FINAL REPORT

SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT FOR THE NORTHERN AIRPORTS INFRASTRUCTURE IMPROVEMENT PROGRAM: IVUJIVIK

Prepared by
MAKIVIK RESEARCH DEPARTMENT

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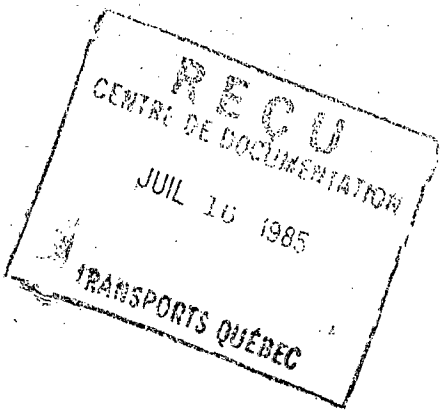
société Makivik corporation



FINAL REPORT

SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

FOR THE NORTHERN AIRPORTS

INFRASTRUCTURE IMPROVEMENT PROGRAM:

IVUJIVIK

Prepared by:

MAKIVIK RESEARCH DEPARTMENT

Submitted to:

Le Service de l'Environnement
Ministère des Transports
Gouvernement du Québec

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SUMMARY OF IVUJIVIK STUDY

1. SUMMARY OF IVUJIVIK STUDY

From November 17, 1983, to February 10, 1984, the Makivik Research Department carried out a field and library study to evaluate the potential social and environmental impacts from the Northern Airports Infrastructure Improvement Program in the communities of Ivujivik and Salluit, Nouveau-Québec. This report summarizes the findings from the Ivujivik study.

The Northern Airports Infrastructure Improvement Program is a joint undertaking between the provincial and federal governments. The purpose of this program is to build new or upgrade existing airstrips in eleven municipalities north of the 55th parallel. Airstrips of 1,066 m (3,500 ft) are proposed. An access road, power supply line, and freight and passenger facilities will be constructed and runway lights and navigational aids will be installed. A sum of $68.5 million has been allocated. The program will begin in the summer of 1984 and continue for approximately 10 years. The order of construction starts is set out in a priority list that was drawn up by the mayors of the municipalities.

Schedule "A" of the Environmental Quality Act requires that a social and environmental impact assessment study be carried out prior to the construction of all airstrips in the territory north of the 55th parallel. The purpose of impact assessment studies, however, is not always clear to Inuit, especially when these studies involve the evaluation of small scale projects that are perceived to be critical for the well-being and development of the communities and region. This perception is further complicated by the fact that the construction of these airstrips and infrastructure will take place in an area that has already been severely disrupted by unplanned community growth.

Inuit do not reject the need for impact assessment prior to the construction of vital community facilities, but they insist that their opinions be reflected in all stages of the assessment process. Consequently, an important objective of this study was to explain the rationale

of impact assessment and to discuss its value for protecting the social, economic and bio-physical environment. These explanations were balanced by listening to Inuit views about impact assessment, and how it should be modified in order to incorporate their concerns, knowledge and perceptions. This approach is fundamental if we are to answer a basic northern question of "how shall we plan?".

The study described in this report involved Inuit in all phases of impact assessment. The research was designed at the Kangiqsujuaq Research Centre whose Inuit personnel participated in the field research, data analysis and development of the final report. The primary method used to collect information was detailed interviews with Inuit. These interviews provided both fact and perception about the social and physical environment. This information was then integrated with information derived from the interpretation of aerial photographs, the evaluation of relevant scientific literature, and from discussions with consultants.

The time restraints imposed on this study, coupled with the difficulty of undertaking certain types of ground surveys in the winter, required that the project be divided into two phases. The most important elements of the study were carried out in phase one. If the phase one findings indicate that information derived from ground surveys is important for determining impacts, then a second phase of field research will be carried out between June 15 and July 30, 1984. The primary objectives of the phase one study were:

1. to describe the development, present status and future prospects of air service in northern Québec, and to establish the importance of the Northern Airport Infrastructure Improvement Program on future development for the communities and the region;

2. to describe the physical and social requirements of the infrastructure program and to establish the types, intensity and geographical zone of potential impacts;

3. to describe the integration between the airstrip infrastructure and the present or proposed physical infrastructure for Ivujivik;

4. to describe the physical and biological environment of Ivujivik and to determine the potential impacts on this environment from the infrastructure improvement program;

5. to describe the social, economic and visual environment of Ivujivik and to determine the potential impacts on this environment from the infrastructure improvement program;

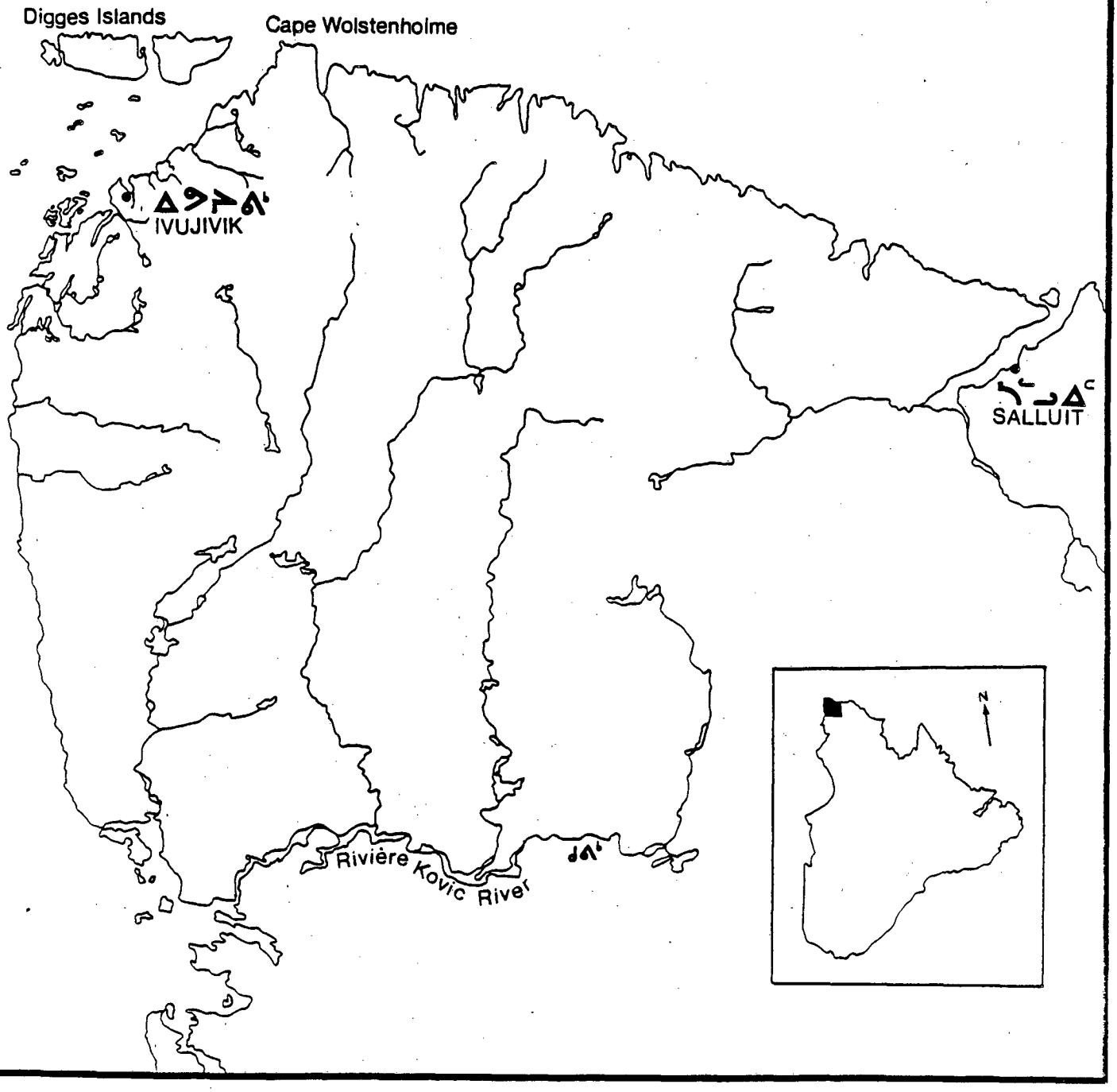
6. to describe the archeological potential of the Ivujivik region and to determine the possible impacts from the infrastructure improvement program on archeological sites.

1.1 Summary of Findings

Ivujivik is a community of approximately 200 Inuit that is situated on the coastline of Digges Sound, near the confluence of Hudson Bay and Hudson Strait (Figure 1). The community has always been isolated with respect to air service. Its geographical location as the northernmost community in Québec meant that it was not on a route for planes flying between larger settlements, and its size meant that it did not create its own needs for freqent air service. In 1970, a small airstrip was built on the low plateau that lies directly north-west of the community. In 1982, Transport Québec began work on a new airstrip, on the same plateau, but tending east-west rather than north-south. This orientation would allow for the strip to be lengthened when required. The airstrip completed in 1982 is 450 m (1,500 ft) in length.

Engineering plans for the airstrip and access road have been completed by the consultant firm Gendron Lefebvre under contract with Transport Canada. No information is yet available on the specific plans for lighting, navigational aids and buildings. The exact cost of the project has not been determined at the writing of the final report, but a reliable estimate of $6.7 million has been given. This estimate includes $5.2 million for construction of the airstrip and access road, and $1.5 million for the terminal facilities and electrical transmission line and equipment. The expected date to begin construction is August 1984 and the

Figure 1.



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LOCATION OF IVUJIVIK

EMPLACMENT de IVUJIVIK

engineering reports estimate that fifteen weeks will be needed to complete the airstrip and access road. A work crew of 39 men is suggested, and a precise list of the machinery needed for blasting, crushing, loading, hauling and grading has been drawn up.

1.1.1 Community Concerns and Air Service

- Ivujivik Inuit do not state an interest in using improved air servcies to promote rapid growth or development of the community. On the other hand, they are concerned that the size or the level of activity within a community should not be a criteria for determining the quality of airport infrastructure. They do not wish to fall behind the other communities and they want to have safer and more reliable air service.

- Ivujivik, like all other Inuit communities, is primarily concerned with the importance of improved air service on the delivery of medical care, especially for emergency treatment and evacuation. The people of Ivujivik feel that the improved airstrip will provide them with better access to the Povungnituk Hospital and to emergency jet service that will serve this hospital.

- Ivujivik Inuit, though not directly concerned with community growth, feel that an improved airstrip and infrastructure will provide a better integration between their community and Povungnituk which they view as a potential transshipment centre for freight and passengers. In particular, they feel that it will be much easier and perhaps less expensive to ship goods from the south to Ivujivik if there is jet service to Povungnituk.

- Ivujivik Inuit express a strong concern over the fact that there are no airport facilities. They want buildings to protect passengers, especially patients and children, and to store freight.

- Ivujivik Inuit express a strong concern that their airstrip presently lacks landing lights and navigational aids. They consider this to be dangerous and it limits the use of the present airstrip for night and bad weather landings, especially for medical reasons.

1.1.2 Community Air Service

- Prior to 1970, there was no airstrip in Ivujivik and service was irregular throughout the year and unavailable in freeze-up and break-up. A small landing strip was built in 1970, on the plateau north of the community. Some scheduled flights began in the mid-1970's with Twin Otters. In 1982, a new strip was built in the same area north of the community. Austin Airways has been the major carrier for Ivujivik since regular, scheduled air service began in the late 1970's.

- Ivujivik is presently served by twice weekly Twin Otter service from Kuujjuarapik. Connections can be made to the Ungava Bay coast via Salluit.

- In 1982, Austin Airways reported 708 passengers travelling from Ivujivik and 578 passengers to Ivujivik. Freight in totaled 24,341 lbs, while 21,288 pounds of freight was shipped out.

1.1.3 The Airport Improvement Program

- The current and proposed infrastructure for the community and airstrip is illustrated in Figure 2.

- Ivujivik now has an airstrip of 455 m (1,500 ft). The orientation of the airstrip will not be changed but it will be lengthened, widened, graded and resurfaced with granular material. The new strip will be 1,070 m (3,500 ft). Plans call for adding 385 m (1,250 ft) to the northeastern end of the present strip and 230 m (750 ft) to the southwestern end.

FIGURE 2

62°25'

EXISTING AND PROPOSED INFRASTRUCTURE

- WATER BODY
- COMMUNITY
- PROPOSED RECREATIONAL AREA
- GRAVE SITE
- EXISTING AIRSTRIP
- ABANDONED AIRSTRIP
- PROPOSED AIRSTRIP EXTENSION
- PROPOSED AIRSTRIP APRON
- EXISTING ROAD
- PROPOSED ROAD
- EXISTING SKI-DOO AND TRUCK ROAD
- AREA TO BE BLASTED

- EXISTING WATER POINT
- PROPOSED WATER POINT
- CURRENTLY USED GRAVEL PIT
- POTENTIAL GRAVEL PIT
- DRAINAGE
- EXISTING DUMP SITE
- PROPOSED DUMP SITE
- EXISTING POWERHOUSE
- PROPOSED POWERHOUSE
- EXISTING GARAGE
- PROPOSED GARAGE

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INFRASTRUCTURE ACTUELLE ET PRÉVUE

- COURS D'EAU
- COLLECTIVE
- AIRE DE RÉCRÉATION PROPOSÉE
- SITE DE SÉPULTURE
- PISTE ACTUELLE
- PISTE ABANDONNÉE
- PROLONGATION PROPOSÉE DE LA PISTE
- TABLIER DE PISTE PROPOSÉ
- ROUTE ACTUELLE POUR CAMIONS ET MOTONEIGES
- RÉGION À DYNAMITER

- POINT D'EAU ACTUEL
- POINT D'EAU PROPOSÉ
- BANC DE GRAVIER EN USAGE
- BANC DE GRAVIER POTENTIEL
- DRAINAGE
- DÉPOTOIR ACTUEL
- SITE PROPOSÉ POUR LE DEPOTOIR
- CENTRALE ACTUELLE
- CENTRALE PROPOSÉE
- GARAGE ACTUEL
- GARAGE PROPOSÉ

DATE / ᐅᓪᓗᖓ	March 1984
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Northern Airport Impact Assessment
Ivujivik Study Site

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Étude d'Impacts des Aéroports Nordiques
Région á l'Étude (Ivujivik)

- An access road of 750 m (2,460 ft) will be built from the community to the airstrip. This new road will replace the present one that can only be used in summer and which requires vehicles to travel along the airstrip. The road will be built without bridges or complicated landfill or drainage.

- A power line will follow the road to the airstrip apron. It will carry electrical power from either the present generator or from a new powerhouse scheduled for construction in 1984 or 1985.

- Runway lights and navigational aids will be installed according to the standards described in the infrastructure program.

- A prefabricated structure for passengers and freight will be erected on the airstrip apron but plans and specifications are not yet available for these buildings.

1.1.4 Integration of Airstrip and Community Infrastructure

- A Master Plan of Ivujivik prepared by the Kativik Regional Government in 1982, calls for the construction of a new powerhouse, water supply point and garbage dump. The new garbage disposal site is critically needed to avoid further contamination of Ivujivik harbour and to remove an immediate health hazard from the community. A new water source is needed to assure an adequate supply in winter. Approriate sites for these two facilities have been determined and are located southwest of the community.

- The major integration of the airstrip with other community infrastructures involves the access road and its partial utilization for travel to obtain water and to reach the proposed new dumpsite.

- The 1982 master plan calls for a road leading to these facilities to be built to the south of the proposed airport access road. These

two roads would parallel each other for approximately 350 m (1,150 ft). Although some construction and filling has already occurred for this road, the Inuit feel that it is badly sited and difficult to maintain because of poor drainage. They prefer to use the airport access road for approximately 350 m, at which point a branch will extend southwest to the water intake and dumpsites.

- The Inuit have suggested that the proposed location for a new powerhouse in the northwestern sector of the community could mean that the powerline follows the old airport access road and airstrip. Pilots note the dangers of a powerline adjacent to the airstrip, and Hydro-Québec noted that, even though this route was shorter, it would be more difficult to service than if the proposed acces road was followed.

- The Inuit consider that there are no other problems with integrating the airport and the community infrastructures.

1.1.5 The Physical Environment

- Ivujivik is situated on a low, massive plateau surrounded by marine waters in summer and sea ice in winter. Local relief is not extreme, and the construction of the airstrip and access road is not affected by a complicated pattern of slope or drainage.

- The location of the airstrip on the low plateau minimizes danger from hills or other topographic features. Two small hills are located in close proximity to the airstrip and must be removed and the rock used for fill.

- Weather conditions, especially fog in spring and fall, can affect the visibility and prevent flights, but bad weather problems are lessened by the low topography and over sea "let down" and approach.

1.1.6 Granular Materials and Fill

- Ivujivik has meagre amounts of available granular material and fill. A minimum of 183,500 m^3 of fine material and 119,400 tons of rough fill will be needed for the airstrip. The technical survey indicated that the four gravel sources could only provide 10,000 m^3 of fine sand and gravel. After balancing the cut and fill procedures of the airstrip and access road construction, 25,000 m^3 of fill will be needed. It is proposed that most of this material would be obtained by blasting and crushing the rock from two small hills adjacent to the airstrip. An estimate of 11,000 and 14,000 m^3 has been established for these two sources. The engineering firm responsible for carrying out the technical survey noted four sources of gravel in the immediate vicinity of the community.

- The deposits of granular material must supply sand and gravel for community use. There are no alternative sites for extracting significant quantities of gravel in the vicinity of the community.

- The engineering survey suggests that additional fill must be derived by the blasting and crushing of bedrock in two areas adjacent to the northeast extension of the airstrip. Precise estimates of the material that could be obtained by blasting and crushing were not stated in the engineering report.

1.1.7 The Biological Environment

- The immediate biological environment of Ivujivik is comprised of land, freshwater, avian and marine resources. Of these resource groups, only marine resources of significance to the economy of the community are harvested in the immediate vicinity of the peninsula and adjacent to the area of airstrip construction.

- The zone of impact for the airstrip does not threaten any freshwater fish or anadromous fish in their freshwater habitat. There are

no major lakes or river systems with either freshwater or anadromous fish near the airstrip construction zone or the community.

- The zone of impact for the airstrip does not include any areas in which there are major seasonal concentrations of migratory or other bird resources. During bad weather, and especially during times of poor visibility, small numbers of migratory birds or ptarmigan may congregate at the north end of the Ivujivik peninsula to await better conditions for proceding north on their spring migration. These congregations are not large, they do not occur with regularity and they are not considered to be important since the birds do not nest or feed in this zone nor do these species utilize the Ivujivik peninsula because of special habitat conditions.

- The most important resources of the Ivujivik peninsula are marine mammals and anadromous char that concentrate in the coastal zone. Both marine mammals and anadromous fish resources are found in important concentrations along the coast of the peninsula in close proximity to the area of construction and blasting for the airstrip.

1.1.8 Social and Economic Conditions

- The community of Ivujivik is interested in the completion of the airstrip and infrastructure more in relationship to the long-term social and economic benefits it will offer than for short-term employment at the construction phase.

- The community expects, however, that construction should provide jobs on the work crews since they state that many individuals have the experience and skills required for this type of construction.

- The community expressed concern over not knowing how many people could be employed and in what type of job. They warned that it may be difficult for the community to supply expected manpower needs.

- The community expressed strong interest interest in the utilization of individuals who have undergone the training program in heavy equipment operation and they want assurance that these individuals will be utilized for the jobs they were trained for.

- The community expressed concern with the prospects of long-term employment linked to the operation and management of the airstrip. They whish to have details on the employment potential, type of position, qualifications and expected training programs.

- The community noted the unavailability of equipment for use on the construction of the airstrip. They have no available equipment since they must use what they have on other community projects.

- The community noted that there is no available space for housing the work force and that the cooperative does not carry a large inventory of stock. A large work force could cause the depletion of staple food items supplied by sealift.

- The community clearly stated that precautions would have to be taken to protect the marine environment and resources adjacent to the construction site. They noted noise, vibrations from blasting, fuel spills and garbage disposal.

- The community stated that the municipal council would be the body concerned with regulating the work force and construction problems. They also stated that the municipal council and the heads of organizations should participate in decisions about the airport infrastructure and the other critical infrastructure needs of the community, especially the relocation of the water source, garbage dump and the construction of an access road to these facilities.

1.1.9 Landscape and Environment.

- The concerns of the community with respect to the visual environment focus on elements that are not directly linked to the airstrip. When discussing the visual quality of the environment, they noted that they perceive the presence of garbage dumps improper disposal of waste waters and material from homes and the run down appearance of many buildings to be the significant elements that affect the visual landscape.

- The construction of the access road will be completed without a significant grading or filling along the route and it was noted by the community that the road will follow the contour of the land. The airstrip will not be relocated and it is felt that there will be little change from the present situation.

- The only area of difficult construction involves the zone of poor drainage directly west of the community. The correction of this situation through drainage and fill will provide additional flat land especially for recreational use.

- The extraction of granular and the grading of the areas after extraction is dependent upon the availability of proper equipment and the community noted that they were not able to relandscape these areas.

1.1.10 Archaeological potential and burial site.

- The archaeology of the Ivujivik peninsula was first surveyed in the late 1950's as an adjunct to a larger project on the coastal islands. Paleo-eskimo sites were discovered in the vicinity of the community and the archaeological material was collected. Pace and compass maps of the sites were made. No archaeology has taken place since that time. It should be expected that additional sites could be found, but it is also obvious that significant disruptions have occured in 20 years to the surface environment.

- The Inuit note that there are no later archaeological or historical sites or features located close to the community.

- The recent burial of a Roman Catholic priest in 1964 took place outside of the community cemetery and is adjacent to the summer access road for the airstrip. This burial site is located on a major gravel deposit which could only be utilized if the burial was relocated.

1.2 Potential Impacts and Corrective Measures

The potential impacts that may occur from the Northern Airport Infrastructure Improvement Program at Ivujivik are described in detail in Section IV of this report. Corrective measures and recommendations with respect to these impacts are also set out in detail in that section. The following points briefly describe the primary impacts and suggest appropriate corrective measures.

1.2.1 Potential Impacts

- The most severe potential impact would result from not having the airstrip construction start on schedule or undergo significant modifications.

- The most positive long-term impact from the project is the establishment of a proper airstrip, lights and navigation aids that will facilitate safer and more reliable air service and especially significantly increase the margin of safety for emergency medical services.

- The positive impacts from employment are considered important for wage labor during construction, but the long-term emphasis will be on the operation and maintenance of the airport. If steps are not taken to assure proper training and employment, this will have an adverse effect on the community.

- Additional economic impacts are perceived to be a possible slowing of the northern air freight costs, and through the eventual incorporation of more suitable aircrafts to increase the speed of freight delivery, the type of goods transported and the conditions of goods, especially foods.

- The construction of proper airport facilities is essential to the community and it will reduce the problems encountered for passenger discomfort and safety. Passenger facilities will end what Inuit consider to be disregard for people and the environment by not having toilet facilities. The housing of freight in a heated building will significantly improve the transport of foodstuffs and reduce other occuring damages from weather.

- The community recognizes the need to integrate infrastructure planning for the airstrip and other facilities. They view the consultation process to be essential for this integration and feel that they do not have control over the consultation process and thus needed community facilities could be delayed because of the decisions of others.

- The community is concerned with the utilization of granular material for the airstrip and they feel that their long-term community needs would be threatened if the major concentrations were expended on the airstrip and access road.

- The creation of granular material by blasting and crushing of rock is viewed by the community as the only alternative. They cautioned that blasting may have a potential negative impact on marine mammals that must be ameliorated. They noted that additional material from blasting and crushing should be stockpiled for future community use.

- The noise and dust created by blasting and crushing is said not to be a problem for the community population since the prevailing winds will seldom carry the dust towards the community. They also noted that they prefered a short-term problem with dust to a long-term problem of depleted community stocks of gravel.

- The impact on bird and freshwater fish resources will be negligeable. The minor concentrations of birds that may occur on the peninsula are in the spring so that most blasting would be completed by that time.

- The blasting operation must consider its potential impact on the movement of white whales into the area in the fall. If noise and vibrations affect this species, it could seriously reduce the community harvest.

- The existence of the airstrip and access road will encourage a more appropriate availability of heavey equipment and the training program set up for running this equipment will provide expertise in the community. The availability of both the equipment and the personel should create a greatly improved system of maintenance throughout the community.

- The location of the airport access road will bring about a change in the relocation of the road to the proposed garbage dump and water disposal site. This will make access to both infrastructures easier and the construction of the airport road should speed the construction of these other facilities.

- The work force will not have a negative effect on the community as long as the management of the operation is shared by the contractor and the responsible community body. Negative impacts could occur if proper planning does not take place for the management of fuel, the disposal of garbage and the importation of adequate food and shelter.

1.2.2 Corrective Measures and Recommendations

- Additional meetings and consultation must occur between the community and the proponent of the project. It is important that the final plans for the project be reviewed by the community and that prior to any construction, the community discuss its concerns with the appropriate technical and management personnel.

- The municipal council will act as the main liaison between the project proponent and the community and it must be informed of the state of the project and the timing of activities for the fall. The municipal council must be assured that arrangements are made for food supplies and shelter of the work force.

- The municipal council requested that further information be provided on the potential impacts of blasting on marine mammals, especially beluga whale. If there is a likelyhood that blasting may affect the fall pattern of movement, hunters will have to advise construction personnel on an appropriate blasting schedule.

- The community must be assured that steps will be taken to assure that individuals now being trained in heavy equipment operation are employed by the project. They also request that further consultation take place on long-term employment and training.

- An archaeological survey of the area within and immediately adjacent to the zone of impact should be undertaken in July of 1984. The details of the survey and further recommendations are included in the consultant's report on archaeology.

- The burial of Father Deltombe must be relocated in a competent and sensitive manner, according to instructions issued by the Roman Catholic Church. (See Appendix F)

- In the future, there must be a closer coordination between all groups involved in planning and the development of community projects. The creation of better information and the formal establishment of Inuit participation in establishing impact assessment guidelines and procedures is absolutely vital as is Inuit participation in the research itself.

II

PROJECT JUSTIFICATION AND BACKGROUND

2. PROJECT JUSTIFICATION AND BACKGROUND

The communities of northern Québec are at a critical stage in their development. Twenty-five years have elapsed since families started to move from the land into permanent settlements, yet every community is still faced with a lack of essential services. This situation is symbolized by the chaotic and poorly conceived physical infrastructures of the communities. Each has developed without a plan and without significant Inuit participation in decisions related to planning.

Expedient solutions to poorly understood problems, a lack of concern or knowledge on the part of decision makers, and the difficulty of formulating a workable integration between the logistics, culture, environment, budget and bureaucracy have all contributed to this situation. The repercussions of such a system are still felt today as pointed out in an editorial by a Kangirsuk resident, Zebedee Nungak (Taqralik, October 1983).

One of the first attempts at municipal planning took place in 1979 with a joint project between the École d'architecture de paysage de la faculté d'aménagement de l'Université de Montréal and the Makivik Research Department. This project provided background information on each municipality and it created a three-dimensional model of the community landscape that could then be used to animate the planning process.

In 1982, the Kativik Regional Government, in response to the conclusions of the Jolicoeur Report, commissioned the production of municipal master plans for each community. Studies were carried out by professional town planners, in cooperation with local planning committees. The master plans that resulted attempted to superimpose some form of order on the unplanned growth of the past and to set standards and directions for future community growth. The research program for these master plans also encouraged the active participation of local Inuit in the planning process and encouraged the development of a shared expertise between north and south. Unfortunately, these master plans do not always

carry authority for decisions on land use and town planning. It is within this context and history of community development that the Northern Airports Infrastructure Improvement Program will be carried out.

Although planning is a critical problem that must be faced by communities, by the proponents of community-based projects and by other organizations involved in the north, the fundamental justification for airport improvement is based on the reality that air travel is the only feasible transportation alternative. This reality, however, is tempered by the fact that the airstrips of northern Québec are both unsafe and unable to accommodate improvement in air services based on newer and larger aircraft. The history of government decision-making and programs in northern Québec has created centralized settlements that are serviced and supported by a multitude of linkages with the outside world. The depency on the efficient operation of these linkages has not been facilitated by an appropriate infrastructure for the physical movement of people, goods and services. Physical isolation must no longer be justified on the assumption that it enables communities to preserve their integrity and assure a control over their own affairs. There are other means for maintaining integrity and accomplishing local control that will utilize in a positive way the social institutions and leadership of Inuit society.

The construction of airstrips and airport facilities that are safe, and which have the capacity to accommodate larger aircraft and expanding air services, are vital for the development of northern Québec communities. There are no other means of public transport available to the Inuit, and the future expansion and delivery of services within the region will depend on the quality of air service. In the world of today's Inuit, it is the airplane that saves lives, delivers essential goods and personnel and facilitates the movement of Inuit and other travellers within the north and between north and south. Air travel has become a way of life for many Inuit who are active in the social, political and economic development of northern Québec and this mode of transportation is gradually becoming more accessible to other Inuit wishing to travel. Many problems with air travel in the north still exist, and most of these prob-

lems relate directly to poor quality of the airport infrastructure that characterizes every municipality north of the 55th parallel, except Kuujjuaq and Kuujjuarapik.

The research findings from Ivujivik confirm a widely held attitude that the quality of airstrips is directly related to the safety and development of their communities. Consequently, all Inuit are vitally concerned that the present conditions of air travel be greatly improved and this can only be done by upgrading the physical infrastructure. The standards for improvement that have been set out in the Northern Airports Infrastructure Improvement Program will, in the mind of Inuit, create a significant and positive change in the present and future quality of air service. Inuit perceive that these changes will most directly affect the safety of their community but that they will also have important implications for economic, social and political development of the region and of their communities.

2.1 The Infrastructure Program

The precarious state of the airports was an important subject for negotiations related to the James Bay and Northern Québec Agreement (the Agreement). Before the signing of the Agreement, the then-Minister of Indian Affairs and Northern Development, Mr. Judd Buchanan, in a letter dated November 15, 1974, addressed to Mr. Charlie Watt, President of the Northern Québec Inuit Association, stated Canada's commitment to undertake the construction of adequate airstrips for permanent northern communities. A complementary undertaking relating to prior studies on the part of both Canada and Québec was stipulated in Section 29.0.36 of the Agreement. From 1975, and particularly from 1981, until the fall of 1983, long and complex negotiations were needed in order to reach an acceptable agreement on the improvement of community airstrips.

On September 27, 1983, a comprehensive agreement was signed by the federal and provincial governments, creating the Northern Airports

Infrastructure Improvement Program. The stated objective of this program is to promote the economic and social development of northern Québec. Under this program, Québec and Canada will jointly plan and carry out the construction of new, or upgrading of present, airstrips and other infrastructures in eleven Inuit communities north of the 55th parallel. At a meeting held in March 1983, the mayors of all eleven communities established the following priority list for airport construction: Salluit, Ivujivik, Povungnituk, Kangirsuk, Tasiujaq, Inukjuak, Kangiqsujjuaq, Quaqtaq, Kangiqsualujjuaq, Akulivik and Aupaluk. This list was formally ratified by a resolution of the Council of the Kativik Regional Government. The program is scheduled to begin in August 1984 and continue for approximately 10 years. The proposed schedule of work is illustrated in Appendix B. At their meeting, the mayors indicated that the future communities of Umiujaq (Richmond Gulf) and Taqpangayuk (Singer Inlet) would have to be included on the priority list once relocation agreements are been signed and additional funding provided.

The cost of the Northern Airports Infrastructure Improvement Program is estimated to be $68.5 million. This amount will not be indexed over the duration of the program. Québec will pay 40% of the total and the Federal government, 60%. The Federal government will be responsible for the selection of each airstrip site, technical studies and engineering plans, project costing, and for the purchase, installation and maintenance of navigational aids. Québec is the promoter and is responsible for carrying out the airport infrastructure program. This includes environmental and social impact studies; the purchase and maintenance of mobile equipment required for the construction and operation of the airports; and obtaining the required rights and authorizations needed for construction. Québec will also be responsible for the operation and maintenance of airport facilities and equipment, with the exception of navigational aids.

The major components of the program are the same for each community and will include: a gravel runway, 1,065 m (3,500 ft) long and 30 m (100 ft) wide, a taxi way and parking area, a system of airstrip lights and navigational aids; facilities for passengers, freight,

equipment, and operation of the airport. An access road to the airstrip will be built or improved and power transmission lines will be erected. At Povungnituk, a 1,220 to 1,370 m (4,000 to 4,500 ft) paved airstrip will be constructed to provide jet service for the new hospital. A program for training Inuit to operate heavy equipment during the construction phase is now underway and further training will be provided to assure permanent employment of Inuit in the operation and maintenance of the completed airport infrastructure, particularly in the areas of radio communication and weather information.

2.2 The Development of Air Services in Northern Québec

The utilisation of the airplane in northern Québec has a history that began in 1927, when a major air survey was undertaken in the vicinity of Ivujivik and Kangiqsujuaq. In the 1940's, airstrips were built at Kuujjuaq and Kuujjuarapik in support of the military effort of World War II. The Cold War that followed had a major impact on northern air service through the development, in the early 1950's, of a sophisticated airport infrastructure associated with the Direct Early Warning (DEW) radar system. While personnel, material and fresh foods could be routinely delivered to remote radar sites, the Inuit population of Québec and the Northwest Territories could only be served occasionally by small aircraft that operated without any infrastructure. Although there were many discussions and an active exchange of memos and correspondence about the critical need for an improved northern air service, no general policies nor specific programs were put forward. Thus it seemed quite easy to overcome the obstacles of getting airlifted supplies into a defence establishment but almost impossible to routinely move vaccines or other critical materials into Inuit settlements.

The irregularities of charter service using single engine aircraft with float or ski landings, characterized air travel from 1955 to around 1970 for most communities. During these years, no one could really depend upon air service as a reliable means of northern travel.

Chartering an aircraft could secure priority of use and determine destinations but it could never guarantee the actual completion of a northern air journey. Until the development of land-based airstrips, there was almost no possibility of air service during freeze-up and break-up. Each of these periods could last from four to six weeks. At other times, poor weather, especially fog, could cause prolonged delays. There was no regularity to freight or mail and no assurance that even the most critical circumstances of sickness or other community problem could be alleviated by calling in an aircraft. Throughout the mid-1950's to the late 1960's, there were occasional air borne miracles, but there were also many tragedies occasioned by the fact that no agency of government had been effective in establishing an infrastructure that would facilitate the utilization of aircraft.

In the 1960's, charter service for the Ungava region was based in Fort Chimo and relied on single engine Norsemen or similar planes throughout the year. For special purposes, such as the movement of personnel or heavy equipment, Cansos were available for water landings and DC-3's could be used on the winter ice. Wheeler Airlines and St-Félicien Air Service were common names in those years in the Ungava Bay region. On the Hudson Bay coast, Austin Airways was establishing charter and mail service as far north as Povungnituk, basing their operation in Timmins and Moosonee, Ontario.

The settlement of Ivujivik was too distant from either Kuujjuaq or Kuujjuarapik to receive any regular flights and thus it was almost impossible to establish any regular contact with the community or to create a program, and institute facilities that depended upon air support. In the early 1970's, small airstrips were built in some communities and there was the desire, if not necessarily the reality, of 'charter only' giving way to some form of scheduled service. From 1972 to 1977, airstrips were reworked and extended and, in 1978, a federal-provincial agreement on airstrips was to provide $100,000 per community for upgrading. In the late 1970's, the use of Twin Otter aircraft became more common, and regularly scheduled air service was developed through Austin Airways on the Hudson Bay coast and Survair in Ungava.

In 1977, Air Inuit was incorporated and began scheduled service for the Ungava Bay and Hudson Strait routes. This fully Inuit owned enterprise had its base in Kuujjuaq with Salluit as the most northerly point for scheduled service. Charter service from Kuujjuaq served the entire region. On January, 16, 1984, Air Inuit acquired the Austin Airways route and mail contract for all points north of Kuujjuarapik.

In 1984, Twin Otter air service operated by Air Inuit is available to every municipality in northern Québec. Unfortunately, the development of essential airport facilities have not kept pace with improved air service. Airstrips are short and narrow (See Table 1); lights, if available, do not conform to any standards and are only temporarily set when night landings are required; the airstrip surface in summer is often soft and irregular and the grading and slope can vary considerably; and there are no ground facilities for passengers, especially infants or patients, and no place to store or protect freight and perishable foods. Consequently, northern air service still involves frequent delays and many anxious moments, especially while flying at night or in bad weather. The quality of today's air service results primarily from the skill and experience of pilots and from the remarkable adaptability of the Twin Otter aircraft, but these features have reached the limits of their capacity to overcome poor and unsafe facilities. Further advancement in the quality of air service and in the safety of the Inuit and others that must use, it will be dependent upon improved facilities.

2.3 Present Air Service

The air service network for Québec and the eastern Arctic is illustrated in Figure 3. Details of the northern Québec air routes are shown in Figure 4 and the size and general conditions of the airstrips and access roads as of 1980 are described in Table 1. Details of the characteristics of airstrips in the eastern arctic communities are found in Appendix C. The volume of air travel for the Ungava region and the movement of people between the eight communities of the Hudson Strait and

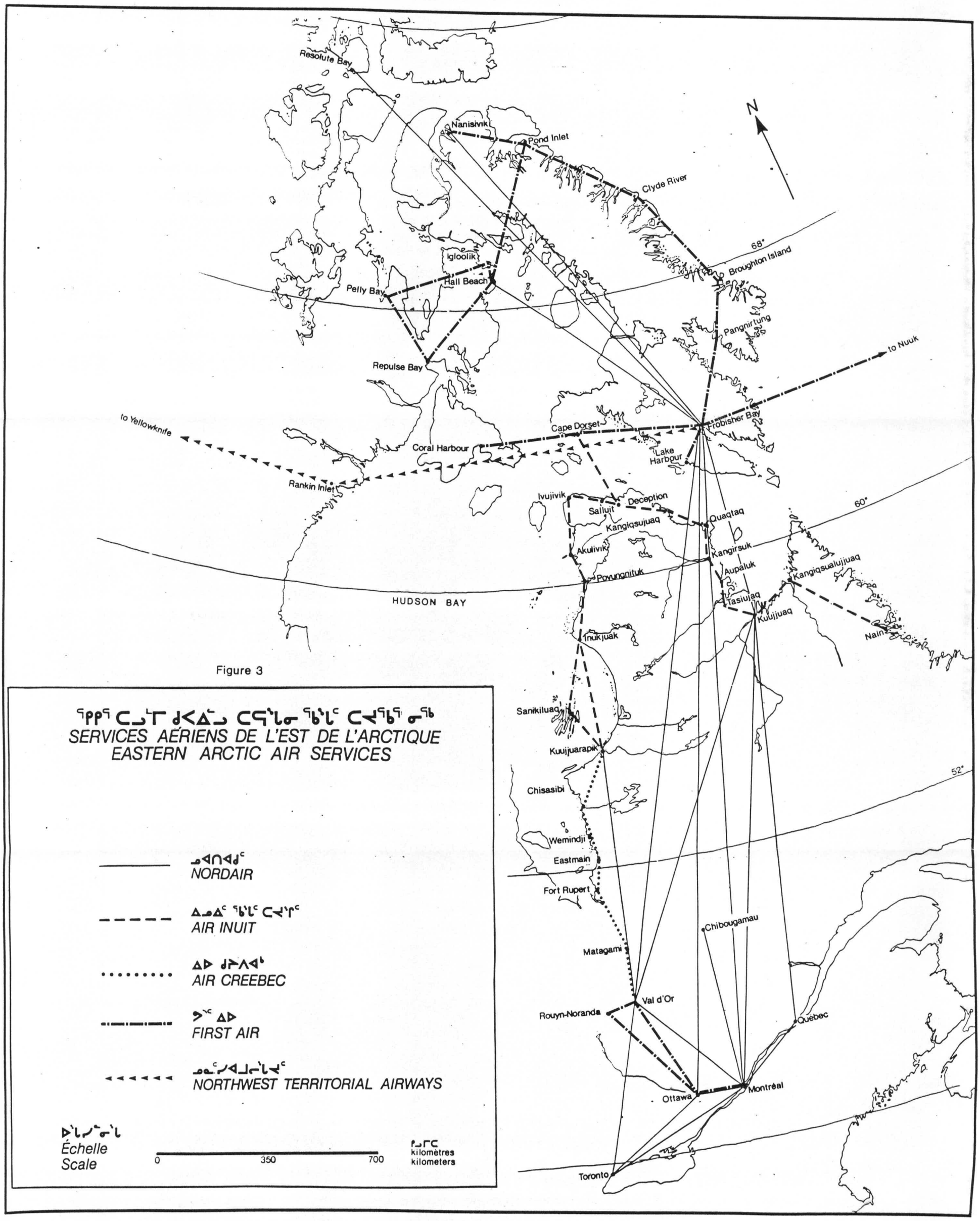

Figure 3

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SERVICES AÉRIENS DE L'EST DE L'ARCTIQUE

EASTERN ARCTIC AIR SERVICES

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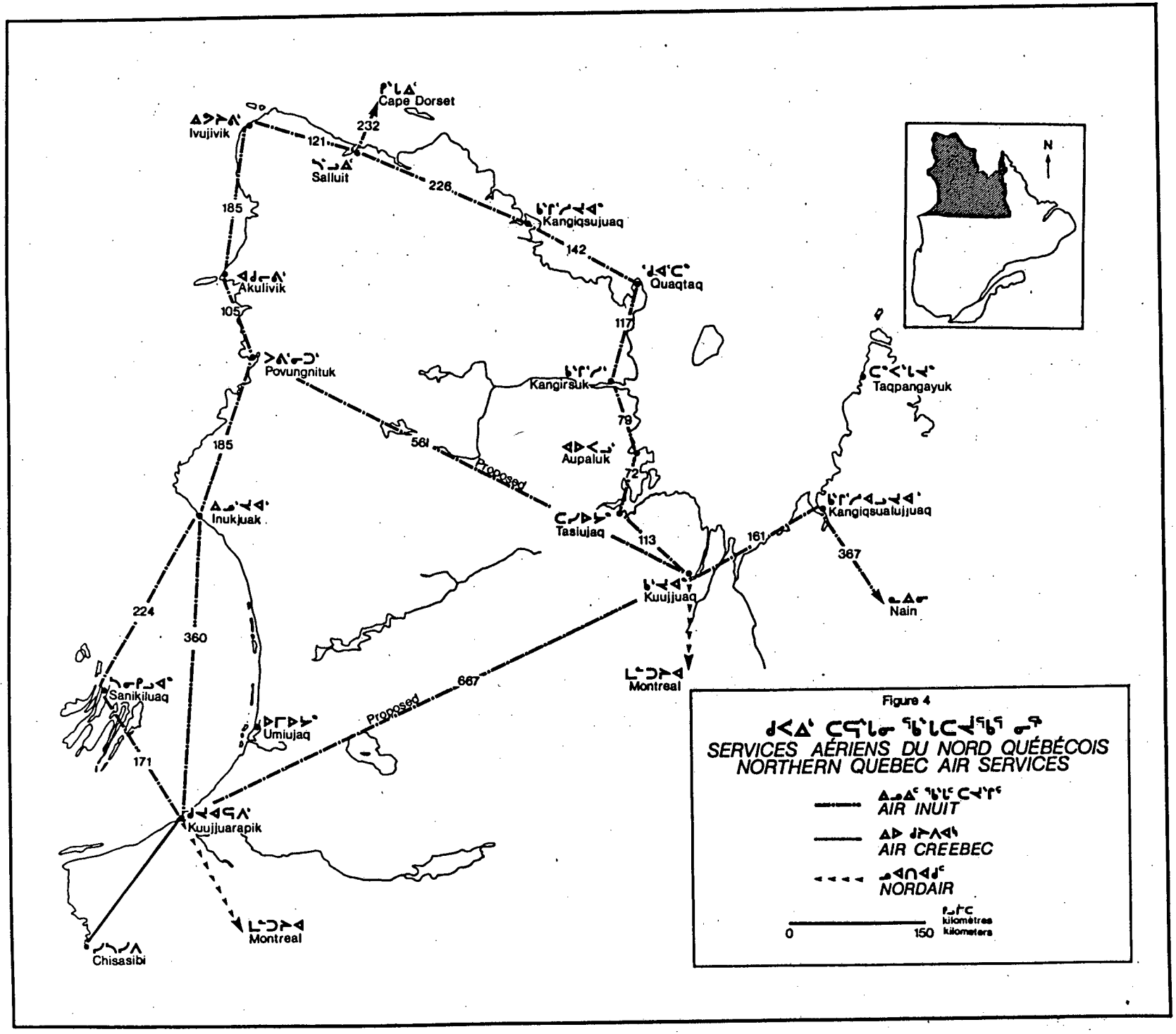

Figure 4

SERVICES AÉRIENS DU NORD QUÉBÉCOIS
NORTHERN QUEBEC AIR SERVICES

AIR INUIT

AIR CREEBEC

NORDAIR

TABLE 1

NORTHERN QUEBEC AIRSTRIPS

	LENGTH Meters	LENGTH Feet	WIDTH Meters	WIDTH Feet	CONDITION	ACCESS
INUKJUAK	610	2000	34	111	sandy and very soft	adjacent to the village
POVUNGNITUK	800	2600	30	96	bad	2.7 km of road in bad condition
AKULIVIK	366	1200	30	96	bad	adjacent to the village
IVUJIVIK	250	810	25	81	good	adjacent to the village
SALLUIT	458	1500	23	73	dangerous	1.5 km of road to be constructed
KANGIQSUJUAQ	400	1300	20	63	good (soft)	approximately 500 m. from the village
QUAQTAQ	400	1300	25	81	pitiful	300 m. from the village
KANGIRSUK	350	1100	20	63	bad	1.7 km from the village, on the hillside, bad condition
AUPALUK	450	1500	20	63	very soft	adjacent to the village
TASIUJAQ	750	2400	30	96	good	0.7 km of good road
KANGIQSUALUJJUAQ	650	2100	25	81	dangerous	300 m. to the village

Note: These statistics were gathered by Transport Québec and reflect the size and condition as of 1980.

Ungava Bay regions are shown in Figure 5 and Table 2. Movement of people and freight along the Hudson Bay Coast and into and out of Ivujivik is shown on Table 3 on page 41.

Air services that developed from the mid-1970's to the present were based on the routes, equipment and initiative of two companies: Austin Airways and Air Inuit which took over the Ungava region from ServAir. This division meant that the Hudson Bay and Ungava Bay coasts developed separately. Salluit was the only point of contact between these two air services.

Austin Airways operated De Havilland Twin Otter aircraft out of Great Whale River and Povungnituk and operated winter freight service from Timmins, Ontario, with a Hawker-Siddeley 748 aircraft where ice strips permitted. Austin Airways also provided weekly service between Salluit and Cape Dorset, N.W.T., which formed the only regular air link between northern Québec and Baffin Island. The use of the Hawker-Siddeley 748 for freight, directly to the communities in winter and for transhipment to Twin Otter in summer, meant that the Hudson Bay coast communities received fresh and other types of foodstuffs from orders placed at Kapuscasing and Timmins, Ontario. Mail was carried out of Great Whale River.

Air Inuit operated De Havilland Twin Otter service from Kuujjuaq to the seven communities of Ungava Bay and Hudson Strait with Salluit as the final destination for these flights. The point of departure and return for all Ungava air service is the main Air Inuit facility at Kuujjuaq. In winter, a McDonnell-Douglas DC-3 and a Gulfstream G-159 aircraft are occasionally used for freight where ice strips permit. Fresh and other foodstuffs for the Ungava and Hudson Strait regions is shipped to Kuujjuaq from Val d'Or, Québec, by Nordair and then taken to the communities.

Charter service is available from both companies and from the privately owned Johnny May Air Charters based at Kuujjuaq. A major source of charter business for the Ungava Bay region is the fishing and caribou

FIGURE 5A

THE LEVEL OF PASSENGERS CARRIED FROM POINT OF DESTINATION—
UNGAVA BAY REGION

NIVEAU DE PASSAGERS TRANSPORTÉS DU POINT DE DESTINATION—
RÉGION DE LA BAIE D'UNGAVA

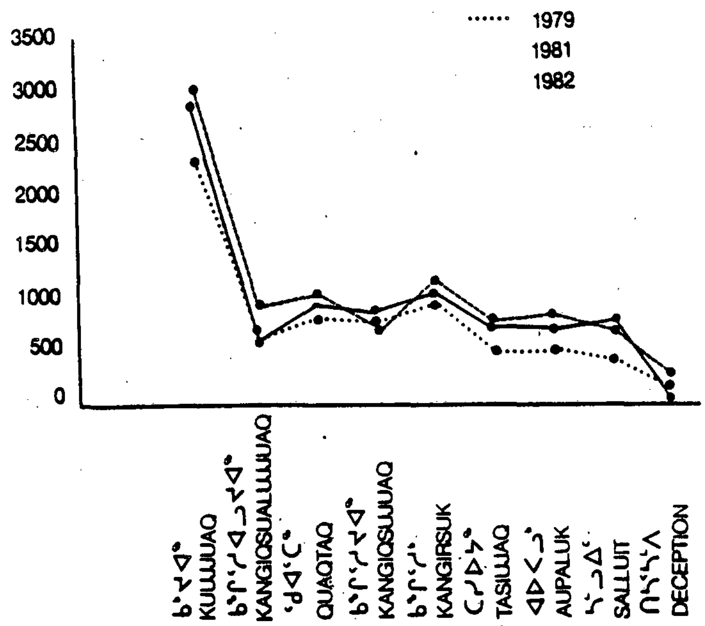

FIGURE 5B

ANNUAL FLIGHT HOURS—UNGAVA BAY REGION

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HEURES DE VOL PAR ANNÉE—RÉGION DE LA BAIE D'UNGAVA

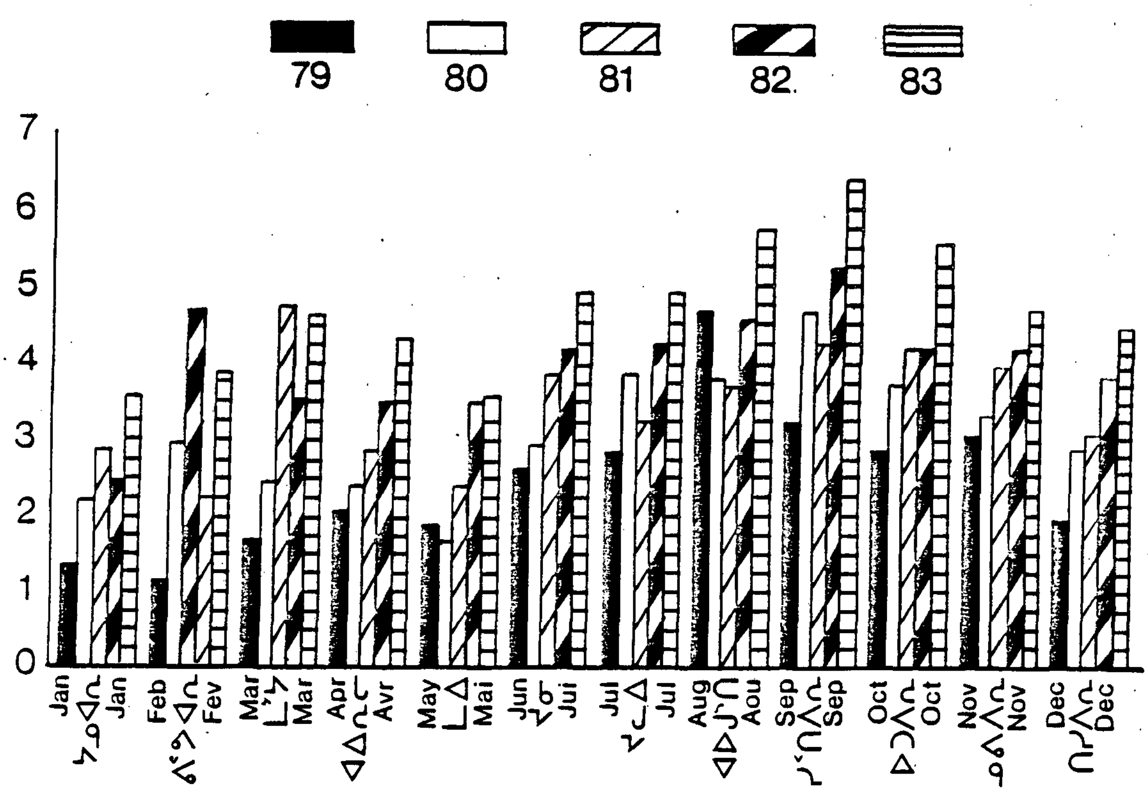

TABLE 2

INTERCOMMUNITY TRAVEL 1982

POINT OF DEPARTURE										TOTAL
Kuujjuaq		521	352	407	527	338	417	306	6	2,875
Kangiqsualujjuaq	564		4			3	1	1		572
Quaqtaq	370	8		127	175	27	34	43		775
Kangiqsujuaq	375		129		33	1	8	127	1	683
Kangirsuk	496		211	43		39	194	71	2	1,056
Tasiujaq	367		25	2	45		72			511
Aupaluk	427		20	17	166	71		18		719
Salluit	340	3	33	104	58	2	9		8	557
Deception	14				1			10		25
TOTAL	2,953	532	774	700	1,005	481	735	576	17	7,773

hunting camps that operate from mid-July to late September. The Ungava Bay region has sixteen active tourist camps and there are five areas where permits have been issued for future development. At the present time, there are no outfitting camps on the Hudson Bay or Hudson Strait coast although three permits have been issued for sites in the Povungnituk region. Air charters using single engine aircraft are less expensive although the range of this type of operation is somewhat restricted by the lack of aviation fuel in some communities, and weather conditions are often more limiting.

The purchase of the Hudson Bay Coast operations of Austin Airways by Air Inuit took place in January 1984. Current plans indicate that there will be no immediate changes in the schedule or routing because of this consolidation. The consolidation of air companies does, however, provide the structure for creating a more integrated service within the region and for rationalizing a more efficient use of equipment. The concept of an airline owned by the people that use it (like Air Inuit) and who must rely on the quality of its service, also carries the possibility that local concerns and the voice of the users will be reflected in both the policy and practice of air transport in northern Québec.

A sample of inter-community travel costs and schedules is included in Appendix D. Travel between communities for either the Hudson Bay or Ungava Bay air systems is based on a regular service that can move people in or out of the community on an almost daily basis. Travel between coasts, however, remains complicated and must often be accomplished by travelling through Montréal. Travel from the north to destinations in the south, though easier than in the past, are not accomplished quickly. The people from Povungnituk and Inukjuak can usually make same day connections to Montréal, whereas travellers from all other communities must spend a night either in Kuujjuaq, Kuujjuarapik or Povungnituk. If Nordair has night departures, it is possible to travel from as far as Salluit to Montréal in a single day. For the most part, however, much more time is involved when travelling out of the region. For example, mid-week meetings of one day in Montréal require people from Ivujivik or Salluit to be

gone for a minimum of eight days, which usually includes at least one weekend. Such trips are also very costly, averaging for transport, lodging and meals, $1,700 from Ivujivik via Kuujjuarapik, and $1,100 from Salluit via Kuujjuaq.

2.4 Development of Future Air Service

At the present time, Air Inuit is able to meet passenger demand as it exists on a day to day basis. Special situations requiring the transport of large groups of people or off schedule travel is handled by charter service. The passenger volume between 1979 and 1982 appears stable (Figure 5). These figures, however, do not include the charter operations. Consequently, the more appropriate perspective for looking at changes in air transport is to use flight hours. These have increased steadily for Air Inuit between the years 1979 and 1983 to meet the increasing demands from passengers, freight and charters. In 1979, Air Inuit flew 2,928 hours and, in 1983, this almost doubled to a total of 5,650 hours of flight. The equipment used to maintain present air service is six Twin Otters, one Single Otter and one Gulfstream 159 which is occasionally used for landing on winter ice strips. In most communities, sea ice strips of 1,065 m (3,500 ft) can often be established and maintained. Early in 1984, Air Inuit also expects to begin operation of cargo flights using an HS-748, as well as possibly adding a seventh Twin Otter.

Pilots, users and management all express confidence in the role of Twin Otter aircraft for northern service. It was this development in technology (short take-off and landing capability), rather than any significant upgrading of the airport infrastructure, that has enabled the present level of air service to be maintained. The Twin Otter aircraft, however, is both expensive to purchase and to operate. The freight payload is 2,500 lbs. maximum and it can carry 20 passengers with 2 pilots. It is considered to be a slow aircraft with a cruising speed of 130 nautical miles per hour, which is significantly reduced when strong headwinds are encountered. Since the planes are constantly combining freight and

passenger service, it is impossible to have any on-board facilities for passenger comfort.

A major limitation for the development of present day air service is the inability to provide efficient cargo service. Cargo shipments are the lifeline of each community and it is not possible to carry enough combined passenger/cargo loads with Twin Otters to be economical. At the same time, the airline cannot maintain enough Twin Otters to run cargo only. Larger aircraft would greatly improve the situation and it is assumed by Air Inuit that the capacity to carry greater payloads would generate a growth in the demand for air service. The Gulfstream G-159 aircraft, for example, has an average freight payload of 3,150 kg (6,945 lbs). Even the utilization of the Macdonnell-Douglas DC-3 in all seasons provides a freight capacity that averages 2,725 kg (6,000 lbs). Both of these aircraft can operate on an airstrip of 1,065 m (3,500 ft). The need for greater freight capacity of aircraft must, in the future, be integrated with the logistics and cost of freight transport by the annual sealift.

It is becoming more apparent that some of the cargo now sent north by ship once a year, would be sent by air, alleviating long delays in receiving items such as building materials, equipment, parts, vehicles and food. This service would also significantly reduce warehousing costs and enable organizations to reduce inventories and thus plan more efficiently. Management personnel of Air Inuit indicated that they felt the larger payloads would also help slow down the fare and rate increases over time which, according to airline management, would mean savings to the consumer.

The new 3500' airstrips and their supporting infrastructure will allow Air Inuit to expand its operations to include the acquisition of more appropriate and cost efficient aircraft and to develop new staging points which will increase the efficiency of service for passengers. This could, for example, mean that planes are stationed in one of the Ungava Bay communities, thus dividing the present "long run" up the Ungava coast from Kuujjuaq to Salluit into a different arrangement of routes.

Most important, however, safety will be greatly improved; safety of passengers, communities, pilots and equipment. The communities will achieve a greater sense of security knowing that medical evacuations will be possible day or night and that direct flights from any community to Québec City or Montréal by aircraft could be available. This peace of mind cannot be measured in payloads and air hours but it remains a central concern of the communities.

Many scenarios have been suggested for future air service but there is no accurate way of establishing a specific plan prior to at least partial development of the infrastructure improvement program. Scenarios of future air service will also be realistic only when they are established in accordance with the economic ideas and allocations that will be set out in the Regional Economic Development Plan. The development of air service has one immediate goal which is to establish and maintain a route that will connect Ungava Bay with Hudson Bay. The access of this route is suggested to be Kuujjuaq-Povungnituk, with a possible return via Inujkuak and Kuujjuarapik. The next phase in a more integrated air system will be directly connecting the north coast of Hudson Strait, if possible through the community of Salluit, into the Ungava Bay and Hudson Bay network. The idea of this phase of development will be to strengthen all three points of the air service triangle: Kuujjuaq, Kuujjuarapik and Salluit. With the intended relocation from Kuujjuarapik to Umiujaq, it is possible that Povungnituk will take its place as the western point of the triangle. Important decisions on future air transport networks will be included as part of continuing discussions on the economic future of northern Québec and specific choices may become part of a structure that will be suggested in an integrated plan for regional development that is now being proposed.

III

IVUJIVIK COMMUNITY STUDY

METHODOLOGY AND RESEARCH SCHEDULE

3. METHODOLOGY AND RESEARCH SCHEDULE

It was stated earlier that a vital question for the development of Inuit communities involves the problem of "how shall we plan". Impact assessment has the potential of becoming a leading edge in northern planning. Serious problems arise, however, if impact assessment is only approached through the application of values and techniques designed in the south and superimposed on the north. Inuit question who controls the assessment procedure; what type of protection impact assessment provides for the bio-physical and socio-economic environment of the north; why these protections are needed; and how specific impacts are determined and corrective or remedial measures established. If these questions are to be answered, new research methodologies must be developed, and impact assessment studies must identify problems and address issues that are relevant to the current conditions and long term needs of Inuit.

The methods used in the Ivujivik study are part of a larger program within the Makivik Research Department that is concerned with the quality of Inuit knowledge and with its appropriate use as an essential component in northern research. This program is also concerned with the development of Inuit expertise in the design and execution of research and in the evaluation and application of research findings. This approach is best be accomplished through the creation of a cooperative association between Inuit and southern-trained scientific personnel. Both groups have the capacity to act as teachers rather than lose themselves in endless argument over "who knows best".

The effective participation of Inuit in cooperative research involves five basic principles. First, there is a need for each group to respect the knowledge of the other. For the Inuit this knowledge is reflected in the vast amount of information that has been acquired over time about the behaviour, patterns, cycles and eccentricities of the biological and physical environment. Second, both groups must respect the means by which information is collected, organized and arranged in a coherent structure. For Inuit, the nature of this structure may differ

considerably from those that characterize southern scientific thought, but they are no less valid. Third, is that the specific information and organized knowledge of both groups is bounded by certain restraints so that, like all systems of knowledge, the limitations must be respected. Fourth, the quality and accuracy of both northern and southern knowledge need not be evaluated on the degree to which it corresponds. Cooperative research should act as a catalyst for creating a new integration between northern and southern frames of reference. The fifth principle applies primarily to Inuit knowledge since it will only assume its rightful place in the larger framework of explanation if the rules that govern the conduct of inquiry and the hierarchy that controls these rules are modified in order to accommodate and give equal value to the Inuit way of viewing and understanding the world.

The development and application of these principles to northern research requires time. The impact assessment studies provide an opportunity to develop the process yet another step and, at the same time, to provide the Inuit of Ivujivik with a study that reflects their ideas and concerns about the airstrip program and its impact. The design and execution of these community studies have, as well, enabled the general Terms of Reference that were used to guide the research to be evaluated for their usefulness for undertaking impact assessment in the other communities.

3.1 Applying the Methodology

The primary means of obtaining information for this report were individual and group interviews. These, in turn, only took place after there was a program of community consultation. This consultation process involved the following steps: telephone and FM radio contact with the community prior to arriving in the community; formal meetings with the municipal council and with the representatives of community organizations to explain the project and the process of impact assessment; interviews on specific topics with individuals and groups; further discussions on the

local FM radio; and discussions of preliminary findings with the municipal council and organization heads.

The primary means by which information was exchanged between the researchers and the community members and by which interviews themselves were most often animated was through the use of maps and aerial photos. In this process, the Inuit are treated as having primary expertise about their environment and about their specific perceptions of impact. The idea in this type of research is to uncover the Inuit system of thought and logic about the problem and to link this to their specific and often very detailed knowledge. Such a process does not exclude the opinion and expertise of outsiders but it does attempt to restructure the relationship of "outside experts" to the problems being studied. This process also bases its validity on the fact that the naturally acquired knowledge of Inuit is of equal value to the formally acquired knowledge of outside academics and other researchers. There are times when the knowledge of outsiders can be very helpful and clarify certain questions raised by Inuit. It does not mean that Inuit knowledge is valuable only to the extent that it coincides with the assumptions and conclusions reached by southern scientists.

In this study, therefore, the interviews were primary to the data gathering and analytical process. Information from the interviews was then structured and augmented by the use of aerial photographs and the interpretation of topographic maps. Non-native expertise from the south was also utilised in relationship to the general framework of organization and explanation that was created through Inuit participation. Attempts were made to utilise those southern researchers who had had actual field experience in the region or in the two communities. In several situations, outside opinion was sought to explain from their perspective the causes for a particular situation that was identified by Inuit. No attempt was made to utilise outside expertise simply as a means of giving some form of credentials, either in lieu of, or in support of, Inuit knowledge and opinion. The only exceptions to the utilisation of Inuit knowledge as the primary basis for this report were the use made of more

specific geological analysis of the land features and, in particular, the utilisation of a particular archeological perspective that was required by the proponent for estimating the archeological potential in the zones of impact.

3.2 Research Schedule

Research in Ivujivik was carried out from January 17 to January 23, 1984. Although the period of field work was short, the schedule for completing all phases of the study did not permit an extended stay in the community. This problem was ameliorated to some extent by the fact that the work period, though short, was intense and all of the individuals needed were available for meetings, interviews and general discussions.

Prior to visiting the community, all materials were prepared, including large scale maps, air photographs, and planning documents. The community was contacted by the reasearch team (see Appendix A) in early December to inform them of the planned study and to discuss an appropriate time for the field work. Because of the need to complete the Salluit field work and to prepare for meetings with Transport Canada and Transport Québec as a result of this field work, the Ivujivik study could not begin until after January 1st.

The Ivujivik study was discussed in detail by telephone early in January and an FM radio broadcast was also prepared prior to the arrival of the field workers. Data collection itself was based on two formal meetings and a series of individual interviews. On January 18, a three hour meeting was held with the municipal council to explain the reason for the impact assessment, to provide information about the state of planning for the Ivujivik airstrip and to gain their opinion about impact assessment and about the conduct of the study in Ivujivik. On January 20, a five hour meeting was held with representatives from all of the organizations within Ivujivik. This meeting again discussed the nature of impact assessment and specific issues dealing with the airport improvement pro-

gram in Ivujivik were fully reviewed and Inuit opinion and specific information was collected.

The following topics were discussed in detail: the need for improved air service; the attitudes of the community with respect to the construction program; the defining of what the community felt was most important for air service and for Ivujivik facilities; the integration of the airstrip infrastructure with that of the village infrastructure, especially in relationship to the water and garbage facilities and access road as called for in the master plan; preferred changes in the master plan, as related to the airstrip; the problem of adequate granular material for both community needs and the airstrip program; community facilities and equipment needed for local construction and for use on the airstrip; employment and training programs; the impact of the workforce on the community; and the nature for controlling the relationship between the community and the workforce; the relationship of the construction and operation phase of the airstrip on land and marine wildlife resources; and, the actual location of archeological sites and the archeological potential of the region. Particular discussions were held on the need to relocate the 1962 burial site of a Roman Catholic priest.

This discussion was animated with the use of maps and an aerial photograph and with large scale plans of the proposed airport infrastructure. Specific topics or issues that were raised in this meeting were further investigated in a series of interviews with individual members of the community. In these interviews, particular attention was paid to the impact of the infrastructure program, especially the construction phase, on resources; the archeological potential of the region; the integration of airstrip and community infrastructures; and the general mechanisms that would have to be developed in order for the community to maintain a productive working relationship with all activities and needs generated by the project.

The field work and interviews in Ivujivik were followed up by further contact with community members. On January 27, a meeting between

Transport Canada, Transport Québec and the community of Salluit was held in Salluit and representatives from Ivujivik were invited to attend. From January 29 to February 10, the Ivujivik data was analysed and reviewed in the Kangiqsujuaq Research Centre and preliminary editions of the maps and of the report were prepared. Questions that arose during this phase were resolved though phone conversations with the Ivujivik residents. On March 9, 11 and 13, formal contact was made with Ivujivik residents, including the mayor and two council members, who were in Montreal. At that time, the final report was fully discussed, maps were reviewed and the basic conclusions of the researchers about potential impacts and remedial measures were agreed upon.

IV

IVUJIVIK COMMUNITY STUDY

INFORMATION ON THE COMMUNITY AND ENVIRONMENT

4. THE IVUJIVIK COMMUNITY

Ivujivik is the most northerly community in Québec. It is located on the coast of Digges Sound, approximately 40 km southwest of the confluence of Hudson Bay and Hudson Strait (Fig. 1). The 1982 population was 197 Inuit and 7 non-natives (Administration régionale Kativik, 1982, pp. 15-19). The total population is comprised of 36 family units that reside in 32 dwellings. The 1982 population was almost evenly divided between males (98) and females (99) and, like other northern communities, the population is young, with 57% under 20 years of age. Estimates based on a 2.8 rate of growth indicate a population of 261 in 1992.

The roots of the present day community were developed from 1938 to 1947. The Roman Catholic mission was established in 1938 and the Anglican mission in 1943. The Hudson Bay Company which had opened a trading post approximately 20 miles to the northeast in 1909 was relocated to a site at Ivujivik in 1947. The Hudson Bay Company continued to operate until 1967 when the Co-operative opened its store. The major impetus for development of the community began in the early 1960's when government subsidized housing started to appear. At that time and for many generations previously, the population spread in seasonal encampments along the coast with three major areas of concentration, two of which are located southwest of the village and the other, east of Cape Wolstenholme. The housing program gained momentum in the latter part of the 1960's and it is now at a stage where new duplex houses are being built and the older Indian Affairs housing is, when possible, being renovated.

Ivujivik has not experienced the same level of development that has occurred in neighbouring communities. The schools are still housed in scattered and aging small buildings; the nursing station built in 1962 is still the only facility to dispense medical services; there are no indoor or outdoor recreational facilities; and the only commercial enterprise is the old local Co-op store whose structure also houses the small and overcrowded municipal offices. The community has a minimum of equipment for maintaining roads, filling and grading where needed and for delivering water and oil and picking up garbage.

The Inuit families of Ivujivik are supported by a mixed economy that is based on resource harvesting, permanent and casual employment, handicrafts and transfer payments. No precise information is available on the total income derived from these sources although a study carried out by the Ministère des Institutions financières et coopératives estimated income from wages and transfer payments to be $4,222 per capita in the year 1981. This provides an approximate yearly income of $21,667 for each family. The cost of living in this community is extremely high. The purchase of essential foods consumes a major amount of income and the cost of equipping a hunter with skidoo, ammunition and gasoline means that even native foods, though plentiful within this food rich area, are costly to obtain. The community master plan completed in 1982 lists 15 employers in the community, that represent both government and local services for the community. The majority of jobs are part-time positions, although principle agencies, such as the Co-op and municipal corporation, also provide fulltime employment for local people.

The community has many active committees that have been formed to oversee various aspects of life within Ivujivik. The school, church, Co-op, radio and TV programming, and hunter support groups all play an active role in the development of municipal affairs. In addition, the fact that Ivujivik has chosen to remain independent of the James Bay and Northern Québec Agreement has created political consciousness within the community that is exhibited in a whole other series of activities.

4.1 Community Air Service

In the early days of air travel, Ivujivik was one of the most isolated communities in the northern Québec peninsula. Prior to 1970, the only service was by ski or float aircraft that had to land on the bay or sometimes on the western side of the peninsula. A small lake, approximately one mile from the village, could also be used by single engine planes. When discussing the regularity of air service prior to the late 1970's, the story is told of a mechanic who came into the community on a

sunny day in the middle of May who planned to spend until the next afternoon repairing a diesel engine, but who was not able to secure a charter out until the middle part of June. The Inuit state that this situation describes air service in those days. With the development of a land strip in 1970, air service began to improve and, with the advent of Twin Otters since about 1975, scheduled flights began and this service was greatly enhanced by construction of the second airstrip in 1982.

At the present time, Ivujivik is served by two weekly flights (Tuesdays and Saturdays) that originate from Kuujjuarapik or Povungnituk. On Tuesday, people can travel from Kuujjuarapik to Ivujivik and return south as far as Povungnituk. On Saturday, it is possible to travel from Kuujjuarapik to Ivujivik and return to Kuujjuarapik. All transport out of Ivujivik stops at Akulivik on the way south, but the frequently heavy air traffic between Povungnituk and Akulivik means that passengers travelling north to Ivujivik or Salluit must deplane at Povungnituk for at least two hours, while a round trip flight is made to Akulivik. On both Tuesday and Saturday there is scheduled service from Ivujivik to Salluit and return.

Table 3 illustrates the volume of passenger and freight that moved into and out of Ivujivik for the year 1982. In that year, 708 people flew from Ivujivik to other northern destinations, and 578 people arrived from other northern communities. The social, work and political connections between Ivujivik and other communities are easy to discern from Figure 2. Salluit has the greatest amount of local traffic which reflects the close social connections between the two communities. The link to Povungnituk reflects the political and economic associations between these communities, while the Kuujjuarapik traffic is primarily for people going south. It can be seen that Ivujivik has a much smaller connection to the south that other Hudson Bay communities. Freight movement also gives a picture of the community and the small number of commercial ventures that require movement of goods or material from south to north. The volume of freight leaving Ivujivik is mainly in the form of native foods, since they accumulate a surplus which is shipped to other communities, especially Kuujjuarapik and Povungnituk. Although Ivujivik does

TABLE 3

AUSTIN AIRWAYS FREIGHT/LBS 1982

	DESTINATION										
POINT OF DEPARTURE	AKULIVIK	CAPE DORSET	FORT CHIMO	FORT GEORGE	GREAT WHALE RIVER	IVUJIVIK	INUKJUAK	POVUNGNITUK	SANIKILUAK	SALLUIT	TOTAL
AKULIVIK					16,265	94	393	2,775		312	19,839
CAPE DORSET						346	237	69		234	886
FORT CHIMO											
FORT GEORGE	11				3,506	1	1,858	177	1	378	5,932
GREAT WHALE RIVER	24,667	1,145		2,830		12,798	109,459	83,010	93,466	22,690	350,065
IVUJIVIK	3,840	236			7,437		2,030	6,324		1,421	21,288
INUKJUAK	1,845			480	67,236	1,828		6,987	4,276	1,700	84,352
POVUNGNITUK	3,638	169		13	42,249	5,873	4,906		3,564	5,546	65,958
SANIKILUAK		28		2	8,911		2,005	491		350	11,787
SALLUIT	1,183	435			4,171	3,401	4,762	1,292	13		15,257
TOTAL	35,184	2,013		3,325	149,775	24,341	125,650	101,125	101,320	32,631	575,364

AUSTIN AIRWAYS PASSENGER VOLUME 1982

	DESTINATION										
POINT OF DEPARTURE	AKULIVIK	CAPE DORSET	FORT CHIMO	FORT GEORGE	GREAT WHALE RIVER	IVUJIVIK	INUKJUAK	POVUNGNITUK	SANIKILUAK	SALLUIT	TOTAL
AKULIVIK		20	6		165	20	126	335	1	56	729
CAPE DORSET	6				5	83	38	9		111	252
FORT CHIMO	4	9		2	38	19	7	23	1		103
FORT GEORGE	5				362		15	13	4		399
GREAT WHALE RIVER	182	3	15	411		111	879	625	525	166	2,917
IVUJIVIK	71	85			146		23	112		271	708
INUKJUAK	127	17	4	12	906	7		430	79	52	1,634
POVUNGNITUK	322	33	11	4	657	123	433		19	224	1,826
SANIKILUAK				1	458		66	27		3	555
SALLUIT	57	129			125	215	73	159	1		759
TOTAL	774	296	36	430	2,862	578	1,660	1,733	630	883	9,882

have an active political life and participates in the activities of regional government, there is still not a large volume of passenger traffic that is created by individuals with travel allowances, since there are few representatives of northern organizations that live in Ivujivik.

4.2 Development of Community Infrastructure

The community infrastructure that has been developed prior to the establishment of the Northern Airsports Infrastructure Improvement Program is shown on Figure 2. The primary components of the community infrastructure are the dwellings and other buildings that have been established over the past 20 years. The recent housing program has been a major factor around which the present pattern of village infrastructure and activity has developed. There is an internal road system that is only used during the summer months, and tracked vehicles are utilised to obtain water, deliver oil and dispose of garbage. The community dump site is located directly south of the community. It is exposed in the summer and its contents drain directly into Ivujivik harbour. The community water supply is obtained from a small lake approximately 1,500 m from the settlement, but the water is said to be of a poor quality and the supply is inefficient for the growing needs of users. The other major components of the community infrastructure are the powerhouse and the series of poles and transmission wires that transmit electrical service. A poorly constructed road extends from the western margins of the community to the water intake.

The first airstrip for Ivujivik was built in 1970 as a cooperative project between the community and St-Félicien Airways. It was located on the low plateau directly northwest of the community and tended in a northwest-southeast direction. The first airstrip was only 200 m long and had an irregular surface that was difficult to maintain. In 1975, the Department of Indian Affairs contributed $5,000 to rework and extend this airstrip to 245 m in length and approximately 20 m in width. This extension almost reached the maximum length that was possible with this parti-

cular siting of the airstrip. In 1978, a federal-provincial agreement provided $100,000 for an airstrip improvement program in each community. With this money, a decision was made to change the orientation of the strip to an east-west direction which would allow for progressive lengthening to take place. In 1981 and 1982, this strip was planned and built to a length of 500 m.

In 1978, a road was built from the northwestern corner of the village to the original airstrip. In 1982, this road was extended to provide access to the new strip, now approximately 500 m in length. The community considers this entire road system to be inadequate since it is hampered in the winter by large areas of drifting and blowing snow and it is almost impossible to maintain in working condition.

4.3 Airport Infrastructure and Construction

The Northern Airport Infrastructure Improvement Program for the community of Ivujivik includes an airstrip of 1,070 m (3,509 ft) and an access road from the community of 750 m (2,460 ft). The new airstrip will incorporate the one built in 1981 and 1982, providing a 230 m (754 ft) extension to the southwest and a 500 m (1,640 ft) extension to the northeast. The engineering plans and field surveys were undertaken on behalf of the federal government by a private engineering consulting firm, Gendron, Lefebvre of Laval, in the fall of 1983. The completed engineering plans were made available for the preparation of this report on February 4, 1984.

The engineering report has established an estimate of the fill needed for the lower and upper levels of the airstrip and access road. It is estimated that the airstrip will require 117,000 tons of rock and 163,000 m^3 of sand and gravel. The access road will require 23,500 m^3 of fine material, 10,000 m^2 of surfacing material for compaction and 12,400 tons of rock. The engineering and construction details are contained in Appendix E.

The engineering report notes four gravel deposits that are estimated to have a total production of 10,000 m^3 of sand and fine gravels. A survey of the air photos of the surface geology indicates that these major areas are, with the exception of the raised beaches upon which the community is built, the only significant deposits of granular material. The first deposit noted in the engineering report consists of the granual material that was used for the original north-south airstrip. This man-made feature is surrounded by a small deposit in the lake bed directly south of the abandoned airstrip. The second gravel deposit is located approximately 300 m west of the community and will be easily accessible from the proposed access road. Part of this deposit has been recently exploited for community use. A third area of granular material is located directly south of the second and has been the deposit most actively exploited for community use. The fourth gravel deposit is located approximately 800 m north of the community, tending in an elongated north-south direction. This deposit has not been exploited in the past since it is a gravesite of a Roman Catholic priest and thus has been left untouched by the community.

These four areas will not produce adequate fill materials for the airstrip and access road, especially since they contain no large aggregates for the base layer. In order to overcome the deficit of granual material and aggregates, two areas have been selected from which rock can be extracted by blasting and then crushed to appropriate size. Both of these areas are comprised of small topographic features in the vicinity of the airstrip and the need to obtain fill material is reinforced by the fact that they are topographic obstacles in the zone of takeoff and landing.

Most of the fill material required for the airstrip and access road will be derived from the process of "balancing" which is the engineering practice of creating a level surface by using material taken from high places to fill low places. In the case of the Ivujivik airstrip and access road, the need for fill material is in excess of 25,000 m^3 which can be obtained through the process of balancing. It is indicated that

the two areas of blasting will provide 14,000 m^3 and 11,000 m^3. This will substantially reduce the need to overexploit the other known areas of sand and gravel although these deposits will also have to be utilized.

The engineering report states that the construction of the airstrip and apron, even if partly built on permafrost, do not present difficult engineering problems because the underlying material is almost all rock. The access road is only partly on rock but the engineers note that the road bed can be levelled without difficulty. In order to exploit the gravel pits, all of the surface material of lichens, humus and some soil will be removed. The report provides a listing of the heavy equipment that will be needed, including among many other things trucks, caterpillar, fuel, fuel trucks, compactors, portable garages, generators. The complete list is included in Appendix E. Thirty-nine (39) men will be required for the project. The specific requirements and skills for these positions are described in Appendix E.

The final plans from Transport Canada for the lighting and navigation systems and for the airport buildings have not yet been completed and submitted for review. However, the electrical supply needed for operation of the airport has been planned to follow a path that parallels the access road. No specifications for the type of power line have yet been defined. The engineering report states that it could either be an underground cable or aboveground poles and wires.

4.4 Integration of Airport and Community Infrastructure

The infrastructure already developed or proposed in the master plan for Ivujivik can be partially integrated with the infrastructure for the airport, especially the access road. The only change that could be made and which is desirable from the Inuit point of view is to integrate the first extension of the road to the water point and proposed dump site with the airport road. The master plan now calls for two separate roads heading west from the community. One will curve north to the airstrip and

the other southwest to the proposed new water point and dump site. This lower road, however, is already difficult to maintain.

The community has recommended that the airport road be used past the areas of heavy winter snow accumulation and poor spring runoff that characterize the present route to the water point. A branch road would then connect with the planned route to these two facilities. This decision would eliminate the work required for building and maintaining two roads and it would also decrease the amount of fill material that is necessary to make the present water point road usable in the spring and summer. The other association of infrastructures that must be considered is the powerhouse and the power line to the airstrip. A new generating plant is proposed to be erected in the summer of 1984 which will be located in the northwestern sector of the community. The best route from this proposed power plant to the access road and airstrip must be determined, although the engineering report notes its location parallel to the road.

4.5 The Visual and Recreational Environment

It is very difficult to identify the relevance of a visual environment when one is dealing with the realities of development within the landscape of a northern community. This is primarily due to the fact that, in that past, the process of creating a community infrastructure was always done at the expense of any care for the visual qualities of either the environment itself or the man-made features that were being established. In a community such as Ivujivik, where the landscape is low and without major features, the creation of a particular set of categories that attempts to group similar landscape vistas does not really address the important issues that meet the eye when searching the community.

In discussions with Inuit about the nature of the visual environment, it was obvious that their perception of what makes a landscape is quite a bit different from ours. Before they are concerned about the way a community looks, they want first to make sure that it operates effi-

ciently. A garbage may be unsightly to an outside observer but to an Inuk resident of a community, it is a health hazard and a reminder of inadequate essential services. On the other hand, the accumulation of wrecked or deteriorating vehicles or other equipment can be considered as either an eyesore or as a vital source of recyclable materials or parts that are necessary to keep other equipment going in a situation in which spare parts are nevery easily accessible. Consequently, the impacts of a project such as the Northern Airports Infrastructure Improvement Program on the visual environment must be concerned with the role of all phases of community development. It is suggested that perhaps certain specific elements such as the colour chosen for the airstrip buildings may create concern among Inuit in some communities since certain colours are considered to be avoided by migratory birds. This, however, is not the case in Ivujivik. There is still a consensus on the part of the Inuit of Ivujivik that one moves outside of the community in order to see the natural world. They do express concern with the day to day conditions that affect the local landscape but they argue that this is a matter of services and funding necessary to create a healthy and pleasing community environment.

In Ivujivik conversations about the visual environment led to other discussions about the recreational environment. Inuit noted that it is important to have areas in and near the community where children may be able to play in either an informal or in an organized way. Therefore, when we were discussing the possibility of levelling the area in which sand and gravel would be extracted west of the community, the Inuit said that this would be good but that perhaps levelling would be adequate to create a field for baseball or other sports that are not easily played in this environment. They also mentioned the existence of a lake further west which has a small gravel pit on its shoreline and noted that this was a place that kids enjoy swimming and should be maintained, if not as a lake that is pleasing to the eye at least as a body of water that is pleasing to those children brave enough to endure a combination of water and air temperatures in order to have an August swim.

5. THE PHYSICAL ENVIRONMENT

Ivujivik is located on a small peninsula that extends into the waters of Digges Strait. The community is situated on a series of raised marine beaches within a structural depression on the eastern side of the peninsula. Although this location provides some shelter from the winds, the community is still subject to severe storms and blowing snow. The specific positioning of the community was selected because of the physical characteristics of the small valley and because the waters provide safe anchorage and protection from the heavy seas of Hudson Strait.

The land is described by Inuit as being very rocky and barren. Although they note that there are no significant hills or other obvious topographic features on the peninsula to provide landmarks for travel. There are no deep river valleys and no areas of well-developed vegetation. To the Inuit, the primary feature of the Ivujivik peninsula is its relationship to the sea and thus to the marine resources.

5.1 The Surface Geology

The Ivujivik peninsula is a low plateau of granites, gneisses and migmatites. Dikes and sills of intrusive rocks are common throughout the area and the geological structures tend in a southwest-northeast direction. The maximum elevation of the plateau does not exceed 500 feet and the local relief is not extreme. The surface areas in the vicinity of Ivujivik are comprised of two plateaus that are separated by a prominent escarpment that tends east-west and is approximately 150 ft high. The plateau to the north of this escarpment is the lower of the two with elevations that do not reach 200 ft. This plateau is the site of airstrip construction. Most of the small basins on the plateau are occupied by shallow lakes and ponds. The entire area of the Ivujivik peninsula was covered during the last glaciation, and the region emerged approximately 9,500 years B.P. After glaciation, the entire Ivujivik peninsula was covered by the sea and has emerged through isostatic rebound. The emergence

of the land is noted by the raised beach ridges, especially in the area of the community.

The primary features of the Ivujivik peninsula are illustrated in Figure 6. A slope map of the area has not been made because of the lack of significant local relief in relationship to the airstrip and access road. The surface of this low plateau which forms the Ivujivik peninsula is characterized by four topographic units. These are: exposed, rounded bedrock knolls; U-shaped valleys; small escarpments, giving an asymmetrical profile to some of the valley areas; and marine terraces. The plateau has not been significantly weathered by mechanical processes since the last marine transgression approximately 9,500 years B.P. Consequently, there is very little accumulation of weathered material on the surface. There is almost no area of well developed soil, even in the valleys which are described by the Inuit as being wet and unstable in the summer. As well, there are no surface features such as patterned ground or significant solifluction slopes.

Deposits of granular material is not extensive and most of it exists in the form of fine sands and small marine deposits that fill the bottom of the U-shaped valleys. These are mainly marine deposits and perhaps some valleys contain reworked marine till. There are a few patches of frost shattered material that have accumulated along the edges of the escarpment but it appears from the aerial photos and from discussions about the geomorphology of the region (B. Robitaille, pers. com.) that there is little in the way of granular material of an intermediate size.

The valley system of Ivujivik follows the structural pattern of fault lines that tend in an east-west direction. Superimposed on these valleys are a series of discontinuous marine terraces that run from the present beach inland and which have been formed by the isostatic adjustment of the peninsula since the last glaciation. The current rate of this rebound is estimated to be approximately one foot per century. The concentrations of sand and other materials for fill that exist on these

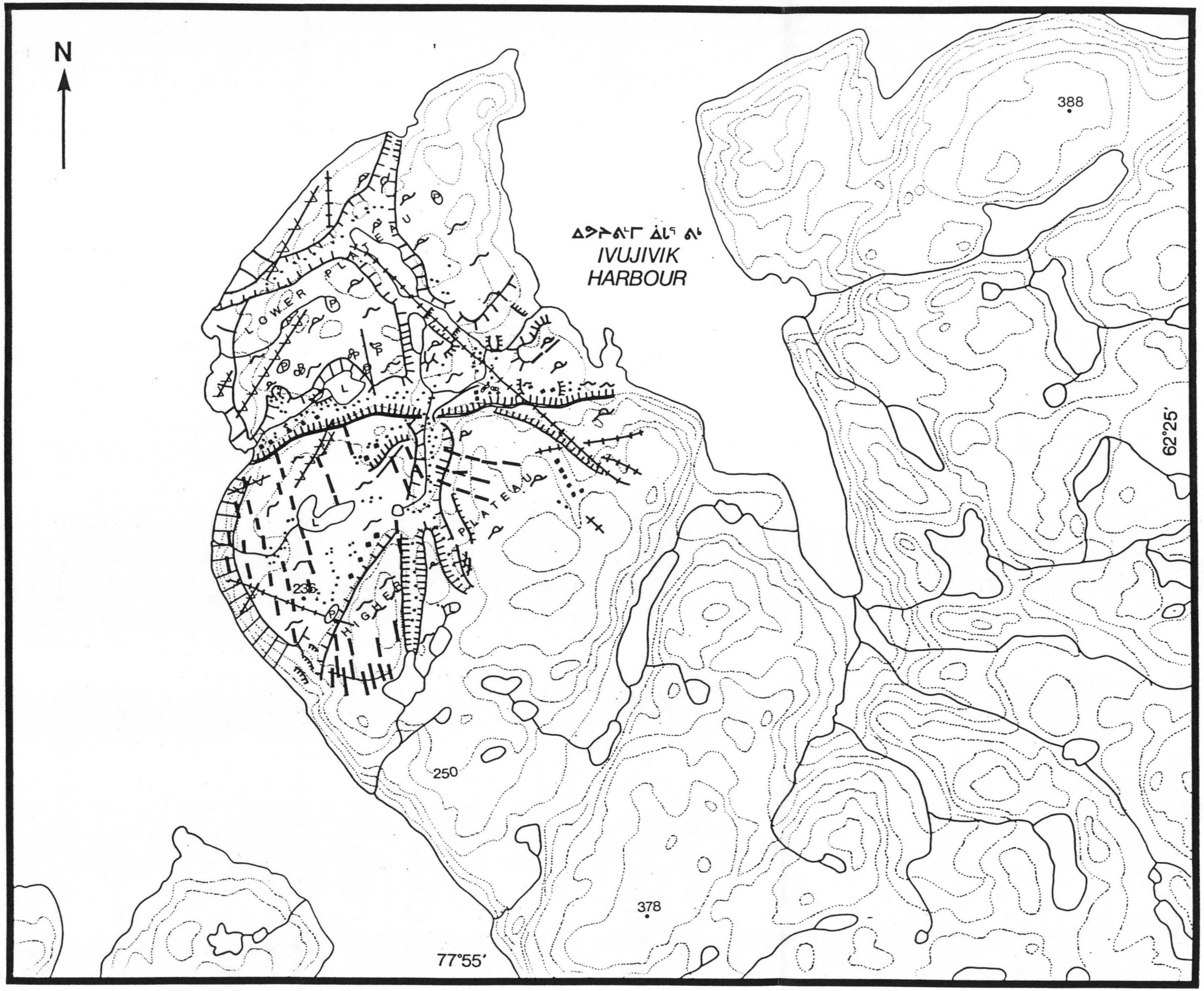

FIGURE 6
GEOMORPHOLOGY

LANDFORMS

- STRUCTURAL LINEAMENTS
- FRACTURES
- PROMINENT DYKES AND SILLS
- PLATEAUX Rolling topography
- Ridge and knob topography
- ESCARPMENTS
- VALLEY-SIDES Steep slopes
- Moderate to gentle slopes
- REWORKED VALLEY FLOOR TILL (marine and fluvial action)
- TALUS SLOPES
- NIVATION PROTALUS

GÉOMORPHOLOGIE

: FORMATIONS TERRESTRES

- DIRECTIONS STRUCTURALES
- FRACTURES
- PRINCIPAUX DYKES ET SILLS
- PLATEAUX : Topographie ondulee
- Topographie de crete et de collines basses
- ESCARPEMENTS
- VERSANTS : Pentes raides
- Pentes faibles à moderees
- TILL REMANIE DES PLANCHERS DE VALLEE (action marine et fluvial)
- PENTES D'EBOULIS
- MORAINE DE NEVE

DATE / March 1984
DESIGNED BY / CONÇU PAR Benoît Robitaille
DRAWN BY / DESSINE PAR Sylvie Côté
CHECKED BY / VERIFIE PAR B.K.

Société Makivik Corporation

SCALE
ÉCHELLE
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MILES
MILLES

Northern Airport Impact Assessment
Ivujivik Study Site

Étude d'Impacts des Aéroports Nordiques
Région á l'Étude (Ivujivik)

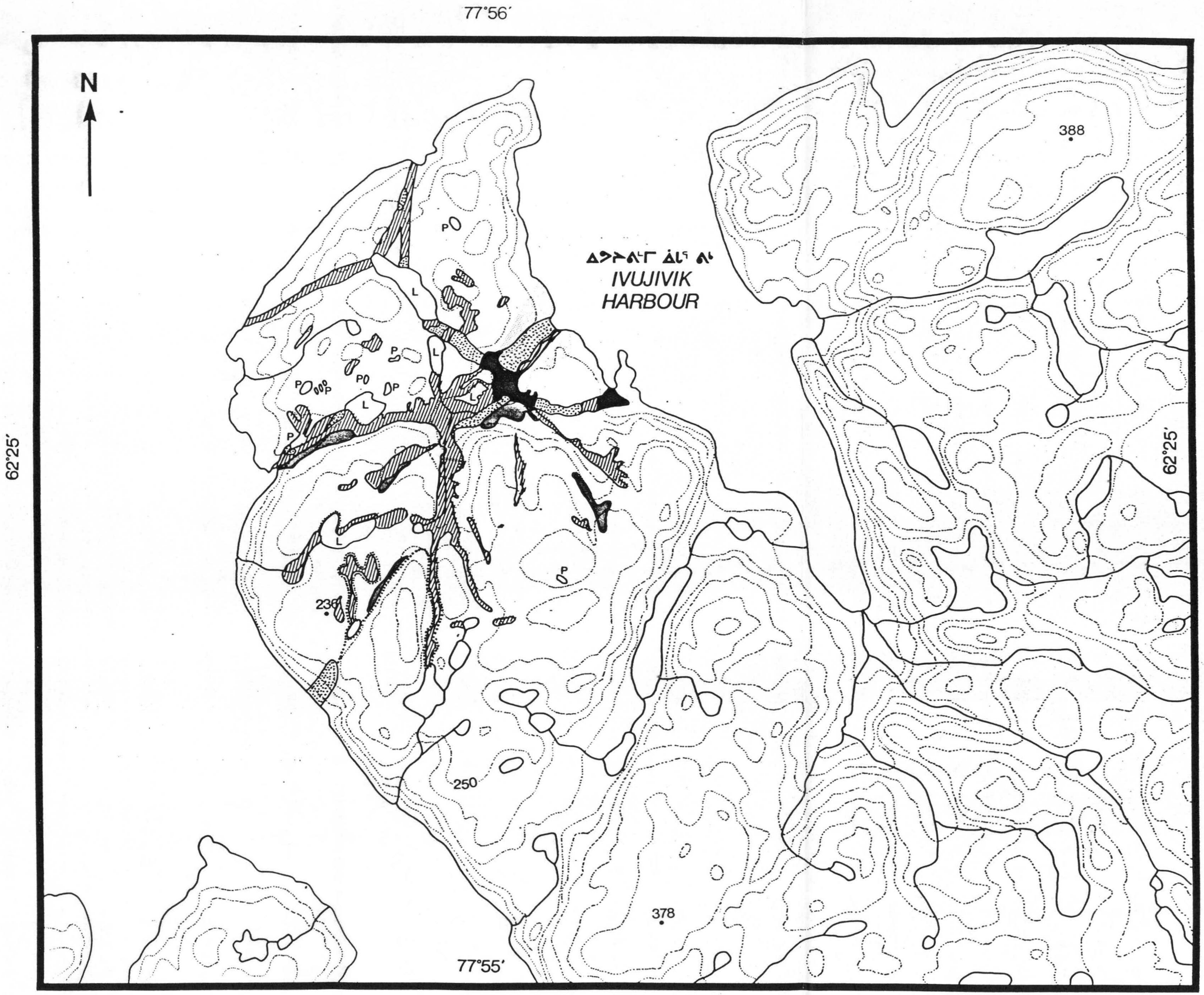

FIGURE 6 B

GEOMORPHOLOGY

BEDROCK (mainly bedrock, with occasional blocks and boulders)

SCREE (blocks and finer material, anguler)

GRAVEL (mainly gravel, with boulders)

SILT and SAND (occasional boulders)

L P WATER (lakes and ponds)

GÉOMORPHOLOGIE

MATÉRIAUX

ROCHE-MÈRE (surtout la roche-mère; blocs erratiques et cailloux)

ÉBOULIS (blocs et matériaux fins, anguleux)

GRAVIER (surtout du gravier avec des cailloux)

SABLE ET GRAVIER (et quelques cailloux)

LIMON ET SABLE (et quelques cailloux)

L P EAU (lacs et étangs)

DATE / March 1984

DESIGNED BY / CONÇU PAR Benoît Robitaille, Dept. of Geography, Laval University

DRAWN BY / DESSINÉ PAR Johanna Galler

CHECKED BY / VERIFIE PAR B.K.

Société Makivik Corporation

SCALE

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MILES

MILLES

Northern Airport Impact Assessment
Ivujivik Study Site

Étude d'Impacts des Aéroports Nordiques
Région á l'Étude (Ivujivik)

raised beaches are not significant with respect to the construction needs for the airstrip.

The drainage basins within the topographic surface of Ivujivik peninsula are not a significant factor to consider in the building of the airstrip or the access road. There are two major areas of poor surface drainage, one directly west of the present village site and another a bit further west and extending 100 m or so to the south. The area west of the village must be crossed by the access road which then tends to the northwest in order to avoid the second area. Both of these zones affect the current road that is used for obtaining the community's water supply in both summer and winter. The two poorly drained areas are the only regions within the potential impact zone of the airstrip that can be considered in terms of their sensitivity to vehicle traffic since they are the only areas in which there is an unstable surface during the frost-free season.

5.2 The Climate and Microclimate

The position of Ivujivik means that the weather conditions can change suddenly during all seasons of the year. In the open water season, changes are reflected in sudden temperature shifts and in the rapid development of fog, while in winter, wind and blowing snow create hazardous weather conditions for landings. Summer temperatures are always repressed by the cold water, especially when there large packs of moving ice in the region. The July temperature averages 7°C and falls to -23°C in January. There are approximately 20 frost-free days per year. An annual precipitation of 41 cm falls mainly in the late spring as wet snow and again during the rain storms of late summer and snow storms of early fall. By December, there is very little precipitation so that snow storms are primarily caused by the wind moving snow across the sea ice.

In spring when more moisture is available from melting snow and there are greater temperature differentials from the land to the sea or

sea ice, fog is a common occurrence. Throughout the summer, fog banks can quickly move in, usually from the west, sweeping across the peninsula. Towards the end of summer and especially in September and early October, storms intensify and the waters near the peninsula are often violent, especially when the wind and tidal currents are in opposition.

The tidal range in Ivujivik is 8 m (25 ft). In the open water period, there are strong tidal currents, described by Inuit as rivers, flowing north at low tide and south at high tide. Sea ice begins to form in mid to late November, first along the shore and further west, larger masses of ice form and then gradually move east. Full winter sea ice usually occurs by late December and is maintained until May. Breakup begins in late May and early June and the waters are usually ice-free by mid-August, but the exact timing from year to year depends on the direction and persistence of the wind.

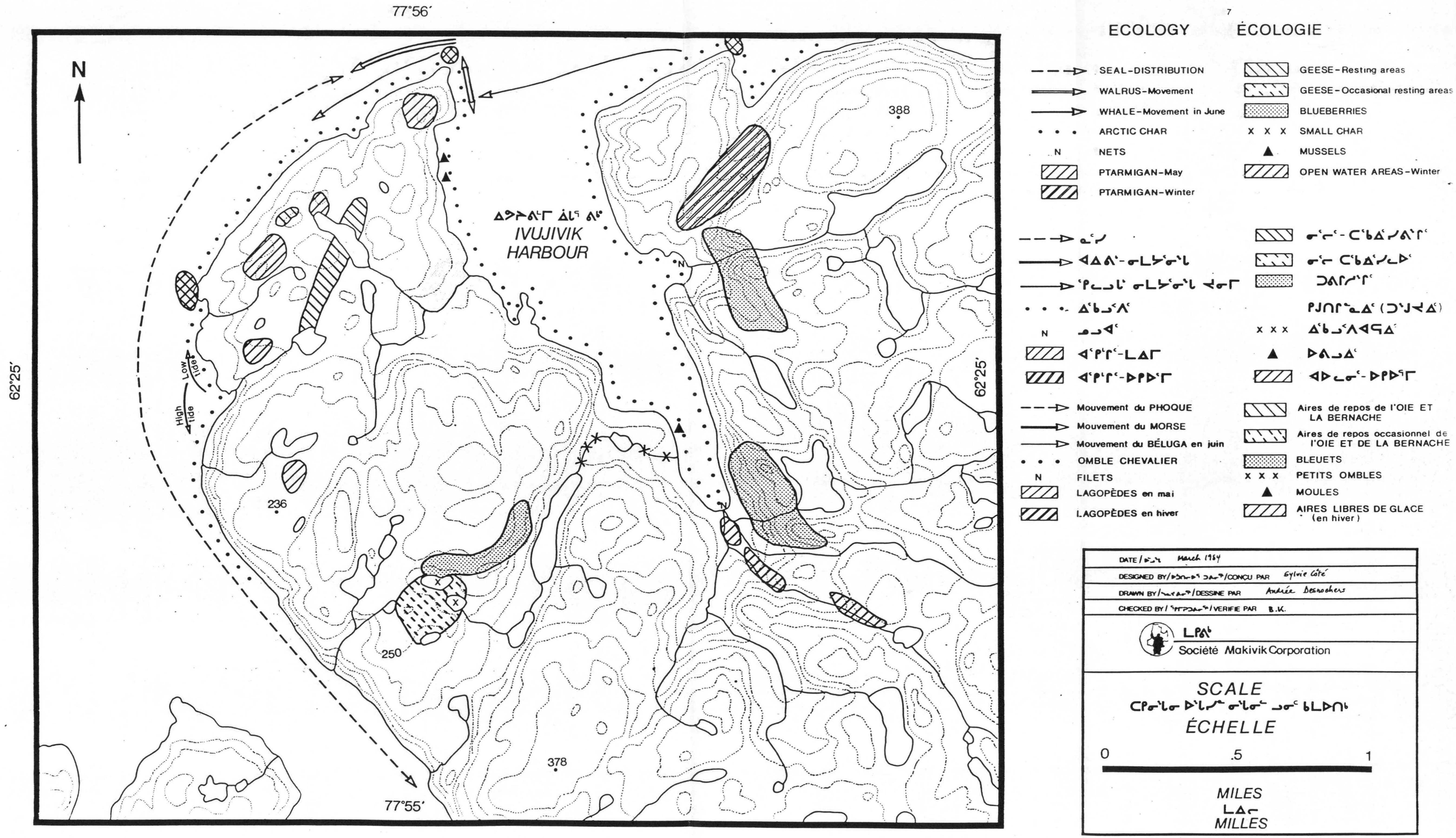
The airstrip is located on the northwestern side of the Ivujivik peninsula in an area in which the winds tend to be strong but with a persistent direction. There are no topographic features to disrupt the wind movement and create erratic wind patterns. The area of the airstrip is often free from snow accumulation, and drifting seldom occurs in this zone. The major weather consideration is the fog of spring and fall, but pilots note that the lack of a significant range of hills in any direction, coupled with the advantage of reducing altitude over the sea minimizes danger in this location.

The surface of the snowscape, especially areas of major snow accumulation, as pointed out, are minimal in the airstrip area and also in the zone designated for the access road that will connect the airstrip with the community. The road that now connects to the old airstrip is difficult to maintain during the winter because of several areas where drifts of 10 m (30 ft) occur. The particular location of the new access road was selected by Inuit and then surveyed by engineers. This corridor is free of heavy snow accumulation and it is well drained even during spring melt.

6. THE BIOLOGICAL ENVIRONMENT

The biological environment of Ivujivik is defined by Inuit to include land, freshwater, avian and marine resources. The general pattern of both the vegetative and faunal resources for the Ivujivik peninsula are illustrated in Figure 7. The regional ecological patterns for major resource groups exploited by Inuit are shown on Figure 8. The zone of potential impacts on this environment is located and shows that the Inuit consider the impact zone to include parts of the marine or sea ice environment and its resources.

The biological environment, defined in terms of resources, continues to be important for the lifestyle of Ivujivik residents and the harvest of these resources is vital to the subsistence economy and therefore to the health of the people. The community is located within easy access of important hunting and fishing areas, but the immediate land environment of the airstrip is not of any ecological importance to the subsistence economy. Nor does the airport infrastructure interfere with any biological zones that are considered by Inuit to be of special interest or unique ecological value. The basic conclusion to be drawn from the information contained on the maps, along with that specified during discussions with Inuit, is that the resource potential of the land areas throughout the Ivujivik peninsula is very low and there are no important concentrations of species to be found in this area. This is particularly true for the land portion of the designated zone of impact. The Inuit express, however, that the very important resource potential for marine mammals and anadromous artic char may be affected. The real value of these resources is proven throughout the seasonal cycle and the Inuit wish to maximize the continuation of their marine harvest into the future. Although at first, it may be difficult to see how the airport improvement program may affect the marine environment, the Inuit express possible connections and indicate specific concerns.

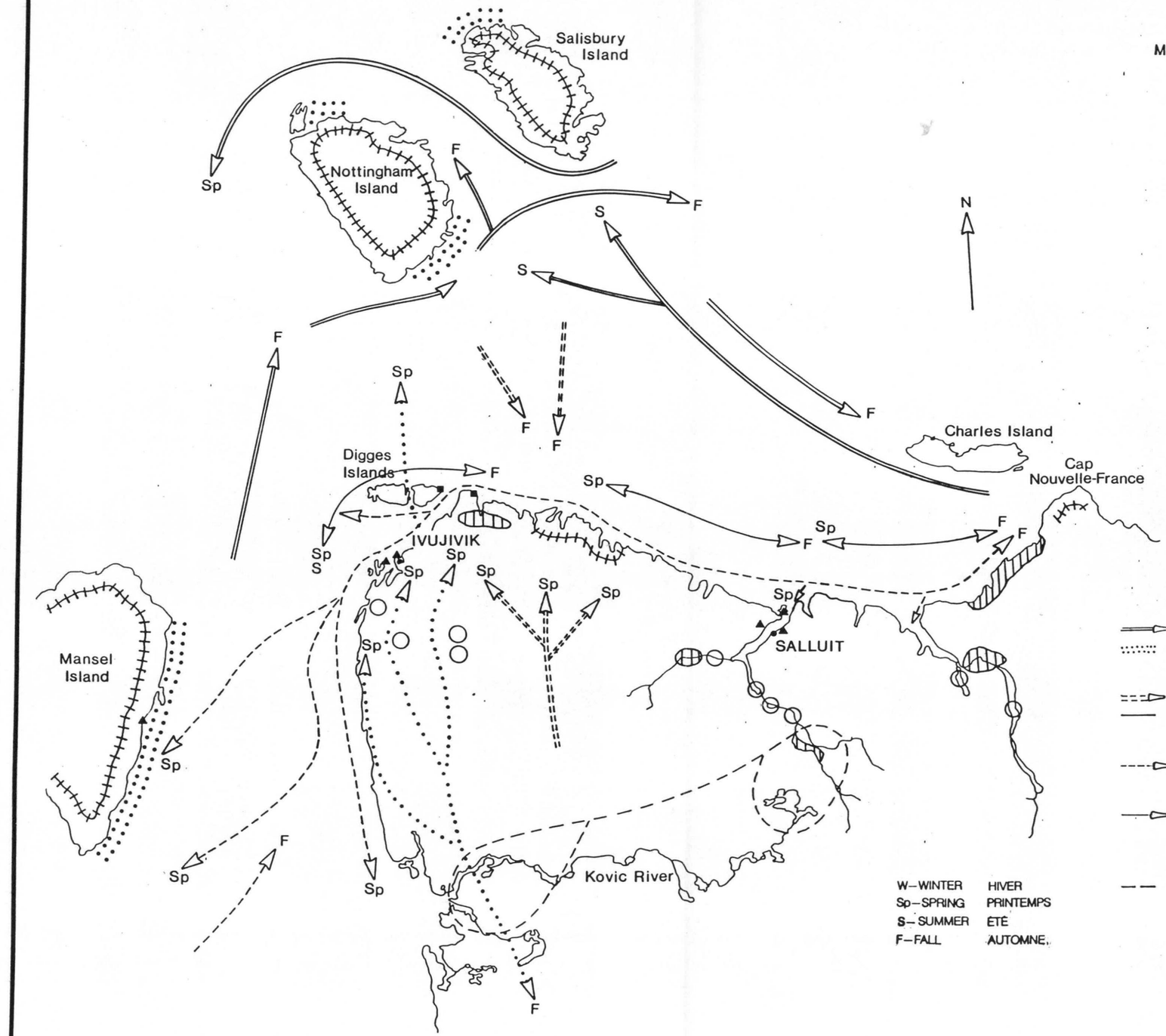


Northern Airport Impact Assessment
Ivujivik Study Site

Étude d'Impacts des Aéroports Nordiques
Région á l'Étude (Ivujivik)

FIGURE 8

THE ECOLOGICAL PATTERNS OF HUDSON STRAIT REGION
MODÈLE ÉCOLOGIQUE DE LA RÉGION DU DÉTROIT D'HUDSON



WALRUS: MORSE
Movement: Mouvement
Hauling Out Areas: Aires de rassemblement

POLAR BEAR: OURS BLANC
Movement: Mouvement
Denning Areas: Aires de tanière

BELUGA WHALE: BÉLUGA
Movement: Mouvement

SEALS: PHOQUE
Movement: Mouvement

CARIBOU: CARIBOU
Approximate Northern Winter Range – 1984
Limite nord approximative de l'aire d'hivernage – 1984

CANADA GOOSE/SNOW GOOSE
BERNACHE CANADIENNE/OIE BLANCHE
Movement: Mouvement
Nesting Areas: Aires de nidification

ARCTIC CHAR: OMBLE CHEVALIER
Wintering Lakes and Rivers: Lacs et rivières d'hivernage

MURRE: MARMETTE
Nesting Areas: Aires de nidification

ARCHEOLOGICAL SITES: SITES ARCHÉOLOGIQUES

6.1 The Local Resource Base

6.1.1 Avian Resources

Three types of birds are important to the Ivujivik hunter: murre, ptarmigan and geese. Small seasonal concentrations of ptarmigan and geese occur within the impact zone, but these species do not utilise the area because of important habitat or available food. There is no significant vegetation on the Ivujivik peninsula in the region of the airstrip and its zone of impact. The Inuit explain the occasional use of this particular place by ptarmigan and geese as resulting from bad weather which forces some of the birds to stop before they move north. Consequently, they are only there, if at all, in late spring or early summer, usually some time in the month of May. If the weather is clear and free of fog, the birds proceed straight across the water to the larger islands. If there is dense fog or very strong northerly winds, some may stop. When the weather clears, these birds continue north. The temporary nature of these resources is indicated by the fact that Inuit refer to them as visitors.

Inuit also explain that wherever there is a route for migratory birds, whether waterfowl or ptarmigan, there may be some particular individuals or small groups that will land for a period of time. Although this is known to occur in the zone of the airstrip, it is neither important nor predictable. When Inuit wish to hunt these species, they move either to known resting or feeding areas or to their summer nesting grounds. During the return fall migration, the birds do not utilise the Ivujivik peninsula at all since the major migration route tends to be from Nottingham Island directly to Cape Wolstenholme or from Nottingham Island to Digges Islands and then to Cape Wolstenholme. The Inuit explain this migration route as reflecting the birds' prefering to travel towards a land area that is visible from out to sea and because the vegetative lushness of the lower slopes of this zone compared to Ivujivik provides adequate food, especially for ptarmigan and snow geese.

6.1.2 Fish Resources

There are no freshwater fish resources that maintain habitat even on a seasonal basis within or adjacent to the zone of impact that is suggested for the airstrip. Only one stream and lake system near Ivujivik has a population of char and these are said to be very small, non-migratory fish. They move into the river in the summer and back into the lakes a few hundred meters west for fall and winter. A situation similar to this has been noted in other areas and it appears as though the spawning capacity of char, coupled with the fact that there are no predators can produce this situation. Even though they have access to the sea, they need not utilise this in their life cycle. This system could produce some minor recreational fishing but it has no importance for food.

The significant fish resources are the anadromous arctic char that move into the area and along the coast from river and lake systems adjacent to the Ivujivik peninsula. All of these fall outside of the zone of impact but the fish themselves can be caught in large numbers during June and July, along the western shore of the Ivujivik peninsula. The seasonal population of arctic char that used to frequent the eastern shore of Ivujivik harbour has declined and the Inuit blame this on activity from motors and primarily from pollution that is derived by the flow of water into the bay from the present garbage dump. Arctic char do play an important role in the food economy of Ivujivik and the Inuit show concern with protecting them. They feel, however, that neither the construction or operation phase of the airport will have a direct effect on the distribution and number of the char. The rapid construction of an access road, however, may speed up the dump relocation and this is viewed as a positive result that could possibly be linked to the airstrip project.

6.1.3 Marine Resources

Marine resources are by far the most critical source of food to the Inuit and hunters are often widely dispersed along the Hudson Strait

and Digges Sound coasts. They also use the coastline near Ivujivik for marine mammal hunting. This activity is particularly important in the fall since at that time the whales move from the south and west along the coast at the point of Ivujivik peninsula. Hunting is important in this zone because at that time year, bad weather can be severe and prolonged so that hunters have difficulty travelling to other sites. This is also an area that is important for the hunting of seals at small open water areas that occur near the point in the wintertime and in some abundance in the spring when seals move onto the ice. Seal hunting declines in this area in the summer since they tend to move further from shore but increases again in the fall prior to the migration of beluga whales.

Inuit are concerned about how continuous blasting could possibly affect the movement of beluga whales. They cite the fact that when beluga whale hunting in the winter, one must be careful of the sounds made by the feet on the ice so that perhaps vibrations, as well as noise, may tend to move them from their traditional migratory path. If this factor does affect the behaviour of whales, then it will be necessary to establish a method for avoiding blasting while the whales are in the vicinity of the Ivujivik peninsula.

6.2 The Exploitation of Biological Resources

A general description of harvest levels for Ivujivik is provided in Table 4. For some species a distinction is made between zone 1, essentially a radius of a day's travel from the community, and zone 2, which is anywhere outside zone 1. Although not all of the harvest levels are reported by zone, several conclusions can be drawn. First, marine mammals and arctic char predominate in the food economy and, second, a high percentage of the marine mammal harvest comes from an area close by or within a few hours' travel from the community. Arctic char is not defined by zone, but interviews tend to support the conclusion that the local, coastal waters are very important.

TABLE 4

IVUJIVIK

REPORTED HARVEST OF 7 MAJOR HUNTERS - 1974-75

Species	No. Reported	% Zone 1	% Zone 2
Ringed Seal	2,082	86.2	13.8
Bearded Seal	45	64.4	35.6
Harp Seal	41	82.9	17.1
Ranger Seal	4	0.0	100.0
Beluga Whale	76	77.6	22.4
Walrus	24	0.0	100.0
Polar Bear	8	62.5	37.5
Caribou	13	0.0	100.0
Arctic Fox	509	27.3	72.7
Ptarmigan	5,646	88.4	11.6
Canada Geese	215	86.1	13.9
Snow Geese	130	100.0	0.0
Ducks	202	92.6	7.4
Duck Eggs	2,080	92.6	7.4
Murre	5,210	-	-
Guillemot	90	-	-
Loons	46	-	-
Owl	27	-	-
Arctic Char	25,100	-	-
Lake Trout	3,094	-	-
Cod	100	-	-
Whitefish	2,043	-	-
Brook Trout	1,227	-	-
Sculpin	1,315	-	-

(-) Zone not specified

The range of the Ivujivik hunters varies with the seasons and with the technology presently employed. The community has access to two Peterhead boats, which means they can travel as far as Nottingham Island to the north and to the area of the Kovik River to the south-west. Trips between Ivujivik and Wolstenholme are frequent, whether by large boat, freighter canoe or by the recently acquired high power speed-boats. The major resource harvesting area of Ivujivik extends from Erik Cove on the east to the Nuvuk Island area to the south-west coastline. Inland and coastal travel will take hunters frequently into the Kovik River region and also into the area of inland lakes that lies south of Ivujivik mid-way between the coast and the Kovik River. Within the general area of resource harvesting, there are certain particular zones of high intensity, such as the murre colonies on Digges Island and the west coast of Erik Bay and the western coast and point of the Ivujivik peninsula.

When discussing impacts that refer so specifically to one particular place, the Inuit tend to indicate that it is important to understand what may happen on the Ivujivik peninsula with the development of a particular project in relationship to all of the other areas that they exploit. Therefore, the regional associations indicate to some extent the wider view that Inuit have when evaluating impacts.

7. THE ARCHAEOLOGICAL POTENTIAL

The archaeological potential of the Ivujivik area was first investigated by William Taylor Jr. of the National Museum of Canada. Surveys were carried out in the region immediately adjacent to the community, but these were not part of a large scale project for the Ivujivik peninsula. The location of sites, however, indicate that the region does have the potential for further archaeological sites to be found and this potential must be seriously considered in the planning for the Ivujivik airstrip.

Both the appropriate methodology and available information base needed to assess the archaeological potential of the Ivujivik peninsula have been developed in the report prepared by the archaeologist, Mr. Ian Badgley of the consulting firm Amenatech Inc. The findings and recommendations of this report on the archaeological potential of Ivujivik are appended to the report prepared by the Research Department of Makivik Corporation. The findings and recommendations of the Amenatech report are considered to adequately deal with the evaluation and potential impact on archaeological sites and resources.

V

EVALUATION OF IMPACTS AND RECOMMENDATIONS

8. EVALUATION OF IMPACTS

The impact assessment studies included both Ivujivik and Salluit. Although this report refers specifically to Ivujivik, certain of the findings on impacts express a concern jointly expressed and reinforced by the two communities.

8.1 The need for improved airstrip infrastructure

- The Inuit view improved airstrips as absolutely essential to their safety and the development of their communities. The Inuit of Salluit and Ivujivik were unanimous in their concern about the need to move forward with the program and to minimize delays. It was stated that the physical improvement of airstrips can never overcome many adverse characteristics of northern Québec weather, but within these limitations, it is necessary to provide better for the safety of travelers. If safety is improved, the potential benefits of many other type will also be accomplished.

- The concern with safety refers primarily to access to emergency medical treatment and evacuation. Safety also implies the improvement of local health services by further enabling medical personnel to visit the community and essential medical supplies or foods to be brought for the sick and infants.

- Concern with personal safety is also voiced by those who must travel by air. They feel that they have the right to move safely and not to worry constantly when family members are travelling.

- The concern with community development, as defined by the Inuit of Salluit and Ivujivik, refers to both social and economic

issues. It was felt that without reliable air services, it would not be possible to develop and maintain any type of small enterprise within the communities. Reliable air services would encourage the development of other activities with beneficial economic or social impacts on the community and both the type of freight and the high cost of transport might be partially alleviated if more economically efficient aircraft could be used.

8.2 Consultation and Impact Assessment

- The Inuit are concerned with the process of consultation that must take place if a project as complex as the Northern Airport Infrastructure Improvement Program is going to be successful. For the Inuit, the process of consultation is a critical starting point for translating the negotiated aims and objectives of a policy into the specific requirements and concerns of an Inuit community. Planning for a significant change in the infrastructure must be incorporated into the social, economic and physical structure of each community in a way that is unique to each particular situation.

- The consultation process in Ivujivik showed that the Inuit had no clear idea about the Northern Airport Infrastructure Improvement Program and how it would be carried out in relationship to their community. In the case of Ivujivik, problems arising from lack of consultation were minimized by the fact that a viable location had already been secured and the engineering studies had been completed. The completion of these studies did not produce findings incompatible with community preferences for siting both the airstrip and the access road.

- The Inuit of both Ivujivik and Salluit accepted the need for impact assessment. But they cautionned the researchers to

accurately represent the depth of their concern about safe and dependable air travel.

- The Inuit were adamant in their opinion about what elements in the life of a community are most important. They also cautioned the researchers not to try to establish the value system around which the positive and negative impacts from the airstrip would be evaluated, independent of consultaion with Inuit concerning their attitudes, values and priorities.

8.3 Impact Assessment and Planning

- The Inuit considered that impacts that result from the airstrip or other community infrastructure developments are often related to ineffectual planning. They questioned why it seemed to take impact assessment for a project to create a concern about planning.

- The problem as stated by Inuit is that no one is really in control of community planning and thus, every mandate is treated in isolation. They called upon the different organizations that were proposing projects to coordinate their plans and specific requirements prior to coming to the community. It was felt that the municipal councils or other bodies could never make rational decisions since they never knew the full range of issues.

- The Inuit felt that certain groups were very naive about the requirements of northern projects and the type of planning that was necessary to make them successful. It was felt that Transport Canada was one of the bodies that had little understanding about the process needed to develop projects within the northern communities.

- The Inuit stated that, although it may be the problem of project proponents to deal with planning and impact assessment, it is often the communities themselves that are penalized when improper planning and poor consultation lead to the failure of the project to meet the criteria necessary for proper environmental and social impact assessment. If a project needed by the community is rejected because of poor planning and coordination, it is the community that looses.

9. SUMMARY OF SPECIFIC IMPACTS

In the course of the Ivujivik study, a specific number of potential social and environmental impacts have been noted. The overall assessment, however, is that the project will cause minimum damage or long-term disruption to either the community or its physical and biological environment. Archaeological sites, if any should be located, would either be excavated or protected from damage.

9.1 Airstrip Planning and Construction

- The plans, as developed by the engineers, coincided with the knowledge and perceptions of the community and there were no discrepancies between what the community wanted and what the proponents described in their plans.

- The Inuit were concerned about the process and schedule for selecting the company that would construct the airstrip and access road. They wished to caution those involved with the selection of the construction company that special attention should be paid to their northern experience and with their desire to work with the people of Ivujivik.

- The Inuit expressed the desire to have local employment on the airstrip program but they also mentioned that many of the men may be working on other projects. This means that the contractor will have to make arrangements to assure an adequate work force for each phase of the project, but to allow for the possibility of a higher level of Inuit employment.

- The Inuit noted that it would be impossible for the community to use existing structures to house the work force since there is transient space for only three or four people. They also noted the continual absence of large quantities of food in the Co-op which means that the logistics for housing and eating will have to be carefully planned and any decisions that may affect the community must be made known well in advance.

- The community suggested that the construction will consume large quantities of fuel and this will have to be considered in the contractor's plan.

9.2 Air Service

- The Inuit noted that the lack of airstrip lighting is a serious problem for them, especially when it is necessary to have medical evacuations at night, which means the airstrip must be marked by the lights from skidoos or other vehicles. This they said, was dangerous for the pilots and for the people. They requested that both the provincial and federal governments look into the possibility of supplying the lighting system before the entire strip is finished. They would like to put the lights in place at the end of the 1984 construction season.

- The Inuit stated that they were very concerned with the poor quality of ground facilities in every northern community and they questioned why children and medical cases must be exposed

to the cold in winter or dampness in summer. They also questioned why, after sometimes hours of flying, it was not possible for people, especially women, to have any type of toilet facilities on the ground.

- The community is dependent on air service continuing while construction is proceeding. Consequently they ask that the contractor establish a plan that would enable adequate runway space to always be available. The old runway is no longer usable so that only the present strip can be considered.

9.3 Granular Materials and Excavation

- The Inuit are concerned with the supply of granular materials in terms of the meagre quantities presently available and their great demand for the airstrip and for other community activities. They mentioned that it would be necessary to assure that the community would have a continued and residual supply of sand and gravels and, if possible, coarser rock material in order to carry out their plans for filling low areas, and for the construction of house pads and roads.

- The Inuit wanted to know whether or not some of the sand and gravel pits would be dug in a way that would make them hazardous for children after the construction. If this is the case, they said that either a fence should be erected, or the pit should be filled. When it was mentioned that there is a responsibility for the contractor to to take corrective measures, they asked to have all excavating areas made safe.

9.4 Land and Freshwater Resources

- The Inuit feel that there will not be sgnificant ecological damage to their land environment from the airstrip construction

program. There is very little vegetation in the region to be destroyed and the impacts on ptarmigan and geese, if any, will be very minor.

- The Inuit stated that the airstrip is an extension of community infrastructure and as such, the noise of construction and the general activity that may occur because of its presence will be one of many factors that tend to limit the use of the Ivujivik peninsula by birds. They noted, however, that if the birds had gathered there in numbers, if they gathered regularly or if they utilized the area because of good habitat and food supply, they would be more concerned with trying to protect them.

- The Inuit stated that there are no significant freshwater fish habitat on the Ivujivik peninsula and especially within the zone of impact. They stated there would be no potential negative impact on freshwater fish or habitat.

9.5 Marine Biological Resources

- The Inuit stated that every effort must be made to protect marine resources from any possible impacts from the construction program. They noted noise, vibrations and pollution to be potential hazards.

- The greatest concern for potential impact was from blasting. It was felt that intensive blasting would create both noise and vibrations that may frighten away marine mammals as they migrate into the area. It was noted that this is particularly important in the fall, where most of the blasting and crushing for rock fill would take place. Since most of the blasting will take place close to important marine mammals, and especially beluga whale, hunting areas, this concern must be taken very seriously.

- The Inuit also noted that the noise from the rock crusher and from the movement of heavy machinery could be a significant deterrent to marine resources that enter the region.

- The Inuit have requested to receive information about how noise and vibrations may have affected marine mammals in other areas, and they would like to know what southern scientists think about this problem.

- The Inuit noted that much of the activity of airport construction, though not directly on the coast, will take place not far from the coastline. They want to be assured that fuels are properly stored and that any disposal of garbage and other waste at the construction site will be done properly.

9.6 The Visual Environment and Landscape

- The Inuit expressed very little immediate concern about how the airstrip may affect the visual environment of their community. They noted that there is already an airstrip where this one will be built, and that the suggested access road will be an improvement on the road now being used to obtain water.

- The possibility of re-lanscaping areas that are disturbed by the construction of the airport, and especially through the excavation for granular material, was accepted but, as mentioned above, their concern was with safety to children and they also felt that the heavy machinery could be used to convert these areas into some form of recreational land for community use.

- The idea of changes to the visual landscape being interpreted as an impact appears to be a new idea. The Inuit have grown used to accepting functional and often unsightly solutions to the problem of developing adequate community infrastructure and when

they were questioned about other ideas, it was obvious that it would be difficult to discuss until they were aware of the range of possibilities that could be used within a community.

9.7 The Archaeological Potential and the Burial Site

- The most important concern to the Inuit is the burial of Father Deltonbe. One of the major sources of gravel has been the burial site of the Roman Catholic priest who died in November 1964. After lengthy discussion, the community stated that they would respect the decision of the Roman Catholic Church as to whether or not the body should be relocated to another burial site. It was suggested that this would have to be the responsibility of the contractor and it would have to be done in a way that respected the situation. The Inuit also stated that the possibility of relocating the body to another village with a Catholic cemetary should be investigated.

- The procedure for relocating the burial site has been described by the Roman Catholic Church and is included in Appendix F.

- The Inuit realize that archaeological material has been collected from the zone of potential impact and they can locate one particular site that is on the west side of the peninsula and outside of the construction zone. They also mentioned that archaeologists have been there in the past and some of the places where material has been found have been subsequently utilized for other purposes.

- The Inuit do not feel that there is a great archaeological potential and they are not concerned with this aspect of the project. When archaeology was discussed, they were able to point out much more significant areas at a distance from the present day village.

10. CORRECTIVE MEASURES AND RECOMMENDATIONS

The corrective measures and specific recommendations for Ivujivik are divided into two groups. The first group involves the immediate impacts that will occur from the final planning and construction of the airstrip and its infrastructure. The second group of corrective measures and recommendations are made in reference to longer term problems of planning and impact assessment.

10.1 Immediate Impacts

10.1.1 Further consultation

- Prior to the start up of construction in Ivujivik, it will be necessary to consult with the community in order to inform them of the exact construction plans, especially those dealing with the airport facilities. At this consultation, it will be necessary to establish a structure for liaison between all of the parties and it is suggested that it also include regional government personnel because of their role in municipal planning and the need to integrate community and airstrip facilities.

10.1.2 Community Employment

- The work force requirements for the project were not yet established in January. These requirements have now been defined and they must be reviewed by the community in order to assure that Inuit are employed wherever possible, but that the contractor can also make decisions about the number of men that must be hired from outside.

- The positions for heavy equipment operators must be identified by the contractor and coordinated with Inuit men who have completed the heavy equipment operator course.

10.1.3 Work Force Accomodation

- Plans will have to be established on where and how to house the work force from August until the end of the construction period. This planning will have to include an evaluation of the accomodation requirements for other work crews that will be in the village at the same time.

10.1.4 Fuel Supplies

- Precise estimates of the fuel required to operate the heavy equipment in both the Fall and Summer seasons should be established and integrated with the expected demand for other community activities, in order to alleviate any problems with inadequate supplies.

10.1.5 Community plans and projects

- An arrangement should be made to encourage technical expertise associated with the airport construction to work with the community in order to solve other technical problems that have some relationship to the airstrip program. In particular, the community should be able to receive engineering help in the draining and filling of the swampy area immediately west of the community. The re-landscaping of construction areas and places where granular materials have been removed should also be discussed with technical personnel and corrective measures determined.

10.1.6 Project Coordination

- It was suggested earlier that the municipal council should act as the coordination body. This role does not have to be highly structure, but its existence should be made to the managers of the construction project. They must know that the community is involved and that a mechanism has been established employment, social, ecological or other problems.

10.1.7 Evaluation of Granular Material

- It will be necessary to establish with greater precision the actual long-term requirements of the community for granular material. It is suggested that the consulting engineers that carried out the original study could be asked to prepare this evaluation. This evaluation should include the deposits of granular material and the potential from blasting and crushing.

10.1.8 Other Community Infrastructure

- Kativik Regional Government must be consulted and their plans for the location and construction of the water intake, garbage disposal site and new power house, clarified. They should be expected to organize their planning in relationship to the established infrastructure of the airstrip program.

10.1.9 Environmental and Ecological Protection

- It has been mentioned earlier that the impact of the project on local resources will be minimal on land, avian and freshwater resources. Nevertheless, this project does involve intensive operations on the Ivujivik peninsula and the work force is large. Consequently, the potential for some form of unexpected impact on the ecology or the environment exists. Certain immediate steps such as the proper storage of fuels and the disposal of waste should minimize problems, but an attitude must exist that will enable reactions to the unexpected to be carried out in a positive manner. This is best accomplished if there is an active liaison between the community and project management.

-. The impact on marine mammals has been refered to in several places in this report and this forms one of the most active concerns of Inuit towards potential problems. It will be necessary to take two

steps. First, additional information on a potential impact of noise and other activities associated with blasting on marine mammals should be collected and potential problems, if any, discussed with the community. Second, in spite of the fact that opinion may vary with respect to this type of impact, the project management should be ready to respond to the perceptions of damage. A mechanism for determining when marine mammals, especially beluga whales, are in the area must be established and the best body for this is the Ivujivik's local Wildlife Management Group.

10.1.10 Archaeological Survey

- The archaeological survey should be carried out according to the recommendations and methods put forward by the consultant from Amenatech Inc. This survey should be coordinated with the Makivik Research Department. This survey, along with the aerial photographic reconnaissance of the Ivujivik area, is the primary project that comprise Phase II of the impact assessment study.

10.1.11 Aerial Reconnaissance

- Aerial photographs could have significantly assisted in the thorough review and interpretation of the region for impact assessment. The Makivik Research Department has an established capacity for this work and an air photo mission must be conducted as soon as the land is snow free. The resulting air photos will be important for further planning efforts associated with airstrip construction and community planning.

10.2 Long-term Planning

During the conduct of the Ivujivik Impact Assessment, many problems involving the planning process were identified. The time has

come for the many different groups with planning mandates to establish a better framework for the identification and resolution of these problems. The following list is far from being exhaustive, but it should form the basis of further discussion.

10.2.1 Utilization of Municipal Master Plans

- The Master Plans carried out by the Regional Government represent an important first step in local planning. These plans provided an overview of needed community facilities and they have been responsible for the creation of more specific technical planning for certain projects in the communities. Nevertheless, much remains to be done, since these plans do not carry any authority, and they do not have to be followed. Specific problems arise for agencies that are not involved in northern community development on a continuing basis. They do not require concern for long-term planning, so that each agency can still operate independently and according to its own requirements and schedule. Serious consideration should be given to strenghtening these municipal plans.

10.2.2 Regional Development Planning

- In order to effectively control the cumulative impacts of an environmental, social or ecological nature that can result from important community projects such as the development of airstrips, direction must be given at a regional level. The creation of the regional plan is the appropriate instrument for asking and answering questions on future air service and community needs. The community impact assessment statements that will be completed for the airport studies will provide an important source of data that represents the views of individual communities, but they lack the ability to integrate these views so the entire system of transport can be evaluated and planned for.

10.2.3 Terms of Reference for Airstrip Impact Assessment

- The process of evaluating impact assessment for all municipalities involved in the infrastructure improvement program could involve several different research groups. Although the specific points of view and expertise of these research groups must be respected, there should also be a continuity in the approach taken.

- This particular study attempted to incorporate the concerns and information base of Inuit into the impact assessment procedure at the level of study design and research. It is appropriate that this orientation continue and that the proponents of northern development projects, especially those at the community level interact with Inuit in a manner that will enable the proponent to reflect a cross-cultural understanding in their terms of reference. This approach will provide yet another step towards solving the problem of "how shall we plan".

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APPENDICES

APPENDIX A

PROJECT PERSONNEL

This report was prepared by William B. Kemp who, as project director, was responsible for overseeing all major aspects of the research design, field work, analysis and report preparation. Mr. Kemp was assisted in the field work by Ms. Souie Gorup, from Makivik's Research Center in Kangiqsujuaq.

Mr. Peter Wilson provided technical assistance in air photo interpretation and in synthesizing the geomorphometric information. Mr. David Gillis, biologist with Makivik Corporation, assisted in synthesizing and analysing the biological information gathered from Inuit during the field work.

Dr. Benoît Robitaille, Department of Geography, Laval University, acted as consultant for the interpretation of the geomorphology of the region. The consulting firm Amenatech Inc., under the direction of Mr. Ian Badgley, provided the archaeological interpretation.

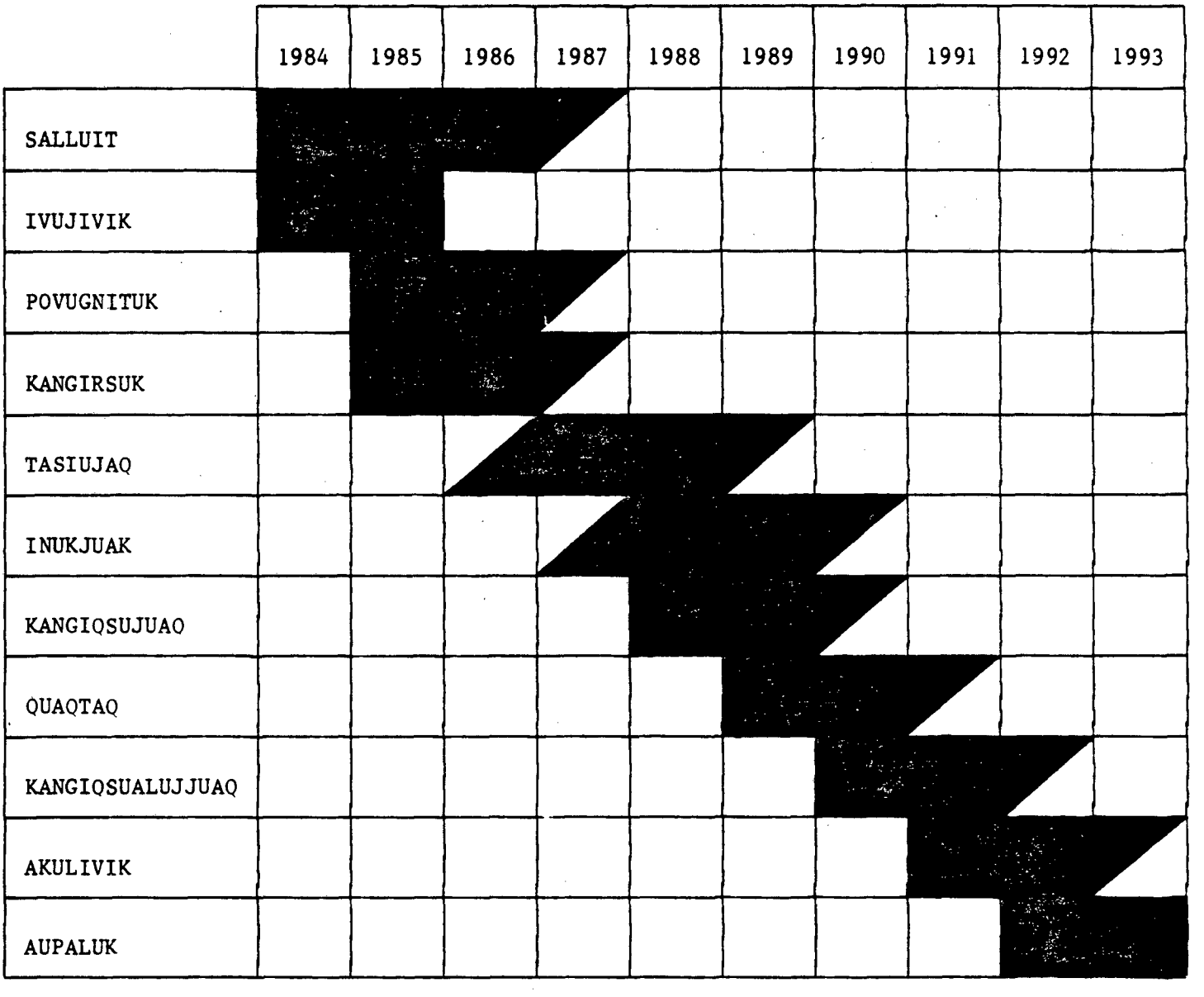
Ms. Sylvie Côté and Ms. Joanna Galler, from Makivik Research Department, acted as cartographers on the project, assisted by Andrée Desrochers, from McGill University. They also compiled background information on the air industry in northern Québec.

Project coordination and administration were provided by Ms. Lorraine Brooke and Mr. Robert Lanari, both from Makivik Research Department.

APPENDIX B

NORTHERN QUEBEC AIRSTRIP IMPROVEMENT INFRASTRUCTURE

PLANNED CONSTRUCTION TIME



APPENDIX C

NORTHWEST TERRITORIES AIRSTRIP INFRASTRUCTURE

	LENGTH (Feet)	WIDTH (Feet)	BEACON	LIGHTS
FROBISHER BAY	9000	200	X	X
LAKE HARBOUR	1700	50	X	X
RANKIN INLET	5000	150	X	X
PELLY BAY	3524	110	X	X
IGLOOLIK	3500	75	X	X
HALL BEACH	5400	150	X	X
REPULSE BAY	3400	100	X	X
CORAL HARBOUR	5200 6000	140 200	X X	X X
CAPE DORSET	4000	100	X	X
RESOLUTE BAY	6500 4000	200 150	X X	X X
PANGNIRTUNG	2500	100	X	X
NANISIVIK	6400	150	X	X
POND INLET	4000	100	X	X
CLYDE RIVER	3500	100	X	X
BROUGHTON ISL.	3475	98	X	X

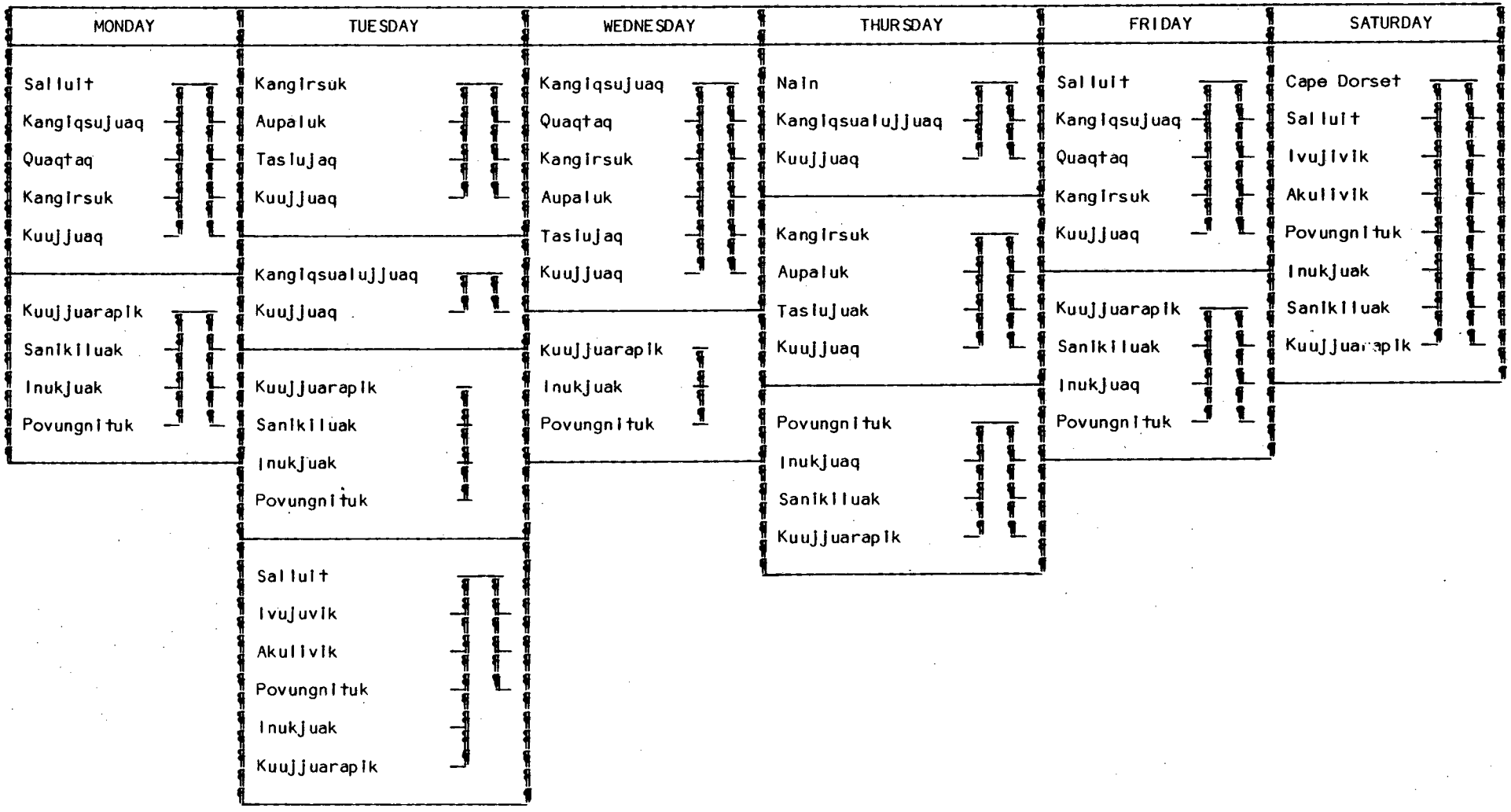
APPENDIX D

AIR INUIT - PASSENGER FARES

(EFFECTIVE AS AT FEBRUARY 14, 1984)

	Kuujjuaq	Kangiqsualujjuaq	Taslujaq	Aupaluk	Kangirsuk	Quaqtaq	Kangiqsujuaq	Deception Bay	Salluit	Nain	Kuujjuarapik	Sanikiluak	Inukjuak	Povungnituk	Akulivik	Ivujivik
Kuujjuaq	---	81	68	88	106	136	171	209	223	117	---	---	---	---	---	---
Kangiqsualujjuaq	81	---	108	125	146	176	212	249	263	58	---	---	---	---	---	---
Taslujaq	68	108	---	57	78	107	143	179	195	167	---	---	---	---	---	---
Aupaluk	88	125	57	---	58	89	123	173	176	183	---	---	---	---	---	---
Kangirsuk	106	146	78	58	---	70	106	143	157	205	---	---	---	---	---	---
Quaqtaq	136	176	107	89	70	---	75	112	128	234	---	---	---	---	---	---
Kangiqsujuaq	171	212	143	123	106	75	---	78	92	264	---	---	---	---	---	---
Deception Bay	209	249	179	173	143	112	78	---	55	307	---	---	---	---	---	---
Salluit	223	263	195	176	157	128	92	55	---	321	321	270	182	100	99	51
Nain	117	58	167	183	205	234	264	307	321	---	---	---	---	---	---	---
Kuujjuarapik	---	---	---	---	---	---	---	---	321	---	---	61	145	223	271	336
Sanikiluak	---	---	---	---	---	---	---	---	270	---	61	---	84	173	217	282
Inukjuak	---	---	---	---	---	---	---	---	182	---	145	84	---	84	135	190
Povungnituk	---	---	---	---	---	---	---	---	100	---	223	173	84	---	54	104
Akulivik	---	---	---	---	---	---	---	---	99	---	271	217	135	54	---	78
Ivujivik	---	---	---	---	---	---	---	---	51	---	336	282	190	104	78	---

AIR INUIT SCHEDULE



APPENDIX E

IVUJIVIK AIRPORT

Quantities required for fill and surfacing

1. AIRSTRIP, ACCESS ROAD AND APRON

Item	Estimated Quantity	Unit of measure	Work Description
1	11,000	m^3	Déblai de matériaux ordinaires
2	100,000	m^3	Déblai de roc
3	43,500	m^2	Compactage de la plateforme
4	1,000	m^3	Creusage de fossé, matériaux ordinaires
5	8,000	m^3	Creusage de fossé, roc
6	66,000	t	Roc brisé, tout-venant, calibre 0-150 mm
7	35,000	t	Matériau de nivellement de l'infrastructure et couche de base, agrégat calibre 63-0
8	16,000	t	Matériau de nivellement de la couche de base, agrégat calibre 19-0

2. ROUTE D'ACCÈS

Item	Estimated Quantity	Unit of measure	Work Description
1	15,000	m^3	Déblai de matériaux ordinaires
2	8,000	m^3	Déblai de roc
3	10,000	m^2	Compactage de la plateforme
4	2,400	t	Roc brisé, tout-venant, calibre 0-150 mm
5	7,000	t	Matériau de nivellement de l'infrastructure et couche de base, agrégat calibre 63-0
6	3,000	t	Matériau de nivellement de la couche de base, agrégat calibre 19-0
7	66	m	Fourniture et installation de tuyau de tôle ondulée, dia. 1200 mm, épaisseur 2,8 mm

IVUJIVIK AIRPORT

Machinery requirements

Unit	Description
1	Pelle Caterpillar 245
1	Pelle Caterpillar 235
1	Tracteur D8K Caterpillar (ripper)
1	Tracteur D7G Caterpillar
1	Tracteur D6D Caterpillar
1	Niveleuse 140G Caterpillar
1	Chargeur 966D Caterpillar
1	Compacteur Vibroplus CA25D
3	Camionnettes ½ tonne (3 x 1700)
1	Camion-citerne arrosoir
1	Camion de service mécanique
1	Camion-citerne pour fuel
1	Chargeur 988B Caterpillar
1	Concasseur primaire
1	Concasseur secondaire
1	Génératrice pour usine de concassage
1	Poudrière pour dynamite
1	Coffre pour "caps"
5	Foreuses poursautage de roc (5 x 11000)
2	Compacteurs plaque vibrante (2 x 200)
3	Camions 769B hors route (3 x 28000)
3	Camions 10 roues à benne (3 x 11000)
1	Garage portatif 40' x 40'
1	Équipement de garage (générateur, soudeuse, etc.)
1	Balance de capacité de 50 000 kg
1	Réservoir pour carburant

IVUJIVIK AIRPORT

PROGRAMME DES TRAVAUX

3½ months in 1984 (15 weeks of work or 850 hours)

MANPOWER (39 employees)

1 Surintendant x 850 heures
3 Contremaîtres (3 x 850 heures)
6 Journaliers (6 x 850 heures)
1 Technicien (homme d'instrument x 850 heures)
2 Chaîneurs (2 x 850 heures)
3 Opérateurs de concasseur (3 x 250 heures)
2 Opérateurs de pelle (2 x 850 heures)
3 Opérateurs de tracteur (3 x 850 heures)
10 Opérateurs (camions et autres) (10 x 850 heures)
1 Commis de chantier x 800 heures
1 Mécanicien x 850 heures
1 Soudeur x 800 heures
5 Opérateurs de foreuse (5 x 850 heures)

APPENDIX F

DIOCÈSE LABRADOR-SCHEFFERVILLE DIOCESE

C.P. 545 318 ELIZABETH P.O. BOX 545
LABRADOR CITY, LABRADOR A2V 2K7
(709) 944-2046

February 17, 1984

Makivik Corporation
4898 de Maisonneuve West
Westmount, Québec
H3Z 1M8

Attention: Monsieur Jules Gagné

Sir:

On February 9th, 1984, I was contacted by Monsieur Jules Gagné, lawyer for Makivik Corporation, relative to the impact study being conducted for the Corporation.

A) THE SUBJECT OF THE STUDY: The extension to an airstrip in Ivujivik.

and

The burial spot of Father Paul Deltombe,omi, buried in Ivujivik, November 1960.

B) THE OBJECT OF THE STUDY: Relocating the remains of Father Deltombe to facilitate the development project.

Isn't it ironic that for the hundreds of square miles in Nouveau-Québec that some little accommodation couldn't have been made to let the " poor missionary" rest in peace!

However, as Roman Catholic Bishop of the Diocese of Labrador-Schefferville, and as requested, I would consent to the relocation with the following conditions, which I would expect to be considered as only normal:

1) *Monsieur Jules Gagnē, your lawyer, informs me that there is no legal problem with moving a burial place. I do, however, want to respect the sensitivities of the Inuit population of Ivujivik in what concerns the remains of the dead, regardless of religion or origin.*

.../2

I understand that the Inuit of Ivujivik would agree to such a removal of remains. For all concerned, a letter to this effect must be obtained from the Ivujivik Community Council.

2) *I would insist that either Father Jules Dion,omi, from Kangiqsujuaq or Father Joseph Baril,omi, from Kuujjuak or another Roman Catholic priest to be named, be present for the transferral of the remains, and that the transferral be supervised by either of them.*

Arrangements for transportation and accommodations should be assured by Makivik.

3) *We request that Father Deltombe's remains be interred in the community's burial area.*

A suitable and secure box should, of course, be provided and identified.

In due time, I would expect to receive some confirmation and clarification from your office with a copy of same to be sent to:

Father Jules Dion,omi
Kangiqsujuaq (Wakeham Bay)
Québec
J0M 1K0

Father Joseph Baril,omi
C. P. 60
Kuujjuak (Fort Chimo)
Québec
J0M 1C0

Yours sincerely,

+ Peter A. Sutton omi.

+ Peter A. Sutton,OMI
Bishop of Labrador-Schefferville Diocese

PAS/ap

cc: Father Jules Dion,omi
Father Joseph Baril,omi

DIOCÈSE LABRADOR-SCHEFFERVILLE DIOCESE

C.P. 545 318 ELIZABETH P.O. BOX 545
LABRADOR CITY, LABRADOR A2V 2K7
(709) 944-2046

March 5, 1984

Makivik Corporation
4898 de Maisonneuve West
Westmount, Québec
H3Z 1M8

Attention: Mr. Jules Gagné

RE: Transferal of Father Deltombe's remains, Ivujivik.

Dear Sir:

Further to my letter of February 17:

While on the Hudson Bay Coast the week of February 21st, I met with both Reverend Peter of the Pentecostal Assembly and with Reverend Benjamin Arreak, Anglican priest responsible for the Anglican Community in Ivujivik.

Both were 'somewhat' acquainted with the proposal to relocate for Father Paul Deltombe's grave.

First of all, I must have misunderstood. I now understand that the present grave is on the site of a gravel pit to be used for the airstrip and not on the proposed airstrip.

I thought there was no alternative. Therein, lies the objection of the Pentecostal Community: that the grave could remain as is, but be conveniently protected by erecting a cement or stone barrier.

Secondly, the Anglican pastor, Reverend Benjamin Arreak, sees no objection to complying with Makivik's request and would be agreeable for the transferal to the Anglican cemetery.

All things considered, I think this would be the most proper thing to do, and is not really a big deal, to which I'm sure you will agree.

.../2

Allow me to simply restate what I consider both reasonable and possible with the following preface:

The cost of any and all accommodation must be borne by Makivik. A man was buried and there has never been a claim to maintenance or whatever of his burial spot.

Whatever must be done, must be done by Makivik, but under the supervision of Father Jules Dion,omi, of Kangiqsujuaq, whose transporation and housing must be assumed by Makivik.

That a suitable burial box be supplied and buried in the Anglican cemetery with the authorization of Reverend Benjamin Arreak.

That the existing headstone, of course, be transferred and appropriately erected in the Anglican cemetery.

This, I believe, clarifies and summaries what you requested in your phone call of February 9, my answer of February 17.

I am forwarding copies of these 2 letters to Reverend Arreak as agreed with him on February 22nd.

Yours truly,

+Peter A Sutton omi

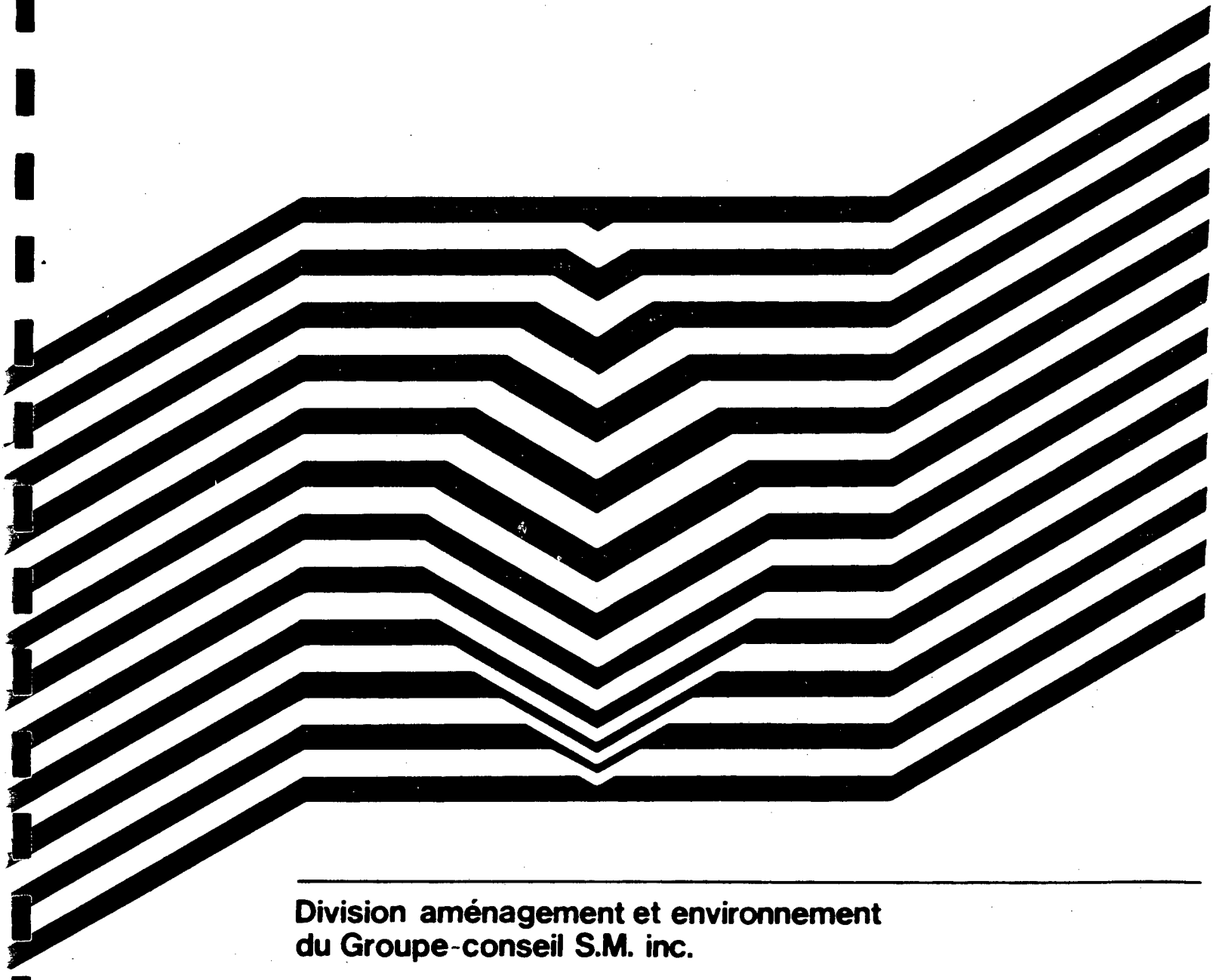
+ Peter A. Sutton,OMI
Bishop of Labrador-Schefferville Diocese

PAS/ap

cc: Reverend Benjamin T. Arreak
Father Joseph Baril, Kuujjuak
Father Jules Dion, Kangiqsujuaq

Aménatech inc.

ARCHAEOLOGICAL POTENTIAL STUDY
OF THE AIRPORT DEVELOPMENT AREA
IVUJIVK, NORTHERN QUEBEC



Division aménagement et environnement
du Groupe-conseil S.M. inc.

ARCHAEOLOGICAL POTENTIAL STUDY OF THE AIRPORT DEVELOPMENT AREA IVUJIVK, NORTHERN QUEBEC

Presented to the
Makivik Corporation

By
Aménatech Inc.
345, Industrial Boulevard
Sherbrooke (Quebec)
J1L 1X8

Sherbrooke, February 2, 1984

Ian Badgley, M.A.

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SUMMARY

The present report concerns the assessment of the prehistoric and historic archaeological potential of the Ivujivik airport development area, northern Quebec. This study has been carried out within the context of present and past Inuit land use and occupancy patterns. The results of the study suggest that certain zones within the airport development area may be of archaeological importance. This implies that prehistoric Inuit sites are probably located in these zones. Several other zones are interpreted as being of lesser yet significant archaeological potential. Recommendations are forwarded for the mitigation of possible heritage resource loss in the study area during the construction of airport facilities.

1.0 MANDATE

In January, 1984, the Makivik Corporation contracted Amenatech Inc. to carry out an archaeological potential study of the construction zones involved in the development of the new airport facilities at Ivujivik, northwestern Quebec. The mandate comprised the following aspects:

- definition of the study area;
- determination of the archaeological potential of the study area defined in terms of available data concerning the prehistoric and historic occupations and corresponding environmental circumstances in the region;
- spatial delimitation and qualification of zones of different archaeological potential within the study area;
- mapping of archaeological potential zones in the area;
- preparation of a final report.

As stipulated in the contract, the documents necessary to the definition of the study area and mapping of archaeological potential zones were to be provided by the Makivik Corporation. The documents provided include the master plan for the Corporation of the northern village of Salluit, a preliminary map of the Salluit region and a map overlay outlining certain major characteristics of the region (prepared by Transport Canada). These documents represent the totality of the information

pertinent to this study currently available to the Makivik Corporation.

Although useful in certain respects, these documents, particularly the maps, have proven generally insufficient to the clear definition of the study area and to the precise delimitation of archaeological potential zones. The results of this study are, consequently, less detailed than would have been desired.

The present report is in conformity with the contract as awarded.

2.0 METHODOLOGY

2.1 General Orientation

The study of the archaeological potential of a given area is oriented toward the determination and delimitation of physical localities which may have been either occupied or exploited by human groups inhabiting the region through time. More explicitly, the study is directed toward the identification and qualification of possible prehistoric and historic site locations within the area defined.

In theory, the distribution of archaeological sites reflects the spatio-temporal availability of biophysical resources socio-technologically accessible to human exploitation. Consequently, the determination of possible sites locations involves the systematic study of past and present biological and physical resources in the area concerned in terms of the predominant economic orientations of the cultural adaptations recognized in the region. The qualification of the potential of the locations determined implies the evaluation of these resources in relation to the various components of these adaptations.

Basically, then, an archaeological potential study is oriented, firstly, to the interpretation of the theoretical relevence of the study area in regards to regional land use and occupancy patterns. Secondly, emphasis is directed to the critical assessment of landscape features in the study area within the context of particular man-land relationships. The archaeologically most visible of these relationships concern settlement-subsistence systems. The study is thus focused principally on the

determination of habitation sites and associated, functionnally-specific sites (i.e., kill sites, travel sites, caches, etc.).

2.2 Procedures and Methods

Procedurally, an archaeological potential study is divided into three (3) phases: library research, interpretation of research data, and delimitation of archaeological potential zones. The library research and data interpretation are oriented toward the clarification and analysis of the cultural systems and environmental circumstances documented for the region within which the study area is situated. The third phase concerns the evaluation and mapping of the different zones of archaeological potential in the study area.

2.2.1 Library Research

The library research involves the study of the literature concerning the prehistoric and historic human occupations and environments of the region concerned. This research is carried out in order to:

- outline the culture-history of the region;
- inventory the locations and principal physical characteristics of the archaeological sites currently known in the region;
- determine the character and distribution of the primary resources available to cultural exploitation of the region through time.

The library research is thus directed toward a preliminary understanding of the extent and orientations of the various cultural adaptations which prevailed in the region both prehistorically and historically. These data allow the definition of primary concepts concerning the relevancy of the study area in terms of theses adaptations.

2.2.2 Data Interpretation

Interpretation of the research data is focused on the reconstruction of regional settlement-subsistence systems within the context of the chronologically-appropriate environmental settings. Such reconstructions, however, are preliminary in nature and, depending on the geographical extent of the study area, need not necessarily concern an in-depth assessment of all variables of possible adaptive capacity in the region. Instead, these reconstructions may be limited to the functional interpretation of the archaeological sites known and analysis of the physical settings of these sites.

The data interpretations allow speculations concerning variability of site habitats and locations associated with diachronic and synchronic occupations in the region. These speculations form the basis for the definition of theoretical models concerning the "adaptive selectivity" of physically-differing localities to human occupation or exploitation through time and in space. The models formulated are expressed in terms of certain geomorphological criteria. The variable associatons of these criteria, complemented by hydrographic situation and

geographic location, represent basic parameters for evaluating the archaeological potential of a study area.

2.2.3 Delimitation of Archaeological Potential Zones

The delimitation of archaeological potential zones is carried out through the application of the theoretical models previously formulated to the landscape comprised in the study area. These models are applied through the study of aerial photographs and topographic maps of the area. This study is directed, then, toward the identification of present localities characterized by a number of biophysical relationships most consistently associated with prehistoric and historic sites known in the region concerned.

The results of the study are illustrated on topographic maps or other cartographic documents, the requirements of the contract depending. These results are presented as "zones" of archaeological potential. The archaeological potential of the separate zones mapped is interpreted in terms of three (3) degrees of probability: high potential (Zone A), moderate potential (Zone B), and low or nul potential (Zone C).

2.3 Zones of Archaeological Potential

As noted above, the delimitation and qualification of zones of different archaeological potential is carried out through the application of certain basic criteria to the landscape of the study area. These criteria, derived from the preliminary analysis of research data, are translated into geomorphological, hydrographic and geographic variables of differing significance to

human occupation or exploitation (c.f., Table 1). These variables, however, are not of absolute value and, considered independently one from the other, are insufficient to the assessment of archaeological potential. Instead, zones of archaeological potential are assessed in terms of the spatial inter-association of a number of basic variables.

For example, close proximity to past or present water bodies or courses of adaptive capacity is generally necessary for the definition of raised gravel beach ridges as being of high archaeological potential. Similar formations situated in interior locations well removed from hydrographic networks would not necessarily be classified as archaeologically important. Alternatively, several criteria involved in the definition of zones of moderate or low archaeological potential may be present in zones of high site probability. In addition, several types of localities commonly assessed as being of low or nul potential may, in fact, have been prefered locations for functionnally specific sites. Such sites include trapping and cache sites located on bedrock outcrops and chipping stations or look-out sites situated on promintories and hill summits of considerable elevation.

The evaluation of archaeological potential implies, consequently, an element of intrepretive flexibility. Nevertheless, certain physical parameters may be posited in definition of zones of different archaeological potential.

Zones of high potential represent localities characterized by a set of variables clearly favourable to human occupation or exploitation. They represent, essentially, the most probable archaeological site locations. Such locations include,

TABLE 1. ARCHAEOLOGICAL POTENTIAL ZONES: PRIMARY DELIMITING CRITERIA

CRITERIA	ZONES OF POTENTIAL		
	High (A)	Moderate (B)	Low or Nul (C)
Morpho-sedimentology	Marine formations (beach ridges, terraces, etc.), fluvio-glacial, glacio-lacustrine and fluvial deposits (deltas, eskers, kames, beaches, etc.), composed of sand, gravel and/or cobbles or boulders overlying granular materials.	Thin till deposits overlying bedrock, sand, gravel and/or cobbles or boulders deposited directly on bedrock or silty-clayey formations.	Sporadic surface deposits on bedrock; bedrock outcrops; deposits composed principally of clayey or silty materials.
Drainage	Well-drained with rapid sub-surface infiltration.	Moderately well-drained with intermittent surface run-off.	Poorly-drained with slow infiltration; stagnation (bogs) and seasonal accumulation (marshes).
Topography	Relatively level or slightly inclined relief.	Irregular or undulating surface; moderate inclines (i.e., hill slopes, etc.).	Marked surface irregularities; steep inclines; depressions; etc.
Hydrography	Close proximity to present or past water bodies or courses; marine littoral; rivers or streams of various dimensions and character leading to inland lakes.	Variable distances from present or past hydrographic systems; featureless shorelines (absence of bays, etc.); ponds.	Absence of association with either present or past hydrographic systems; intermittent streams.

ideally, relatively level, efficiently-drained zones situated close to areas of potential resource exploitation.

Zones of moderate potential are characterized as being of lesser archaeological significance. In general, these zones include topographically-irregular and less well-drained locations situated some distance from hydrographic networks and/or principal faunal resource habitats. They suggest locations which, although possibly used for various reasons, were not "prefered" for cultural occupation or exploitation.

Finally, zones of low or nul potential signify localities within the study area either lacking the primary physical variables usually associated with archaeological sites or dominated by circumstances generally unfavourable to human occupation or use. These zones are thus the least likely to provide positive archaeological data. Examples of low or nul potential zones include vertical cliff faces, geographically extensive muskegs, etc.

3.0 THE STUDY AREA

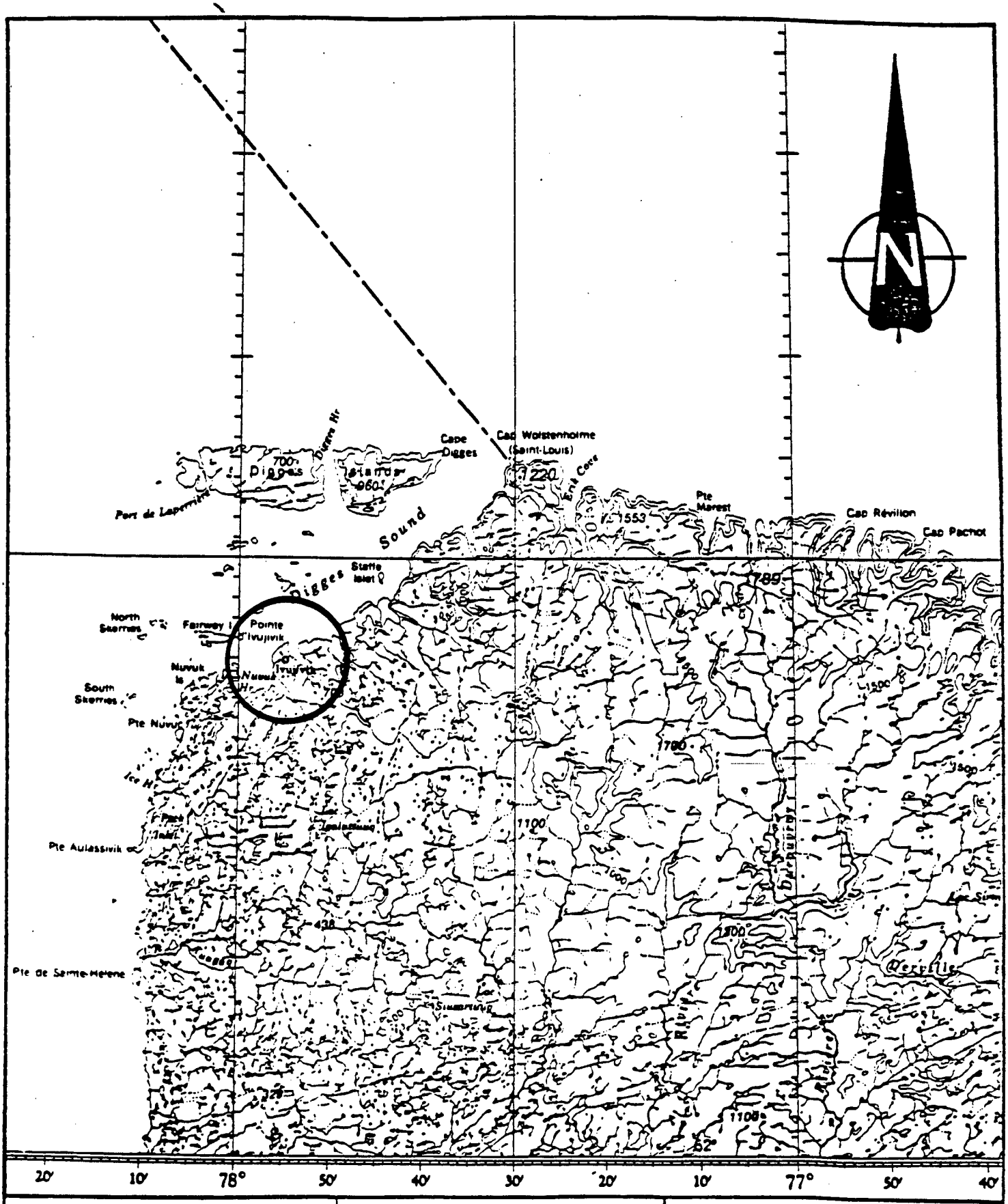
3.1 Geographic Location and General Description

Ivujivik is located on the west side of a small bay on the extreme northeast coast of Hudson Bay, approximately 40 km from Cape Wolstenholme, the mouth of Hudson Strait (Figure 1). Situated at 62°25'N.Lat., 77°54'W.Long., it is the most northerwesterly community of Quebec.

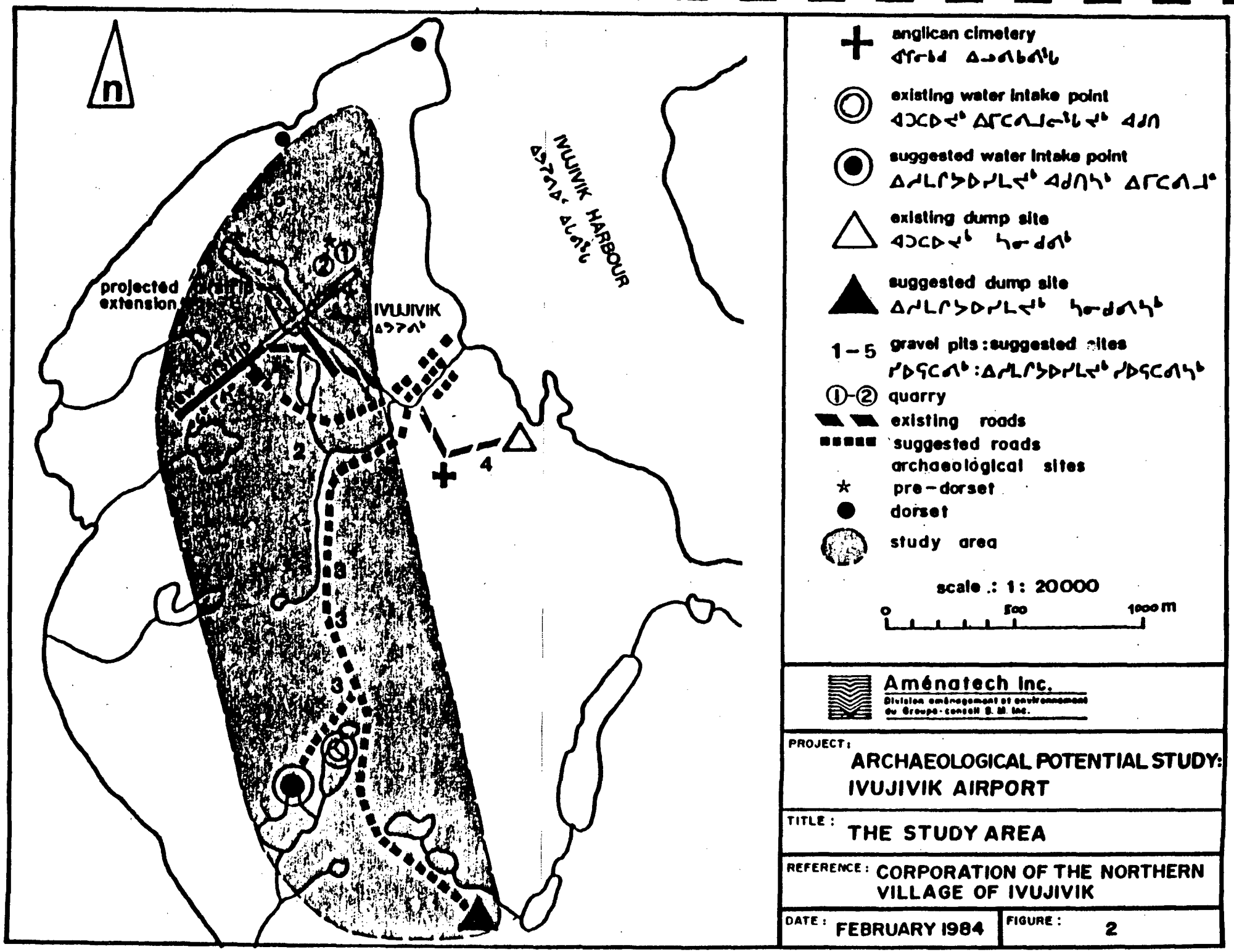
The village is located in a narrow valley bordered, to the northwest and southeast, by bedrock hills and, to the east, by Ivujivik Harbour. The bedrock hills form a low, undulating plateau averaging roughly 50 m.a.s.l. in altitude. Hill summits rarely exceed 100 m in elevation.

The study area, as arbitrarily defined, is situated in the central part of the plateau, roughly 400 m west of Ivujivik Harbour (Figure 2). It extends 1 km westward from the limits of the village and, from the northern limit of the small lake northwest of the village, 3 km toward the south. This area comprises the two (2) existing airstrips, the proposed water intake point, dump site access roads and three (3) of the four (4) suggested gravel pits. The fourth gravel pit, although located outside of this area, is also included in the study.

While the limits of the study area as defined may seem somewhat restrictive, this area has been determined in view of three (3) practical considerations. Firstly, the area comprises zones and sites which will undergo landscape alteration in the near future. The study is thus directed toward the management of



Aménatech inc.	PROJECT: ARCHAEOLOGICAL POTENTIAL STUDY: IVUJIVIK AIRPORT	TITLE: LOCATION OF THE STUDY AREA
DESSINÉ PAR: Y.C.	APPROUVÉ PAR: I. B.	DATE: FEBRUARY 1984
ÉCHELLE / SCALE: 1 : 500 000	RÉFÉRENCE:	FIGURE: 1



Aménatech inc.
Division aménagement et environnement du Groupe-conseil S. M. Inc.

PROJECT: ARCHAEOLOGICAL POTENTIAL STUDY: IVUJIVIK AIRPORT

TITLE: THE STUDY AREA

REFERENCE: CORPORATION OF THE NORTHERN VILLAGE OF IVUJIVIK

DATE: FEBRUARY 1984

FIGURE: 2

cultural resources and, in particular, toward the development of an emergency archaeological salvage project. Secondly, in order to minimize potential jurisdictional disputes or problems in the organization and promotion of possible archaeological research activities at Ivujivik, only the area involved in the development of airport facilities and infrastructure has been circumscribed. Thirdly, the eastern limits of the study area have been defined so as to avoid zones of possible sensitivity to the community. These zones include the villages itself, the Anglican cemetery and the shoreline of Ivujivik Harbour.

As illustrated by Pluritec ltée (1982, Appendix III), the surface of the study area consists almost entirely of rock outcrops overlain, in certain places, by thin patches of organic soils. Narrow marine beach deposits of limited extent occur sporadically throughout the area, especially on midslope locations north and west of the village. These deposits, several of which border small lakes, are generally composed of sands and gravels mixed with small boulders and thus provide good drainage conditions. Several other beach deposits composed of fine sands and loams with traces of clay are found in linear depressions. These beaches afford poor drainage, surface runoff usually accumulating on top of these deposits. Small bogs and alluvial deposits occur rarely.

3.2 Geology and Physiography

Geologically, the study area is located in the Cape Smith Fold Belt of Churchill Province, the northeastern section of the Canadian Shield (c.f., Stockwell et al., 1972). This Belt is characterized by structural unconformities marking the boundary between the Churchill and Superior geological provinces. The unconformities consist of folded Aphebian rocks of the Hudsonian Orogency grading into the more highly metamorphosed rocks of Churchill province. The major deposits include conglomerate, greywacke, sandstone, quartzite, limestone, dolomite and chert (c.f., Stockwell et al., 1972:52).

The Cape Smith Fold Belt corresponds to the Sugluk Plateau division of the James physiographic region (c.f., Bostock, 1972). This plateau, bordered to the south by the Povungnituk Hills, is of undulating relief, attaining an elevation of roughly 590 m.a.s.l. At certain places along the north coast of the Ungava Peninsula, it drops precipitously as much as 525 m into Hudson Strait. To the west, it slopes gently toward Hudson Bay. The western section is within the limits of the Tyrrell Sea and contains landscape features and deposits associated with this postglacial marine transgression. The overwhelming majority of the plateau consists of exposed bedrock covered, in places, by a thin mantle of glacial till.

3.3 Environmental Setting

The climate of northwestern Ungava Peninsula is characteristic of High Sub-Arctic regions. Summers are short, cool and wet while winters are long, cold and relatively dry. Northwest

winds prevail during summer and south winds are dominant during winter. An average of 20 frost-free days occur annually. Annual precipitation is in excess of 40 cm.

The vegetation of the region is characterized as a predominantly moss-lichen tundra mixed with herbaceous and shrubby elements (c.f., Richard, 1981:18-23). The moss and lichens dominate in exposed, dry areas while Cyperceae and Gramineae occupy less well drained surface deposits in relatively protected zones. The principal shrubs, although occuring only infrequently, include dwarf birch, willow, and alder. Sphagnum colonies of limited extent occur in wet areas.

The fauna of the region is composed of a diversity of arctic marine and terrestrial mammals, a variety of fish species, and numerous migratory waterfowl. Marine mammals of particular importance include Ringed seal (Phoca hispida), Bearded seal (Erignathus barbatus), Greenland seal (Phoca groenlandicus) and walrus (Odobenus rosmarus); the latter, although previously abundant in the region, now occur only in small numbers (c.f., Mansfield, 1968; Science Advisory Board of the Northwest Territories, 1980). Belugas (Delphinapterus leucas) are numerous during spring and early summer. Large whales also frequent the region.

Terrestrial mammals of note include the polar bear (Ursus maritimus) and, until the early twentieth century, caribou (Rangifer tarandus sp.). However, as illustrated by Audet (1979:22-23, Figure 2), the major Ungava caribou herds are currently restricted to south of the Payne River, with only several small aggregrates and isolated individuals occuring

further north. Additional mammals found in the region include fox, weasel, mink and hare.

As listed by Vezinet (1982:73, Table 3), Common Eider (Somateria molissima), Kakawi (Clangula hyemalis), Common Loon (Gavia immer), Red-throated Loon (Gavia stellata), Arctic Loon (Gavia arctica), Canada Goose (Branta canadiensis), Brants (Branta bernicla) and several varieties of gulls represent the principal bird species in northernmost Quebec. Other species include Arctic Tern (Sterna paradisca), Black Guillemot (Cepphus grylle), Willow Ptarmigan (Lagopus lagopus) and the Rock Ptarmigan (Lapogus mutus rupestris).

Major fish species previously and presently exploited by human groups in the region include Arctic Char (Salvelinus alpinus), Quebec Red Char (Salvelinus s. marstoni), Lake Trout (Salvelinus namaycush), and Speckled Trout (Salvelinus fontinalis); Rock Cod and Sculpin also occur in relative abundance (c.f., McCart and Beste, 1979; Vezinet, 1982). Too, clams, several varieties of mussels, and krill are found in the region.

3.4 Paleoenvironment

As illustrated by Prest (1972, Figure XII-15), the final Wisconsin deglaciation began in the eastern Hudson Strait region around 9000 B.P., and, by roughly 8000 B.P., the Ungava Peninsula coastline had been freed from Laurentian ice. This ice-mass continued to retreat toward the interior and, by 6500 B.P., the majority of the peninsula had been deglaciated. Five hundred years later, remnant ice in the interior had disappeared.

The deglaciation of the Hudson Bay coast was accompanied by the Tyrrell Sea marine transgression. This transgression, dated to between 8000 B.P. and 7000 B.P., extended to variable distances inland along the entire perimeter of Hudson and James Bays (c.f., Hillaire-Marcel, 1979, Figure 41). In northeastern Hudson Bay, however, it was generally restricted to the present coastal zone, attaining a maximum limit of 167 m at Cape Wolstenholme (Hillaire-Marcel, 1979:98). The Tyrrell Sea retreated in correspondence with isostatic rebound and, by 3000 B.P., the northwestern section of the Ungava Peninsula had fully emerged. The present Hudson Bay littoral developed following this latter date.

The final Wisconsin deglaciation is associated with a general climatic warming trend which culminated, around 3500 B.P., in the Climatic Optimum (c.f., Liu, 1981; Richard, 1981). This trend was followed by a climatic deterioration and progressive decrease in precipitation. As summarized by Bryson and Wendland (1967), major fluctuations during this period include the warmer and drier Neo-Atlantic episode (ca. 1000-750 B.P.), the transitional Pacific episode (ca. 750-400 B.P.) and the colder Neo-Boreal episode (beginning around 400 B.P.).

According to Richard (1981; intra vida), the coastal areas of the northern Ungava Peninsula were probably colonized by a sparse herbaceous tundra vegetation sometime shortly after 8000 B.P. This tundra expanded into the upland areas coincidental with the deglaciation of the interior. The colonizing vegetation was replaced by a shrub tundra around 6200-5500 B.P. However, beginning around 4500 B.P., this more luxuriant flora was succeeded by a second herbaceous tundra. As indicated by the

palynological evidence, this latter tundra has undergone little change during the past 3500 years.

4.0 HUMAN OCCUPATION OF NORTHERN UNGAVA

4.1 The Prehistoric Period

As defined by Maxwell (1976:3), the Hudson Strait region of the Ungava Peninsula occurs in the so-called "Eastern Arctic Core Area". This area, including northern Hudson Bay, the Foxe Basin, and western Hudson Strait, appears to have been continuously occupied by human populations throughout the past 4000 years. The Core Area is presumed, in addition, to have represented a demographic reservoir from which different populations variously expanded and re-expanded into previously unoccupied or abandonned regions.

4.1.1 Paleoeskimo Occupations

The Paleoeskimo Period in the Eastern Canadian Arctic is generally defined as comprising four (4) related cultures: Independence I (ca. 2200-1700 B.C.), Pre-Dorset (ca. 1700-900 B.C.), Independence II (ca. 1100-650 B.C.) and Dorset (ca. 900 B.C. - A.D. 1100-1200). Currently, only the Pre-Dorset and Dorset cultures have been identified in Ungava, the Independance I and II populations having generally occupied more northerly regions.

Pre-Dorset occupation of eastern Hudson Bay is indicated by the Arnapik site on Mansel Island (Taylor, 1968), three (3) sites at Ivujivik (Taylor, 1962, see Addendum 1), and several sites located at the mouth of the Great Whale River (c.f., Plumet, 1976). To the east, the DIA.1 and DIA.3 sites have been provisionnally interpreted as Pre-Dorset occupations (Pinard, 1980; Desrosiers, 1980). The latter two (2) sites are located on

Diana Island, in Diana Bay, the northwestern extremity of Ungava Bay.

Radiocarbon determinations presently available suggest that the initial expansion of Paleoeskimo populations into northern Ungava occurred during a late phase of the Pre-Dorset culture. The Arnapik site dates to approximately 1200 B.C. (McGhee and Tuck, 1976, Table 2) and the Great Whale Pre-Dorset occupation, to 1350 B.C. (Plumet, 1976:146). Typological comparisons suggest similar estimates for the Ivujivik and Diana Island Pre-Dorset sites.

These Pre-Dorset sites vary considerably in terms of physical setting and altitude. The Arnapik, Ivujivik and DIA.1 sites are located on raised gravel beach ridges while the Great Whale sites and DIA.3 occur in boulder fields. Elevationally, Arnapik and the Ivujivik sites occur between 19 and 45 m.a.s.l., DIA.1 and DIA.3 between 16 and 22 m.a.s.l. and the Great Whale sites between 50 to 126 m.a.s.l. The distance of these sites from the active shoreline varies from several hundred meters (i.e., DIA.3) to several kilometers (i.e., the Great Whale sites).

The differences in elevation and distance from the shore submitted by these sites result from regional variation in the rates of isostatic rebound. Consideration of these rates suggests that these occupations were situated in close proximity to contemporaneous shorelines. While faunal remains are generally lacking from these sites, their the coastal location indicates a maritime economic orientation for the Ungava Pre-Dorset populations. Intensive exploitation of marine mammals, especially seal, and, as suggested by Plumet (1976:136), possibly beluga in

the Great Whale estuary is implied. Fish, migratory waterfowl and caribou frequenting the Hudson Bay littoral were also probably exploited on a seasonal basis. However, in view of the current lack of known Pre-Dorset sites in interior Ungava, early Paleoeskimo adaptations in this region do not appear to have included exploitation of inland resources.

Early Paleoeskimo occupations were succeeded in northern Ungava by populations of Dorset culture affiliation. As in the case of the Pre-Dorset, however, these populations date to a relatively late phase of the Dorset culture. As speculated by Barré (1970:101), Dorset occupation of the Hudson Strait region of the Ungava Peninsula probably occurred no earlier than 400 B.C. This evaluation is supported by more recent research in northwestern Ungava Bay; radiocarbon dates obtained from numerous sites in this area suggest that the earliest Dorset occupation of Ungava Bay occurred toward the end of the last millenium B.C. (Plumet, 1979).

These dates and typological extrapolations suggest a hiatus in excess of 800 years between Pre-Dorset and Dorset occupations in northern Ungava. On the other hand, less well-publicized data recovered at Inukjuak and in nearby localities (Weetaluktuk, 1980, 1982, for example), may indicate an early Dorset occupation of northwestern Ungava, dating, possibly, to 800-700 B.C. These data may signify, then, that the supposed occupational hiatus of the southern Hudson Strait region is more apparent than real and, in all probability, results from the bias of archaeological research carried out to date in the region.

At present, a wide variety of both interior and coastal Dorset habitation sites are known in northern Ungava. Coastal sites are concentrated, in particular, along the northwestern coast of Ungava Bay (c.f., Plumet, 1979), in the Maricourt-Wakeham Bay region of Hudson Strait (c.f., Barré, 1970), in the Inukjuak area (c.f., Weetaluktuk, 1979, 1980), and at Richmond Gulf (c.f., Salaün and Gosselin, 1974; Harp, 1976). Interior site clusters occur, notably, at Payne Lake (Lee, 1966) and at Robert's Lake (Pilon, 1978). The overwhelming majority of the coastal sites is situated on raised gravel beach ridges in bays and on points distributed both along the mainland and on offshore islands. These sites are of relatively low elevation, usually less than 10-15 m.a.s.l., and are located either on or close to the active shoreline. The interior sites are of generally similar situation, occuring, for the most part, on well drained beach ridges close to lake or river shores.

The distribution of Dorset sites in Ungava indicates a coastal-interior adaptation oriented to the intensive seasonal exploitation of seals, walrus, and caribou. As indicated by faunal remains recovered in these sites, fish, migratory waterfowl, and polar bear were also exploited by these populations.

The Paleoeskimo period terminates in the Canadian Arctic with the widespread disappearance of the Dorset culture between A.D. 1000-1200. This disappearance coincides with a marked climatic warming trend and with the migration of Neoeskimo Thule populations from northern Alaska as far east as northern Greenland. Local Dorset populations, however, appear to have persisted in northwestern Ungava Bay and Richmond Gulf until the 15th century (c.f., Plumet, 1979; Harp, 1976).

4.1.2 Neoeskimo Occupations

As currently understood, the Neoeskimo Thule migration was based on the development of communal large whale hunting techniques in northern Alaska around A.D. 900 and on the coincidental expansion of bowhead whale summer feeding grounds into the Arctic archipelago during the Neo-Atlantic climatic episode. The earlier Thule populations spread into the Victoria Island-Coronation Gulf area of the western Arctic and throughout the High Arctic as far eastward as Greenland during the 12th century.

The succeeding Pacific episode resulted in a geographic reduction in the bowhead feeding grounds and, correspondingly, in a shift in the Thule economic orientation from large whale hunting to the exploitation of smaller marine mammals. This shift was accompanied by the gradual movement of High Arctic populations into more southerly regions. By the 15th century, if not earlier, Thule groups had spread into south-central Labrador, along the east coast of Hudson Bay as far south as Richmond Gulf and the Belcher Islands and into the Keewatin District of western Hudson Bay.

To date, little effort has been devoted to Thule Eskimo archaeological research in Ungava. However, relatively intensive surveys carried out in Richmond Gulf (Harp, 1972; Salaün and Gosselin, 1974), in the vicinity of Wakeham Bay (Barré, 1970), and along the west coast of Ungava Bay (Plumet, 1979) have allowed the identification of numerous Neoeskimo habitation sites in these

regions. Inland Neoeskimo occupations have also been identified at Robert's Lake (Pilon, 1978) and at Payne Lake (Michea, 1950).

Brief sampling of these sites has failed to yield temporal diagnostics and, consequently, the chronology of these occupations remains undetermined. Many of these sites may, in fact, date to the early historic period. However, a single radiocarbon date of A.D. 1140 obtained from a Thule habitation located on Igloo Island, Diana Bay, suggests that Neoeskimo populations had expanded into northern Ungava during the 12th century (Plumet, 1979:114-115).

Neoeskimo coastal sites in Ungava are frequently found in locations previously occupied by Dorset groups. In Wakeham Bay and in northwestern Ungava Bay, a number of multi-component sites containing both Thule and Dorset dwellings have been located. A similar situation occurs at Payne and Robert's Lakes. In the case of multi-component sites, however, the Thule dwellings are generally well-separated from Dorset habitations; Neoeskimo groups do not appear to have re-occupied the earlier Paleoeskimo structures.

Neoeskimo sites are also found at locations apparently unoccupied by the Dorset. In Diana Bay, for example, Neoeskimo occupations are concentrated on the coast while the majority of known Dorset sites in this bay are located on islands. These localities are, nevertheless, generally similar in character, comprising raised gravel beach ridges usually bordered by bedrock outcrops. Small ponds are frequently found in association with both Dorset and Thule sites.

Excluding whale hunting (especially beluga), the late Neoeskimo exploitation pattern in northern Ungava does not appear to have differed significantly from that of the earlier (and, in part, contemporaneous) Dorset populations. A coastal-inland adaptation is indicated, involving the seasonal exploitation of marine mammals, land mammals (caribou in particular), birds and fish.

This basic adaptation pattern persisted throughout the early historic period, the late Neoeskimo populations representing the ethnohistoric Inuit groups encountered in this region.

4.2 The Historic Period

4.2.1 Europeans and Euro-canadians

As summarized by Vezinet (1982:17-27), the initial European contact with northern Ungava Inuit occurred during the passage of Henry Hudson through Hudson Strait in 1610. During this voyage, Hudson encountered and entered into open conflict with Inuit groups at Digges Island, immediately west of Cape Wolstenholme. A second contact with these same groups is dated to 1697, during the voyage of Iberville's fleet into Hudson Bay.

The Hudson Strait region appears to have been largely ignored by Europeans throughout the 18th century. By the beginning of the 19th century, Moravian missionary activities intensified along the Labrador coast and, in 1811, Kohlmeister and Kmoch entered Ungava Bay, eventually reaching present-day Fort Chimo. Subsequently, in 1830, the Hudson Bay Company established trading posts at Fort Chimo, Leaf Bay, and the mouths of the George and

Whale Rivers. These posts, however, were short-lived, being abandonned in 1843.

Early missionary and trading activities centered on the Labrador coast and Ungava Bay and do not appear to have extended into the western portions of Hudson Strait. Somewhat latter, parts of the northern Ungava coast were frequented by American whalers who, in 1846, began to exploit the Hudson Bay whale fisheries. Following the depletion of the Hudson Bay whale populations in 1870, economic interest in this area shifted to walrus and beluga hunting. Commercial exploitation of these resources persisted until 1915.

In 1866, the Hudson Bay Company re-opened Fort Chimo for trading purposes and commercial fishing. Commercial activities intensified during the period 1880-1920, both the HBC and the Company of Revillon Frères establishing trading posts at several locations along the west coast of Ungava Bay, as well as at Wakeham Bay. During this period, several independent traders opened posts on Hudson Strait, notably Herbert Hall at Sugluk in 1924.

Federal government agencies increased in importance throughout the area during the 1930's. The following decade witnessed relatively intense military activities in the Ungava Bay and adjacent regions. The subsequent period, extending to the present, is characterized by a further increase in both federal and provincial government involvement in the area and by extensive commercial as well as mineralogical exploitation activities.

4.2.2 Inuit Populations

Vezinet (1982) recognizes three (3) general phases in the contactual development of northern Quebec Inuit during the historic period. Each of these phases is characterized by European-Inuit contact situations of different intensity and by varying degrees of cultural interaction.

The initial contact phase begins in 1610 with Hudson's voyage and extends to approximately 1880. As noted above, European contacts with northern Ungava Inuit during the 17th and 18th centuries are conspicuous by their absence. Contact situations of some regularity were initiated following the establishment of HBC trading posts in Ungava Bay during the early 19th century. These posts, although primarily used by Naskapi and Inuit groups inhabiting the southern section of Ungava Bay, were probably frequented occasionnally by geographically farther removed Inuit groups. Trading activities, however, were limited to the eastern Hudson Strait region and, in addition, were temporary in character, the HBC posts being abandonned in 1843.

Although commercial whaling in Hudson Bay began at about this time, the bulk of the whaling fleets navigated the north shore of Hudson Strait. Contacts with Ungava populations deriving from these commercial activities were thus sporadic and involved, basically, brief encounters between ship-wrecked whalers and local Inuit groups.

The traditional settlement-subsistence pattern of the northern Ungava Inuit appears to have been little affected during the greater part of the initial contact phase. Subsistence

techniques continued to be based on the seasonally-intensive exploitation of coastal-interior faunal resources using a traditional technology. As noted by Vezinet (1982:19-20), prefered coastal site locations included relatively exposed points, river mouths and interior bays; inland site localities included river and lake narrows favourable to the exploitation of both caribou and fish. Although trade with the Hudson Bay Company provided the Inuit with certain manufactured goods and may have occasionned changes in seasonal movements, this pattern appears to have undergone no major modifications during the initial contact phase.

The subsequent phase is characterized by the intensification of contacts between 1880 and 1920. During this phase, both missionary activities and commerce increased in scope and intensity throughout the Ungava Bay region. With the establishment of the Company of Revillon Frères in the area at the beginning of the 20th century, commercial activities accelerated and expanded along the Hudson Strait coast.

The intensification of contacts during this period produced several marked changes in the earlier Inuit subsistence economy and technology as well as in the settlement pattern. Technologically, fire-arms and an assortment of metal goods (such as steel traps), previously in short supply, replaced their traditional counterparts. Correspondingly, economic adaptations became progressively oriented toward the acquisition of manufactured commodities. Also, local populations began to settle at or near the trading posts.

In spite of these developments, traditional subsistence activities persisted and Inuit groups continued to exploit both

marine and terrestrial fauna on a coastal-interior seasonal basis. However, as a result of intensified trapping, the territories exploited changed somewhat in character and in extent. Prefered settlement sites remained, nevertheless, basically unchanged, generally well-drained lacustrine, riverine and coastal locations dominating.

The post - 1920 phase is characterized by the progressive and final acculturation of the Ungava Inuit. By 1920, these populations were extensively involved in trapping and trading and permanent Inuit communities had been established at the trading posts. With the subsequent development of military bases and meteorological stations, as well as of governmental social services involvement, temporary wage-labour became common place.

Although significantly modified by "modern" technology, Inuit economic pursuits have continued to involve traditional subsistence activities. These activities, however, are usually of short duration and are generally carried out in the vicinity of the villages.

5.0 DATA INTERPRETATION

Archaeological data presently available suggest that northern Ungava was initially populated by Early Paleoeskimo Pre-Dorset groups sometime around 3500 B.P. These occupations, although possibly of short duration, probably endured until the development of the Late Paleoeskimo Dorset culture at about 900 B.C. While Early Dorset occupations are poorly understood in northwestern Ungava, a cultural continuum in excess of 600 years may be indicated for this region.

Regardless, between approximately 400 B.C. and the beginning of the Christian era, Dorset populations expanded throughout Ungava as far south as Great Whale River on the Hudson Bay coast and into southern Ungava Bay. In certain areas, such as Richmond Gulf and northwestern Ungava Bay, local Dorset populations appear to have persisted into the 15th century.

However, by as early as the mid-12th century, Neoeskimo Thule groups had began to populate northern Ungava. Although evidence of cultural contacts and interaction between Dorset and Thule groups in Ungava is lacking, it may be presumed that resident Paleoeskimo populations in the region were eventually assimilated by the Neoeskimo groups.

This presumed cultural assimilation had been completed by the beginning of the historic period, the ethnohistoric groups encountered in the region during the early 17th century being the direct descendants of late Neoeskimo peoples. During the following 200 years, European-Inuit contacts in Ungava remained virtually inexistant. By the mid-19th century, regular cultural contact

situations involving European and Inuit interaction had been established in Ungava Bay.

With the intensification of trading activities and commercial fishing shortly thereafter, Inuit economic adaptations became progressively oriented toward trapping and the acquisition of manufactured commodities. This final acculturative trend culminated during the 1940's and 50's with the installation of permanent logistic facilities and southern-based government social service agencies in the area.

The prehistoric adaptations interpreted from the research data suggest that, while Ungava Pre-Dorset groups were restricted to maritime zones, the later Dorset and Thule populations exploited interior as well as coastal areas. However, since the study area is located in the coastal zone of northern Ungava, only the maritime components of these latter two (2) adaptive systems are relevent to the present study. The archaeologically most salient points within this context may be summarized as follows.

- Concerning Early Paleoeskimo occupations:

Pre-Dorset sites occur on isostatically-raised marine formations located at river mouths and on interior bays situated either on islands or the mainland. Well-drained localities composed of boulder fields overlying sand deposits and gravelly beach ridges were favoured site localities. The elevation of these localities varies in accordance with regional rebound rates, extending from approximately 16 m.a.s.l. (northwestern Ungava Bay) to roughly 126 m.a.s.l. (Great Whale River). Intermediate elevations are suggested for northwestern Ungava Peninsula.

. Concerning Late Paleoeskimo occupations:

Dorset sites occur consistently on elevationnally low, well-drained gravel beach ridges situated on both offshore islands and bay islands, on the edges of mainland bays and points, and along river banks extending inland. Featureless shorelines do not appear to have been prefered as habitation site locations. The majority of Dorset sites are situated below 15 m.a.s.l. In certain areas, however, Dorset occupations occur at high elevations; in these latter cases, the sites are usually situated some distance from the active shoreline and are frequently associated with small lakes or ponds.

. Concerning Neoeskimo Thule occupations:

Late prehistoric Thule site localities are both geomorphologically and locationnally similar to Dorset site situations. Multi-component Dorset-Thule sites are not uncommon. Neoeskimo sites are also found in a variety of physical locations that do not appear to have been occupied by Dorset groups. Thule sites are situated at low elevations in close proximity to (if not on) active shorelines. Thule sites at elevations higher than 10 m.a.s.l. are rare.

. Concerning historic Inuit occupations:

Historic Inuit habitation sites in northern Ungava are located on active beaches composed of various granular materials providing efficient drainage of surface water. Occupation was generally restricted to a relatively narrow coastal zone, with

inland movements occurring mostly through major river valleys. High elevation zones and areas removed from present hydrographic networks do not appear to have figured significantly in northern Ungava historic Inuit land use patterns.

In sum, the study area occurs in a coastal location which, in theory, was probably occupied and/or exploited by both prehistoric and historic northern Ungava Inuit populations. However, as spatially defined, this area does not extend to the active shoreline. Instead, it is situated some distance from the coast and at an elevation exceeding 25 m.a.s.l. Consequently, the archaeological potential zones determined in the study area concern, primarily, possible Pre-Dorset and Dorset site probability.

6.0 DELIMITATION OF ARCHAEOLOGICAL POTENTIAL ZONES

The archaeological potential zones delimited in the study area are illustrated in Appendix 1. Zones of high, moderate, and low or nul archaeological potential occur in the area.

6.1 Zones of High Potential (A)

Five (5) zones of high archaeological potential have been determined in the study area. The first of these zones covers a broad area extending along the northeast edge of the large pond north of the village and the northeasterly and southeasterly outlets of this pond. This zone comprises the three (3) Pre-Dorset sites, the proposed gravel pit No. 5, and a small section of the projected airstrip extension.

The remaining four (4) zones of high potential are situated: 1. at the mouth of the outlet of the pond southwest of the airstrip; 2. on the southern perimeter of this pond; 3. at the possible gravel pit (No. 4) located east of the Anglican cemetery and; 4. along the drainage located in the southwestern section of the study area.

6.2 Zones of Moderate Potential (B)

Four (4) zones of varying extent are evaluated as of moderate archaeological potential. Three (3) of these zones occur on upper beaches located in the west-central section of the study area. The most northwesterly of these zones is situated between the high potential zones bordering the small lake on the western

perimeter of the area. The fourth zone of moderate potential occupies the suggested quarry sites north of the village.

The upper beaches consist of well drained sand and deposits. The evaluation of these zones as moderate rather than high archaeological potential is primarily based on their present location in relation to the shoreline and existing drainage systems.

6.3 Zones of Low or Nul Potential (C)

The overwhelming majority of the land comprised in the study area is considered to be of low or nul archaeological potential. Exposed bedrock and poorly drained surface deposits, including several bogs, predominate. Although certain, particular localities m ~ have been used for functionally specific reasons, the low or nul potential zones area, theoretically, of minimal archaeological importance.

7.0 RECOMMENDATIONS

Available archaeological, ethnohistoric, and biophysical data suggest that certain zones within the airport development area of the village of Ivujivik are of high or moderate archaeological potential. In order to mitigate the impact of airport construction works on the known and possible cultural resources in these zones, it is therefore recommended:

- that surface collection and controlled excavation of the three (3) Pre-Dorset sites and the prehistoric quarry be carried out prior to the initiation of construction works;

- that these archaeological activities be complemented by survey and systematic test-pit sampling of zones of high and moderate potential;

- that low or nul archaeological potential zones by subjected to cursory examination in order to verify the potential assessed;

- that the community be informed of the research to be undertaken, and additionally, consulted as to the location of archaeological sites in the village vicinity;

- that Inuit participate actively in the survey, in order to familiarize the community with potential archaeological site locations and to inform the village of research results.

8.0 PERSONNEL

This report was written by Mr. Ian Badgley, Senior Archaeologist of Aménatech Inc. and verified by Mr. René Allaire, Assistant to the Director of the firm. Mr. Yvan Cadorette was responsible for the drafting.

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ADDENDUM 1. PALEOESKIMO SITES AT IVUJIVIK, NORTHERN QUEBEC

Archaeological research carried out during 1958 and 1959 in northern Ungava by Dr. William Taylor, then of the National Museum of Man, resulted in the discovery of three (3) Pre-Dorset and two (2) Dorset sites north of the village of Ivujivik. A sixth site, a small prehistoric quartz quarry, was also found in this area. Although the cultural affiliation of the latter site is undetermined, possible use of the quarry by Dorset groups is speculated.

The data reported in Taylor (1959, 1960, 1962) allow only a rough approximation of the Ivujivik site locations. These data indicate, nevertheless, that the Pre-Dorset sites and, possibly, the presumed Dorset quarry are situated in the study area (Figure 2). More particularly, it appears that these four (4) sites are located either within or on the perimetre of construction work zones proposed for the airport development project (Appendix 1). A full description of the information available for the Ivujivik sites, including the Dorset occupations, is thus warranted.

(A) Pre-Dorset sites

The three (3) Pre-Dorset sites were discovered in 1959 (Taylor, 1960). The most complete published descriptions of these sites are contained in Taylor (1962).

The Meeus site (KcFr-4)

The Meeus site is situated on the south and east-facing slopes of a hill overlooking the village of Ivujivik. The site is

defined by a thin scatter of lithic material covering an area roughly 550 m in length and 170 m in width. The southern extremity of this scatter occurs approximately 360 m northwest of the "...Roman Catholic Mission building..." (Taylor, 1962:80). The elevation of the site varies between 32 and 42 m.a.s.l.

Two (2) shallow, partly overlapping depressions situated on the southwestern edge of the site were recognized as dwellings. These depressions, excavated by local Inuit, were apparently circular in form, each measuring approximately 4,5 m in diametre. These dwellings produced little cultural material. Subsequent test-pitting adjacent to the depressions proved, with a single exception, archaeologically negative. The exception yielded six (6) chert flakes and forty (40) decomposed bone fragments; twelve (12) of these fragments were identified as seal bones. Excluding the six (6) flakes, all cultural material recovered from the site was surface collected. This material included 157 worked artifacts, the bulk of which are in chert. No spatial concentrations of artifacts or lithic reject material were noted.

The Pita site (KcFr-5)

The Pita site occurs on the east side of the northern extremity of a large pond, roughly 930 m "...north of the mission" (Taylor, 1962:81). The site, covering an area of approximately 135 X 33 m , is situated between 35 and 38 m.a.s.l. No habitations were observed at the site. With the exception of a few flakes, five (5) incomplete artifacts, and 89 decomposed bone fragments recovered from several test-pits, all cultural material recovered from the site was surface collected. Of the 31 tools or worked

pieces collected, all but three (3) are in chert. The bone fragments included 1 walrus and 9 seal bones.

The Mungiok site (KcFr-7)

The Mungiok site is located approximately 300 m southeast of the Pita site and 185 m "...from the northeastern extremity of the Meeus site..." (Taylor, 1962:81). The site occupies a small area of irregular relief, roughly 75 X 95 m, situated at an elevation of 35-38 m.a.s.l. As in the case of the two (2) other Pre-Dorset sites, Mungiok is defined by a thin scatter of lithic material on the surface. Again, this material is predominantly in chert. Neither faunal remains nor habitation features were collected or observed at the site.

(B) Dorset sites

The two (2) Dorset sites at Ivujivik are briefly reported in Taylor (1959, 1960, 1962). In Taylor (1959:66), the first of these sites, registered as Eeteevianee, (KcFr-1), is reported as occurring in a small cove about 1 mile (1,6 km) north of Ivujivik. The second site, Ohituk (KcFr-3), is placed on a rocky point north of the village (Taylor, 1960:2). In a later article, Taylor (1962:81) states that these "Two small Dorset culture sites stand nearby on the same rocky point of land at Ivujivik". The Ohituk site, interpreted as Early Dorset, is situated between 19 and 22 m.a.s.l.; Eeteevianee, a Middle Dorset occupation, occurs between 12 and 14 m.a.s.l.

Consideration of these data suggests that these two (2) sites are located on the northern extremity of the peninsula

formed by Ivujivik and Nuvuk Harbours (c.f., Figure 2 and Appendix 1). These sites are situated outside of but in close proximity to the study area as defined.

(C) The Quarry site (KcFr-6)

This site is represented by a quarry pit measuring approximately 3,5 X 1,8 m by 60 cm in depth. The elevation of the site is roughly 70 m.a.s.l. As noted by Taylor (1960:2):

> Although reject material was scattered profusely about the pit, the only artifacts recovered were six (6) hammerstones. This site cannot be assigned to any prehistoric culture but might well have been associated with the Dorset culture site Eeteevianee...about a mile distant.

Although the Ministry of Cultural Affairs archival maps locate the quarry in the same general area as the Pita site, Taylor's (1960:2) statement suggests that this site is located close to the northern edge of the village of Ivujivik, probably near the Meeus site.

4 cartes pliées en pochette