

BEAUFORT SEA



COMMUNITY GRANULAR MATERIALS INVENTORY

INUVIK
N.W.T.

DEPARTMENT OF INDIAN AFFAIRS
AND
NORTHERN DEVELOPMENT



D003575

RIPLEY, KLOHN & LEONOFF INTERNATIONAL LTD.
Consulting Geotechnical Engineers

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1. INTRODUCTION

1.1 Assignment

The Department of Indian Affairs and Northern Development commissioned Ripley, Klohn & Leonoff International Ltd. to undertake Stage #2 of a granular material inventory, which includes all unconsolidated material and bedrock suitable for engineering construction. The search area included the Tuktoyaktuk Peninsula, Richards Island, and the Mackenzie River Delta, south to Fort McPherson and Arctic Red River.

This report presents the results of the investigation and testing of granular materials adjacent to the Community of Inuvik, N.W.T. The work was conducted in accordance with the requirements of the Stage #2 Terms of Reference provided by the Department which requested recommendations for usage, development and restoration of each source. The approximate quantities of granular materials required for the Inuvik Community were as follows:

Fine grained aggregate (sand)	90,000 cu. yds.
Coarse grained aggregate (gravel)	120,000 cu. yds.
Material suitable for building pads, roads, airstrips etc	3,000,000 cu. yds.

Authorization to proceed with the work was received September 5, 1972 under Contract No. OTT-72-141 and Authority Reference T.B. No. 714562.

1.2 Procedure

The investigative procedure entailed a study and compilation of existing geological data from the work of the Geological Survey of Canada, pipeline route studies, and other previous work conducted within the designated area by Ripley, Klohn & Leonoff International Ltd.

The field reconnaissance to ground-check potential sources was done by means of surface sampling and hand-dug test pits. Observations relative to existing access roads, drainage conditions, biotic environmental concerns and source development considerations were made. The reconnaissance program indicated that 3 sources for the Community are within a 10 mile radius of the Community, 4 sources from 10 to 17 miles away lie east of the Community, and 1 lies about 38 miles to the northwest.

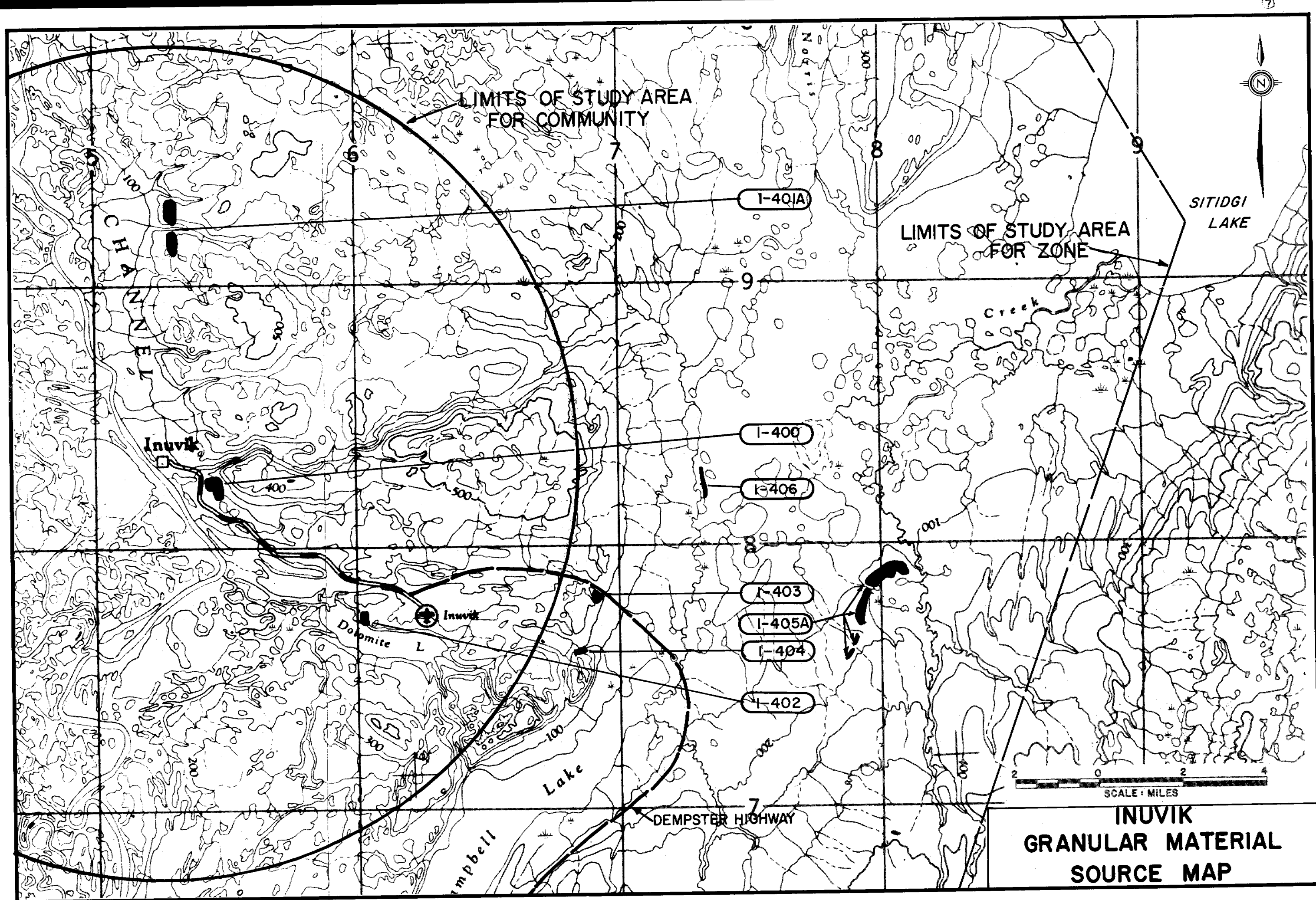
1.3 Data Presented

Information for the granular material sources is presented in the following sections:

Section entitled "Inuvik" is the text of the report which provides a general appreciation of surficial geology and environment in the area, and recommendations with respect to the use of materials, management, development and restoration of the source areas.

Section entitled "Maps and Tables" provides topographic maps showing the location of the Community and the location of the sources for the Community. A summary table giving the pertinent information relative to each source is also provided in this section, together with an explanation of the symbols and terms used in the report.

Sections entitled "Source No. ____" provide all details for each source, including test pit and test hole logs, results of laboratory analyses and details of the development and restoration of each source.



**INUVIK
GRANULAR MATERIAL
SOURCE MAP**

2. INUVIK COMMUNITY

2.1 Surficial Geology

This area around Inuvik consists of three physiographic units, the Mackenzie Delta lying to the west, the Anderson Plain in the south-east, and the Caribou Hills lying on the eastern boundary of the Delta to the north.

Bedrock is exposed along the west flank of the Caribou Hills and south of Inuvik, to the valley joining Campbell and Sitidgi Lakes. The age is Precambrian to Tertiary, and the Rocky Hills area is mainly Devonian to Ordovician, with Devonian sandstone dominating.

The Anderson Plain is generally covered by a silty ground moraine of variable thickness over the bedrock, in turn covered locally by more recent glacial features (eskers, kames, etc.) left by the last glacial retreat.

The Delta is predominantly recent silt deposits. Some rivers entering from the east have deposited sand and gravel in their streambeds.

2.2 Environment

The Anderson Plain is almost altogether covered by forests of a variety of trees, mostly coniferous. Generally the poorly-drained areas support a heavy ground cover of moss.

The area east of Inuvik is the Winter Range of the Mackenzie Reindeer Herd, a critical wildlife area. This area lies within the Anderson Plain, and two deposits studied in this report (Sources 1-405 and 1-406) are close to this critical area.

Another critical wildlife zone lies along the northwest side of Campbell Lake, containing an important habitat of the Peregrine Falcon. The same general area is proposed as a horticultural reserve under the International Biological Programme. Three sources recommended for consideration or development (1-402, 403 and 404) are in or adjacent to these critical areas.

With the exception of the three critical areas described above, the area east of the Community Study area is the habitat of the Mackenzie Reindeer Herd and of some barren-land caribou, with calving and breeding taking place in some areas. The area supports some trapping, and moose are hunted during the winter.

Source I-407, 38 miles northwest of Inuvik, lies within the critical Mackenzie Delta wildlife region, an area that is valued for its productivity in fur-bearing animals and in water fowl. The channels of the Delta and tributary streams support a fishery that is important to the native population.

Another reserve of the International Biological Programme is proposed for the east bank of the Delta, just south of Source I-407, in the northern end of the Caribou Hills.

2.3 Sources and Materials

Of the 8 sources investigated for the supply of granular material to Inuvik, 6 are recommended for development and further study. Sources I-401A and I-405A are rejected because of poor quality of material and high ice content.

Sources I-400 and I-407 are now used by the people of Inuvik as sources of general fill and, to a limited extent, for concrete aggregate. Both are sources of sand and gravel with Source I-400 having a higher silt content.

Source I-402 is an established bedrock quarry developed for the construction of Inuvik Airport and still capable of producing good material in large volume. Source I-403 is another bedrock quarry now in use in connection with the construction of the Dempster Highway, and is recommended for further development after Source I-402 is depleted. Source I-404, another quarry in soft sandstone, is held in reserve for general fill.

Source I-406 is a remote esker rated low priority, and is recommended for development only if a project is planned nearby.

Concrete aggregate can be produced from Sources I-402, I-403, and I-407, although the crushed fine aggregate from the bedrock sources will probably require blending with a natural sand to improve the workability of the concrete. The other sources can produce general fill and road-building material.

The petrographic analysis of gravel from Test hole I-407-4 indicates that this is a remarkably sound material, with quartzite (78%) and quartz (13%) the main constituents, with granite, chert (3%), and soft sandstone (6%) making up the remainder. Only the sandstone is unsound.

The volume of material available to Inuvik is sufficient for projected needs, and even provides latitude for considering alternative development plans.

2.4 Management

Sources I-400 and I-402 are near the Community and airport respectively, and their continued use should cause no serious concern for other uses of the surrounding areas. The same applies to a lesser degree to the development of Source I-403, and still less to Source I-404, because these are more remote and closer to the proposed International Biological Programme reserve and falcon sanctuary. Both Sources I-403 and I-404 are not likely to be developed for Community use for some years in the future, in any case.

Source I-406 offers no particular problems to wildlife or fish, provided the recommended measures are followed.

Source I-407 is now under limited development in a sensitive area. It is recommended that the large-scale development of this source be preceded by an environmental impact study to determine whether and how such a development can proceed without excessive disruption of the natural environment.

Obviously the environmental setting has a large influence on the schedule of development of granular sources in this area. For the immediate future, on about the present rate of use, Sources I-400 and I-407 will continue to meet the needs of the Community. Large-scale use of general fill will probably require an expansion of the pit at Source I-402. Large-scale demand for concrete aggregate will require an expansion of Source I-402 or of Source I-407, depending on the scale and type of development.

It is recommended that the indiscriminate development of granular sources for small volumes should be avoided, in order to minimize the impact on the surrounding area and on other uses of the area. Where the development of a large number of sources cannot be avoided, as for example in connection with the construction of a Highway, these sources must be graded and restored before they are abandoned.

2.5 Development

2.5.1 General

As described more fully under Management (2.4), the future needs of Inuvik can probably be served from the sources now in use, which fortunately have considerable reserves and potential for expansion.

2.5.2 Access

Sources I-400 and I-402 are close to Inuvik, and all-weather access is assured by road. Sources I-403 and I-404 are somewhat further away, but are available at any season.

Source I-406 is about 20 miles away in the Anderson Plain, and can be reached only by winter road.

Source I-407 is most remote of all, 38 miles by air from Inuvik, but transportation is direct and may be quite economical by barge during the summer months. Winter transportation is long for a truck-haul, but is simple and direct, following the east channel of the Mackenzie River.

2.5.3 Material Uses and Handling

General fill can be produced from any of the 6 sources under consideration near Inuvik. Only Sources I-402, I-403 and I-407 can produce aggregate for concrete and asphalt construction, and the quarry operations will probably require blending with a natural sand to make their aggregate less harsh for use in concrete.

The 3 quarry operations, Sources I-402, I-403 and I-404, require more equipment for development than do the granular sources. Source I-403 will require drilling and blasting before excavation, and probably Sources I-402 and I-404 will require equipment for drilling and blasting to be available. Because the pit-run material is generally quite coarse, a crusher will be required for nearly all production from these sources.

Additional equipment will be required for these and other sources, such as dozers for stripping, ripping, and grading, front-end loaders, and trucks or barges for transportation.

The production of specification aggregate for concrete or asphalt construction will require crushing and screening equipment.

2.5.4 Stripping and Restoration

Source I-400 has been in use for many years, and the depleted areas of this source should be graded, recovered, and seeded for revegetation.

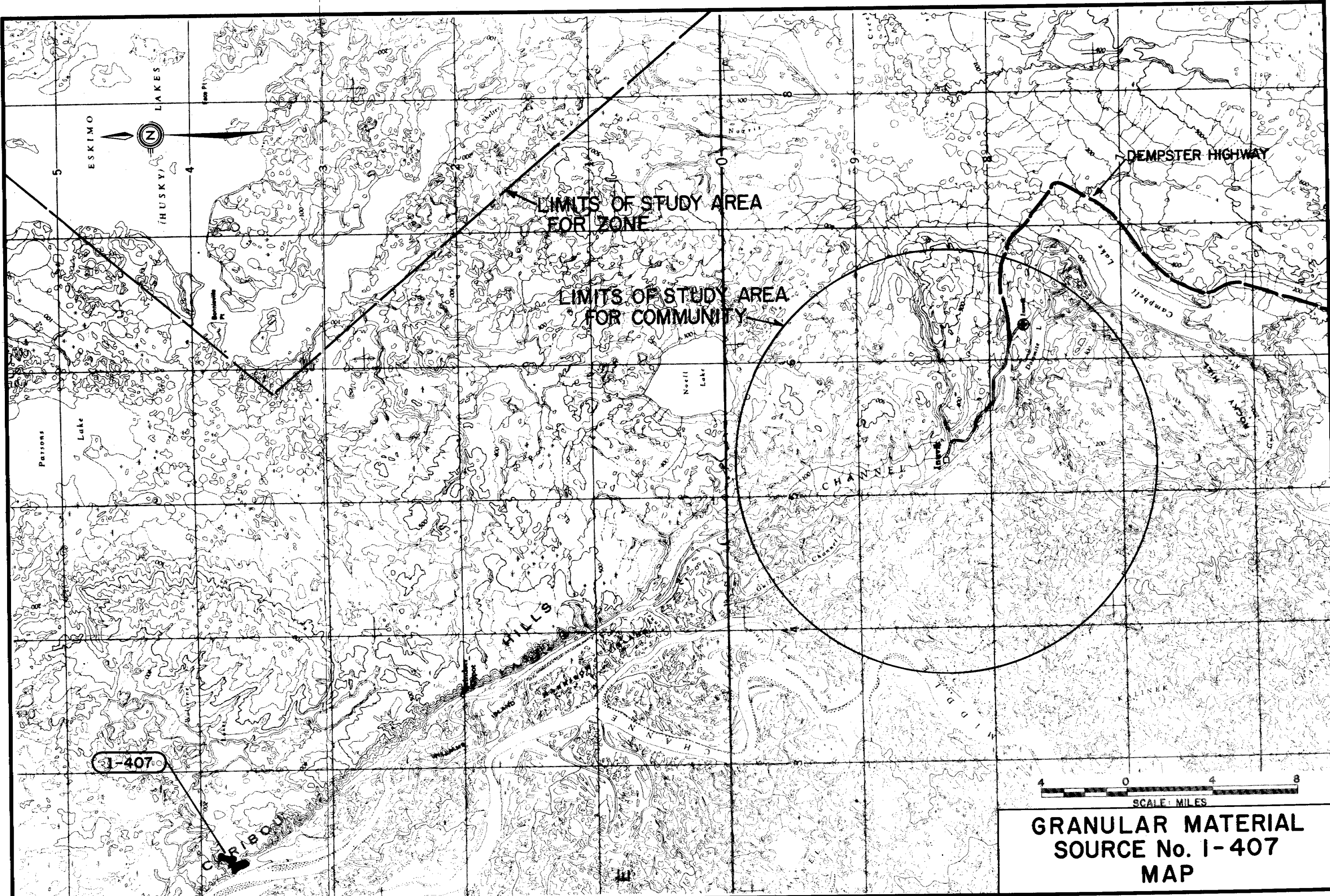
Sources I-402, I-403 and I-404 are all quarries, with bedrock outcropping over a large area. Only a limited amount can be done to restore these areas, but the steep walls should be cut to a stable slope and recovered with any topsoil and organic cover that may be available. Reseeding and revegetation must be done with the advice of the staff of the International Biological Programme, responsible as they are for the reserve that has been proposed nearby.

Source I-406 is a typical glacial feature in tundra, requiring stripping, replacement of topsoil and organic cover, and reseeded for speedy revegetation.

Source I-407 is relatively barren, with no vegetative cover on the steep slopes. The large-scale development of this source should be preceded by an environmental study, and probably some detailed recommendations for restoration will be provided at that time. In any case it will be necessary to avoid the exposure of areas of ground ice on the slopes of this steep deposit.

In general, the description of vegetative cover to be employed in restoring disturbed areas is beyond the scope of this report, but can be provided by a botanist familiar with the Arctic.

More detailed comments concerning the stripping and restoration of the sources investigated near Inuvik are provided in the discussion of each source.





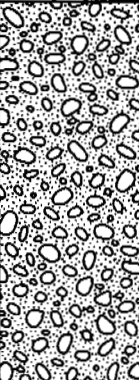

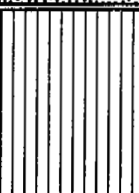
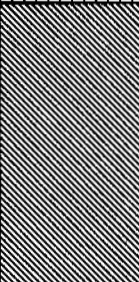


4 0 4 8
SCALE: MILES

GRANULAR MATERIAL
SOURCE No. 1-407
MAP

SOURCE No.	DISTANCE FROM COMMUNITY MILES	MATERIAL TYPE (UNIFIED GROUP SYMBOL)	VOLUME ESTIMATES CUBIC YARDS	ENVIRONMENTAL CONCERNS	CONCLUSIONS	SOURCE DEVELOPMENT DATA									
						DRAINAGE	STRIPPING			GRD. ICE	REC. DEPTH (FT.)	TYPE OF EXCAVATION	MATERIAL USEAGE	EQUIPMENT REQUIRED	STATE OF DEVELOPMENT OF SOURCE
							MATERIAL	DEPTH (FT)	DISPOSAL						
1-404	14 by road	SANDSTONE - soft	100,000	No major concerns	Source is low priority for development due to poor quality and distance from Community	Excellent	Topsoil and silt	0 to 3	Stockpile adjacent to pit for later re-grading	Nil	25	Rip or blast, load into trucks	General fill	Dozer-Ripper, Blasting equipment, Loader, Trucks	Developed by contractor for Dempster Highway
SEE SECTION 1-404 FOR SOURCE DETAILS															
1-405A	20	SAND - and silt (S M)		No major concerns	Not recommended for development due to poor quality and medium to high ice content	Good	Topsoil, peat and silt	1 to 4		Medium to high			Poor quality General fill		Undeveloped
SEE SECTION 1-405A FOR SOURCE DETAILS															
1-406	20	GRAVEL - some sand (GW - GM) SAND - little gravel (SW - SM)	40,000	No major concerns	Low priority for development due to inferior quality and difficulty of access	Good	Peat and silt	0.5 to 2	Stockpile away from stream adjacent to esker	Low to Medium	10 to 15	Rip, doze into piles, thaw and drain, load in trucks	General fill	Dozer-Ripper, Loader, Trucks	Undeveloped
SEE SECTION 1-406 FOR SOURCE DETAILS															
1-407	40	GRAVEL - and sand (GW - GM) SAND - some gravel (S W)	6,000,000	Critical wildlife area	Suitable for continued development probably requiring impact study for large scale operation	Good	Topsoil and silt	1 to 5	Stockpile away from river for later grading	Low	40	Doze into piles, load onto trucks or barges	General fill fine and coarse aggregate for concrete and asphalt	Loader, Trucks or Barges, Screen plant	Partially developed for Community
SEE SECTION 1-407 FOR SOURCE DETAILS															

SOURCE No.	DISTANCE FROM COMMUNITY MILES	MATERIAL TYPE (UNIFIED GROUP SYMBOL)	VOLUME ESTIMATES CUBIC YARDS	ENVIRONMENTAL CONCERNS	CONCLUSIONS	SOURCE DEVELOPMENT DATA									
						DRAINAGE	STRIPPING			GRD. ICE	REC. DEPTH (FT.)	TYPE OF EXCAVATION	MATERIAL USEAGE	EQUIPMENT REQUIRED	STATE OF DEVELOPMENT OF SOURCE
							MATERIAL	DEPTH (FT)	DISPOSAL						
1-400	1	SAND - some gravel some silt (S M)	250,000	No major concerns	Source is suitable for continued use but requires management	Good to Fair	Peat and silt	1 to 3	Stockpile adjacent to pit for later re-grading	Low to high	30	Rip and doze into piles, thaw, load in trucks	General fill	Dozer - Ripper, Loader, Trucks	Developed and in use by Community
SEE SECTION 1-400 FOR SOURCE DETAILS															
1-401A	6	SAND - some gravel some silt (S M) SILT - some gravel some sand (M L)		No major concerns	Not recommended for development due to poor quality and high ice content	Good	Peat and silt	1 to 6		High			Poor quality General fill		Undeveloped
SEE SECTION 1-401A FOR SOURCE DETAILS															
1-402	8 by road	SHALE - hard dense fractured	6,000,000	No major concerns	Source is suitable for continued development	Good	Topsoil and silt	0 to 2	Stockpile for later regrading in pit	Nil	30	Rip or blast, doze into piles, load in trucks Crush and Screen for aggregate	General fill Fine and coarse aggregates for concrete and asphalt	Dozer-Ripper, Blasting equipment, Loader, Trucks, Crusher and Screen plant	Developed and in use
SEE SECTION 1-402 FOR SOURCE DETAILS															
1-403	13 by road	LIMESTONE-hard dense layered	2,500,000	No major concerns	Source is suitable for development after source 1-402 is depleted	Good	Topsoil and silt	0 to 3	Stockpile for later regrading in pit	Nil	40	Blast, load into trucks Crush and Screen for aggregates	General fill Fine and coarse aggregates for concrete and asphalt	Blasting equipment, Loader, Trucks Crusher and Screen plant	Developed by contractor for Dempster Highway
SEE SECTION 1-403 FOR SOURCE DETAILS															

EXPLANATION OF SYMBOLS AND TERMS USED IN THIS REPORT

GENERAL CLASSIFICATION SYSTEM FOR SOILS						
MAJOR DIVISION			Group SYMBOL	Graph SYMBOL	TYPICAL DESCRIPTION	
COARSE-GRAINED SOILS (more than half by weight larger than 200 sieve)	BOULDERS		N/A		LARGER THAN 8 INCHES DIAMETER	
	COBBLES		N/A		3 TO 8 INCHES DIAMETER	
	GRAVELS more than half coarse grains larger than No. 4 sieve & 100% smaller than 3 inches diameter	CLEAN GRAVELS (little or no fines)	G W		WELL GRADED GRAVELS, LITTLE OR NO FINES	
			G P		POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		DIRTY GRAVELS (with some fines)	G M		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
			G C		CLAYEY GRAVELS, GRAVEL-SAND CLAY MIXTURES	
	SANDS more than half fine grains smaller than No. 4 sieve.	CLEAN SANDS (little or no fines)	S W		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
			S P		POORLY GRADED SANDS, LITTLE OR NO FINES	
		DIRTY SANDS (with some fines)	S M		SILTY SANDS, SAND-SILT MIXTURES	
			S C		CLAYEY SANDS, SAND-CLAY MIXTURES	
FINE-GRAINED SOILS (more than half by weight passes 200 sieve)	SILTS below "A" line negligible organic content	W_L 50%	M L		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	
		W_L 50%	M H		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS above "A" line on plasticity chart negligible organic content	W_L 30%	C L		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	
		30% W_L 50%	C I		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		W_L 50%	C H		INORGANIC CLAYS OR HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS below "A" line on chart	W_L 50%	O L		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
		W_L 50%	O H		ORGANIC CLAYS OF HIGH PLASTICITY	
HIGHLY ORGANIC SOILS			P t		PEAT AND OTHER HIGHLY ORGANIC SOILS	

SUPPLEMENTARY TERMS IDENTIFYING THE COMPOSITION OF GRANULAR SOILS

Component	Identification	Terms Identifying Proportions	Defining Range Percentage by Weight
Principal Component.....{	GRAVEL SAND SILT	50 or more
Minor Component.....{	Gravel Sand Silt	and some little trace	35 to 50 20 to 35 10 to 20 1 to 10

CLASSIFICATION SYSTEM FOR ICE

Non Visible Ice	Nf Nbn Nbe	Poorly bonded Well bonded Excess Ice
Visible Ice Less than 1 inch thick	Vx Vc Vr Vs	Individual ice crystals or inclusions Ice coatings or particles Random or irregularly oriented ice formation Stratified or distinctly oriented ice formations
Visible Ice Greater Than 1 inch thick	ICE+ ICE	Ice with soil inclusions Ice without soil inclusions

GROUND ICE CONTENT - % BY VOLUME

Low - <10% Med - 10% to 20% High - >20%

DESCRIPTIVE SOIL TERMS

Well graded having wide range of grain sizes and substantial amounts of all intermediate sizes.

Poorly graded .. predominantly of one grain size.

Coarse Aggregate .. Gravel retained on $\frac{1}{4}$ inch screen.

Fine Aggregate . Sand passing $\frac{1}{4}$ inch screen.

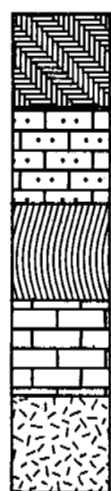
Interbedded composed of alternate layers of different soil or rock types.

Calcareous containing appreciable quantities of calcium carbonate.

Organic containing organic matter; may be decomposed or fibrous.

Peat a fibrous mass of organic matter in various stages of decomposition. Generally dark brown to black in colour and of spongy consistency.

SUPPLEMENTARY SYMBOLS AND NOTATIONS



Bedrock

Sandstone

Shale

Limestone

Talus

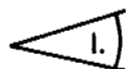
Prefix Indicating Community
 FM-501A -1
 No. Indicating No. of Test Hole (Letters "A", "B", "C" etc. indicate Test Pits)
 Suffix "A" Indicating Source not to be developed
 No. Indicating Source



Indicates Test Hole Location

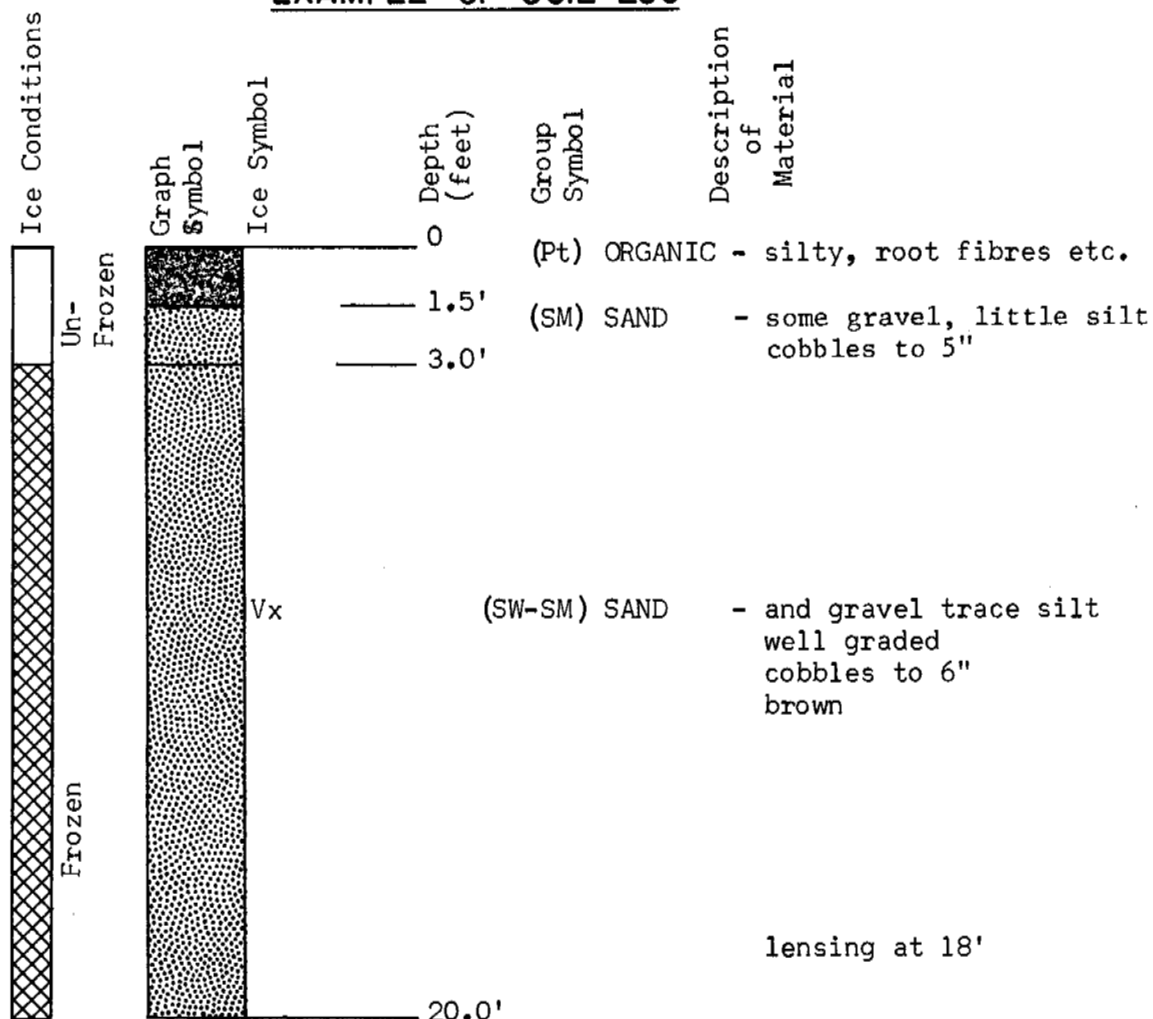


Indicates Test Pit Location



Indicates Direction of Ground Photograph and Field of View

EXAMPLE OF SOIL LOG



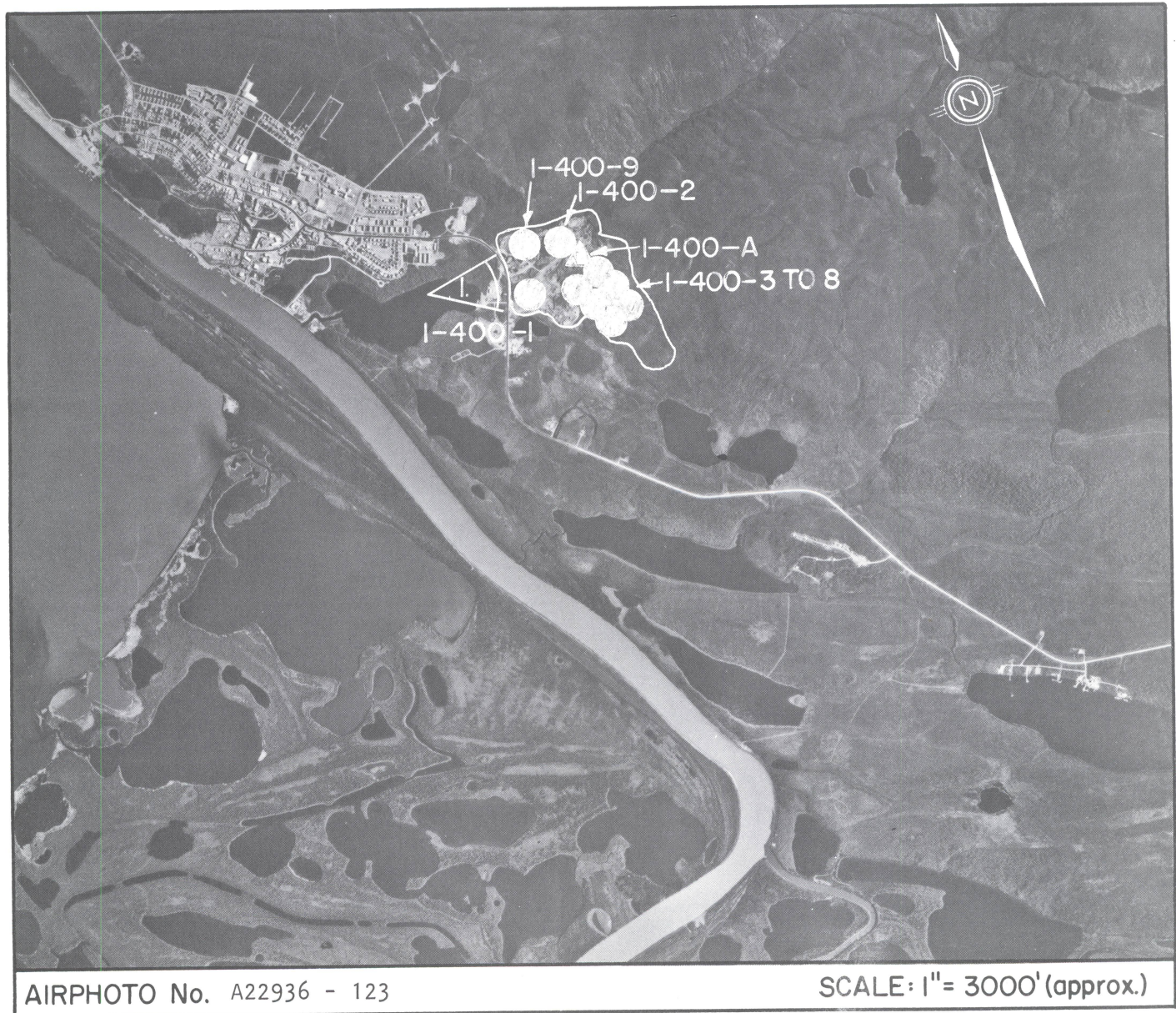
INUVIK
SOURCE No. I-400

LANDFORM AND LOCATION: Glaciofluvial outwash area 1 mile south of Inuvik.

MATERIAL: SAND - some gravel, some silt

VOLUME: 250,000 cu. yds.

CONCLUSION: Source now in use but needs management to minimize material wastage and to restore depleted areas. Source is suitable for general fill.



I-400 ENVIRONMENT

Physical

The source is part of a glaciofluvial outwash area located on the southern outskirts of Inuvik and at the southern tip of the Caribou Hills physiographic region. This area has been developed for the supply of granular material to the Community, and now extends about 2,000 feet in length and about 1,500 feet in width, with some pits dug to a depth of 30 feet.



Photo No. 1 Source 400 showing present pit area

A small stream known as Boot Creek flows west through the pit area to the Mackenzie Delta. Drainage is satisfactory, except for ponding where pits have been dug below the level of the stream.

The source lies about 1 mile south of the center of Inuvik.

Biotic

Vegetative cover is primarily sphagnum moss with scattered black spruce up to 20 feet high. This area lies within the Mackenzie Reindeer Grazing Reserve, and supports a variety of small wildlife as well, such as muskrat, mink, and beaver. Trapping these animals is important to the native population, as is fishing in the nearby channel of the Mackenzie River.

The vicinity of the source is a popular recreational area, with skiing, snowmobiling, and hiking at different seasons.

I-400 MATERIALS AND QUANTITIES

The materials are silt, sand, and gravel in a wide variety of combinations. The maximum particle size is about 6 inches. Ice content is also variable, with ice formations observed on many exposures in the pits. The moisture content in different samples from test holes ranged from 36% to 5%.

Much of the deposit is fine, from silt to sand with silt, although gravel is discovered in thin and scattered layers. Petrographic analysis of the gravel shows the main constituents to be sandstone (17 to 38%), quartzite (36 to 61%) with shalestone, granite, chert (4%), limestone, felsite, pyrite (1%), and ironstone making up the remainder.

The volume of material remaining in this source is estimated to be 250,000 based on continued development following the current practise. If some control were applied to the creek to permit deeper excavation the reserves could be extended.

I-400 DEVELOPMENT

General

The pit development to date appears to lack planning, with stockpiles of granular material, waste, and overburden scattered among undeveloped areas, thus making wastage high and restoration difficult.

A manager should be appointed in Inuvik to manage this and other sources nearby. His first duty should be to supervise a clean-up and restoration of depleted areas. His continuing duties would be the supervision of further excavation.

Access

Year-round access is assured, with the source located within 1 mile of the center of Inuvik.

Material Use and Handling

Material from this source is suitable for general fill.

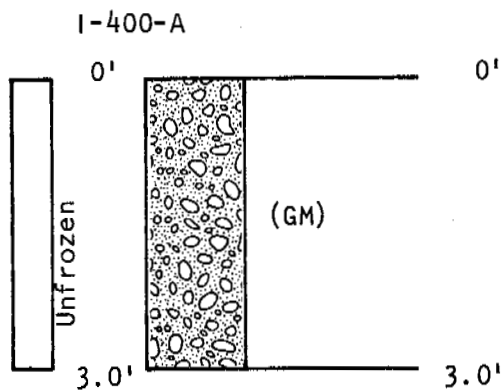
Development requires the use of a dozer with ripper attachment, front-end loader, and trucks.

Stripping and Restoration

The first move in this direction should be the restoration of depleted areas within the source. Many banks up to 20 feet high should be graded to a stable slope, then covered with the overburden that has been stockpiled nearby. Probably these stockpiles contain trees and roots, which should be raked out during the grading operation and burned. Finally the graded areas should be reseeded for speedy revegetation, using a selection of plants and methods of preparation recommended by a scientist experienced in Arctic horticulture.

As soon as possible all excavation in this source should be concentrated within a small area, to minimize the area that is disturbed at any time. Restoration should follow close behind development.

TEST PIT LOGS
SOURCE No. I-400



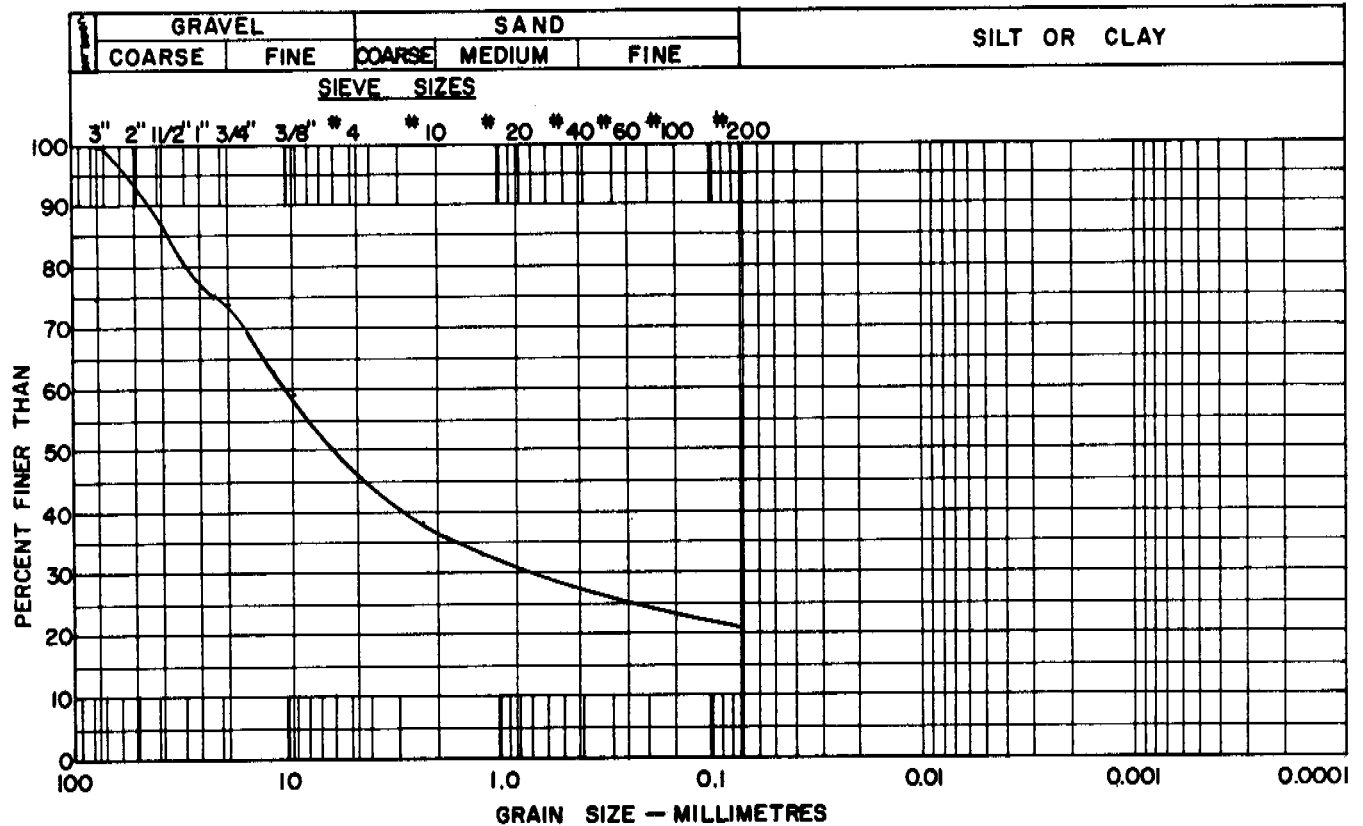
(GM)

GRAVEL - and sand, some silt, max 3",
angular, shale, gravel, non-
plastic, fines, brown

LABORATORY TEST DATA

SOURCE No. I-400-A

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

ORGANIC CONTENT

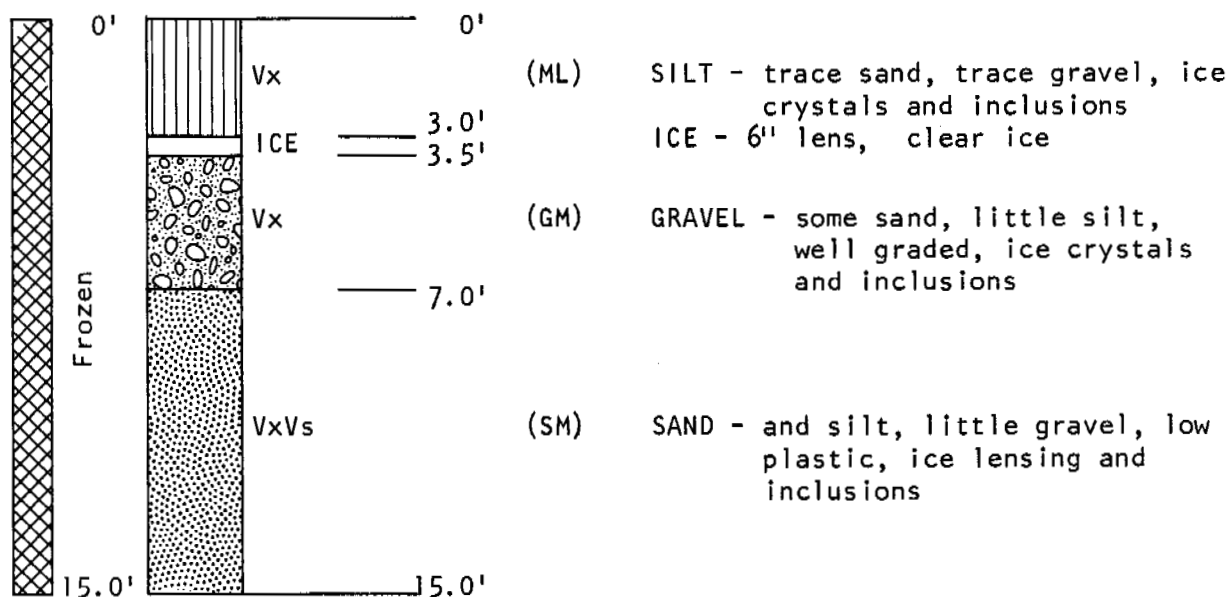
HARDNESS TEST

PETROGRAPHIC ANALYSIS

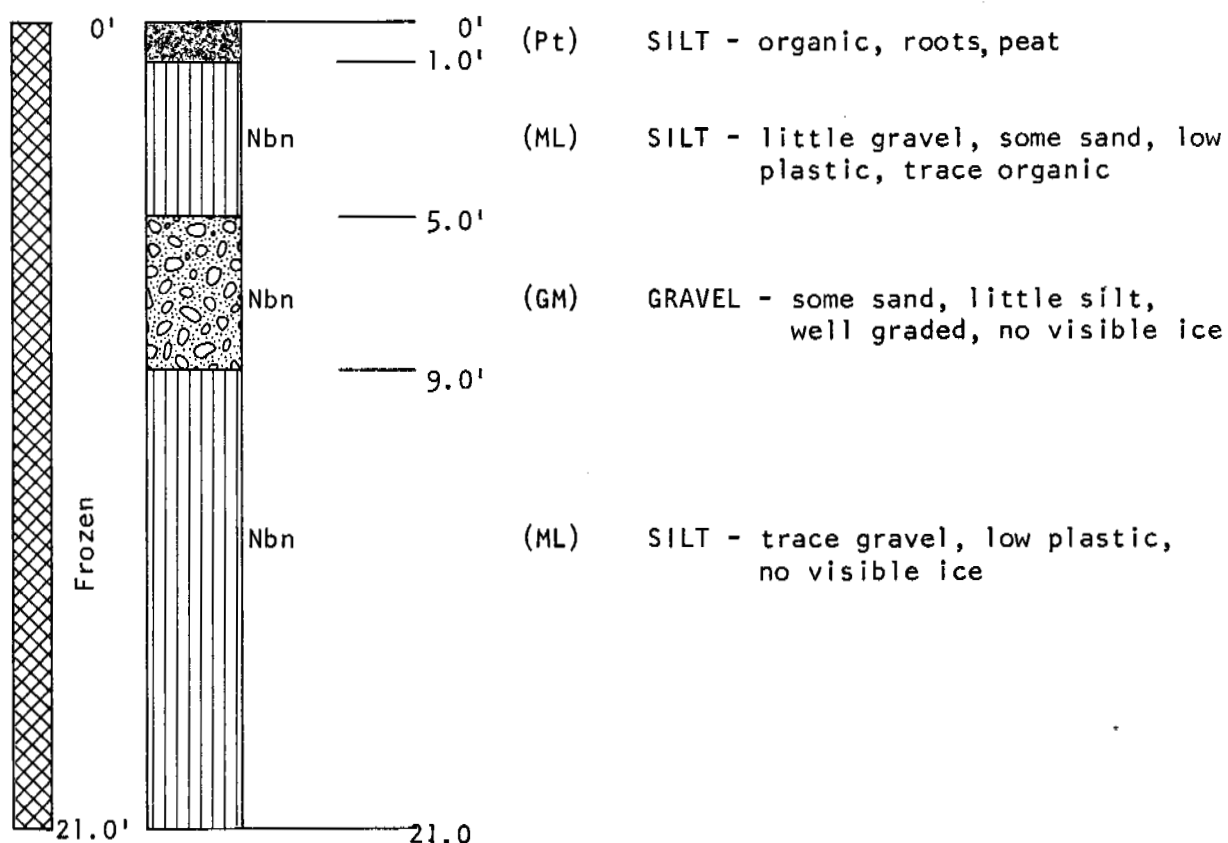
TEST HOLE LOGS

SOURCE No. I-400

I-400-1



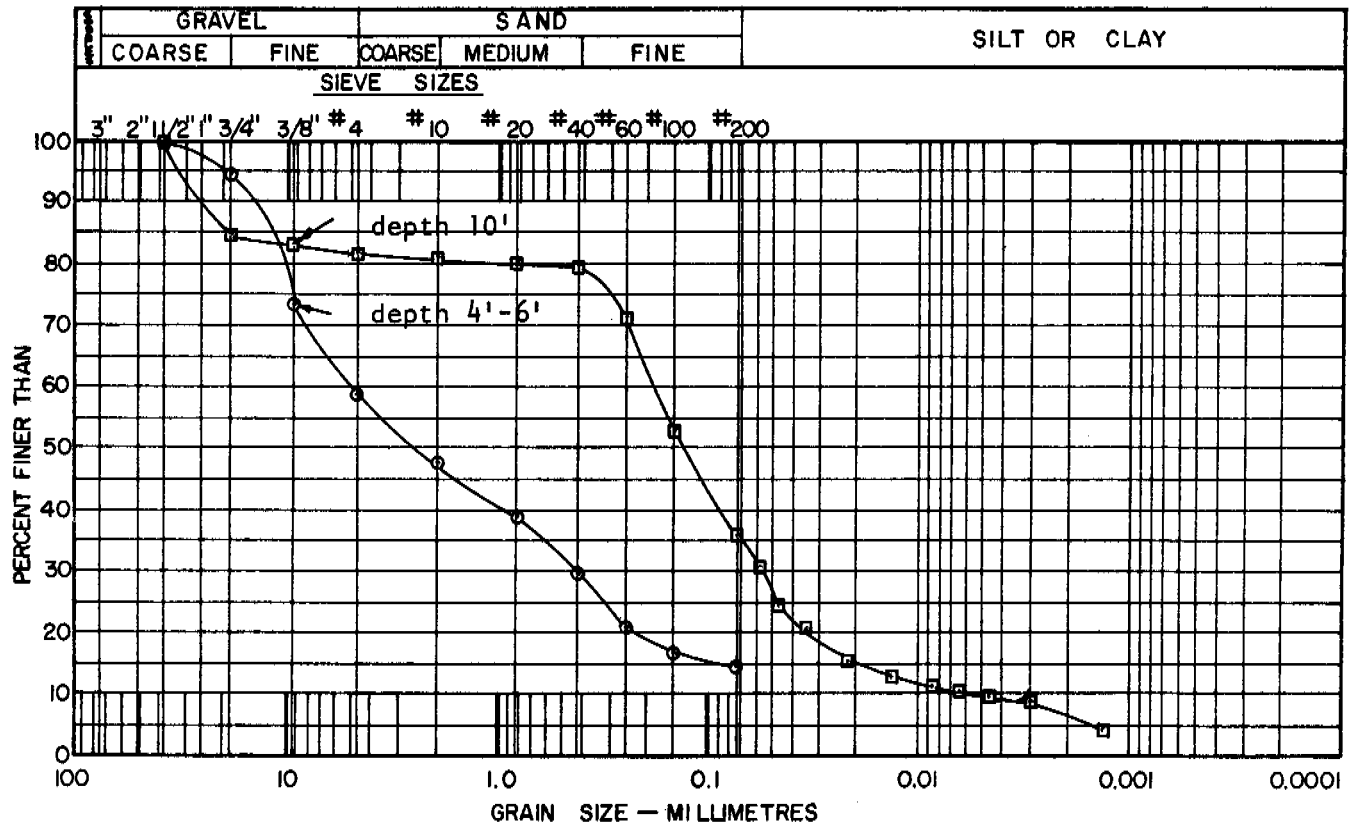
I-400-2



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-1

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2'	24.0%	Sample 6 depth 15'	37.8%
Sample 2 depth 4'	10.0%		
Sample 3 depth 6'	14.0%		
Sample 4 depth 8'	36.2%		
Sample 5 depth 10'	29.7%		

ORGANIC CONTENT

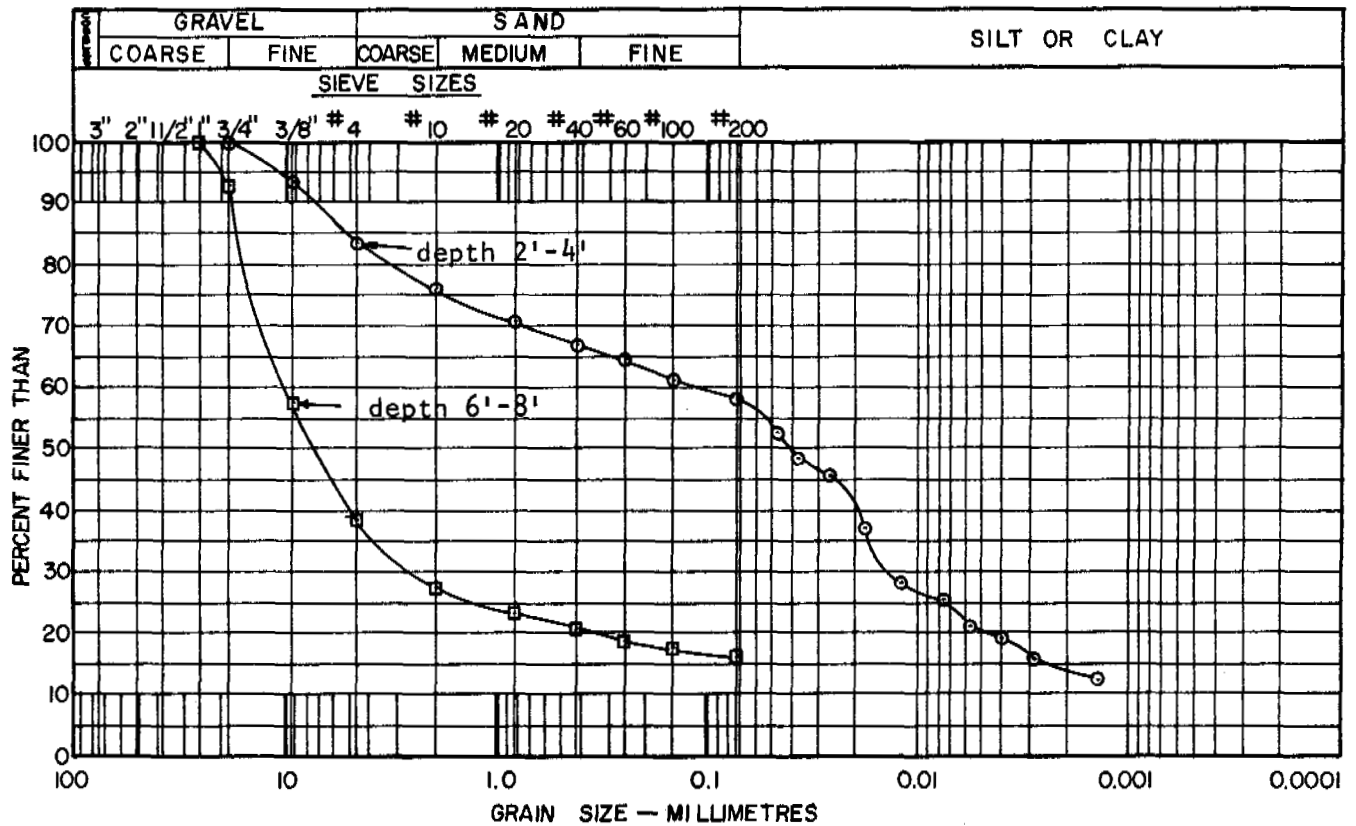
HARDNESS TEST

PETROGRAPHIC ANALYSIS

LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-2

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2'	28.3%
Sample 2 depth 4'	27.2%
Sample 3 depth 6'	13.1%
Sample 4 depth 8'	13.8%
Sample 5 depth 10'	32.7%

ORGANIC CONTENT

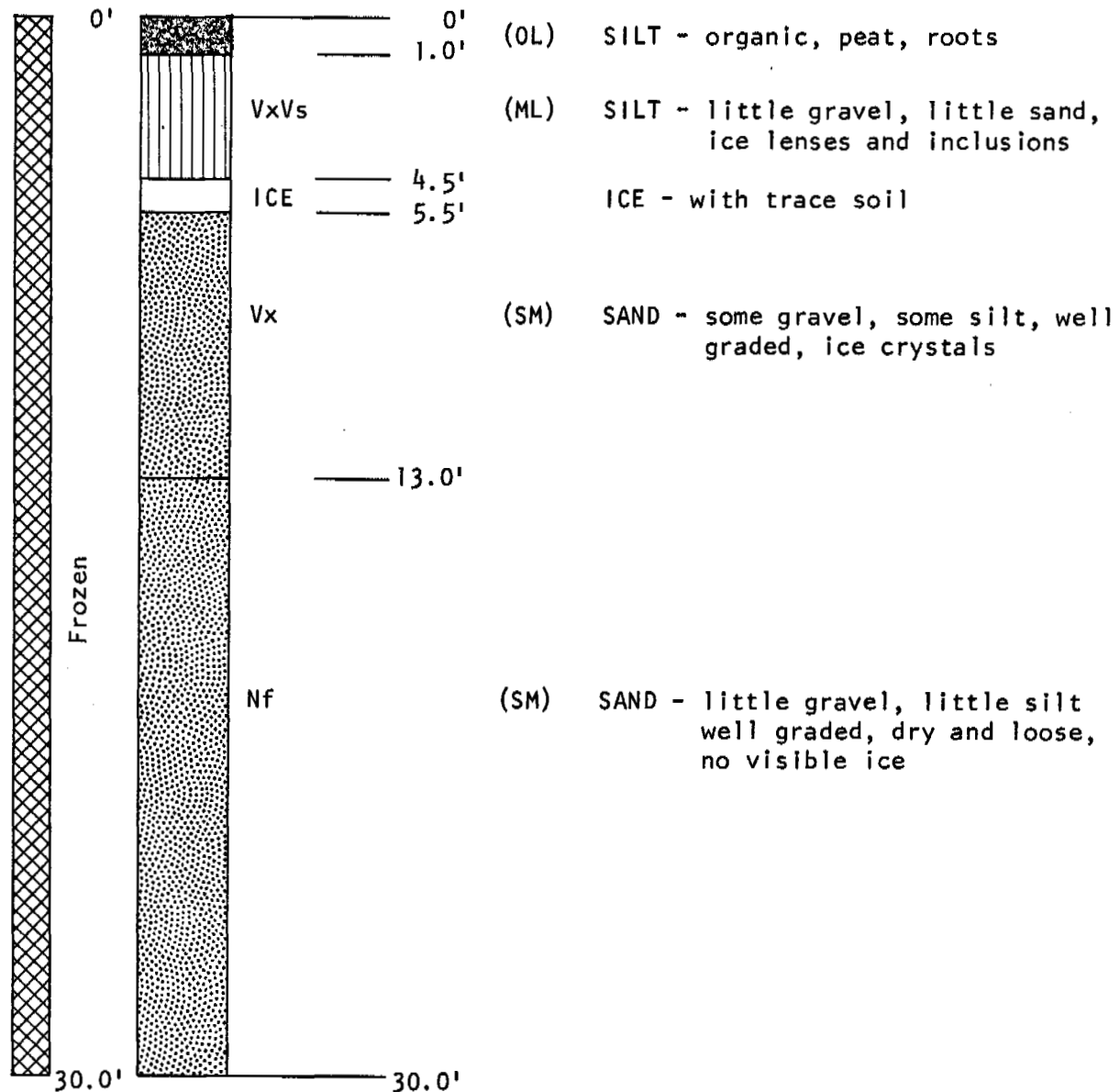
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-400

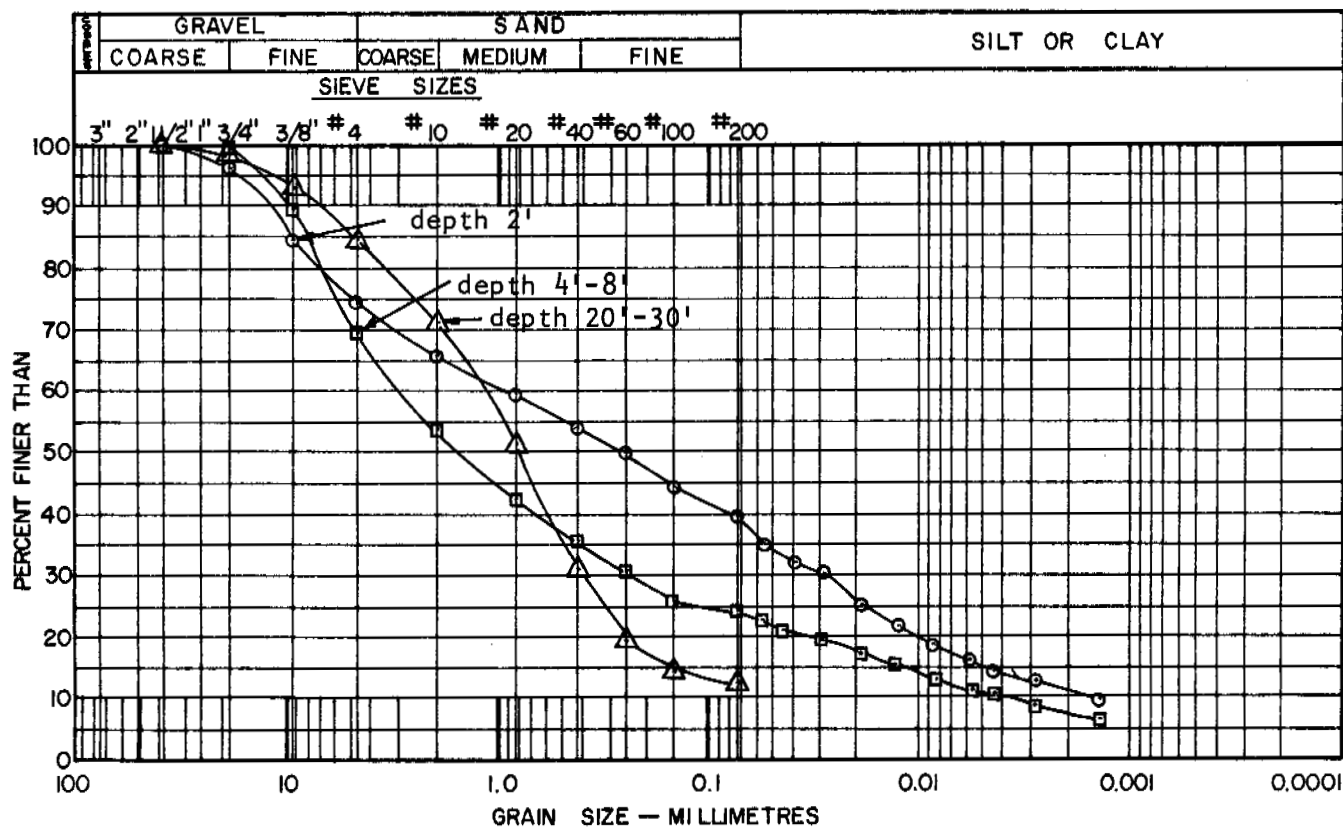
I-400-3



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-3

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 12.6%
 Sample 2 depth 4' 15.2%
 Sample 3 depth 6' 13.9%
 Sample 4 depth 8' 14.9%
 Sample 5 depth 10' 28.6%

Sample 6 depth 15' 19.3%
 Sample 7 depth 20' 6.4%
 Sample 8 depth 25' 6.4%
 Sample 9 depth 30' 4.9%

ORGANIC CONTENT

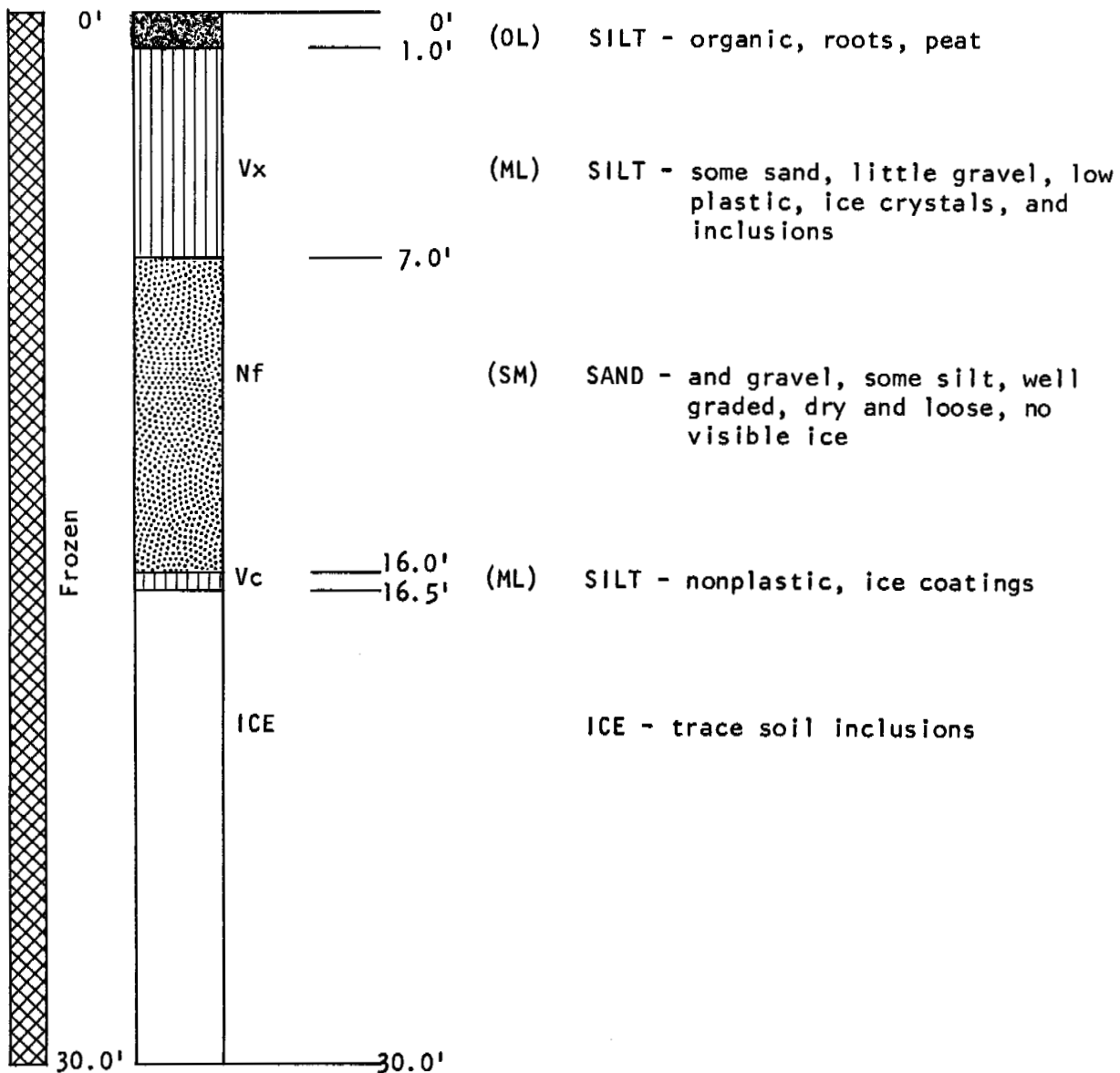
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-400

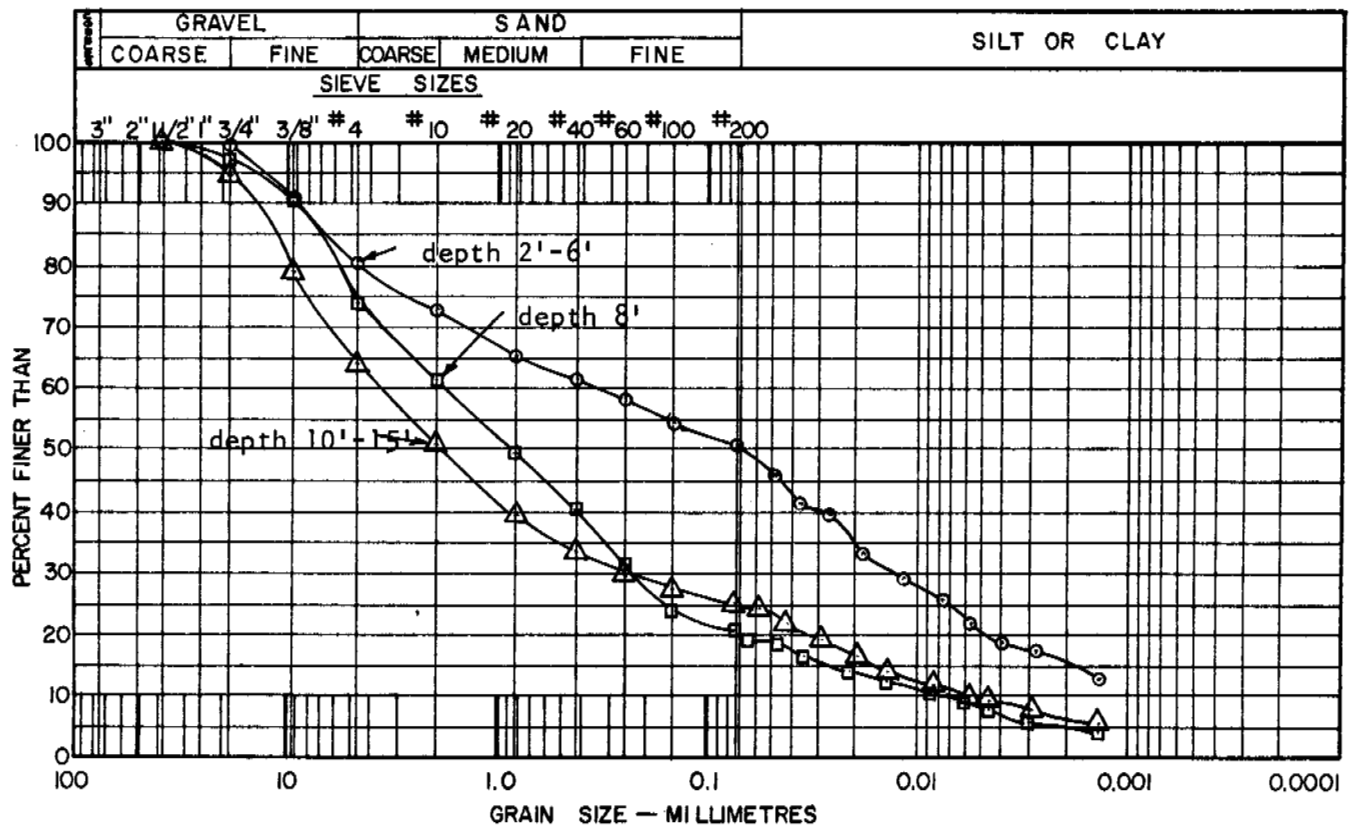
I-400-4



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-4

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 23.5%
 Sample 2 depth 4' 19.3%
 Sample 3 depth 6' 28.4%
 Sample 4 depth 8' 13.9%
 Sample 5 depth 10' 16.9%

Sample 6 depth 15' 16.2%

ORGANIC CONTENT

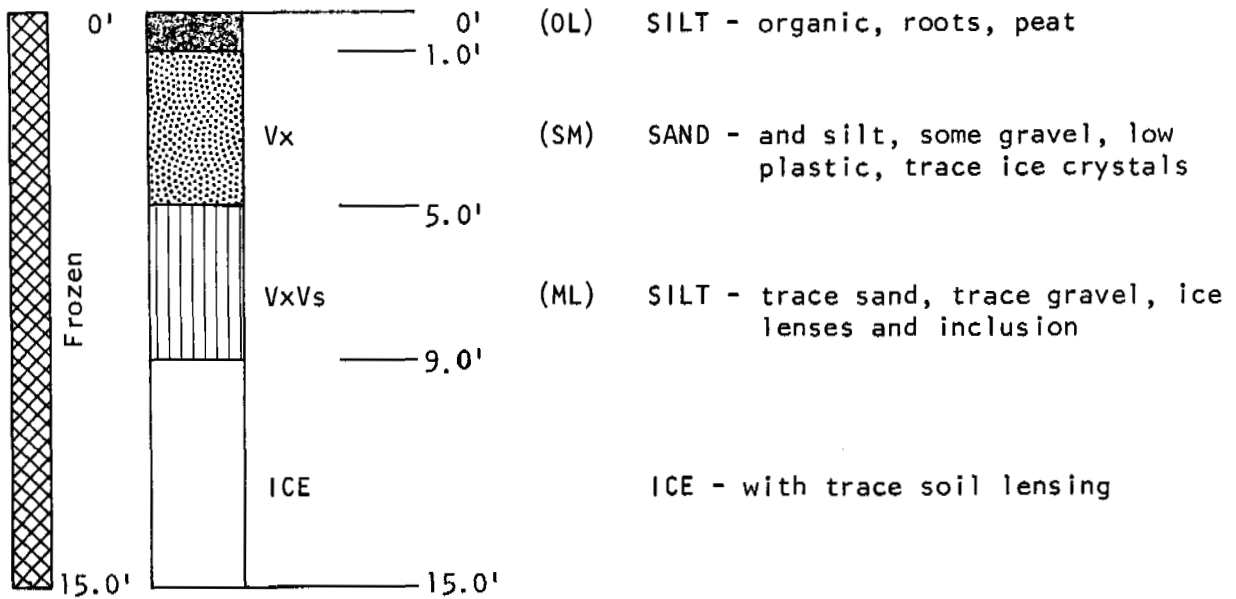
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-400

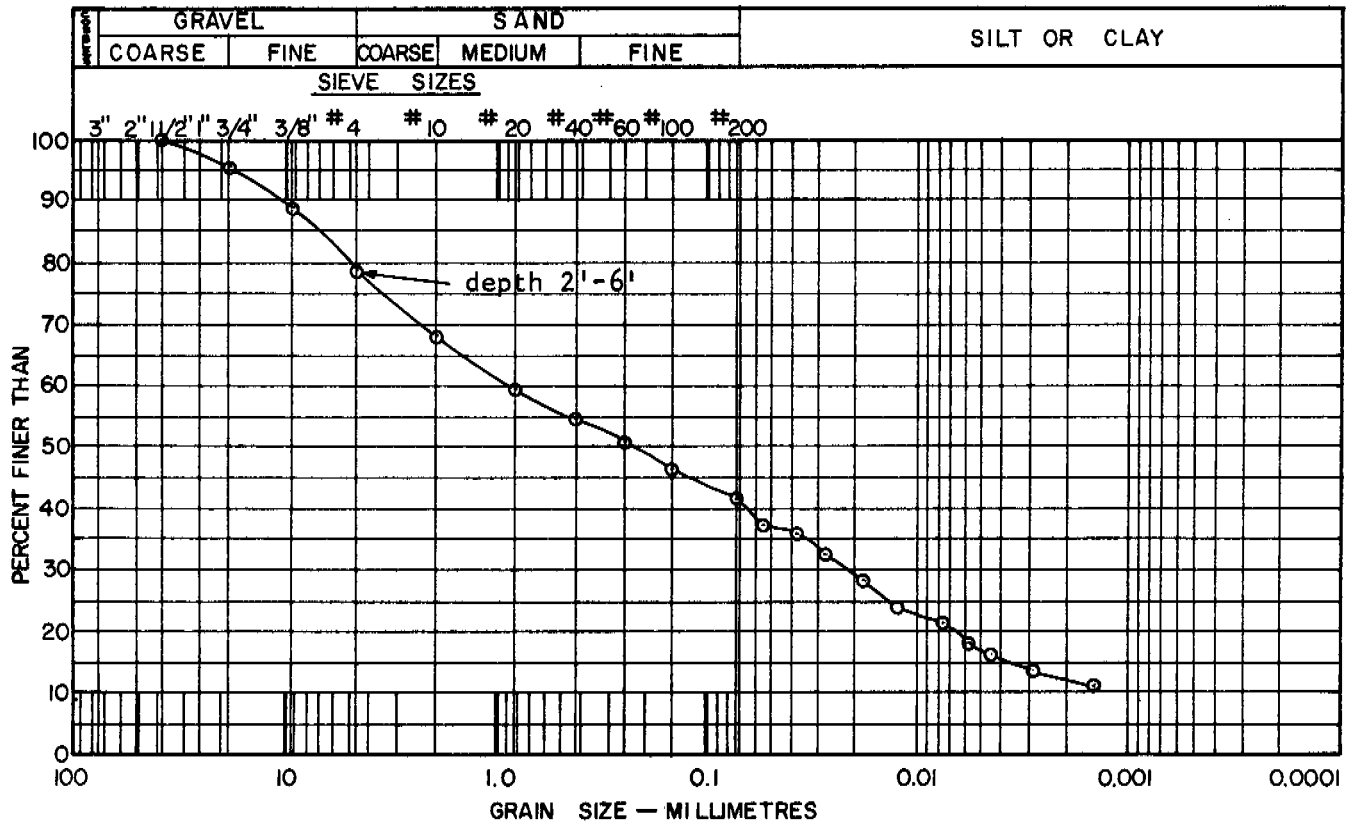
I-400-5



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-5

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 16.3%
 Sample 2 depth 4' 26.1%
 Sample 3 depth 6' 15.2%
 Sample 4 depth 8' 15.5%

ORGANIC CONTENT

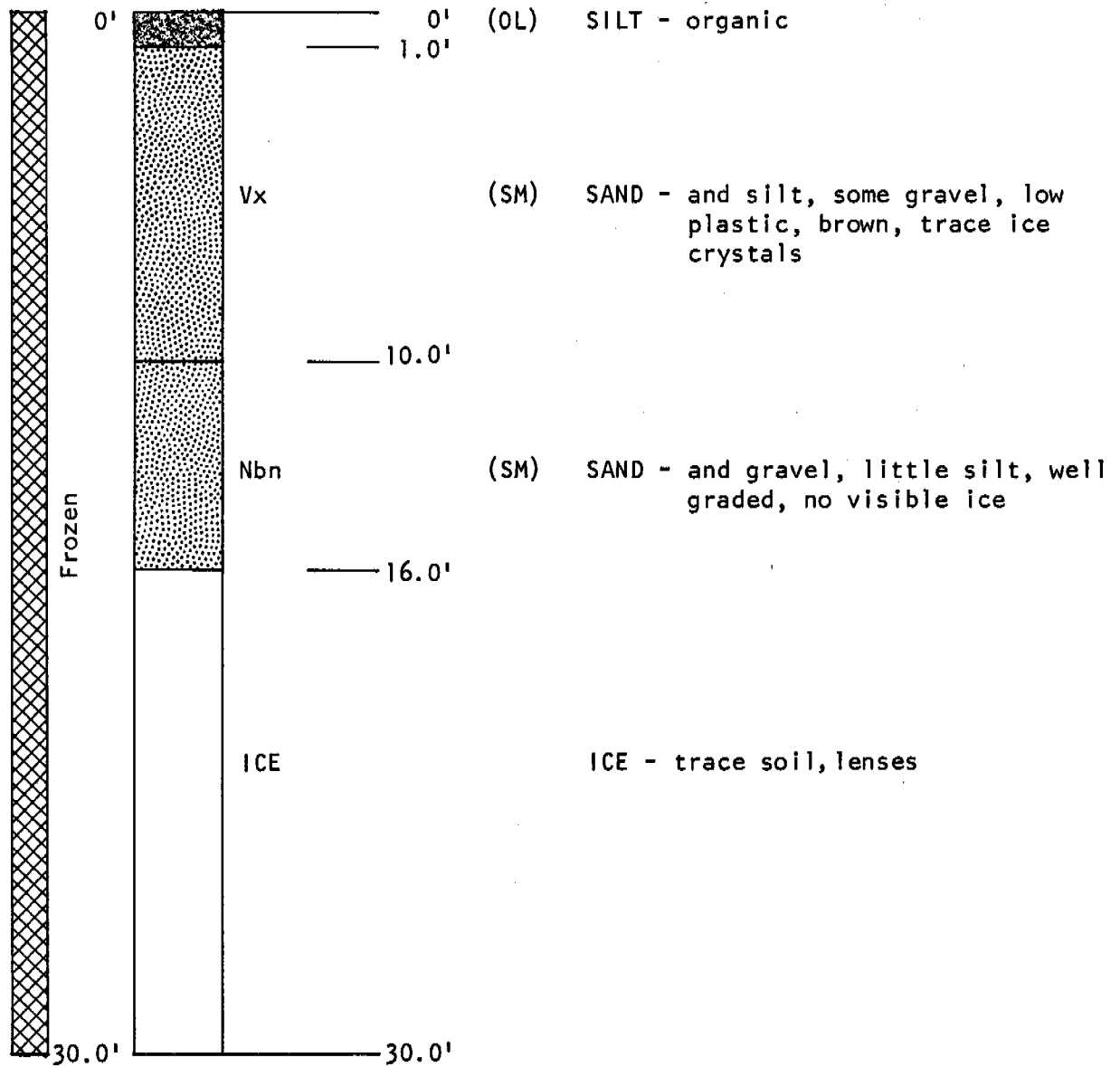
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-400

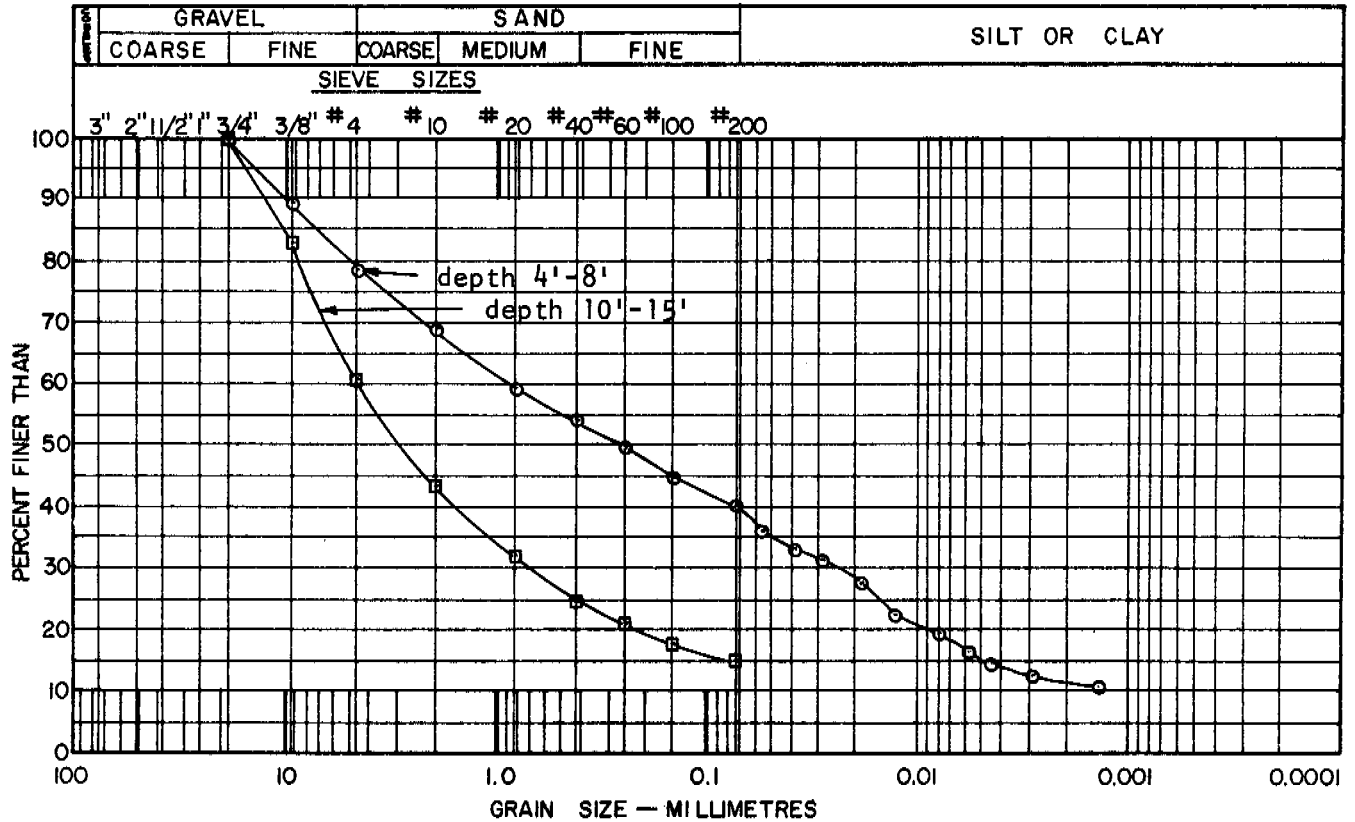
I-400-6



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-6

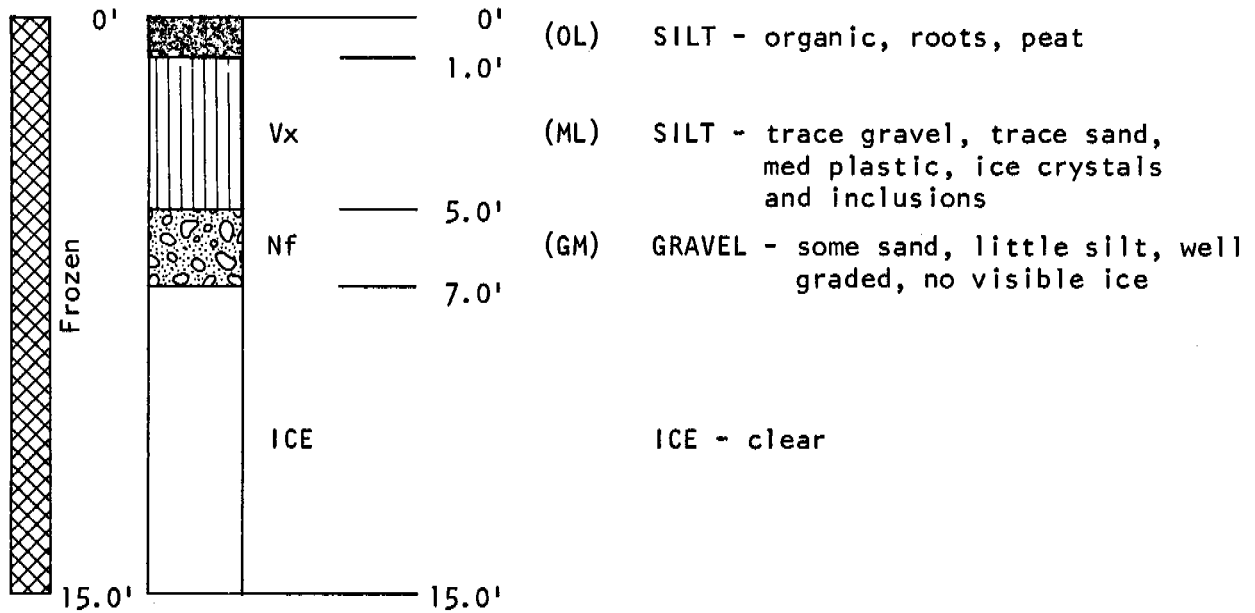
GRAIN SIZE DISTRIBUTION



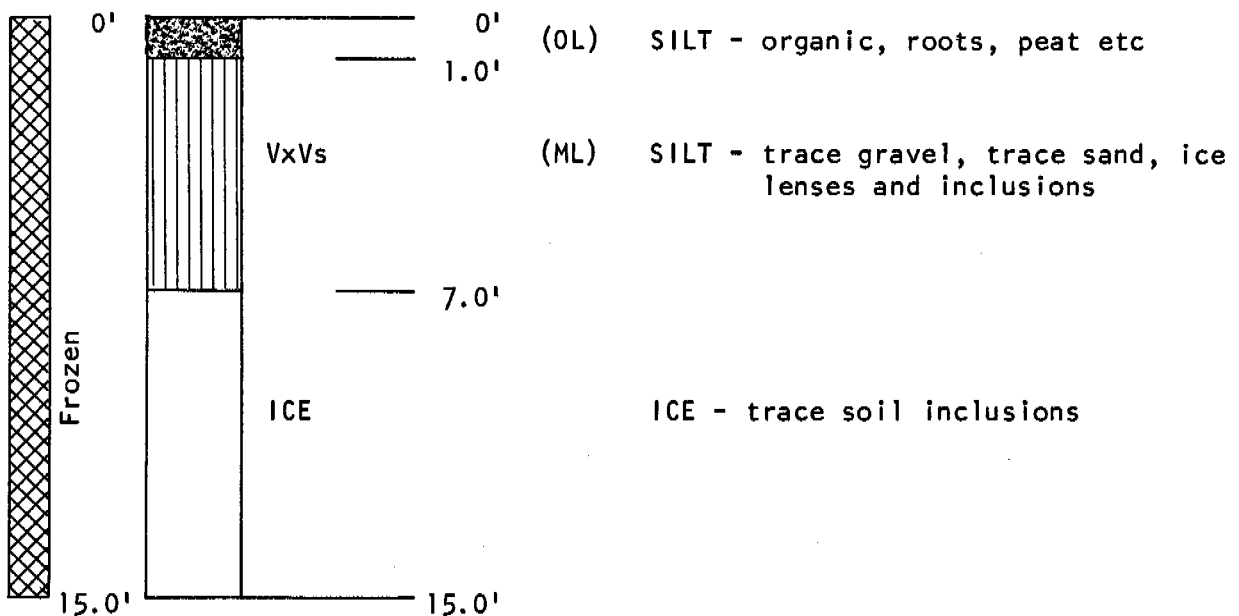
TEST HOLE LOGS

SOURCE No. I-400

I-400-7



I-400-8



Sample 1 depth 2' 55.1%
 Sample 2 depth 4' 33.4%
 Sample 3 depth 6' 30.5%

GRAIN SIZE DISTRIBUTION



ORGANIC CONTENT

HARDNESS TEST

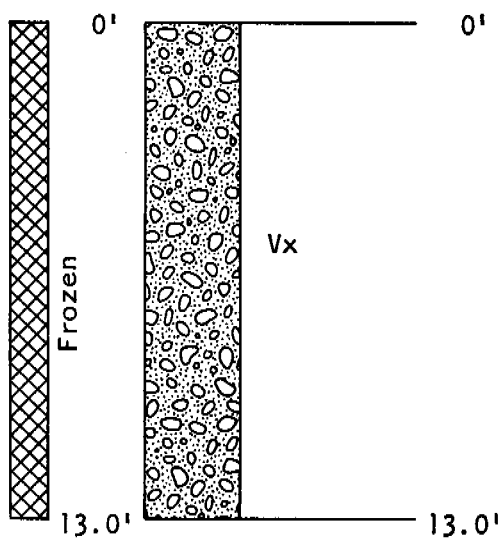
PETROGRAPHIC ANALYSIS

Sample 3 Depth 6'

Quartzite - 61%	Quartz - neg.
Sandstone - 17%	Chert - <u>neg.</u>
Ironstone - 11%	
Limestone - 8%	Total 100%
Granite - 3%	

TEST HOLE LOGS
SOURCE No. I-400

I-400-9

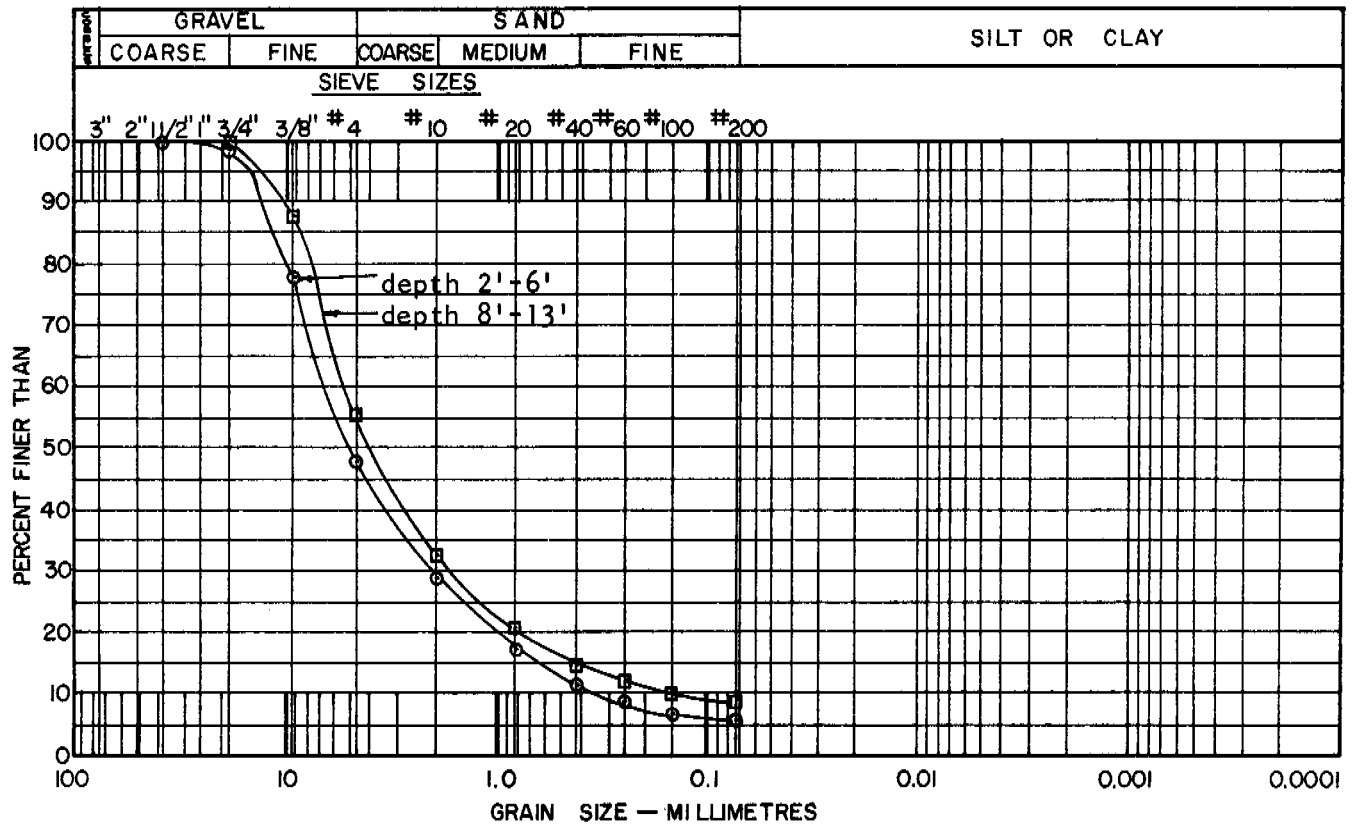


(GW) GRAVEL - and sand, trace silt, well
graded, ice crystals, and
inclusions.

LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-400-9

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2'	9.5%	Sample 6 depth 13'	7.2%
Sample 2 depth 4'	9.7%		
Sample 3 depth 6'	7.8%		
Sample 4 depth 8'	9.9%		
Sample 5 depth 10'	8.5%		

ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

Sample 9 Depth 4' - 13'

Quartzite	- 36%	Felsite	- 2%
Sandstone	- 38%	Pyrite	- 1%
Shalestone	- 12%	Ironstone	- neg.
Chert	- 4%	Total	100%
Granite	- 3%		
Limestone	- 4%		

INUVIK

SOURCE No. I-401A

LANDFORM AND LOCATION:

A group of small kames in morainal terrain, about 6 miles north of Inuvik.

MATERIAL:

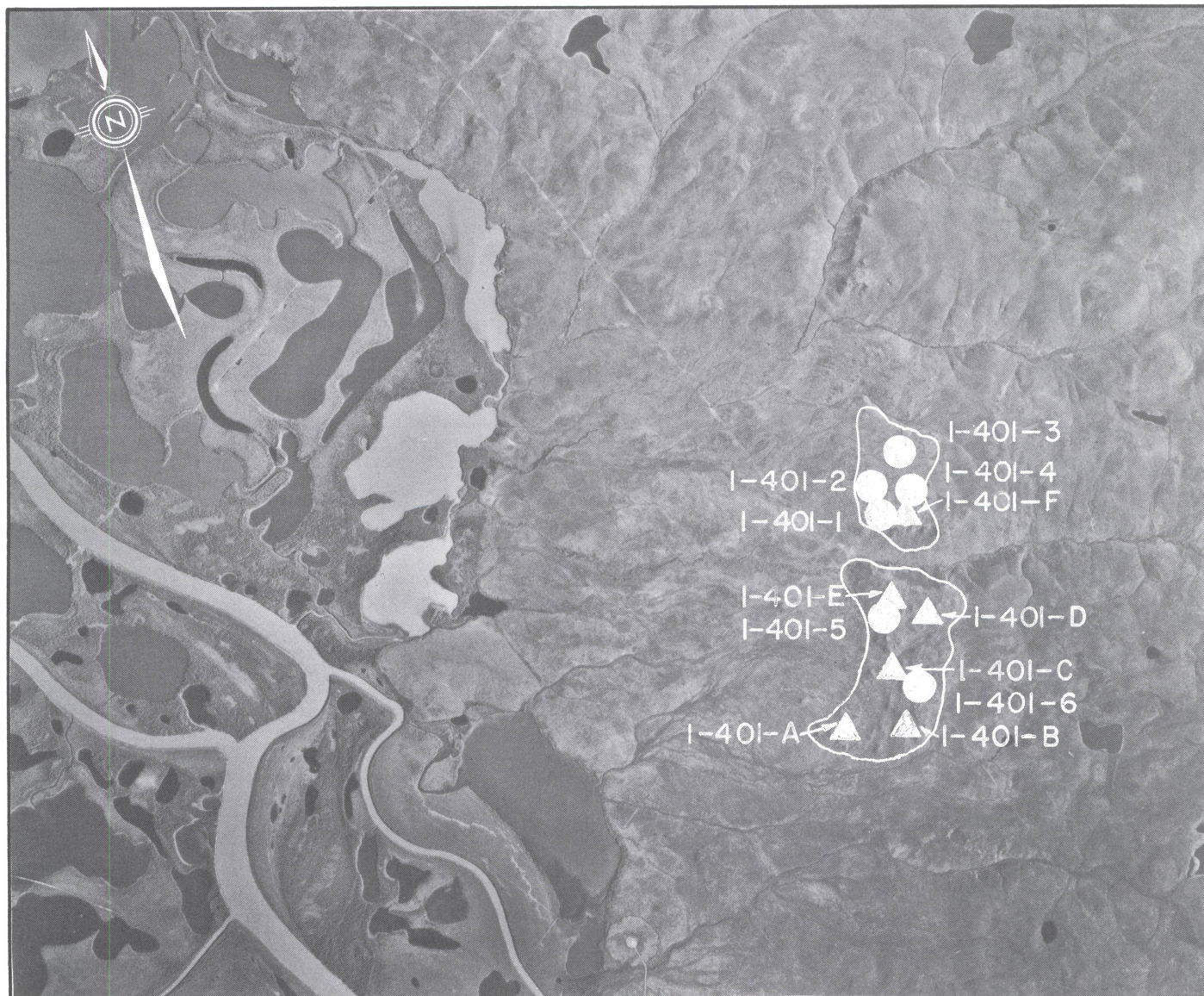
SILT -some gravel, some sand.

SAND -some gravel, some silt.

VOLUME:

CONCLUSION:

This source is not recommended for development because of poor quality and the problems of restoring a large sloping area containing massive ground ice.



AIRPHOTO No. A22936 - 83

SCALE: 1" = 3000' (approx.)

I-401A ENVIRONMENT

Physical

This source is a group of small kames located in rolling morainal terrain about 6 miles north of Inuvik, near the southern end of Caribou Hills. The kames are a series of hillocks 10 to 15 feet high, distributed over an area about 6,000 feet by 2,000 feet that is bisected by a small stream flowing in a deeply incised valley. Flow slides were observed in the upper reaches of this same valley, indicative of the prevalent ground ice. The source slopes toward the Mackenzie Delta, and the surface is well drained.

This source has not been developed.

Biotic

The vegetation in this area is a dense ground cover of moss and some dwarf shrubs. The trees that grew here have been destroyed by forest fires, leaving only the charred stumps.

This source lies within the western boundary of the Mackenzie Reindeer Grazing Reserve, and is 1 mile outside the critical Mackenzie Delta trapping area. It lies on the border of the Inuvik Development Control Zone.

The source is not located in any critical wildlife zone.

I-401A MATERIALS AND QUANTITIES

The material in this source is mainly silt with some sand and some gravel. Some gravel lies on the surface, probably a false indication of the percentage of gravel to be found beneath the surface.

Ice is prevalent, with lensing near the surface and massive ground ice at depth.

I-401A DEVELOPMENT

General

Because of the poor quality of material and the massive ground ice discovered in some test-holes, this source is not recommended for development. The area slopes toward the Delta, and disturbance of the insulating cover over the ground ice would lead to sloughing that would be difficult to stabilize.

Access

Access to this area can be accomplished by winter road, following the east channel for about 6 miles from Inuvik and then going up the hill about 2 miles to the source. A summer access road could be extended about 3 miles from the Canadian Forces Establishment, to complete a road of 8 miles terminating in Inuvik.

Material Use and Handling

The material in this source is a poor grade of general fill. If excavated this material would have to be thawed, drained and dried before it could be used.

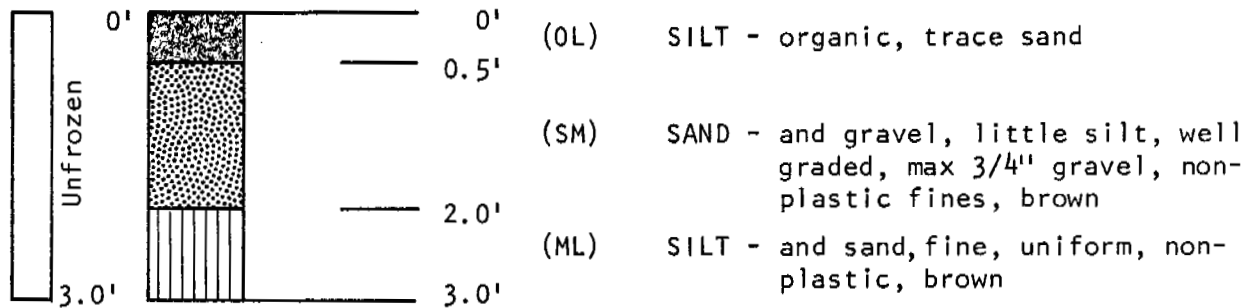
Stripping and Restoration

If stripping of this source were attempted and the underlying massive ground ice exposed, thermal erosion of slopes could be a very serious problem requiring extensive restoration of the area. Therefore development of the source is not recommended.

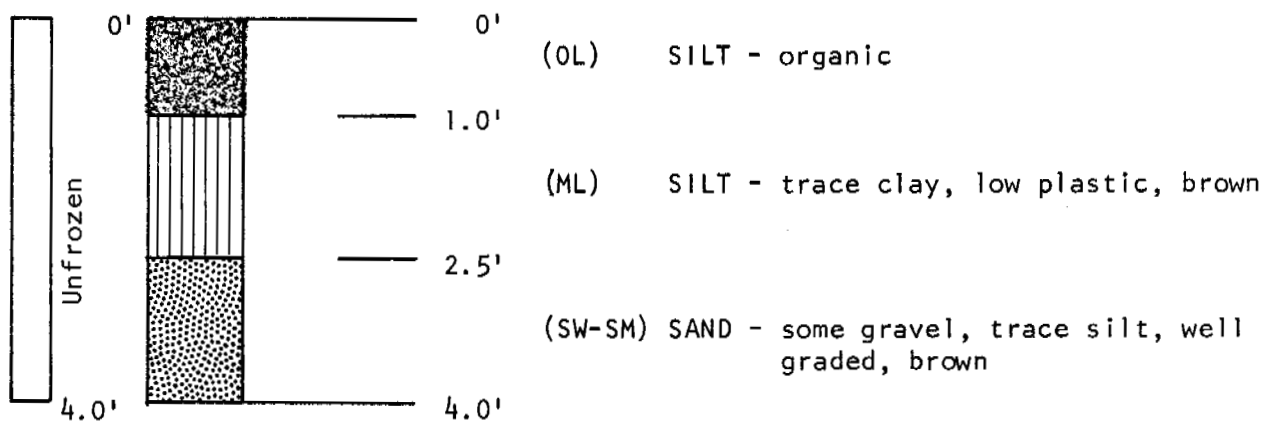
TEST PIT LOGS

SOURCE No. I-401A

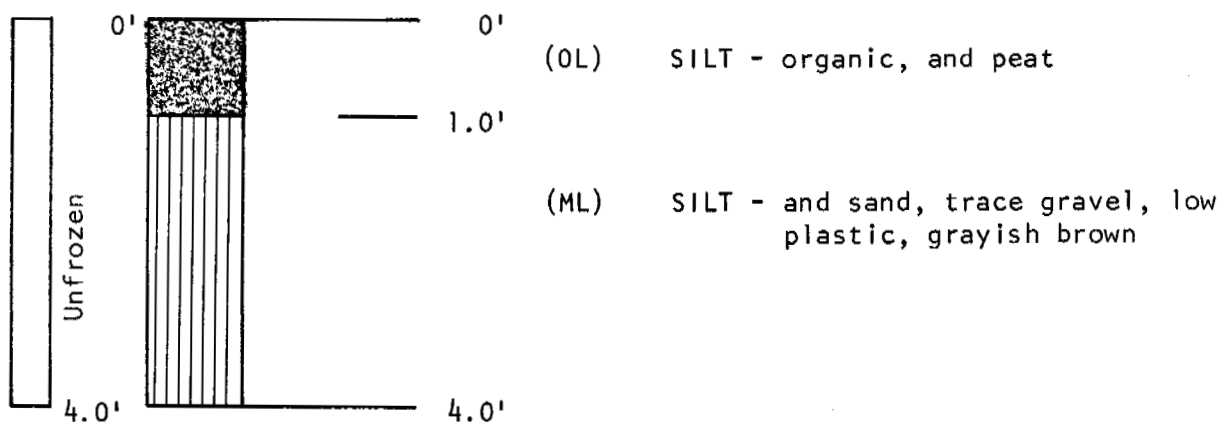
I-401A-A



I-401A-B



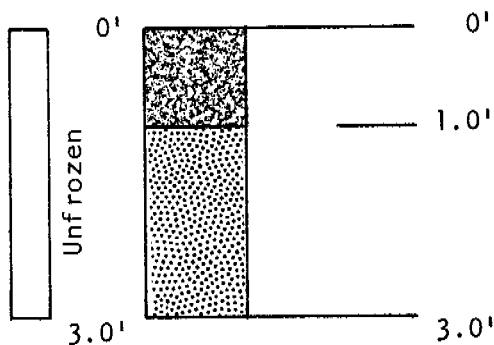
I-401A-C



TEST PIT LOGS

SOURCE No. I-401A

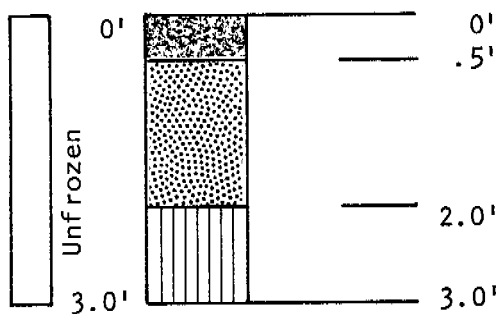
I-401A-D



(OL) SILT - organic, moss, trace sand

(SM) SAND - some gravel, some silt, well graded, low plastic. greyish brown

I-401A-E

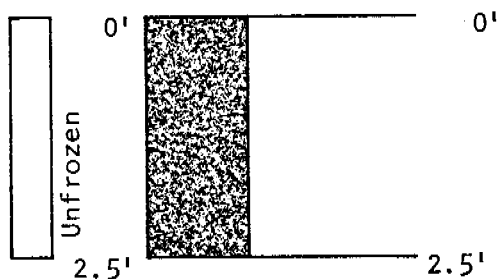


(OL) SILT - organic, moss

(SW-SM) SAND - and gravel, trace silt, well graded, max 3/4", gravel, brown

(ML) SILT - and sand, fine, uniform, saturated, nonplastic

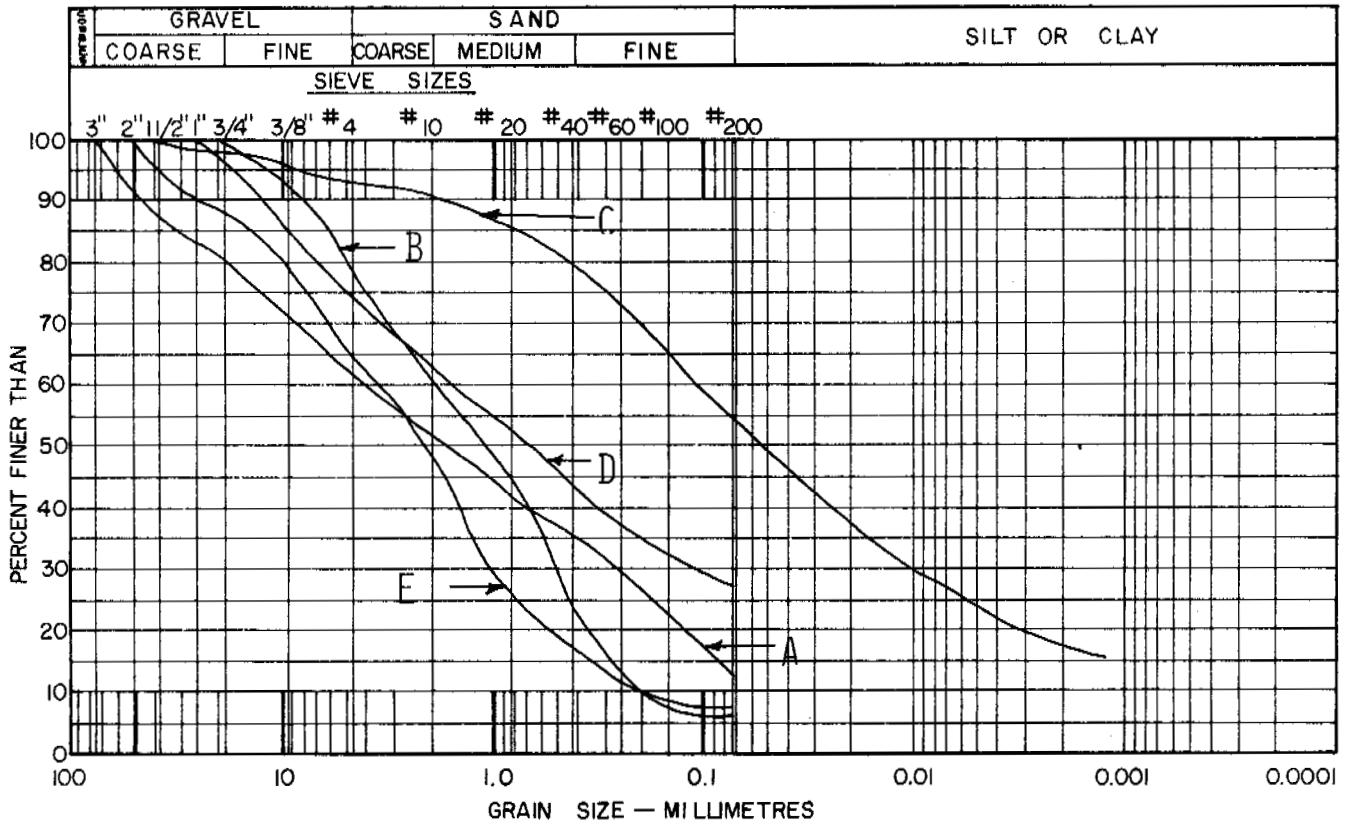
I-401A-F



(OL) SILT - organic, little sand, trace fine gravel

LABORATORY TEST DATA TEST PIT-SOURCE No. I-401A

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Test Pit A	Depth 0.5' - 2'	7.4%
Test Pit A	Depth 2' - 3'	12.8%
Test Pit B	Depth 1' - 2.5'	16.0%
Test Pit B	Depth 2.5' - 4'	5.6%
Test Pit C	Depth 1' - 4'	16.0%

Test Pit D	Depth 1' - 3'	9.9%
Test Pit E	Depth 0.5' - 2'	6.0%

ORGANIC CONTENT

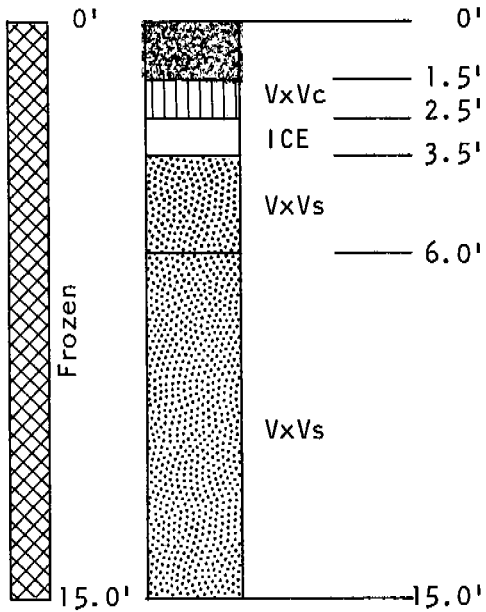
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

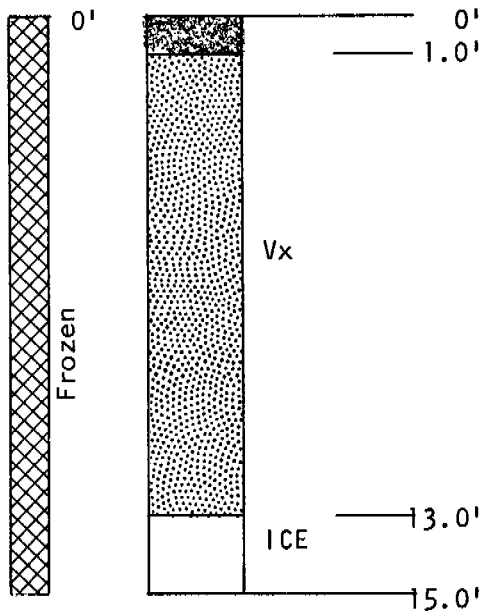
SOURCE No. I-401A

I-401A-1



- (OL) SILT - organic, peat, roots.
- (ML) SILT - trace gravel, trace sand, ice crystals
ICE - clear
- (SM) SAND - little gravel, some silt, low plastic, ice lensing & inclusions
- (SM) SAND - and gravel, little silt, ice lensing & inclusions

I-401A-2

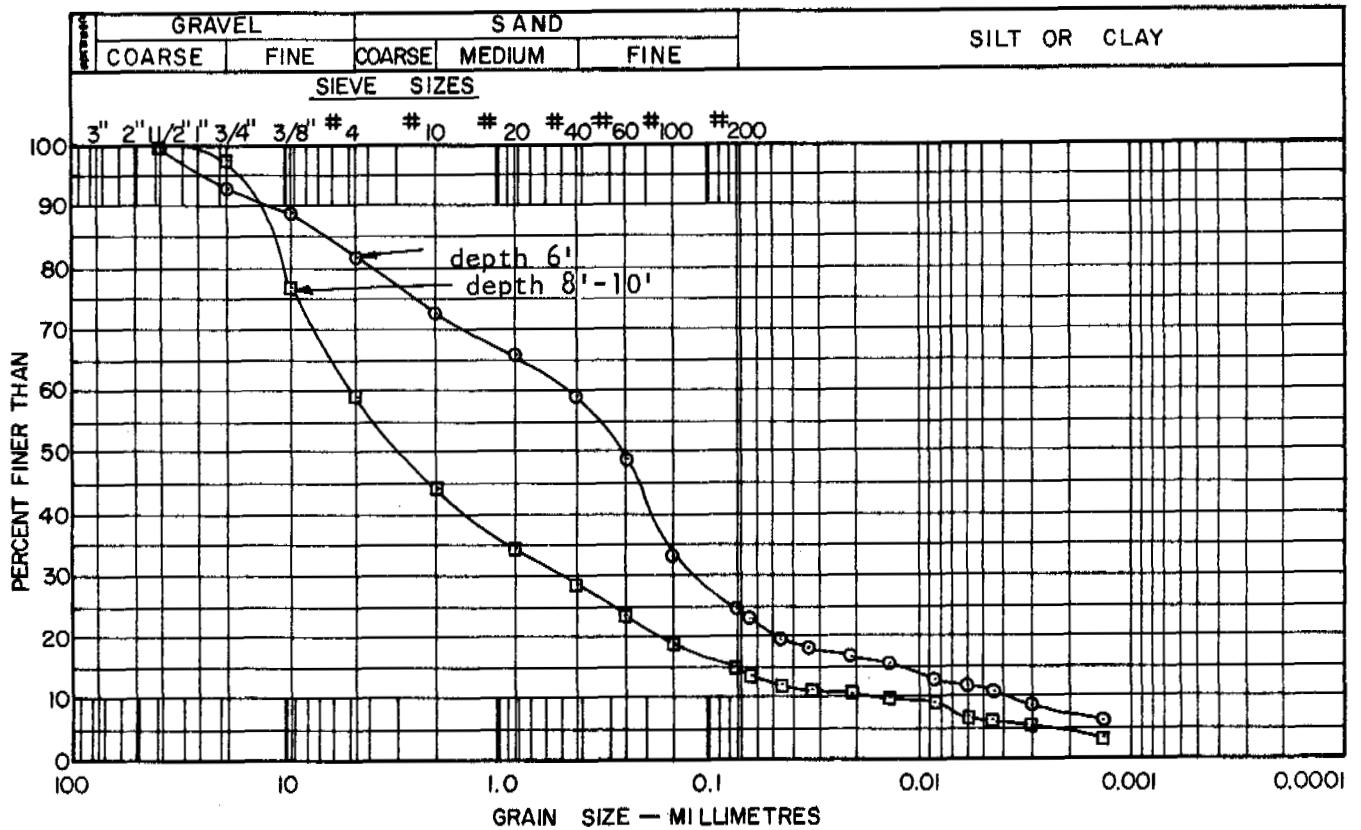


- (OL) SILT - organic, peat, roots etc.
- (SM) SAND - little gravel, some silt, non-plastic, ice lenses to 3"
- ICE - trace soil inclusions

LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-401A-1

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth	2'	21.8%
Sample 2 depth	4'	33.6%
Sample 3 depth	6'	14.2%
Sample 4 depth	8'	11.1%
Sample 5 depth	10'	14.1%

ORGANIC CONTENT

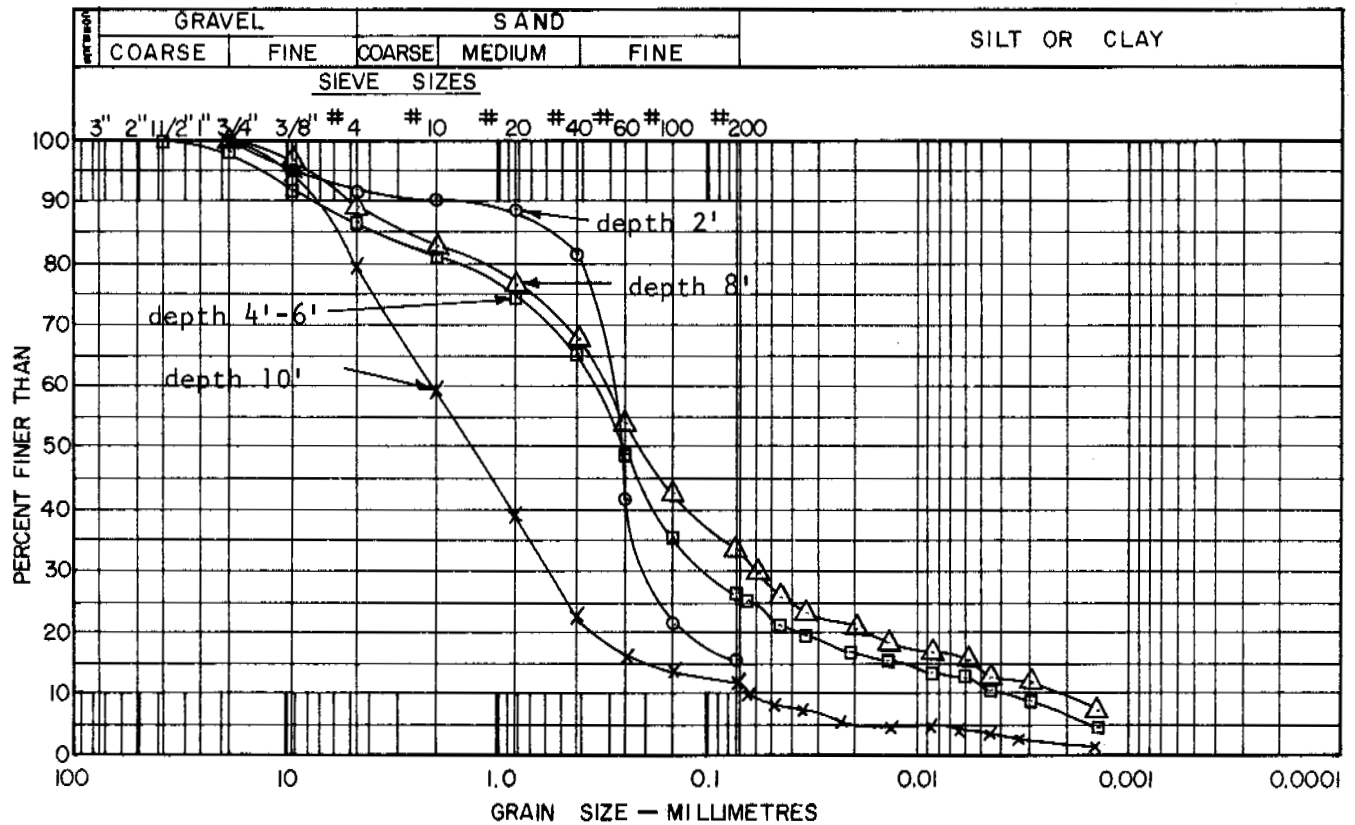
HARDNESS TEST

PETROGRAPHIC ANALYSIS

LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-401A-2

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 8.3%
 Sample 2 depth 4' 11.2%
 Sample 3 depth 6' 19.1%
 Sample 4 depth 8' 19.4%
 Sample 5 depth 10' 15.2%

ORGANIC CONTENT

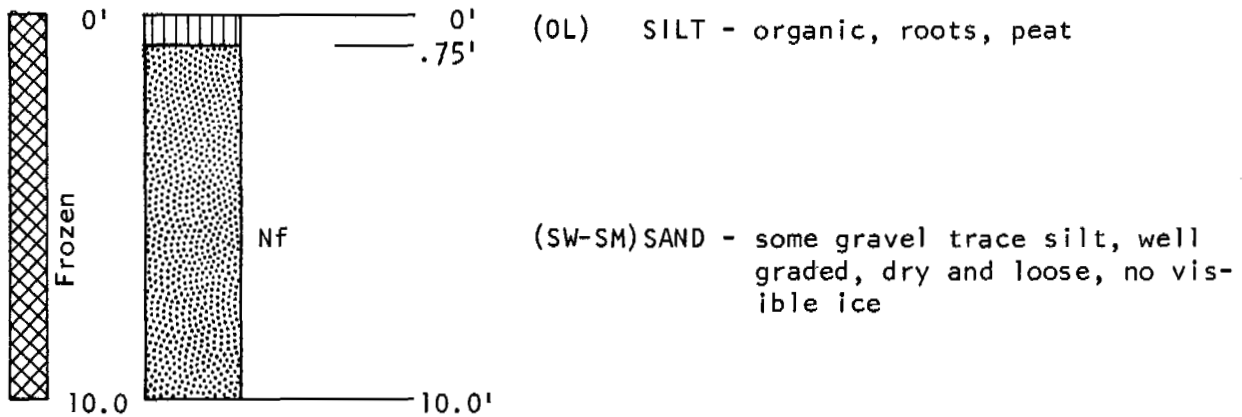
HARDNESS TEST

PETROGRAPHIC ANALYSIS

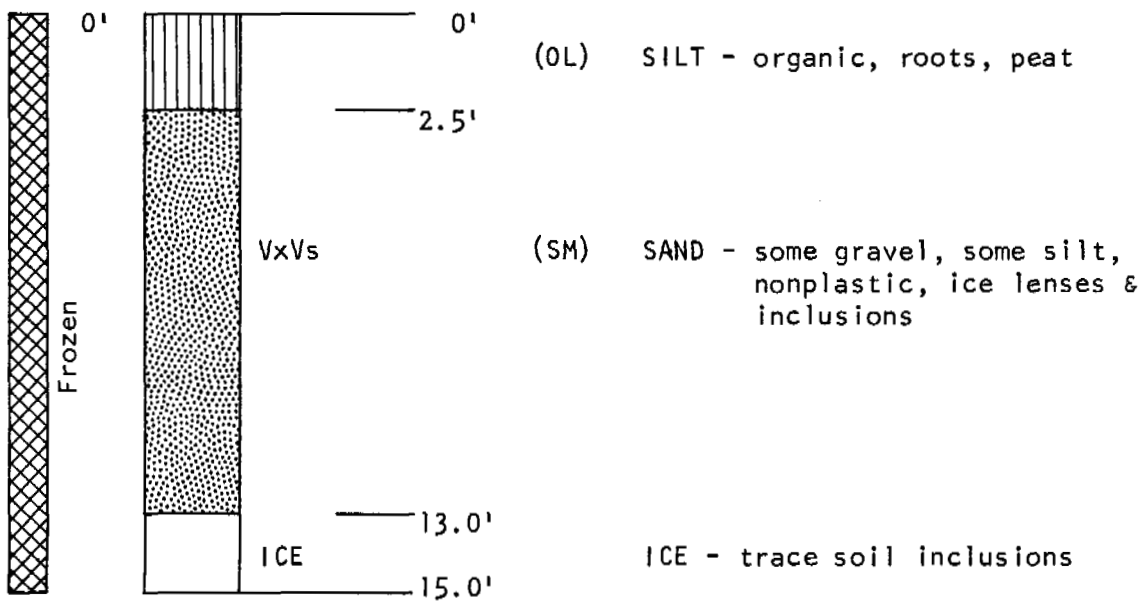
TEST HOLE LOGS

SOURCE No. I-401A

I-401A-3

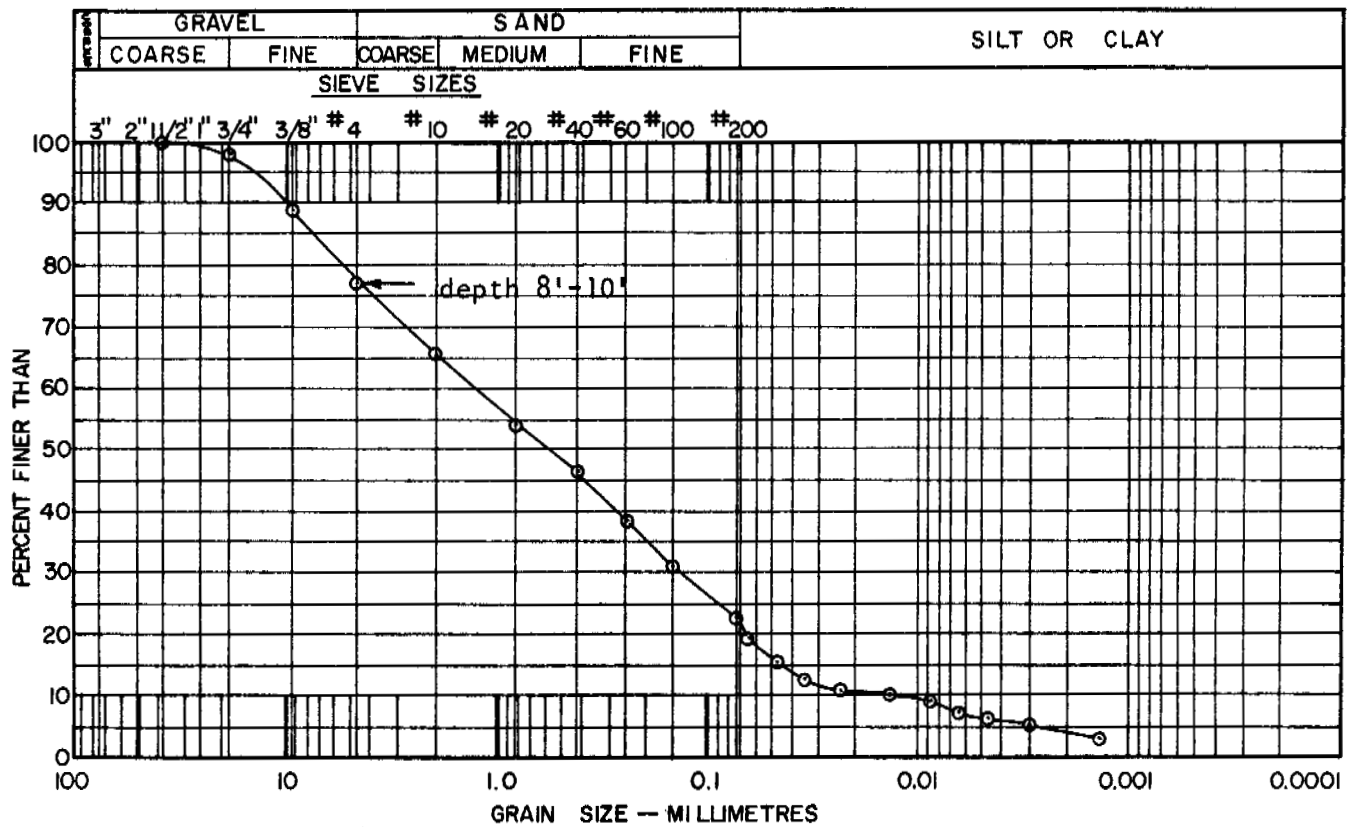


I-401A-4



LABORATORY TEST DATA TEST HOLE-SOURCE No. I-401A-4

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 130.7%
 Sample 2 depth 4' * 27.5%
 Sample 3 depth 6' * 19.9%
 Sample 4 depth 8' 18.8%
 Sample 5 depth 10' 15.3%

*Bag leaked

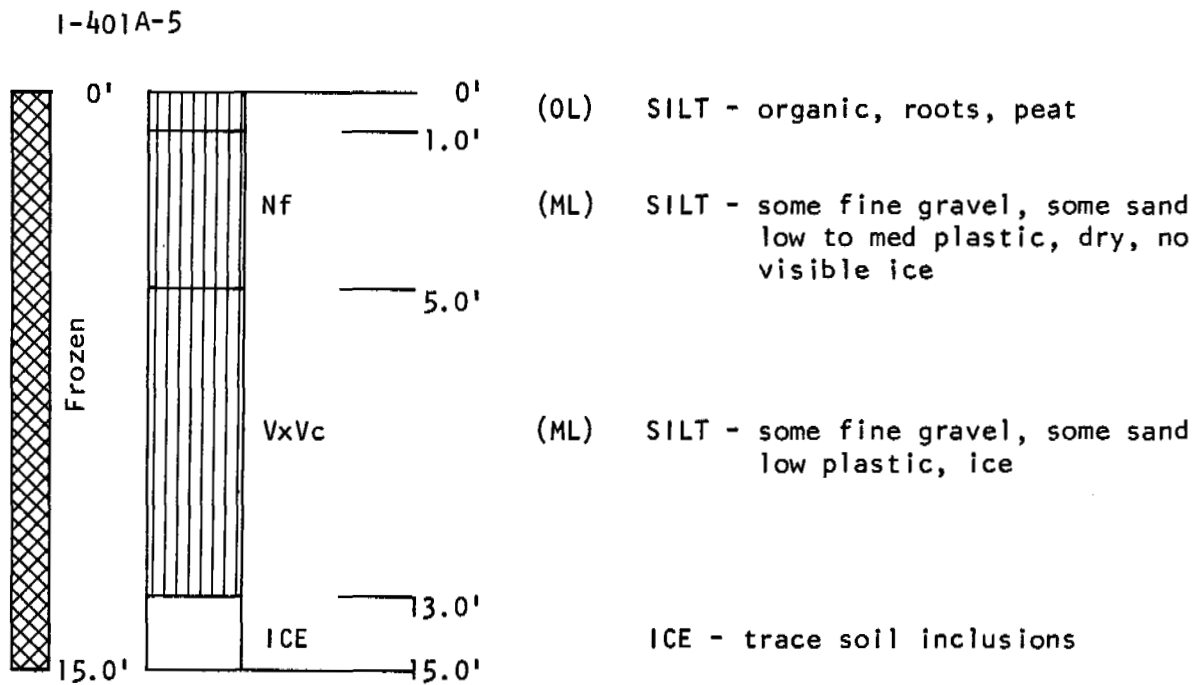
ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-401A

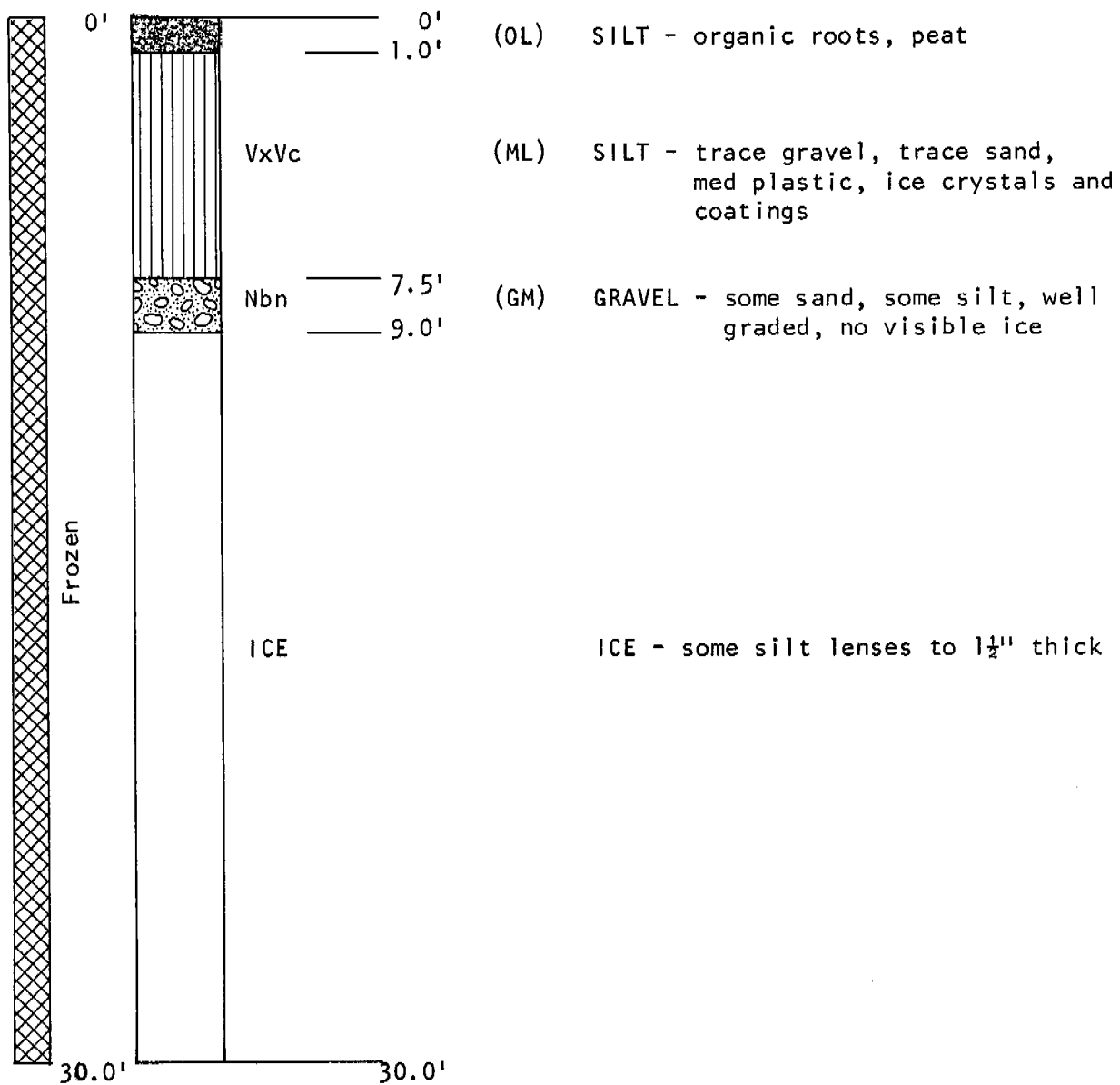


Sample 1	depth 2'	12.8%
Sample 2	depth 4'	13.1%
Sample 3	depth 6'	23.9%
Sample 4	depth 8'	18.7%

TEST HOLE LOGS

SOURCE No. I-401A

I-401A-6



Sample 1	depth	2'	15.8%
Sample 2	depth	4'	20.3%
Sample 3	depth	6'	18.2%
Sample 4	depth	8'	9.1%

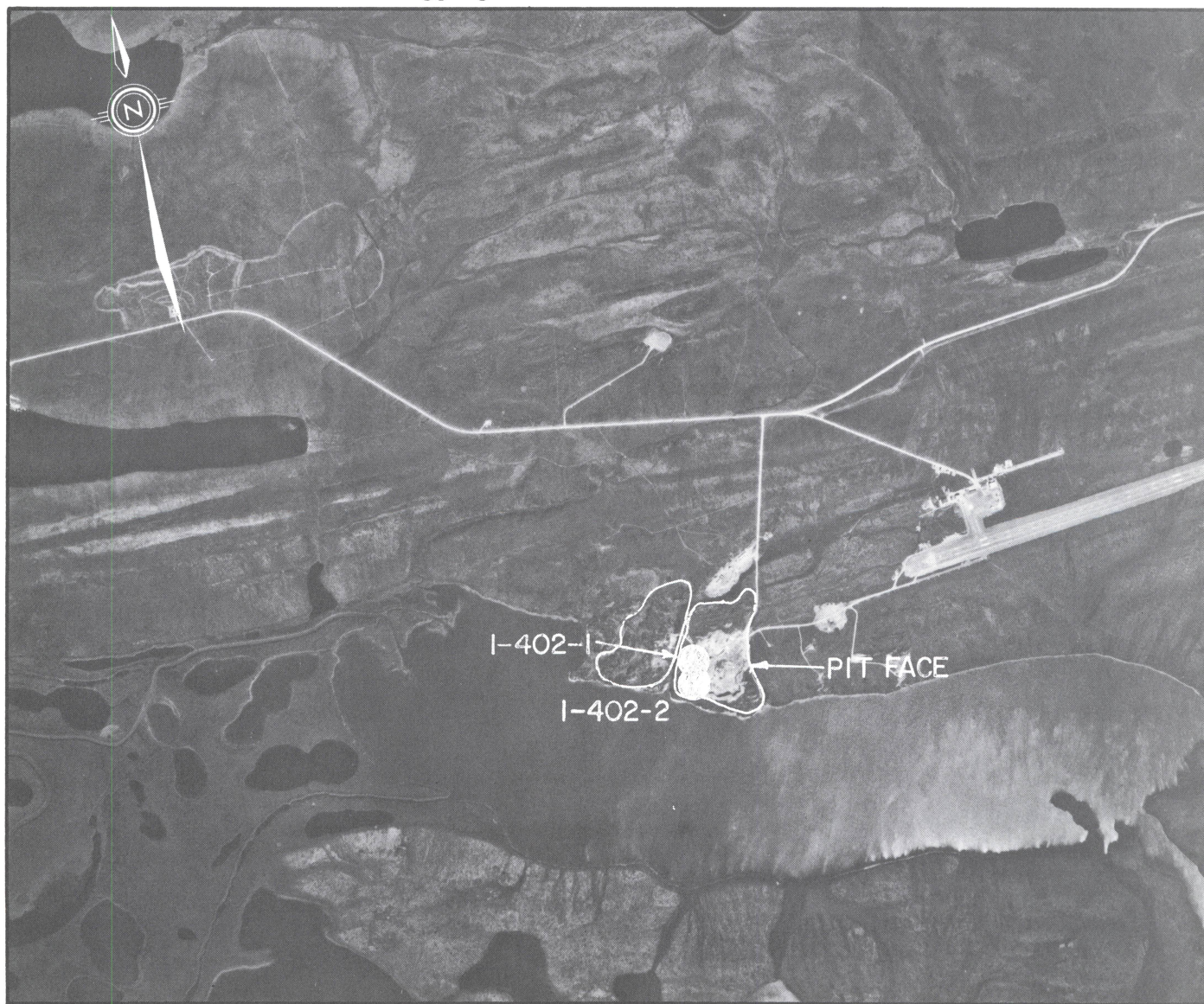
INUVIK
SOURCE No. 1-402

LANDFORM AND LOCATION: Bedrock exposure located 1 mile west of Inuvik Airport

MATERIAL: SHALE - hard, dense, fractured with bands of limestone

VOLUME: 6,000,000 cu. yds. approximately

CONCLUSION: Source is suitable for continued use as general fill and the production of fine and coarse aggregates



AIRPHOTO No. A22957 - 18

SCALE: 1" = 3000' (approx.)

I-402 ENVIRONMENT

Physical

This source is an existing bedrock quarry located 1 mile west of Inuvik Airport and 6 miles southeast of the Community, on the north shore of Dolomite Lake. Bedrock is exposed intermittently over an area about 3,000 feet by 2,000 feet. The existing quarry is about 500 feet by 1,000 feet, and 30 feet deep. The exposure stands above the surrounding ground, so drainage is good as long as excavation is not carried below this ground level.

Biotic

Some white birch and white spruce grow over the area, with shrubs and moss providing a discontinuous ground cover.

The area is important to ecologists from many points of view. Firstly, it lies on the northern border of a proposed reserve under the International Biological Programme, an area valued for its rare diversity of plant life.

The area lies within 1/2 mile of a critical habitat of the peregrine falcon. This same habitat lies on the line of the Inuvik landing strip, so perhaps the falcons are now conditioned to noise and disturbance.

The area is part of the Mackenzie Reindeer Grazing Reserve, and also within the Inuvik Development Control Zone.

Dolomite Lake is part of the recreational area extending down into Rocky Hills, and popular for cross-country skiing, hiking, picnics, fishing, and other activities.

I-402 MATERIALS AND QUANTITIES

The bedrock is light brown shale, badly fractured, hard, and dense, containing thin bands of limestone.

The estimated volume remaining in this source is 6,000,000 cu. yds.

I-402 DEVELOPMENT

General

This source was first developed for the construction of Inuvik Airport. The material is dense and durable, suitable for general fill as it comes from the pit but also suitable for use as aggregate if processed.

The source will continue to serve the area as an important supply of granular material.

Access

Year-round access to Inuvik is assured, following the single-lane gravel road that serves the airport. The distance to Inuvik is about 8 miles by road.

Material Use and Handling

The material from this source is suitable for general fill or base course. If washed, screened, and crushed the shale can be used as coarse aggregate for concrete or asphalt construction. A random sample taken from the stockpile is well graded to a maximum size of 3 inches, with 30% retained on the 1½ inch screen, 60% on the #4, and 8% passing the 200 mesh, a satisfactory fine aggregate.

In the past, most of the shale has been excavated by ripping, but some blasting is required from time to time. The pit-run material is about 12 inches maximum size. Evidently the Ministry of Transport operate a crusher in the pit intermittently for their own needs.

The continued development of this source will require a large dozer with ripper attachment, a front-end loader, and trucks. Drilling and blasting equipment should be available, and screening and crushing equipment is required for the production of fine fill and aggregate.

Stripping and Restoration

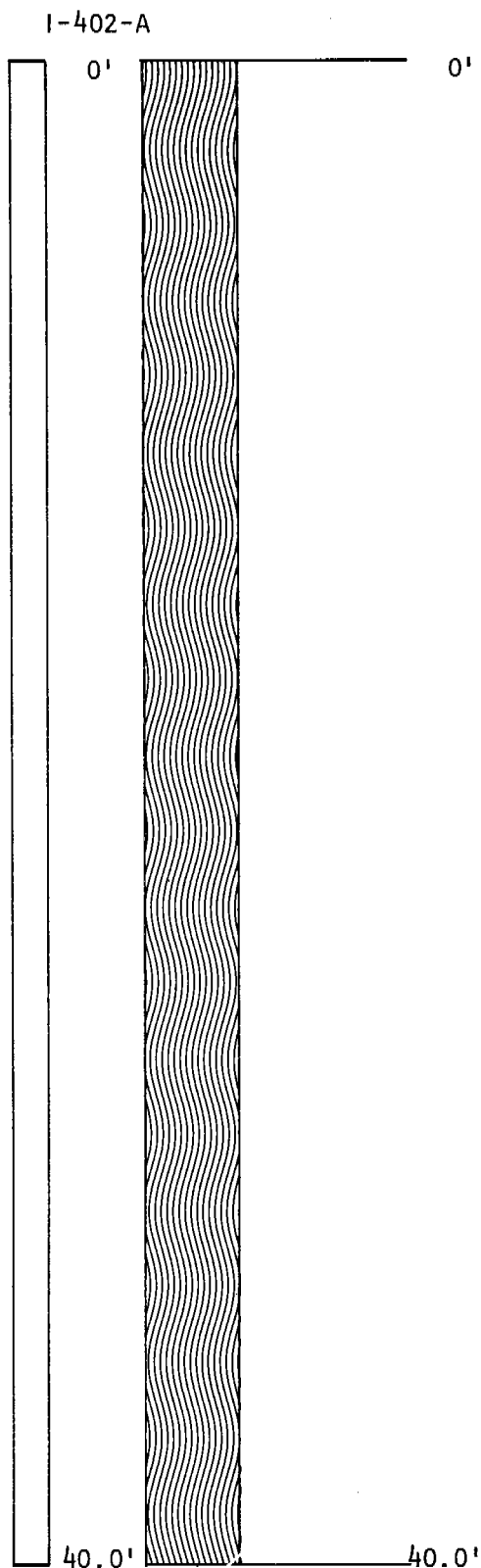
Stripping is minimal, but all material removed must be stockpiled

for replacement in the depleted pit area.

Any seeding or planting in this area must be done with the approval of the staff of the International Biological Programme.

TEST PIT LOGS

SOURCE No. I-402 PIT FACE



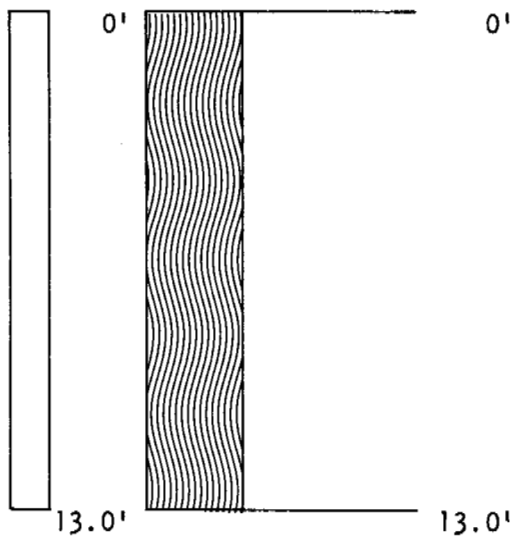
SHALE - with limestone bands, hard
dense, folded, light brown-
grey

Pit Face logged in field

TEST HOLE LOGS

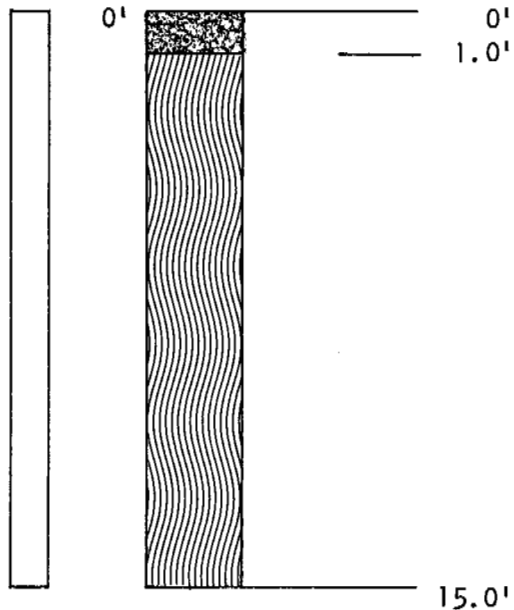
SOURCE No. I-402

I-402-1



SHALE - fractured, silt shale,
light brown

I-402-2



0' (OL) SILT - and organic, roots etc.

SHALE - fractured silt shale, light
brown

Sample 1 depth 2' 17.1%

Sample 2 depth 4' 14.8%

Sample 3 depth 6' 4.6%

Sample 4 depth 10' 3.1%

INUVIK
SOURCE No. I- 403

LANDFORM AND LOCATION:

Bedrock exposure located 4 miles east of Inuvik airport and 11 miles southeast of Community.

MATERIAL:

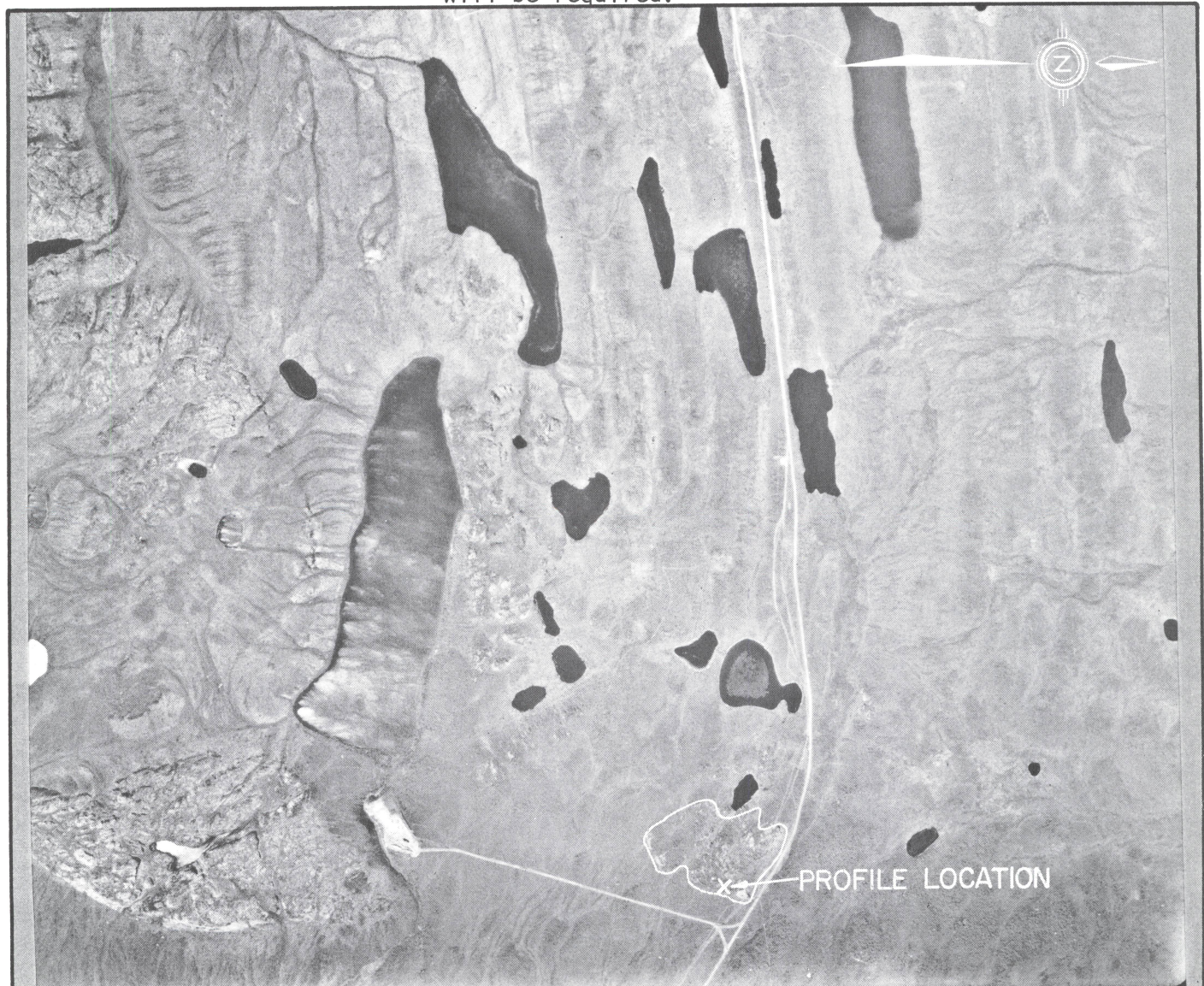
LIMESTONE - hard, dense, layered.

VOLUME:

2,500,000 cu. yds. at least.

CONCLUSION:

Source is suitable for use as general fill and the production of fine and coarse aggregate. However production from the pit will be more difficult than from Source I-402 since blasting will be required.



AIRPHOTO No. A22936 - 220

SCALE: 1" = 3000' (approx.)

I-403 ENVIRONMENT

Physical

This source is a bedrock quarry located 4 miles east of Inuvik Airport and 11 miles southeast of the Community. The surface of the source is irregular, much of it an exposure of the limestone bedrock, and sloping away from the road. The area of exposure is about 1,500 feet square.

A contractor working on the Dempster Highway has developed this source for road material, cutting 3 benches into the slope.

Drainage of this area is good.

Biotic

Forest cover in this area consists of scattered aspen and white spruce about 20 feet high, with a ground cover of moss and dwarf shrubs.

The source lies within the Mackenzie Reindeer Grazing Reserve. The area is occasionally trapped for marten, lynx, and fox, and moose are hunted during the winter.

About 1½ miles to the south is a critical wildlife area, the habitat of the peregrine falcon.

The source is not contained within any critical wildlife or ecological area.

I-403 MATERIALS AND QUANTITIES

The material in this source is a hard, dense, sandy limestone, with definite bedding planes.

The volume of material is estimated to be more than 2,500,000 cubic yards.

I-403 DEVELOPMENT

General

The material in this source is suitable for general fill, and can be processed for use in concrete or asphalt.

On the other hand the source is about 5 miles further from Inuvik than Source I-402, and will be more expensive to operate (blasting compared to ripping).

This source is not recommended for development as long as Source I-402 is in operation, but should be considered a reserve supply of high-grade granular material.

Access

With the construction of the Dempster Highway adjacent to this source, all-weather access is assured to Inuvik, about 13 miles distant.

Material Use and Handling

This material is suitable for general fill and can be processed to provide aggregate for concrete and asphalt construction.

The deposit requires drilling and blasting before excavation, then can be used for general fill or road construction. The production of aggregate will require crushing and screening equipment.

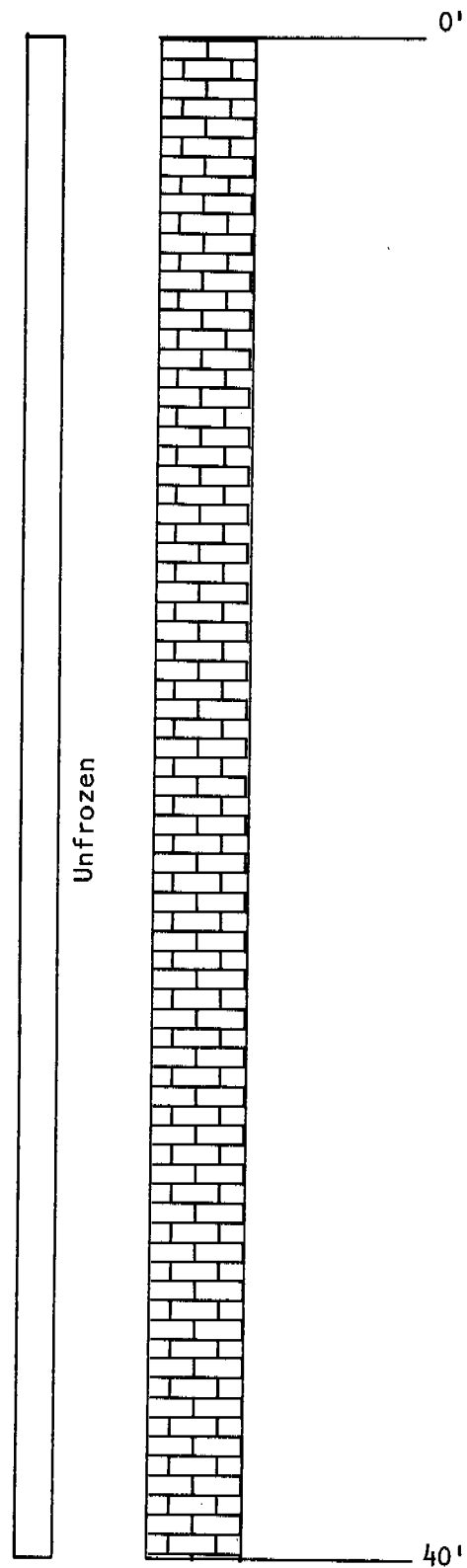
Equipment required for this operation, in addition to that described above, is a front-end loader, trucks, and a dozer for stripping and clean-up.

Stripping and Restoration

All trees must be cleared from the area to be developed and the trees and roots burned. Any ground cover and topsoil must then be stripped and stockpiled for later regrading over the depleted pit area.

TEST PIT LOGS

SOURCE No. I-403 PIT FACE

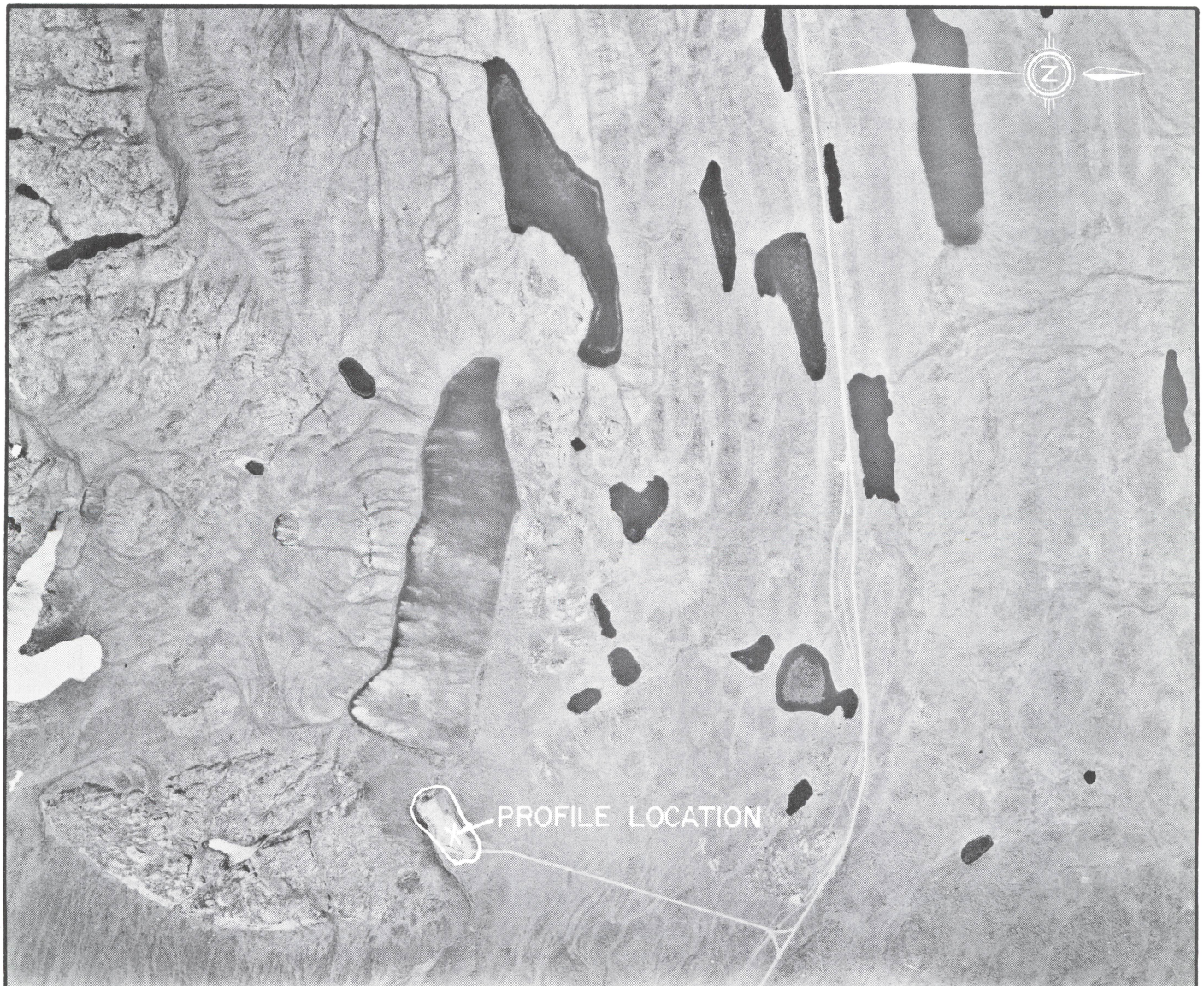


LIMESTONE - sandy, hard,
dense, layered

Pit face logged in the field

INUVIK
SOURCE No. 1-404

LANDFORM AND LOCATION:	Bedrock exposures located 4 miles east of Inuvik airport and 10 miles by air southeast of the Community.
MATERIAL:	SANDSTONE - soft.
VOLUME:	100,000 cu. yds. at least.
CONCLUSION:	Source is low priority for development as superior quality material is available from Source 1-402.



AIRPHOTO No. A22936 - 220

SCALE: 1" = 3000' (approx.)

Physical

This source is a bedrock quarry located 11 miles east-southeast of Inuvik and 4 miles east of Inuvik Airport. It is a sandstone outcrop about 1,000 feet long and 700 feet wide.

The source has been developed by a contractor in connection with the construction of the Dempster Highway, and his pit extends over an area of about 700 feet by 100 feet and with benches of about 35 feet in height. The source is just over a mile from the Highway.

Drainage from the source is excellent.

Biotic

Forest cover in this area consists of scattered white spruce and aspen up to 20 feet high, and the ground is partially covered by a heavy growth of moss and dwarf shrubs.

The source lies within the Mackenzie Reindeer Grazing Reserve, and supports a population of marten, lynx, and fox that are trapped occasionally. Moose are hunted during the winter.

The source lies just outside the borders of two important ecological areas. One is the habitat of the peregrine falcon, classified as a critical wildlife area. The other is a proposed reserve of the International Biological Programme, an area valued for its rare diversity of plant life.

Although the general area is important, the source does not lie within any critical wildlife area.

The small stream that flows past the source continues to Campbell Lake, an important fishery for the native population.

1-404 MATERIALS AND QUANTITIES

The material from this source is a thin-bedded sandstone, soft and poorly cemented, that decomposed when immersed in water.

The estimated volume of material remaining in the source is over 100,000 cubic yards.

1-404 DEVELOPMENT

General

This source is low priority for development, because superior material is available in large volume at Source 1-402, near the Inuvik Airport.

Access

The contractor has built a road from the source to the Highway, so all-weather access is assured to Inuvik, a distance of about 14 miles.

Material Use and Handling

The materials from this pit are suitable for general fill and road construction, but are too soft for concrete aggregate.

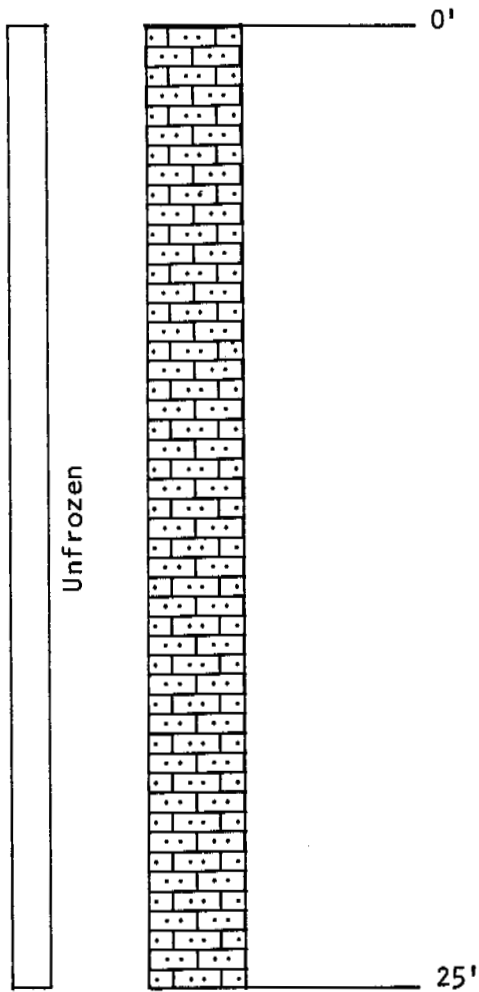
The equipment required for development is the usual assembly of dozer with ripper attachment, front-end loader, and trucks. The contractor working in the pit used blasting as well as ripping, but probably a large ripper would be satisfactory.

Stripping and Restoration

All trees must be cleared from the area to be developed, and the trees and roots burned. Any ground cover and topsoil must then be stripped and stockpiled for later regrading over the depleted area.

TEST PIT LOGS

SOURCE No. I-404 PIT FACE



Pit face logged in field

SANDSTONE - some thin shale
bands,
porous,
medium to coarse
grained,
soft,
light brown-grey

INUVIK
SOURCE No. I- 405A

LANDFORM AND LOCATION:

Kames, terraces, small kames and eskers
about 17 miles east-southeast of Inuvik.

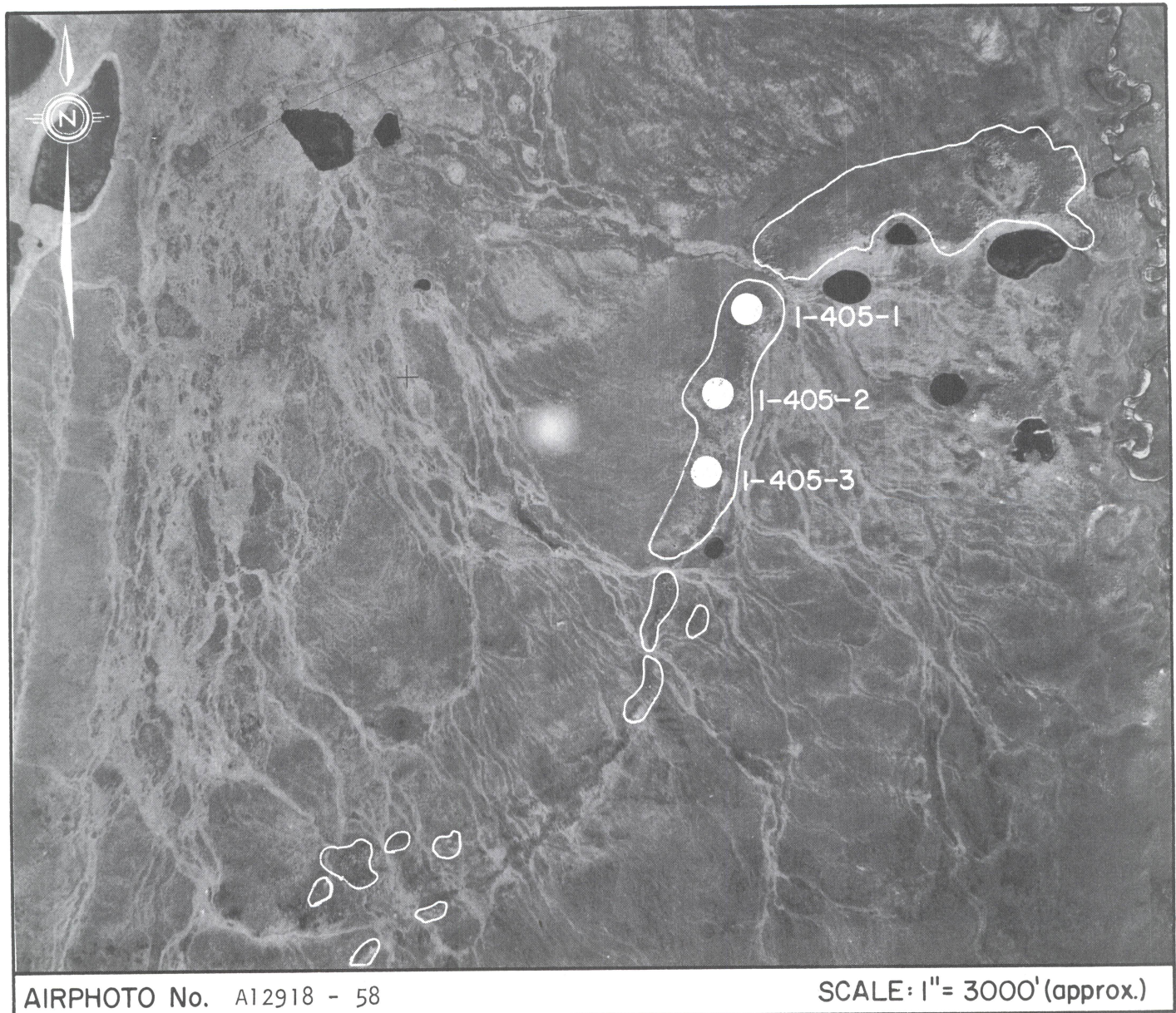
MATERIAL:

SAND - and silt.

VOLUME:

CONCLUSION:

Not recommended for development due to poor
quality and medium to high ice content.



I-405A ENVIRONMENT

Physical

The source is a group of kame terraces, small kames, and small eskers lying on the south side of the valley joining Campbell and Sitidgi Lakes, about 17 miles east-southeast of Inuvik. Two large terraces are each about 6,000 feet long and up to 2,000 feet wide, and the kames and eskers rise up to 40 feet above the surrounding ground.

Drainage of this source is good, although ice within the feature is very high, right to the underside of the ground cover. The source has not been developed.

Biotic

Forest cover in this area is scattered white spruce and aspen running to about 20 feet in height. The ground is covered by heavy moss and dwarf shrub.

The source lies within the Mackenzie Reindeer Grazing Reserve, and may be occupied during the calving season in summer. Just to the east is the critical winter range of the Reindeer Herd, and possibly of barren land caribou as well. The whole area is trapped occasionally for marten, lynx, and fox, and moose are hunted during winter months.

The source does not lie within an area considered critical to wildlife.

I-405A MATERIALS AND QUANTITIES

The materials in this source are sand, and silt. The Geological Survey of Canada report a grading of 78% silt and 22% fine sand, whereas the samples analyzed for this report would average about 45% silt and 55% sand.

Moisture content of the material is high, running to 43% at a depth of 2 feet at one sampling point, and about 33% in all test-holes at depth.

I-405A DEVELOPMENT

General

This source is not recommended for development. The material could not be excavated because of the high ice content, and would be a very poor grade of fill in any case. The restoration problems associated with this development would be large and difficult.

Access

The only practical access to the area is by winter road from the Highway at the north end of Campbell Lake, travelling northeast along the chain of lakes for 3 miles, then east across land for another 3 miles. The distance to Inuvik would be about 20 miles.

Material Use and Handling

The material from this source could be used as a poor quality general fill if it were thawed, drained, and dried. The problems of production are too great to consider this a feasible development. In addition the source has too high a silt content to use as a blending sand for concrete.

Stripping and Restoration

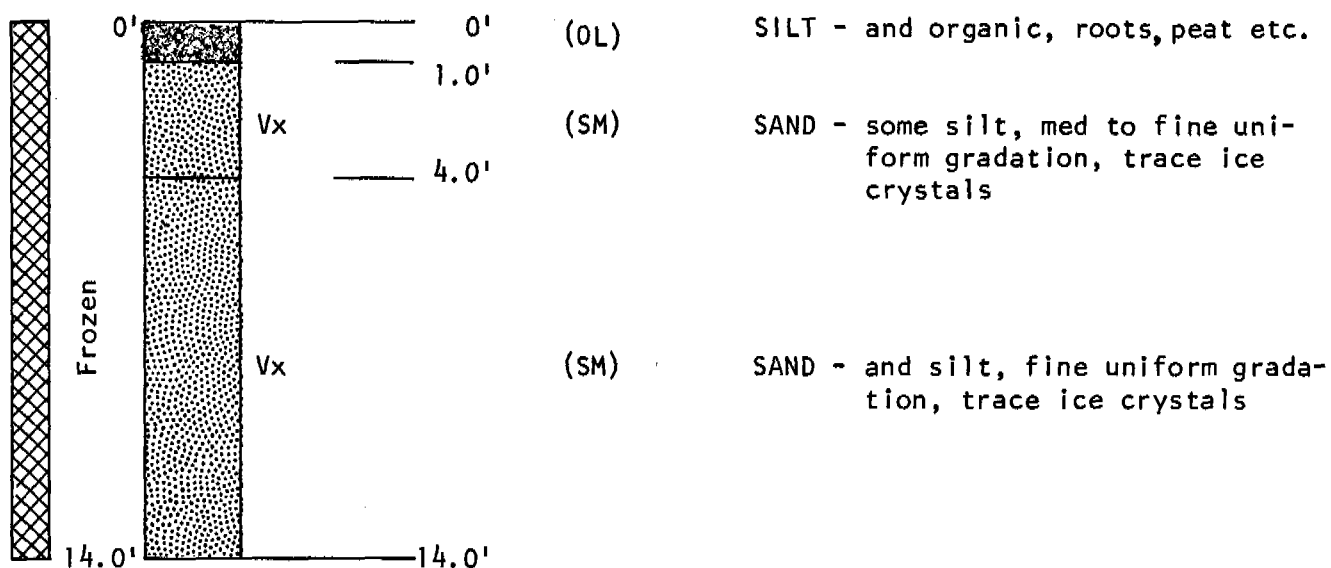
If this source were developed, the techniques used elsewhere on glacial deposits would be applied, but because of the very high ice content near the surface the common problems would be magnified.

From an environmental point of view, as well as from the engineering point of view, development of this source is not feasible.

TEST HOLE LOGS

SOURCE No. I-405A

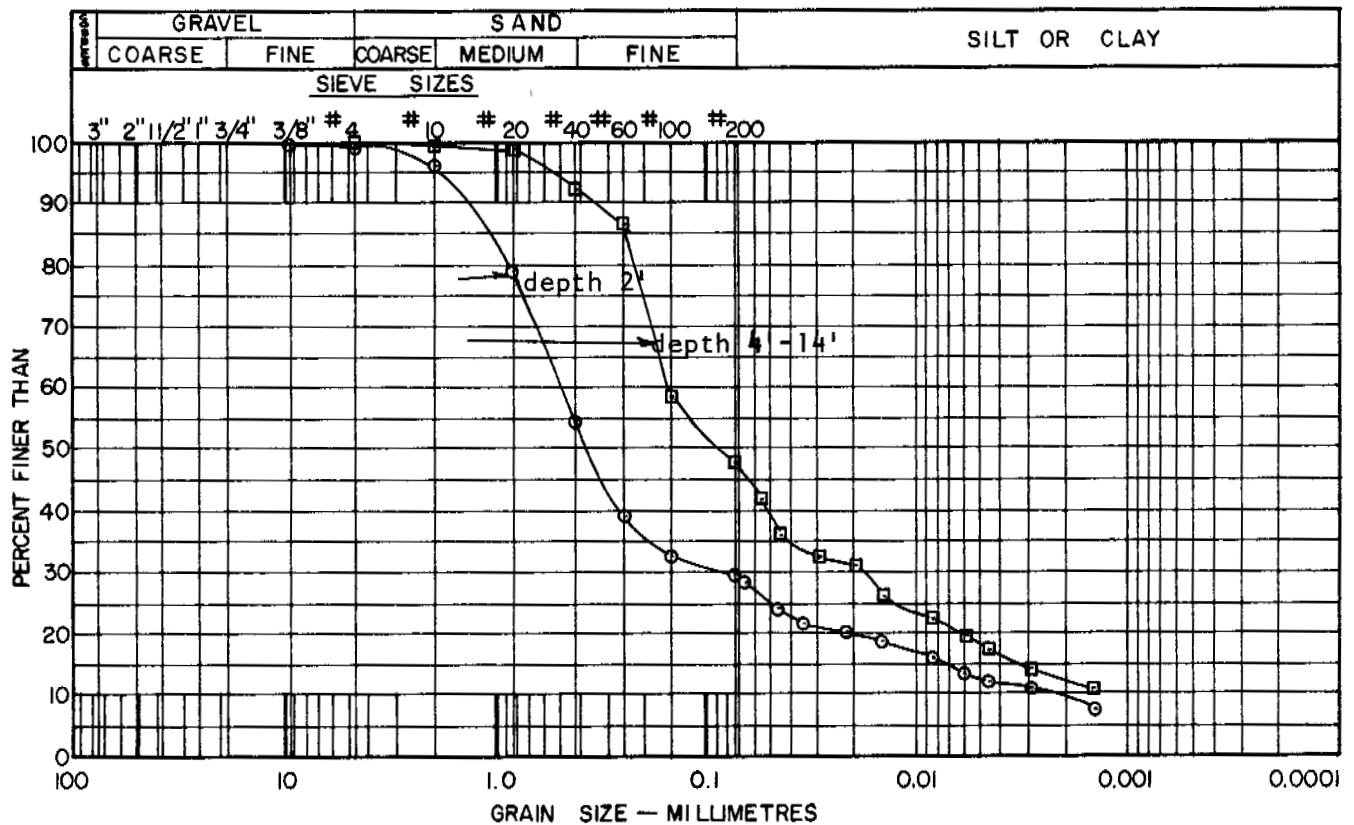
I-405A-1



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-405A-1

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 22.6%
 Sample 2 depth 4' 25.5%
 Sample 3 depth 14' 33.3%

ORGANIC CONTENT

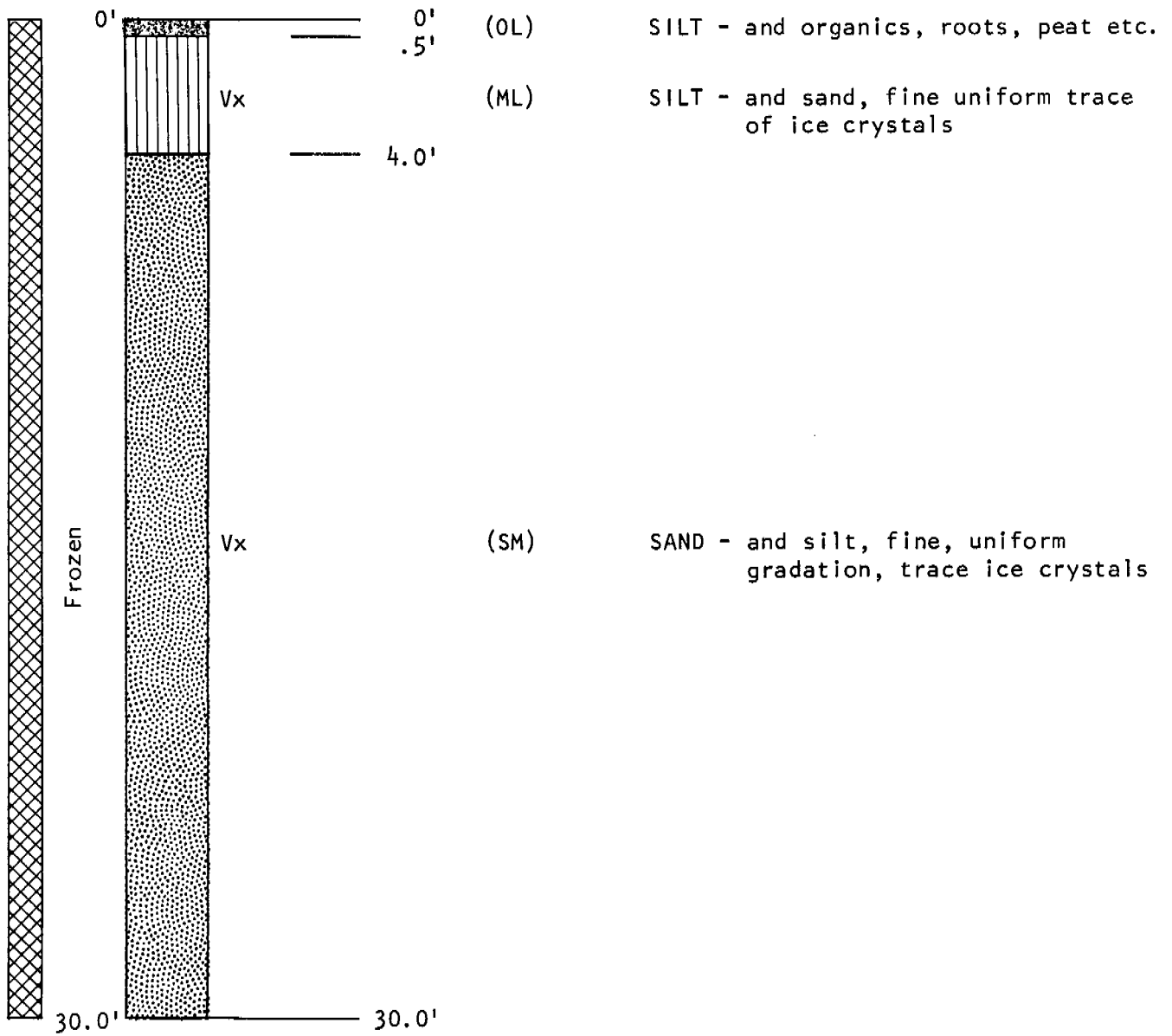
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-405A

I-405A-2



GRAIN SIZE DISTRIBUTION



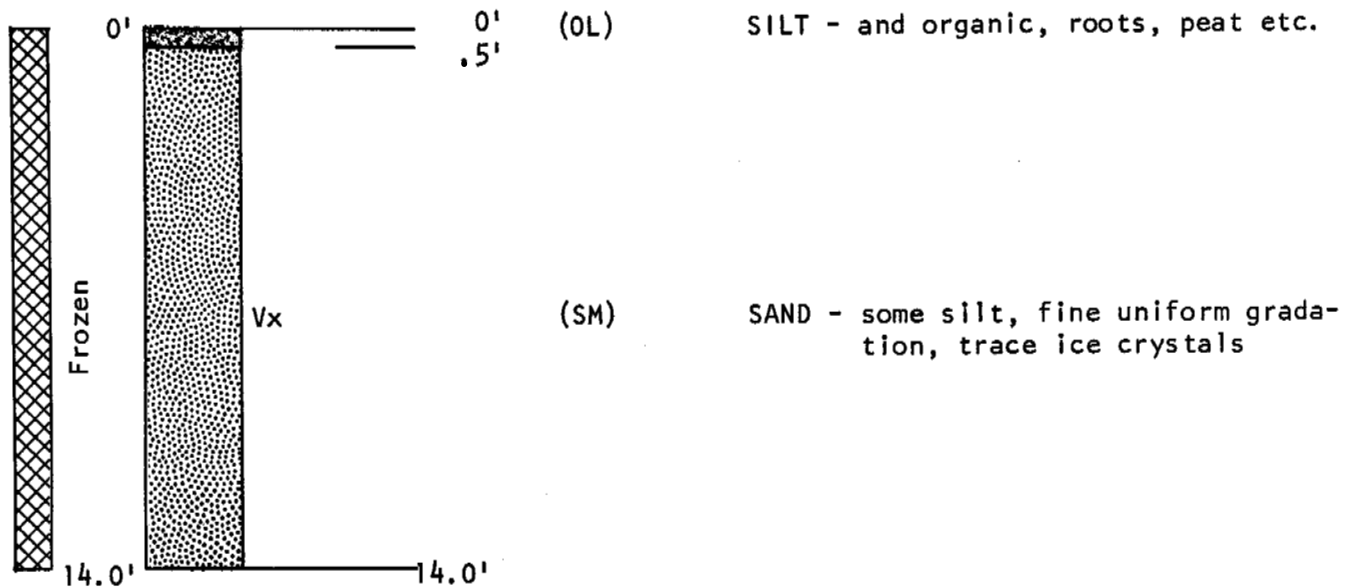
ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

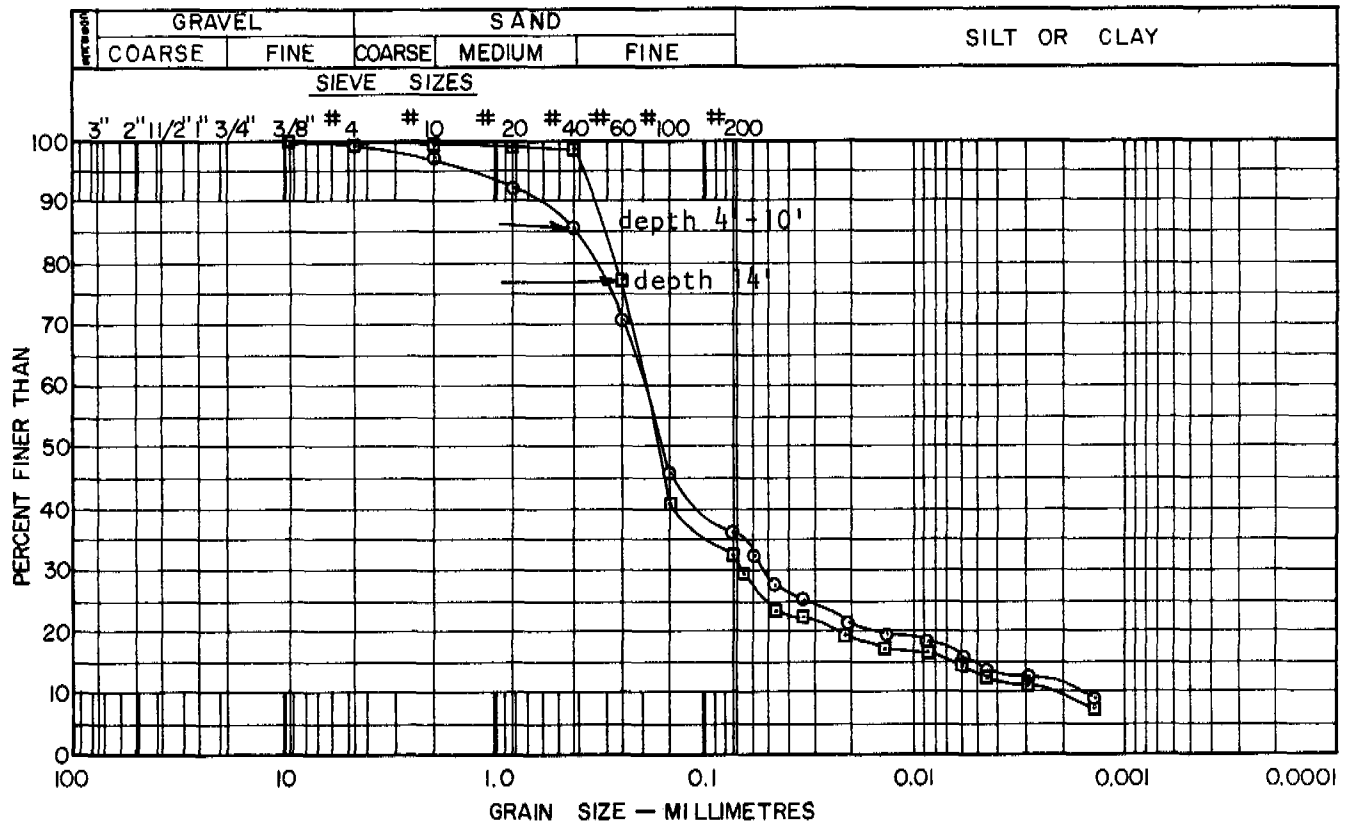
TEST HOLE LOGS
SOURCE No. I-405-A

I-405A-3



**LABORATORY
TEST DATA**
TEST HOLE-SOURCE No. I-405A-3

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 43.3%
 Sample 2 depth 4' 23.8%
 Sample 3 depth 6' 30.4%
 Sample 4 depth 8' 29.8%
 Sample 5 depth 10' 22.0%

Sample 6 depth 12' 33.5%
 Sample 7 depth 14' 28.8%

ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

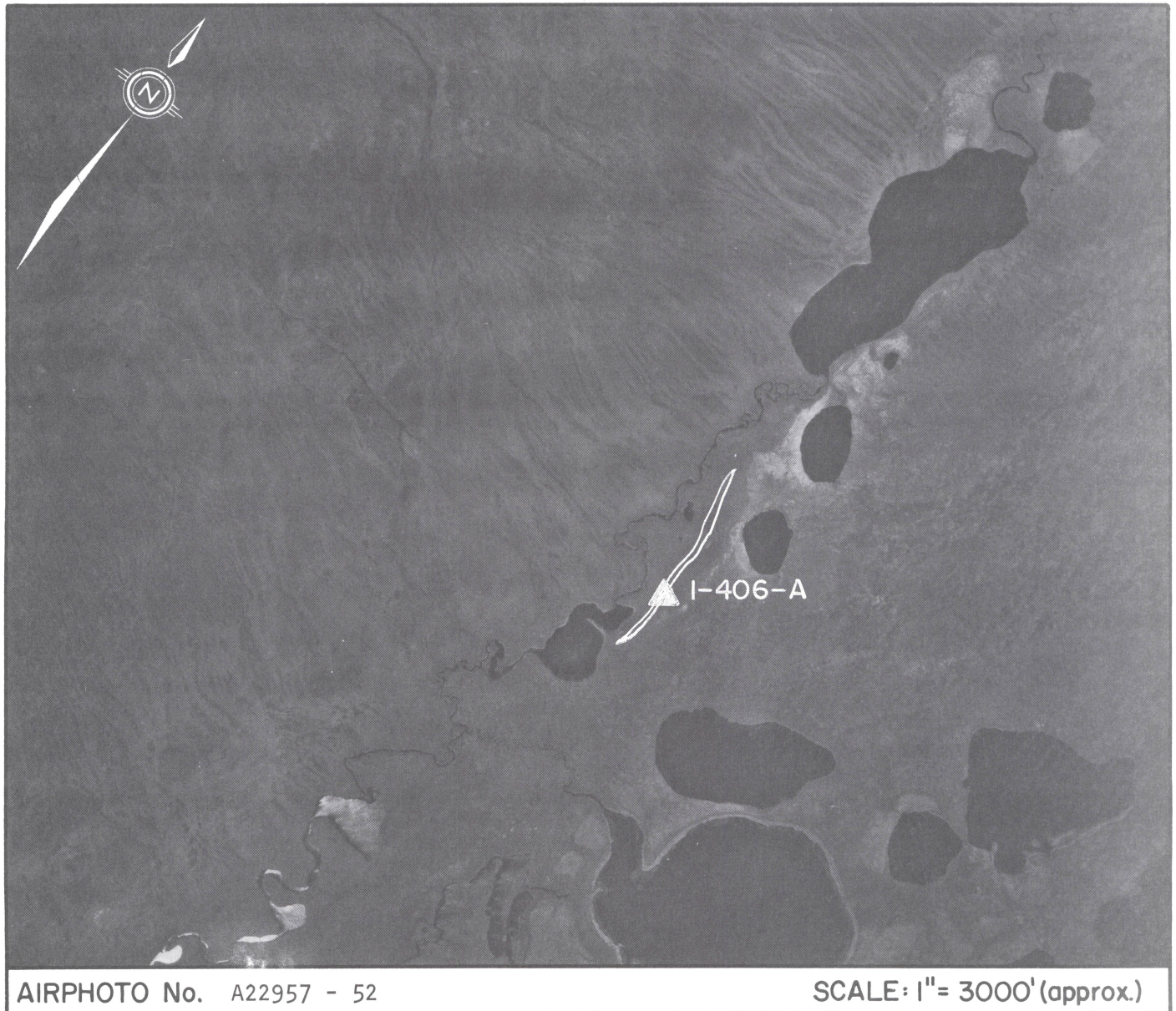
INUVIK
SOURCE No. 1- 406

LANDFORM AND LOCATION: Esker ridge, about 4,000 feet long
located about 13 miles by air east of Inuvik

MATERIAL: GRAVEL - some sand
SAND - little gravel

VOLUME: 40,000 cu. yds.

CONCLUSION: Low priority for development due to quality
and difficulty of access.



I-406 ENVIRONMENT

Physical

The source is a small esker ridge about 4,000 feet long and 10 to 15 feet high, located 13 miles east of Inuvik. The esker lies beside a small stream in a broad valley.

Drainage of the source is good, with no ground ice discovered within 3½ feet of the surface in September. The source has not been developed.

Biotic

Forest cover in the area consists of upland dwarf spruce, aspen, white spruce, and white birch, all running to a maximum of 30 feet in height. The ground is covered by moss, peat, and dwarf shrub.

The source is located within the Mackenzie Reindeer Grazing Reserve, and the area is trapped occasionally for marten, lynx, and fox. Moose are hunted in winter. The source does not lie within a critical wildlife area.

The stream flowing past the source continues to Campbell Lake, an important fishery for the native population.

I-406 MATERIALS AND QUANTITIES

This source was examined during the reconnaissance of September, 1972. Time would not permit drilling during the following winter, so information about the material is very scanty.

The material tested in this source is gravel and sand, with a trace of silt. At the sampling point a layer of gravel 1½ feet thick overlay sand, and the sand contained 10% coarser than #4 mesh and only 7% passing the 200 mesh. The gravel was well-graded to a maximum size of about 3 inches.

The petrographic analysis of gravel from the sampling point indicates that the main component is a poor sandstone (72%), with chert (11%), quartzite (5%), limestone (6%), quartz (3%), ironstone, and granite (3%) making up the remainder. The material would produce an unsound

aggregate.

The volume of material in this source may be as much as 40,000 cubic yards. Surficial examination indicates a good possibility of consistency through this landform.

I-406 DEVELOPMENT

General

This source is low priority for development. The volume is small, and the cost of hauling over the winter road would make the development uneconomical unless a project is nearby.

Access

The only feasible access to this source is by winter road from the Highway at the north end of Campbell Lake, travelling along the chain of lakes to the northeast for three miles, then north and west for another three to four miles. Part of the road could follow an existing cleared line that passes 1/2 mile south of the source. The distance to Inuvik by road would be about 20 miles.

Material Use and Handling

The material that was tested could be used as general fill or road material. The poor sandstone component in the gravel makes it unsuitable for use in concrete or asphalt.

Development of this source would require the usual assembly of equipment, including dozer with ripper attachment, front-end loader, and trucks.

Stripping and Restoration

The trees and shrubs in areas to be developed must be cleared and burned. The organic ground cover and topsoil must then be stripped and stockpiled away from the small stream, adjacent to the esker. The full depth of usable material in the esker should then be excavated and loaded, after which the stripped material would be replaced on the depleted area. It is important that the disturbed and

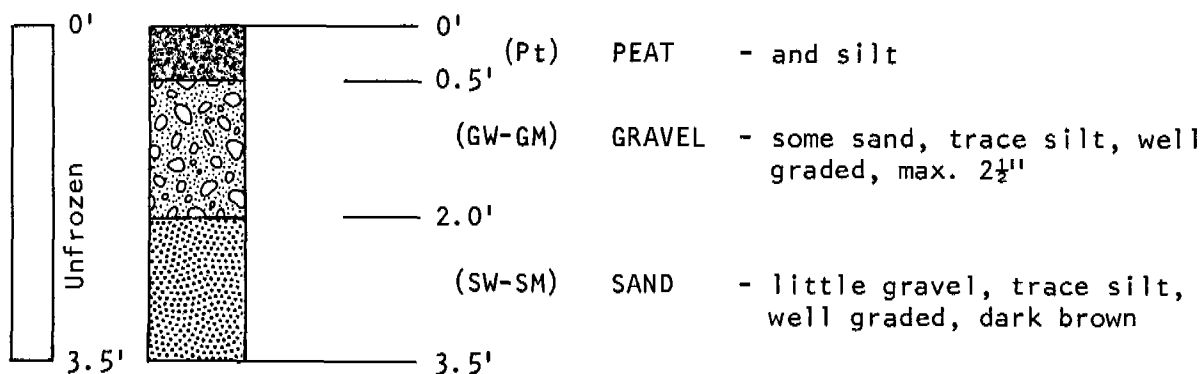
exposed area should be kept small in order to minimize the disruption of frozen ground below.

An important consideration is the need to avoid siltation of the small stream.

TEST PIT LOGS

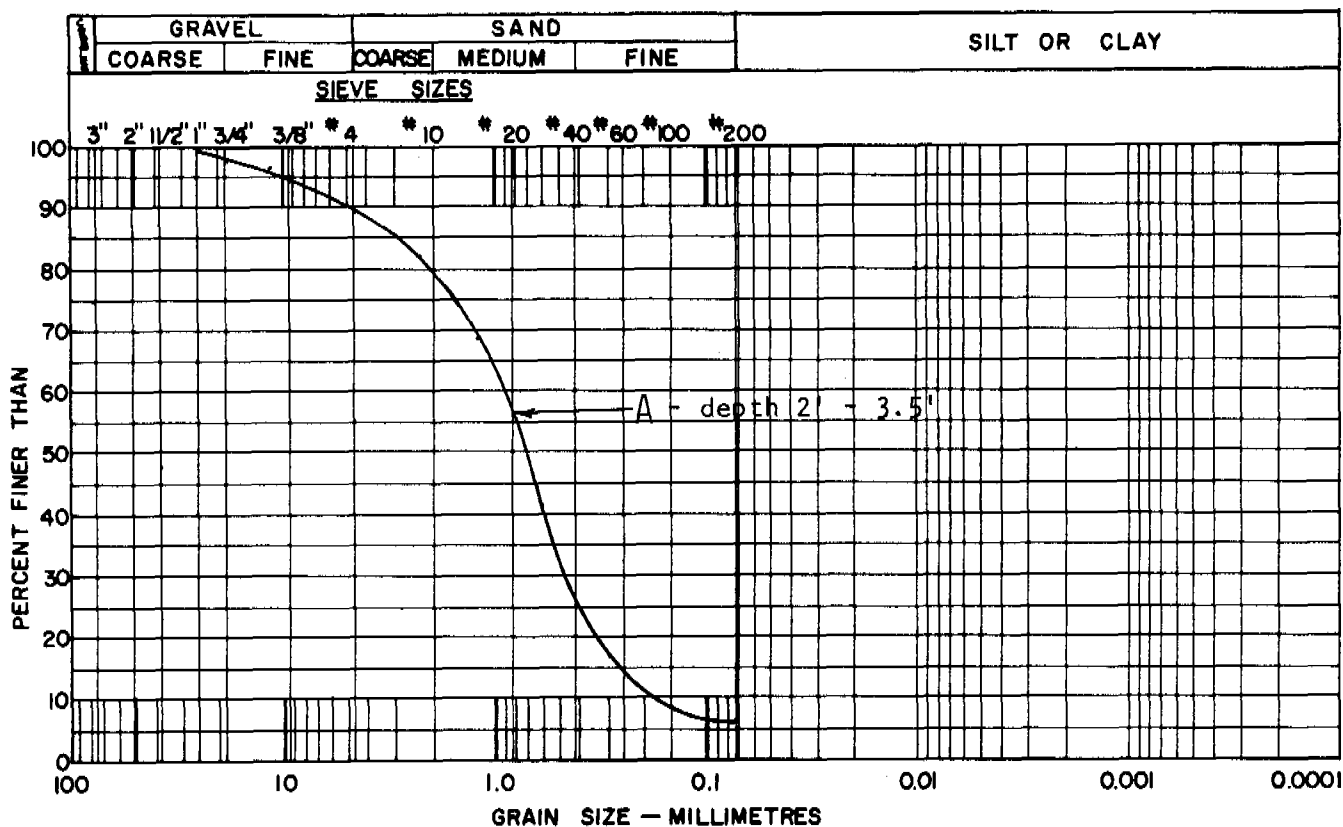
SOURCE No. I-406

I-406-A



LABORATORY TEST DATA SOURCE No. I-406

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

Sandstone soft - 72%
 Chert - 11%
 Limestone - 6%
 Quartzite - 5%
 Ironstone - 2%
 Granite - 1%
 Quartz - 3%

Total 100%

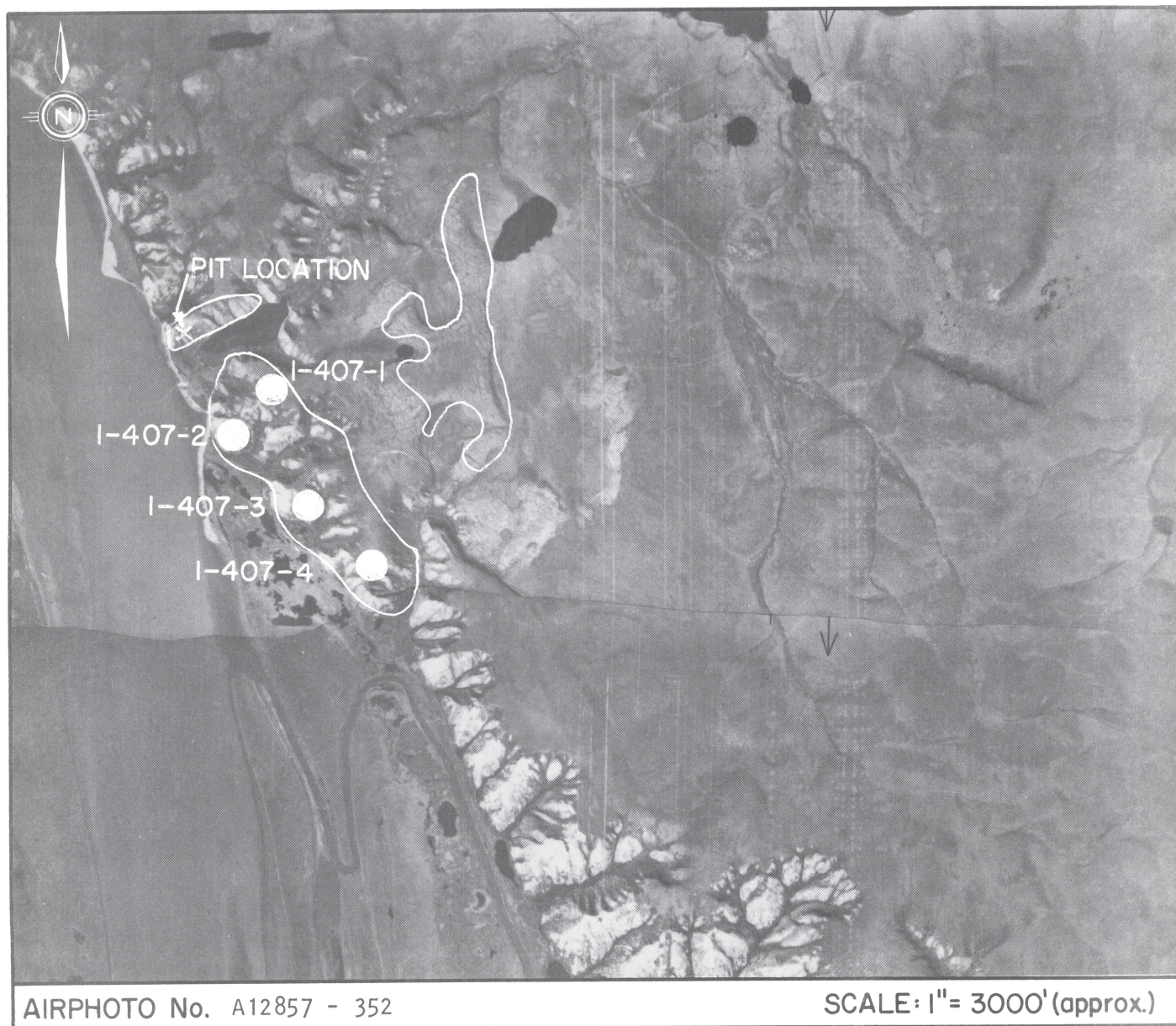
INUVIK
SOURCE No. 1- 407

LANDFORM AND LOCATION: Terrace remanant located about 38 miles by air northwest of Inuvik.

MATERIAL: GRAVEL - and sand
SAND - some gravel

VOLUME: 6,000,000 cu. yds.

CONCLUSION: Source is suitable for continued development but larger scale operation will probably require an environmental impact study due to proximity to river and wildlife



Physical

The source is located at the north end of the Caribou Hills on the eastern boundary of the Mackenzie Delta, about 38 miles northwest of Inuvik. The area is large and complex, extending over a vertical range of over 200 feet. On the upland to the northeast is a large terrace remnant over 1 mile long and about 1/4 mile wide. The outer slopes of the Caribou Hills, probably Tertiary deltaic deposits, display gravel for a distance of about 7,000 feet along the Delta, and over a vertical height of about 200 feet. In the source area these lower deposits are divided by a small lake and a deep gully near the northern end, and are limited by a gully at the southern end. The southern gully provides access to the upland, and is used by the oil exploration crews working at Peter Lake.

Some development has taken place at Delta level at the northern end of the source, the material being transported by barge and by truck along the east channel of the Mackenzie River to Inuvik.

Drainage of this source is good.

Biotic

The only trees discovered in this area are stunted white spruce and black spruce located in gullies where they are protected from wind. The exposed slopes of the Caribou Hills are partly bare, partly covered by moss and dwarf upland shrub. The upland is largely grass, with some dwarf shrub.

The source lies within the eastern boundary of the critical Mackenzie Delta wildlife region, intensively trapped for muskrat, mink, and beaver. Waterfowl are abundant as well through summer months. The source is also contained within the Mackenzie Reindeer Grazing Reserve, although near its western boundary. The northern boundary of the proposed Caribou Hills reserve of the International Biological Programme is about 2 miles to the southeast of this source.

I-407 MATERIALS AND QUANTITIES

The materials in this source are gravel and sand in varying combinations and containing varying amounts of ground ice, although generally the ice content is relatively low. Test Hole I-407-4 contained 36 feet of well-graded gravel and sand in 42 feet total depth. The pit face developed for Inuvik is 40 feet of sand with no interruptions. The other three test holes penetrated silt, some of it lying beneath a veneer of gravel.

Grain size analyses of the sand and gravel indicate the material is well-graded.

Petrographic analysis of the gravel from I-407-4 shows that quartzite (78%) and quartz (13%) are the main constituents, with granite, chert (3%), and soft sandstone (6%) making up the remainder. Only the sandstone is unsound.

The gravel from the developed pit is not as good as the material from Test Hole I-407-4 but is still acceptable for use as aggregate. The main constituents are quartzite (40%), chert (34%), soft sandstone (13%), and quartz (11%), with granite, limestone, and ironstone making up the remaining 2%. The unsound material is about 13½%. The chert is not likely to be reactive, but pending further qualitative studies it is recommended that concrete made with this aggregate should use cement containing no more than 0.6% alkali.

The volume of material contained in this source is estimated to be more than 6,000,000 cubic yards.

I-407 DEVELOPMENT

General

This source is recommended for continued use on an increasing scale as the demand for granular material increases.

The value of this source to wildlife will require that an environmental study be conducted before a large-scale operation can be started. The study should determine whether such an operation

can be conducted without excessive disturbance to wildlife and also, if permitted, how the operation should be planned for minimal disturbance.

Any operation at this source must give consideration to the need for preserving water quality in the east channel of the Mackenzie River. Siltation must be limited, for example by operating the processing plant on a closed circuit with water re-circulated through settling ponds.

Access

The haul to Inuvik is direct but relatively long, either by barge in summer or by truck in winter. The route will follow the east channel of the Mackenzie River, and will be about 40 miles long. In either summer or winter the season is short and stockpiling will be required at the source and at Inuvik.

Material Use and Handling

The material from this source can be used for any purpose, from general fill to concrete aggregate.

The present development draws from the bottom of a slope about 200 feet high. Probably a large-scale operation will draw from benches at intermediate levels on a slope, and may use conveyors to feed material to a central processing and distribution plant.

For the continuing small-scale operation the only equipment required is a front-end loader and barges or trucks. The large-scale operation will require much additional equipment, including dozers with ripper attachments, conveyors, a processing plant, and stockpiling and reclamation equipment.

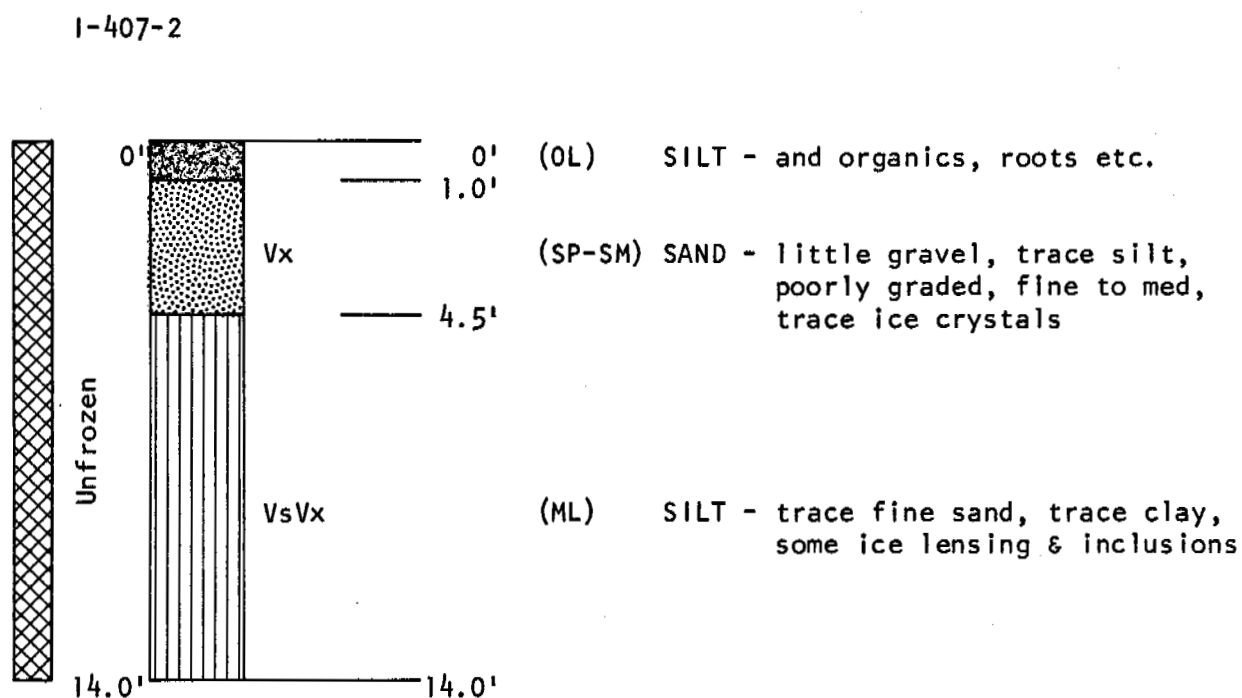
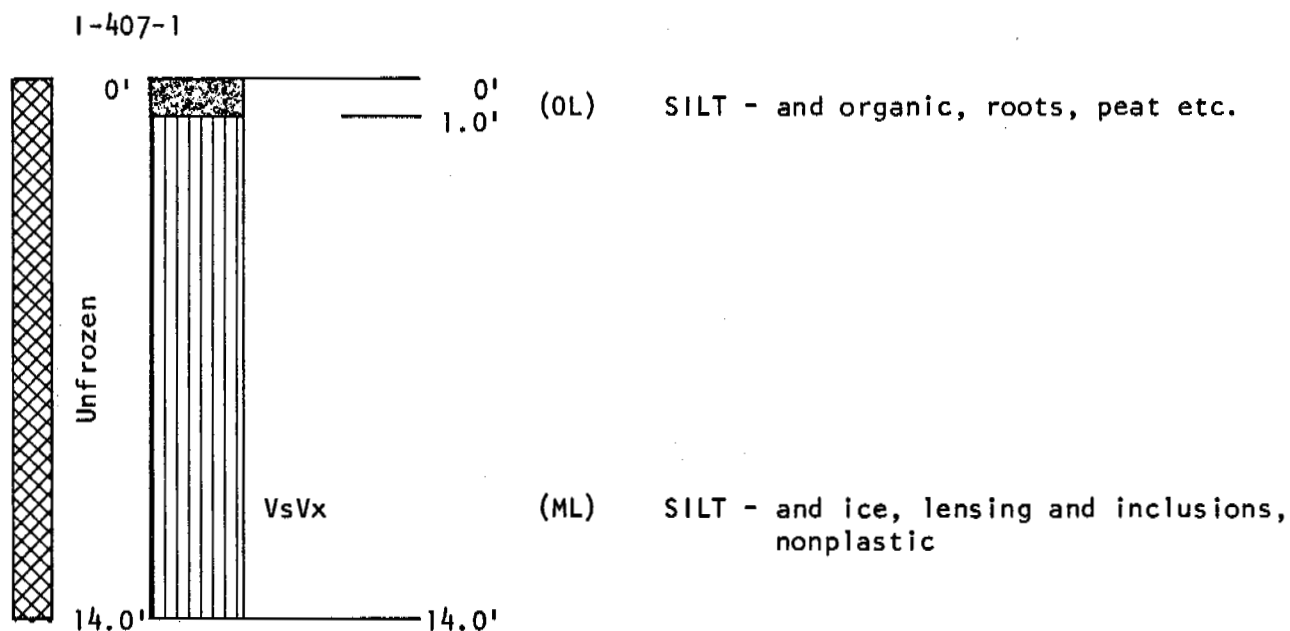
Stripping and Restoration

Little or no stripping is required on the slopes of the Caribou Hills, but any surface cover stripped must be stockpiled for later distribution over depleted areas. It is recommended that the operation of

this source be concentrated in a small area in order to minimize the disturbance and to aid in restoration. All banks must be graded to a stable slope before restoration.

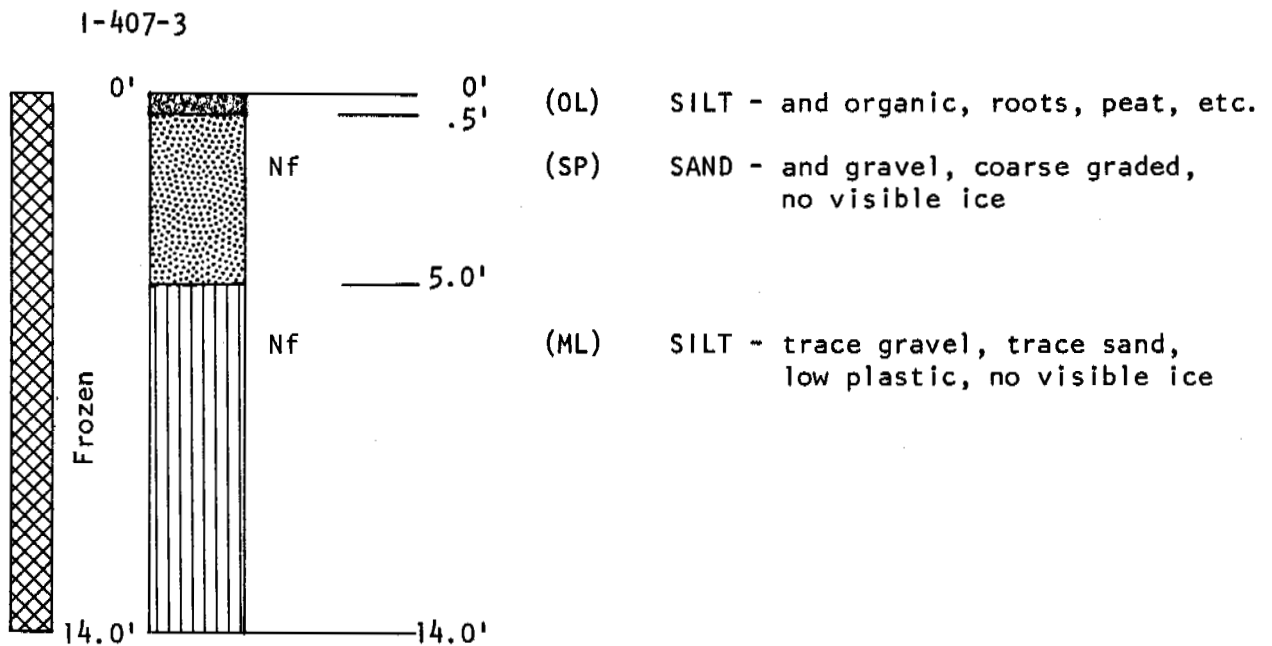
TEST HOLE LOGS

SOURCE No. I-407



TEST HOLE LOGS

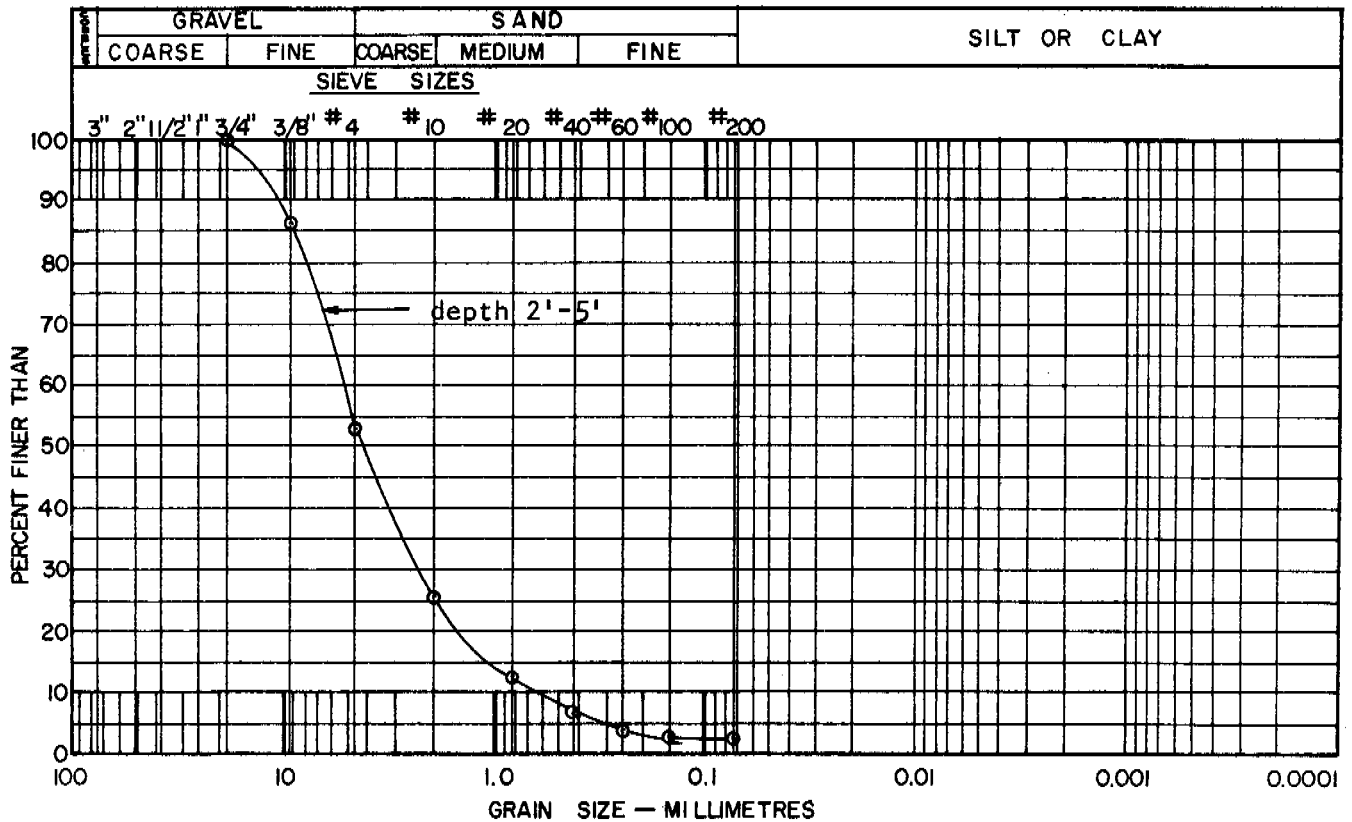
SOURCE No. I-407



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-407-3

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2' 2.4%
 Sample 2 depth 5' 2.9%
 Sample 3 depth 10' 13.8%
 Sample 4 depth 14' 12.7%

ORGANIC CONTENT

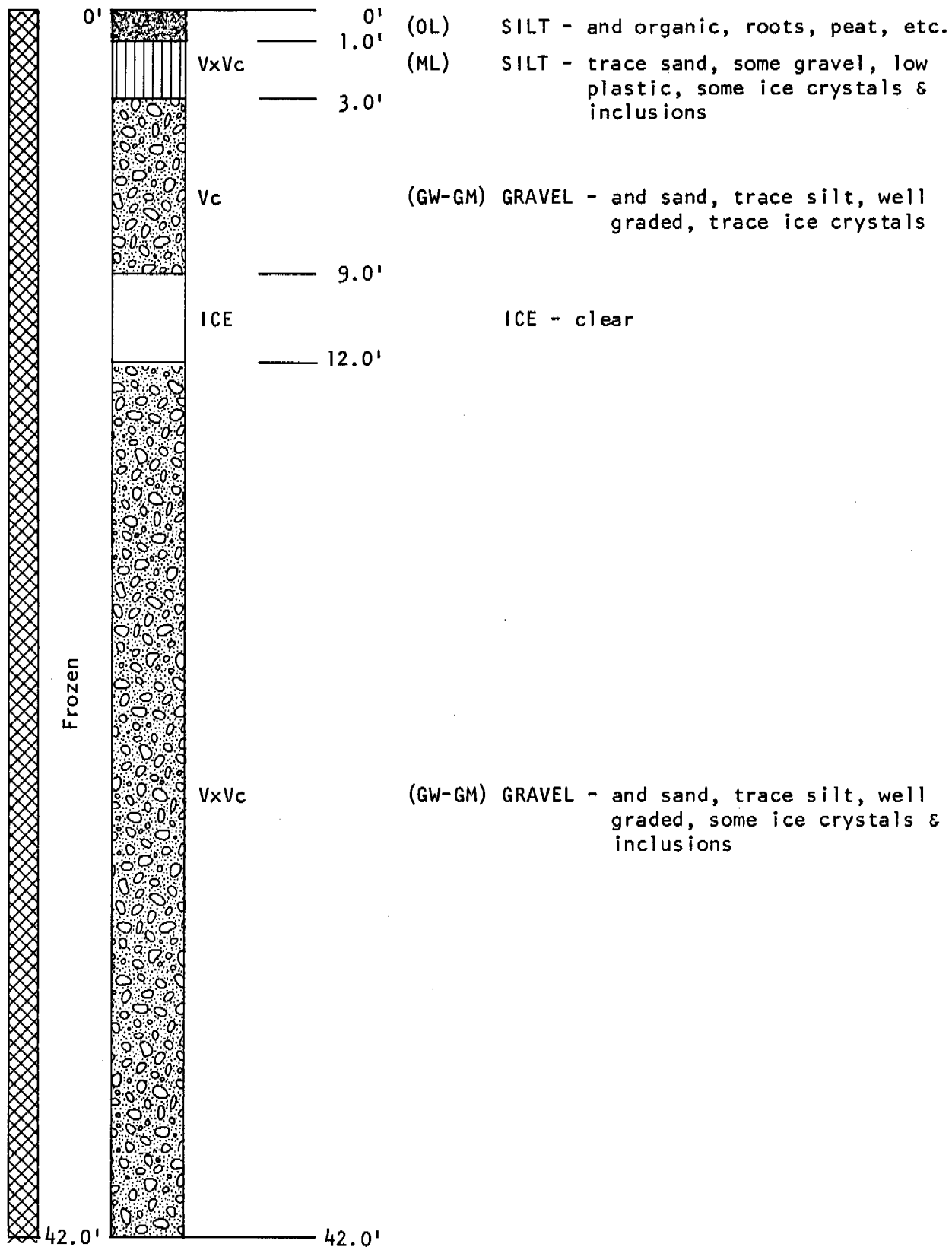
HARDNESS TEST

PETROGRAPHIC ANALYSIS

TEST HOLE LOGS

SOURCE No. I-407

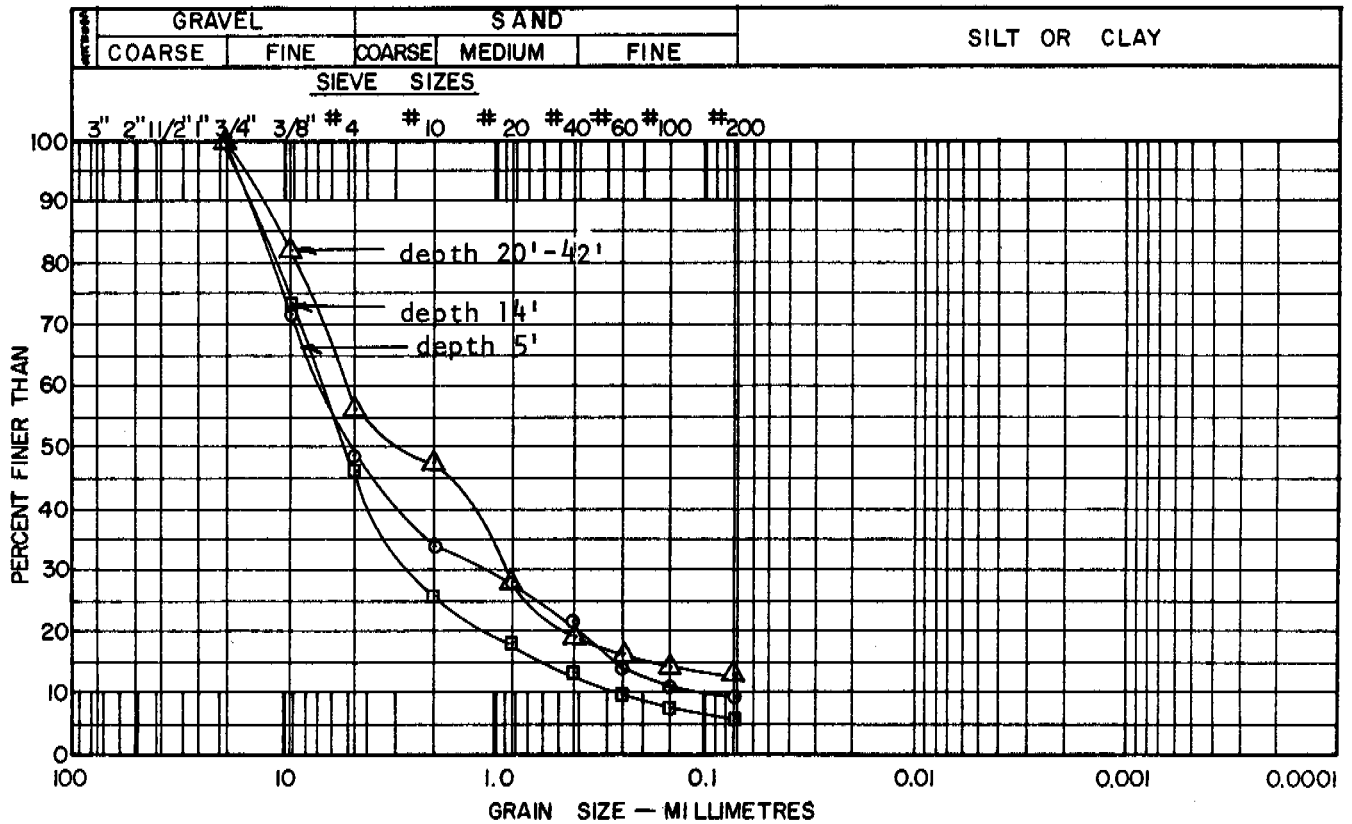
I-407-4



LABORATORY TEST DATA

TEST HOLE-SOURCE No. I-407-4

GRAIN SIZE DISTRIBUTION



MOISTURE CONTENT

Sample 1 depth 2'	8.6%	Sample 6 depth 45'	6.6%
Sample 2 depth 5'	7.7%		
Sample 3 depth 14'	9.0%		
Sample 4 depth 20'	8.3%		
Sample 5 depth 30'	8.5%		

ORGANIC CONTENT

HARDNESS TEST

PETROGRAPHIC ANALYSIS

Sample 4 depth 120' - 42'

Quartzite	- 78%
Quartz	- 13%
Sandstone soft	- 6%
Chert	- 3%
Granite	- Neg.

Total 100%

TEST PIT LOGS

SOURCE No. I-407 PIT FACE

