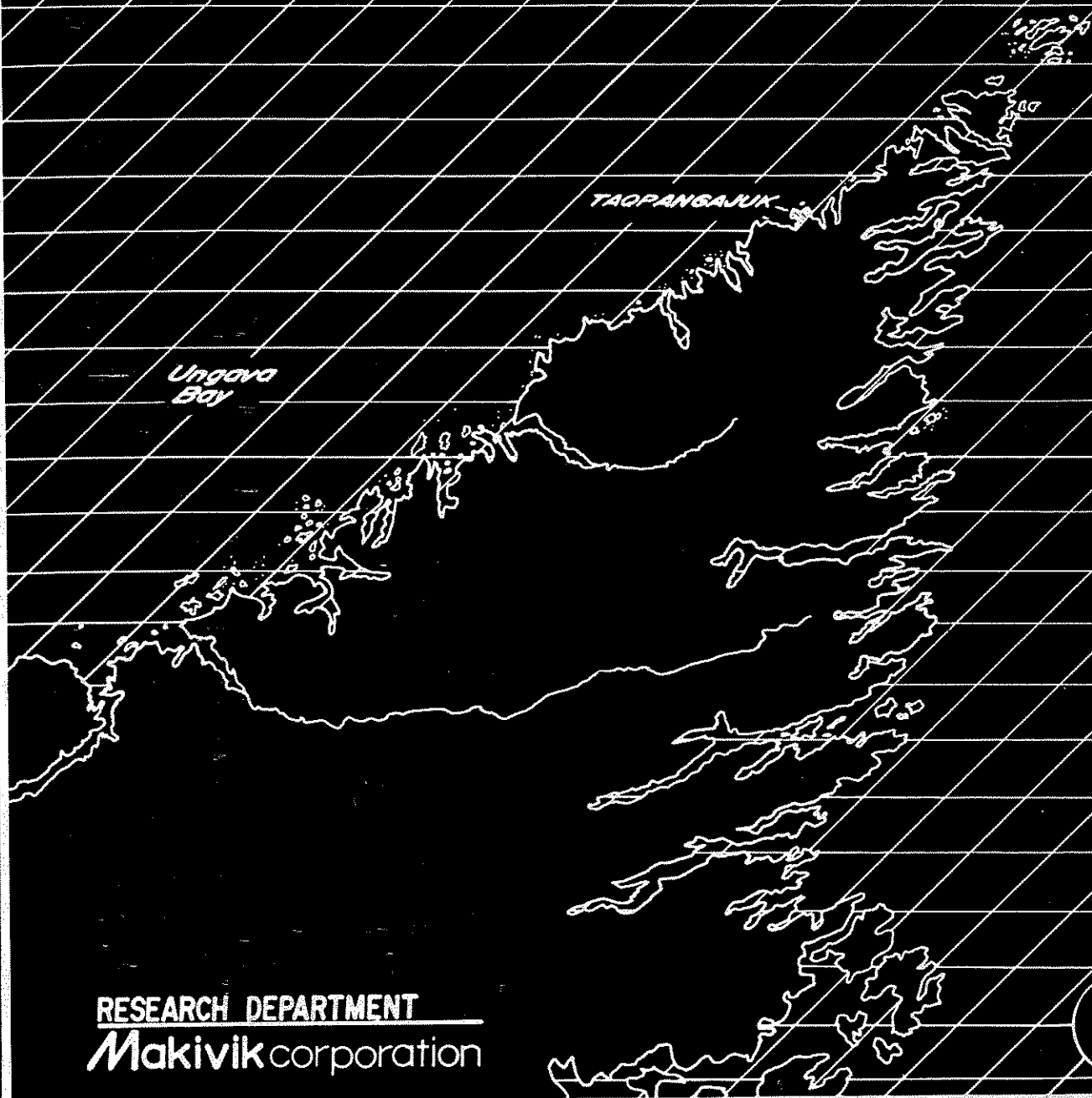


The Relocation to Taqpagajuk: A Feasibility Study



RESEARCH DEPARTMENT
Makivik corporation



TAQPANGAJUK RELOCATION
A FEASIBILITY STUDY

PHASE II

Prepared for
Department of Indian Affairs and
Northern Development

By
Makivik Corporation

April, 1987



LPA

société **Makivik** corporation

May 15, 1987

Mr. Richard Van Loon
Assistant Deputy Minister
Self-Government
Department of Indian and Northern Affairs
Hull (Québec),
K1A 0H4

Dear Mr. Van Loon,

We are pleased to present the Department of Indian Affairs and Northern Development with the final report for Phase II of the Taqpangajuk feasibility study. This document complements the three volume report on Phase I that was submitted to your department in May 1986. The feasibility study was carried out on behalf of the Killiniq Inuit and in support of their strong desire to relocate to Taqpangajuk. The results of our studies clearly illustrate that relocation is possible with respect to environmental, technical, social and economic factors. The relocation of Killiniq Inuit to a new community at Taqpangajuk has a long history and the Inuit concerns are best summarized in the letter that follows.

The findings presented in both the Phase I and Phase II final reports are the result of a major research effort that involved cooperation between many individuals and organizations. The first phase provided the basic data needed to evaluate the technical, social and economic feasibility of the relocation; it identified the required infrastructure; and it developed a master plan for the proposed community. Phase II reviewed the findings from Phase I, verified the availability of marine access and derived new estimates of population growth over a 25 year period. The Phase II study also established a preferred management structure, verified project costs, evaluated the potential for cost sharing and created options for the schedule of activities needed to build a new community.

Throughout the feasibility study there was an effort to involve the former Inuit of Killiniq in all of the discussions and decisions related to the interpretation of information and to the development of plans.

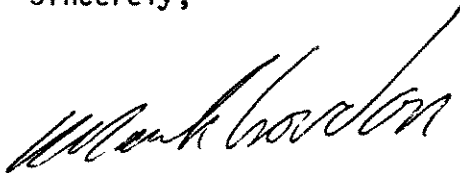
.../2

Mr. Richard Van Loon
Page 2
May 15

It has been a pleasure for Makivik to have had an opportunity to participate in this study and to work closely with the Killiniq Inuit and with the personnel from the Department of Indian Affairs and Northern Development.

We sincerely hope that the feasibility study will play an important role in a positive decision on Taqpangajuk by the Federal Cabinet.

Sincerely,

A handwritten signature in cursive script, appearing to read "Mark R. Gordon".

Mark R. Gordon
President

TABLE OF CONTENTS

	Page
Executive Summary	i
1. INTRODUCTION	1
1.1 Background to Relocation	4
1.2 The Phase I Study	5
1.3 Review of Phase I Study	6
1.4 The Phase II Study	7
1.5 Primary Findings from Phase II	9
Population to be Served	9
Marine Access	10
Level of Services and Infrastructure	10
Schematic Community Plan	10
Management Scenarios	12
Cost Analysis	12
Sharing of Financial Responsibilities	12
Strategies and Schedules for Development	13
Impact Assessment Procedures	13
Information from Umiujaq Relocation	14
Killiniq Inuit and the Relocation Process	14
2. PHASE II FINDINGS	16
2.1 The Killiniq Population Projection	16
Assumptions for Demographic Projections	16
Determining the Population Base	17
Growth Rate Projections for 25 years	17
Results of Phase II Evaluation	18
2.2 Marine Access	19
The 1986 Bathymetric Survey	22
Sea Lift Operations	23
Oil Delivery	25
2.3 Air Transportation	26
2.4 Level of Services and Infrastructure	27
Defining the Level of Services	27
Municipal Services	29
Housing	29
Water supply	29
Solid waste disposal	30
Liquid waste	30
Municipal service facilities	31
Health services	32
Police station	33
Educational services	33
Electrical energy	34
Airport	34
Other services	35
Organization of services and master plan	36

Table of Contents (con't)

	Page
2.5 Management Structure	36
Aims and Objectives of the Management Body	39
Criteria of Management	41
The Possible Management Bodies	43
Selection of the Proposed Management Option	45
2.6 Scheduling	53
2.7 Cost Estimate Assessment	71
2.8 Project Cost Analysis	72
Economic Analysis of Options and Schedules	72
Basic Assumptions for Economic Analysis	72
Net Present Cost	73
Evaluation of Net Present Cost	74
Evaluation of Cost in Current Dollars	79
Discussion of Economic Analysis	81
2.9 Risk Assessment	82
3. SUMMARY	85
3.1 Conclusions	85
3.2 Proposed Future Strategies	86
Short Term	86
Medium Term	86
Long Term	88
3.3 Recommendations	88

APPENDICIES

Appendix 1. Schedule of Events
Appendix 2. Project Cost Summary
Appendix 3. Marine Access Notes
Appendix 4. SHQ Correspondence
Appendix 5. K.E.Q.C. Standards and Supporting Documents
Appendix 6. Correspondence : Taq pangajuk Airport Estimate
Appendix 7. Development of Taq pangajuk Discount Rate
Appendix 8. Risk Factors for Implementation Schedules
Appendix 9. BPR Report : . Taq pangajuk Relocation
. Assessment of the Cost Estimates
and Schedules of the Feasibility Study

Table of Contents (con't)

FIGURES

	Page
Figure 1 General Location of Taqpangajuk	2
Figure 2 Taqpangajuk - Detailed Map of the Site - Location Map	3
Figure 3 Master Plan	11
Figure 4 Various Projected Population Growth Curves for Taqpangajuk	51
Figure 5 Assivakvik Corporation : Structure 1	52
Figure 6 Assivakvik Corporation : Structure 2	53
Figure 7 Schedule 1 - 5 Year Plan	56
Figure 8 Schedule 2 - 7 Year Plan	61
Figure 9 Schedule 3 - 9 Year Plan	66

TABLES

Table 1 Phase I Population Projections	18
Table 2 Phase II Population Projections	20
Table 3 Level of Services	37
Table 4 Weighting Factors for Criteria of Management	43
Table 5 Public Works Canada Management Analysis	47
Table 6 Québec Government Management Analysis	48
Table 7 Assivakvik Corporation Management Analysis	49
Table 8 Comparison of Management Options	50
Table 9 Option 1 - 3,500' airstrip - Federal Funding	75
Table 10 Option 1 - 3,500' airstrip - Total Cost	76
Table 11 Option 2 - 2,000' airstrip - Federal Funding	77
Table 12 Option 2 - 2,000' airstrip - Total Cost	78
Table 13 Inflation Factors	79
Table 14 Scheduling Scenario - Option 1 - Federal Funding	79
Table 15 Scheduling Scenario - Option 1 - Total Cost	80
Table 16 Scheduling Scenario - Option 2 - Federal Funding	80
Table 17 Scheduling Scenario - Option 2 - Total Cost	81
Table 18 Total Project Risk - Option 1	82
Table 19 Total Project Risk - Option 2	83

EXECUTIVE SUMMARY

In July 1985, the Department of Indian Affairs and Northern Development provided funds to determine the feasibility of relocating the former residents of Killiniq, Northwest Territories, to a new community that would be built on the mainland of Québec. The proposed site for relocation is situated 40 km south of Killiniq at a place the Inuit call Taqpangajuk.

Although the Inuit of Killiniq were recognized as a signatory to the James Bay and Northern Québec Agreement in November 1975, this did not prevent a gradual deterioration in government services and programs at Killiniq. This decline created an insecure environment and gave rise to a slow out-migration of families in search of settlements with assured access to essential services, especially medical and air transport. Between November 1975 and February 1978, a total of 50 Inuit left Killiniq in search of a more secure environment. On February 8, 1978, the 47 people that remained were notified by radio that the Federal government was sending planes to take them from the community and that Killiniq would be closed.

All of the former residents are now scattered in five host communities. They arrived without housing, without income, and without many of their personal effects. Family groups were broken up and the people separated from their seasonal hunting territory. The "host communities" were neither advised nor prepared for this influx of people and there have been no follow up programs or special funds to help with their resettlement.

Since 1978, the desire of the Killiniq families to regroup in a new location has continued. Their efforts were acknowledged by the Federal government in June 1985 when funds were allocated for a feasibility study. The Taqpangajuk Feasibility Study began in September 1985 and was completed in March 1987. During this period two phases of study were

undertaken. The purpose of the Phase I study was to investigate the physical characteristics of the Taqpangajuk site, to identify and plan for the appropriate infrastructure and to evaluate the social and economic implications of the relocation. The results from Phase I were then reviewed by technical personnel within DIAND and Public Works Canada. Based on this review, additional questions were raised and a decision was made to undertake Phase II of the feasibility study. The primary objective of Phase II was to address the concerns identified during the review process and to finalize the data and conclusions about the Taqpangajuk relocation.

The primary conclusion that can be drawn from the information now on hand is that :

It is physically and socially feasible to build and to develop the community of Taqpangajuk according to the criteria set out in the terms of reference for the feasibility study. There is the social will and commitment by Inuit to relocate and create a strong community, and the site, resources and development potential of Taqpangajuk and its immediate surroundings can meet the needs of the residents, now and in the year 2014.

This general statement is supported by the specific findings that were presented in the three volume final report for the Phase I Study and in the information that is contained in the final report for Phase II. The following points summarize the major findings discussed in the feasibility study.

- . The former residents of Killiniq are committed to return to the region and to reestablish their roots and the normal routines of northern life within familiar surroundings. The development of Taqpangajuk does not, however, simply reflect the desire to "go back". Much more important to the Inuit is the challenge it offers to move forward, and therefore the community is determined to incorporate new families, and adopt goals and programs of social and economic development.

- . Taqpangajuk will have an initial population of 160 individuals. This number is based on the "core group" of 104 who were at Killiniq at the time of closing or who left in the five years that preceeded the closing. The other segment of the base population will be comprised of individuals who have had a long affiliation with Killiniq and the immediate region.
- . Population projections based on a declining birth rate in Northern Québec give an estimate of 280 Inuit in the year 2014.
- . The site of Taqpangajuk can physically accomodate the infrastructure required for the new community now and over the next 25 years. The physical site has the required attributes of space, land stability, drainage, fresh water, rock for crushing, marine access, and areas for liquid and solid waste disposal.
- . The infrastructures selected for Taqpangajuk are based on the need to provide a level of services that is equal to those of other Northern Québec Inuit communities. These services include housing, nursing, education, local government, oil storage, diesel electric generators, water truck delivery system, solid and liquid waste disposal facilities, and roads, airstrip and marine offloading.
- . A master plan has been developed to illustrate the preferred location of these selected infrastructures in relationship to site characteristics and social considerations. This master plan provides a starting point to guide the specific geo-technical studies that are still requisite, and it shows that the site can easily incorporate community growth over 25 years.
- . The biological resources within the territory of Taqpangajuk indicate that there will be an adequate level of subsistence harvesting to

sustain the basic food requirements of the population and discussions with the hunters point out that practical management programs can be put in place.

- . Recent biological surveys have indicated the existence of "non-traditional" resources (scallops, shrimps, and Greenland halibut) that are available in the nearshore or offshore waters. These surveys have led to the establishment of experimental fisheries in cooperation with the Inuit of Killiniq. In addition, the natural and scenic resources of the landscape surrounding Taqpangajuk offer potential for local economic development.
- . The procedures required for a formal impact assessment have been identified and basic information concerning the project and its potential impact has been forwarded to the Kativik Environment Quality Commission. It has been determined that this Commission and le ministère de l'Environnement du Québec will be responsible for impact assessment prior to and during construction. The assessment process has been defined by the James Bay and Northern Québec Agreement and specific requirements and guidelines have been issued by the ministry and the Commission. Regular meetings have taken place between project personnel and the Commission.
- . A comparison of various management structures was conducted through the analysis of several criteria. The structure that was selected as being most appropriate was a special relocation organization called Assivakvik. Assivakvik would be an independent non profit organization that allows representation by Inuit and by both levels of government. It would be responsible for coordinating the different government programs and for securing funds. Management structures of this type have been established for other relocation projects under the Federal government. Assivakvik would cease to

exist once the community is constructed and incorporated as a municipality.

- . The Phase II Study employed an independent consulting firm to work closely with project researchers for a reevaluation of the project costs generated in Phase I. Each infrastructure unit was evaluated according to infrastructure needs and the construction criteria identified in Phase I. In addition, cost analyses were conducted for implementation schedule durations of five, seven and nine years to determine what savings, if any, might be derived from prolonging the implementation period. A summary of projected Federal Expenditures for each schedule can be found in Table A. The new costs, in 1987 constant dollars, were \$37.8 million for a five-year plan, \$39.2 million for a seven-year plan, and \$40.1 million for a nine-year plan. A summary of the findings can be found for two options, without private funding, in Table B.
- . The potential for cost sharing between federal and provincial governments was recognized and specific programs identified for housing and airstrip construction.
- . Elements of risk were recognized within the study, especially with respect to possible cost sharing programs. The total cost of the project will remain the same, however, there is the risk that the Federal contribution could vary with the success or failure of the cost sharing programs.

TABLE A

FEDERAL PARTICIPATION BY OPTION AND SCHEDULE

1 000\$ (1987 CONSTANT DOLLARS)

OPTION 1		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	TOTAL
Schedule 1	Duration		5 months	8 months	10 months	12 months					
	Participation	2 011,8	7 008,9	6 941,3	6 696,4	5 534,0					28 192,4
Schedule 2	Duration		4 months	6 months	8 months	10 months	12 months	12 months			
	Participation	1 501,2	3 011,4	4 552,0	5 816,3	5 825,6	5 840,2	2 891,1			29 437,6
Schedule 3	Duration		4 months	6 months	8 months	10 months	12 months	12 months	5 months	5 months	
	Participation	1 097,5	2 894,6	3 441,5	4 692,4	4 657,1	4 048,1	3 524,0	3 288,0	2 601,9	30 245,1

OPTION 2		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	TOTAL
Schedule 1	Duration		5 months	8 months	10 months	12 months					
	Participation	1881,8	7 008,9	6 941,3	5 736,4	5 012,0					26 580,4
Schedule 2	Duration		4 months	6 months	8 months	10 months	12 months	12 months			
	Participation	1 501,2	3 011,4	4 552,0	5 816,3	5 695,6	4 880,2	2 396,1			27 825,8
Schedule 3	Duration		4 months	6 months	8 months	10 months	12 months	12 months	5 months	5 months	
	Participation	1 097,5	2 894,6	3 441,5	4 692,4	4 657,1	4 048,1	3 394,0	2 328,0	2 079,9	28 633,1

TABLE B

SUMMARY OF ANALYSIS			X 1000 DOLLARS		
		Option*	Schedule 1	Schedule 2	Schedule 3
FEDERAL FUNDING	Net present cost	1	26 404.4	26 673.4	26 754.3
	Constant dollars	1	28 192.4	29 437.8	30 245.1
	Current dollars	1	30 270.7	32 715.2	34 498.3
TOTAL COSTS	Net present cost	1	32 785.5	32 821.5	32 818.1
	Constant dollars	1	35 205.2	36 570.4	37 497.9
	Current dollars	1	38 017.4	41 038.4	43 234.4
=====					
FEDERAL FUNDING	Net present cost	2	24 932.1	25 292.6	25 452.8
	Constant dollars	2	26 580.4	27 825.8	28 633.1
	Current dollars	2	28 496.3	30 823.5	32 491.5
TOTAL COSTS	Net present cost	2	30 418.3	30 597.2	30 721.5
	Constant dollars	2	32 605.2	33 970.4	34 987.9
	Current dollars	2	35 146.6	37 986.9	39 993.7

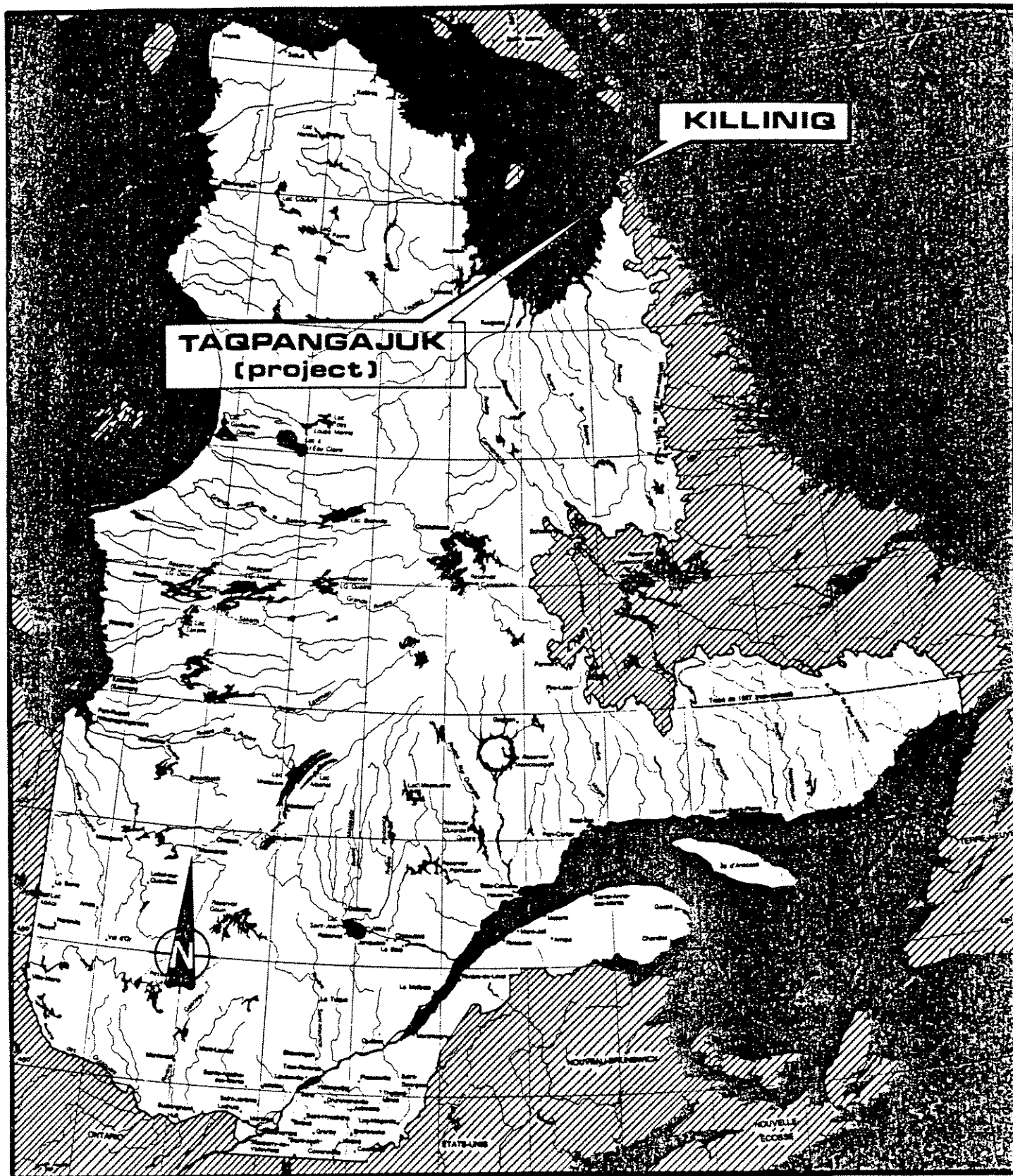
- * 1. Community with a 1,070 meter airstrip
 2. Community with a 600 meter airstrip

1. INTRODUCTION

The purpose of this report is to present the conclusions from Phase II of the Feasibility Study for the relocation of Killiniq Inuit to a new community site at Taqpangajuk. The proposed site is located in Singer Inlet on the east coast of Ungava Bay, approximately 40 km south of Killiniq Island. Figure 1 shows the general location of Taqpangajuk and Figure 2 provides a more detailed map of the site.

A relocation has been considered by the Killiniq Inuit since the signing of the James Bay and Northern Québec Agreement in November 1975. In February 1978, Killiniq was closed by the Federal and Northwest Territories governments and, consequently, relocation became the only way that the former Inuit of Killiniq could maintain their own community. Since 1978, the desire of the Killiniq people to regroup at a new location has continued and their efforts were finally acknowledged by the Federal government in June 1985 when funds were allocated for a feasibility study.

The purpose of the Phase I Study was to investigate the physical characteristics of the Taqpangajuk site, to identify the infrastructure and community plan, and to evaluate the social and economic implications of the relocation. The results from Phase I were then reviewed by technical personnel within DIAND and Public Works Canada. Based on this review, additional questions were raised and a decision was made to undertake Phase II of the feasibility study. The primary objective of Phase II was to address the concerns identified by the review process and to finalize the data and conclusions about the Taqpangajuk relocation.

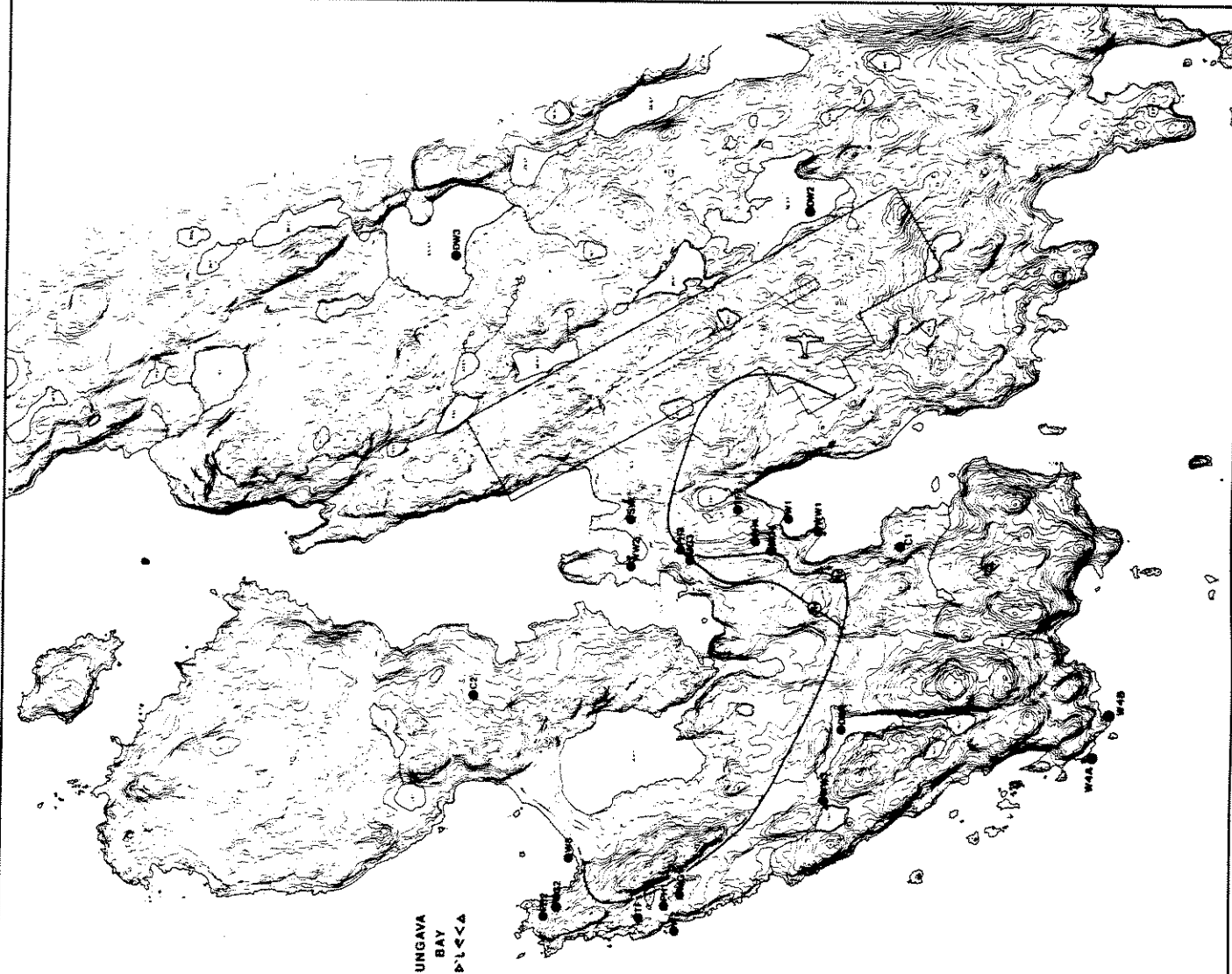


PROJECT LOCATION

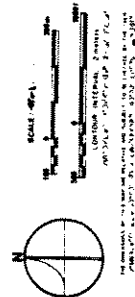
Figure 1

TAQPANGAJUK FEASIBILITY STUDY

LOCATION MAP



- [illegible]



Approved for: **LEW ROBERT J. JONES**
by: **MANITOK CORPORATION**
to: **MANITOK REGIONAL GOVERNMENT**
Subject: **Manitok Technical Assistance Department**
Manitok Affiliated Business Enterprise

DATE	10-24-68
AMOUNT	\$3,000
PROJECT NO.	
PROJECT NAME	

FORWARDED BY: **MANITOK REGIONAL GOVERNMENT**
DATE: **10-24-68**
PROJECT NO.: **10-24-68**
PROJECT NAME: **MANITOK REGIONAL GOVERNMENT**

1.1 Background to Relocation

Early on the morning of February 8, 1978, the residents of Killiniq were made aware of the government's decision to close their community by radiophone. Planes arrived and the residents were asked to board as quickly as possible. By late afternoon, the move was complete and the Killiniq Inuit were distributed in five Ungava Bay communities. They arrived without housing, without income, and without many of their personal effects. Family groups were broken up and the people separated from their seasonal hunting territory. The "host communities" were neither advised nor prepared for this influx of people and there have been no follow up programs or special funds to help with their resettlement.

This catastrophic event in the lives of the Killiniq residents was foreshadowed by a decline in government services between 1975 and 1978. The decline in services permeated every aspect of community life. Some of the problems simply caused inconveniences while others threatened the essential safety and well-being of the Inuit. No additions or improvements were made to community infrastructures, there was no new housing or renovations; economic assistance programs were severely reduced or terminated and there was no attempt to improve air service, thus raising concern about medical evacuations and creating very serious problems for the delivery of supplies. As services were reduced, jobs were lost, the economy declined and there was a serious deterioration in morale and social climate.

The most significant impact on the security and well-being of the Killiniq Inuit occurred when medical services were first curtailed and then terminated. In September 1977, the nursing station was closed, the nurse was recalled and all medications and other medical supplies were taken to the community dump and destroyed by fire. This act left the community without nurses or medication just as freeze-up was approaching and the only life-line for sickness or injury would be helicopter service, if available, from Kuujuaq.

The conditions under which Killiniq people lived from the early 1970's to 1978 gave rise to a gradual out-migration of families in search of a settlement with assured access to essential services, especially health and air transport. Between November 11, 1975, and February 8, 1978, a total of 97 Inuit left Killiniq. Fifty left in search of a more secure environment with basic services, and the other 47 remained until the closure by government. It is this legacy that the Inuit are desperately striving to overcome as they try to hold their community together and to take the steps required for a relocation. The first of these steps was to complete a feasibility study.

1.2 The Phase I Study

The Phase I Study was carried out from August 1, 1985, to May 30, 1986. The procedures and results were described in a three-volume report that was submitted to the Department of Indian Affairs and Northern Development on June 2, 1986. The Phase I Study was the responsibility of the Makivik Research Department working in close cooperation with the Kativik Regional Government. A Technical Committee was established to participate in the planning process, and to provide additional perspectives and expertise. Every stage of the study and all of the findings were reviewed by the Technical Committee and by the Inuit of Killiniq.

Throughout Phase I, the emphasis was on acquiring the technical information needed to identify and evaluate potentials and constraints offered by the site and to determine the socio-economic conditions of the relocation. The Phase I Study determined the feasibility for physically building a new community at Taqpangajuk and presented several approaches as to how the project could be carried out. It also established the commitment of Killiniq Inuit to relocate, and described how the community would function as a social and economic entity. Phase I

not only included the development of planning scenarios, it suggested a preferred master plan, and it identified certain factors to be considered in a formal impact assessment.

The final conclusion of Phase I was :

It is physically and socially feasible to build and to develop the community of Taqpangajuk according to the criteria set out in the terms of reference for the feasibility study. There is the social will and commitment by Inuit to relocate and create a strong community, and the site, resources and development potential of Taqpangajuk and its immediate surroundings can meet the needs of the residents, now, and in the year 2014.

1.3 Review of Phase I Study

The three-volume report was reviewed by representatives of the Technical Services and Contracts Branch of DIAND. The results of this review were submitted to Makivik Corporation in September 1986. A separate review was undertaken by Public Works Canada for DIAND. The results of their review was presented to DIAND and then to Makivik in a report dated August 29, 1986.

Although both groups raised certain technical questions about the Taqpangajuk site, infrastructure and master plan, only one topic, that of marine access, was considered incomplete for accepting Taqpangajuk as a feasible site. Other concerns arising from the review process addressed more general issues that had to be answered prior to the tabling of a final report that would then be used to prepare the submission to the Federal Cabinet.

In particular, questions were raised about the initial community size and subsequent population growth; the level of services to be provided; the plan for the development and management of an implementation strategy; and about the final cost, including the potential cost sharing by various federal or provincial agencies. In the critiques,

each of these general categories was further subdivided into specific topics, some of which required additional study and supporting data, others which called for a re-evaluation of Phase I information, and others for the development of alternative planning scenarios and management structures.

In a letter, dated September 29, 1986, from the Assistant Deputy Minister, Self-Government, to the President of Makivik Corporation, the next steps that had to be taken prior to a Cabinet submission of the project were identified. In this letter, it was stated :

I propose, therefore, that over the next 6 to 8 months, we collaborate on a second phase of the feasibility study that will have as its objective to develop sufficient information that we can present a submission to Cabinet in the late spring or early summer 1987 outlining a manageable option with alternatives for creating a new Inuit community at Taqpangajuk.

1.4 The Phase II Study

The development of a manageable option for submission to the Federal Cabinet was the primary objective of the Phase II feasibility study. The work conducted during Phase II reinterpreted and described the characteristics and conditions of a manageable option for the planning, construction and operation of Taqpangajuk as a new Northern Québec community. The critiques of the Phase II Study identified ten areas of concern.

1. defining the population to be served;
2. recognition of specific planning problems on marine access and initial planning related to airstrip location and construction;
3. determining the level of services and identifying the infrastructures needed to deliver these services;

4. defining alternative strategies and schedules for the development of Taqpangajuk;
5. determining project implementation and management options;
6. completing the cost analysis of the alternative strategies based on benefit cost and lifecycle forecasting;
7. investigating the sharing of financial responsibilities with other parties;
8. initiating the first phase of impact assessment studies, as required by the Kativik Environmental Quality Commission (K.E.Q.C.);
9. investigating the experience gained from the recent Umiujaq relocation.

These nine topics were considered most important in the development of a manageable option for Taqpangajuk. The collection and analysis of information on each topic, along with the pertinent findings from the Phase I Study, would comprise the approach and content of the Phase II report. From this information base it would be possible for representatives of DIAND to develop the document that would then be reviewed by the Federal Cabinet.

The design of Phase II did not, with one exception, require field research. The need for particular types of technical information and expertise, however, were recognized. The one exception was the need for field information to confirm marine access to Taqpangajuk. Other technical studies that call for on site investigations have been identified but will not be undertaken until the project is given approval.

Phase II began on November 1, 1986, and an interim report was submitted to DIAND on March 2, 1987. The approach used during the study emphasized co-operation and the sharing of responsibilities between Makivik, the Inuit of Killiniq and the Department of Indian Affairs and

Northern Development. Once again a committee comprised of representatives from the Killiniq community, Makivik Corporation and DIAND was established in order to identify topics, set priorities and discuss technical and other issues that would arise during Phase II. Technical consultation with the appropriate departments within Québec or with other governmental and private organizations that might be involved with the planning, construction or future operation of Taapangajuk was also carried out. Contact between the study team and the community, focused on Inuit representation on the Technical Committee. The results of Phase II were formally presented to the community at the Heads of Family Meeting that took place from March 17 to 19, 1987. A general schedule of activities during Phase II is shown in Appendix 1.

1.5 Primary Findings from Phase II

The collection and evaluation of Phase II information by the project staff, Technical Committee and outside expertise led to the following conclusions :

Population to be Served

The evaluation of the population projections in Phase I indicated that certain assumptions about population growth based on natural increase and migration were not correct. These assumptions resulted in a projected growth rate that was significantly higher than that used in other demographic studies on the Inuit population. In consultation with a northern demographer, the assumptions of growth were reevaluated and a revised population projection was made. The population base of 160 people used in Phase I was maintained in Phase II. The utilisation of a lower growth rate over a 25 year period changes the Phase I finding of 412 people to 280 people from Phase II.

Marine Access

A technical evaluation of coastal waters and harbour sites for Taqpangajuk was carried out by a research vessel of the department of Fisheries and Oceans. The findings from the bathymetric survey indicate that marine access is feasible. Certain changes could be made in the location of infrastructure to accomodate the best possible location of marine access.

Level of Services and Infrastructure

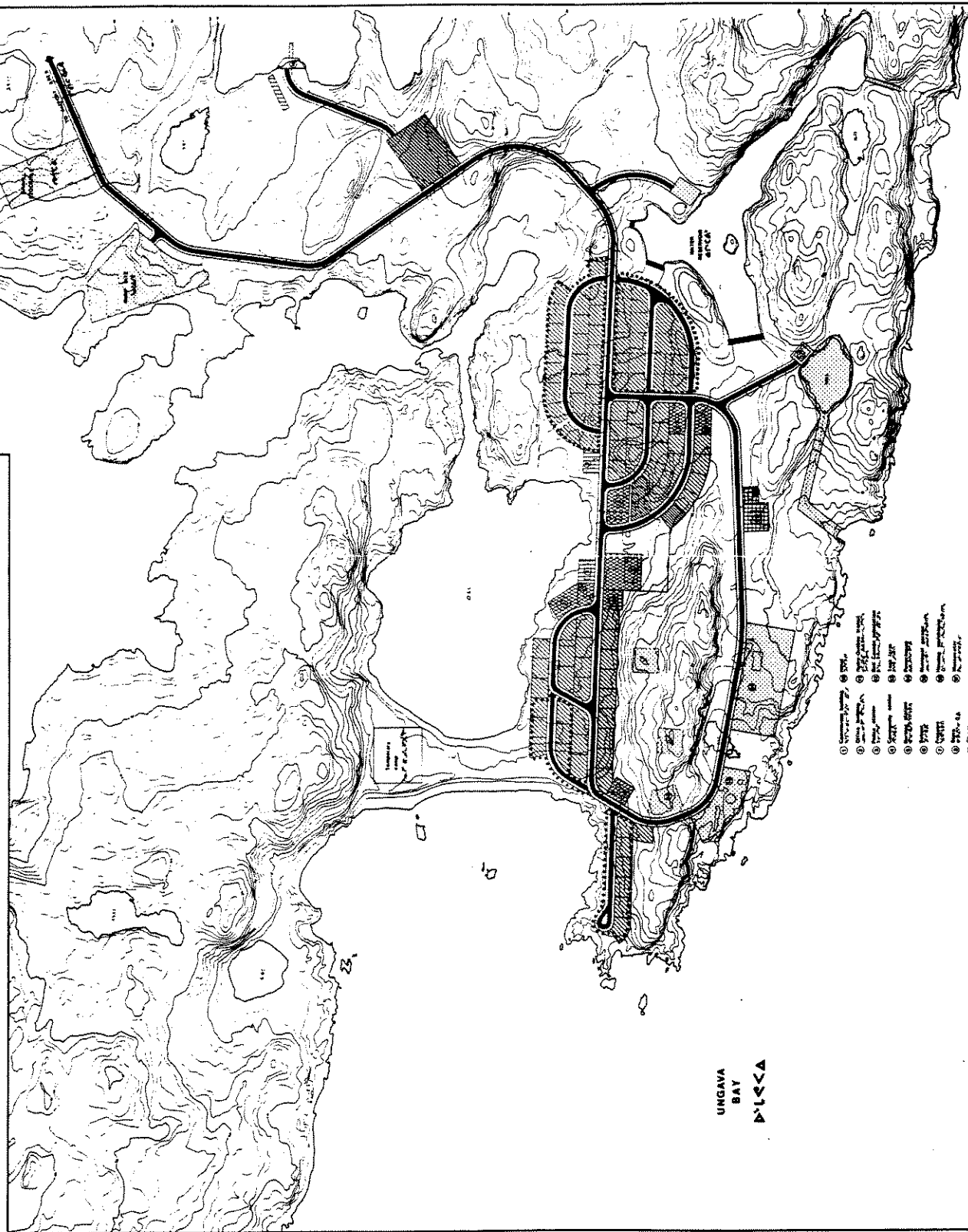
In Phase II, all of the services and infrastructure proposed for the community in the Phase I report were reviewed and evaluated. This process questioned the primary obligation of government to provide essential services in Taqpangajuk at a level that is equivalent to the other Northern Québec municipalities. The primary services that will be delivered by Kativik Regional Government and other Northern Québec agencies, include housing, health, education, water supply and sewage disposal, power plant, fuel storage and delivery, and facilities for air service. These infrastructures would be supported by the required equipment and maintenance facilities, by a system of roads and by a marine offloading facility. Additional infrastructures needed to operate the community such as stores, church, and other social or economic facilities would be built through other funding sources.

Schematic Community Plan

The Phase I Study provided three planning scenarios and specified a preferred master plan. The Phase II Study noted certain possible changes in this master plan that might be required because of environmental or engineering considerations. In particular, possible alternative airstrip sites as well as sites for the fuel storage and power house were identified. Nevertheless, the Phase I master plan is still considered to be applicable to the development of Taqpangajuk. A map showing the original master plan is provided in Figure 3.

המחלקה לטיפול בנפגעים

مجلس الشورى



UNGAVA
BAY

①	②	③	④
⑤	⑥	⑦	⑧
⑨	⑩	⑪	⑫
⑬	⑭	⑮	⑯
⑰	⑱	⑲	⑳
㉑	㉒	㉓	㉔
㉕	㉖	㉗	㉘
㉙	㉚	㉛	㉜
㉝	㉞	㉟	㊱
㊲	㊳	㊴	㊵
㊶	㊷	㊸	㊹
㊺	㊻	㊼	㊽
㊾	㊿		

[illegible]

Management Scenarios

The Phase II Study reviewed various options that could be used to establish a management structure for the planning and construction of Taqpangajuk. This structure had to incorporate principles of Inuit involvement, technical expertise, cost control, and the capacity to work with many diverse agencies within three levels of government. An attempt was made to establish principles and criteria and then to evaluate possible options in relationship to these criteria. On this basis, a management structure called Assivakvik Corporation was determined to be most appropriate. This structure is an independent non-profit corporation that will have representation by Inuit and government. This type of structure is not a new idea. Similar management bodies have been created for other federally funded relocation projects in Québec and have proven to be cost effective.

Cost Analysis

The Phase II Study employed an independent consulting firm to work closely with project researchers for a reevaluation of project costs. Each infrastructure unit was evaluated according to the infrastructure needs and the construction criteria identified in Phase I and in relationship to the level of services defined in Phase II. Costs were estimated for a five, seven and nine year implementation schedule. The new cost in 1987 constant dollars was \$37.8 million for a five-year schedule; \$39.2 million for a seven-year schedule; and, \$40.1 million for a nine-year schedule.

Sharing of Financial Responsibilities

The Phase II Study evaluated many potential options that would allow for the project cost to be shared by different levels of governments and by private organizations. It also identified existing programs that could be used to help fund Taqpangajuk. In particular,

the Phase II project dealt directly with the Québec government for housing programs and medical services and also the funds needed for long-term maintenance and operation of the community. Other potential sources of funding were identified from existing government programs such as the Northern Airstrip Infrastructure Improvement Program, or from agencies such as Hydro-Québec and la Fédération des Coopératives du Nouveau-Québec. No final commitments for outside funding have yet been established, but Phase II has brought all parties together and it has identified the potential contributions from each source. Based on this assumption, it has been possible to determine the level of new funds required to build Taqpangajuk. These figures are identified in the tables of the cost analysis and cash flow forecasting included in the BPR Consultants' report. A summary table is presented as Appendix 2.

Strategies and Schedules for Development

The Phase II Study reevaluated the four-year implementation schedule that was established in Phase I. It was assumed that the Phase I schedule was too ambitious and did not allow for any possible delays in the sequence of studies, approvals, funding allocation, and logistics. In Phase II, implementation schedules of five, seven and nine years were used to distribute costs. Each schedule indicated the preferred sequence of planning and construction events and it identified the funds that would be needed to complete each event.

Impact Assessment Procedures

For the most part, Taqpangajuk would be a federally funded project carried out on Québec territory. This created some concern about the jurisdiction for the impact assessment process. In Phase II, the responsible party for impact assessment was determined to be le ministère de l'Environnement du Québec (MENVIQ). Impact assessment would be completed according to the rules and procedures of the Kativik Environmental Quality Commission (K.E.Q.C.). In order to begin this process, a series of meetings were held between project staff and the

K.E.Q.C., a formal notification of the project was submitted to MENVIQ, by Makivik Corporation in its role as project proponent, and a series of official reports describing the project were submitted for preliminary review by the Commission. A formal impact assessment cannot begin until the relocation is officially approved. Discussions within the K.E.Q.C. indicate that the plans and approaches to construction described in the Phase I Study create no obvious barriers to an orderly review process. The main concern is to establish a procedure that will allow for project modification within the review process.

Information from Umiujaq Relocation

The Phase II Study for Taqpangajuk has utilized information from the recently completed relocation of Inuit from Kuujjuarapik to Umiujaq. The Umiujaq relocation process encountered many of the problems that will have to be solved for Taqpangajuk and it was possible for the Taqpangajuk study to incorporate the experience, both positive and negative, gained from an investigation of the Umiujaq relocation. This information was particularly helpful in designing the submission to the K.E.Q.C., in establishing cost estimates for both construction and infrastructure, in evaluating potential problems with respect to logistics and other delays, in establishing a flexible yet professional management structure and, in formalizing the most appropriate way to incorporate Inuit into the management structure and relocation process.

Killiniq Inuit and the Relocation Process

All of the plans and costs of Taqpangajuk were determined for a particular population. The Phase I Study established an initial population of approximately 162 people. Phase II investigations have continued to respect this number as a reasonable estimate of the base population for Taqpangajuk.

The 162 people can be divided into two groups. The first and largest group of 104 individuals is referred to as the "core group". It includes all of the residents of Killiniq who either moved away at the time in which services were being reduced, or those who were relocated into host communities in February 1978. The second group includes 58 individuals who have had continuous or close ties with the Killiniq community.

The fact that the former residents are scattered in five host communities separated by up to 500 kilometers makes it very difficult for them to maintain their solidarity as a social group. Nevertheless, the Phase I Study showed that neither distance nor the 9 years that followed the closure of Killiniq have lessened their social identity. The Landholding Corporation continues to exist, community interests are recognized in all discussions or negotiations on the social, economic and political development of Northern Québec and there has been a three-year feasibility study on the commercial exploitation of inshore fishery resources in the Killiniq area. This study brings a group of about 25 Killiniq people back to the region each summer.

All of these findings clearly indicate that the Killiniq people wish to relocate to Taq Pangajuk. This conclusion, however, should not be misinterpreted to mean that the process itself will not create difficult decisions for some individuals. The 9 years that have passed left scars of mistrust and the separation of the people has prevented any consistent momentum from developing. The Phase I Feasibility Study served both as a unifying force and as a mechanism, through Heads of Family meetings, to discuss specific issues and problems faced by this scattered community.

2. PHASE II FINDINGS

In this section, the questions raised by the review process and briefly identified in Section 1 will be treated in greater detail. A discussion of the problem, the approach, the data base and the conclusions will be presented for each of the major topics. Information and conclusions about the cost and management options will also be presented, however, the specific details about the costs are presented in a separate report prepared by an outside consultant.

2.1 The Killiniq Population Projection

Assumptions for Demographic Projections

The terms of reference for the feasibility study called for the identification of the potential Taqpangajuk population in 1985 and for a 25-year projection of growth. In order to accomplish this task, four objectives were developed to :

- 1- identify an initial population that would include those individuals recognized by the federal government as residents of Killiniq who were forced to relocate prior to, or at the time of, the community closure in 1978.
- 2- identify a second group of potential residents comprised of individuals who considered themselves eligible for reasons of historical settlement, marriage into the core group, and other social or historical linkages to the Killiniq people or territory.
- 3- establish the growth rate of this population (1 and 2 above) based on assumptions of natural population growth.

- 4- determine additional factors influencing growth through assumptions about in migration of individuals or family units.

These four objectives formed the basis of the demographic projections.

Determining the Population Base

During Phase I the core group was identified as 104 individuals. The age, sex, and social relationships of these individuals were used to determine the population structure and social network of Taqpangajuk. This core group can be easily identified since they were residents of Killiniq or born to these residents since 1978.

The core group was then asked to identify other individuals or family units that also had close associations with Killiniq in recent times. Other individuals or family units were also given the opportunity to identify themselves independently of the core group. This process led to the creation of a second group of potential Taqpangajuk residents estimated at 58 individuals.

The population from 1 and 2 above totalled 162 individuals and was referred to as the population base for Taqpangajuk. This was the number used for all population projections.

Growth Rate Projections for 25 years

In Phase I the growth rates of various communities in Northern Québec were determined, and a community of similar size to Taqpangajuk, Kangiqsujuaq, was selected. Its growth rate was 3.8 per cent including natural increase and migration. This growth was then assumed to be constant (the constant and percentage growth rate method) over a 25 year planning horizon. This assumption yielded the following figures on five year intervals (Table 1).

Table 1
Phase I Population Projections

<u>Year</u>	<u>Inuit</u>
1985	162
1990	195
1995	235
2000	283
2005	342
2010	412

The review of the Phase I final report questioned the assumptions and methods used to derive the population estimates for Taqpangajuk. Reviewers felt that the selection of a 3.8% growth rate could not be supported and appeared "fairly high" when compared to the assumptions developed for the North in a study carried out by a professional demographer, Dr. Norbert Robitaille, from Département de démographie, Université de Montréal.

Results of Phase II Evaluation

The Phase II Study attempted to clarify the assumptions used for the population projection. This was done through correspondence and meetings with Dr. Robitaille. Although he recognized the difficulties for making demographic projections for such a small group he was able to provide new estimates on the rate of population growth. The figure 3.8% was high as a starting assumption and it would consistently exaggerate the growth rate if used as a basis of the "constant percentage method" of population evaluation.

In Phase II, three growth rate assumptions were evaluated. The first was a 3% growth rate which now appears to be the average throughout the N.W.T. Based on his work, however, Dr. Robitaille felt that

this growth rate would not sustain itself for much longer. The second assumption was a declining growth rate that would begin at 2.8% in the year 1989 and decline to 2.0% for the years after 2004. The third was a constant percentage assumption of 2.2% that could be applied to the 25 year projection.

These new assumptions, applied to a population of 162 yielded projections illustrated in Table 2 and Figure 4. The new projection based on a 2.2% constant percentage growth rate yields a 25 year population level, beginning in 1989, of 279 for the year 2014, and the declining growth rate from 2.8% to 2.0% yields a 25 year population of 287. Consequently, an assumption of approximately 280 appears valid and reasonable for the Taqpangajuk population in the year 2014.

2.2 Marine Access

The Phase I Feasibility Study investigated physical characteristics of the proposed site. The availability of appropriate technology and finances, prevented a true bathymetric survey of marine access to be undertaken. The construction and maintenance of Taqpangajuk is dependent upon marine transport and sea lift activity. Thus, it is imperative that this community, like other northern communities, have proven safe access for large sea lift vessels. Access involves a passage from the sea to the shore, reasonably well-protected anchorage locations, marine access from the anchorage to the beach for barges, and a beach that can accomodate offloading and storage and which has road access to the community. The situation is complicated in Taqpangajuk because of a tidal range of 7 meters.

The Phase I survey identified potential marine access areas and three potential harbour and offloading sites. In the Phase I site study visual observations of these areas were made during high and low tides, with no obvious obstructions to prevent sea lift barges from coming to shore. Nevertheless, the Phase I results could only propose, but not verify harbour sites and marine access.

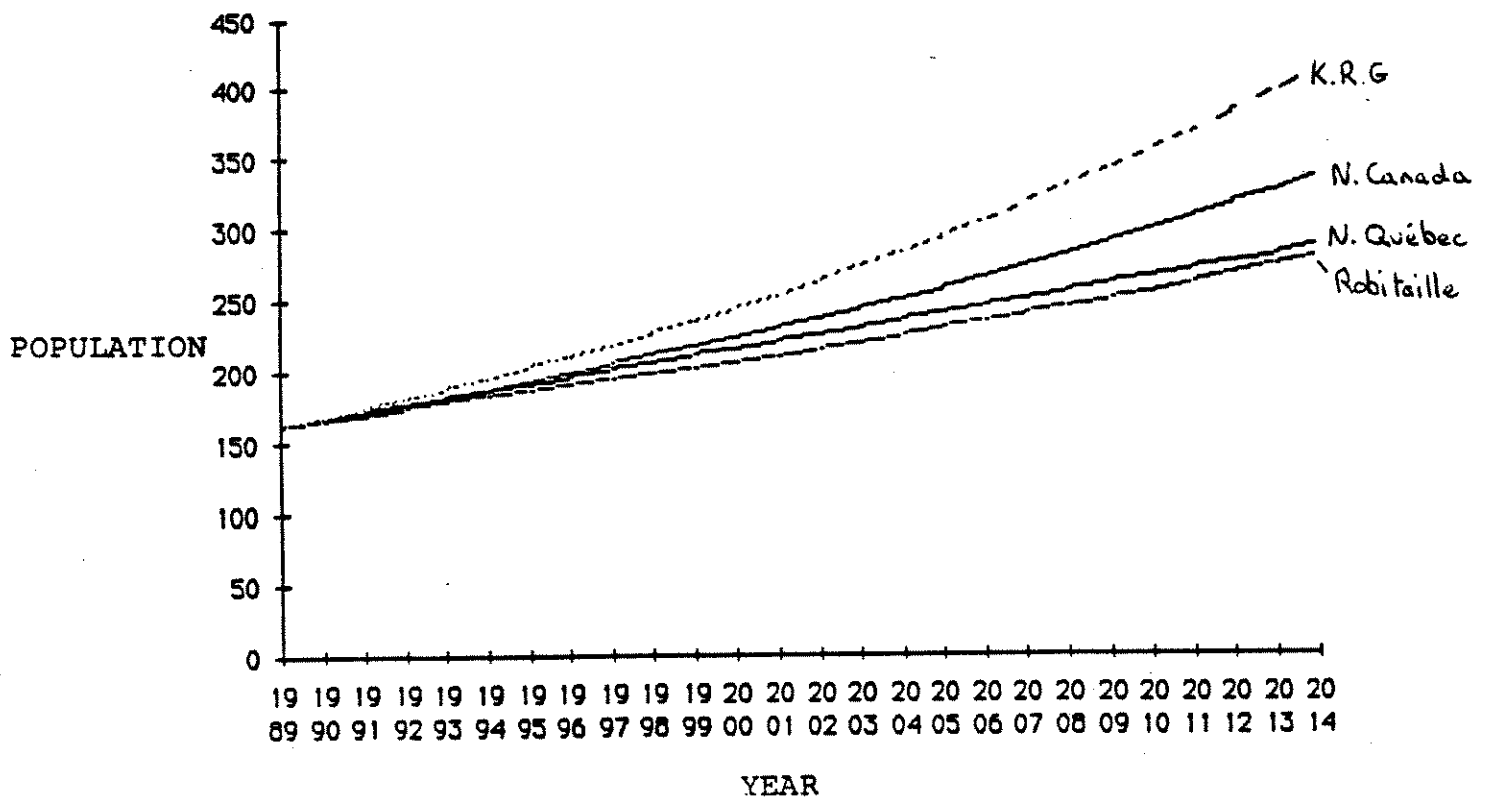
Table 2

Phase II Population Projections

KRG Growth Curve		Northern Canada Growth Rate	
YEAR	KRG-3.8%	YEAR	N.Can-3.0%
1989	162	1989	162
1990	166	1990	167
1991	175	1991	172
1992	181	1992	177
1993	188	1993	182
1994	195	1994	187
1995	203	1995	193
1996	210	1996	199
1997	218	1997	205
1998	227	1998	211
1999	235	1999	217
2000	244	2000	223
2001	253	2001	230
2002	263	2002	237
2003	273	2003	244
2004	283	2004	251
2005	294	2005	258
2006	305	2006	266
2007	317	2007	274
2008	329	2008	282
2009	341	2009	290
2010	354	2010	299
2011	367	2011	308
2012	381	2012	317
2013	395	2013	326
2014	410	2014	336

N.Robitaille-2.2%		N.Quebec Declining Growth Rate	
YEAR	N.Rob-2.2%	YEAR	Staggered
1989	162	1989	162
1990	166	1990	166
1991	170	1991	171
1992	174	1992	176
1993	178	1993	181
1994	182	1994	186
1995	186	1995	191
1996	190	1996	196
1997	194	1997	201
1998	198	1998	206
1999	202	1999	211
2000	206	2000	216
2001	210	2001	221
2002	215	2002	226
2003	220	2003	231
2004	225	2004	236
2005	230	2005	241
2006	235	2006	246
2007	240	2007	251
2008	245	2008	256
2009	250	2009	261
2010	255	2010	266
2011	261	2011	271
2012	267	2012	276
2013	273	2013	281
2014	279	2014	287

Figure 4 : Various Projected Population Growth Curves for Taqpangajuk



All of the reviews clearly indicated that marine accessibility would have to be confirmed before any further planning was done for Taqpangajuk. In the words of the review by the Professional Services Directorate, DIAND :

No additional development work should be carried out until marine access is reasonably assured (p.9).

The review prepared by Public Works Canada stated :

This relocation project should not be further developed until the feasibility of marine access has been technically demonstrated (p.2).

The discussion of marine access is related to other transport considerations, especially the logistics of annual sea lift and the requirements for year round access by air transportation. Although sea lift continues to be important for major equipment and supplies, air transport is essential for safety, for delivering fresh foods and consumer goods, and for meeting the increasing need of Inuit to travel for personal or other purposes.

The 1986 Bathymetric Survey

Phase II could not proceed until a precise marine access study was carried out. The Canadian Hydrographic Service (Atlantic Region) of Fisheries and Oceans Canada was contacted and they agreed to divert a research vessel to carry out the technical study at Taqpangajuk.

A preliminary bathymetric survey for Singer Inlet was completed in September 1986. The survey focussed on the possible harbour sites proposed in the feasibility report and included both the approach from Ungava Bay and the inshore bathymetric features. No data was collected for the northern side of the Taqpangajuk peninsula.

Once the bathymetric data was received, maps of the coastal area were constructed and the Technical Committee, assisted by outside consultants, the Canadian Hydrographic Service and the Buildings Division of DIAND, evaluated the information. The main conclusion stated by marine transport consultants was that marine access was adequate for both sea lift and fuel delivery operations to Taqpangajuk. While navigational aids would facilitate marine access, the sea captains interviewed were under the impression that the current bathymetric data was more than what most northern communities presently have at their disposal.

A problem with all of the proposed harbour sites was that none offer protection against the prevailing winds of the area except the site proposed by Fisheries and Oceans (W4, Figure 2*). As a result, unloading operations might have to be curtailed in periods of rough weather when vessels would move to designated zones that have less restricted manoeuvrability. Lingering or trapped ice could also cause difficulties in marine access especially if the sea lift was early in the season. Several future studies were suggested. A bathymetric study of Taqpangajuk's northern inlet might indicate enough deep water for a sheltered harbour. The influence of tidal currents could have on anchorage sites may be important; and, an examination of wave and swell action around Taqpangajuk would be essential for barge operations and the construction of any permanent harbour structure.

Sea Lift Operations

Two types of marine deliveries are required; one for sea lift and the other for fuel. This problem was discussed with outside expertise to gather their impressions on possible problems and procedures (Appendix 3). Valuable information was obtained from these consultations, on access to the site, and on the marine operations at Taqpangajuk during construction. Four separate groups participated;

* Note : Site W4 was proposed after all consultations had been carried out and therefore is not highlighted in the following discussions. A brief discussion is presented, however, on the basis of the BPR report, Appendix 9).

Fednav Limited, Arctic Consultants, Logistec Navigation, and le ministère des Transports, Québec.

Fednav. A meeting was held with Fednav on November 12, 1986, to present and discuss the bathymetric data available for the Taqpangajuk area. There was no question that marine access to the proposed community site would be possible. Indeed, the elevated beach (W3 on the location map, Figure 2), appeared to be ideal for the sea lift operations Fednav envisaged for the project. While navigational aids would aid the drop off process they were not deemed essential. Fednav would wish to see the site prior to operations and then rely on their ship captains' experience and on any notes taken during their survey of the area.

Fednav followed up this meeting with a letter, dated February 10, 1987, in which they outlined some of the possible characteristics a sea lift operation to Taqpangajuk would entail. These include time estimates for loading and unloading the materials, plus barge time from ship to shore.

The end result of discussions with Fednav is that they are prepared to carry out a sea lift operation at Taqpangajuk. The preliminary navigation charts already provide more information than is available for many other northern communities. This data, along with an on site investigation by their personnel would be all that was needed for a successful sea lift operation.

Logistec and Arctic Consultants. Communications with Logistec Navigation proved equally helpful in terms of information and by providing contact with Arctic Consultants Ltd. In an initial meeting on November 14, 1986, background information and bathymetric data was presented. After studying this information and consulting with several ship captains, further discussions were held on December 2, 1986, and a report from Arctic Consultants was filed on January 21, 1987.

The results of this work was that sea lift operations can be carried out at Taqpangajuk. Of the possible wharf sites proposed (W1,

W2 and W3, Figure 2), W2 and W3 appear to be most suitable for sea lift operations. W2 offers the best site for a wharf and has enough deep water that a 12,000 ton ship, drawing 9 meters of water, could be manoeuvred safely. Unfortunately, W2 offers no protection from the prevailing winds of the area.

W3 on the other hand, appears to be the most appropriate site for offloading of sea lift vessels. Due to the presence of rock outcrops in the area a barge system from a main vessel offshore would have to be used. Two possible anchorages were identified offshore for vessels of 3,000 tons and 12,000 tons. Once again, however, the lack of protection from the prevailing winds was of concern.

This report recommend that further bathymetric studies be carried out on the inlet north of W1. This area may provide a protected harbour for a large vessel if there is sufficient space and deep water for safe manoeuvring under adverse weather conditions.

Oil Delivery

There are two fuel suppliers in Northern Québec communities, Shell Canada Ltd. and La Fédération des Coopératives du Nouveau-Québec (Co-op). Shell Canada, however, operates all tankers that carry the fuel north. As a result, they were approached and asked for their impressions on the marine accessibility of Taqpangajuk.

Two meetings were held with representatives of Shell Canada. The first was an information session for both parties. The researchers gained valuable insights into questions and possible scenarios concerning fuel delivery and supplies. The question of marine accessibility was to be studied by the Shell marine department and reported on in December. Prior to the second meeting, Makivik received an official letter from Shell Canada stating their interest in the project, possible approaches to financing, and a strategy for fuel supply during the initial period of construction.

The second meeting with Shell Canada was an informal discussion of the available bathymetric data with two Shell tanker captains. It was immediately emphasized that none of the available sites at Taqpangajuk offered protection against the prevailing winds of the area and, hence, it would only be considered a fair weather port. In addition, due to Taqpangajuk's location on the east coast of Ungava Bay, lingering and trapped ice might delay safe delivery of fuel until late August or early September.

Shell was considering two possible areas of delivery. Both would present problems in periods of rough weather. The proposed tank farm location (TF 1, Figure 2) would facilitate a ship/hose delivery system while the southern inlet would have to use a barge operation for delivery. A third possible area for fuel drop off was the yet unsurveyed northern inlet.

In conclusion, Shell Canada believed that marine access to Taqpangajuk was adequate for fuel delivery, however, they suggested three additional studies :

- 1) bathymetric soundings for the northern inlet and approaches from Ungava Bay;
- 2) a study of tidal currents and their possible influence on anchorage sites;
- 3) a study of wave and swell action would be important if barge work was to be required for fuel delivery.

Les Consultants BPR

While reviewing the costs of the Taqpangajuk project, BPR also investigated the marine accessibility of the community site and in particular potential dock sites. Three dock sites were considered, W2, W4 A and B, and a site in the northern inlet near WW2 (see Figure 2). W2 was considered to be too unprotected for any docking site. W4 A and B offered better protection, however, assess to these sites would be

difficult as a result of the terrain. No data was available for the site at WW2.

Due to the availability of only preliminary marine charts, BPR proposed that no docking site or construction costs could be determined. They therefore suggested that a barge system would be necessary for any sea lift operations at Taqpangajuk. The barges could unload at sites W1, W2 and W3, with the final site seeming to be the easiest of the three. The main ship would have to anchor to the southwest of the peninsula at a site recommended by the Department of Fisheries and Oceans (Appendix 3).

2.3 Air Transportation

One service that is essential to all northern communities is that of air transportation. The lack of an airstrip at Killiniq/Port Burwell was one of the reasons it was closed. The Killiniq Inuit would not commit themselves to moving to Taqpangajuk until Transport Canada had verified that a location for an airstrip actually existed. Phase I established the site for an airstrip of 1,070 meters.

During Phase II, the topic of the community airstrip was raised in several discussions. Initially, it was proposed that construction would have to start immediately with the airstrip. This would enable the construction camp to begin and end operations before and after sea lift activity, thus lengthening the already short construction season.

In order to provide other construction schedule options, Transport Canada was approached by the researchers with several different scenarios for the construction of a temporary airstrip. Transport Canada agreed to provide estimates on the cost and possible location of possible permanent airstrip site along the southwestern coast of Taqpangajuk.

The airstrip site proposed in the Phase I report is still the official airstrip for Taq Pangajuk. All schedules, except one, would require the use of a temporary airstrip so as to facilitate construction. The last option, that of a new location for the airstrip, must be verified through an on-site study before any changes can be made. Under all circumstances it is planned to have an airstrip that conforms to the Northern Airport Infrastructure Improvement Program so that Inuit at Taq Pangajuk will have the security and service of year-round air transportation.

2.4 Level of Services and Infrastructure

Defining the Level of Services

The delivery of municipal and other government services to Northern Québec Inuit is the responsibility of le ministère des Affaires municipales, le ministère des Affaires sociales, le ministère de l'Éducation and Hydro-Québec. The services provided by these three government agencies are organized within or coordinated through Kativik Regional Government. All education services and infrastructure are the responsibility of Kativik School Board. The service sector is the major source of long-term employment in the communities and services are delivered at the local level through municipal government.

The standard for services is defined through the policies of the Kativik Regional Government in relationship to the commitments made within the James Bay and Northern Québec Agreement and in accordance with the guidelines of each agency. Prior to the signing of the Agreement, the infrastructure of services in Northern Québec was poorly developed and consequently several "catch-up programs" have been initiated, especially for housing and airstrips.

The development of services in Northern Québec including their justification and standards was formally reviewed by a commission that was created by the Québec government to study and make recommendations about the required services. A report entitled "Municipal Services in Inuit Territory", by Gilles Jolicoeur et al, was published in 1979 and has served as an important reference for all discussions of required services and standards in Northern Québec. Volume II of the Phase I Study provides all of the technical descriptions and space needs for municipal and other services in Taq pangajuk.

In addition to the municipal or other governmental services, Northern Québec communities have regular air service, and a satellite based telephone, radio and T.V. system. Air transport plays a major role in maintaining health services, and its importance is increasing in the movement of foods and other materials. Sea lift is still the main means of delivering fuel, large equipment and building supplies. Fuel oil is obtained by private contract either through Shell Oil or Fédération des Coopératives du Nouveau-Québec and other consumer goods are merchandised through Hudson Bay Company stores or la Fédération. A small number of individually operated businesses are beginning to develop and provide access to consumer goods or special services.

Municipal Services

Housing

Standards for Inuit housing in Northern Québec have been determined by la Société d'Habitation du Québec (SHQ). The design features of the SHQ house have recently been modified to incorporate suggestions and concerns raised by Inuit in a study of their housing needs and design preferences. In order to obtain an adequate level of housing throughout Northern Québec, SHQ has initiated a five-year catch-up program that will supply the required housing projected for each community by 1992. The housing program will continue to stress 3,4 and 5 bedroom houses each of which has the standard services for running water, fuel oil based heating systems and electrical cooking.

The development of Taqpangajuk will be based on the SHQ standards and delivered as part of the catch-up program. The SHQ will reallocate to Taqpangajuk houses now scheduled to be built for Killiniq Inuit in the host communities, where applicable. Under SHQ's designs the core group of Killiniq Inuit, 20 families, would require (Appendix 4)

- 1 building containing 4 two bedroom houses;
- 7 three bedroom houses;
- 3 buildings containing 2 four bedroom houses;
- 1 five bedroom house;
- 2 six bedroom houses.

Water supply

Design criteria and estimated consumption rates are based on two types of delivery systems; trucks or pipes. Standards for these two systems have been implemented by the Kativik Environmental Quality Commission and are generally used by K.R.G. when upgrading these services in Northern Québec (Appendix 5).

The average consumption in Northern Québec for truck delivery systems, and the standard applied to Taqpangajuk, is 120 liters per person per day. Based on this average consumption rate and on the size of the community, it is possible to determine daily and total yearly consumption in cubic meters for northern municipalities.

Solid waste disposal

All Northern Québec municipalities must have a designated site for the disposal of solid waste. The location and physical characteristics of waste disposal sites are controlled by provincial regulations which in turn are used by the K.E.Q.C. (Appendix 5). All solid waste sites must be fenced, granular material must be available for eventual back filling of the site, and all toxic waste must be shipped to the South for disposal.

During Phase I a solid disposal site of 15,200 m² was identified (SW, Figure 2) on the basis of the Phase I population projection. The site met all of the requirements of the K.E.Q.C. and would have an approximate life of 20 years. With the new population projections it has been estimated that the disposal site will only have to be 14,500 m² for a 25 year life span.

Liquid waste

A set of accepted design criteria have been established for the treatment of all waste water in Northern Québec by Environnement Québec and the K.E.Q.C. (Appendix 5). These treatment systems are intended to remove the soluble and colloidal organic matter. The two mechanisms for affecting this treatment are through physical-chemical means or by biological treatment. For the North, biological treatment processes are most appropriate.

This service can be provided in Taq pangajuk through a rotating biological contactor (RBC), a mechanically driven system that only requires a prefabricated building to be erected in an appropriate siting. A second possible system uses a facultative pond system, a preferred option for small communities. However, specific site and design constraint analyses must be made before choosing this type of treatment because it requires natural or man-made ponds with an impervious substrate that can be used for the oxidation of waste.

Natural ponds of this type do not exist at Taq pangajuk and the system selected for the delivery of waste water is the RBC.

Municipal service facilities

The delivery of municipal services is dependent upon the availability of facilities and equipment that are standard for every municipality in Northern Québec. These facilities include :

- . An office building for administrative functions needed to deliver and manage community services. In most Northern communities, this building also serves to house other services such as the Post office, the government of Québec offices (welfare, manpower, etc.) and the local Landholding Corporation.
- . A fire hall that includes space to house a special fire truck, pumps and firefighting equipment.
- . A housing warehouse to serve as the storage and maintenance center for all of the materials and equipment needed to maintain the housing units including their heating, plumbing and other facilities.
- . A municipal garage which is required to house and repair all of the vehicles and other types of equipment or tools that service the community and are now standard in Northern Québec.

Health services

The delivery of reliable health services is absolutely essential in every community. The system developed in Northern Québec involves the utilization of nursing stations with trained nurses that are connected by telephone and air service to the regional hospital in Kuujjuaq. Kuujjuaq is in turn connected to major health facilities in Montréal or Québec city.

The standard design for the nursing station includes two examination rooms, a waiting room, pharmacy, consultation office, showers and toilet facilities. In Northern Québec, the new nursing stations also have a meeting room for the local health committee and an office for social services.

The nursing station will provide three types of services to the community: community health, nursing and social services. Two nurses and a local assistant will give front-line services in nursing and community health, and a local social worker will take care of social services. They will be assisted periodically by visiting doctors, dentists, others specialists, and social workers from the Ungava Hospital Centre in Kuujjuaq.

Police station

The police station will be part of la Sûreté du Québec network, until the Kativik Regional Police Force is created, and must respect standards established for Northern Québec communities. There will be 1 local police officer to maintain peace and order and to carry out prevention programs on a 24 hours-a-day, 7 days-a-week basis. There may be an auxiliary officer to help him.

The building itself will have to be detached from any other building because of the nature of police activities. These activities are prevention, detention, incarceration, conservation of exhibits, investigation and answering calls of complaint. In Northern Québec, the police stations include : an office (for complaints and investigations); 2 cells (for detention and incarceration); an exhibits room (for evidence, fingerprints, etc.); and a bathroom.

Educational services

In Northern Québec, educational services are the mandate of the Kativik School Board which was created under the James Bay and Northern Québec Agreement. The Kativik School Board recommends that Taqpingajuk have a school to provide education from kindergarten through Secondary III in Inuktitut, English and French. For Secondary IV and V, the students will have to go to Jaanimmarik School in Kuujjuaq. If they want to continue their education they must go outside the territory since

there are, at present, no post-secondary institutions in Northern Québec.

The schools in Northern Québec are also the focus of many community activities because of their available space and they serve the important function of providing community recreation through a gymnasium and adjacent playgrounds.

Electrical energy

In the 13 Northern Québec municipalities electricity is produced by diesel generators with a capacity of 50 kw to 800 kw depending on the local needs. The cost of such an operation is extremely high but Hydro-Québec has standardized domestic rates across the province.

As agreed in the terms of reference for this study, the standards used by Hydro-Québec have been applied. Since Hydro-Québec took over the Northern Québec communities' electrical generating equipment, in 1981, there has been a continuous upgrading and standardization of equipment. The present 5-year program, ending in 1990, will have the majority of northern villages enjoying new or upgraded facilities. Consequently, it has been assumed that this will also apply to Taqpangajuk.

Airport

During the last Killiniq Heads of Family Meeting, March 17-20, 1987, much discussion occurred about the airport design criteria for Taqpangajuk. The Killiniq Inuit agreed that while a 1070 meter airstrip was preferable, since it is the standard for Northern Québec communities, they would be able to live with an airstrip of only 600 meters in length.

The Inuit also made it clear that they would prefer a 600 meter airstrip with all support infrastructure (buildings, instrumentation, lighting, etc...) than a 1070 meter airstrip without any.

As a result, two village options were developed :

Option 1 : the village of Taqpangajuk as already described in the Phase I Feasibility Study with a 1070 meter airstrip;

Option 2 : the same village of Taqpangajuk as above except with a 600 meter airstrip.

In both cases, the airstrips would be equipped with the required terminal and buildings, and minimal instrumentation and lighting.

Although a 600 meter airstrip would not fit the current standards in Northern Québec, it should be acceptable to both Transport Canada and Transports Québec since it would only be serviced by Twin Otter. This airstrip could also be extended at some future date so as to meet the 1070 meter standard.

Other Services

Volume II of the Phase I report provided a detailed description of other facilities that are required to maintain the economic and social functions of northern communities. These include commercial services, church, formal recreation area, such as a hockey rink, and perhaps a hotel or transient facility.

The design, space requirements and specific functions of each of these facilities were described in Volume II and a cost has been established for each of these services. In Phase II, they have been eliminated as part of the immediate community cost covered by government, but their specifications and estimated cost are provided in BRR's report for Phase II. All the services are described in Table 3.

Organization of Services and Master Plan

The terms of reference for the Phase I Study called for the development of master plan options. This was necessary in order to establish an appropriate location for facilities in relationship to their needs and site requirements. The master plan was an important tool that was used to animate serious discussions with the Inuit about the design and functioning of the proposed community.

The results of this process along with the suggested changes that are evident from the Phase II Study are illustrated in Figure 3. This master plan is not considered to be a final option and, as suggested in the critique of Phase I, and in some of the technical committee meetings held during Phase II, it may be possible to suggest other design criteria and locational preferences for Taqpangajuk that meet the requirements for services and their facilities as developed in Northern Québec. The master plan, however, provides an important point for future discussions. It also serves as a base for additional geotechnical studies and other site evaluations to be carried out when preliminary studies take place and final construction plans are drafted.

2.5 Management Structure

The planning and construction stage for Taqpangajuk should be under the direction of an independent management and well defined body. Upon completion of the community, this management body will relinquish its role and the community will be operated by la Corporation du village nordique de Taqpangajuk following the standards of municipal governments under the Kativik Regional Government.

The construction of a new community at Taqpangajuk requires cooperation between the federal and provincial governments, as well as the Kativik Regional Government, Makivik Corporation and various other agencies such as Hydro-Québec, and la Fédération des Coopératives du Nouveau-Québec.

TABLE 3
Level of Services *

ITEM	SOURCE OF STANDARD	DETAILS		LIFE SPAN
		Building Size	Lot Area	
Native houses	S.H.Q.	according to their current housing policies and programs		
Warehouse	K.R.G.	12.0m X 9.0m	650m ²	
Office building	K.R.G.	15.9m X 23.5m	1240m ²	
School & playground	K.S.B.	40.0m X 21.0m	9200m ²	
Nursing station	M.A.S.	18.8m X 14.4m	900m ²	
Police station	Sûreté du Québec	12.8m X 4.3m	728m ²	
Municipal garage	K.R.G.	20.0m X 17.0m	1800m ²	
Community center	K.R.G.	7.6m X 24.4m	851m ²	
Telephone	C.R.T.C., Bell Canada, Telesat Canada	earth station: 37.0m X 37.0m substation: 18.0m X 23.0m	1400m ² 420m ²	
Tank farm	Shell Canada, F.C.N.Q.	capacity 1600m and 320m	4900m ²	
Store & warehouse	F.C.N.Q.	each 9.1m X 15.2m	1250m ²	
Power house	Hydro Québec	19.5m X 12.2m	12000m ²	
Drinking Water supply	K.E.Q.C.	provides 120L./pers.d. via truck 5.0m X 5.0m	900m ²	For Phase I 25 year population (435 persons)
Waste water treatment	K.E.Q.C.	R.B.C. serviced by a truck system 21.0m X 18m	750m ²	20 years with Phase I population projection
Solid waste disposal site	K.E.Q.C.		15200m ²	For Phase I 25 year population (435 persons)
Municipal equipment	K.R.G.	based on services to be delivered		
Sealift Storage	K.R.G.		7500m ²	
Airport	Transport Québec	eventually a 1070m airstrip		
Hotel	K.R.G. estimate	18.6m X 10.8m	59700m ² 1100m ²	
Radio station	C.R.T.C., T.N.I.	as in other northern communities		
Church	Arctic Diocese of the Anglican church of Canada	14.6m X 6.1m	858m ²	

*: For full details, consult The Relocation to Terpengejuk: A Feasibility Study, Volume II, Section I.

Although the greatest percentage of capital cost will be invested by the Canada, the Government of Québec will be responsible for the long-term operation and maintenance cost of the new municipality. The Kativik Regional Government will be responsible for the day-to-day operation of municipal services and the Killiniq Landholding Company will oversee development related to Category I and II lands, as defined in the James Bay and Northern Québec Agreement. The following agencies or departments will have a direct involvement in the development and operation :

- . Kativik Regional Government; Re : Municipal services
- . Kativik School Board; Re : School facilities and pedagogical program
- . Transport Québec; Re : Airstrip construction and future maintenance
- . Société d'Habitation du Québec; Re : Housing
- . Conseil Régional de la santé et des services sociaux Kativik; Re : Nursing station
- . Hydro-Québec; Re : Electrical power.

The development of an implementation plan for the construction involves that the management body recognizes the role and responsibilities of the following agencies :

- . Department of Indian and Northern Affairs; Re : Full technical support in cooperation with the project component and the development of documentation required for project funding
- . Secrétariat des Affaires autochtones (SAA); Re: Coordination of Québec policy and agencies north of the 55th parallel and in relationship to Kativik Regional Government and all provincial responsibilities within the James Bay and Northern Québec Agreement
- . Makivik Corporation; Re : Political, legal, technical and administrative advice and support
- . Killiniq Landholding Corporation; Re : Management and planning for Category I and II lands and all local responsibilities in respect to the Agreement and the Killiniq Inuit

- . Fédération des Coopératives du Nouveau-Québec; Re : Community store, fuel supply and other commercial ventures
- . Public Works Canada; Re : Technical expertise, project evaluation and critique
- . Société d'habitation du Québec; Re : Supply of housing in relationship to the five-year plan for housing in Northern Québec
- . Canadian Mortgage and Housing Corporation (CMHC); Re : Funding for Inuit housing through S.H.Q.
- . Environnement Québec through K.E.Q.C.; Re : Impact assessment procedures and project monitoring after project approval
- . Transport Québec and Transport Canada; Re : Funding and technical support for airstrip
- . Fisheries and Oceans Canada; Re : Technical support for sea lift and hydrographic data
- . Travail Québec and le ministère de la Main-d'oeuvre, de la Sécurité et du Revenu; Re : Safety standards in public buildings
- . Commission de la santé et de la sécurité au travail; Re : Safety standards on the work place
- . Air Inuit; Re : Scheduled and emergency air service
- . Canadian Coast Guard; Re : Technical and first stage logistical support
- . Bell Canada; Re : Communications within and outside the community.

Aims and Objectives of the Management Body

The management body responsible for the construction of Taqpangajuk will be faced with difficult logistical problems and working conditions created by the isolation of the proposed site and by the lack of transportation or other infrastructure. The body will have to accomodate the mandates of the participating agencies within a single management plan and within a specific budget and time table. The management body will have to respect the following considerations in order to complete successfully the construction of Taqpangajuk :

- 1) the obligations to the people of Killiniq as described in the Feasibility study;
- 2) the delivery of a level of service as first described in Phase I and then refined in the Phase II Study;
- 3) the completion of all phases of the work in accordance with an agreed budget;
- 4) the solicitation and management of funds in accordance with the implementation schedules and agreed guidelines established for the project.
- 5) plan and complete the construction of Taqpangajuk within a specified period of time;
- 6) assure that all work carried out conforms to the standards, laws and regulations that govern construction in Northern Québec;
- 7) design and construct particular buildings and infrastructures according to the specific requirements of the agency who will then operate a particular service;
- 8) assure that the Killiniq Inuit, in particular, and other Inuit, in general, are involved in the decision-making and that they benefit economically and socially from the construction program;
- 9) assure that the construction of the future community will respect the guidelines and remedial measures, if any, established during the Environmental Impact Review;
- 10) maintain efficient coordination and foster active cooperation between all of the bodies involved with the construction of Taqpangajuk.

Criteria of Management

In order to accomplish the above aims and objectives it is necessary to establish clear criteria with which to analyse and compare each proposed management structures.

1) Organizational structure; basic principles.

Efficiency with respect to human and financial resources as well as to establishing priorities and completing tasks; harmony with respect to the integration of the diverse groups involved in the project; flexibility to adjust all phases of the project when required but to maintain an overall direction to project objectives and procedures; availability of management personnel to maintain a constant contact with the project in order to minimize delays; representation that will respect the expertise and perspective of all groups participating in the project and encourage communication on all phases of the project.

2) Cost control.

The ability to design and establish cost control systems; the ability to justify and obtain funding from given sources; the ability to administer and control costs related to engineering, logistics, and construction; and the ability to maintain low overhead costs.

3) Competence and experience.

Previous experience of staff on similar projects; a balance of management and other skills required for the project; maintaining staff stability during project duration; knowledge about the North and sensitivity to Inuit concerns; and experience and understanding of government organizations, programs, and decision-making processes.

4) Native autonomy.

A structure involving Inuit in the decision-making process; development of a management style and objectives that will encourage Inuit to easily and effectively serve on, and contribute to, the management body; interest of management body in Inuit training and employment.

5) Phasing and duration.

Project scheduling flexibility and integration of stages according to the project plan; ability to minimize and overcome logistical, administrative and unforeseen delays.

6) Control of outside bodies.

Inclusion of one federal and one provincial representative on the management body to ensure links with funding sources; consultation and informing of all parties involved to ensure acceptability of buildings and infrastructure to future owners and operators; and implementation of procedures to all relevant standards and regulations.

7) Legal responsibilities.

Capacity to avoid or resolve problems that involve legal aspects of the project; ability to produce contracts and other documents that have legal implications; capacity to regulate jurisdictional problems.

8) Environmental quality control.

Capacity to follow instructions that result from the impact review process; recognition of a structure to have project modifications undergo review; on-site supervision of project with respect to the environment.

In order to use the criteria of management for comparative purposes importance factors for each had to be derived. By presenting the criteria to eight individuals and asking them to weight each so as to total 100, a mean weight value was arrived at.

Table 4
Weighting Factors for Criteria of Management

Criteria	Weight Factors									TOTAL	MEAN
	S	Y	R	J	M	B	C	G			
Organizational structure	25	15	15	10	20	25	16	20	146	18	
Influence on costs	15	12	10	8	15	3	16	15	94	12	
Competence and experience	25	14	20	11	15	20	15	10	130	16	
Native autonomy	20	25	20	24	15	15	11	20	150	19	
Phasing and duration	5	6	10	15	10	15	17	10	88	11	
Outside organism's control	10	6	10	11	10	4	14	15	80	10	
Legal responsibilities	0	3	10	5	5	3	5	5	36	5	
Environmental quality	0	18	5	16	10	15	6	5	75	9	

The weight factors, along with the criteria of management, would then enable a comparison of possible management bodies to ensue.

The Possible Management Bodies

During the course of the Phase II Study seven possible management bodies were discussed : Public Works Canada,
Kativik Regional Government,
DIAND,
Government of Québec,
Private Management Corporation,
Makivik Corporation,
Assivakvik.

Consideration of DIAND and Makivik Corporation as management bodies was dropped early on. DIAND was eliminated because its technical services would soon be moved to Public Works Canada. Makivik, on the other hand, was deleted because the project fell outside the capacity and mandate of the organization.

A brief description of the remaining five possible management bodies follows.

- 1) Public Works Canada. This group has access to experience and expertise within its own staff, and as described in the Feasibility Study critique, dated August 29, 1986, they have developed a Project Delivery System that could provide well-organized support and management for a project of this scale.
- 2) Kativik Regional Government. This government body is responsible for the implementation of capital projects in Northern Québec and for providing municipal services throughout Northern Québec. They have technical expertise and experience within their department of engineering and municipal technical services.
- 3) The Government of Québec. The provincial government through SAA has been responsible for the planning and the construction of a new community at Umiujaq and would be able to develop a similar team responsible for the Taqpangajuk project. Experience as a coordinating body, experience in the North with informal staff.
- 4) Private Management Corporation. This body would consist of technical and management expertise that would be drawn from one of the several capable consulting firms that have northern experience.
- 5) Assivakvik Corporation. This would be the name given to an independent non-profit relocation company that would be created to manage the Taqpangajuk project. This corporation would follow the

models of similar corporations that were developed for federal government sponsored relocations in the Indian communities of Chisasibi and Kawawachikamach.

The potential benefits and problems for each of these five bodies were discussed by the research personnel and by others who were invited to comment on the suitability for managing the Taqpangajuk project. During this process, two of the bodies, Kativik Regional Government and the Private Management Corporation, were eliminated as possible management structures. It was felt that Kativik Regional Government would be included under the Government of Québec option and that it would also be represented within the Assivakvik Corporation. Therefore, the elimination of Kativik Regional Government as an actual management structure would not diminish its role and responsibilities within the relocation process or management structure. The Private Management Corporation was eliminated as an option because it was considered that while a large consulting firm could technically carry out the project, it would be difficult for them to achieve a balance between the private and governmental sectors.

The remaining three management bodies were then analysed according to the criteria of management and their respective weights so as to select the most appropriate management option.

Selection of Proposed Management Option

The criteria and remarks for each of the three options are presented in Tables 5, 6 and 7. In addition, the criteria were evaluated by the weight factors and an overall score developed. The scores were used to rank the proposed management options and the outcome is shown in Table 8. This table shows that Assivakvik Corporation is considered to be the most appropriate management body.

Two possible management structures were discussed for the Assivakvik Corporation (Figure 5 and 6). Each figure identifies the major agencies and organizations that will play a role in the relocation and the relationship between them. Figure 5 is the more flexible management structure of the two. In this scenario all the money would be given to Assivakvik from whence contracts would be distributed. Moreover, economies of scale would be had because all earthworks would be carried out by Assivakvik.

The management structure in Figure 6 has less money going through Assivakvik and more directly to the involved parties. This provides less flexibility for Assivakvik and removes the economies of scale possible with the earthworks.

Either way, Assivakvik is the most appropriate management option. Through a structure such as Figure 5 or 6 an implementation procedure will be developed and a logical schedule of priorities established to meet the demands of construction and the social needs of the Killiniq Inuit. The estimated budget for meeting this task, in 1987 constant dollars, varies depending on the implementation schedule duration; \$2 million for five years, \$2.6 million for seven years, and \$3.0 million for nine years.

TABLE 5
PUBLIC WORKS CANADA MANAGEMENT ANALYSIS

Criteria	Remarks
Organisational Structure	. includes many departments and special services related to project needs; . well-organized and with experience in this scale of project; . may have difficulty concentrating attention on Taqungajuk project; . limited by bureaucratic procedures and less flexibility, especially with Québec.
Cost Control	. can be assumed that rigorous cost control procedures will be followed; . would be difficult to separate particular requirements or procedures needed for cost control of this project from more general departmental procedures.
Competence and Experience	. has the general competence and experience required for this scale of project; . access to wide range of departmental expertise; . has no recent experience in Northern Québec large construction projects.
Native Autonomy	. Killiniq Inuit have no direct experience with P.W.C. mandates or bureaucracy; . special positions would have to be created for Native representation with special procedures to assure access by Inuit; . center of management would be distant from North; . would be difficult to guarantee Inuit involvement that requires special training for employment.
Phasing and Duration	. overall control of projects is known to be very good; . start up and approval process may be slow;
Control of Outside Bodies	. relationship with other groups or agencies may be good within the federal system but difficult within Québec; . direction will be far from site; . procedures and standards for infrastructure to be maintained and operated by Québec may be difficult to assure.
Legal Responsibilities	. can develop required documents through contract branch; . has access to legal services and opinion; . risk of jurisdiction problems with federal construction on provincial lands.
Environmental Quality Control	. will follow the requirements established by impact review process; . will have to work through system established by le ministère de l'Environnement of Québec and by the K.E.Q.C. for project modifications; . will require P.W.C. work to be under supervision of on-site representatives of ministère de l'Environnement du Québec.

TABLE 6
QUEBEC GOVERNMENT MANAGEMENT ANALYSIS

Criteria	Remarks
Organisational Structure	. has capacity for access to management and technical expertise within Québec; . well-organized to work with other Northern Québec institutions and governmental procedures; . has flexibility and experience for coordination.
Competence and Experience	. has acquired experience through the planning, construction and evaluation of Umiujaq relocation; . experience and competence working with Québec based firms and other construction groups; . experience in management and operation of Northern Québec communities.
Native Autonomy	. Northern Québec Inuit familiar with SAA and have mechanisms for access; . Inuit training and on-site employment has been demonstrated in Umiujaq; . demonstrated development of Native planning and management body for Umiujaq.
Cost Control	. recent experience with Umiujaq on cost estimates and control; . has access to technical expertise on Northern Québec construction costs and their control; . no formal capacity to establish controls on federal budget allocations and procedures.
Phasing and Duration	. start up and approval process may be adequate within Québec but awkward with federal programs and procedures; . overall control of project with respect to schedule should be adequate;
Control of Outside Bodies	. relationship with other groups or agencies may be good within the provincial system but difficult within federal system; . familiar with bidding and selection procedures for Québec firms; . direction will be close to site through associations with Kativik Regional Government; . will be able to coordinate between construction and the standards required for future maintenance and operation of facilities.
Legal Responsibilities	. has access to legal services and opinion; . risk of certain jurisdiction problems concerning federal funding and provincial control over construction; . aware of legal problems and responsibilities within James Bay Agreement concerning Inuit employment and other types of participation.
Environmental Quality Control	. will have to prove its concern with following the mandates established from impact review process; . will have to establish system for respecting review process when making project modifications; . will easily facilitate on-site representation by ministère de l'Environnement du Québec.

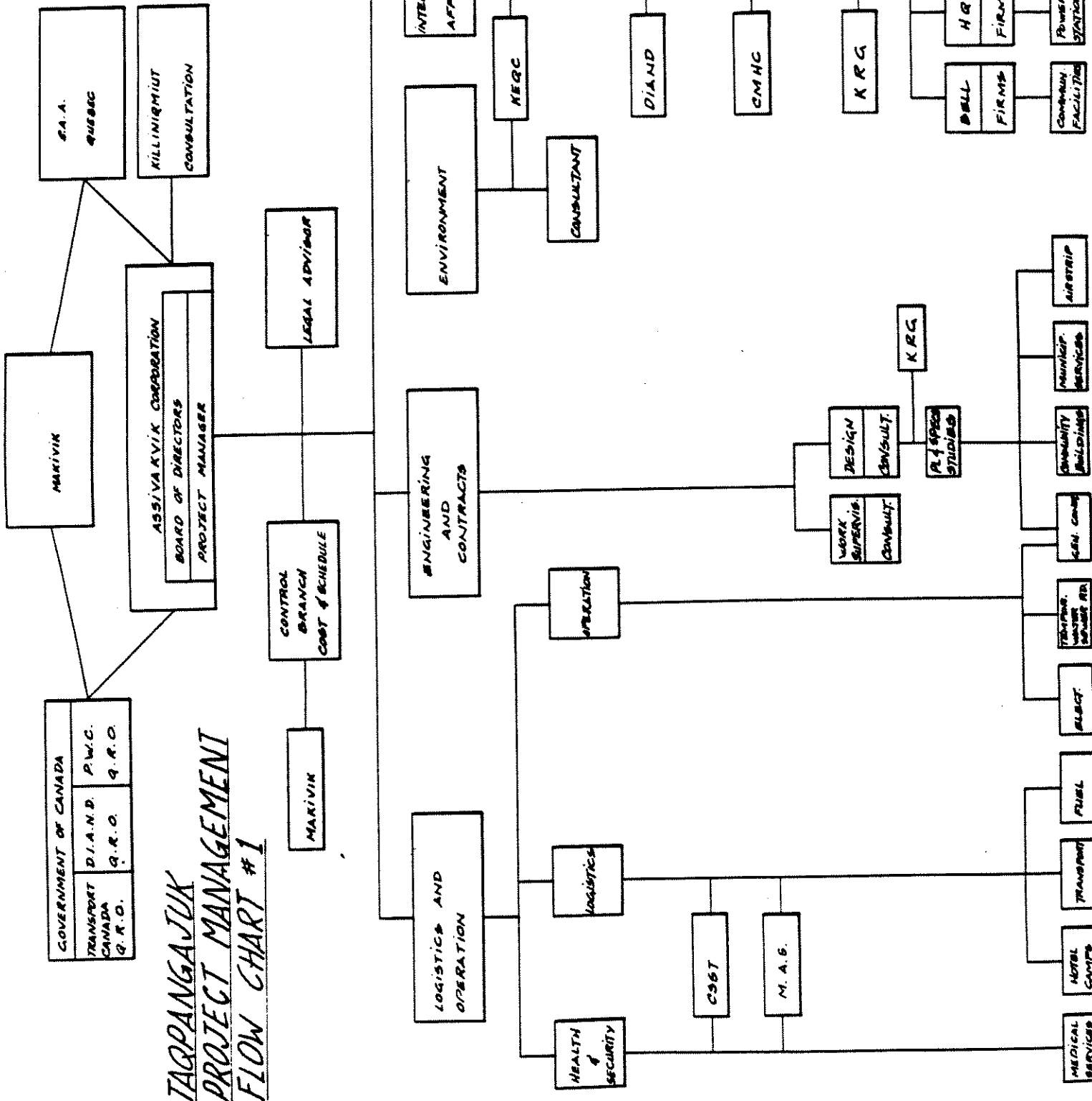
TABLE 7
ASSIVAKVIK CORPORATION MANAGEMENT ANALYSIS

Criteria	Remarks
Organisational Structure	. has advantage of single purpose organisation focussed specifically on Taqangajuk; . structure itself will have no experience and require that personnel has experience in required areas; . can accomodate both federal and provincial structures.
Cost Control	. has no formal experience in cost control; . will be able to design specific procedures and acquire needed expertise to manage cost; . can use Makivik Corporation accounting department for administration.
Competence and Experience	. will be new organisation with no proven experience but with enthusiasm of new organisation; . has capacity to examine needs and acquire competent personnel in accordance with these needs.
Native Autonomy	. will be able to establish Inuit participation in project management; . will encourage Inuit presentation of concerns and ideas throughout project; . will have to establish clear limits between Native autonomy and the utilisation of other technical expertise and non-Native concerns.
Phasing and Duration	. will be directly involved in project planning and identify clear stages of development; . will be mandated to complete project within the final plan.
Control of Outside Bodies	. will be established with representation from federal and provincial government on Board of Directors; . will select management personnel with experience in dealing with relevant outside bodies; . can balance relationships between different jurisdictions and bodies.
Legal Responsibilities	. will be designed with full legal responsibilities for its decisions and actions; . will have access to legal department of Makivik Corporation; . can draw on legal expertise within both governments for contracts and other documents required for project.
Environmental Quality Control	. can be mandated to follow all environmental requirements established in law and requested by impact review process; . can establish procedure for project modification in relationship to review process.

TABLE 8
COMPARISON OF MANAGEMENT OPTIONS

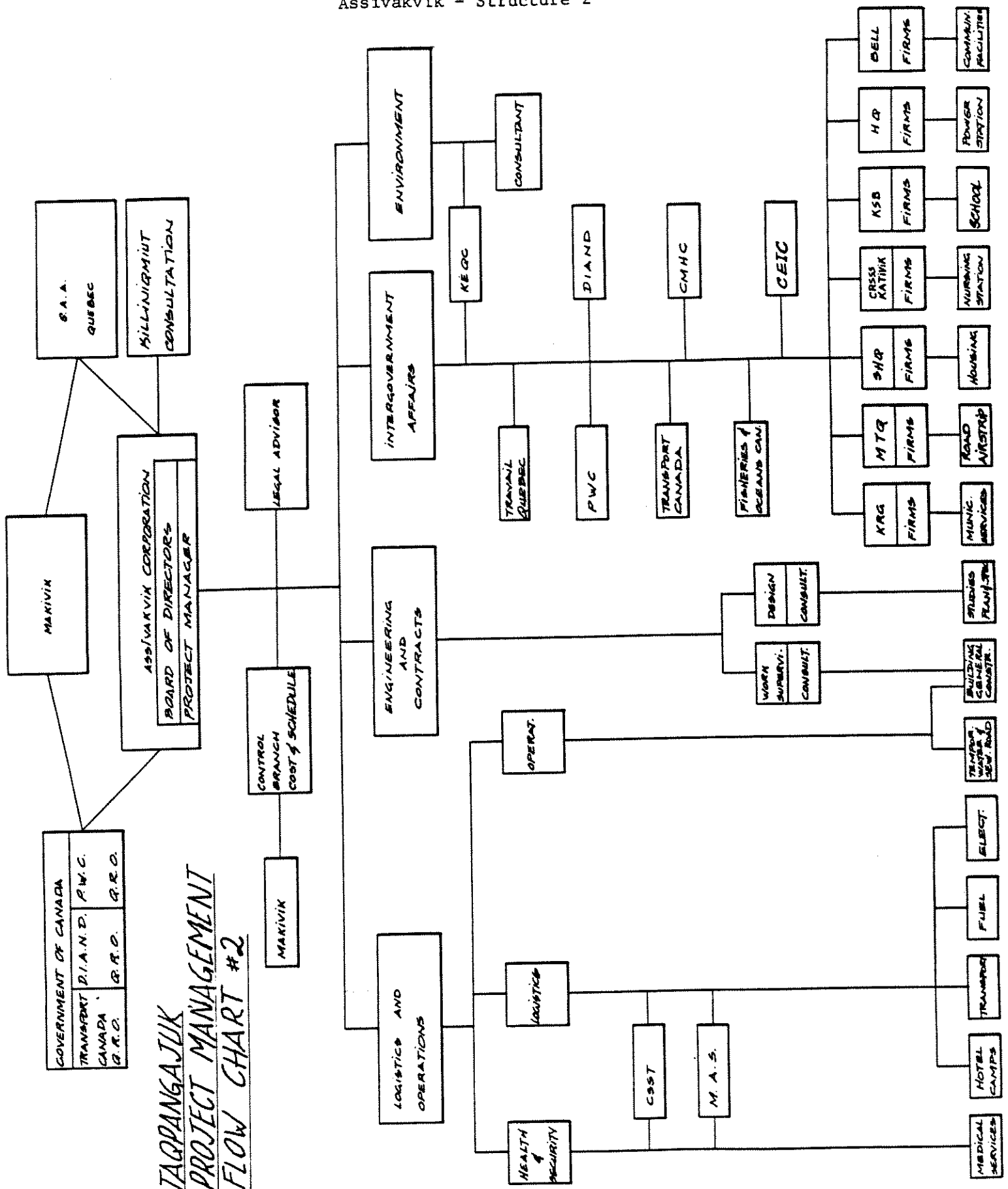
Criteria (weight)	Score		
	PWC	QUEBEC	ASSIVAKVIK
Organisational Structure (18)	378	162	702
Influence on cost (12)	216	228	384
Competence/Experience (16)	356	544	512
Native Autonomy (19)	209	570	779
Phasing Duration (11)	176	231	363
Outside bodies' control (10)	180	240	380
Legal Responsibility (5)	75	100	180
Government Quality Control (9)	252	207	333
TOTAL	1842	2282	3633
RANK	3	2	1

FIGURE 5
Assivakvik - Structure 1



*TAQPANGAJUK
PROJECT MANAGEMENT
FLOW CHART #1*

FIGURE 6
Assivakvik - Structure 2



2.6 Scheduling

As an outcome of the Phase I Feasibility Study, the Taqpangajuk project was planned for delivery in a five year plan. The review of Phase I by DIAND and PWC questioned the proposed implementation strategy and asked for more details.

Through a long process of consultation the research team, along with consultants, consulting engineers, and Umiujaq project representatives, developed a better picture of the scheduling problem. The following milestones were established in order to facilitate appropriate scheduling of the project.

1. Preliminary studies
2. Plans and specifications
3. Temporary services installation
4. Basic earthworks to allow Twin Otter aircraft service and construction of municipal garage
5. Continuation of earthworks to allow access to both the dump and airport
6. Construction of a permanent/temporary airstrip on the airport site.

After then adding other construction and operation activities around these milestones a redesigned five year implementation plan was derived.

At the last Technical Committee meeting, March 2, 1987, it was agreed that more scheduling options should be examined. Since the project cannot be compressed into 4 years, or less, the other schedules to be considered were to be seven and nine year plan.

The three proposed schedules were reassessed by BPR and costs generated for each. A brief description the schedule specifications follows :

Schedule 1 - 5 Year Plan

- 87/88 - first fiscal year used mainly for preliminary studies plus plans and specifications
- 88/89 - second fiscal year used to install construction camp, municipal garage and warehouse; construct roads (also to be used as a temporary airstrip), drainage and foundations; and to purchase municipal equipment
- 89/90 - third fiscal year to carry on earthwork and roads, construct municipal services and some buildings
- 90/91 - fourth fiscal year used for buildings, airport and power house construction
- 91/92 - fifth fiscal year used for buildings, airport and power house construction.

This schedule does not need a temporary airstrip because to begin with a part of the street network can be used as an airstrip until the permanent one is completed.

Schedule 2 - 7 Year Plan

- 87/88 - first fiscal year used for preliminary studies and a part of the plans and specifications
- 88/89 - second fiscal year used to complete the plans and specifications, install construction camp temporary services and complete earthworks required to install municipal garage and warehouse and to allow Twin Otter aircraft service
- 89/90 - third to fifth fiscal years used to complete the road network and construct buildings and municipal services
- 90/91 - temporary airstrip built in third year
- 91/92 - temporary airstrip built in third year
- 92/93 - sixth and seventh fiscal years used to complete buildings and to construct the permanent airstrip and other airport components.
- 93/94

Schedule 3 - 9 Year Plan

87/88 - used for preliminary studies

89/90 - used for plans and specifications

90/91

91/92 - used for construction of buildings, municipal services,
92/93 roads and foundations

93/94

94/95 - used for airport construction

95/96

Bar charts illustrating the respective schedules are shown in Figures 7, 8 and 9.

All three schedules were presented at the Killiniq Heads of Family Meeting and it was agreed upon by the Inuit that the five year implementation plan, Schedule 1, would best serve their aim and goals.

FIGURE 7
SCHEDULE 1 - 5 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89		1989-90		1990-91		1991-92	
				5 months		8 months		10 months		12 months	
CONSTRUCTION	<u>Category 1 - Buildings:</u>										
	Native houses (32)										
	Non native houses (6)										
	Warehouse										
	Office Building										
	School and playground										
	Nursing station										
	Police station										
	Municipal garage										

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES
	=====	_____	————— —————	-----

Fig. 7 (cont'd)

SCHEDULE 1 - 5 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89		1989-90		1990-91		1991-92	
				5 months		8 months		10 months		12 months	
CONSTRUCTION	<u>Category 2 - Municipal services</u>										
	- Drinking water supply & reservoir										
	- Dikes (for water supply)										
	- Wastewater treatment plant										
	- Solid waste disposal site										
	- Municipal equipment										
	<u>Category 3 - Earthworks</u>										
	- Permanent airport facilities										
	- Wharf & unloading area										
	- Fishing boat haul out										

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES
		—		-----

Fig. 7 (cont'd)

SCHEDULE 1 - 5 YEAR PLAN

TYPE	DESCRIPTION	1987-88					1988-89		1989-90	1990-91	1991-92
							5 months	8 months	10 months	12 months	
	- Roads										
	- Drainage works										
	- Foundations										
	- Cemetery										
	Category 4 - Public utilities										
	- Power house										
	- Power lines										
	- Radio station										

LEGEND

STUDIES
||||

PLANS & SPECIFICATIONS

CONSTRUCTION
|-----|

ONGOING ACTIVITIES

Fig. 7 (cont'd)

SCHEDULE 1 - 5 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89		1989-90		1990-91		1991-92	
				5 months	8 months	10 months	12 months				
OTHER EXPENSES	Assivavik project management										
	Archeological study	---									
	Preparatory study	---									
	Topographic survey and soil study	---									
	Hydrographic survey	---									
	Impact studies	---									
	Land surveyor	---									
	Construction camp				---						
	Construction power plant				---						
	Telephone installation				---						
	Moving of families and their personal belongings										

LEGEND

STUDIES

PLANS & SPECIFICATIONS

CONSTRUCTION

ONGOING ACTIVITIES

SCHEDULE 1 - 5 YEAR PLAN

TYPE	DESCRIPTION	1987-88				1988-89				1989-90				1990-91				1991-92			
						5 months				8 months				10 months				12 months			
	Project evaluation																				
TEMPORARY SERVICES (O + M)	Temporary services management																				
	Camp maintenance																				
	Nursing																				
	Space heating																				
	Electricity																				
	Drinking water supply																				
	Wastewater and solid waste																				
	Telephone																				
	Road maintenance																				
TOTAL:																					
FEDERAL GOVERNMENT PARTICIPATION:																					

LEGEND

STUDIES PLANS & SPECIFICATIONS CONSTRUCTION ONGOING ACTIVITIES

FIGURE 8
SCHEDULE 2 - 7 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89		1989-90	1990-91	1991-92	1992-93	1993-94
				4 months		6 months	8 months	10 months	12 months	12 months
CONSTRUCTION	<u>Category 1 - Buildings:</u>									
	Native houses (32)									
	Non native houses (6)									
	Warehouse									
	Office Building									
	School and playground									
	Nursing station									
	Police station									
	Municipal garage									

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES

Fig. 8 (cont'd)

SCHEDULE 2 - 7 YEAR PLAN

TYPE	DESCRIPTION	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
			4 months	6 months	8 months	10 months	12 months	12 months
CONSTRUCTION	<u>Category 2 - Municipal services</u>							
	- Drinking water supply & reservoir							
	- Dikes (for water supply)							
	- Wastewater treatment plan							
	- Solid waste disposal site							
	- Municipal equipment							
	<u>Category 3 - Earthworks</u>							
	- Temporary airstrip							
	- Permanent airp. facilities							
	- Wharf & unloading area							
	- Fishing boat haul out							

LEGEND

STUDIES
|||||

PLANS & SPECIFICATIONS

CONSTRUCTION
—————▶

ONGOING ACTIVITIES

Fig. 8 (cont'd)

SCHEDULE 2 - 7 YEAR PLAN

TYPE	DESCRIPTION	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
			4 months	6 months	8 months	10 months	12 months	12 months
OTHER EXPENSES	Assivekvik project management	---	---	---	---	---	---	---
	Archeological study	---	---	---	---	---	---	---
	Preparatory study	---	---	---	---	---	---	---
	Topographic survey and soil study	---	---	---	---	---	---	---
	Hydrographic survey	---	---	---	---	---	---	---
	Impact studies	---	---	---	---	---	---	---
	Land surveyor	---	---	---	---	---	---	---
	Construction camp	---	---	---	---	---	---	---
	Construction power plant	---	---	---	---	---	---	---
	Telephone installation	---	---	---	---	---	---	---
	Moving of families and their personal belongings	---	---	---	---	---	---	---

LEGEND

STUDIES

PLANS & SPECIFICATIONS

CONSTRUCTION

ONGOING ACTIVITIES

Fig. 8 (cont'd)

SCHEDULE 2 - 7 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89		1989-90		1990-91		1991-92		1992-93		1993-94	
				4 months		6 months		8 months		10 months		12 months		12 months	
	Project evaluation														
TEMPORARY SERVICES (O + M)	Temporary services management			---		---		---		---		---		---	
	Camp maintenance			---		---		---		---		---		---	
	Nursing			---		---		---		---		---		---	
	Space heating			---		---		---		---		---		---	
	Electricity			---		---		---		---		---		---	
	Drinking water supply			---		---		---		---		---		---	
	Wastewater and solid waste			---		---		---		---		---		---	
	Telephone			---		---		---		---		---		---	
	Road maintenance			---		---		---		---		---		---	
TOTAL:															
FEDERAL GOVERNMENT PARTICIPATION:															

LEGEND

STUDIES

PLANS & SPECIFICATIONS

CONSTRUCTION

ONGOING ACTIVITIES

FIGURE 9

SCHEDULE 3 - 9 YEAR PLAN

TYPE	DESCRIPTION	1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
CONSTRUCTION	<u>Category 1 - Buildings:</u>									
	Native houses (32)									
	Non native houses (6)									
	Warehouse									
	Office Building									
	School and playground									
	Nursing station									
	Police station									
	Municipal garage									

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES
	=====	_____	—————▶	-----

Fig. 9 (cont'd)

SCHEDULE 3 - 9 YEAR PLAN

TYPE	DESCRIPTION	1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
CONSTRUCTION	<u>Category 2- Municipal services</u>									
	- Drinking water supply & reservoir									
	- Dikes (for water supply)									
	- Wastewater treatment plan									
	- Solid waste disposal site									
	- Municipal equipment									
	<u>Category 3 - Earthworks</u>									
	- Temporary airstrip									
	- Permanent airp. facilities									
	- Wharf & unloading area									
	- Fishing boat haul out									

LEGEND

STUDIES  PLANS & SPECIFICATIONS  CONSTRUCTION  ONGOING ACTIVITIES 

Fig. 9 (cont'd)

SCHEDULE 3 - 9 YEAR PLAN

TYPE	DESCRIPTION	1987-88		1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
				4 months	6 months	8 months	10 months	12 months	12 months	5 months	5 months
	- Roads										
	- Drainage works										
	- Foundations										
	- Cemetery										
	<u>Category 4 - Public utilities</u>										
	- Power house										
	- Power lines										
	- Radio station										

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES
	=====	_____	—————▶	-----

Fig. 9 (cont'd)

SCHEDULE 3 - 9 YEAR PLAN

TYPE	DESCRIPTION	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
OTHER EXPENSES	Assiavvik project management	-----	4 months	6 months	8 months	10 months	12 months	12 months	5 months	5 months
	Archaeological study	-----								
	Preparatory study	-----								
	Topographic survey and soil study	-----								
	Hydrographic survey	-----								
	Impact studies	-----								
	Land surveyor	-----								
	Construction camp	-----								
	Construction power plant	-----								
	Telephone installation	-----								
	Moving of families and their personal belongings									

LEGEND	STUDIES	PLANS & SPECIFICATIONS	CONSTRUCTION	ONGOING ACTIVITIES
	=====	-----	—————▶	-----

Fig. 9 (cont'd)

SCHEDULE 3 - 9 YEARS' PLAN

TYPE	DESCRIPTION	1987-88		1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
				4 months	6 months	8 months	10 months	12 months	12 months	5 months	5 months
	Project evaluation										
TEMPORARY SERVICES (O + M)	Temporary services management			---	---	---	---	---	---	---	---
	Camp maintenance			---	---	---	---	---	---	---	---
	Nursing			---	---	---	---	---	---	---	---
	Space heating			---	---	---	---	---	---	---	---
	Electricity			---	---	---	---	---	---	---	---
	Drinking water supply			---	---	---	---	---	---	---	---
	Wastewater and solid waste			---	---	---	---	---	---	---	---
	Telephone			---	---	---	---	---	---	---	---
	Road maintenance										
TOTAL:											
FEDERAL GOVERNMENT PARTICIPATION:											

LEGEND

STUDIES

PLANS & SPECIFICATIONS

CONSTRUCTION

ONGOING ACTIVITIES

2.7 Cost Estimate Assessment

In the review of the Phase I Feasibility Study it was noted that while the project costs were reasonable for a Class "D" estimate they might have been presented in a different manner. It was therefore decided by the Technical Committee that the Phase I costs should not only be reassessed to confirm their accuracy, but also reassessed in conjunction with the 3 different implementation schedules so as to determine any savings that might be had.

An outside consultant, les Consultants BPR, was hired and a final report on the project cost submitted (Appendix 9). Tables 6,7,8 and 9 of the BPR report present a good overview of the project cost as related to schedules 1,2 and 3. The estimates prepared by BPR are based solely on Option 1, a village with a 1070 meter airstrip.

Estimated costs for Option 2, a village with a 600 meter airstrip, were derived from those of Option 1 in accordance with Transport Canada's evaluation presented in Appendix 6. According to Transport Canada, a 600 meter airstrip would reduce the overall cost by \$2,750,000 (1986-87 dollars), or \$2,860,000 (1987-88 dollars). Out of this, \$260,000 is already included in the construction camp and service items. Hence, it was assumed that a 600 meter airport's total cost would be reduced by \$2,600,000 (1987-88 dollars), which in turn would reduce the federal participation by \$1,612,000 (1987-88 dollars).

A detailed cost estimate for Option 2 has not been produced since the only modification from Option 1 is on the airstrip cost. Nevertheless, cash flows for Option 2 have been established on the basis of the aforementioned reduction.

2.8 Project Cost Analysis

Economic Analysis of Options and Schedules

One of the most important factors for a comparative analysis of project options is that of cost efficiency. The cost efficiency for each of the proposed options and schedules must be compared in order to facilitate the correct choice for the implementation of the Taqpangajuk project.

A standard benefit cost analysis is not apropos for such a comparison as no money interest is yielded by the project implementation. A more appropriate method is the Net Present worth of construction costs, or Net Present Cost, as derived from Life Cycle Costing analyses. Based on this means for comparing each option, a comparative economic analysis can be carried out. This approach allows current dollar (indexed) cash flows and total cost figures to be presented and compared in the same manner for both the global and federal cash flows.

Basic Assumptions for Economic Analysis

Due to the complexities of any comparative economic analysis basic assumptions must be made. During the course of the project several potential sources of funding were identified. These were :

- that the Québec government pay its share of the airstrip's cost according to the Northern Airstrip Infrastructure Improvement Program;
- that Hydro Québec pay for the construction of the power plant once Taqpangajuk was built, as required by law and federal and provincial agreements;
- that the Québec government assumes all operation and maintenance costs for the community once it is constructed;

- that other private organizations finance the construction of infrastructures such as the tank farm, store, church, etc.

These sources were assumed to exist in the economic analysis calculations. It should be noted that the total cost figures, however, do not include any of the private funding monies. The approximate 2.6 million dollars to be put forward by private sources could not be used in the calculations because the timing for this spending was unspecified.

Net Present Cost

The Net Present Cost of a project is the amount of money that should be placed in a bank to finance the project over its duration. The fact that the money will grow at a certain interest rate is taken into consideration.

Depending on the type of cost estimate used, there are two ways to determine the Net Present Cost. If the expenses to be covered are estimated in current dollars (indexed) it is necessary to use an interest rate that corresponds to that at which the owner can borrow or lend money. In a perfect market these rates should be approximately equal.

If, however, the expenses to be covered are estimated in constant dollars (dollars of the same year), as they are presented in the BPR report, a net discount rate is used to determine the Net Present Cost. The net discount rate is basically derived as follows :

$$1 + d = \frac{1 + r}{1 + i}$$

where d = discount rate

r = interest rate (to borrow or lend money)

i = inflation rate

Hence,
$$d = \frac{1 + r}{1 + i} - 1$$

For example, if r = 7% and i = 3%, the net discount rate would be :

$$d = \frac{1.07}{1.03} - 1 = 3.9\%$$

Each of the expense cash flows is therefore discounted by a factor of $(1 + d)^y$, where y is the number of the year (from year 0) cash flow is to be spent.

Since the major part of funding for the Taqpangajuk project is federal it was decided to conduct all calculations with the Federal government's net discount rate, as derived in Appendix 7.

Evaluation of Net Present Cost

On the basis of the developed discount rate (3.0%) a comparison of two options, a village with a 1070 meter airstrip and a village with a 600 meter airstrip, was carried out. For each option, the Net Present Cost of both the Federal contribution and global cost was calculated for a five, seven and nine year implementation schedule.

The cash flows for Option 1 are the amounts of money to be spent for each fiscal year according to the BPR estimates (Tables 6,7 and 8 of Appendix 9).

The cash flows for Option 2 are almost identical except an amount of \$2,600,000 was subtracted as explained in Section 2.7.

Tables 9 to 12 show the cash flows by option and the results of the Net Present Cost calculations.

TABLE 9

OPTION 1
1070 meter airstrip

Federal Funding
Cash Flows
(1000 1987 dollars)

Year		Schedule 1 5 year Plan	Schedule 2 7 year Plan	Schedule 3 9 year Plan
Year 0	1987-88	2011.8	1501.2	1097.5
Year 1	88-89	7008.9	3011.4	2894.6
Year 2	89-90	6941.3	4552.0	3441.5
Year 3	90-91	6696.4	5816.3	4692.4
Year 4	91-92	5534.0	5825.6	4657.1
Year 5	92-93	--	5840.2	4048.1
Year 6	93-94	--	2891.1	3524.0
Year 7	94-95	--	--	3288.0
Year 8	95-96	--	--	2601.9

Net Discount Rate	Net Present Cost (1000 1987 dollars)		
	Schedule 1	Schedule 2	Schedule 3
0%	28 192.4	29 437.8	30 245.1
2%	26 977.8	27 548.4	27 846.2
3%	26 404.4	26 673.4	26 754.3
4%	25 852.3	25 840.9	25 727.2
6%	24 807.6	24 293.6	23 848.3

TABLE 10

OPTION 1
1070 meter airstrip

Total Cost
Cash Flows
(1000 1987 dollars)

Year	Schedule 1 5 year Plan	Schedule 2 7 year Plan	Schedule 3 9 year Plan
Year 0 1987-88	2014.6	1501.2	1097.5
Year 1 88-89	7043.9	3013.4	2896.6
Year 2 89-90	7492.9	5142.0	3841.5
Year 3 90-91	11096.4	5851.1	4727.4
Year 4 91-92	7557.4	6144.2	4975.7
Year 5 92-93	--	9560.2	6048.1
Year 6 93-94	--	5358.3	4525.1
Year 7 94-95	--	--	5238.0
Year 8 95-96	--	--	4148.0

Net Discount Rate	Net Present Cost (1000 1987 dollars)		
	<u>Schedule 1</u>	<u>Schedule 2</u>	<u>Schedule 3</u>
0%	35 205.2	36 570.4	37 497.9
2%	33 560.6	34 004.7	34 277.5
3%	32 785.5	32 821.5	32 818.1
4%	32 039.9	31 699.0	31 449.0
6%	30 631.4	29 621.2	28 955.1

TABLE 11

OPTION 2
600 meter airstrip

Federal Funding
Cash Flows
(1000 1987 dollars)

Year		Schedule 1 5 year Plan	Schedule 2 7 year Plan	Schedule 3 9 year Plan
Year 0	1987-88	1881.8	1501.2	1097.5
Year 1	88-89	7008.9	3011.4	2894.6
Year 2	89-90	6941.3	4552.0	3441.5
Year 3	90-91	5736.4	5816.3	4692.4
Year 4	91-92	5012.0	5695.6	4657.1
Year 5	92-93	--	4880.2	4048.1
Year 6	93-94	--	2369.1	3394.0
Year 7	94-95	--	--	2328.0
Year 8	95-96	--	--	2079.9

Net Discount Rate	Net Present Cost (1000 1987 dollars)		
	Schedule 1	Schedule 2	Schedule 3
0%	26 580.4	27 825.8	28 633.1
2%	25 460.9	26 095.3	26 449.5
3%	24 932.1	25 292.6	25 452.8
4%	24 422.7	24 528.2	24 513.5
6%	23 458.1	23 105.2	22 790.7

TABLE 12

OPTION 2
600 meter airstrip

		Total Cost Cash Flows (1000 1987 dollars)		
Year		Schedule 1 5 year Plan	Schedule 2 7 year Plan	Schedule 3 9 year Plan
Year 0	1987-88	1884.6	1501.2	1097.5
Year 1	88-89	7043.9	3013.4	2896.6
Year 2	89-90	7492.9	5142.0	3841.5
Year 3	90-91	9496.4	5851.1	4727.4
Year 4	91-92	6687.4	6014.2	4975.7
Year 5	92-93	--	7960.2	6048.1
Year 6	93-94	--	4488.3	4395.1
Year 7	94-95	--	--	3638.0
Year 8	95-96	--	--	3278.0

		Net Present Cost (1000 1987 dollars)		
<u>Net Discount Rate</u>		<u>Schedule 1</u>	<u>Schedule 2</u>	<u>Schedule 3</u>
0%		32 605.2	33 970.4	34 897.9
2%		31 119.1	31 662.9	32 026.7
3%		30 418.3	30 597.2	30 721.5
4%		29 743.9	29 585.2	29 494.7
6%		28 468.9	27 709.3	27 253.5

Evaluation of Cost in Current Dollars

For any federally funded project total current dollar figures must be presented to the relevant department officials and Treasury Board analysts. In order to evaluate Taq pangajuk's real project cost in current dollars, inflation factors were applied to the 1987 constant dollar cash flow as provided by the Treasury Board (Table 13).

TABLE 13
PROJECTED INFLATION FACTORS 1987-1996

<u>Year</u>	<u>Inflation Rate</u>	<u>Inflation Factor</u>
1987-88	3.4	1.000
1988-89	3.1	1.0340
1989-90	3.0	1.0661
1990-91	3.0	1.0980
1991-92	3.0	1.1310
1992-93	3.0	1.1649
1993-94	3.0	1.1999
1994-95	3.0	1.2358
1995-96	3.0	1.2729

The current dollar figures for the total cost and federal funding for options 1 and 2, and all scheduling scenarios can be found in Tables 14, 15, 16 and 17.

TABLE 14
Option 1 (1070 meter airstrip)
Federal Funding

Year	Inflation factor	Cash Flows (1000 current dollars)		
		Schedule 1	Schedule 2	Schedule 3
87-88	1.0000	2011.8	1501.2	1097.5
88-89	1.0340	7247.2	3113.8	2993.0
89-90	1.0661	7400.1	4852.9	3669.0
90-91	1.0980	7352.6	6386.3	5152.3
91-92	1.1310	6259.0	6588.8	5267.2
92-93	1.1649		6803.2	4715.6
93-94	1.1999		3469.0	4228.4
94-95	1.2358			4063.3
95-96	1.2729			3312.0
Total		30270.7	32715.2	34498.3

TABLE 15
Option 1 (1070 meter airstrip)
Total cost

Year	Inflation factor	Cash Flows (1000 current dollars)		
		Schedule 1	Schedule 2	Schedule 3
87-88	1.0000	2014.6	1501.2	1097.5
88-89	1.0340	7283.4	3115.9	2995.1
89-90	1.0661	7988.2	5481.9	4095.4
90-91	1.0980	12183.4	6424.5	5190.7
91-92	1.1310	8547.4	6949.1	5627.5
92-93	1.1649		11136.4	7045.4
93-94	1.1999		6429.4	5429.7
94-95	1.2358			6473.1
95-96	1.2729			5280.0
Total		38017.4	41038.4	43234.4

TABLE 16
Option 2 (600 meter airstrip)
Federal Funding

Year	Inflation factor	Cash Flows (1000 current dollars)		
		Schedule 1	Schedule 2	Schedule 3
87-88	1.0000	1881.8	1501.2	1097.5
88-89	1.0340	7247.2	3113.8	2993.0
89-90	1.0661	7400.1	4852.9	3669.0
90-91	1.0980	6298.6	6386.3	5152.3
91-92	1.1310	5668.6	6441.7	5267.2
92-93	1.1649		5684.9	4715.6
93-94	1.1999		2842.7	4072.5
94-95	1.2358			2876.9
95-96	1.2729			2647.5
Total		28496.2	30823.5	32491.5

TABLE 17
Option 2 (600 meter airstrip)
Total cost

Year	Inflation factor	Cash Flows (1000 current dollars)		
		Schedule 1	Schedule 2	Schedule 3
87-88	1.0000	1884.6	1501.2	1097.5
88-89	1.0340	7283.4	3115.9	2995.1
89-90	1.0661	7988.2	5481.9	4095.4
90-91	1.0980	10427.0	6424.5	5190.7
91-92	1.1310	7563.4	6802.1	5627.5
92-93	1.1649		9272.8	7045.4
93-94	1.1999		5385.5	5273.7
94-95	1.2358			4495.8
95-96	1.2729			4172.6
Total		35146.6	37986.9	39993.7

Discussion of Economic Analysis

By comparing Taqbangajuk's "Total Cost" or "Federal Funding" figures (Table B, Executive Summary) for Options 1 and 2 it can be seen that Schedule 1, the 5 year plan, is the most cost efficient duration of implementation. This is illustrated in all three presentations of the costs. While the Net Present Cost figures demonstrate Schedule 1's economy by a variance of a few hundred thousand dollars, the savings in "current dollars" is approximately 4 million dollars between Schedule 1 and Schedule 3.

2.9 Risk Assessment

The scope of this section is to determine the risk factors inherent in the Taqpangajuk project, and to evaluate the risk amounts accordingly. To do so, the project was divided into five infrastructures or work categories, as described in the BPR report, plus one other for operation and maintenance :

1. Buildings
2. Earthworks
3. Municipal Services
4. Public Utilities
5. Studies and Temporary Services
6. Operation and Maintenance of the Village after Construction.

For each of the categories there are four possible sources of risk :

- a) Quality or quantity of actual preliminary studies
- b) Tender call and scheduling
- c) Construction business market
- d) Unquantifiable elements.

Risk factors were developed by the research team on the basis of Class "D" estimates for each implementation schedule and option (Appendix 8). The project risk, by schedule and option, is summarized in Tables 18 and 19.

TABLE 18
Total Project Risk - Option 1
(1000, 1987 constant dollars)

Schedule	Category of work	Cost	Risk Factor %	Risk Amount
Schedule 1	Buildings	11,700	20	2,340
	Earthworks	13,950	57	7,950
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				15,260
	Studies and Temp. Services	4,990	25	1,250
Total Construction Risk				16,510
	Operation	550	500	2,750

Schedule 2	Buildings	11,700	20	2,340
	Earthworks	14,290	57	8,150
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				15,460
	Studies and Temp. Services	5,990	25	1,500
Total Construction Risk				16,960
	Operation	550	300	1,650

Schedule 3	Buildings	11,700	20	2,340
	Earthworks	14,590	57	8,320
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				15,630
	Studies and Temp. Services	6,620	25	1,660
Total Construction Risk				17,290
	Operation	550	100	550

TABLE 19
Total Project Risk - Option 2
(1000, 1987 constant dollars)

Schedule	Category of work	Cost	Risk Factor %	Risk Amount
Schedule 1	Buildings	11,700	20	2,340
	Earthworks	11,350	54	6,130
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				13,440
	Studies and Temp. Services	4,990	25	1,250
Total Construction Risk				14,690
	Operation	550	500	2,750

Schedule 2	Buildings	11,700	20	2,340
	Earthworks	11,690	54	6,310
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				13,620
	Studies and Temp. Services	5,990	25	1,500
Total Construction Risk				15,120
	Operation	550	300	1,650

Schedule 3	Buildings	11,700	20	2,340
	Earthworks	11,990	54	6,470
	Mun. Services	2,800	20	560
	Public Utilities	4,410	100	4,410
Construction Risk Subtotal				13,780
	Studies and Temp. Services	6,620	65	4,300
Total Construction Risk				15,440
	Operation	550	100	550

3. SUMMARY

3.1 Conclusions

The completion of the Phase II report on the relocation of the Killiniq Inuit to a new community at Taqpangajuk has provided all of the information needed to confirm that the site, the infrastructure and the relocation process is feasible. Since the beginning of the Phase I study in July 1985, there has been a continual process of data collection, analysis and evaluation about Taqpangajuk. This process has incorporated Inuit from Killiniq, representatives of Makivik Corporation, Kativik Regional Government and both the government of Canada and Québec, and it has been supported by technical expertise from within and outside these groups.

All of the data and the specific or general findings derived from this data have been described in the reports issued on the relocation. At this point in time, it should be clear that the physical characteristics of the site, the requirement and type of infrastructure and the level of required services have been identified and integrated into a preliminary master plan. Many technical details remain to be studied but there should be no concern at this time that these technical studies will alter any of the basic conclusions from the Phase I and Phase II studies.

Finally, it must once again be reiterated that the technical aspects of relocation have been dealt with in order to further the legitimate social aspirations of the Killiniq Inuit to regroup within a new community. It is this objective that served as the focus for all technical studies. The need for a new community has been clearly demonstrated and the commitment of the Killiniq Inuit has not faltered in spite of their frustrations with continuing studies and assessments of the new community.

3.2 Proposed Future Strategies

The following activities are to be carried out in the next phase of the project. Short term activities will be carried out immediately; medium term activities will be carried during the 1987 field season and into the winter; and long term activities are those to be carried out from 1988 on.

Short Term

1. The formalization of the Assivavik Corporation structure and legality.
2. The preparation of job descriptions for the essential management posts in the project.
3. The preparation of terms of reference for the preliminary studies and plans and specifications.
4. The carrying out of correspondence with KSB, KRG, CRSSS Kativik, and other provincial organizations asking for the development of necessary plans and studies.
5. The obtaining of project approval from Cabinet.
6. The development of a strategy to deal with the planned move of approximately 50 Killiniq Inuit to Taqpangajuk this summer so as to not jeopardize future work at the site.

Medium Term

1. The selection of staff for the posts described in #2 above.
2. The carrying out of all studies necessary for the development of specific plans and specifications including the following :

- geotechnical studies to confirm the rock structure in the area of planned activity and the availability and type of aggregate material present;
 - hydrological studies on the drinking water lake's depth and interconnection with other nearby ponds and lakes;
 - a bathymetric study of Taqpangajuk's northern inlet to verify its marine accessibility;
 - a wave and tidal current study to determine any impediments that may exist either for sea lift barge operations or for permanent dock facilities;
 - a reassessment of the archeological potential of Taqpangajuk and development of protection plan, if necessary;
 - an investigation and evaluation of alternate airstrip sites put forward during Phase II;
 - an evaluation and possible reworking of the Master Plan developed during the Phase I study, in conjunction with the above studies.
3. The negotiation between Canada, Québec and Makivik for funding related to;
- airstrip construction,
 - power generation,
 - housing,
 - operation and maintenance of the constucted community.

4. The finalizing of arrangements with KSB, KRG, CRSSS Kativik, and other provincial organizations.
5. The finalizing of plans for buildings such as the school, nursing station, etc.
6. The development of a revised estimate of costs and cost sharing based on more accurate data.
7. The development of a revised schedule of project implementation.
8. The development of plans and specifications.

Long Term

1. The awarding of contracts and the mobilization and organization of construction materials for Taqpangajuk
2. The construction of the village.

3.3 Recommendations

The following are recommendations that are considered necessary for the successful realization of the Taqpangajuk project.

1. That the Federal government prepare itself to approve the Taqpangajuk project in view of the outstanding Killiniq issue.
2. That the Federal government select the 5 year implementation schedule for Option 2, the village of Taqpangajuk with a 600 meter airstrip, as it is both accepted by the Killiniq Inuit and the least expensive.

3. That the Federal government approves funding of \$ 1,681,000 for the development of project plans and specifications and \$330,000 for the setting up of the Assivakvik Corporation.
4. That Makivik Corporation continues negotiations with both Québec and Hydro Québec for funding of the airstrip and power plant at Taqpangajuk.
5. That DIAND organizes with the Québec government for project funding through various cost sharing programs.
6. That Canada and Québec commence negotiations over who shall pay for the Operation and Maintenance (O/M) of Taqpangajuk after it is constructed.
7. That the Federal government commence the approval process for funds so that construction can proceed during the summer of 1988.

APPENDIX 1
Schedule of Events

SCHEDULE OF EVENTS

May 1986	Submission Phase I Report
June 6	Public Works Canada requested to review Phase I report.
August 7	Makivik and P.W.C. meeting to discuss project.
August 12	Makivik, P.W.C. and DIAND meet to discuss the review of feasibility study and other related aspects of the project.
August 29	P.W.C. submits review of feasibility study to DIAND.
September	DIAND submits internal review of feasibility study.
September 4	Meeting with Makivik, Bill Clevette (DIAND), Anthony Price to discuss work to be done and various options for a Phase II feasibility study.
September 12	Gilles Gagné, Anthony Price and Marc Morais meet in Québec to discuss Marc's involvement with the project.
Mid-September	Canadian Hydrographic Service carried out preliminary bathimetric survey of Taq pangajuk area.
September 23	Makivik submits project proposal for Phase II of Feasibility Study.
October 6	Makivik receives review reports from DIAND.
October 10	Letter to Mr. R. Van Loon from the Canadian Hydrographic Service with initial observations on the bathymetry of Taq pangajuk and maps.
October 15	Makivik receives comments on their project proposal from DIAND.
October 23	Technical Committee Meeting held to discuss the Phase II study.
October 30	Project Brief on Phase II submitted to DIAND by Makivik Corporation.
November 5	Makivik contacts Shell Canada to arrange meeting on fuel oil delivery and facilities.
November 6	Bill Clevette sends draft list of planning activities leading to a submission to the Cabinet in mid-May to William Kemp.
November 12	Colin Bird (Makivik) meets with Fednav Ltd. to discuss the question of marine access to Taq pangajuk.

November 14 Makivik, Marc Morais (DIAND) and Shell Canada meet to discuss possible involvement of Shell in Taqpangajuk project.

Colin Bird (Makivik), Marc Morais (DIAND) and Yves Normandin (Arctic Consultants Ltd.) with Logistec Navigation to discuss marine access to Taqpangajuk.

November William Kemp meets with K.E.O.C.

November 17 Letter to Rick Van Loon from the Center Hydrographic Service with reviewed comments on the Taqpangajuk bathymetry.

Marc Morais writes to Environment Canada about possible impact assessment process for Taqpangajuk project.

November 19 Makivik receives three new bathymetric maps from DIAND.

November 26 Makivik meet with Norbert Robitaille to discuss the demographic projections of Taqpangajuk Phase I.

December 2 Makivik receives a letter from Shell Canada with proposal about Shell Canada's involvement in Taqpangajuk.

Makivik meets with Marc Morais (DIAND) and Roger Beaudoin (SAGMAI) to discuss with Mr. Beaudoin his reactions to the Phase I report given his experiences with the Umiujaq relocation.

Yves Normandin joints meeting to report on marine access findings and interpretations.

December William Kemp meets with K.E.Q.C.

December 5 Colin Bird (Makivik) meets with Shell Canada representatives and two of their ship captains to discuss the marine access to Taqpangajuk.

Dec. 9-12 Trip to Yellowknife, N.W.T. to discuss G.N.W.T. contribution to the Taqpangajuk Project.

December 12 Technical Committee Meeting held in Montreal to discuss the Phase II studies and receive progress reports on each.

December 15 Makivik receives memo to Dave Renshaw concerning DIAND's impressions of marine access to Taqpangajuk.

December 16 Marc Morais (DIAND) receives reply from Environment Canada stating impact assessment to be carried out under Environnement Québec policies.

Makivik and Marc Morais (DIAND) meet to discuss future course of action for Phase II studies.

January 8 (1987) Marc Morais (DIAND) and Roger Beaudoin (SAGMAI) meet to discuss project management options for the Taqpangajuk project.

January 16 Marc Morais (DIAND) receives letter from le ministère des Transports concerning marine access to Taqpangajuk.

January 21 Makivik receives report on marine access from Yves Normandin (Arctic Consultants Ltd.).

January 29 Makivik, Marc Morais (DIAND) and Claude Prévost (Transport Canada) meet to discuss possibility of temporary various possible scenarios for the Taopangajuk airstrip.

February 2 Norman Snowball and the Inuit of Killiniq invite the Honourable Bill McKnight to upcoming Heads of Family meeting.

February Reports submitted to K.E.O.C.

February 10 Fednav Ltd. replies to Makivik with proposal of how sea lift activities at Taqpangajuk might be carried out.

February 11 Makivik, Marc Morais (DIAND) and Roger Beaudoin (SAGMAI) meet with Québec Municipal Affaires with respect to their role in operating and maintaining Northern Québec communities.

Makivik, Marc Morais (DIAND) and Rober Beaudoin (SAGMAI) meet with la Société d'Habitation du Québec (S.H.Q.) to discuss the housing aspects of the Taqpangajuk project.

February 13 Bill Clevette (DIAND) interviewed about Killiniq issue on CBC radio's day break show.

February 16 Makivik receives a letter from SHQ concerning housing costs in Northern Québec and numbers of houses used by Killiniq people.

February 18 Colin Bird (Makivik) and Marc Morais (DIAND) discuss airstrip options with Transport Canada's civil aviation group.

February 19 Technical Committee Meeting held to update Phase II work and discuss future course of action to reach a submission to Cabinet for April 15.

Norman Snowball and the Inuit of Killiniq invite the Right Honourable Brian Mulroney, Bruce Rawson and Rick Van Loon to the upcoming Heads of Family Meeting.

February 23 Terms of Reference for BPR Consultants work on assessing the costs and schedules of Taq pangajuk formalized.

February William Kemp meets with K.E.O.C.

February 24 Colin Bird meets with Crawley McCracken Ltd. to discuss the cost of a caterer for a main construction camp.

February 27 Makivik receives preliminary report from BPR consultants.

March 2 Technical Committee Meeting in Ottawa to discuss Cabinet submission, BPR report, and the Phase II report.

March 5 Makivik receives letter from Gilles Jolicoeur, secrétaire général associé, Secrétariat aux Affaires autochtones, Québec, concerning Québec's commitment to the Taq pangajuk project.

March 11 The Right Honourable Brian Mulroney replies to the Inuit of Killiniq saying he cannot attend the Head of Family Meeting.

March 12 Rick Van Loon replies to the Inuit of Killiniq saying he cannot attend the Head of Family Meeting.

March 16 Makivik presents Taq pangajuk project to joint meeting of Québec Ministers and DIAND officials.

March 17-19 Killiniq Heads of Family Meeting, Kangiqsualujjuaq.

March 18 William Kemp meets with K.E.O.C.

April 6 Makivik sends letter to Norbert Robitaille with reevaluated demographic projections for the Taq pangajuk population.

April 10 Final BPR Consultants report received by Makivik.

APPENDIX 2
Project Cost Summary

PROJECT COST SUMMARY

1 000\$ (1987 CONSTANT DOLLARS)

SCHEDULE	EXPENSES		COST SHARING				
	CAPITAL	OPERATION AND MAINTENANCE	FEDERAL GOVERNMENT	PROVINCIAL GOVERNMENT	MUNICIPALITY OF TAGPANGAJUK	PRIVATE CORPORATIONS	TOTAL
1 (5 YEARS)	CONSTRUCTION		23 230,9	6 937,4	75,4	2 625,5	32 869,2
	OTHER EXPENSES		3 980,0				3 980,0
		TEMPORARY SERVICES	981,5				981,5
	TOTAL:		28 192,4	6 937,4	75,4	2 625,5	37 830,7
2 (7 YEARS)	CONSTRUCTION		23 446,9	7 057,4	75,4	2 625,5	33 205,2
	OTHER EXPENSES		4 540,0				4 540,0
		TEMPORARY SERVICES	1 450,7				1 450,7
	TOTAL:		29 437,6	7 057,4	75,4	2 625,5	39 195,9
3 (9 YEARS)	CONSTRUCTION		23 626,9	7 177,4	75,4	2 625,5	33 505,2
	OTHER EXPENSES		4 940,0				4 940,0
		TEMPORARY SERVICES	1 678,2				1 678,2
	TOTAL:		30 245,1	7 177,4	75,4	2 625,5	40 123,4

APPENDIX 3
Marine Access Notes

Results of meeting with Mr. Pat O'Reilly, Traffic Manager for Fed. Nav. Ltd.

Date : November 12, 1986

After explaining to Mr. O'Reilly some of the background to the Taq pangajuk Project a discussion ensued with respect to marine access to the site and sea lift operations.

Mr. O'Reilly said that sea lifts could be scheduled to deliver probably from the 3rd week in July to Mid October, ice depending. The site is only 7 days from Montreal so sea lifts could be sent all summer long and the goods staggered according to their priority and need.

The beach site looks ideal for sea lift operations. Mr. O'Reilly said that even with the charts they would use these only as guidelines and rely mainly on the experience of the sea captain. They would still wish to see the site personally before going in with the boats (included in the bidding package).

Navigational aids delimiting channels would be nice but not of necessity. They would note in their own data where they could or couldn't go.

They would bring in their own jetties and build them so that the barges could be unloaded. Depending on how close they could get they might have to unload on to small barges. A barge 50' X 25' can carry 40-60 tons, depending on what size the material is, and only has a four (4) foot draft. There is little or no risk of goods being ^{lost} ~~loss~~ during transfer from one barge to another according to Mr. O'Reilly. Damages may occur in transport but this an accepted loss (?).

Mr. O'Reilly said information such as wave height and frequency is unnecessary and can be forgotten about. This is usually asked for by individuals who are just nit-picking and looking for things to ask.

The data we presently have is probably more than what any community has for its sea lift. The job can be done without any problem.

Tankers may be a different story, he doesn't know. They can draw 20-30 feet in depth. Still, he thinks that all they have to do is find a safe anchorage from which to run their hoses from. The length of the hose and the distance that oil can be pumped is therefore the key with tankers.

The possibility of Fed. Nav. being involved in the sea lift is small as a result of the Quebec tender process. Fed. Nav. would only be able to bid on a Federal Package and even then the politics behind their doing it would be extremely large and complicated. Nevertheless they would like to be kept posted as to any developments in the project because they are interested in the job and they have the experience and equipment to do such a sea lift operation.

Fednav Limited

Suite 2600, 600 de la Gauchetière ouest, Montréal, Québec H3B 4M3



February 10, 1987

Mr. C. Bird
Société Makivik Corp.
4898 de Maisonneuve W.
Montreal, Quebec H3Z 1M8

Dear Colin:

We acknowledge receipt of your letter of January 22, with reference to our earlier meeting in connection with the proposed new settlement at Taqangajuk.

As advised by you this project is still in the planning stage and I suppose you would be looking down the road two or three years before it becomes a practicality.

We are deeply interested in this type of operation; as a matter of fact we have had extensive experience in this type of "Turn Key" operation. In 1979-80 we carried all the necessary materials and equipment for the Cominco Mine Site at Little Cornwallis Island, N.W.T. (approx. 65 miles west of Resolute Bay). In 1985 we carried out a very successful sealift from Halifax, N.S. to the East side of Greenland (Scoresby Sound) for the Atlantic Richfield Co. of California. Both of these operations were extremely successful and involved approximately 13000 tons (Cominco) and 6000 tons (Atlantic Richfield). These materials were placed at high water mark areas at both places with very minimal damage to cargoes or equipment.

We are assuming your initial movement to be in the area of 2500-3000 tons and have based our proposed operation on this amount. We further assume that water depths will allow us to place a vessel of approximately 7000 tons D.W. carrying approximately 3000 tons of cargo as close inshore to the site to enable us to lighter to barges and carry the materials ashore. We will naturally want to perform our own survey of the area in order to a) choose a safe anchorage for the vessel. b) select a satisfactory beach area for landing cargo.

All of the above being done, we are looking at the following.

- 1) Consolidation of cargoes at Montreal (section 42) at least three weeks prior to the arrival of the vessel to load.

...2



- 2) Loading at Montreal estimated to be approximately 10 days.
- 3) Transit time to discharge site (Taqpangajuk) 6 days.
- 4) Discharge time approximately 8-10 days (weather-ice permitting).

With the completion of loading at Montreal, our vessel will sail for (Taqpangajuk) completely self-supported. i.e. She will have on board all of the equipment necessary to place your material at the high water mark at site.

She will be supported by Barges (50'x25') - 2 units.

1 x LCM and 2 Workboats to propel barges from vessel to beach.

1 x 30 ton Crane to be placed at beach to discharge cargo from barges.

2 x 930 Cat Loaders to move cargoes from crane to high water mark.

All other equipment necessary for a successful beach operation.

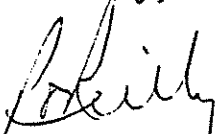
We will carry our own stevedores (10 men). Together with elements of the vessels crew this will constitute our work force at site.

We will set up a discharge operation at site that will be consistent with your ability to handle cargoes as they are placed at the high water mark.

The foregoing means simply that Fednav will take the full responsibility from the moment cargoes come into our possession at Montreal and insure the safe lay-down at site.

We are prepared to discuss in detail all aspects of the above at your convenience.

Yours truly,


Mr. P. O'Reilly

POR/gc

**Meeting with Yves Normandin, representative of Logistec Navigation,
November 14, 1986**

Attending : Yves Normandin, Arctic Consultant;
Marc Morais, DIAND;
Colin Bird, Makivik.

Mr. Normandin began the meeting by introducing himself as an Arctic transportation consultant. He is presently on contract with Logistec however his contract terminates in December.

After giving a brief introduction to the Taq Pangajuk project discussions followed. The first topic dealt with how the sea lift operation worked in Northern Québec. The sea lift operation is controlled by the Ministry of Transport, Québec. This is done through a public tender process. Only those companies with a Québec permit and a Canadian flag ship can ship to Northern Québec. The advantage of the process is that the price is known in advance.

If the volume is great enough (2,000 - 2,500 cubic meters) another route would be possible according to Mr. Normandin, that of negotiating directly with a company. The advantage is that this will give priority to your goods while the first option doesn't. A fixed price would be set and then could be played against the tender's price so that the lower price prevailed.

A third option would be to go via a company without a Québec permit. A company such as Federal Navigation would be one such company. In this case the company would not be able to drop off the goods on the way north but on the return southward trip they could. This would mean late, and uncertain delivery times.

The route chosen all depends on the volume of goods to be shipped. A final option could be to look into a longterm contract with a company with the option to pull out. The first year there would be only a small volume but afterwards the amount would grow.

Mr. Normandin believes that there are some skid tanks to be found in Akulivik.

Mr. Normandin says that next summer ('87) there will be a lot of ships going to Kuujjuaq. This means a ship every month, minimum. This also means that ships will probably be in the area until mid October which is good for us.

The travel time to Taqpangajuk really depends on the ship that is being used and the volume of goods being shipped. It will probably be in the range of 4-6 days travel.

Mr. Normandin said that the two main companies that work in Northern Québec are Logistec and Daigonir^e. Both, however, are not very big companies and might have to get help from others in order to handle the full job.

According to Mr. Normandin it is imperative to know what you are going to ship and when you wish it to arrive. The weight of large equipment is especially important. Once we have evaluated the quantity of goods to be shipped we can then decide upon the best shipping option for our needs.

Mr. Normandin will discuss with some ship captains about marine access, working areas, delivery, sea lift techniques, etc... and get back to us with the information be collect.

APPENDIX VI

Extracts from Taqpangajuk Project Meeting held on December 2, 1986

16:30 Yves Normandin, Logistec, joins the meeting to give a report of marine accessibility :

- there is an 18 foot tidal range;
- W1 (southern inlet);
 - there is not enough water or enough space for a sea lift
 - it is good for canoes and speed boats
- two possible anchorages can be found near W2 and W3;
 - a spot for a 3,000 ton vessel 10 minutes offshore
 - a spot for a 12,00 ton vessel 15-20 minutes offshore
 - both would need to use a barge tug system;
- W2 seems to be practical;
 - water of 9 m in depth
 - only one beacon would be necessary for navigation purposes
 - there is no protection against the wind
 - there is a possible wharf location just north of W2
 - a marine engineer would be needed to confirm this
 - once again problems with the wind
- northern inlet
 - we have no data
 - might be worth a survey of depths
 - tidal times and heights could affect the amount of time available to work in the inlet
- we are working on 2 scenarios
 - the proposed site
 - a site on the northern inlet

W2 would need a short oil pipe to have oil pumped in

W3 rocks nearby will decrease the working time of the barges

- we could work from both ends at once
- have tank farm at W2
- have smaller tanks near the crushing site
- then work on both the airstrip and roads at the same time.

Y.N. Suggests

1) need new bathymetric data

2) site for wharf needs to be selected

- contact the Ministry of Transport - R. Kwail (?)
- he has the authority to do both of these studies.



LES CONSULTANTS DE L'ARCTIQUE
ARCTIC CONSULTANTS

Montréal, le 21 janvier 1987

Monsieur Marc Morais
Chargé de projets
Affaires indiennes et
du Nord Canada
Complexe Place Jacques Cartier
4ième étage
320, rue St-Joseph Est
Québec, Québec
G1K 7Y2

Objet: Projet TAQPANGAJUK

Cher Monsieur,

Suite à votre demande, exprimée lors de deux rencontres tenues dans les bureaux de la Société Makivik, j'ai effectué certaines recherches et j'ai étudié les différentes cartes que vous m'avez remises.

J'ai demandé l'avis de différentes personnes impliquées dans le transport maritime et j'ai consulté deux Capitaines ayant de l'expérience en navigation dans le Nouveau-Québec et dans l'Arctique Canadien. Voici un bref résumé du résultat de mes recherches et consultations.

Documents utilisés

- TAQPANGAJUK FEASIBILITY STUDY
Plan no 3, préparé par K.R.G., daté du 10 mars 1986.
- Deux plans de sondage maritime, non vérifiés, par le Ministère du transport du Canada.

... 2

A) Le plan no 3 identifie trois emplacements, comme sites potentiels d'un futur quai ou d'une plage de déchargement des navires ou des barges: W1, W2 et W3.

a-1) Site W1: Pas assez d'eau et d'espace pour manoeuvrer. Les cartes semblent indiquer la présence de nombreuses roches de grosseur non identifiée. Cet endroit semble bien protégé contre les vents et pourrait remplir la fonction de marina locale pour petites embarcations type; "Peter Head", bateaux à moteur, "freighter".

a-2) Site W2: A partir des données que nous possédons, il semble que ce soit le meilleur endroit pour construire un quai. Cet emplacement possède suffisamment d'eau et d'espace de manoeuvre pour permettre l'accès à des navires de 12,000 tonnes ayant un tirant d'eau de 9 mètres. Malheureusement, ce site n'offre aucune protection contre les vents violents qui régissent cette région. De plus, il est très éloigné du site projeté pour la construction de la future piste d'atterrissage. Ceci pourrait causer certains problèmes, entre autre, pour l'acheminement d'équipement lourd, nécessaire à ce genre de construction.

Bien entendu, avant de prendre une telle décision, il est fortement recommandé de consulter des spécialistes en la matière, tels qu'ingénieur maritime et autres.

Sur la photocopie no 1, annexée, l'emplacement du quai est identifié par la lettre D. Ce site pourrait aussi servir comme plage de déchargement des barges. Bien entendu, une inspection du terrain est indispensable.

a-3) Site W3: A prime abord, la plage à cet endroit semble plus appropriée pour la réception des barges de déchargement. Encore une fois, une étude du terrain est indispensable. La carte de sondage maritime indique la présence de roches de grosseur non identifiée, et la profondeur de l'eau, à cet endroit limite son utilisation à la réception de barges.

Le plan no 3 indique aussi deux sites potentiels pour l'emplacement des réservoirs de combustible pour le village. TANK FARM: TF1 et TF2.

TF1 - D'après les données que nous avons en main, cet emplacement pourrait être très facilement desservi par les navires pétroliers.

TF2 - Pour les mêmes raisons stipulées dans le cas de W1, ce site ne devrait pas être retenu.

B) Identification des points d'ancrage.

- b-1) Point d'ancrage identifié avec la lettre B. Photocopie no 2.

Un navire de 3,000 tonnes pourrait s'y ancrer et desservir les sites W2 et W3. Avec l'aide de cartes plus précises, un navire à plus faible tonnage pourrait s'ancrer beaucoup plus proche. Ce point est situé à environ 1.2 mille marin de la terre ferme et cette distance peut être couverte en quinze minutes, par un remorqueur tirant une barge.

- b-2) Point d'ancrage identifié avec la lettre C. Photocopie no 2.

Un navire de 12,000 tonnes avec un tirant d'eau de 9 mètres pourrait s'y ancrer et desservir les sites W2 et W3. Il se situe à environ 1.7 mille marin de la terre ferme, soit, approximativement vingt-cinq minutes avec un remorqueur tirant une barge.

- b-3) Aide à la navigation: photocopie no 1.

L'installation d'une balise (beacon) à l'emplacement marqué avec la lettre A permettrait aux navires d'identifier leur point d'ancrage.

C) Les marées sont de 5.5 mètres dans cette région.

1987-01-21

N'étant pas au courant de toutes les données relatives à ce projet, j'ai tenté de répondre à vos questions au meilleur de ma connaissance. Je crois que d'autres endroits devraient faire le but de sondage marin, entre autre, la région située au nord de l'emplacement projeté pour la future piste d'atterrissage sur la plan no 3.

La personne responsable, pour le Gouvernement Canadien, de la construction de nouveaux quais et ainsi que de la confection des cartes maritimes est:

Monsieur R. Quail
Sous-Ministre, Adjoint-Marine
Commissaire de la Garde côtière Canadienne

Je tiens à vous remercier de m'avoir permis de travailler sur ce projet. Si le besoin se faisait sentir, n'hésitez pas à me contacter.

Recevez, cher Monsieur Morais, mes salutations distinguées.



Yves Normandin

YN/cv

p.j. (2)

c.c. M. Collin Bird

PHOTO COPIE #2

385000
666300

SINCRB

385000

382900

Meeting with Shell Canada, November 14, 1986

Attending : Léo Lafontaine, Arctic Zone manager, Shell Canada;
George Sztyk, Industrial District, Shell Canada;
Marc Morais, DIAND;
Gilles Gagné, Makivik;
William B. Kemp, Makivik;
Colin Bird, Makivik.

The meeting began with a brief introduction to the Taqpangajuk project for the benefit of the Shell Canada personnel. One of the first questions that they asked related to the population of the new community. Depending on the size of the community and its expected growth rate Shell might approach the tank farm question in various ways. They believe that they would like to start small and grow as the community does. This could be done through the use of prefab tanks, called skid tanks, which are easily moved around, easily added to, and could supply the community for a number of years.

We would have to give them one year notice in order to get fuel in, ie fuel for '88 would have to be in by '87. For us this means two years in advance, as a result we are back to construction in '89 as it is we'll unlikely have a commitment before April-May '87. Some skid tanks could be brought in on the last ships of '87 but they wouldn't be able to be filled until August '88. Oil drums could be brought in late '87 to cover the beginning of '88 until the skid tanks could be filled.

Gilles Gagné thought that this fact should be included in our submission for the first year.

We would have to try and minimize the number of barrels brought in as they are very expensive.

1986 : \$ 30 for a drum that contains 205 L

approx.: .95/L for heating oil

" : 1.10/L for gas, motor oil, or jet fuel

Meeting with Shell Canada, November 14, 1986.

The cost of returning the drum must also be included therefore approximate cost per drum is :

\$ 230 for heating oil

\$ 260 for gas, etc...

Shell Canada will take care of all infrastructure designs when it comes time to build. They will do this on recommendation from their marine department. We provide the site and they will do the rest including geotechnical studies.

A full tank will cost Shell upwards of \$1 million while skid tanks may be at least half the price. Depending on the ground and soil it might cost \$ 10,000 for a 20,000 gallon tank. The depreciation on tanks is 7% a year.

The tanker uses a 4" hose and it can be used as far away as 5,000 feet. If necessary a pipe can be put on the land to a spot that will allow the shortest connection to the ship.

We have to make some decisions for '87 as to the amount of oil required and the type.

Possible places where we can pick up used skid tanks :

- Lac Helen
- James Bay region(?)
- Akulivik

The marine accessibility will be looked at by the Shell marine department. They'll give us a written report on their findings in December, or later.

Meeting with Shell Canada, November 14, 1986.

- the number of houses and their usual consumption (SHQ);
- size of the power plant and its consumption (Hydro);
- the consumption for heating various infrastructures (from communities);
- the amount for equipment on the roads (from communities);
- airstrip construction (Beaudoin?)
 - approximately 500,000 L/yr.



Produits Shell Canada Limitée

758, rue Sherbrooke Ouest
Montréal (Québec) H3A 1G1
(514) 287-7000

December 2, 1986

Makivik Corporation
4898, de Maisonneuve West
Montréal (Québec)
H3Z 1M8

Attention: Colin R. Bird
Taqpangajuk Project Co-Ordinator

Dear Sirs:

We refer you to our meeting of November 14, 1986 at Makivik's Montréal office. Many aspects of the above project were discussed, mainly the fuel supply and the marine accessibility.

As stated during our meeting, our marine department will be briefed about the project, and we foresee a meeting in Montréal in early December to discuss in detail the various aspects and requirements. Fuel supply requires more planning due to the nature of supply for the construction of the airstrip and village infrastructure.

As mentioned during our meeting, for the initial period, a combination of drums and skid tanks should be used. In this regard adequate lead-time will be required.

We wish to state that Shell Canada is indeed interested in becoming involved in this project. However, before incurring any major expenditures, we would require a commitment on the part of Makivik that Shell would become the petroleum supplier under a long-term contract.

Various approaches can be utilized to finance this endeavour:

1. Complete financing by Makivik/D.I.N.A. with Shell to perform Engineering and project work.
2. Shell to finance construction, with funds recovered on a cents per litre basis for this location alone.

.../2

3. Taqvangajuk to become part of our "Frostbite" network and capital funds to be recovered as per existing formula. Approval of other municipalities would be required in this case.

Please advise us of any new developments in this file.

Yours very truly,



G. Sztyk
Accounts Manager - Northern Sales
Industrial and Lubricants District

- c.c. Eastern Complex - Québec and Maritimes
- Industrial Sales Manager
 - District and Engineering Manager
 - District Manager - Arctic

GSjs

Working Notes from meeting with Shell Canada, December 5, 1986

This meeting was held in response to questions and requests that had been posed to Shell at our earlier meeting, Nov. 14, 1986.

Attending : M.A. Wilcock, Superintendent Marine, Shell Canada;
Léo Lafontaine, Arctic Zone manager, Shell Canada;
Two ship captains, Shell Canada;
Colin Bird, Makivik.

The meeting proceeded rather informally with a discussion of the available bathymetric data and its implications as far as fuel delivery was concerned.

To begin with it was emphasized that Taq pangajuk would be a fair weather port only. None of the sites available with present information provide any protection against the prevailing winds of the region, northwesterlies. As a result, any winds over 28 mph (?) would cause a stoppage in delivery as the ship would have to find safe water.

The presence ice in the air photos brought up to the topic of ice in the area. The Taq pangajuk area is similar to Killiniq as far as ice is concerned. Being on the east coast of Ungava Bay, the ice tends to be pushed up against the coastline, especially towards the northern tip of the Torngat Peninsula. As a result, we should not expect Taq pangajuk to have an early drop off. The danger of a ship being trapped by ice for either a few days or even a few weeks would be too great, hence delivery would only occur in late August or in September.

From the available bathymetric data Shell was looking at two possible areas for delivery; 1) the proposed tank farm area, and 2) the southern inlet. If they were to go to the proposed tank farm area, an anchorage site was available for their ships close enough offshore that they would be able to use a hose and pump directly from the

December 5, 1986

/2

ship. While such a hose system allows rough weather delivery, with a very strong wind the delivery would have to stop. The Shell captains also believed that there might be considerable tidal currents in this area which could hamper delivery.

The southern inlet has no anchorage close enough to allow a hose system of delivery. There is an anchorage deeper in Singer Inlet than for the other site from which a barge operation could be run. This system would also depend on the wind as the barges cannot operate in very windy weather. The southern inlet might also prove to be usable only on a rising tide. The inlet's beach may have to be bulldozed so as to remove the boulders for a flat landing place.

Shell expressed interest in the use of the northern inlet as a possible harbour. They thought it unfortunate that no soundings had been taken for this area this fall. The northern inlet, if it had enough water, i.e. if it is deep enough at low tide, could provide a possible protected anchorage for a large ship. Fuel could then be unloaded via a hose system to a storage area near TF2 on the Location Map.

Shell agreed that a split storage/drop off system could be arranged especially for the construction season. Mr. Lafontaine still believed that temporary storage tanks were the way to go prior to building a full scale tank farm. Either way the storage should be near the hydro plant as it is the greatest consumer of fuel.

Shell wished to know whether they should approach the government for further studies or whether Makivik Corporation would initiate the process. This was left undecided, however, three areas of study were considered of possible importance (in order of priority) :

December 5, 1986

/3

- 1) Bathymetric soundings for the northern inlet and its approaches from Ungava Bay;
- 2) a study of tidal currents and there possible influence on anchorage sites;
- 3) a study of wave and swell action would be important if barge work was to be required for fuel delivery.



Gouvernement du Québec
Ministère
des Transports

Québec, le 16 janvier 1987

✓
Monsieur Marc Morais, ing.
Chargé de projets
Ministère des Affaires indiennes
et du Nord Canada
320, rue St-Joseph est
C.P. 3725
QUÉBEC (QC)
G1K 7Y2

E-4345-1

Monsieur,

Après analyse des documents reçus il appert qu'il y a des zones d'amarrage pour différents types de navire. Cependant, il est difficile à cette étape-ci de déterminer des endroits précis vu que les documents sont incomplets et non certifiés pour la navigation.

J'aimerais continuer à travailler dans ce dossier afin de vous fournir des informations plus formelles, quand vous posséderez une carte du service hydrographique.

De plus, il serait important au cours de la saison estivale de voir quel serait le site idéal pour la plage de débarquement. Présentement, je peux relever quelques endroits, mais il y a des zones grises en ce qui a trait à quelques questions comme:

- l'enrochement de la plage à partir de la ligne des hautes eaux à marée basse ?

JAN 20 1987

.../

M. M. Morais

1987.01.16

- la portée du sol pour permettre la circulation des véhicules lourds ?
- l'inclinaison de la berge à marée haute ?

Je demeure à votre disposition pour de plus amples informations.

Bien à vous,



Gilles Desgagnés
Service de l'exploitation



Fisheries
and Oceans

Pêches
et Océans

XXXXXXXXXXXX
XXXXXXXXXXXX

XXXXXXXXXXXX
XXXXXXXXXXXX

October 10th, 1986

Telex 01931557

Your file Votre référence

5450-12 Notre référence

Mr. Rick Van Loon
Assistant Deputy Minister
Self-Government
Dept. of Indian and Northern Affairs
10 Wellington Street
Hull, Québec K1A 0H4

Dear Mr. Van Loon:

RE: Your Request of July 18, 1986 for preliminary bathymetric data in the Singer Inlet area east side Ungava Bay

I wish to advise you that we have completed a preliminary hydrographic survey for the approaches to Singer Inlet. We have also carried out a survey of the three proposed landing/docking sites.

It is apparent from these preliminary surveys that there is deep water in the seaward approaches to the inlet but in the vicinity of the proposed settlement there are a number of significant dangers to navigation in the form of drying ledges and shoals. To the south west of the proposed settlement there is an area about 1 kilometer in diameter with depths of approximately 40 metres which we believe may be a suitable anchorage for medium sized ships. However the channels leading into it, west of the site, appear narrow, being approximately 200 metres across. Navigation through these channels could be improved by the construction of leading marks (ranges) and passive radar transponders.

We foresee some difficulty in unloading oil cargoes at the proposed tank sites at W2 as it may be difficult to secure a ship immediately off this point. The proposed anchorage to the south west or an alternative anchorage further offshore to the north west are both approximately 2 kilometres from W2. We propose that you investigate the possibility of having the storage tanks relocated about 1000 metres to the south east where a ship could secure close to the shore.

W3 landing site appears unsatisfactory as there are many rocks and shoals in the bay opposite it. The landing site at W1 appears more suitable for small craft but the channel is narrow and should be marked in some manner.

.../2

Canadian Hydrographic Service
(Atlantic Region)
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, N.S. B2Y 4A2

Service hydrographique du Canada
(Région de l'Atlantique)
Institut océanographique de Bedford
C.P. 1006
Dartmouth, N.E. B2Y 4A2

Canada

Enclosed for your information, are photographs taken from a helicopter at the low water stage of the tide.

If you wish further information, please contact Reg Lewis at (902) 426-2411.

Yours truly,



A. J. Kerr
Regional Director
Canadian Hydrographic Service (Atlantic)
Scotia-Fundy Region

RCL/ad
encl

cc: S. B. MacPhee, DFO
D. Renshaw - DINA
W. Kemp - Makivik Corp.

W1 site (Singer Is. Lat)
looking Northwest at W1

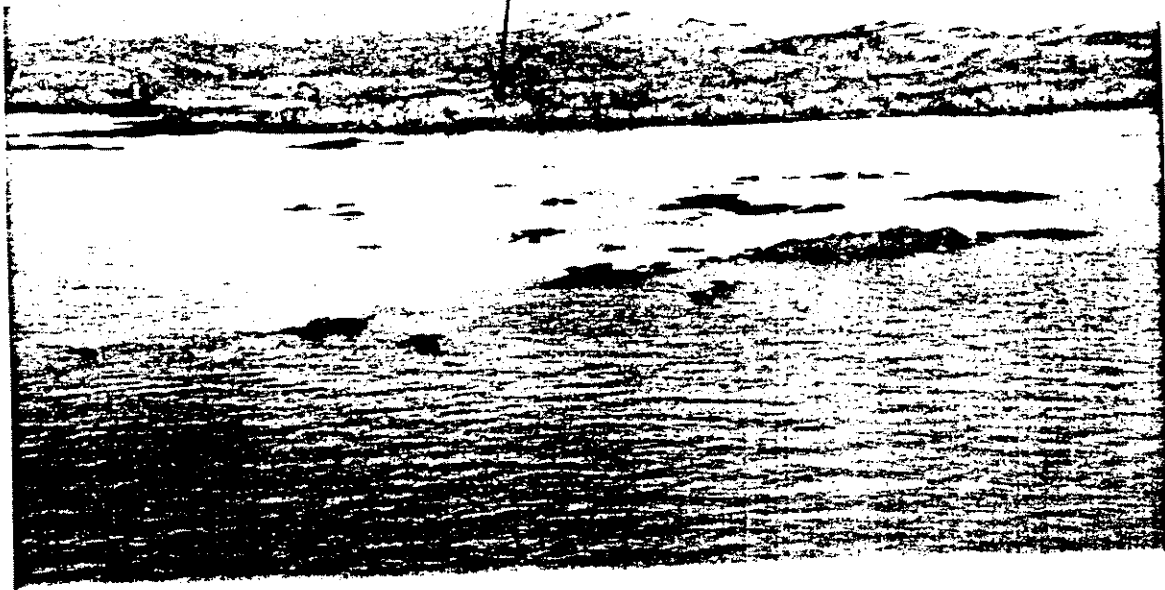


W1 site



Approaches to W1 site (Singer Inlet)

w 2 site (Tank Farm)
(looking from Seaward)



w3 site, w2 site

w1 site



Fisheries
and Oceans

Pêches
et Océans

~~XXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXX~~

~~XXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXX~~

NOV 25 1986

November 17th, 1986

Telex 01931552

Your file Votre référence

Our file Notre référence
5450-12

Mr. Rick Van Loon ✓
Assistant Deputy Minister
Self-Government
Dept. of Indian and Northern Affairs
10 Wellington Street
Hull, Québec K1A 0H4

Dear Mr. Van Loon:

RE: Singer Inlet, Ungava Bay

Further to our letter of October 10th, 1986, we have reviewed our preliminary data and have prepared some recommendations concerning the location of ranges and docking sites which may assist you in this project.

To safely reach the anchorage located south of the proposed settlement will require the installation of three sets of ranges, as shown on the enclosed plan. With regards to landing beach sites, it is quite evident that the W3 site is unsatisfactory and W1 is only suited for small boats as the channel is narrow and tortuous due to shoals and drying rocks. Therefore, you may wish to consider other docking sites as indicated on the plan. These sites would certainly require the construction of a breakwater to provide protection from the southwest winds. This will be a major task where the mean tide range is 5.5 metres and the large range is 7.8 metres. //

In addition, we have color-coded the 2, 5 and 10 metre contours on the overlay plan to better reflect the channels and roughness of the bottom topography. You will also find enclosed two field sheets that show more detail than the previous ones. Once the final field sheets are completed, we will send you copies.

Canadian Hydrographic Service
(Atlantic Region)
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, N.S. B2Y 4A2

Service hydrographique du Canada
(Région de l'Atlantique)
Institut océanographique de Bedford
C.P. 1006
Dartmouth, N.-É. B2Y 4A2

Canada

In conclusion, I would strongly recommend that tidal current measurements be taken before vessels use this area.

If you wish further information, please contact Reg Lewis at (902) 426-2411.

Sincerely,



A. J. Kerr
Regional Director
Canadian Hydrographic Service (Atlantic)
Scotia-Fundy Region

RCL/ad
encl (sent under seperate cover)
cc: S. B. MacPhee



DEC - 9 1986

Mr. Dave Renshaw
Chief, Buildings Division
Professional Services Directorate

Your file Votre référence

Our file Notre référence

Marine Access to Taqpangajuk/Singer Inlet

I have examined the preliminary bathymetric survey data for Singer Inlet, supplied to you by the Canadian Hydrographic Service (CHS). Although these show somewhat restricted, deep-water access to the inlet (approaches to the most suitable anchorage site for medium-sized ships narrow to about 200m), my impression is that with suitable navigation aides, a sea-lift operation by medium vessels should not present any major problems. This view was also expressed by CHS (letter 10/10/86 A.J. Kerr to R. Van Loon) and, through informal conversation, by the Canadian Coast Guard (Mr. Len Forrest, Fleet Operational Services, Fleet Systems).

Although he was happy to express his informal opinion on the basis of the preliminary bathymetric data, Mr. Forrest advised that before CCG could comment officially, which they would like to have the opportunity of doing, DIAND should first formally submit the information for comment and approval, perhaps at the ADM level, to: the Commissioner, Canadian Coast Guard, Tower A, Place de Ville, Ottawa, K1A 0N5. Apparently, if four copies could be enclosed it would considerably speed up the CCG internal distribution of the material and increase the likelihood of early response.

Other specific points are the following:

1. From information seen, CCG felt that in addition to (or instead of) passive radar transponders an active device such as a Raycon Beacon would be a required aide to navigation.
2. CCG (Mr. Len Forrest) also met with the Makivik Corporation (Mr. Yves Normandin) during which the bathymetric data and other aspects of the Taqpangajuk relocation were discussed. CCG also advised the Makivik Corporation that the information should be submitted formally to CCG for their comment and approval.
3. On the basis of the bathymetric data I would recommend, as was suggested by CHS, that the fuel storage tank site be relocated about 1km southward near to where the most suitable anchorage for medium-sized vessels has been identified. Due to the very close proximity, this would help to minimize the risk of spills during fuel transfer.

4. There appear to be no wind, wave, current, tide, nor ice data available for Singer Inlet. Although, as mentioned in the feasibility study, winds are likely to be quite similar to those of nearby locations (i.e. Killiq, Resolution Island, Frobisher Bay and Quaqtaq) and the tidal ranges are known approximately, I would be concerned about:

- (a) wind waves when winds are from the west or west northwest, since these can be intense and the fetch is effectively infinite in this direction;
- (b) the possibility of storm surges causing extreme tidal elevations;
- (c) excessive accumulations of ice caused by winds and currents;
- (d) effects of ice, especially in combination with strong west winds, and/or waves on any planned harbour structure.

While this lack of data should be of concern I do not think that development should be held up unduely as a result. I would stress, however, that studies of the physical environment begin as soon as possible since these will have to be done at some stage in any case. Results from such a study could and should strongly influence the town planning - not to mention harbour structures.

I hope some of these comments will be helpful. Meanwhile, please let me know if I can be of any help.



Jon Moen,
Oceanographer
Marine Environment Division
Northern Environment Directorate

c.c. Camille Mageau
Mark Morait

APPENDIX 4
SHO Correspondence



Société
d'habitation
du Québec

1039, de la Chevrotière
Édifice "G", 26e étage
Québec, Qc
G1R 4Z3

Québec, le 16 février 1987

Monsieur Collin Bird
Société Makivik
4898 ouest, de Maisonneuve
Westmount, Québec
H3Z 1M8

Monsieur,

Suite à la réunion tenue à mon bureau le 11 février courant, j'ai demandé à monsieur Roland Villeneuve de la direction de l'évaluation et normes de me fournir les types de logements nécessaires selon les mêmes critères et normes que le plan triennal en vigueur jusqu'en 1989.

Vous trouverez, en annexe, le résultat de son étude, et on obtient donc les besoins suivants:

- a) 1 bâtiment de 4 logements de deux (2) chambres à coucher;
- b) 7 bâtiments de 1 logement de trois (3) chambres à coucher;
- c) 3 bâtiments de 2 logements de quatre (4) chambres à coucher;
- d) 1 bâtiment de 1 logement de cinq (5) chambres à coucher;
- e) 2 bâtiments de 1 logement de six (6) chambres à coucher.

Total 14 bâtiments pour 20 logements

L'évaluation des coûts de construction est difficile à faire pour l'immédiat compte tenu que nous réaliserons ces types de logements en 1987 et que nous n'avons pas de record, cependant à la lumière des coûts antérieurs, je risquerais les coûts suivants pour 1987:

.../2

a)	1	x	500 000 \$	=	500 000 \$
b)	7	x	135 000 \$	=	945 000 \$
c)	3	x	275 000 \$	=	825 000 \$
d)	1	x	225 000 \$	=	225 000 \$
e)	2	x	235 000 \$	=	470 000 \$

TOTAL = 2 965 000 \$

Compte tenu que la Société complétera les besoins exprimés dans les villages de Kangiqsujaq, Quaqtaq et Tasiujaq, le MAINC devra donc prévoir dans ces budgets un paiement à la Société d'habitation du Québec, d'une somme à être déterminée plus tard pour compenser la part de 25% que le Québec devrait déboursier pour l'exploitation des logements au cours des trente-cinq (35) prochaines années. En effet, dans ces villages des logements seront en surplus et le Québec ne peut être tenu responsable.

Si d'autres informations sont nécessaires, n'hésitez pas à communiquer avec moi et je vous prie d'agréer, Monsieur, mes sentiments les meilleurs.



Claude Tremblay, directeur
Habitation autochtone

/cn

p.j.

NOUVEAU VILLAGE NORDIQUE

TAQPANGAJUK

VILLAGE D'ORIGINE	Description des familles			Besoin cc. nouveau village	Logements devenus inutiles
	+ de 16 ans	11 à 16 ans	- de 11 ans		
KANGIQSUALUJJUAQ	5F + 4M	1M	1F + 3M	8	1 X 8 cc.
	2F + 2M	3M	1F	6	1 X 6 cc.
	1F + 1M	0	1F	2	1 X 4 cc.
	1F + 1M	0	2F + 1M	3	2 X 3 cc.
	1F + 1M	0	2M	2	2 X 2 cc.
	1F + 1M	1F	2M	3	
	1F + 2M	2M	0	4	
KANGIQSUJJUAQ	2F + 2M	1F	2M	4	1 X 5 cc.
	2F + 2M	1M	2M	5	1 X 4 cc.
KILLINIQ	1F + 1M	0	1F + 1M	2	
	1F + 1M	0	2F + 3M	4	
KUJJUAQ	1M	0	0	1	1 X 1 cc.
QUAQTAQ	1F + 1M	0	1F + 2M	3	1 X 4 cc.
	1M	0	0	1	3 X 3 cc.
	1F + 1M	1F	2M	3	1 X 2 cc.
	1M	2M	2F	3	1 X 1 cc.
	1F + 1M	0	1F	2	
	1F + 3M	1M	0	4	
TASIJJUAQ	1F + 3M	1M	0	4	1 X 4 cc.
	1F + 1M	0	1F + 1M	2	1 X 2 cc.
TOTAL	20 familles			66	

Eescins Taqpangajuk

Fréquence

1 cc.	2
2 cc.	5
3 cc.	5
4 cc.	5
5 cc.	1
6 cc.	2
Total	20



APPENDIX 5
K.E.Q.C. Standards and Supporting Documents

18/3/87 AO

General KEQC criteria
for liquid and solid waste disposal sites
and for potable water reservoirs

Solid waste disposal sites

- The location of a solid waste disposal site must be in a different watershed from the community's potable water point and, insofar as possible, from the watershed of the community itself.
- Insofar as possible, the sites should not be visible from the community.
- Access to the site must be ensured throughout the year.
- The site must be located at a sufficient distance from the municipal airstrip so that birds do not represent a menace to flight security. In this respect, Transport Québec must be consulted.
- All efforts should be made to locate the site near the liquid waste disposal site.
- The Solid Wastes Regulation (c.Q-2, r.14) must be respected. Section x.1 of the regulation specifically applies to the north. Among others, the following criteria must be respected:
 - the solid waste disposal site must be located
 - 1) a minimum of 100 meters from a lake or watercourse,
 - 2) a minimum of 300 meters from a house, school, religious place, cemetery or hospital,
 - 3) a minimum of 500 meters from a well or potable water point.

The regulation also specifies criteria for fencing the site and covering it once it is abandoned.

Liquid waste disposal sites

- The KEQC subscribes to the principal that municipal liquid wastes must be treated.
- The treatment system chosen must be of a simple design and operation (oxydation ponds and rotating biological disks are the systems presently favored for northern village corporations).

- The outflow location of treated wastewater must: 1) ensure good diffusion of treated wastewater, 2) avoid any possible contamination of drinking water points, 3) avoid areas used by the population, 4) avoid fish spawning sites and 5) where possible, use natural sites such as peat bogs as long as such sites are not used by local people.
- Access to the site must be ensured throughout the year.
- All efforts should be made to locate the site near the solid waste disposal site.

Potable water point

- As stated in the KEQC draft guidelines for Taq pangajuk, the drinking water point must be able to supply 250 L (55 gal.)/person/day for a population of 450 or more persons.
- The water quality (physico-chemical, bacteriological) of the water point must respect the norms of the Drinking Water Regulation (c.Q-2, r.4.1).
- Access to the drinking water point must be ensured throughout the year.
- The water point should be fenced.
- See pertinent criteria for liquid and solid wastes.

Others

- For all infrastructures, the proponent must evaluate the site's archeological potential.



c. Q-2, r.14

Règlement sur les déchets solides

Loi sur la qualité de l'environnement
(L.R.Q., c. Q-2, a. 20, 31, 46, 53, 54, 55, 61, 66, 70,
71, 72, 74, 87 et 88)

SECTION I INTERPRÉTATION

1. Définitions : Dans le présent règlement, à moins que le contexte n'indique un sens différent, on entend par :

a) « aire d'exploitation » : la partie d'un lieu d'élimination où l'on mène les opérations de dépôt, de traitement ou d'entreposage des déchets solides, y compris les surfaces prévues pour le déchargement et le stationnement des véhicules et autres équipements mobiles ;

b) « certificat » : un certificat délivré par le sous-ministre selon l'article 54 de la Loi, pour un système de gestion des déchets solides ou une partie d'un tel système ;

c) « compostage » : méthode de traitement des déchets solides par la décomposition biochimique de ceux-ci ;

d) « comté » : toute municipalité de comté désignée dans la Loi sur la division territoriale (L.R.Q., c. D-11), y compris le territoire des municipalités de cité et ville englobées dans chacun des comtés ;

e) « déchets solides » : les produits résiduels solides à 20°C provenant d'activités industrielles, commerciales ou agricoles, les détritiques, les résidus d'incinération de déchets solides, les ordures ménagères, les gravats, les plâtras et les autres rebuts solides à 20°C à l'exception :

1° des carcasses de véhicules automobiles, des terres et des sables imbibés d'hydrocarbures, des pesticides, des rebuts pathologiques, des fumiers, des résidus miniers, des déchets radioactifs, des boues, des résidus solides provenant des fabriques de pâte et papier ou des scieries, de même que des déchets dangereux au sens du Règlement sur les déchets dangereux (adopté par le décret 1000-85 du 29 mai 1985) ;

2° des déchets qui ne sont pas des déchets dangereux au sens du Règlement sur les déchets dangereux, qui résultent de procédés industriels des secteurs d'activités de la tannerie, du raffinage de pétrole, de la métallurgie, de la chimie minérale, de la chimie organique et du traitement et revêtement de surface et dont la concentration de contaminants en composés phénoliques, en cadmium, en chrome, en cuivre, en nickel, en zinc, en plomb, en mercure, en huile ou en graisse dans le lixiviat du déchet est supérieure aux normes prévues à l'article 30; le lixiviat est obtenu selon la

méthode décrite dans la *Procédure d'évaluation des caractéristiques des déchets solides et des boues pompables* publiée par le ministère de l'Environnement du Québec en 1985 ;

f) « dépotoir » : tout lieu d'élimination où l'on déposait des déchets à ciel ouvert sur le sol au 10 mai 1978 et qui n'est pas conforme aux normes prévues aux sections IV, IX et X ;

g) « eau de lixiviation » : liquide ou filtrat qui percole à travers une couche de déchets solides ;

h) « expérimental » : qui fait partie d'une expérience menée par un organisme ou un laboratoire de recherche scientifique ou technique ;

i) « exploitant » : toute personne ou municipalité qui exploite un lieu d'entreposage ou d'élimination des déchets solides ;

j) « habitation » : tout bâtiment destiné à loger des êtres humains et pourvu de systèmes d'alimentation en eau ou d'évacuation des eaux usées reliés au sol ;

k) « incinération » : méthode de traitement des déchets solides par le brûlage contrôlé de ceux-ci dans un bâtiment conçu à cette fin ;

l) « lieu d'élimination » : lieu de dépôt définitif ou de traitement des déchets solides ;

m) « Loi » : la Loi sur la qualité de l'environnement (L.R.Q., c. Q-2) ;

n) « matériaux secs » : les résidus broyés ou déchiquetés qui ne sont pas fermentescibles et qui ne contiennent pas de déchets dangereux, le bois tronçonné, les gravats et plâtras, les pièces de béton et de maçonnerie et les morceaux de pavage ;

o) « permis » : un permis délivré par le sous-ministre selon l'article 55 de la Loi, pour un système de gestion des déchets solides ou une partie d'un tel système ;

p) « poste de transbordement » : lieu d'entreposage des déchets solides avec ou sans réduction de volume, où l'on transborde les déchets solides du camion qui en a effectué l'enlèvement dans un autre transporteur qui les porte dans un lieu d'élimination ;

q) « récupération » : méthode de traitement des déchets solides qui consiste à trier et à récupérer les matières ou produits contenus dans les déchets solides en vue de leur recyclage ;

r) « volumineux » : qui excède 1 mètre de longueur ou qui pèse plus de 25 kilogrammes ;

s) « sous-ministre »: le sous-ministre de l'Environnement.

R.R.Q., 1981, c. Q-2, r.14, a. 1; D. 1003-85, a. 1.

2. Population : Dans le présent règlement, la population de toute municipalité est celle inscrite au dernier dénombrement reconnu valide par un décret du gouvernement publié à la *Gazette officielle du Québec* conformément à l'article 7 de la Loi sur les cités et villes (L.R.Q., c. C-19), de l'article 16a du Code municipal et aux dispositions de la charte de toute municipalité de cité ou de ville.

ii. un relevé des servitudes réelles et personnelles qui grèvent le terrain ainsi que des équipements de surface et des équipements souterrains qui s'y trouvent ;

iii. un plan d'aménagement du terrain à échelle comprise entre 1/1 000 et 1/1 500 indiquant, entre autres, les écrans naturels, les secteurs prévus pour le creusage des tranchées ou le prélèvement des matériaux de recouvrement, les zones de déboisement, l'emplacement prévu pour les bâtiments destinés au personnel et au remisage de l'équipement, les aires de circulation des véhicules, de stockage des matériaux de recouvrement et d'entreposage des objets récupérés et l'emplacement des équipements de pesée, des clôtures, des barrières, des puits-témoins et de tout équipement de détection ou de brûlage des gaz requis ou prévu, le cas échéant ;

iv. des coupes longitudinales et transversales du terrain montrant le profil initial et final de celui-ci ainsi que l'évolution du plan d'aménagement au fur et à mesure de l'avancement des opérations ;

v. une coupe-type du terrain illustrant la superposition des couches de déchets solides compactés et recouverts ;

vi. les plans et profils du système de drainage ;

vii. les plans et devis des équipements et ouvrages destinés à recueillir et traiter les eaux de lixiviation, s'il y a lieu ;

viii. les plans et devis des équipements et ouvrages destinés à prévenir ou contrôler la migration dans le sol ou l'émission dans l'atmosphère des gaz produits par la décomposition des déchets solides qui seront enfouis, dans le cas où de tels équipements ou ouvrages sont prévus ; et

ix. un devis descriptif de l'exploitation du terrain ainsi que de l'affectation de la main d'oeuvre prévue et des dispositions qui seront prises pour l'entretien et la réparation de la machinerie et pour son remplacement en cas de bris de plus de 48 heures.

5. Rapport technique pour autres lieux d'élimination ou d'entreposage des déchets solides : Toute demande de certificat soumise selon l'article 3 en vue d'établir ou de modifier un lieu d'entreposage des déchets solides ou un lieu d'élimination visé aux sections V à IX doit être accompagnée d'un rapport technique comportant les renseignements et documents énumérés ci-dessous :

a) un plan de localisation indiquant l'emplacement précis du lieu d'élimination ou d'entreposage des déchets solides ;

b) les plans et devis de tous les équipements fixes qui seront utilisés pour entreposer ou traiter les déchets solides, y compris tout appareil ou ouvrage destiné à réduire,

contrôler, contenir ou prévenir le dépôt, le dégagement, l'émission ou le rejet de contaminants dans l'environnement, toute aire d'entreposage et tout quai de chargement et de déchargement ;

c) un devis descriptif de l'exploitation décrivant notamment les opérations, l'affectation de la main-d'oeuvre et les dispositions prises pour l'entretien, la réparation de l'équipement mécanique et son remplacement en cas de bris de plus de 48 heures ;

d) dans le cas d'un lieu de traitement de déchets solides, la mention du lieu de dépôt définitif des résidus de traitement et des déchets solides qui n'y sont pas acceptés ;

e) dans le cas d'une usine de compostage, le document requis par le paragraphe b de l'article 4, un avis technique relativement aux risques de contamination des nappes d'eau souterraines et de surface, un plan d'aménagement du terrain et les plans et profils du système de drainage ;

f) dans le cas d'un dépôt de matériaux secs, l'objectif et la justification du projet de remplissage, le plan d'aménagement final et l'affectation prévue du terrain restauré.

6. Modification : Dans le cas d'une demande de certificat en vue de modifier un lieu d'élimination ou d'entreposage des déchets solides pour lequel un certificat a déjà été délivré antérieurement, il n'est pas nécessaire de soumettre à nouveau les renseignements et documents visés aux articles 3 à 5 dans la mesure où ils sont identiques à ceux déjà fournis en vue d'obtenir le certificat délivré précédemment. Il suffit alors que le requérant indique que ces données sont inchangées.

7. Dépôt en tranchée : Toute demande de certificat en vue d'établir un dépôt en tranchée visé à la section X doit être présentée sur la formule qui se trouve à l'annexe A. Dans ce cas, il suffit de fournir les renseignements exigés par cette formule.

7.1 Milieu nordique : Toute demande de certificat en vue d'établir un dépôt de déchets en milieu nordique visé à la section X.1 doit être présentée sur la formule conforme à l'annexe C.

D. 1075-84, a. 2.

8. Personnes : Une demande de certificat soumise par une personne doit être accompagnée d'une demande de permis à moins que cette personne ne soit déjà détenteur d'un permis délivré pour la partie du système de gestion des déchets solides qui fait l'objet de la demande de certificat ou à moins que ce lieu d'élimination n'ait été soustrait de l'application de l'article 55 de la Loi.

R.R.Q., 1981, c. Q-2, r.14, a. 8; D. 195-82, a. 2.

catégorie de lieu d'élimination ou d'entreposage des déchets solides	montant de la garantie
enfouissement sanitaire destiné à desservir moins de 20 000 habitants	25 000 \$
enfouissement sanitaire destiné à desservir entre 20 000 et 80 000 habitants	50 000 \$
enfouissement sanitaire destiné à desservir plus de 80 000 habitants	100 000 \$
incinérateur, pyrolyseur, usine de compostage, poste de transbordement ou système de récupération	5% du coût d'immobilisation et minimum 25 000 \$
dépôt de matériaux secs	25 000 \$

R.R.Q., 1981, c. Q-2, r.14, a. 17; D. 195-82, a. 4.

18. Police de la garantie : Toute personne qui a fourni une police de garantie dont la durée de validité est plus courte que celle du permis doit la renouveler et s'assurer qu'elle demeure en vigueur pendant toute la durée de validité du permis et pendant une période de 60 jours après la date d'échéance ou de révocation du permis. Toute personne visée par le présent article doit transmettre au sous-ministre une preuve de tout renouvellement d'une police de garantie.

Toute police de garantie doit comporter une disposition en vertu de laquelle l'assureur doit prévenir le sous-ministre en cas d'annulation de la police.

19. Utilisation de la garantie : Le ministre de l'Environnement ou le sous-ministre peut utiliser la garantie visée à l'article 17 pour exécuter ces travaux aux frais de l'exploitant dans tous les cas prévus aux articles 59, 81, 82, 84, 113, 114 et 115 de la Loi.

En cas d'utilisation de la garantie pendant la période de validité du permis, l'exploitant doit, dans un délai de 15 jours, remplacer la garantie utilisée.

20. Préavis : Avant d'utiliser la garantie, le ministre ou le sous-ministre, selon le cas, doit donner un avis préalable de 30 jours au détenteur du permis. À l'expiration de ce délai, le ministre peut employer la garantie pour les fins énumérées à l'article 19 à moins que le détenteur du permis n'ait, dans les entrefaites, effectué les travaux pour lesquels le ministre ou le sous-ministre veut utiliser la garantie.

21. Remise de la garantie : La garantie est remise à l'exploitant à la date d'échéance de son permis, sauf si elle a été utilisée par le ministre ou le sous-ministre tel que prévu aux articles 19 et 20.

22. Renouvellement de permis : Toute personne qui veut renouveler son permis doit soumettre sa demande de renouvellement au moins 6 mois avant la date d'échéance du permis qu'elle possède déjà.

SECTION IV ENFOUISSEMENT SANITAIRE

23. Zonage et plaines de débordement : Il est interdit d'établir un lieu d'enfouissement sanitaire dans une plaine de débordement ou dans tout territoire zoné par l'autorité municipale pour fins résidentielles, commerciales ou mixtes (résidentielles-commerciales) et à moins de 150 mètres d'un tel territoire.

24. Aéroport : Il est interdit d'établir un lieu d'enfouissement sanitaire à moins de 3 kilomètres d'un aéroport.

25. Voie publique : Aucun lieu d'enfouissement sanitaire ne peut être établi à moins de 152,40 mètres de tout chemin entretenu par le ministre des Transports et à moins de 50 mètres de toute autre voie publique.

26. Distance de certains lieux : L'aire d'exploitation d'un lieu d'enfouissement sanitaire doit être située à plus de 150 mètres de tout parc municipal, terrain de golf, piste de ski alpin, base de plein air, plage publique, réserve écologique créée en vertu de la Loi sur les réserves écologiques (L.R.Q., c. R-26), parc au sens de la Loi sur les parcs (L.R.Q., c. P-9), parc au sens de la Loi sur les parcs nationaux (S.R.C., 1970, c. N-13), mer, fleuve, rivière, ruisseau, étang, marécage ou batture.

27. Distance de certains immeubles : L'aire d'exploitation d'un lieu d'enfouissement sanitaire doit être située à plus de 200 mètres de toute habitation, institution d'enseignement, temple religieux, établissement de transformation de produits alimentaires, terrain de camping, restaurant ou établissement hôtelier détenteur d'un permis délivré en vertu de la Loi sur l'hôtellerie (L.R.Q., c. H-3), colonie de vacances et établissement au sens de la Loi sur les services de santé et les services sociaux (L.R.Q., c. S-5).

28. Lacs : L'aire d'exploitation d'un lieu d'enfouissement sanitaire doit être située à plus de 300 mètres de tout lac.

29. Conditions hydrogéologiques : L'enfouissement sanitaire des déchets solides doit s'effectuer sur un terrain où les conditions hydrogéologiques sont telles que les eaux de lixiviation s'infiltrent dans le sol et que le temps de migration des eaux y est supérieur à 5 ans avant de parcourir 300 mètres ou avant d'atteindre tout puits ou source servant à l'alimentation en eau potable et situé à une distance inférieure à 300 mètres, à moins que ces eaux n'aient fait résurgence auparavant. Dans ce dernier cas, elles doivent avoir circulé dans le sol pendant plus de 2 ans à une vitesse moyenne inférieure à 150 mètres par an.

Nature du contaminant	Type de contenant	Mode de conservation	Délai maximal entre le prélèvement et le début de l'analyse
composés phénoliques	de verre	acidification à pH 4 avec H_3PO_4 et 1 gr/l de $CuSO_4$	24 heures
cyanures	de verre ou de polyéthylène	pH > 12 avec NaOH	24 heures
sulfures	de verre ou de polyéthylène	2 ml d'acétate de zinc 2N par litre d'échantillon	24 heures
huiles et graisses	de verre	acidification à pH < 2 avec H_2SO_4 ou HCl	24 heures
cadmium	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
chrome	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
cuivre	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
fer	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
nickel	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
zinc	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
plomb	de polyéthylène	acidification à pH < 2 avec HNO_3 concentré	6 mois
mercure	de verre	acidification à pH < 2 avec HNO_3 ou H_2SO_4 (libre de mercure) et 0,05% du dichromate de potassium	30 jours
chlorures	de polyéthylène		7 jours
sulfates	de polyéthylène		7 jours
demande chimique en oxygène	de polyéthylène	acidification à pH < 2 avec H_2SO_4	7 jours
demande biochimique en oxygène	de polyéthylène		24 heures
bactéries coliformes totales	de polypropylène		24 heures
bactéries coliformes fécales	de polypropylène		24 heures

Le préservatif requis afin de conserver un échantillon doit être ajouté sur-le-champ lors du prélèvement de l'échantillon.

D. 195-82, a. 5.

30.4 Méthodes d'analyse: Les échantillons d'eau de lixiviation prélevés pour l'application de l'article 30 doivent être analysés selon les méthodes suivantes:

a) les cyanures sont déterminés selon les méthodes de préparation numéros 412 A et 412 B intitulées respectivement *Preliminary Treatment of Samples* et *Total Cyanide after Distillation* et la méthode de dosage numéro 412 D intitulée *Colorimetric Method* ou numéro 412 C intitulée *Trisrimetric Method* décrites dans la 15^e édition (1980) de l'ouvrage intitulé *Standard Methods for the Examination of Water and Wastewater* publié conjointement par l'*American Public Health Association*, l'*American Water Works Association* et la *Water Pollution Control Federation*;

b) les composés phénoliques sont déterminés selon les méthodes numéros 510 A et 510 B intitulées respectivement *Cleanup Procedure* et *Chloroform Extraction Method* décrite dans l'ouvrage visé au paragraphe a) ou selon la méthode numéro 420.2 intitulée *Phenolics, Total Recoverable* décrite dans l'ouvrage intitulé *Methods for Chemical Analysis of Water and Wastes* publié en mars 1979 par l'Agence américaine de protection de l'environnement (EPA) sous la cote numéro 600/4-79-020;

c) les sulfures sont déterminés selon la méthode de préparation numéro 427 B intitulée *Sample Pretreatment to Remove Interfacing Substances or to Concentrate the Sulfide* et selon la méthode de dosage numérique 427 C intitulée *Methylene Blue Method* ou numéro 427 D intitulée *Trisrimetric (Iodine) Method* décrites dans l'ouvrage visé au paragraphe a);

j) être conçu et exploité de façon à assurer un enlèvement de 85% de la demande biochimique en oxygène 5 jours des eaux de lixiviation;

k) être muni, dans le cas d'un étang d'aération, d'un surpresseur d'urgence;

l) être entouré, à moins de 10 mètres, d'une clôture permanente de broche d'acier d'au moins 2 mètres de hauteur dont les carreaux possèdent des côtés d'une longueur maximale de 8 centimètres; et

m) être pourvu d'un chemin d'accès carrossable en toute saison.

D. 195-82. a. 6.

32. Dissimulation : Les opérations d'enfouissement doivent être dissimulées derrière une clôture visée à l'article 33, un rideau de conifères, un talus, un accident topographique ou un autre écran naturel de manière à ce qu'elles ne puissent être vues par une personne qui se trouve sur une voie publique ou dans tout bâtiment ou parc où le public a accès.

33. Clôture de dissimulation : Si on pose une clôture en tout ou en partie autour d'un lieu d'enfouissement sanitaire pour respecter les exigences prescrites à l'article 32, cette clôture doit avoir une hauteur d'au moins 2,50 mètres, doit être verticale et doit :

a) être pleine et être constituée de bois teint ou peint, de briques, de pierre ou de panneaux de fibre de verre ou d'aluminium peint ; ou

b) être faite de planches de bois verticales ou horizontales teintées ou peintes d'une largeur d'au moins 15 centimètres séparées les unes des autres par une distance d'au plus 2,5 centimètres.

34. Talus : Si un talus est construit autour d'un lieu d'enfouissement sanitaire en vue de respecter les exigences prescrites à l'article 32 et que ce talus est lui-même visible d'une voie publique, il faut qu'il soit recouvert de végétation. Le responsable du lieu d'enfouissement doit prendre les mesures requises pour que la végétation croisse comme dans le milieu environnant.

35. Clôture pare-papiers : L'aire d'enfouissement doit en outre être pourvue d'une clôture pare-papiers d'au moins 3 mètres de hauteur destinée à empêcher l'éparpillement des papiers dans l'environnement. Cette clôture doit être aménagée sur patins pour permettre son déplacement selon les besoins. Elle doit être recourbée vers l'intérieur dans sa partie supérieure, être disposée verticalement sur le sol et être constituée de broche à carreaux n'excédant pas 5 centimètres de côté. Cette clôture doit être placée à moins de 20 mètres des opérations d'enfouissement.

36. Accès : Le chemin d'accès et les aires de circulation du lieu d'enfouissement sanitaire doivent être carrossables en toute saison pour des camions de 10 tonnes métriques.

37. Abri : Lorsqu'un lieu d'enfouissement sanitaire est en opération plus de 16 heures par semaine, on doit y aménager un abri chauffé pourvu d'eau potable, d'un téléphone ou d'un radio-émetteur-récepteur, d'éclairage et d'un cabinet d'aisance.

38. Drainage : Tout lieu d'enfouissement sanitaire doit être pourvu d'un système de drainage conçu pour empêcher que le ruissellement des eaux de surface ne communique avec les déchets solides déposés sur le lieux d'enfouissement sanitaire.

39. Zone-tampon : Tout lieu d'enfouissement sanitaire doit être pourvu d'une zone-tampon d'une largeur d'au moins 10 mètres entre les limites de l'aire d'enfouissement des déchets solides et tout terrain voisin occupé par une personne autre que l'exploitant du lieu d'enfouissement sanitaire.

Dans le cas où cette zone-tampon est boisée, on doit y conserver les arbres existants afin de maintenir l'encadrement forestier naturel.

40. Affichage : Tout lieu d'enfouissement sanitaire doit être clairement identifié comme tel à l'entrée au moyen d'une affiche indiquant qu'il s'agit d'un lieu d'enfouissement sanitaire et mentionnant le nom et l'adresse du propriétaire ainsi que les heures d'ouverture du lieu d'enfouissement sanitaire.

Toute personne qui exploite un lieu d'enfouissement sanitaire doit également afficher son permis.

41. Contenant à l'entrée : L'exploitant d'un lieu d'enfouissement sanitaire doit placer à l'entrée de son terrain un contenant étanche d'une capacité minimale de 2 m³ destiné à recevoir les déchets solides en dehors des heures d'ouverture.

42. Opérations journalières : Les déchets solides déposés dans un lieu d'enfouissement sanitaire doivent être compactés mécaniquement en couches uniformes dont l'épaisseur ne doit pas excéder 2 mètres et la surface de chaque couche ainsi compactée doit être recouverte d'au moins 20 centimètres d'un matériau de recouvrement visé à l'article 48 au fur et à mesure de la progression de la couche de déchets solides compactés.

Le front de la couche de déchets solides doit être également compacté et recouvert de 20 centimètres du même matériau de recouvrement après chaque journée d'opération dans le cas où on interrompt les opérations d'enfouissement.

54. Déchets acceptables : l'exploitant d'un lieu d'enfouissement sanitaire ne peut y accepter que des déchets solides, des déchets biomédicaux non contaminés et solides à 20°C autres que des déchets anatomiques humains, des résidus non dangereux solides à 20°C provenant d'une fabrique de pâtes et papiers ou d'une scierie, des boues pelletables non dangereuses et au plus 100 m³ de terres et sables imbibés de moins de 5 % en poids d'hydrocarbures par période de 4 mois consécutifs.

R.R.Q., 1981, c. Q-2, r.14, a. 54; D. 1003-85, a. 2.

55. Prohibition : Nul ne peut déposer ou permettre le dépôt sur un lieu d'enfouissement sanitaire d'un déchet exclu par l'article 54. La présence d'un tel déchet dans le sol d'un lieu d'enfouissement sanitaire est prohibée au sens de l'article 20 de la Loi.

56. Pneus : Nonobstant les autres dispositions du présent règlement, l'exploitant d'un lieu d'enfouissement sanitaire ne peut accepter une quantité quotidienne de pneus non déchiquetés qui excède 1 % du volume total de déchets solides déposés quotidiennement dans le lieu d'enfouissement sanitaire.

57. Brûlage : Il est interdit de brûler ou de tolérer le brûlage de déchets sur un lieu d'enfouissement sanitaire.

La présence dans l'environnement de toute fumée provenant d'une telle combustion est prohibée au sens du deuxième alinéa de l'article 20 de la Loi.

57.1. Registre : L'exploitant d'un lieu d'enfouissement sanitaire doit tenir un registre de ses opérations indiquant, pour chaque camion qui y dépose des déchets :

- a) le nom du transporteur à qui appartient ce camion;
- b) la nature des déchets déposés par ce camion; et
- c) la provenance de ces déchets.

Il doit conserver ce registre pendant une période d'au moins 2 ans.

D. 195-82, a. 10.

58. Nettoyage des lieux : Les voies d'accès, les clôtures pare-papiers et les abords de tout terrain d'enfouissement sanitaire doivent être nettoyés après chaque journée d'opération de sorte qu'il n'y subsiste plus aucun déchet solide.

59. Extermination : L'exploitant de tout lieu d'enfouissement sanitaire doit faire usage de poison lorsque requis pour exterminer les rats et la vermine pendant l'exploitation de son terrain d'enfouissement. Il doit également faire usage de poison pendant une période de 3 mois après la fermeture définitive du lieu d'enfouissement sanitaire.

60. Exception saisonnière : Pendant toute période de l'année où la population desservie par un lieu d'enfouissement sanitaire baisse en-deçà de 2 000 personnes, il est permis d'exploiter ce lieu d'enfouissement sanitaire selon les normes prévues aux articles 97 et 100 au lieu des articles 42 et 43, à condition que ces articles 97 et 100 soient rigoureusement respectés.

SECTION V INCINÉRATION

61. Application de cette section : La présente section ne s'applique qu'aux incinérateurs d'une capacité supérieure à une tonne métrique/heure.

62. Zonage : Tout incinérateur doit être placé dans un secteur zoné à des fins industrielles par l'autorité municipale compétente et à plus de 150 mètres des limites d'une telle zone.

63. Réception des déchets : Tout incinérateur doit être pourvu d'une fosse ou d'une aire de réception des déchets située à l'intérieur d'un bâtiment et maintenue sous pression négative.

La fosse à déchets est obligatoire pour un incinérateur d'une capacité supérieure à 50 tonnes métriques/jour.

Toute aire de réception des déchets solides doit être nettoyée à la fin de chaque journée d'opération.

64. Pyromètre : La chambre de combustion de tout incinérateur doit être pourvue d'un pyromètre à enregistrement continu. Les résultats ainsi enregistrés doivent être conservés pendant un an par l'exploitant de l'incinérateur.

65. Lieu d'élimination complémentaire : Les résidus de l'incinération des déchets solides doivent être éliminés dans un lieu d'enfouissement sanitaire visé dans la section IV. Il en est de même des déchets solides qui ne sont pas acceptés à l'incinérateur.

Avant d'être ainsi éliminés, les résidus d'incinération doivent être éteints et refroidis.

66. Émission de contaminants dans l'atmosphère : Tout incinérateur doit respecter les normes d'émission de contaminants dans l'atmosphère prévues dans le Règlement sur la qualité de l'atmosphère (c. Q-2, r.20).

67. Eaux usées : Les articles 30 et 31 s'appliquent *mutatis mutandis* aux eaux de procédé utilisées dans un incinérateur pour refroidir les cendres ou pour diminuer les rejets de contaminants dans l'atmosphère, de même qu'aux eaux provenant de la fosse et de l'aire de réception de déchets.

SECTION IX DÉPÔT DE MATÉRIAUX SECS

85. Pratique limitée : Les matériaux secs peuvent être déposés sur le sol à ciel ouvert seulement dans le cadre d'un projet de remplissage d'une excavation, d'une carrière ou d'une sablière dont la profondeur moyenne est égale ou supérieure à 3 mètres.

86. Déchets acceptables : L'exploitant d'un dépôt de matériaux secs régi par la présente section ne peut y recevoir que des matériaux secs et des matériaux d'excavation.

Nul ne peut déposer ou permettre le déchargement sur un dépôt de matériaux secs d'un déchet dont la présence n'y est pas permise selon le premier alinéa. La présence d'un tel déchet dans le sol d'un dépôt de matériaux secs est prohibée au sens de l'article 20 de la Loi.

87. Opérations : Les matériaux secs déposés doivent être régalez et recouverts complètement d'une couche de matériel granulaire visé au premier alinéa de l'article 48 au moins une fois par mois pendant les mois d'opération.

88. Autres normes d'exploitation : Les articles 32, 33, 34 et 40 et le troisième alinéa de l'article 48 s'appliquent *mutatis mutandis* en tout temps aux dépôts de matériaux secs.

89. Profil final : À la fin du projet de remplissage, le profil final d'un dépôt de matériaux secs, y compris la couche de recouvrement final, ne doit pas dépasser le profil du terrain environnant.

90. Recouvrement final : Dès que le remplissage d'un dépôt de matériaux secs est complété jusqu'à une profondeur de 60 centimètres ou 120 centimètres sous le profil du terrain environnant, selon les cas visés à l'article 45, l'exploitant du dépôt de matériaux secs doit procéder immédiatement au recouvrement final en la manière visée à l'article 45.

91. Brûlage : Il est interdit de brûler ou de tolérer le brûlage de quelque matière que ce soit sur un dépôt de matériaux secs. Le deuxième alinéa de l'article 57 s'applique *mutatis mutandis*.

92. Désaffectation ou suspension des activités : Lorsqu'un dépôt de matériaux secs est désaffecté ou lorsqu'il demeure inutilisé pendant une période de 12 mois consécutifs, il doit être recouvert en la manière indiquée aux articles 89 et 90.

SECTION X DÉPÔT EN TRANCÉE DE DÉCHETS SOLIDES

93. Pratique limitée : Il est permis d'établir un dépôt en tranchée de déchets solides uniquement dans le but de recevoir les déchets solides des populations qui habitent les territoires suivants :

- a) tout territoire non organisé en municipalité locale;
- b) toute municipalité dont la population n'est pas desservie par un service organisé d'enlèvement des ordures ménagères;
- c) toute municipalité dont la population desservie par un service organisé d'enlèvement des ordures ménagères est inférieure à 2 000 habitants et qui est entièrement située à plus de 30 kilomètres, par voie routière carrossable à l'année, d'un lieu d'élimination pour lequel un certificat ou un permis a été délivré conformément aux sections IV, V, VII, VIII et XI;
- d) Supprimé.

e) les municipalités de Fermont, Schefferville, Murdochville, Gagnon, Témiscaming, Ville-Marie, Havre-Saint-Pierre et de la Baie-James.

R.R.Q., 1981, c. Q-2, r.14, a. 93; D. 195-82, a. 11.

94. Population maximale : Un dépôt en tranchée de déchets solides ne peut desservir plus de 2 000 personnes, sauf dans les cas prévus au paragraphe e de l'article 93.

95. Normes de localisation : Tout dépôt en tranchée de déchets solides doit être placé à une distance d'au moins :

- a) 150 mètres de toute mer, fleuve, rivière, ruisseau, étang, marécage, batture ou réserve écologique créée en vertu de la Loi sur les réserves écologiques (L.R.Q., c. R-26);
- b) 300 mètres d'un lac;
- c) 152,40 mètres d'un chemin entretenu par le ministère des Transports et 100 mètres d'une autre voie publique;
- d) 500 mètres d'une habitation, institution d'enseignement, temple religieux, établissement de transformation de produits alimentaires ou de tout puits ou source servant à l'alimentation humaine.

R.R.Q., 1981, c. Q-2, r.14, a. 95; D. 195-82, a. 12.

APPENDIX 6

Correspondence : Tanpangajuk Airport Estimate

November 7, 1966.

Mr. Claude Prevost,
Project Manager,
Grants & Contributions,
Transport Canada,
P.B. 5000,
Dorval, Quebec
H4Y 1B9

A4365-31/C-T

Dear Mr. Prevost:

Taqpangayuk Airport Estimate

Thanks for your letter of October 31st. However, as discussed with F. Melling, we require an estimate to cover the cost of expanding the 910m runway to 1070 m as a separate contract at a later date which would probably cost more because of additional mobilization costs etc.

Yours sincerely,

C. Turner
Senior Engineer
Planning and Traffic
Transportation Services Section

A. Turner, P.Eng.,
Senior Engineer,
Planning and Traffic,
Transportation Services Section,
Transportation Division,
Technical Services & Contracts Branch,
Ottawa, Ontario.
K1A 0N4.

TURNER:ijr (977-8266)

January 22, 1987

A4365-31/0-T

Mr. A. Turner, P. Eng.
Senior Engineer
Transportation Services Section
Technical Services & Contracts Branch
Indian and Northern Affairs Canada
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Your file Votre référence

5168-0685 (NKOC/G)

Our file Notre référence

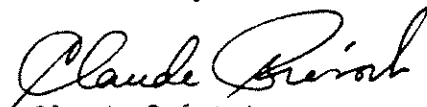
Subject: Taq pangayuk Airport Estimate

Dear Sir:

Following your letter of November 7th 1986, the cost of mobilization for expanding the 610m runway to 1070m, is estimated to \$2.2M. This amount is in addition to the construction costs as per our letter of October 31st 1986.

We regret the delay in answering your request and hope all is to your satisfaction.

Yours truly,


Claude Prévost
Project Manager

*noted
sent 2/2/87*

3/2/87

CP/lr

Regional Administration
P.O. Box 5000
Montreal Int'l Airport
Dorval, P. Quebec
H4Y 1B9

JAN 29 9 17 AM '87

517809

Canada

Canada Post
Canada Post

P.B. 5000, Dorval, Que. H4Y 1B9

NOV 5 1986
TSX 62

October 31st, 1986

6/11/86

Your file Your reference

Your file Your reference

5168-1 (QA00/G)

Mr. Allan Turner,
Head, Transportation Services Section,
Indian and Northern Affairs Canada,
Technical Services and Contracts,
Les Terrasses de la Chaudière,
Ottawa, Ont.
K1A 0H4

SUBJECT: COST ESTIMATES - TAQPANGAYUK

Dear Mr. Turner,

This is to confirm our telephone conversation of October 30th.

The cost estimates (construction only) for the proposed runway, taxiway and apron for the 2 options are as follows:

Option 1 - 610m runway	\$1,950.0K (\$86-87)
Option 2 - 1070m runway	\$4,700.0K (\$86-87)

Yours truly,

Claude Prevost

CLAUDE PREVOST,
Project Manager,
Grants & Contributions

cg

Canada

$\Delta = 2750\$$
 $\times 1.035$
 $\boxed{2846\$}$

Nov 5 1986
TSX 62

APPENDIX 7
Development of Taqpangajuk Discount Rate

The Discount Rate

For many investors the discount rate is very easy to evaluate, however, that of Canada is somewhat more complex. As with other investors, Canada's interest rate is assumed to be the same for either borrowing or investing monies in a perfect market. A means of determining this rate is necessary in order to establish Canada's discount rate.

The information obtained from the Bank of Canada shows that Canada's loan sources are the following : Short Term Canada Bonds

Long Term Canada Bonds

Canada Treasury Bills

Canada Savings Bonds

According to the Bank of Canada representatives, the overall loan is shared by these sources accordingly :

Short Term Bonds (STB)	19%
Long Term Bonds (LTB)	17%
Treasury Bills (TB)	43%
Savings Bonds (CSB)	<u>21%</u>
	100%

For each loan source the interest rate varies both with year and within each year. The data received from the Bank of Canada (Table x) is for low and high yearly interest yield rates for STB, LTB and TB, and the yearly interest yield rates for CSB for the years 1971 to 1986. Forecasted rates were also obtained for the period 1987 to 1992.

Inflation rates were procured from both Statistics Canada and the Treasury Board.

The net rate must first be calculated for each source :

For STB, LTB and TB (1971 to 1986)

$$d = \frac{1 + \frac{Lr + Hr}{2}}{1 + i} - 1 \quad \text{where } Lr = \text{low rate} \\ Hr = \text{high rate}$$

For CSB (1971 to 1992) and STB, LTB and TB (1987 to 1992)

$$d = \frac{1 + Mr}{1 + i} - 1 \quad \text{where } Mr = \text{mean rate} \\ i = \text{interest rate}$$

The net rates appear in Table x

From Table x the mean net rates can be derived.

	Mean Net Rates %	
	1971 to 1986	Projected Range 1987 to 1992
STB	1.53	3.58 - 2.62
LTB	2.40	4.84 - 3.88
TB	1.58	3.09 - 2.33
CSB	0.98	<u>3.48 - 2.67</u>

The net discount rates (NDR) can then be calculated as follows :

$$\text{NDR} = 0.19 \text{ STB} + 0.17 \text{ LTB} + 0.43 \text{ TB} + 0.21 \text{ CSB}$$

giving

$$\text{NDR (1971 to 1986)} : 1.58\%$$

$$\text{NDR (1987 to 1992) range} : \text{from } 3.56 \text{ to } 2.72\%$$

Since the Taqangajuk project is a long term project the Net Present Cost was calculated with a NDR of 3%, the approximate mean of the projected NDR (1987 to 1992) value.

For the purpose of sensitivity analysis, and in case the rates should change in some way, calculations for NDR's of 0%, 2%, 4% and 6% were performed.

Interest (yield) Rates
(Sources : Statistics Canada Bank of Canada and Treasury Board)

	Infla- tion rate	Short-term Bonds			Long-term Bonds			Treasury Bills			Saving Bonds	
		Low	High	Net rate	Low	High	Net rate	Low	High	Net rate	Means	Net rate
1971	2.9	4.21	5.51	1.90	6.56	7.49	4.01	3.00	4.68	0.91	7.19	4.17
1972	4.7	4.76	5.97	0.64	6.73	7.49	2.30	3.36	3.73	-1.10	7.30	2.48
1973	7.7	5.45	7.27	-1.24	7.16	7.82	-0.19	3.90	6.50	-2.32	7.54	-0.15
1974	10.9	6.58	9.30	-2.67	7.74	9.84	-1.90	6.07	9.11	-2.98	9.75	-1.04
1975	10.8	5.91	8.72	-3.15	8.17	9.72	-1.67	6.26	8.64	-3.02	9.38	-1.28
1976	7.5	7.10	8.54	-1.20	8.77	9.39	1.47	8.53	9.13	1.24	9.13	1.52
1977	7.9	6.96	7.51	-0.62	8.52	8.85	0.73	7.05	8.04	-0.33	8.06	0.15
1978	8.8	7.68	10.09	0.35	9.06	9.68	0.52	7.13	10.46	0.00	9.50	0.64
1979	9.2	9.69	12.83	1.89	9.66	11.32	1.18	10.78	13.66	2.77	10.78	1.45
1980	10.2	10.48	14.27	1.97	11.29	13.45	1.97	10.06	17.01	3.03	10.68	0.44
1981	12.5	13.06	18.93	3.11	12.96	17.66	2.50	14.41	20.82	4.55	12.27	-0.20
1982	10.8	9.85	16.24	2.03	11.69	16.03	2.76	9.80	16.33	2.04	9.14	-1.50
1983	9.8	9.75	10.86	4.26	11.18	12.34	5.63	9.70	9.71	3.69	7.39	1.50
1984	9.4	10.44	13.02	6.01	11.66	13.96	7.03	9.73	12.73	5.53	7.75	2.23
1985	4.4	9.10	11.69	5.74	10.06	12.30	6.49	8.53	12.27	5.27	6.84	2.34
1986	4.0	8.63	10.88	5.53	9.16	10.49	5.60	8.24	11.55	5.67	7.15	3.03
Mean				1.53			2.40			1.58		0.98
Forecasts				Mean Net rate			Mean Net rate			Mean Net rate		
1987	3.4		7.10	3.58		8.40	4.84		6.60	3.09	7.00	3.48
1988	3.1		6.70	3.49		7.90	4.66		6.50	3.30	6.50	3.30
1989	3.0		6.30	3.20		7.50	4.37		6.00	2.91	6.25	3.16
1990	3.0		5.90	2.82		7.20	4.08		5.60	2.52	6.00	2.91
1991	3.0		5.90	2.62		7.10	3.98		5.40	2.33	5.75	2.67
1992	3.0		5.70	2.62		7.00	3.88		5.40	2.33	5.75	2.67

References

- Khowry, Nabil T. Rentabilité et risque de l'investissement en obligations au Canada. In Gestion. November 1981, vol.6, no.4, pp.54-62.
- Gagnon, G.M., et Khowry, N.T. Traité de gestion financière, Gaeten, Morin et Associés, 1981.

APPENDIX 8
Risk Factors for Implementation Schedules

OPTION 1

Schedule 1. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Tight schedule and time frame and short yearly work period	5
	3. Cons. market	Lots of works gain on up north but conditions may change	5
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Tight schedule short work period	7
	3. Cons. market	Lots of contractors in the area now. Conditions may change	4
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	26
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Tight schedule, short work period	5
	3. Cons. market	As for earthworks	5
	4. Unquantified	Environment requirements may cause changes	-
4. Public Utilities	1. Studies	Basic studies only Incomplete data Class D estimate	-
	2. Scheduling	Tight schedule short yearly work period	-

OPTION 1
Schedule 1. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	25
	2. Scheduling	Tight field schedule and short work period on the site for studies Complex logistics for temporary services	10
	3. Cons. market	As for other services	0
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	500

OPTION 1

Schedule 2. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Compact schedule and time frame and short yearly work period	3
	3. Cons. market	Lots of works gain on up north but conditions may change	7
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Compact schedule short work period	5
	3. Cons. market	Lots of contractors in the area now. Conditions may change	6
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	26
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Compact schedule, short work period	3
	3. Cons. market	As for earthworks	7
	4. Unquantified	Environment requirements may cause changes	
4. Public Utilities	1. Studies	Basic studies only incomplete data Class D estimate	-
	2. Scheduling	Compact schedule short yearly work period	-

OPTION 1

Schedule 2. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	5
	2. Scheduling	Tight field schedule and short work period on the site for studies complex logistics for temporary services	10
	3. Cons. market	As for other services	does not apply
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	300

OPTION 1

Schedule 3. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Time frame and short yearly work period	0
	3. Cons. market	Lots of works gain on up north but conditions may change	10
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Short work period	3
	3. Cons. market	Lots of contractors in the area now. Conditions may change	8
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	26
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Short work period	2
	3. Cons. market	As for earthworks	8
	4. Unquantified	Environment requirements may cause changes	
4. Public Utilities	1. Studies	Basic studies only incomplete data Class D estimate	
	2. Scheduling	Short yearly work period	-

OPTION 1
Schedule 3. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	5
	2. Scheduling	Tight field schedule and short work period on the site for studies complex logistics for temporary services	10
	3. Cons. market	As for other services	does not apply
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	100

OPTION 2
Schedule 1. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Tight schedule and time frame and short yearly work period	5
	3. Cons. market	Lots of works gain on up north but conditions may change	5
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Tight schedule short work period	7
	3. Cons. market	Lots of contractors in the area now. Conditions may change	4
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	23
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Tight schedule, short work period	5
	3. Cons. market	As for earthworks	5
	4. Unquantified	Environment requirements may cause changes	
4. Public Utilities	1. Studies	Basic studies only Incomplete data Class D estimate	-
	2. Scheduling	Tight schedule short yearly work period	-

OPTION 2

Schedule 1. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	5
	2. Scheduling	Tight field schedule and short work period on the site for studies Complex logistics for temporary services	10
	3. Cons. market	As for other services	does not apply
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	500

OPTION 2
Schedule 2. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Compact schedule and time frame and short yearly work period	3
	3. Cons. market	Lots of works gain on up north but conditions may change	7
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Compact schedule short work period	5
	3. Cons. market	Lots of contractors in the area now. Conditions may change	6
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	23
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Compact schedule, short work period	3
	3. Cons. market	As for earthworks	7
	4. Unquantified	Environment requirements may cause changes	
4. Public Utilities	1. Studies	Basic studies only incomplete data Class D estimate	-
	2. Scheduling	Compact schedule short yearly work period	-

OPTION 2

Schedule 2. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	5
	2. Scheduling	Tight field schedule and short work period on the site for studies complex logistics for temporary services	10
	3. Cons. market	As for other services	does not apply
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	300

OPTION 2
Schedule 3. Risk Factors

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
1. Buildings	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	10
	2. Scheduling	Time frame and short yearly work period	-
	3. Cons. market	Lots of works gain on up north but conditions may change	10
	4. Unquantified		
2. Earthworks	1. Studies	Basic feasibility study info. only incomplete soil data Class D estimate	20
	2. Scheduling	Short work period	3
	3. Cons. market	Lots of contractors in the area now. Conditions may change	8
	4. Unquantified	Québec may refuse to pay its share for airport works in short term 40% of airport represents 31% of total earthworks	23
3. Municipal Services	1. Studies	Basic studies info only incomplete soil data Class D estimate Water reservoir "Dykes" present special difficulty	10
	2. Scheduling	Short work period	2
	3. Cons. market	As for earthworks	8
	4. Unquantified	Environment requirements may cause changes	-
4. Public Utilities	1. Studies	Basic studies only incomplete data Class D estimate	-
	2. Scheduling	Short yearly work period	-

OPTION 2

Schedule 3. Risk Factors (con't)

<u>Work Category</u>	<u>Risk Source</u>	<u>Remark</u>	<u>Risk Factor</u>
4. Public Utilities (con't)	3. Cons. market	As for other works	-
	4. Unquantified	Hydro Québec might oblige the federal government to pay for the construction of the powerhouse	100
5. Studies and temporary services	1. Studies	Studies may prove the need for further investigations Temporary services as Class D estimates	5
	2. Scheduling	Tight field schedule and short work period on the site for studies complex logistics for temporary services	10
	3. Cons. market	As for other services	does not apply
	4. Unquantified	Approval delays, for both, management for studies and temporary services may bring extra costs	10
6. Operation and maintenance of the village	4. Unquantified	Québec should take care of operation and maintenance but may try to delay its acceptance of the village should the negotiation on this point turn bad, the Federal Government would have to assume O & M costs of the village until 1997 or thereabouts	100

APPENDIX 9

BPR Report :

- . Taqpangajuk Relocation
- . Assessment of the Cost Estimates
and Schedules of the Feasibility Study

Consultants **BPR**

Les Consultants **BPR**
Québec
Beauport, Cap-Santé
Chicoutimi, Montmagny
Rimouski, Ste-Marie

Québec:
3333 boul. Hamel
Québec, Qc G1P 2J7
Tél.: 418-871-8151
Télex:
051-31707 B P R QBC

Consultants BPR

Quebec, April 30 1987

MAKIVIK CORPORATION
4898, de Maisonneuve West
Montreal, Quebec
H3Z 1M8

Attention to: Mr. Colin Bird

RE: Assessment of cost estimates for
"Relocation to Taq pangajuk"
a feasibility study.
Our file: M31-87-33

Dear Sir,

At your request, we desire to clarify a few points in order to improve the link needed between our report and the one you are producing.

2.1 Cost estimates

It was requested to clarify the method used to evaluate engineering fees.

- Design fees:

We have first evaluated the design fees for similar construction in the Quebec City area. We have then increased those design costs by both 1.25 and 1.10 factors to take into account a certain degree of difficulty and special expenses (as travel etc.).

2.2 Project schedules

3.1.2

As it was agreed the schedules have been developed on the basis of the following:

Schedule 1

- First fiscal year used for studies, plans and specifications.

. . . 2

Les Consultants BPR
Québec
Beauport, Cap-Santé
Chicoutimi, Montmagny
Rimouski, Ste-Marie

Québec:
3333 boul. Hamel
Québec, Qc G1P 2J7
Tél.: 418-871-8151
Télex:
051-31707 B P R QBC

ans
de génie

Consultants BPR

/ 2

- Second to fifth fiscal year used to construction and completion.
- The site would not need a specific temporary airstrip since a part of the main street and housing pads can be used as an airstrip for a couple of years. Use of roads and pads as temporary airstrip does not involve additionnal cost.

Schedule 2

- First fiscal year used for studies and part of the plans and specifications.
- Second year used to complete plans and specifications and commence mobilization and works.
- Third to seventh year used for construction and completion.
- Due to cash flow spreading over years it is required to use at first a temporary airstrip that would be on the site of the permanent one, this is if we want to preserve a logical implementation strategy.

Schedule 3

- First fiscal year used for studies.
- Second fiscal year used for plans and specifications.
- Third to seventh years used for most of construction.
- Eight and ninth years used for completion and permanent airstrip construction.
- As for schedule 2 it is required to use a temporary airstrip that would be located on the site of the permanent one.

. . . 3

ans
de génie

Les Consultants **BPR**
Québec
Beauport, Cap-Santé
Chicoutimi, Montmagny
Rimouski, Ste-Marie

Québec:
3333 boul. Hamel
Québec, Qc G1P 2J7
Tél.: 418-871-8151
Télex:
051-31707 B P R QBC

Consultants **BPR**

/ 3

2.3 Annual cash flow and project cost summary

We would like to make sure that the understanding of all tables is at its best. We list the design of all of them.

- 1- TABLE 1: includes construction and engineering costs, and 10% for unforeseen for all the infra-structures and buildings.
- 2- TABLE 2: summarizes the same costs as the table 1 in accordance with schedules 1, 2 and 3.
- 3- TABLE 3: includes capital expenses other than construction and engineering (e.g. other than table 2).
- 4- TABLE 4: includes all operation and maintenance costs for construction temporary services.
- 5- TABLE 5: summarizes tables 2, 3 and 4.
- 6- TABLES 6-7-8: annual cash flow tables show the detail of all tables 2, 3 and 4 throughout the time but exclude the following buildings for they are not scheduled yet: community center, church, store, freezers commercial services building, hotel and tank farm.
- 7- TABLE 9: the project cost summary is a cost sharing break down of the contents of table 5.

3.3.10 Telephone installation

Basically the whole installation of permanent service infrastructure by Bell Canada should be at its own expenses, after the village is built. In the case of Taq pangajuk which is almost the same as Umiujaq it is necessary to have a perfect communication service during the construction of the village. Therefore on the basis of what was done in Umiujaq we have included in the estimates an amount of

. . . 4

Les Consultants **BPR**
Québec
Beauport, Cap-Santé
Chicoutimi, Montmagny
Rimouski, Ste-Marie

Québec:
3333 boul. Hamel
Québec, Qc G1P 2J7
Tél.: 418-871-8151
Télex:
051-31707 B P R QBC

ANS
de génie

/ 4

160 000,00\$. Bell Canada would require this amount to compensate the inherent risk of building an expensive facility without having the village construction proven.

3.2.6.2 Schedule 2

A construction temporary airstrip is needed to maintain this schedule cost spreading. Basically this temporary airstrip should lead to an extra cost of 1 000,000,00\$, but by the fact it is planned on the same site as the permanent airstrip, it contributes to reduce the cost of the latest. However the total cost of the temporary and the permanent airstrip shall exceed the cost of a single permanent one by 336 000,00\$.

3.2.6.3 Schedule 3

As for schedule 2, the same temporary airstrip is needed except that the total cost of the temporary and permanent airstrips shall exceed the cost of a single permanent one by 636 000,00\$, because of an additionnal mobilization and demobilization of equipments.

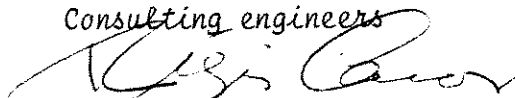
3.4.9 Telephone

At first in all cases (schedules 1, 2 and 3) we have estimated that in the first two years of operations, the permanent telephone service would not be installed yet and, therefore, a temporary radio service would be required. The cost for this temporary radio service has been estimated at 12 500,00\$ a year from the experience of Quebec Government building Umiuq.

However we stated in the report that temporary telephone service would cost 1 000,00\$ a month. In the cases of schedules 2 and 3, due to spread of activities, yearly cost should not exceed 10 000,00\$. We have observed that in table 8, years 92-93 and 93-94 present yearly cost of 12 000,00\$. This cost should be reduced by 2 000,00\$. Since the change has no effect on the choice for a schedule, we suggest to keep this table as it is.

Yours truly,

LES CONSULTANTS BPR
Consulting engineers



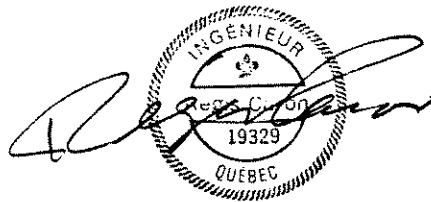
Régis Caron, eng.
RC/dm

MAKIVIK CORPORATION

TAQPANGAJUK RELOCATION
ASSESSMENT OF THE COST ESTIMATES AND SCHEDULES
OF THE FEASIBILITY STUDY

Prepared by:

Les Consultants BPR
Consulting engineers
4655, Blvd Hamel
Quebec (QUEBEC)
G1P 2J7
TEL.: (418) 871-8151



APRIL 1987

TABLE OF CONTENT

	<u>Page</u>
1. INTRODUCTION	1
2. METHODOLOGY	2
3. PROJECT COST ESTIMATES	5
4. ANNUAL CASH FLOW AND PROJECT COST SUMMARY	38
5. MARINE ACCESS	55
6. CONCLUSION	58
APPENDIX	

LIST OF TABLES

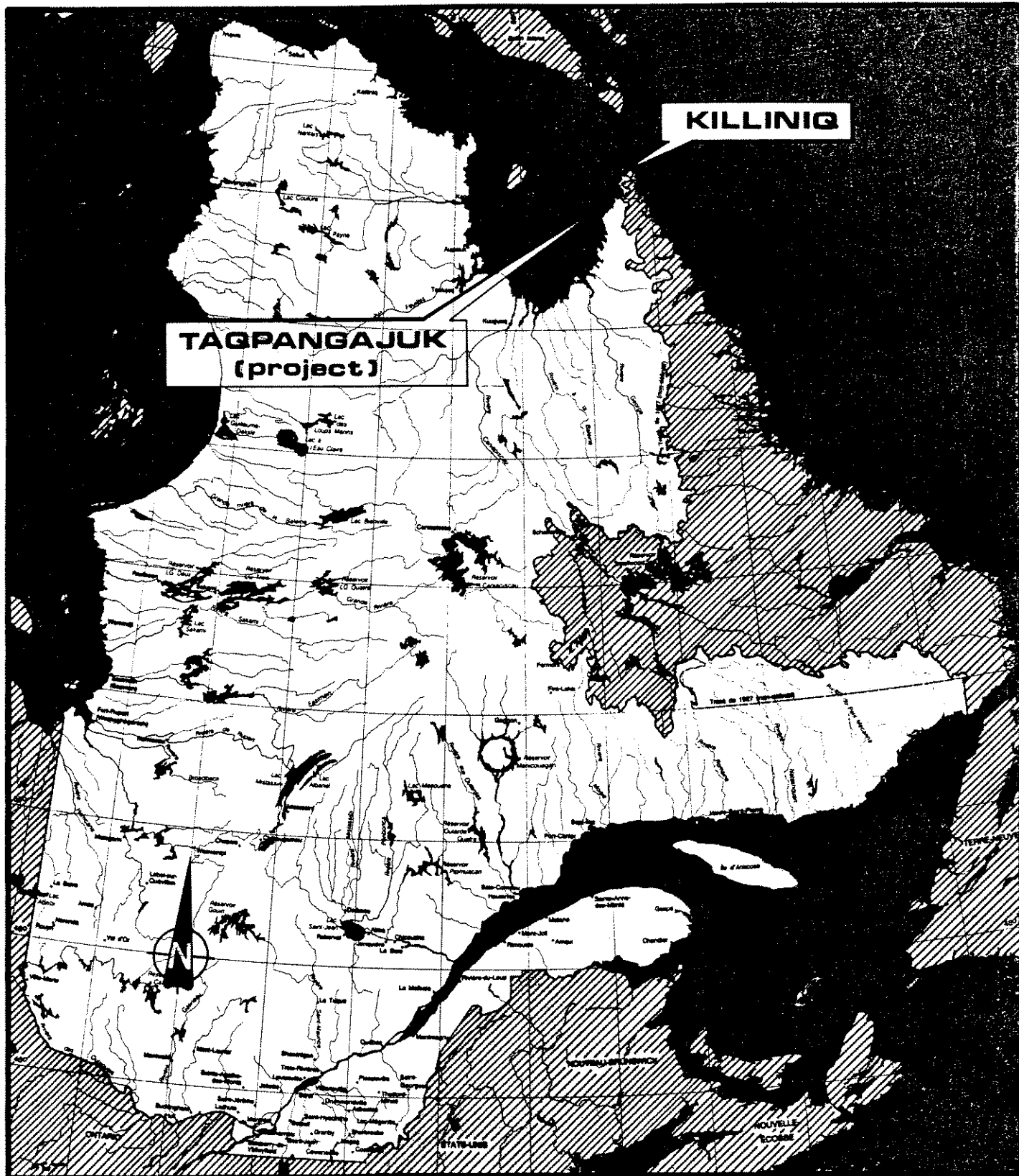
TABLE N°1	- CONSTRUCTION COST FOR ALL BUILDINGS AND INFRASTRUCTURES (SCHEDULE 1 - 5 YEAR PLAN)
TABLE N°2	- CONSTRUCTION COST SUMMARY
TABLE N°3	- OTHER EXPENSES COST (1 000 1987 CONSTANT DOLLARS)
TABLE N°4	- TEMPORARY SERVICES COST (1 000 1987 CONSTANT DOLLARS)
TABLE N°5	- PROJECT COST ESTIMATE
TABLE N°6	- ANNUAL CASH FLOW - SCHEDULE 1 - 5 YEAR PLAN
TABLE N°7	- ANNUAL CASH FLOW - SCHEDULE 2 - 7 YEAR PLAN
TABLE N°8	- ANNUAL CASH FLOW - SCHEDULE 3 - 9 YEAR PLAN
TABLE N°9	- PROJECT COST SUMMARY (1987 CONSTANT DOLLARS)

LIST OF FIGURES

FIGURE N°1	- PROJECT LOCATION
FIGURE N°2	- PROJECT SCHEDULE 1 - 5 YEARS
FIGURE N°3	- PROJECT SCHEDULE 2 - 7 YEARS
FIGURE N°4	- PROJECT SCHEDULE 3 - 9 YEARS

APPENDIX

APPENDIX 1	- PLAN NO 3 OF THE FEASIBILITY STUDY (Location map)
------------	---



PROJECT LOCATION

Figure 1

1. INTRODUCTION

In May 1986, the Makivik Corporation presented a feasibility study concerning the relocation of the former inhabitants of Killiniq to a newly proposed community, Taqpangajuk. The site for this new community faces Ungava Bay in Northern Quebec, along the 60th parallel and, as shown in figure 1, just 40 km south of Killiniq.

In February 1987, Les Consultants BPR, was mandated by Makivik Corporation to evaluate the cost estimates and the construction schedule presented in their phase I, feasibility study.

Following the presentation of our preliminary report, the mandate was revised to include a comparative study of three construction schedules based upon a project completion time of 5, 7 and 9 years, respectively.

At the request Makivik, the report also presents a general analysis of requirements for marine access to Taqpangajuk. This includes an examination of the constraints related to sealift operations and the selection of a protected harbour for smaller boats.

2. METHODOLOGY

2.1 COST ESTIMATES

The evaluation of cost estimates is based on two factors. Costs for buildings, airport facilities, municipal services, roads and foundations were compared to those of similar existing works. Then, costs for the temporary facilities, the preparation of studies and management functions were determined through consultation with specialists and by information supplied by Makivik Government of Quebec, private contractors, DINA and our project management department.

The cost estimate has been revised to incorporate certain modifications. For instance, the construction cost estimate has been reevaluated to incorporate a temporary construction camp and all of the services required during construction, hence reducing the costs of material mobilisation. In addition, the 1985 estimates presented in the feasibility study have been adjusted to 1987 dollars using inflation rates of 4,4 and 4,0 for 1985 and 1986 (Cr Statistics Canada).

Professional fees have been established on the basis of our experience in northern regions and fees proposed by the Association of Consulting Engineers of Quebec. The percentage of the project's total cost attributed to preliminary plans and specifications is that used for projects in southern Quebec. This percentage was then multiplied by a factor of 1,25 which accounts for the degree of difficulty related to Northern projects and then by a factor of 1,10 for expenses. The costs for construction supervision are based upon our experience with airport projects currently under construction in Northern Quebec.

Contingencies have been evaluated at ten percent (10%) of the cost for construction, plans and specifications and supervision. This is the percentage normally applied to "D" class estimates.

2.2 PROJECT SCHEDULES

Three schedules have been considered, each applying to a different construction period but all according to the master plan proposed by the feasibility study. All three are based upon a project startup during the summer of 1987.

Schedule 1, is based upon a 5 year. All planning and studies are completed by the spring of 1988 and the construction period extends from 1988 to 1992. No temporary airstrip will be built but roads and pads will be planned to permit landing of "Twin Otter" aircrafts.

In schedules 2 and 3, the construction period extends until 1994 and 1996, respectively. Temporary airstrips will be built early in the schedule on the site of the permanent airport facilities.

2.3 ANNUAL CASH FLOW AND PROJECT COST SUMMARY

Following the cost estimate study, work completion was determined in relation to a balanced annual cash flow and a logical realization sequence. Finally, the project cost summary shows the potential for cost sharing.

It is important to distinguish the project cost estimates from the annual cash flow. The first include all costs and the latter omits the cost of the community center, the church, the store, the freezers, the commercial services building, the hotel and the tank farm.

3. PROJECT COST ESTIMATES

3.1 GENERAL CONSIDERATIONS

3.1.1 Cost breakdown

Cost estimates have been figured out for the project schedules described in 3.1.2.

The project expenses are made up of both "capital" costs and "operation and maintenance" costs.

Capital costs "include construction costs", as detailed in table 1, and "other expenses" costs as per table 3 such as survey, preparatory studies, construction camp, management and others.

"Operation and maintenance" costs listed in table 4 are temporary services needed during the construction period, particularly to maintain the construction camp.

3.1.2 Project schedules

Construction schedules have been prepared for all three proposed phasings, which represent different periods of project completion.

The schedules are presented using 1987 as year one. All studies and surveys as well as final plans and specifications will be initiated during that year. The buildings and infrastructures construction will be started during the summer of 1988.

The schedules were developed so that the project will be completed during a 5, 7 or 9 year period in such a way that the work progression is logical and that annual expenses remain as constant as possible. The proposed schedules are presented by Figures 2, 3 and 4.

Schedule 1 - 5 years

Figure 2 presents the schedule 1 activities. This represents the shortest period for which the project can be completed.

For this schedule, the construction of roads and foundation pads in the community will be planned to provide sufficient space for STOL aircrafts until the permanent airstrip is built.

Schedule 1 will require the most coordination from the project managers in order to meet the 5 year period without having to suffer any delays. Also, since aircrafts will land in the limits of the community for the first years, the planification for the construction of buildings and power lines will be submitted to constraints to allow airplane transportation.

Schedule 2 - 7 years

Figure 3 presents the proposed schedule 2. Following this schedule, a temporary airstrip will be built in 1988 on the future airport site. This will allow STOL aircraft access until 1993, when permanent facilities will be completed.

FIGURE -2

PROJECT SCHEDULE -1

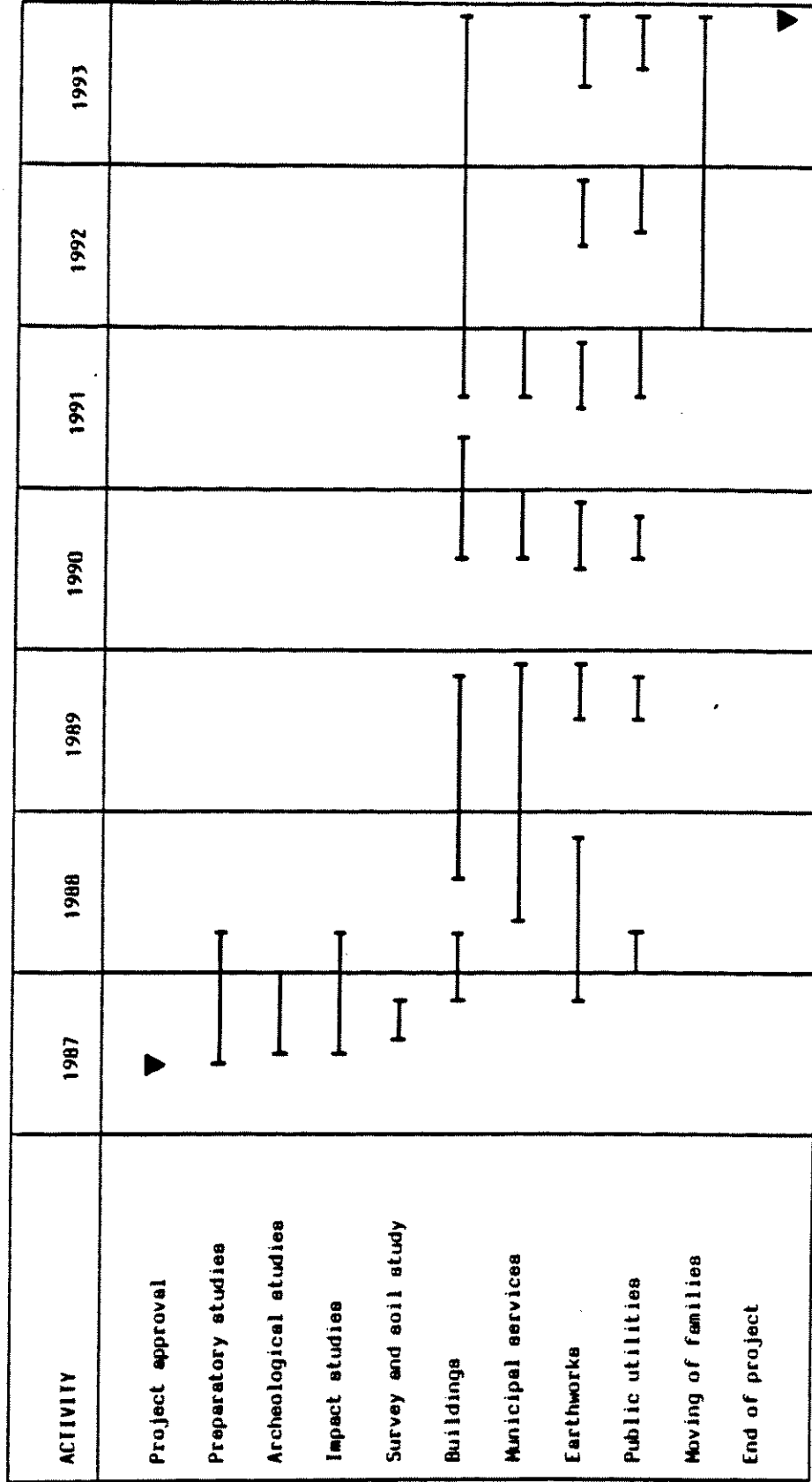
5 YEARS

ACTIVITY	1987	1988	1989	1990	1991
Project approval	▼				
Preparatory studies	—	—			
Archeological studies	—				
Impact studies	—	—			
Survey and soil study	—				
Buildings	—	—	—	—	—
Municipal services	—	—	—		
Earthworks	—	—	—	—	—
Public utilities	—	—	—	—	—
Moving of families					—
End of project					▼

FIGURE - 3

PROJECT SCHEDULE - 2

7 YEARS



PROJECT SCHEDULE - 3

[illegible]

Schedule 3 - 9 years

The 9 year schedule is essentially the same as schedule 2 except that it is extended by 2 more years. The permanent airfield facilities are completed during the years 1994/95 and 1995/96.

3.2 CONSTRUCTION COSTS

3.2.1 General approach

The construction costs are comprised of professional fees for final plans and specifications, construction costs, supervision and contingencies. Table 1 presents the list of buildings and infrastructures with their respective costs based on schedule 1.

The construction costs for schedules 2 and 3 have not been tabled since the one difference with schedule 1 is the cost for airport facilities. This difference is explained in section 3.2.6.

To evaluate construction costs, it was considered that a construction camp with basic services will be supplied to the contractors for the construction period. As a result there will be an economy of scale.

TABLE 1

CONSTRUCTION COST FOR ALL BUILDINGS AND INFRASTRUCTURESBASIC COSTSSCHEDULE 1 - 5 YEAR PLAN

COST (X 1 000 1987 CONSTANT DOLLARS)					
BUILDINGS & INFRASTRUCTURES	A Construction	B Plans and specifica- tions (5% x A)	C Supervision (7% x A)	D Contingencies (10%(A+B+C))	E Total
<u>Category 1 - Buildings:</u>					
- Native houses (32)	3 561,7	178,1	249,3	398,9	4 388,0
- Non native houses (6)	546,7	27,3	38,3	61,2	673,5
- Warehouse	222,0	11,1	15,5	24,9	273,5
- Office Building	496,0	24,8	34,7	55,5	611,0
- School and playground	1 741,0	87,1	121,9	195,0	2 145,0
- Nursing station	574,7	28,7	40,2	64,4	708,0
- Police station	99,2	5,0	6,9	11,1	122,2
- Municipal garage	689,9	34,5	48,3	77,2	850,0
- Community center	293,5	14,7	20,5	32,9	361,6
- Church	311,1	15,6	21,8	34,8	383,3
- Store	161,5	8,1	11,3	18,1	199,0

TABLE 1 (cont'd)

CONSTRUCTION COST FOR ALL BUILDINGS AND INFRASTRUCTURESBASIC COSTSSCHEDULE 1 - 5 YEAR PLAN

COST (X 1 000 1987 CONSTANT DOLLARS)					
BUILDINGS & INFRASTRUCTURES	A Construction	B Plans and specifica- tions (5% x A)	C Supervision (7% x A)	D Contingencies (10%(A+B+C))	E Total
<u>Category 1 - Buildings: (Cont'd)</u>					
- Freezers	152,5	7,7	10,7	17,1	188,0
- Commercial services building	485,0	24,2	34,0	54,3	597,5
- Hotel	161,6	8,1	11,3	18,1	199,1
<u>Category 2- Municipal services</u>					
- Drinking water supply & reservoir	252,0	12,6	17,7	28,3	310,6
- Dikes (for water supply)	110,0	5,5	7,7	12,3	135,5
- Wastewater treatment plant	425,0	21,3	29,8	47,6	523,7
- Solid waste disposal site	74,0	3,7	5,2	8,3	91,2
- Municipal equipment	1 415,0	70,8	99,1	158,5	1 743,4
<u>Category 3 - Earthworks</u>					
- Permanent airport facilities	7 215,0	360,8	505,1	808,1	8 889,0
- Wharf & unloading area	230,0	11,5	16,1	25,8	283,4

TABLE 1 (cont'd)

CONSTRUCTION COST FOR ALL BUILDINGS AND INFRASTRUCTURESBASIC COSTSSCHEDULE 1 - 5 YEAR PLAN

COST (1 000 1987 CONSTANT DOLLARS)					
BUILDINGS & INFRASTRUCTURES	A Construction	B Plans and specifica- tions (5% x A)	C Supervision (7% x A)	D Contingencies (10%(A+B+C))	E Total
- Fishing boat haul out	37,0	2,0	2,6	4,2	45,8
- Roads	2 257,0	112,9	158,0	252,8	2 780,7
- Drainage works	74,0	3,7	5,2	8,3	91,2
- Foundations	1 495,7	74,8	104,7	167,5	1 842,7
- Cemetery	15,0	0,8	1,1	1,7	18,6
<u>Category 4 - Public utilities</u>					
- Tank farm	565,7	28,3	39,6	63,4	697,0
- Power house	2 708,0	135,3	189,5	303,3	3 336,1
- Power lines	300,0	15,0	21,0	33,6	369,6
- Radio station	10,0	0	0	1,0	11,0
- Téléphone	0	0	0	0	0
TOTAL:	26 679,8	1 334,0	1 867,1	2 988,2	32 869,2

Tenders for recent northern projects under construction show that 30% of the total construction cost applies to the site organization and the equipment and material mobilization and demobilization.

Therefore, construction costs from our prior estimates were reduced by 8% approximately, taking into account that a part of the site organization will be supplied to contractors.

3.2.2 CATEGORY 1 - BUILDINGS

.1 Native houses

Based upon information obtained from La Société d'Habitation du Québec (S.H.Q.) in February 1987, the cost for 20 housing units to accommodate 104 persons, is 2 965 000\$. With a population forecast of 166 persons in 1990, 32 units will be necessary for an estimated cost of 4 744 000\$.

The S.H.Q.'s estimate includes the cost for construction lodging room and board and these are already accounted for in our estimate under the heading of other expenses and temporary services. The total construction cost is duly reduced to 4 388 000\$.

.2 Non-native houses

Three duplex dwellings will be built to accommodate the non-native population of approximately 10 people. Our cost estimate for these is 673 500\$.

.3 Warehouse

The feasibility study estimates a cost of 2 666\$/m² (1985 dollars) for the warehouse (12 m x 9 m). After comparison with similar buildings, we have reduced this to 2 532\$/m² (1987 dollars). We have retained the study's estimate for the cost of tools and materials.

.4 Office Building

The estimated total cost for the office building is 611 000\$ (1987 dollars). The size of the proposed building is 15,9 m x 23,5 m yielding a unit cost of 1 635\$/m². This is a reasonable cost for a building of this size.

.5 School and playground

The total cost for the school and playground is 2 145 000\$. There is no provision for teacher housing which is included in the non-native houses. According to the Kativik School Board director, the proposed size of the school (1 100 m²) is a minimum for a village of this size.

.6 Nursing Station

The cost estimate of 708 000\$ (1987\$) provided by le Ministère des Affaires Sociales du Québec, is for the nursing station only. There is no provision for the nurses and the social worker's housing which is included in the non-native houses. The nursing station will be 18,8 m x 14,4 m and is estimated at 2 615\$/m².

.7 Police Station

The feasibility study's estimated cost of 122 200\$ (1987 dollars) for the police station has been retained. The building is 12,8 m x 4,3 m for a unit cost of 2 220\$/m².

.8 Municipal Garage

Historical costs show that the total cost for a 20 m x 17 m 5 door garage is 850 000\$, a unit cost of 2 500\$/m².

.9 Community Center

The estimated cost is 361 600\$. The size of the building is 7,6 m x 24,4 m for a unit cost of 1 950\$/m² in 1987 dollars.

.10 Church

The feasibility study's cost for the church is high in comparison to other structures of this type. This cost may be justified depending upon the style of architecture selected. It should be pointed out that certain styles of architecture may prove more economical to others.

.11 Other buildings

The costs of the store, freezers, commercial buildings and the hotel estimated in the feasibility study are realistic. These have then been indexed with the inflation rates.

3.2.3 CATEGORY 2 / MUNICIPAL SERVICES

.1 Drinking water supply and reservoir

Lake DW-1 should be an appropriate water source; it is well located and has easy access. According to the feasibility study, however, the lake's watershed can only supply about three times the average annual water demand of the future population (280 inhabitants in 2010). The watershed capacity was calculated using average yearly precipitations. The final studies should investigate the real capacity required for the future water supply before the final design is undertaken. It is important to note that in the feasibility study, only the domestic water demand was considered. Other special water uses such as industries (fish processery facility, hotel, etc.) could greatly affect the water supply required.

The feasibility study proposes that the lake's level be raised by building dykes to increase water depth underneath the ice cover. Freeze and thaw cycles can be a major strain on water retaining structures and, because of the lake and watershed capacity, no leaks can be tolerated. In-depth studies are needed to determine the watertightness of the actual lake's basin (it might be interconnected with the existing surrounding lakes). The methods used to increase the lake's volume and depth will also have to be carefully studied before plans are undertaken.

Removal of the vegetation over the shoreline should be considered as well as excavating the removable material from Lake's bottom to increase depth and volume. An approximate cost for this task has been included in the cost estimate.

According to our estimates, the construction cost for the water supply facilities, excluding the dykes, are:

Building (structure, architecture, electricity, heating and ventilation)	65 000 \$
Disinfection	13 000 \$
Pumps (including one with a diesel engine drive which eliminates the need for a generator)	35 000 \$
Piping and truck filling system	28 000 \$
Water intake	23 000 \$
Controls	7 000 \$
Access and apron	9 000 \$
Lake cleanup and excavation	26 000 \$
Fence	46 000 \$
CONSTRUCTION COST:	252 000 \$

Therefore, a total cost of 310 600\$ is estimated for the work, including professional fees and contingencies.

.2 Dykes

The estimated cost for dykes as detailed in the feasibility study has been retained except that the cost is now indexed to 1987 to be 135 500\$.

As it was mentioned in section 3.2.3.1, the method for building the dykes and raising the lake's level should be carefully studied.

.3 Wastewater treatment plant

Rotating, biological contactors (RBC) are most likely the appropriate solution for the community's wastewater treatment.

The proposed site for the RBC is far enough from the community. However, we think it is too close to the drinking water reservoir. In addition, the treated wastewater should not be discharged in a lake adjacent to this reservoir. We therefore recommend that the wastewater treatment plant be moved further to the North and that the treated water be discharged into the sea. The dilution of such a small flow of treated wastewater into the sea will have a negligible impact on environment and there will be no risk of contamination of the drinking water. The treated water discharged through a protected polyethylene pipe that reaches under the ice cover, will eliminate accumulation on the shore during the winter period.

The population projections proposed by Makivik Corporation were used for a preliminary sizing of the wastewater treatment plant. In a 25 years horizon, a total population of

280 was considered. The construction costs have been estimated by comparing them to tenders for similar projects in Northern Quebec and to projects built in other areas of the province of Quebec.

Our cost estimate for this item is:

Building:	
(structure, architecture, electricity, heating and ventilation)	208 000 \$
RBC unit:	
- supply	120 000 \$
- installation	20 000 \$
Piping and equalization basin	31 000 \$
Ocean outfall	37 000 \$
Access and apron	9 000 \$
CONSTRUCTION COST:	425 000 \$

The total cost is 523 700\$ including professional fees and contingencies.

.4 Solid waste disposal site

The feasibility study cost estimates for the solid waste disposal site appears to be acceptable for the proposed site to fulfil the needs of the community, according to the existing regulations. The total cost is 91 200\$.

.5 Municipal Equipment

The estimation for the purchase of municipal equipment, as in the feasibility study is realistic. Hence, no modification has been made except the inflation rate increase.

3.2.4 CATEGORY 3 / EARTHWORKS

.1 Airport facilities (1 070 m Airstrip)

The construction cost of the airport facilities, excluding the access road, is based on the Salluit, Kangirsuk and Inukjuak projects.

A) Salluit: 6 740 000\$ (1986)
 7 000 000\$ (1987)

B) Kangirsuk: 5 518 000\$ (1985)
 5 940 000\$ (1987)

The latter cost had to be adjusted, since the Kangirsuk project includes 9 000 m³ of rock cut, 77 800 m³ of earth cut and 82 500 m³ of rock cut and fill, while the Taqpangajuk airstrip will have approximately 210 000 m³ of rock cut and fill. From this, we anticipate an additional cost of 1 800 000\$. The resulting construction cost is estimated at 7 800 000\$.

C) Inukjuak: 5 743 000\$ (1986)
 5 944 000\$ (1987)

As of the previous case, the 1987 cost of 5 944 000\$ was adjusted since the Inukjuak project includes 36 000 m³ of earth cut, 6 000 m³ of rock cut, 41 000 m³ of rock fill and 45 000 m³ of earth fill (a total cut and fill of 128 000 m³), while the Taqpangajuk airstrip has 210 000 m³ of rock cut and fill. Therefore, an additional cost of 1 800 000\$ must be added to 5 944 000\$ to find the cost of airport facilities.

According to these three projects, the estimated construction cost of airport facilities should be 7 800 000\$. Since the construction camp and its maintenance is no more included in the construction cost, the estimate for this item becomes 7 215 000\$. With professional fees and contingencies, the total cost is 8 889 000\$.

.2 Wharf and unloading area

An overview of the possibilities for marine access to Taqpangajuk is presented in section 5. At this point, it appears that no docking facilities will be built and the unloading of the ships will be done by transferring the material on barges.

We propose that an unloading area and a ramp be built to help the operation of barges. This type of facility was built in Kangirsuk and planned for Inukjuak. Based on the costs of those projects, we estimate the cost for that in Taqpangajuk at 230 000\$. With professional fees and contingencies, the total cost is 283 400\$.

.3 Fishing boat haul out

The cost estimate of the feasibility study has been indexed to 1987 dollars.

.4 Roads

The road construction cost is based on recent projects in the communities of Kangirsuk and Inukjuak. The total construction cost is estimated at 455 850\$ per kilometer and the total road network is 6,1 km. Hence, the total construction cost is 2 780 700\$.

.5 Drainage works

The cost estimates of the feasibility study are appropriate. They have been indexed to 1987.

.6 Foundations

The cost of foundations have been estimated on the basis of both Figure 6.1 and the summary of cut and fill (page 102) of the phase I feasibility study. We supposed that all the pads for the 38 houses and other buildings would be levelled with blasted rock, and covered with 300 mm of crushed stone (0-150 mm) and 150 mm of crushed stone (0-63 mm).

a) Rock cut:

The total rock cut for the foundations has been calculated by subtracting from the total quantity of excavated materials (71 000 m³), the amount needed for the

rock fill of houses pads and roads (44 000 m³). Therefore, for this item, 27 000 m³ has been costed at 18,00\$/m³.

The total cost is 486 000\$

b) Rock fill under 38 houses and other building

$$\text{Vol.} : 22\,000\text{ m}^3 + 6\,500\text{ m}^3 - 2\,500\text{ m}^3 = 26\,000\text{ m}^3$$

$$26\,000\text{ m}^3 @ 13\$/\text{m}^3 = 338\,000\$$$

c) Crushed stone 0 - 150 mm

$$61\,700\text{ m}^2 \times 0,3\text{ m} = 18\,510\text{ m}^3 \text{ or}$$

$$40\,700\text{ t} @ 9,00\$ = 366\,300,00\$$$

d) Crushed stone 0 - 63 mm

$$61\,700\text{ m}^2 \times 0.15\text{ m} = 9\,255\text{ m}^3 \text{ or}$$

$$20\,360\text{ t} @ 15,00\$ = 305\,400,00\$$$

Total cost for foundations: 1 495 700,00\$

The total cost is 1 842 700 with professional fees and contingencies included.

.7 Cemetery

Those costs have been pegged up to the actual price according to the inflation rates.

3.2.5 CATEGORY 4 / PUBLIC UTILITIES

The cost of the public utilities included in this category has been brought up to the 1987 dollars value and reduced by 8%, to take into account central service of construction camp.

Power lines are planned to be constructed early in the schedule to provide electricity to buildings and municipal services. Those will be permanent and installed according to Hydro-Quebec specifications.

3.2.6 CONSTRUCTION COST SUMMARY

As explained in the methodology, the only difference between schedules is the cost of airport facilities included in the "earthwork" category. The airport cost differences are detailed as follows and the total cost for each schedule is summarized in Table 2.

.1 Schedule 1

The cost of airport facilities (8 889 000\$) is explained in section 3.2.4.1 and the construction cost related to this schedule is 32 869 200\$.

.2 Schedule 2

Since the same site is being planned for both temporary and permanent airstrips, the cost for this infrastructure has been increased by 336 000\$ in relation with schedule 1. An additional amount of 36 000\$ applies to professional fees

TABLE 2

CONSTRUCTION COSTS SUMMARY

CATEGORY	DESCRIPTION	COST (X 1 000 1987 CONSTANT DOLLARS)		
		SCHEDULE 1 5 years	SCHEDULE 2 7 years	SCHEDULE 3 9 years
1	Buildings	11 699,7	11 699,7	11 699,7
2	Municipal services	2 804,4	2 804,4	2 804,4
3	Earthworks	13 951,4	14 287,4	14 587,4
4	Public utilities	4 413,7	4 413,7	4 413,7
	TOTAL:	32 869,2	33 205,2	33 505,2

for making up two final plans and specifications for tender. Also, a 300 000\$ increase is provided for a part of earthwork equipment mobilization/demobilization. The construction cost under this schedule is 33 205 200\$.

.3 Schedule 3

The airport infrastructure will cost 636 000\$ more than the first schedule. This addition includes the same amount of 36 000\$ for professional fees justified in the schedule 2.

In this schedule, the permanent airport facilities will begin in 1995, this is two years later than most of the earthwork construction. As a result, we figured an additionnal equipment mobilization and demobilization at 600 000\$. Therefore, the total construction cost of this schedule is 33 505 200\$.

3.3 OTHER EXPENSES

The summary of these expenses for all three schedules is presented in Table 3.

3.3.1 Assivavik project management

The Assivakvik Corporation will have the responsibility of the project management. The Corporation mandate will extend throughout the project, starting with the coordination of the study activities. Its task will also include the establishment and management of the construction camp and services.

TABLE 3

OTHER EXPENSES COST (1 000 1987 CONSTANT DOLLARS)

DESCRIPTION	SCHEDULE 1	SCHEDULE 2	SCHEDULE 3
	5 YEARS	7 YEARS	9 YEARS
Assivakvik Project management	2 040,0	2 600,0	3 000,0
Archeological study	35,0	35,0	35,0
Preparatory study	350,0	350,0	350,0
Topographic survey and soil study	200,0	200,0	200,0
Hydrographic survey	50,0	50,0	50,0
Impact studies	60,0	60,0	60,0
Land surveyor	50,0	50,0	50,0
Construction camp	640,0	640,0	640,0
Construction power plant	150,0	150,0	150,0
Telephone installation	160,0	160,0	160,0
Moving of families and their personal belongings	215,0	215,0	215,0
Project evaluation	30,0	30,0	30,0
TOTAL:	3 980,0	4 540,0	4 940,00

This Corporation will be formed for the total duration of the project and will include full and part time participants in various fields which include the following activities:

- Project management and coordination
- Cost control
- Legal services
- Logistics
- Consultation and coordination with future residents

For budget purposes, it was estimated that the Corporation would be formed of four to six participants and, because of the nature of the project, several meetings will be necessary. We foresee an annual budget for wages that stands between 150 000\$ and 250 000\$ plus 150 000\$ for travel expenses. For all three schedules, we adjusted management budgets in proportion to annual construction previsions.

This budget does not include wages and expenses for representatives of the different government departments who will be involved in various phases of the project.

3.3.2 Archeological study

The archeological study shall be undertaken immediately after the project approval. The budget for this study was directly taken from the feasibility study and was indexed to 1987\$.

3.3.3 Preparatory study

The preparatory study will be the step required prior to the realization of final plans and specifications for the project.

The preparatory study will basically be a completion to the feasibility study and will include:

- Population consultation
- Final master plan
- Preliminary plans for all elements of the project
- Revised cost estimates
- Project adaptation following results from the archeological and impact studies.

Following our estimation, a budget of 350 000\$ will be necessary for the preparatory study.

3.3.4 Topographic survey and soil study

After consultation with a soil laboratory specialist, the topographic survey and the soil study have been planned to be realized in coordination with each other. We estimated forty (40) days of field work for a 5-person crew.

Our budget estimate for the field work, the logistics, the travelling expenses and the preparation of plans and reports is 200 000\$.

3.3.5 Hydrographic survey

In coordination with our firm representative, a specialist in this matter figured a ten day survey with two men and a cost estimate of 50 000\$. This cost is established with the assumption that a temporary camp is already on the site for the topographic survey.

3.3.6 Impact study

The feasibility study is the basic reference taken to determine the cost of 60 000\$. Therefore, it should be done at the same time as the topographic survey to reduce the cost of the field organization.

3.3.7 Construction camp

The construction camp built after the study period, will be used by for all on-site residents during the construction period. It will include a kitchen, dining and laundry facilities, rooms, construction of a nursing station and offices for managers.

The cost for a construction camp is based on historical data from other projects. We foresee that the camp should have the capacity to board 70 persons. We then figure a total floor space of 600 m² at 1 065\$/m² for construction installation. The estimated cost is 640 000\$.

3.3.8 Construction power plant

A temporary power plant is planned to supply electrical power during the construction period, until the permanent powerhouse is built by Hydro-Quebec.

The capacity of the plant shall be sufficient to support the construction camp activities and basic construction tools. The cost estimate of 150 000\$ is based on historical costs for two 180 KW generators, installed in a temporary building, and a 2 300 liter reservoir.

3.3.9 Temporary tank farm

The temporary tank farm shall be installed by the fuel supplier (COOP) at its own expenses.

3.3.10 Telephone installation

Bell Canada will fund telephone service installation only for the permanent community. From the experience of Quebec Government building Umiujaq, it has been considered essential to have an amount of 160 000\$ included in the budget in order to negotiate permanent telephone installation for the first year of construction.

3.4 TEMPORARY SERVICES

3.4.1 General considerations

Temporary service costs for each schedule are broken down in Table 4.

As shown, the costs increase in proportion with the construction period. In schedule 1, the total period is of 35 months, while schedules 2 and 3 last 52 and 62 months respectively.

TABLE 4

TEMPORARY SERVICE COSTS (1 000 1987 CONSTANT DOLLARS)

DESCRIPTION	SCHEDULE 1	SCHEDULE 2	SCHEDULE 3
	5 YEARS	7 YEARS	9 YEARS
Temporary services management	88,0	130,5	155,0
Camp maintenance	140,0	208,0	248,0
Nursing	140,0	208,0	208,0
Space heating	87,5	130,0	155,0
Electricity	350,0	520,0	620,0
Drinking water supply	45,5	67,6	80,6
Wastewater and solid waste	45,5	67,6	80,6
Telephone	55,0	75,0	83,0
Road maintenance	30,0	44,0	48,0
TOTAL:	981,5	1 450,7	1 678,2

3.4.2 Temporary services management

The temporary services will need a construction site manager working half time during the construction period. At this rate, these services will cost 2 500\$ a month. Therefore, management expenses amount to:

88 000\$ for the 5 year schedule

130 500\$ for the 7 year schedule

155 000\$ for the 9 year schedule

3.4.3 Camp maintenance

The camp maintenance expenses include material and labor for repairs and utility maintenance. A manpower of 66hr/month at 30\$/hr is provided for it and will cost 2 000\$ a month. From past experience, material for maintenance normally cost as much as the manpower. Hence the total cost for the camp maintenance is 4 000\$ a month.

3.4.4 Nursing

Based on information received from an experienced project manager in nordic regions, two nurses will be required during the construction period. With medical supplies, the nursing service for 70 persons, including 1 500\$ a month for nurses' living expenses would cost about 12 000\$ a month.

We assume that the costs for the medical care will be paid by the regular programs of le Ministère des Affaires Sociales du Québec. Since for the construction period, Taqpangajuk will not be an established community, we estimated that a budget of 4 000\$ per month is needed for the nurses' living and travelling expenses, lodging and maintenance of the nursing station.

3.4.5 Space heating

Spaces to be heated during construction are the camp with a kitchen and a nursing station for a total size of 600 m². Certain buildings will probably have to be heated during the winter, like the municipal garage and a few houses. We allowed 270 m² for those spaces.

Based on a fuel price of 0,72\$/liter and a monthly need of 4,0 liter/m² in the nordic region, a heating cost of 2 500\$ a month has been prescribed for the 870 m².

All other heating required would be at the Contractors' expense and has been accounted for accordingly.

3.4.6 Electricity

Electricity costs are planned to support the construction camp activities and basic construction tools. All other consumption is assumed to be at the contractors' expense and is accounted for the accordingly. Based on the Umiujaq project, the monthly cost of electricity would be of 10 000\$ approximatly.

3.4.7 Drinking water supply

The drinking water supply will need one man, for about 10 hours a week, carrying water with a four wheeler or the water truck when roads will be available. The cost has been fixed at 1 300\$ a month.

3.4.8 Wastewater and solid waste

The manpower and the cost for this service is the same as that of the drinking water supply, 1 300\$ a month.

3.4.9 Telephone

The cost for services and long distance calls has been estimated at 1 000\$ a month.

3.4.10 Road maintenance

The road maintenance was estimated at 2 000\$ per kilometer from past experiences. Depending on the construction schedule, the cost was determined to be 30 000\$ for the schedule 1, 44 000\$ for the schedule 2 and 48 000\$ for schedule 3. The detail of those costs are shown in annual cash flow tables in Chapter 4.

3.5 PROJECT COST ESTIMATE

Table 5 is a project cost estimate summary for all the schedules.

The main difference between schedule costs stands in management and temporary services during construction, since that depend on completion time.

Also, the project cost for schedules 2 and 3 is increased by equipment mobilization and demobilization, since the construction of Airport facilities is undertaken later than most of earthworks.

TABLE 5
PROJECT COST ESTIMATE

SCHEDULE	COST (1 000 1987 CONSTANT DOLLARS)
1- 5 YEARS	37 830,7
2- 7 YEARS	39 195,9
3- 9 YEARS	40 123,4

4.0 ANNUAL CASH FLOW AND PROJECT COST SUMMARY

For each schedule, the annual cash flow was computed per fiscal year. Tables 6, 7 and 8 present the annual investment for all types of project expenses, including construction, management and temporary services. The Federal Government's participation was brought out by subtracting from the complete project the costs that are to be paid by other levels of government or organizations. These costs are identified in the tables by asterisks.

Plans and specifications are included in study expenses for schedule 1 and completed in the year 1987/88.

In schedule 2 (7 years), these costs are spreaded over both the study and the construction period. Schedule 3 present a very long period of time (9 years) and all plans and specifications have been foreseen during the construction period.

TABLE 6

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 1 - 5 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD			
TYPE	DESCRIPTION		1988-89 5 months	1989-90 8 months	1990-91 10 months	1991-92 12 months
CONSTRUCTION	<u>Category 1 - Buildings:</u>					
	Native houses (32)			1 700,0		2 688,0
	Non native houses (6)			673,5		
	Warehouse	11,1	262,4			
	Office Building	24,8			586,2	
	School and playground	87,1			1 600,0	457,9
	Nursing station	28,7		679,3		
	Police station	5,0			117,2	
	Municipal garage	34,5	815,5			
Sub-total:		191,2	1 077,9	3 052,8	2 303,4	3 145,9

TABLE 6 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 1 - 5 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD				
TYPE	DESCRIPTION		1987-88	1988-89 5 months	1989-90 8 months	1990-91 10 months	1991-92 12 months
CONSTRUCTION	<u>Category 2 - Municipal services</u>						
	- Drinking water supply & reservoir	12,6		298,0			
	- Dikes (for water supply)	5,5	130,0				
	- Wastewater treatment plant	21,3		502,4			
	- Solid waste disposal site	3,7	87,5				
	- Municipal equipment	70,8	1 357,6	315,0			
	Sub-total:		113,9	1 575,1	1 115,4	0	0
	<u>Category 3 - Earthworks</u>						
	- Permanent airport facilities	360,8			3 600,0 * 2 400,0	1 516,9 * 1 011,3	
	- Wharf & unloading area	11,5		271,9			
	- Fishing boat haul out	** 2,0		** 43,8			

(*) Provincial Government

(**) Private Corporations

TABLE 6 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 1 - 5 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD			
TYPE	DESCRIPTION		1988-89 5 months	1989-90 8 months	1990-91 10 months	1991-92 12 months
- Roads		112,9	1 000,0	1 477,8 * 190,0		
- Drainage works		3,7	87,5			
- Foundations		74,8	1 767,9			
- Cemetery		** 0,8		** 17,8		
Sub-total:		566,5	2 855,4	2 001,3	6 000,0	2 528,2
Category 4 - Public utilities						
- Power house			* 35,0	* 300,0	* 2 000,0	* 1 001,1
- Power lines		15,0		354,6		
- Radio station		0				** 11,0
Sub-total:		15,0	35,0	654,6	2 000,0	1 012,1
Sub-total - Construction:		886,6	5 543,4	6 824,1	10 303,4	6 686,2

(*) Provincial Government

(**) Private Corporations

TABLE 6 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 1 - 5 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD			
TYPE	DESCRIPTION		1988-89 5 months	1989-90 8 months	1990-91 10 months	1991-92 12 months
OTHER EXPENSES	Assivavik project management	330,0	450,0	450,0	415,0	395,0
	Archeological study	35,0				
	Preparatory study	350,0				
	Topographic survey and soil study	200,0				
	Hydrographic survey	50,0				
	Impact studies	60,0				
	Land surveyor	50,0				
	Construction camp	40,0	600,0			
	Construction power plant		150,0			
	Telephone installation		160,0			
	Moving of families and their personal belongings				100,0	115,0

TABLE 6 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 1 - 5 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD				
TYPE	DESCRIPTION		1987-88	1988-89 5 months	1989-90 8 months	1990-91 10 months	1991-92 12 months
	Project evaluation						30,0
Sub-total - Other expenses:		1 115,0	1 360,0	450,0	515,0	540,0	
TEMPORARY SERVICES (O + M)	Temporary services management	0,5	12,5	20,0	25,0	30,0	
	Camp maintenance		20,0	32,0	40,0	48,0	
	Nursing		20,0	32,0	40,0	48,0	
	Space heating		12,5	20,0	25,0	30,0	
	Electricity		50,0	80,0	100,0	120,0	
	Drinking water supply		6,5	10,4	13,0	15,6	
	Wastewater and solid waste		6,5	10,4	13,0	15,6	
	Telephone	12,5	12,5	8,0	10,0	12,0	
	Road maintenance		0	6,0	12,0	12,0	
Sub-total - Temporary services:		13,0	140,5	218,8	278,0	331,2	
TOTAL:		2 014,6	7 043,9	7 492,9	11 096,4	7 557,4	
FEDERAL GOVERNMENT PARTICIPATION:		2 011,8	7 008,9	6 941,3	6 696,4	5 534,0	

TABLE 7

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 2 - 7 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD						
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months
CONSTRUCTION	<u>Category 1 - Buildings:</u>								
		Native houses (32)						1 857,0	2 531,0
		Non native houses (6)					673,5		
		Warehouse		11,1		262,4			
		Office Building		24,8		586,2			
		School and playground		87,1		857,9	1 200,0		
		Nursing station		28,7		679,3			
		Police station		5,0		117,2			
	Municipal garage	34,5	300,0	515,5					
	Sub-total:	34,50	456,70	515,50	2 503,00	3 730,50	2 531,00		

TABLE 7 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 2 - 7 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD						
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months
CONSTRUCTION	<u>Category 2- Municipal services</u>								
	- Drinking water supply & reservoir		12,6		298,0				
	- Dikes (for water supply)		5,5	130,0					
	- Wastewater treatment plan		21,3		502,4				
	- Solid waste disposal site		3,7	87,5					
	- Municipal equipment			1 743,4					
	Sub-total:			43,1	1 960,9	800,4			
	<u>Category 3 - Earthworks</u>								
	- Temporary airstrip		50,0	600,0 * 400,0					
	- Permanent airp. facilities	150,0				196,8	2 580,0 * 1 720,0	2 116,9 * 1 411,3	
	- Wharf & unloading area		11,5		271,9				
	- Fishing boat haul out		** 2,0						** 43,8

(*) Provincial Government

(**) Private Corporations

TABLE 7 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 2 - 7 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD					
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months
	- Roads	50,0	62,9	810,0 * 190,0	1 000,0	667,8		
	- Drainage works	3,7	87,5					
	- Foundations	50,0	824,8		520,0	447,9		
	- Cemetery					** 18,6		
	Sub-total:	253,7	1 038,7	2 000,0	1 791,9	1 331,1	4 300,0	3 572,0
	Category 4 - Public utilities							
	- Power house				* 35,0	* 300,0	* 2 000,0	* 1 001,1
	- Power lines	15,0		100,0	100,0	154,6		
	- Radio station							** 11,0
	Sub-total:	15,0		100,0	135,0	454,6	2 000,0	1 012,1
	Sub-total - Construction:	303,2	1 538,5	4 576,4	5 230,3	5 516,2	8 831,0	4 584,1

(*) Provincial Government

(**) Private Corporations

TABLE 7 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 2 - 7 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD					
TYPE	DESCRIPTION		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93
OTHER EXPENSES	Assivakvik project management	400,0	4 months	400,0	400,0	350,0	300,0	300,0
	Archeological study	35,0						
	Preparatory study	350,0						
	Topographic survey and soil study	200,0						
	Hydrographic survey	50,0						
	Impact studies	60,0						
	Land surveyor	50,0						
	Construction camp	40,0	600,0					
	Construction power plant		150,0					
	Telephone installation		160,0					
	Moving of families and their personal belongings						100,0	115,0

(*) Provincial Government

(**) Private Corporations

TABLE 7 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 2 - 7 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD						
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months
	Project evaluation								30,0
Sub-total - Other expenses:		1 185,0	1 360,0	400,0	400,0	400,0	350,0	400,0	445,0
TEMPORARY SERVICES (O + M)	Temporary services management	0,5	10,0	15,0	20,0	25,0	30,0	30,0	30,0
	Camp maintenance		16,0	24,0	32,0	40,0	48,0	48,0	48,0
	Nursing		16,0	24,0	32,0	40,0	48,0	48,0	48,0
	Space heating		10,0	15,0	20,0	25,0	30,0	30,0	30,0
	Electricity		40,0	60,0	80,0	100,0	120,0	120,0	120,0
	Drinking water supply		5,2	7,8	10,4	13,0	15,6	15,6	15,6
	Wastewater and solid waste		5,2	7,8	10,4	13,0	15,6	15,6	15,6
	Telephone	12,5	12,5	10,0	10,0	10,0	10,0	10,0	10,0
	Road maintenance			2,0	6,0	12,0	12,0	12,0	12,0
Sub-total - Temporary services:		13,0	114,9	165,6	220,8	278,0	329,2	329,2	329,2
TOTAL:		1 501,2	3 013,4	5 142,0	5 851,1	6 144,2	9 560,2	5 358,3	5 358,3
FEDERAL GOVERNMENT PARTICIPATION:		1 501,2	3 011,4	4 552,0	5 816,3	5 825,6	5 840,2	2 891,1	2 891,1

TABLE 8

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 3 - 9 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD								
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
CONSTRUCTION	<u>Category 1 - Buildings:</u>										
		Native houses (32)							1 857,0	2 531,0	
		Non native houses (6)							673,5		
		Warehouse		11,1	262,4		586,2				
		Office Building		24,8			1 743,3	314,6			
		School and playground		87,1			679,3				
		Nursing station		28,7							
		Police station		5,0		515,5		117,2			
		Municipal garage		34,5	300,0						
	Sub-total:		191,2	562,4	515,5	3 008,8	2 962,3	2 531,0			

TABLE 8 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 3 - 9 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD								
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
CONSTRUCTION	<u>Category 2- Municipal services</u>										
	- Drinking water supply & reservoir		12,6		298,0						
	- Dikes (for water supply)		5,5	130,0							
	- Wastewater treatment plan		21,3			502,4					
	- Solid waste disposal site		3,7	87,5							
	- Municipal equipment				1 743,4						
	Sub-total:		43,1	217,5	2 041,4	502,4					
	<u>Category 3 - Earthworks</u>										
	- Temporary airstrip		50,0	600,0 * 400,0							
	- Permanent airp. facilities		150,0					196,8	2 640,0 * 1 760,0	2 236,9 * 1 491,3	
	- Wharf & unloading area		11,5		271,9						
	- Fishing boat haul out		** 2,0								** 43,8

(*) Provincial Government

(**) Private Corporations

TABLE 8 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 3 - 9 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD							
TYPE	DESCRIPTION		1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
- Roads			92,9	1 500,0	694,8			20,0	283,0 * 190,0	
- Drainage works			91,2							
- Foundations			874,8		450,0	367,9	150,0			
- Cemetery						** 18,6				
Sub-total:			1 272,4	2 500,0	1 416,7	386,5	150,0	216,8	4 873,0	3 772,0
<u>Category 4 - Public utilities</u>										
- Power house					* 35,0	* 300,0	* 2 000,0	* 1 001,1		
- Power lines			15,0		100,0	100,0	154,6			** 11,0
- Radio station										
Sub-total:			15,0		135,0	400,0	2 154,6	1 001,1		11,0
Sub-total - Construction:			1 521,7	3 279,9	4 108,6	4 297,7	5 266,9	3 748,9	4 873,0	3 783,0

(*) Provincial Government

(**) Private Corporations

TABLE 8 (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 3 - 9 YEAR PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD								
TYPE	DESCRIPTION		1987-88	1988-89 4 months	1989-90 6 months	1990-91 8 months	1991-92 10 months	1992-93 12 months	1993-94 12 months	1994-95 5 months	1995-96 5 months
OTHER EXPENSES	Assivavik project management	300,0	350,0	400,0	400,0	400,0	400,0	350,0	300,0	250,0	250,0
	Archéological study	35,0									
	Preparatory study	350,0									
	Topographic survey and soil study	200,0									
	Hydrographic survey	50,0									
	Impact studies	60,0									
	Land surveyor	50,0									
	Construction camp	40,0		600,0							
	Construction power plant			150,0							
	Telephone installation			160,0							
	Moving of families and their personal belongings							100,0	115,0		

TABLE B (cont'd)

ANNUAL CASH FLOW (1 000\$)

SCHEDULE 3 - 9 YEARS' PLAN

EXPENSES		STUDY	CONSTRUCTION PERIOD								
TYPE	DESCRIPTION		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
	Project evaluation		4 months	6 months	8 months	10 months	12 months	12 months	12 months	5 months	5 months
Sub-total - Other expenses:		1 085,0	1 260,0	400,0	400,0	400,0	400,0	450,0	445,0	250,0	250,0
TEMPORARY SERVICES (O + M)	Temporary services management		10,0	15,0	20,0	25,0	30,0	30,0	30,0	12,5	12,5
	Camp maintenance		16,0	24,0	32,0	40,0	48,0	48,0	48,0	20,0	20,0
	Nursing		16,0	24,0	32,0	40,0	48,0	48,0	48,0		
	Space heating		10,0	15,0	20,0	25,0	30,0	30,0	30,0	12,5	12,5
	Electricity		40,0	60,0	80,0	100,0	120,0	120,0	120,0	50,0	50,0
	Drinking water supply		5,2	7,8	10,4	13,0	15,6	15,6	15,6	6,5	6,5
	Wastewater and solid waste		5,2	7,8	10,4	13,0	15,6	15,6	15,6	6,5	6,5
	Telephone	12,5	12,5	6,0	8,0	10,0	12,0	12,0	12,0	5,0	5,0
	Road maintenance			2,0	6,0	12,0	12,0	12,0	12,0	2,0	2,0
Sub-total - Temporary services:		12,5	114,9	161,6	218,8	278,0	331,2	331,2	331,2	115,0	115,0
TOTAL:		1 097,5	2 896,6	3 841,5	4 727,4	4 975,7	4 525,1	6 048,1	4 525,1	5 238,0	4 148,0
FEDERAL GOVERNMENT PARTICIPATION:		1 097,5	2 894,6	3 441,5	4 692,4	4 657,1	3 524,0	4 048,1	3 524,0	3 288,0	2 601,9

1 000\$ (1987 CONSTANT DOLLARS)

SCHEDULE	EXPENSES		COST SHARING				TOTAL
	CAPITAL	OPERATION AND MAINTENANCE	FEDERAL GOVERNMENT	PROVINCIAL GOVERNMENT	MUNICIPALITY OF IACANGAJUK	PRIVATE CORPORATIONS	
1 (5 YEARS)	CONSTRUCTION		23 230,9	6 937,4	75,4	2 625,5	32 869,2
	OTHER EXPENSES		3 980,0				3 980,0
	TEMPORARY SERVICES		981,5				981,5
	TOTAL:		28 192,4	6 937,4	75,4	2 625,5	37 830,7
2 (7 YEARS)	CONSTRUCTION		23 446,9	7 057,4	75,4	2 625,5	33 205,2
	OTHER EXPENSES		4 540,0				4 540,0
	TEMPORARY SERVICES		1 450,7				1 450,7
	TOTAL:		29 437,6	7 057,4	75,4	2 625,5	39 195,9
3 (9 YEARS)	CONSTRUCTION		23 626,9	7 177,4	75,4	2 625,5	33 505,2
	OTHER EXPENSES		4 940,0				4 940,0
	TEMPORARY SERVICES		1 678,2				1 678,2
	TOTAL:		30 245,1	7 177,4	75,4	2 625,5	40 123,4

5. MARINE ACCESS

5.1 SEALIFT

The many shoals and reefs are found in the Taqpangajuk area will make access to the shore difficult for ships.

Using the available data, different sites have been identified where docking facilities could be planned. One of these is indicated as W-2 on Plan no. 3 of the feasibility study included in Appendix. The access to this particular site is, however, difficult because of the shoals which restrict the access to open waters. The major disadvantage of site W-2, and it has been noted by most of the persons who looked into the project, is the vulnerability to winds, tidal currents and ice. At this point, these constraints are, to our opinion, sufficient to abandon this site for a dock construction.

Sites W-4 and W-4b could be appropriate for dock construction. They offer a better protection against bad weather. The land access to these sites, however, is difficult because of steep slopes and the cost for an access road would be important.

The bay at the North of the community should be investigated. No data is available on depths of the water in this bay, but it might offer a suitable docking area near the site identified "WW2" on Plan no 3.

It cannot be determined at this point in time that a docking area for sealift vessels can be built at reasonable costs since only preliminary and incomplete marine charts are available.

Therefore, at this stage, and until more information is available, it should be considered that the ships will have to anchor at a certain distance from shore and the shipment transferred on barges. Following the existing charts, the best area for a ship anchorage is offshore to the southwest of the Taqpangajuk peninsula. This area was recommended by Fisheries and Oceans Department since it should offer a fairly good protection against bad weather and prevailing winds.

Three sites could be used for barge unloading. They are sites W-1, W-2 and W-3. According to the existing charts, site W-3 seems the easiest one for shallow draft barges but more investigation is necessary before a final location is chosen. A budget has been planned in section 4.3.2 to build a ramp for barges and unloading equipment.

If ships are to anchor to the southwest of the peninsula, it is recommended by Fisheries and Oceans Department to relocate the tank farm to the southeast of the location proposed in the feasibility study. It will then be easier for ships to use a safe anchorage from which to run their hoses.

5.2 FISHING VESSELS AND SMALLER BOATS

Small boats need a well protected area. The bay leading to the site shown as W-1 on Plan no 3 offers that protection and at this stage, is recommended. This bay is of easy access at high tide but it may be difficult for bigger boats to enter at low tide. We would recommend to have buoys or markers to help boats navigate in this bay.

It is impossible at this point to estimate with any precision the cost for building any docking facilities since too little information is available on the water depth or the nature of the bottom. We recommended that the budgetary provisions of the feasibility study be kept until more information is available.

6. CONCLUSION

The project cost summary (Table 9) shows that schedule 1 is the most economical choice. Its cost of 37 830 700\$ (1987 constant dollars) represents a saving of 1 365 200\$ in comparison with schedule 2 or 2 292 700\$ with schedule 3. Most of the cost increase is a result of management and temporary services expenses.

Also, the second and third schedules are more expensive because of the cost of the airport facility. The construction schedules for this infrastructure do not allow economies of scale and require two equipment mobilization phases.

Comparing the schedule 1 (37 830 700\$) with the feasibility study master plan (35 000 000\$ in 1987 dollars), we note an increase of 2 830 700\$. The difference between those two costs mostly comes from the fact that we added a 10% contingency to the estimated work costs.

While studying the project, we noticed that an airport closer to the village would be economical, particularly for access road construction and maintenance costs. However, an impact study should determine its effects on the community and particularly on the lake proposed as a drinking water supply which is located near the possible airstrip site.

APPENDIX

UNGAVA
BAY
P.L.C.A.

Δσβδζεζς^c μολδδ^φ

DRINKING WATER SUPPLY
ATCA

WASTE WATER PLANT

MS
SOLID WASTE SITE
100'-0" ΔΔΔΔΔ

PH1224
POWERHOUSE
VIA VISA

62-116100-1000

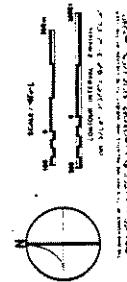
YF12
3ANK FARM
D14-26DN

WT-1A1F
D15-D16

233
VOLUME
(CONTENTS)

ROUTE ONE
400' 1

ROUTE TWO
4500 2



Prepared for
MAANINK CORPORATION
by
KATHINK REGIONAL GOVERNMENT
Technical Assistance Department
Municipal Affairs Section

Page 44

• • • • •

.....

$\frac{1}{2} \pi$ and $\frac{3}{2} \pi$