PLAN FOR THE RESERVATION AND DEVELOPMENT OF GRANULAR MATERIALS IN THE VICINITY OF SACHS HARBOUR, N.W.T.

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PLAN FOR THE RESERVATION AND DEVELOPMENT OF GRANULAR MATERIALS IN THE VICINITY OF SACHS HARBOUR, N.W.T.

Prepared For:

INDIAN AND NORTHERN AFFAIRS CANADA, OTTAWA

Prepared By:

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This project was a joint venture of Hardy BBT Limited,
Calgary, Alberta and Avati Associates,
Yellowknife, N.W.T.

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Agnes Carpenter	Sachs Harbour Community Corporation (CC)
Andy Carpenter	Vice Chairman, Inuvialuit Game Council
Earl Esau	Sachs Harbour Hunters and Trappers Committee (HTC) / Harvesting Study
Peter Esau	Sachs Harbour HTC / Hamlet Council
Graham Roberts	Hamlet Foreman
Lena Wolki	Sachs Harbour Native Women's Association
Geddes Wolki	Elders Committee /Sachs Harbour HTC
Teddy Elias	Youth Worker

The help of the following individuals is also appreciated:

Leslie Huget	Senior Land Officer, Lands Division, Municipal and Community Affairs, GNWT, Yellowknife
Kevin McCormick	Habitat Biologist, Canadian Wildlife Service, Yellowknife

SUMMARY OF RECOMMENDATIONS

This plan was produced as part of the implementation of the Inuvialuit Final Agreement. It recommends a strategy to reserve and develop supplies of sand and gravel on Inuvialuit lands in the vicinity of Sachs Harbour, N.W.T. Its goals are the reservation of adequate supplies of sand and gravel for the community's future needs, and the siting and management of these reserves so as to minimize the environmental and social impacts of their development. The plan was developed with members of the Sachs Harbour Land Use Planning Working Group and other representatives of the community. It is based on existing scientific and community information, and will be revised at least every 5 years. The plan assesses potential sources of sand and gravel from of the community east to the area near Picnic Lake (Source 13 on the accompanying map, Figure 5), and west to Mary Sachs Creek (Sources 7 and 1 in Figure 5). Potential sources along the Kellett River were also considered.

Recommendations of the plan are:

. Granular resources from the community west to Mary Sachs Creek should be reserved for public community and Inuvialuit use. This area is the optimal one from the perspective of minimizing environmental, wildlife, and harvesting impacts. In addition, it can be developed at the most reasonable cost to the community. Granular development should be confined to this area until such time as its reserves can no longer meet community requirements.

. The quality and quantity of granular resources in the recommended area, and particularly in the Mary Sachs area, should be more accurately determined through field studies.

- If the deposits from the community west to Mary Sachs Creek do not contain sufficient Class 2 materials to meet the community's higher-class needs, Source 13 should be reserved for development. Prior to doing so, the community requests that further exploration for a Class 2 source be carried out in the Kellett River area because of environmental and cultural concerns at Source 13.

- A development/environmental protection plan should be produced for the recommended area. The plan should be produced in consultation with local and regulatory authorities, and should come under the approval of ILAC. It should outline a 5-to-10 year strategy for the orderly development of the granular resources so as to minimize the environmental and visual effects of extraction and transportation, and maximize the volume of materials recovered. Granular materials development should be actively managed to minimize high grading (the use of better-quality materials than are necessary for a job). Providing that these reserves are properly managed, they should be sufficient to meet the community's foreseeable future needs.

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INTRODUCTION

In March 1988, as part of the implementation of the Inuvialuit Final Agreement, Indian and Northern Affairs Canada (INAC) contracted Hardy BBT of Calgary, Alberta and Thomas Nesbitt and Associates (now Avati Associates) of Yellowknife, N.W.T. to carry out the present study. The INAC departmental representative for the project was R.J. Gowan, Geotechnical Advisor, Land Management Division.

The terms of reference of the study were:

(1) To determine the potential environmental, cultural, and economic implications of the possible future exploitation of selected granular borrow deposits within and adjacent to Inuvialuit lands

(2) To identify and evaluate other community concerns

(3) To prepare recommendations on the establishment of reserves of granular borrow for public community needs

These objectives were met through the preparation of a plan outlining a strategy for the reservation and development of granular materials around each of the six Inuvialuit communities (Aklavik, Holman, Inuvik, Paulatuk, Sachs Harbour, and Tuktoyaktuk). The Sachs Harbour plan is divided into four parts:

Part 1 sets out the scope of the study: why it was undertaken, its objectives, how it was carried out, and how it is intended to be used. It also identifies for whom the plan is written and defines some of the technical terms used.

Part 2 describes the goals of the plan.

Part 3 presents the factual information upon which the plan is based and assesses different plan options.

Part 4 presents the plan recommendations.

PART 1: SCOPE OF THE STUDY

1.1 REASONS FOR UNDERTAKING THE STUDY

1.1.1 Requirements of the Inuvialuit Final Agreement

With the signing of the Inuvialuit Final Agreement (IFA) and the enactment and proclamation of the Western Arctic (Inuvialuit) Claims Settlement Act in 1984, the Government of Canada granted Inuvialuit title to substantial tracts of land in the vicinity of each of the six Inuvialuit communities. These lands, shown in Figure 1, are commonly known as Inuvialuit 7(1)(a) and 7(1)(b) lands, in reference to the sections of the Final Agreement where their interests are described. They are administered by the Inuvialuit Land Administration (ILA) and the Inuvialuit Land Administration Commission (ILAC).

In the Sachs Harbour area, 7(1)(a) lands cover approximately 1800 square kilometres (700 square miles), and directly surround the lands administered by the Hamlet. On these lands, Inuvialuit own both surface and subsurface rights. On 7(1)(b) lands, which cover approximately 18 600 square kilometres (7,200 square miles) of Banks Island, the Inuvialuit own surface rights only. Granular materials (sand and gravel) are surface resources. The Inuvialuit Final Agreement thus transferred ownership of most of the accessible sources of sand and gravel in the Sachs Harbour area, and indeed throughout the Western Arctic region, to the Inuvialuit. Because of this, and because of the general scarcity of suitable sand and gravel throughout the region, the Final Agreement also attached

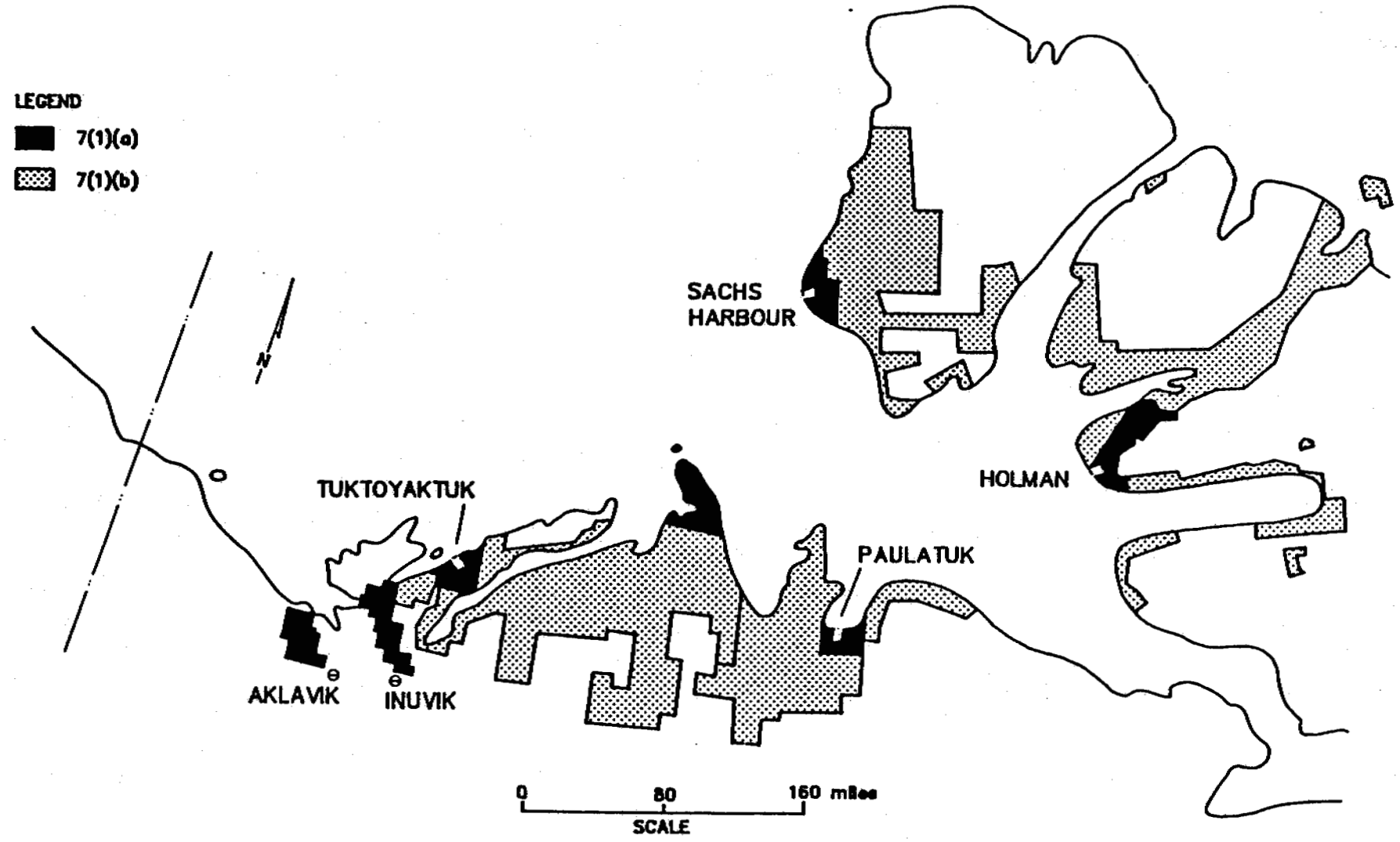

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FIGURE 1. INUVIALUIT LANDS LOCATION PLAN

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several conditions to Inuvialuit ownership and management of these resources. The Agreement regulates the price which can be charged for sand and gravel. It also requires that the Inuvialuit establish and maintain reserves of sand and gravel on Inuvialuit lands. In the establishment of these reserves, the first priority is that adequate supplies of suitable materials be set aside to meet public community needs (IFA, Section 7(27)). These needs include granular requirements for the community's roads and airfields, community arenas, firehalls, and sewage lagoons. Reserves are also to be established, as a second priority, for the private and corporate needs of the Inuvialuit (Section 7(28)). Such needs include projects advocated and owned by the Inuvialuit, for example the proposed Tuktoyaktuk gas gathering system. As a third priority, sand and gravel are to be made available for any project approved by the appropriate government agencies (Section 7(29)). Examples of this sort of granular requirement include pads for oil rigs and rip rap for erosion protection on artificial islands.

This study focuses primarily on the establishment of granular reserves to meet Sachs Harbour's public community needs (the first priority above). The Final Agreement requires that the reserves be based upon reasonable 20-year forecasts of the volumes required from Inuvialuit lands. Reserves are to be of an appropriate quantity and quality to meet these forecasts, and are to be within reasonable transport distances of the communities. The demand forecasts upon which the reserves are based are to be prepared jointly by the Inuvialuit and government, and they are to be revised at least every 5 years.

1.1.2 Implementation

In order to implement the above-mentioned requirements of the Final Agreement, the Federal Government established a specific granular materials project as part of the IFA Implementation Program. This project, designated Task 7- Sand and Gravel Inventories, involves a four-phase process developed in consultation with the Territorial Government and the ILA.

(1) An analysis of the projected 20-year demand for sand and gravel and an inventory of potential sources to supply this demand was carried out by EBA Engineering Consultants Ltd. This study, completed in April, 1987, made recommendations on the development of specific sources of supply.

(2) The present study is designed to supplement the EBA information with environmental and socio-economic information, particularly from the community level. It is also designed to develop a plan, with community representatives and other affected parties, for the reservation and future development of granular materials for public community needs in each of the six Inuvialuit communities.

(3) The quality and/or quantity of materials at some of the recommended sources of supply may have to be confirmed by more-detailed site investigations. These investigations will be based on the recommendations of the communities.

(4) In order to assist the Inuvialuit with the preparation and implementation of granular resource development plans which can be managed at the local level, additional studies will be undertaken each year to 1994.

1.2 OBJECTIVES AND METHODS OF THE PRESENT STUDY

The ultimate objectives of the present study were:

(1) The identification of environmental, cultural, and economic concerns, particularly at the community level, associated with local granular resource development

(2) The development of a fair and reasonable plan which could be understood and managed at the local level

(3) The achievement of a consensus among the affected parties

In order to accomplish these ends, workshops of a full day's duration were carried out in each of the six Inuvialuit communities. The workshops were carried out primarily with members of the existing land use planning working group in each community. Other affected interests were also invited to participate.

The land use planning working groups were established in 1987 to provide each community with an ongoing land use planning capability, and a means of making recommendations on the use of lands surrounding the communities to the Beaufort/Delta Regional Planning Commission and the decision-making bodies at the community level. Each working group includes nominees from the community's Hunters and Trappers Committee, its Community Corporation, the Hamlet (or Town), the Elders, and other parties as deemed appropriate by community representatives.

The workshops supplemented the supply/demand information and recommendations produced in Phase 1 of the study (EBA 1987). They also identified potential economic, cultural, and environmental impacts of developing the sites identified in Phase I. The workshops were designed to

solicit community concerns and allow the working groups to use the information in a planning context. They were facilitated by Tom Nesbitt, an environmental planning consultant who has worked extensively with the working groups in the past. Technical advice for the workshops was provided by Jim Howell, an environmental consultant and professional geologist.

Unless noted otherwise, the plan detailed in the report represents the consensus of the Sachs Harbour Workshop.

1.3 STATUS AND INTENDED USES OF THE PLAN

The conclusions of this report have the status of recommendations only. They are recommendations to INAC and the ILA/ILAC, the parties implementing the Inuvialuit Final Agreement and administering Crown and Inuvialuit lands respectively, and to the Hamlet and the GNWT as the administrators of Hamlet and Commissioner's Lands. The results will also be of interest to the various government departments and other granular resource users. Finally, the study can be considered a sectoral plan recommended to the Regional Land Use Planning Commission in the Beaufort/Delta region. As such, the conclusions of the study are subject to changes within the context of the larger planning exercise. Given the community basis of the plan, however, the authors do not expect fundamental changes to it.

1.4 TERMINOLOGY

Several terms describing the kinds of granular materials required by the communities and the confidence of volume estimates are used extensively throughout the plan. These terms are briefly explained in this section.

1.4.1 Classification of Granular Resources

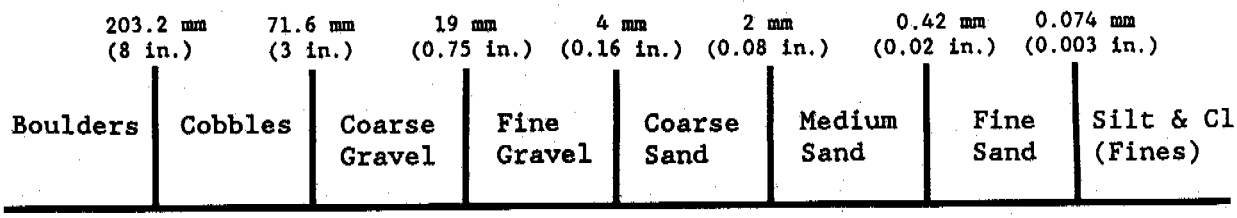
Granular resource supply and demand is discussed in terms of five classes of material:

Class 1 Excellent quality material
Class 2 Good quality material
Class 3 Fair quality material
Class 4 Poor quality material
Class 5 Bedrock, felsenmeer, and talus

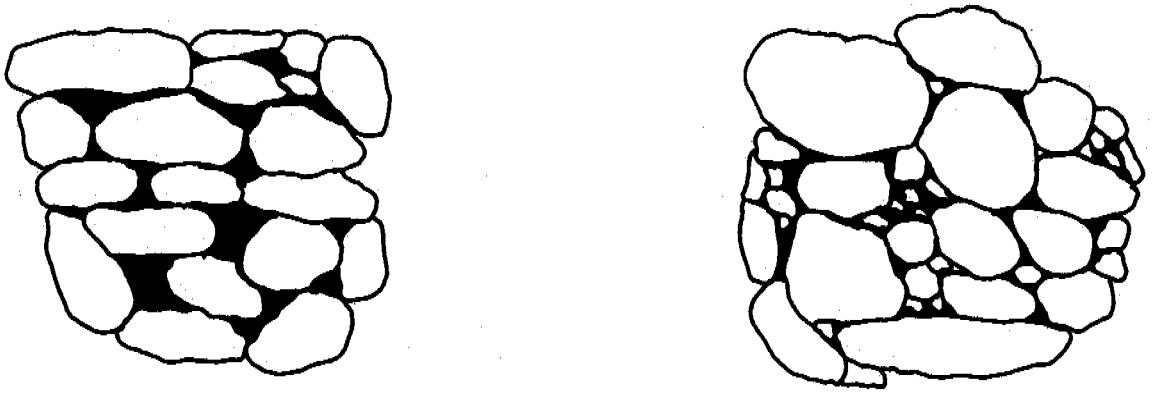
The first four classes are defined in terms of the gradation of the deposit. A brief discussion on gradation is necessary prior to describing these classes in more detail.

1.4.1.1 Gradation

The term gradation refers to the relative size of particles in a deposit. Granular resources can contain particles ranging in size from boulders through clay, as shown in Figure 2. Boulders and cobbles are usually undesirable in a granular deposit. They may be crushed to smaller sizes or discarded as waste. The gravel- and sand-sized particles are the more desirable components of a granular deposit. Silt- and clay-sized particles, also called fines, cannot be seen by the naked eye. These particles



2a. Particle size limits for gravel, sand, and fines. A well-graded granular deposit contains an equal amount of each gravel and sand size.



2b. Poorly-graded materials with all particles the same size or with a lack of certain particle sizes (left drawing) have more voids and are less stable than well-graded materials where the voids are filled by the smaller particle (right drawing).

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FIGURE 2. PARTICLE SIZE AND GRADATION

are undesirable in high proportions because they hold more water which, in the North, results in higher ice contents and a greater likelihood of frost heaving or thaw slumping.

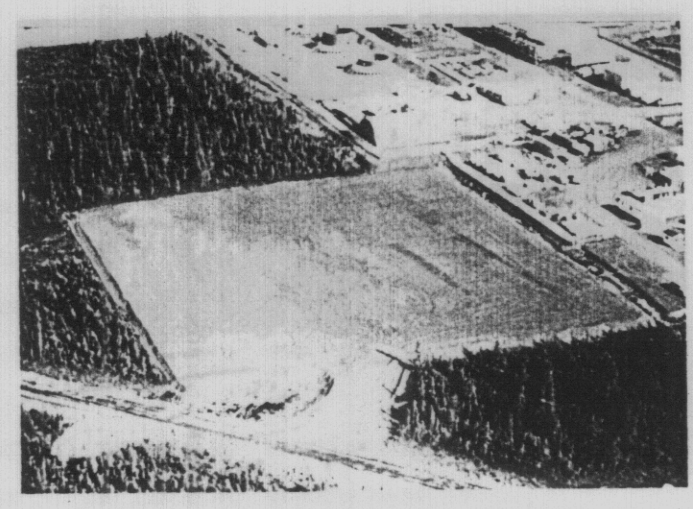
A well-graded granular deposit has an equal amount of each gravel and sand size and little or no fines. Deposits such as this are called "clean". A poorly-graded granular deposit has an excess of some particle sizes and a shortage or lack of others, or has nearly all particles the same size. Poorly-graded deposits can be processed to improve and upgrade their quality. Screening and washing can be used to remove undesirable particle sizes. Boulders and cobbles can be crushed to produce gravel and sand.

The importance of using well-graded materials for pads on which structures will be built is shown in Figure 2. With well-graded materials, the finer particles tend to fit between the coarse ones, reducing the amount of voids or empty spaces to a minimum and forming a strong pad. Pads formed of poorly-graded materials where many voids are present are more likely to shift when the weight of a structure is added.

1.4.1.2 Description of Granular Resource Classes

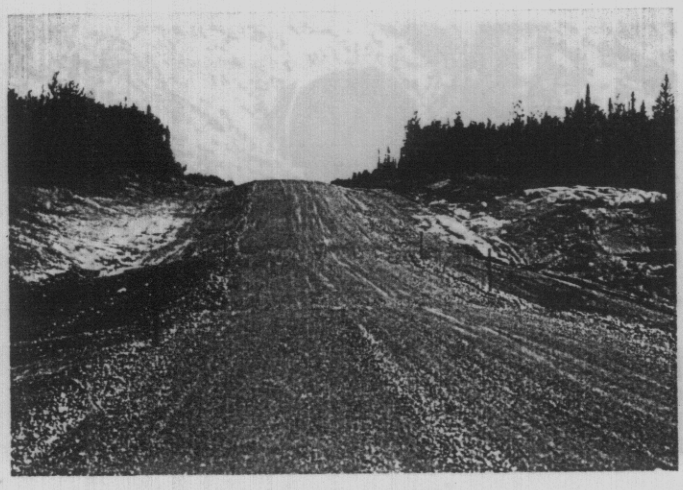
The five granular resource classes are defined below in terms of their gradation and recommended uses. Figures 3 and 4 show photographs of each class and examples of their use.

Class 1 - Excellent quality materials; well-graded, no fines.

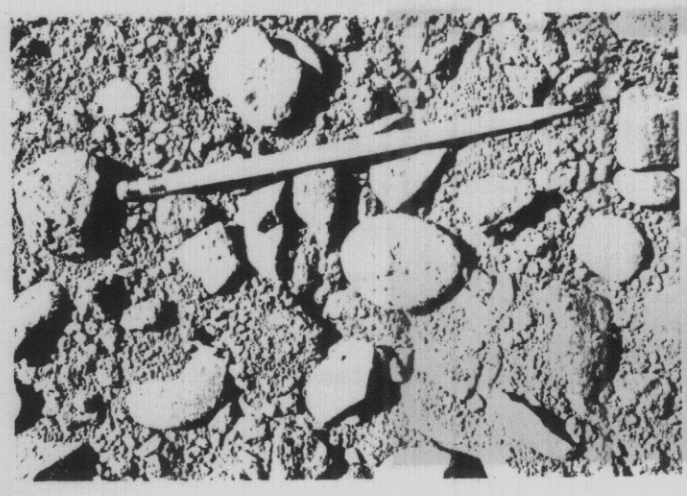


Class 1 material used for a pipeline pumping station pad at Norman Wells

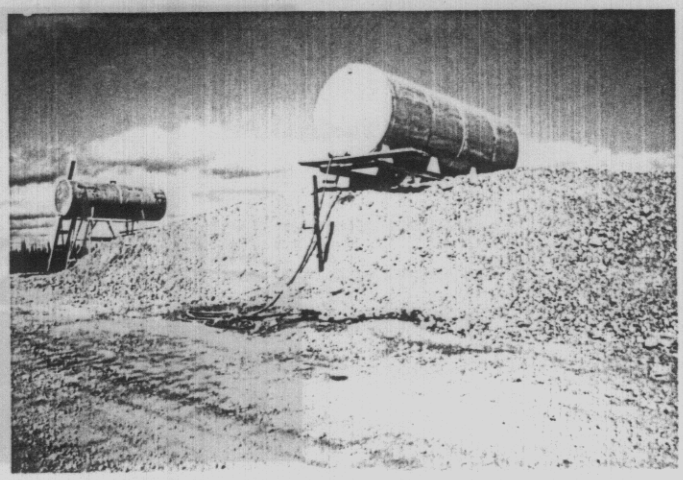
Class 2 - Good quality materials; generally well-graded, some fines



Class 2 material used for surfacing the Mackenzie Highway near Fort Simpson



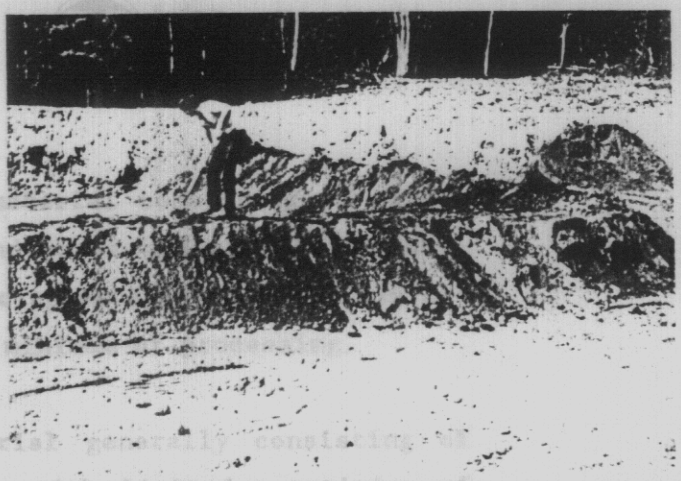
Class 3 - Fair quality materials; poorly-graded with substantial fines



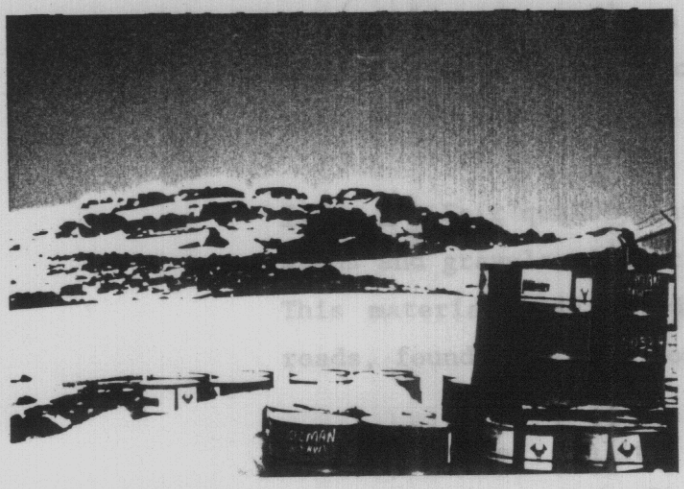
Class 3 material used as a pad for fuel storage tanks

FIGURE 3. CLASS 1,2, AND 3 GRANULAR MATERIALS

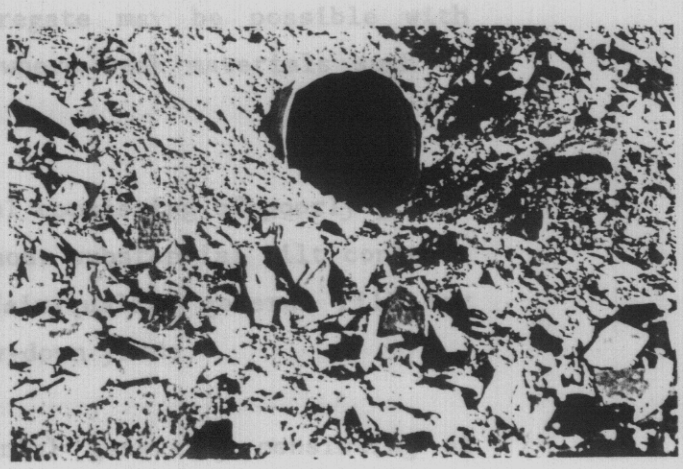
Class 4 - Poor quality materials; poorly-graded with minor gravel and a large proportion of fines



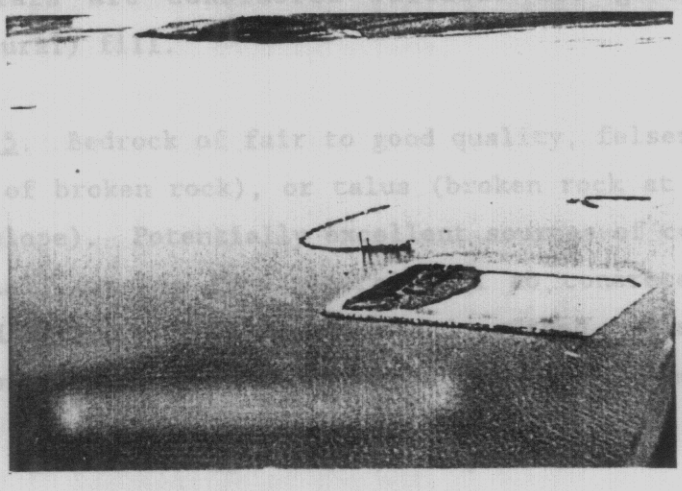
Class 4 material used as a berm around a fuel storage site



Class 5 - Outcropping of bedrock at Holman, N.W.T.



Class 5 material used as rip rap to protect a culvert outlet



Class 5 material used as armour stone around an artificial island in the Mackenzie River at Norman Wells

FIGURE 4. CLASS 4 AND 5 GRANULAR MATERIALS

Class 1. Excellent quality material consisting of clean, well-graded, structurally-sound sands and gravels suitable for use as high-quality surfacing materials, or as asphalt or concrete aggregate, with a minimum of processing.

Class 2. Good quality material generally consisting of well-graded sands and gravels with limited quantities of silt. This material will provide good-quality base and surface-course aggregates or structure-supporting fill. Production of concrete aggregate may be possible with extensive processing, except where weak materials such as shale are present.

Class 3. Fair quality material consisting of poorly-graded sands and gravels with or without substantial silt content. This material will provide fair-quality general fill for roads, foundation pads, or lay-down yards.

Class 4. Poor quality material generally consisting of silty, poorly-graded, fine-grained sand with minor gravel. These deposits may also contain weak particles. These materials are considered suitable for general (non-structural) fill.

Class 5. Bedrock of fair to good quality, felsenmeer (open areas of broken rock), or talus (broken rock at the bottom of a slope). Potentially excellent sources of construction material, ranging from general fill to concrete aggregate or building stone if quarried and crushed. Also includes erosion control materials such as rip-rap or armour stone.

1.4.2 Confidence of Volume Estimates

The volume estimates for the granular material sources identified in the EBA (1987) report are classified as being proven, probable, or prospective.

A proven volume is one whose existence, extent, thickness, and quality is supported by ground truth information such as geotechnical drilling, test-pitting, and/or exposed stratigraphic sections. Usually the thickness of material encountered in a borehole is extrapolated to a radius not exceeding 50 metres around the hole.

A probable volume is one whose existence, extent, thickness, and quality is inferred on the basis of direct and indirect evidence, including topography, landform characteristics, airphoto interpretation, extrapolation of stratigraphy, geophysical data, and limited sampling.

A prospective volume is one whose existence, extent, thickness, and quality is suspected on the basis of limited direct evidence, such as airphoto interpretation and/or general geological considerations.

1.5 IMPLICATIONS OF GRANULAR MATERIAL EXTRACTION

The development of granular resource deposits normally involves three major tasks:

(1) Obtaining access to the deposit.
(2) Development of the deposit.
(3) Reclamation of the pit.

Each of these tasks can have economic, cultural, and environmental implications associated with it.

1.5.1 Obtaining Access to the Deposit

The development of access to a source can involve significant economic costs. These costs will have a strong bearing on the cost of materials delivered to the community and on the ultimate feasibility of developing the source.

There are also several potential social and cultural impacts associated with the development of access to a granular source. The development of access, particularly year-round access, can lead to unforseen development activities in an area, and to long-term changes to an area or region which could not be anticipated at the time of the original development. Hunting, fishing, and trapping pressure on an area may increase, visitors to the region may gain access to an area that was previously accessible only to the limited population of the community, and there may be some interference with community activities in the area of the source. On the other hand, road construction may open an area to year-round recreational use by the community, or to possible tourism development benefits on the part of the community.

Environmentally, access road construction can create drainage and erosion problems and habitat destruction if proper construction techniques are not followed. Disturbance to the active layer in permafrost terrain can result in thawing and erosion. If eroded sediments enter

watercourses, fish habitat can be damaged or destroyed. Furthermore, the development of larger access roads could conceivably affect wildlife movements and result in habitat abandonment.

Access road impacts can be minimized by following guidelines presented in the INAC (1984) publication "Land Use Guidelines, Access Roads and Trails".

1.5.2 Development of the Deposit

The development of a deposit involves the stripping of vegetation, the removal of overburden, and the extraction of granular materials. The amount of vegetative stripping and overburden removal required to develop a source will play an important role in the costs of development. A thick covering of silts or clays may make the development of the source unfeasible. Similarly, the ease of extraction will affect costs. A dry deposit is much cheaper to develop than one with substantial volumes of ice, which may require blasting.

The opening of a pit may destroy important wildlife and fisheries habitat or may interfere with hunting, trapping, or fishing activities. The pit may be located in an area used for recreation by the community or be near enough to such an area that the presence of the pit will impair the aesthetics of the recreational site. As with the opening of an access road, pit development may lead to the discovery of heritage resource sites, but it also offers the opportunity to destroy such sites if their presence is not noted prior to extraction.

Environmentally, pit development offers the potential for drainage and erosion problems, habitat destruction, and wildlife disturbance. Vegetative stripping and overburden removal expose materials to wind and water erosion. The deposition of eroded materials in streams can result in damage to fish habitat. A high ice content in the deposit can result in further erosion and siltation when thawing occurs during extraction. Noise from equipment used during development can disturb wildlife during critical periods such as calving or nesting.

Guidelines to minimize the impacts of development of the deposits are available in the INAC (1982) publication "Environmental Guidelines Pits and Quarries".

1.5.3 Reclaiming the Pit

The costs of pit abandonment and reclamation should be factored into the costs of developing a source. Pits which have not been properly restored can be subject to unnecessary longer-term erosion and drainage problems. Pit reclamation can enhance the recreational and habitat capabilities of a site.

Reclamation guidelines for pits and quarries are included in the INAC (1982, 1987) publications "Environmental Guidelines Pits and Quarries" and "Reclamation Guidelines for Northern Canada".

PART 2: PLAN GOALS

The definitions, principles, and goals of the Inuvialuit Final Agreement form the basis of this plan.

The underlying goal of the community is the enhancement of an economy on Banks Island that is consistent with the hunting, fishing, and trapping economy and with the long-term conservation of the renewable resource base of the community. It is generally agreed that no development should waste resources, either renewable or non-renewable.

Specifically, the goals of this plan are:

(1) To reserve adequate supplies of appropriate quality granular materials for the community's future needs.

(2) To site and manage these reserves within reasonable distance of the community, and so as to ensure that granular development does not interfere with wildlife, archaeological resources, or with people out camping, hunting, fishing, or trapping.

(3) To minimize the negative environmental and visual effects of granular development (pits and access roads). To prevent drainage problems. To ensure that pits are fully restored when depleted.

(4) To ensure that the development of granular materials is well planned and managed, so that the materials in existing and planned pits are fully used and are not wasted.

PART 3: PRESENTATION AND ASSESSMENT OF RESOURCE INFORMATION

3.1 PHYSICAL SETTING

Sachs Harbour is located on the southwest tip of Banks Island. Granular deposits mapped by EBA (1987) lie within the area bounded on the south and west by the Beaufort Sea, on the north by the Kellett River, and on the east by Picnic Lake (Figure 5). All of the deposits are on 7(1)(a) or Hamlet lands.

Most of the Sachs Harbour area is rolling lowlands; the area southeast of the settlement is an outwash plain.

Banks Island has been extensively glaciated during the Quaternary Period (the last three million years, approximately) and the surficial sediments and landforms reflect the interaction between glaciers and the sea. Five types of sediments have been mapped by Vincent (1980, 1983) in the Sachs Harbour area:

(1) till
(2) fluvial and glaciofluvial deposits
(3) marine deposits
(4) aeolian deposits
(5) pre-glacial deposits

The distribution of these sediments is shown in Figure 6 and described below. The granular deposits identified in the Sachs Harbour area occur in the till, fluvial deposits, and marine deposits.

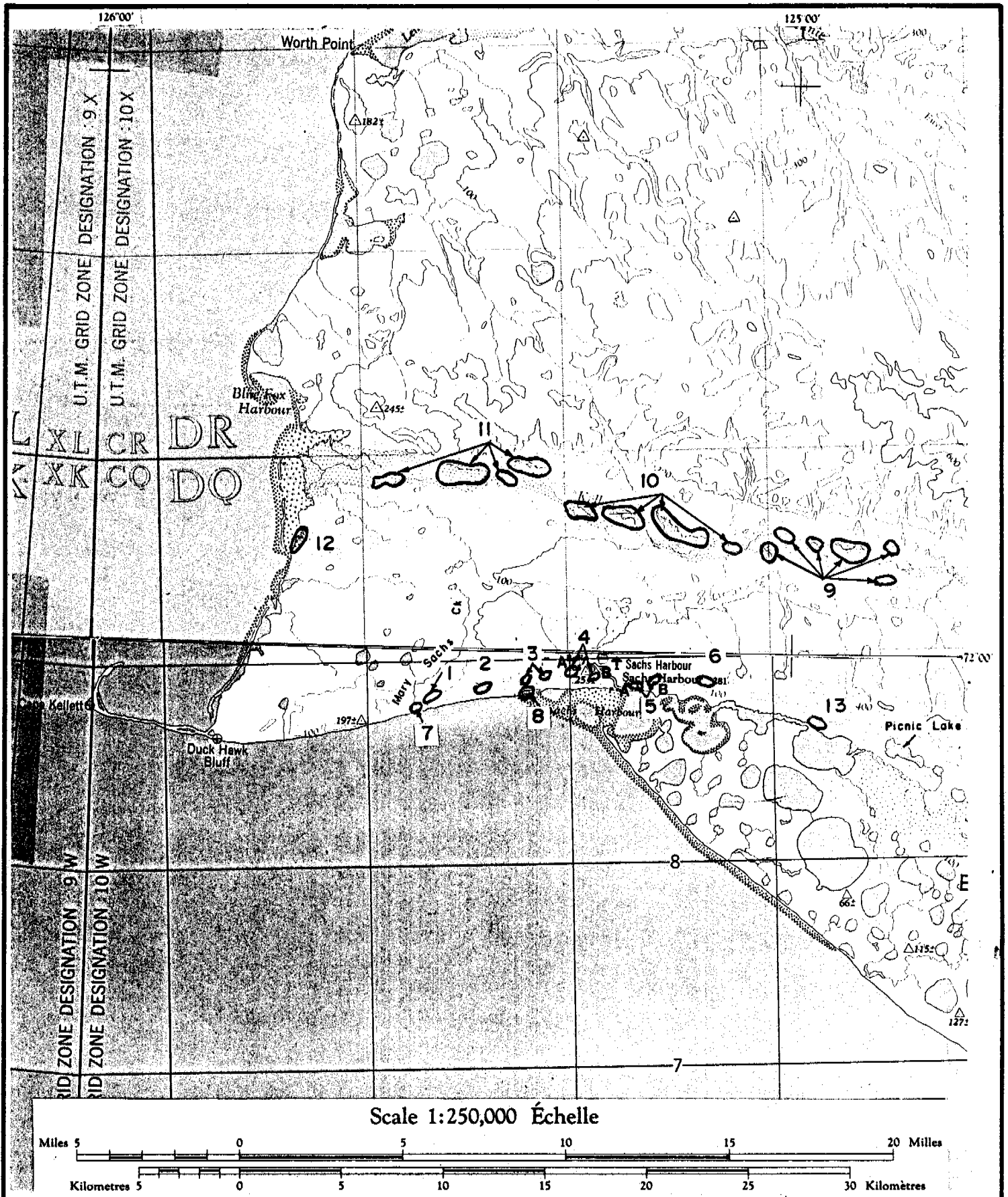


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FIGURE 5. LOCATION OF GRANULAR DEPOSITS, SACHS HARBOUR, N.W.T.

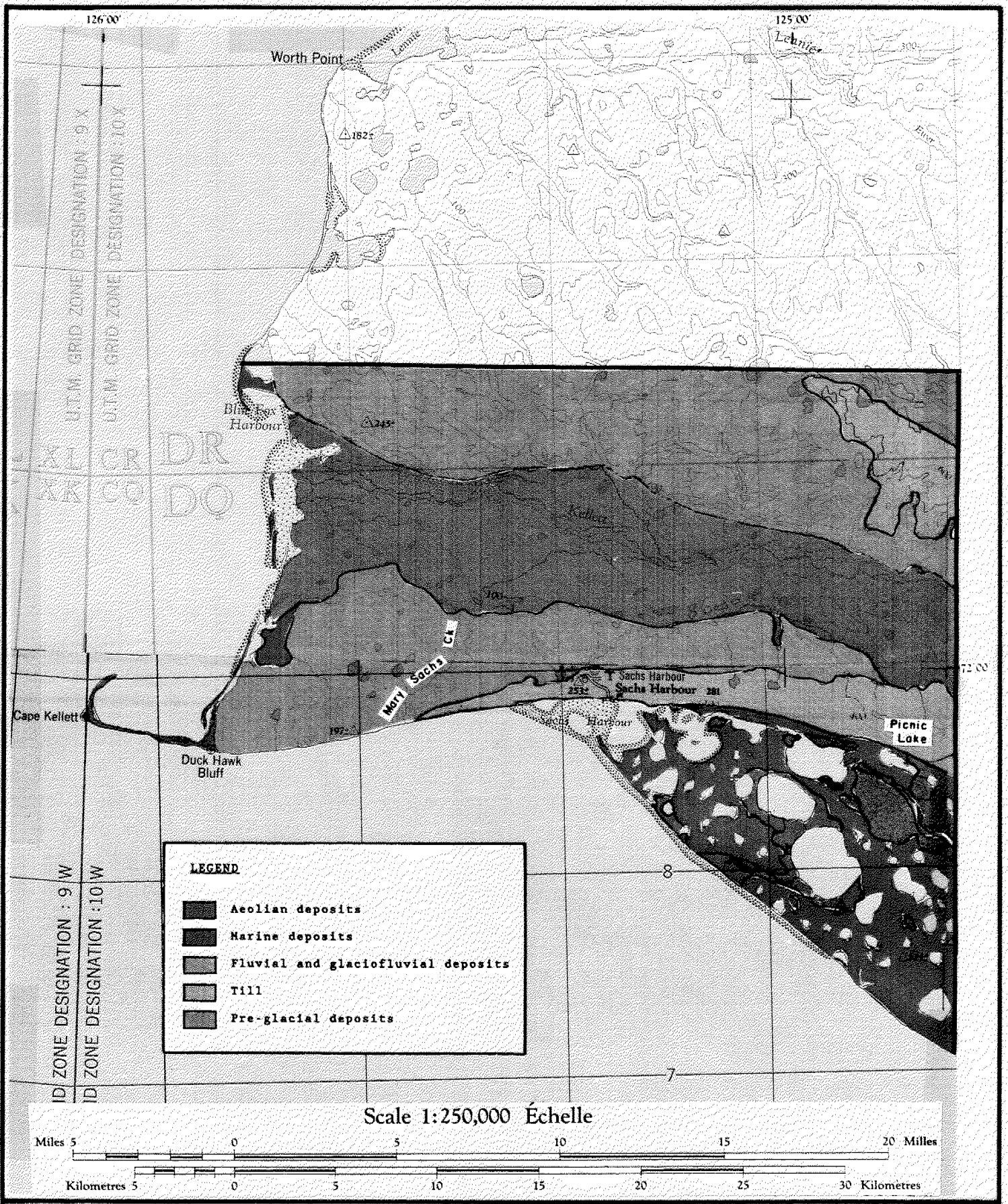

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FIGURE 6. DISTRIBUTION OF SURFICIAL SEDIMENTS IN THE SACHS HARBOUR AREA

Till, deposited by glaciers, is a mixture of gravel, sand, silt, and clay. In the Sachs Harbour area, till consists largely of gravel and sand, with about 20 percent fines.

Fluvial and glaciofluvial deposits consist principally of sands, gravels, and silts deposited along present rivers and by glacial meltwater streams during various glaciations. These materials occur along the present-day Sachs and Kellett river floodplains.

Sand and gravel deposited by glacial meltwater in the shallow embayment southeast of Sachs Harbour have been reworked by waves and are classified as marine deposits. Sand and gravel present as spits and beaches along the modern coastline are also classified as marine deposits.

Aeolian deposits are the fine sand and silt with traces of organic matter that have been transported by wind. These sediments overlie portions of the marine deposits in the shallow embayment southeast of Sachs Harbour.

The pre-glacial deposits are dominantly gravel, sand, and minor organic matter with small areas of silt and clay intermixed in the area along Mary Sachs Creek.

3.2 COMMUNITY SETTING

Sachs Harbour is a small Inuvialuit community located on the southwest coast of Banks Island. In this century, Banks Island appears to have been settled more or less permanently only from the late 1920's onwards, when several

Mackenzie Delta families moved to the area to trap foxes. The historical use of the Island stretches back, however, for at least 3600 years (Moll 1987).

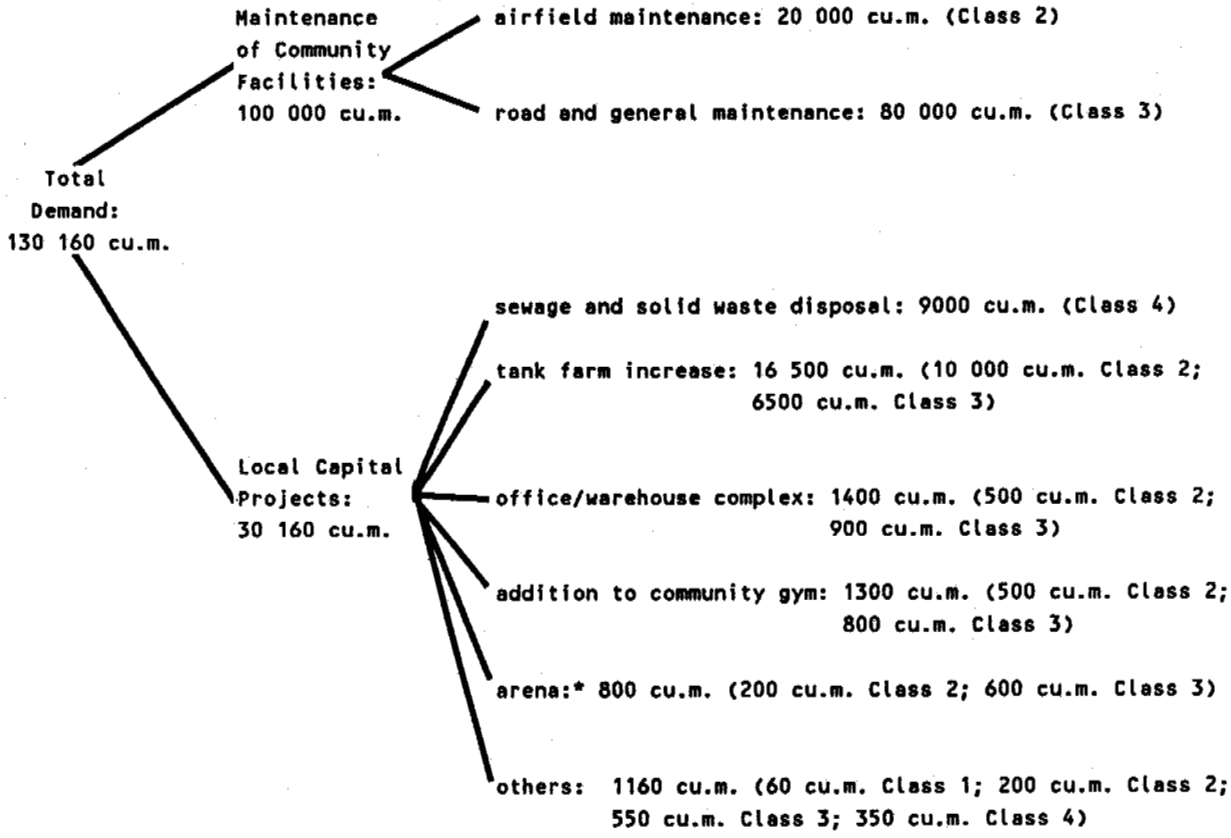
During the trapping era, from the late 1920's to the early 1960's, most Banks Islanders wintered in small camps along the coast of the island. During this period their economy was a mixed one, relying both upon the prosperous trapping sector, as well as upon subsistence hunting and fishing. The orientation of these people was seasonal (as is the present renewable resource orientation of the community), and caribou, seal, fish, waterfowl, polar bear, musk-ox, and fox were taken during different times of the year. Many Banks Islanders travelled to the mainland by schooner in the summer to trade. In 1953, the RCMP set up a post at Sachs Harbour, and in 1955 a weather station was established by the Department of Transport. A general store was opened in 1958 and by 1961 most Inuvialuit had left their traditional land based camps to settle in Sachs Harbour (Usher 1976). In 1986, the year the community was incorporated as a hamlet, the population of Sachs Harbour was 158 (Statistics Canada 1986).

As in many Arctic communities, the economy of Sachs Harbour is a blend of the cash economy and the hunting, fishing, and trapping economy and way of life. Accurate figures on the relative contribution of different sectors to the overall cash economy are not, however, available. In non-quantitative terms, the community derives its income from employment with the Hamlet, the Government of the Northwest Territories, the school, and the Nursing Station; from local private service, transportation, and tourism/big game

hunting businesses; from Federal and Territorial transfer payments; and from trapping. Generally speaking, the economic orientation of the community is two-fold: on the one hand, it relies on a diversity of private businesses and wage employment for the income necessary in a modern community. On the other, Sachs Harbour continues to look to the hunting, fishing, and trapping economy and way of life for a significant proportion of its food, and for many of its cultural and economic values. While the people of Sachs Harbour want to diversify and enhance their local economy, they are also concerned that environmental quality and wildlife habitat and populations be preserved.

3.3 NEED FOR GRANULAR MATERIALS (DEMAND)

Figure 7 presents the forecast 20-year demand for granular materials in Sachs Harbour, based on the EBA (1987) figures. Of a total forecast demand of approximately 130 000 cubic metres over 20 years, approximately 100 000 cubic metres will be required for the maintenance of community facilities. Of the 100 000 cubic metres, approximately 20 000 cubic metres of Class 2 materials will be needed for airstrip maintenance; the remaining 80 000 cubic metres is for Class 3 materials for road and general maintenance. Local capital projects will consume a further 30 000 cubic metres of granular materials. The main capital users are shown in Figure 7. They include sewage/solid waste disposal (9000 cubic metres, Class 4), a tank farm increase (16 500 cubic metres Classes 2 and 3), an office/warehouse complex (1400 cubic metres, Classes 2 and 3), an addition to the community gym (1300 cubic metres, Classes 2 and 3) and an arena (800 cubic metres,



* arena constructed in 1987

Hardy BBT Limited
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

FIGURE 7.

REQUIRED VOLUMES OF GRANULAR MATERIALS (DEMAND) BY MAIN USERS, SACHS HARBOUR 1987-2006 (EBA 1987)

Classes 2 and 3). Since the completion of the EBA report, the arena has been constructed.

Table 1 focuses more specifically on the volumes of different classes of materials that will likely be required in the community for each five-year period. The preponderance of the community's forecast demand will be for Class 2 and Class 3 materials: approximately 30 000 to 35 000 cubic metres of Class 2, and 90 000 to 95 000 cubic metres of Class 3 materials will likely be required. Approximately 10 000 cubic metres of Class 4 materials will also be required.

The present study was not mandated to revise the forecast demand figures. However, any new or changed projects, as identified in the workshop and which may affect the demand, were noted. Community representatives have pointed out that a new school and golf course are being talked about, and that the construction of two to three houses a year has not been specifically accounted for in the forecasts. Furthermore, airfield, road, and general maintenance are virtually the only demands accounted for in the last 15 years of the 20-year forecast period. On the whole, however, the demand figures appear sufficiently accurate for the purpose of setting aside reserves, particularly given the fact that the figures and the reserves must be reviewed at least every 5 years.

3.4 POTENTIAL SOURCES OF SUPPLY

Granular material sources in the Sachs Harbour area are shown in Figure 5 and described in Table 2. Nearly all

TABLE 1

REQUIRED VOLUMES OF GRANULAR MATERIALS (DEMAND), IN CUBIC METRES, AND RECOMMENDED SOURCES OF SUPPLY, SACHS HARBOUR, 1987 - 2006 (FROM EBA 1987)

Class	1987-91	1992-96	1997-2001	2002-06	Totals	Recommended Sources
Class 1	100	0	0	0	100	SH-13
Class 2	16 400	5 000	5 000	5 000	31 400	SH-13
Class 3	29 200	20 200	20 000	20 000	89 400	SH-1-5
Class 4	9 400	0	0	0	9 400	SH-1-5
Class 5	0	0	0	0	0	-
				TOTAL	130 000	

Note: EBA figures used in this table have been rounded to the nearest 100 cu.m.

TABLE 2

GRANULAR MATERIAL SOURCES - SACHS HARBOUR
(FROM EBA 1987)

urce o.	Location	Estimated Volume	Access	Comments
-SH-1	9 km west of Sachs Harbour	170 000 m^3 Class 3 (prospective)	All-weather road	(1) Used with Source 7 to meet air strip upgrading requirements in late 1970-s - early 1980's. (2) Within Banks Island Bird Sanctuary No. 1
-SH-2	6 km west of Sachs Harbour	30 000 m^3 Class 3 (prospective)	All-weather road	Part of area identified by Hamlet foreman as proposed granular material source (parallelling road to Mary Sachs Creek).
-SH-3	4 km west of Sachs Harbour	25 000 m^3 Class 3 (prospective)	All-weather road	Part of area identified by Hamlet foreman as proposed granular material source (parallelling road to Mary Sachs Creek).
-SH-4	West side of Hamlet of Sachs Harbour	50 000 m^3 Class 3 (probable)	All-weather road	Source has been depleted to meet local needs.
-SH-5	East side of Hamlet of Sachs Harbour	30 000 m^3 Class 3 (prospective)	All-weather road to 5a; tundra road in winter to 5b	(1) Source has western (5a) and eastern (5b) components. (2) 5a is on lands administered by the Hamlet; 5b on Inuvialuit lands. (3) Source 5a is nearly depleted.
-SH-6	4 km east of Sachs Harbour	20 000 m^3 Class 3 (prospective)	Tundra road in winter	(1) Not considered a priority source by workshop participants. (2) Possible secondary source of Class 3 materials.
-SH-7	10.5 km west of Sachs Harbour	20 000 m^3 Class 3 (prospective)	All-weather road to Source 1	(1) Locally considered a source of sand (2) Within Banks Island Bird Sanctuary No. 1
-SH-8	4 km west of Sachs Harbour	200 000 m^3 Class 3 (prospective)	Ice road in winter; along the beach in summer, or via all-weather road	(1) Not considered a priority source by workshop participants. (2) Potential for inclusion with other sources parallelling road to Mary Sachs Creek as next Hamlet source.

TABLE 2 (Continued)

GRANULAR MATERIAL SOURCES - SACHS HARBOUR
(FROM EBA 1987)

urce o.	Location	Estimated Volume	Access	Comments
-SH-9	10 km north-northeast of Sachs Harbour	2 000 000 m^3 Class 3 (prospective)	Tundra road in winter	Not considered a priority source by workshop participants.
-SH-10	9 km north of Sachs Harbour	4 500 000 m^3 Class 3 (prospective)	Tundra road in winter	Not considered a priority source by workshop participants.
-SH-11	13 km north-northwest of Sachs Harbour	6 500 000 m^3 Class 3 (prospective)	Tundra road in winter	Not considered a priority source by workshop participants.
-SH-12	18 km west-northwest of Sachs Harbour	100 000 m^3 Class 4 (prospective)	Tundra road in winter; barge in summer	Not considered a priority source by workshop participants.
-SH-13	10 km east-southeast of Sachs Harbour	30 000 m^3 Class 2 (prospective)	Ice road in winter; barge in summer	Considered sensitive with respect to environmental and social-cultural considerations by workshop participants.

sources have been rated by EBA as Class 3. Source 13 is rated Class 2 and Source 12, Class 4. There are no known sources of Class 1 or Class 5 materials near Sachs Harbour.

The Hamlet has been using sources 4 and 5 to meet local needs. These sources are on lands administered by the Hamlet and are nearing depletion (Graham Roberts, pers. comm.). The community will thus be looking increasingly to Inuvialuit lands for sources to supply its needs.

3.4.1 Class 1 and 2 Materials

EBA has recommended the reservation of Source 13 for the community's Class 1 and 2 requirements (Table 1). Source 13 lies on Inuvialuit lands approximately 10 km east of the community (Figure 5). If developed, it would likely be connected to the community by a winter ice road.

Source 13 is the only identified supply of materials better than Class 3 in the area. It has a prospective volume of 30 000 cubic metres of Class 2 material. Sachs Harbour's projected 20-year public community requirement for Class 1 and 2 materials is approximately 32 000 cubic metres. Any shortfall would have to be met with Class 3 materials.

Community representatives suggest that Source 1, known locally as the Mary Sachs Pit, may be used to meet Class 1 and 2 requirements. Source 1 lies on Inuvialuit land, 9 km west of the community, and is accessible by an all-weather road.

Source 1 was originally developed by the Department of Transport for runway construction in the late 1970's and early 1980's. Although Source 1 was rated Class 3 by EBA, the very low maintenance requirement of the runway (no gravel added in the last 2 years - Graham Roberts, pers. comm.) suggests that higher-quality materials are available in the source. Source 1 has a prospective volume of 170 000 cubic metres and could contain a sufficient volume of higher-class materials to meet the community's 20-year Class 1 and 2 requirements (32 000 cubic metres).

3.4.2 Class 3 and 4 Materials

EBA recommends the reservation of sources 1 through 5 to meet the community's Class 3 and 4 requirements. With the exception of sources 4b and 5, these sources lie west of the community on Inuvialuit lands (Figure 5). They are connected to the community by a 9-km, all-weather road to Source 1. Sources 4b and 5a lie on lands administered by the Hamlet. Source 5b lies on Inuvialuit lands just east of the community.

Sources 1 through 5 have a prospective volume of 305 000 cubic metres of Class 3 materials. The community's Class 3 and 4 requirements are approximately 100 000 cubic metres. EBA recommends using Class 3 materials from these sources for the community's Class 4 needs because of the excess of Class 3 materials available, the small volumes of Class 4 materials required, and the greater distance to Source 12, the only Class 4 source identified in the area.

Workshop participants concur with the use of the lower-class materials at Source 1 and the materials at sources 2, 3, and 5 to meet Class 3 and 4 requirements and suggest that Source 7 could also be used.

3.4.3 Class 5 Materials

Sachs Harbour has no foreseeable requirement for nor source of Class 5 granular materials.

3.5 ASSESSMENT OF POTENTIAL SOURCES

3.5.1 Sources 1, 2, 3, 5, and 7 (Sachs Harbour to Mary Sachs)

The area from Sachs Harbour to Mary Sachs (Sources 1 and 7) is generally well-drained and bare of vegetative cover and overburden. Extensive excavation and stockpiling of covering materials would thus be unnecessary. The area is significant neither for wildlife nor for the local hunting, fishing, and trapping economy. In fact, the Mary Sachs Pit was originally chosen and developed with environmental considerations in mind (Andy Carpenter, pers. comm.). There are no locally-known archaeological resources in the area. While local people sometimes use the Mary Sachs area for picnics, conflicts between gravel extraction and local activities are not expected by community representatives and have not been significant in the past. The Mary Sachs Pit is accessible by an all-weather road needing little maintenance. Materials can thus be excavated and stockpiled during July and parts of June and August for year-round use.

The consensus of the workshop was that Sources 1, 2, 3, 5, and 7 could be reserved and developed without significant environmental or social impacts.

3.5.2 Source 13

The development of Source 13 would likely entail removal of vegetation and overburden. The source is also in a coastal embayment. Care would thus have to be taken to avoid drainage and coastal erosion problems. The Source 13 area is used in some years by nesting waterfowl (from June to the end of July). It is also used for fox trapping and hunting caribou in the winter, for local camping in the spring, and for fishing in the spring and fall (char and trout). There are no locally-known archaeological resources in the area. The development of Source 13 would likely entail the construction of an ice road for winter extraction, or the use of barges for summer extraction.

The consensus of the workshop was that the development of Source 13 could have minor effects on drainage, coastal stability, waterfowl habitat, and areas used by local people for camping.

3.5.3 Sources 9, 10, or 11 (Kellett River Sources)

In the event that higher-quality materials are not available in the Mary Sachs Pit (Source 1), the community would prefer that exploration be carried out along the Kellett River, to determine the potential of sources 9, 10, and 11 for supplying Class 2 material, prior to the reservation and development of Source 13. These sources

are presently considered to contain Class 3 materials and could also satisfy the community's long-term demand for lower quality materials. The Kellett River area is not highly used by wildlife or local people. While the general area is used by caribou and for caribou hunting in some winters, significant impacts are not expected from the sort of development proposed. Nor is the area particularly important for waterfowl nesting, local fishing, or camping. Were a source developed in this area, a 9-to-13 km long road would be required to connect it to the community.

Physical impacts, in the form of permafrost thawing, slumping, water and wind erosion, and stream siltation could occur if a Kellett River source were developed. The consensus of the workshop was that a Kellett River source could be reserved and developed, if required however, without unacceptable environmental and social impacts. A letter from Fisheries and Oceans Canada outlining recommended procedures to minimize impacts to fisheries resources at such sites is included as Appendix A.

3.6 COMPARATIVE ASSESSMENT OF SOURCES

A comparative assessment of the granular resource sites near Sachs Harbour is summarized in Table 3 and discussed below.

The potential environmental and social impacts of developing Sources 1, 2, 3, 5, and 7 are considered acceptable by community representatives. The concentration of development in the area west of the community to Mary Sachs would minimize the area under development. These

TABLE 3

COMPARISON OF GRANULAR RESOURCE SOURCES -
SACHS HARBOUR

Source	Use	Environmental and Aesthetic Considerations	Wildlife and Social-Cultural Considerations	Economic Considerations	Comments	Ranking	
						Significance of Impacts	Acceptability of Development
SH-1,2,3, 5,6,7,&8	Class 1, 2, 3 & 4 needs	Least sensitive option: all-season access already available, no overburden stripping required.	Least sensitive option: area is not significant for wildlife, hunting, fishing or trapping. Conflicts with recreational uses not expected.	Least expensive option: accessible by existing all-weather road.	Testing program required to prove presence of material suitable for Class 1 and 2 needs. Sources 6 and 8 considered as secondary sources. Source 4 is depleted.	Insignificant	Acceptable
SH-9,10,11	Class 3 needs	Potential for erosion on Kellett River banks and on terrain exposed by vegetative stripping and overburden removal.	Not important for wildlife, fishing, or trapping. Not an important camping area.	Construction of a tundra road, 9-to-13 km long, required each winter.	Further examination of Kellett River area suggested to search for Class 2 materials.	Significant	Acceptable
SH-13	Class 2 needs	Vegetation and overburden removal required. Potential for drainage disruption and shoreline erosion.	Used in some years by nesting waterfowl. Used for fox trapping, caribou hunting, camping and fishing.	Construction of an ice road, 10 km long, required each winter.	Preferred as a last option, only if no suitable materials available in other sources.	Significant	Acceptable only as a last resort
SH-12	Class 4 needs	Not addressed.	Not addressed.	Construction of a tundra road, 18 km long required each winter; barge in summer.	Not considered a viable source because of excess volumes of Class 3 material available close to the community and long haul distance.	Significant economic considerations	Not acceptable

sources are also the most accessible and least expensive for the community to develop. Sources 6 and 8, although not considered priority sources, could be developed with sources 1,2,3,5, and 7 if necessary. The development of a Kellett River source would also be acceptable to the community, if required. The development of Source 13, on the other hand, is of some concern to the community on environmental and social grounds. The community would prefer that Source 13 be reserved and developed for high-quality materials only if necessary, and only after the potential of Sources 1, 2, 3, 5, and 7 and sources along the Kellett River had been explored, and any suitable materials encountered had been exhausted.

Sachs Harbour's 20-year demand for granular materials (all classes) is approximately 130 000 cubic metres. Sources 1, 2, 3, 5, and 7 are estimated to contain a prospective volume of 275 000 cubic metres. If a sufficient volume of Class 2 materials exists in the Mary Sachs Pit (Source 1), sources 1, 2, 3, 5, and 7 should satisfy the community's future needs. The reservation of Source 13 (or of a Kellett River source) for the community's higher quality needs would then be unnecessary.

It should be noted here that all areas greater than 8 km from the community are within Banks Island Sanctuary No. 1. They are therefore protected under the Migratory Birds Convention Act. It is very unlikely, however, that the scale of development planned would have significant effects on regional migratory bird populations. Thus the Canadian Wildlife Service would likely issue a permit for the

development under the Migratory Bird Sanctuary Regulations (Kevin McCormick, pers. com.).

PART 4: PLAN RECOMMENDATIONS

(1) Granular sources from the community west to Mary Sachs Creek (sources 1,2,3,5, and 7) should be reserved for public community use in Sachs Harbour. The private and corporate interests of the Inuvialuit should be assured access to these reserves, provided that the estimated total (public and Inuvialuit) 20-year demand is within the estimated volumes of the reserves. The development of granular materials for public and Inuvialuit needs should be confined to this area until such time as these reserves can no longer meet community requirements. If carefully managed, these reserves should prove adequate for the community's foreseeable future needs. Unless otherwise approved, however, these reserves should not be made available to other substantial users.

(2) Given the speculative nature of existing supply information, the quality and quantity of materials in the area from the community west to Mary Sachs and particularly in the Mary Sachs area itself should be more reliably determined.

(3) The community would prefer that exploration for higher quality (Class 2) sources be carried out along the Kellett River prior to the development of Source 13. The potential development of a Kellett River source, including access, is considered less significant from the perspective of wildlife and local harvesting impacts than is the potential development of Source 13. If higher-quality materials in the area west of the community are proven insufficient to meet the projected demand or are depleted, Source 13 should be reserved.

(4) It is recommended that a granular development and environmental protection plan be produced for the area west of the community to Mary Sachs Creek. This plan should be produced in consultation with local and regulatory authorities (see Appendix A), and should come under the approval of ILAC. The plan should lay out a 5-to-10 year strategy for the orderly development of the area as a whole, so as to ensure that the goals of Part 2 of this plan are met. It should therefore ensure that the area is developed so as to minimize environmental and aesthetic effects,

and maximize the amount of materials recovered from the area. It should also lay out procedures for the proper development and restoration of pits. It is recommended that the extraction of materials from the area be actively managed, so as to minimize high grading and ensure a matching of the class of materials required for a job with the class of materials used.

(5) The Canadian Wildlife Service should be consulted, and a permit under the Migratory Bird Sanctuary Regulations should be obtained for the development of sources within Banks Island Sanctuary No. 1.

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APPENDIX A

LETTER FROM NANCY WITHERSPOON, HABITAT MANAGEMENT BIOLOGIST, WESTERN ARCTIC AREA, FISHERIES AND OCEANS CANADA

Government of Canada / Gouvernement du Canada
Fisheries and Oceans / Pêches et Océans

May 29, 1988

Your file / Votre référence

Our file / Notre référence

Fisheries & Oceans
Western Arctic Area
Box 1871
Inuvik, NWT
X0E 0T0

Mr. Tom Nesbitt
Thomas Nesbitt and Associates
5210 Lundquist Road
Yellowknife, NWT
X1A 3G2

GRAVEL EXTRACTION IN THE WESTERN ARCTIC AREA

Dear Tom:

We have looked at existing and potential sites for gravel extraction in our area and provide the following comments related to the fisheries resources:

1. Gravel extraction near creeks or lakes should be conducted so that:
   a) silt is not released into the water body
   b) bank disturbances are minimized as are changes to the shape and direction of the watercourse
   c) that watercourses are not dammed as a result of the activity
   d) pounding along side watercourses does not take place
   e) spawning gravels are not removed on creek or river bottoms
   f) refuse does not enter water bodies
   g) winter and summer road construction to the sites are constructed to minimize disruptions to water bodies as outlined above
   h) any summer operations near water bodies should be conducted outside fish migratory or spawning periods if they are conflicting

2. Underwater gravel extractions should be conducted giving consideration to;
   a) type of equipment used for extraction
   b) timing of migration and spawning of species in the area
   c) utilizing of the areas by fish for feeding or rearing

Specific sites identified that have fisheries concerns include:

1. Aklavik area sites 455 and 467

....2

2. Tuk area sites 155, 160, 162 and 158

3. Inuvik area sites 2.45, 2.44, 2.43,314, R28 and R29

4. Sachs Harbour sites 9, 10 and 11

5. Paulatuk sites 14 to 19

All sites could be reviewed in detail as they come up for development.

I hope this will assist you in producing your report and if you have any questions don't hesitate to contact me or Richard Barnes at (403)979-3314.

Yours truly,

Nancy Witherspoon
Habitat Management
Biologist
Western Arctic Area

cc: D.V. Gillman
B. Wong
J. Stein
R. Barnes