

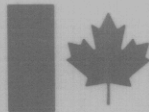
EBA Engineering Consultants Ltd.

Civil, Geotechnical and Materials Engineers

**INUVIALUIT SETTLEMENT
SAND AND GRAVEL INVENTORY
AND RECOMMENDATIONS
FOR DEVELOPMENT**

SACHS HARBOUR, N.W.T.

PREPARED FOR



**INDIAN AND NORTHERN AFFAIRS
CANADA**

APRIL 1987



INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

SACHS HARBOUR

**REPORT SUBMITTED TO
INDIAN AND NORTHERN AFFAIRS CANADA**

**SUBMITTED BY
EBA ENGINEERING CONSULTANTS LTD.**

0101-4575

APRIL 1987



EXECUTIVE SUMMARY

This report presents the results of a study, conducted under the terms of the Inuvialuit Final Agreement, to determine the supply of granular materials and the 20-year demand for granular materials in the community of Sachs Harbour. Development scenarios and recommendations designed to optimize the utilization of resources for the anticipated demand are presented.

In summary, the 20-year demand for granular materials in the community is about 130,000 cubic metres. Most of the demand is for maintenance of community facilities (100,000 cubic metres) while local capital projects consume the remainder (30,000 cubic metres).

Granular materials sufficient to meet the forecast demand are available in the Sachs Harbour area, although in some cases the demand must be satisfied with materials of a slightly lower quality than desirable. In particular, this is the case for concrete aggregate which does not exist in quantity in the Sachs Harbour vicinity.

The community has several convenient sources of Class 3 (general) granular material. Development of these sources should continue in the manner that has been established. These sources are located adjacent to the community and currently provide a substantial portion of Sachs Harbour's public demand. It is important that these deposits are reserved for use on community projects. Development of these sources should continue in the manner that has been established.

Substantial volumes of fair quality granular material exist several kilometres from the community. Development of these sources is only recommended if the current community deposits become depleted or if a large unforeseen project were to develop.



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1.0 INTRODUCTION

1.1 Background

The Inuvialuit Final Agreement provided that Canada grant to the Inuvialuit, fee simple title to a land quantum of 90,650 square kilometres (35,000 square miles) in the Western Arctic Region. The Agreement further specified that the land be sub-divided into two categories, that with mineral rights and that without. For purposes of classification, the two categories have become known as 7(1)(a) and 7(1)(b) lands, respectively. The former includes 12,950 square kilometres (5,000 square miles) of lands; the latter 77,700 square kilometres (30,000 square miles). The 7(1)(a) lands are generally located adjacent to each of the six communities (Aklavik, Holman, Inuvik, Paulatuk, Sachs Harbour and Tuktoyaktuk, Figure 1) considered in the Final Agreement. The 7(1)(b) lands generally surround the 7(1)(a) lands and extend outward from the communities.

The Agreement recognized that most of the proven granular resources of acceptable quality within reasonable distance of the communities were located on Inuvialuit 7(1)(a) lands. In order to ensure that adequate reserves of granular material were maintained at a regulated cost, the Agreement granted control of the 7(1)(a) granular resources to the Inuvialuit, subject to certain provisions.

For purposes of the project described in this report, the provisions concern the supply of, and the demand for, granular resources. Under the terms of the provisions, the Inuvialuit agreed to maintain granular material reserves of appropriate quality sufficient to meet the projected 20-year demand as determined by the Inuvialuit Land Administration [ILA] and appropriate levels of government. The demand for granular materials was to be formed on the basis of estimates of requirements in each community.

In order to ensure that adequate supplies of sand and gravel of appropriate quality remained available within reasonable distance of the communities, the provisions stipulated that the supply of granular materials should be prioritized according to end use as determined by the 20-year demand. The first priority was established as the need of the community, the second priority is the need of the Inuvialuit and the third priority is the need of others.

Indian and Northern Affairs Canada [INAC], on behalf of the ILA, has undertaken to develop a granular resources inventory and management plan to fulfill these initial

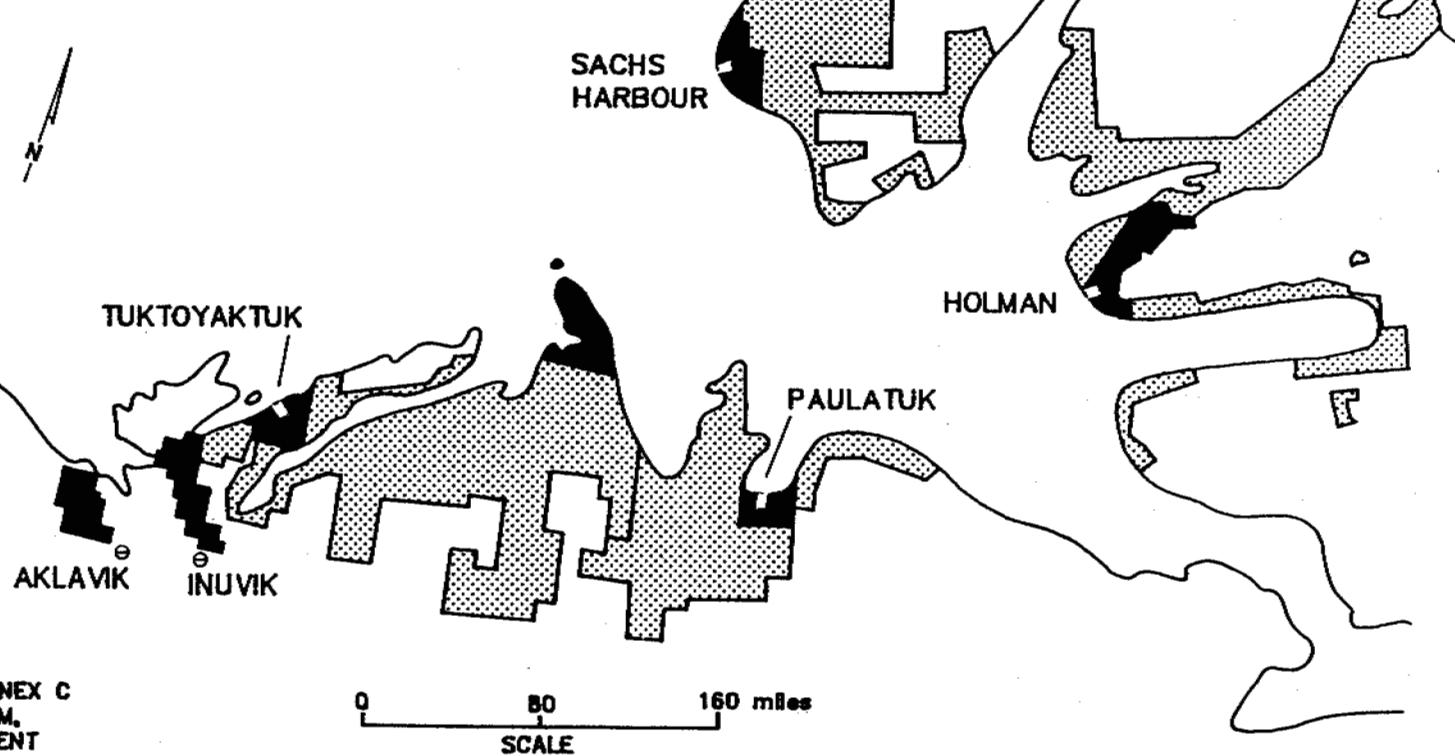


LEGEND

7(1)(a)

7(1)(b)

NOTE:
PLAN OBTAINED FROM ANNEX C
OF WESTERN ARCTIC CLAIM,
INUVIALUIT FINAL AGREEMENT



EBA Engineering Consultants Ltd.

PROJECT

**GRANULAR RESOURCES INVENTORY
AND MANAGEMENT PLAN**

CLIENT

INDIAN AND NORTHERN AFFAIRS CANADA

TITLE

**INUVIALUIT LANDS LOCATION PLAN
WESTERN ARCTIC AGREEMENT**

DATE 87/02/24

DVN EBR

CHKD BAB

JOB NO. 0101-4575

4575-001

obligations. This report presents the resource inventory as it is currently known together with certain development recommendations for the community of Sachs Harbour.

1.2 Project Authorization

This study was authorized by Supply and Services Canada [SSC] through Contract No. 25ST.A7134-6-0014, awarded to EBA Engineering Consultants Ltd. [EBA]. The Scientific Advisor for the project was Mr. R. J. Gowan, Geotechnical Advisor for the Northern Renewable Resources Directorate of INAC.

1.3 Project Scope

The project scope, as defined by SSC and INAC in the contract, included the following:

- a) Development of granular resource supply models for each of the six communities by examination of all existing reports describing granular material deposits.
- b) Development of a granular resource demand model for each community through consultation with private and public sector users.
- c) Development of a recommended resource development scenario for each community to ensure reserves are established according to the priorities outlined in the Inuvialuit Final Agreement.
- d) Preparation of appropriate development recommendations for those sources with the best development prospects.

The following task was subsequently added to the project through a contract amendment:

- e) Development of a geotechnical data base consisting of historic borehole information from the study area.



2.0 EVALUATION OF GRANULAR RESOURCES

2.1 Classification

2.1.1 General

A standard for the classification of granular borrow material does not exist within the study area. The first granular resource inventories in the region, carried out in the early 1970's, classified potential borrow material encountered during exploration according to the Unified Classification System [USC]. However, this general classification proved inadequate because there was no direct reference to the end use of the material.

Several years ago, the Government of the Northwest Territories [GNWT] initiated a classification system whereby potential granular borrow was graded according to its most suitable application. The territorial government's system provided the following five material groups:

- Concrete Aggregate [CA],
- Surfacing Material [SM],
- Base [B],
- Subbase [SB],
- Embankment [E] and
- Rip-Rap.

In 1983, INAC adopted a classification system similar to that presented in the draft Territorial Pits and Quarries Regulations that considered both the USC classification of the material as well as the most suitable end use. This system, modified by INAC, is the basis for all borrow material classification carried out under the current contract.

Materials at prospective borrow sources have been graded into one of the five following classes:

Class 1	Excellent Quality Material,
Class 2	Good Quality Material,
Class 3	Fair Quality Material,
Class 4	Poor Quality Material and
Class 5	Bedrock, Felsenmeer and Talus.

These abbreviated descriptions are elaborated upon in the following subsections of this report.



2.1.2 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.

2.1.3 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 deleterious materials are present.

2.1.4 Class 3

Fair quality material consisting generally 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.

2.1.5 Class 4

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

2.1.6 Class 5

Bedrock of fair to good quality, felsenmeer or talus. Potentially excellent sources of construction material, ranging from general fill to concrete aggregate or building stone if quarried and processed. Also includes erosion control materials such as rip-rap or armour stone.

2.1.7 Summary

The five material classes presented above are summarized in Table 1. For reference purposes, the GNWT's classification system has been correlated in the table with the adopted INAC system.



TABLE 1

GRANULAR MATERIAL TYPES

MATERIAL DESCRIPTION	CLASS	POTENTIAL APPLICATIONS
Excellent quality material consisting of clean, well-graded, structurally-sound sands and gravel suitable for use as high-quality (e.g., runway or roof) surfacing materials, or as asphalt or concrete aggregate, with a minimum of processing.	1	Concrete Aggregate (CA), Surfacing Material (SM)
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 aggregates may be possible with extensive processing, except where deleterious materials are present.	2	Concrete Aggregate (CA), Surfacing Material (SM)
Fair quality material consisting generally of poorly-graded sands and gravels with or without substantial silt content. This material will provide fair quality general fill for roads, flexible foundation pads, or lay-down yards.	3	Base (B), Subbase (SB), Embankment (E)
Poor quality material generally consisting of silty, poorly-graded, fine-grained sand, with minor gravel. May also contain weak particles and deleterious materials and are considered suitable only for marginal, general (non-structural) fills.	4	Subbase (SB), Embankment (E)
Bedrock of fair to good quality, felsenmeer, or talus. Potentially excellent sources of construction material, ranging from general fill to concrete aggregate or building stone if quarried and processed. Also includes erosion control materials such as rip-rap or armour stone.	5	Rip-rap, or if processed properly, equivalent to Class 1 or any other class of material.



2.2 Inventory

The calculated volumes of the various types of granular materials available at the examined sources have been divided into various certainty levels, as detailed below. These definitions are consistent with those used by INAC.

2.2.1 Proven

A 'proven' volume is one whose occurrence, distribution, 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.

2.2.2 Probable

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

2.2.3 Prospective

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

In the context of this project, the uncertainty associated with prospective volumes of granular material varies with the terrain conditions specific to the various communities. For instance, substantial amounts of bedrock are located northwest of the community of Aklavik. Since the bedrock has not been explored in detail, the volume of rock is considered to be prospective. Any exploration would likely result in the prospective volume becoming 'probable' or 'proven'. The situation is very different in the vicinity of Tuktoyaktuk, where granular materials are scarce and landforms are poorly defined. Features that contain 'prospective' volumes of material are often found during detailed investigation to contain little or no useable granular material.



3.0 SUPPLY OF GRANULAR RESOURCES

3.1 General

The amount of information available on the borrow sources in the vicinity of each community varies greatly. This is due in part to the historic level of activity in and around each community, but predominately to the relative supply of acceptable quality borrow within reasonable distance of the community.

Communities whose growth has not been significantly affected by northern petroleum exploration (ie. Holman, Paulatuk and Sachs Harbour) have little formal information regarding the location, size and quality of appropriate borrow sources. As the granular materials demand in general is modest and wholly generated by the community, there is little incentive to undertake borrow material studies provided adequate quantities for current needs exist adjacent to the community. The quality of the borrow materials may not meet desirable standards but this is usually offset by the convenient location. If the borrow performs poorly once in place, it is a simple matter to obtain more material and improve the deteriorating areas.

Communities whose recent growth can be partially attributed to northern petroleum exploration (Inuvik and Tuktoyaktuk) have greater requirements for granular resources. These requirements usually impact both the quality and quantity of borrow materials. Industrial developments usually require large volumes of higher quality material.

The extent of identification and investigation of granular material sources has depended upon local demand. Minimal information is available pertaining to borrow reserves in the vicinity of Holman, Paulatuk and Sachs Harbour. Transport Canada has conducted airphoto studies for the area adjacent to each community, but the results have not been confirmed by field evaluations. Information pertaining to borrow resources for Inuvik and Aklavik is available, however, extensive exploration work has not been undertaken because developed sources have been sufficient to meet the demands.

Tuktoyaktuk is a unique situation with respect to supply of granular materials. Although Tuktoyaktuk has grown substantially over the past 10 years and petroleum resource activities have put unusual demands on granular material resources, semi-continuous granular resource exploration activities have generally failed to prove large deposits of quality material within a reasonable distance of the community.



The supply of granular resources for the six western Arctic communities was determined summarizing existing data from site investigations, airphoto interpretation and field reconnaissance of prospective sources. These estimates were made by combining the areal extent of the sources (aerial photography and field measurements) with the stratigraphy determined from test pits and boreholes within the source.

The accuracy of the estimates may not accurately reflect the true situation as detail is lacking for certain sources. Some sources have no ground truthing or very few boreholes and test pits and the depth to which the investigations were completed was often insufficient to reasonably represent the extent of the individual materials within a source. Testing of samples for moisture content or grain size analysis was not necessarily carried out consistently and so designation of a certain class of material to a particular source may be based only upon visual soil description.

Source-by-source descriptions and estimated material volumes are located in the Supply appendix. The following sections describe the supply of granular resources situated on or near 7(1)(a) and 7(1)(b) lands adjacent to the community of Sachs Harbour.

3.2 Sachs Harbour

3.2.1 General

Sachs Harbour is located on the southwest tip of Banks Island. The community is underlain by poorly or unlithified sand and gravel of the Beaufort and related formations. Since deposition, the materials in coastal proximity have been modified and covered with till, a large portion of which has been subjected to marine submergence and reworking. The upper portions of the till within Sachs Harbour have been developed as community gravel sources.

The Kellett River valley, situated north of the community, has a cover of marine fine-grained sediments over an older glaciofluvial plain. Recent meandering of the river has exposed extensive sandy gravel channel deposits.

A broad glaciomarine plain is located southeast of Sachs Harbour. Dunes and deflation features suggest that sand is predominant in the area.

All of the sources discussed in the following sub-sections have been identified through airphoto interpretation and limited visual inspection of existing sources.



3.2.2 Class 1

No sources of Class 1 material were found in the Sachs Harbour region.

3.2.3 Class 2

There is only one source in the Sachs Harbour region with any substantial volume of Class 2 material (Table 15). This source, designated 87-SH-13, is located 10 km from the community, on the coast. It is estimated to contain about 30,000 cubic metres of material.

3.2.4 Class 3

Eleven sources have been identified in this region as having significant volumes of Class 3 material (Table 16). The largest potential source, designated 87-SH-11 has a prospective volume of 6,500,000 cubic metres. Only a small volume (50,000 cubic metres) has been determined as probable (Figure 6) but the total prospective volume for the region is about 13,545,000 cubic metres. Two sources are presently being developed (87-SH-1 and 87-SH-4) but are of relatively small volume (170,000 and 50,000 cubic metres, respectively). The potentially large volume sources (87-SH-9, 10 and 11) are all located in river environments and are within 15 km of the community.

3.2.5 Class 4

Only one source (87-SH-12) is considered to have any volume of Class 4 material and The volume is estimated at about 100,000 cubic metres (Table 17).

3.2.6 Class 5

No sources of Class 5 material were identified in this study.



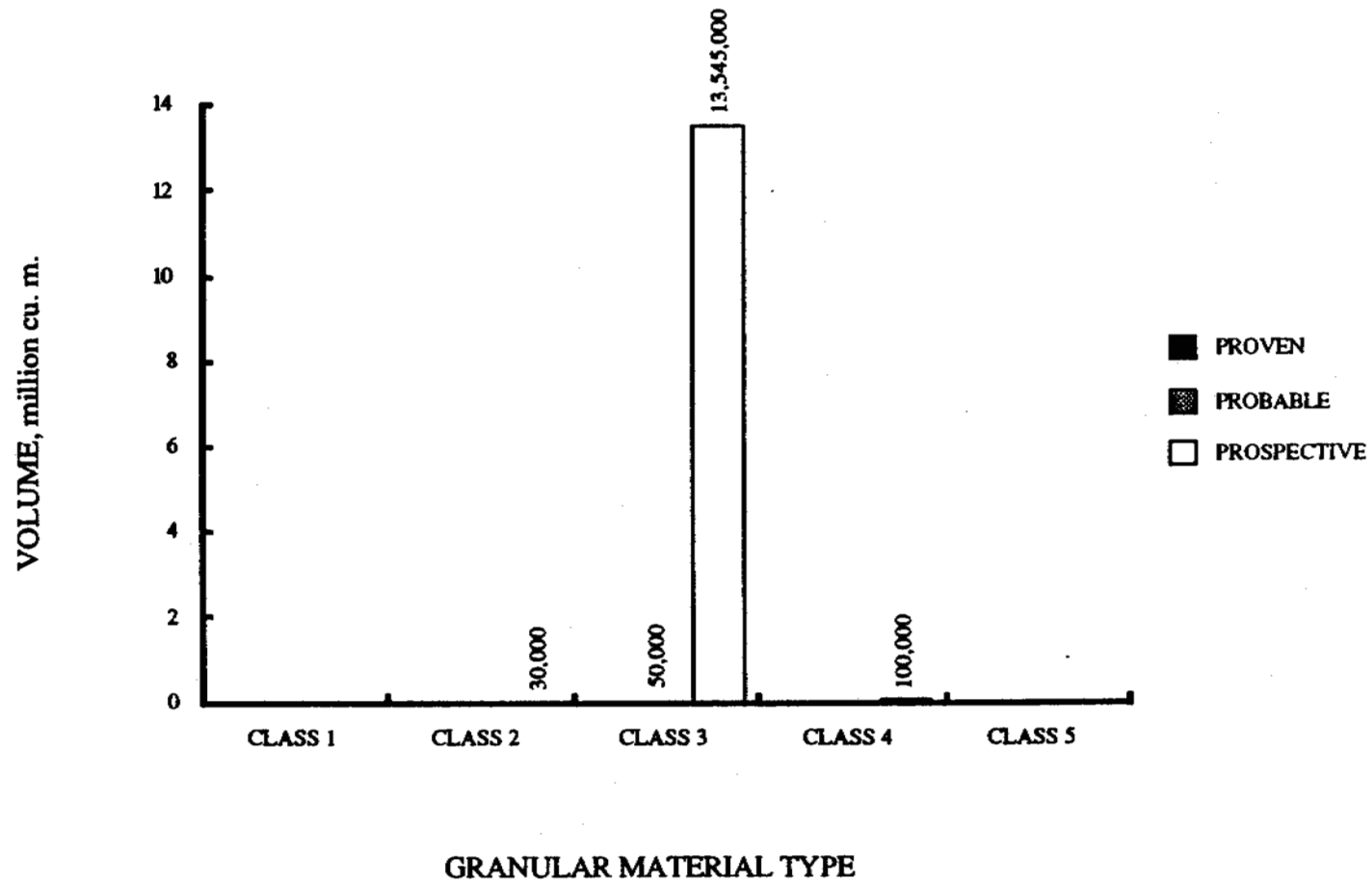


FIGURE 6

SUPPLY OF GRANULAR RESOURCES-
SACHS HARBOUR

TABLE 15 DISTANCE TO CLASS 2 GRANULAR RESOURCES-
SACHS HARBOUR

SOURCE	DISTANCE	PROVEN	PROBABLE	PROSPECTIVE	CONSIDERATIONS
	(km)	(cu. m.)	(cu. m.)	(cu. m.)	
87-SH-13	10			30,000	Coastal environment, limited size

TABLE 16 DISTANCE TO CLASS 3 GRANULAR RESOURCES-
SACHS HARBOUR

SOURCE	DISTANCE	PROVEN	PROBABLE	PROSPECTIVE	CONSIDERATIONS
	(km)	(cu. m.)	(cu. m.)	(cu. m.)	
87-SH-4	1		50,000	50,000	Partially depleted, uncertain volume
87-SH-5	1			30,000	
87-SH-3	4			25,000	Near road
87-SH-6	4			20,000	Difficult access, isolated
87-SH-8	4			200,000	Coastal environment, marginal quality
87-SH-2	6			30,000	Near road
87-SH-1	9			170,000	Currently under development
87-SH-10	9			4,500,000	River environment
87-SH-9	10			2,000,000	River environment
87-SH-7	10.5			20,000	Coastal environment
87-SH-11	13			6,500,000	River environment

TABLE 17 DISTANCE TO CLASS 4 GRANULAR RESOURCES-
SACHS HARBOUR

SOURCE	DISTANCE	PROVEN	PROBABLE	PROSPECTIVE	CONSIDERATIONS
	(km)	(cu. m.)	(cu. m.)	(cu. m.)	
87-SH-12	18			100,000	

4.0 DEMAND FOR GRANULAR RESOURCES

4.1 General

The purpose of the demand model was to determine the requirements for granular materials within the study area for a period encompassing the next 20 years. The needs of the model required that a substantial amount of specific information be obtained. This information consisted of descriptions of proposed types of projects and end users of the granular material, as well as material type and volume requirements.

The first step in compilation of the demand model was the identification of individuals and groups likely to have granular material demands or, alternatively, be concerned with the use of granular materials in general. A list of potential respondents was prepared by identifying the various departments in all levels of government involved with civil-oriented community projects and by forming a list of contractors residing or prominent in each community. A questionnaire was then assembled and distributed.

The questionnaire was designed to determine the need for various quantities of selected types of granular materials and to indicate the end use of the material. The questionnaire recipient was also asked to indicate, if possible, the likely or preferred source of the granular materials for each project or material type. In an attempt to quantify the rate of granular material demand, information was requested to be submitted in four data blocks, each five years in length.

Shortly after submission of the questionnaires, two EBA representatives, Messrs. D. Hayley, P. Eng., and J. Carss, P. Eng., visited each project community, as well as Yellowknife and Cambridge Bay, to meet with recipients of the questionnaires and other representatives of the local community to discuss their specific requirements for granular materials. This not only provided direct contact with most of the users and regulators of granular materials but also permitted the EBA representatives to become familiar with local conditions regarding granular resources.

Recipients of the questionnaire who were not visited were contacted by telephone, where possible, to ensure that all possible input was obtained and to clarify any questions or ambiguities that developed regarding the information sought by the questionnaire. The data collected was then assembled into a computerized data base to facilitate data handling and interpretation.



A large number of the respondents defined material quality in terms other than those in the INAC classification system that was outlined in the questionnaire. Table 1 presents the current interpretation of these various classes of required materials in light of the INAC classification system.

The process of data assimilation indicated that a project requiring granular materials could best be described as belonging to one of three categories: planned capital projects, speculative projects and maintenance. While the demand generated by all three project categories may be somewhat speculative, the 'speculative' projects category specifically refers to large scale projects that may or may not occur within the next 20 years. These projects usually involve a political decision and require a substantial commitment of both funding and granular materials and typically involve projects such as airstrips, lengthy highways and construction of infrastructure for the production of oil and gas.

The total demand for granular materials in all of the Western Arctic communities is graphically presented in Figure 8. The total demand for granular materials for the years 1987 to 2007 has been estimated at 17.4 million cubic metres. Ninety-two percent of the demand (16 million cubic metres) is for projects that have been described as speculative, five percent of the demand (0.8 million cubic metres) has been indicated for planned capital projects and three percent of the demand (0.6 million cubic metres) has been designated for maintenance. Most of the demand is created by the various levels of government, with expansion of private industry requiring only three percent of the non-speculative capital project demand.

Despite the attempt of the questionnaire to determine the 20-year demand in 5-year blocks, most data received did not contain any specific 5-year information for non-speculative capital projects beyond 1991. The reasons for this occurrence appear to be two-fold: first, the Territorial Government uses an annually up-dated 5-year plan for budgeting capital expenditures; and second, most of the communities will acquire their basic facilities (ie. schools, nursing stations, government offices, etc.) within the next five years.

Projects designated as speculative appear to require 38 percent of the designated 16 million cubic metres within the next five years and 62 percent thereafter. This breakdown is likely as speculative as the projects themselves, since it predominately reflects the desire for the project to occur in the near future. In contrast to the public/private split



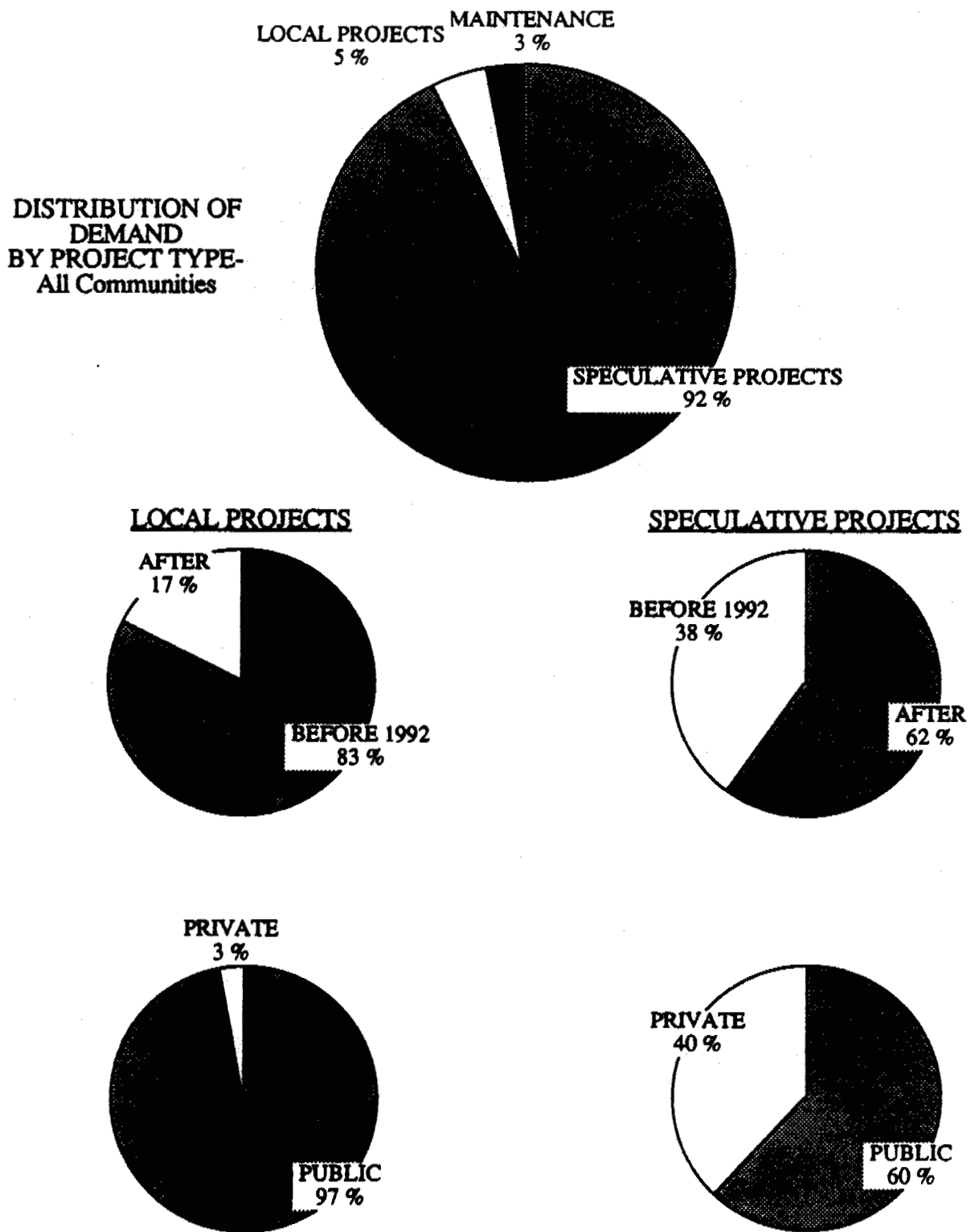


FIGURE 8 GRANULAR RESOURCES DEMAND SUMMARY- ALL COMMUNITIES



on local capital projects, private industry envisages requiring 40 percent (6.9 million cubic metres) of the total speculative demand.

The following subsections present and discuss the demand data collected. Granular material requirements for the projects identified within the area of the community are presented and summarized in the Demand appendix. Figures presenting the required volume of each class of material Sachs Harbour are contained in the following text.

4.2 Sachs Harbour

4.2.1 General

Sachs Harbour is a hamlet which has plans for the upgrading and expansion of their public facilities. Local capital projects in Sachs Harbour are estimated to consume 30,160 cubic metres of granular materials over the next 20 years. All but 210 cubic metres are designated for use within the next five years. The 20-year demand for granular materials for maintenance purposes is 100,000 cubic metres.

The largest single granular demand is for a two-year duration tank farm expansion project which is responsible for slightly more than one-half of the total demand for local capital projects. A further 30 percent of the total capital project demand is associated with development of a sewage and solid waste disposal site. Required material volumes by class are graphically presented in Figure 19; a cumulative demand summary is presented in Figure 20.

4.2.2 Class 1

Sachs Harbour requires 60 cubic metres of Class 1 granular material. Most of the demand (50 cubic metres) is generated between 1987 and 1991, with only 10 cubic metres required in 1997 through 2001.

4.2.3 Class 2

The Class 2 granular material requirement is for 31,400 cubic metres. Slightly less than one-half of the demand (16,400 cubic metres) is required between the years 1987 and 2001, with each of the subsequent five-year groups requiring 5,000 cubic metres of material. The relatively large demand indicated between



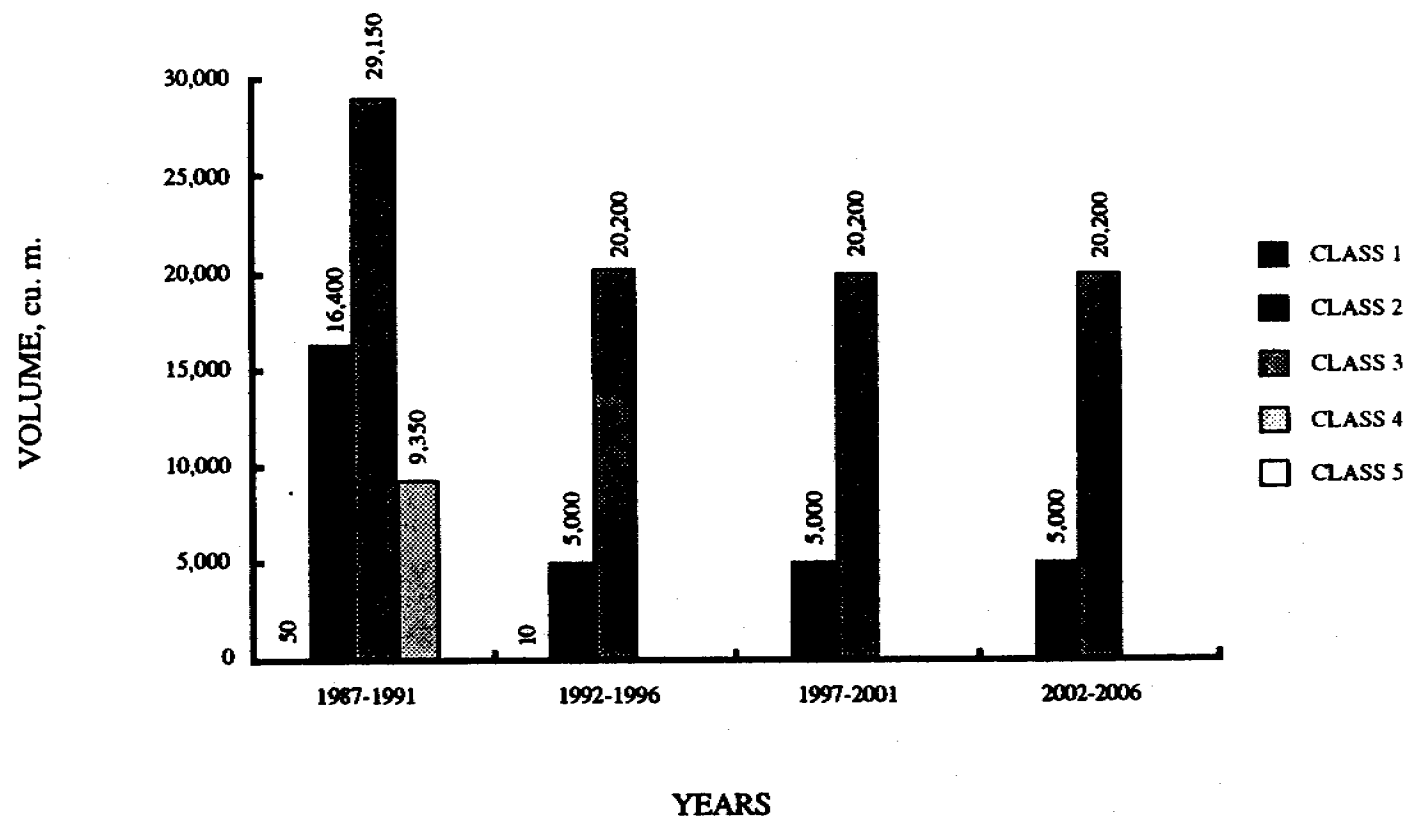
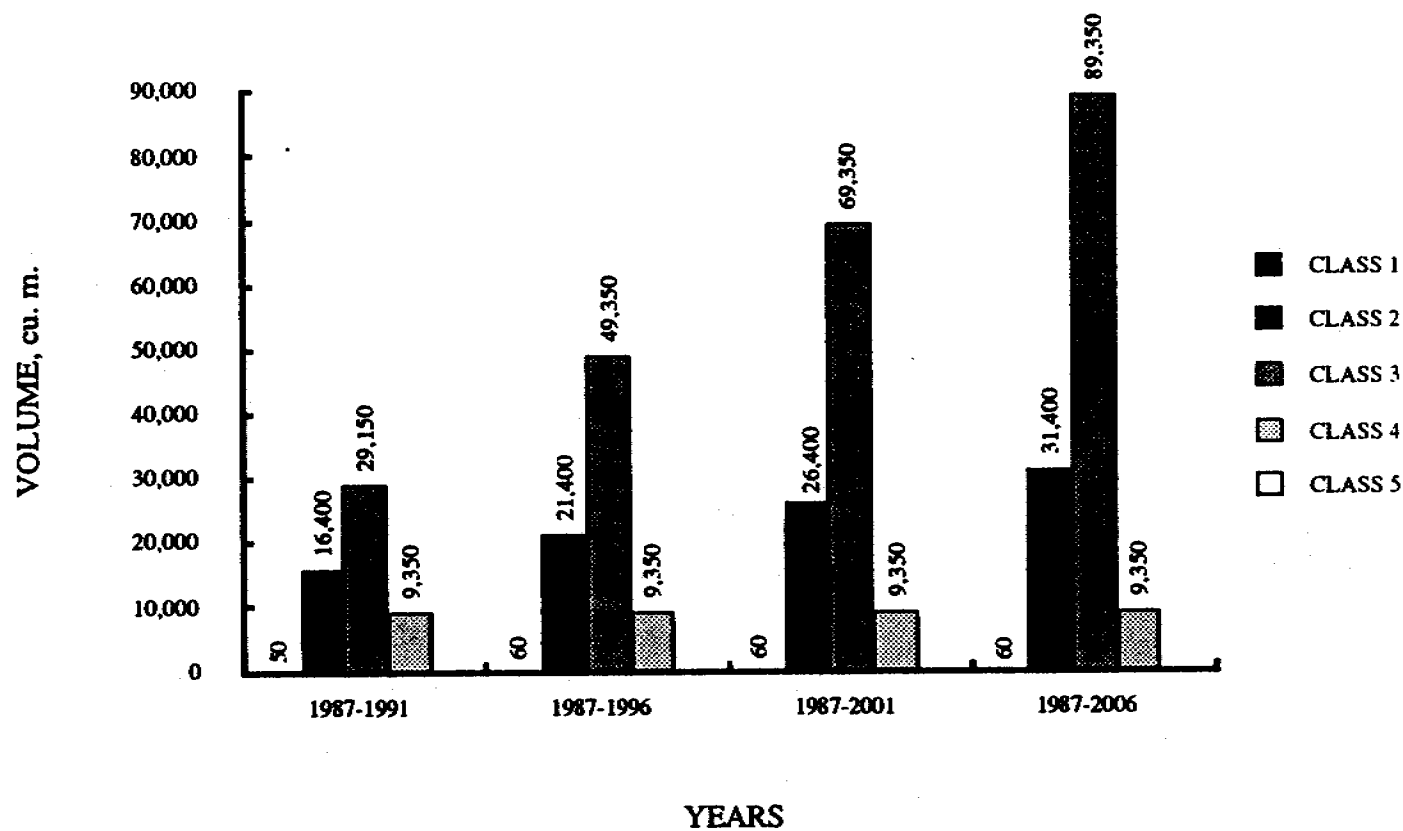


FIGURE 19

DEMAND FOR GRAULAR RESOURCES-
SACHS HARBOUR





**FIGURE 20 CUMULATIVE DEMAND FOR GRANULAR RESOURCES-
SACHS HARBOUR**



1987 and 2001 is required for upgrading of the tank farm. The remaining demand is required for airstrip maintenance.

4.2.4 Class 3

Requirements for Class 3 material total 89,350 cubic metres, with 29,150 cubic metres required between 1987 to 1991. Subsequent 5-year blocks require 20,000 cubic metres, except for 1997 through 2006, when 20,200 cubic metres are required. The bulk of this demand is for material to be used for road maintenance and other general public projects.

4.2.5 Class 4

It has been estimated that 9,350 cubic metres of Class 4 granular material are required during the first five years of the study period, with no apparent requirement for material of this type in the subsequent study years. Most of the demand is generated by the proposed construction of a sewage and solid waste disposal site.

4.2.6 Class 5

Sachs Harbour has no apparent requirement for Class 5 granular resources.



5.0 DEVELOPMENT SCENARIOS

5.1 General

Sachs Harbour currently obtains fair to good quality granular borrow material from till knobs located within and adjacent to the community. This material is suitable for continued use, but higher quality borrow will need to be brought into town for certain applications. It would be advantageous to develop a pit with material superior in quality to that currently existing near the community, such that the better material could be used on more projects.

The development scenario for the community of Sachs Harbour is summarized in Table 27 and is presented in detail in the following section.

5.2 Class 1

There are no deposits of Class 1 granular material located within the Sachs Harbour study area. The required 60 cubic metres of Class 1 material should be obtained from selected, higher quality portions of the recommended Class 2 source, 87-SH-13.

5.3 Class 2

Airphoto-identified Source 87-SH-13 is recommended for production of Class 1 and Class 2 granular material for use in Sachs Harbour. The source will not likely produce sufficient material volume to meet the expressed demand; however, there is no other source of Class 2 material in the area. Following depletion of the source, Class 2 borrow material will need to be recovered from Class 3 sources.

5.4 Class 3

In contrast to the shortage of Class 1 and 2 borrow material, substantial reserves of Class 3 material exist in the Sachs Harbour vicinity. The borrow sources currently under development (87-SH-1, 2, 3, 4 and 5) are recommended for continuing development until they are depleted. All Class 3 granular material can then be obtained from Source 87-SH-9 or 10, both of which are located adjacent to the Kellett River, north of Sachs Harbour. Any large projects that are carried out should obtain the required borrow material from 87-SH-9 or 10 so as to leave the in-town sources available for local projects.



5.5 Class 4

Sachs Harbour's Class 4 granular requirements are small and should be obtained from one of the Class 3 borrow sources. Class 4 material is located in the vicinity of the community, but the distance is excessive, given the required volume.

5.6 Class 5

There is no known source of Class 5 borrow material in the area; however, Sachs Harbour currently has no demand for this type of material.



TABLE 27

GRANULAR RESOURCE UTILIZATION-
SACHS HARBOUR

MATERIAL		1987-1991	1992-1996	1997-2001	2002-2006
CLASS 1	Demand, cu. m. Source(s)	50 87-SH-13	10 87-SH-13		
CLASS 2	Demand, cu. m. Source(s)	16,400 87-SH-13	5,000 87-SH-13	5,000 87-SH-13	5,000 87-SH-13
CLASS 3	Demand, cu. m. Source(s)	29,150 87-SH-1/2/3/4/5	20,200 87-SH-1/2/3/4/5	20,000 87-SH-1/2/3/4/5	20,000 87-SH-1/2/3/4/5
CLASS 4	Demand, cu. m. Source(s)	9,350 87-SH-1/2/3/4/5			
CLASS 5	Demand, cu. m. Source(s)	0			

NOTES:

1. Source 87-SH-13 is located in a coastal setting but is the only Class 2 material source. As there are no sources of Class 1 borrow material it is recommended that 87-SH-13 be developed and that material be processed to Class 1 criteria as required.
2. Source 87-SH-1 is the largest close source of Class 3 material. Sources 87-SH-2, 3, 4 and 5 are all currently under development but the volumes thought to be remaining are unknown. It is recommended that the latter sources continue to be developed until depleted and restored. Source 87-SH-1 should then be worked as the prime source of Class 3 granular material. However, if large volumes of material are required for any project, the use of either Source 87-SH-9 or 10 (located adjacent to the Kellett River) is recommended to protect the town's supply of granular material.



6.0 BORROW SOURCE DEVELOPMENT RECOMMENDATIONS

6.1 General

The following sections present guidelines and recommendations for developing a management plan.

These recommendations have taken into consideration information presented in the Environmental Guidelines: Pits and Quarries Handbook (Indian and Northern Affairs Canada, 1983), and the draft Territorial Lands and Public Lands Pits and Quarries Regulations. The ILA currently do not have regulations governing pits and quarries, but generally follow the guidelines suggested in the above documents.

6.2 Objectives

Site-specific management plans must consider the requirements and constraints of regional borrow demand and availability. Each plan should ensure that economical recovery of quality granular materials is achieved at each pit while minimizing the adverse environmental impact. The environmental impact on the region can be minimized by restricting granular recovery operations to a select number of pits, realizing that maximum extraction from a pit will likely cause a slight rise in material cost. This cost increase must be weighed against the environmental costs associated with high grading the better drained surface materials. This local practice frequently results in numerous smaller pits being worked simultaneously or sequentially. Pit management plans should be developed primarily to maximize the utilization of limited resources and to minimize environmental disturbance.

6.3 Pit Access

Access to sources of granular material should be by the most economical, least environmentally damaging manner. Areas with granular resources located nearby (Inuvik, Holman, Paulatuk and Sachs Harbour) can access certain resources with all weather roads. Areas with distant resources (Aklavik and Tuktoyaktuk) can usually only obtain borrow in the winter by tundra/ice roads or in the summer by barge, if the sources are located adjacent to a waterway.

Summer operations would require construction of temporary access roads from the sources and docking facilities for barges. The construction of these facilities would



probably require large quantities of granular materials, and would significantly reduce the recoverable volumes.

6.4 Pit Development

6.4.1 Site Preparation Work

Site preparation should be conducted in advance of excavation to prevent contamination of granular materials. This preparation also should preferably be carried out in winter to minimize disturbance to the surrounding terrain. Snow should be cleared from both the area to be excavated and yard areas and placed so as to minimize subsequent pit infilling by drifting snow. Topsoil consisting of peat and organic soils, while typically scarce, should be stripped where possible and stockpiled or windrowed at the edges of the pit area. Windrows should be placed parallel to slope direction to prevent ponding of surface water during spring, or contamination of granular materials. Inorganic overburden materials should be stripped and placed in separate stockpiles or windrows, with similar consideration of drainage considerations. The stripped materials are to be reserved for reclamation purposes. Disturbed areas must be kept to a practical minimum.

6.4.2 Extraction Methods

Winter recovery operations will normally consist of the ripping of friable frozen granular material and pushing it into temporary windrows or stockpiles for loading. This type of extraction can be conducted with conventional equipment including bulldozers with rippers, loaders, and trucks. Poorly-bonded or friable granular material will usually be located near the surface of deposits that exhibit positive relief. If an insufficient volume of material cannot be obtained through ripping, blasting will be necessary.

Summer operations will typically consist of stripping and windrowing or stockpiling thawed layers of granular material with bulldozers, commencing when thaw has progressed about 0.5 m into the deposit. The cycle of operation is largely dependent on the rate of thawing, and the drainage considerations. This method allows potentially greater annual recovery by progressively increasing the amount of thawed material, and it may enhance drainage of the material in stockpiles or windrows.



Experience has shown that winter excavation of frozen stockpiles windrowed the previous summer, may be just as difficult as winter excavation directly from the borrow source unless the stock pile process results in a significant reduction in natural moisture content. Moisture reduction from 10 percent in situ to 5 percent in a stockpile has been achieved by use of conveyors during favourable summer conditions (Hayley and MacLeod, 1977). Frozen gravel stockpiles with a moisture content less than 5 percent are usually sufficiently friable for direct loading without ripping.

Drilling and blasting of frozen ground in the winter has proven cost effective for larger operations. The techniques developed and used extensively at Prudhoe Bay, Alaska, is to remove gravel in lifts 5.5 m thick, by drilling shot holes 6 m deep on a 3 m pattern. Load factors are typically 0.9 kg of ANFO explosive per cubic metre of gravel to create manageable size chunks. Typical specifications for Alaska winter construction restrict the size of frozen gravel chunks to 200 mm.

6.4.3 Treatment of Massive Ice

Logistical constraints caused by massive ice during summer development of YaYa Lake pit are described by Hayley and MacLeod (1977). Where practical, the extent of massive ice in a prospective deposit should be defined prior to pit development. The development plans should include methodology for coping with ice bodies as they are encountered.

Where practical, large bodies of massive ice should be avoided. Thin, or less extensive massive ice within the granular material at higher elevations should be excavated and wasted, or exposed to permit thawing during the summer months. Drainage must be considered with either method of disposal.

Relatively thin layers of massive ice at depth may be permitted to thaw provided all overlying recoverable granular materials are removed during one extraction season. Formation of thaw ponds as ice melts during the summer is inevitable in this situation. Appropriate measures must be taken to control drainage and to protect, and ensure access to, adjacent recoverable granular materials.

It may be desirable to identify and preserve thicker ice bodies at depth. If this material thaws it is likely to prevent recovery of adjacent materials, or result in



major disturbance of the surrounding areas. A minimum cover of 1.5 m of granular material should be left as insulation over massive ice to prevent excessive thawing. Criteria for establishing the minimum thickness of massive ice beds which should be preserved is influenced by topographic relief, thickness and extent of granular materials, and the effect of thaw ponds on surrounding terrain. Operators involved with large extraction operations may simply wish to excavate and waste the ice.

6.4.4 Drainage Considerations

Adequate drainage of pit areas must be maintained to ensure availability of recoverable granular material and to attain required annual extraction rates. Higher moisture contents inhibit thawing, increase excavation costs and reduce material quality. Small amounts of meltwater runoff from ice bonded and thinly ice-lensed granular materials could be allowed to seep into the surrounding terrain. Larger amounts of runoff, from thawing of large massive ice bodies, should be directed to retention ponds or sumps excavated in the pit floor. Where gravity drainage is possible, natural ponds or drainage ditches may be effective at removing water from the site. However, excavated ditches are generally ineffective in areas of high ice content.

It is essential that pit drainage facilities be maintained and updated frequently to ensure that moisture drains away from the working face, and that ponded runoff does not accumulate on recoverable granular material. Where thaw ponds are allowed to form by exposing buried massive ice, or where collection ponds are created, care should be taken to preserve and maintain access to adjacent recoverable granular materials. A development plan to adequately account for pit drainage is particularly important where summer extraction operations are employed.

6.4.5 Waste Material

All lenses of fine-grained material (silts and clays) found within the granular deposit, should be stripped and wasted. Waste material should be stockpiled near the stockpiled overburden for use in pit reclamation. Fine-grained waste material at depth will undoubtedly have high excess ice contents, hence it may be



advisable to construct a dyke of drier overburden around waste piles to prevent flow of thawed waste onto surrounding terrain or into pit areas.

6.5 Restoration

Restoration measures are required whether the pit is being abandoned temporarily or permanently. All worked areas should be cleaned of all debris, and graded to remove all topographic irregularities. Where abandonment is temporary, positive drainage away from existing faces and access routes must be provided by grading or by ditching to ensure the future recovery of remaining materials. Berms should be constructed at the top of pit faces, if necessary, to prevent surface runoff from entering the pit area.

Prior to permanent abandonment, the edges of worked areas or pit walls should be recontoured to blend into the surrounding terrain. All obstructions to natural drainage should be removed and any slopes graded to prevent runoff from channelling and downcutting. If thaw ponds and lakes and massive ground ice are common in the area, flooding of pits is an acceptable, and frequently inevitable, method of restoration. Areas which are not likely to become flooded should be smoothly graded and covered with stockpiled overburden and organics.

Revegetation may be feasible in certain areas by redistributing stockpiled organic topsoil and peat over the graded slopes of areas unlikely to be flooded, and by seeding or allowing reinvasion of natural vegetation, depending on the nature of the site and the quality of the topsoil. Fine-grained overburden soils are generally adequate for surface reclamation, however, the amount of naturally-occurring topsoil is very limited at some sites. The fertility of these soils may require enrichment for revegetation.

6.6 Site Specific Development Plans

6.6.1 General

The site specific development plans presented in the following report subsections pertain to selected sources that are prominent in the development scenario proposed for the community of Sachs Harbour. The level of detail presented for each source reflects the amount of information available for a particular deposit.



6.6.2 Source 87-SH-1/2/3/4/5

Access

These sources are located at the edges of the community of Sachs Harbour and are accessible by all-weather roads on a year-round basis.

Site Preparation

The sites are currently partially developed and some of them may be considered to be nearly depleted. Any further site preparation should be conducted in accordance with the recommendations presented in Section 6.4.1 of this report.

Extraction Methods

Extraction of granular material from the source is currently accomplished on an as-needed basis by excavating material that has thawed and drained during the summer. It is recommended that this practice continue.

Drainage Considerations

The pit floor should be graded where possible, to ensure gravity drainage of surface and melt water. Water should be collected and discharged in an environmentally acceptable manner. Good drainage enhances seasonal thaw and limits the ingress of water. As the subject sources are located on the side of a gentle hill, drainage at the sites was adequate.

Treatment of Massive Ice

Massive ground ice may be encountered at the source. Depending on the extent and distribution of the ice, it may either be excavated and wasted or covered with an insulating blanket of granular material and left in place. More detailed information on dealing with ground ice is contained in Section 6.4.3 of this report.

Restoration

When the pits partially become exhausted, restoration can be undertaken concurrent with further borrow recovery. Restoration should be conducted in accordance with the recommendations presented in Section 6.5 of this report and



should primarily consist of roughening the surface and contouring the abandoned areas of the pit to ensure adequate drainage occurs and that large volumes of water are not trapped within the pit area. Revegetation can be examined as pit abandonment proceeds.

6.6.3 Source 87-SH-13

Access

The source is located in a coastal location and is likely accessible only during the winter by a tundra road.

Site Preparation

The site is undeveloped at present. However, in the event that extensive site preparation is required, activities should be conducted in accordance with the recommendations presented in Section 6.0 of this report. Care should be taken such that site development has minimal adverse effects on the stability of the coastline.

Extraction Methods

Extraction of granular material from the source should be accomplished on an as-needed basis by excavating material that has thawed and drained during the summer. It is recommended that this practice continue unless the demand increases substantially. If large demands occur, extraction through ripping and pushing materials into temporary stockpiles for loading onto trucks is recommended.

Drainage Considerations

The pit floor should be graded where possible, to ensure gravity drainage of surface and melt water. Water should be collected and discharged in an environmentally acceptable manner. Good drainage enhances seasonal thaw and limits the ingress of water.



Treatment of Massive Ice

Massive ground ice may be encountered at the source. Depending on the extent and distribution of the ice, it may either be excavated and wasted or covered with an insulating blanket of granular material and left in place. More detailed information on dealing with ground ice is contained in Section 6.4.3 of this report.

Restoration

If large-scale borrow material extraction occurs at the pit, restoration activities should be implemented. Any restoration should be conducted in accordance with the recommendations presented in Section 6.0 of this report and should primarily consist of roughening and contouring the abandoned areas of the pit to ensure adequate drainage occurs and that large volumes of water are not trapped within the pit area.



7.0 RECOMMENDATION

7.1 Source 87-SH-13

Additional work will be required to confirm the quantity and quality of granular resources contained in this prominent source of granular material. Source 87-SH-13 is unexplored but it has the potential to supply a substantial portion, if not all of Sachs Harbours' future requirements. The source should last for many years at present consumption rates. However, if large projects place exceptional demand on the source, it is recommended that a limited geotechnical drilling and sampling program be undertaken at the site. Objectives of the geotechnical program should be to establish the quantity and quality of material available.



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150	RKL 1973, ZONE 1	157	HARDY 1977
151	RKL 1973, ZONE 1		
152A	RKL 1973, ZONE 1		
153	RKL 1973, ZONE 1	165	HARDY 1977
154	RKL 1973, ZONE 1	166	HARDY 1977
155	RKL 1973, ZONE 1	2.01	HARDY 1986
156	RKL 1973, ZONE 1	T108-112	RKL 1973, TUKTOYAKTUK
157	RKL 1973, ZONE 1	T100-103,150	RKL 1973, TUKTOYAKTUK
158	HARDY 1977	T104,106,107	RKL 1973, TUKTOYAKTUK
159	HARDY 1977	TUK HARBOUR, AIRSTRIP	EBA 1973
160/161	HARDY 1977	TUK HARBOUR, AIRSTRIP	EBA 1973
162	HARDY 1977		
163	HARDY 1977		
164	HARDY 1977		
165	HARDY 1977	153	RKL 1973, ZONE 1
166	HARDY 1977	154	RKL 1973, ZONE 1
167	HARDY 1977	T113	RKL 1973, TUKTOYAKTUK
168	HARDY 1977	168	BBT 1983
169	HARDY 1977	169	HARDY-BBT 1986
170	HARDY 1977		
171	HARDY 1977	25	DPW 1976
172	HARDY 1977	24, 24A, 24B	DPW 1976
173	HARDY 1977	23, 23A, 23B, 23C, 23D	DPW 1976
174	HARDY 1977		
175	HARDY 1977		



SOURCE NUMBER, TEXT REFERENCES AND CROSS REFERENCES, cont.

PRIMARY SOURCE NO. OR NAME AND TEXT REFERENCE		CROSS-REFERENCE SOURCE NO. OR NAME AND TEXT REFERENCE	
176	HARDY 1977		
177	HARDY 1977		
181	HARDY 1977		
183	HARDY 1977		
184	HARDY-BBT 1986		
211	BBT 1983	211	RKL 1973, ZONE 2
211E	EBA 1986		
214	BBT 1983	2.02	HARDY-BBT 1986
215	EBA 1986	2.03	HARDY-BBT 1986
216	RKL 1973, ZONE 2	216	EBA 1986
216S	EBA 1986		
217	RKL 1973, ZONE 2	217	EBA 1986
217E	EBA 1986		
218	RKL 1973, ZONE 2	218	EBA 1986
218N	EBA 1986		
219	EBA 1986	219	EBA 1986
222	EBA 1986	222	EBA 1976a
300A	RKL 1973, ZONE 3		
301	RKL 1973, ZONE 3		
302	RKL 1973, ZONE 3		
303	RKL 1973, ZONE 3	303; 2.08	EBA 1976a; HARDY-BBT 1986
304	RKL 1973, ZONE 3		
305	RKL 1973, ZONE 3		
306	RKL 1973, ZONE 3		
307	RKL 1973, ZONE 3		



SOURCE NUMBER, TEXT REFERENCES AND CROSS REFERENCES, cont.

PRIMARY SOURCE NO. OR NAME AND TEXT REFERENCE		CROSS-REFERENCE SOURCE NO. OR NAME AND TEXT REFERENCE	
308	RKL 1973, ZONE 3		
309	RKL 1973, ZONE 3		
310A	RKL 1973, ZONE 3		
311	RKL 1973, ZONE 3		
312	RKL 1973, ZONE 3		
313	RKL 1973, ZONE 3		
314	RKL 1973, ZONE 3		
315	RKL 1973, ZONE 3		
316	RKL 1973, ZONE 3		
317	RKL 1973, ZONE 3	2.17	HARDY-BBT 1986
318	RKL 1973, ZONE 3		
319	RKL 1973, ZONE 3		
320	RKL 1973, ZONE 3		
321	RKL 1973, ZONE 3		
322	RKL 1973, ZONE 3	2.16	HARDY-BBT 1986
323A	RKL 1973, ZONE 3	2.15	HARDY-BBT 1986
324A	RKL 1973, ZONE 3	2.14	HARDY-BBT 1986
325	RKL 1973, ZONE 3	2.41	HARDY-BBT 1986
326	RKL 1973, ZONE 3	326A; 2.12	EBA 1976b, HARDY-BBT 1986
327	RKL 1973, ZONE 3	2.33	HARDY-BBT 1986
328A	RKL 1973, ZONE 3	2.39	HARDY-BBT 1986
I400	RKL 1973, ZONE 3		
I401A	RKL 1973, ZONE 3	2.47	
I402	RKL 1973, INUVIK		
I403	RKL 1973, INUVIK		



SOURCE NUMBER, TEXT REFERENCES AND CROSS REFERENCES, cont.

PRIMARY SOURCE NO. OR NAME AND TEXT REFERENCE		CROSS-REFERENCE SOURCE NO. OR NAME AND TEXT REFERENCE	
I404	RKL 1973, INUVIK		
I405A	RKL 1973, INUVIK		
I406	RKL 1973, INUVIK		
I407	RKL 1973, INUVIK	2.13	
455	RKL 1973, ZONE 4		
467	HARDY 1976		
456A	RKL 1973, ZONE 4		
457A	RKL 1973, ZONE 4		
463	HARDY 1976	R24	EBA 1983a
464	HARDY 1976	R25	EBA 1983a
468	HARDY 1976	R27	EBA 1983a
469	HARDY 1976	R26	EBA 1983a
PARSONS LK. 1	KLCL 1974		
PARSONS LK. 2	KLCL 1974		
PARSONS LK. 3	KLCL 1974		
PARSONS LK. 4	KLCL 1974		
PARSONS LK. 5	KLCL 1974		
PARSONS LK. 6	KLCL 1974		
PARSONS LK. 7	KLCL 1974		
PARSONS LK. 8	KLCL 1974		
PARSONS LK. 9	KLCL 1974		
PARSONS LK. 10	KLCL 1974		
PARSONS LK. 11	KLCL 1974		
R28/29	EBA 1976b	R28/29	EBA 1983a
YAYA	EBA 1975		



SUPPLY SUMMARY
SACHS HARBOUR

0101-4575
APRIL, 1987

INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-1

ILA 7(1) (a)

LOCATION: 9 km W of Sachs Harbour

REFERENCE(S): Transport Canada 1986

SETTING
Crest of bluff

RELIEF
2 to 5 m

WINTER ACCESS
Road

LANDFORM
Morainal

CONTINUITY
Two sections

SUMMER ACCESS
Road

AREA
70,000 sq m

DEVELOPMENT CONSTRAINTS
None discernible

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 170,000

RECOVERABLE, cu.m: 170,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3					85,000	170,000
CLASS 4						
CLASS 5						



INDIAN AND NORTHERN AFFAIRS CANADA
INUUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-2

ILA 7(1) (a)

LOCATION: 6 km W of Sachs Harbour

REFERENCE(S): Transport Canada 1986

SETTING
Crest of bluff

RELIEF
2 to 3 m

WINTER ACCESS
Road

LANDFORM
Morainial

CONTINUITY
4 isolated knobs

SUMMER ACCESS
Road

AREA
10,000 sq m

DEVELOPMENT CONSTRAINTS
None discernible

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN

TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE

Unknown
-
-

POTENTIAL VOLUME, cu. m.: 30,000

RECOVERABLE, cu.m: 30,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3					15,000	30,000
CLASS 4						
CLASS 5						



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INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-3

ILA 7(1) (a)

LOCATION: 4 km W of Sachs Harbour

REFERENCE(S): None

SETTING
Crest of bluff

RELIEF
3 to 4 m

WINTER ACCESS
Road

LANDFORM
Morainial

CONTINUITY
2 knobs

SUMMER ACCESS
Road

AREA
7,500 sq m

DEVELOPMENT CONSTRAINTS
Small volumes

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN

TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE

Unknown
-
-

POTENTIAL VOLUME, cu. m.: 25,000

RECOVERABLE, cu.m: 25,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total

CLASS 1

CLASS 2

CLASS 3

12,500 25,000

CLASS 4

CLASS 5



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-4

ILA 7(1) (a)

LOCATION: 1 km S of Sachs Harbour

REFERENCE(S): Existing source

SETTING
On bluffs

RELIEF
6 to 10 m

WINTER ACCESS
Road

LANDFORM
Morainial

CONTINUITY
3 separate knobs

SUMMER ACCESS
Road

AREA
35,000 sq m

DEVELOPMENT CONSTRAINTS
Considerably depleted

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN

TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE

Unknown
-
-

POTENTIAL VOLUME, cu. m.:

50,000

RECOVERABLE, cu.m:

50,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3			50,000	50,000	50,000	50,000
CLASS 4						
CLASS 5						



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-5

ILA 7(1) (a)

LOCATION: 1 km E of Sachs Harbour

REFERENCE(S): None

SETTING
On bluffs

RELIEF
6 to 10 m

WINTER ACCESS
Tundra road

LANDFORM
Morainal

CONTINUITY
5 isolated mounds

SUMMER ACCESS
None

AREA
20,000 sq m

DEVELOPMENT CONSTRAINTS
Small volume, discontinuous

BOREHOLES (#)
Unknown

TEST FITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 30,000

RECOVERABLE, cu.m: 30,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3					30,000	30,000
CLASS 4						
CLASS 5						



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-6

ILA 7(1) (a)

LOCATION: 4 km E of Sachs Harbour

REFERENCE(S): None

SETTING
Top of bluffs

RELIEF
2 m

WINTER ACCESS
Tundra road

LANDFORM
Morainal

CONTINUITY
Continuous

SUMMER ACCESS
None

AREA
10,000 sq m

DEVELOPMENT CONSTRAINTS
Small size

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 20,000 RECOVERABLE, cu.m: 20,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total

CLASS 1

CLASS 2

CLASS 3

20,000 20,000

CLASS 4

CLASS 5



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-7

ILA 7(1) (a)

LOCATION: 10.5 km W of Sachs Harbour

REFERENCE(S): None

SETTING
Baymouth bar

RELIEF
2 m

WINTER ACCESS
Tundra road

LANDFORM
Coastal spit

CONTINUITY
Continuous

SUMMER ACCESS
Trail

AREA
10,400 sq m

DEVELOPMENT CONSTRAINTS
Coastal location

BOREHOLES (#)
Unknown

TEST FITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.:

20,000

RECOVERABLE, cu.m.:

20,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total

CLASS 1

CLASS 2

CLASS 3

20,000 20,000

CLASS 4

CLASS 5



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-8

ILA 7(1) (a)

LOCATION: 4 km W of Sachs Harbour

REFERENCE(S): None

SETTING
Beach

RELIEF
1 to 2 m

WINTER ACCESS
Ice road

LANDFORM
Coastal spit

CONTINUITY
??

SUMMER ACCESS
Along beach

AREA
145,000 sq m

DEVELOPMENT CONSTRAINTS
Coastal location

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 200,000

RECOVERABLE, cu.m: 200,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3					200,000	200,000
CLASS 4						
CLASS 5						



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INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-9

ILA 7(1) (a)

LOCATION: 10 km NNE of Sachs Harbour

REFERENCE(S): None

SETTING
Meander plain

RELIEF
1 to 3 m

WINTER ACCESS
Tundra road

LANDFORM
Alluvial bars & terraces

CONTINUITY
Discontinuous

SUMMER ACCESS
None

AREA
1.3 sq km

DEVELOPMENT CONSTRAINTS
River environment

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 2,000,000

RECOVERABLE, cu.m: 2,000,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total

CLASS 1

CLASS 2

CLASS 3 2,000,000 2,000,000

CLASS 4

CLASS 5



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INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-10

ILA 7(1) (a)

LOCATION: 9 km N of Sachs Harbour

REFERENCE(S): None

SETTING
Meander plain

RELIEF
1 to 3 m

WINTER ACCESS
Tundra road

LANDFORM
Alluvial bars & terraces

CONTINUITY
Semi-continuous

SUMMER ACCESS
None

AREA
3.1 sq km

DEVELOPMENT CONSTRAINTS
River environment

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 4,500,000

RECOVERABLE, cu.m.: 4,500,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total

CLASS 1

CLASS 2

CLASS 3

4,500,000 4,500,000

CLASS 4

CLASS 5



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-11

ILA 7(1)(a)

LOCATION: 13 km NNW of Sachs Harbour

REFERENCE(S): None

SETTING
Meander plain

RELIEF
1 to 3 m

WINTER ACCESS
Tundra road

LANDFORM
Alluvial bars & terraces

CONTINUITY
Discontinuous

SUMMER ACCESS
None

AREA
4.3 sq km

DEVELOPMENT CONSTRAINTS
River environment

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 6,500,000

RECOVERABLE, cu.m.: 6,500,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3					6,500,000	6,500,000
CLASS 4						
CLASS 5						



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-12

ILA 7(1) (a)

LOCATION: 18 km WNW of Sachs Harbour

REFERENCE(S): None

SETTING
Coastal lagoon

RELIEF
1 to 2 m

WINTER ACCESS
Tundra road

LANDFORM
Coastal spit

CONTINUITY
Continuous

SUMMER ACCESS
Barge

AREA
67,500 sq m

DEVELOPMENT CONSTRAINTS
??

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN
TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE
Unknown
-
-

POTENTIAL VOLUME, cu. m.: 100,000

RECOVERABLE, cu.m: 100,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2						
CLASS 3						
CLASS 4					100,000	100,000
CLASS 5						



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES SUPPLY SUMMARY
Sachs Harbour

SOURCE: 87-SH-13

ILA 7(1) (a)

LOCATION: 10 km ESE of Sachs Harbour

REFERENCE(S): None

SETTING
Beach

RELIEF
3 m

WINTER ACCESS
Ice road

LANDFORM
Barrier bar

CONTINUITY
Continuous

SUMMER ACCESS
Barge

AREA
10,000 sq m

DEVELOPMENT CONSTRAINTS
Coastal location

BOREHOLES (#)
Unknown

TEST PITS (#)
Unknown

MOIST. CON. (#)
Unknown

GRAINSIZE (#)
Unknown

OVERBURDEN

TYPE: Unknown
EXTENT: -
THICK.: -

GROUND ICE

Unknown
-
-

POTENTIAL VOLUME, cu. m.:

30,000

RECOVERABLE, cu.m:

30,000

MATERIAL	PROVEN, cu.m.		PROBABLE, cu.m.		PROSPECTIVE, cu.m.	
	Annual	Total	Annual	Total	Annual	Total
CLASS 1						
CLASS 2					15,000	30,000
CLASS 3						
CLASS 4						
CLASS 5						



DEMAND SUMMARY

SACHS HARBOUR

INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES DEMAND SUMMARY
Sachs Harbour

YEAR GROUP	PROJECT (V Denotes Speculative Project)	CATEGORY	VOLUME, cu.m.	
1987-1991	ADDITION TO COMMUNITY GYM	PUBLIC	Class 1:	
			Class 2:	500
			Class 3:	800
			Class 4:	
			Class 5:	
			TOTAL	1,300
1987-1991	AIRFIELD MAINTENANCE	PUBLIC	Class 1:	
			Class 2:	5,000
			Class 3:	
			Class 4:	
			Class 5:	
			TOTAL	5,000
1987-1991	ARENA	PUBLIC	Class 1:	
			Class 2:	200
			Class 3:	600
			Class 4:	
			Class 5:	
			TOTAL	800
1987-1991	FIREHALL	PUBLIC	Class 1:	50
			Class 2:	100
			Class 3:	150
			Class 4:	350
			Class 5:	
			TOTAL	650
1987-1991	OFFICE/WAREHOUSE COMPLEX	PUBLIC	Class 1:	
			Class 2:	500
			Class 3:	900
			Class 4:	
			Class 5:	
			TOTAL	1,400
1987-1991	ROAD/GENERAL MAINTENANCE	PUBLIC	Class 1:	
			Class 2:	
			Class 3:	20,000
			Class 4:	
			Class 5:	
			TOTAL	20,000



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES DEMAND SUMMARY
Sachs Harbour

YEAR GROUP	PROJECT (V Denotes Speculative Project)	CATEGORY	VOLUME, cu.m.
1987-1991	SEWAGE AND SOLID WASTE DISPOSAL	PUBLIC	Class 1: Class 2: Class 3: Class 4: 9,000 Class 5: TOTAL 9,000
1987-1991	STAFF HOUSES	PUBLIC	Class 1: Class 2: 100 Class 3: 200 Class 4: Class 5: TOTAL 300
1987-1991	TANK FARM INCREASE	PUBLIC	Class 1: Class 2: 10,000 Class 3: 6,500 Class 4: Class 5: TOTAL 16,500
1992-1996	AIRFIELD MAINTENANCE	PUBLIC	Class 1: Class 2: 5,000 Class 3: Class 4: Class 5: TOTAL 5,000
1992-1996	DETACHMENT BUILDING	PUBLIC	Class 1: 10 Class 2: Class 3: 200 Class 4: Class 5: TOTAL 210
1992-1996	ROAD/GENERAL MAINTENANCE	PUBLIC	Class 1: Class 2: Class 3: 20,000 Class 4: Class 5: TOTAL 20,000



INDIAN AND NORTHERN AFFAIRS CANADA
INUVIALUIT SETTLEMENT SAND AND GRAVEL INVENTORY AND RECOMMENDATIONS FOR DEVELOPMENT

GRANULAR RESOURCES DEMAND SUMMARY
Sachs Harbour

YEAR GROUP	PROJECT (W Denotes Speculative Project)	CATEGORY	VOLUME, cu.m.	
1997-2001	AIRFIELD MAINTENANCE	PUBLIC	Class 1: Class 2: Class 3: Class 4: Class 5:	5,000
			TOTAL	5,000
1997-2001	ROAD/GENERAL MAINTENANCE	PUBLIC	Class 1: Class 2: Class 3: Class 4: Class 5:	20,000
			TOTAL	20,000
2002-2006	AIRFIELD MAINTENANCE	PUBLIC	Class 1: Class 2: Class 3: Class 4: Class 5:	5,000
			TOTAL	5,000
2002-2006	ROAD/GENERAL MAINTENANCE	PUBLIC	Class 1: Class 2: Class 3: Class 4: Class 5:	20,000
			TOTAL	20,000
1987-2006	SUMMARY OF DEMAND VOLUMES Sachs Harbour		Class 1: Class 2: Class 3: Class 4: Class 5:	60 31,400 89,350 9,350 0
			TOTAL	

