplier of 2.4 was identified for the Town of Inuvik. It can only be concluded that the use of the 0.2 induced employment multiplier is based on the assumption that virtually all services to oil company employees will be provided out of southern centres such as Edmonton and that local business generated by pipeline activities will be minimal.

Based on the foregoing, the population projections of Gemini North have not been accepted as being realistic for the purpose of this study. Instead, Stanley Associates Engineering Ltd. have used Makale's population forecast as a base line population curve for normal growth and estimated the population impact upon the Town of Inuvik due to pipeline activities. This permanent pipeline population component has been added to Makale's base population to give an estimated total population for the Town of Inuvik for each year over the study period.

Assumptions:

1) The Town of Inuvik will receive practically all of the population increase in the Lower Mackenzie/Delta Sub-Region, as defined by Gemini North, as a result of petroleum exploration and production.

2) Practically all skilled jobs will be filled by personnel from outside the territories (at least in the initial stages).

3) Average household size of employees with skilled jobs would be 2.5 people/household.

4) Total Induced Employment opportunities will be 1.0 times permanent employment in man years plus .2 times temporary employment in man-years.

5) Most induced employment will be filled with white entrepreneurs.

6) Seventy percent (70%) of induced employment will be family heads.

7) Due to stated company isolation policy, pipeline construction workers will be housed at various construction sites along the pipeline route.

8) Gas industries construction personnel will be housed on the site.

9) No significant amount of gas industry positions will be filled from within Inuvik's present unemployment ranks.

High Population Forecast Assumptions:

a) Fifty percent (50%) of the semi-skilled and unskilled permanent and temporary jobs will be filled by native workers from the Lower Mackenzie region.

b) Male native workers with permanent jobs will tend to move their families into Inuvik.

c) Average native family size of 4.0. Average family size of others, 2.5.

High Projection

Sample Calculation: 1978

Permanent Skilled Employment:[1]

Positions	x	Family Size		
117	x	2.5	=	293 persons

Permanent Semi-Skilled and Unskilled:[1]

Positions	x	Family Size[2]		
364	x	3.25	=	1,183 persons

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1 From Table 3.3.

2 Average household size of employees with permanent semi-skilled and unskilled jobs would be (.5 x 4.0) + (.5 x 2.5) = 3.25 people.

Induced Employment:

Permanent Positions	x 1.0	+ Temporary Positions	x .2	= Induced
(117 + 364)	x 1.0	+ $\frac{(1,435)}{2}$	x .2	= 625

Induced	x .7	= Family Heads
625	x .7	= 438

Family Heads	x Family Size	= Persons
438	x 2.5 =	= 1,095 persons

Total Pipeline Related Population:

293 + 1,183 + 1,095 = 2,571 persons

Low Population Forecast Assumptions:

a) All semi-skilled and unskilled permanent and temporary jobs will be filled by workers from outside the territories.

b) Average household size of employees with permanent semi-skilled and unskilled jobs would be 2.5 people.

Low Projection:
Sample Calculation: 1978

Permanent Skilled Employment:
Positions x Family Size
117 x 2.5 = 293 persons

Permanent Semi-Skilled and Unskilled:
Positions x Family Size
364 x 2.5 = 910 persons

Induced Employment (from high projection):
= 1,095 persons

Total Pipeline Related Population:
293 + 910 + 1,095 = 2,298 persons

Pipeline Related Population by Years

Year	Low Estimate	High Estimate
1975	580	639
1976	1,475	1,614
1977	1,753	1,933
1978	2,298	2,571
1979	3,180	3,548
1980	3,188	3,565
1981	3,488	3,965
1982	3,625	4,073
1983	3,778	4,239

TABLE 3.2

Total Population Forecast for The Town of Inuvik[1]

Year	Low Estimate	High Estimate
1975	4,029	4,088
1976	5,376	5,515
1977	5,744	5,924
1978	6,381	6,654
1979	7,357	7,725
1980	7,461	7,838
1981	8,180	8,657
1982[2]	8,475	8,923
1983[2]	8,778	9,237
1984[3]	9,240	9,660
1985	9,700	10,140
1986	10,185	10,650
1987	10,700	11,180
1988	11,235	11,740
1989	11,800	12,230
1990	12,390	12,950
1991	13,010	13,600
1992	13,660	14,280
1993	14,340	14,990
1994	15,060	15,740
1995	15,810	16,530

1. Makale's natural increase plus projected pipeline-related increase.
2. Pipeline induced population increase added to Makale natural increase extrapolated to 1983.
3. Population 1984 – 95 increased at average rate of 5% per annum, natural increase.

TABLE 3.3

Forecasted Employment For The Lower Mackenzie/Delta Sub-Region Due To Petroleum Exploration And Production[1]
(After Table 3, Section 14.f, and Table 2.1 2D Section 13.6, CAGPL, March '74)

Permanent Employees[2]						Year	Temporary Employees[2]					
Pipeline Operations			Delta Gas Industries				Gas Industries Construction			Gas Field Development		
S	SS	U	S	SS	U		S	SS	U	S	SS	U
			18	19	28	1974				35	121	189
			32	36	42	1975				86	308	246
			105	95	90	1976	200	100	100	137	408	448
			115	122	118	1977	200	100	100	137	408	448
			117	201	163	1978	200	100	100	142	407	486
18	28	8	196	258	196	1979	75	38	37	115	326	474
22	47	8	192	256	192	1980	75	38	37	88	251	296
22	50	8	212	288	210	1981	75	38	37	83	239	266
22	49	8	215	310	230	1982				56	179	228
22	49	8	228	319	238	1983	75	38	37	62	179	212

1. Pipeline construction personnel not included.

2. Number of employees divided into job classifications, skilled (S), semi-skilled (SS), and unskilled (U).

3.1.3.2 Physical Services[1]

Introduction

The Town of Inuvik is situated at the eastern edge of the Mackenzie River Delta on a gently sloping plateau, elevated an average of 70 feet above the normal water level of the east channel of the Mackenzie River. The soils in the centre of the townsite are coarse-grained and are not susceptible to frost-heaving in the active layer. Soils on the periphery of the Town in new development areas tend to be fine grained and particularly susceptible to frost-heaving. In the new residential areas single family dwellings require thick gravel pads or above-ground piles to adequately insulate the base of the building from the permafrost. In addition, considerable amounts of granular fill are required for new roads and maintenance of the existing network.

Inuvik is located in the continuous permafrost zone where the permafrost is over 300 feet thick. Conventional sanitary engineering technology in the form of piped services can not be buried in the ground due to the problems incurred by heat loss to the surrounding frozen ground, resulting in pipe rupturing through differential settlement. Instead, conventional piped services have been constructed above-ground, inside insulated utilidors. This has necessitated rear lot servicing and numerous road-utilidor bridge crossings in the design of the townsite. The Town presently has a sizeable commercial and institutional core and three industrial districts, one in the centre of town, one on the North side (Navy Road), and the other between the Town and the airport.

Present and Future Requirements

The present physical services of water, sewerage, utilidors, roads, drainage and solid waste disposal have been assessed for their ability to accommodate the existing population and the anticipated population increases due to normal and accelerated growth.

The present water supply, treatment, and distribution system consists of water supply lines from Hidden Lake, Lake B and the Mackenzie River; a water treatment plant consisting of micro-strainers and a fluoridation-chlorination plant; a 90,000 gallon storage

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1 More extensive description in Appendix A.

at Hidden Lake; and a water distribution system consisting of tank truck deliveries in the western part of Town, and utilidors in the rest of the Town. The initial capacity of the water supply system is limited since the water supply from Lake B is not available during the winter months. This limits the effectiveness of the system to supply peak daily flows of water to only 3,000 people during the winter months. The treatment plant will be upgraded this year with the addition of two gravity sand filters. Upon completion, the water treatment plant should be capable of meeting peak daily flows for a population of 6,700. Also in 1975 it is planned that a 500,000 gallon storage tank will be constructed and, upon completion, the water storage system should be capable of serving a population of 6,500 people. Portions of the utilidor water distribution system are undersized for fire flow purposes and require upgrading to appropriate standards. To bring the Town's water supply system up to appropriate standards to accommodate a future population of 10,000 people would require a new 8-inch supply line and temporary intake into the Mackenzie River, further additions to the water treatment plant, a second 500,000 gallon storage tank, and extensions to the main utilidor system to service new areas and upgrade the west end of the Town. The total capital cost of upgrading Inuvik's water system (exclusive of the distribution system) to meet anticipated growth has been estimated at 849,000 dollars.

The present sewage collection system consists of pump-out truck service and utilidors. Sewage treatment is currently handled by a 44-acre sewage lagoon, located within 700 feet of existing Town developments. The present lagoon is inadequate and should be replaced. Expansion of the present sewage collection system and replacement of the sewage treatment facilities will be required to accommodate a future population of 10,000 people. A new 3-cell anaerobic-aerobic lagoon site (265 acres) has been chosen on the west side of the East Channel and would require a new 14-inch sewage outfall line to a pumphouse at the edge of the townsite. The sewage would then be pumped across the river through a 12-inch insulated steel pressure line to the lagoon. The total capital cost to build these facilities has been estimated at 2.3 million dollars.

The present utilidor system consists of a variety of above-ground designs. The original system is still in operation and consists of water, sewer and steam heating lines in the central core of the Town. More recent proto-types have included the wood box utilidor, econo-utilidor, and the proposed utilidor to be used for future expansion. As mentioned previously, existing water lines will require upgrading to meet fire flow standards and sewage lines will require upgrading in order to handle increased flows. In addition, new main utilidors will be constructed into new development areas as required. Secondary lines and connections will be charged against the purchases of new residential, commercial or

industrial lots. The total capital off-site costs to build new utilidors and upgrade existing ones has been estimated at 9.0 million dollars.

The present road network consists of dirt and gravel surfaces. The roads are generally adequate with dust being controlled in the summer by oiling. The future growth of the community will place additional traffic loads upon the existing road system, thereby necessitating further upgrading. Included in this upgrading will be the paving of 1.5 miles of Mackenzie Road. Arterial and collector roads will be required to be constructed into new areas as they are developed. The total capital cost of constructing and upgrading arterial and collector roads to a population of 10,000 people has been estimated at 5.9 million dollars.

Solid wastes are collected from barrels placed throughout the community by the town. Burning is encouraged before pick-up. The waste ground is located approximately 1 mile away from the built-up area of the Town but within the Town limits. It has been proposed that the Town dispose of future solid wastes by means of an incinerator. The capital cost of building an incinerator has been estimated at $735,000 dollars.

Summary

Costs for expanding the municipal off-site services for the high population forecasts are shown in Table 3.4 for normal growth and pipeline growth. The present worth in 1975 of all capital expenditures was computed with a discount rate of 10% per year. Present worth calculations do not include factors for recovery or expected life. It was determined that the present worth of capital expenditures for normal growth is approximately $12,196,700; whereas, for the accelerated growth due to the pipeline, it would be $17,070,000. The difference is $4,873,300. Present worth calculations, for the difference in operating and maintenance cost between the accelerated growth period and normal growth period, were computed in the table below. It was assumed that operating and maintenance costs for each item do not vary from one year to another.

(Cost in Millions)	Normal Growth	Accelerated Growth	Difference
Capital Costs	12.20	17.07	4.87
Operating Costs	—	—	2.26
Total Costs	**12.20**	**17.07**	**7.13**

The above costs show an order-of-magnitude impact of 7 million dollars that the pipeline will have on the physical services of Inuvik.

The capacities of the proposed systems will reach a critical stage at 10,000 population (1985). At this time more developable land would be needed and capacities of the water system and sewerage system would have to be upgraded.

TABLE 3.4

All Costs in 1975 Dollars

Town of Inuvik
Physical Services Cost Analysis

	Capital Cost	Maint. & Operation Cost/Year	Normal Growth Year Required	Normal Growth Capital PW	Accelerated Growth Year Required	Accelerated Growth Capital PW	PW Cost Difference Capital	PW Cost Difference Maint. & Operation
A. Waterworks:								
1) Supply	341,000	34,000	1975	341,000	1975	341,000	–	–
2) Treatment & Storage	508,000	10,000	1987	161,800	1977	419,800	258,000	50,800
B. Sewerage:								
1) Outfall	400,000	40,000	1975	400,000	1975	400,000	–	–
2) Treatment Works	1,857,000	41,100	1980	1,153,000	1975	1,857,000	704,000	163,200
C. Utilidors:								
1) Stage I	1,570,000	195,800	1975	1,570,000	1975	1,570,000	–	–
2) Stage II	3,428,000	68,000	1981	1,935,000	1976	3,116,000	1,181,000	234,400
3) Stage III	3,994,000	77,000	1989	1,052,000	1978	3,000,000	1,948,000	375,700
D. Roads:								
* 1) Stage I	4,656,000	426,000	1975	4,656,000	1975	4,650,000	–	–
* 2) Stage II	600,000	84,000	1981	339,000	1976	545,000	206,000	289,500
* 3) Stage III	661,000	101,000	1989	174,000	1978	497,000	323,000	492,800
E. Waste Disposal	735,000	189,000	1981	414,900	1976	668,200	253,300	651,400
Total Costs	**18,750,000**	**1,265,900**		**12,196,700**		**17,070,000**	**4,873,300**	**2,257,800**

* Assume maintenance for normal years.

3.1.3.3 Social and General Services

Introduction

Social and general services which fall under the umbrella of the municipal corporation include by-law enforcement, fire protection, culture and recreation programs, and general administration. Other community services outside the direct jurisdiction of the municipal corporation include education, hospital, and health care programs. These social services are currently financed and administered by the Territorial Government.

Housing

Housing in Inuvik has been generally provided by the Territorial and Federal Governments, the oil companies and the Town of Inuvik. Most of the residential land development has been recently undertaken by the Town administration and, at present, residential lots are being sold for between $7,500 and $10,000 per lot.

The permanent population generated by the activities of building and operating the Mackenzie Valley Gas Pipeline will require approximately 1,200 housing units to be added to the Town between the years 1975 and 1983. Critical housing shortages will likely be experienced by the community between 1975 and 1976 when approximately 300 additional housing units will be required and between 1978 and 1979 when a further 300 housing units will be required to house those employees attached to the operations of the pipeline. This projection has been based on an average occupancy rate provided by the Makale General Plan.

The municipal response to the demand for housing will lie mainly in the field of land development. The municipal corporation, assuming the role of land developer in the Town will be required to insure that enough serviced lots are available so that the necessary permanent housing may be constructed. In the initial stages it may be necessary to develop mobile home lots which could be later converted into single family or multiple family lots. Each mobile home would have to be self contained and utilize such services as incinerator toilets, waste water storage tanks, and facilities to handle water delivery by truck. As extensions to the utilidor system becomes both economic and practically feasible, these lots should be tied into the municipal water and sewage systems.

Education

Currently Inuvik has 37 elementary classrooms and 26 high school classrooms. This classroom supply should accommodate the total education demand until 1977, after which time additional facilities will have to be provided.

Assumptions[1] for projecting education demand in Inuvik are stated as follows:

a) average of 300 students per 1,000 population

b) of the total students 38% will be high school students (grades 7 – 12), 62% will be elementary students (grades 1 – 6)

c) no provision is made for accommodating education levels above that of high school in the Delta Region

d) elementary classroom requirements are based on 28 students per classroom

e) high school classroom requirements are based on 25 students per classroom

f) no estimate of the core school facilities has been assigned to pipeline related population increases.

The demand for elementary and high school classrooms will increase substantially between the years 1975 and 1976 and again between the years 1978 and 1979. The total number of additional elementary classrooms which will be required between the years of 1975 and 1983 will be approximately 28 classrooms. Similarly 20 additional high school classrooms will be required between the years 1975 and 1983 as result of pipeline activities.

At present all educational facilities in Inuvik fall under the responsibility of the Territorial Government. All property owners presently pay an educational tax of 15 mills to the Territorial Government. Should Inuvik eventually convert to a school board educational

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1 **Makale, Holloway & Associates, General Plan for Inuvik**, 1973.

system, as outlined in the proposed educational ordinance for the NWT, then considerable tax load would fall upon the residents of Inuvik in the absence of major capital and operating grants structures. At present the Territorial Government, through the Department of Education provides all school facilities in the three existing school boards at Yellowknife and Rae-Edzo. The three school boards are presently responsible for carrying out capital programs but are funded with 100% of the cost by territorial capital grants. The school boards are also awarded a grant of 75% of their approved operating and maintenance budget.

Hospital Facilities

At present Inuvik has a regional hospital with a 129 bed capacity. This hospital is sufficient to provide hospital facilities for a regional population of approximately 37,000 people.

Even though there are likely to be increasing demands placed upon the hospital facilities in Inuvik due to the permanent population increase and industrial accidents arising out of pipeline construction activities, it is assumed that the present hospital capacity will be able to handle the anticipated case load. This has been verified by experience reported, to date, on the building of the Trans-Alaska Pipeline. The increase patient load on Alaskan hospitals has not been a significant factor in their day to day operations of regional hospitals.[1]

Recreation Facilities

Present recreation facilities in Inuvik consist of a library, hockey rink, curling rink, softball diamond, and a gymnasium for sports activities. Commercial facilities such as a pool hall, a movie theatre, taverns and lounges also provide recreational outlets for the residents of Inuvik.

The demand for recreation facilities in Inuvik cannot be projected using only southern standards. Severe climatic conditions, long hours with or without daylight, and traditional cultural recreation pursuits affect the recreation demand analysis significantly.

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1 **Pipeline Impact Information Centre Report No. 3,** August 7, 1974, Fairbanks, North Star Borough.

A great many of the workers which will be employed in the pipeline-related activities will be from southern Canada. Any prolonged exposure to the northern life in Inuvik will likely bring extreme pressures to bear upon the municipal corporation for the provision of first class recreation facilities based upon southern aspirations.

It is felt locally that an indoor swimming pool would be an asset to the community in that it would facilitate year round water safety instruction. Such a facility is costly both in terms of initial capital cost and subsequent maintenance and operation. Future recreation demand may be significantly altered with the provision of improved television reception in the region from the ANIK Project.

The responsibility of providing recreation and cultural programs falls almost exclusively upon the shoulders of the municipality.

The Applicant has specifically addressed itself to the topic of recreation facilities in its stated socio-economic policies. It will be of critical importance to the Applicant to ensure that the Town of Inuvik will provide first class recreation facilities comparable to the best that the south has to offer. The purpose of providing these facilities would be to reduce turnover in permanent staff who find themselves faced with living in northern Canada. This has been recognized by the Applicant in their social economic policy as stated in Section 2.1.3 of this report. It is important that participation by the Applicant in the provision of recreational facilities in Inuvik be accomplished in such a way as to reinforce municipal programs, rather than through establishing independent, company owned facilities.

Other Services

Police protection in the community is presently divided between the RCMP and a municipal by-law enforcement officer. The present fire department consists of a 24 men volunteer fire department and two pumpers.

The demand for other services such as fire protection, by-law enforcement and general administration will probably increase substantially as more people enter the community. This prediction has been based on historical evidence in the case of Grande Prairie, Alberta, and upon present request for pipeline impact funding in Alaska (see Appendix E). There was a noteable divergence from per capital operating expenditures in Grande Prairie for fire protection, by-law enforcement, culture and recreation, and general administration. This divergence was in the form of significant increases in per capita

expenditures over the period of accelerated growth (1968 – 73) as compared to trends established in the normal growth period prior to 1968.

Inuvik's response to the anticipated increases in per capita operating costs as a result of rapid growth would be to apply for extra-ordinary funding from the Territorial Government.

3.1.3.4 Energy Supply

The only energy source at present being utilized in the Town of Inuvik is fuel oil from Norman Wells and refined petroleum products such as gasoline. Electrical power for lights and appliances is provided through diesel generators, owned and operated by the Northern Canada Power Commission. Inuvik is unique to the north in that the central core contains a central steam heating system in the older sections of the utilidor system. Heating requirements of the newer neighbourhoods are supplied by individual oil furnaces.

In general, the energy demand of the Town of Inuvik will double, from present rates, to a 1980 demand. It is anticipated that there will be no major shift in the energy consumer sectors between residential, commercial, and industrial. Extensions to the industrial heating system which is presently provided in the core of the Town is not anticipated due to the extremely high cost of building and operating such a system.

Several options may be opened to the community in securing the necessary energy sources and distribution system to supply the forecasted energy requirements in the 1980's. As identified in section 4.0 of this report, a very real possibility exists for the construction of gas trunk distribution lines off the main pipeline to supply the community with an alternate source of energy to that of fuel oil. Other independent studies, one by Underwood McLellan and the other by the Applicant, have shown the Town of Inuvik to be in a competitive market position relative to the distribution and sale of natural gas produced in the Mackenzie Delta. The hydroelectric potential in the Mackenzie Delta area has been neglected as being relatively insignificant.

Of considerable importance to the Town of Inuvik would be the possibility of the formation of a gas distributing utility within the Town boundaries to operate either on a franchise basis or as an arm of the existing municipal corporation. In addition, the community's electrical costs might be considerably reduced through the conversion of the present diesel generators to natural gas. The cost of constructing and operating a trunk line facility from the pipeline to the Town gate will be considered in detail in Section 4.0 of this report.

3.1.3.5 Community Resupply

The Town of Inuvik is presently supplied from Hay River by the various barging companies operating on the Mackenzie Valley waterway during the summer shipping season. Because the Mackenzie Marine Transportation System is only operative for approximately 80 days out of each year, this has resulted in an abnormally high amount of commercial square footage being developed in Inuvik for the storage of supplies shipped over the summer period for the winter season. Of secondary importance, for the community resupply, has been air transportation. Most perishable foods (and certain materials required by the oil industry) are presently being flown into Inuvik from Edmonton on a regularly scheduled basis.

The volume of goods transported into the Town of Inuvik will more than double during the study period. This will be mainly due to increased population, the shipment of supplies via the Mackenzie Valley Marine Transportation System in order to construct the pipeline, and continued petroleum exploration effort in the Mackenzie Delta and Beaufort Sea. Continued demand will be placed upon the community for waterfrontage and storage in close proximity to the waterfront. The southern industrial area is ideal for this type of activity since it presently has good connections with the existing local road network and is ideally located relative to the anticipated regional road network.

It is expected that with a road connection via the Dempster Highway to the City of Whitehorse that the need for community supply via the Mackenzie Valley Marine Transportation System may be reduced and the resultant excess commercial storage may eventually be converted into other commercial and industrial uses. A portion of these supplies could as well be shipped from Edmonton via the Mackenzie Highway when constructed.

3.1.3.6 Community Finances

Expenditures incurred by the municipal corporation have dramatically increased from $185,000 in 1968 to over $823,000 in 1973. Greatest expenditure changes have occurred in the fields of recreation and community services, protective services, general government services, transportation services, and capital expenditures from general revenue. The most noticeable change in the municipal corporate expenditure pattern has been in the field of recreation and community services, which has increased from $11,227 in 1968 to $125,619 in 1973.

Revenue generated by the municipality to offset increasing expenditures has been acquired mainly through taxation, grants in lieu of taxation, and other revenue from owned sources (consisting mainly of land). A marked change occurred in 1970 when Inuvik achieved Town status. Since 1971, the proportion of general revenue generated by government transfer payments has steadily decreased from 30% of the general revenue in 1970 to 21% in 1973. The responsibility for financing extensions to the utilidor system was taken over by the Town in 1973 and expenditures in that year amounted to approximately $133,000. N.C.P.C. is now responsible for the operation of the present system and for constructing future facilities.

The anticipated financial demands to be placed upon the community as a result of the increase in population due to pipeline-related activities have been estimated for off-site physical services, educational requirements, and other services. The cost of servicing land with utilities and internal streets will continue to be self-liquidating, being recovered in the sale of serviced lots.

The anticipated financial demands in 1975 present worth dollars as a result of the pipeline have been forecast over the study period in the following table:

TABLE 3.5

INUVIK – FINANCIAL IMPACT SUMMARY

Year	Physical Services		Social Services		Total	Municipal Corporations Share
	Capital	Operating	Capital	Operating		
1975	704,000	163,200		69,100	936,300	936,300
1976	1,640,300	1,175,300	413,600	381,200	3,610,400	2,859,700
1977	258,000	50,800	150,400	587,400	1,046,600	559,000
1978	2,271,000	868,500	239,300	733,500	4,112,300	3,479,300
1979	–	–	310,800	989,500	1,300,300	494,900
1980	–	–	–	908,300	908,300	908,300
1981	–	–	135,200	995,500	1,130,700	742,200
1982	–	–	–	926,300	926,300	469,800
1983	–	–	–	863,600	863,600	461,700
TOTAL	**4,873,300**	**2,257,800**	**1,249,300**	**6,454,400**	**14,834,800**	**10,911,200**

The financial impact analysis shows that the present worth cost to the community as the result of the pipeline will be in the order of 14.8 million 1975 dollars, out of which the municipal corporation will be responsible for administering 10.9 million. The majority of the 10.9 million dollars can be recovered through Territorial Grants available under existing legislation for capital works.

In order to offset increases in funding required for capital and operating expenditures as a result of pipeline activities, the community should apply to the Territorial Government for extra-ordinary funding in accordance with recommendations 6.2.1 and 6.3.1 of this report.

3.1.3.7 Inuvik Community Concerns

While the general results of Council Workshop are reported in Section 5.0 of this report, certain issues emerged from the Inuvik workshop that are specific to that community.

These issues relate to:

1. Shortage of granular materials.

   There is a need to locate new sources of granular fill material to facilities development of land and provision of road networks.

2. Industry contribution to recreation facilities.

   In addition to the continuation of the per capita recreation grants from the Territorial Government, it was felt that the pipeline company should be required to provide contributions to local recreation facilities and programs, in that, pipeline personnel would place additional demand on municipality provided facilities.

3. The Northern Canada Power Commission rate base to the community should not include the component of capital costs necessitated by expansion due to pipeline activity. Power rates paid by present population should not be increased as a result of capital expenditures required to facilitate the pipeline-related growth.

In addition to specific community concerns, certain recommendations were made by the community that were regional in nature.

These recommendations include:

1. In order to secure an adequate supply of granular materials for future lands development and roads, quarrying rights should be established over those deposits in close proximity to Town which would satisfy future municipal requirements.

2. In order to check urban sprawl, no satellite communities should be established within commuting distance of Inuvik.

3. In order to maximize public investment, government spending in the region be co-ordinated between Municipal, Territorial, and Federal levels of government.

3.1.4 Hamlet of Tuktoyaktuk

3.1.4.1 Population

The Hamlet of Tuktoyaktuk grew very slowly between 1961 and 1971. The 1961 population was estimated at 409 and the 1971 population at 605 persons. The estimated population in 1975, as determined by Makale, Holloway & Associates in their Update of the Tuktoyaktuk General Plan, has been cited as 670 people.

The present population is composed almost entirely of Eskimo people with only a handful of whites permanently living in the community. Each summer there is an influx of workers into the community as a result of shipping operations in the Port of Tuktoyaktuk and because of support staff required for the Arctic Polar Shelf Project.

The population impact which will be exerted upon the Hamlet of Tuktoyaktuk in the future by the petroleum industry is difficult to predict. Makale has reported that very few Eskimos have been employed by Imperial Oil in their labour camps on Richards Island: "The Imperial Oil Camp is an entity completely separated physically, economically, and socially from the community. There are no requirements that the community could fulfill for the Imperial Oil Camp and, with the exception of slight increase of purchase of artifacts, influence of this large camp is negligible."[1]

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1 Makale, Holloway & Associates Limited, **Planning & Engineering Assessment of Existing and Future Development Tuktoyaktuk, N.W.T.,** March 1972.

Since the above Report was written, considerable interest has been shown in offshore exploration in the Beaufort Sea. Wells drilled to date have been stationed on artifical islands, constructed from granular materials. Plans are underway for the use of semi-submersible offshore rigs which could greatly increase the number of wells which can be drilled in a single drilling season. In addition, the continued exploration effort on land, the Delta Gas Plant construction, and the continued construction of field gathering lines, as new gas fields are discovered and brought into production, will increase the employment opportunities in relatively close proximity to the community. The degree to which the native community participates in the wage economy will depend upon many factors including the employment policies of the individual oil companies involved and the attitudes of the Eskimo community towards participating in industrialized society.

Population projects for the Hamlet of Tuktoyaktuk have been estimated by Gemini North in 1973 and by Makale, Holloway & Associates in 1975.

The results of the population projections for Tuktoyaktuk are listed as follows:

a) **Gemini North (1973)**

Assumptions as per Inuvik:

Year	Population
1972	695
1973	720
1974	750
1975	780
1976	811
1977	844
1978	872
1979	912
1980	949

b) **Makale, Holloway General Plan (1975)**

Assumptions:

- Population projection based on natural increase of 19 persons/year over the time period.

— Population increase project does not anticipate any significant population impact from Resource Industry in Mackenzie Delta Region.

Year	Population
1975	670
1980	765
1985	860
1990	955
1995	1,050

It is generally assumed that permanent employees in the pipeline and petroleum industries will migrate into the Lower Mackenzie/Delta Sub-Region and settle in Inuvik rather than in smaller centres. Thus, permanent population increases in Tuktoyaktuk due to an influx of employees from the South would be minimal. Any significant increase in population would place additional demand on the available land, and the presently inadequate water supply and sewage disposal systems. Conversion to a utilidor system may be necessary in the community due to natural population increase alone. Slightly accelerated growth due to resource industry activity in the Delta region and the in-migration of Eskimo families into the community may necessitate the conversion sooner than would normally be the case. Serious land development constraints presently exist in the Hamlet and a new town site may be required to accommodate any significant amount of future population growth.

Potential community impact due to the pipeline and Delta Gas Industry, other than permanent population increase, could be:

1. An increase in the regional transportation function of Tuktoyaktuk due to its strategic location in the Delta Region as a deep water port. With the advent of modular assembly in Vancouver of gas plant equipment, Tuktoyaktuk might play an important role as a transhipment point for ocean going vessels bringing components via Alaska and the Bering Strait.

2. Employment opportunities in the Delta gas plants construction period would be available to Tuktoyaktuk residents.

VanGinkle points out:

> "Both plants are within 50 miles of the settlement (Tuk) so that residents could commute to jobs on a daily basis".[1]

Training programs and hiring policies will determine to what extent the local labour force will be able to obtain employment in these operations.

With continued exploration and discoveries in the Beaufort Sea and Arctic Islands and the resultant expansion of the Delta resource industry, continued employment opportunities will be made available in the Delta region.

3. Oil and Gas exploration and development in the Beaufort Sea and the Arctic Islands may well increase the demand placed on the Port of Tuktoyaktuk, as a transhipment point and as a regional supply and service centre for the petroleum industry.

4. With subsequent construction of a gathering system to bring new reserves into the pipeline, additional impact may be experienced in Tuktoyaktuk in terms of employment opportunities, transportation industry expansion and increased transient population.

It is difficult to predict the ultimate effects of Delta developments on the community. The transportation logistics, employment, and training policies of the Applicant and the Delta gas producers will play a strong role in the future growth of Tuktoyaktuk.

3.1.4.2 Tuktoyaktuk Community Concerns

While the general results of Council workshops are reported in Section 5.0, certain issues emerged from the Tuktoyaktuk workshop that were specific to that community.

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1 VanGinkle & Associates: **Communities of the Mackenzie, Affects of the Hydro-Carbon Industry,** 1975, page 55.

These issues relate to:

1. Harbour Facilities

   A need was expressed for an industrial harbour expansion plan, separating waterfront land from residential land use. An expansion plan would prevent the random growth of industrial waterfrontage.

2. Communication Facilities

   Community growth will require the upgrading of present facilities to ensure there is no overloading problem. This issue relates specifically to the telephone system.

3. Depletion or destruction of hunting, fishing and trapping

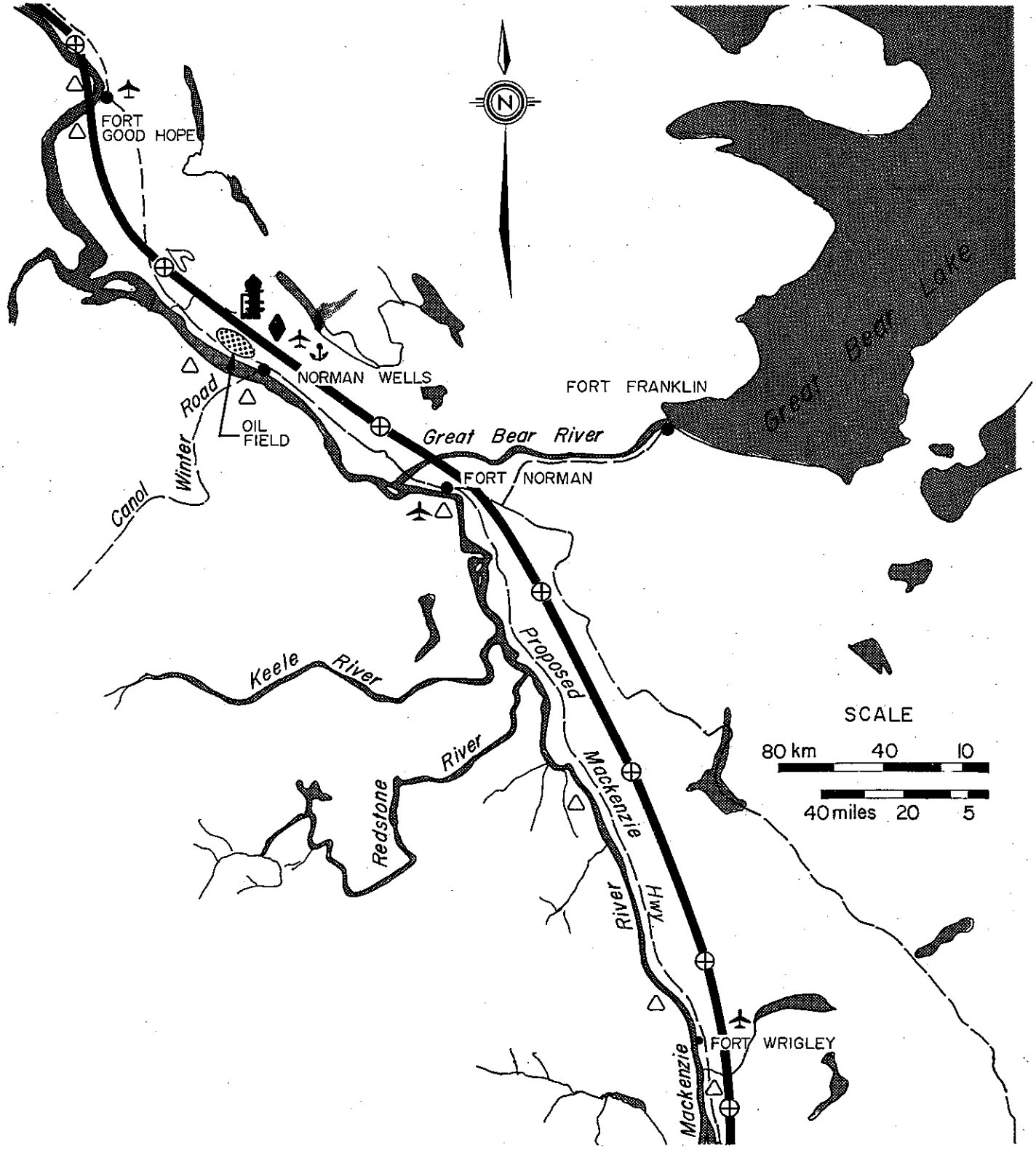
   Pipeline activity must not interfere with present trap lines. Petroleum exploration has had an adverse affect on fishing in local waters. Caribou migration should not be hindered by pipeline or exploration activities.

4. Shortage of Granular Materials

   A source of suitable granular material must be established in order to facilitate local development. A road from Tuktoyaktuk to Husky Lakes where granular fill is available would remedy this problem.

3.2 THE CENTRAL MACKENZIE SUB-REGION (Figure 3-3)

The Central Mackenzie Sub-Region extends north of Fort Wrigley to Fort Good Hope along the Mackenzie River. This region is very sparsely settled and represents a climatological transition between the more southern climate of Great Slave Lake and the northern permafrost area of the Mackenzie Delta. It was in this region, at Norman Wells, where the N.W.T.'s first commercial petroleum discovery occurred in 1920. The oil from this field is currently being refined at Norman Wells at the only Canadian oil refinery north of 60. This refinery produces a heavy diesel distillate which is used by many of the communities in the Mackenzie Delta area. Other communities in the Central Mackenzie Sub-Region include Fort Norman, Fort Franklin, Fort Wrigley, and Fort Good Hope.



Stanley Associates Engineering Ltd.
Consulting Engineers and Planners

CENTRAL MACKENZIE SUB-REGION

(AFTER C.A.G.P.L. & VAN GINKEL)

FIGURE 3-3

3.2.1 Community Role and Function Within The Region

The primate centre within the Central Mackenzie Sub-Region will be the community of Norman Wells. Norman Wells is presently an industrial community with a barge docking facility and an oil refinery. In addition to its present role in the region, the Applicant, has designated Norman Wells to be a district operating and maintenance headquarters.

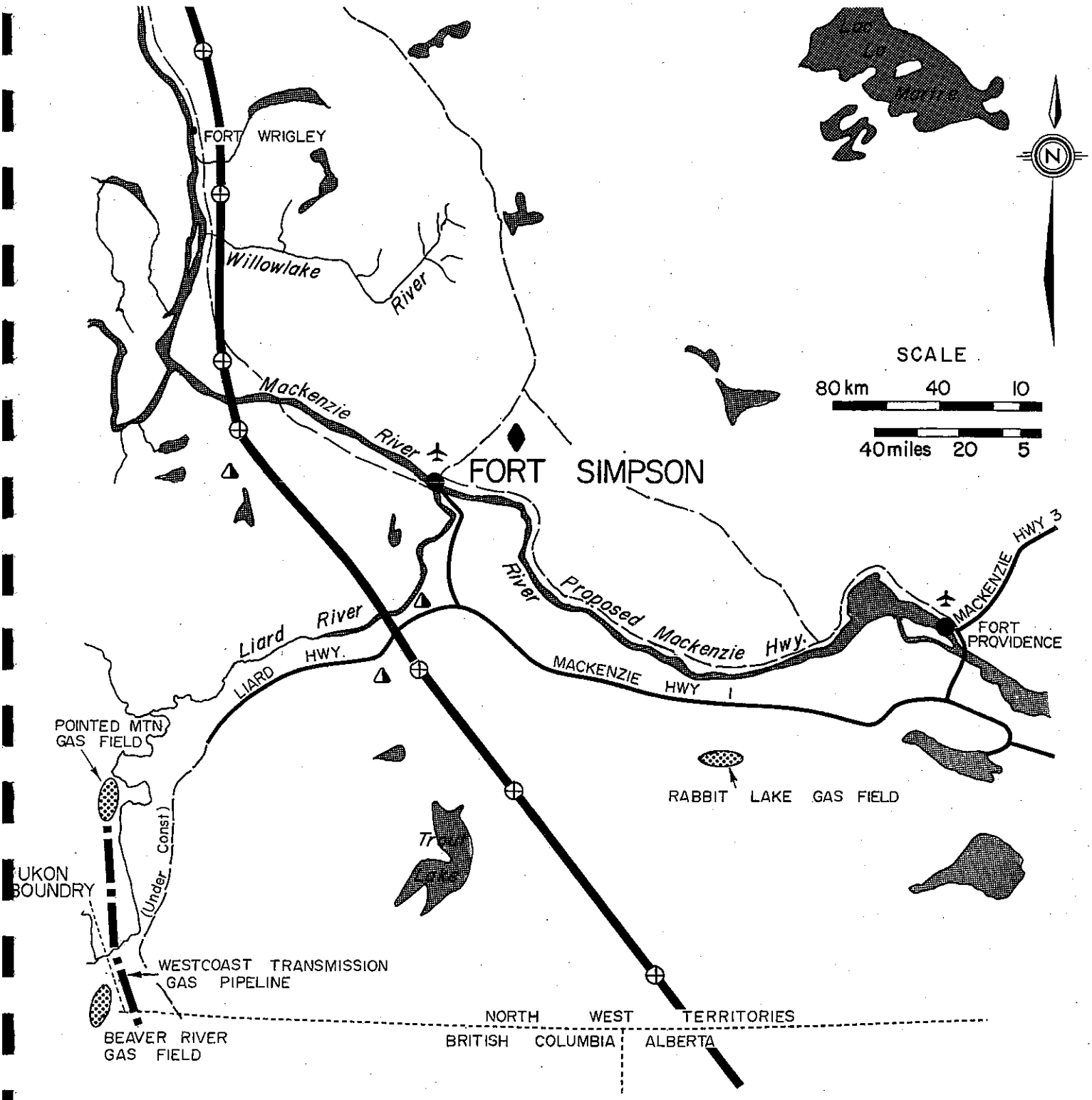
Should other local oil fields be discovered in the immediate region, an expansion to the existing oil refinery might be anticipated.

However, the relative petroleum potential of the area is only rated to be from poor to fair and must be considered as having considerably less potential than the Mackenzie Basin or the western portion of the Tathlina area southwest of Fort Simpson (see Table 3.1). It is anticipated that the native communities of Fort Norman, Fort Franklin, Fort Good Hope or Fort Wrigley will not experience any great changes in population, although they are located directly along the pipeline route on the same bank of the Mackenzie River. The degree to which the Applicant is successful in isolating its construction camps from the communities will, in large measure, determine whether there will be any impact upon these communities due to transients or construction workers entering these communities.

Since there are no member municipalities located in the Central Mackenzie Sub-Region, none of the communities have been studied in detail. However, all the communities were contacted by letter asking for their concerns relative to the proposed gas pipeline. Two responses have been received, one from Norman Wells and the other from Fort Norman. These are presented in Appendix D of this report.

3.3 THE UPPER MACKENZIE SUB-REGION (Figure 3 – 4)

The Upper Mackenzie Sub-Region represents the northernmost area which has direct highway access to the south via the Mackenzie Highway 1. In addition, the Liard Highway is presently under construction which will link this region to the northeastern portion of British Columbia. Approximately 30 miles north of the junction of the Liard and Mackenzie Highways is located the Village of Fort Simpson on the Mackenzie River. Further to the east lies the community of Fort Providence at the intersection of Mackenzie Highway No. 3 and the Mackenzie River. To the north of Fort Simpson along the Mackenzie River lies the small community of Fort Wrigley.



LEGEND

- HIGHWAYS
- WINTER ROADS
- AIRPORTS
- STOCK PILE SITES
- DELTA GAS PLANTS
- COMPRESSOR STATIONS
- OPERATING & MAINTENANCE DIVISION & DISTRICT H.Q.
- OPERATING & MAINTENANCE DISTRICT H.Q.
- PROPOSED NATURAL GAS PIPELINE — CANADIAN ARCTIC GAS PIPELINE LTD.
- 2000 + POPULATION
- 500 – 999
- 250 – 499
- 0 – 249

(1971 CENSUS)

Stanley Associates Engineering Ltd.
Consulting Engineers and Planners

UPPER MACKENZIE SUB-REGION

(AFTER C.A.G.P.L. & VAN GINKEL)

FIGURE 3-4

Natural gas in significant quantities has been discovered in the Beaver River and Pointed Mountain gas fields near the Alberta and British Columbia borders (see Figure 3-4). Recent estimates of the Canadian Petroleum Association assigned the Pointed Mountain gas field with 1 trillion cubic feet of proven gas reserves. As of 1973, 3.71 trillion cubic feet of natural gas had been proven out of a possible 11.2 trillion cubic feet in the western portion of the Tathlina Petroleum province, for a net remaining potential of 7.49 trillion cubic feet. The Mackenzie Valley Gas Pipeline, if constructed, will not be the first pipeline in this immediate area. West Coast Transmission already has a pipeline which extends from the Beaver River gas field at the British Columbia – Northwest Territorial boundary to the Pointed Mountain gas field approximately 150 miles southwest of Fort Simpson. Most of the drilling success to date has been centered on the region lying south of the Mackenzie River and west of Fort Providence. Even though the first well drilled in the area, Wendy Point No. 1, was drilled by Imperial Oil as far back as 1920, the first significant gas discovery in the Tathlina area was not made until 1955 at Rabbit Lake. The discovery well, D. Todd Briggs Rabbit Lake No. 1, flowed from the Sulphur Point Formation at a rate of 17 million cubic feet per day. Subsequent to the Rabbit Lake discovery, the Beaver River anticline was discovered in 1959 and the Pointed Mountain gas field, located 25 miles northeast of the Beaver River field, was discovered by Pan American in 1966.

The western portion of the study region, known as the western Tathlina Petroleum Province, has been given a qualitative rating of fair by McCrossan and Porter in their Future Petroleum Provinces of Canada study. This potential has been recognized in the submissions by CAGPL in the stated manpower requirements for oil and gas exploration and production in the Upper Mackenzie/Slave Sub-Regions. The manpower schedule shows a requirement in 1975 of 80 man years for exploration, increasing to 120 in 1979, and remaining constant throughout the study period to 1983. No manpower requirements have been assigned to production activities in the Upper Mackenzie/Slave Sub-Region and this may be due to the fact that the West Coast Transmission Gas Pipeline is already in operation.

3.3.1 Community Role and Function within the Region

Fort Simpson has been designated by Canadian Arctic Gas Pipeline Ltd. as a district operating and maintenance headquarters. Fort Simpson presently has a hospital and plans are underway for the upgrading of the airport and for the provision of a regional high school. With these kinds of major developments planned for Fort Simpson, it can be assumed that this community will form the primate centre in this region for many years to come.

3.3.2 Assumptions Relative to the Future Role of Communities In the Upper Mackenzie Sub-Region

1) Fort Simpson will emerge as the primate centre for the Upper Mackenzie Sub-Region over the study period.

2) Fort Simpson and its counterpart, Fort Nelson, in B.C., will serve as major distribution points for the petroleum exploration effort in the western portion of the Tathlina Petroleum Province. Any exploration effort in the Rabbit Lake gas field area will likely be serviced out of the Hay River – Enterprise urban corridor.

3) There will be no significant growth or impact upon Fort Wrigley or Fort Providence as a direct result of the building and operation of the Mackenzie Valley Gas Pipeline.

4) Any major development of Fort Liard will be due more to the West Coast Transmission Gas Pipeline and the Liard Highway than to the building and the operation of the Mackenzie Valley Gas Pipeline.

3.3.3 Village of Fort Simpson

3.3.3.1 Population

The population of Fort Simpson has grown from 563 in 1961 to 747 in 1971. Since the completion of the northern extension of the Mackenzie Highway to Fort Simpson in 1971, the population has grown to approximately 1,100 in 1974. The community achieved Village status in 1973.

Fort Simpson originally started as a native settlement but in recent years the white component of the population has grown to predominate in 1974.

Three population projections have been compiled for the Fort Simpson region. These include Gemini North (NWT, 1973), Gemini North (CAGPL, March 1974), and W. J. Francl & Associates (Townsite Expansion Study, 1974). With the exception of the Gemini North regional population projection forecasted for Canadian Arctic Gas Pipeline Ltd., the other two population projections are specifically for the Village of Fort Simpson. The assumptions and results of these three population forecasts are given below as follows:

a) **Gemini North (NWT, 1973)**

Assumptions: as per Inuvik:

Year	Population
1972	1,200
1973	1,284
1974	1,374
1975	1,470
1976	1,573
1977	2,383
1978	2,501
1979	2,627
1980	2,762

b) **W. J. Francl & Associates Consulting Engineering Ltd.**
(January 1974, Townsite Expansion Study)

1) **Without Pipeline**

Population based on anticipated expansion of various sectors of employment.

2) **With Pipeline**

i) No consideration of any new local major industries except pipeline.

ii) A "Conservative" service multiplier of 1.0 was used to compute commercial service activities in the community.

iii) Average family size for projection purposes set at 3.5 persons per family.

iv) Does not include induced employment as result of the presence of temporary workers.

Year	Population Without Pipeline[1]	Population With Pipeline	Permament Population Change
1973	1,100	1,100	–
1974	1,360	1,360	–
1975	1,590	1,590	–
1976	1,750	1,775	25
1977	1,910	2,060	150
1978	1,970	2,300	330
1979	2,020	2,870	850
1980	2,190	3,160	970

[1]Corrected to include only permanent population

c) **Gemini North (CAGPL March 1974)**
Upper Mackenzie Sub-Region

Assumptions: As per Inuvik:

Year	Regional Permanent Population Increase
1981	268 (Impact) + 2,312 = 2,580
1983	268 (Impact) + 2,456 = 2,724

Since the two Gemini North population projections were based on different assumptions, particularly on the subject of induced employment, the difference is noted between their findings (eg. A regional population of only, 2,580 in 1981 (CAGPL 1974) compared to a Village of Fort Simpson population of 2,762 in 1980 (NWT, 1973)). The Francl population forecast may be over-stated due to a high service multiplier used to calculate induced employment.

As a check on the above-mentioned population forecasts, the following population projection has been calculated by Stanley Associates Engineering Ltd.:

1) Assumptions:

a) The Village of Fort Simpson will receive virtually all the population increase in the Upper Mackenzie Sub-Region as defined by Gemini North Ltd., as a result of the pipeline project.

b) In accordance with stated company isolation policy, pipeline construction workers will be housed at various construction sites along the pipeline route.

c) Total induced employment opportunities will be 1.0 times man years for pipeline maintenance and operations staff plus 1.0 times indirect pipeline employment in man years.

d) Indirect employment in petroleum exploration and development occurs at a constant rate of 130 man years after 1979. Man years above this 130 man years are considered transient and not used in the calculation of local induced employment. (Presently 80 man years of indirect employment in region, therefore there will be 50 additional man years by 1979.)

e) Indirect employment will have no effect on permanent population forecasts except for induced employment generated.

f) Seventy percent (70%) of induced employment will be family heads with balance of employment filled from within family.

g) No significant amount of gas industry positions will be filled from Fort Simpson's present unemployment ranks.

h) The project population figures reflect pipeline-related growth only and do not consider any other major resource or industrial developments in the NWT.

i) 15% of the total employment opportunities will be taken by native workers.

j) Average household size of native workers will be 5.2.

k) Average household size of non-native workers will be 3.5 persons.

l) Average household size will be
(.15 x 5.20) + (.85 x 3.5) = 3.8

Sample Calculation: 1978

Pipeline Maintenance and Operation
73 employees

Induced Employment
(Op. & Main. + Indirect) x 1.0 = Induced
(73 + 50) x 1.0 = 123
123 x .7 = 86 family heads

Total Pipeline Related Population
(Op. & Main. + Induced) x Family Size
(73 + 86) x 3.8 = 604 persons

TABLE 3.6

Fort Simpson Population Projection

Year	Normal Growth	Accelerated Growth[1]	Pipeline Related Projection
1975	1,180	1,310	130
1976	1,260	1,390	130
1977	1,350	1,740	390
1978	1,450	2,050	600
1979	1,550	2,250	700
1980	1,660	2,370	710
1981	1,740	2,490	
1982	1,830	2,610	
1983	1,920	2,740	
1984	2,020	2,880	
1985	2,120	3,020	
1986	2,230	3,170	
1987	2,340	3,330	
1988	2,460	3,500	
1989	2,580	3,680	
1990	2,710	3,860	
1991	2,850	4,050	
1992	2,990	4,250	
1993	3,140	4,460	
1994	3,300	4,680	

1 Natural population projections at 7% increase per annum until 1980 and at 5% increase per annum from 1980 to 1994.

3.3.3.2 Physical Services[1]

Introduction

The townsite of the Village of Fort Simpson is located on an island immediately downstream of the confluence of the Mackenzie and Liard Rivers. The island rises gradually from the river in three terraces which have stratified soils of a sandy silt, gravel and clay beds. The island is joined to the mainland by a causeway on the southwest bank of the Mackenzie River. From this point the main road links the settlement to an industrial/transportational zone situated on the Liard River between the townsite and the junctions of the Mackenzie Highway. The community is situated in the middle of the discontinuous permafrost zone. The climate in the Fort Simpson area will allow the installation of buried utilities, although caution must be exercised to avoid permafrost islands in the subsurface.

Present and Future Requirements

The present physical services of water, sewerage, roads, drainage, and solid waste disposal have been assessed for their ability to service the existing population and the anticipated population increases due to normal and accelerated growth. Previous studies have been liberally drawn upon and these are listed in the Appendix B of this report.

The present water supply, treatment and distribution system consists of a Mackenzie River intake (supplemented in summer by a spring on the mainland), a water treatment plant and a looped water distribution system. The all-year water intake on the Mackenzie River is suitable for a population of 940; and the water treatment plant (with a new 50 gpm filter constructed) and storage system will only serve a population of 810 people. In order to bring the community's water system up to appropriate standards for 3,000 people, a new water intake pipe (14-inch, diameter), an extention to the old treatment plant, two half million gallon storage reservoirs, and a new water distribution system for 1,500 people would have to be constructed. The total capital costs to improve the Village's water system has been estimated at 3.8 million dollars.

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1 More Extensive Description in Appendix B.

The present sewage collection system consists of 8-inch trunk sewers which discharge their effluent, without treatment, into the Mackenzie River. A sewerage collection system would be required to expand the townsite onto the mainland, and the sewage effluent from the island would require a lift station and forcemain to transport the effluent to the proposed sewage lagoon. The sewage lagoon would be located in the flats on the mainland, downstream from the community. The total capital costs of upgrading the Village's sewerage system to serve 3,000 people has been estimated at 1.5 million dollars.

The present road system consists of the Mackenzie Highway and an internal road network on the island which are gravelled and considered adequate. Future expansion of the Village onto the mainland will necessitate the building of another snye crossing at the western end of the island. In addition, a new internal road network must be constructed on the mainland to provide road services to the individual lots. The estimated capital cost of constructing new roads is 1.45 million dollars.

The cost of drainage has been included in the roads and the sanitary landfill site is considered to be satisfactory.

Summary

To determine the actual impact cost due to the pipeline, the present worth (in 1975 dollars) of all capital expenditures has been computed at a discount rate of 10% per year. Present worth calculations do not include factors for recovery or expected life. It has been determined that the present worth of capital expenditures for normal growth is approximately $5,800,000; while for the accelerated growth due to the pipeline it is $6,200,000. The difference is $400,000. The present worth difference in maintenance and operation cost is $275,500. The costs of physical services for normal and accelerated growth are summarized in the table below:

(Cost of Millions)	Normal Growth	Accelerated Growth	Difference
Capital Cost	5.80	6.20	0.40
Operating and Maintenance costs	—	—	0.28
	5.80	6.20	.68

These costs show an order-of-magnitude impact cost of .68 million dollars that the pipeline will have on the municipal services in the Village of Fort Simpson.

There also appears to be two special development plateaus which are identifiable by significant cost increases. The first plateau occurs in 1975 regardless of the rate of growth. The second plateau occurs at the beginning of the development of the mainland which takes place in 1979 under normal growth and in 1977 under accelerated growth.

The capacities of the proposed system would appear to be adequate beyond a population of 3,000 with minor modifications.

Fort Simpson's major services are presently inadequate and would need to be brought up to standards whether the proposed pipeline is built or not. The design for the capacities of any of these services would be sized for at least 3,000 population.

TABLE 3.7

All costs in 1975 dollars.

Village of Fort Simpson
Physical Services Cost Analysis

Item	Capital Cost	Maint. & Operation Cost/Year	Normal Growth Year Required	Normal Growth Capital PW	Accelerated Growth Year Required	Accelerated Growth Capital PW	PW Cost Difference Capital	PW Cost Difference Maint. & Operation
A. Waterworks								
1) Supply	1,500,000	50,000	1975	1,500,000	1975	1,500,000	--	--
2) a) Treatment	500,000	70,000	1975	500,000	1975	500,000	--	--
b) Storage Island	500,000	15,000	1975	500,000	1975	500,000	--	--
c) Storage Mainland	500,000	15,000	1979	341,500	1977	413,200	71,700	21,500
3) Distribution Mainland	800,000	22,000	1979	546,400	1977	661,100	114,700	31,600
B. Sewerage								
1) Treatment	500,000	40,000	1975	500,000	1975	500,000	--	--
2) Collection								
a) Mainland	250,000	10,000	1979	170,900	1977	206,600	35,800	14,300
b) Island	750,000	25,000	1975	250,000	1975	750,000	--	--
C. Roads								
1) Snye Crossing	1,200,000	120,000	1979	819,600	1977	991,200	171,600	172,200
2) Mainland	250,000	25,000	1979	170,800	1977	206,600	35,800	35,900
D. Solid Waste	N/A	N/A						
TOTAL COSTS	**6,750,000**	**392,000**		**5,799,100**		**6,228,700**	**429,600**	**275,500**

3.3.3.3 Social and General Services

Introduction

Social and general services, which are the responsibility of the municipality include by-law enforcement, fire protection, culture and recreation programs, and general administration. Other community responsibilities falling outside the jurisdiction of the municipal corporation include education and health care programs which are currently financed and administered by the Territorial Government.

Housing

Most of the existing housing stock in Fort Simpson is either self-owned, supplied by the Northern Rental Housing Program, or provided by both senior levels of government. Land development in the past has been undertaken almost exclusively by the two senior levels of government. The Village of Fort Simpson has occasionally gained revenue from the annual sale of one or two lots.

Housing needed by the Village of Fort Simpson to accommodate the permanent population generated by pipeline activities will require that approximately 205 additional housing units be added to the existing housing stock between the years 1975 and 1983. Critical housing shortages will likely be experienced by the community between 1977 and 1978. Approximately 65 new housing units should be constructed in both 1977 and 1978 in order to accommodate the anticipated population influx as result of the start-up of operational activities on the gas pipeline. The total number of housing units required to be added to the Village of Fort Simpson as a result of the pipeline activities between the years 1975 and 1980 will amount to approximately 200 housing units.

It has been assumed that an occupancy rate of 3.5 persons per housing unit can be considered as being typical of the resultant population influx.

It is anticipated that the municipal corporation will take on additional responsibilities, particularly if the Village acquires Town status in the near future. Experience in Hay River and Inuvik has shown that the land development function can be adequately administered by the municipal corporation. In this manner the price of lots can be minimized to the eventual land purchaser.

During periods where the housing demand will be high in Fort Simpson, the supply of traditional single family units may lag behind the accelerated demand. It is suggested that mobile home subdivisions be designed with standard single family dwelling lots. This could partially solve any housing shortages anticipated in Fort Simpson since mobile units can easily be transported via the Mackenzie Highway to the Village. As the community grows and becomes more sophisticated in the very near future, then the lots can been laid out such that a mobile home could be sold and a more permanent structure constructed on the site.

Education

Assumptions for projecting education demands in Fort Simpson are stated as follows:

a) 300 students per 1,000 population

b) 60% elementary students, 40% high school students

c) 28 students per elementary classroom and 25 students per high school classroom

d) due to the Territorial Educational policy of decentralization, Fort Simpson will offer a complete high school program in the future.

The present supply of classrooms space in Fort Simpson consists of 16 classrooms. These facilities should be adequate until 1977 when three additional classrooms will be required. It will be necessary for the community to double its educational facilities to approximately 31 classrooms in 1983. Approximately one half of the community's response to increasing educational demand will be due to pipeline-related activities.

The future educational demand for classroom facilities due to pipeline related activities has been estimated for 1980 at 5 elementary classrooms and 4 high school classrooms. These additional classrooms have been added to the normal educational demand to give a total educational demand in 1980 of 15 elementary classrooms and 11 high school classrooms. It is indeed likely that the proposed Fort Simpson high school will draw upon a much larger regional population, and the classroom demand, stated for the high school, should be interpreted as only being Fort Simpsons' demand component for the overall facility.

The regional demand could not only significantly increase the classroom demand but could as well require the expansion of hostel facilities within the Community. Fort Simpson could emerge as the regional education centre for the Upper Mackenzie Sub-Region.

Hospital

In 1973, a 12 bed hospital was constructed in Fort Simpson. This hospital is presently staffed with one doctor and six nurses.

Based on a criteria of 3.5 beds per 1,000 population, the existing 12 bed hospital facility should be adequate to supply Fort Simpson and the region with hospital services until the year 1983. By applying the standard to a 1983 population of 2,740 the hospital demand is calculated as being 10 hospital beds to accommodate growth as a result of normal and pipeline induced population increases.

An additional doctor to make local surgery possible has been requested by the community. Local surgery would place additional demand on the existing hospital beds in that, presently surgery cases are sent out to other centres for treatment. This new demand might require the expansion of the hospital sooner that would otherwise be the case.

Recreation Facilities

Present recreation facilities in Fort Simpson consist of a curling rink, arena, track, tennis court, ball diamond, gymnasium, and an outdoor swimming pool.

With accelerated population growth and an increase in the seasonal transient population, the demand on existing recreation facilities will increase. A year round swimming pool will likely be required in the future as the population will more than double between 1975 and 1983.

Since the Applicant has stated a desire to work with communities which will house their operations and maintenance staff, it would be advisable for the Village to take advantage of any assistance that the Applicant could provide in obtaining a civic recreational complex.

Other Services

Police protection in the community is presently the responsibility of the RCMP. The present fire department consists of a 12 man volunteer fire department and 1 pumper truck.

The demand for other services such as fire protection, by-law enforcement and general administration will likely increase significantly as more people enter the community. This prediction has been based on historical evidence in the case of Grande Prairie, Albera, and upon present requests for pipeline impact funding in Alaska (see Appendix E). There was a noteable divergence from per capita operating expenditures in Grande Prairie for fire protection, by-law enforcement, culture and recreation, and general administration. This divergence was in the form of significant increases in per capita expenditures over the period of accelerated growth (1968-73) as compared to trends established in the normal growth period prior to 1968.

Fort Simpson's response to the anticipated increases in per capita operating costs as a result of rapid growth would be to apply for extra-ordinary funding from the Territorial Government.

3.3.3.4 Energy Supply

The Village of Fort Simpson is presently supplied with electrical energy generated by four diesel units operated by the Northern Canada Power Commission. Individual homes and commercial buildings are heated by oil furnaces.

Even though the commercial discovery of the Pointed Mountain gas field lies only 150 miles southwest of Fort Simpson, the local market has apparently not been of sufficient size to warrant the construction of a distribution line from the Pointed Mountain gas field to the Fort Simpson Village gate. At present, the producers of the Pointed Mountain gas field are under contract to West Coast Transmission Pipeline Ltd. and are currently producing natural gas into the pipeline for export to the south.

With the anticipated population increase from the present population of 1,100 to the 1983 estimated population of 2,700 people, it is expected that the energy demand of Fort Simpson will approximately triple. In addition, as the community becomes more sophisticated with resultant increased commercial and industrial sectors, a new energy demand component will likely become evident as a community grows.

The geographic position of the Village of Fort Simpson puts the community in a relatively good position relative to securing future alternate sources of energy. Fort Simpson presently lies approximately midway between two potential areas for hydroelectric power generation; Great Bear Lake and the eastern arm of Great Slave Lake. In addition, its proximity to both British Columbia and Alberta could, in the future, make it a logical candidate to receive an extension from existing provincial grids.

The possibility of receiving natural gas at the Village gate as an energy fuel has considerable potential. Should a natural gas discovery be made within the immediate Fort Simpson vicinity, a source of local supply might be secured for the community. In addition, with the Mackenzie Valley Gas Pipeline passing only 30 miles (distance dependant on CAGPL route alignment) to the southwest of Fort Simpson, a trunk line facility could be easily constructed from the main line to the Village gate. A more comprehensive study of the economics of supplying Fort Simpson with gas from the Mackenzie Valley Pipeline is considered in Section 4.0 of the report.

3.3.3.5 Community Resupply

Fort Simpson is presently supplied through the regional transportation network consisting of the Mackenzie Highway and the Mackenzie River Transportation System. Storage space is required in the community during the breakup and freezeup periods on the Liard River.

It is anticipated that the community supplies will more than triple between 1975 and 1980 due to population increase and increasing economic activities as a direct result of petroleum exploration, construction of the pipeline, and operation of the pipeline in the Fort Simpson region.

Fort Simpson will likely enjoy the advantages of having greater year-round access to the southern centres of Edmonton and Vancouver with completion of the Liard Highway.

3.3.3.6 Community Financial Impact

Expenditures incurred by the Municipal Corporation have remained relatively stable between the years 1971 and 1973 at approximately $100,000 per year. Even though the total budget has remained the same there have been expenditure shifts between the

expenditures sectors, most notably, increased spending for general government services. The preliminary financial statement for 1974 shows an increase in expenditures from $100,000 (1973) to $500,000 (1974). Total expenditures on transportation services (mainly road maintenance) declined from approximately $55,000 in 1971 to $12,000 in 1973.

Revenue generated by the corporation of offset expenditures, has been acquired mainly from the senior levels of government in the form of grants and grants in-lieu-of taxation. The corporation dependency upon this revenue has sharply declined from 97% in 1971 to 70% in 1973. During the same time period the total revenue generated by taxation has increased from $6,000 in 1971 to $21,000 in 1973. The preliminary financial statement for 1974 shows an increase in revenue generated by taxation from $21,000 (1973) to $82,000 (1974).

The demand for extra funds as a result of pipeline impact has been projected for Fort Simpson from 1975 to 1983. Capital and operating impact costs have been estimated for physical services, which include water, sewer and roads; and social services, which include education, culture and recreation, police and fire protection, and general administration. A summary of these impact costs, expressed in 1975 present worth dollars, is presented in Table 3.8.

TABLE 3.8

Fort Simpson Financial Impact Summary

Year	Physical Services		Social Services		Total	Municipal Corporation Share
	Capital	Operating	Capital	Operating		
1975	—	—	—	3,100	3,100	3,100
1976	—	—	57,300	34,800	92,100	2,900
1977	429,600	275,500	52,100	67,600	824,800	714,900
1978	—	—	73,000	102,700	175,700	16,300
1979	—	—	—	114,400	114,400	18,800
1980	—	—	—	89,600	70,600	18,200
1981	—	—	35,600	103,200	138,800	18,500
1982	—	—	—	95,300	95,300	18,300
1983	—	—	14,700	93,000	107,700	18,400
Total	429,600	275,500	232,700	703,700	1,641,500	829,400

The financial impact of pipeline-related activities upon the Village of Fort Simpson has been estimated to be in the order of 1.6 million dollars (1975, present worth), of which the municipal corporation is presently responsible for administering .8 million dollars under current territorial financing arrangements.

Since the Village of Fort Simpson will likely emerge as the dominate centre in the Upper Mackenzie Sub-Region and since the projected population for 1983 is 2,740 people, the Village could apply to the Territorial Government for Town status. This would double the present borrowing powers of 10 percent of taxable assessment to 20 percent. Even though the financial impact upon the community as a result of the pipeline will be relatively insignificant, a considerable amount of funds will be required to upgrade existing facilities to an appropriate standard typical of other similar sized communities in the Northwest Territories (see Table 6.4).

3.3.3.7 Fort Simpson Community Concerns

While the general results of Council workshops are reported in Section 5.0, certain issues emerged from the Fort Simpson workshop that are specific to that community.

These issues are:

1) Academic and Artistic Education

   Instruction available in the arts i.e. dancing, painting, music, etc. would help occupy the leisure time of the people in the community and contribute to cultural sophistication. The academic program offered in the community should be increased so that a higher level of education would be provided locally.

2) Provision of group and receiving homes

   Provision of accommodation in the Community is necessary for transients and adolescents.

3.4 THE GREAT SLAVE LAKE SUB-REGION (Figure 3 – 5)

The region is presently the most urbanized area within the NWT. The communities surrounding Great Slave Lake are numerous and relatively large. Yellowknife, the capital, has a present day population of 7,500 people. Hay River, Pine Point and Fort Smith all have populations within the range of 1,500 to 3,500 people. This relatively complex region may be divided essentially into three areas:

1) the Yellowknife urban region
2) the Hay River urban region
3) the Fort Smith region.

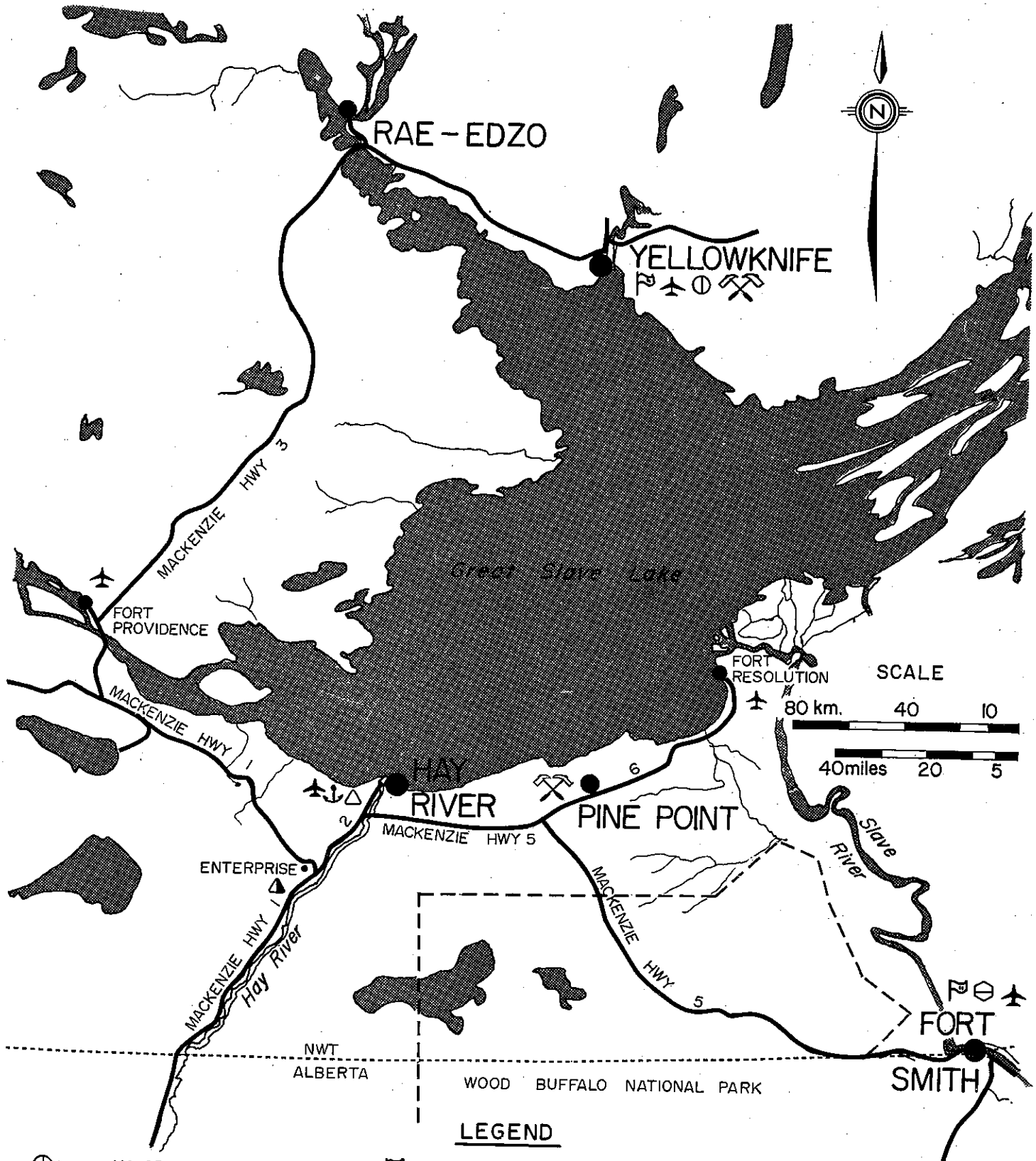
Located within the sphere of influence of the City of Yellowknife are the communites of Rae-Edzo and Fort Providence. The mining Town of Pine Point, the community of Fort Resolution, and the community of Enterprise all lie within the sphere of influence of the Town of Hay River. The Town of Fort Smith is more closely aligned with communities outside the NWT, such as Uranium City, Fort Chipewyan, and Fort McMurray.

3.4.1 Community Role and Function Within The Region

The primate centre in the Slave Sub-Region is actually a combination of the municipalities of Hay River and Yellowknife. Yellowknife is essentially a government Town containing the offices of the Northwest Territorial Civil Service and the Commissioner of the NWT. Yellowknife's history, prior to becoming the capital, dates from the establishment of gold mines within the city limits. Hay River, on the other hand, is fast developing into an industrial Town and contains the necessary transportational infrastructure to guarantee the continuation of its dynamic growth within the study period. Fort Smith, the former capital of the NWT, still maintains a government role in the NWT and is quickly taking on an increased educational and health services function within the Slave and Fort Smith regions. The future petroleum potential in this region is poor. However, small fields may be discovered in the vicinity of Fort Providence and Hay River which might be used for local consumption.

3.4.2 Assumptions Relative to the Future Role of Communities in the Slave Sub-Region

1) Yellowknife will remain the Capital of the NWT and consequently most government activity will be centered in that City.



Stanley Associates Engineering Ltd.
Consulting Engineers and Planners

GREAT SLAVE LAKE SUB-REGION

(AFTER C.A.G.P.L. & VAN GINKEL)

FIGURE 3-5

2) The Town of Hay River will continue to be the industrial centre of not only the Slave Sub-Region but of the District of Mackenzie.

3) The Port of Hay River will see increasing activity during the construction phase of the pipeline.

3.4.3 Town of Hay River

3.4.3.1 Population

The population of the Town of Hay River has grown from a 1961 population of 1,338 to a 1971 population of 2,400. Hay River is very similar to Inuvik in that both Towns experience a transient worker population each year. Inuvik's occurs in the winter during the drilling season while Hay River's occurs in the summer during the shipping season. Makale has estimated the 1974 transient population component in Hay River to be as high as 1,120 people, which, when added to the estimated permanent population, gave Hay River a seasonal high population of 4,660 people in 1974.

The Town contains within its boundaries part of the first Indian Reserve to be officially established in the Northwest Territories. In 1973, Gemini North estimated that 275 Treaty Indians resided within the Town boundaries, primarily on the east bank of the Hay River. A considerable component of the Town's population is Metis.

The impact of pipeline activities upon Hay River's future population growth has been examined by Makale, Holloway & Associates Ltd., and Stanley Associates Engineering Ltd., in a joint study of the industrial potential of Hay River as input into the General Plan. In addition to these studies, Gemini North also has given a population projection for Hay River in their socio-economic impact study of the proposed Mackenzie Valley Gas Pipeline for the Government of the Northwest Territories in 1973. One year later, Gemini North also completed a series of reports for Canadian Arctic Gas Pipeline Ltd., on the socio-economic impact of the pipeline on the Sub-Regions, including the "Slave Sub-Region".

The results of these studies are presented in summary form and are prefaced by their general assumptions as follows:

a) **Gemini North (1973 N.W.T.)**

Assumptions: Same as for the Town of Inuvik

Year	Population
1975	3,735
1976	3,992
1977	4,268
1978	4,562
1979	4,877
1980	5,212

b) **Gemini North (CAGPL, March 1974)**

Slave Sub-Region

Assumptions:

1) Assumes zero participation of northerners in new permanent employment opportunities.

2) Each migrant employee is assumed to support a total family of 2.5 persons.

3) Induced employment multiplier of 0.2 is used.

4) No direct employment in Slave Sub-Region.

Resultant Population Projection:

Year	Regional Permanent Population Increase
1981	0 (Impact) + 21,468 (Natural Increase) = 21,468
1983	0 (Impact) + 22,802 (Natural Increase) = 22,802

c) **Makale, Holloway & Associates (1974 General Plan) and Stanley Associates Engineering Ltd.**

Assumptions:

1) A basic to non-basic ratio of 1.0

2) 70% of workers are married

3) Average family size is 3.63 persons

4) 70% of non-basic workers are family heads. (based on Northern Alberta)

5) All pipeline materials destined for points north of Fort Simpson will be transhipped through Hay River.

TABLE 3.9

Hay River Population Projection

Population by Year	Normal Growth	Pipeline Growth	Additional Population
1974	3,540	3,540	–
1975	3,730	3,970	240
1976	3,910	4,390	480
1977	4,100	4,820	720
1978	4,290	5,250	960
1979	4,475	5,675	1,200
1980	4,710	6,210	1,500
1981	4,950	6,740	1,790
1982	5,190	7,280	2,090
1983	5,420	7,810	2,390
1984	5,660	8,345	2,685
1985	5,960	8,740	2,780
1986	6,260	9,140	2,880
1987	6,550	9,540	2,990
1988	6,850	9,940	3,090
1989	7,150	10,340	3,190
1990	7,530	10,870	3,340
1991	7,900	11,400	3,500
1992	8,280	11,940	3,660
1993	8,650	12,470	3,820
1994	9,030	13,000	3,970

Even though the Town of Hay River has not been designated as an operating and maintenance district headquarters by the Applicant, it presently occupies the position of being the southern terminus of the Mackenzie waterway transportation system. The Port of Hay River serves as the transhipment point between the Great Slave Railway, the Mackenzie Highway, and the Mackenzie River barging system. The small community of Enterprise, 25 miles south of Hay River, is strategically located and could become the major transhipment point between the Great Slave Railway and the Mackenzie Highway.

Should the pipeline be constructed, then the industrial activity in Hay River and vicinity would increase the population of the Town due to increased permanent employment. Certain tonnage presently being shipped on the Mackenzie waterway would be lost to truck transport when the Mackenzie Highway is completed. Within the study period however, it is expected that total waterway tonnages will increase due to the shipment of pipeline construction materials north of Fort Simpson by barge. In addition, other materials bound for the Alaskan North Slope and the Arctic Islands will travel north through Hay River on the Mackenzie River. Based on the results of a joint CN-CP Arctic Railway Study, it was estimated that a railway would require 10 years for construction. This is outside the time period of this study and, therefore, has not been considered.

3.4.3.2 Physical Services[1]

Introduction

The Town of Hay River is located on the south shore of Great Slave Lake at the mouth of the Hay River. The townsite consists of two concentrated developments, the Old Town on Vale Island and the New Town on the west bank of the river. The Old Town is joined to the mainland by a rail and a highway bridge over the west channel and is located 3.5 miles from the CBD of the New Town. Vale Island is susceptible to flooding during spring breakup and considerable land preparation is required to minimize any future damage due to flooding. The Town of Hay River is situated in the southern fringe of the discontinuous permafrost zone and is therefore suitable for the installation of undergound utilities.

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1 More extensive description in Appendix C.

Present and Future Requirements

The present physical services of water, sewerage, roads, drainage and solid waste disposal have been assessed for their ability to accommodate the existing population and the anticipated population increases due to normal and accelerated growth.

The present water supply, treatment, and distribution system consists of a water intake from Great Slave Lake, fluoridation and chlorination treatment, a water storage capacity totalling 1.5 million gallons, and a complete distribution system in the New Town and a water truck delivery system in the Old Town on Vale Island. The present water supply system is capable of serving 3,300 people. To bring the Town's water system up to appropriate standards to accommodate present and future growth would require a new 24-inch diameter intake pipe, a new 16-inch diameter transmission line across Vale Island, a new one million gallon water reservoir, new feedermains to areas 1B, 2A, and a new feedermain into the industrial area on Vale Island. The total capital cost of upgrading the Town's water system to meet anticipated growth has been estimated at 7.5 million dollars.

The present sewage collection system consists of a network of gravity sewers, lift stations and forcemains. This system is capable of accommodating 4,100 people. Sewage treatment facilities consist of a 2-cell anaerobic lagoon. The present lagoon system is operating beyond capacity and is inadequate. To bring the sewage collection and treatment system up to handle increased growth would require that a new 3-cell lagoon be built immediately. Areas 1B and 2A would also require services to accommodate future growth. The total capital cost required to build these sewerage facilities has been estimated at 2.8 million dollars.

The major thoroughfare is the Mackenzie Highway which parallels the railroad tracks and extends onto Vale Island. This highway presently is surfaced with a cold mix asphaltic material. All other roads, except for a short section which is paved in the downtown area, are gravelled and are considered adequate. The basic street network for the expansion areas include the upgrading of the Mackenzie Highway through Town as well as construction of arterial and collector streets. Local streets within the development areas have been considered as on-site services and are not included in estimates of capital costs for services in the specific areas. When Area 1B is developed, unpaved collector and arterial streets will be required. When Area 2A is required the Mackenzie Highway should be improved to a higher standard which would include four lanes. Also, at this time all the roads built in the first stage should be paved. The estimated cost of these capital expenditures would be 4.5 million dollars.

Drainage in Hay River is presently handled mostly by open ditches; although the downtown area has some curbs and gutters. There is no storm sewer system in the Town. At the present time, with rapid growth occurring, drainage can be provided initially by means of a system of ditches, designed to be compatible with a future storm sewer system. In the New Townsite, east of the railway, the drainage pattern has already been identified, and main discharge channels have been constructed. The proposed drainage system consists almost entirely of open ditches, and the estimated capital costs of 668,000 dollars is based on this type of system.

At the present time, solid waste is collected under contract in the New Townsite and on Vale Island. The disposal area is a sanitary landfill site owned by the Town of Hay River and operated by the collection contractor under a franchise agreement. The disposal area is located west of the railway approximately one mile south of the Town off the Mackenzie Highway. A new sanitary landfill site will be required in 1975. Investigations are presently being carried out to locate a new site. It is estimated that it will cost $29,000.

Summary

To determine the actual impact cost due to the pipeline, the present worth (in 1975 dollars) of all capital expenditures has been computed with a discount rate of 10% per year (Table 3.10). Present worth calculations do not include factors for recovery or expected life. It has been determined that the present worth of capital expenditures for normal growth is approximately $9,000,000; while for the accelerated growth due to the pipeline, it would be approximately $11,400,000. The difference is $2,400,000. The present worth difference in cost for maintenance and operation is $1,300,000. These results are summarized in the following table:

(Cost in Millions)	Normal Growth	Accelerated Growth	Difference
Capital Costs	9.00	11.40	2.40
Operating and Maintenance Costs	—	—	1.30
	9.00	**11.40**	**3.70**

These costs show an order-of-magnitude impact cost of 3.7 million dollars that the pipeline will have on the municipal services of Hay River.

There also appear to be three special development plateaus which are identifiable by significant cost increase. The first plateau occurs in 1975-76 regardless of the rate of growth. The second plateau occurs at the beginning of development of Area 1B which takes place in 1980 under normal growth and in 1977 under accelerated growth. The third plateau occurs at the beginning of development of Area 2A which takes place in 1990 under normal growth and in 1984 under accelerated growth.

The capacities of the proposed system will be adequate beyond a population of 13,000 with minor modifications.

TABLE 3.10

All Costs in 1975 Dollars.

Town of Hay River
Physical Services Cost Analysis

Item	Capital Cost	Maint. & Operation Cost/Year	Normal Growth		Accelerated Growth		PW Cost Difference	
			Year Required	Capital PW	Year Required	Capital PW	Capital	Maint. & Operations
A. Waterworks:								
Supply	4,186,000	97,000	1976	3,805,500	1975	4,186,000	380,500	88,200
Treatment & Storage	1,150,000	20,000	1994	188,000	1985	443,300	255,300	44,400
Distribution:								
a) Area 1B	1,598,000	50,000	1980	992,200	1977	1,320,600	328,400	102,800
b) Area 2A	600,000	20,000	1990	143,600	1984	254,500	110,900	36,900
B. Sewerage:								
Treatment:								
a) Stage I	700,000	20,000	1975	700,000	1975	700,000	–	–
b) Stage II	418,000	10,000	1996	56,500	1989	110,100	53,600	12,800
Collection:								
a) Area 1B	1,288,000	40,000	1980	799,700	1977	1,064,400	264,700	82,200
b) Area 2A	350,000	12,000	1990	83,800	1984	148,400	64,600	22,200
C. Drainage:								
a) Area 1B	633,000	21,000	1980	393,000	1977	523,100	130,100	43,200
b) Area 2A	35,000	3,000	1990	8,400	1984	14,800	6,400	5,500
D. Roads:								
a) Area 1B	1,657,000	165,000	1980	1,028,800	1977	1,369,300	340,500	339,100
b) Area 2A	2,834,000	283,000	1990	678,500	1984	1,201,900	523,400	522,700
E. Solid Wastes:								
Disposal	29,000	3,000	1975	29,000	1975	29,000	–	–
Total Costs	**15,478,000**	**744,000**		**8,907,000**		**11,365,400**	**2,458,400**	**1,300,000**

3.4.3.3 Social and General Services

Introduction

Under the present Municipal Ordinance in the Northwest Territories, the municipal corporation's responsibilities include by-law enforcement, fire protection, culture and recreation programs, and general administration. Other community concerns which fall outside the legal jurisdiction of the municipal corporation, such as education and health care programs, are currently financed and administered by the Territorial Government and private interests.

Housing

Housing in Hay River has been generally provided by the Territorial and Federal Governments, private companies, and the Town of Hay River. Residential land development is presently being undertaken by the Town Administration in the New Town and serviced lots are being sold for between $8,000 and $10,000 each.

At present the estimated 1975 permanent population of 3,730 persons is accommodated in 1,028 housing units. Estimated population growth in Hay River as a result of normal growth between 1975 and 1983 will require an additional 465 housing units to be constructed within that time period. However, under accelerated growth due to pipeline activities between 1975 and 1983, the housing demand will almost triple to 1,205 housing units. There may also be a requirement for the total or partial relocation of some of the residents presently residing in the Old Town on Vale Island. Makale has estimated that approximately 208 housing units would be required to relocate these residents raising the total demand for housing units to 1,413. Over a 9 year period this would require approximately 160 housing units to be brought on stream each year.

Hay River at present has 220 single family lots, 140 mobile home lots, and 288 multi-family units constructed or planned for development. According to the Makale General Plan and housing mix projected therein, it is anticipated that the single family and multi-family units will satisfy the anticipated demand due to normal growth until 1979. However, with pipeline accelerated growth the supply of single family residential lots will only be adequate until 1977. The present stock of mobile home lots will accommodate the anticipated demand until 1979, depending on the timing of any residential relocation from Vale Island. With the construction of 288 multi-family units there should be adequate multi-family accommodation until after 1983.

Temporary population influx as a result of pipeline development may alter the demand for all types of housing units.

The community response to the demand for housing to accommodate the population influx into Hay River will lie mainly in the field of land development. The Municipal Corporation, assuming the role of chief land developer in the Town, will be required to ensure that enough serviced lots are available so that the necessary permanent housing may be constructed. Evidence to date has shown that the Town is presently preparing itself to adequately meet this demand for increased population growth. Any additional requirements for public housing will be negotiated between the Town, the Territorial Housing Corporation and CHMC.

Considerable controversy has surrounded the anticipated impact of industrial development of Hay River on the present residents in the Old Town on Vale Island. Studies to date have shown that additional industrial land will likely be required behind the existing waterfront area on Vale Island.

Education

The present educational facilities consist of 27 elementary classrooms to handle students in Kindergarten to Grade 7. The Diamond Jenness Secondary School provides 14 high school classrooms for Grades 7 to 12.

Assumptions for projecting education demand in Hay River are stated as follows:

a) A total of 264 students per 1,000 population
b) Kindergarten to Grade 3, 89 students per 1,000 population
c) Grades 4 to 7, 95 students per 1,000 population
d) Grade 8 to 12, 80 students per 1,000 population
e) One classroom will accommodate 25 students.

The increased demand for classroom space which will be placed upon the Town of Hay River as a result of pipeline-related activities will amount to 24 additional classrooms between 1975 and 1983.

Under the present education system in the NWT, the Town of Hay River has no responsibility for providing education facilities or operating educational programs. All property owners pay an education tax of 15 mills to the Territorial Government. Should the

Town of Hay River eventually convert to a School Board Education System, as discussed in the proposed Educational Ordinance for the NWT, then considerable tax load will fall upon the residences of Hay River in the absence of major capital and operating grant structures. The three existing school boards in the NWT, located in Yellownkife and Rae-Edzo, are presently responsible for carrying out capital programs but are funded 100% by Territorial Capital Grants and the school board is awarded, each year, a grant of 75% of their approved operating and maintenance budget.

Hospital Facilities

At present the Town has a 24 bed hospital. This hospital provides regional health services to the Hay River area. Using an approximate standard of 3.5 beds per 1,000 population, this hospital can accommodate a regional population of 6,800 people. This approaches the Hay River regional population in the summer and suggests that this hospital is presently operating at capacity. Plans are being made to increase the hospital capacity in the near future.

If it is assumed that the Town of Hay River will be the only population centre which is likely to substantially grow as a result of pipeline activities within the existing Hay River hospital region, than it can be calculated that the hospital should be expanded by at least 15 additional hospital beds by the year 1983. Approximately 9 hospital beds or 60% of the increased hospital facility demand can be attributable to pipeline activities. However, this projection is limited to considering permanent population only. In the event of increased transient population with pipeline development, this may alter significantly the demand placed on the hospital facilities in Hay River in the future. This may necessitate the provision of a much larger hospital facility than is presently envisioned.

Recreation Facilities

Present recreation facilities in Hay River consist of a modern community recreation centre (arena, curling rink, and an indoor swimming pool), baseball diamonds, tennis courts, NWT Campground and a natural beach. Recently the Y.M.C.A. has become involved in the Town and is conducting a recreation leadership program which will impart skills to local residents in the hope that they will be able to operate their own programs. Commerical recreation facilities such as pool halls, movie theatres, bars and lounges also provide leisure time outlets for residents in Hay River.

The demand for recreation facilities in the communities surrounding Great Slave Lake cannot be projected using southern standards exclusively. However, because of Hay River's relatively mild climate in comparison with the Mackenzie Delta communities, southern Canadian standards for recreation are more applicable in this region than in the Mackenzie Delta. The Hay River Region is well endowed with natural recreational features such as Great Slave Lake and numerous water falls. Also, Hay River enjoys a relatively good regional road network which reduces the feeling of isolation and allows families and individuals to pursue their own individual recreational pursuits into the region, particularly during the summer season.

At present Hay River enjoys a relatively high standard of recreation facilities. However, the sports complex, which was constructed in 1969, is not being utilized to its full potential and the complex is expensive to operate and maintain.

Since the responsibility for providing recreation and cultural programs fall almost exclusively upon the shoulders of the municipality, it is predicted that considerable impact, both financial and operational, will be exerted upon the municipal corporation. Since the Town of Hay River has not been identified as an operational headquarters by the Applicant, it could be assumed that the Applicant will not become directly involved in any cost sharing programs for recreational facilities.

In light of the present territorial grant structure which supplies to each municipality a recreation operational grant of $5.00 per capita, the present Hay River recreation and cultural budget of approximately $35.00 per capita is obtained almost exclusively from the tax payer. If the community is going to respond to the anticipated increase in per capita recreation expenditures, then it is conceivable that the tax payers in Hay River will have to assume this increased responsibility under the terms of current legislation.

Other Services

Police protection in the community is presently divided between the RCMP and a municipal by-law enforcement officer. The present fire department consists of a 24 men volunteer fire department with 3 fire halls and pumper trucks.

The demand for other services such as fire protection, by-law enforcement, and general administration will probably increase substantially as more people enter the community. This prediction has been based on historical evidence in the case of Grande

Prairie, Alberta, and upon present requests for pipeline impact funding in Alaska (see Appendix E). There was a noteable divergence from per capita operating expenditures in Grande Prairie for fire protection, by-law enforcement, culture and recreation, and general administration. This divergence was in the form of significant increases in per capita expenditures over the period of accelerated growth (1968-73) as compared to trends established in the normal growth period prior to 1968.

Hay River's response to the anticipated increase in per capita operating costs as a result of rapid growth would be to apply for extra-ordinary funding from the Territorial Government.

3.4.3.4 Energy Supply

The Town of Hay River presently obtains its energy almost exclusively from fuel oil. Residential dwellings are presently being heated, for the most part, by fuel oil furances. All the electricity within the Town of Hay River is generated through the facilities of Alberta Power which operates a diesel generating station.

It is anticipated that the future demand for energy as a result of pipeline activities will substantially increase over and above any direct normal increase in per capita consumption. This additional demand is anticipated in the expansion of the industrial sector.

Several options are available for the Town in order to secure future energy supplies. These include the extension of the present NWT Power Grid west from Pine Point to Hay River in conjunction with a northern extension of the Alberta Power Grid. This would secure two independent sources of electrical supply. In addition, a real possibility exits for a lateral facility to be constructed from the main 48-inch diameter gas pipeline to the Town gate for the purposes of distributing natural gas to the individual households, the commercial sector, and the expanding industrial sector.

The Town finds itself in a relatively fragile ecosystem. Any heavy industrial activities in the Great Slave Lake Area could materially benefit from the use of natural gas as an industrial fuel due to its low environmental impact.

The competitive position of natural gas as compared with fuel oil is dealt with in detail in Section 4.0 of the report.

3.4.3.5 Community Resupply

The Town of Hay River is presently equipped with the most sophisticated transportation infrastructure of any community in the NWT, having year-round links to the south via the Mackenzie Highway and the Great Slave Railroad. The Town experiences no major delays in the community resupply throughout the year.

The demand for supplies and equipment is anticipated to increase substantially with additional population. Increased industrial development on Vale Island will necessitate the movement of heavy materials, primarily via the existing rail line. The movement of heavy materials through the center of the Town will cause considerable impact to land uses adjacent to the railway. As the Town expand further to the west, increased volumes of traffic will be required to cross the railroad tracks. It should be ensured that unit trains can be properly accommodated on Vale Island in order to avoid blockage of the tracks in the New Town.

Steps have already been taken by the Town of Hay River in anticipation of the problems which will arise as a result of pipeline accelerated growth. An overall master plan has been devised for the industrial development on Vale Island and a general plan has been created to guide the expansion and rearranging of land uses in the New Town.

3.4.3.6 Community Finances

Expenditures incurred by the Municipal Corporation of Hay River have almost tripled from $396,430 in 1968 to $1,116,806 in 1973. During this same period the permanent population doubled. Assuming a 5% per year inflation rate over this period, the real growth in per capita expenditure was 10%. Significant expenditure increases have been experienced in the areas of protection services, recreation and community services, and debt charges.

Total revenues over the same period have also most tripled from $386,105 in 1968 to $1,276,193 in 1973. During the last three years (1971-73) Hay River has enjoyed an operating surplus at year end. A significant shift occurred between 1972 and 1973 when other revenues, generated primarily through land developments administered by the Town, rose sharply from only 11.5 percent of total revenues in 1972 to 37 percent of total revenues in 1973. In 1968, 29 percent of the Town's total revenue originated at the senior levels of government; while only 21 percent was obtained from government sources in 1973.

The anticipated financial demands to be placed upon the community as a result of the increase in population due to pipeline-related activities have been estimated for off-site physical services, educational requirements, and other services. The cost of servicing land with utilities and local streets will likely continue to be self-liquidating, being recovered in the sale of serviced lots.

The anticipated financial demands (in 1975 present worth dollars) as a result of the pipeline have been forecasted over the study period as follows:

TABLE 3.11

Hay River Financial Impact Summary

Year	Physical Services		Social Services		Total	Municipal Corporation Share
	Capital	Operating	Capital	Operating		
1975	380,500	88,200	–	16,700	485,400	485,400
1976	–	–	57,300	109,000	166,300	33,600
1977	1,063,700	567,300	52,100	108,100	1,791,200	1,681,300
1978	–	–	118,300	167,800	286,100	66,400
1979	–	–	43,000	197,600	240,600	81,500
1980	–	–	58,700	234,900	293,600	101,400
1981	–	–	53,300	266,200	319,500	119,400
1982	–	–	64,600	290,800	355,400	136,900
1983	–	–	44,100	320,600	364,700	152,600
1984	705,300	587,300	–	–	1,292,600	1,292,600
1985	255,300	44,400	–	–	299,700	299,700
1986	–	–	–	–	–	–
1987	–	–	–	–	–	–
1988	–	–	–	–	–	–
1989	53,600	12,800	–	–	66,400	66,400
Total	**2,458,400**	**1,300,000**	**491,400**	**1,711,700**	**5,961,500**	**4,517,200**

The financial impact analysis shows that the cost to the community as the result of the pipeline will be in the order of 6 million 1975 dollars, out of which the Municipal Corporation will be responsible for administering 4.5 million dollars under current territorial financing arrangements.

3.4.3.7 Hay River Community Concerns

While the general results of Council workshops are reported in Section 5.0 of this report, certain issues emerged from the Hay River workshop that are specific to that community.

These issues relate to:

1) Surplus development in anticipation of pipeline

   Hay River has developed certain excess capacity in the community in anticipation of pipeline development. If the pipeline is delayed or not constructed this excess capacity could be a problem in Hay River.

2) Vale Island Development Study

   Optimal harbour usage is important to the planned development of Hay River. Port facilities must be provided for the tourist industry as well as for normal industrial usage.

3) Encouraging Permanent Residents in the Community

   Efforts must be made to encourage permanent residents in the community of Hay River. Low interest loans for housing purchases should be made available by government and large companies.

3.4.4 City of Yellowknife

Since becoming the Capital of the NWT in January, 1967, Yellowknife has expanded to an estimated 1974 population of 7,500. Extensive growth of the Government Sector (both Territorial and Federal) has accounted for part of this population increase. The Mining Industry has continued to be an important contributor to the growth of Yellowknife. The historical growth of the City is shown in the following table:

Historical Population Growth

Year	Population
1956	3,100
1961	3,245
1966	3,741
1971	6,122

3.4.4.1 Population Projections

a) **Makale, Holloway (1974)**

Assumptions:

- The average family size in Yellowknife will be 3.7 for the length of the projection period.
- The percentage of married male employees with families will be 70% of the increased employment.
- After 1980, 50% of the increased employment will be filled by existing city residents.
- That this growth is additional to that of natural increase.

Year	Population[1]
1970	6,500
1975	9,800
1980	12,346
1985	14,126

1 At time of writing the General Plan was being revised. Included in Makale's Projection is an increase in Governmental employment and administrative expansion as a result of the proposed pipeline.

Due to the low level of pipeline impact in Yellowknife in comparison with general expansion, it is difficult to separate the pipeline growth component from the total projected growth for the City. Recognition must, however, be given to an increase in government employment (both Federal and Territorial) as a result of gas industry development and related population increase in the NWT. Expansion of the government sector will be to accommodate this increased population, to monitor pipeline impact, and to create new government programs to respond to such impact in the NWT. Such an increase in the government sector is difficult to anticipate, in that, it will be determined by future policies for government spending and hiring.

CAGPL and its constituent companies, that were contacted, did not have any plans for establishing or expanding branch offices in the community for either the construction or operation period of the pipeline. There may, however, be some expansion of the private sector as a result of increased economic activity in the north with resource developments such as the pipeline. Expansion of the private sector will be determined by its ability to secure contracts with the Applicant for local supply.

In summary it is concluded that pipeline-related growth in Yellowknife will probably be minimal compared to normal growth. As a result there will not be a requirement for significant extraordinary expenditures by the municipal corporation.

3.4.4.2 Yellowknife Community Concerns

While the general results of Council workshops are reported in Section 5.0 of this report, certain issues emerged from the Yellowknife workshop that are specific to that community.

These issues relate to:

1) Role of women in pipeline development

   Women should be given the opportunity to participate in employment associated with pipeline development. This would decrease the necessity for importing workers and, as a result, decrease the local housing demand. It might also alleviate labour shortages in the communities. Day Care Centers that would provide proper child care would facilitiate the overall participation of women in the local labour force.

2) Lack of Municipal Sophistication

An adequate level of expertise and sophistication in Municipal Government is required in order that optimal community management be attained with accelerated pipeline growth. Problems arising from pipeline accelerated growth could be aggrevated by mismanagement of the community. It was thought to be desirable to attract those persons to Municipal Government that exhibit the highest level of governmental sophistication.

3.4.5 Town of Fort Smith

Fort Smith is located on the Slave River approximately one mile from the Alberta border. The community was incorporated as a Town in 1967 at which time it lost its "Capital" status to Yellowknife. The historic Governmental function of Fort Smith has remained on a regional rather than a territorial level and remains the predominant employer in the community. The Adult Vocational Training Centre in Fort Smith provides post secondary education for the entire NWT. The Community has grown to a estimated 1974 population of 2,702 (Community Hand Book). The historical growth of the Town is presented in the following table:

Historical Population Growth

Year	Population
1961	1,681
1966	2,120
1971	2,364

3.4.5.1 Population Impact

Fort Smith is rather remote from pipeline construction and operations. There will undoubtedly be some impact on the population of Fort Smith, but this population impact is not quantifiable due to the lack of available data and due to the minor level of pipeline impact. Possible population influences will be:

a)[1] Increased involvement in vocational training school in Fort Smith in response to pipeline labour demand.

b) Increased government employment as a result of a).

c) Possible out migration of labour force to work in pipeline related employment.

d) With generally higher wage scale throughout the NWT, there will possibly be an increased attraction to a transient population seeking jobs in Northern Canada. As a result more transients may move through Fort Smith.

3.4.5.2 Fort Smith Community Concerns

While the general results of Council workshops are reported in Section 5.0 of this report, certain issues emerged from the Fort Smith workshop that are specific to that community.

These issues relate to:

1) Role of Adult Vocational Training Centre in pipeline development

It is important to emphasize the role of the Adult Vocational Training Centre in training northerners so that they may participate in pipeline development and operation. To that end, Fort Smith must be identified as the regional vocational training centre.

2) Potential Hydroelectric Power Sales

In consideration of hydroelectrical potential of the Fort Smith Region it was felt that a market for this energy should be promoted so that this development would take place.

3) Promotion of recreation in Fort Smith Region

A recreation potential of the Fort Smith Region and Wood Buffalo National Park could be more extensively utilized by other residents of the NWT and by

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[1] No enrollment projections were available from Government of Northwest Territories.

tourists coming to the Territories from southern Canada. This potential may as well attract off-shift pipeline workers seeking a place to spend leisure time. Conservation of these natural recreational resources must be considered with more intensive use.

3.4.6 Town of Pine Point

Pine Point is located approximately 50 miles from Hay River. Established as a townsite for Cominco Mines, it became a Hamlet in 1969, a Village in 1973 and achieved Town status in 1974. Although initially planned for a population of 1,000, the community had grown to 1,225 in 1971 and had an estimated 1,750 residents in 1974. Cominco Mines continues to be the dominant employer in the community. The following table illustrates the historical growth of the Community:

Historical Population Growth

Year	Population
1966	459
1971	1,225
1974	1,750

3.4.6.1 Population Impact

Pine Point will not experience any significant population impact due to pipeline construction and operations. Cominco Mines dominates the community activities and Pine Point's regional function is very limited due to its proximity to Hay River. The mine is the primary employer and community population growth will be determined, to a great extent, by the expansion policies of the mining company rather than by the activities of the Applicant. Some of the possible impacts upon the community due to the pipeline are identified as follows:

a) To the extent that Cominco Mines can compete with wages offered in the pipeline it will retain its employees. If Cominco cannot compete there may be a possible out migration of residents seeking employment on the pipeline, as 35% of the present work force are single males.

b) With general higher wage scales throughout the NWT, there will possibly be an increased attraction to a transient population seeking jobs in Northern Canada. As a result more transients may move through Pine Point.

3.4.6.2 Pine Point Community Concerns

While the general results of Council workshops are reported in Section 5.0 of this report, certain issues emerged from the Pine Point workshop that are specific to that community.

These issues relate to:

1) Inadequate retail outlets

Efforts should be made to encourage the establishment of competitive retail outlets in Pine Point. The present lack of a competitive situation has resulted in high prices and poor service.

2) Electrical Shortage and high cost of Power

Pine Point expressed a desire to tie into the Alberta Power Grid in order to ensure provision of adequate electrical power at a more reasonable cost.

3) Shortage of Female Residents

A large component (35%) of the local labour force is single males. If the present male/female ratio was improved, the Town's population might stabilize.

3.4.7 Hamlet of Rae-Edzo

Rae, which is situated on a peninsula in Marion Lake, and Edzo, which is located on the Mackenzie Highway, achieved Hamlet status jointly in 1971. Although separated geographically, these two centres are administered as a unit by the Rae-Edzo municipal council. Government is the prime employer in the community but traditional activities such

as hunting and fishing are still very important. The historical population of Rae is shown from 1956 to 1966, and the population of Rae-Edzo is shown from 1971 to 1974 in the table below:

Historical Population Growth

Year	Population
1956	698
1961	522
1966	779
1971	1,081
1974	1,270

3.4.7.1 Population Impact

As the result of Rae-Edzo's distance (approximately 200 miles) from the proposed Mackenzie Valley Pipeline it will experience relatively minor population impact due to direct pipeline construction activities. Potential impact may be:

a) A decrease in population due to local people finding jobs in pipeline construction camps. An increased involvement in vocational training programs offered outside the community may also result in a population decrease.

b) With increased territorial population as the result of pipeline development the volumes of traffic moving along the Mackenzie Highway No. 3 may significantly increase. This could result in an expansion of the highway service function of Rae-Edzo.

c) If there is increased transient movement within the Slave Sub-Region during the pipeline construction period, Rae-Edzo might experience a social impact and short term population change.

3.4.7.2 Rae-Edzo Community Concerns

Although a workshop meeting could not be arranged with the council of Rae-Edzo, various community concerns emerged from communications with the Hamlet Council and from a visit to the community.

These issues relate to:

1) Promotion of locally based economic activity and employment opportunities

   The residents of the community are trying to generate employment opportunities, locally, through the promotion of native businesses; such as guiding and resort fishing, local handicraft industry, a bookkeeping service for community businesses, and caretakers services for local offices and stores. Generally the intention of the municipal council has been focused on establishing local industry and providing employment opportunities in which the native population could readily participate. Local gas supply would facilitiate this process.

2) Net Out-Migration from Rae-Edzo

   Concern was expresssed that there would be a net out-migration from Rae-Edzo as a result of employment opportunities during pipeline construction and vocational upgrading opportunities in Fort Smith coming with such development.

SECTION 4.0

GAS SUPPLY TO COMMUNITIES

The development of a gas transmission line through the Mackenzie Valley provides the potential for an alternate energy source for Valley communities. Currently, fuel oil provides the basic energy source for heating throughout the area. For many communities, fuel oil is also the basic energy source for electrical generation.

Many of the communities within the study area are at a substantial distance from the proposed pipeline route. Recognizing this fact, and the implied high cost of transmission from pipeline to community, and further recognizing the wish of the municipalities to benefit directly from the exploitation of a northern resource, the NWTAM moved the following resolution on October 2, 1973:

> "Whereas no visible direct benefit can be ascertained from the construction of a gas pipeline in the Mackenzie Valley to many of the communities in the north, and
>
> Whereas indirect benefits from construction of a gas pipeline in the Mackenzie Valley are not likely to be substantial or long-term in most areas,
>
> Therefore be it resolved that the Northwest Territories Association of Municipalities urge Applicants to the National Energy Board for the construction of a gas pipeline in the Mackenzie Valley to provide as part of their proposal for the construction of a minimum of five hundred (500) miles of spur line from the main pipe at the cost of the Applicant and,
>
> Be it further resolved that the Commissioner of the Northwest Territories and the Minister of Indian Affairs and Northern Development be requested to support municipalities of the North in this regard at National Energy Board hearings."

Subsequent to the passage of the foregoing resolution, two studies have been completed relating to the supply of gas to Mackenzie Valley communities.

A study entitled "Energy Alternatives for Mackenzie Valley Communities" was completed by Underwood McLellan and Associates Limited for the Department of Indian Affairs and Northern Development in May 1974. This study dealt with a comparison of three alternative energy sources; oil, natural gas and electricity. Based upon "order of magnitude" cost estimates and distribution systems costs extrapolated from an analysis of a "typical" community, this study concluded as follows:[1]

i) "It will cost more to use natural gas or electricity for heating purposes for those communities having a population of less than 100 and located over 50 miles from the proposed pipeline route.

ii) Communities of greater than 300 persons and within 10 miles of the pipeline route will find that conversion to natural gas results in the greatest savings.

iii) The remaining communities ranging in population from 185 to 7,100 will realize the greatest savings by converting to electricity (Hydro-electric)."

The communities considered are listed below according to estimates concerning conversion to the least expensive energy alternative by 1995.

Oil	Natural Gas	Electricity
Enterprise	Inuvik	Tuktoyaktuk
Jean Marie R.	Fort McPherson	Fort Norman
Arctic Red R.	Aklavik	Wrigley
	Fort Good Hope	Fort Simpson
	Norman Wells	Yellowknife[1]
		Hay River[2]
		Fort Providence
		Rae-Edzo[1]
		Fort Franklin[2]

1 Presently on Snare River Grid (NCPC)

2 Slated for tie-in to Taltson and APL Grid.

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1 Underwood McLellan and Associates Ltd. May 1974 **Energy Alternatives for Mackenzie Valley Communities,** Summary pp. vii

The following qualifications should be considered in assessing the conclusion of the Underwood McLellan & Associates Study.

1) The entire study is based on the Great Bear Power Project being feasible.

2) The economic evaluation is for the space heating market only.

3) The population (and therefore the space heating market) has been based on an annual growth rate of 4 percent.

4) Space heating per capita requirements are extrapolated from the "typical community" of Fort McPherson.

5) The entire analysis is based on the following future price levels.

	Oil	Gas	Electricity
1974	$ .51/gal.	.53/MCF	2.5¢/KWH
1980	$ .66/gal.	.67/MCF	2.5¢/KWH
1994	$1.11/gal.	.97/MCF	2.5¢/KWH

A study entitled "Impact of Proposed Arctic Gas Pipeline on Energy Costs in Northern Communities" was prepared by CAGPL and released in February, 1975. This report investigated the economics of supplying natural gas to Mackenzie Valley communities. The cost comparisons between natural gas and fuel oil did not consider the cost of conversion from oil to gas. The analysis is based on the ability of securing 50 percent of the space heating market and 100 percent of the thermal generation of electricity in communities not connected to an electrical grid.

The report concluded that under either community or overall system pricing, gas distribution systems linked to the proposed Arctic Gas pipeline would reduce energy costs in the communities in Inuvik, Norman Wells, Fort McPherson, Fort Simpson, Fort Good Hope and Aklavik, while under overall system pricing, energy costs in Fort Norman and Wrigley would also be reduced. The report further concludes that lateral pipelines to serve

the Yellowknife and Hay River areas would not provide energy at a lower cost than the alternative fuel oil and that the alternative of generating at the trunk pipeline and transmitting electricity instead of gas to any of the communities would result in net heating costs far above costs possible with gas transmission and distribution.

The basic data and methodology used in the CAGPL study was reworked to view the subject from two different perspectives; namely, from the point of view of the eight member municipalities of the NWTAM, and from the point of view of all twenty municipalities in the Mackenzie Valley — Great Slave Lake Regions.

Tables 4.1 and 4.2 show the cost of natural gas to the consumer (assuming a one-price gas marketing policy) under an individual community pricing system and under two franchise pricing systems (one made up from the 8 member municipalities, and the other from the 20 communities). Each calculated gas price is compared to the 1980 equivalent b.t.u. cost of fuel oil ($/MCF) in each one of the communities. The 1980 price of fuel and diesel oil in Norman Wells and Hay River has been assumed to be 85¢/gallon. Communities north of Norman Wells will be supplied with oil from the Norman Well's refinery, and communities south of Norman Wells will be supplied out of Hay River. A transportation charge of 6¢ per ton-mile has been added to the base price of 85¢/gallon at the two distribution points of Norman Wells and Hay River to arrive at a fuel oil price to the other communities. The 1980 price of natural gas to the communities has been calculated by summing up the following price components:

1) The wellhead price of gas in the Mackenzie Delta (conservative upper limit of $1.00/MCF).

2) The pipeline tariff charged to transport the gas from the Delta to the community lateral junction.

TABLE 4.1

Price of Natural Gas to Eight Member Municipalities in 1980

Community	1980 Equivalent Cost of Oil	Community Pricing System Well-head Cost + Main Tariff + Lateral Tariff + Distribution Tariff	
		0% Lateral Subsidy (Capital Cost)	100% Lateral Subsidy (Capital Cost)
Tuktoyaktuk	6.67 ($/MCF)	43.08 ($/MCF)	4.73 ($/MCF)
Inuvik	6.40	1.55	1.37
Fort Simpson	6.07	4.43	2.40
Hay River[1]	5.67	5.15	2.27
Pine Point[1]	5.67	7.64	2.90
Yellowknife[1]	6.20	10.71	3.37
Rae-Edzo[1]	6.20	13.54	5.72
Fort Smith[1 + 2]	5.80	18.67	3.53
Overall Franchise Pricing System	**6.10**	**6.93**	**2.43**

Total Length of Laterals – Approximately 675 miles.

1 Slave community prices based on overall particpation in Slave Lateral System.

2 Costs based on SAEL Projections.

TABLE 4.2

Price of Natural Gas to 20 Communities in the
Mackenzie Valley — Great Slave Lake Region (1980)

Community	1980 Equivalent Cost of Oil	Community Pricing System Well-head Cost + Main Tariff + Lateral Tariff + Distribution Tariff	
		0% Lateral Subsidy (Capital Cost)	100% Lateral Subsidy (Capital Cost)
Tuktoyaktuk	6.67 ($/MCF)	43.08 ($/MCF)	4.73 ($/MCF)
Inuvik	6.40	1.55	1.37
Fort Simpson	6.07	4.43	2.40
Hay River[1]	5.67	4.93	2.26
Pine Point[1]	5.67	7.08	2.87
Yellowknife[1]	6.20	10.59	3.37
Rae-Edzo[1]	6.20	13.39	5.72
Fort Smith[1 + 2]	5.80	18.11	3.50
Norman Wells	5.67	2.70	2.22
Fort McPherson	6.27	4.41	3.14
Fort Good Hope	6.00	4.63	3.19
Aklavik	6.40	6.47	3.15
Fort Norman	6.00	7.21	3.86
Wrigley	6.27	8.93	5.02
Arctic Red River	6.20	16.87	3.92
Fort Franklin	6.67	28.77	4.02
Jean Marie River	6.14	60.07	7.77
Fort Providence[1]	6.00	5.70	3.45
Fort Resolution[1 + 2]	5.74	22.54	3.91
Enterprise[1]	5.67	68.23	2.45
Overall Franchise Pricing System	**6.09**	**7.39**	**2.56**

1 Slave community prices based on overall participation in Slave Lateral System.

2 Costs based on SAEL Projections

3) The community lateral tariff charged to transport the gas from the CAGPL line to the Town gate.

4) The community distribution tariff charged to distribute the gas from the Town gate to a gas customer.

The gas prices presented in Tables 4.1 and 4.2 have been calculated to reflect the true economics (0% lateral capital cost subsidy) and altered economics (100% lateral capital cost subsidy). The cost of natural gas to a community will vary directly as the number of miles from the CAGPL line and inversely as the number of people in the community. A majority of the communities in the Western Arctic find themselves at an economic disadvantage owing to their small population and distance from the proposed pipeline route. With the introduction of a 100% capital cost subsidy of the community lateral lines (gas price component number 3), any economic disadvantage is practically eliminated in almost all of the 20 communities.

From the foregoing, the following conclusions may be drawn:

Eight Member Municipalities

1) On the basis of an overall franchise pricing system and no lateral subsidy, all eight municipalities would benefit only through the securing of an alternate source of energy.

2) On the basis of a community pricing system and no lateral subsidy, only the municipalities in Inuvik and Fort Simpson would benefit from the use of gas.

3) On the basis of either a community pricing system or an overall franchise pricing system and a 100% lateral subsidy, all eight municipalities would benefit from the use of gas.

Twenty Communities In the Mackenzie Valley – Great Slave Lake Regions

1) On the basis of an overall franchise pricing system and no lateral subsidy, all twenty communities would not benefit.

2) On the basis of a community pricing system and no lateral subsidy, only the communities of Inuvik, Fort McPherson, Fort Good Hope, Norman Wells, and Fort Simpson would benefit from the use of gas.

3) On the basis of either a community pricing system or an overall franchise pricing system and a 100% lateral subsidy, nineteen of the communities would benefit from the use of gas. Jean Marie River would only benefit under an overall franchise pricing system.

The value of a 100% lateral subsidy consisting of constructing approximately 910 miles of community laterals to the 20 municipalies would be in the order of 100 million dollars. A similar capital cost subsidy of constructing 675 miles of lateral lines to the eight member municipalities would amount to 80 million dollars.

SECTION 5.0

COUNCIL WORKSHOPS

During this Community Impact Study for the NWT Association of Municipalities the study group of Stanley Associates Engineering Ltd. visited the member communities in order to solicit their thoughts on the proposed Mackenzie Valley Pipeline and its possible affects on their respective communities. Workshop meetings were conducted by the study team with the municipal councils of Tuktoyaktuk, Inuvik, Fort Smith, Fort Simpson, Yellowknife, Pine Point and Hay River. The study sessions were designed so as to facilitate problem identification, goal setting and strategy formulation by the councils as a group and by individual council members. Following the completion of the council meetings the issues or concerns expressed by all the communities were tabulated in a workshop summary. As a result of the workshop sessions certain issues immerged that were recurringly identified by municipal councils. An issue was determined to be a "key issue" if it was raised at 4 out of the total of 7 municipal meetings (Table 5.1). Local gas supply and financial impact are dealt with in depth in the preceding sections. The other concerns commonly expressed, although not quantifiable, are important in the recognition of total pipeline impact in the communities.

TABLE 5.1

Key Municipal Issues

		Frequency[1]
1.	Local Gas Supply	7
2.	Recreation	7
3.	Improved Transportation	6
4.	Revenue Sharing from Resources Taxation	6
5.	Social Security (Transients)	6
6.	Labour Shortage and Increased Wages	5
7.	Financing Impact	5
8.	Drug and Alcohol Abuse	5
9.	Native Land Claims	4

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1 Out of total of seven meetings.

Workshop sessions were only conducted in communities that were members of the Northwest Territories Association of Municipalities. The Hamlet of Rae-Edzo, although a member of the Association, was not included because suitable meeting arrangements could not be made. Other municipalities of the NWT were contacted and invited to submit their comments on the proposed pipeline. Their replies appear in Appendix D.

The following notes intend to explain the "key issues" identified and present some of the solutions suggested.

5.1 RECREATION

Recreation emerged as one of the most often identified community concerns. A need for improved community recreation was expressed by all councils participating in the workshop sessions. Improvement was deemed necessary in the establishment of new recreation facilities (swimming pools, community centers, etc.), expansion of present facilities in order to meet increased demand, the establishment of more recreational programs (arts and crafts, swimming lessons, etc.), and acquiring staff for such programs and facilities. The incidences of social problems such as criminal activity, drug and alcohol abuse, and juvenile delinquency were identified by the communities as related to the lack of recreational opportunities offered locally.

It was generally felt that senior governments should continue to support communities in the provision of recreation facilities. Operation and maintenance of facilities and the establishment of suitable programs has proven very costly to the municipalities in the past. At Inuvik, it was suggested that the pipeline company contribute to the recreational budget of the community in that its employees would be using the Town's facilities.

5.2 TRANSPORTATION

As a result of the workshop sessions certain issues and recommendations were made relative to the provision of transportation services in the NWT. Areas of improvement of the present transportation system include:

1) improvement of air service and airport facilities, both land and water

2) construction and upgrading of roads in the NWT

3) optimal use of ports and water transportation facilities.

Generally dissatisfaction was expressed with the high transportation costs experienced by residents in the NWT. It was felt that, through improvement of the transportation system, these costs could be reduced. With the demands placed on the existing transportation system with the construction of the Mackenzie Valley Pipeline, it was felt that the level of service provided to the communities would possibly deteriorate in terms of either community access or community resupply problems.

5.3 REVENUE SHARING FROM RESOURCES TAXATION

The member municipalities generally felt that they should receive a share of the revenue generated by resource development. These monies would help to offset the financial impact on the municipalities due to pipeline-induced community expansion. These funds should be placed into the general revenue fund of the Territorial Government in order to move the Northwest Territories towards a position of fiscal autonomy.

Resource development will facilitate improvement of the standards of living of northern communities. Provision of amenities, taken for granted in southern Canada, would be possible if the NWT and its communities received a substantial share of revenue generated from northern resource development.

5.4 SOCIAL SECURITY

In workshop meetings concern was expressed over the degradation of the social fabric of the member communities with the influx of transient population. Comment in Inuvik:

> "What to expect from such an influx of southerners, increase in liquor and drug abuse, prostitution, juvenile delinquency....."

In order to minimize this type of impact; provision of recreation facilities, increase in the RCMP presence, and provision of transient facilities were considered appropriate action by the member communities. A recommendation was also made for stricter penalties for those persons charged and convicted locally.

Concern was expressed over the presence of pipeline construction crews located in proximity to communities. It was generally thought that by limiting access between camps and communities or by strict supervision of visiting construction workers, it would be possible to minimize the negative impact of resident-construction worker interaction.

The concern expressed over the possible negative impact of transient population is well warranted in light of the Alaskan experience, (Fairbanks) where 50% of the persons arrested in the past year were new arrivals.[1]

5.5 LABOUR SHORTAGE AND INCREASED WAGES

Communities were concerned that labour demand as a result of the pipeline construction and its related activities might create a labour shortage in the north. Employees that are presently employeed locally might be drawn away to higher paying pipeline jobs. Labour required to replace workers taking higher paying pipeline jobs and additional labour required for normal operations expansion might not be readily available.

[2]In Alaska the minimum wage is $2.60 per hour, which equals $450.00 per month for a 40 hour week. By comparision the lowest monthly wage for a pipeline job is $1,225.00 (60 – 70 hours per week). The monthly wages of pipeline clerical workers are two to three times greater than non-pipeline clerical workers, and for custodial and cullinary work monthly wages are three to five times greater. Complaints have come from local government and business administrators that it is difficult to attract and keep employees in clerical, secretarial, and other relatively low paying jobs (see Table 5.2).

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1 Pipeline Impact Information Centre Report, **Fairbanks North Star Borough**, No. 9, Nov. 13, 1974, pp. 30.

2 Pipeline Impact Information Centre Report, **Fairbanks North Star Borough**, No. 10, Nov. 27, 1974, pp. 14.

TABLE 5.2 *

Alaska Pipeline Wage Comparison

Job Position	Hourly Wage ($) Non-Pipeline Fairbanks	Hourly Wage ($) Pipeline	Monthly Wage ($) Non-Pipeline Fairbanks 40 Hours	Monthly Wage ($) Pipeline 60-70 hours	Fairbanks Average Monthly Wage ($) 40 hour week
Clerk	2.60 – 3.84	4.04	450 – 665	1,225	675 – 720
Intermediate Clerk-Typist	3.50 – 4.50	4.50	607 – 780	1,365	780
Senior Clerk-Secretary	3.50 – 4.68	4.79	607 – 811	1,452	860
Chief Clerk-Senior Secretary	4.04 – 5.59	5.42	700 – 969	1,644	945
Bookkeeper					
Jr. Accountant	4.04	5.42	700	1,644	945
Intermediate Acct.	4.61	6.52	800	1,977	1,145
Janitor[1]	3.87	8.31	671	3,061	–
Maid-Bullcook[1]	3.75	8.31	650	3,061	–
Cook[1]	5.87	9.12	1,017	3,359	–
Dishwasher[1]	3.68	8.31	638	3,061	–
Sales Person	2.60 – 4.65		450 – 806		–
Labourer	4.00[2] – 9.60[3]	9.60[3]	693[2] – 1,664[3]	3,536[3]	–

1. Union wage scale effective October 1, 1974, for pipeline jobs and July 1, 1974 for non-pipeline jobs.
2. Non-union wages, jobs listed in Alaska State Employment Center Daily Job Demand List.
3. Union Wages.

* Pipeline Impact Information Centre Report, **Fairbanks North Star Borough**, No. 10, Nov. 1974, p. 13.

5.6 DRUG AND ALCOHOL ABUSE

Drug and alcohol abuse is presently a serious problem in the NWT. Drinking is considered one of the main recreational activities pursued in the north. It is a problem to the Indian, Eskimo, Metis and White man alike.

Communities fear that with the advent of the pipeline associated transient population, the present situation would be worsened. Solution to the present and anticipated problems include provision of detoxification centres, intensified drug and alcohol education, and a provision of alternative recreation opportunities in the communities.

In Alaska the National Institute for Alcohol Abuse and Alcoholism (N.I.A.A.A.) provided Federal funds to the State for the alcohol programs which respond to the needs created by the construction of the Trans-Alaskan Oil pipeline. The N.I.A.A.A. has granted 1.5 million dollars for the provision of educational programs and nearly 500,000 dollars of these funds have been designated for the smaller pipeline corridor communities. This includes "mini-grants" of approximately 10,000 dollars each to develop recreation programs as an alternative to drinking in the Villages. Attention also has been given to the provision of sleep-off facilities and alcoholism councillors. The Alaska Labour Management Employees Affairs (ALMEA) is attempting to operate an occupational alcoholism program for the Alyeska Pipeline Service Company. ALMEA was organized as a co-operative effort by unions and contractors to develop a program of early identification of alcoholism and referral for treatment.[1]

A possible indication of increase in drug use in Alaska as a result of pipeline construction is reflected in arrests statistics for narcotic drug law violations which have more than doubled in 1974 over 1973.

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1 **Pipeline Impact Information Centre Report,** No. 9, Nov. 1974, pp. 26.

TABLE 5.3

Arrests According to Type of Drug[1]

	Drug Type	Number of Cases	Percentage of Total
1.	Marijuana	94	88.7
2.	Opium or cocaine and their derivatives (morphine, heroin, codeine).	7	6.6
3.	Synthetic narcotics	2	1.9
4.	Other dangerous non-narcotic drugs (barbituates benzedrine, etc.)	3	2.8
	TOTAL	**106**	**100.0**

5.7 NATIVE LAND CLAIMS

The matter of settlement of Native Land Claims is essentially beyond the scope of this report. The issue of Native Land Claims was, however, identified in many of the communities visited. Generally it was felt that senior Government should act promptly and fairly in the settlement of those native claims. It was thought that the improvement of the native situation, as a result of claims settlement, might better equip them to participate in a meaningful way in the development of the NWT and its municipalities. The municipalities recommended, however, that such lands dedicated to the Native Claim Settlement be located at sufficient distance from present corporate boundaries so as not to interfere with the necessary and orderly expansion of these centres in the future. Granular material sources in the vicinity of present municipalities should be reserved exclusively for community use.

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1 Pipeline Impact Information Centre Report, **Fairbanks North Star Borough**, No. 9, Nov. 1974, p. 30.

SECTION 6.0

SUMMARY AND RECOMMENDATIONS

INTRODUCTION

The Northwest Territories Association of Municipalities was formed in 1967 to act as the central co-ordinating agency for the various Municipal Councils in the Northwest Territories. Member municipalities who have participated in the formulation of this submission include the City of Yellowknife, the Town of Fort Smith, the Town of Hay River, the Town of Inuvik, the Town of Pine Point, the Village of Fort Simpson, the Hamlet of Rae-Edzo, and the Hamlet of Tuktoyaktuk.

The Municipal Councils of these communities represent a total population of approximately 24,000 or approximately 60% of the population of the Northwest Territories.

The intent of this submission is to express the concerns of the member municipalities as identified by the various Municipal Councils, and to present recommendations in response to these concerns. It is deemed imperative by the Association that the recommendations contained herein be agreed to and implemented by all parties concerned, prior to commencement of construction by the Applicant. With this stipulation, the Association is in favour of early construction of the proposed pipeline.

6.1 LOCAL GAS SUPPLY

The development of a gas transmission line through the Mackenzie Valley provides the potential for an alternate energy source for valley communities. Currently, fuel oil provides the basic energy source for heating throughout the area. For many communities, fuel oil is also the basic energy source for electrical generation.

Many of the communities within the study area are at a substantial distance from the proposed pipeline route. Recognizing this fact, and the implied high cost of transmission from pipeline to community, and further recognizing the wish of the municipalities to benefit directly from the extraction of a northern resource, the Northwest Territories Association of Municipalities moved the following resolution on October 2, 1973:

"Whereas no visible direct benefit can be ascertained from the construction of a gas pipeline in the Mackenzie Valley to many of the communities in the North, and,

Whereas indirect benefits from construction of a gas pipeline in the Mackenzie Valley are not likely to be substantial or long term in most areas,

Therefore be it resolved that the Northwest Territories Association of Municipalities urge Applicants to the National Energy Board for the construction of a gas pipeline in the Mackenzie Valley to provide as part of their proposal for the construction of a minimum of five hundred (500) miles of spur line from the main pipe at the cost of the Applicant and,

Be it further resolved that the Commissioner of the Northwest Territories and the Minister of Indian Affairs and Northern Development be requested to support municipalities of the North in this regard at National Energy Board hearings."

In a letter dated August 14, 1974, the Commissioner indicated his concurrance with the foregoing.

Subsequent to the passage of the foregoing resolution, two studies have been completed relating to the supply of gas to Mackenzie Valley communities.

A study entitled "Energy Alternatives for Mackenzie Valley Communities" was completed by Underwood McLellan & Associates Ltd. for the Department of Indian Affairs and Northern Development in May, 1974. The study dealt with a comparison of three alternative energy resources: oil, natural gas and electricity. Based upon "order-of-magnitude" cost estimates and distribution system costs extrapolated from an analysis of a "typical" community, the study concluded as follows:

"1) It will cost more to use natural gas or electricity for heating purposes for those communities having a population of less than 100 and located over 50 miles from the proposed pipeline route.

2) Communities of greater than 300 persons and within 10 miles of the pipeline route will find that conversion to natural gas results in the greatest savings.

3) The remaining communities ranging in population from 185 to 7,100 will realize the greatest savings by converting to electricity."[1]

A study entitled "Impact of Proposed Arctic Gas Pipeline on Energy Costs in Northern Communities" was prepared by Canadian Arctic Gas Pipeline Ltd. and released in February, 1975. This report investigated the economics of supplying natural gas to Mackenzie Valley communities. The report concluded that under either community or overall system pricing, gas distribution systems linked to the proposed Arctic Gas Pipeline would reduce energy costs in the communities of Inuvik, Norman Wells, Fort McPherson, Fort Simpson, Fort Good Hope and Aklavik, while under overall system pricing, energy costs in Fort Norman and Wrigley would also be reduced. The report further concludes that lateral pipelines to serve the Yellowknife and Hay River areas would not provide energy at a lower cost than the alternative fuel oil, and that the alternative of generating electricity at the trunk pipeline and transmitting electricity instead of gas would result in net heating costs far above costs possible with gas transmission and distribution.

It must be recognized that the foregoing conclusions of the Canadian Arctic Gas Pipeline Ltd. study were based on the assumption that the entire cost of construction, operation and maintenance of lateral lines to each community would be recovered through the sale of gas to the ultimate consumer. No subsidy of lateral lines was considered.

Based upon cost information contained within the Canadian Arctic Gas Pipeline Ltd. study, Table 6.1 compares the anticipated cost of natural gas to consumers (based upon a well head price of $1.00/MCF) in the eight member municipalities in 1980 with the equivalent cost of fuel oil under two conditions. Condition one is based upon the assumption that consumer costs would include the cost of constructing lateral supply lines to the communities. Condition two assumes that a subsidy is applied to the total cost of construction of lateral supply lines to communities. This table indicates that under conditions of total subsidy of lateral supply line costs, each of the eight member communities will enjoy an economic benefit from the use of natural gas as opposed to the use of fuel oil. The total length of lateral supply line required to service these eight municipalities will be approximately 675 miles.

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1 Underwood McLellan & Associates Ltd., May 1974 **"Energy Alternatives for Mackenzie Valley Communities"**, Summary, pp. vii.

Table 6.2 indicates similar information for each of the twenty communities along the Mackenzie Valley and within the Great Slave Lake region.

TABLE 6.1

Price of Natural Gas to Eight Member Municipalites in 1980

Community	1980 Equivalent Cost of Oil	Community Pricing System Well-Head Cost + Main Tariff + Lateral Tariff + Distribution Tariff	
		0% Lateral Subsidy (Capital Cost)	100% Lateral Subsidy (Capital Cost)
Tuktoyaktuk	6.67 ($/MCF)	43.08 ($/MCF)	4.73 ($/MCF)
Inuvik	6.40	1.55	1.37
Fort Simpson	6.07	4.43	2.40
Hay River[1]	5.67	5.15	2.27
Pine Point[1]	5.67	7.64	2.90
Yellowknife[1]	6.20	10.71	3.37
Rae-Edzo[1]	6.20	13.54	5.72
Fort Smith[1 + 2]	5.80	18.67	3.53
Overall Franchise Pricing System	**6.10**	**6.93**	**2.43**

Total Length of Laterals — Approximately 675 miles.

1 Slave community prices based on overall participation in Slave lateral system.

2 Costs based on SAEL projection.

TABLE 6.2

Price of Natural Gas to 20 Municipalities in the Mackenzie Valley – Great Slave Lake Region (1980)

Community	1980 Equivalent Cost of Oil	Community Pricing System: Well-Head Cost + Main Tariff + Lateral Tariff + Distribution Tariff	
		0% Lateral Subsidy (Capital Cost)	100% Lateral Subsidy (Capital Cost)
Tuktoyaktuk	6.67 ($/MCF)	43.08 ($/MCF)	4.73 ($/MCF)
Inuvik	6.40	1.55	1.37
Fort Simpson	6.07	4.43	2.40
Hay River[1]	5.67	4.93	2.26
Pine Point[1]	5.67	7.08	2.87
Yellowknife[1]	6.20	10.59	3.37
Rae-Edzo[1]	6.20	13.39	5.72
Fort Smith[1 + 2]	5.80	18.11	3.50
Norman Wells	5.67	2.70	2.22
Fort McPherson	6.27	4.41	3.14
Fort Good Hope	6.00	4.63	3.19
Aklavik	6.40	6.47	3.15
Fort Norman	6.00	7.21	3.86
Wrigley	6.27	8.93	5.02
Arctic Red River	6.20	16.87	3.92
Fort Franklin	6.67	28.77	4.02
Jean Marie River	6.14	60.07	7.77
Fort Providence[1]	6.00	5.70	3.45
Fort Resolution[1 + 2]	5.74	22.54	3.91
Enterprise[1]	5.67	68.23	2.45
Overall Franchise Pricing System	**6.09**	**7.39**	**2.56**

Total Length of Laterals – Approximately 675 miles.

1 Slave community prices based on overall participation in Slave lateral system.

2 Costs based on SAEL projection.

6.1.1 Recommendations

(a) **It is recommended that as a condition of construction approval, the Applicant be required to construct, at its own cost, lateral feeder lines from the main trunk pipeline to each member municipality and to other municipalities within the Mackenzie Valley Great Slave regions which might request natural gas.**

(b) **It is recommended that each municipality be given the option of constructing and operating its own gas distribution utility or granting a franchise for same to a private company.**

(c) **It is recommended that the powers of the existing Territorial Public Utilities Board be expanded to include control of gas utilities.**

6.2 IMPACT FUNDING TO MUNICIPALITIES

Three member municipalites of the Northwest Territories Association of Municipalities will be subjected to substantial direct impact as a result of pipeline construction and operation. This impact will result in the requirement for expenditures of a magnitude far exceeding those which might be normally anticipated. It is essential that the Territorial Government establish budgeting procedures such that the necessary funding, as required by present legislation, can be made available to the communities when required.

Tables 6.3, 6.4, and 6.5, provide order-of-magnitude estimates of the amount and timing of capital expenditures anticipated for the high impact communities of Inuvik, Fort Simpson, and Hay River respectively. In addition to the foregoing, moderate pipeline induced growth will occur at Tuktoyaktuk. Should such growth be deemed sufficient to justify the provision of piped services to that community, then further capital will be required from the Territorial Government. Estimates for the provision of piped services to Tuktoyaktuk are not available at this time.

The tables indicate the Territorial share of anticipated capital costs, based upon current grant legislation. No diminution of municipal self-determination is envisaged.

In addition to the costs noted above, the Territorial Government will be required to provide temporary financing to communities, probably through purchase of municipal debentures, so as to enable the municipalities to proceed with the servicing of lands for expansion purposes. While the magnitude and timing of such requirements will depend upon individual municipal planning decisions, as a rule of thumb for budgeting it may be assumed that such costs will range from $3,000 per capita population increase in the Slave area to $5,000 in the Delta.

In general, it is felt that the impact of the pipeline in this instance will be the exacerbation of current problems relating to the Territorial Governments inability to provide for long-term community budgeting.

2.1 Recommendations

(a) **It is recommended that the Territorial Government apply to the Federal Government for extraordinary funding, and that the Federal Government be required to provide same, such as to enable the provision of the necessary capital and short term financing to high impact communities so that the communities in turn may respond at the earliest possible date to anticipated demands.**

TABLE 6.3

Town of Inuvik

Total Capital Expenditures for Accelerated Growth
(1975 Estimated Costs)

Year	Physical Services	Social Services	Total	Cost Sharing	
				Municipal	Territorial
1975	$ 8,824,000	$ ---	$ 8,824,000	$2,328,000	$ 6,496,000
1976	4,763,000	682,500	5,445,500	1,035,000	4,410,500
1977	508,000	227,500	735,500	---	735,500
1978	4,575,000	364,000	4,939,000	330,500	4,608,500
1979	---	500,500	500,500	---	500,500
1980	---	91,000	91,000	---	91,000
1981	---	455,000	455,000	---	455,000
1982	---	91,000	91,000	---	91,000
1983	---	136,500	136,500	---	136,500
	$18,670,000	**$2,548,000**	**$21,218,000**	**$3,693,500**	**$17,524,500**

TABLE 6.4

Village of Fort Simpson

Total Capital Expenditures for Accelerated Growth
(1975 Estimated Costs)

Year	Physical Services	Social Services	Total	Cost Sharing	
				Municipal	Territorial
1975	$3,750,000	$ ---	$3,750,000	$ ---	$3,750,000
1976	---	63,000	63,000	---	63,000
1977	3,000,000	94,500	3,094,500	725,000	2,369,500
1978	---	126,000	126,000	---	126,000
1979	---	63,000	63,000	---	63,000
1980	---	31,500	31,500	---	31,500
1981	---	63,000	63,000	---	63,000
1982	---	63,000	63,000	---	63,000
1983	---	31,500	31,500	---	31,500
	$6,750,000	**$535,500**	**$7,285,500**	**$725,000**	**$6,560,500**

TABLE 6.5

Town of Hay River

Total Capital Expenditures for Accelerated Growth
(1975 Estimated Costs)

Year	Physical Services	Social Services	Total	Cost Sharing	
				Municipal	Territorial
1975	$ 4,915,000	$ ---	$ 4,915,000	$ 29,000	$ 4,886,000
1976	---	157,500	157,500	---	157,500
1977	5,176,000	126,000	5,302,000	1,145,000	4,157,000
1978	---	189,000	189,000	---	189,000
1979	---	126,000	126,000	---	126,000
1980					
1980	---	189,000	189,000	---	189,000
1981	---	189,000	189,000	---	189,000
1982	---	189,000	189,000	---	189,000
1983	---	157,500	157,500	---	157,500
1984	3,828,000	---	3,828,000	1,434,500	2,393,500
1985	1,150,000	---	1,150,000	---	1,150,000
1989	418,000	---	418,000	---	418,000
	$15,487,000	**$1,323,000**	**$16,810,000**	**$2,608,500**	**$14,201,500**

6.3 MUNICIPAL TAX LEVELS

While it is extremely difficult to project, in definitive terms, the impact of pipeline construction and operation upon municipal revenue requirements, it can be anticipated that extraordinary expenditure demands will be placed upon the municipalities during this period. The origin of such demands may be anticipated relative to pipeline influenced wage rate increases, labour shortages, and similar situations. These demands will be reflected in increased per capita tax burdens and increased utility service charges.

The municipalities are concerned that extraordinary costs occasioned by the pipeline should not be reflected in drastic increases in the residential tax load or in drastic increases to utility service charges.

6.3.1 Recommendations

(a) **It is recommended that the rate of increase of annual average per capita tax load in any community should be limited to the average rate of increase of per capita tax load experienced by that community during the period 1967 through 1973. It is further recommended that any shortfall in revenue occasioned by application of the foregoing formula shall be recovered through an appropriate increase in the operating grant provided to the municipalities by the Territorial Government.**

The foregoing limitation of per capita tax load increases should be applied during, and for two years subsequent to pipeline construction. If at that time it is found that any community is experiencing an operating deficit, then the per capita tax load should be increased at such a rate that the deficit (and the concomitant requirement for extraordinary grants) will be eliminated over a period of five years.

(b) **It is recommended that a formula similar to that recommended in (a) above be applied to limit the rate of increase of utility service charges over the same period.**

6.4 INDIRECT IMPACT

While the construction and operation of a Mackenzie Valley Pipeline is expected to impose a substantial direct impact only upon three member municipalities, indirect impact from pipeline construction will be felt throughout the Valley. Although the magnitude of such indirect impact is difficult to foresee at this time, a brief review of current Alaskan experience under similar circumstances indicates the probability of accelerated cost of living increases, increased wage rates, labour shortages in traditionally low paying sectors, and concomitant social hardships, particularly among those with fixed incomes.

6.4.1 Recommendations

(a) **In order to reduce the impact of regional inflation due to pipeline construction, it is recommended that the senior levels of government grant a special regional supplement to those people living on fixed incomes. It is recommended that such a supplement be keyed to a regional cost of living index.**

6.5 RESOURCE TAXATION

Royalties accruing as a result of resource extraction in the Northwest Territories are payable to the Federal Government. As is pointed out in the Final Report of the Standing Committee on Development and Ecology, on the assumption of revised Federal royalty rates and probable well head gas prices, royalties generated by the extraction of Delta gas reserves will likely exceed Territorial deficit financing required from Federal sources. It is the feeling of the municipalities that northern generated resource revenues should be retained in the North and applied directly in such a manner as to improve the quality of life in the North. Further, it is the feeling of the municipalities that revenues so obtained should be placed into the general revenue fund of the Territorial Government in order to move the Territories towards a position of fiscal autonomy.

6.5.1 Recommendations

(a) **It is recommended that the Federal Government share northern generated resource revenues with the Territorial Government on the basis of a mutually agreeable formula, and that Territorial revenues so derived be placed into the General Revenue fund of the Territorial Government.**

6.6 IMPACT OF TRANSIENTS

The municipalites are concerned relative to the probability of a large influx of transients seeking employment with pipeline construction contractors or related developments. The municipalities are further concerned relative to the potential impact of pipeline construction workers should construction camps be located in proximity to, and with easy access to, existing urban areas.

6.6.1 Recommendations

(a) **It is recommended that rigid implementation of current Canadian Arctic Gas Pipeline Ltd. policy regarding construction camp isolation be made a condition of any approval for pipeline construction.**

(b) **It is recommended that all hiring of non-Territorial residents for pipeline construction and related activities (such as Delta Gas Industries) be undertaken only at "points of hire" south of the 60th parallel. Such a policy, properly publicized, should greatly reduce the number of transients moving into the North seeking employment.**

(c) **It is further recommended that all "leaves" and "job terminations" shall include transportation back to the original "point of hire". Properly enforced, this policy should minimize the social impact of "southern workers on leave" in northern communities.**

6.7 RECREATION

The Northwest Territories Association of Municipalities is very concerned over the recreational opportunities that currently exist in the North. At present the municipal governments receive assistance in the form of capital grants to aid in the cost of building recreational facilities, and also receive a $5.00 per capita operational grant each year from the Territorial Government. Maintenance of facilities as well as the establishment of suitable programs has proven very costly in the past, and the per capita grant is found to be inadequate in terms of current operating experience. The NWTAM has previously made

specific recommendations to the Territorial Government as input to the forthcoming policy statement on recreation. Generally, it is felt that the high incidence of social problems such as criminal activity, drug and alcohol abuse, and juvenile delinquency are in part related to the amount and quality of recreational opportunities offered locally.

The Applicant has stated in their submitted socio-economic policies that complete on-camp recreation facilities will be provided in the pipeline construction camps. They suggest, therefore, that "the shortage of recreational facilities will not be made more acute as a result of pipeline construction activities". The success of implementing this policy to achieve the desired end of "no impact" upon existing recreational programs in the communities will depend ultimately upon the degree to which construction camps are in fact isolated from the communities.

During the pipeline operations phase, the Applicant has expressed considerable interest in working with the communities designated as operating and maintenance divisions, and district headquarters (namely Inuvik, Norman Wells and Fort Simpson), to provide appropriate recreational facilities. The Applicant has recognized that the presence of pipeline staff and their families will intensify the demand for recreational facilities. It is further noted that the increased population levels in the communities will help to justify the provision of a higher level of recreational facilities and programs.

As stated in the Applicant's "Recreational Facilities" policy, it is their intention to provide and administer such facilities for the needs of the total community. While the general intent behind this policy is admirable, the municipalities are concerned that the independent provision of recreational facilities by the Applicant may not in fact reflect the recreational needs of the entire community.

6.7.1 Recommendations

(a) **It is recommended that the Applicant's involvement in the provision of recreational facilities in northern communities be limited to the provision of appropriate funding, the application of which will be determined by a local recreational board upon which the Applicant shall have representation.**

6.8 DRUG AND ALCOHOL ABUSE

The Association recognizes that alcohol and drug abuse is already a very serious problem in the North. The Association is concerned that transients and pipeline construction workers moving into the communities may possibly attract existing drug networks in the South into the North to "cash in" on the high wages being paid pipeline employees. Strong interaction between transient workers and the community could increase the number of social problems such as family breakdown, alcoholism, drug addiction and crime.

Experience in Alaska is already pointing out the problems being experienced by the communities along the pipeline which have already seen narcotic drug law violations more than double in 1974 over 1973. Response in Alaska to the problem of drug and alcohol abuse has come from two different sources. Firstly, the National Institute of Alcohol Abuse and Alcoholism has provided Federal funds to the State for the establishment of local alcohol abuse programs. Funds totalling $1.5 million have been committed for the provision of educational programs out of which one-third has been reserved for the smaller, pipeline corridor communities. This includes "mini-grants" of approximately $10,000 each to develop recreation programs as an alternative to drinking in the Villages. Secondly, the Alaska Labour Management Employees Affairs (ALMEA) has established an occupational alcoholism program for the Alyeska Pipeline Service Company. ALMEA was organized as a co-operative effort by unions and contractors to develop a program of early identification of alcoholism and referral for treatment.

6.8.1 Recommendations

(a) **It is recommended that existing drug and alcohol abuse programs be strengthened, specifically in communities along the pipeline route. It is further recommended that such programs should include the provision of detoxification centres, staffed with qualified counsellors.**

6.9 NATIVE LAND CLAIMS

While the Association is in favour of an early settlement of native land claims in the Territories, it is concerned regarding the possible implications of such claims upon the continuing ability of member municipalities to expand on a planned, rational basis and to obtain necessary regional resources such as granular fill material to enable such expansion.

The concern of the Association is best expressed by the following motions that were carried at a meeting of the Association on 27 March 1974.

> "Be it resolved that the Northwest Territories Association of Municipalities urges the Federal Government to ensure that no granting of reserves under the Indian Act shall occur in any municipality or within 20 miles of any municipal boundary without full consultation from the beginning with the municipal government concerned."

> "Be it resolved that the Northwest Territories Association of Municipalities urges the Federal Government to speedily find a satisfactory settlement of grants of land to the Indian Bands in the Northwest Territories mutually acceptable to the Indians and other residents in the Northwest Territories."

SECTION 7.0

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APÊNDICE

APPENDIX A

Communities of the Mackenzie

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APPENDIX A

INUVIK PHYSICAL SERVICES

1.0 GENERAL EFFECT OF PIPELINE CONSTRUCTION

The general effect of the pipeline construction with regards to the municipal services would be the accelerated need of these services in approximately 3 years as compared to the normal need in 14 – 20 years. In certain areas this would mean abandoning the existing facilities and replacing with larger facilities due to the higher level of population. This portion of the study relates to the capacities and costs of the services due to the impact of the pipeline. The cost impacts can be defined as follows:

a) the present worth of capital expenditures for services that would be required under normal growth conditions for the high population forecast,

b) the present worth of expenditures for services required to satisfy accelerated growth due to the pipeline impact.

Municipal Services Studied

The following Municipal Services are covered in this section:

a) Waterworks
b) Sewerage
c) Roads
d) Drainage
e) Solid waste disposal

2.1 BASIC DATA AND STANDARDS

2.1.1 General

For the Town of Inuvik all costs, design criteria and system layouts are based on engineering reports and capital budgets prepared by Associated Engineering Services Ltd. (AESL). Also used were reports and standards for the NWT government. A list of reports and persons contacted are as follows:

Population Projection

Year	Normal Growth	Accelerated Growth
1975	3,500	4,100
1976	3,900	5,500
1977	4,000	5,900
1978	4,100	6,700
1979	4,200	7,700
1980	4,300	7,800
1981	4,700	8,700
1982	4,900	8,900
1983	5,200	9,200
1984	5,500	9,700
1985	5,800	10,100
1986	6,100	10,700
1987	6,400	11,200
1988	6,700	11,700
1989	7,000	12,300
1990	7,300	13,000
1991	7,800	13,600
1992	8,200	14,300
1993	8,600	15,000
1994	9,000	15,700
1995	9,500	16,500
1996	10,000	17,400
1997	10,500	18,200
1998	11,000	19,100
1999	11,600	20,100
2000	12,200	21,100

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All cost estimates are based on estimates made by A.E.S.L., adjusted to 1975 costs. This was done by increasing all estimates made before and including 1972 by 7% per year, while those including 1973 and after were increased by 15% per year. It should further be pointed out that these cost estimates are used for purposes of assessing order-of-magnitude of impact and should not be used for preparation of by-laws, or budgets.

2.2 CRITERIA AND STANDARDS

2.2.1 Population and Land Use

The following land use and population levels are quoted directly from the General Plan Expansion by Makale, Holloway & Associates Ltd. "To overcome the difficulties of projecting population in terms of time, the General Plan Expansion deals with population levels based on the physical conditions of expansion. Accordingly, the three population levels or stages are established.

Level (Stage) 1 – comprises the areas presently under the development and contains the potential population of 4,500 persons.

Level (Stage) 2 – comprises the area encompassed by the by-pass road right-of-way and contains the potential population of 7,000 persons.

Level (Stage) 3 – comprises the two first stages of development and on the area to the north of the by-pass road capable of accommodating 3,000 additional population. The total population in the three stages could reach a level of 10,000 persons."

2.2.2 Waterworks Requirement

The following criteria and standards are as stated in A.E.S.L. "Water & Sewage Analysis Report of 1973". All gallons referred to are imperial. The average daily demand is 100 gpcd with a Daily Peak factor of 1.2 to 1.3 and an Hourly Peak factor of 2.0. The probable maximum water demand will be due to fire flow combined with peak daily. The fire flow and pressure requirements are:

a) residential — a flow of 840 gpm with a minimum residential pressure at the hydrant of 10 psi and a maximum operating pressure of 60 psi.,

b) commercial — a flow of 1,200 gpm, with a minimum residential pressure of 20 psi and a maximum pressure of 75 psi.

2.2.3 Water Storage and Distribution

In usual waterworks, practice, storage must satisfy three requirements:

1) Provide water to the distribution system during hourly peak demands (distribution equalization).

2) Provide water during emergency periods of failure of the water supply system.

3) Provide water for fire-fighting purposes.

The quantity of storage required for distribution equalization and emergency storage is frequently taken as 25% of the demand on the maximum day and 15% of an average day respectively. This ratio has been established empirically on the basis of general experience.

Storage for fire protection is taken in accordance with the 1960 requirements of the Canadian Underwriters Association.

The total of these three quantitative requirements is the amount of water storage theoretically required in the community. A.E.S.L. have modified their storage requirement in Inuvik as outlined under storage later in this report.

2.2.4 Sewerage

The following sewage flows and standards are taken from A.E.S.L. "Report on Sewerage, 1973."

"The flow rate predictions are based on water usage of 100 gpcd. To calculate peak flows in the collection system this rate was multiplied by a factor of 3.0 with a factor of 2.5 being used for the outfall main." "At the ultimate projected population of 10,000 the water usage is projected at 1,000,000 gpd and the peak hourly sewage flow rate at 4.65 cubic feet per second (cfs)." Secondary treatment is the objective of the A.E.S.L. report with the effluent objectives being:

a) BOD_5 – 15 mg/l max.
b) Suspended Solids – 15 mg/l max.

The quality of the raw sewage is as follows:

a) BOD_5 – 253 mg/l
b) Suspended Solids – 170 mg/l
c) COD – 403 mg/l
d) Bacteriological quality – 7,350,000 coliform/100 ml
e) Alkalinity – averaged pH 7.5 at 133 mg/l.

2.2.5 Solid Waste Disposal

The disposal of garbage will be as governed by the regulations in the N.W.T.

3. MUNICIPAL SERVICES

A. Water Supply

The present source of raw water is Hidden Lake and except for the period of breakup and freezeup this is supplemented by water pumped from the East Channel of the Mackenzie River through 5,700 feet of 4 inch diameter main at a rate of 267 gpm. Precipitation over the Hidden Lake basin accounts for about 14 gpm on a yearly basis. A 3 mile supply line of 6 inch and 8 inch diameter pipe with a capacity of 600 gpm was laid

Lake B to Hidden Lake to agument the supply for the summer months only. This line will provide non-turbid water to Hidden Lake during the summer period which will alleviate the immediate problems of poor quality and insufficient volumes of water between the periods of breakup and freezeup. Without the water supply from Lake B, which is not available during the winter months, the capacity of the supply system is not adequate for the present population, but is only sufficient for a population of 3,000 if water supply is to meet peak daily flows.

B. Water Treatment

The existing water treatment plant is situated adjacent to Hidden Lake and is fed by a 290 gpm pump. Treatment consists of micro-strainers with an upper capacity of 320 gpm and a lower capacity of 150 gpm when the water becomes turbid during the summer. The water is also treated by fluoridation, chloramination and polyphosphate to prevent corrosion of the lines.

Therefore the existing treatment plant microstrainers are incapable of meeting the system demand during periods of poor raw water quality.

The treatment plant as it exists is incapable of producing enough water for the average daily demand for a population of approximately 3,000 at the lower treatment capacity of 150 gpm.

In 1975, according to A.E.S.L., it is planned to add to the treatment plant two gravity sand filters with a capacity of 150 gpm each. With the new filters supplemented by the old microstrainers the production of the plant under ideal conditions would be approximately 600 gpm but the probable productive under summer conditions would be 450 gpm. It is assumed that these additions are part of the present system.

Taking into account the added filters and an assumed production of 600 gpm this treatment plant would be capable of producing water at peak daily demand to serve a population of 6,700.

C. Water Storage

The Town's treated water storage consists of a 90,000 gallon ground level steel tank located next to Hidden Lake. The treated water from the plant is pumped to this tank where it then goes to the distribution system by gravity. There is planned for 1975,

construction of a 500,000 gallon treated water storage tank and by using the 1960 standards set out by C.U.A., it is suitable for a population of 2,000. It is assumed that this storage is part of the present system. But based on A.E.S.L.'s Modified and Conditional C.U.A. method of storage and fire requirements the above storage would be sufficient to a population of 6,500. This method assumes that the Hidden Lake water can be used in the system without treatment, other than chlorination to meet fire flows. In other words, the tank storage is designed to meet only domestic demands during fire, hourly peaks and emergency shutdown. Fire needs are met with direct pumping from the raw water storage through the storage tanks with only chlorination taking place.

D. Water Distribution System

The water distribution system is combined with the sewage collection system in above-ground utilidors. The utilidors will be explained in more detail under the sewage collection system. The people in the west part of town which are not served by utilidors have water delivered under contract by tank truck.

The present water distribution system has satisfactory working pressures which range from 25 to 60 psi depending on the location in the system. But for fire conditions the existing system is seriously under-designed in certain areas. This is due to the use of 4 inch mains in parts of the system, non-looped portions, and the higher topography in the northwest. To bring the present system up to fire flow requirements would require the above deficiencies to be corrected.

E. Sewage Collection System

The collection system, as stated before, is located with the water lines in above-ground utilidors. There are several types of utilidors with the original type containing water lines, sewer lines, and heating pipes, while others carry only water and sewer lines. Details of the construction and engineering aspects of the utilidors are explained in many reports and studies and are not relevant in this study. The sewage collection system, with some modifications, is capable of handling the present sewage flows. The outfall line, which is 4,093 feet of 8 inch A.C., has been overloaded for the last few years and a booster pump has been installed to help overcome this problem during peak flow periods.

This booster pump has created problems such as excessive leakage and back-up of connecting mains downstream.

In portions of the Town not served with utilidors, sewage is collected by truck.

F. Sewage Treatment

The sewage treatment facilities consists of an irregular shaped lagoon in which the raw sewage from the outfall is dumped. The lagoon has an area of approximately 43.5 acres and an adjustable liquid depth of 1 to 4.5 feet. At maximum depth it holds 56.8 million gallons which provides a 162 day retention period for a population of 3,500. The effluent discharges to the Mackenzie River approximately 4,500 feet downstream of the Town. The lagoon has much growth throughout it and some slumping of the embankments. The Town has now expanded within 700 feet of the lagoon. According to Alberta Government regulations the lagoon should be relocated.

G. Roads

The roads consist entirely of dirt and gravel tops. The roads are generally adequate with dust being controlled in the summer by oiling.

H. Waste Collection and Disposal

Garbage is collected from barrels placed throughout the community by the Town. Burning is encouraged before pick-up. The waste ground is located approximately 1 mile away from the Town proper but within the Town limits.

4. FUTURE MUNICIPAL REQUIREMENTS AND ESTIMATED COSTS

For the community of Inuvik, future municipal requirements are analysed for a population of 10,000. Capital cost estimates have been developed for each of the municipal services by A.E.S.L. and these have been escalated as stated previously to 1975 price levels. All operating costs have either been developed by A.E.S.L. and increased accordingly or where they are unavailable they have been taken as 10% of the capital cost. Operating costs are for each additional capital expenditure and not for the entire system, except for Stage I which includes operating costs for the entire system to the end of Stage I. Capital costs for on-site lot services and development have not been included. All capital costs include engineering fees.

4.1 Water Supply

Since the water supply at present is barely capable of satisfying the present needs an 8 inch permanent supply line with a temporary intake to the Mackenzie River is required immediately. The Mackenzie River is proposed as the main water source since it is presently the only known reliable source of water. A permanent intake structure and intake line will be required once the population reaches between 6,000 and 7,000 people according to A.E.S.L. The 8 inch supply line and ancillary items would cost in the order of $341,000. The permanent intake cost is included with the total cost of the storage facility and treatment additions to be built at that time.

4.2 Water Treatment and Storage

The present treatment plant is capable of supplying treated water for 6,700 population assuming the filters have a capacity of 600 gpm. After this population figure has been reached added treatment would be required.

Present storage is available for a population of 6,500, therefore to bring the storage capacity of the treated water system to a population of 10,000 would require a second 500,000 gallon tank. This storage capacity is based on A.E.S.L.'s modified and conditional C.U.A. method as explained previously. The cost of this additional storage, permanent intake line and extra treatment capacity is estimated at $508,000.

4.3 Utilidor System (Water Distribution and Sewage Collection System)

The cost estimates for the utilidor service to each of the development stages as outlined previously are listed below.

	Cost of Services
Stage 1 — total population level 4,500	$1,570,000
Stage 2 — total population level 7,000	$3,428,000
Stage 3 — total population level 10,000	$3,994,000

Stage 1 includes upgrading the present utilidor system to meet the required fire demands and sewage flows as well as expansion to meet the demands of population growth. Stages 2 and 3 include utilidor expansions to meet a total population of 10,000 persons.

These costs only include main utilidors which are off-site costs. Since there is no detail construction schedule it is assumed these costs will be incurred at the beginning of each stage.

4.4 Outfall Sewer

The existing 8 inch outfall will need to be replaced immediately by an outfall comprising of A.C. pipe with sizes ranging from 12 inches to 14 inches. This outfall will cost approximately $400,000. This outfall will discharge into the existing lagoon until the new treatment facility is built. It will eventually connect to a pumphouse where the sewage will be pumped across the river through a 12 inch insulated steel pressure line to the treatment facility site. The sewage treatment facility construction would be undertaken at the end of Stage 1. This pumphouse will be sized for 10,000 population and will also be receiving sewage from the north outfall. The cost of this north outfall is included in the collection system cost. The estimated cost of the pumphouse and pressure line is included in the cost of the sewage treatment facilities since the construction would take place at approximately the same time.

4.5 Sewerage Treatment

The treatment facilities would be located across the river in a delta area subjected to intermittent inundation. The facilities would consist of a 5 acre anaerobic lagoon followed by the use of long retention ponds thereby meeting the Federal Standards. The anaerobic lagoon will be 8 feet in depth and have a 20 day retention at present flows and 8 day retention at ultimate population. This corresponds with the Alberta requirement for 2 cells each of 4 days retention. The long retention ponds would consist of a 100 acre primary pond, and a 160 acre secondary pond. These long retention ponds will have an average depth of 8 feet. The primary pond will have a retention time of 6 months and the secondary pond will have a retention time of 9 months including ice cover. The estimated cost of the pumphouse, pressure line and treatment facilities is $1,857,000 and is estimated to be constructed at the end of Stage I.

4.6 Roads

The cost estimates for roads are shown below broken down into the three stages of development. Stage I includes upgrading of all existing roads as well as paving approximately 1.5 miles of the Mackenzie Road through the Town. This stage also includes development of some new roads. Stage II and Stage III include only the development of new collector and arterial roads in the expansion areas.

Stage I	$4,656,000
Stage II	$ 600,000
Stage III	$ 661,000

4.7 Solid Waste Disposal

The cost estimate of garbage disposal, according to A.E.S.L., is based on the probable cost of building and operating an incinerator. It is estimated at approximately $735,000.

5. SUMMARY

Costs for expanding the municipal off-site services for the high population forecasts are shown in Table I for normal growth and pipeline growth. The total costs are the same except that they are spread over different time intervals for each growth period. To determine the actual cost impact due to the pipeline, the present worth in 1975 of all capital expenditures was computed with a discount rate of 10% per year. Present worth calculations do not include factors for recovery or expected life. It was determined that the present worth of capital expenditures for normal growth was approximately $12,196,700 while for the accelerated growth due to the pipeline it would be $17,070,000. The difference is $4,873,300. Present worth calculations for the difference in operating and maintenance cost between accelerated and normal growth periods were computed. It was assumed that operating and maintenance costs for each item do not vary from one year to another. The present worth difference in maintenance and operation costs is $2,257,800.

(Cost in Millions)	Normal Growth	Accelerated Growth	Difference
Capital Costs	12.20	17.07	4.87
Operating and Maintenance Costs	—	—	2.26
Total Costs	**12.20**	**17.07**	**7.13**

The costs show the order-of-magnitude impact that the pipeline will have on the municipal services of Inuvik.

There also appear to be three special development plateaus with significant cost increases. These plateaus are at the beginning of each of the three stages of development. The plateaus do not bring a higher level of service but only expand the existing type of service. These plateaus are identifiable by the three cost increases at that time. Under normal growth the plateaus would take place in 1975, 1981 and 1989. Under accelerated growth the plateaus would not be as significant since they would all take place within 4 years of each other. At this time the plateaus would appear as one large expansion and very definite "growing pains" would be realized.

With regards to capacities of the future proposed systems and land development a critcal stage would be reached at 10,000 population. At this time more developable land would need to be found and capacities of the water system and sewerage system would have to be upgraded. It is estimated that the accelerated growth would populate the Town to 8,700 in 1981 and then continue growth at normal rate. The capabilities of the systems and available land would then be sufficient only until 1985 at which time major additions would be required. Under normal growth the proposed systems and land developments would be adequate until 1996. It therefore can be seen that the pipeline impact will result in the need for expansion beyond the 10,000 population 10 years earlier. For this future period of time no capital cost estimate for added expansion has been done since it is beyond the scope of this survey.

TABLE I

All Costs in 1975 Dollars

Town of Inuvik
Physical Services Cost Analysis

Item	Capital Cost	Maint. & Operation Cost/Year	Normal Growth Year Required	Normal Growth Capital PW	Accelerated Growth Year Required	Accelerated Growth Capital PW	PW Cost Difference Capital	PW Cost Difference Maint. & Operation
A. Waterworks								
1) Supply	341,000	34,000	1975	341,000	1975	341,000	—	—
2) Treatment and storage	508,000	10,000	1987	161,800	1977	419,800	258,000	50,800
B. Sewerage								
1) Outfall	400,000	40,000	1975	400,000	1975	400,000	—	—
2) Treatment Works	1,857,000	41,100	1980	1,153,000	1975	1,857,000	704,000	163,200
C. Utilities								
1) Stage I	1,570,000	195,800	1975	1,570,000	1975	1,570,000	—	—
2) Stage II	3,428,000	68,000	1981	1,935,000	1976	3,116,000	1,181,000	234,400
3) Stage III	3,994,000	77,000	1989	1,052,000	1978	3,000,000	1,948,000	375,700
D. Roads								
*1) Stage I	4,656,000	426,000	1975	4,656,000	1975	4,656,000	—	—
*2) Stage II	600,000	84,000	1981	339,000	1976	545,000	206,000	289,500
*3) Stage III	661,000	101,000	1989	174,000	1978	497,000	323,000	492,800
E. Waste Disposal	735,000	189,000	1981	414,900	1976	668,200	253,300	651,400
Total Costs	**18,750,000**	**1,265,900**		**12,196,700**		**17,070,000**	**4,873,300**	**2,257,800**

* Assume maintenance for normal years.

APPENDIX B

APPENDIX B

FORT SIMPSON PHYSICAL SERVICES

1.0 GENERAL EFFECT OF PIPELINE CONSTRUCTION

The general effect of the pipeline construction with regards to the municipal services would be the accelerated need of the mainland services in approximately 2 years as compared to the normal need in 4 years. In certain areas this would mean abandoning the existing facilities and replacing with larger facilities due to the higher level of population. This portion of the study relates to the capacities and costs of the services due to the impact of the pipeline. The cost impacts can be defined as follows:

a) the present worth of capital expenditures for services that would be required under normal growth conditions for the high population forecast,

b) the present worth of expenditures for services required to satisfy accelerated growth due to the pipeline impact.

Population Projection

Year	Normal Growth	Accelerated Growth
1975	1,180	1,310
1976	1,260	1,390
1977	1,350	1,740
1978	1,450	2,050
1979	1,550	2,250
* 1980	* 1,660	* 2,370
1981	1,740	2,490
1982	1,830	2,610
1983	1,920	2,740
1984	2,020	2,880
1985	2,120	3,020
1986	2,230	3,170
1987	2,340	3,330
1988	2,460	3,500
1989	2,580	3,680
1990	2,710	3,860
1991	2,850	4,050
1992	2,990	4,250
1993	3,140	4,460
1994	3,300	4,680

* Natural populatuion projected at 7% per annum increase to 1980, after 1980 population projected at 5% per annum until 1994.

Municipal Services Studied

The following Municipal Services are covered in this section:

a) Waterworks
b) Sewerage
c) Roads
d) Drainage
e) Solid waste disposal

2. BASIC DATA AND STANDARDS

2.1 General

For the Village of Fort Simpson all costs, design criteria and system layouts are based on engineering reports and estimated capital expenditures by Strong, Lamb & Nelson Ltd. Also used were reports and standards for the NWT government. A list of reports and persons contacted are as follows:

1) Report on Municipal Services in NWT – Heinke, 1971
2) Townsite Expansion Study Village of Fort Simpson – W. J. Francl & Associates – 1974
3) Lagoon Sewage Treatment – 1967 – R. N. Dawson
4) The Proposed Water and Sanitation Policy – A.E.S.L.
5) Mr. M. Pich, P. Eng., Project Manager for Fort Simpson – Strong, Lamb & Nelson Ltd.

All cost estimates are based on estimates made by Strong, Lamb & Nelson Ltd. and are preliminary only and are subject to change. All cost estimates are adjusted to 1975 prices. This was done by increasing all estimates made before and including 1972 by 7% per year, while those including 1973 and after were increased by 15% per year. It should be further pointed out that these cost estimates are used for purposes of assessing order-of-magnitude impact and should not be used for preparation of by-laws, or budgets.

2.2 Criteria and Standards

2.2.1 Population and Land Use

The land use and population levels for Fort Simpson are based on the "Townsite Expansion Study" by W. J. Francl & Associates in January 1974. According to this report the present island townsite has a capacity for a population of approximately 1,535. After this figure has been reached expansion to the mainland is necessary. The mainland site selected is on the high ground across from the island. The mainland area and island townsite are expected to be able to accommodate a total population of 7,000 which is more than adequate for a 20 year accelerated pipeline population projection.

2.2.2 Waterworks Requirements

Demand rates used in waterworks design are:

*1) Annual Average Daily per Capita Demand – this is determined by dividing the total recorded annual water use in the community by 365 and by the number of people "connected to the system".

2) Maximum Daily Demand – this is the recorded maximum day use over a full year of record, or the average of five (5) consecutive days of maximum use recorded in a full year of operation.

* All gallons referred to are imperial gallons.

For purposes of projection, it is the usual practice to develop the Maximum Daily Demand Rate by applying a peaking factor to the Annual Average Daily Demand.

Based on Strong, Lamb & Nelson Ltd. preliminary work, an Annual Average Daily Per Capita Demand of 100 gallons was chosen for purposes of this study. On this basis, a Peaking Factor of 2.0 was selected as a ratio of Maximum Daily Demand to Annual Average Daily Demand. The selected demand rates used in this study are:

1) Annual Average Daily Per Capita – 100 gallons
2) Maximum Daily Per Capita – 200 gallons

2.2.3 Water Supply and Treatment

Experience with many waterworks systems has shown that generally the most economic combination of supply and treatment facilities and storage is achieved when supply and treatment capacity is approximately equal to the Maximum Daily Demand rate and hourly peaks are drawn from storage.

2.2.4 Water Storage and Distribution

In usual waterworks practice, storage must satisfy three requirements:

1) Provide water to a distribution system during hourly peak demands (distribution equalization).

2) Provide water during emergency periods of failure of the water supply system.

3) Provide water for fire-fighting purposes.

In this study, the quantity of storage required for distribution equalization is based on Strong, Lamb & Nelson Ltd.'s practical experience in this community.

Storage for fire protection is taken in accordance with the current (1973) requirements of the Canadian Underwriters Association.

The total of these three quantitative requirements is the amount of water storage theoretically required in the community.

The primary distribution system must be capable of delivering water at the required demand rates with adequate pressures. Acceptable operating pressures range from 40 to 100 pounds per square inch. Below 40 pounds per square inch, delivery in homes is seriously affected. Above 100 pounds per square inch, difficulty with fixtures and appliances is encountered. Fire hydrants should operate at the probable maximum demand (Maximum Daily Demand plus fire flow), with a residual pressure of 20 pounds per square inch. Valving should be such that a maximum of 600 feet of distribution main can be isolated for purposes of repair or maintenance. It has been determined that for the Village of Fort Simpson a maximum fire flow of 1,200 gpm is required for the commercial area.

Freezing and unstable ground conditions continue to be problems in the Fort Simpson system and therefore, the depth of bury for uninsulated pipe should be a minimum of 10 to 12 feet, and ductile iron pipe or pipe of a similar flexible material should be used.

2.2.5 Sewerage

No measurements of flow have been taken which would allow a reliable development of flow parameters for future design. Primarily based on water consumption, an average flow of 100 gallons per capita per day has been assumed for this study.

The peak flows which will occur in various parts of the sewerage system are affected by the size of the area served and by the land use in the area. The Harmon formula provides an empirical method of estimating peaks, based on the first consideration, and this is used in this study. For areas other than predominantly residential, for example, the commercial centre and the industrial area, equivalent population or in some cases specific flows, are used.

Treatment requirements are determined generally in the Regulations Respecting Public Sewerage Systems – Public Health Ordinance of the Northwest Territories. As they apply to Fort Simpson, these fall into two parts:

1) There are the General Principals Part II which state – "No final disposal of effluent from a sewerage system shall be carried out in a manner so as to (a) create a health hazard with respect to water supplies, swimming beaches, or any body of water in the area; or (b) create aesthetically unacceptable conditions with respect to temperature, turbidity, colour, taste and odour of any stream or body of flowing water in the area."

2) Part V Sewage Treatment Design states – "Sewage treatment system shall be designed so as to provide for adequate protection of the receiving water considering both the existing and future possible uses of the receiving water."

On the basis of the foregoing, secondary treatment is required.

There is not sufficient direct data from sampling and analysis of the raw sewage to draw any reliable conclusions regarding the composition of the sewage. For this reason and purposes of this study, it is assumed that the raw sewage will have a BOD_5 in the order of

200 ppm (parts per million) and Suspended Solids in the order of 225 ppm. This is consistent with experience in other Northern communtiies where rates of water use are inordinantly high by comparison with rates for similar communities in more southerly climates.

Normally there is a temperature gain in water as it passes from the supply system through the demand centres into the waste water disposal system. In Fort Simpson, because of the high rate of usage of water during the winter months when temperature is critical, it is likely that this temperature gain will be significantly smaller than in southern communities. Although there are no specific data available, on the basis of experience in other Northern communities, we would expect the temperature of the raw sewage at discharge from the collection system to be in the order of $40^{o}F$.

2.2.6 Drainage

The drainage system is usually closely related to the road system. Storm drains are usually located in road rights-of-way, and surface drainage, that is curb and gutter or ditches, are usually located along roadways.

Adequate drainage can be provided by a well designed and well maintained system of ditches. However, as community standards of service rise, a higher level of drainage facilities will be required. A complete storm drain system with drains on every street and connections to individual houses provides the highest level of service, but it is so costly that most communities cannot justify it. A combination of a limited system of drains and surface flow in curb and gutter or ditches, is more usual, and probably should be the objective in Fort Simpson.

3. EXISTING MUNICIPAL SERVICES

3.1 Water Supply

Fort Simpson's water needs are supplied from two sources. They are the Mackenzie River and a natural spring located on the mainland across from the island. Each water supply will be considered separately.

a) **Mackenzie River Supply**

This river intake was constructed in 1959-60 on the bank of the island. It consisted of an 8 inch pipe approximately 155 feet in length connecting to an 8 foot diameter pump well. The last 45 feet of the pipe was originally put on piles above the river bed but has been twice destroyed by ice and is presently not there. This intake has an assumed capacity of 130 lgpm. The water drawn by this intake is that of the sediment-laden Liard River which enters the Mackenzie River upstream of Fort Simpson. The pumpwell, which is well below the high water level of the river, contains two submersible pumps with capacities of 125 and 140 lgpm, although only one is used at a time. Reliability of these pumps are uncertain due to the high silt deposition in the pumpwell.

b) **Mainland Spring Supply**

Because the capacity of the treatment plant was overtaxed in the summer of 1972 due to high turbid river water a supplementary supply was found. This supplementary supply is a spring on the mainland approximately 7,000 feet west of the treatment plant. An earthfill dam and a six foot diameter intake well were constructed at the spring with a 6 inch yellow-jacket steel supply pipe to the treatment plant. This line is of a temporary nature having been laid on the surface of the mainland and buried at shallow depths at the syne crossing and on the island and is usable only during the summer months. The water quality at the spring was at first found to have very high colour, high turbidity, high hardness and alkalinity and attempts to treat the water in the existing treatment plant were only partially successful. Modifications of the intake well have helped to improve the water quality somewhat. The capacity of this supply line is approximately 170 lgpm. Since the water supply system is only capable of producing 130 lgpm during the winter months due to the temporary nature of the spring supply the capacity of the system is only suitable for a population of 940. This figure is based on the design standard that the water supply system is to meet the maximum day demand.

3.2 Water Treatment and Storage

The treatment plant, which is located near the river intake, was installed in 1959. The plant consists of a Cochrane solids-contact reactor-clarifier, gravity (carbon) filter, chemical feeders and a 100,000 gallon storage reservoir. The water is both chlorinated and fluoridated prior to distribution.

Two service pumps of 62 Igpm charge the distribution system with two 21 Igpm circulating pumps drawing the water back to prevent freezing. There are also two fire pumps of 417 Igpm.

The treatment plant design capacity was 63 Igpm although it is averaging 85 Igpm. This plant has been unable to meet the maximum daily demand for some time now. There is presently being constructed an additional 50 gpm filter thereby bringing the total treatment capacity to 113 gpm. Using the design criteria that the treatment capacity is to meet maximum daily it is calculated that a 113 gpm plant will be sufficient only for a population of 810. Even with the present additions the treatment plant is undersized.

With regard to storage, two additional steel tanks of 35,000 gallons each are being constructed thereby bringing the total storage to 170,000 gallons. According to the 1973 C.U.A. requirements, the maximum fire flow requirements for Fort Simpson is 1,200 gpm for a two hour duration. Therefore, storage of 144,000 gallons is required by the C.U.A. and the present storage meets this requirement but does not meet the other two requirements as stated previously.

3.3 Water Distribution System

The water distribution system consists of 8 inch and 6 inch A.C. mains buried to a depth of approximately 10 feet. All mains are lopped or sub-looped with the water being circulated year round by pumps at the water treatment plant. Individual building services consist of two copper lines and a small internal circulating pump.

3.4 Sewage Collection System

The sewage collection system consists of 8 inch asbestos cement sewer pipe with ring-tite joints. Manholes in the original system were constructed from concrete blocks while manholes in subsequent extensions were constructed from precast concrete rings. All manholes have frost protection covers. Depths of sewer mains vary from 5 to 12 feet. Portions of the original mains were constructed with very flat slopes, and these lines require periodic flushing to maintain flows. Some problems have been experienced with freezing of mains, probably due to flat slopes and shallow cover.

3.5 Sewage Treatment

Effluent from the existing system is presently being discharged untreated into the Mackenzie River at the downstream end of the community.

3.6 Drainage

Drainage in Fort Simpson is presently handled by open ditch. There is no system of storm sewers in the Village.

3.7 Roads

The major throughfare is the Mackenzie Highway which terminates on the island and which is presently built to a good rural standard. All other roads are gravelled and adequate at present.

3.8 Solid Waste Disposal

Garbage disposal is presently handled by sanitary landfill at a site at Mile 295 on the Mackenzie Highway.

4.0 FUTURE MUNICIPAL REQUIREMENTS AND ESTIMATED COSTS

For the Village of Fort Simpson, future municipal requirements were analysed for a population of approximately 3,000 since any major service construction now or later will be sized for that minimum population. Operating costs, which are tabulated, have either been developed by SAEL or have been assumed as 10% of the capital cost. Capital costs for on-site lot servicing and development have not been included. All capital costs include engineering fees. The future municipal services have been determined by Strong, Lamb & Nelson Ltd., as well as all capital cost estimates. These services and cost estimates are **preliminary only** and are subject to change.

4.1 Water Supply

Since the present water supply has been determined to be inadequate for the present population, a new supply system is required immediately. It is proposed to abandon

the mainland spring water supply because of the bad water quality and the unknown reserve. It is proposed to supply the total water demand from the Mackenzie River. A 14 inch diameter intake pipe of 3,000 feet in length located approximately 1,600 feet downstream of the exisiting treatment plant is proposed. The capacity of this intake, approximately 1.9 cfs, would be more than sufficient for any population forecasted in the study. The river intake is estimated to cost approximately $1,500,000. Included in this cost is the wet well and pumping equipment.

4.2 Water Treatment and Storage

The water treatment plant is now under capacity for the present population. Therefore it is necessary to construct immediately a treatment plant for present and future requirements. The raw water would be pumped from the proposed intake to the site of the old treatment plant. The old treatment plant would then be expanded to house new filters, boilers, pumps, etc., to meet the future demands. The estimated cost of the treatment plant expansion is approximately $500,000.

With regard to storage, the existing storage meets the new C.U.A. fire storage requirements but they do not meet peak hourly demands or shut down requirements. Therefore to meet all the storage requirements a 500,000 gallon storage reservoir should be constructed. This reservoir would only meet the requirements of the island development. Construction of this reservoir should take place immediately. Once the mainland development beings a new 500,000 gallon storage reservoir would have to be constructed in that area. A new reservoir would have to be built on the mainland because of the physical separation between the water supply system and the mainland distribution system. It is estimated that the cost of each of the reservoirs, including pumping equipment, etc., would be $500,000.

4.3 Water Distribution System

It is assumed that the island distribution system is fully developed and any future costs will be for the mainland area only. Once the mainland development takes place a water supply line connecting the treatment plant and the two reservoirs would need to be constructed. It is proposed that a 10 inch diameter line would connect the island and mainland systems at a cost of $500,000. Also to service the mainland area with feedermains for a population of 1,500 would cost approximately $300,000. It is assumed that the depth of the feedermains would be 10 – 12 feet and the sizes to be 6 inch and 8 inch diameter.

4.4 Sanitary Sewerage System

As stated above for the water distribution system, the island collection system is assumed to be fully developed. The sewerage collection system on the mainland would consist of 8 inch and 10 inch diameter pipe and is estimated to cost $250,000. The sewerage would flow by gravity to the mainland flats on the downstream end of the community where the proposed sewage treatment facilities would be located. The estimated cost of the gravity outfall is included in the cost of the lagoon. The sewage from the island would have to be pumped via a lift station and then a forcemain across the snye to the lagoon site. It is estimated that the lift station and the forcemain would cost approximately $750,000. The construction of the lift station and forcemain on the island should take place immediately along with the lagoon.

4.5 Sewage Treatment

The treatment facilities would provide secondary treatment and would be located in the flats on the mainland downstream from the community. The treatment would consist of aerated lagoons of 20 day retention periods sized for a population of 3,000. The sewage flows are assumed at 100 gpcd. The estimated cost of the lagoon, including the gravity forcemain, is approximately $500,000.

4.6 Roads

Included in the cost of roads is the drainage system. It is once more assumed that the roads on the island are developed. The basic street network for the mainland expansion area include the snye crossing and the Arterial and Collector Streets. Another snye crossing would be constructed to connect the island to the mainland thereby bringing the two areas within a one mile distance of each other. The cost of construction of the crossing is estimated to be $1,200,000 and should take place prior to development of the mainland.

The remainder of the collector roads on the mainland are estimated to cost approximately $250,000.

5.0 SUMMARY

Cost for expanding the municipal off-site services for the high population forecasts are shown on Table I for normal growth and pipeline growth. The total costs are the same except that they are spread over different time intervals for each of the growth periods. To determine the actual cost impact due to the pipeline, the present worth in 1975 of all capital expenditures was computed with a discount rate of 10% per year. Present worth calculations do not include factors for recovery or expected life. It was determined that the present worth of capital expenditures for normal growth was approximately $5,800,000 while for the accelerated growth due to the pipeline it would be $6,200,000. The difference is $400,000. Present worth calculations for the difference in operating and maintenance costs between the accelerated growth period and normal growth period were computed. It was assumed that operating and maintenance costs for each item do no vary from one year to another. The P.W. difference in maintenance and operation cost is $275,500.

(Cost in Millions)	Normal Growth	Accelerated Growth	Difference
Capital Cost	5.80	6.20	0.40
Operating and Maintenance Costs	—	—	0.28
	5.80	**6.20**	**0.68**

These costs show the order-of-magnitude impact that the pipeline will have on the municipal services of the Village of Fort Simpson.

There also appear to be two special development plateaus which are identifiable by significant cost increases. The first plateau occurs in 1975 regardless of the rate of growth. The second plateau occurs at the beginning of the development of the mainland which takes place in 1979 under normal growth and in 1977 under accelerated growth.

With regard to the capacities of the proposed system for future growth beyond a population of 3,000, the major services would appear to be adequate with minor modifications. The major capital expenditures would be for the development of residential land on the mainland. It therefore can be shown from the cost difference of the present worth calculations that the proposed pipeline would not have that significant an impact on

the physical infrastructure of Fort Simpson, as compared to Inuvik or Hay River. This is due to the fact that all Fort Simpson's major services are presently inadequate and would need to be brought up immediately to standards regardless of the proposed pipeline. Also, the design for the capacities of any of these services would be sized for at least 3,000 population. Therefore, the only acceleration of services would be the earlier development of the mainland which is in the order of two years.

TABLE I

Village of Fort Simpson
Physical Services Cost Analysis

All costs in 1975 Dollars

Item	Capital Cost	Maint. & Operation Cost/Year	Normal Growth Year Required	Normal Growth Capital PW	Accelerated Growth Year Required	Accelerated Growth Capital PW	PW Cost Difference Capital	PW Cost Difference Maint. & Operation
A. Waterworks								
1) Supply	1,500,000	50,000	1975	1,500,000	1975	1,500,000	–	–
2) a) Treatment	500,000	70,000	1975	500,000	1975	500,000	–	–
b) Storage Island	500,000	15,000	1975	500,000	1975	500,000	–	–
c) Storage Mainland	500,000	15,000	1979	341,500	1977	413,200	71,700	21,500
3) Distribution Mains Mainland	800,000	22,000	1979	546,400	1977	661,100	114,700	31,600
B. Sewerage								
1) Treatment	500,000	40,000	1975	500,000	1975	500,000	–	–
2) Collection Trunks								
a) Mainland	250,000	10,000	1979	170,800	1977	206,600	35,800	14,300
b) Island	750,000	25,000	1975	750,000	1975	750,000	–	–
C. Roads								
1) Snye Crossing	1,200,000	120,000	1979	819,600	1977	991,200	171,600	172,200
2) Mainland	250,000	25,000	1979	170,800	1977	206,600	35,800	35,900
D. Solid Waste	N/A	N/A						
Total Costs	**6,750,000**	**392,000**		**5,799,100**		**6,228,700**	**429,600**	**275,500**

APPENDIX C

APPENDIX C

HAY RIVER PHYSICAL SERVICES

1.0 GENERAL EFFECT OF PIPELINE

The general effect of the pipeline regarding municipal services will be the accelerated need for these services sooner than would have been required under normal growth. These services will be required in 2 to 14 years instead of the anticipated 20 years under normal conditions. This portion of the study relates to the capacities and costs of the services due to the impact of the pipeline. The cost impacts can be defined as follows:

a) the present worth cost of capital expenditures for services that would be required under normal growth conditions for the high population forecast,

b) the present worth of expenditures for services required to satisfy accelerated growth due to the pipeline impact.

The population projection is tabulated below for both normal and accelerated growth. Also tabulated are separate population figures which indicate the number of people at that year which are tied into the serviced areas. This serviced population table is used to determine in which year a certain utility may be required.

TABLE 1

Population Projection

Year	Normal Growth	Serviced Population for Normal Growth	Accelerated Growth	Serviced Population for Accelerated Growth
1974	3,540	2,230		
1975	3,730	2,600	3,920	2,790
1976	3,910	3,000	4,390	3,480
1977	4,100	3,400	4,820	4,120
1978	4,290	3,600	5,250	4,560
1979	4,470	3,900	5,670	5,100
1980	4,710	4,190	6,210	5,690
1982	5,190	4,670	7,280	6,760
1983	5,420	4,900	7,810	7,290
1984	5,660	5,140	8,340	7,830
1985	5,960	5,440	8,740	8,220
1986	6,260	5,740	9,140	8,620
1987	6,550	6,030	9,540	9,020
1988	6,850	6,330	9,940	9,420
1989	7,150	6,630	10,340	9,820
1990	7,530	7,030	10,870	10,370
1991	7,900	7,400	11,400	10,900
1992	8,200	7,700	11,940	11,440
1993	8,650	8,150	12,470	11,970
1994	9,030	8,530	13,000	12,500

The effects of the pipeline were analyzed only to 1994 since population growth at this time will be at a normal growth rate, and the impact would be stabilizing. Also, it is normal practice to design for a 20 year period.

Municipal Services Studied

The following Municipal Services are covered in the sections:

a) Waterworks
b) Sewerage
c) Drainage
d) Roads
e) Solid Waste Disposal

2. BASIC DATA AND STANDARDS

2.1 General

For the Town of Hay River all costs, design criteria and system layouts are based on engineering reports prepared by Stanley Associates Enginering Ltd. (SAEL) and their estimated capital costs. Also used were reports and standards for the NWT government. A list of reports used are as follows:

1) Report on Municipal Services in NWT – 1971 – Heinke
2) The Proposed Water and Sanitation Policy – A.E.S.L.
* 3) Development Plan – Town of Hay River 1974 – Volume I – Makale, Holloway & Associates Ltd. (Draft)

* Development Plan – Town of Hay River 1974 – Volume II – Engineering Study – SAEL – (Draft)

* These reports are in draft form only and are subject to change.

All cost estimates are based on SAEL 1974 Engineering Study (Draft) with all costs increased by 15% to determine 1975 dollars. It should further be pointed out that these cost estimates are used for purposes of assessing order-of-magnitude impact and should not be used for preparation of by-laws or budgets.

2.2 Criteria and Standards

2.2.1 Population and Land Use

Shown in tabulated form is the land usage and population distribution which was determined in the planning study. This portion of the study does not include the procedures which were used to arrive at the areas and populations which are forecasted below.

TABLE 2

Distribution of Project Population

To Development Areas

Vale Island Old Townsite	New Townsite East of Railway	Lot 553	Area 1B	Area 2A	Area 1A	Area 2B	Total
832	1,963	270					3,540
600	3,500	630	470				5,675
400	3,500	630	3,260	555			8,345
200	3,500	630	3,260	2,275			10,340
100	3,500	630	3,260	5,035			13,000
100	3,500	630	3,260	5,820	2,640	3,530	19,955*

* This is the total population which can be accommodated within these areas at a gross density of 15 persons/acre.

Note: It is assumed that the West Channel will stablize at a population of 200 and the Indian Village at a population of 275.

2.2.2 Waterworks Requirements

Demand rates used in waterworks design are:

* 1) Annual Average Daily Per Capita Demand – this is determined by dividing the total recorded annual water use in the community by 365 and by the number of people, "connected to the system".

2) Maximum Daily Demand – this is the recorded maximum day use over a full year of record, or the average of five (5) consecutive days of maximum use recorded in a full year of operation.

* All gallons referred to are imperial gallons.

For purposes of projection, it is the usual practice to develop the Maximum Daily Demand Rate by applying a peaking factor to the Annual Average Daily Demand.

Based on past experience and records, an Annual Average Daily Per Capita Demand of 120 gallons was chosen for purposes of this study. On the basis of records, a Peaking Factor of 1.5 was selected as a ratio of Maximum Daily Demand to Annual Average Daily Demand. The selected demand rates used in this study are:

1)	Annual Average Daily Per Capita	–	120 gallons
2)	Maximum Daily Per Capita	–	180 gallons

2.2.3 Water Supply and Treatment

Experience with many waterworks systems has shown that generally the most economic combination of supply and treatment facilities and storage is achieved when supply and treatment capacity is approximately equal to the Maximum Daily Demand rate and hourly peaks are drawn from storage. Analysis of the Hay River waterworks system shows that this has been the case up to the present time. It may not be so in the future.

As regards water quality and the need for treatment, Table 3 shows the chemical composition and quality of the water from the existing supply, compared with the standards of the Public Health Ordinance of the Northwest Territories.

TABLE 3

Quality of Water from the Existing Supply

Item	Analysis	Standards
Hardness	94 parts per million	
Iron	Less than 0.05 parts per million	0.3 parts per million
Turbidity	Less than 10 JT units	5 JT units
Total dissolved solids	Less than 150 parts per million	550 parts per million
Colour	Less than 15 Co units	15 Co units

The turbidity of the water from the existing supply although higher than the standard, has been considered acceptable in the community. There have been short periods of time during which the colour and turbidity have become somewhat higher.

Water from the existing supply is chlorinated and fluoridated, but no other treatment is provided.

2.2.4 Water Storage and Distribution

In usual waterworks practice, storage must satisfy three requirements:

1) Provide water to a distribution system during hourly peak demands (distribution equalization).

2) Provide water during emergency periods of failure of the water supply system.

3) Provide water for fire-fighting purposes.

In this study, the quantity of storage required for distribution equalization is taken as 25% of the demand of the maximum day and 15% of average daily. This ratio is established empirically on the basis of general experience.

Storage for fire protection is taken in accordance with the 1960 requirements of the Canadian Underwriters Association.

The total of these three quantitative requirements is the amount of water storage theoretically required in the community.

The primary distribution system must be capable of delivering water at the required demand rates with adequate pressures. Acceptable operating pressures range from 40 to 100 pounds per square inch. Below 40 pounds per square inch, delivery in homes is seriously affected. Above 100 pounds per square inch, difficulty with fixtures and appliances is encountered. Fire hydrants should operate at the probable maximum demand (Maximum Daily Demand plus fire flow), with a residual pressure of 20 pounds per square inch. Valving should be such that a maximum of 600 feet of distribution main can be isolated for purposes of repair or maintenance.

Freezing and unstable ground conditions continue to be problems in the Hay River system and therefore, the depth of bury for uninsulated pipe should be a minimum of 12 feet, and ductile iron pipe or pipe of a similar flexible material should be used.

2.2.5 Sewerage

No measurements of flow have been taken which would allow a reliable development of flow parameters for future design. Primarily based on water consumption, an average flow of 100 gallons per capita per day has been assumed for this study.

The peak flows which will occur in various parts of the sewerage system are affected by the size of the area served and by the land use in the area. The Harmon formula provides an empirical method of estimating peaks, based on the first consideration, and this is used in this study. For areas other than predominantly residential, for example, the commercial centre and the industrial area, equivalent population or in some cases specific flows, are used.

Treatment requirements are determined generally in the Regulations Respecting Public Sewerage Systems – Public Health Ordinance of the Northwest Territories. As they apply to Hay River, these fall into two parts:

1) There are the General Principles Part II which state – "No final disposal of effluent from a sewerage system shall be carried out in a manner so as to (a) create a health hazard with respect to water supplies, swimming beaches, or any body of water in the area; or (b) create aesthetically unacceptable conditions with respect to temperature, turbidity, colour, taste and odour of any stream or body of flowing water in the area."

2) Part V Sewage Treatment Design states – "Sewage treatment system shall be designed so as to provide for adequate protection of the receiving water considering both the existing and future possible uses of the receiving water."

On the basis of the foregoing, the following specific requirements for Hay River were developed for purposes of this study:

1) Primary treatment is required.

2) Provision must be made for future secondary treatment.

3) Disinfection of effluent is required whenever there is danger to potable water supplies.

4) Aerobic lagoons will require a one (1) year retention period.

5) Anaerobic lagoons will require five (5) days maximum retention and two (2) day minimum retention. Effluent can be discharged to surface waters.

There is not sufficient direct data from sampling and analysis of the raw sewage to draw any reliable conclusions regarding the composition of the sewage. For this reason for purposes of this study, it is assumed that the raw sewage will have a BOD_5 in the order of 200 ppm (parts per million) and Suspended Solids in the order of 225 ppm. This is consistent with experience in other Northern communities where rates of water use are inordinantly high by comparision with rates for similar communities in more southerly climates.

Normally there is a temperature gain in water as it passes from the supply system through the demand centres into the waste water disposal system. In Hay River, because of the high rate of usage of water during the winter months when temperature is critical, it is likely that this temperature gain will be significantly smaller than in southern communities. Although there are no specific data available, on the basis of experience in other Northern Communities we would expect the temperature of the raw sewage at discharge from the collection system to be in the order of 40°F.

2.2.6 Drainage

The drainage system is usually closely related to the road system. Storm drains are usually located in road rights-of-way, and surface drainage, that is curb and gutter or ditches, are usually located along roadways.

Adequate drainage can be provided by a well designed and well maintained system of ditches. However, as communtiy standards of service rise, a higher level of drainage facilities will be required. A complete storm drain system with drains on every street and connections to individual house provides the highest level of service, but it is so costly that most communities cannot justify it. A combination of a limited system of drains and surface flow in curb and gutter or ditches, is more usual, and probably should be the objective in Hay River.

Drains are designed on the basis of providing against the probability of a storm of selected intensity recurring at a selected interval of time. For purposes of this study, a two-year storm recurring frequency has been used. The usual practice is to use a two-year storm for residential areas and a five-year storm for commercial areas. However, in the absence of specific data, time-intensity-frequency data for the Edmonton region have been used, and these are probably more severe than the situation in Hay River would require. Therefore, the two-year frequency throughout was considered justified for Hay River. However, this should be reviewed in the future.

The runoff from various kinds of developed and undeveloped areas was estimated on the basis of factors which have been shown by experience to be applicable. These are:

Residential area	—	0.35
Multi-family area	—	0.40

Undeveloped areas or Community use areas	—	0.20
Light industrial area	—	0.35
Highway commercial and commercial areas	—	0.60

The requirements for surface drainage for the Town of Hay River for the present and future have been estimated on the basis of these criteria.

3. EXISTING MUNICIPAL SERVICES

3.1 Water Supply

The source of water is Great Slave Lake from which water is drawn by means of an intake structure located four miles out from the north shore of Vale Island. A 10 inch diameter intake conduit, steel pipe, coated and cement motor-lined, delivers water by gravity to the intake well on the shore. The water requires no treatment except for fluoridation and chlorination. There has been some complaints that the water is becoming turbid and has a taste during spring break-up.

Since there is no need for mechanical treatment, pumps are directly connected to the intake supply line and the water is pumped directly to the system. The pumping arrangement consists of one 175 Igpm @ 230 TDH pump and two 415 Igpm @ 390 TDH pumps. All the pumps are electrically driven with the small pump having a gasoline standby engine.

The water is pumped through 23,000 feet of 6 inch diameter line along Vale Island to the New Town distribution system. With the pumping capcity available at the intake pumphouse, it is calculated that the capacity of the Vale Island transmission line to deliver water to the mainland distribution system is approximately 200 gpm.

Therefore, it has been necessary to add an in-line booster pumping station on Vale Island. With the present pumping capacity, including the in-line booster, the transmission system can deliver water to the mainland distribution system at 415 Igpm at a pressure of 40 psi. at the start of the mainland distribution system.

Water supply systems are designed to meet maximum daily supply which in the case of Hay River is 1.5 times the average. Past water usage and with water meters being installed shortly the Hay River average daily consumption per person is computed as 120 lgpcd. Therefore, the water supply system is determined adequate for a population of 3,300 persons.

3.2 Water Storage

The water storage in Hay River consists of a 500,000 gallon steel tank and a 1,000,000 gallon concrete reservoir. These storage facilities are at ground level and pumping by means of service pumps and fire pumps into the distribution system is required. The storage facilities are adequate for a population of approximately 8,300. The storage requirements are in accordance with the C.U.A. standards of 1960.

3.3 Water Distribution System

The existing primary distribution system consists basically of an 8 inch diameter feeder main running through the existing residential area in the New Townsite. From this feeder line 6 inch diameter mains branch out through the New Townsite as well as west of the tracks to lot 553. These lines are ductile iron buried to an approximate depth of 12 feet. The system has been extended about as far as it can be while maintaining adequate residual pressures at the extreme ends. The provision of new storage facilities and service pumps in the outer southern end of the system has extended capacity life of the primary distribution system. This distribution system is capable of accommodating approximately 4,100 persons.

The Old Townsite in Vale Island has about 20 service connections to the supply main with the majority of the people on Vale Island being served by water truck.

3.4 Sewage Collection System

The existing sewage collection system consists of buried 8 inch and 10 inch diameter sewers at an average depth of 10 feet. These sewers discharge through three lift stations to the sewage treatment facilities. The sewers are at minimum grade and in general, have been extended as far as possible while still retaining service depths at the extreme ends. Because the ground is so flat, lift stations are required. The mainland lift station is a prefabricated steel station with a capacity of 540 gpm at 90 feet TDH.

The majority of the sewage flows are pumped through this station to the sewage treatment facility by an 8 inch diameter forcemain. This lift station is presently operating continuously at full capacity. The Southern Expansion lift station is a prefabricated steel station which has a capacity of 330 gpm @ 90 feet TDH which pumps the sewage through an 8 inch diameter forcemain to the treatment facilities. This lift station will handle all the Southern Expansion Area. The third lift station is a temporary station located in lot 553 with a capacity of 175 gpm at 40 feet TDH. The sewage is pumped to the gravity system and thence to the mainland lift station. The sewerage system is capable of accommodating approximately 4,100 people.

3.5 Sewage Treatment

Existing sewage treatment facilities are located on the west side of Town and consist of a 2-cell anaerobic lagoon system. When the cells are operated in series, retention with present flows is less than one day per cell. Normally design conditions require a minimum retention of 2 days and a maximum of 5 days per cell. Therefore, the sewage treatment facilities are presently inadequate.

3.6 Drainage

Drainage in Hay River is presently handled mostly by open ditch while the downtown area has some curb and gutter. These is no system of storm sewers in the Town.

3.7 Roads

The major thoroughfare is the Mackenzie Highway which follows the railroad tracks and extends through to Vale Island. This highway is presently built to a good standard in rural cross-section with a cold mix asphaltic surface. All other roads, except for a short stretch which is paved in the downtown area, are gravelled and adequate at the present.

3.8 Solid Waste Disposal

At the present time, solid waste is collected under contract in the New Townsite and on Vale Island. The disposal area is a Sanitary Landfill owned by the Town of Hay River and operated by the collection contractor under a franchise agreement. The disposal area is located west of the railway approximately one mile south of the Town along the Mackenzie Highway. A new Sanitary Landfill Site will probably be required in 1975.

4.0 FUTURE MUNICIPAL REQUIREMENTS AND ESTIMATES COSTS

For the Town of Hay River, future municipal requirements were analysed for a population of approximately 13,000 since any major service constructed now or later will be sized for that minimum population. Operating and maintenance costs, which are tabulated, have either been developed by SAEL or have been assumed as 10% of the capital cost. Capital costs for on-site lot servicing and development have not been included. All capital costs include engineering fees. All populations referred to are connected to the serviced areas. Therefore, there is calculated in the population chart the number of persons which will be connected to the serviced areas at that time period.

4.1 Water Supply

The present water supply system is capable of production under normal growth to 1976 but would have to be expanded at that time. Under pipeline growth the present system would need to be expanded immediately. It is proposed that a new 24 inch diameter intake pipe be twinned to the existing 10 inch diameter line complete with a new pumphouse. Also required would be a new 16 inch diameter insulated transmission line across Vale Island to connect to the mainland distribution system. The total estimated capital cost of this project is $4,186,000.

4.2 Water Treatment and Storage

Treatment of the water would continue the same as the present with only fluoridation and chlorination being used. This cost is included in the water supply.

In regards to storage, more storage will be required after a population of 8,400. At this time a one million gallon concrete reservoir would be added to the existing reservoir in the Southern Expansion Area. This added storage would be sufficient for a population of 17,000 and is estimated to cost $1,150,000.

4.3 Water Distribution System

The cost of the water distribution system is related only to the cost of the main supply lines and not to any of the service mains. It is therefore assumed that all feedermains in the New Townsite are complete and the only feedermains required will be in the new development areas. Individual service connections are also not included in these capital costs.

Once the serviced population has reached 4,100, new areas will need to be devloped. The first area to be devloped will be Area 1B, the southern west end of Town. The feedermains will be 10 inch diameter. Included in the area is the 12 inch diameter feedermain which services the industrial area from the 16 inch diameter supply line. The cost of a 10 inch diameter line from the existing 500,000 gallon steel storage reservoir to the 16 inch diameter main will also be included in this capital cost. The capital cost to service this area is estimated at $1,598,000. With this additional area a population of 7,400 can be served. Once this population has been reached. Area 2A will then be devloped with 10 inch diameter feedermains. Area 2A is expected to accommodate 5,800 persons therefore the total land developed would have a population level of 13,200. To develop Area 2A with water feedermains the estimated capital cost is $600,000.

4.4 Sanitary Sewerage System

As stated above for the water distribution system that once the population has reached 4,100 persons Area 1B will need to be developed. Included in the sanitary sewerage collection system for Area 1B will be the 10 inch diameter and 12 inch diameter collection trunk mains, but no service connections. Also included in Area 1B costs will be the lift station, forcemain and the 10 inch diameter and 12 inch diameter trunk mains from the industrial area. It is estimated that the capital cost for the sewerage collection system related to Area 1B is $1,288,000. This area will bring the total population of the Town to 7,400 after that time Area 2A will have to be developed. Area 2A, when developed, will accommodate 5,800 persons thereby bringing the total population to 13,200. The capital cost of the sewermains in Area 2A is estimated at $350,000.

4.5 Sewage Treatment

With respect to sewage treatment, it is assumed that treatment by anaerobic lagoons will continue to be acceptable, but that a new location must be found. According to the present loading on the sewage lagoon system, a new lagoon needs to be located and built in 1975. It is expected to stage the construction of the lagoon. The first stage, in 1975, a 3-cell lagoon system with each cell having capacity to provide 2 days of retention for a population of 10,300. At this time stage 2 would be built which would consist of twinning the stage 1 lagoons and would provide 2 days of retention for a population of slightly more than 13,000. It is estimated that the cost of stage 1 would be $700,000 and stage 2 would be $418,000.

4.6 Drainage

At the present time, with rapid growth occuring, drainage can be provided initially by means of a system of ditches, which will be compatible with a future storm sewer system. In the New Townsite east of the railway, the drainage pattern has already been identified, and main discharge channels have been constructed. In the new development areas, which will accommodate up to 13,000 persons, most of the areas slope to the northwest and will have to be drained in that direction. There is very little natural grade to the ground and the natural drainage is poorly defined, although it is known that final discharge is to Great Slave Lake, west of the West Channel.

The proposed drainage system consists almost entirely of open ditches, and estimates of capital costs are based on this type of system.

When Area 1B is developed, the industrial area will also be developed at that time. Part of the industrial area will be served with pipes while the remaining areas will be served by open ditch. The cost to service this area is $633,000 which also includes the main drainage ditch to the Great Slave Lake. When Area 2A is required an estimated additional $35,000 will be required for ditching in that area.

4.7 Roads

The basic street network for the expansion areas include the upgrading of the Mackenzie Highway through Town as well as construction of Arterial and Collector Streets. Local streets within the development areas have been considered as on-site services and are not included in estimates of capital costs for services in the specific areas.

When Area 1B is required, unpaved collector and arterial streets will be required at an estimated cost of $6,657,000. When Area 2A is required the Mackenzie Highway should be improved to a higher standard which would include four lanes. Also, at this time all the roads built in the first stage should be paved. The estimated cost of this capital expenditure would be $2,834,000.

4.8 Solid Waste Disposal

A new Sanitary Landfill will be required in 1975 regardless of the size of growth. Investigations are presently being carried out to locate a new site. It is estimated to cost $29,000.

5.0 SUMMARY

Costs for expanding the municipal off-site services for the high population forecasts are shown in Table I for normal growth and pipeline growth. The total costs are the same except that they are spread over different time intervals for each of the growth periods. To determine the actual cost impact due to the pipeline, the present worth in 1975 of all capital expenditures was computed with a discount rate of 10% per year. Present worth calculations do not include factors for recovery or expected life. It was determined that the present worth of capital expenditures for normal growth was approximately $9,000,000 while for the accelerated growth due to the pipeline it would be approximately $11,400,000. The difference is approximately $2,400,000. Present worth calculations for the difference in operating and maintenance cost between accelerated and normal growth periods were computed. It was assumed that these operating and maintenance costs for each item do not vary from one year to another. The present worth difference in cost for maintenance and operation is $1,300,000.

(Costs in Millions)	Normal Growth	Accelerated Growth	Difference
Capital Costs	9.00	11.50	2.50
Operating and Maintenance Costs	—	—	1.30
	9.00	**11.50**	**3.80**

These costs show the order-of-magnitude impact that the pipeline will have on the municipal services of Hay River.

There also appear to be three special development plateaus which are identifiable by significant cost increases. The first plateau occurs in 1975-76 regardless of the rate of growth. This is due to the fact that at this time the Town of Hay River will require new water supply and sewage treatment facilities. The second plateau occurs at the beginning of development of Area 1B which takes place in 1980 under normal growth and in 1977 under accelerated growth. The third plateau occurs at the beginning of development of Area 2A which takes place in 1990 under normal growth and in 1984 under accelerated growth.

With regards to capacities of the proposed system for future growth beyond a population of 13,000, the major water supply and sewerage facilities would appear to be adeqate with minor modifications. The major capital expenditures would be for the development of residential land. Makale, Holloway & Associates Ltd. in their report "Development Plan – Town of Hay River Volume I – 1974 (Draft)" outline land usage up to a population of 20,000. It therefore can be seen that the pipeline will result in land being developed 6 to 8 years earlier than anticipated.

TABLE I

Town of Hay River
Physical Service Cost Analysis

All costs in 1975 Dollars

Item	Capital Cost	Maint. & Operation Cost/Year	Normal Growth Year Required	Normal Growth Capital PW	Accelerated Growth Year Required	Accelerated Growth Capital PW	PW Cost Difference Capital	PW Cost Difference Maint. & Operation
A. Waterworks								
1) Supply	4,186,000	97,000	1976	3,805,500	1975	4,186,000	380,500	88,200
2) Treatment and Storage	1,150,000	20,000	1994	188,000	1985	443,300	255,300	44,400
3) Distribution — Mains								
a) Area 1B	1,598,000	50,000	1980	992,200	1977	1,320,600	328,400	102,800
b) Area 2A	600,000	20,000	1990	143,600	1984	254,500	110,900	36,900
B. Sewerage								
1) Treatment								
a) Stage I	700,000	20,000	1975	700,000	1975	700,000	—	—
b) Stage II	418,000	10,000	1996	56,500	1989	110,100	53,600	12,800
2) Collection — Trunks								
a) Area 1B	1,288,000	40,000	1980	799,700	1977	1,064,400	264,700	82,200
b) Area 2A	350,000	12,000	1990	83,800	1984	148,400	64,600	22,200
C. Drainage								
1) Area 1B	633,000	21,000	1980	393,000	1977	523,100	130,100	43,200
2) Area 2A	35,000	3,000	1990	8,400	1984	14,800	6,400	5,500
D. Roads								
1) Area 1B	1,657,000	165,000	1980	1,028,800	1977	1,369,300	340,500	339,100
2) Area 2A	2,834,000	283,000	1990	678,500	1984	1,201,900	523,400	522,700
E. Solid Wasted Dis.	29,000	3,000	1975	29,000	1975	29,000	—	—
Total Costs	**15,478,000**	**744,000**		**8,907,000**		**11,365,400**	**2,458,400**	**1,300,000**

APPENDIX D

Yor file: 1246-~~H~~-1-

ARCTIC RED RIVER
CHIEF & BAND COUNCIL (403) 953 - 2211

Arctic Red River Indian Band, Arctic Red River, N.W.T. X0E 0B0

Stanley Associates Engineering Ltd.
Edmonton, Alberta

February 12, 1975

Attn: J.M. Lainsbury

John:

Your letter dated February 7, 1975 listed three questions you wanted answerd. Hopefully, the following information would help.

1. Current population; 96 It should be noted that many people are absent from the community because of employment, education etc.

2. General feeling in the community is that the pipeline should not be built period. If it's going to be built, they would like to see the current land claims issue settled. No doubt the pipeline will be built and other concerns expressed is that not too many natives from the settlement are taking advantage of training & opportunities in fields related to the construction of the pipeline. The proposed right of way, they felt should be changed to cross the Mackenzie River south of the community rather than north of the community.. Also the social and environmental & consequences of such a massive project were questiond. My concern is that the people are not informed enough and there is not that much time to kick around.

3. That the people who will be the most affeted by such a project benefit as much as possible from it in terms of; low cost fuel, royalties, employment, and most of all, that the land claims issue be settled.

John, on the Development Plan for Arctic Red River, I feel that the community is ready to meet with the consultants and planners to discuss and finalized all aspects of the plan. My apologies for the delay in passing information re: this study.

Tours truly,

Robert Andre,
Band Secretary- Manager

FILE

GOVERNMENT OF THE NORTHWEST TERRITORIES
CANADA

Settlement Office,
Fort Norman, N. W. T.
February 10th, 1975.

Stanley Associates Engineering Ltd.,
11748 Kingsway Avenue,
Edmonton, Alberta.

Dear Mr. Lainsbury;

In reply to the questions you raise in your letter of February 7th concerning the proposed MacKenzie Valley Gas Pipeline, I should like to point out that in no way do I speak officially for the people of Fort Norman. I can only answer as a civil servant who has lived and worked in Fort Norman for one year as an administrator and political advisor.

#1 The population of Ft. Norman is 254 persons ($\pm$5)

#2 (a) How can any organization, alone or in co-operation with other organizations, build anything on land they do not own?

(b) What are the long-term job prospects for the young men and women of this community? Many of them have not been able to stand the lonliness of being away from their families and have not finished high school as a result. They see this as the fault of the various governments because of the way the school system was established.

(c) Over the short run of the construction period, what will be the social effects of the tremendous cash inflow as a result of construction jobs held by the men of this area? What will be the aftermath of pipeline employment when these men are no longer employed at high wage jobs and whose families have become used to a higher standard of living?

(d) What will be the social effects of an influx of outside construction workers on Fort Norman? The workers from other areas of the country are seen as a potential threat to the established social order and customs and lives of the people here. History shows that working class men have not been particularly sensitive to the indian people and their mores, their land, and their weaknesses.

(e) To what extent will the construction processes affect wildlife and wildlife habitat? What is

...../2

the threat to wildlife and wildlife habitat from a possible pipeline leak? Since the pipeline will pass under the Bear River near Fort Norman, what is the potential danger to the drinking water supply for the town from a possible pipeline leak?

(f) The relationship between the questions listed under (b), (c), (d), and (e) to the question posed in (a) is a problem. If the risks are so great, what is needed is not reassurances about the latter questions, but a sincere and honest answer to the first, against which all else must be measured. The people who stand to lose the most are the very people who should be considered most, since the entire project is a usurpation of what they conceive to be their property rights. This is not their project nor is it being carried out for their good; but the losses will be their losses. You can build the Union Pacific Railroad or the MacKenzie Valley Pipeline if you own the land; but if the land is someone else's, then the people who own it must be negotiated with and must have considerable input into the planning phases. Later will be too late. For example, buffalo were not a problem when the railway was conceived, but later it turned out that they had to be exterminated to serve the interests of the railway company. This was a disaster to the native peoples. What will be the second result of the pipeline? No one knows. But for example, it might mean regular overflights to patrol the pipeline to keep it safe. What will be the long-term effects of this on the small mammals these people trap for their livlihood? Of course, this is only an example. The real problem, when it dawns, may be quite different.

#3 Very simply, the aboriginal rights of the native people must be dealt with honestly and sincerely first. Failing that, the pipeline consortium and the Government which gives the pipeline approval, must give iron-clad assurances to the native people concerning their responsibilities for the social, economic, and ecological aftermath of the pipeline. There can be no saying, "Prove it was our fault!"

These are the concerns I have culled from scores of dialogues with the people of Fort Norman and between the people of Fort Norman.

Yours very truly,

John S. I. McEwen,
Settlement Manager.

JMc/hh

SETTLEMENT COUNCIL

P.O. BOX 5

NORMAN WELLS

N.W.T.

February 17th., 1975.

Stanley Associates Engineering Ltd.,
11748 Kingsway Avenue,
Edmonton, Alberta.
T5G OX5

Attention: J.M. Lainsbury.

Dear Sir:-

With respect to your letter of February 7th., 1975 to Ms. Claire Barnabe, Settlement Manager of Norman Wells, the Settlement Council decided at their Regular Meeting of January 10th., 1975, that they themselves would also answer your letter.

In general, some of our concerns are as follows:-

1. Lack of available developed land.
2. Lack of available developed services, such as utilidor system, etc.
3. Would not have adequate water resources.
4. Require adequate policing.
5. Inadequate planning in view to Education facilities.
6. Lack of drivable roads.

We have two main recommendations, which are:-

1. Natural gas should be made available to northern communities.
2. That local businessmen and work forces should be utilized as much as possible.

It should be noted that we feel that this pipeline should proceed as soon as possible.

Yours Very Truly,

~/Dawne Peterson.

H. Dawne Peterson,
Acting Secretary-Treasurer.

HDP:hdp

APPENDIX E

THE NORTHWEST TERRITORIES ASSOCIATION

OF MUNICIPALITIES

ALASKA REPORT
(APPENDIX E)

STANLEY ASSOCIATES ENGINEERING LTD.,
EDMONTON, ALBERTA

and

OLSON & ASSOCIATES,
ANCHORAGE, ALASKA

MARCH 1975

TABLE OF CONTENTS

A. HISTORICAL OVERVIEW

In 1967, Atlantic-Richfield Company drilled the discovery well of the Prudhoe Bay Oil Field on the Alaskan North Slope. The National Petroleum Council of the United States has estimated the Prudhoe Bay Oil reserves at 31.3 billion barrels, of which 12.5 billion are considered recoverable.

In the late 1960's, Alyeska Pipeline Service Company applied to the U.S. Government to build a 48 inch diameter oil pipeline from Prudhoe Bay on the Arctic Ocean to Valdez on the Pacific. The pipe was ordered in 1969 and stock-piled in Alaska in 1970. The native and environmental lobby delayed the actual construction of the pipeline until the Alaska Native Claims Settlement Act was passed in 1971 and the Arab Energy Crisis of 1973-74 resulted in an energy self-sufficiency policy for the United States. Construction of Alyeska Pipeline commenced in 1974.

B. A COMPARISON BETWEEN THE ALASKAN AND CANADIAN PIPELINES AND THEIR REGIONAL SETTINGS

1. CLIMATE

The Climate of northern and central Alaska is similar to that of the Mackenzie Delta and Great Bear regions in the Mackenzie Valley. However, the moderating influence of the Pacific Ocean gives the southern portion of Alaska a warmer winter climate than that of the Great Slave Lake region. For this reason northern ice-free ports exist along the southern coast of Alaska. This gives the State a year-round sea link to the U.S. West Coast. In contrast, the Great Slave Lake region only enjoys a 100 day shipping season link to a year-round railroad terminal at Hay River.

2. OIL PIPELINE vs. GAS PIPELINE

The similarities between constructing an oil pipeline and a gas pipeline of the same diameter are many. The transportation logistics are similar. The pipe must be manufactured in the steel producing areas; transported to a central receiving station in the north and distributed to the job sites. The pipe may be rolled into either 40 or 60 foot lengths. The sections of pipe can be joined at the pipe rolling mill, at the central receiving station, or on

the job site. Even though the construction process and the right-of-way design specifications may differ between a hot-oil pipeline and a chilled-gas pipeline, the work force required to clear, construct and lay the pipeline will be approximately the same.

The development and production in the Prudhoe Bay Oil Field will be similar to activities in the Mackenzie Delta Gas Fields. Gathering lines must be constructed to link the producing wells together. Usually some pre-treatment of both the oil and gas will be necessary prior to delivery to the main pipeline. Oil pumping stations will be required at intervals along the Alaska Pipeline just as compressors and gas refrigerating stations will be required along the Mackenzie Valley Gas Pipeline.

The major differences between the two pipelines will be in the field of operation. Due to the fact that oil is a liquid and that Alaska is isolated from the rest of the United States, the pipeline route terminates at Valdez. Valdez had been selected as the southern terminus because it had marine characteristics superior to the other northern ice-free ports. Large oil storage tanks and deep-sea oil tanker terminals are being constructed as the transhipment point between the pipeline and ocean tankers. Because of Canada's continuous land mass between the Delta Gas Fields and southern markets, the total gas transportating system will be handled by pipeline.

3. HUMAN SETTLEMENT POLICIES

The bulk of corporate administrative personnel for Alyeska will reside in Fairbanks (1975 population – 30,000) and Anchorage (1975 population – 165,000); whereas the majority of corporate administrative staff for Canadian Arctic Gas will live in Calgary (population – 450,000).

Points of hire for Alyeska and the labour unions have been established at Anchorage, Fairbanks and Valdez (company town and pipeline terminus). Contractors working on the pipeline will guarantee their employees transportation to and from these hiring centres, including leave time. Generally, every workman works 7 days, 10 hours a day, for 9 weeks and then leaves the work site for a one week rest period in Anchorage, Fairbanks or Valdez. Aside from local residents who live off-camp and return to work at 7:00 A.M. each morning, there is little leisure time. A point-of-hire policy was not contained in the stated socio-economic policies of Canadian Arctic Gas.

A comparison between the urban hierarchies in Alaska and the N.W.T. points out the difference between the two. Alaska presently has one modern, second order centre of 165,000 people which is capable of offering certain services which smaller centres are incapable of supplying (e.g. University of Alaska). Third-order centres (10,000 – 30,000) such as Fairbanks and Juneau exist as distribution centres in their respective regions. Fourth-order centres consist primarily of small native communities (e.g. Copper Centre). The Northwest Territories presently has one community (Yellowknife) which is approaching the size of the Alaskan third-order centres. Most settlements in the Northwest Territories are equivalent to the fourth-order Alaskan communities.

A summary comparions between the urban hierarchies of Alaska and the Northwest Territories is given below:

ALASKA & U.S.	URBAN CENTRE	N.W.T. & CANADA
Seattle (1,500,000)	1st order	Edmonton – Calgary (1,000,000)
Anchorage (165,000)	2nd order	---
Fairbanks (40,000)	3rd order	Yellowknife – Hay River (11,000)
Copper Centre (1,000)	4th order	Aklavik (1,000)

From examining the above table it is quickly seen that the N.W.T. does not have a 2nd order urban centre similar to Anchorage. It could also be argued that the N.W.T. really does not have a 3rd order centre either.

Therefore, when reading impact statements from Alaska and drawing parallels to the communities in the N.W.T., due caution should be exercised to compare like communities in similar positions. The relative lack of sophistication and experience in urban management in the Northwest Territories makes these communities highly susceptible to economic development of any kind, let along the largest private undertaking in history.

C. IMPACT UPON THE COMMUNITIES IN ALASKA

1. PROGRESS REPORT – SPRING 1975

The pipeline project is behind the schedule originally conceived by Alyeska Pipeline Service Company. A number of factors have caused delays in elements of the schedule, but Alyeska personnel maintain that completion and operation will still occur in 1977. In other words, segments of the work have been rearranged to reduce the impact of delays in other areas.

In general, 1974 proved to be a year of preparation – the building of the camps and the sorting out of interrelationships between the contractors, the contract arrangement firm (Bechtel) and the owner's representative (Alyeska). Relatively little work was performed in clearing the right-of-way, building access roads and the mining, crushing and hauling of sand and gravel.

Camp construction began on July 4, 1974, about one month late. Construction of the first phase of the camp was completed during January. Due to the compressed nature of the entire work schedule however, manpower requirements for the project as a whole have doubled. Whereas between 7 – 8,000 men were predicted at the peak activity period of summer 1975, Alyeska indicates peak loading is now calculated at 14 – 16,000 by August 1975. The original camp designs did not contemplate the larger load factor and further camp construction will take place in some sites into spring of this year.

Valdez double jointing (the welding of two sections of the pipeline together) began late in the fall of 1974. The hauling of the pipe to stockpile began in late January, five months later than expected. Difficultities in securing hauling permits and the arrival of special hauling equipment, were factors in delaying this segment of the work.

Work on **access roads and the right-of-way** began in a scattered fashion in August (access roads) and December (right-of-way). Full scale clearing of both work segments will begin in February. The principle cause for delays here has been failure to secur NTP's from State and Federal Agencies.

No **pump station site work** has yet been done but will begin in two to three weeks. Again, NTP delays seem to be the root cause.

Obviously, no pipe has been installed anywhere on the pipeline. It is currently being transported to storage yards along the route. The right-of-way has yet to be prepared.

In sum, many segments of the work program are behind the May 1974 schedule. Alyeska strategy for recovering lost time is to double field manpower during 1975. Peak projected manpower for summer 1975 now numbers 14 – 16,000 men and women, necessitating larger camps and aggravating the impact of the project upon Alaskan communities.

2. CASE STUDY – FAIRBANKS

The City of Fairbanks has been designated as an administrative centre and a point-of-hire by the Alyeska Pipeline Service Company.

In a submission, dated September 25, 1974, the City applied to the State Government for extraordinary funding caused by pipeline impact upon Fairbanks. Impact funding was requested in the following municipal areas and in the following amounts:

	Requested		
	Sept. 25/74		**Nov. 15/74**
Municipal Utilities			
Telephone (operating)	$ 478,000		
Water and Steam (operating)	106,000		
Electric Dept. (operating)	30,000		
Fire – Ambulance	328,209	&	$140,000
Public Works & General Gov't.	857,849	&	166,000
Police	167,534		
Alcohol Abuse	392,440		
TOTAL	**$2,360,032**	**&**	**$306,000**

These funds were requested for the period, October 1, 1974 to June 30, 1975. During this period the population of the City will increase from 29,664 to 30,858. A previous award of $606,000 had been made to Fairbanks for an impact population of 2,514

people. The following table shows the per capita impact costs as attributed to pipeline impact by the City of Fairbanks:

IMPACT FUNDS	PIPELINE IMPACT POPULATION	$/CAPITA
1973-74 $ 606,000	$2,514	$ 241
1974-75 2,666,032	1,194	2,233
TOTAL $3,272,032	**$3,708**	**$ 882**

Of particular note is the unanticipated impact of the pipeline in the request for funds in 1973-74. The funds requested only represented 25% of the actual per capita cost.

3. CASE STUDY – AHTNA Region (one of 12 Native Regional Corporations)

The AHTHA Corporation also submitted a request for pipeline impact funding of $867,800 in 1974 – 75. The AHTNA region has 18.5 million acres of land, making it the 7th in size of the 12 regional corporation areas established under the Alaskan Native Land Claims Settlement Act. The Native population of the region is approximately 1,057 persons out of a total regional population in 1970 of 2,700.

Of particular interest are some of the items identified with an "unknown cost". Most notable are the costs of inflation on those living on fixed incomes. Also, the problem of "squatting" has been identified through the "zoning issue":

> **"There is no land use control in the region. It is recommended that the State, operating as the unorganized borough, zone the area. This action will require public hearings and other close contact with the local people, but the process should be started as soon as possible."[1]**

---

1 AHTNA Native Corporation, **The Project Report**, October, 1974.

4. SUMMARY

The various impact statements provide a fragmentary view of community response to the demographic change each government finds itself confronting. Given that 1975 is clearly the first year of pipeline construction, the magnitude of impact is not fully comprehended in any quarter and will not likely be known until 1976.

The impact statements themselves are to be used with caution. The emergency legislation for municipalities and boroughs passed and funded last year, which is the target for requests, produced quite a "rush" to be first at the "pork barrel".

D. ALASKAN RESPONSE TO PIPELINE IMPACT

1. DISTRIBUTION OF OIL REVENUES TO STATE AND LOCAL GOVERNMENTS

The Constitution of the State of Alaska provides that all State revenues, including oil royalties, go into a general revenue fund. Monies are then appropriated for specific uses from the fund.

There are three primary methods by which the State has granted aid to pipeline impacted communities.

1. Emergency Impact Funds

A total of $20 million was appropriated by the 1974 legislature under this Act. $10 million for boroughs, $10 million for municipalities.

2. Governor's Discretionary Fund

The fund is designed not for new programs but to supplement existing programs. The 1974 legislature appropriated $11.7 million for this fund.

3. Governor Administered Fund for Unorganized Boroughs

Most of the pipeline traverses unorganized areas with no form of local government. The State legislature acts as a Borough Council for these unorganized areas. The 1974 appropriation for the unorganized areas total $2.5 million.

Additional sources of funds for organized local governments include revenue sharing, the school foundation program and the gross business tax.

In general, the State receives 90% of the 12.5% Federal royalty for oil production on Federal lands. For new oil production on State owned lands, the State receives the 12.5% royalty in cash or in kind.

2. NATIVE LAND CLAIMS SETTLEMENT

On December 18, 1971, the U.S. Congress passed the Alaskan Native Claims Settlement Act (ANCSA), extinguishing the aboriginal claims of Alaska Natives, and providing compensation of 40 million acres of land and $962.5 millions.[1]

Unlike the more conventional approach of governments to the land tenure and distribution question, wherein land title and financial compensation are re-allocated but often without simultaneous development of institutions designed to ensure orderly transition and implementation, the ANCSA provides for implementation through the organization of twelve regional corporations and some village corporations. **Land title will be conveyed to the corporations in accordance to the number of Native people enrolled in each corporation.** Similarly, **compensatory payments are distributed among the corporations on a per capita basis.** The compensatory payments originate in part from the U.S. Treasury

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1 **Alaska Native Claims Settlement Act** (public law 92-203). See also Research Service, **Alaska Native Claims Settlement Act of 1971,** (public law 92-203). **History and Analysis,** May 22, 1972, and the Alaska Native Foundation, a **Technical Analysis of the Alaska Native Claims Settlement Act,** (January, 1974).

($462.5 million) and from a **2% overriding royalty** on mineral leases and production from public lands ($500 million), and are **expected to be fully executed by the mid 1980's.** Selection of land by village corporations occurred in December, 1974, and will occur in December, 1975, in the case of the regional corporations.

For the most part, an **individual** Native person enrolled in a **regional corporation** and **village corporation,** receives **100 shares of common stock** in each. Some individuals, whose residence at a particular village was obscure, enrolled in a region on an 'At-Large' basis, foregoing any relationship with a village corporation. "At-Large" enrollers receive larger cash settlements, but of course have no ownership interest in a village corporation and its land.

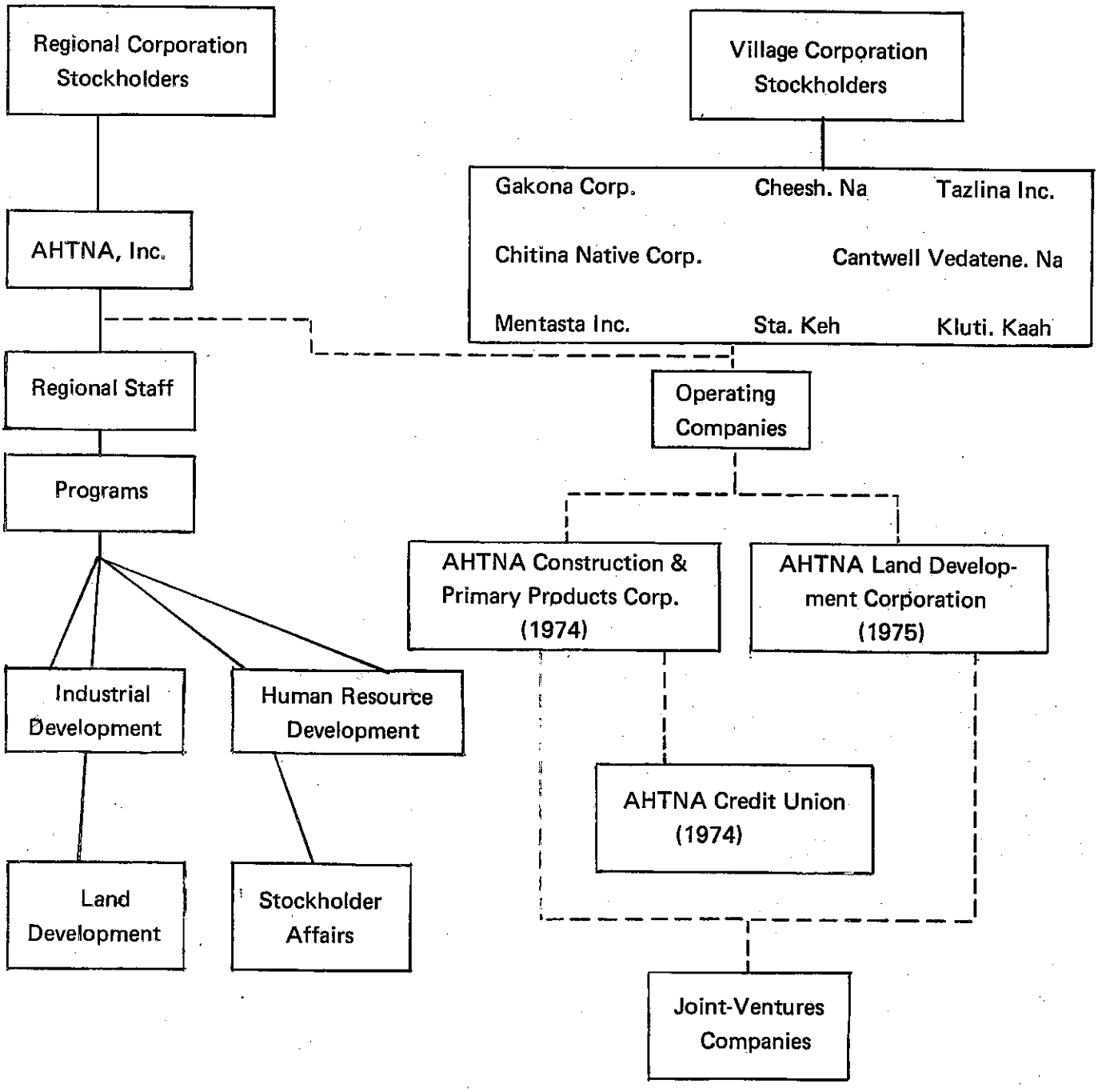
The ANCSA is creative legislation. The Act legislates detailed relationship between the twelve regional corporations; between each regional corporation and the village corporations which are located within the region; and between the corporations and their shareholders. Certain of these legislated relationship are designed to protect shareholder wealth until the full extent of the corporate estate is known, **(shares are not alienable until 1991);** or to prevent precipitous decisions by the village corporations **(the village corporations must submit development plans to their regional corporation);** or to achieve broader socio-economic aims **(revenue derived from natural resource development must be shared among the regional corporations).**

ANCSA corporations are novel entities operating in a novel decision-making environment. In a real sense, these corporations represent congressional efforts to legislate an imaginative recombination of economy, society, and private government. In a more pragmatic sense, they represent an attempt to utilize the corporate structure to inspire, achieve and maintain the self-determination of a here-to-fore neglected people.

In any case, it seems prudent to begin a continuing periodic appraisal of the operational effectiveness of ANCSA corporations. **Native groups in Northern Canada and elsewhere in the United States are studying the ANCSA in light of their own need to manage the settlement of aboriginal claims now being pressed upon government.** Furthermore, those pressuring to legislate corporate social responsibilities have much to learn from periodic assessment of the developing ANCSA corporations and the initial problems facing these novel organizations.

The following chart shows how one of the native regional corporations (AHTNA) has been organized:

ANCSA Organizationa — The AHTNA Region



3. SUMMARY

The key differences between Alaska and the Northwest Territories may be summarized as follows:

1. Alaska has achieved Statehood and is thus entitled to royalties from mineral production of Government lands. All royalties on mineral production in the N.W.T. are payable to the Canadian Government.

2. The Alaskan Native Claims were settled **before** pipeline construction began. Settlement of Native Claims in the N.W.T. are still pending.

3. Alaska contains second and third order urban centres whereas the N.W.T. does not.

Alaska's response to pipeline impacted communities to date has been as follows:

1. Due to the lack of an overall plan by the State, each city and borough government has chosen its own method of requesting financial assistance. The proposals are reactive rather than serving as an example of sound local management of rapid growth.

2. The State of Alaska has responded to aid pipeline impacted communities in the following ways:

   a) Emergency Impact Funds (20 million dollars).
   b) Governor's Discretionary Fund (12 million dollars).
   c) Governor's Administrative Fund for Unorganized Boroughs (2.5 million dollars).

3. Areas of Municipal responsibility upon which the Alaska Pipeline is having the greatest impact to date include:

   a) Telephone systems
   b) Fire and Ambulance Service
   c) Public Works and General Government
   d) Alcohol Abuse.

REFERENCES

A. The Trans-Alaskan Pipeline

1. Progress report — Spring 1975

   Exhibit A1 (a) Ayleska Reports Vol. 1, No. 1, January 1975.

   Exhibit A1 (b) **Summary Network Analysis Diagram** May 14, 1974.

2. Policies of Alyeska Pipeline Service Company.

   Exhibit A2 (a) **Title 43** Public Lands part 27 Nondiscrimination regulation.

   Exhibit A2 (b) **Affirmative Action Plan** — Alyeska Nov. 23, 1974.

   Exhibit A2 (c) **Project Labour Agreement** April 29, 1974.

   Exhibit A2 (d) **Environmental Health Practices.**

   Exhibit A2 (e) **Wildlife rules.**

   Exhibit A2 (f) **Contingency Plan — oil spills.**

   Exhibit A2 (g) **Misc. Contractor Requirements**

   - equal employment opportunity provisions
   - certification of nonsegregated facilities
   - firearms control
   - fire prevention
   - health practices
   - trapping

B. Socio-Economic Impact

1. Stated policies regarding distribution of oil revenues to State and Local governments.

   Exhibit B1 (a) Alaska Law SSS-CSSBlam, **Emergency Assistance Act for impacted Communities.**

   - ch. 18, State Aid to local governments.
   - Synopsis of Laws enacted Eighth legislature

2. Unanticipated impact upon communities.

Exhibit B2	(a)	**Greater Anchorage Area Borough Oil. Impact Funds Application** October 21, 1974.
Exhibit B2	(b)	**Anticipated Impact of Trans-Alaska Pipeline on Public Services and Housing in the Greater Anchorage Area** October 9, 1973.
Exhibit B2	(c)	**Population Projection 1970 – 1995.**
Exhibit B2	(d)	**Greater Anchorage Area Borough Health Department Pipeline Impact Response** January 1975.
Exhibit B2	(e)	**Trans-Alaska Pipeline Impact Statement** – City of Anchorage December 18, 1973.
Exhibit B2	(f)	**Pipeline Impact Report** – Copper River Basin October 21, 1974.
Exhibit B2	(g)	**City of Fairbanks Impact Response** September 25, 1974
Exhibit B2	(h)	**A Proposal to Alleviate Community Impact Problems Due to Alcohol Abuse**

C. **Background Information on the Alaska Native Claims Settement Act.**

Exhibit C1	(a)	**Alaska Native Claims Settlement Act Conference Report.**
Exhibit C1	(b)	**Native Land and Capital** December 1974.
Exhibit C1	(c)	**A Technical Analysis of the Alaska Native Claims** Settlement Act. January 1974.

APPENDIX F

File: 1188-1

OFFICE OF THE CHAIRMAN

CANADA

NATIONAL ENERGY BOARD
OFFICE NATIONAL DE L'ÉNERGIE

BUREAU DU PRÉSIDENT

Ottawa, K1A 0E5,
January 22, 1975

Mr. F. J. Dusel, P. Eng.,
Vice-President,
Stanley Associates Engineering Ltd.,
11748 Kingsway Avenue,
EDMONTON, Alberta.
T5G 0X5

Dear Mr. Dusel:

Re: Policy Regarding the Allocation of N.W.T. Proven Gas Reserves for Local Consumption

This will acknowledge receipt of your letter of January 16, 1975 (file No. 1246-1-1-1).

The National Energy Board does not have authority to establish a "reserve policy" setting aside gas reserves for use in one region of Canada. However, under section 60 of the National Energy Board Act, the Board, if it finds such action necessary or desirable in the public interest, may direct a company operating a pipeline for the transmission of gas to extend or improve its transmission facilities to provide facilities for the junction of its pipeline with any facilities of, and sell gas to, any person or municipality engaged or legally authorized to engage in the local distribution of gas to the public, and for such purposes to construct branch lines to communities immediately adjacent to its pipeline, if the Board finds that no undue burden will be placed upon the company thereby,

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but the Board has no power to compel a company to sell gas to additional customers if to do so would impair its ability to render adequate service to its existing customers.

I am forwarding a copy of your request to the Department of Indian and Northern Affairs which may be able to comment more specifically on the production and conservation of oil and gas in the Northwest Territories.

Yours very truly,

Marshall A. Crowe

c.c. Mr. A. D. Hunt,
Assistant Deputy Minister
(Northern Affairs),
Department of Indian and
Northern Affairs,
Centennial Tower,
400 Laurier Avenue West,
Ottawa, Ontario. K1A 0H4

Assistant Deputy Minister
Indian and Northern Affairs

Northern Affairs

Sous-ministre adjoint
Affaires indiennes et du Nord

Affaires du Nord

March 4, 1975

Your file Votre référence 1246-1-1-1

Our file Notre référence

Mr. F.J. Dusel, P. Eng.,
Vice President,
Stanley Associates Engineering Ltd.,
Consulting Engineers and Planners,
11748 Kingsway Avenue,
EDMONTON, Alberta,
T5G 0X5.

Dear Mr. Dusel:

I am writing in reply to your letter of January 16, 1975. We are currently examining the question of control of natural gas exports to guarantee gas for northern communities.

There are major geographical and economic constraints vis-a-vis many proven or potential gas reserves in the Territories in terms of providing natural gas to small communities. As you are aware both Industry and Government have been examining the economics of gas distribution from the proposed Mackenzie Valley Pipeline to communities located close to the pipeline.

There is currently no fixed policy of allocating reserves definitely by volume and by pool to secure a long term supply (for example 25 years) to satisfy future Northern or Mackenzie Valley sector demands for oil and gas akin to the policy of Alberta. We have long ago recognized the requirement to provide for Northern needs where that would be an advantage. For example, the Norman Wells production is allocated to the north and indeed by priority to small consumers, Territorial Government and local industries. I believe the expanded guidelines for Northern Pipelines 1972 and the Mackenzie Valley Pipeline Inquiry will identify areas where local use of Northern gas or oil supplies will be beneficial to Northern people.

No inflexible policy exists at this time. The National Northern objectives for 1971 to 1981 embody the principle that non-renewable resource development should provide maximum benefits to Northerners (as well as the nation).

Yours sincerely,

A.D. Hunt