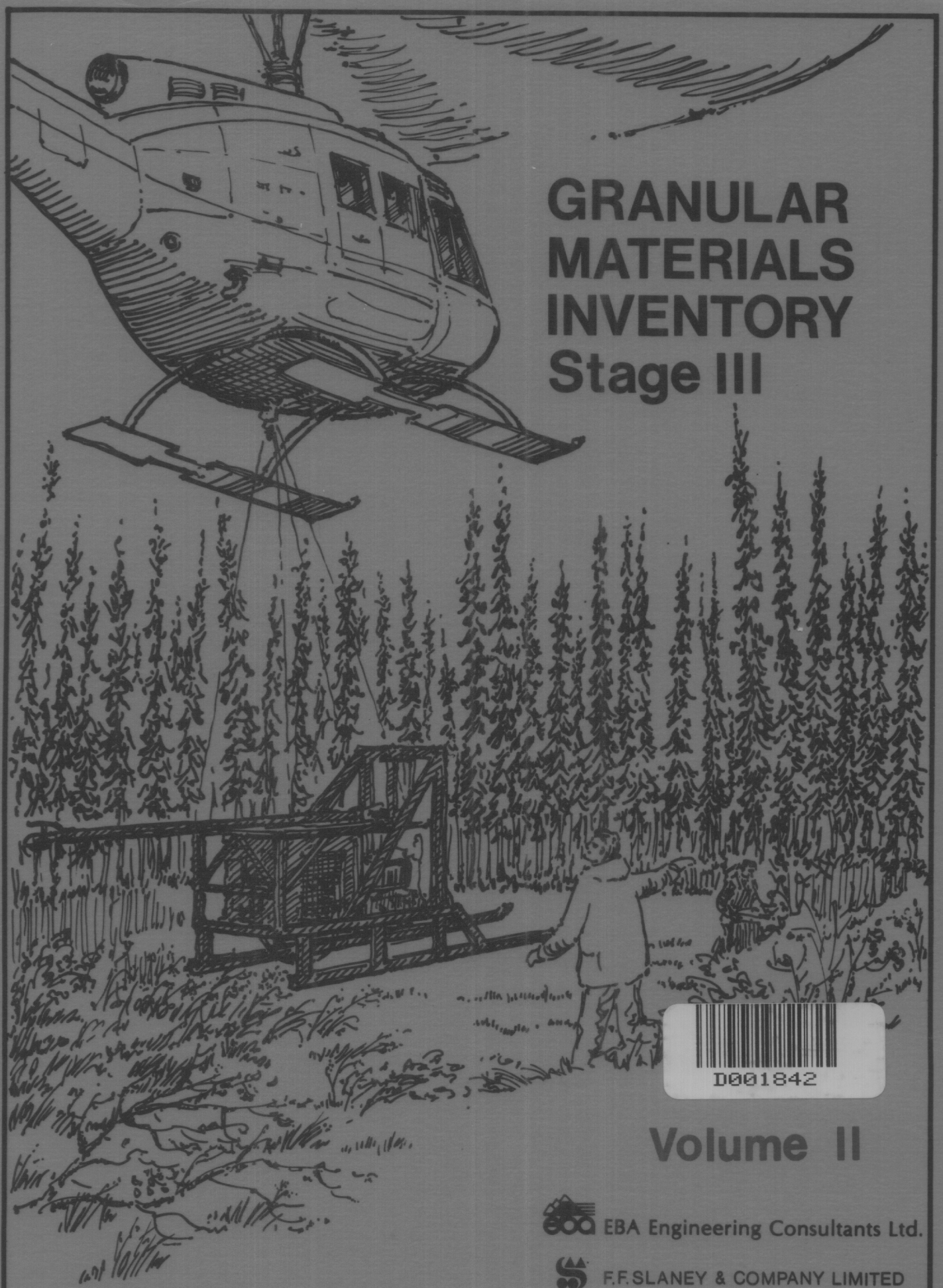


GRANULAR MATERIALS INVENTORY Stage III

D001842

Volume II

EBA Engineering Consultants Ltd.

F.F.SLANEY & COMPANY LIMITED

COPY NO. 35.

GRANULAR MATERIALS INVENTORY STAGE III

VOLUME II

SOUTH HALF

SITES 1101 - 1053, 1055 - 1060

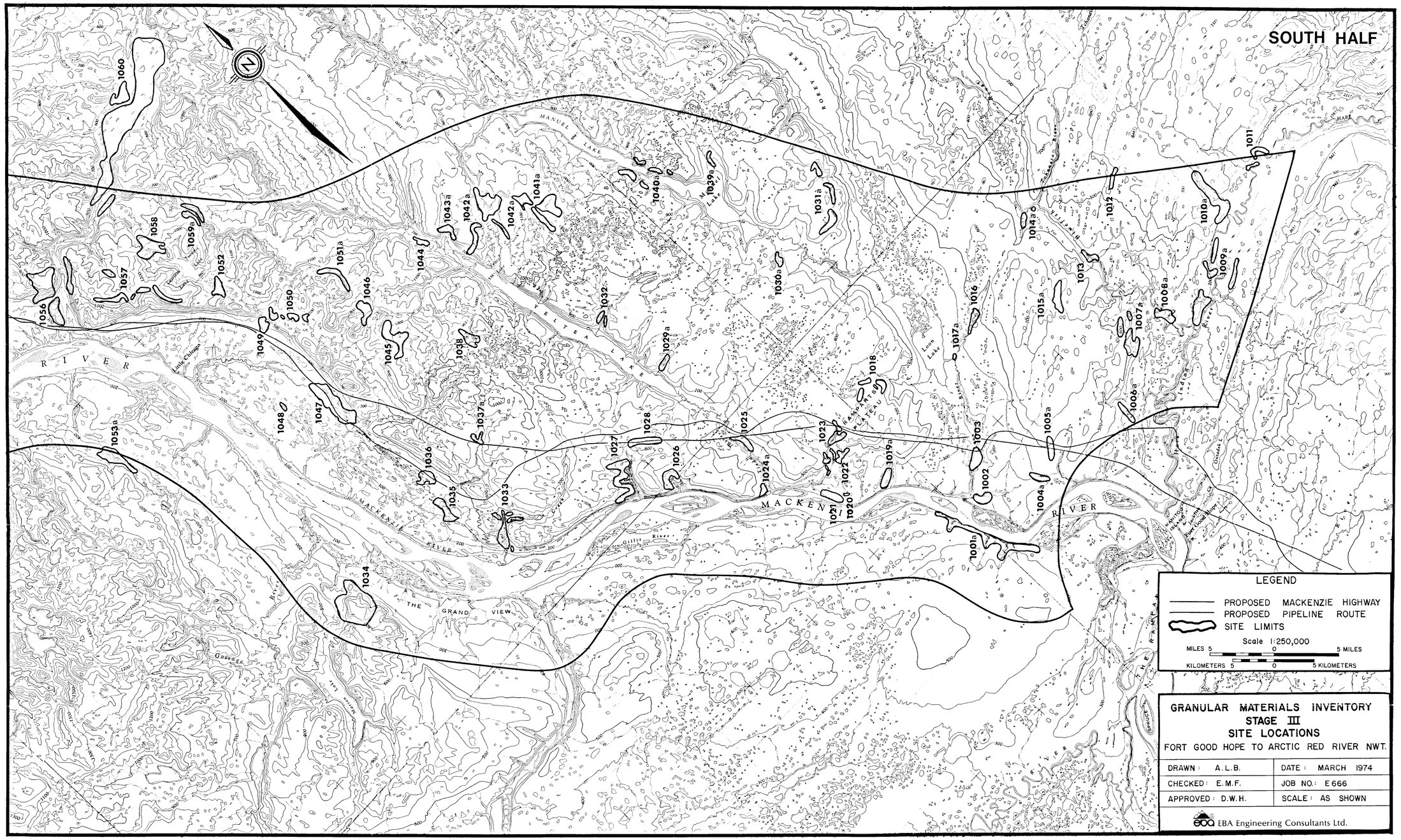
Submitted to:

GOVERNMENT OF CANADA

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

APRIL, 1974

eba Engineering Consultants Ltd.


SOUTH HALF
LEGEND
PROPOSED MACKENZIE HIGHWAY
PROPOSED PIPELINE ROUTE
SITE LIMITS
Scale 1:250,000
MILES 5 0 5 MILES
KILOMETERS 5 0 5 KILOMETERS
GRANULAR MATERIALS INVENTORY
STAGE III
SITE LOCATIONS
FORT GOOD HOPE TO ARCTIC RED RIVER NWT.
DRAWN: A.L.B.
DATE: MARCH 1974
CHECKED: E.M.F.
JOB NO.: E666
APPROVED: D.W.H.
SCALE: AS SHOWN
EBA Engineering Consultants Ltd.
MACKENZIE RIVER
THE GRAND VIEW
MANUEL LAKE
YELTEA LAKE
ROREY LAKE
RAMPARTS PLATEAU
Loon Lake
Gillis River
Little Chicago
Gossage
1060
1058
1059a
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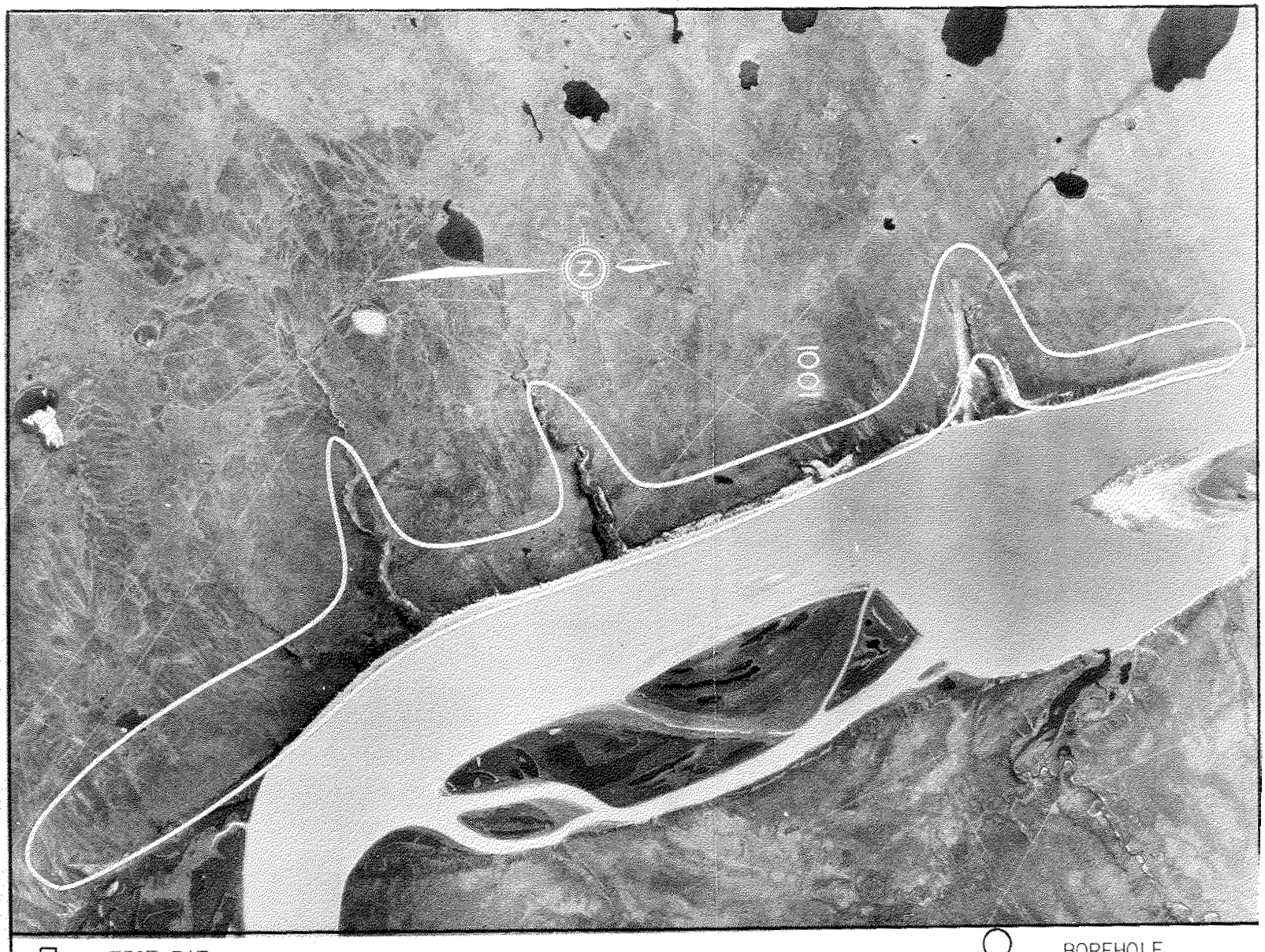
1002
1001a

Site No.	Material Type		Suitability of Material	Estimated Volume (cu. yd.)	Est'd Recov. Depth (feet)	Overburden			Ground Ice (content)	Drainage	Method of Extraction	Min. Haul. Dist. (mi.)	Relative Environmental Sensitivity	Assessment
	Description	Sym.				Type	Depth (feet)	Disposal						
1001a	Limestone, Bedrock	--	Most Construction Aggregates	N.D.	--	N.D.	N.D.	--	--	Good	Quarry and Blasting	6-7	High - 390	Not Recommended
1002	Sand, trace Silt	SM	Marginal General Fill	8,300,000	+26.5	--	--	--	None	Good	Conventional	3½-4½	Moderate - 280	Recommended
1003	Gravel and Sand, trace Silt	GP-GW	General Fill	>1,900,000	N.D.	Peat and Silt	4	Strip and Stockpile	Low	Good	Conventional	1	Moderate - 320	Excellent Prospect
1004a	Fine sand, some silt	SP-SM	Unsuitable	N/A	--	--	--	--	N.D.	Good	N/A	3	N.D.	Not Recommended
1005a	N.D.	--	N.D.	N.D.	--	--	--	--	--	--	--	0	N.D.	Poor Prospect
1006a	Fine sand, some silt	SW-SM	Unsuitable	N.D.	--	--	--	--	Low	Good	N/A	3-4	Moderate - 255	Not Recommended
1007a	Limestone Bedrock	--	Most Construction Aggregates	N.D.	--	N.D.	N.D.	--	--	Good	Quarry and Blasting	7-8	Low - 215	Not Recommended
1008a	Silty sand, some gravel	GM	General Fill	800,000	8	--	--	--	None	Good	Conventional	12	High - 345	Not Recommended
1009a	Silt and fine sand	ND	Unsuitable	N/A	--	--	--	--	N.D.	Good	N/A	16	High - 370	Not Recommended
1010a	Limestone Bedrock	ND	Most Construction Aggregates	N.D.	--	Silt	4	Strip and Stockpile	--	Good	Quarry and Blasting	21	High - 345	Not Recommended
1011	Sand and Gravel, trace Silt	SP & GP-GW	Most Construction Aggregates	N.D.	8	--	--	--	None	Good	Conventional	26	High - 340	Poor Prospect
1012	Sand and Gravel, some Silt	GP GM	General Fill	N.D.	25	Silt	7-14	Strip and Stockpile	Low	Good	Conventional	22	N.D.	Poor Prospect
1013	Sandy gravel, trace Silt	GW SM	General Fill	N.D.	+14	Peat	1	--	None	Good	Conventional	14½	High - 325	Poor Prospect
1014a	Silt	--	Unsuitable	N/A	--	--	--	--	--	Good	--	16	N.D.	Not Recommended
1015a	Limestone Bedrock	--	Most Construction Aggregates	N.D.	--	N.D.	--	Strip and Stockpile		Good	Quarry and Blasting	11	Moderate - 300	Not Recommended
1016	Sand and Gravel	GW-GP	General Fill	N.D.	20	--	--	--	None	Good	Conventional	9	Low - 235	Not Recommended
1017a	Sand and silt, trace Gravel	SM	Unsuitable	N/A	--	--	--	--	--	Good	--	6	High - 370	Not Recommended
1018	Limestone Bedrock	--	Most Construction Aggregates	N.D.	--	Clay	N.D.	--	N.D.	Good	Quarry and Blasting	3	Low - 175	Recommended
1019a	Sand	--	Marginal General Fill	N.D.	--	--	--	--	--	Good	Conventional	3	N.D.	Not Recommended
1020	Gravel with fine to Coarse Sand	GW	General Fill	800,000	21	Clayey Silt and Fine Sand	12	--	High	Good	--	4½	Low - 225	Fair Prospect
1021	Gravel and Sand.	GW SP-SW	General Fill	8,500,000	20+	Sand and Silt	5	Strip and Stockpile	Low	Good	Conventional	5	Low - 225	Excellent Prospect
1022	Gravel and Gravelly Sand	GW-GP SM	General Fill	4,500,000	15+	--	--	--	None	Good	Conventional	2½	Low - 235	Excellent Prospect
1023	Limestone Bedrock	--	Most Construction Aggregates	Unlimited	--	N.D.	N.D.	--	--	Good	Quarry and Blasting	1	Moderate - 300	Excellent Prospect
1024a	Limestone Bedrock	--	Most Construction Aggregates	N.D.	--	Silt	20	Strip and Stockpile	N.D.	Good	Quarry and Blasting	5	High - 380	Not Recommended
1025	Gravelly Silt	ND	Marginal General Fill	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	Good	Conventional	1	N.D.	Fair to Good Prospect
1026a	Limestone Bedrock	--	Most Construction Aggregates	N.D.	N.D.	N.D.	N.D.	--	N.D.	Good	Quarry and Blasting	4-5	High - 365	Not Recommended
1027	Silty sand and Limestone	--	Most Construction Aggregates	Unlimited	N.D.	N.D.	N.D.	--	N.D.	Good	Quarry and Blasting	1-2	High - 385	Fair to Good Prospect
1028	Shale Bedrock	--	General Fill	N.D.	N.D.	Clay Till	12	Strip and Stockpile	N.D.	Fair	Quarry and Blasting	1	Low - 185	Fair to Good Prospect
1029a	Silty sand	--	General Fill	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	Good	Conventional	4½-6	Moderate - 275	Not Recommended
1030a	Limestone	--	Most Construction Requirements	N.D.	N.D.	Peat/Clay	5-10	--	N.D.	Good	Quarry and Blasting	13	Moderate - 265	Not Recommended
1031a	Limestone	--	Most Construction Requirements	N.D.	N.D.	--	--	--	--	Good	Quarry and Blasting	16	Moderate - 310	Not Recommended
1032	Sand and Gravel	GP	General Fill	350,000	N.D.	--	--	--	None	Good	Conventional	9½	Low - 240	Not Recommended
1033	Limestone, Sand and Gravel	--	General Fill	N.D.	N.D.	N.D.	10+	--	N.D.	Good	Conventional to Blasting	2	Moderate - 320	Good Source
1034a	Glacial till	--	Unsuitable	--	--	--	--	--	N.D.	--	--		Moderate - 295	Not Recommended
1035	Gravel, some Sand	GW-GM	General Aggregate	11,000,000	20+	N.D.	--	Strip and Stockpile	None	Fair to Good	Conventional	2	Moderate - 260	Excellent Source
1036	Gravel and Sand	GW	Construction Aggregate	2,200,000	N.D.	N.D.	1-2	N.D.	N.D.	Fair	Conventional	½	Low - 195	Good Deposit
1037a	Clay, silt	--	Unsuitable	--	--	N.D.	N.D.	N.D.	N.D.	Good	Conventional	2	N.D.	Not Recommended

Site No.	Material Type		Suitability of Material	Estimated Volume (cu. yd.)	Est'd Recov. Depth (feet)	Overburden			Ground Ice (content)	Drainage	Method of Extraction	Min. Haul. Dist. (mi.)	Relative Environmental Sensitivity	Assessment
	Description	Sym.				Type	Depth (feet)	Disposal						
1038	Sandy Gravel	--	General Fill	3,500,000	N.D.	N.D.	N.D.	N.D.	N.D.	Good	Conventional	8	Low - 205	Fair Prospect
1039a	Sandy Silt	SM-ML	Poor	--	N.D.	None	--	--	Low	Good to Fair	Conventional	21	Moderate - 295	Not Recommended
1040a	Limestone	--	General Aggregate	--	--	--	Thick	N.D.	N.D.	Good	--	21	High - 365	Not Recommended
1041a	Gravel, Sand	GP-GM	General Aggregate	3,500,000	N.D.	None	--	--	High	Fair to Poor	Stock Piling Required	19	Moderate - 260	Not Recommended
1042a	Clayey Silt	--	Unsuitable	--	--	--	--	--	--	--	--	20	N.D.	Not Recommended
1043a	N.D.	ND	N.D.	--	--	N.D.	--	--	N.D.	Good	N.D.	14	Low - 235	Not Recommended
1044	Sandy Gravel	GM	General Construction Use	1,000,000	--	Silt	1.0	--	N.D.	Fair	Conventional	13	Moderate - 275	Not Recommended
1045	Gravel and Sand	GW-GM	General Aggregate	5,650,000	14	Peat/Silt	< 1	Strip and Stockpile	14' to Permafrost	Good	Conventional	7	Low - 175	Fair Prospect
1046	Gravelly Sand and Silt	GM	General Fill	1,000,000	N.D.	Organic Soil	< 1	Strip and Stockpile	7' to Permafrost	Good	Conventional	7	Low - 190	Fair Prospect
1047	Sand and Gravel	SM	Construction Aggregate	42,000,000	15	Silt	1	Strip and Stockpile	15' to Permafrost	Excellent	Conventional	0-1	Low - 215	Excellent Prospect
1048	Sand and Gravel	SM	General Fill	N.D.	14	N.D.	--	--	14' to Permafrost	Good	Conventional	3	N.D.	Fair Prospect
1049	Gravelly Sand	SM	General Fill	175,000	N.D.	None	--	--	Not frozen	Fair	Conventional	½-1	Low - 190	Fair Prospect
1050	Gravel and Sand	GM	General Fill	1,500,000	N.D.	Silt	1-5	Strip and Stockpile	--	Good	Conventional	2-3	Low - 200	Fair Prospect
1051a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	8	N.D.	Not Recommended
1052	Sand and Gravel	GP-GM	Construction Aggregates	120,000	--	Negligible	--	--	Unfrozen	Good	Conventional	3	Low - 230	Good Prospect
1053a	Silt and Clay	SC	Unsuitable	--	--	Peat	--	--	--	--	--	10	N.D.	Not Recommended
1056	Shale	--	General Fill	--	--	Peat	½-7	Strip and Stockpile	Low to Moderate	Good	Striping and Blasting	1	Moderate - 295	Fair to Poor Prospect
1057	Sand and Gravel	GC	Construction Aggregate	10,500,000	24	--	Thin	Strip	Unfrozen	Good	Conventional	1½	Low - 210	Excellent Prospect
1058	Shale	--	General Fill	--	--	Clay	4-6	Strip and Stockpile	Unfrozen	Good	Blast and Quarry	4	Low - 190	Fair Prospect
1059a	Clay	CL	Unsuitable	--	--	--	--	--	--	--	--	8½	N.D.	Not Recommended
1060	Sand and Gravel	GM	Construction Aggregate and Fill	80,000,000	--	Peat	Thin	Strip and Stockpile	Irregular	Good	Conventional	7	Low - 245	Good Prospect

Notes:

- N.D. — Not determined.
- N/A — Not applicable.
- SITE NUMBER: The site number, followed by an "a", codes sites which are not recommended for development.
- METHOD OF EXCAVATION: "Conventional" indicates use of such standard equipment as dozers, overhead loaders, backhoes, light rippers and trucks.
- MINIMUM HAULAGE DISTANCE: The minimum haulage distance is an air mileage from proposed pipeline and highway routes to the site.
- RELATIVE ENVIRONMENTAL SENSITIVITY: The relative environmental sensitivity is based on an environmental sensitivity index as established by F.F. Slaney and Co. Ltd.
- ASSESSMENT: Refer to site descriptions section.



□ TEST PIT

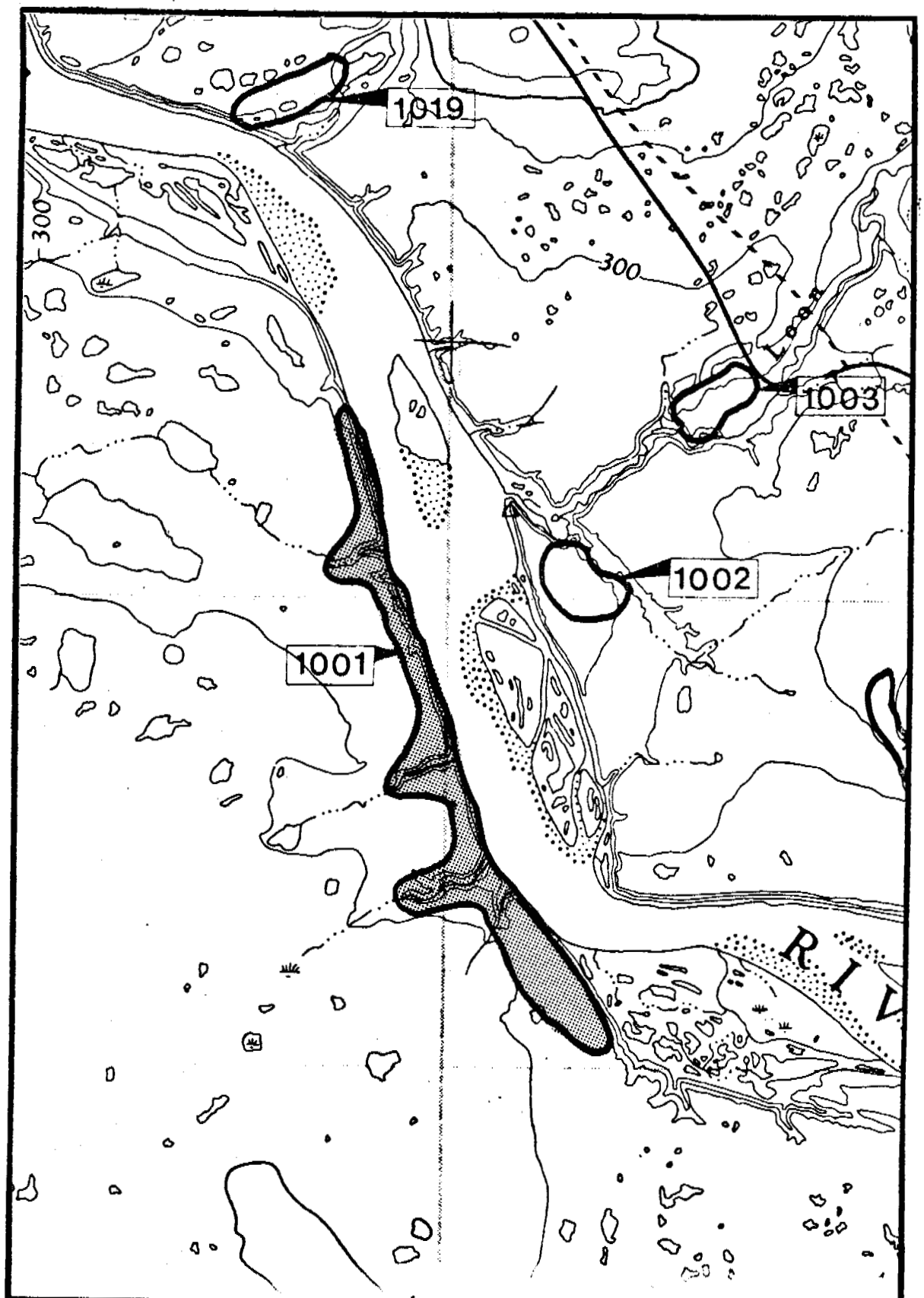
○ BOREHOLE

AIRPHOTO No. A22421-153

SCALE: 1" = 5500' (approx.)

SITE 1001a

Location:	Site 1001 is situated along the west bank of the Mackenzie River opposite the point of confluence of the Loon and Mackenzie Rivers, approximately 14 to 20 miles NW of Fort Good Hope. Proposed pipeline and highway routes are 6 to 7 miles NE on the east side of the Mackenzie River.
Material:	Limestone.
Volume:	Unlimited.
Drainage:	The site is well drained.
Assessment:	The limestone encountered at site 1001 could serve as fair to good quality general fill. An almost unlimited volume of material is available; however, the site is located on the opposite side of the Mackenzie River and 6 to 7 miles from the proposed pipeline and highway developments. Access difficulties are further complicated by 300 foot high cliffs along the Mackenzie. The environmental overview has assessed the site as being environmentally sensitive and it is suggested winter operations be avoided. This would necessitate a barging system to transport borrow across the river. Site 1001 is <u>not</u> recommended for development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1001

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 4 (5) Rating: 75	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 (5) Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas. Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 (3) 4 5 Rating: 30	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 2 3 4 (5) Rating: 50	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 390

SPECIAL CONCERNS: On west bank of Mackenzie, opposite Loon River. Important winter moose concentration area. Avoid winter operations, preserve riparian vegetation. High possibility of discovering fossil or archaeological sites. Material must cross river, access roads must traverse river banks. Buffer zones and restoration standards may be imposed.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

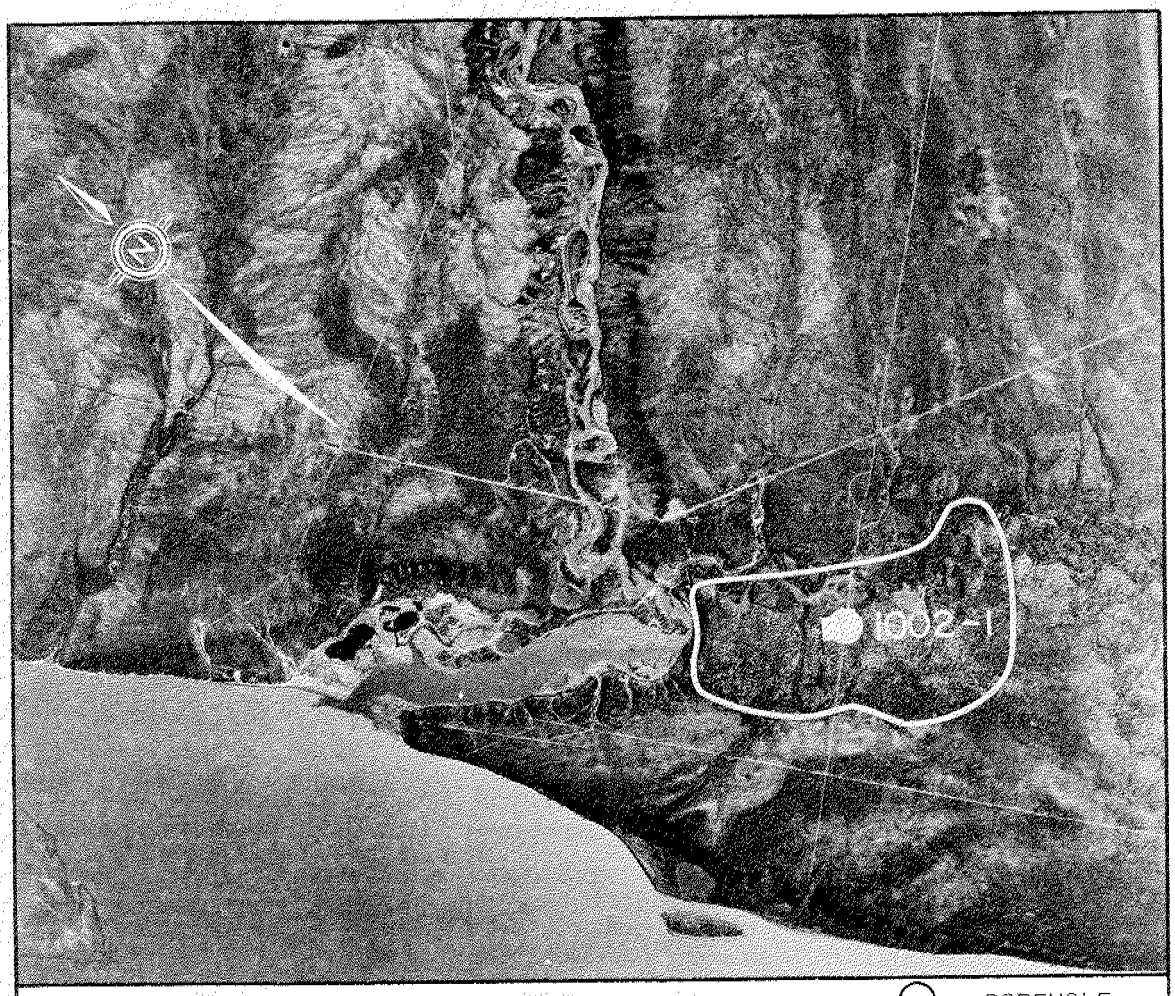
SITE 1002

Location: Site 1002 is located to the south of the point of confluence of the Loon and Mackenzie Rivers, 15.5 miles NNW of Fort Good Hope. Proposed pipeline and highway routes are situated 3.5 and 4.5 miles NE of the site, respectively.

Geology: Site 1002 is an actively eroding, high river terrace. The terrace was formed during an earlier phase of river development when the elevation of the river was higher and flow volume greater.

Material: Sand, trace of silt, poorly graded.

Volume: 8,300,000 cu. yd., estimate is probably quite realistic.

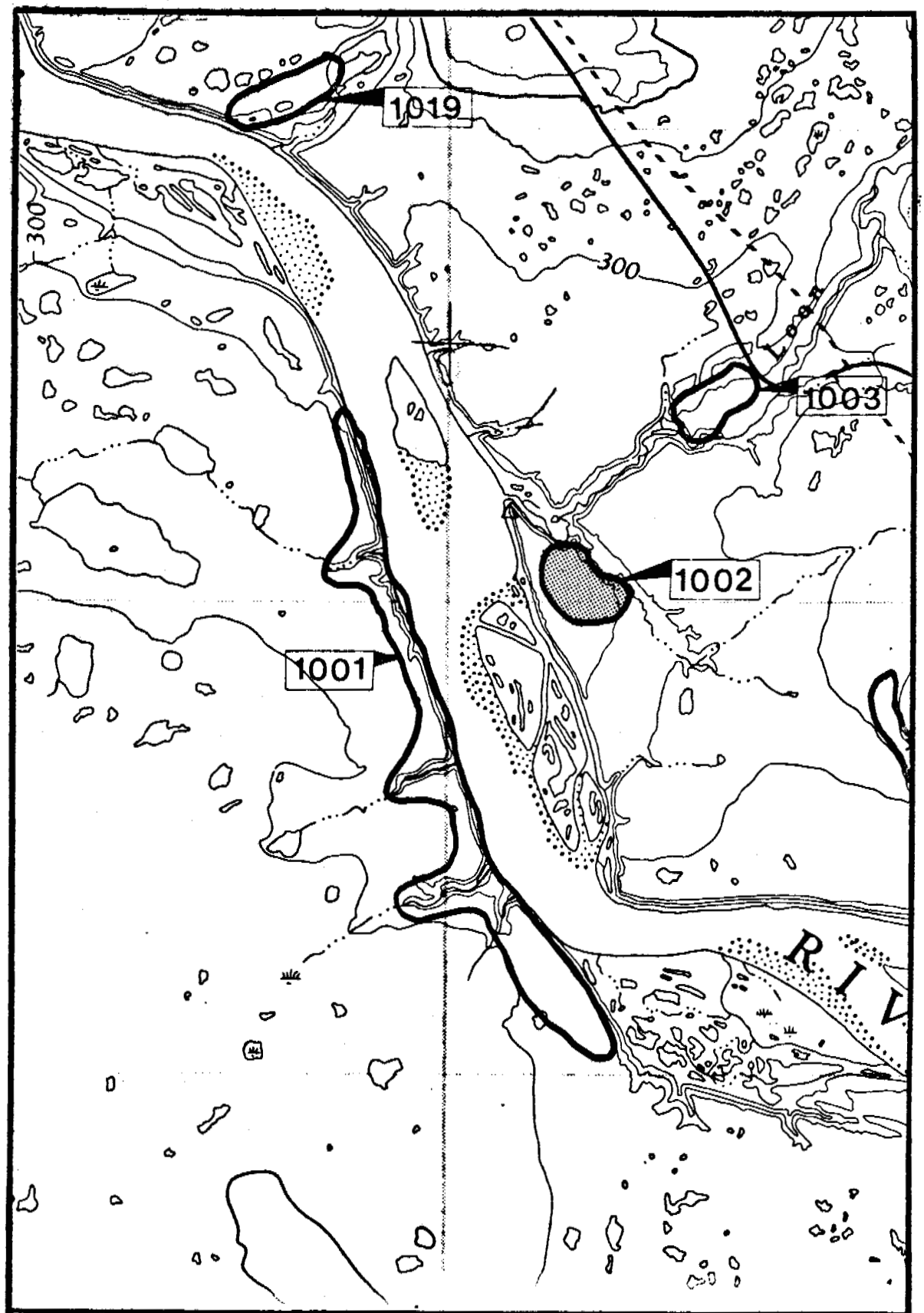


☐ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-45 SCALE: 1" = 3000' (approx.)

Drainage: The site is well drained into the Mackenzie River.

Assessment: The borrow material at site 1002 is unfrozen and of fair quality, suitable for general fill. A large volume is available at a distance of 3.5 and 4.5 air miles from proposed highway and pipeline routes, respectively. Overburden is only a few inches thick and can be incorporated into the borrow or stripped during grubbing. Vegetative cover is sparse and should present few problems to development. The environmental rating indicates a relatively high environmental sensitivity, with the major concerns centered on siltation and bank slumping into the river. A buffer zone should be left undeveloped along the river edge to protect against this possibility, although bank instability problems are not anticipated at this site. Moisture content of the sand is low enough to facilitate pit development either in summer or in winter. However, the long access roads required to reach the site will probably dictate haulage over temporary winter roads. Site development will require a detailed field investigation, however, the general guidelines for development contained in this report are suitable for preliminary assessment purposes.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1002

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 (5) Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 280

SPECIAL CONCERNS: Near confluence of Loon River with Mackenzie. Toxic materials have direct access to Mackenzie. Bank slumps could block fish access to Loon River. Buffer zones may be required to protect riparian habitat.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1002 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
		SAND	NOT FROZEN		
1		-some silt, trace fine gravel, sand medium to coarse grained, dry, light brown.			1
2					2
3					3
4	SM				4
		(4' + 6') 3% GRAVEL 71% SAND 26% SILT & CLAY			
5					5
6		-slightly silter, gravelly, fine to medium sizes, subangular			6
7					7
8	SM				8
		(8' + 10') 15% GRAVEL 66% SAND 19% SILT & CLAY			
9					9
10		-silty, gravelly, sand medium grained			10
11					11
12					12
13		-some silt, trace fine gravel			13
14					14
15					15
16					16
17					17

DATE DRILLED: Oct.1/73 LOGGED BY: EBA 184-1 COMPLETION DEPTH: 26.5'

DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1002 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	SP-SM	SAND -trace to some silt, trace fine gravel, medium grained, dry, light brown	NOT FROZEN		18
19					19
20					20
21					21
22					22
23					23
24					24
25					25
26					26
27		END OF HOLE			27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 1/73 LOGGED BY: EBA 184-1 COMPLETION DEPTH: 26.5

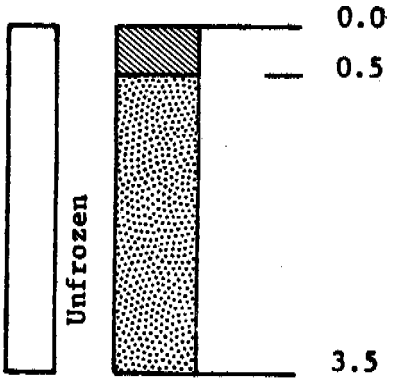
DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1002-1

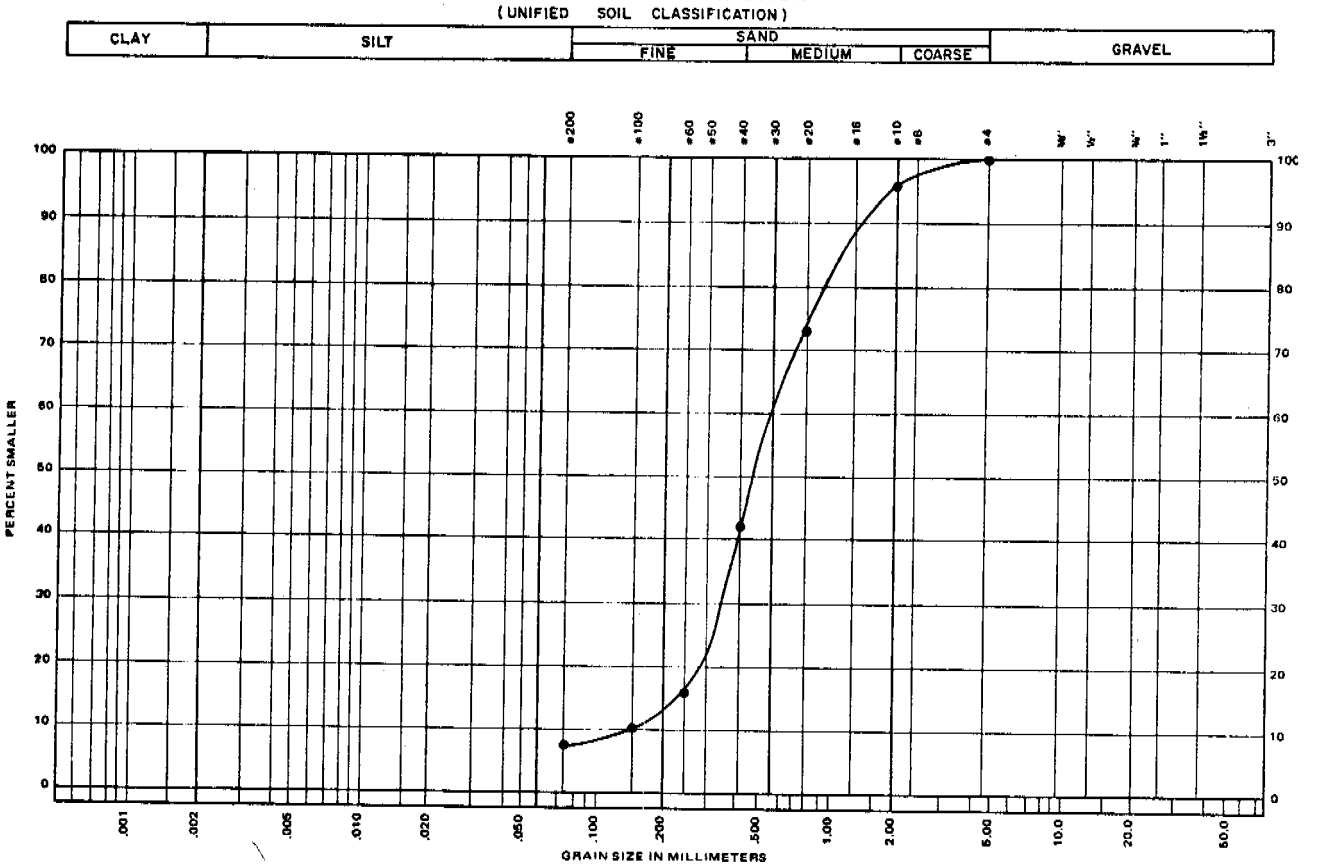


Silt & organic soil.

Sand, medium to coarse, with some fine gravel.

92% SAND
8% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

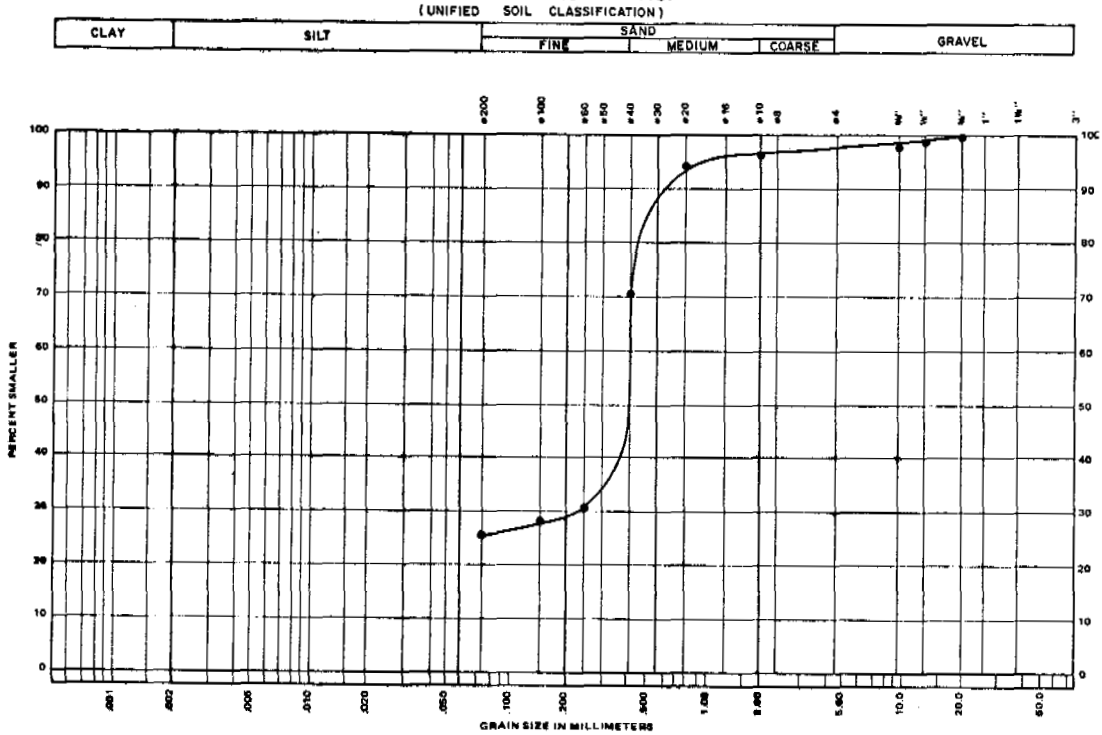


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of Silt (SP-SM) M/C = 3.9%

PROJECT Granular Resources
JOB No. E 666 DATE Dec.16/73
SAMPLE No. TP 1002-1
DEPTH 3.5'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

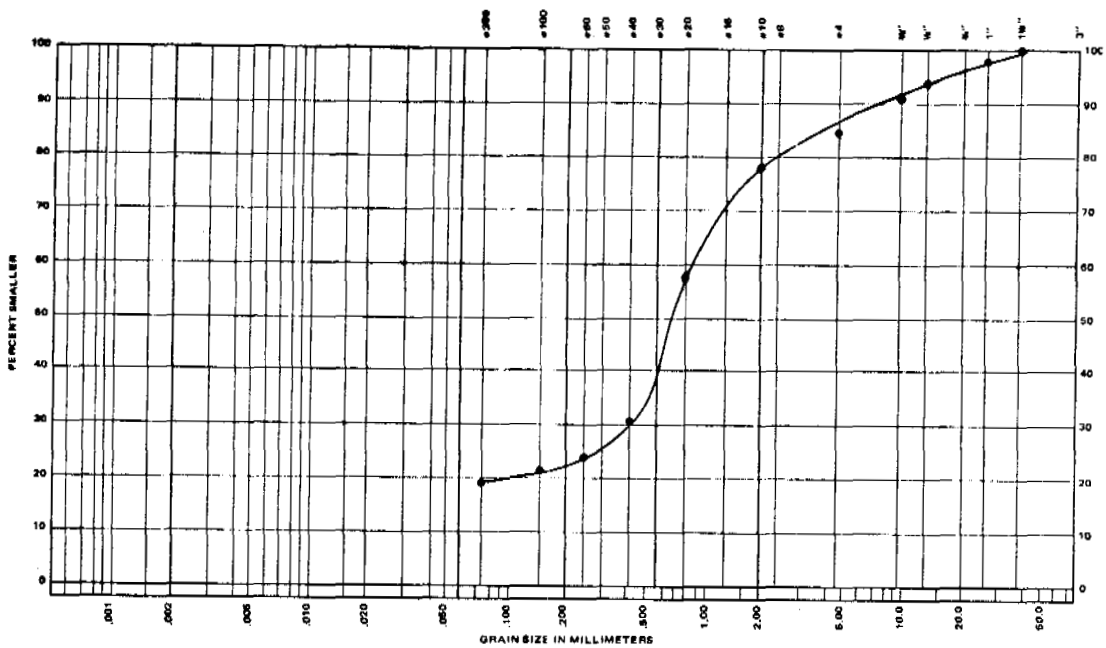


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty sand with a Trace of Gravel (SM) -uniform

PROJECT Granular Resources
JOB No. E666 DATE Jan. 11/74
SAMPLE No. BH 1002-1
DEPTH 4' + 6'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with some Silt and some Gravel (SM) -well graded

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1002-1
DEPTH 8' + 10'

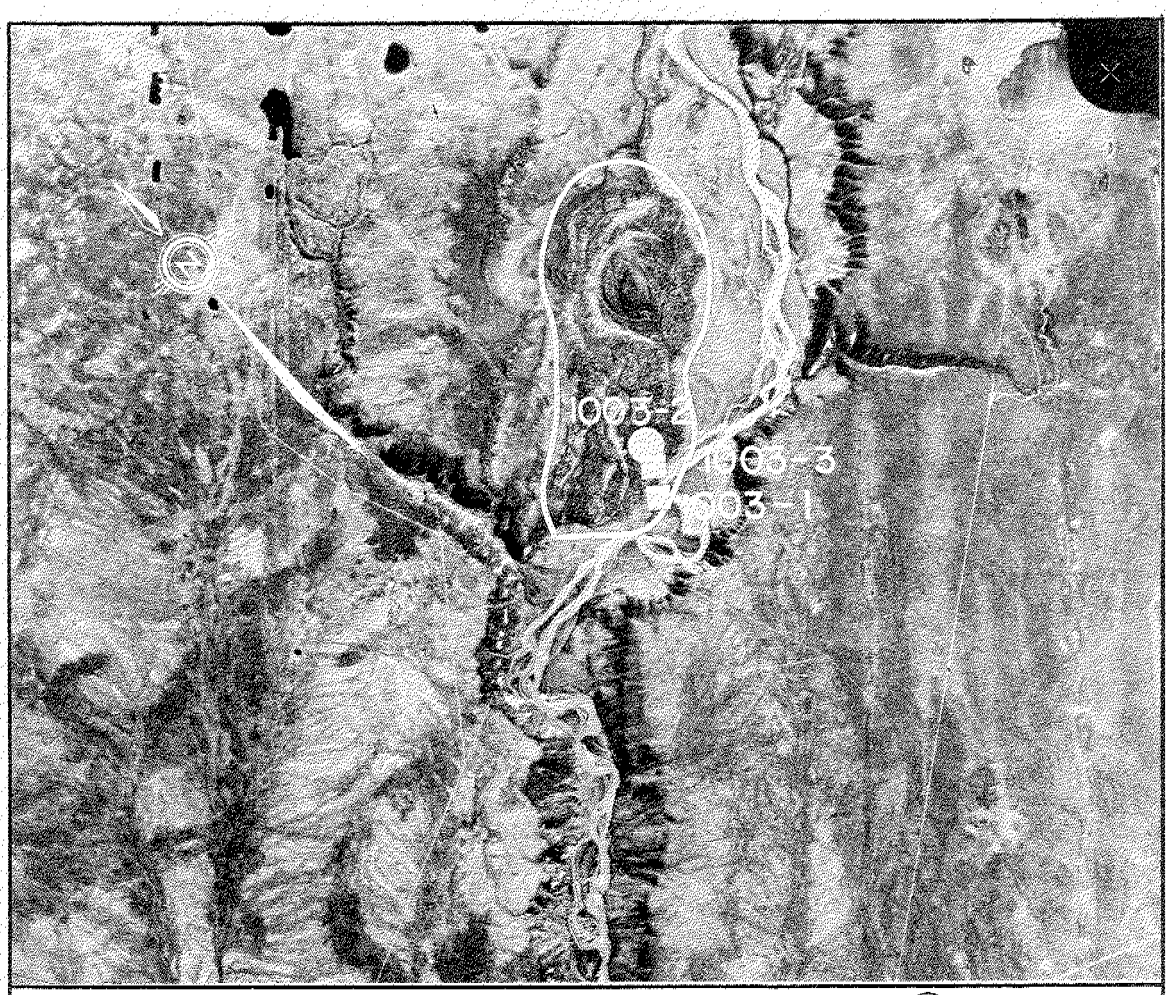
SITE 1003

Location: Site 1003 is located along the Loon River, 3 miles upstream from its point of confluence with the Mackenzie River. Proposed pipeline and highway routes pass one mile west and through the area respectively.

Geology: Site 1003 is an actively eroding high river terrace. The terrace was formed during an earlier phase of river development when the elevation of the river was higher and flow volume greater.

Material: Gravel and sand, trace of silt, well graded.

Volume: 1,900,000 cu. yd., estimate may be conservative.



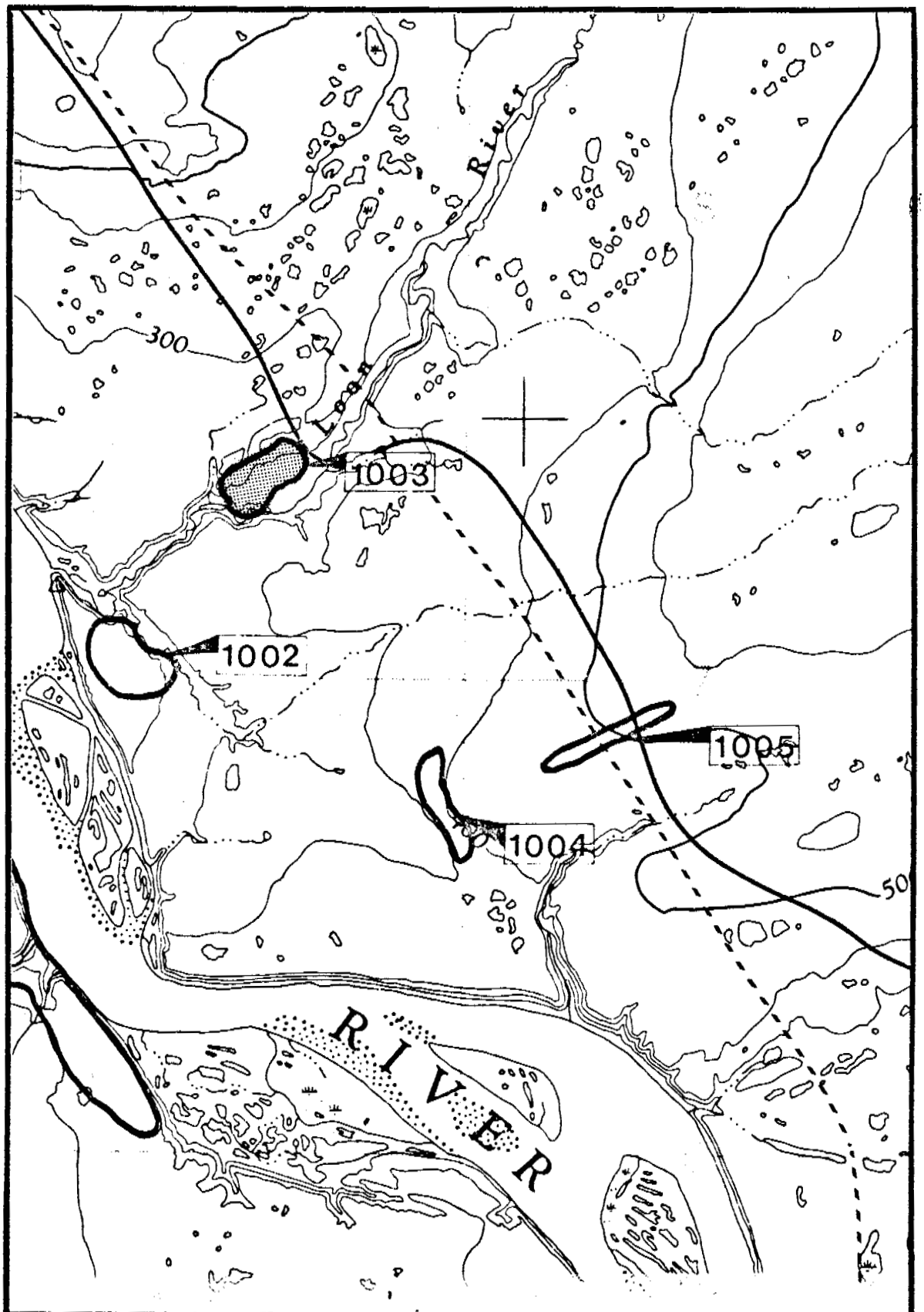
☐ TEST PIT ◯ BOREHOLE

AIRPHOTO No. A22858-45 SCALE: 1" = 3000' (approx.)

Area: 400 acres.

Drainage: Drainage is excellent into the Loon River.

Assessment: Site 1003 has good quality borrow material available which is suitable for embankment fill, base course and surface aggregates, pipeline berms and building pads. Further testing will have to be undertaken to determine the suitability of the material for use in the processing of concrete aggregate. Minimum processing requirements for material with less than 5% fines will be washing and screening to remove fines and cobbles respectively. If fines content is from 5 - 15% the processing will require screening off the fraction above the 1/4 inch seive, washing it and the crushing part of it to obtain a sand fraction. The processing can be carried out either at the pit or the material can be stockpiled and processed at some point along the route. Good quality water is available from the Loon River, however, the water must be stored in a settling pond before being discharged back into the river. Preliminary assessment of the borrow as a concrete aggregate is encouraging. Access to the site will be provided by the highway which crosses the north end of the site. The volume present may be larger than indicated because the borehole did not penetrate through the gravel layer; therefore reliable volume estimates cannot be obtained without further drilling. Overburden consists of approximately 1.5 feet of peat plus 2.5 feet of silt which will have to be stripped and stockpiled for use in restoration. Vegetation consisting of spruce to 30 feet and underbrush covers the site. The borrow was frozen below a depth of 1.5 feet. Buffer zones along the Loon River to minimize siltation and slumping into the river, care to avoid toxic spills and a high quality restoration program are recommended in order to minimize environmental damage. Both summer and winter operation can be undertaken. A more detailed drilling program should be carried out to prove reserves and quality of the material. If the exploration program justifies development, development within the general borrow pit guidelines and environmental recommendations contained in this report is recommended.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1003

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 4 (5) Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 (4) 5 Rating: 40	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 320

SPECIAL CONCERNS: Site on south shore of Loon River, access corridor to Rorey Lake. Bank stability important to fish, and mammal use levels. Buffer zones are recommended.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1003 HOLE NO. 2 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	PT	PEAT -fibrous, organic silty, dark brown.	NOT FROZEN		1
2	ML	SILT grey,moist to wet	FROZEN		2
3					3
4					4
5	GW	GRAVEL sandy, coarse, well graded, light brown			5
6					6
7					7
8		END OF HOLE			8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Oct.1/73 LOGGED BY: EBA 182-2 COMPLETION DEPTH: 7.0'

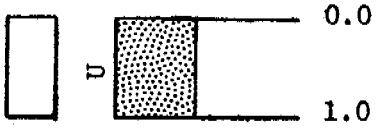
DRILLING METHOD: AUGER THAW DEPTH: 1.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

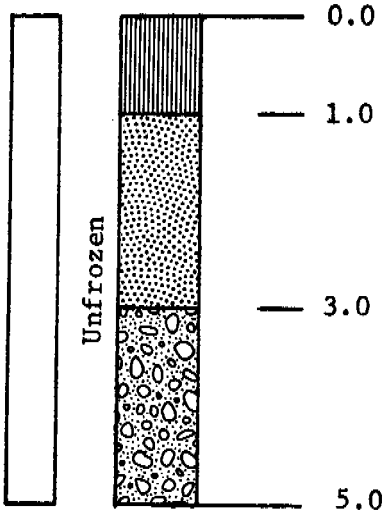
TP 1003-1



Cobbles & coarse sand

56% GRAVEL
37% SAND
7% SILT & CLAY

TP 1003-2



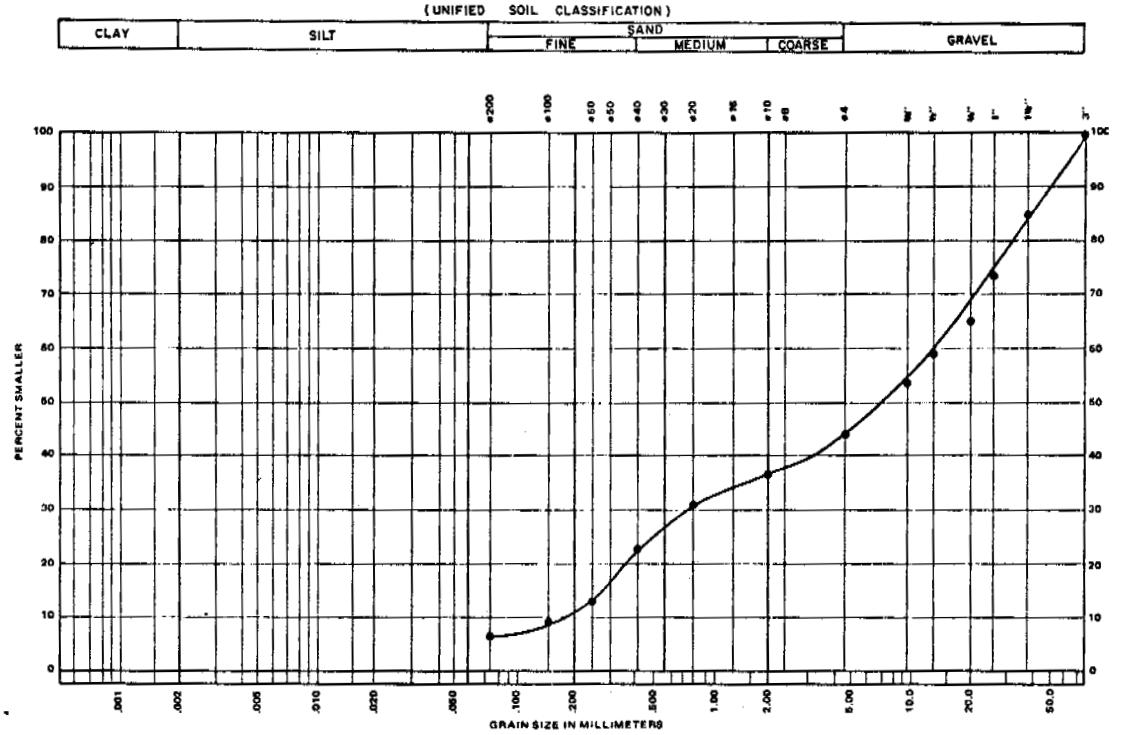
Surface organics and silt

Sand, silty fine

Gravel, sandy

63% GRAVEL
37% SAND

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

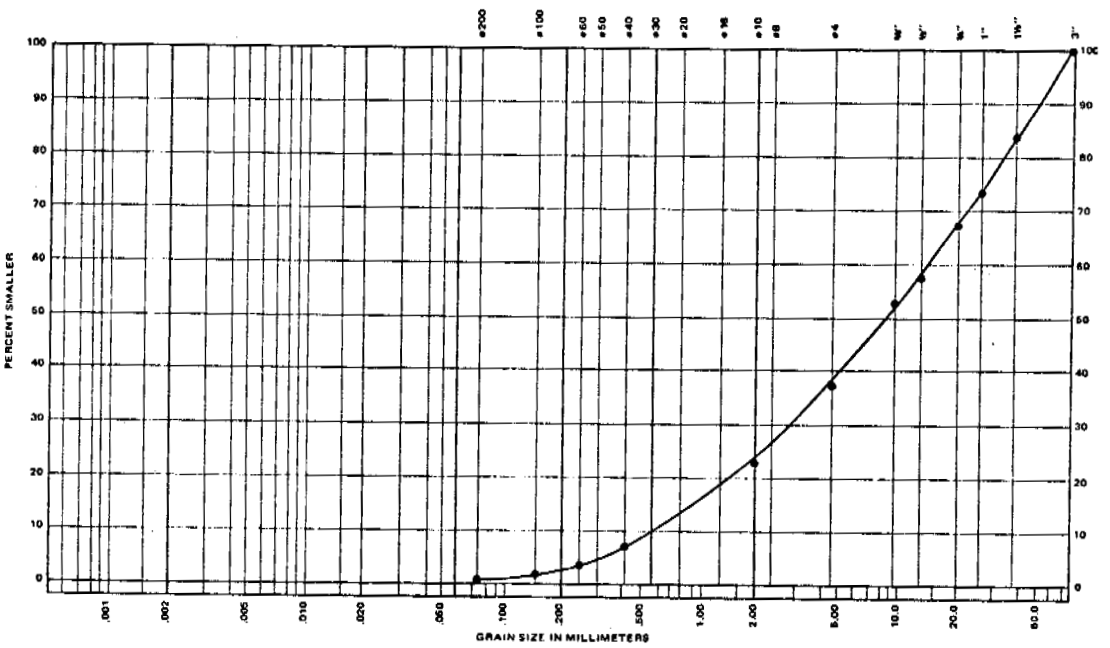


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with a Trace of Silt (GP-GW) M/C = 5.7%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1003-1
DEPTH 1'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

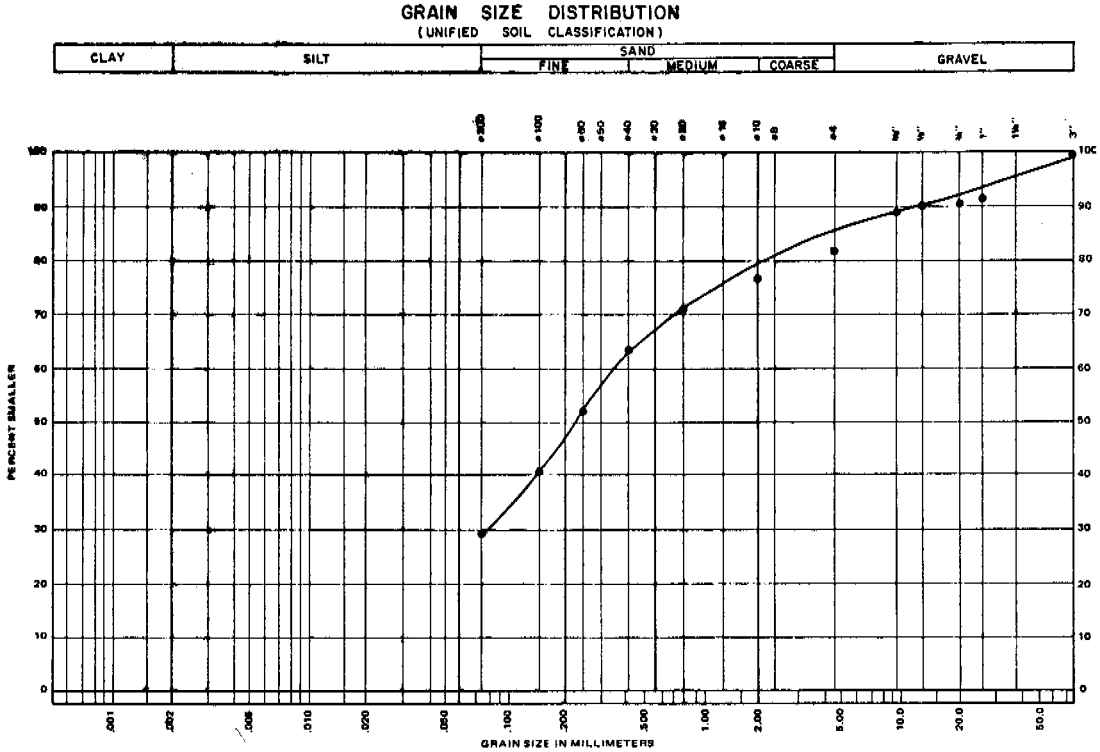


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with a Trace of Silt (GP) M/C = 2%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1003-2
DEPTH 3' - 5'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand and some Gravel (SM) M/C = 7.3%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1003-3
DEPTH Surface sample.

PETROGRAPHIC ANALYSIS

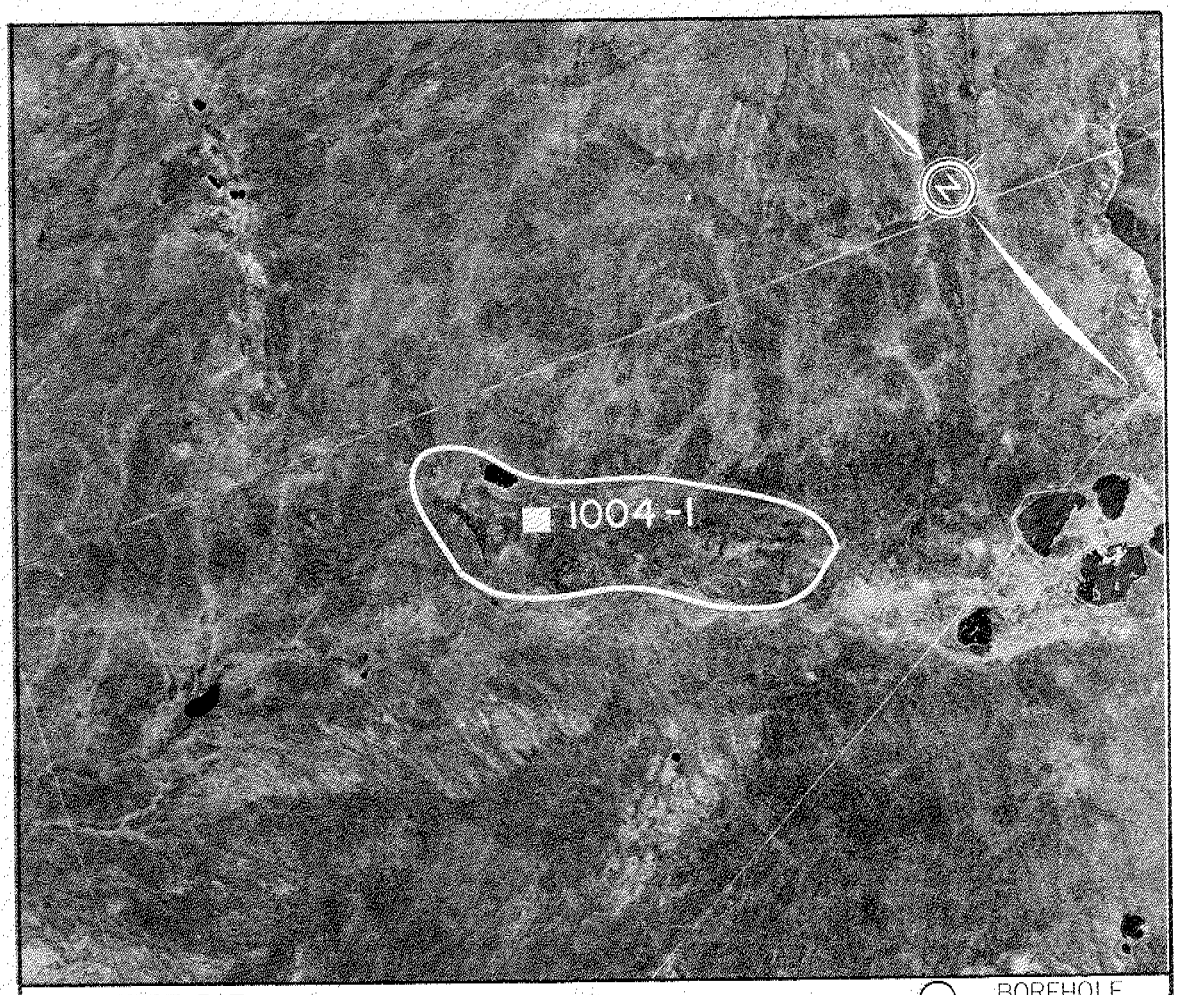
Limestone	12%
Dolomite	6%
Sandstone	58%
Chert	1%
Quartzite	2%
Ironstone	3%
Granite	10%
Basalt	10%

SITE 1004a

Location: Site 1004 is located six miles south-east of the point of confluence of the Mackenzie and Loon Rivers. Proposed highway and pipeline routes are three miles east of the site.

Geology: The material at this site is contained in a complex os small, low kames. It is expected that the material will be somewhat variable.

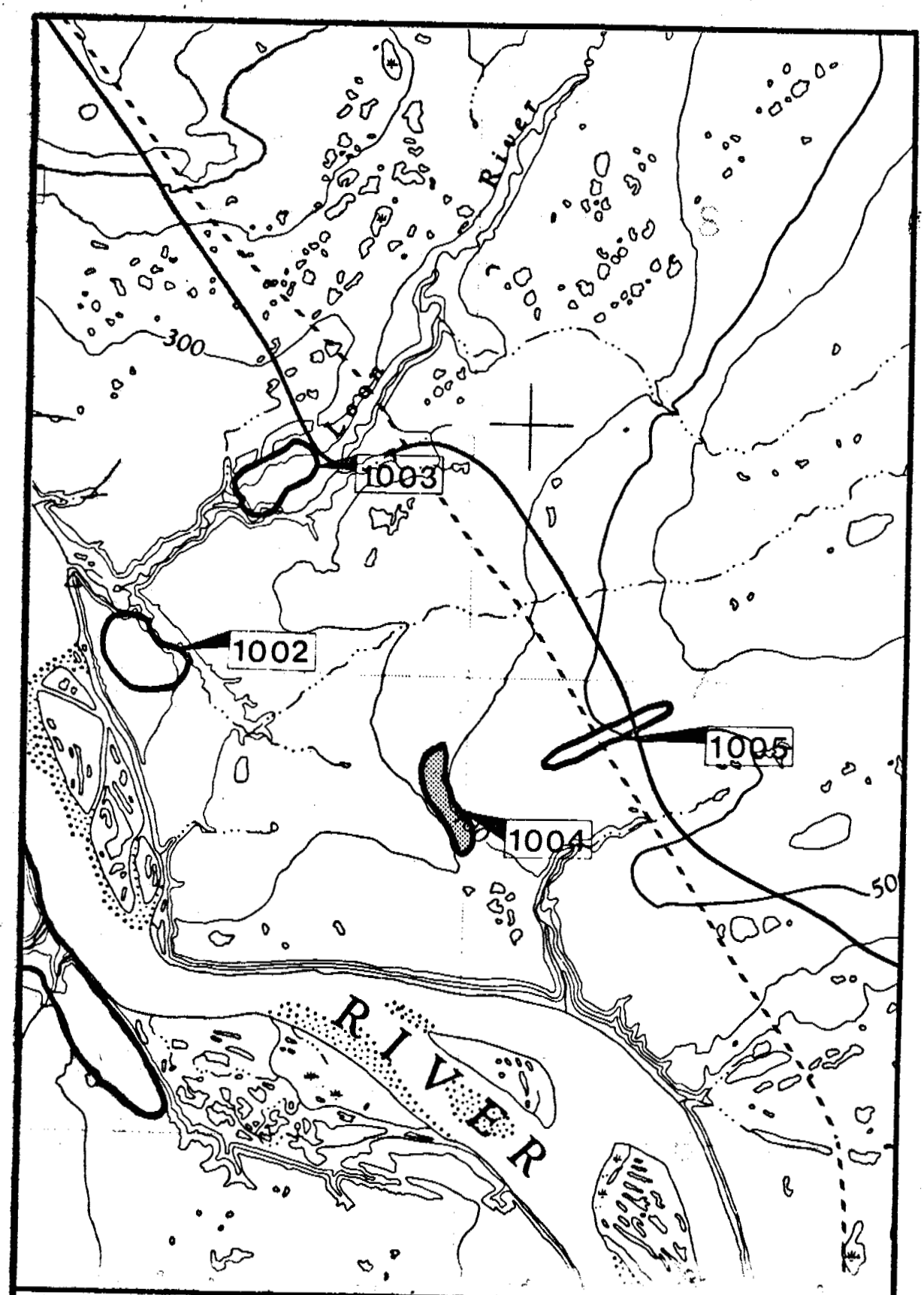
Assessment: The material at site 1004 is of poor quality, generally poorly suited for construction purposes. Moreover the highly variable nature of such ice



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-48 SCALE: 1" = 3000' (approx.)

contact stratified drift together with anticipated high ice content at depth tend to make these deposits difficult to exploit.



SITE LIMITS

PROPOSED GAS PIPELINE

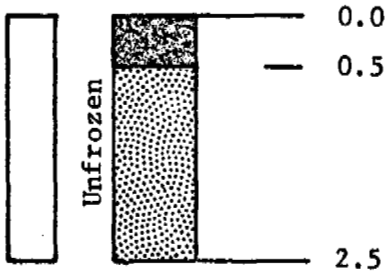
PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

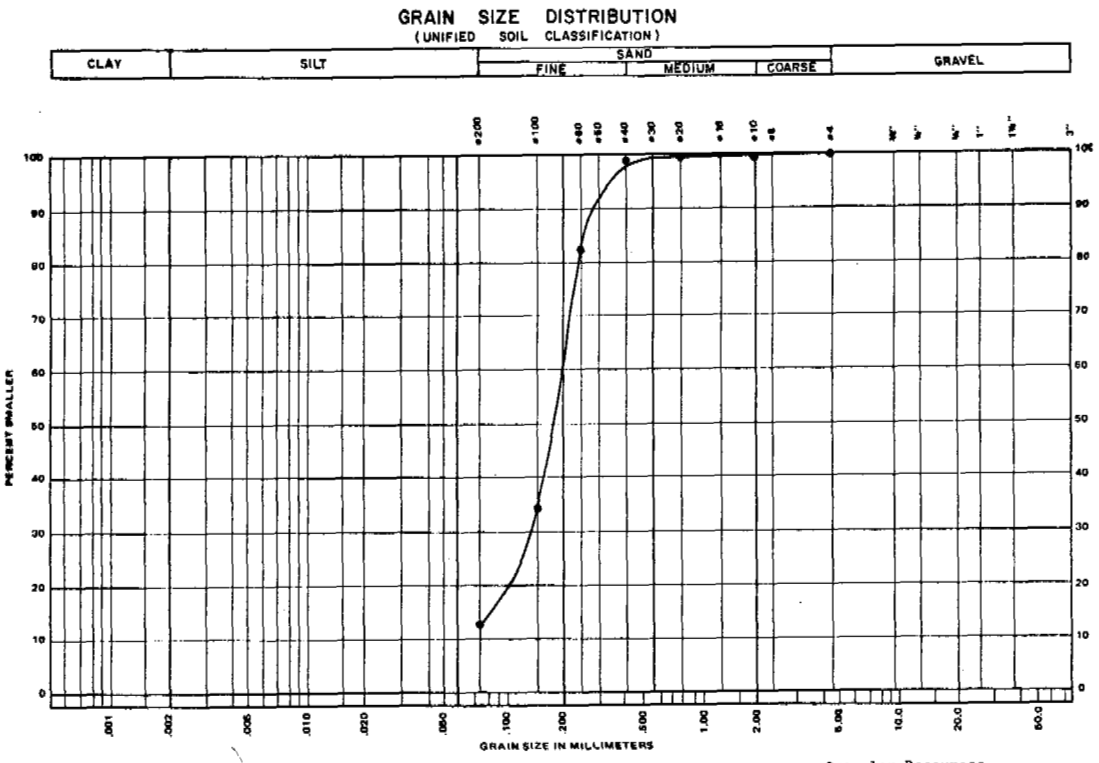
TEST PIT LOG

TP 1004-1



Surface organics

Sand, medium to fine, clean, dry



EBA Engineering Consultants Ltd.

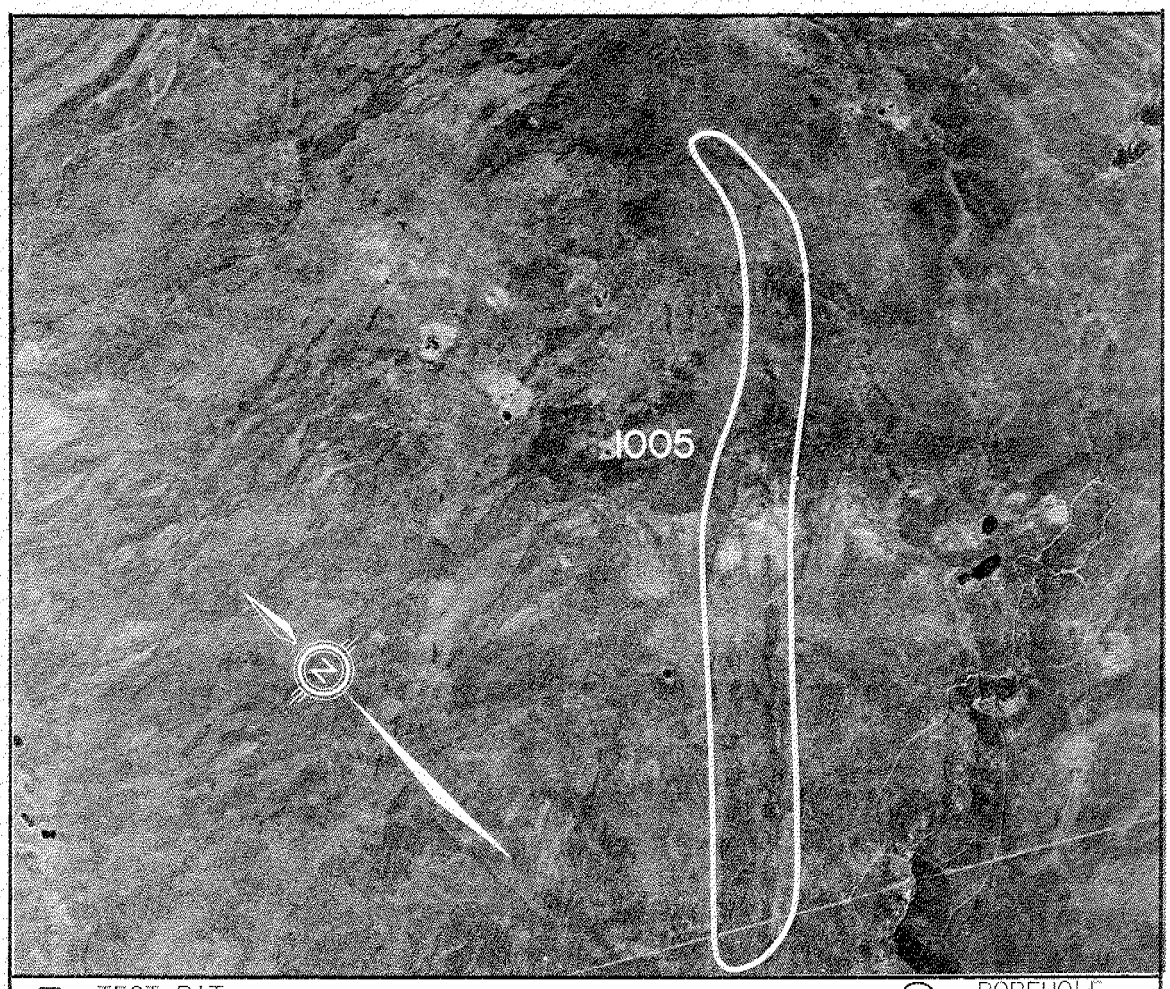
SAMPLE DESCRIPTION Sand, some Silt (SP-SM) M/C = 3.8%

PROJECT Granular Resources
JOB No. E666 DATE Feb. 19/74
SAMPLE No. TP 1004-1
DEPTH

SITE 1005a

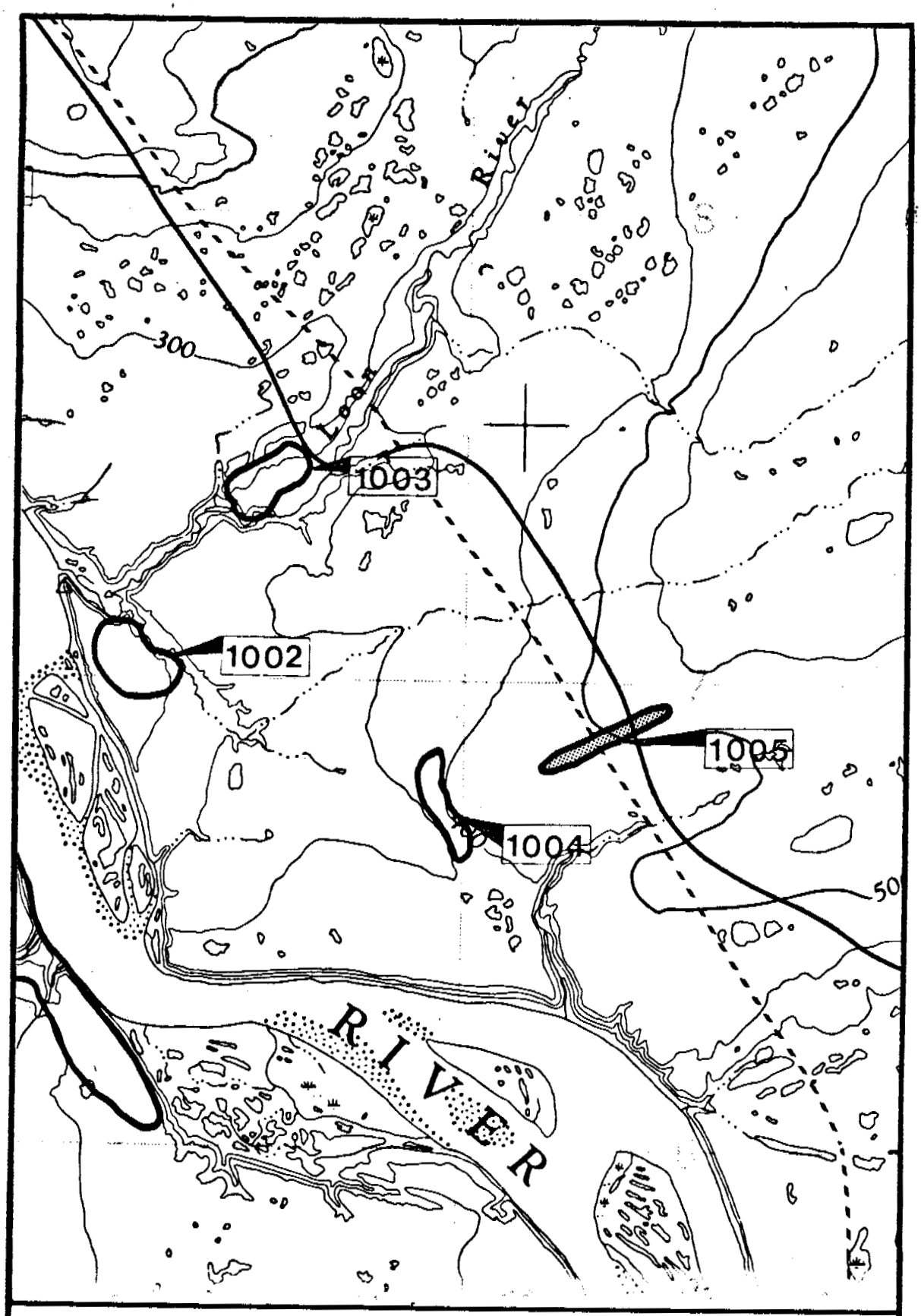
Location: Site 1005 is situated 12.5 miles north of Fort Good Hope. Proposed pipeline and highway routes cross the site.

Material and Assessment: Site 1005 was located by aerial photographic interpretation but was not investigated in field. The feature is a long, straight, narrow ridge which may be a till fluting, however, geological origin is uncertain. The material at the site is expected to be of poor quality, however, field investigation will be necessary to prove quality and determine quantities.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22890-57 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

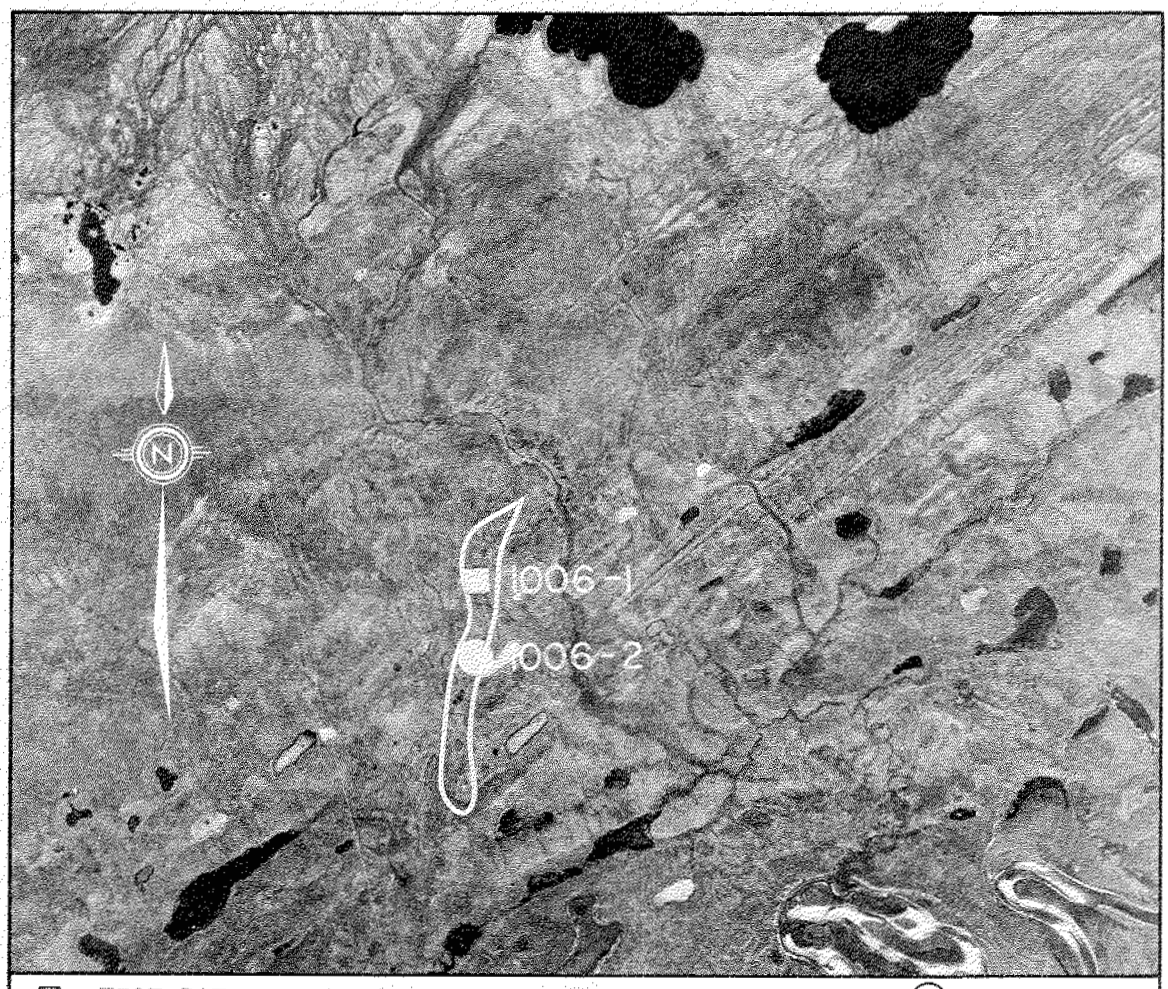
SCALE: 1:125,000

SITE 1006a

Location: Site 1006 is 8 miles north-east of the point of confluence of the Mackenzie and Hare Indian Rivers. Proposed highway and pipeline routes are 3 and 4 miles west of the site respectively.

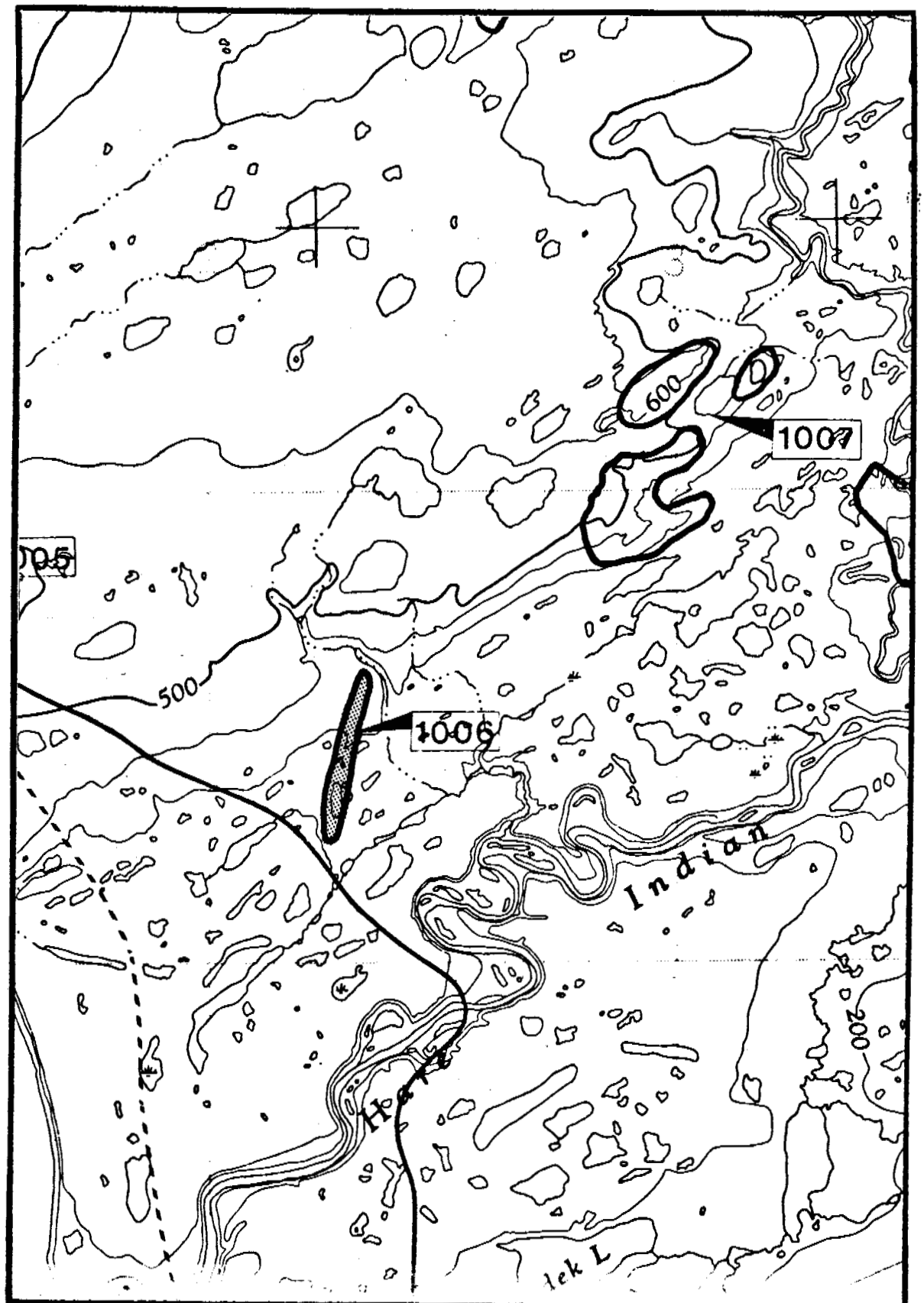
Geology: The material at site 1006 is contained in a small esker.

Assessment: The material at site 1006 is of poor quality and is unsuitable as construction material. The site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-157 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-1

SCALE: 1:125,000

SITE 1006

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities, Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 255

SPECIAL CONCERNS: Surrounded by lake-marsh complex. Mammal denning requirements should be considered in any development plan.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1006 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1		SAND -trace of sand, few fine gravel sizes, dry, medium brown	NOT FROZEN		1
2					2
3					3
4					4
5					5
6					6
7					7
8	SW SM	0% GRAVEL 85% SAND (4' + 10') 15% SILT & CLAY			8
9					9
10					10
11					11
12					12
13		-some fine sand, damp			13
14			Nbn		14
15					15
16					16
17					17

DATE DRILLED: Oct. 2/73 LOGGED BY: EBA 303-2 COMPLETION DEPTH: 25.0'

DRILLING METHOD: AUGER THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1006 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SAND -silty, damp, medium brown			18
19					19
20	SW SM	SAND -silty, sand fine, damp, light to medium brown			20
21					21
22					22
23					23
24					24
25					25
26		END OF HOLE			26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 2/73 LOGGED BY: EBA 303-2 COMPLETION DEPTH: 25.0'

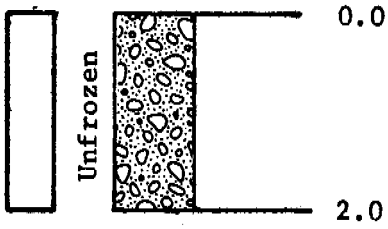
DRILLING METHOD: AUGER THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

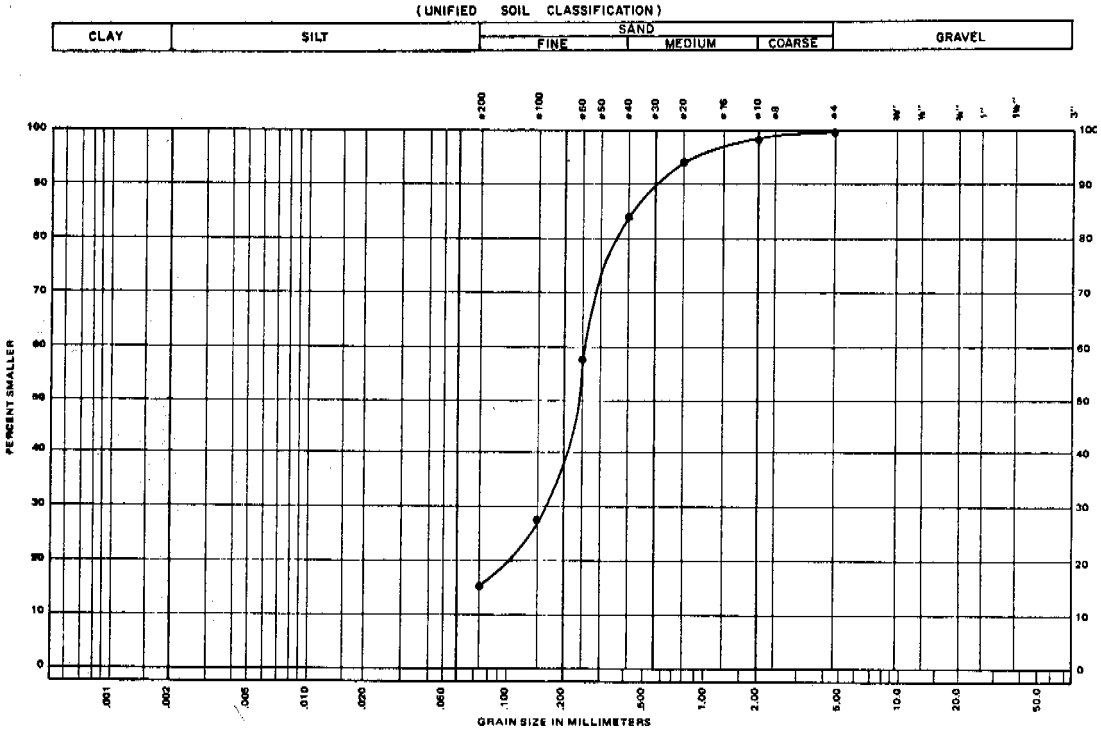
TEST PIT LOG

TP 1006-1



Coarse sand & gravel

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand, some Silt (SW-SM)

PROJECT Granular Resources
JOB No. E666 DATE Feb. 19/74
SAMPLE No. BH 1006-2
DEPTH 4' - 10'

SITE 1007a

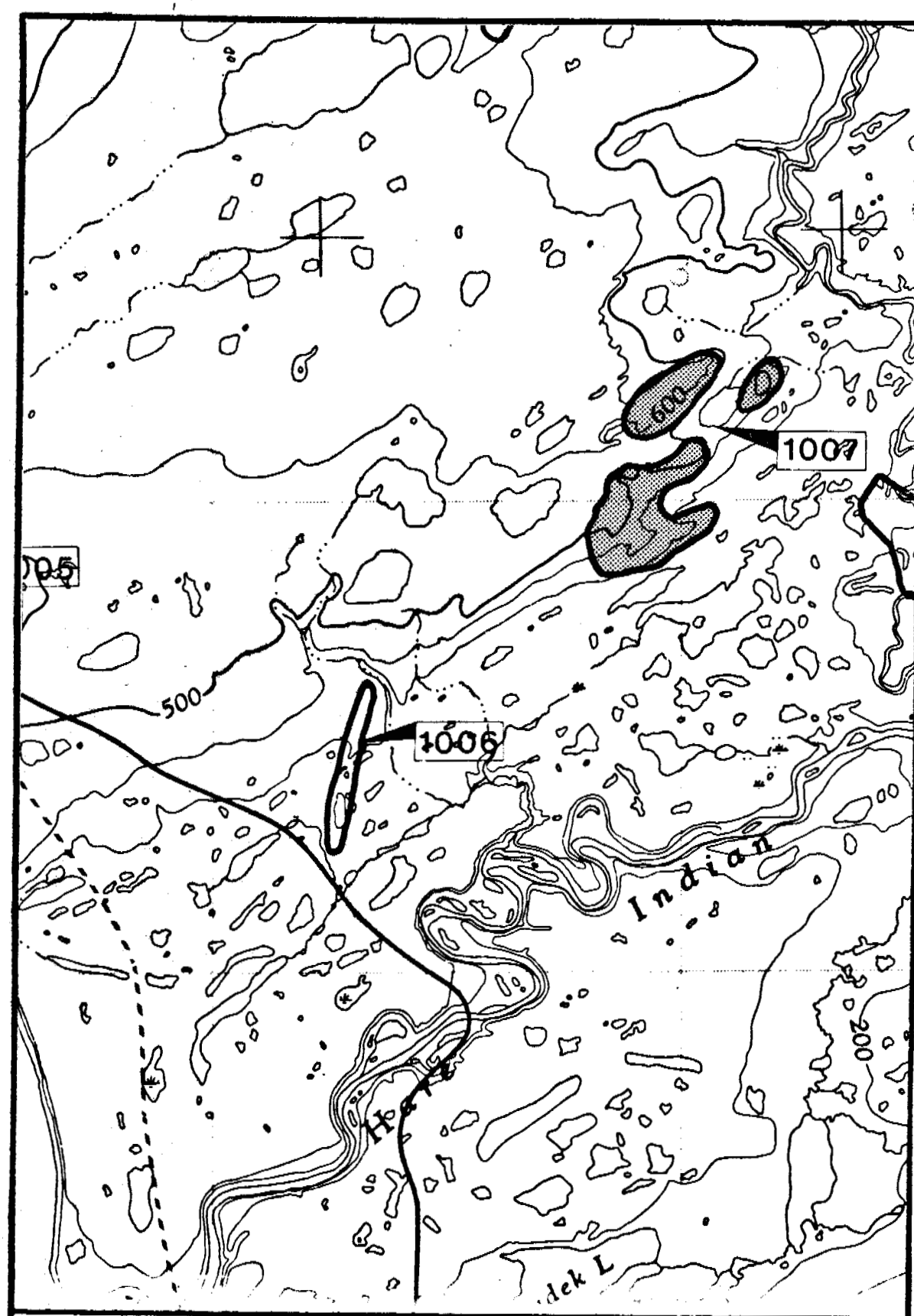
Location: Site 1007 is 13 miles north-east of the confluence of the Mackenzie and Hare Indian Rivers. Proposed pipeline and highway routes are 8 and 7 miles SWW of the site respectively.

Material: Limestone.

Assessment: Site 1007 is a flat outcropping scarp of limestone suitable as fair to good quality borrow. Haulage distance to proposed routes is 7-8 miles and is too long to warrant development. The site has a relatively low environmental sensitivity. Site 1007 is not recommended for development because of the long haulage distance.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-158 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1007

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 215

SPECIAL CONCERNS: Upland area near woodland caribou wintering area. Siltation and habitat alteration should be regulated.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

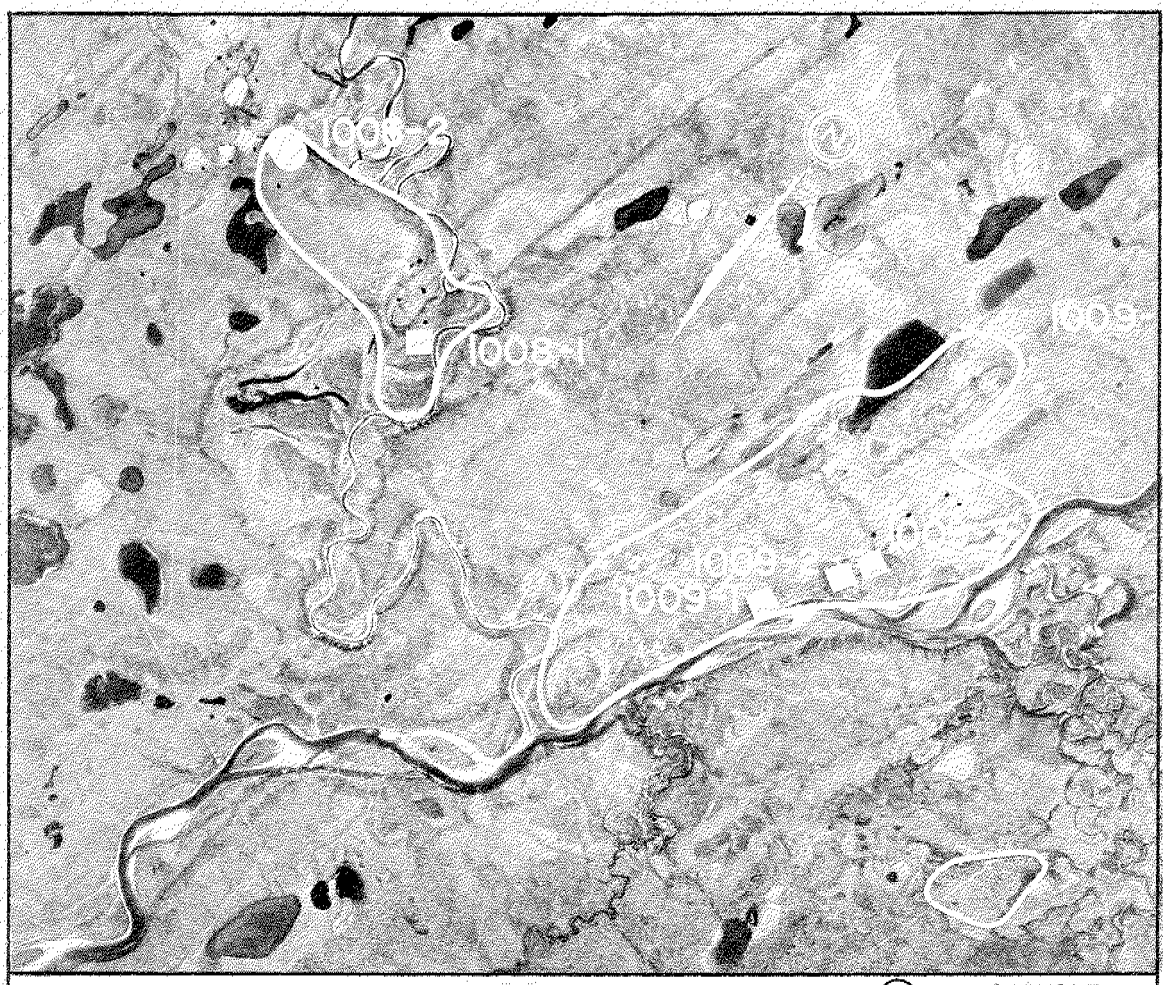
SITE 1008a

Location: Site 1008 is situated 19.5 miles NNE of Fort Good Hope and 5 miles north of the Hare Indian River on the west bank of the Bluefish River. Proposed highway and pipeline routes are located 12 miles SWW of the site.

Geology: Site 1008 is composed a few small isolated kames. Material is probably variable from kame to kame.

Material: Silty sand, some gravel, fairly well graded.

Volume: 800,000 cu. yd.

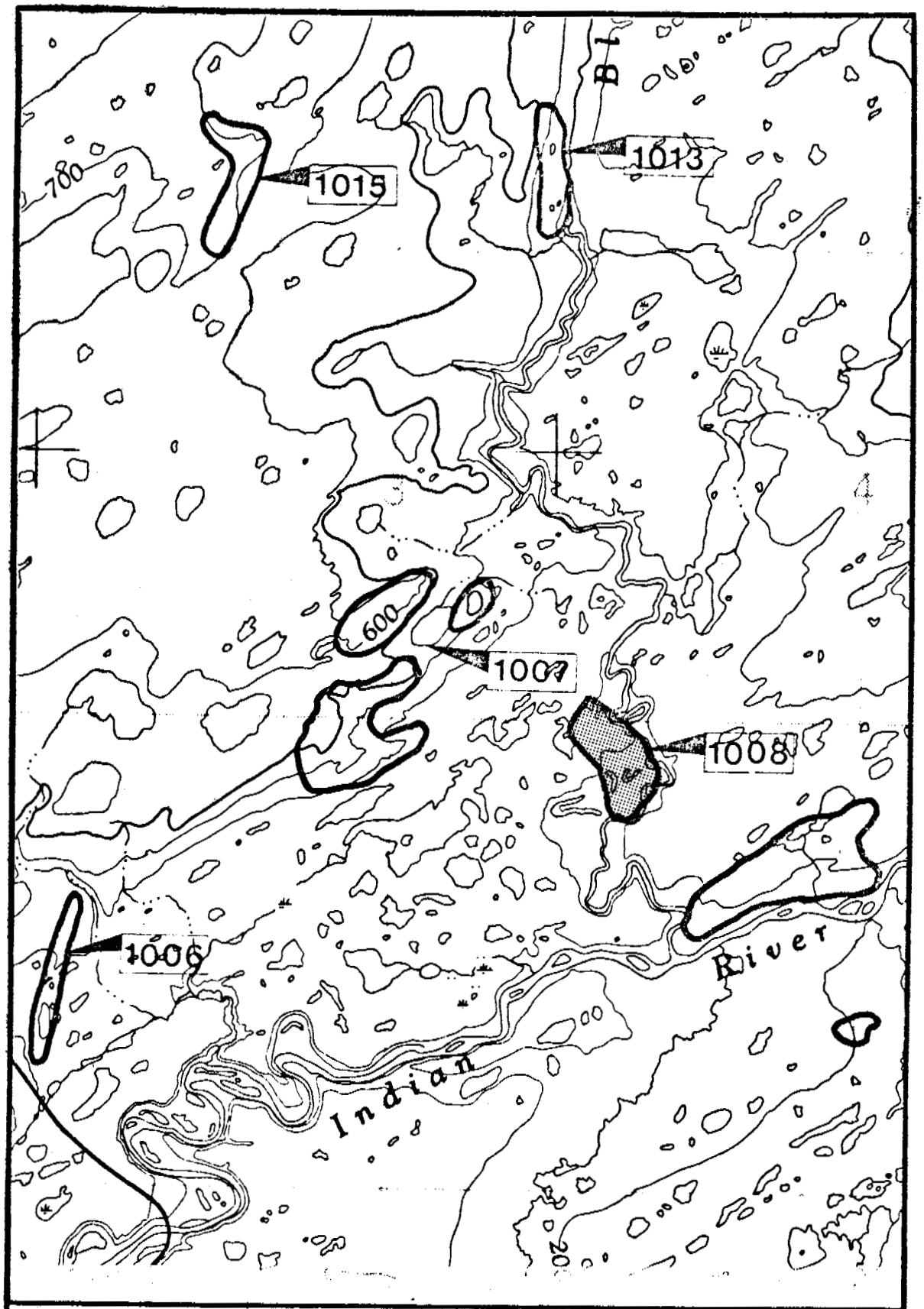


☐ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-159 SCALE: 1" = 5500' (approx.)

Area: 65 acres.

Assessment: Site 1008 is not recommended for development. The borrow material is of poor quality, volume is limited and the distance from proposed pipeline and highway routes is too great. Furthermore the site has been evaluated to be quite environmentally sensitive.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1008

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 (4) 5 Rating: 60	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 345

SPECIAL CONCERNS: Adjacent to west bank of Bluefish river. Marten, caribou and fishery values important. Frequent native use from Fort Good Hope. Stream bank buffers and siltation controls are recommended.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1008 HOLE NO. 2 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	SM	SAND -trace fine gravel, trace clay, dry, dark brown -clayier with depth -glacial till 5.9% O.C. (2' + 4') 19% GRAVEL 61% SAND 20% SILT & CLAY	NOT FROZEN		1
2					2
3					3
4					4
5					5
6					6
7					7
8	CL	CLAY -silty, trace gravel, moist, medium plastic, dark brown	Nbn		8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16		END OF HOLE			16
17					17

DATE DRILLED: Oct.2/73 LOGGED BY: EBA 186-2 COMPLETION DEPTH: 15.0'

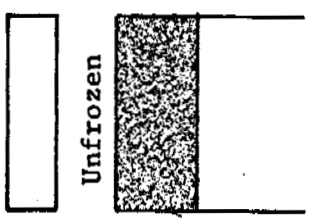
DRILLING METHOD: AUGER THAW DEPTH: 8.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1008-1

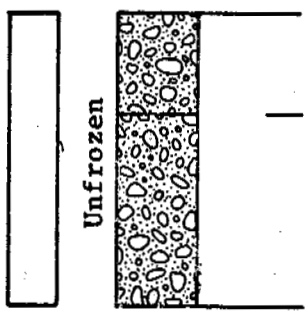


0.0

Peat, black, fibrous

2.0 Permafrost at 2',Grey Clay Till.

TP 1008-2



0.0

Gravel, reddish-brown, silty

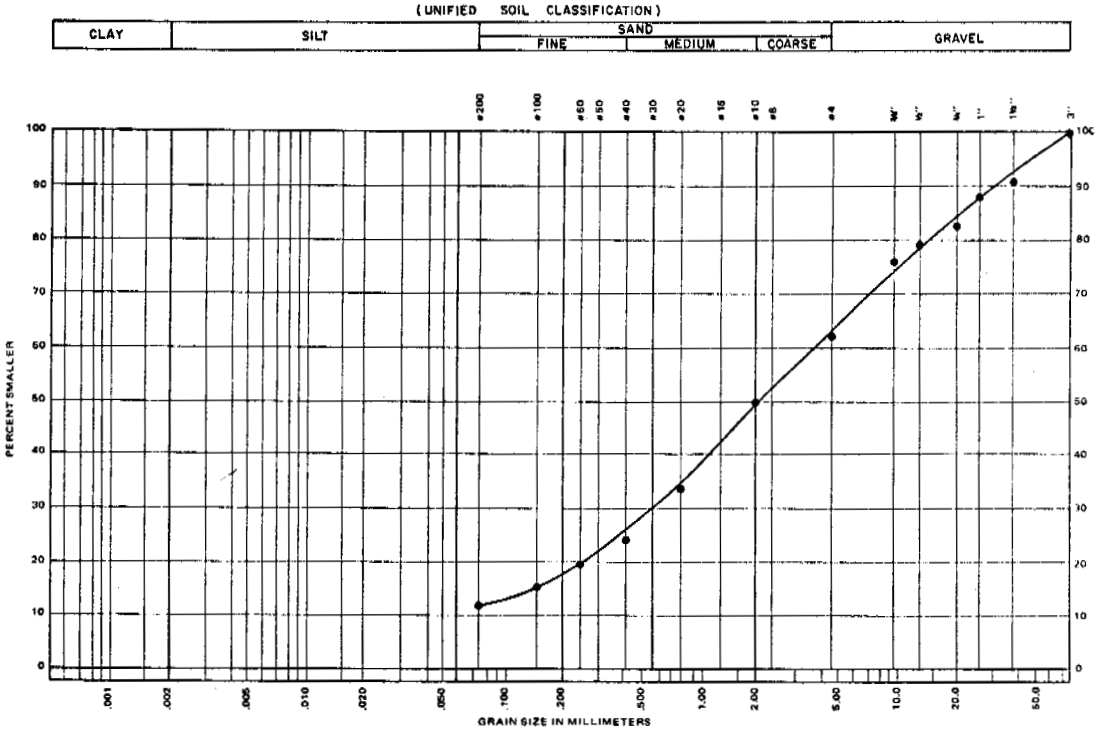
1.0

Gravel medium brown, silty, some cobbles, sandy.

38% GRAVEL
50% SAND
12% SILT & CLAY

3.0

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

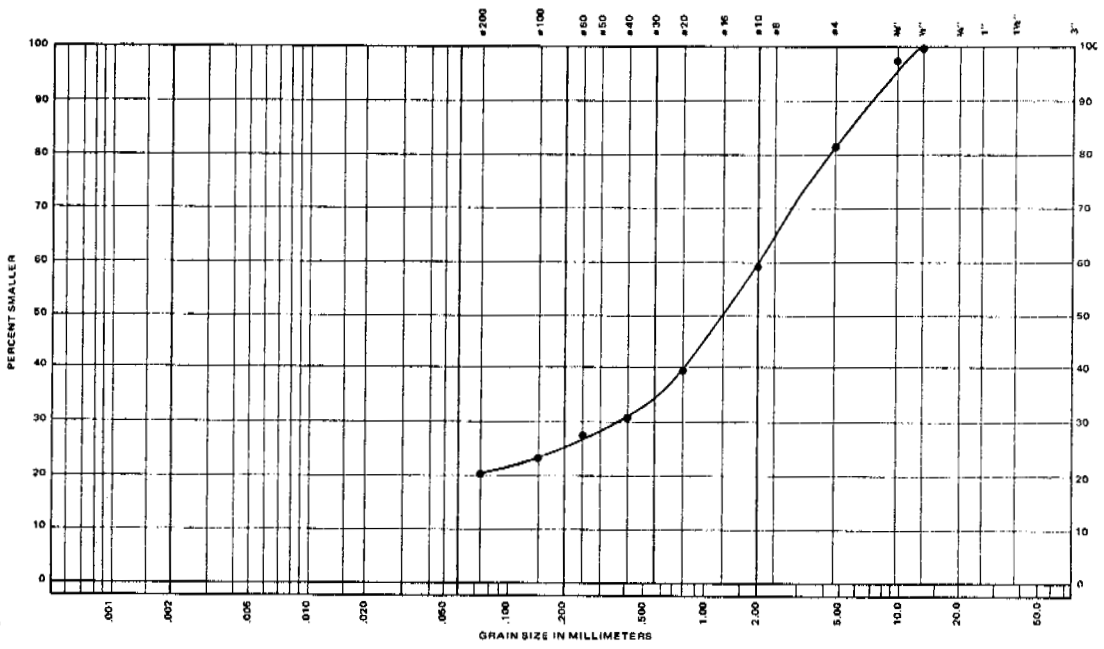


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and some Silt. (GP-GM) M/C = 7.3%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1008-2
DEPTH 1' - 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand and some Gravel (SM)

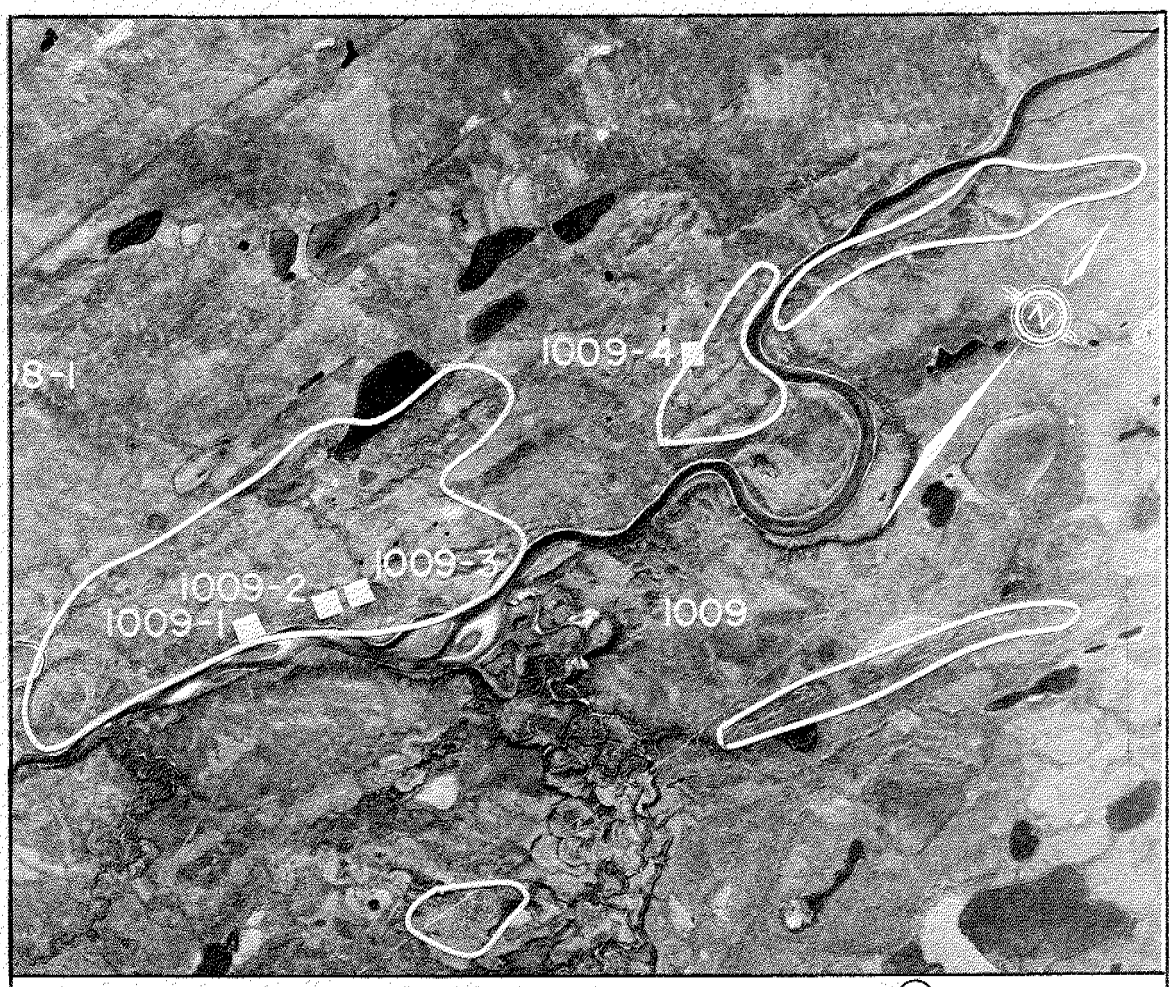
PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1008-2
DEPTH 2' + 4'

SITE 1009a

Location: Site 1009 is situated 20 miles north-east of Fort Good Hope along the Hare Indian River near its point of confluence with the Bluefish River. Proposed pipeline and highway routes are located 16 miles to the west of the site.

Geology: The material at site 1009 is contained in an eroding river terrace and in a few sand dunes.

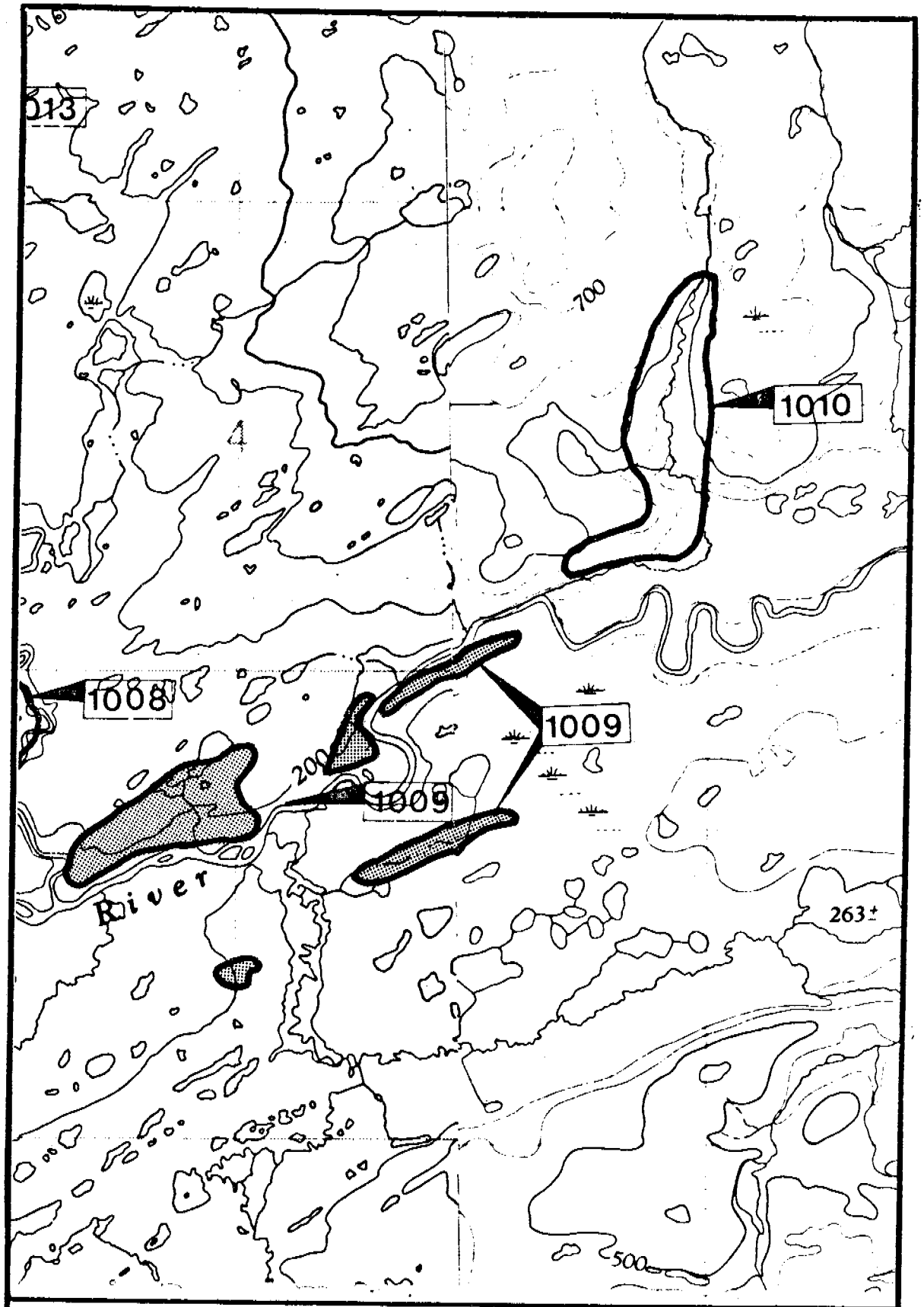
Material: Silt and fine sand.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-159 SCALE: 1" = 5500' (approx.)

Assessment: The material at site 1009 is of poor quality for construction purposes and is located a great distance from proposed highway and pipeline routes. The site is very sensitive to environmental disturbance. Site 1009 is not recommended for development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

LAC BELOT 96-L

SCALE: 1:125,000

SITE 1009

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 5 Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 5 Rating: 30	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 4 5 Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 5 Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 4 5 Rating: 40	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

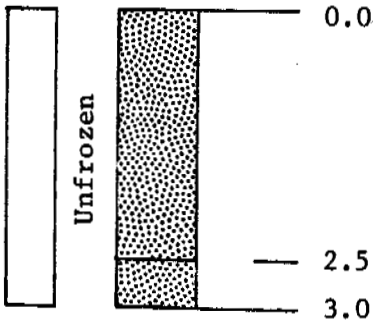
TOTAL INDEX: 370

SPECIAL CONCERNS: Northshore of Hare Indian River near confluence with Bluefish. Major grayling, whitefish and burbot spawning river with significant domestic use. Buffer zones, siltation controls and bank stabilization measures are recommended.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

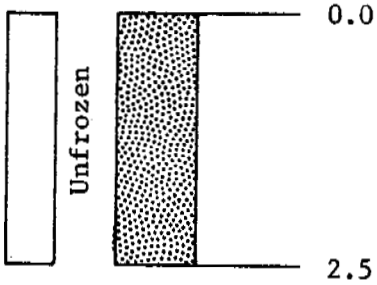
TP 1009-1



Sand, rusty brown, fine to medium, clean — 40% SAND, 60% SILT & CLAY

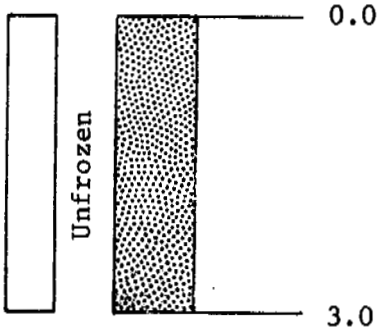
Sand, silty, fine to medium, light brown

TP 1009-2



Sand, clean, medium fine

TP 1009-3



Sand

SITE 1010a

Location: Site 1010 is situated from 1 to 3.5 miles north of the Hare Indian River and 25 miles east of the point of confluence of the Hare Indian and Mackenzie Rivers. Proposed highway and pipeline routes are 21 miles to the west of the site.

Material: Limestone.

Assessment: Overburden consisting of a few feet of clay and silt overlies limestone, suitable for use as fair quality general fill, at site 1010. The site has a high environmental sensitivity and is located a great distance from proposed highway and pipeline routes. Site 1010 is not recommended for development.

SITE 1010

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 (4) 5 Rating: 60	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish — Smelt Grayling — Sculpin Pike — Goldeye Trout-Perch — Chub Lake Trout — Dace Burbot — Walleye Suckers — Char Stickleback — Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

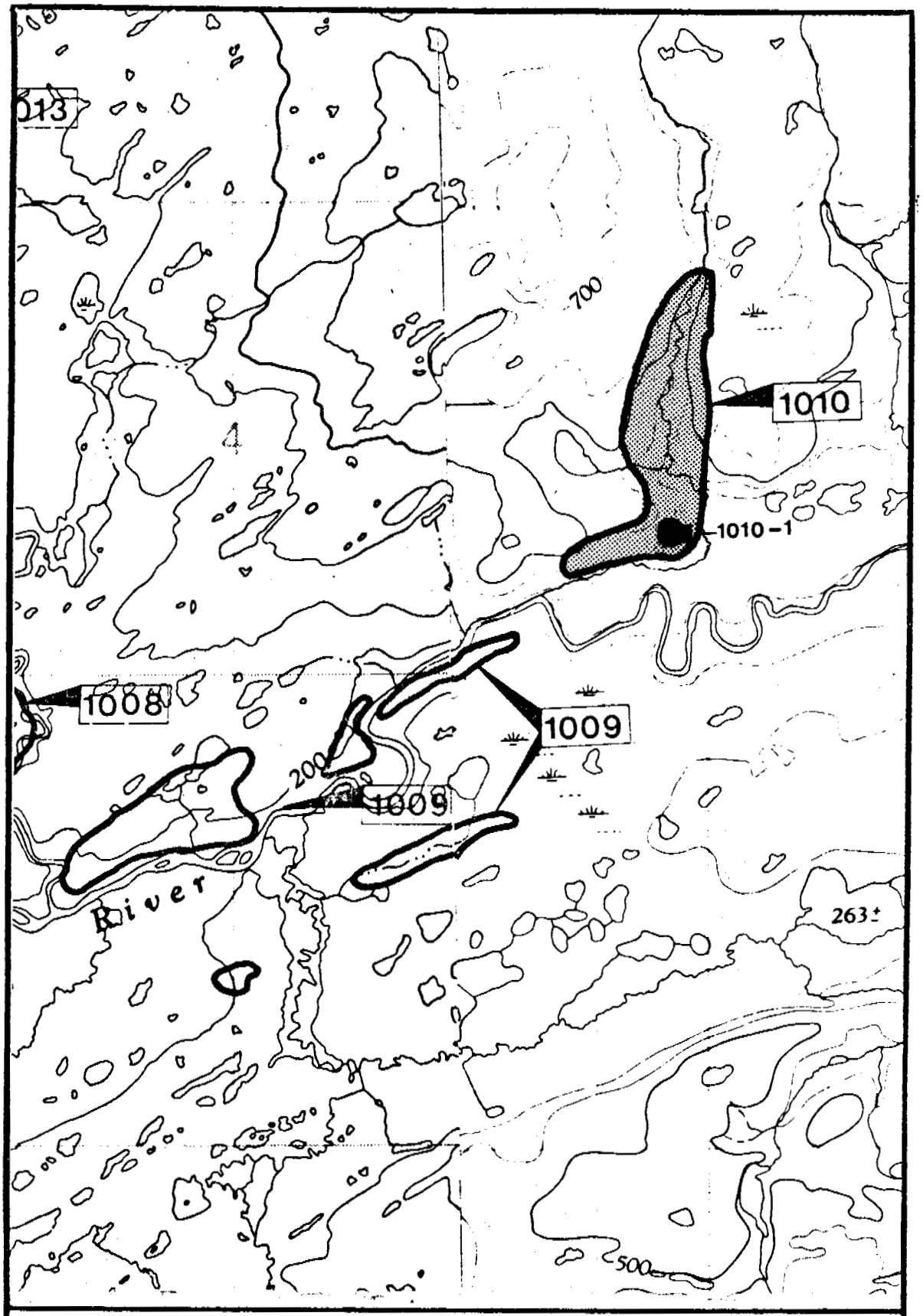
NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 345

SPECIAL CONCERNS: Straddles tributary to Hare Indian River and within important woodland caribou winter range, and marten abundance area. Extensive habitat alterations through clearing, fire or drainage alterations should be avoided. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

LAC BELOT 96-L

SCALE: 1:125,000

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1010 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	ML	SILT	NOT FROZEN		1
2		-trace fine gravel, dry, light brown		o	2
3					3
4					4
5		END OF HOLE			5
6		* seems to be bedrock (limestone) at 4.0'			6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Oct.2/73

LOGGED BY: EBA 301-3

COMPLETION DEPTH: 4.0'

DRILLING METHOD: AUGER

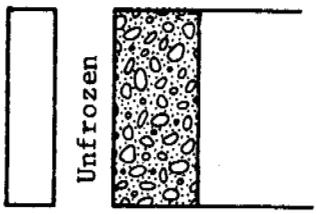
THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

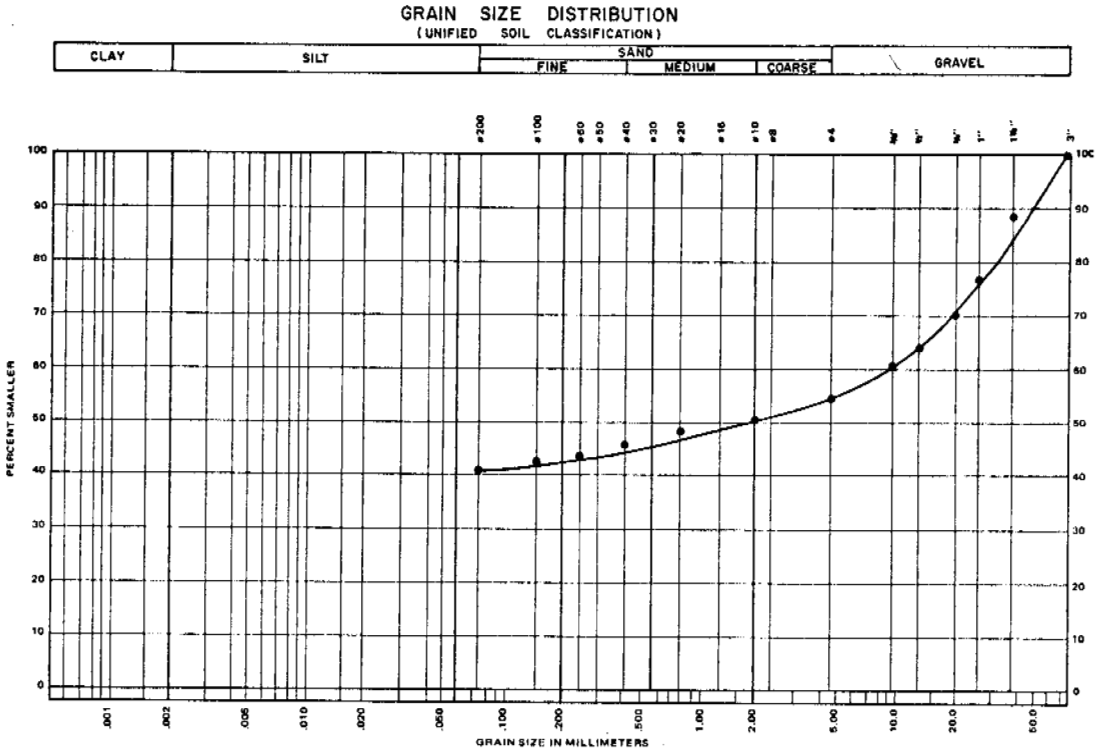
TP 1010-1



0.0 Gravel, medium brown, silty sandy, angular limestone cobbles

45% GRAVEL
14% SAND
41% SILT & CLAY

2.0 Boulders at 2'



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Silt and some Sand. (GM) M/C = 10.8%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1010-1
DEPTH

SITE 1011

Location:	Site 1011 is situated on the north bank of the Hare Indian River, 28 miles upstream from the Mackenzie River. Proposed pipeline and highway routes are 26 miles to the west of the site.
Geology:	This site is a high river terrace which is being actively eroded. The terrace was formed during a previous stage of river development when the elevation of the river was higher.
Material:	Interbedded sands and gravels with a trace of silt, occasional silt strata.
Drainage:	The site is well drained into the Hare Indian River.
Assessment:	The borrow material at site 1011 is good quality material, suitable for embankment fill, base course and surface aggregates, pipelines berms and building pads. The site is 26 miles from the proposed route locations and has been assigned a relatively high environmental sensitivity. In view of the long distance involved in hauling to major access routes, feasibility of site development is questionable. Additional work on both resource evaluation and environmental assessment should be carried out before site utilization is considered.

SITE 1011

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 (5) Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers, Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 4 (5) Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems

R.I.R. - Relative Importance Units - Base of 100 units.

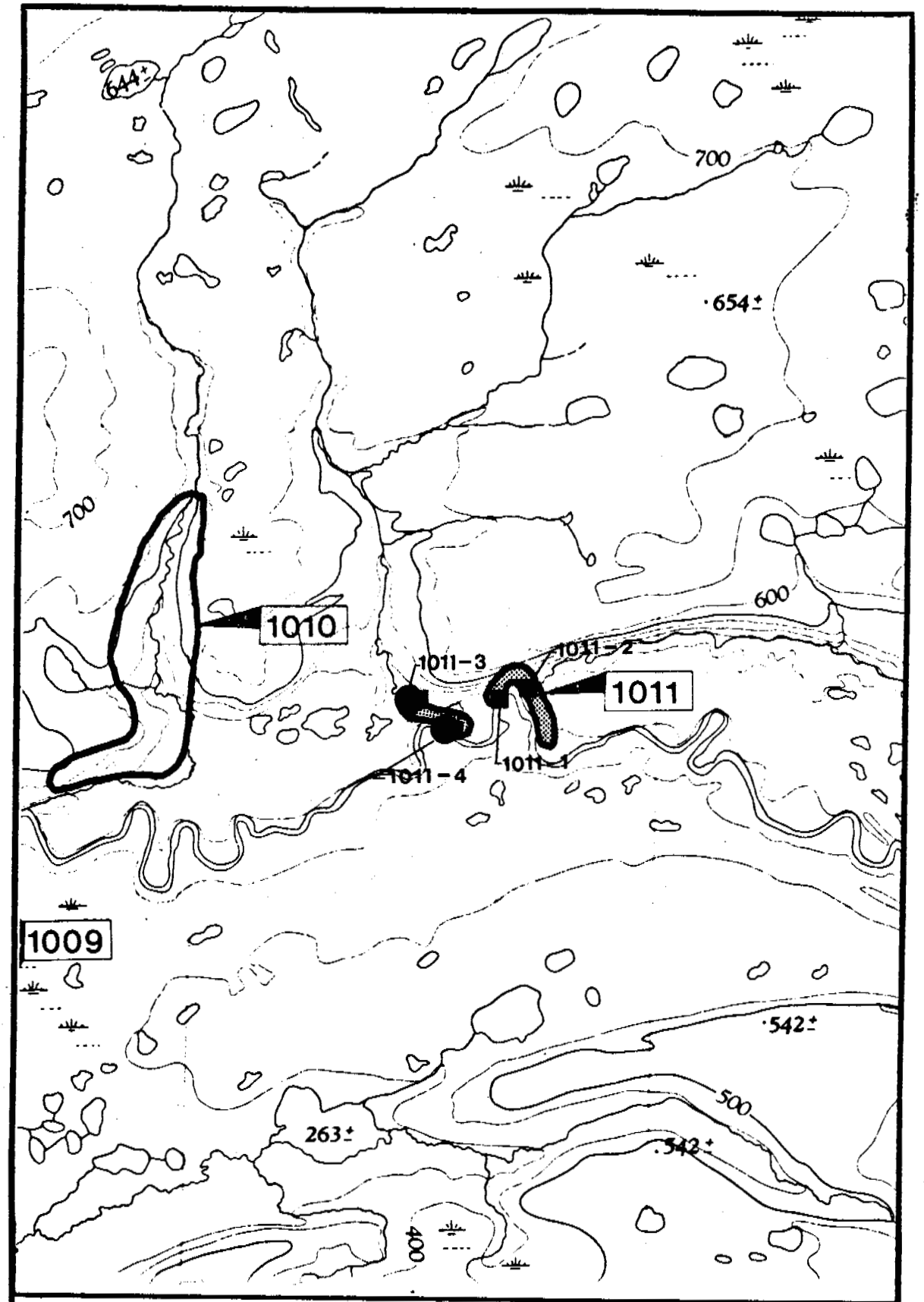
NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 340

SPECIAL CONCERNS: On north shore of Hare Indian River.
Frequent mammal and resource use by natives of Fort Good Hope.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: LAC BELOT 96-L

SCALE: 1:125,000

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1011 HOLE NO. 3 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	GW	GRAVEL -many cobbles, some sand, dense, dry, light brown			1
2					2
3					3
4		END OF HOLE			4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Oct.2/73

LOGGED BY: EBA 300-3

COMPLETION DEPTH: 3.0'

DRILLING METHOD: AUGER

THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1011 HOLE NO. 4 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	SW	SAND	NOT FROZEN		
1		-medium grained, trace fine gravel, dry, medium brown			1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
	ML	SILT	FROZEN		
9		-sandy, wet, low plasticity light brown.			9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Oct.2/73

LOGGED BY: EBA 300-4

COMPLETION DEPTH: 25.0'

DRILLING METHOD: AUGER

THAW DEPTH: 7.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1011 HOLE NO. 4 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	ML	SILT			
18		-same, very wet			18
19					19
20					20
21					21
22					22
	SM	-sandier with depth			
23					23
24					24
25					25
26		END OF HOLE			26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 2/73

LOGGED BY: EBA 300-4

COMPLETION DEPTH: 25.0'

DRILLING METHOD: AUGER

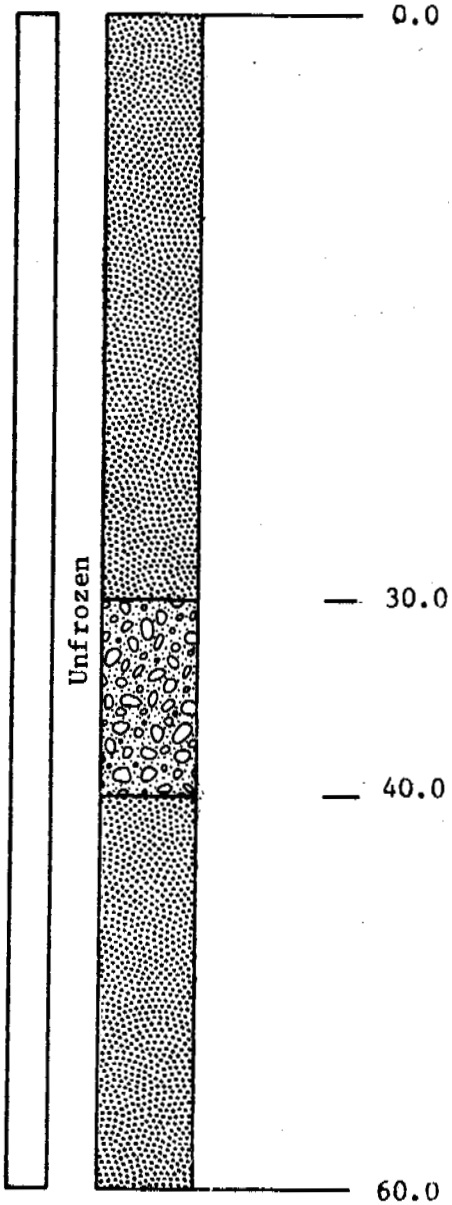
THAW DEPTH: 7.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SURFACE EXPOSURE LOG

TP 1011-1



0.0

Medium fine sand clean

30.0

Gravel and Sand

47% GRAVEL
49% SAND
4% SILT & CLAY

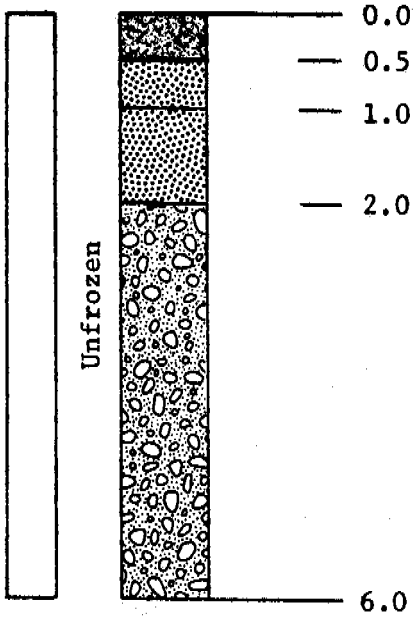
40.0

Sand medium fine clean

60.0

TEST PIT LOG

TP 1011-2



Peat and organic silt

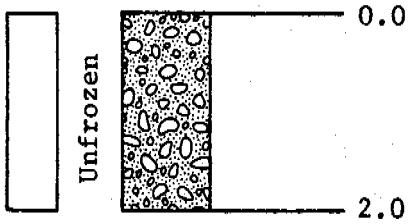
Fine sand, silty

Sand, coarse, well graded, clean

Sand and Gravel, coarse, clean

M.C. = 4.2%

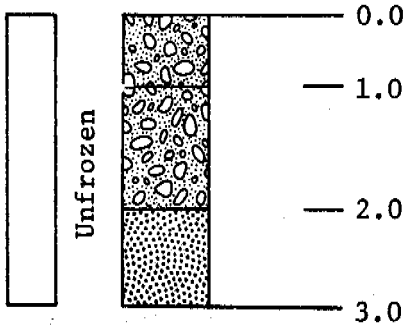
TP 1011-3



Gravel

82% GRAVEL
16% SAND
2% SILT & CLAY

TP 1011-4



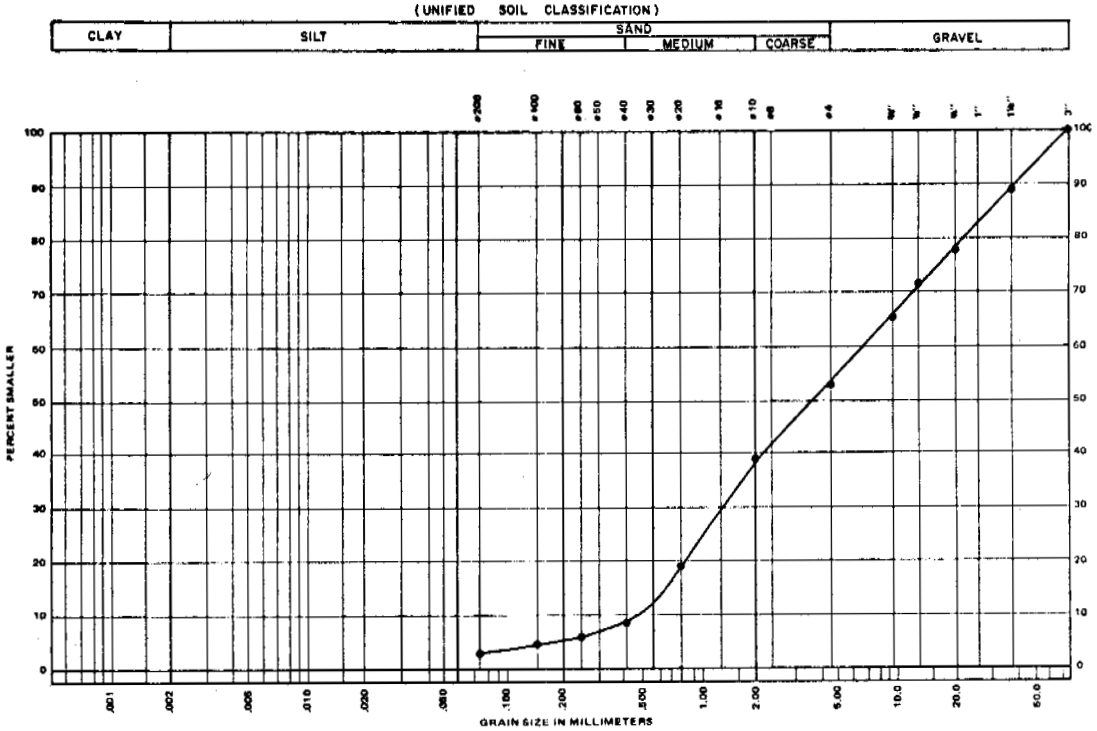
Gravel, light brown, silty

Gravel, reddish brown, sandy well graded

3% GRAVEL
94% SAND
3% SILT & CLAY

Sand, medium brown, coarse some gravel

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

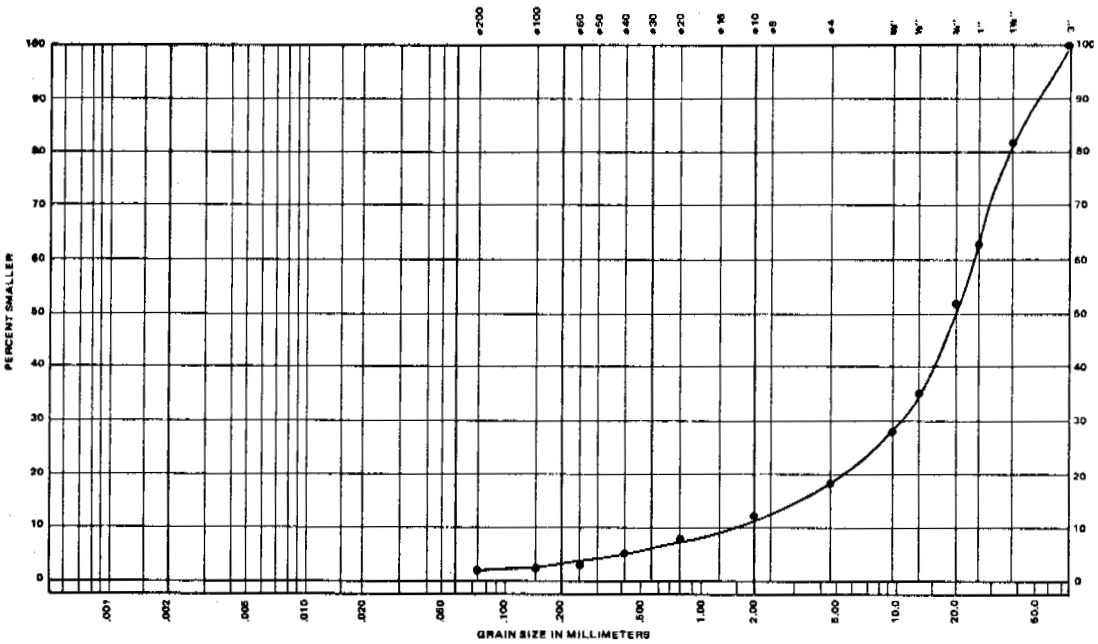


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with a Trace of Silt. (GP) M/C = 4.1%

PROJECT Granular Resources
JOB No. E666 DATE Jan.14/74
SAMPLE No. TP 1011-1
DEPTH 35'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

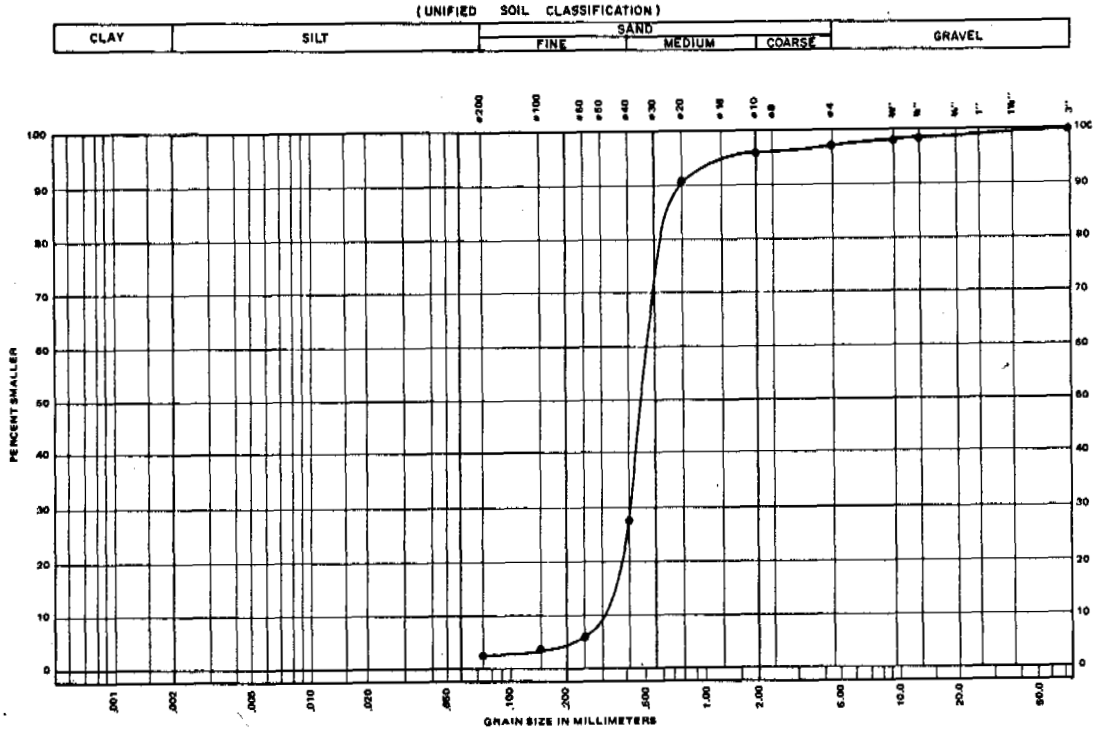


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and some Sand with a Trace of Silt (GW)

PROJECT Granular Resources
JOB No. E666 DATE Jan.14/74
SAMPLE No. TP 1011-3
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with Trace of Gravel and Silt. (SP) M/C = 2.2%

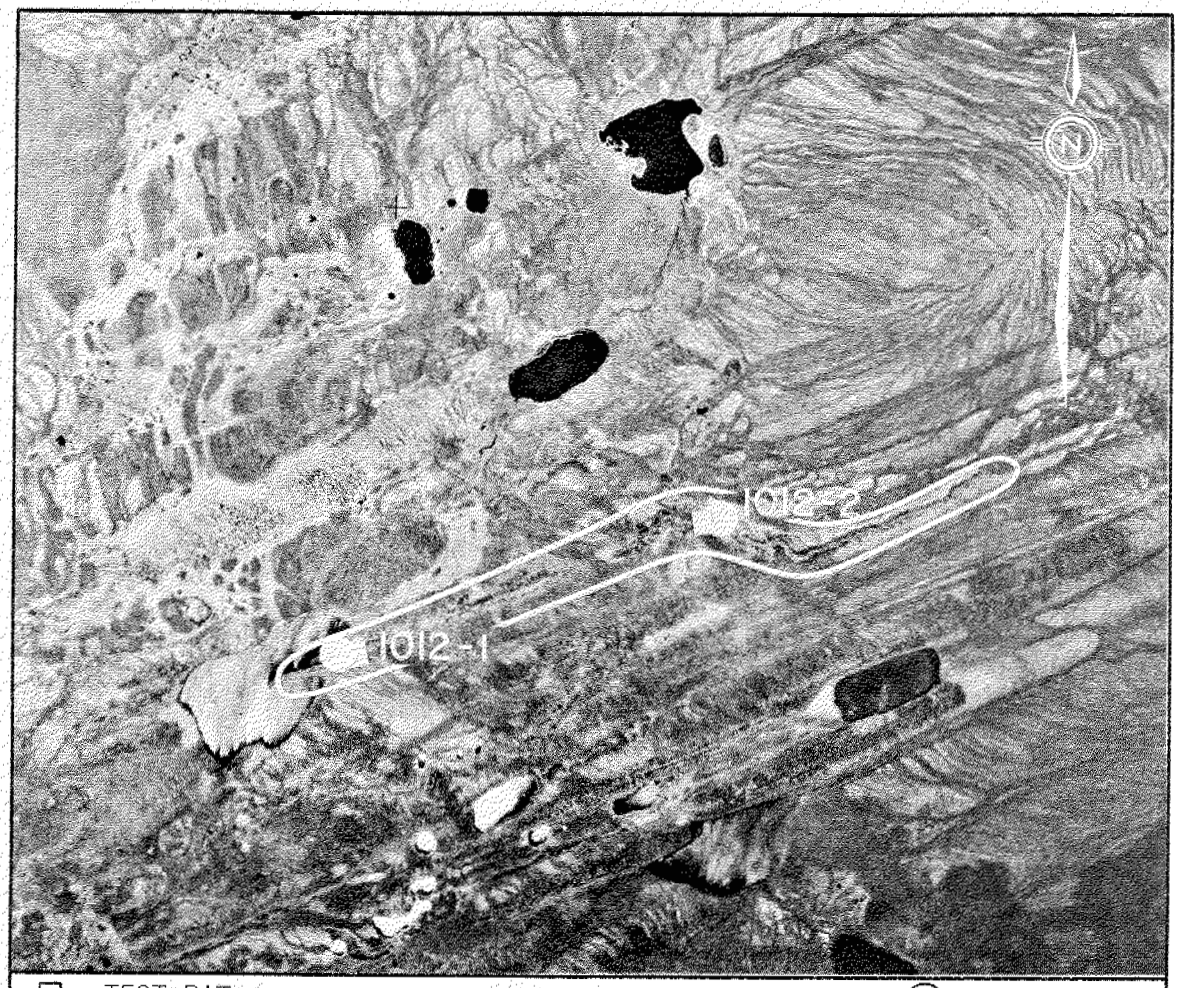
PROJECT Granular Resources
JOB No. E666 DATE Jan.14/74
SAMPLE No. TP 1011-4
DEPTH 2'

SITE 1012

Location: Site 1012 is 6 miles south-east of the point of confluence of the Tchaneta and Bluefish Rivers. Proposed pipeline and highway routes are 22 miles SEE of the site.

Geology: The site is a long narrow esker which terminates in a small lake. Some variation in the material should be expected.

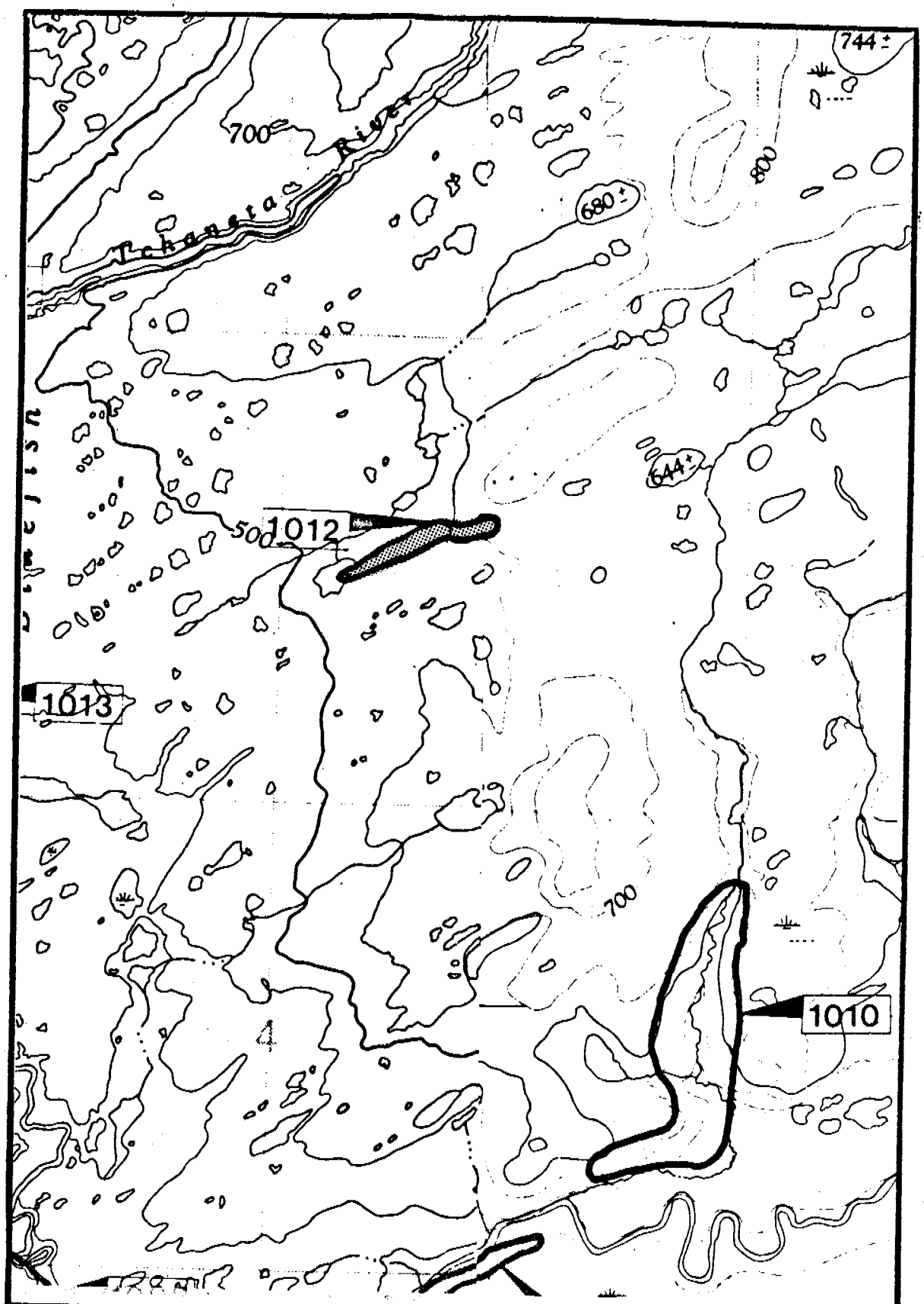
Material: Sand and gravel, some silt, well graded.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. 12575-391 SCALE: 1" = 3000" (approx.)

Assessment: Site 1012 contains a relatively small volume of fair quality borrow. Permafrost depth varies from 7 to 14 feet and blasting would probably be required to excavate frozen gravel. Silt overburden of variable thickness will have to be stripped and stockpiled for use in restoration. Dense spruce on the site will have to be removed for disposal. The long haulage distance to proposed highway and pipeline routes makes development, under the present circumstances questionable.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

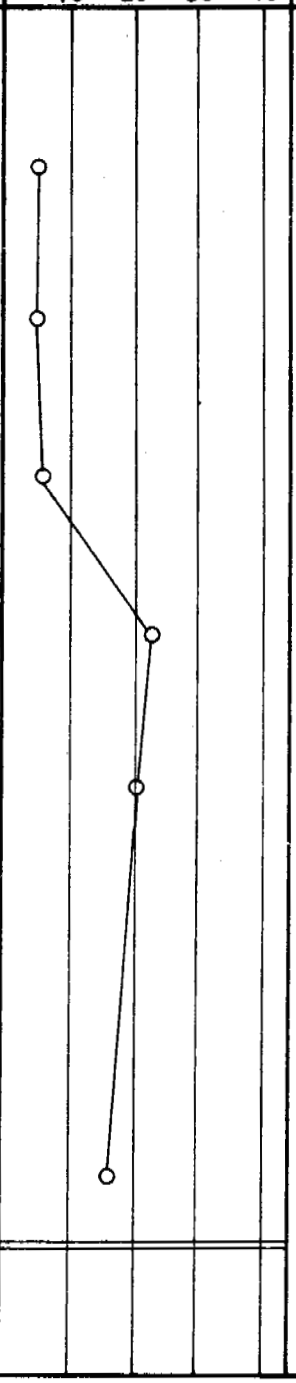
LAC BELOT 96-L

SCALE: 1:125,000

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1012 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	SM	SAND -silty, trace fine gravel, dry, light brown 13% O.C.	NOT FROZEN
2			
3			
4			
5			
6			
7	ML	SILT -some sand, wet, medium to dark brown. -sandier with depth	FROZEN
8			
9			
10			
11			
12			
13			
14			
15			
16			
17		END OF HOLE	



DATE DRILLED: Oct. 2/73

LOGGED BY: EBA 314-1

COMPLETION DEPTH: 16.0'

DRILLING METHOD: AUGER

THAW DEPTH: 7.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

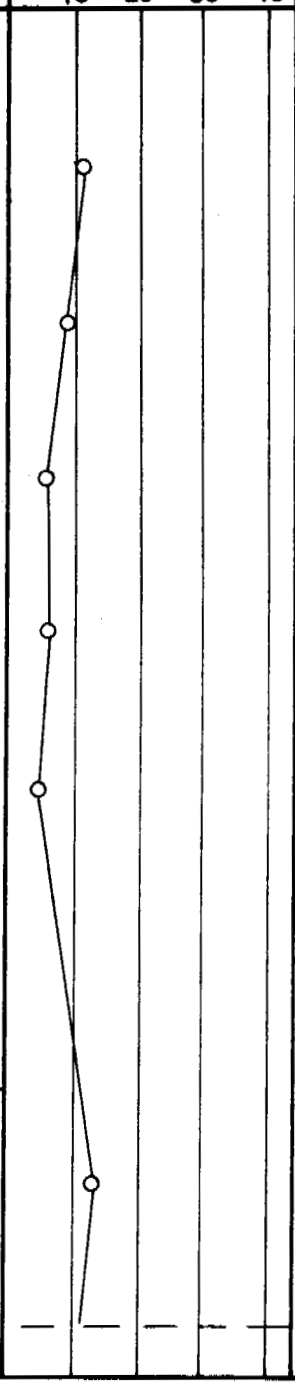
EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1012 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	MC	SILT trace sand, trace fine gravel, dry, light brown	NOT FROZEN
2			
3			
4		14.6% O. C.	
5			
6			
7			
8	GP-GM	GRAVEL (8' + 10') 54% GRAVEL 35% SAND 11% SILT & CLAY	
9			
10		-some fine gravel	
11			
12			
13			
14	GM	GRAVEL -very clayey, wet, light grey	FROZEN
15			
16			
17			

MOISTURE CONTENT %



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Oct. 2/73

LOGGED BY: EBA 314-2

COMPLETION DEPTH: 25.0'

DRILLING METHOD: AUGER

THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1012 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	GM	GRAVEL	FROZEN		18
19		-same			19
20					20
21					21
22					22
23					23
24					24
25					25
26		END OF HOLE			26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 2/73 LOGGED BY: EBA 314-2 COMPLETION DEPTH: 25.0'

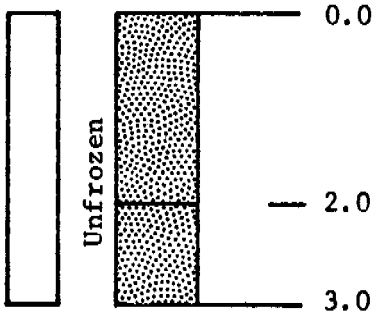
DRILLING METHOD: AUGER THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

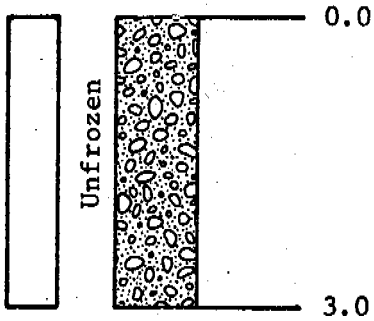
TEST PIT LOG

TP 1012-1



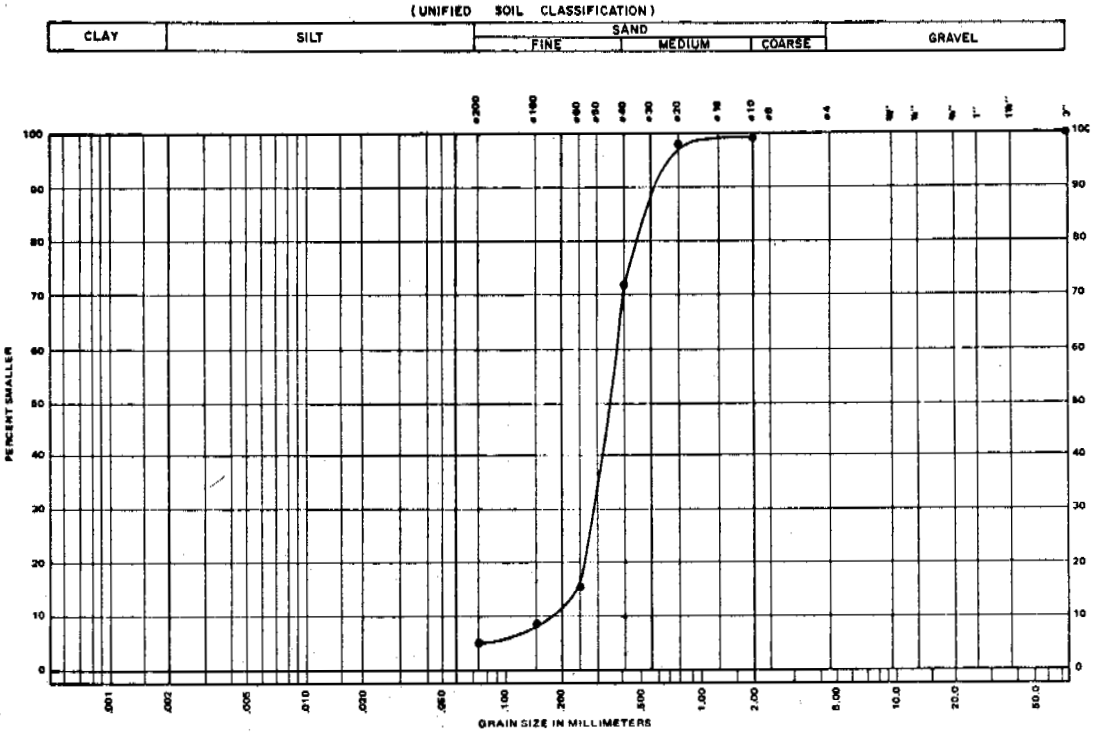
Sand, light brown, gravelly, dry	1% GRAVEL 94% SAND 5% SILT & CLAY
Sand, light brown, uniformly graded (fine-dry)	

TP 1012-2



Gravel, medium brown, silty, sandy, well graded	39% GRAVEL 49% SAND 12% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

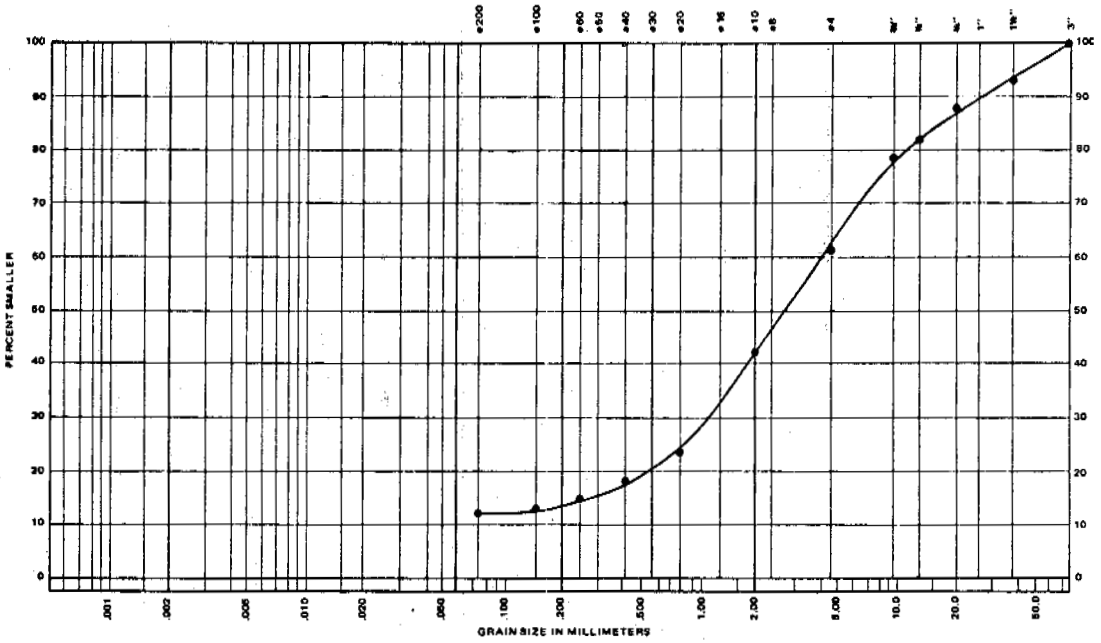


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of Silt and Gravel (SP) M/C = 3.7%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1012 - 1
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



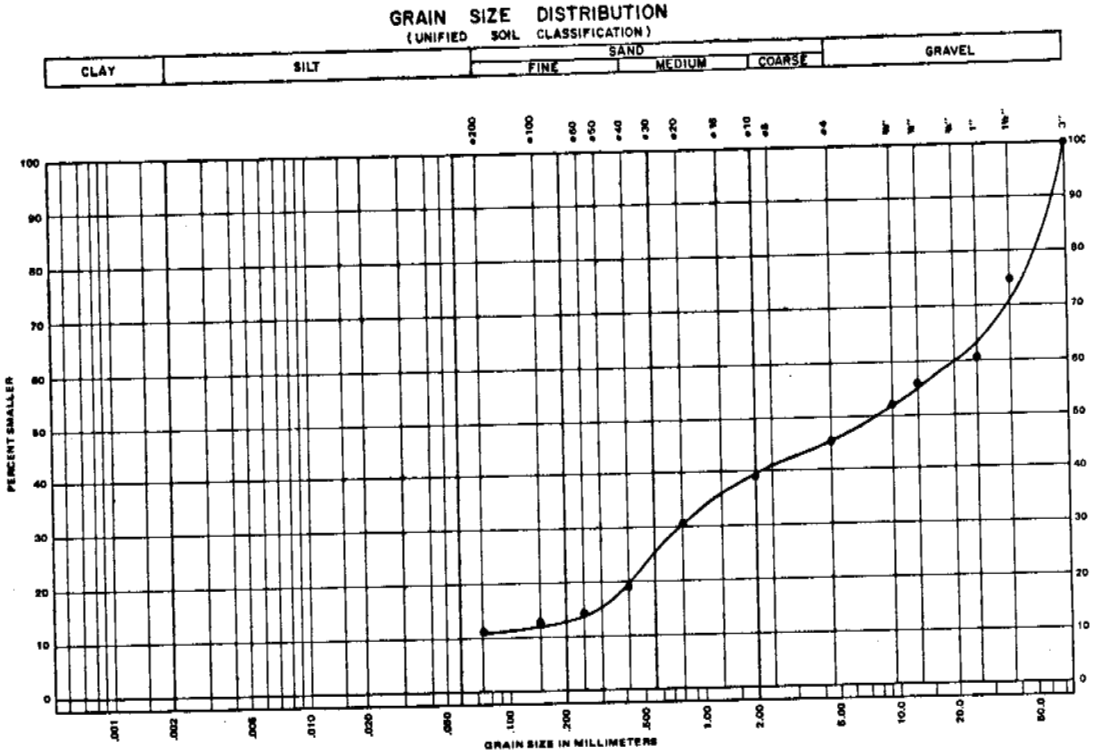
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and some Silt. (GP-GM) M/C = 4.8%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1012-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and some Silt. (GP-GM)

PROJECT Granular Resources

JOB No. E666 DATE Jan.11/74

SAMPLE No. BH 1012-2

DEPTH 8' + 10'

SITE 1013

Location: Site 1013 is located along the west bank of the Bluefish River 5.5 miles south of its point of confluence with the Tchaneta River. Proposed highway and pipeline routes are 14.5 miles SWW of the site.

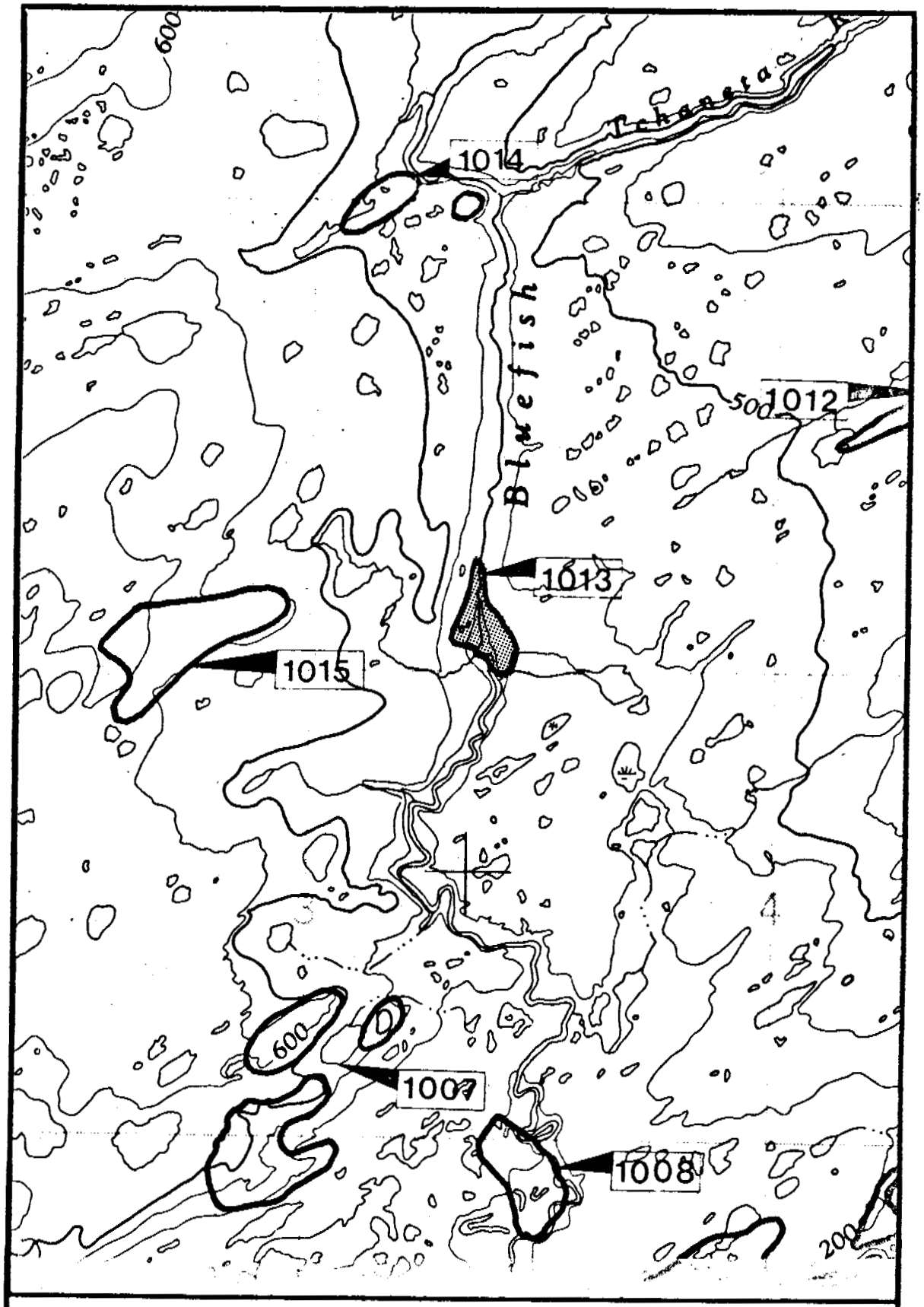
Geology: The site is an actively eroding river terrace.

Material: Sandy gravel, trace silt, well graded.

TEST PIT BOREHOLE

AIRPHOTO No. 12602-250 SCALE: 1" = 3000' (approx.)

Assessment: A moderate volume of borrow material can be expected at site 1013; however, an 8 foot thick layer of clay till was encountered in the drilling program. Further drilling should be undertaken to determine the extent of the clay till and thickness and extent of the gravel. Overburden is negligible, however, clay pockets or layers within the borrow will have to be stripped and stockpiled for use in restoration. Spruce trees up to 70 feet tall cover the site and will have to be removed for disposal. The gravel at the site is of good quality for construction purposes. The ground between the route locations and the site is flat thus access should be easy. Temporary winter roads are recommended if the site is developed. The haulage distance to anticipated construction projects is long, thereby making the feasibility of development, under the present circumstances, questionable.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1013

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 (4) 5 Rating: 60	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.
6	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 325

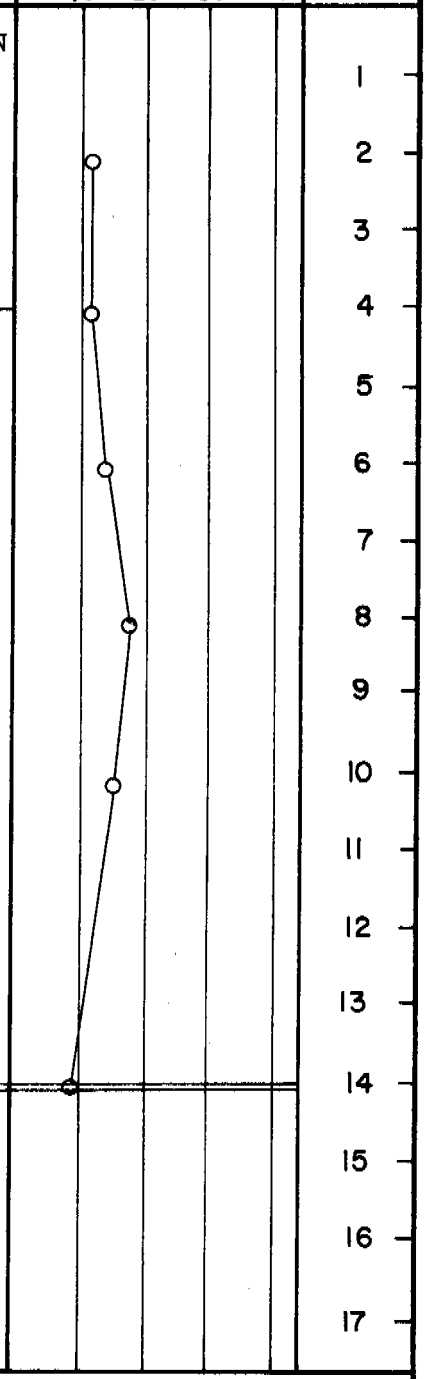
SPECIAL CONCERNS: On north shore of Bluefish Creek and within caribou and marten concentration area. Buffer zones may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1013 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
		PEAT -dry brown	NOT FROZEN
1	GW	GRAVEL -some sand, occassional cobble, well graded, light brown	
2			
3			
4	CL	CLAY -sandy, wet, low plasticity creamy texture, light brown -sandier with depth	FROZEN
5			
6			
7			
8			
9			
10			
11			
12	GC	GRAVEL -clayey, occassional cobble light brown	
13			
14			
15		END OF HOLE	
16			
17			



DATE DRILLED: Oct. 2/73 LOGGED BY: EBA 308-1 COMPLETION DEPTH: 14.0'

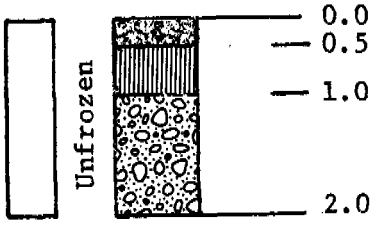
DRILLING METHOD: AUGER THAW DEPTH: 4.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1013-1

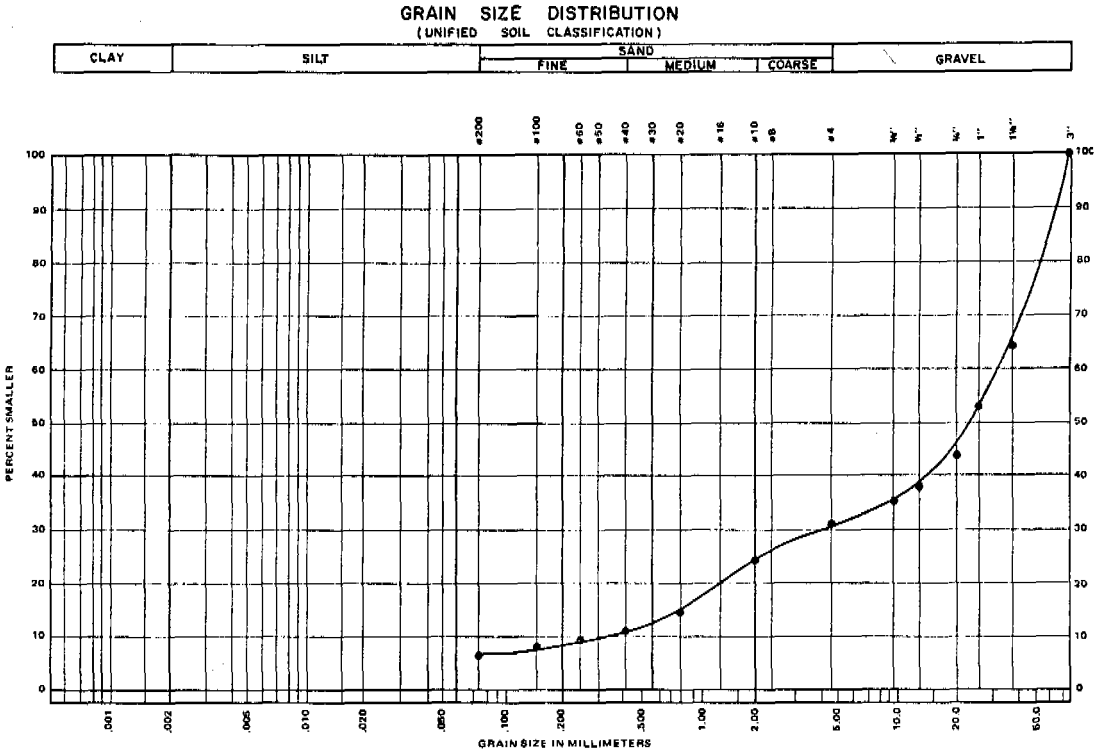


Moss

Silt, cobbly, surface organics

Sand and Gravel, coarse sand and gravel

69% GRAVEL
25% SAND
6% SILT & CLAY



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel with a Trace of Silt (GW-GM) M/C = 8.1%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1013-1
DEPTH 2'

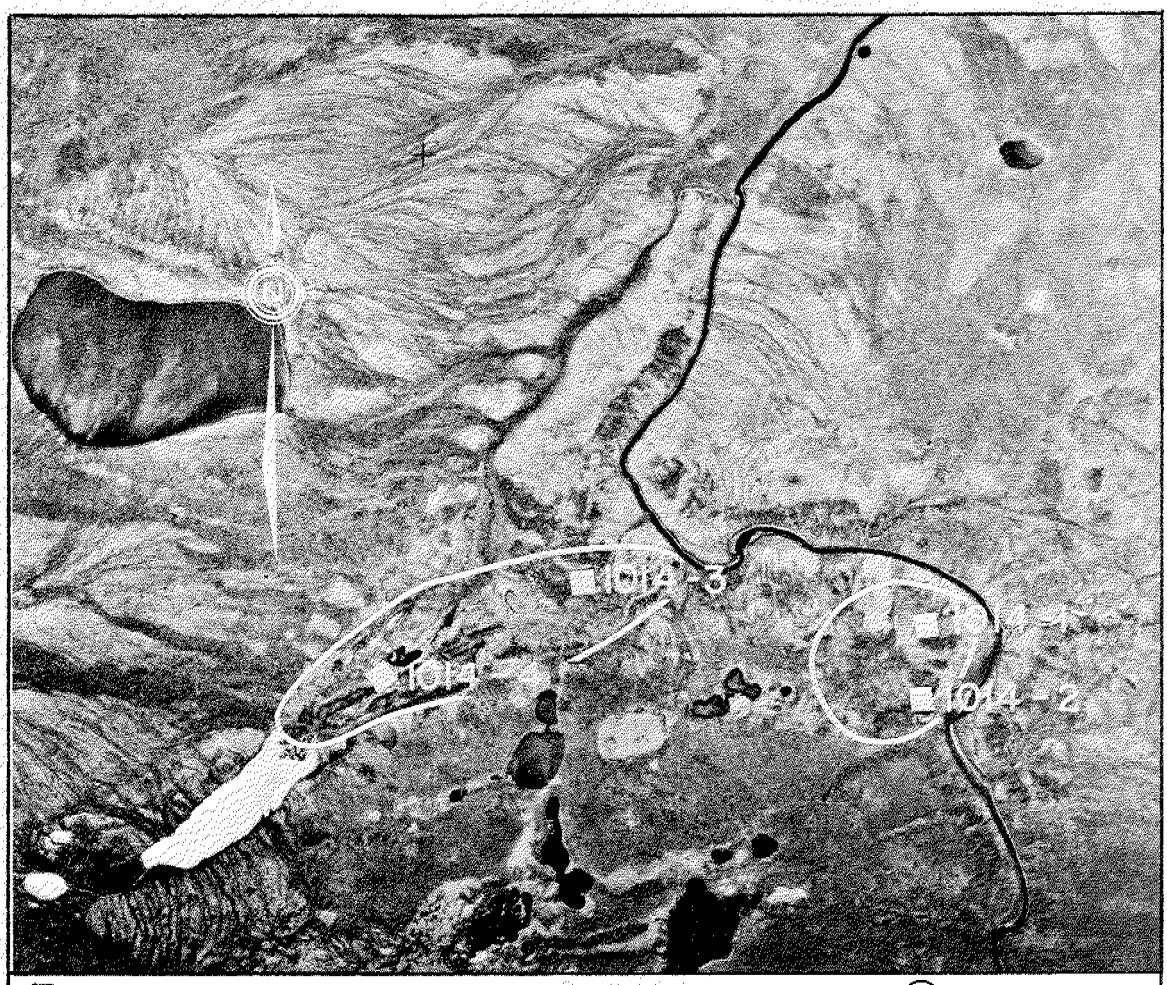
SITE 1014a

Location: Site 1014 is located just west of the point of confluence of the Tchaneta and Bluefish Rivers. Proposed pipeline and highway routes are approximately 16 miles SW of the site.

Geology: The material at site 1014 is contained in small scattered kames and river terraces.

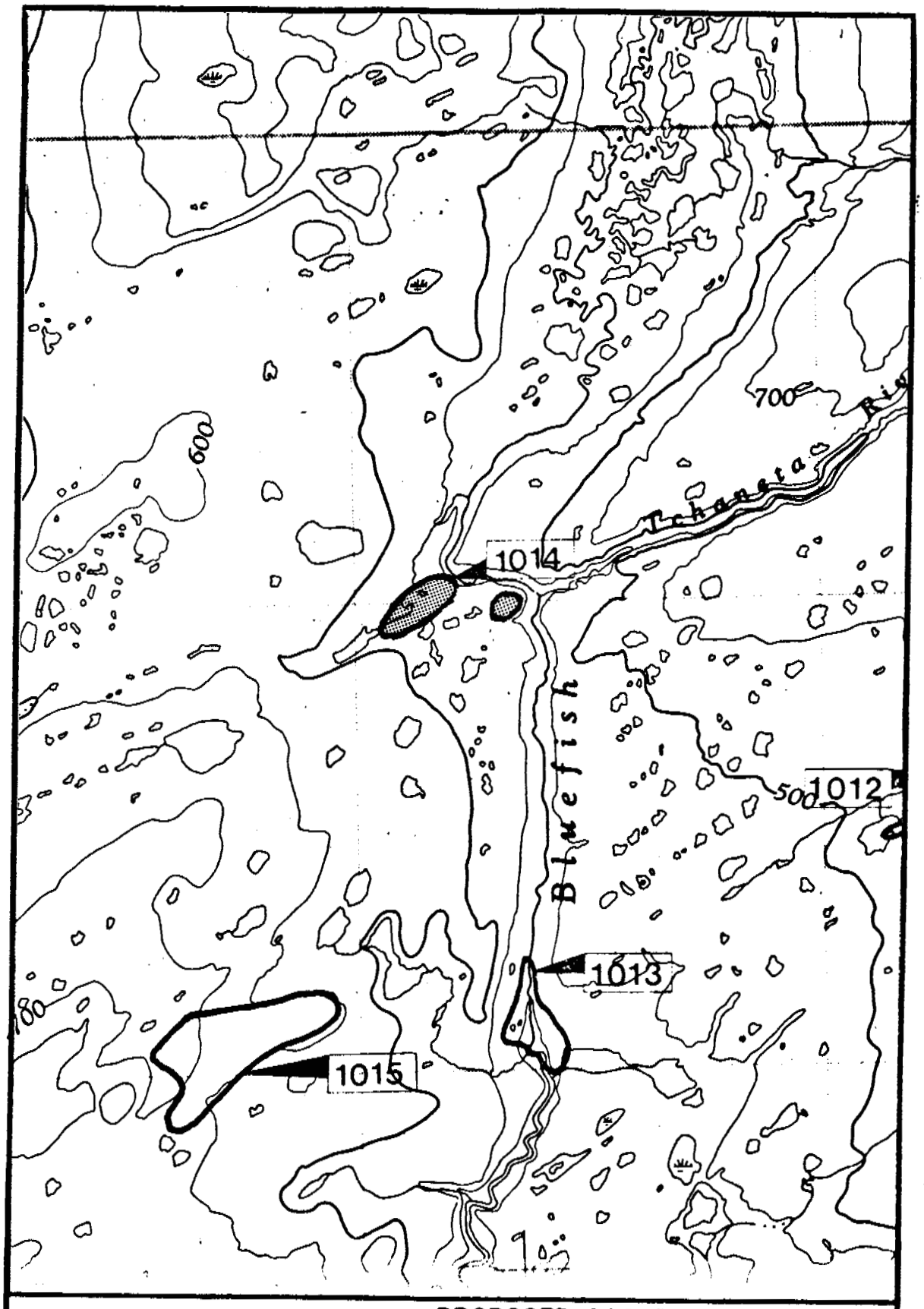
Material: Silt, with some small areas of sand.

Assessment: The testing program revealed the material at site 1014 to be of poor quality, unsuitable for construction purposes. Site 1014 is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A12602-253 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

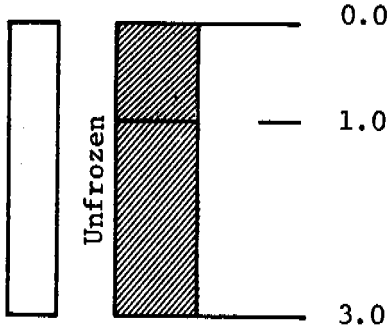
PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

TEST PIT LOG

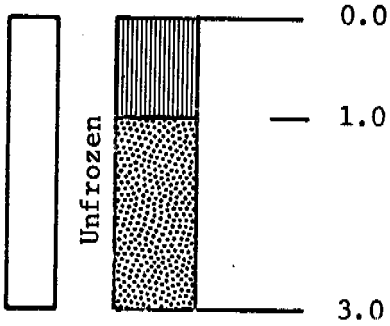
TP 1014-1



Clay, medium brown, silty, medium plasticity

Clay, grey, silty, medium plasticity, angular gravel, inclusions (glacial till)

TP 1014-2



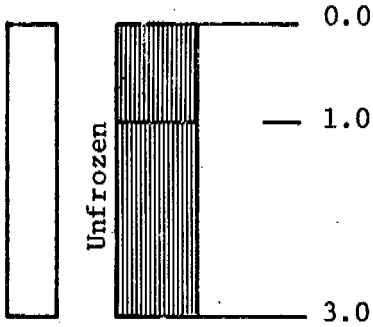
Silt, reddish brown, trace of gravel

Sand, medium brown, fine grained, some coarse angular sand particles, poorly graded

1% GRAVEL
88% SAND
11% SILT & CLAY

TEST PIT LOG

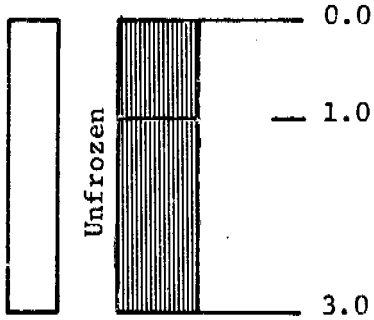
TP 1014-3



Silt, reddish brown, sandy

Silt, medium brown

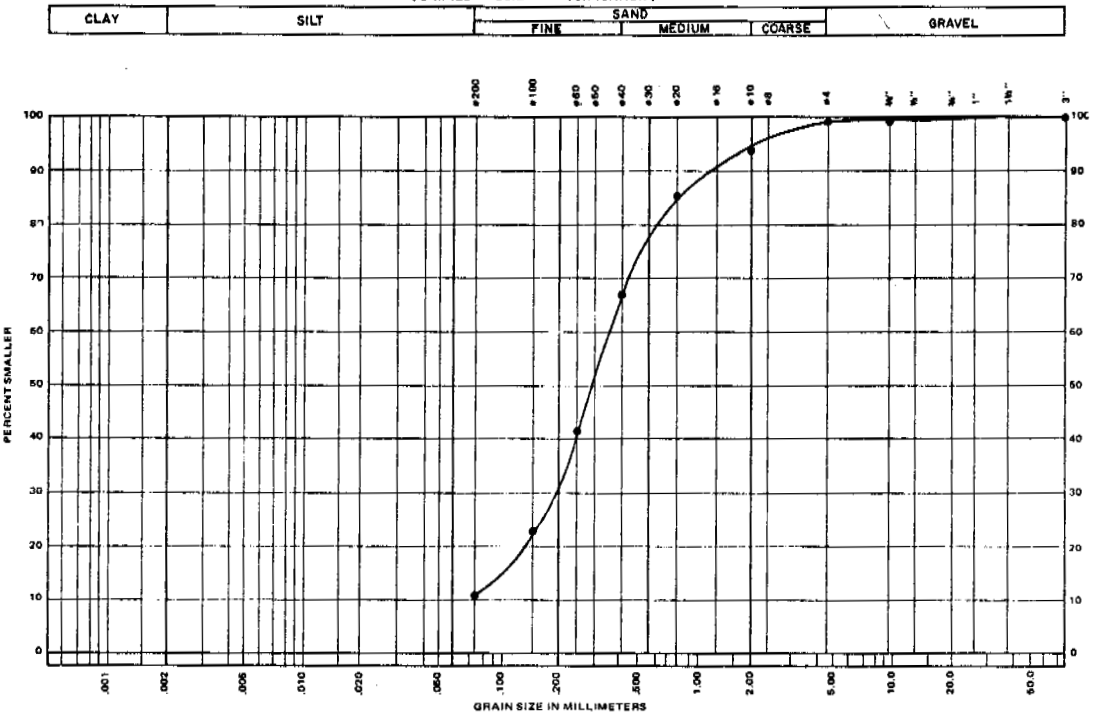
TP 1014-4



Silt, reddish brown, organic

Silt, light brown, sandy,
(fine grained)

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and some Silt with a Trace of Gravel (GW-GM)

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1014-2
DEPTH 3'

SITE 1015a

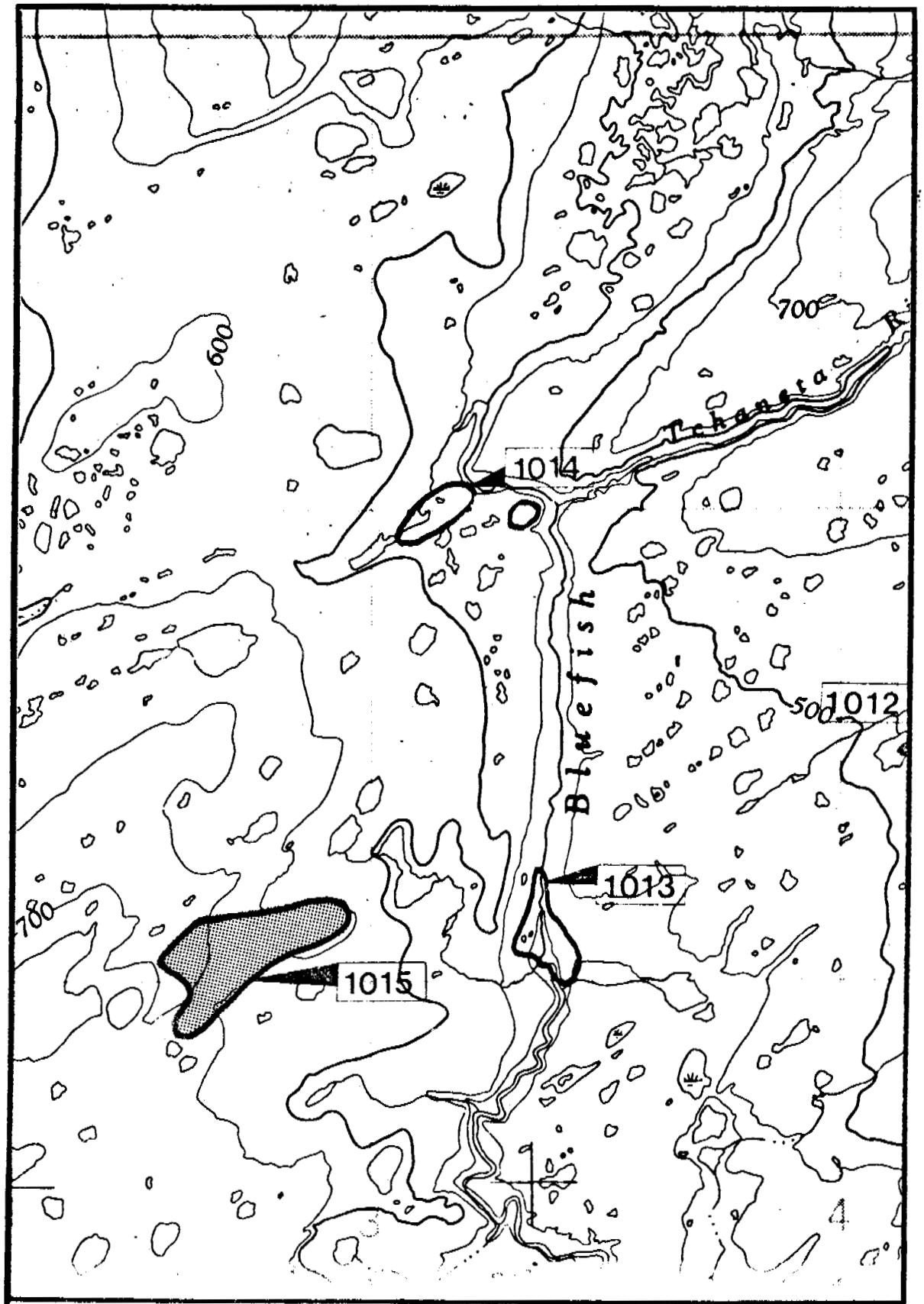
Location: Site 1015 is 9 miles SEE of Loon Lake and approximately 11 miles NEE of proposed highway and pipeline routes.

Material: Bedrock (limestone).

Assessment: Considerable overburden overlies the bedrock and the site is a considerable distance from proposed pipeline and highway routes. Drilling would have to be undertaken to delimit the outcrop and determine overburden thickness. The site is not recommended for development.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A12604-94 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1015

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish Grayling Pike Trout-Perch Lake Trout Burbot Suckers Stickleback Smelt Sculpin Goldeye Chub Dace Walleye Char Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High, Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 300

SPECIAL CONCERNS: Upland area in lake complex. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

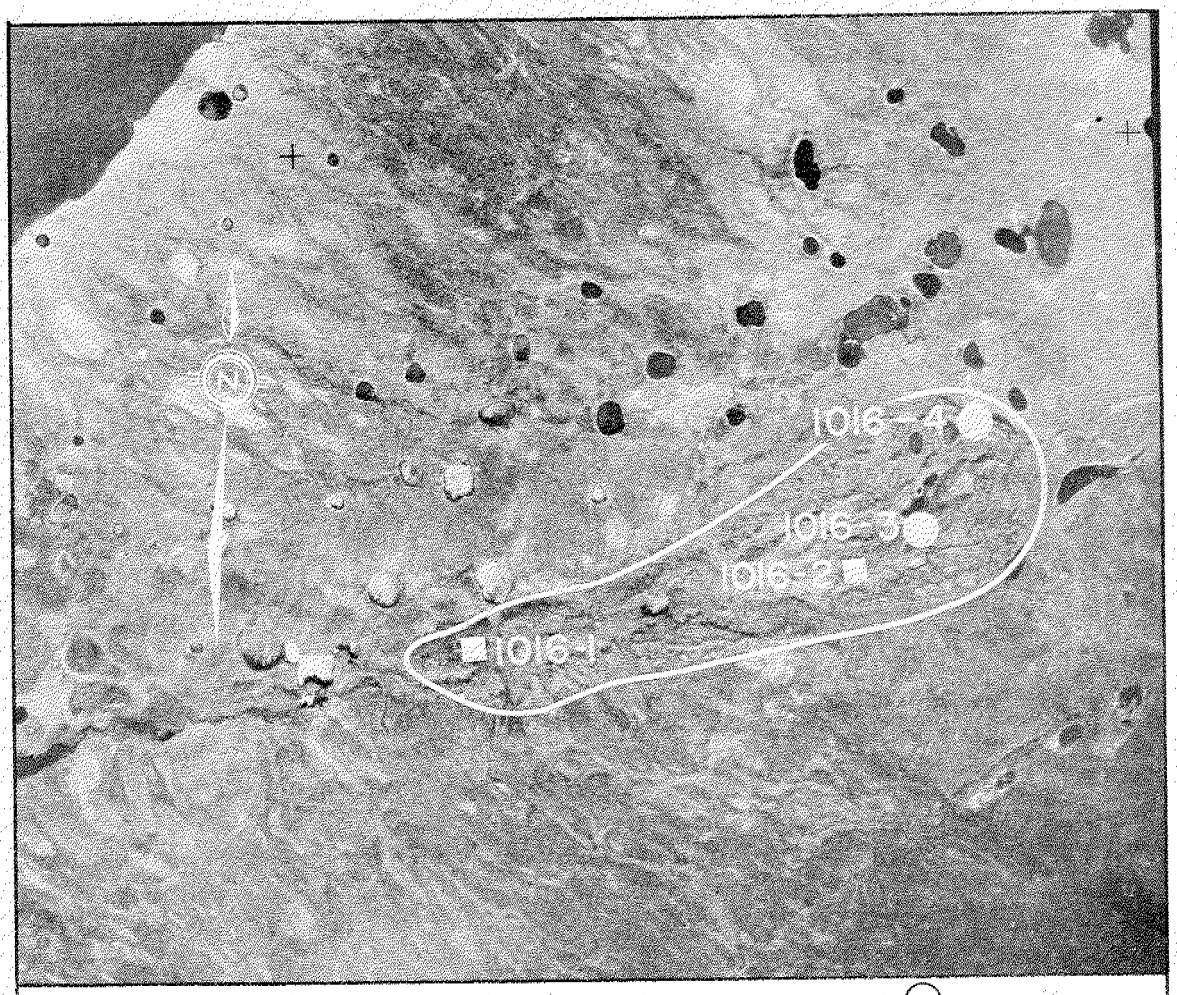
SITE 1016

Location: Site 1016 is 4 miles east of the point of confluence of Loon Lake and Loon River. Proposed highway and pipeline routes are approximately 9 miles SW of the site.

Geology: Site 1015 is a hummocky esker-kame complex which is expected to exhibit considerable variation in composition.

Material: Gravel, trace sand, trace silt, poorly graded, narrow esker ridges; sand, gravelly, some silt, well graded, kames, some variation in composition.

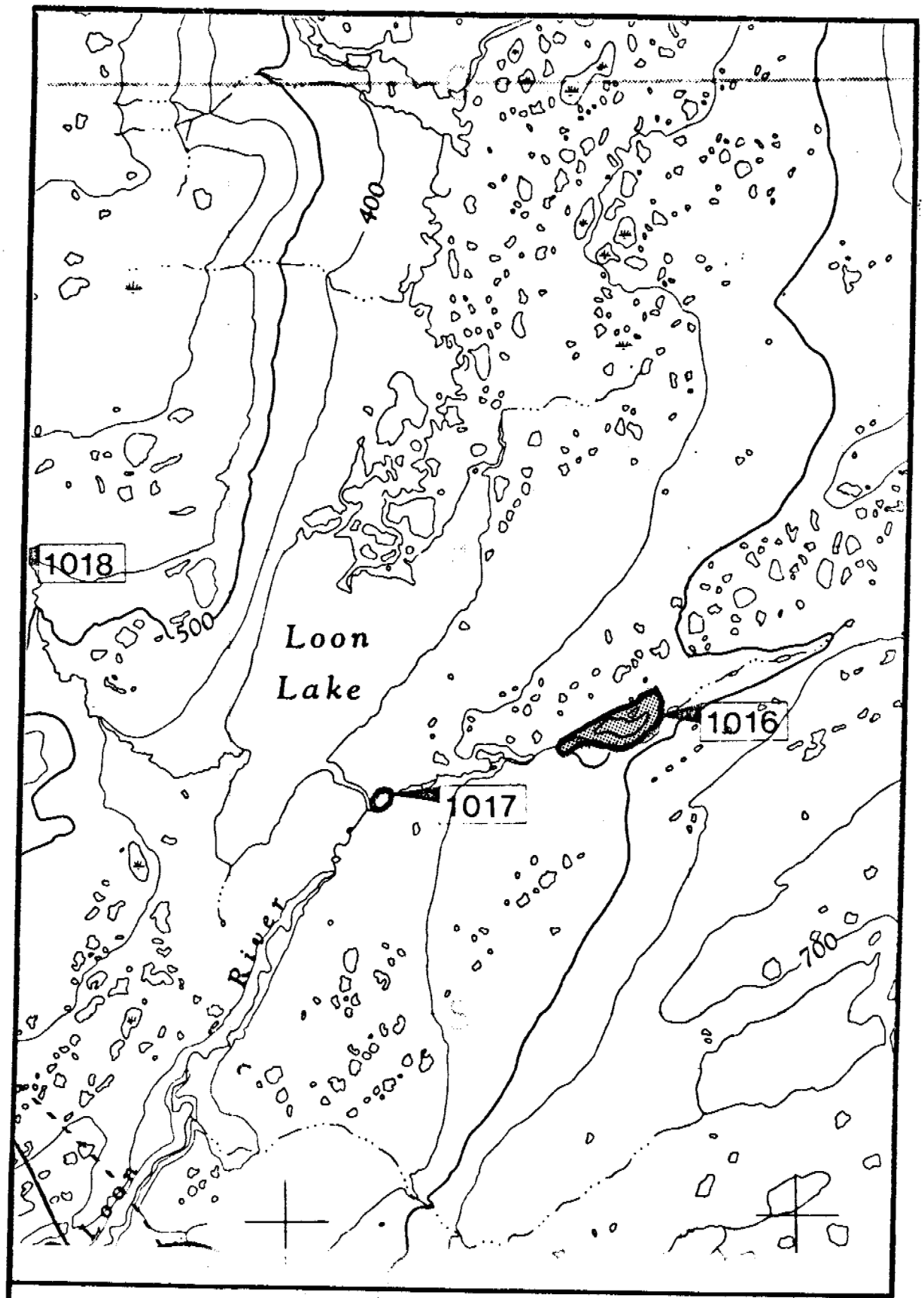
Drainage: The site is well drained.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. 12579-217 SCALE: 1" = 3000' (approx.)

Assessment: The esker gravel is of good quality and dry but will probably contain pockets of silt or clay till. Volume yield is expected to be low. The kame material could be used as fair quality fill and again a low volume of dry material is expected. Selective extraction may yield material suitable for processing into concrete aggregate. Environmentally, the site has a relatively low sensitivity rating. Overburden is negligible, however, 30 to 40 foot spruce and birch will have to be removed for disposal. Permafrost depth is approximately 14 feet but may be somewhat variable. Access between routes and site is relatively easy, however the long haulage distance, under present circumstances, makes development feasibility questionable.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE **1016**

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 235

SPECIAL CONCERNS: Straddles tributary to Loon Lake. Siltation controls and drainage maintenance may be required.

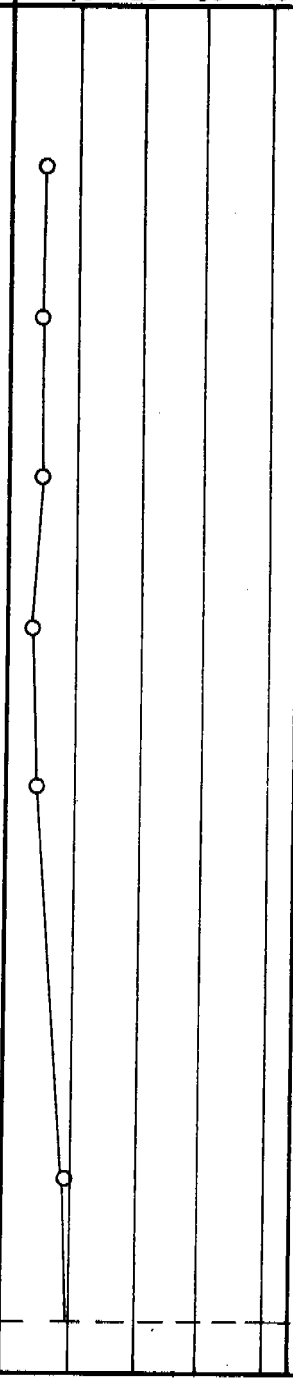
F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1016 HOLE NO. 3 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	GW	GRAVEL & COBBLES silty, some sand, dry, light brown.	NOT FROZEN
2	GW GM	SAND & GRAVEL -silty, medium grained sand fine to medium subangular to subrounded gravel, dry, light brown.	
3			
4			
5			
6			
7			
8		(2' - 10') 46% GRAVEL 42% SAND 12% SILT & CLAY	
9			
10			
11			
12			
13			
14			
15		-less gravel, trace clay, slight plasticity	Nbn
16			
17			

MOISTURE CONTENT %



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Oct. 1/73

LOGGED BY: EBA 306-3

COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER

THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1016 HOLE NO. 3 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
		SAND & GRAVEL -same	Nbn		
18					18
	SM	SAND -trace gravel, some clay, moist, low plasticity, grey-brown			
19					19
20					20
21		END OF HOLE			21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct.1/73

LOGGED BY: EBA 306-3

COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER

THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1016 HOLE NO. 4 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1		COBBLES -silty, some gravel, rounded to subangular	NOT FROZEN		1
2	GP	GRAVEL -trace silt, fairly loose, maximum 2", average 3/4", subangular to subrounded, dry			2
3					3
4					4
5		(2') 99% GRAVEL 1% SAND			5
6	GP				6
7		(6') 94% GRAVEL 4% SAND 1% SILT & CLAY			7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15		END OF HOLE			15
16					16
17					17

DATE DRILLED: Oct. 1/73 LOGGED BY: EBA 306-4 COMPLETION DEPTH: 14.5'

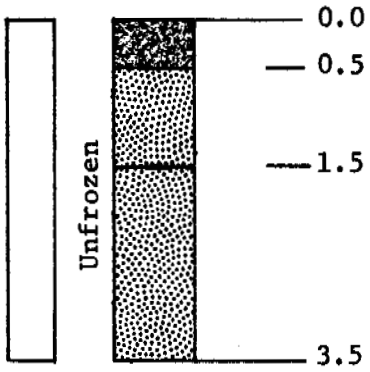
DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1016-1



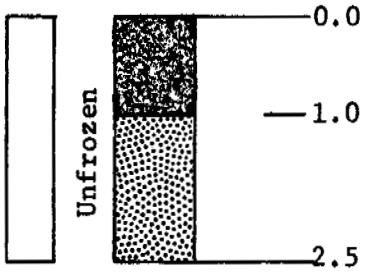
Surface organics

Sand, medium, fine, rusty brown

Gravelly sand

38% GRAVEL
48% SAND
19% SILT & CLAY

TP 1016-2

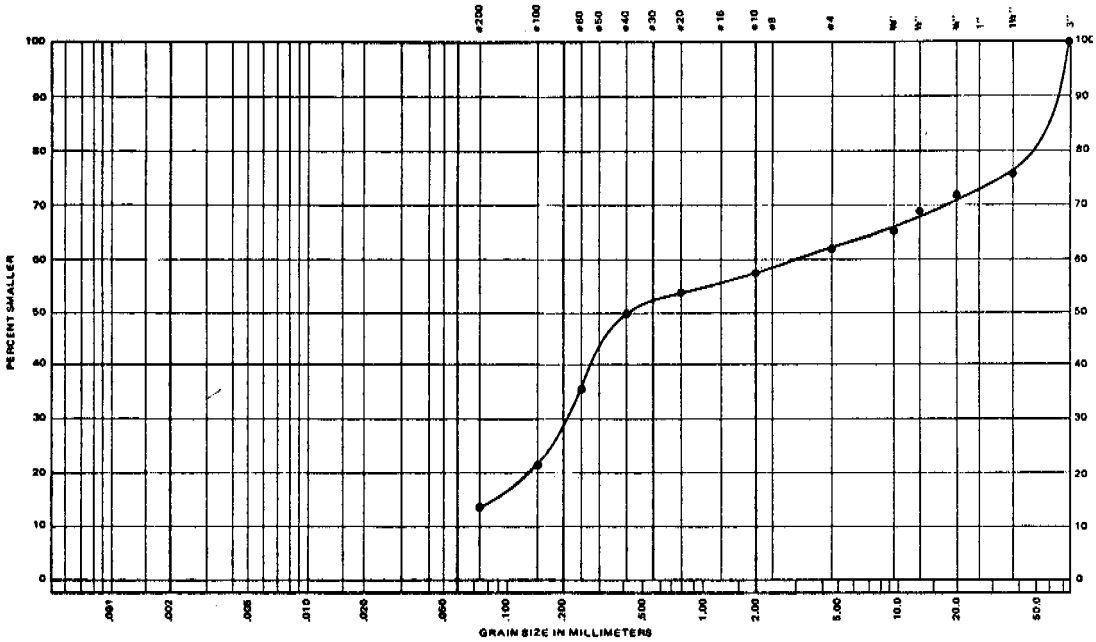


Cobbles, sand, surface, organics

Sand, gravel, minor silt

28% GRAVEL
59% SAND
13% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

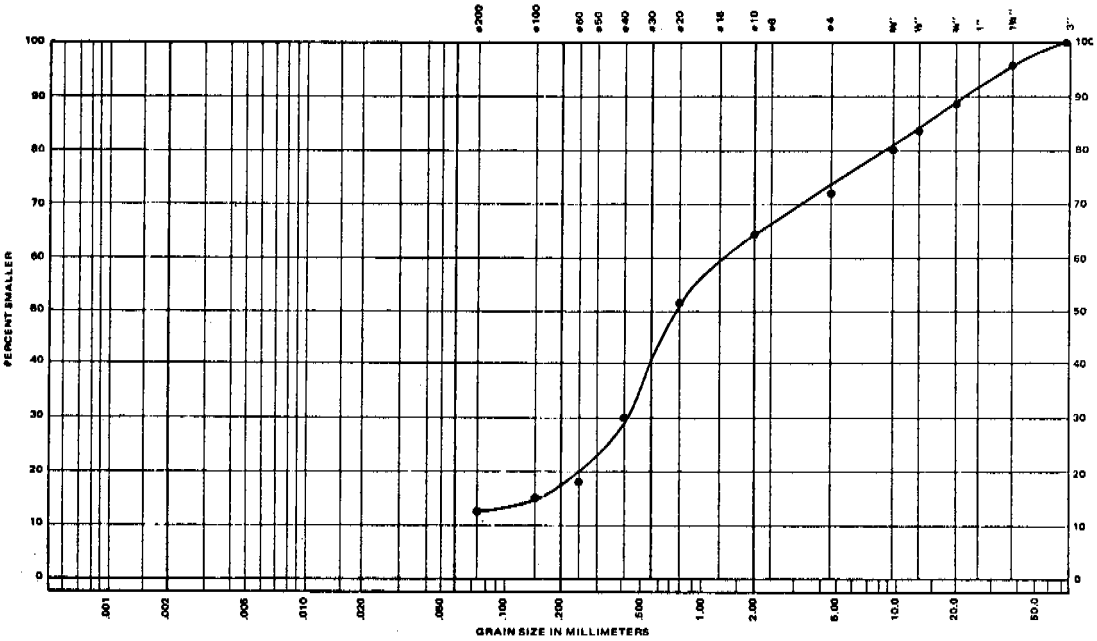


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and some Silt. (GP-GM) M/C = 4.9%

PROJECT Granular Resources
JOB No. E 666 DATE Dec.17/73
SAMPLE No. TP 1016-1
DEPTH 2.5'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

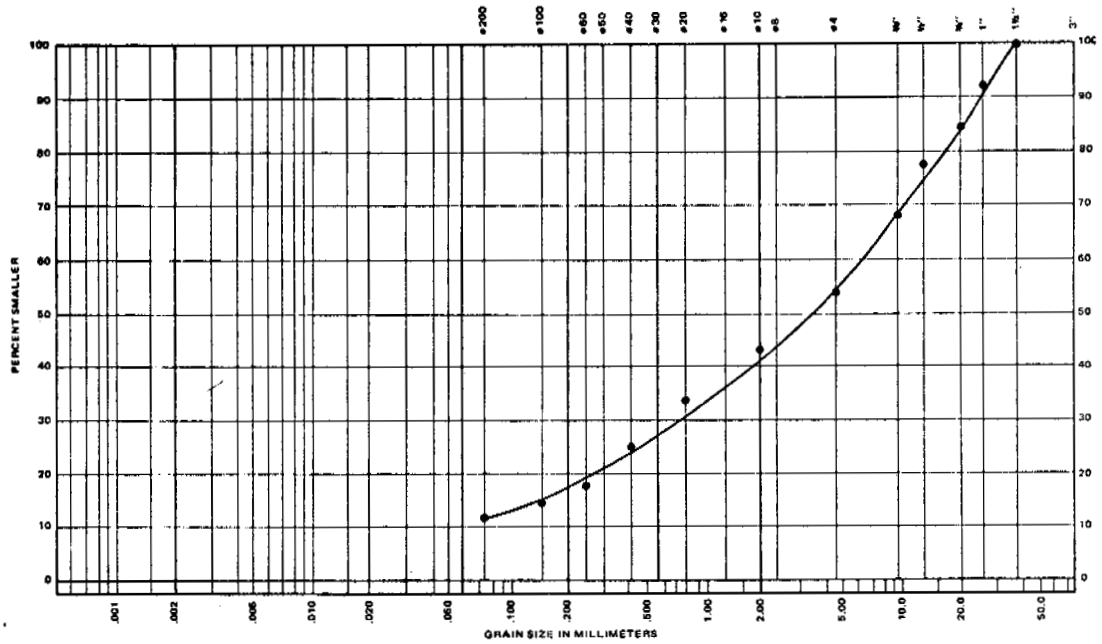


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Sand and some Silt (SP-SM) M/C = 5.5%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1016-2
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

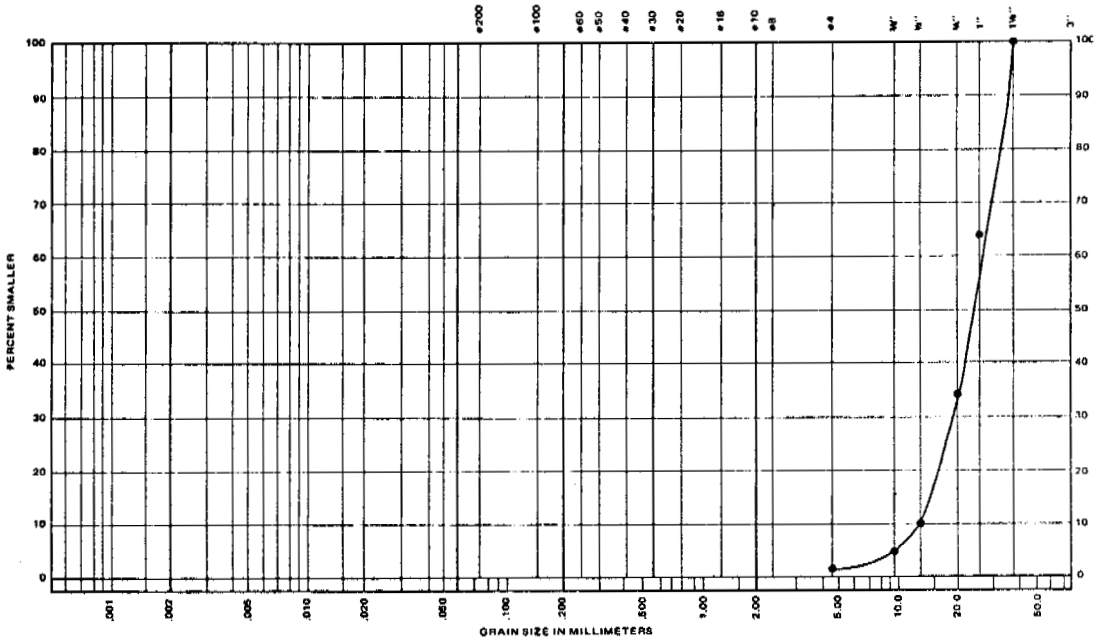


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand some Silt (GW-GM)

PROJECT Granular Resources
JOB No. E666 DATE Jan.14/74
SAMPLE No. BH 1016-3
DEPTH 2' - 10'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

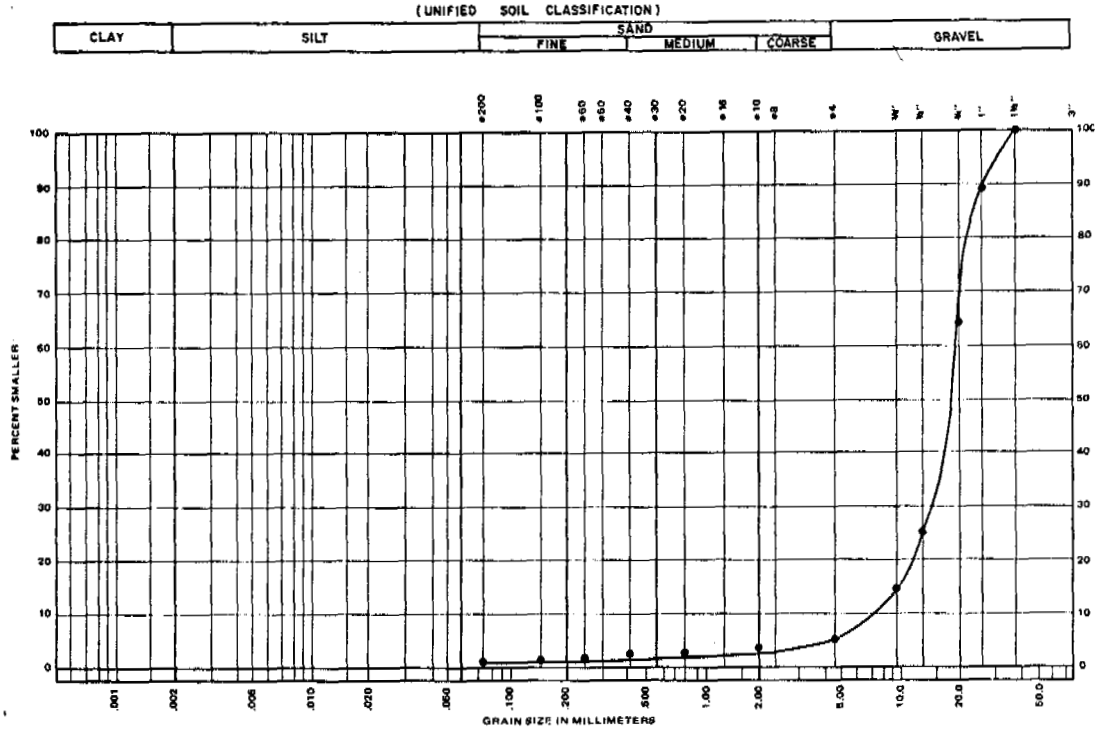


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel with A Trace of Sand. (GP)

PROJECT Granular Resources
JOB No. E666 DATE Jan.11/74
SAMPLE No. BH 1016-4
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel with a Trace of Sand and Silt. (GP)

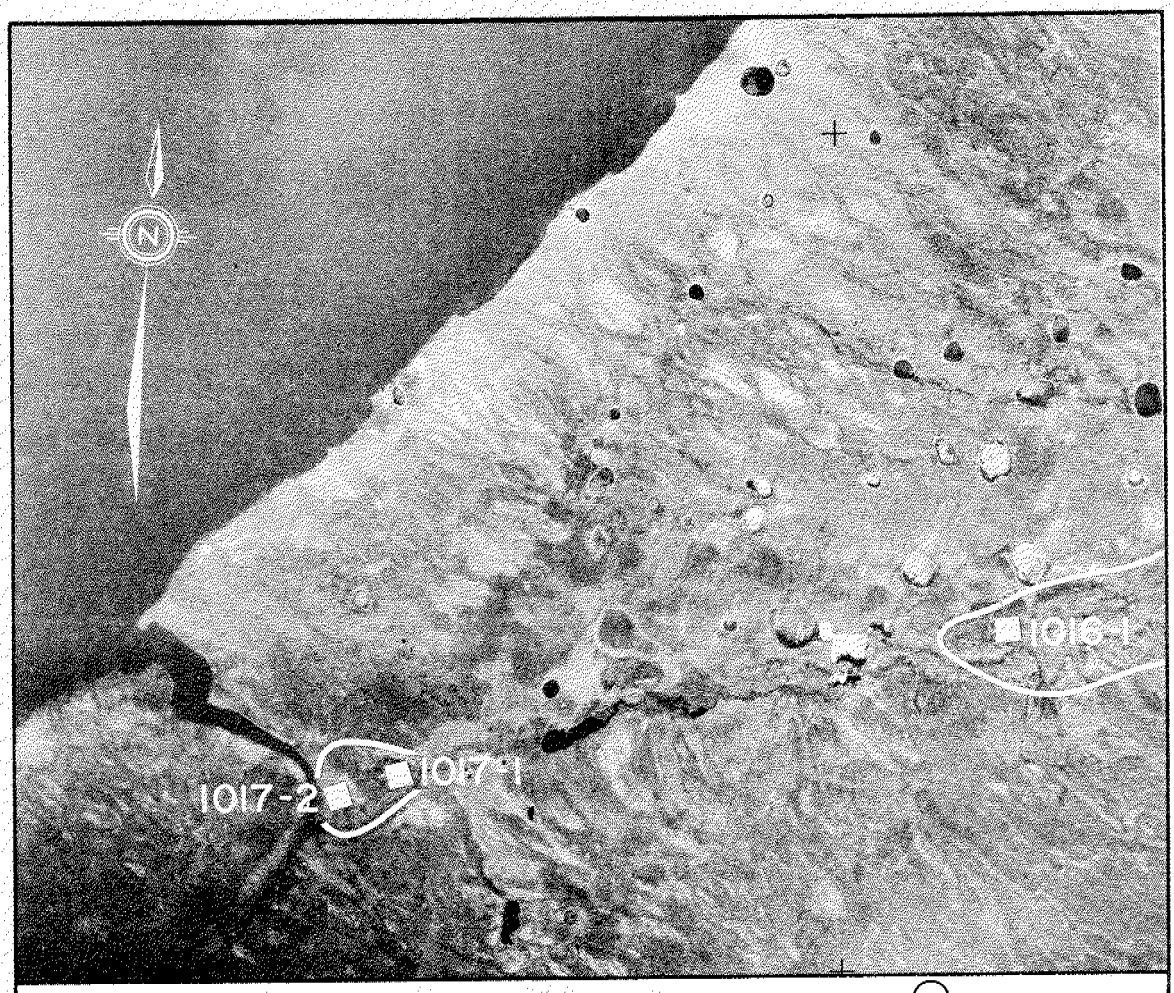
PROJECT Granular Resources
JOB No. E666 DATE Jan. 11/74
SAMPLE No. BH 1016-4
DEPTH 6'

SITE 1017a

Location: Site 1017 is located one mile east of Loon Lake on the north shore of the Loon River. The proposed pipeline is 6 miles to the SW.

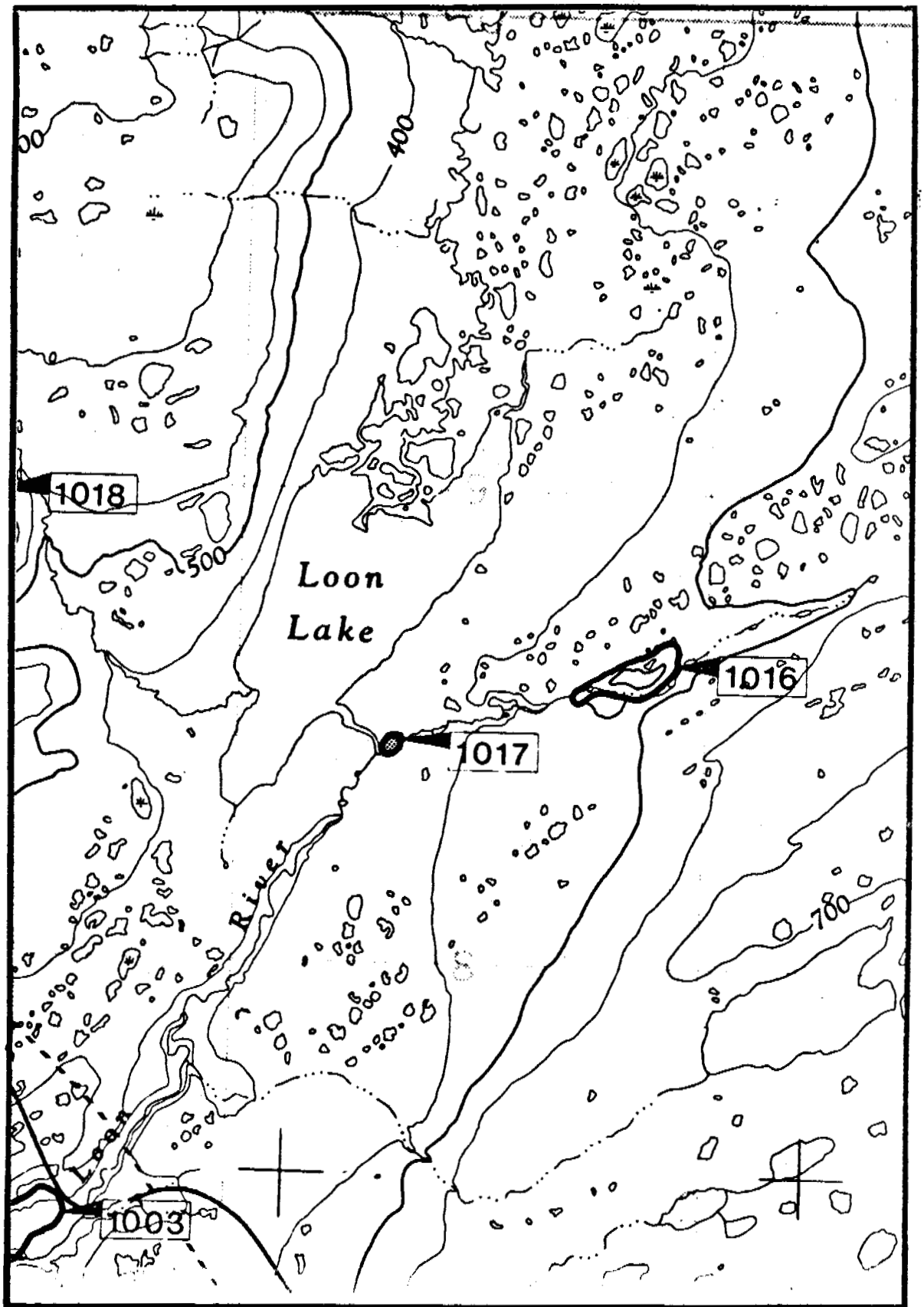
Material: Sand and silt, trace of gravel.

Assessment: The sand and silt at site 1017 is of poor quality and is unsuitable for construction purposes. The site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. 12579-217 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1017

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 (4) 5 Rating: 60	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 (4) 5 Rating: 40	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 (5) Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 4 (5) Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing, Domestic, Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants, Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

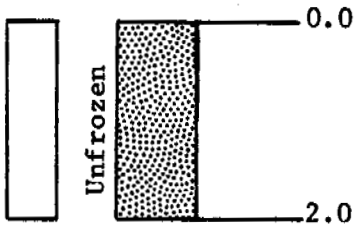
TOTAL INDEX: 370

SPECIAL CONCERNS: Adjacent east shore of Loon River. Resource and utilization values indicate high potential for disturbance. Development design should insure buffer zones and habitat replacement.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

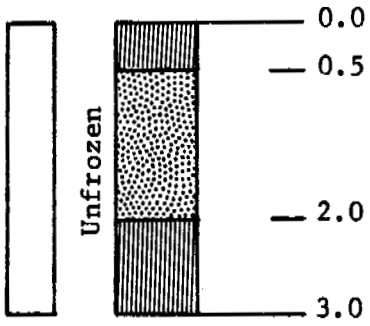
TP 1017-1



Sand, minor gravel
boulder pavement

M.C. = 6 - 13%

TP 1017-2



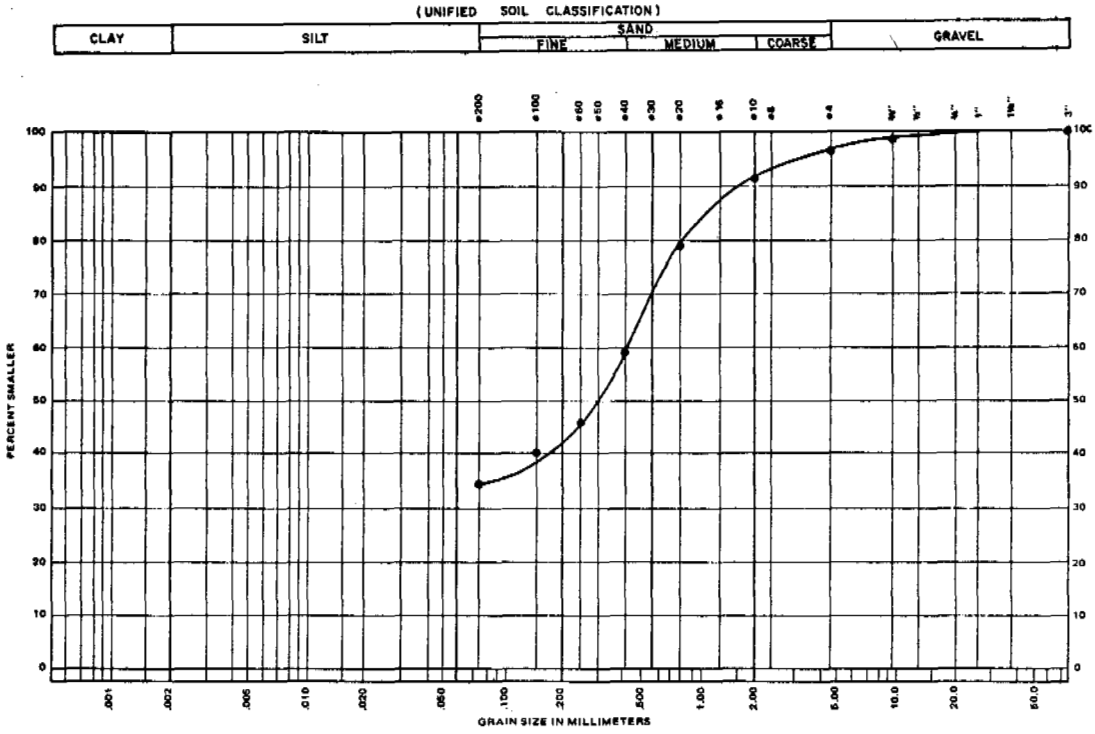
Surface silt

Sand, some gravel, poorly graded
brown

4% GRAVEL
61% SAND
35% SILT & CLAY

Silt, sandy, light brown

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

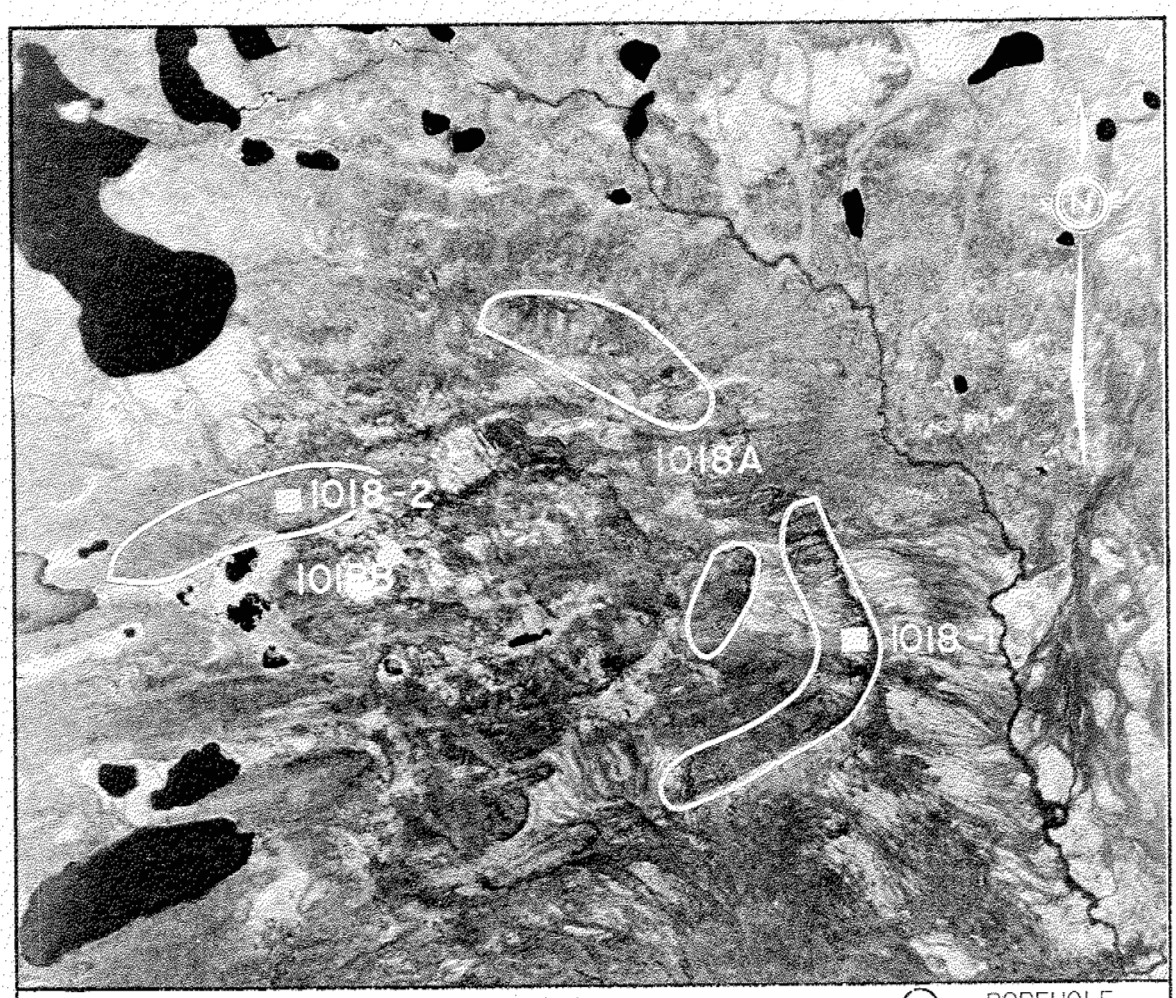
SAMPLE DESCRIPTION Sand and Silt with a Trace of Gravel (SM)

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1017-2
DEPTH 1.5'

SITE 1018

Location: Site 1018 is situated 10 miles east of the point of confluence of the Tieda and Mackenzie Rivers. The proposed highway and pipeline routes are 2.5 miles west of Loon Lake. The proposed highway and pipeline routes are 3 miles south west of the site.

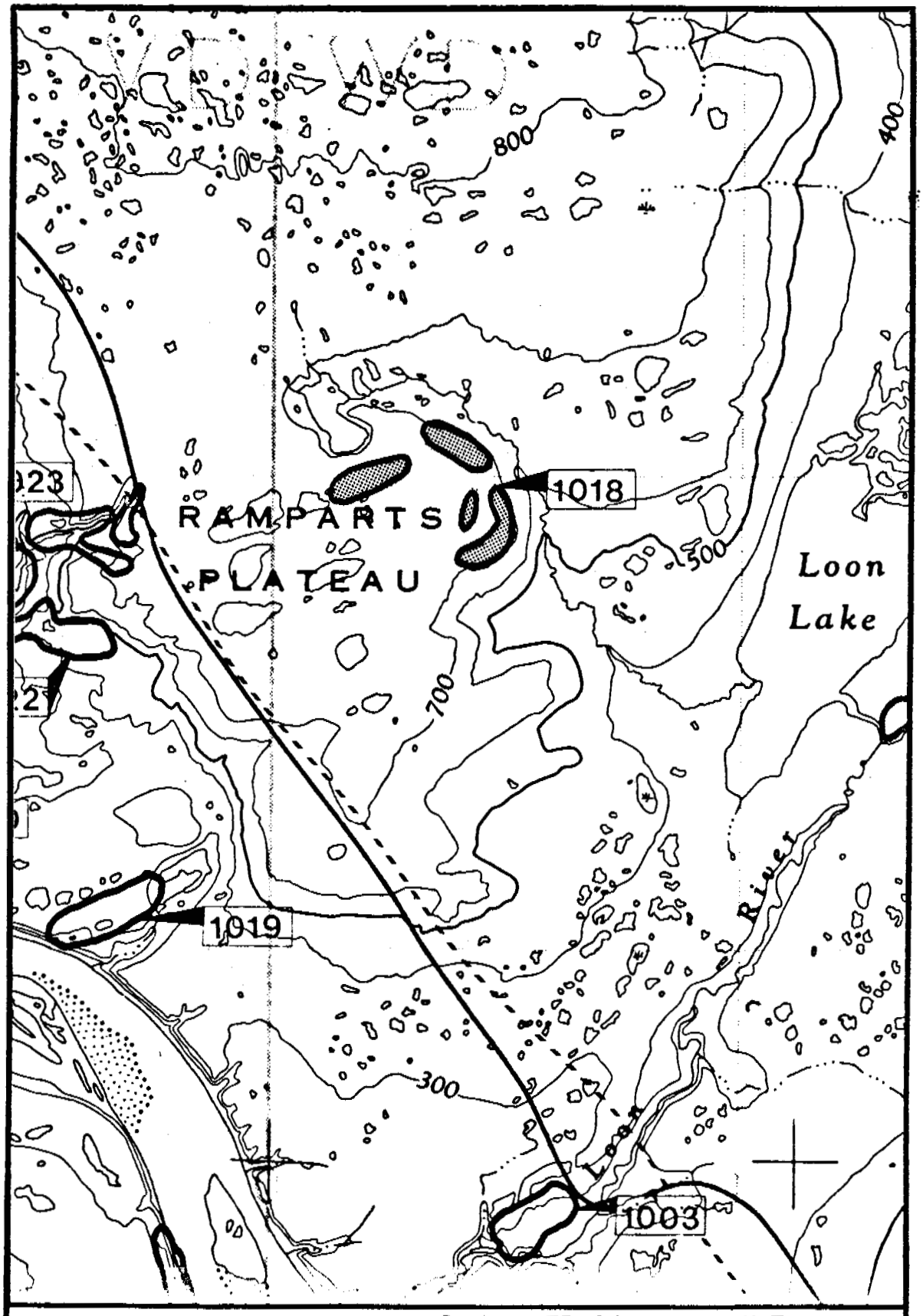
Material: 1018A, clay
1018B, limestone



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A12609-15 SCALE: 1" = 3000' (approx.)

Assessment: The material at site 1018A is unsuitable for engineering uses. The limestone at site 1018B is of fair to good quality borrow. The rock is exposed as a small ridge rising above the surrounding terrain. The environmental assessment indicates the area to be of low environmental sensitivity. More drilling will be necessary to delimit the rock and to determine overburden thickness. The haulage distance to proposed highway and pipeline routes is within reasonable limits. Site 1018B has a promising potential as a source of bedrock borrow.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1018

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION (1) 2 3 4 5 Rating: 5	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 175

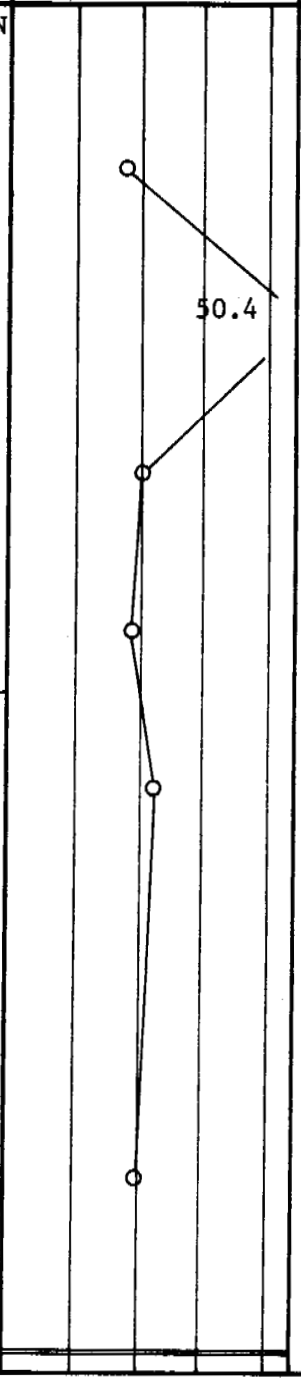
SPECIAL CONCERNS: Upland area. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1018 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
	CL	CLAY	NOT FROZEN
1		silty, trace fine sand, some fine gravel, medium plasticity, grey-brown	
2			
3		-trace of fine gravel	
4			
5			
6			
7			
8			
9			FROZEN
10		-medium plasticity, grey to brown-grey	
11			
12			
13			
14			
15			
16			
17		END OF HOLE	



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Sep.30/73

LOGGED BY: EBA 181-1

COMPLETION DEPTH: 17.5'

DRILLING METHOD: AUGER

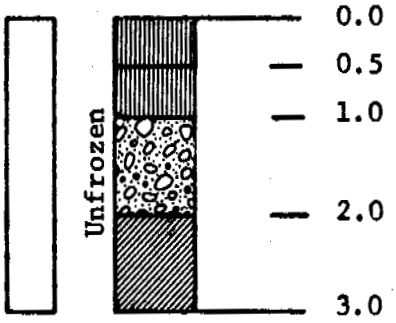
THAW DEPTH: 9.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1018-1



Silt, reddish brown

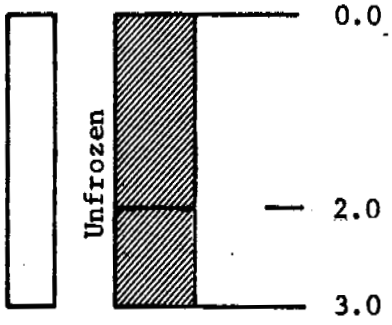
Silt, greyish brown

Gravel, medium brown, silty
some sand

35% GRAVEL
39% SAND
26% SILT & CLAY

Clay, grey, silty, gravelly
(glacial till)

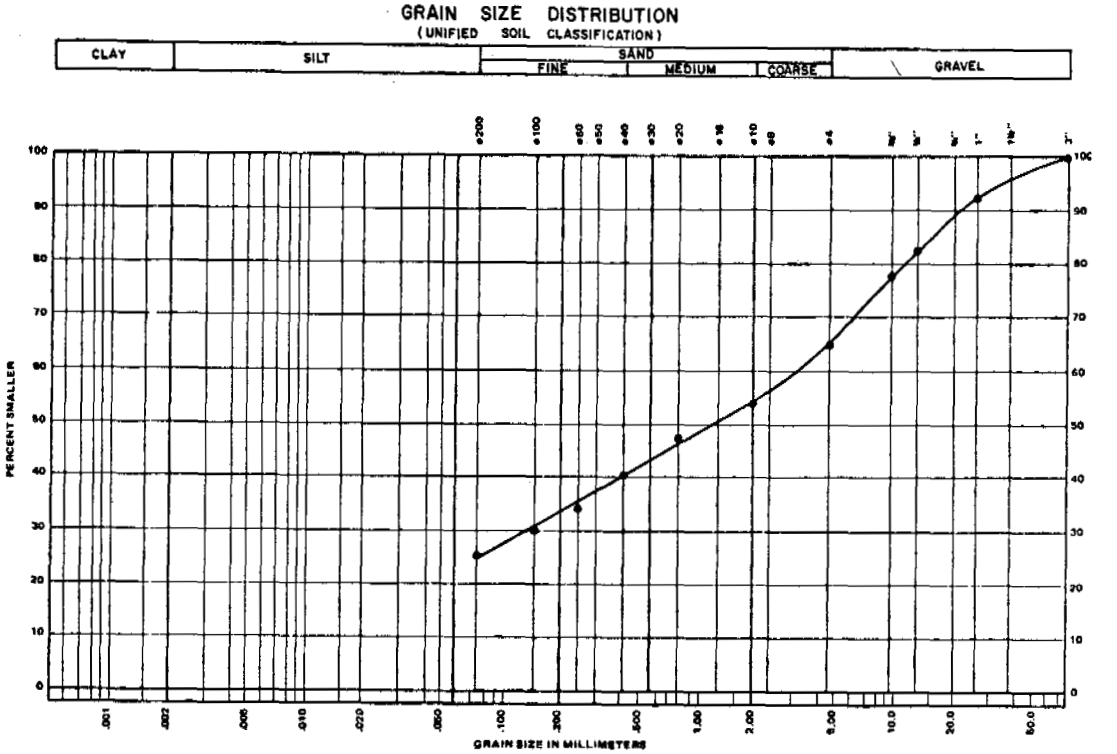
TP 1018-2



Reddish-brown, clayey
medium plasticity, cobbles
(limestone)

Clay, grey, silty, medium plasticity
limestone boulders, carbonates

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel, silty. (GM) M/C = 7%

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. TP 1018-1
DEPTH 1.5'

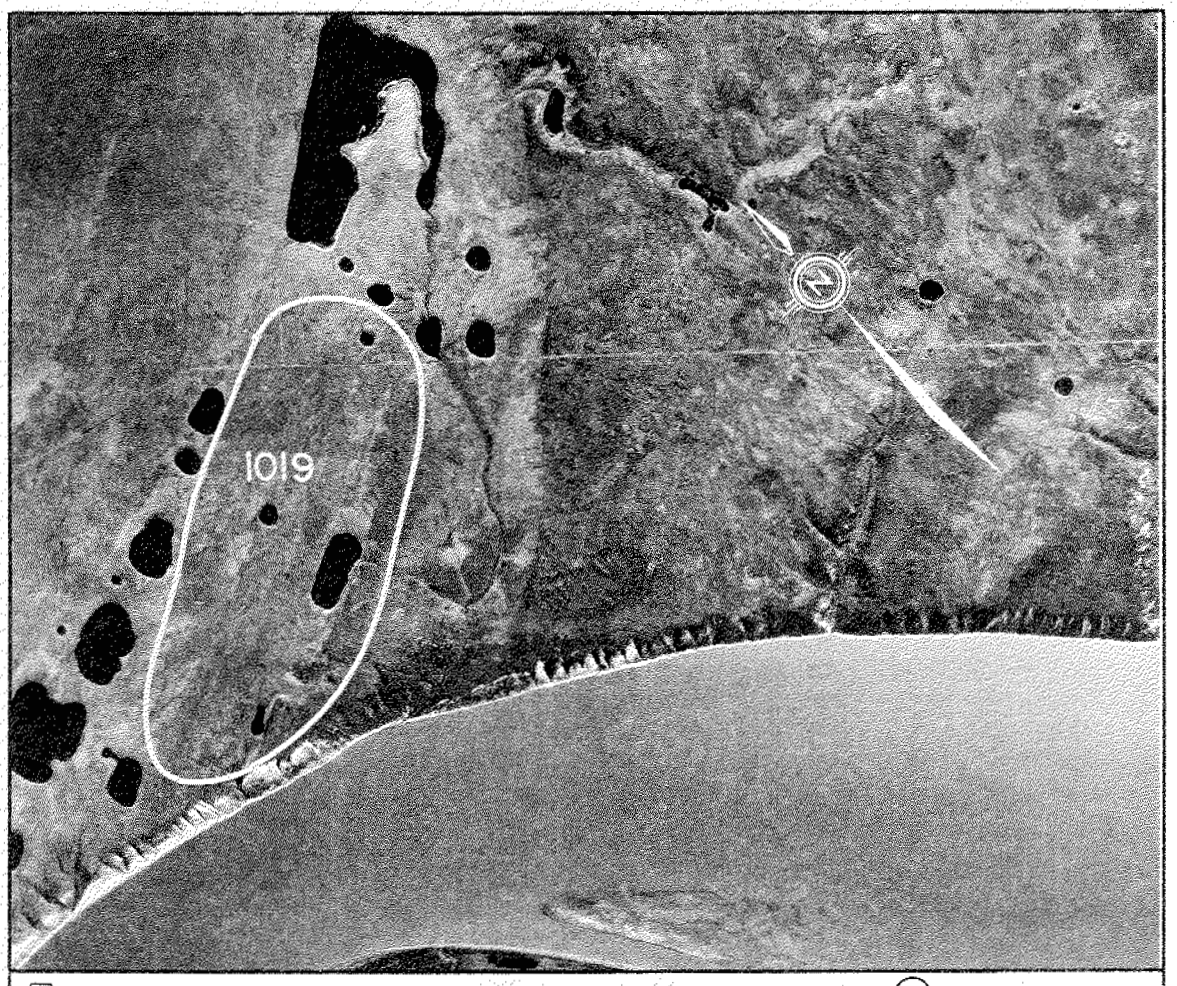
SITE 1019a

Location: Site 1019 is 6.5 miles north-west of the point of confluence of the Loon and Mackenzie Rivers. Proposed pipeline and highway routes are 3 miles north-east of the site.

Geology: Site 1019 is a small thin outwash.

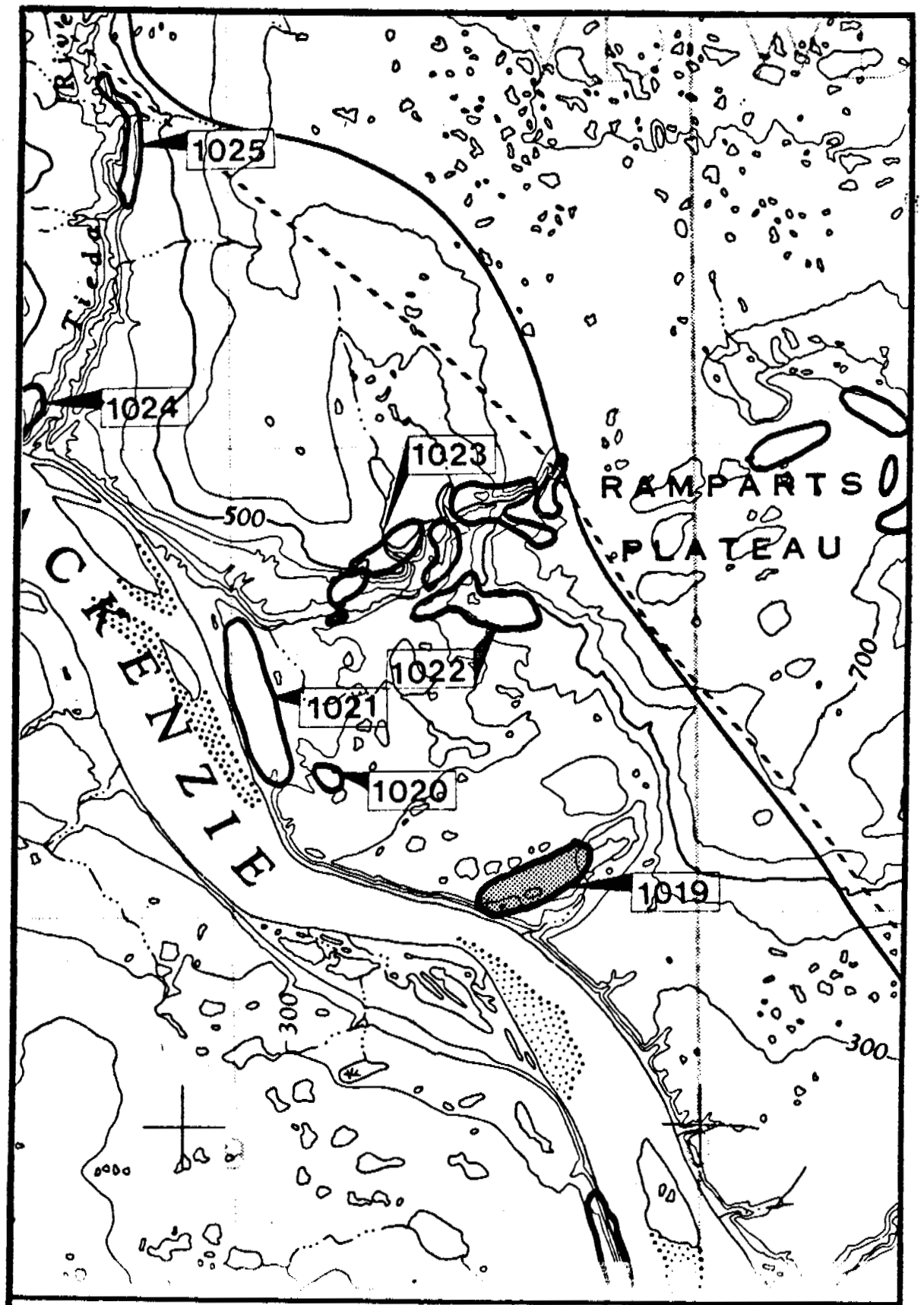
Material: Sand.

Assessment: Site 1019 is poor quality material and low volume. The site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-43 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1020

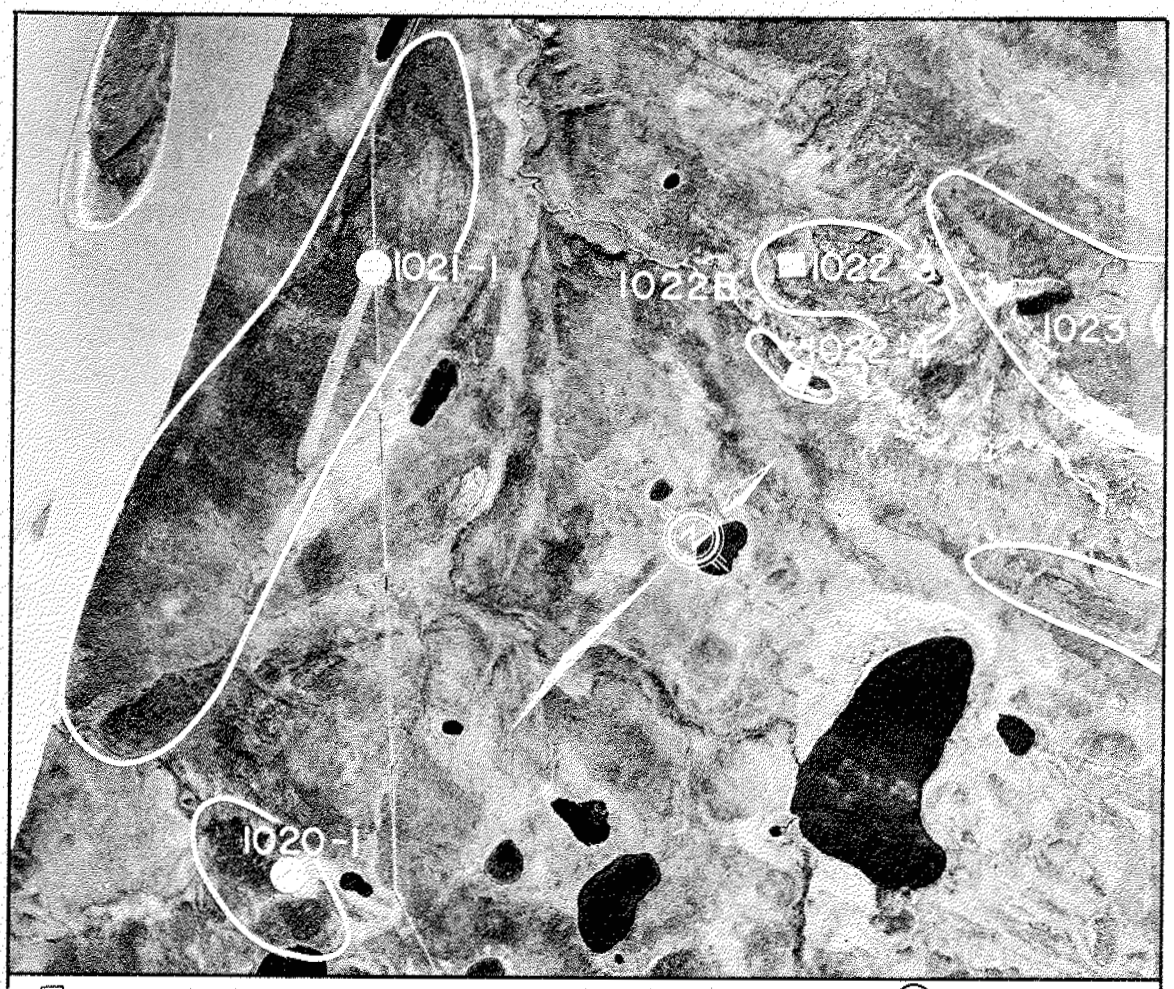
Location: Site 1020 is located one mile north-east of the Mackenzie River and 6 miles south-east of the point of confluence of the Mackenzie and Tieda Rivers. Proposed pipeline and highway routes are 4.5 miles north-east of the site.

Geology: Site 1020 is a large kame which will probably exhibit some variation in quality of material.

Material: Gravel with fine to coarse sand, well graded.

Volume: 800,000 cu. yd., estimate is reliable.

Area: 55 acres.

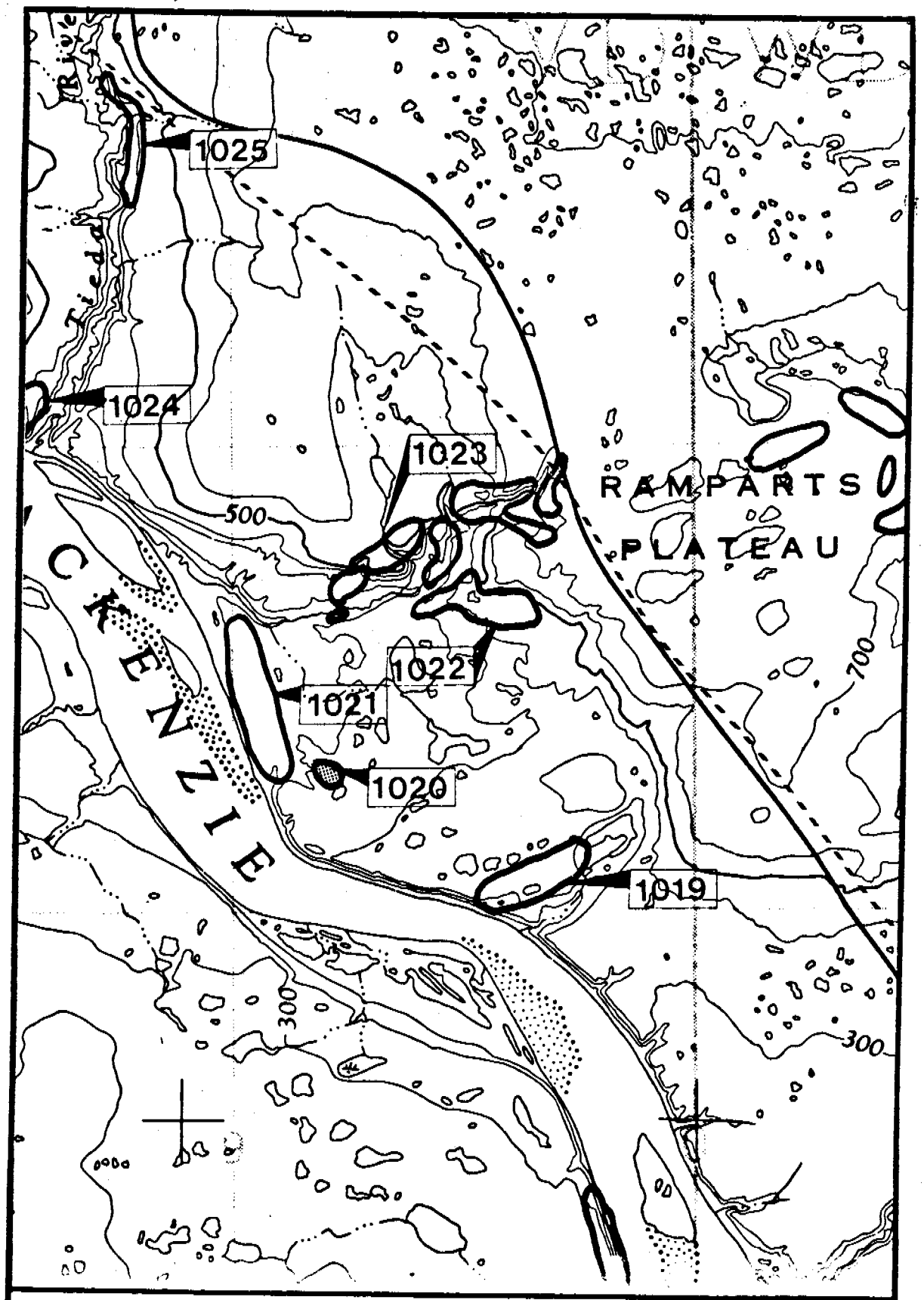


☐ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-40 SCALE: 1" = 3000' (approx.)

Drainage: The site is well drained.

Assessment: The good quality borrow at site 1020 is overlain by 12 feet of clayey silt which is unsuitable for use in construction. Haulage distance is quite long and overburden removal would be very expensive. Site 1020 should be developed only as a last resort and then only after more detailed field work to assess quality and ice content of materials.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1020

PRELIMINARY ENVIRONMENTAL OVERVIEW

R.I.R.	CATEGORY AND QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	CATEGORY AND QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

TOTAL OF ASSESSMENTS: 225

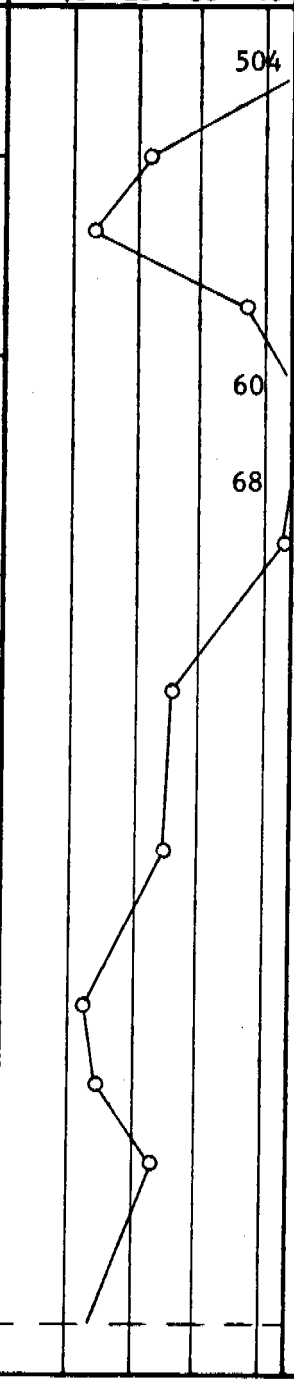
SPECIAL CONCERNS: Site near east bank of Mackenzie. Buffer zones may be required to prevent slumping.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1020 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1–2	OL	SILT brown organic, with peat	Vr
2–4	SM	SAND brown silty fine	Nbn
5–12	ML	SILT brown clayey with fine sand -sand absent	Vs
12–17	GW	GRAVEL grey with fine to coarse sand -silty zones (GM)	Nf
17			Nbn



DATE DRILLED: Mar. 13/72 LOGGED BY: MVPL 72C-51 COMPLETION DEPTH: 28'

DRILLING METHOD: Failing 1000 Air THAW DEPTH: N/A

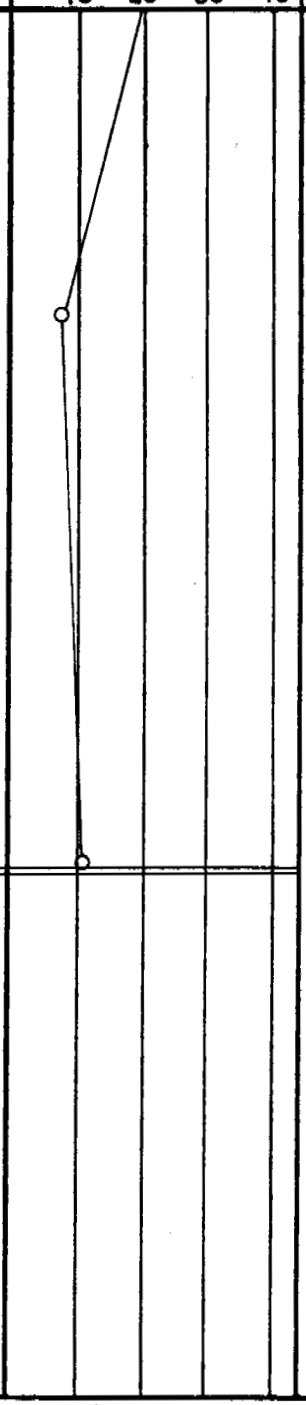
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1020 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18					18
19	GW	GRAVEL			19
20			Nbn		20
21					21
22	ML	SILT grey clayey sandy with gravel (till)			22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34



DATE DRILLED: Mar. 13/72 | LOGGED BY: MVPL 72C-51 | COMPLETION DEPTH: 28'

DRILLING METHOD: Failing 1000 Air | THAW DEPTH: N/A

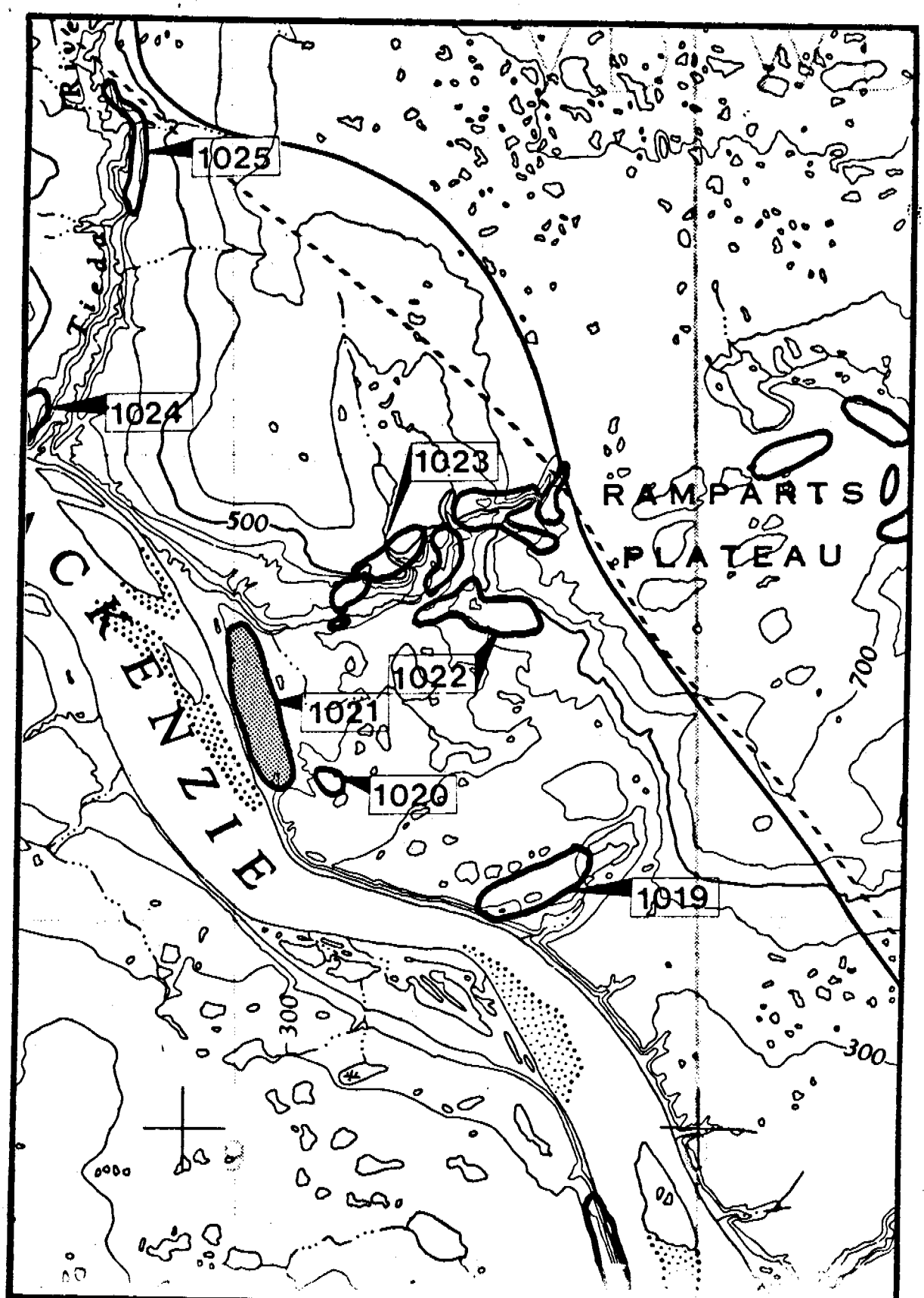
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

Drainage: The site is well drained.

Assessment: Borrow material encountered at site 1021 varies in quality with depth. Near the surface the material is of fair quality but with depth grades into good quality. Overburden consisting of 5 feet of fine sand overlies the borrow. There appears to be a large volume of material available at the site. Haulage distance is probably on the fringe of acceptable limits. Preliminary environmental assessment indicates the site to have a relatively low environmental sensitivity.

A detailed drilling program to prove qualities and quantities and establish a detailed development plan is recommended. The general guidelines for borrow pit development and environmental guidelines contained in this report may serve as a framework for development and restoration planning.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1021

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3* 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 225

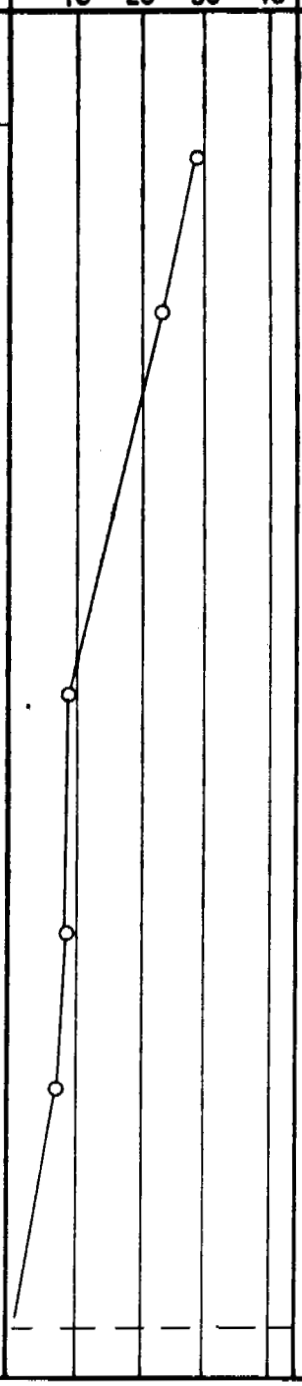
SPECIAL CONCERNS: Site near east bank of Mackenzie. Buffer zones may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1021 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	OL	SILT brown sandy organic	Vr
2, 3, 4, 5, 6, 7, 8, 9, 10	SP	SAND brown fine -silty zones (SM)	Nf
6, 7, 8, 9, 10	SW	SAND grey gravelly fine to coarse (very dense)	
11, 12, 13, 14, 15, 16, 17	GW	GRAVEL grey sandy fine to coarse (very dense)	



DATE DRILLED: Mar. 13/72 LOGGED BY: MVPL 72C-53 COMPLETION DEPTH: 20'

DRILLING METHOD: Failing 200 Air THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1021 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	GW	GRAVEL grey sandy fine to coarse (very dense)	Nf		18
19					19
20					20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Mar. 13/72 LOGGED BY: MVPL 72C-53 COMPLETION DEPTH: 20'

DRILLING METHOD: Failing 200 air THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SITE 1021

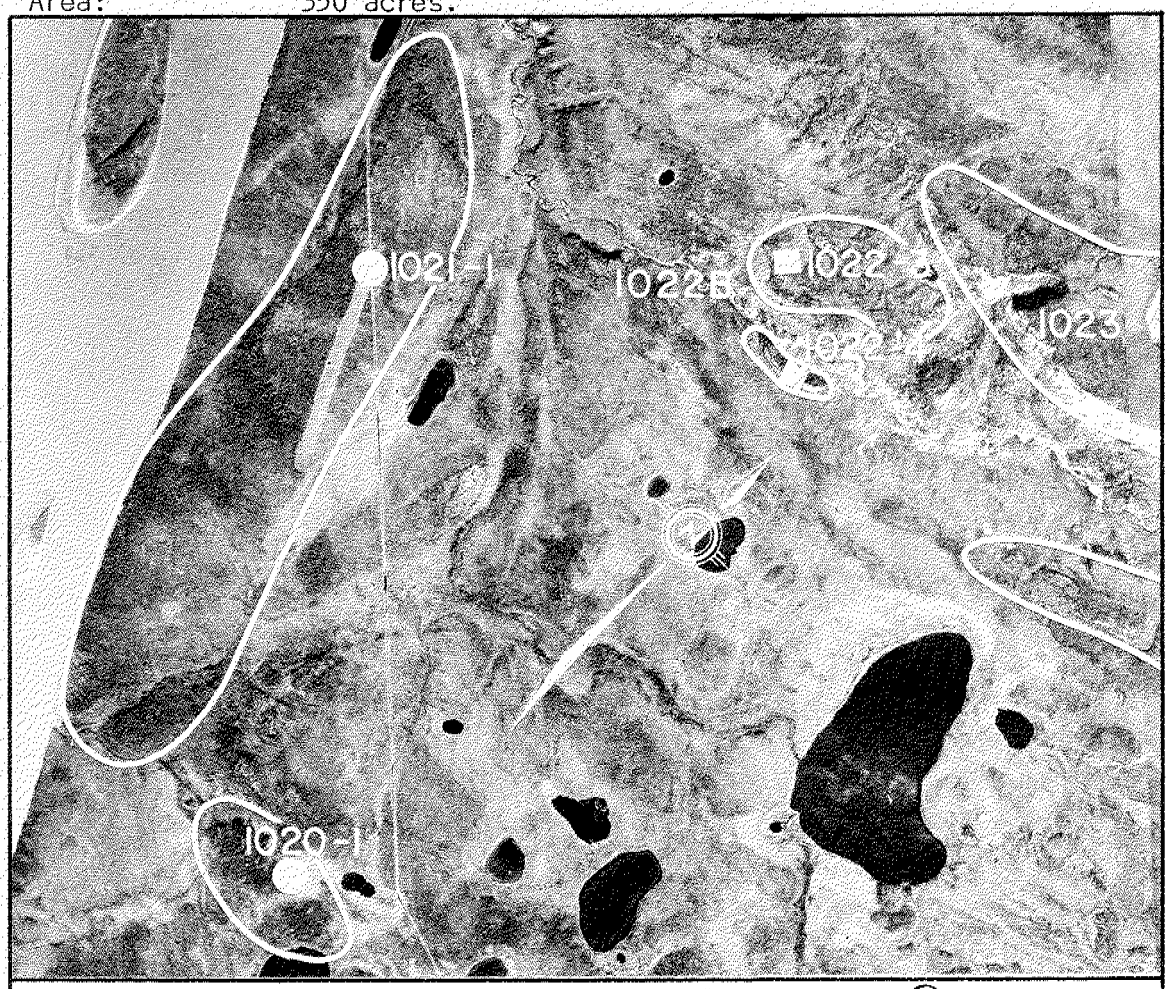
Location: Site 1021 is 5 mile east of the east bank of the Mackenzie River and 5 miles south-east of the point of confluence of the Tieda and Mackenzie Rivers. Proposed highway and pipeline routes are approximately 5 miles north-east of the site.

Geology: Site 1021 is a large long hill which may be of kame terrace origin. Variations within the material may be anticipated.

Material: Gravel and sand, well graded.

Volume: 8,500,000 cu.yd., reliability of estimate is uncertain.

Area: 350 acres.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-40 SCALE: 1" = 3000' (approx.)

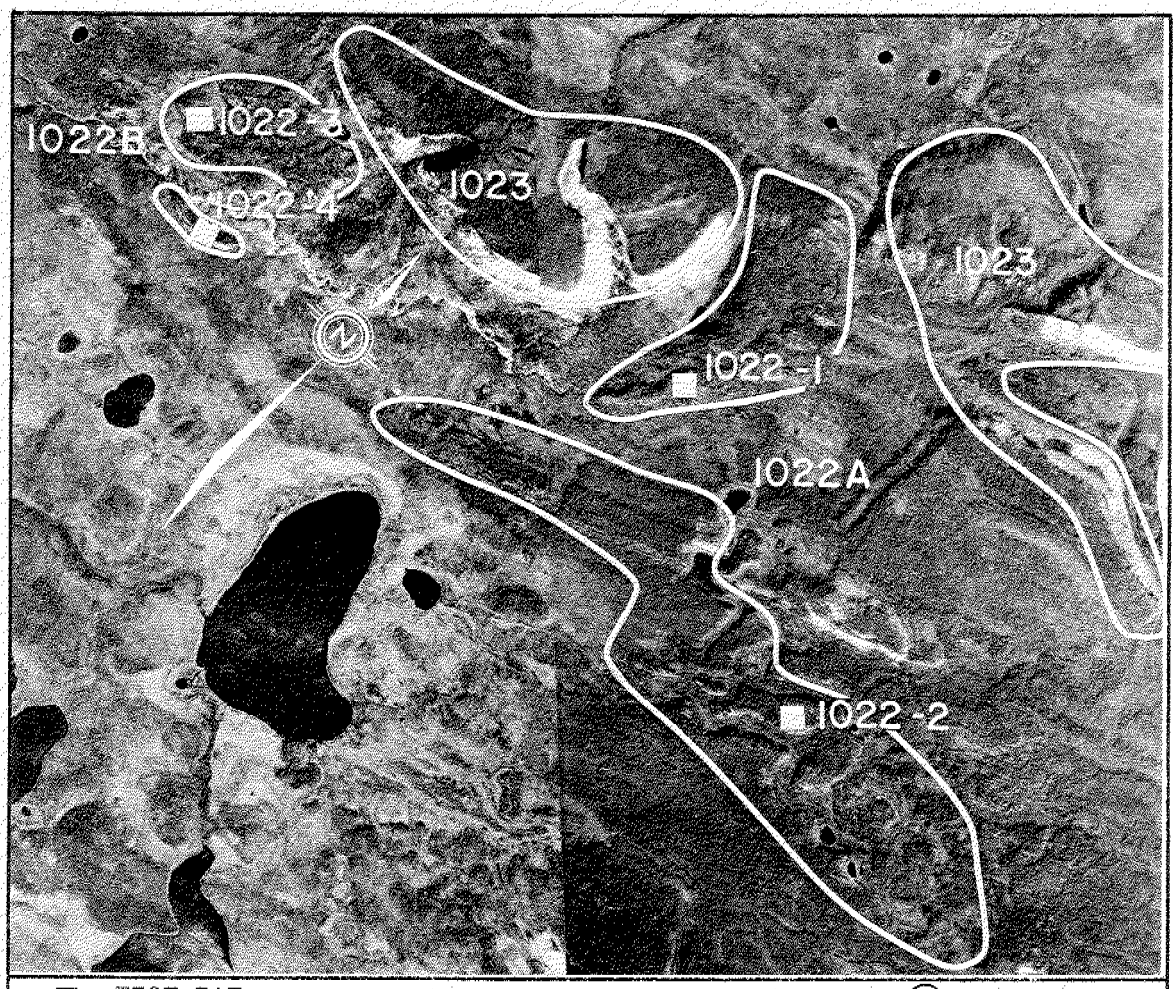
SITE 1022

Location: Site 1022 is 11 miles west of Loon Lake, 5 miles SEE of the point of confluence of the Tieda and Mackenzie Rivers. The site is 2.5 miles west of proposed highway and pipeline routes.

Geology: Granular materials at this site are in the form of kames and kame terraces.

Material: Variable from gravel and sand with a trace of silt to gravelly sand and silt, fairly well graded.

Volume: 4,500,000 cu. yd., volume estimate is probably conservative.



□ TEST PIT ○ BOREHOLE

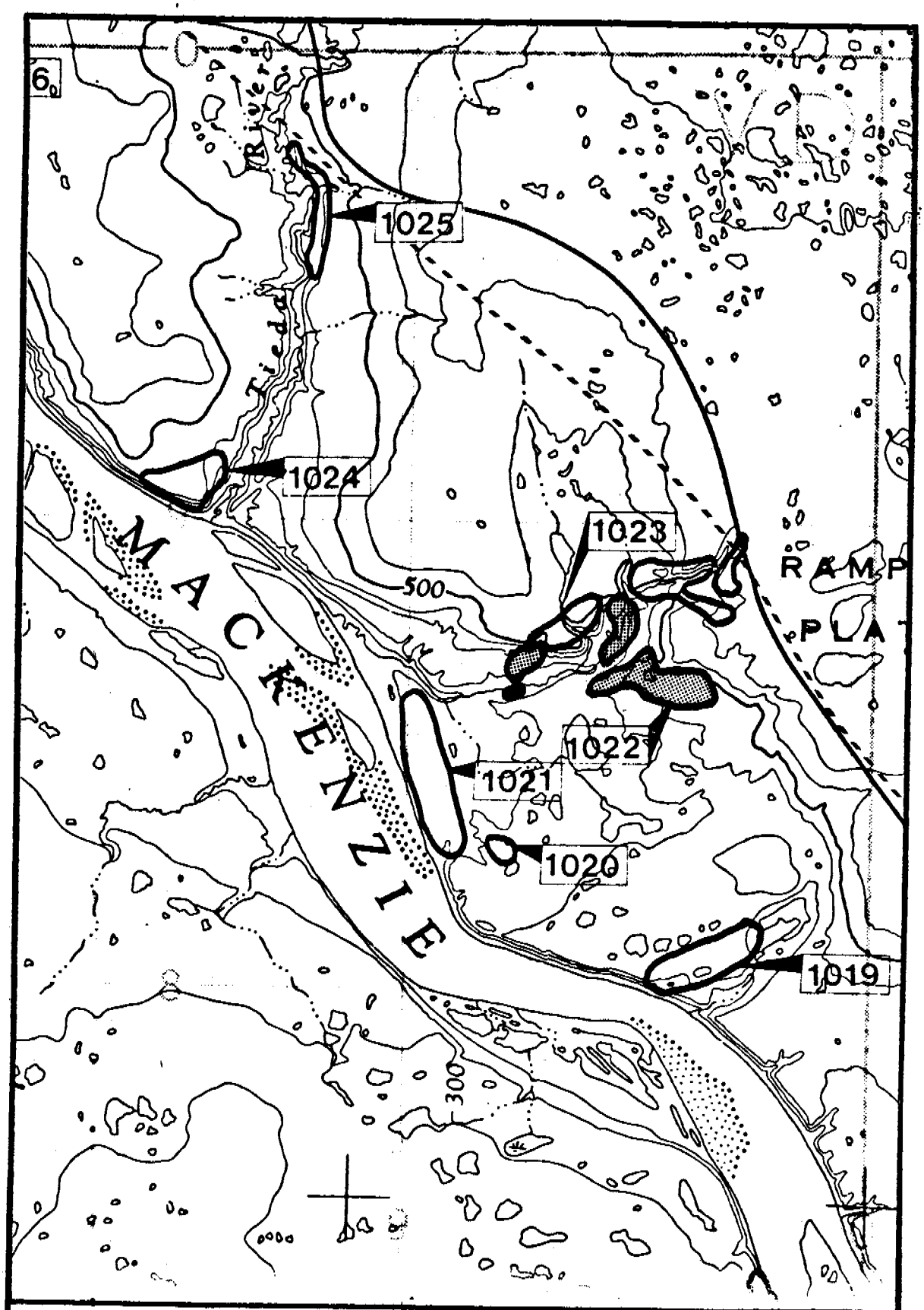
AIRPHOTO No. A22890-65
A22858-40

SCALE: 1" = 3000' (approx.)

Area: 300 acres.

Drainage: The site is well drained by an unnamed creek.

Assessment: The quality of borrow varies considerably at this site. A large volume of fair to good quality borrow was encountered at 1022A but poor quality borrow was found at 1022B. Overburden thickness is variable and tree cover is dense. Frost depth varies from 7 to 14 feet. Access to the site may be difficult because of the steep hills and cliffs surrounding it, however, haulage distance is relatively short. The preliminary environmental assessment indicates the site to have a relatively low environmental sensitivity. A drilling program should be carried out prior to any development to prove quantity and quality of material present at site 1022A. Borrow pit development within the general guidelines contained in this report is suggested.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1022

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 235

SPECIAL CONCERNS: Straddles tributary to Tieda River. Siltation controls may be required.

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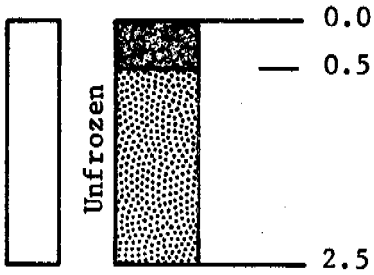
VANCOUVER, B. C.

TEST PIT LOG

TP 1022-1

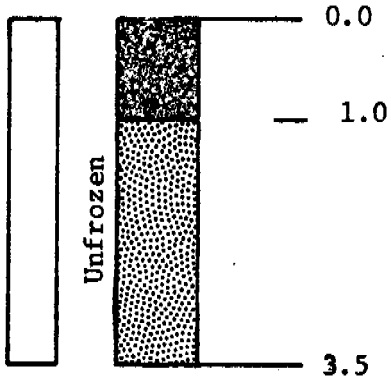


Surface organics and silt

Sand, gravelly, brown, poorly graded to well graded

21% GRAVEL
41% SAND
38% SILT & CLAY

TP 1022-2



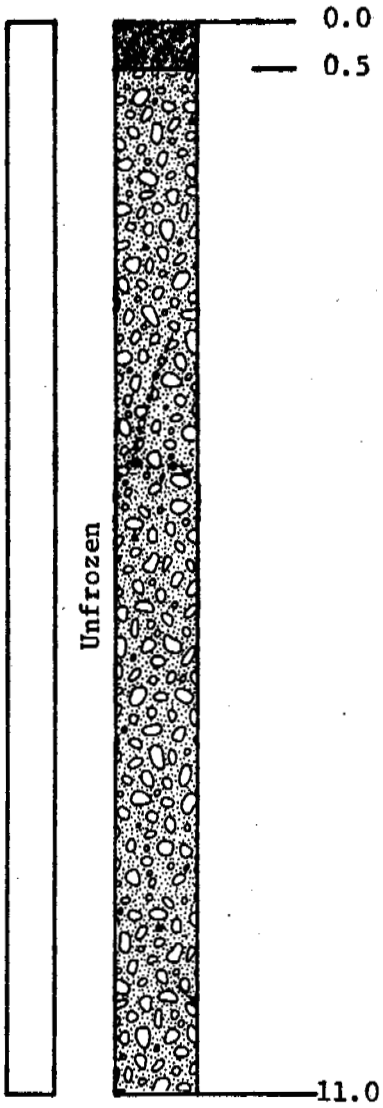
Surface organics and silt

Sand, some gravel and silt, well graded

85% GRAVEL
14% SAND
1% SILT & CLAY

SURFACE EXPOSURE LOG

TP 1022-3



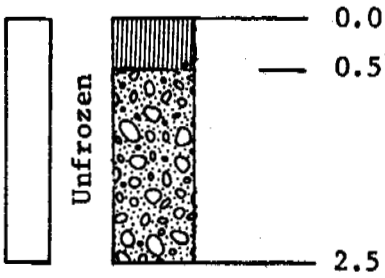
Surface organics

7% GRAVEL
48% SAND
45% SILT & CLAY

Cobbles, gravel, some sand to sandy

TEST PIT LOG

TP 1022-4



Surficial silt, organics

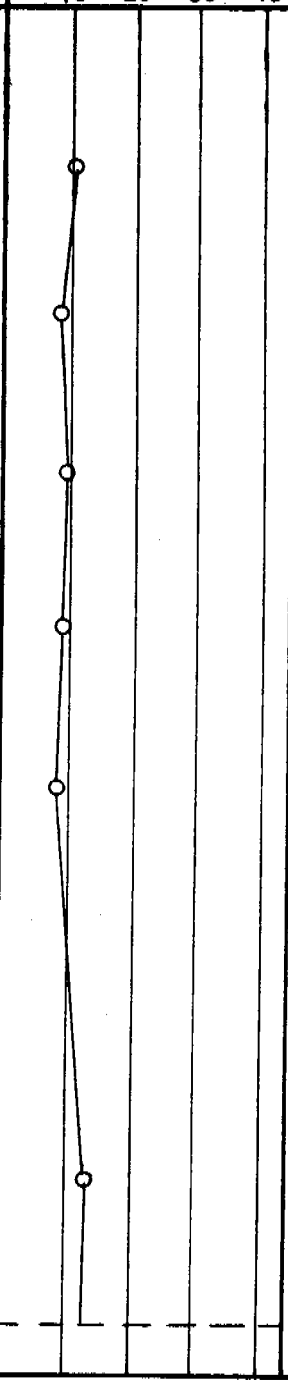
Sand and Gravel, silty, medium brown

41% GRAVEL
55% SAND
4% SILT & CLAY

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1022 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1–5	SM	SAND -silty, very fine, dry, light brown -very silty, trace to some fine to medium sized gravel	NOT FROZEN
5–12	ML	SILT -some sand, trace of fine gravel, dry, light to medium brown	
12–17	ML	SILT -some clay, moist, medium brown	Nbn



DATE DRILLED: Oct.1/73 LOGGED BY: EBA 307-1 COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1022 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SILT same			18
19					19
20					20
21		END OF HOLE			21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 1/73

LOGGED BY: EBA 307-1

COMPLETION DEPTH: 20.5

DRILLING METHOD: AUGER

THAW DEPTH: 14.0'

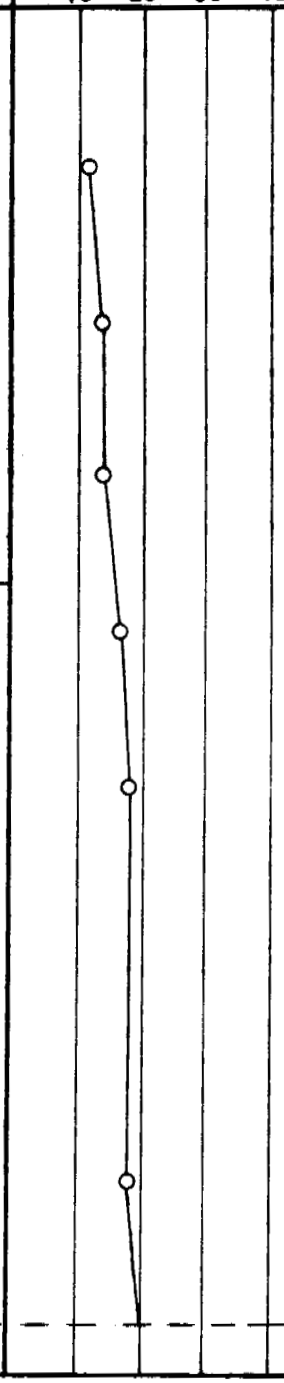
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1022 HOLE NO. 3 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	SM	SAND -very silty, trace fine gravel, sand fine, dry, light brown.	NOT FROZEN
2			
3	SM	SILT & SAND -fine, dry, light brown	
4			
5			
6	ML	SILT -some fine sand, trace clay moist to dry, slight plasticity, light brown	
7			
8			FROZEN
9			
10			
11		-some clay, low plasticity	
12			
13			
14			
15			
16			
17			



DATE DRILLED: Oct.1/73

LOGGED BY: EBA 307-3

COMPLETION DEPTH: 18.5'

DRILLING METHOD: AUGER

THAW DEPTH: 7.5

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1022 HOLE NO. 3 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	ML	SILT	FROZEN		
18		-same			18
19		END OF HOLE			19
20					20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Oct. 1/73

LOGGED BY: EBA 307-3

COMPLETION DEPTH: 18.5'

DRILLING METHOD: AUGER

THAW DEPTH: 7.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1022 HOLE NO. 4 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1		SAND -silty, some fine gravel, subangular, sand fine to medium grained, dry, light brown	NOT FROZEN		1
2	SM				2
3					3
4		9.3% O.C.			4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12		-moist	Nbn		12
13					13
14					14
15					15
16		END OF HOLE			16
17					17

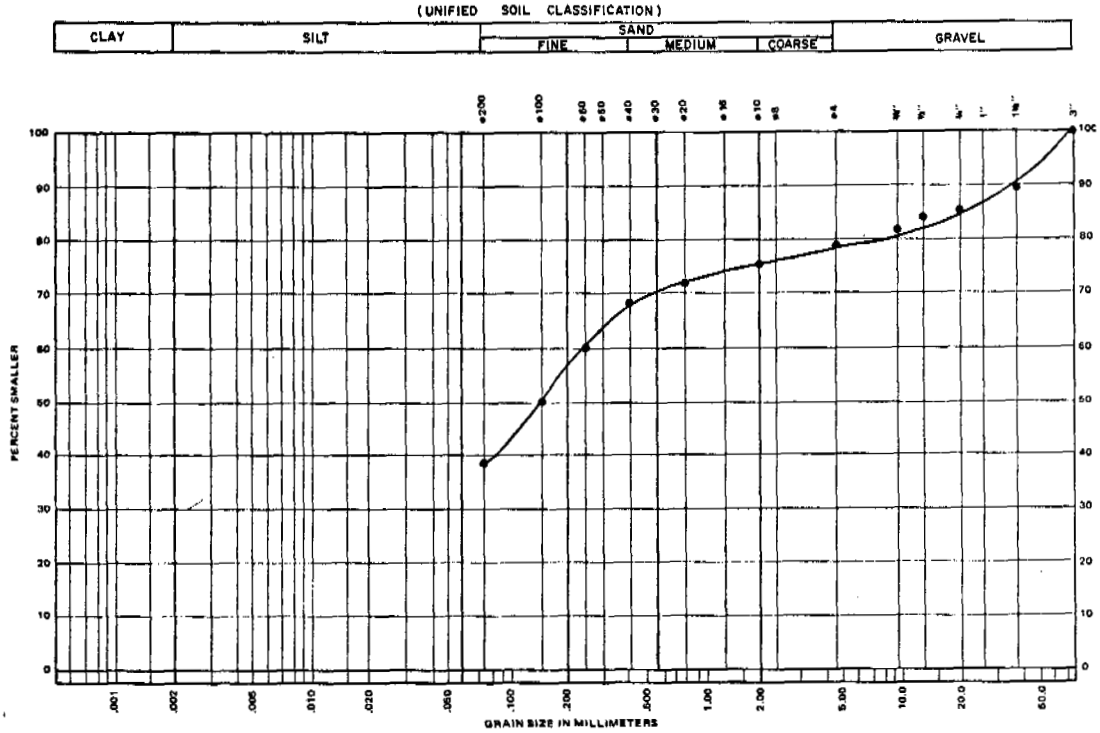
DATE DRILLED: Oct. 1/73 LOGGED BY: EBA 307-4 COMPLETION DEPTH: 15.5'

DRILLING METHOD: AUGER THAW DEPTH: 11.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

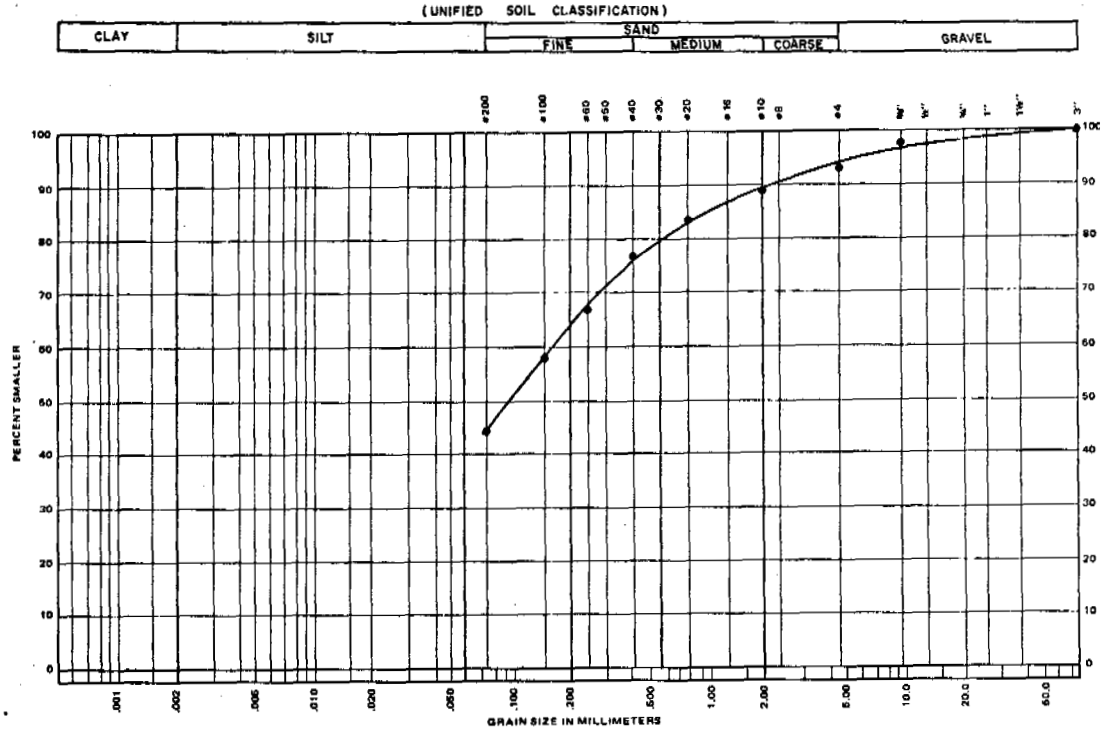


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt, Gravelly, (SM) M/C = 9.0%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1022-1
DEPTH 0.5 - 2.5'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

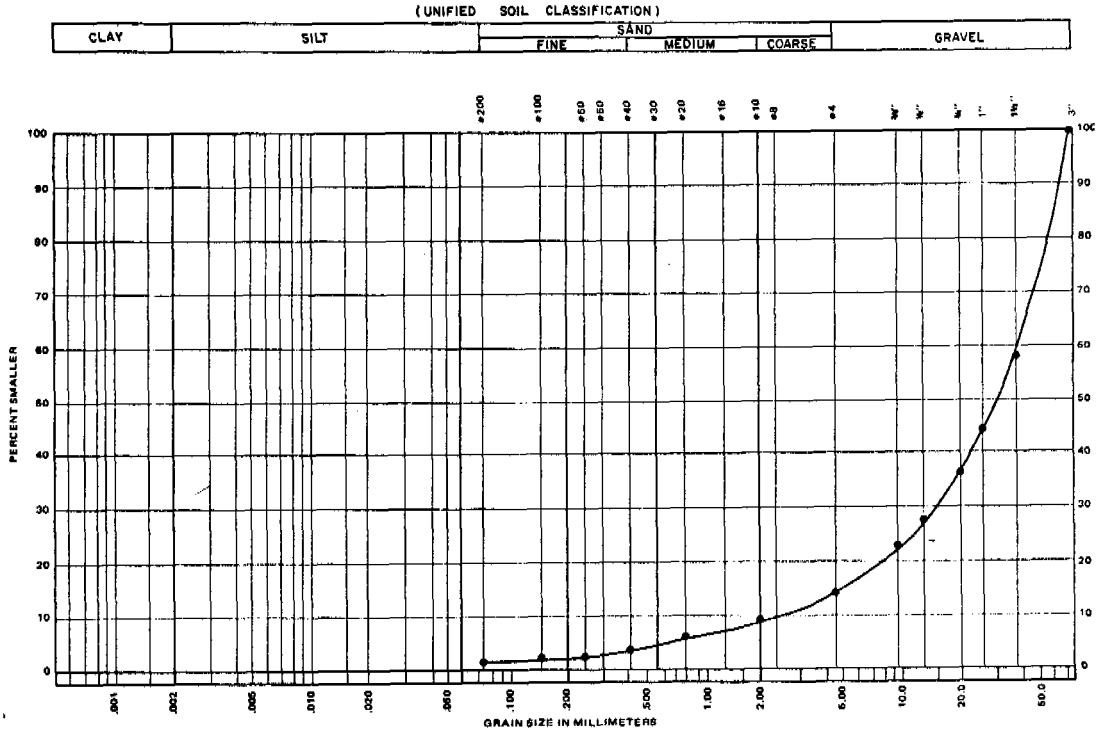


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt with a Trace of Gravel (SM) M/C = 12.7%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1022-2
DEPTH 3.5'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

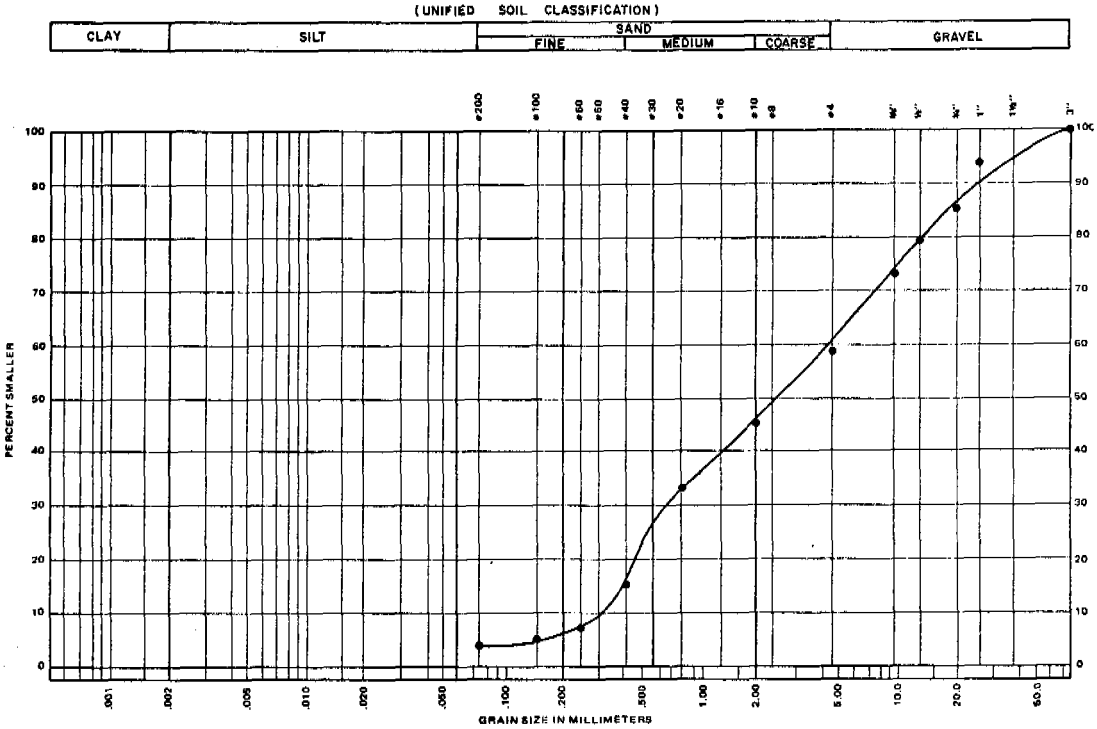


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Gravel some Sand and a Trace of Silt (GW) M/C = 3%

PROJECT: Granular Resources
JOB No.: E666 DATE: Dec.17/73
SAMPLE No.: TP 1022-3
DEPTH: 11'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



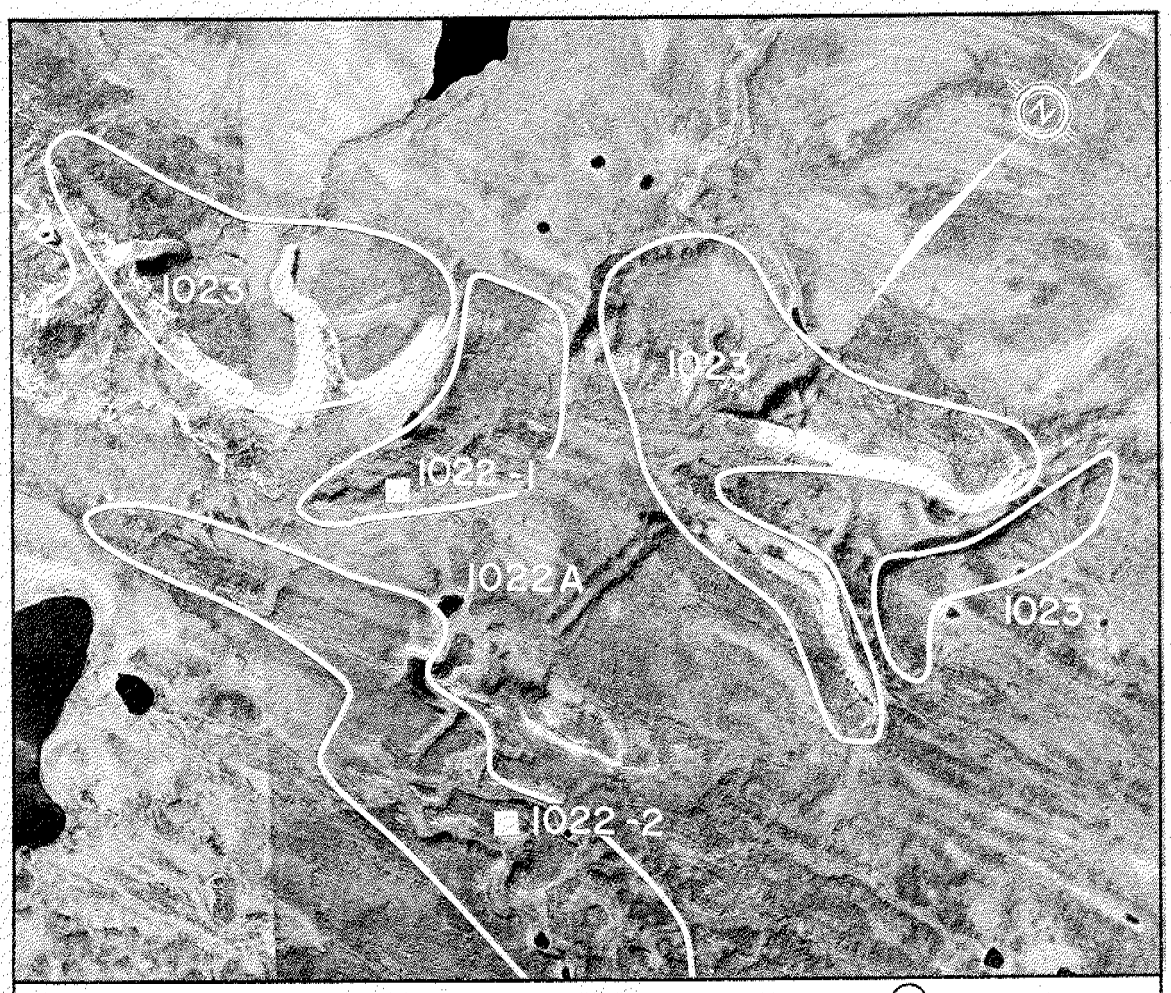
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Sand and Gravel with a Trace of Silt (GP) M/C = 2%

PROJECT: Granular Resources
JOB No.: E666 DATE:
SAMPLE No.: TP 1022-4
DEPTH: 2.5'

SITE 1023

Location:	Site 1023 is 9.5 miles west of Loon Lake and 6 miles east of the point of confluence of the Tieda and Mackenzie Rivers. Proposed pipeline and highway routes are less than one mile east of the site.
Material:	Limestone.
Volume:	Unlimited.
Area:	350 acres.
Drainage:	The site is well drained.

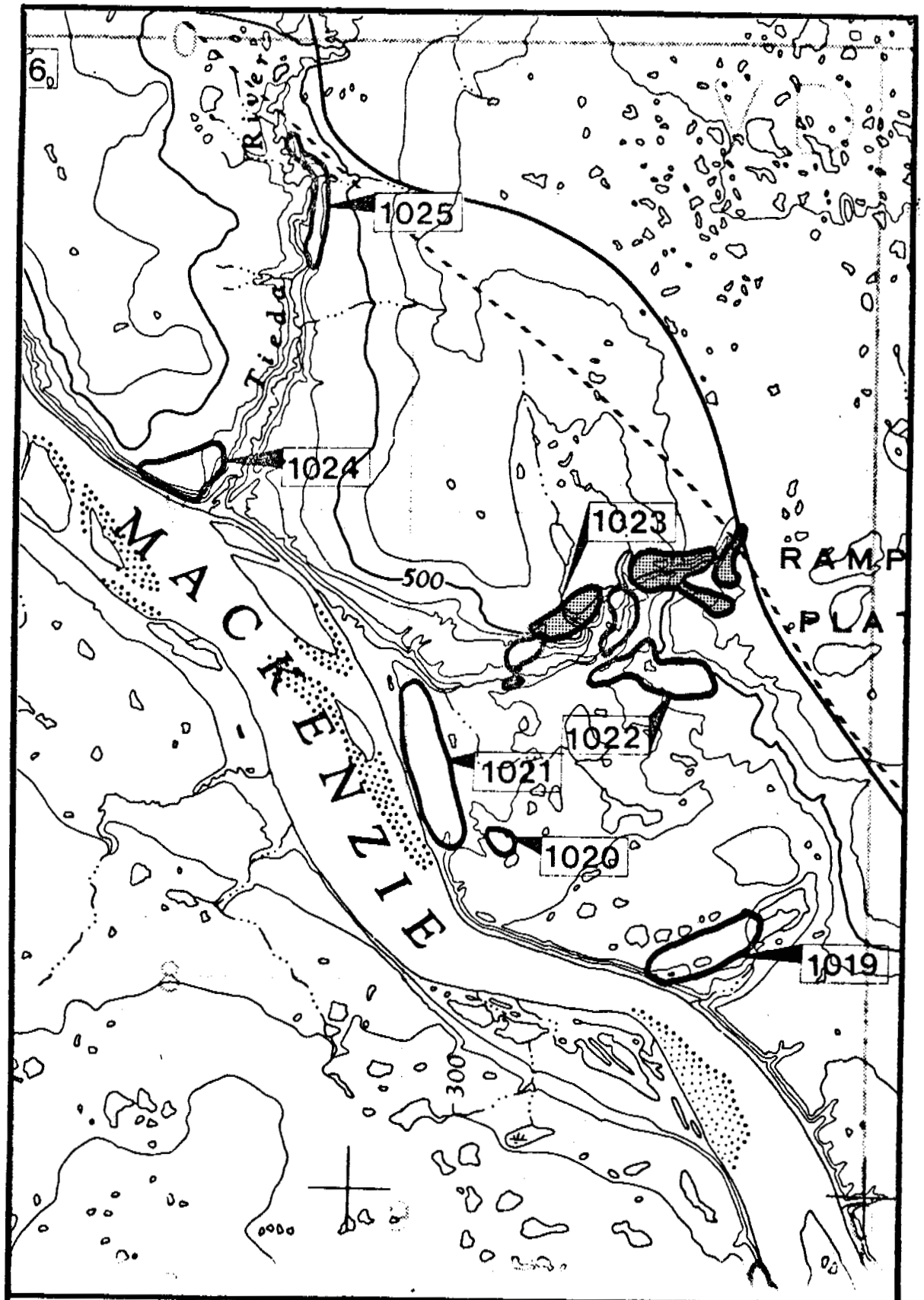


□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A-22890-85
A-22858-40

SCALE: 1" = 3000' (approx.)

Assessment: The limestone at site 1023 could serve as fair to good quality borrow and is of almost unlimited volume. Access should be relatively easy as the end of the site is less than 5 mile from the proposed locations. The site has been assessed to have a moderate environmental sensitivity with major emphasis falling on aesthetics and restoration. Quarrying should not be attempted from existing scarp faces and attention should be directed towards stringent siltation control. General guidelines for quarry development are contained within this report.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1023

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Grayling, Pike, Trout-Perch, Lake Trout, Burbot, Suckers, Stickleback Smelt, Sculpin, Goldeye, Chub, Dace, Walleye, Char, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 2 3 4 (5) Rating: 50	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 300

SPECIAL CONCERNS: Scarp faces in headwater area. May be visible from highway. Buffer zones may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

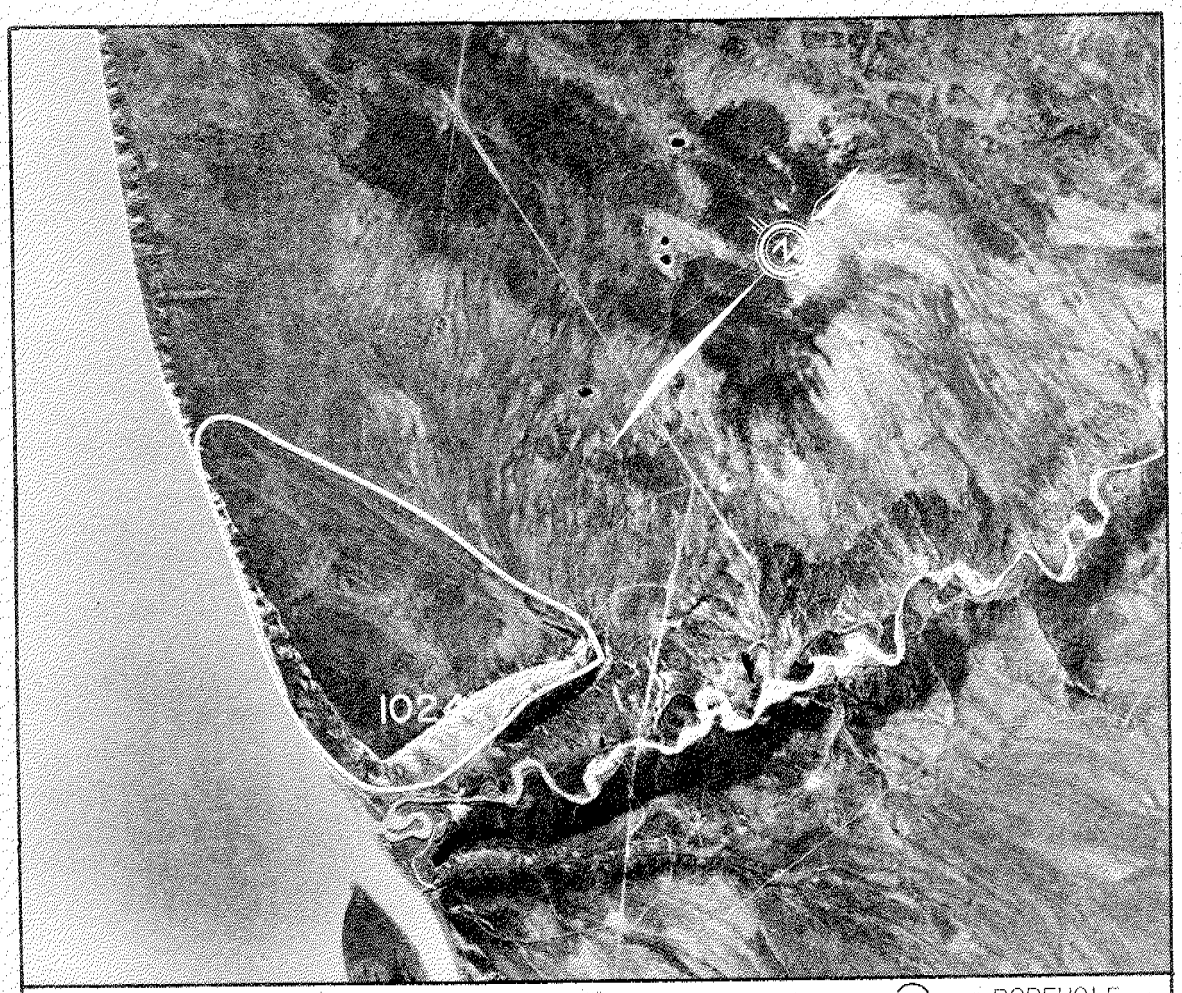
SITE 1024a

Location: Site 1024 is situated on the north shore of the Mackenzie River at the point of confluence of the Tieda River. Proposed pipeline and highway routes are located 5 miles NE of the site.

Material: Limestone.

Volume: Unlimited.

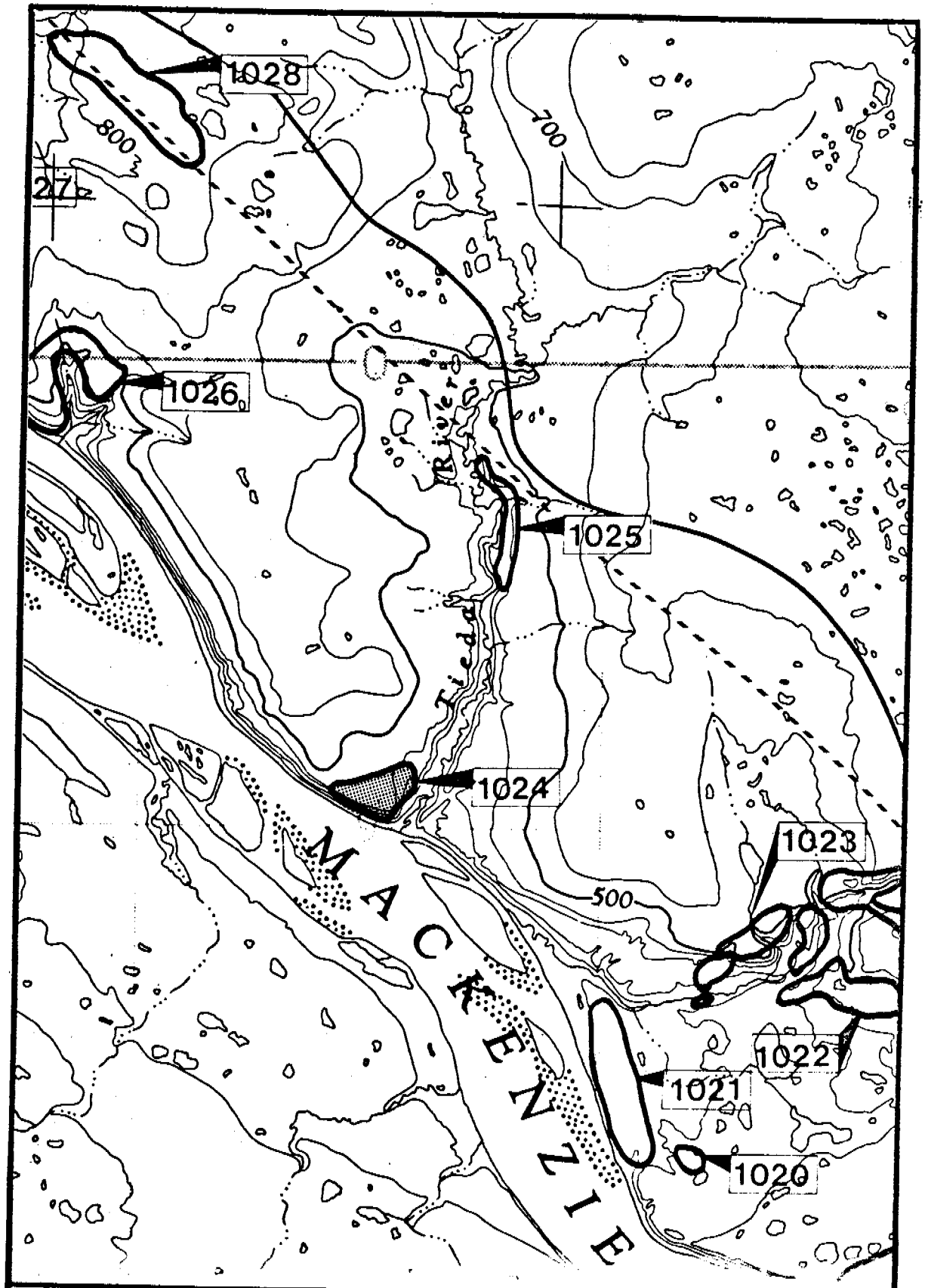
Area: 300 acres.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-37 SCALE: 1" = 3000' (approx.)

Assessment: The limestone is not suitable for concrete aggregate, however, it would be suitable for fair to good quality general fill. Haulage distance (5 air miles) to highway and pipeline routes is on the outer fringe of acceptable limits. An almost unlimited quantity of material is available, however, a thick layer of silt overburden, approximately 20 feet thick, overlies the rock. The site has been assessed to be very sensitive environmentally. Site 1024 is not recommended for development because of overburden thickness, haulage distance and environmental sensitivity.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1024

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 4 (5) Rating: 25	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 4 (5) Rating: 50	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
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R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
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10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 4 (5) Rating: 50	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 380

SPECIAL CONCERNS: Site is scarp area at confluence of Tieda River with Mackenzie. Peregrine falcons nest in the scarp face, May to August. River bank stability important to wildlife, fishery and visual values. Blasting may require permits. Buffer zones and restoration guidelines may be imposed.

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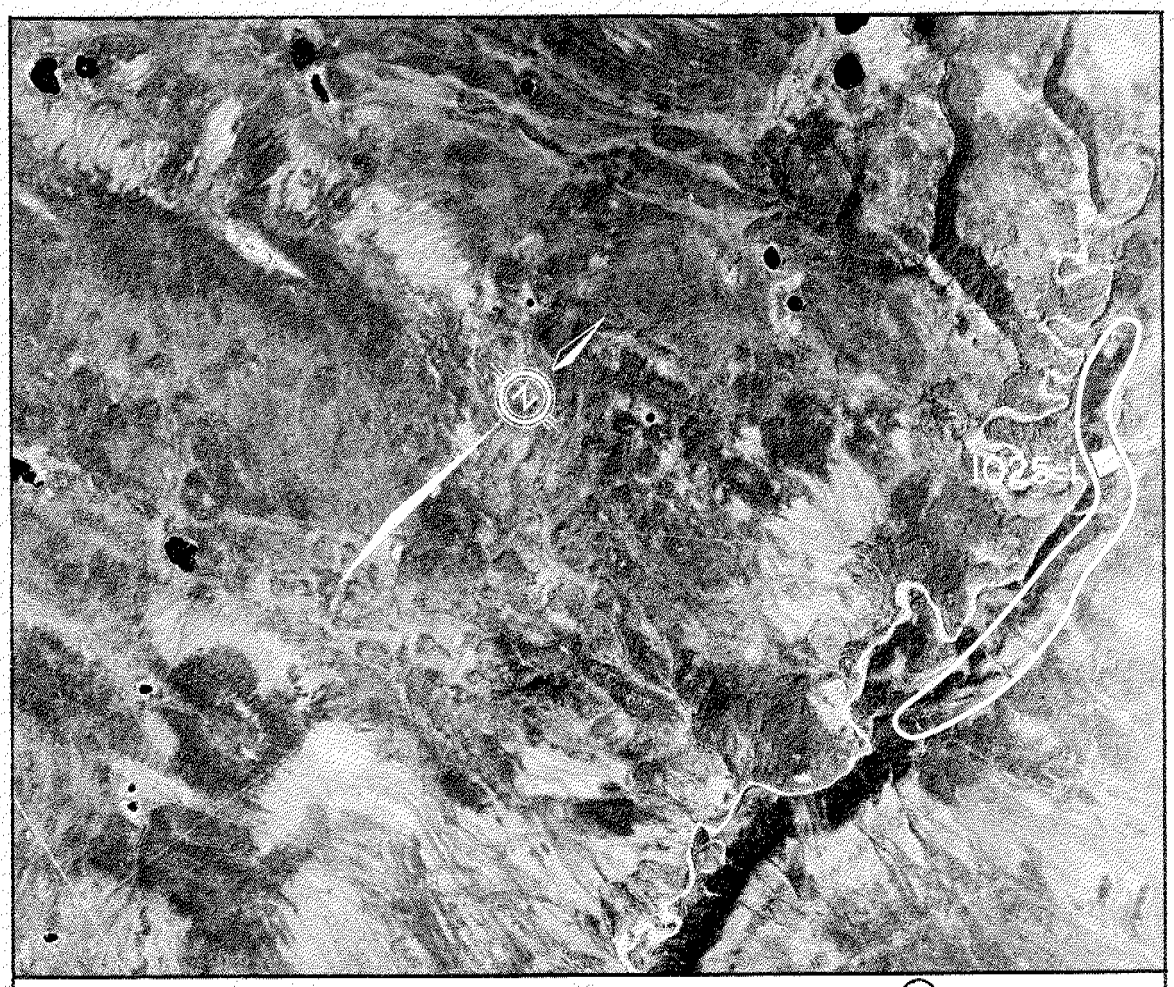
SITE 1025

Location: Site 1025 is located at the top of the Tieda River Valley, 4 miles upstream from the point of confluence with the Mackenzie River. Proposed pipeline and highway routes are less than one mile north of the end of the site.

Geology: Site 1025 is a long, relatively straight esker paralleling the Tieda River Valley.

Material: Gravelly silt.



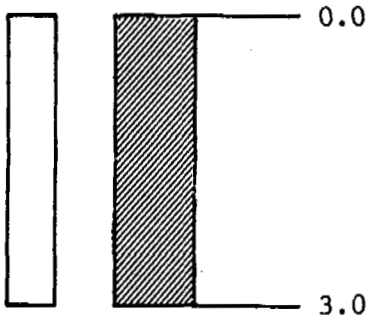
□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-37 SCALE: 1" = 3000' (approx.)

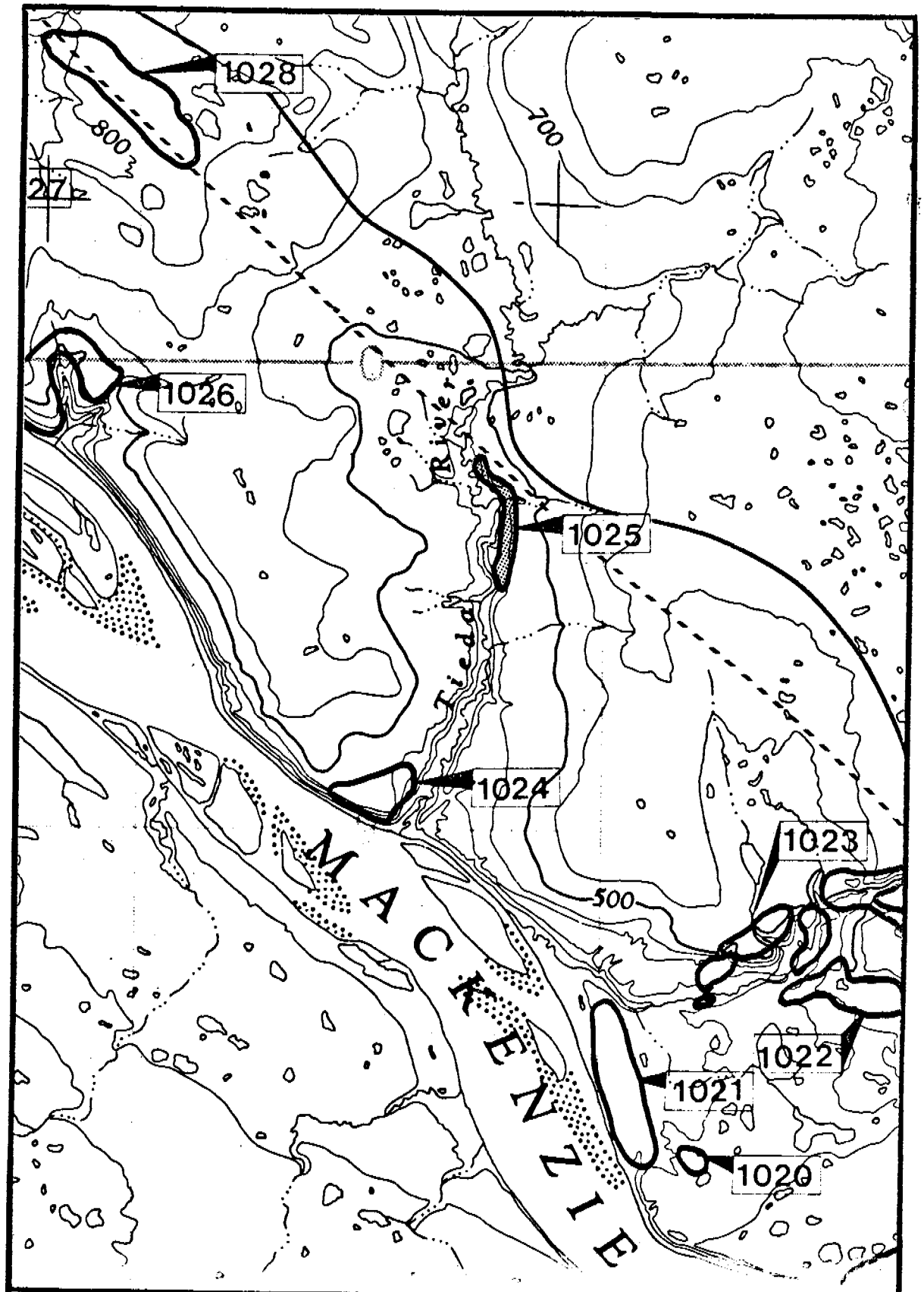
Assessment: Access to site 1025 was difficult and material tested of poor to fair quality. The site is close enough to proposed highway and pipeline routes to warrant more detailed examination. The material is expected to be variable, however, there is a good probability of encountering good quality borrow.

TEST PIT LOG

TP 1025-1



Gravelly silt



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

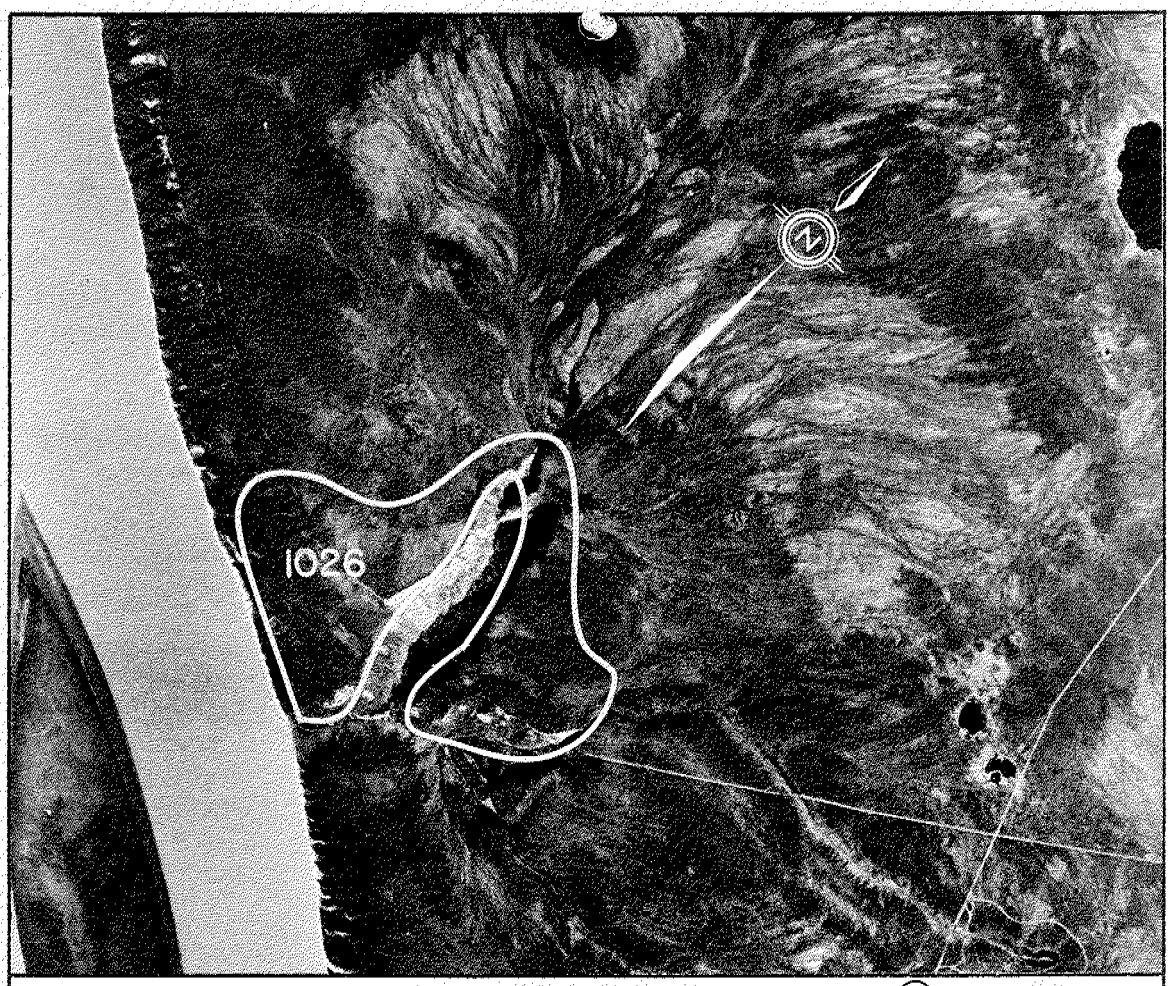
MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1026

Location: Site 1026 is located 7 miles north-west of the point of confluence of the Tieda and Mackenzie Rivers. A small unnamed creek flows into the Mackenzie River at the site. Proposed pipeline and highway routes are situated 4 and 5 miles NE of the site respectively.

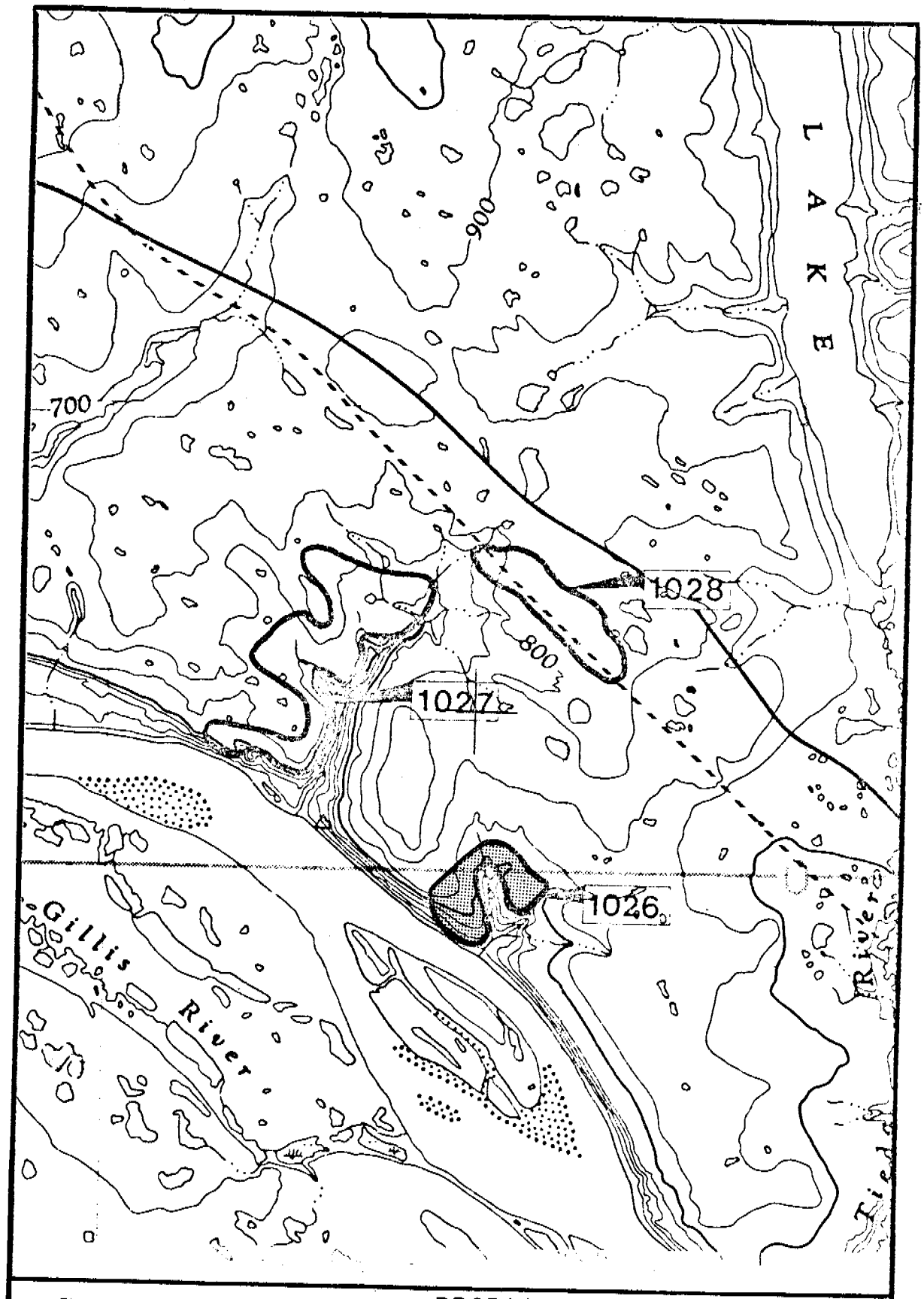
Material: Limestone.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-34 SCALE: 1" = 3000' (approx.)

sessment: The borrow of site 1026 is of fair to good quality and of almost unlimited quantity but is located on the fringes of acceptable haulage distances. The site has a high environmental sensitivity with emphasis being placed on peregrine falcon nesting potential. Overburden is expected to be fairly thick. Site 1026 should only be developed if adequate bedrock borrow sources cannot be found closer to the highway or pipeline routes.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1026

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 4 (5) Rating: 25	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 (4) 5 Rating: 40	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 4 (5) 25 Rating:	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 4 (5) Rating: 50	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants. Sustained Maintenance, Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 365

SPECIAL CONCERNS: Exposed faces visible from Mackenzie River. Potential nesting habitat for peregrine falcon, May to August. High potential for discovery of fossil and archaeological sites. Buffer zones recommended.

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SITE 1027

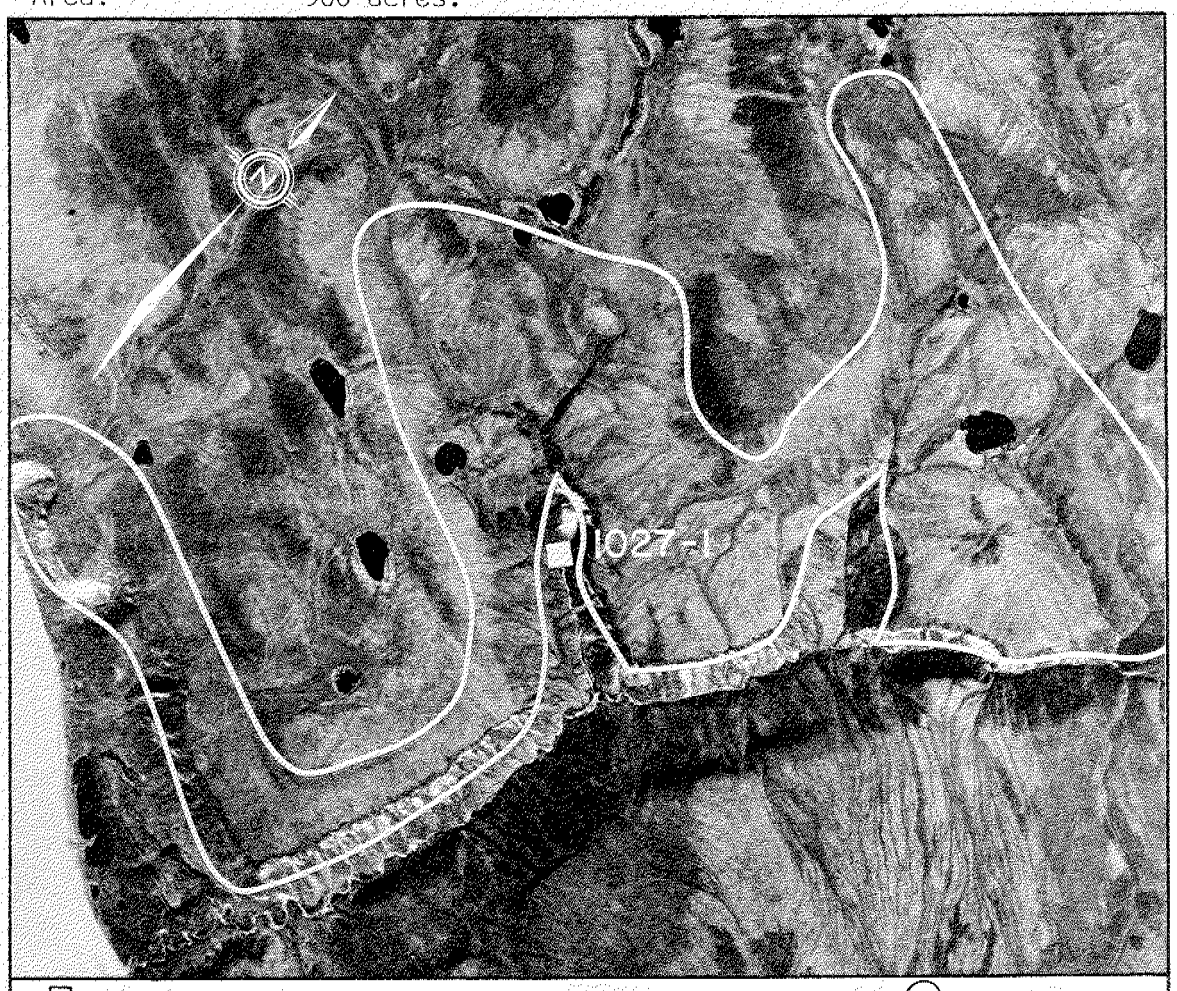
Location: Site 1027 is located 11 miles NW of the point of confluence of the Tieda and Mackenzie Rivers. A small unnamed stream passes through the site. Proposed pipeline and highway routes are NE of the site at distances of 1 mile and 2 miles respectively.

Geology: Site 1027 is a long limestone outcrop with kames overlying it.

Material: Silty sand and limestone.

Volume: Unlimited.

Area: 900 acres.

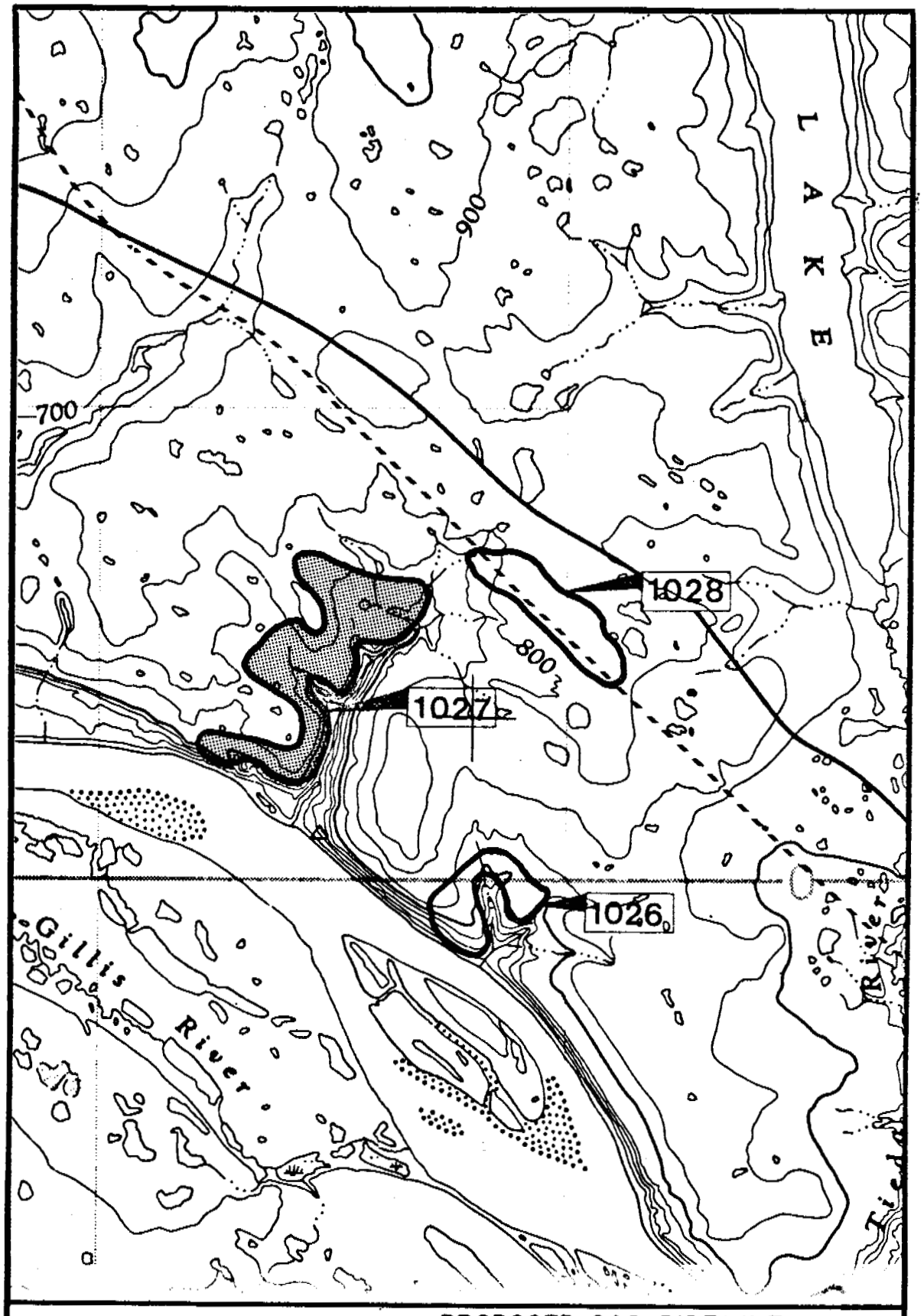


□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-32 SCALE: 1" = 3000' (approx.)

Drainage: The site is well drained.

Assessment: The borrow in the kames is of poor quality and unsuitable for construction purposes. The limestone is an interbedded sequence of soft, shaley limestone and harder silty limestone. The rock is suitable as fair quality borrow material. The volume of material available is almost unlimited and haulage distance from the east end of the site to proposed pipeline and highway routes is reasonable. Overburden thickness is expected to be fairly thick, but may be variable. The site has a high environmental sensitivity and precaustions against siltation and slumping will have to be effected. Winter operations will probably be most acceptable environmentally. Site 1027 is a potential source of a large volume of fair quality borrow. Quarry development within the general guidelines contained in this report is suggested. Attention should be directed towards environmental concerns when designing the quarry.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1027

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 4 (5) Rating: 25	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 3 (4) 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 3 (4) 5 Rating: 60	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 (4) 5 Rating: 40	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery, Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 4 (5) Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing, Domestic, Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 4 (5) Rating: 50	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 385

SPECIAL CONCERNS: Sites near exposed faces visible from Mackenzie. Potential peregrin falcon nesting habitat, May-August. Base of rock face, probably supports furbearers, moose winter in creek. Exposed face is interesting terrain feature. High potential for archaeological sites. Buffer zones are recommended.

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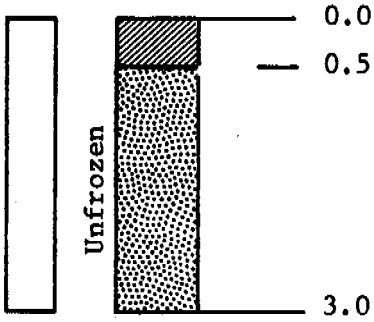
TEST PIT LOG

TP 1027-1



Surface silt

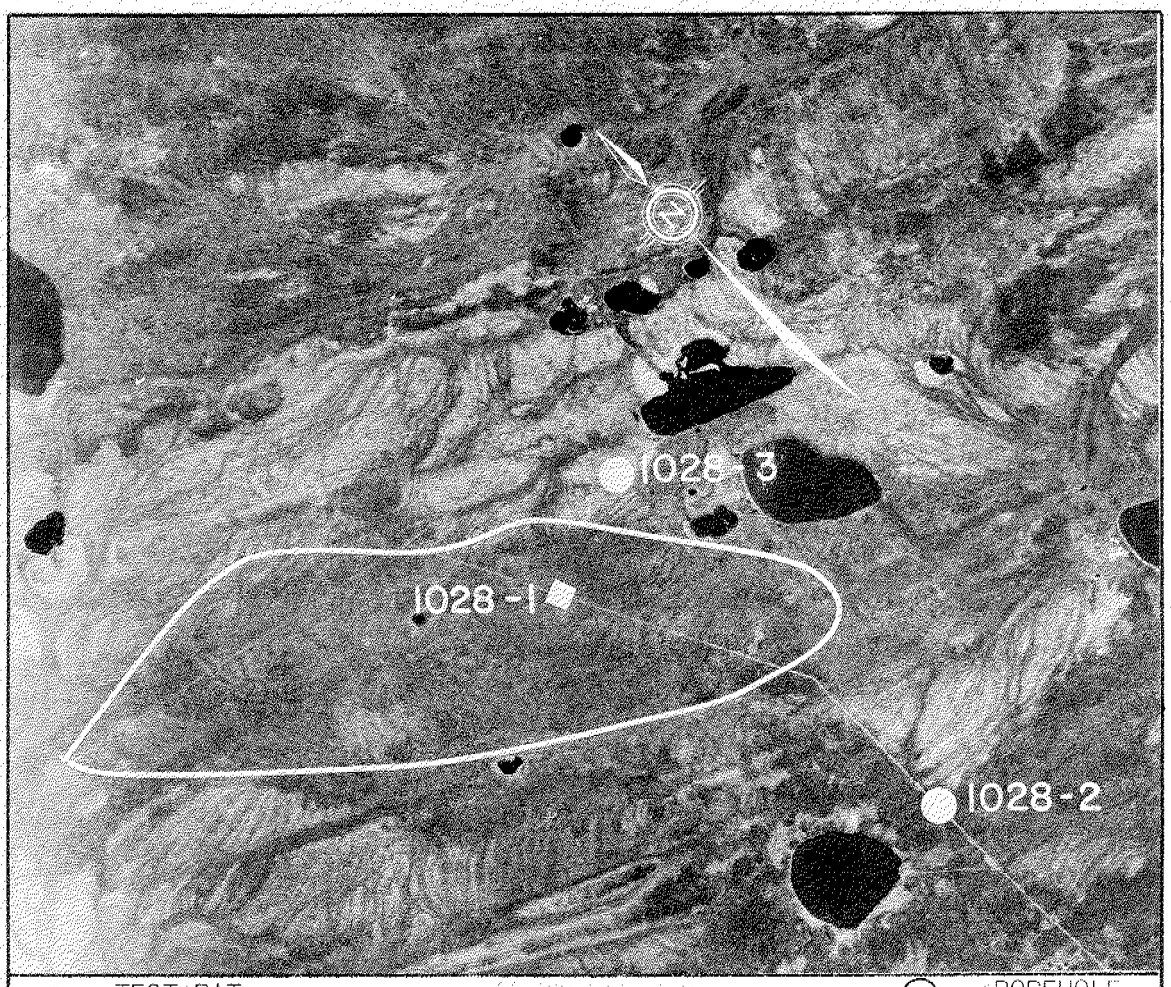
Sand, medium fine, poorly graded sand, some silt

SITE 1028

Location: Site 1028 is located 4 miles west of the southern tip of Yeltea Lake. The proposed pipeline route crosses the site; the proposed highway route is 1.5 miles north of the site.

Material: Shale.

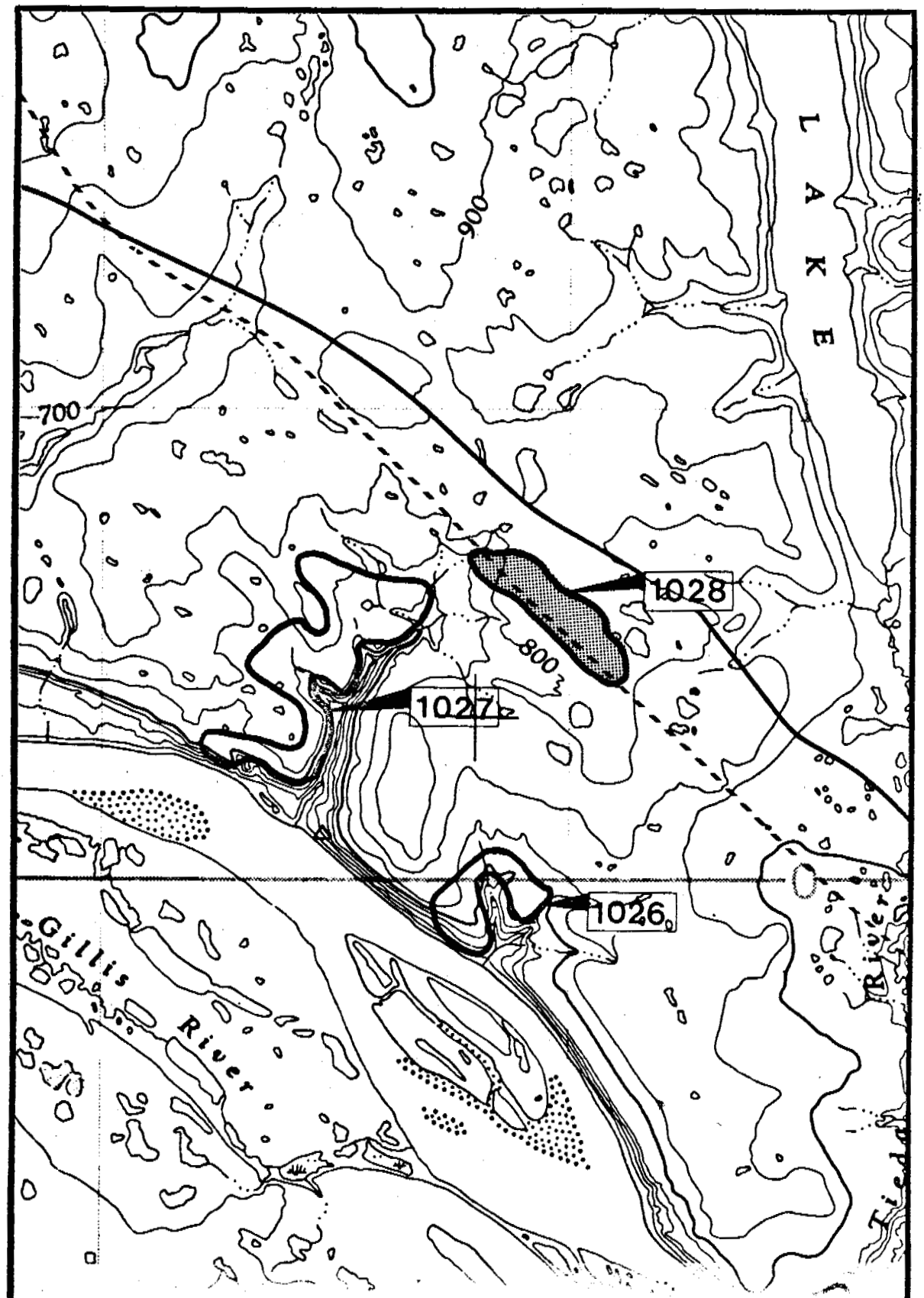
Assessment: Site 1028 is fair quality material but is overlain by 12 feet of clay till and soft weathered shale. Overburden thickness is expected to range up to approximately 20 feet. The quantity of material available is uncertain but will largely depend on excavation depth and overburden thickness. The site has a low environmental sensitivity and is



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22890-72 SCALE: 1" = 3000' (approx.)

situated close to proposed pipeline and highway routes, however, overburden thickness dictates the site to be, at best, marginal for development. If development is undertaken, it is suggested that the general quarry guidelines contained in this report be followed and that attention be directed towards environmental concerns. Drainage problems associated with pit development are possible.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1028

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS (1) 2 3 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish — Smelt Grayling — Sculpin Pike — Goldeye Trout-Perch — Chub Lake Trout — Dace Burbot — Walleye Suckers — Char Stickleback — Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION (1) 2 3 4 5 Rating: 15	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 (4) 5 Rating: 40	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 185

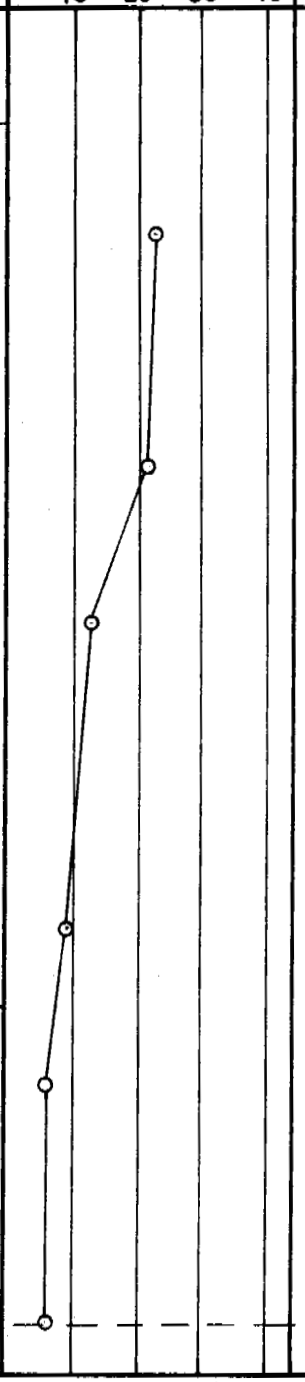
SPECIAL CONCERNS: Upland area crossed by highway location. Buffer zones and visual restoration may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1028 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	PT	PEAT -brown fibrous	Vr
2	CL	CLAY -brown silty sandy, with gravel (re-worked till)	Vx/Vc
3			
4			
5			
6			
7			
8	br	BEDROCK -grey silty shale (soft) -grades to firm. Thin sandstone layers	
9			
10			
11			
12			
13			Nbn
14			
15			
16			
17			



DATE DRILLED: Mar. 14/72

LOGGED BY: MVPL 72C-60

COMPLETION DEPTH: 20'

DRILLING METHOD: Failing 1000 Air

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1028 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	br	BEDROCK -grey silty shale (soft)	Nbn		18
19		-grades to firm. Thin sandstone layers			19
20					20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Mar. 14/72 LOGGED BY: MVPL 72C-60 COMPLETION DEPTH: 20'

DRILLING METHOD: Failing 1000 Air THAW DEPTH: N/A

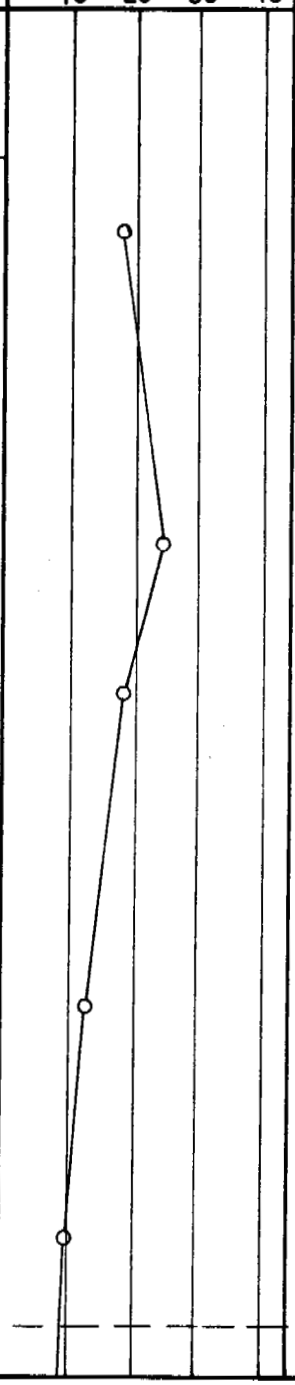
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1028 HOLE NO. 3 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	OL	SILT AND PEAT -brown organic	
2			
3	CL	CLAY -brown silty, with occassional fine gravel	
4			
5			
6			
7			
8			
9			
10		-weathered bedrock	
11			
12			
13	br	SHALE -grey silty (firm)	
14			
15			
16			
17			



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Mar. 14/72

LOGGED BY: MVPL 72C-61

COMPLETION DEPTH: 28'

DRILLING METHOD: Failing 200 Air

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1028 HOLE NO. 3 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18					18
19					19
20	br	SHALE -grey silty (firm)			20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Mar. 14/72 LOGGED BY: MPVL 72C-61 COMPLETION DEPTH: 28'

DRILLING METHOD: Failing 200 Air THAW DEPTH: N/A

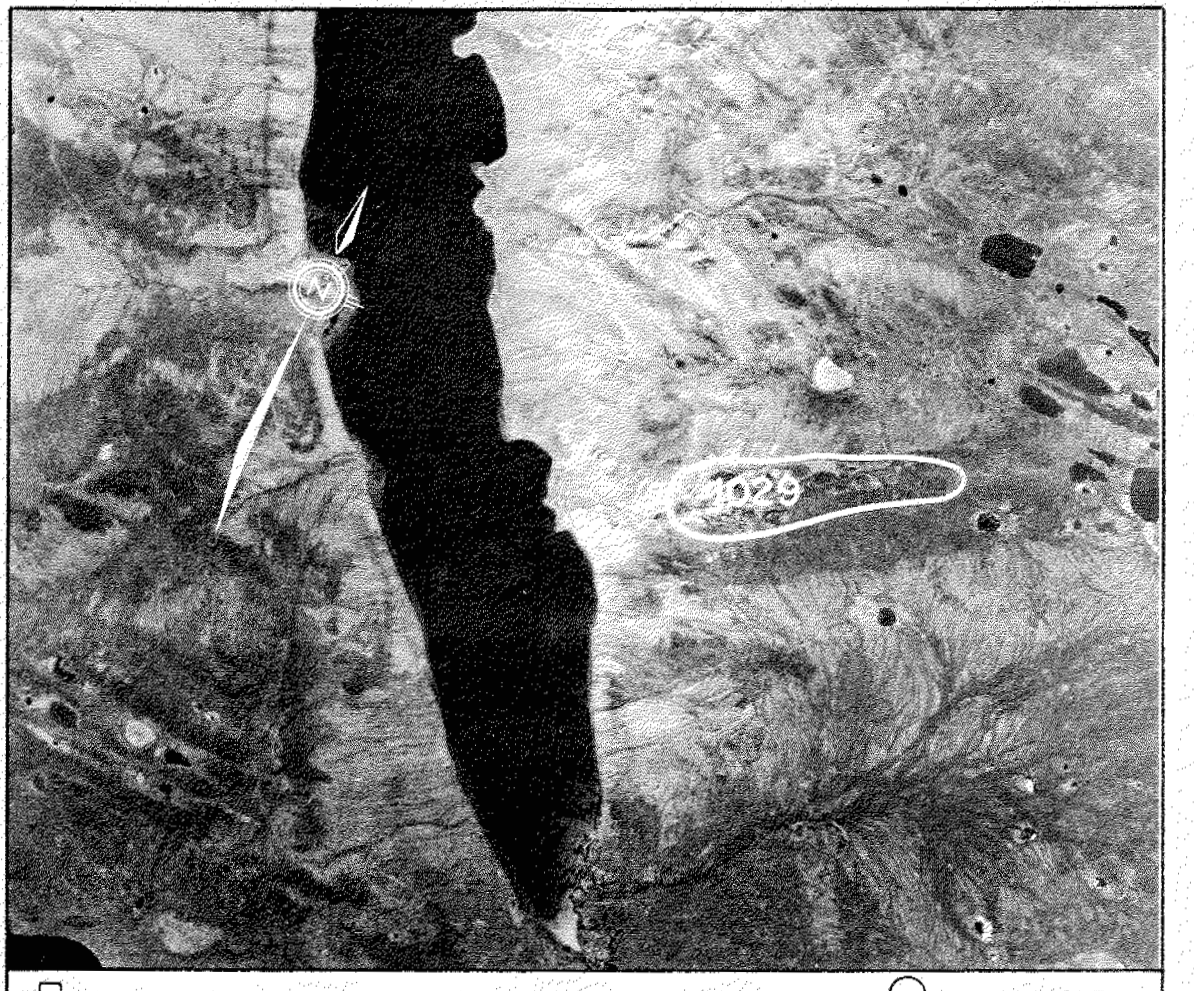
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SITE 1029a

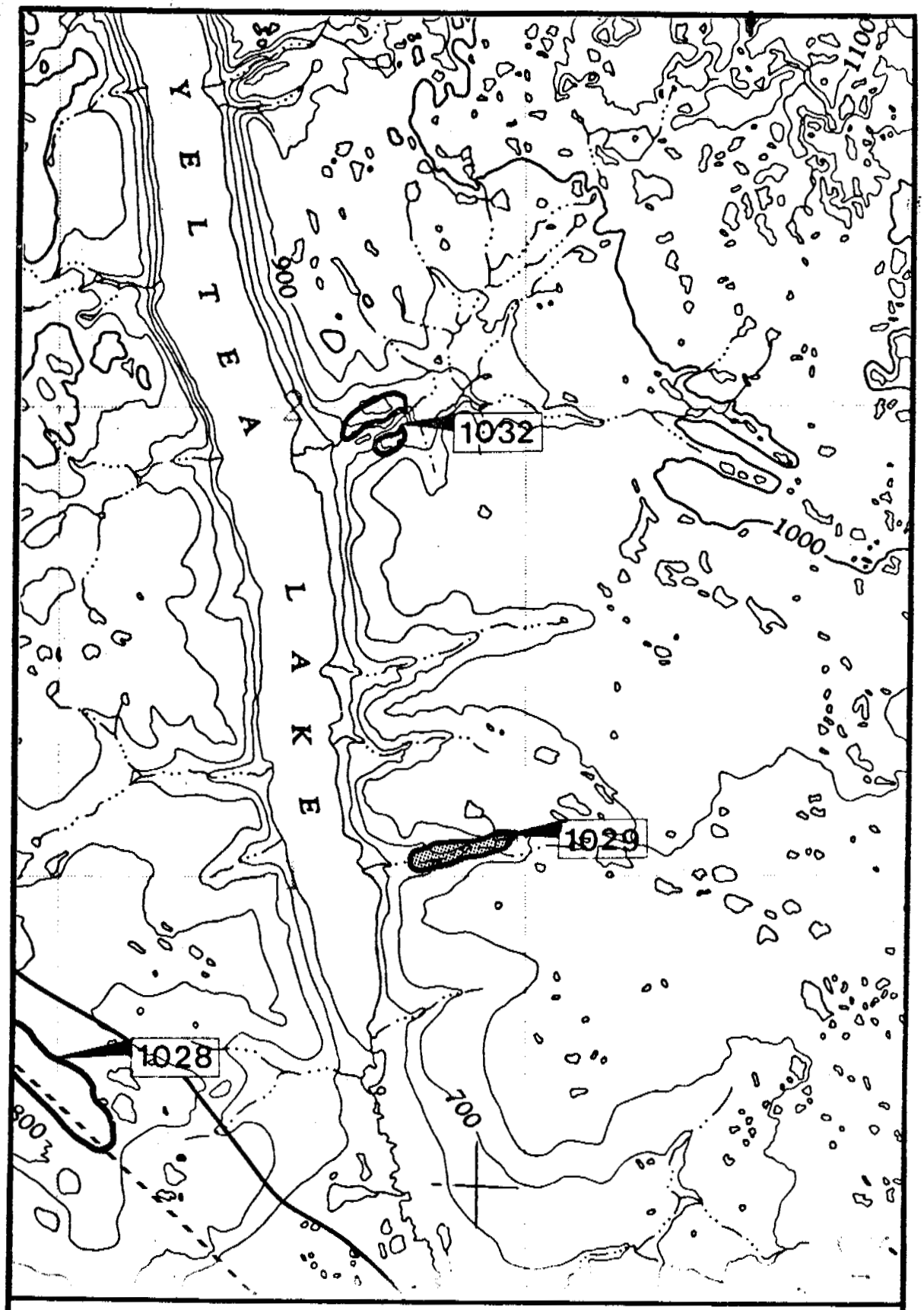
Location: Site 1029a is 5 mile east of Yeltea Lake and 2.5 miles north of the lake's southern tip. Proposed highway and pipeline routes are 4.5 miles and 6 miles south-west of the site respectively.

Assessment: Aerial photographic interpretation suggests that the material in these small eskers will be of limited volume and probably of variable composition. Haulage distance is long for such a small site and the site has a relatively high environmental sensitivity. Site 1029 is not recommended for development or further follow up investigation.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-202 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1029

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish Grayling Pike Trout-Perch Lake Trout Burbot Suckers Stickleback Smelt Sculpin Goldeye Chub Dace Walleye Char Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers, Eutrophication, Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 275

SPECIAL CONCERNS: Straddles a tributary on the east side of Yeltea Lake. Bank stability important to fishery and mammal values. Known archaeological sites present. Buffer zones and siltation controls may be required.

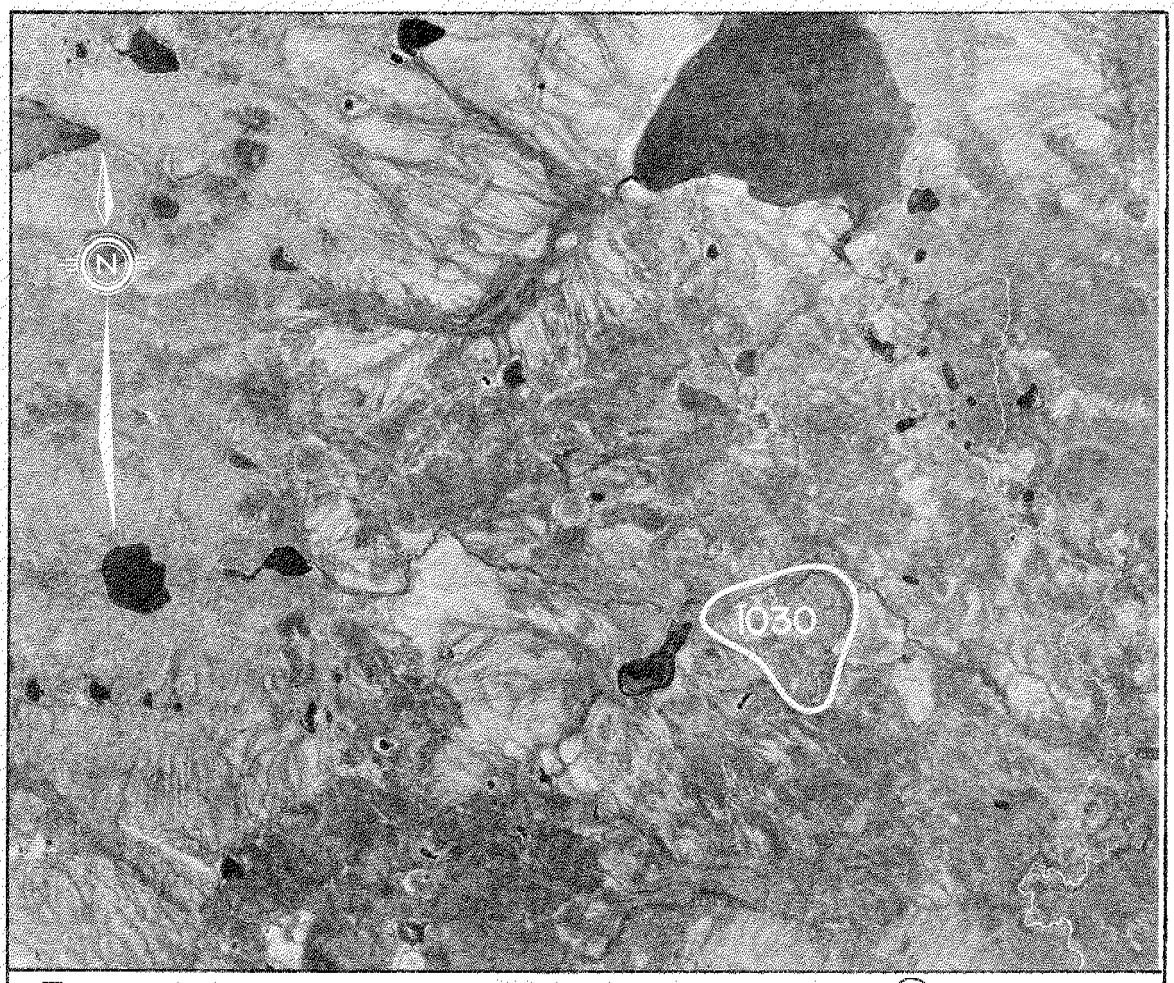
F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

SITE 1030a

Location: Site 1030 is 4.5 miles south of Manuel Lake. Proposed highway and pipeline routes are located 13 miles SW of the site.

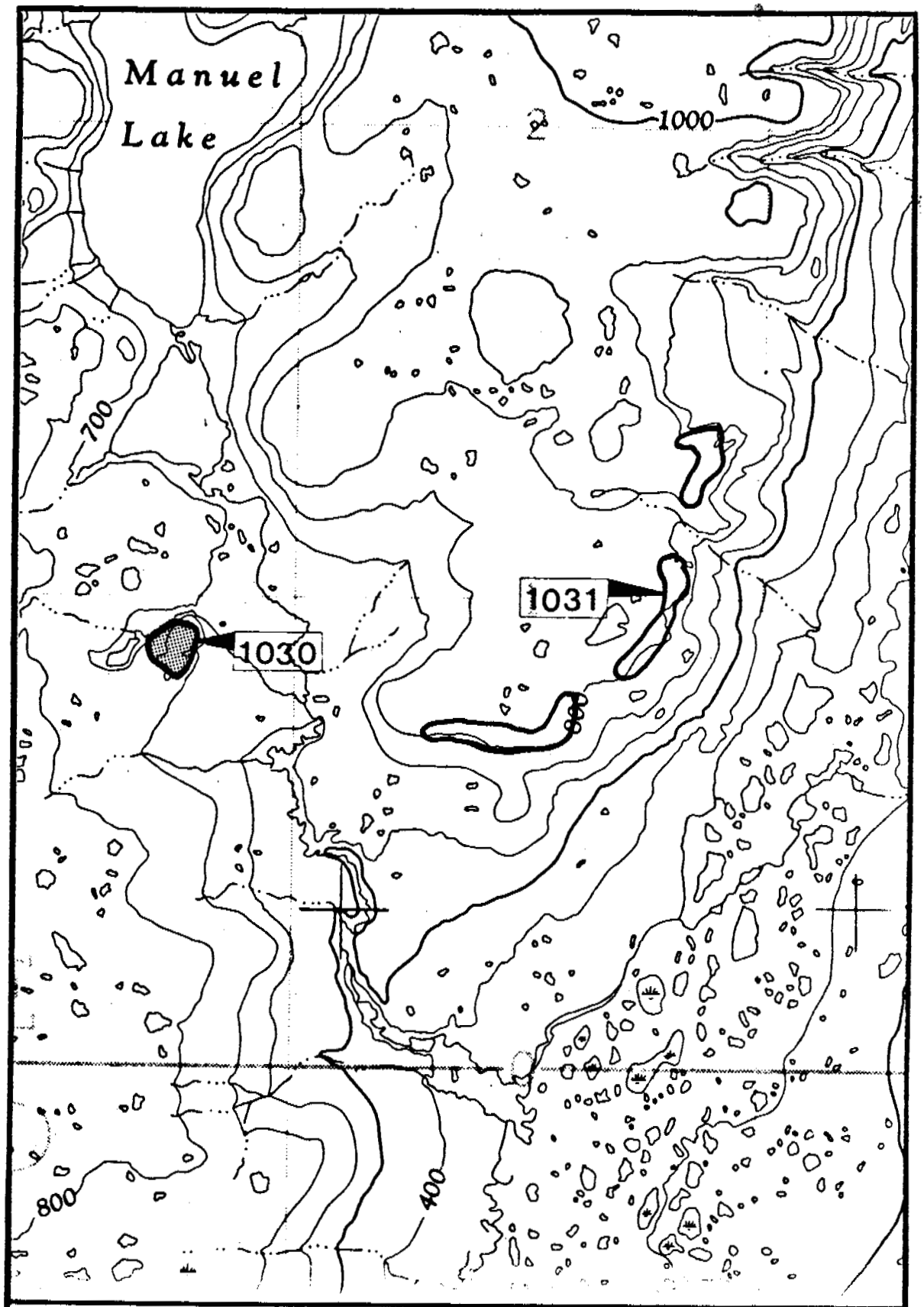
Material: Limestone.

Assessment: Fair quality limestone borrow outcrops in the form of a small knob about 3/8 mile in diameter. Overburden is expected to be clay and peat 5 to 10 feet thick. Because of the long haulage distance the site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-199 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1030

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 (4) 5 Rating: 20	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 265

SPECIAL CONCERNS: Upland area. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

SITE 1030

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 (4) 5 Rating: 20	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill, Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 265

SPECIAL CONCERNS: Upland area. Siltation controls may be required.

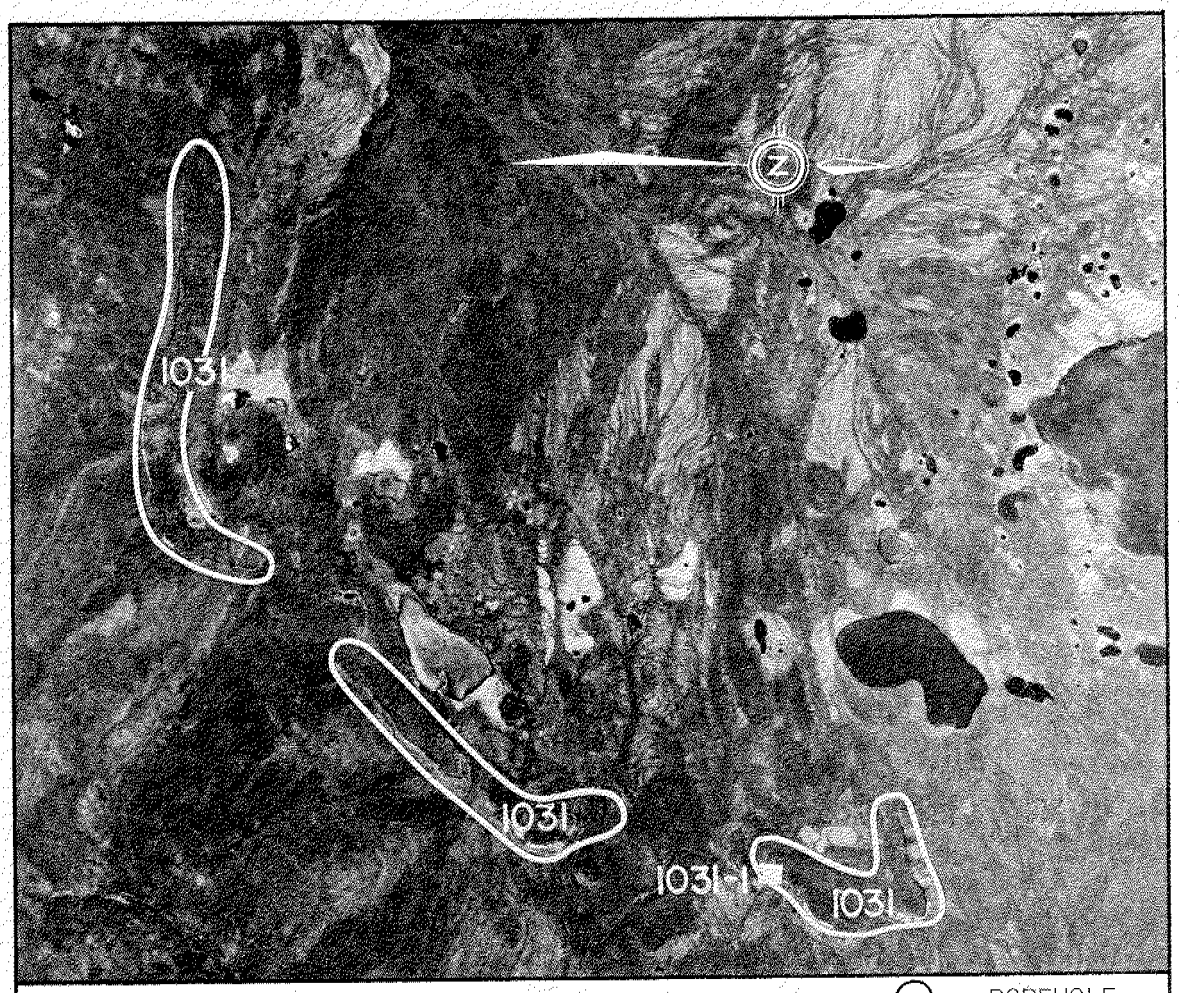
F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

SITE 1031a

Location: This site is a section of a bedrock ridge beginning 2 miles west of the narrow south arm of Rorey Lake and continuing for approximately 5 miles SSW. Proposed pipeline and highway routes are approximately 16 miles SW of the site.

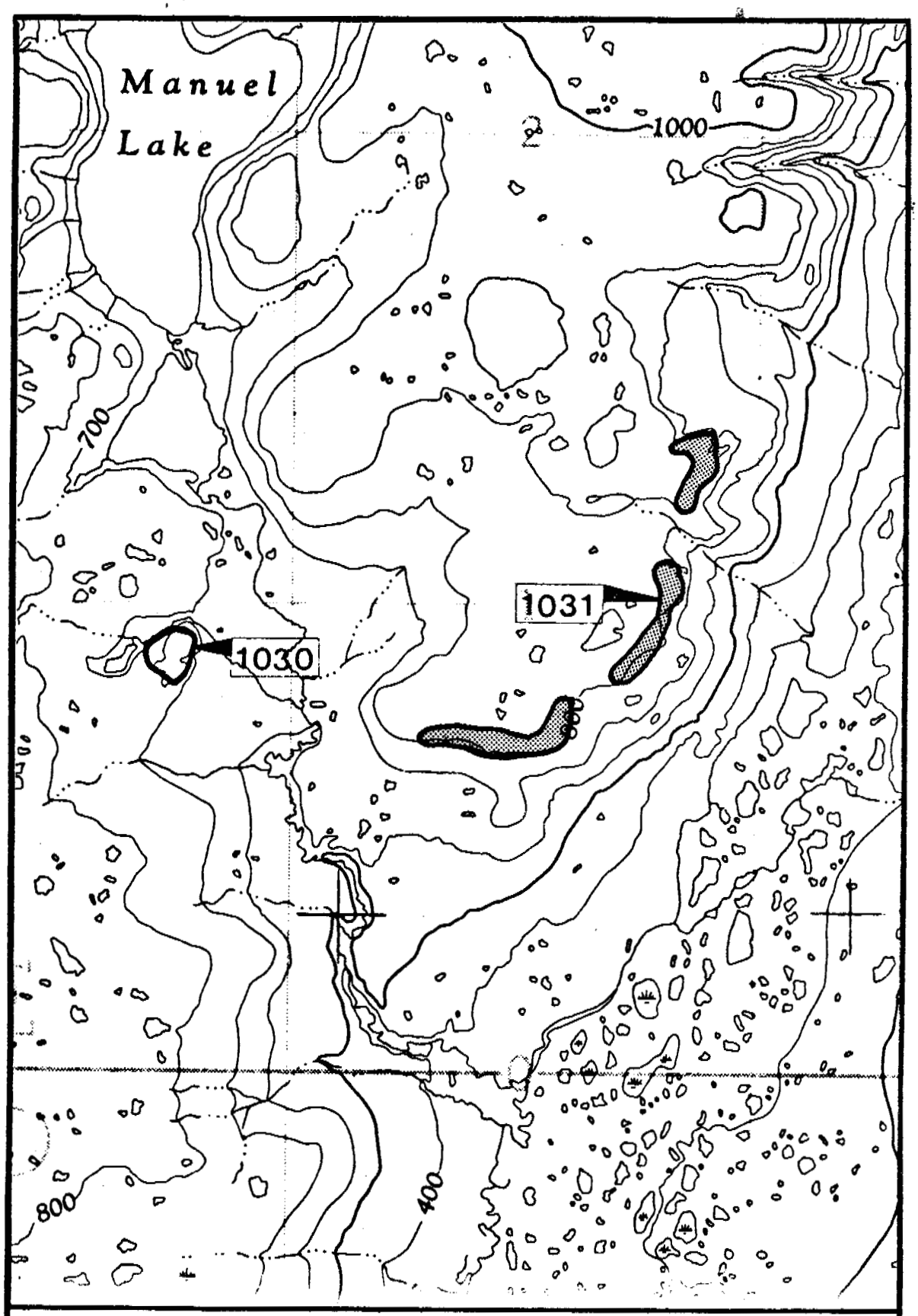
Material: Limestone.

Assessment: The limestone would make fair quality fill. Site 1031 is not recommended for development because of the long haulage distance to the pipeline and highway routes.



☐ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-198 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1031

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 (4) 5 Rating: 20	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 (4) 5 Rating: 40	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 310

SPECIAL CONCERNS: Sites near escarpments visible from Rorey Lake. Potential raptor nesting area.
Near caribou winter range and marten areas; minimize tree removal, control fires. Winter operations preferred.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1031 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	PT	PEAT -silty,fibrous, dark brown	NOT FROZEN		1
2		-siltier, dark brown to black	FROZEN	277.6	2
3	CL	CLAY some silt, medium plasticity, moist, light grey-brown			3
4					4
5					5
6					6
7					7
8		END OF HOLE			8
9		* 7.3' to limestone bedrock			9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sept. 30/73 LOGGED BY: EBA 175-1 COMPLETION DEPTH: 7.3'

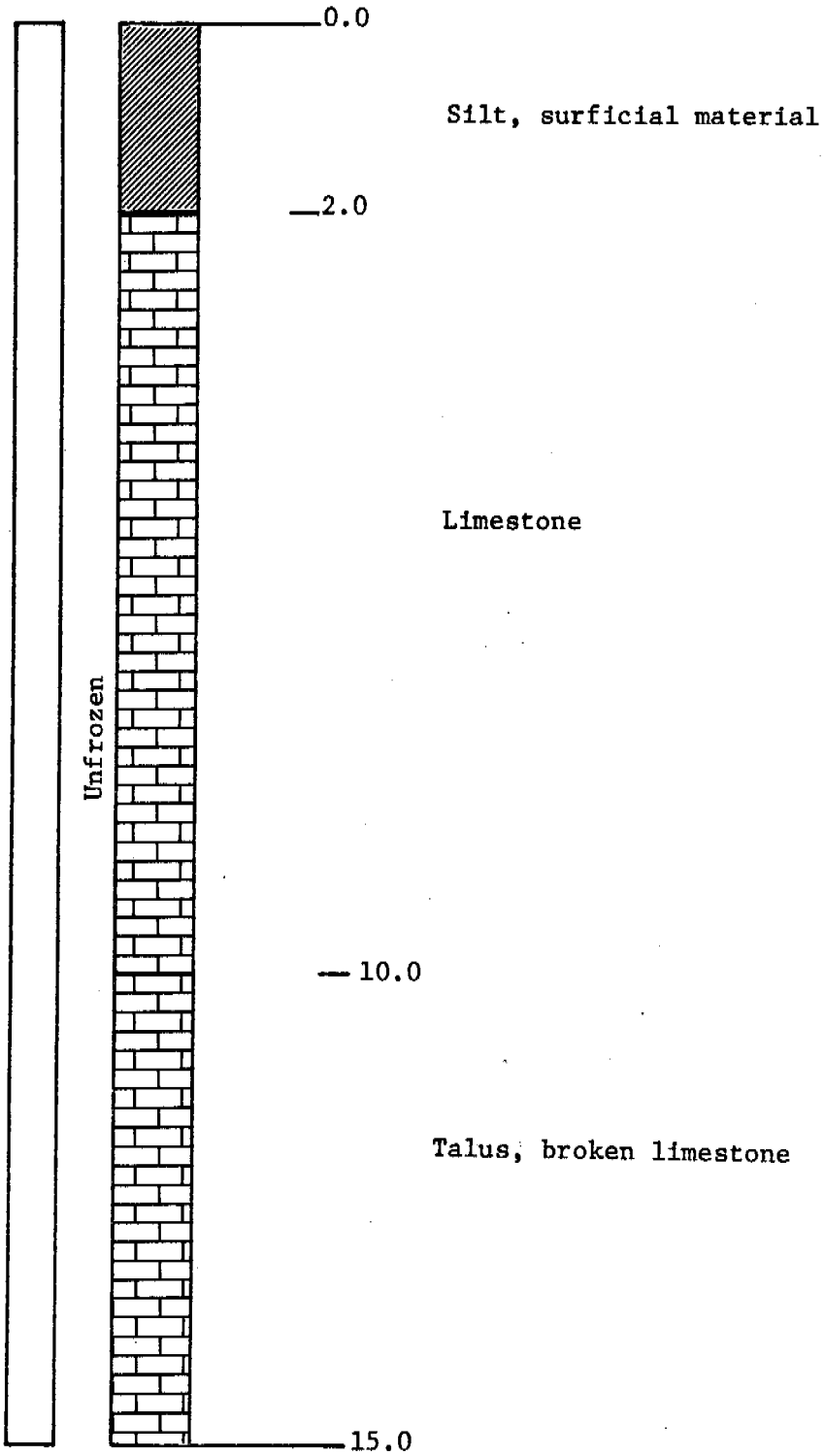
DRILLING METHOD: AUGER THAW DEPTH: 1.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SURFACE EXPOSURE LOG

TP 1031-1

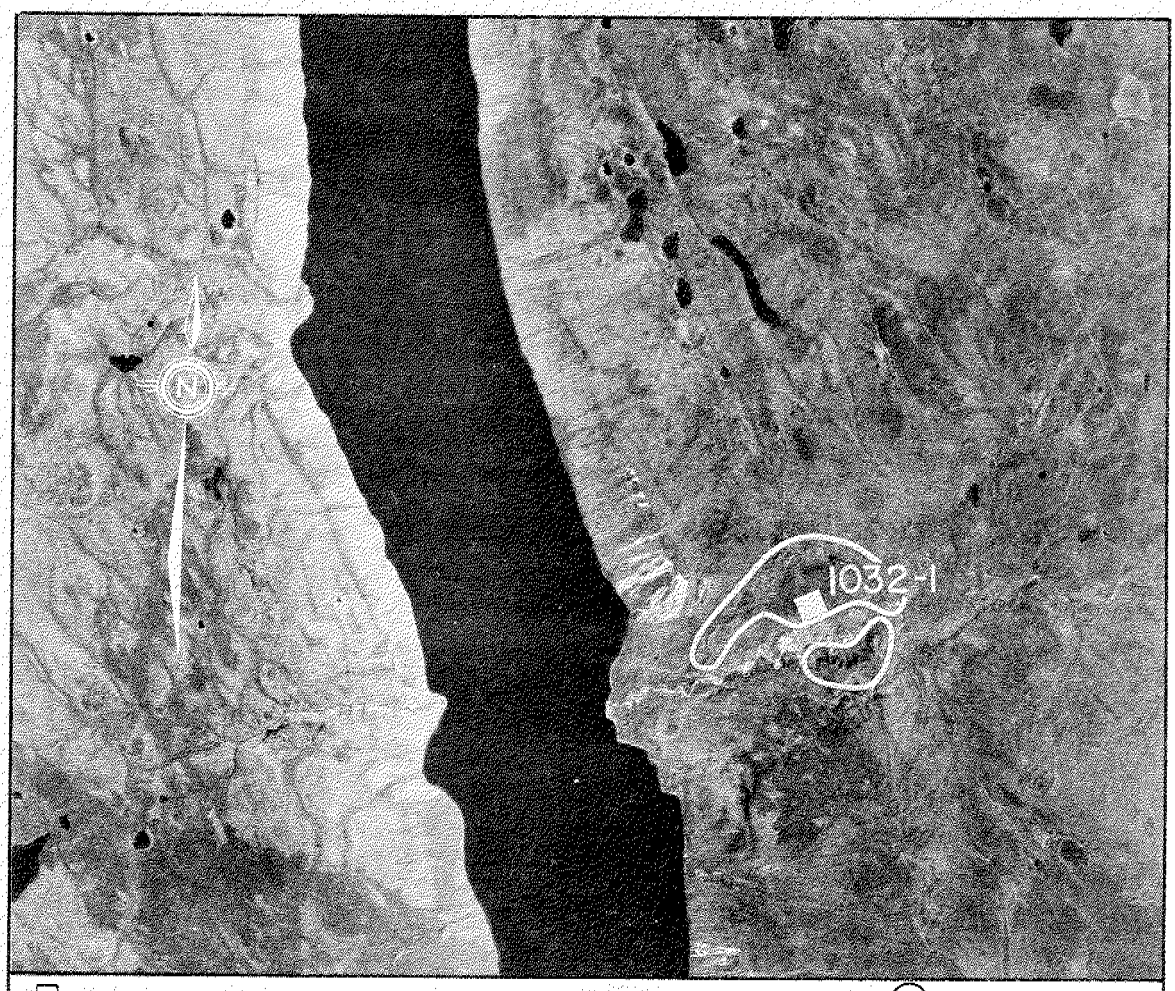


SITE 1032

Location: Site 1032 is located one mile east of Yeltea Lake, 8.5 miles from its southern tip. Proposed pipeline and highway routes are 9.5 miles SSW.

Geology: Site 1032 is a kame terrace with an esker deposit on top of the terrace.

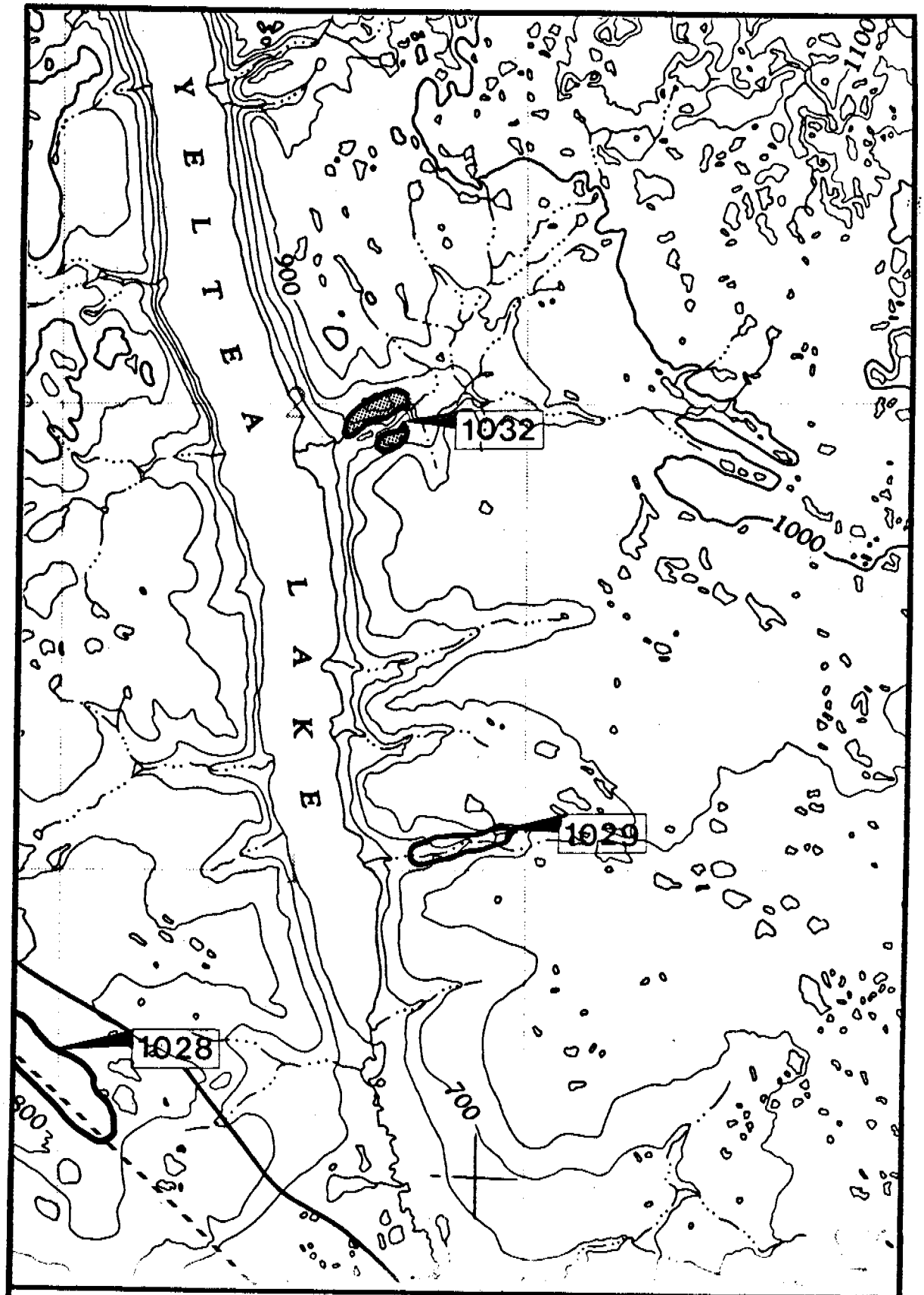
Material: Sand and gravel, trace silt, well graded.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-100 SCALE: 1" = 5500' (approx.)

Assessment: The sand and gravel at site 1032 is fair to good quality borrow of relatively low volume and is situated a considerable distance from proposed pipeline and highway routes. The site has a moderate environmental sensitivity rating. A 15 to 20 mile long haul road would be required to reach the deposit from the proposed highway because of its situation on the east side of Yeltea Lake. For this reason and because of the limited material quantities the site is probably precluded from development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1032

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION (1) 2 3 4 5 Rating: 5	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS (1) 2 3 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

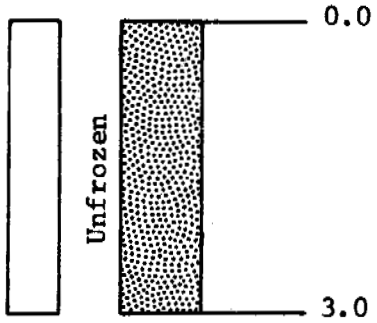
TOTAL INDEX: 240

SPECIAL CONCERNS: Straddles tributary on east side of Yeltea Lake. Known archaeological site on lakeshore. Buffer zones and siltation control may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

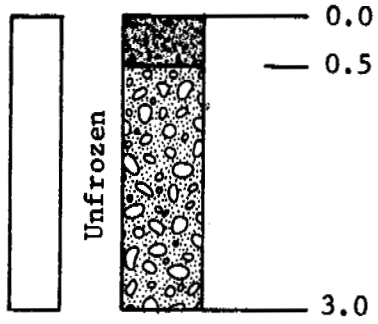
TP 1032-1



Sand, gravelly, brown,
well graded

36% GRAVEL
59% SAND
5% SILT & CLAY

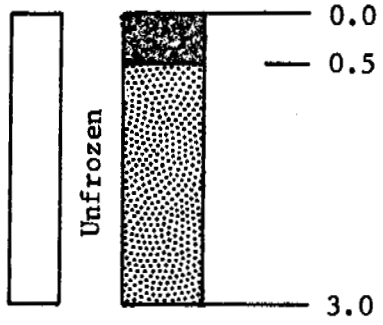
TP 1033-2



Moss

Gravel, light brown
well graded
moist

TP 1033-3

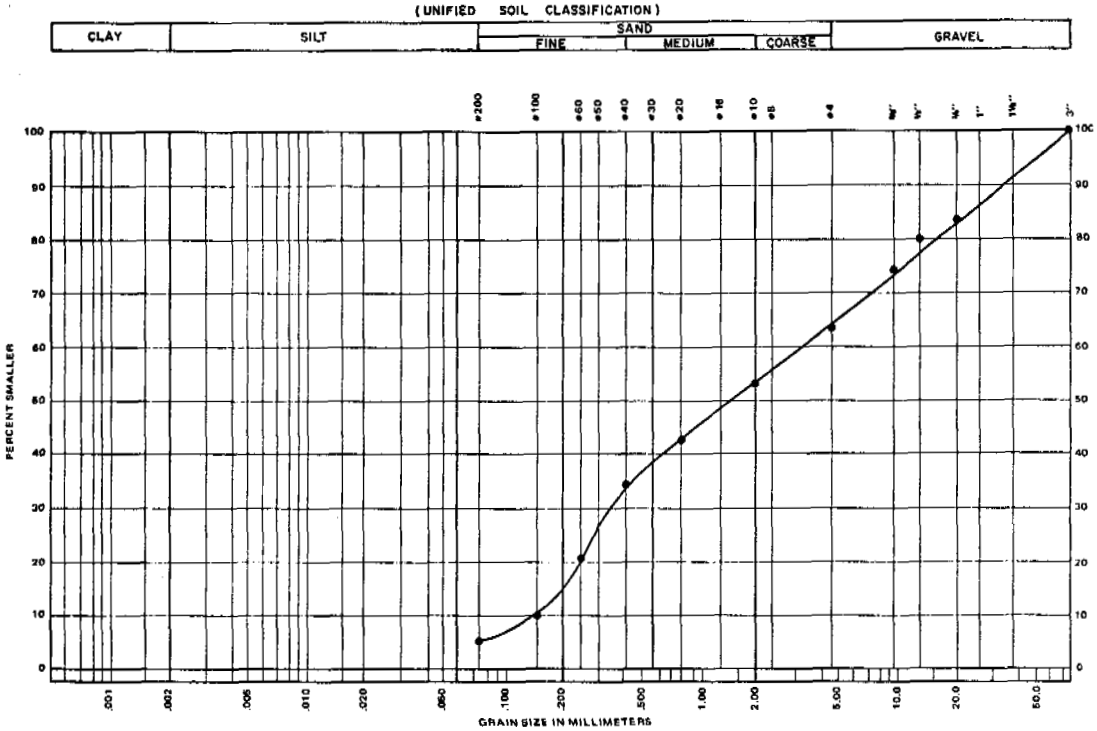


Moss

Sand, light brown
occassional cobbles
clay

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel, Trace Silt. (GP)

PROJECT Granular Resources

JOB No. E666 DATE Dec. 17/73

SAMPLE No. TP 1032-1

DEPTH 3'

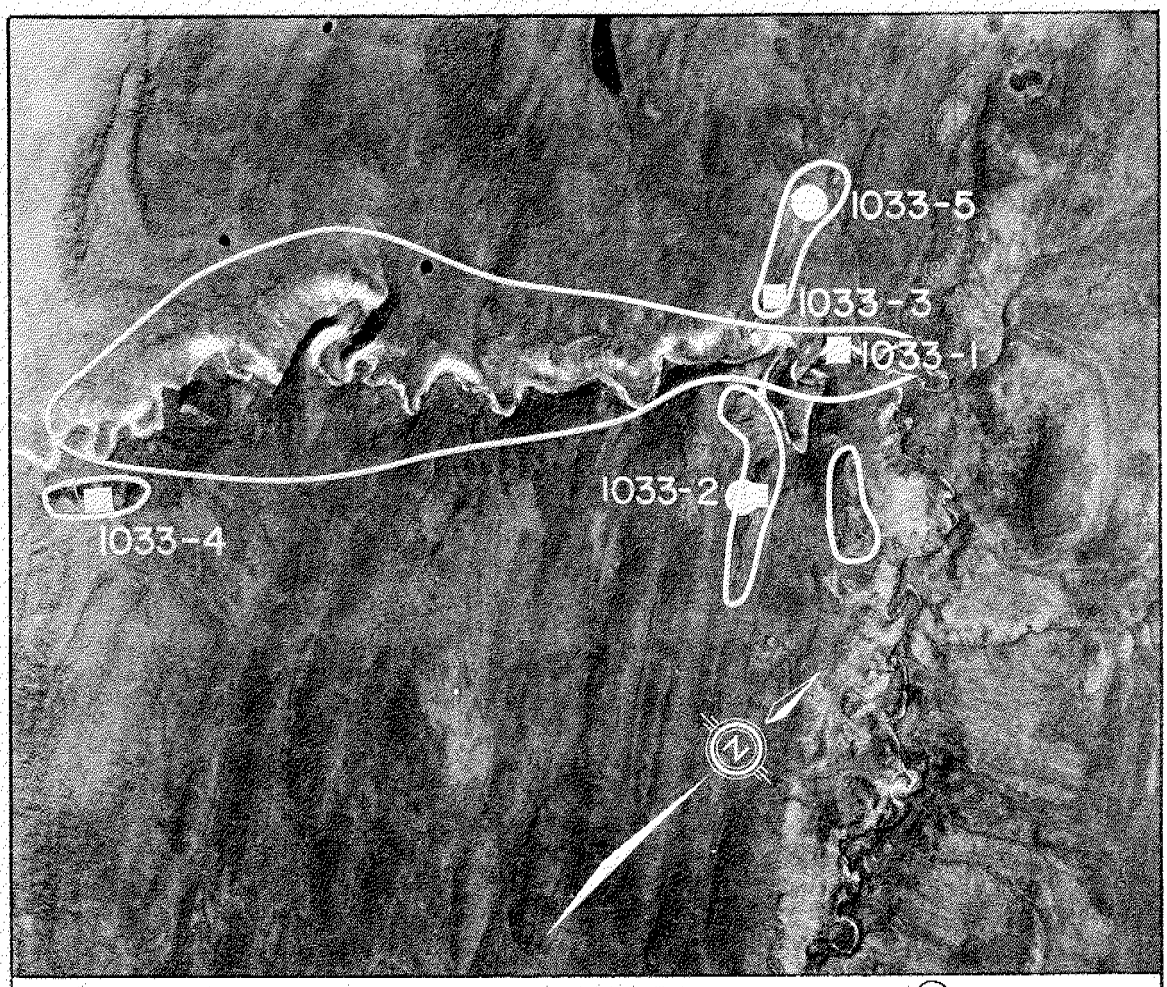
SITE 1033

Location: Site 1033 is located at the sharp bend in Payne Creek, 4 miles upstream from its point of confluence with the Mackenzie River. The proposed highway route is 2 miles north of the site.

Geology: Limestone is exposed along the valley occupied by Payne Creek. A few small eskers are situated along the valley slopes.

Material: Sand, some silt, some gravel, variable grading. Limestone.

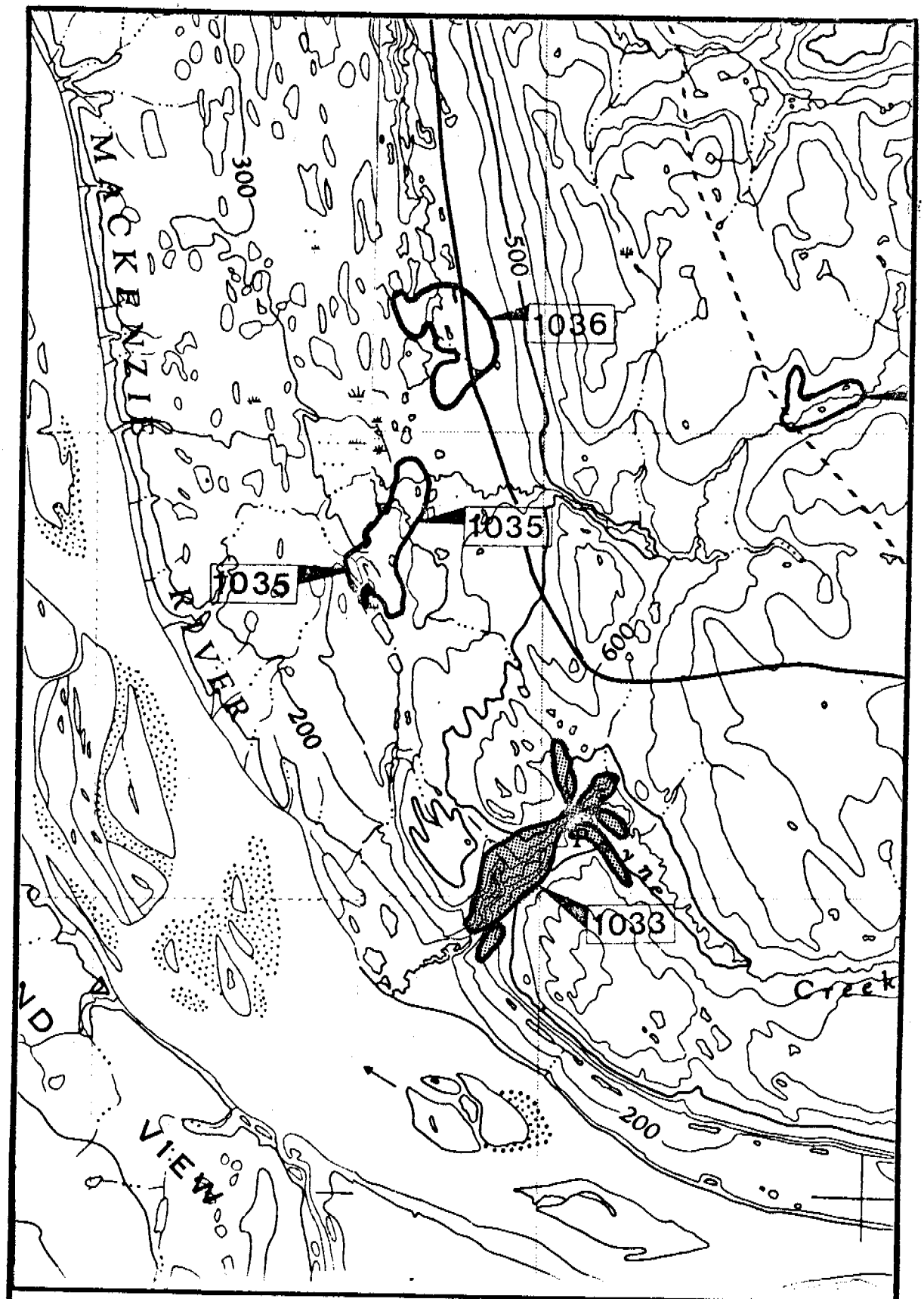
Drainage: The site is well drained by Payne Creek.



☐ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22889-188 SCALE: 1" = 3000' (approx.)

Assessment: The esker sand sampled at site 1033 is of fair quality but may be variable. Boreholes into the eskers show that borrow thickness is 20 feet or greater. The limestone, as well, is of fair quality. In general the borrow from the site would be suitable for sub-grade use although it is, to some extent, frost susceptable. Volume yield for the sand is low and access somewhat difficult because of steep hills and stream valleys. Limestone volume is essentially unlimited, however access will again be somewhat difficult. The site has been assessed a high environmental sensitivity. Creek bank stability is very important to prevent slumping and consequent obstruction to fish migrations. A winter operation is preferable. Overburden thickness is uncertain but may be expected to reach 10 feet or greater. Site 1033 is a good source of borrow located a reasonable distance from the proposed route locations. The site is recommended for development within the guidelines contained within this report.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: ONTARATUE RIVER 106-J

SCALE: 1:125,000

SITE 1033

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 (4) 5 Rating: 40	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 (3) 4 5 Rating: 30	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 (4) 5 Rating: 40	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 320

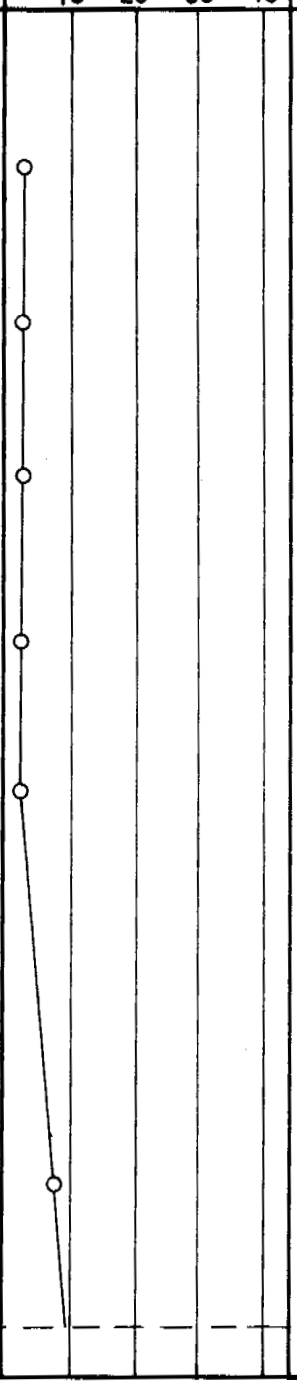
SPECIAL CONCERNS: Upland area straddles Payne Creek. Creek bank stability important to denning and fishery resource. Buffer zones recommended. Fish migration passage should be insured.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1033 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1, 2, 3	GM	GRAVEL sandy, silty, medium sized gravel, dry, light brown. 10.2% O.C.	NOT FROZEN
4, 5, 6, 7, 8, 9, 10, 11, 12	SM	SILT, SAND & GRAVEL gravel fine, subangular, dry, light brown. (2'-10') 19% GRAVEL, 65% SAND, 16% SILT & CLAY	
13, 14, 15, 16, 17	SM	SAND Silty, gravelly, coarse sand and fine subangular gravel.	Nbn



DATE DRILLED: Sep.29/73 LOGGED BY: EBA 166-2 COMPLETION DEPTH: 19.5

DRILLING METHOD: AUGER THAW DEPTH: 13.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1033 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
		SAND	Nbn		
18	SM	-same			18
		13% GRAVEL			
19		(19') 59% SAND			19
		28% SILT & CLAY			
20		END OF HOLE			20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 29/73 LOGGED BY: EBA 166-2 COMPLETION DEPTH: 19.5'

DRILLING METHOD: AUGER THAW DEPTH: 13.0'

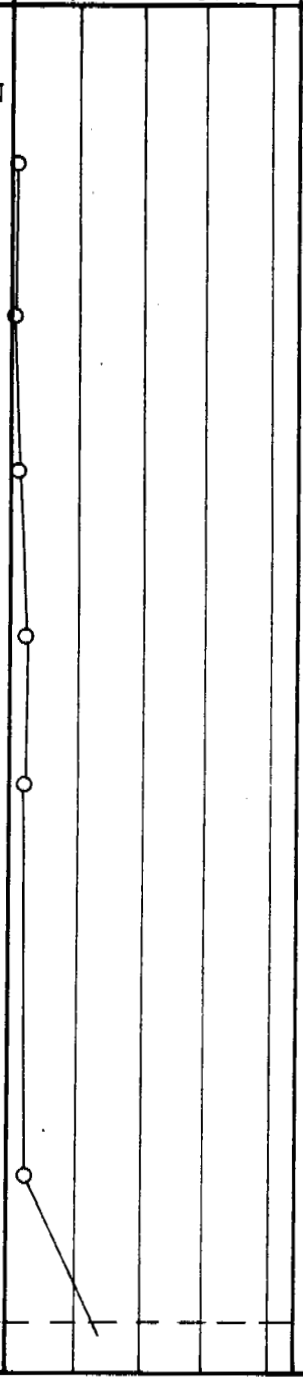
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1033 HOLE NO. 5 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1		SAND -fine, uniform, clean, dry, light brown	NOT FROZEN
2			
3	SP-SW		
4		1.6 % O.C 1% GRAVEL 92% SAND	
5		(2' + 4' + 6') 7% SILT & CLAY	
6			
7		-some fine gravel, trace coarse sand	
8			
9		2.5% O.C. 21% GRAVEL	
10		(8' + 10') 68% SAND 11% SILT & CLAY	
11	SP-SW		
12		- some silt	
13			
14		-silty, trace fine gravel, dry	
15			
16			
17			



DATE DRILLED: Sep.29/73	LOGGED BY: EBA 166-5	COMPLETION DEPTH: 25.5'
DRILLING METHOD: AUGER		THAW DEPTH: 22.0'

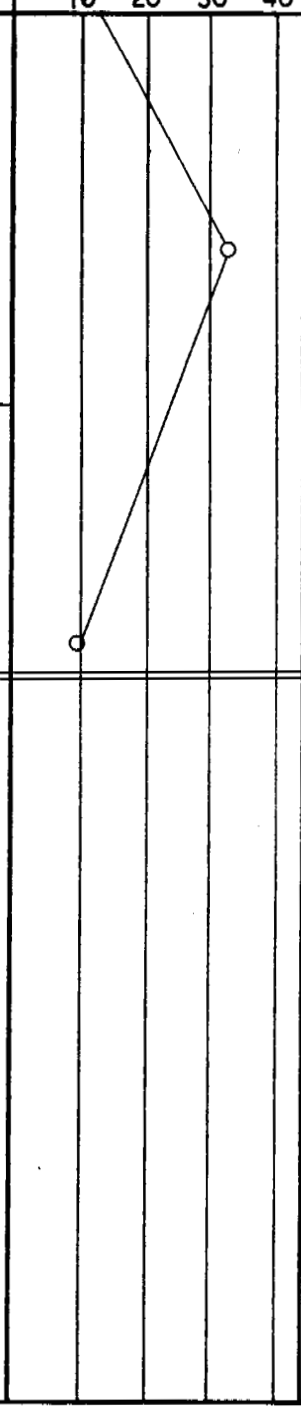
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1033 HOLE NO. 5 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SAND	NOT FROZEN		18
		same			
19	SW-SM				19
20		-trace gravel, moist			20
21					21
22			FROZEN		22
23					23
24					24
25					25
26		END OF HOLE			26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34



DATE DRILLED: Sep. 29/73

LOGGED BY: EBA 166-5

COMPLETION DEPTH: 25.5

DRILLING METHOD: Auger

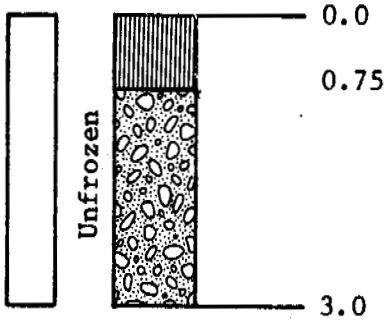
THAW DEPTH: 22.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1033-1

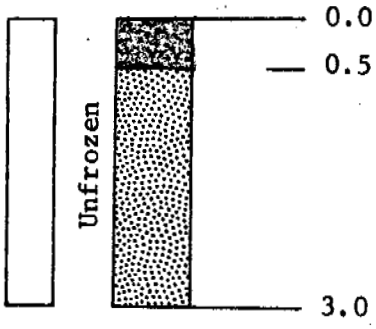


Surface silt & Sand

Sand & Gravel

18% GRAVEL
74% SAND
8% SILT & CLAY

TP 1033-3



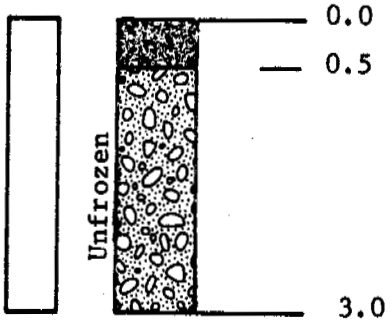
Moss

Sand, light brown
occassional cobbles
dry

5% GRAVEL
86% SAND
9% SILT & CLAY

TEST PIT LOG

TP 1033-4

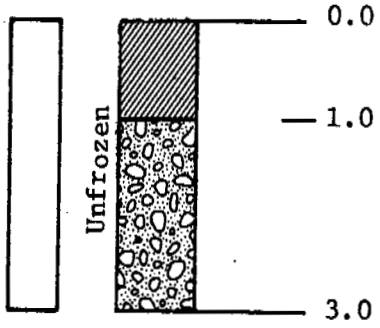


Moss

Gravel, silty, limestone, fine
dry

29% GRAVEL
60% SAND
11% SILT & CLAY

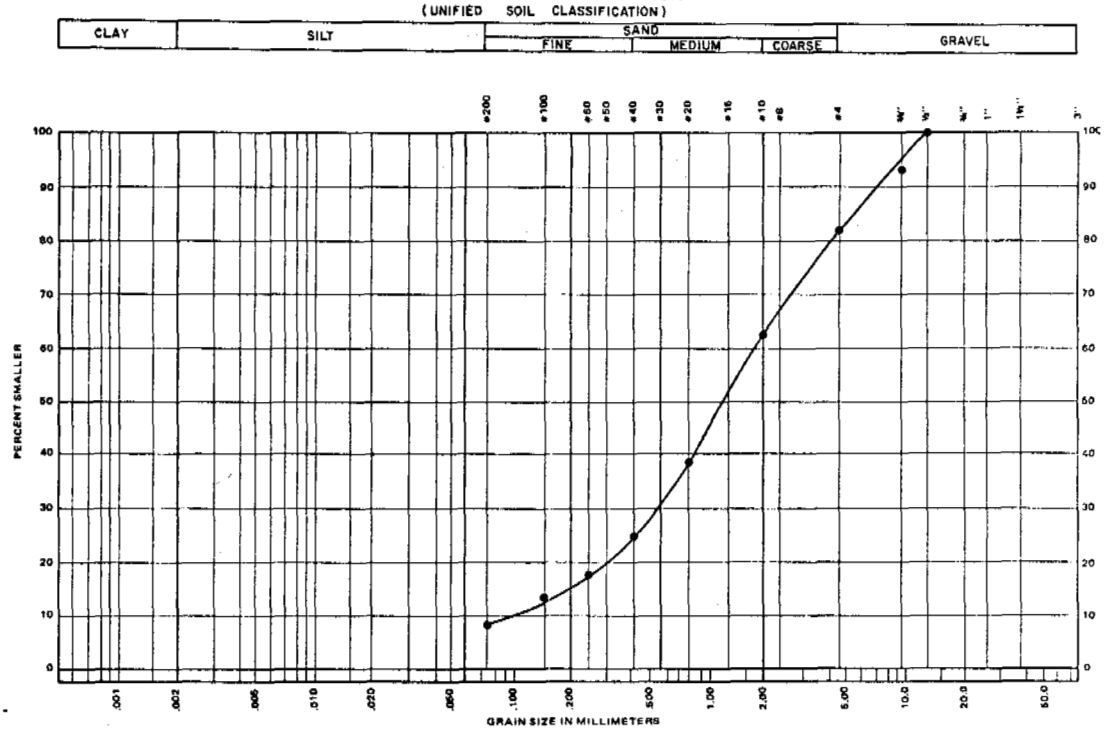
TP 1033-5



Silt and Sand, surface material

Sand and Gravel, some silt
brown to rusty
well graded

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

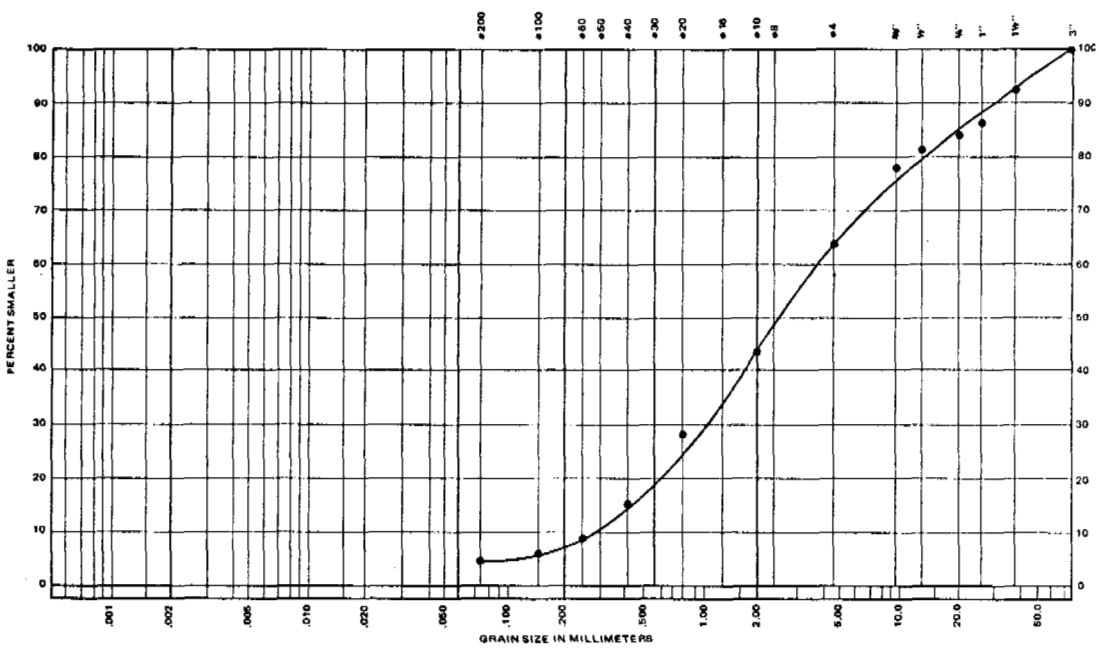


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and some Gravel with a Trace of Silt (SW-SM) M/C = 3%

PROJECT Granular Resources
JOB No. E666 DATE Jan.29/74
SAMPLE No. TP 1033-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

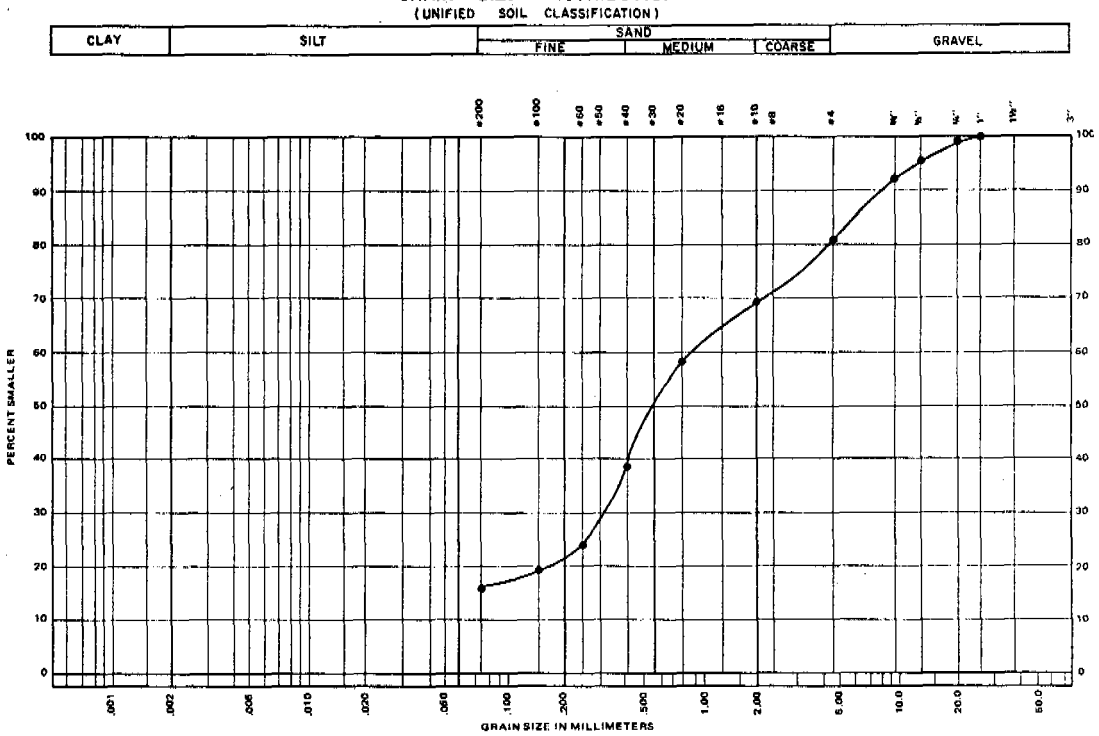


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel with a Trace of Silt (GW) M/C = 3.3%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1033-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

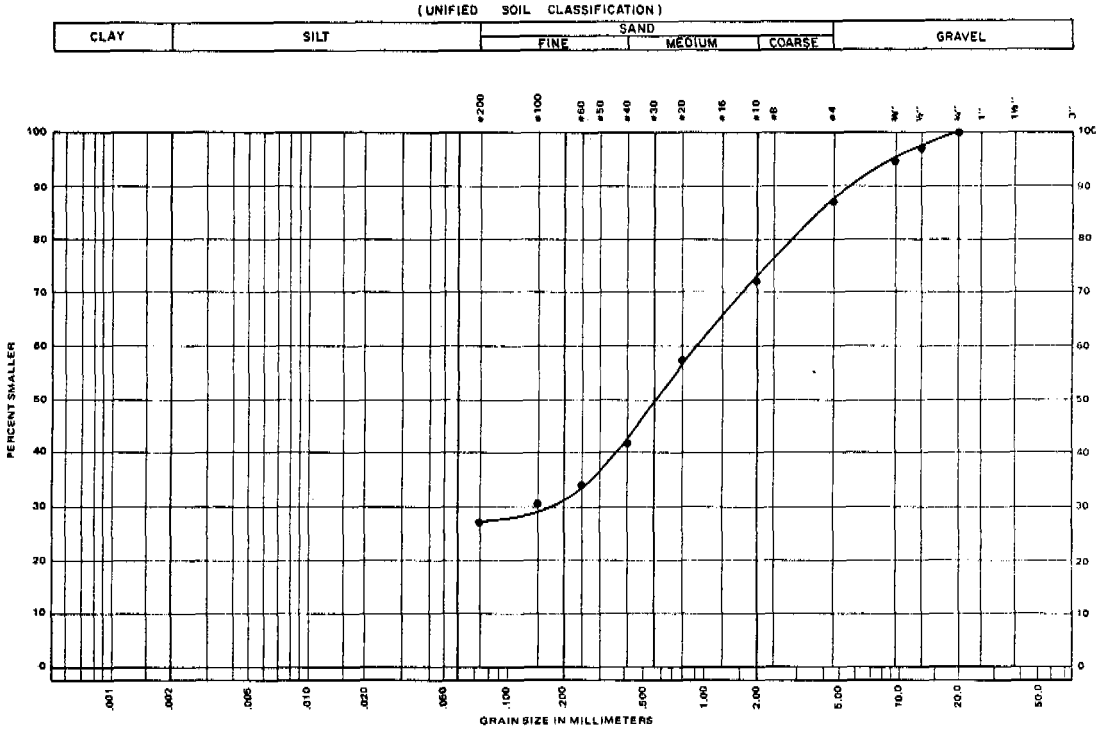


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Some Gravel and some Silt. (SM)

PROJECT Granular Resources
JOB No. E666 DATE Jan. 11/74
SAMPLE No. BH 1033-2
DEPTH 2' - 10'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

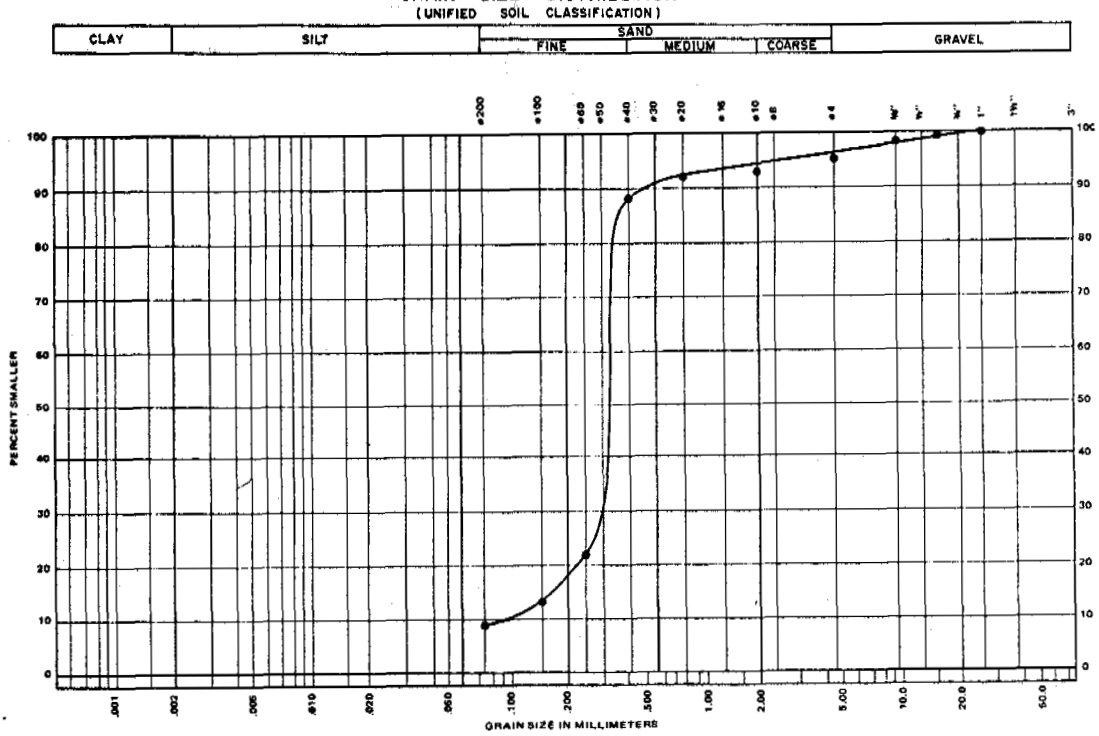


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and some gravel Silty. (SM)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1033-2
DEPTH 19'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

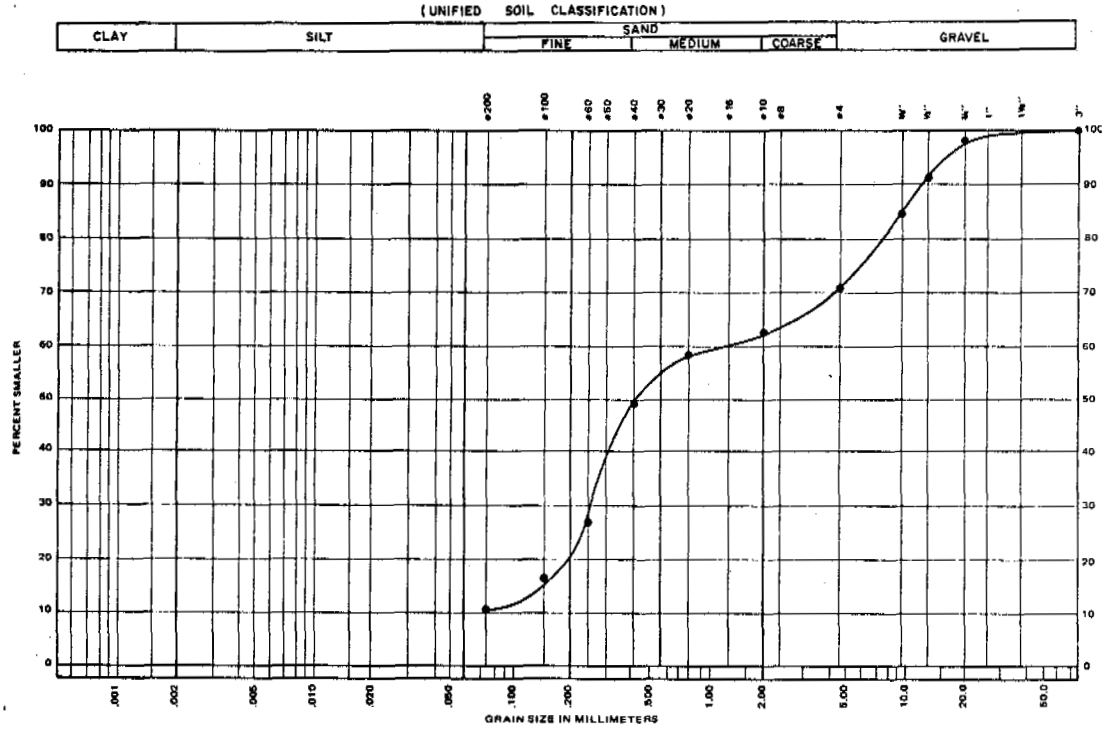


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with A Trace of Silt and Gravel (SP-SM) M/C = 3%

PROJECT Granular Resources
JOB No. E666 DATE Jan. 29/74
SAMPLE No. TP 1033-3
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

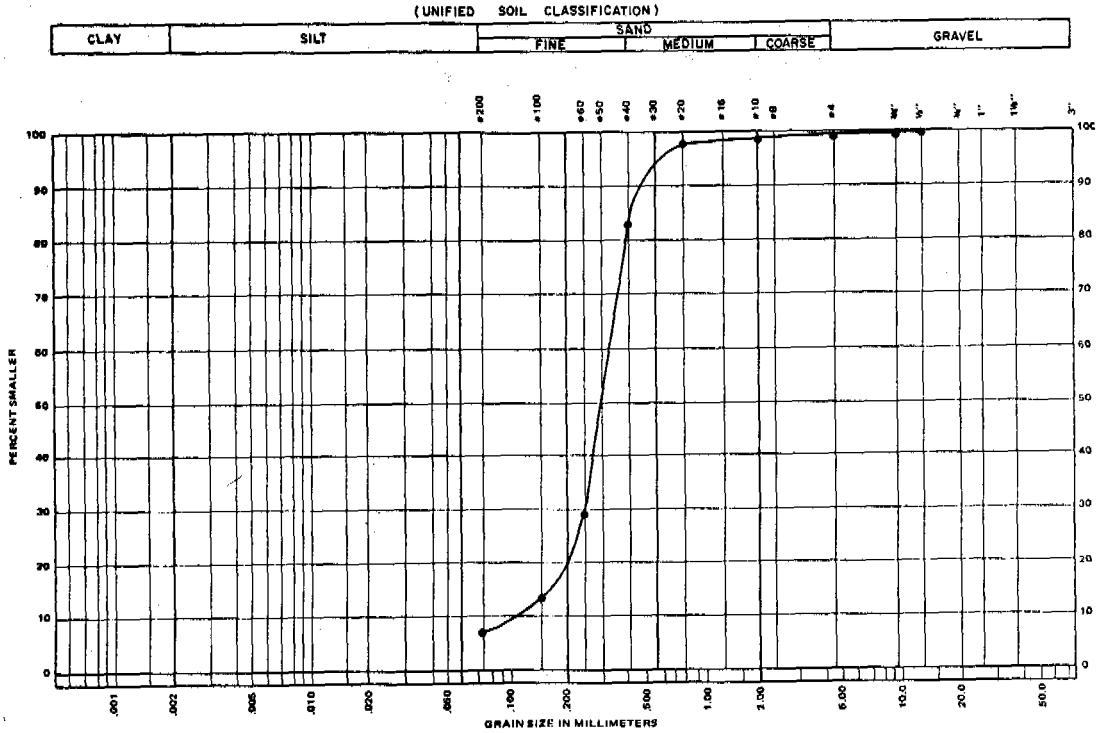


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly, sand and some Silt. (SP-SM) M/C = 2.8%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1033-4
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

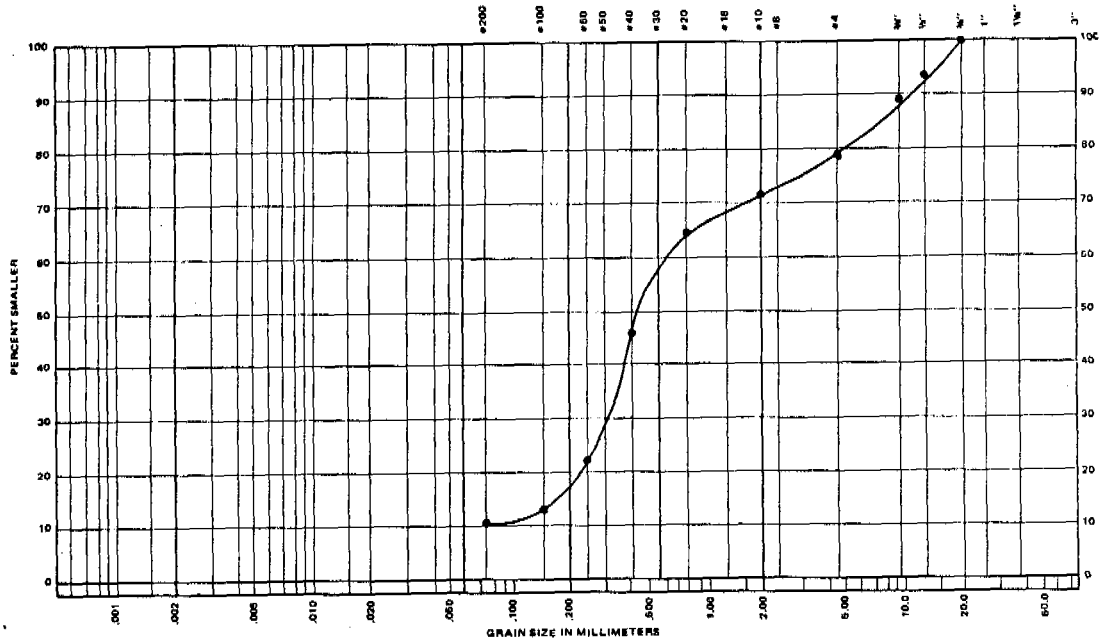


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of Silt and Gravel, (SP-SW)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1033-5
DEPTH 2' + 4' + 6'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Sand with some Silt. (SW-SM)

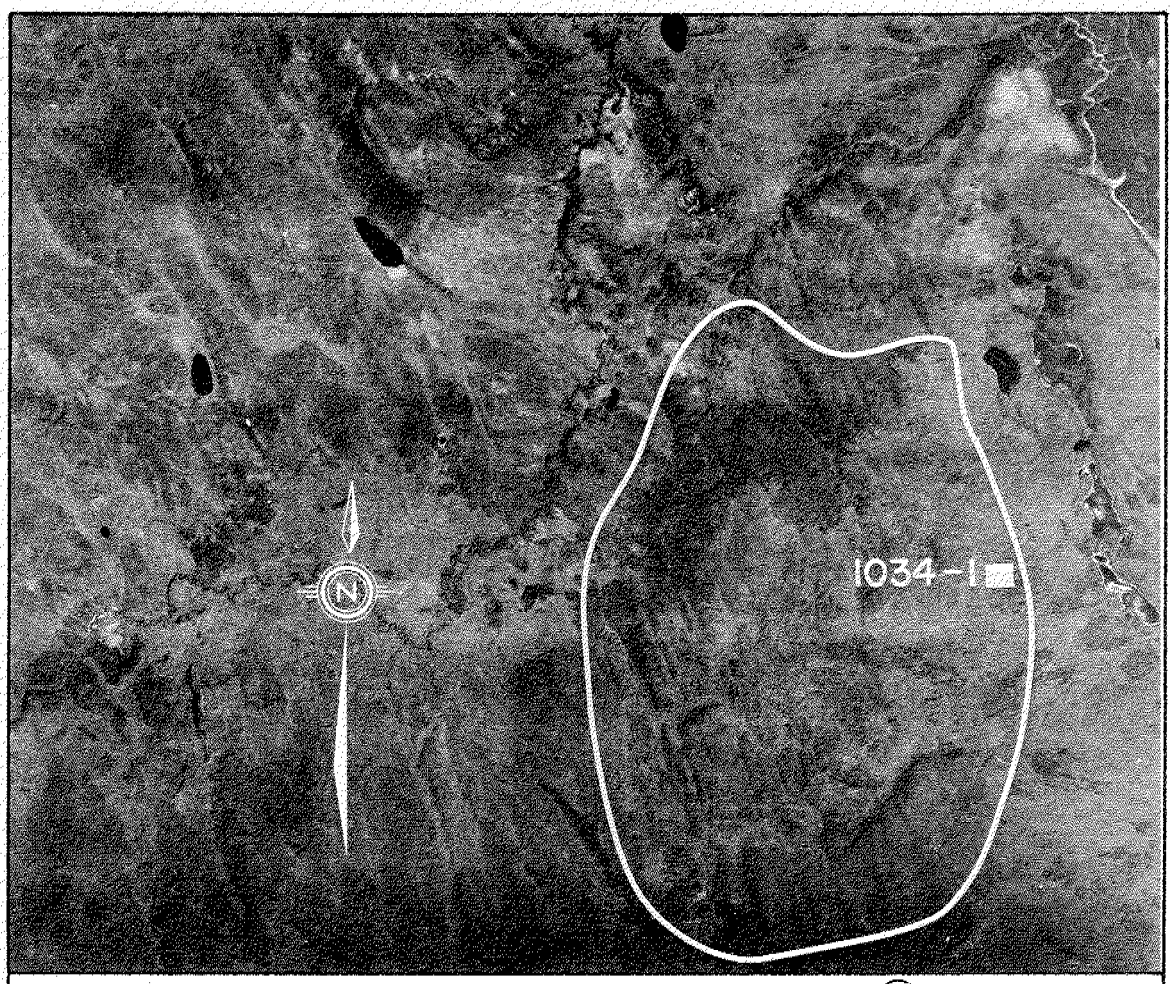
PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1033-5
DEPTH 8' + 10'

SITE 1034a

Location: Site 1034 is situated 5 miles east of the northern tip of Marion Lake. The site is on the west bank of the Mackenzie River and is 11 miles west of the proposed highway route.

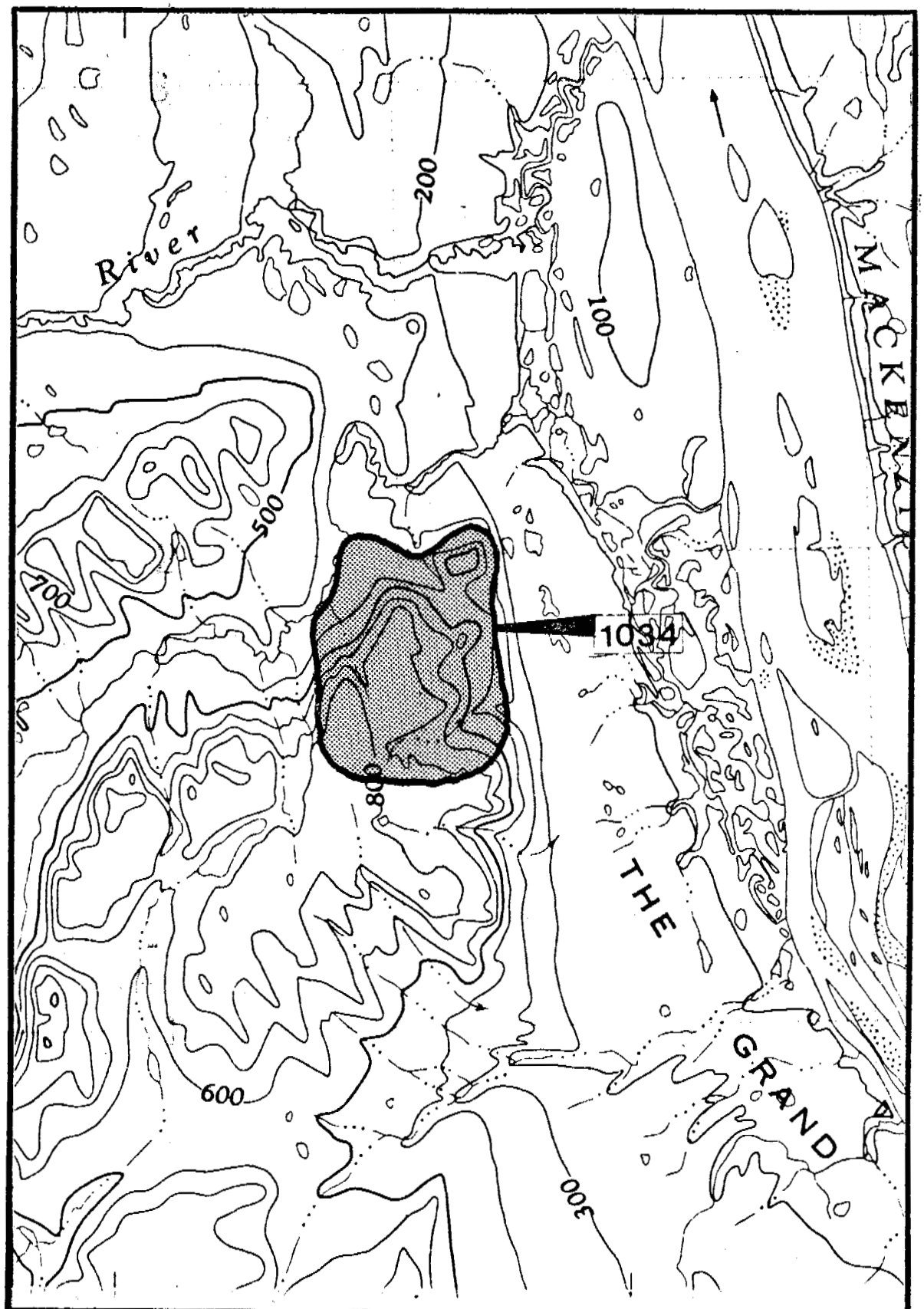
Material: Till.

Assessment: The site was examined as a possible source of exposed bedrock or bedrock covered by thin glacial drift. One shallow test pit encountered only glacial till and there was little or no indication that bedrock is close to the surface. The site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22421-93 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: ONTARATUE RIVER 106-J

SCALE: 1:125,000

SITE 1034

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Structures.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

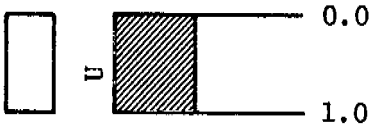
TOTAL INDEX: 295

SPECIAL CONCERNS: On west bank of Mackenzie River. Good moose winter habitat present. Material must cross river. Spring waterfowl staging area.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

TP 1034-1



Till

SITE 1035

Location: Site 1035 is located 8 miles north of the point of confluence of the Ontaratue and Mackenzie Rivers. The proposed highway is 2 miles east of the site.

Geology: The material at site 1035 is contained in the remnants of an outwash deposit.

Material: Gravel, some sand, trace silt, fairly well graded.

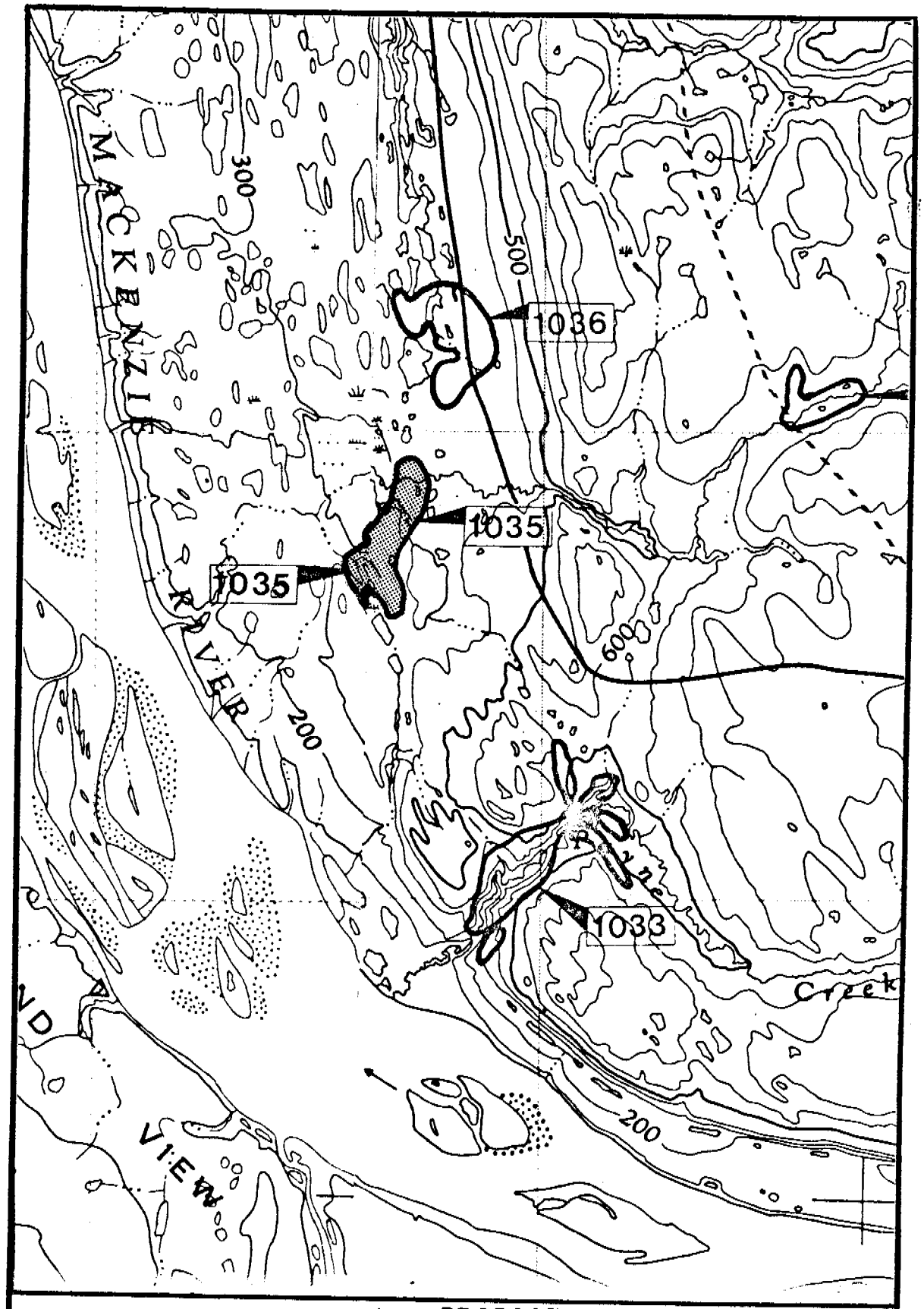
Volume: 11,000,000 cu. yd., volume estimate is realistic.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22889-191 SCALE: 1" = 3000' (approx.)

Area: 325 acres.

Assessment: The gravel at site 1035 is good quality borrow contained in a high volume outwash deposit and is located relatively close to the proposed highway route. Concrete aggregate may be processed by screening off material above the 1/4" seive, washing it and crushing to obtain a sand fraction. Access is not expected to be difficult and haulage distance reasonable. Overburden consists of a few inches of moss which can readily be stripped off during grubbing. Vegetative cover is sparse and should not present any difficulties. The proposed borrow material is unfrozen to at least 20 feet deep. The environmental assessment rates the site as being moderately sensitive. Winter operations, buffer zones and careful siltation and drainage controls will be necessary to ensure environmental stability. A detailed drilling program should be undertaken to prove quantity and quality prior to development, however the site appears to be an excellent source of borrow material. Development within the general guidelines in this report is suggested.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: ONTARATUE RIVER 106-J

SCALE: 1:125,000

SITE 1035

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 3 (4) 5 Rating: 40	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Structures.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 260

SPECIAL CONCERNS: Within lake-wetland complex used by migrating waterfowl, May to June. Buffer zones, siltation controls and drainage maintenance may be required at pits and along acess roads.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1035 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
			NOT FROZEN		
1		GRAVEL			1
		-silty, sandy, rounded to subrounded, dry, light brown.			
2	GW				2
	GM				
3		-few cobbles, some sand.			3
4		71% GRAVEL (4') 19% SAND 10% SILT & CLAY			4
5					5
6					6
		45% GRAVEL 38% SAND			
7	GM	(6' + 8') 17% SILT & CLAY			7
8					8
9		-some sand, some silt			9
10					10
11					11
12		-decreasing gravel content, siltier			12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 29/73 LOGGED BY: EBA 161-2 COMPLETION DEPTH: 21.5'

DRILLING METHOD: AUGER THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1035 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % 10 20 30 40	DEPTH (feet)
		GRAVEL			
18		-same			18
19	GM				19
20					20
21		END OF HOLE			21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 29/73

LOGGED BY: EBA 161-2

COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER

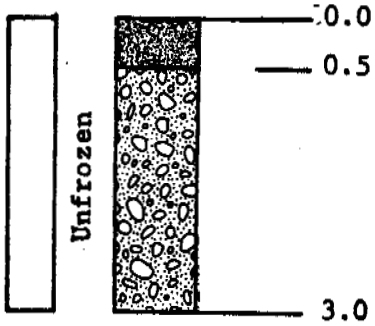
THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1035-1

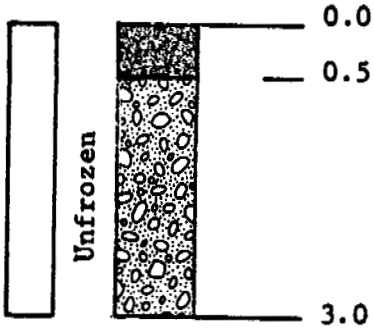


Moss

Gravel, moist
light brown

47% GRAVEL
37% SAND
16% SILT & CLAY

TP 1035-2

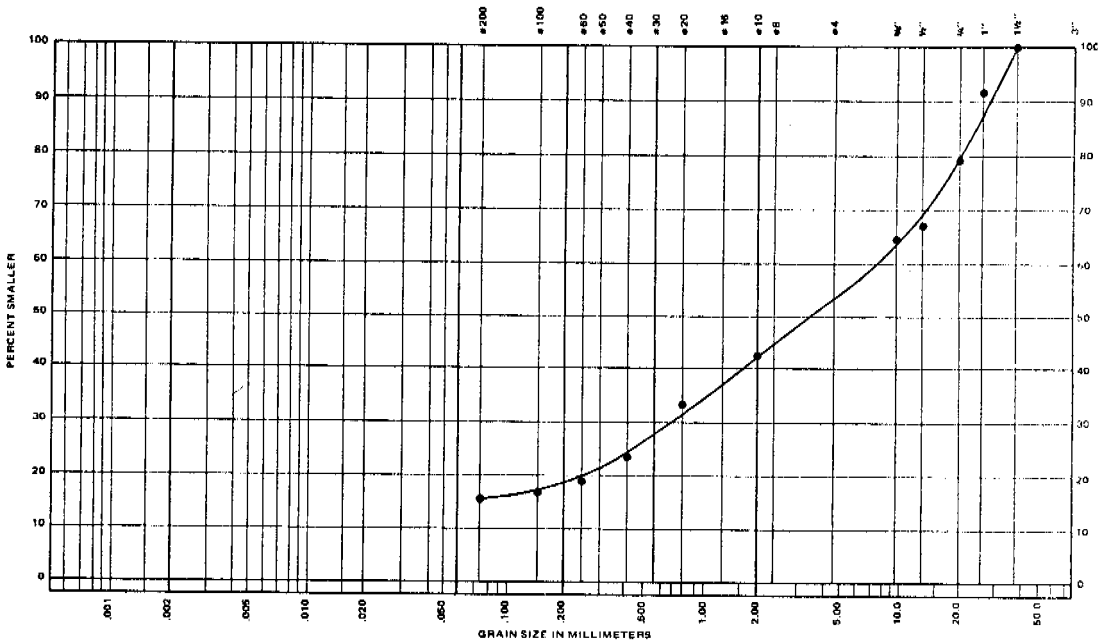


Moss

Gravel, silty
moist

54% GRAVEL
35% SAND
11% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

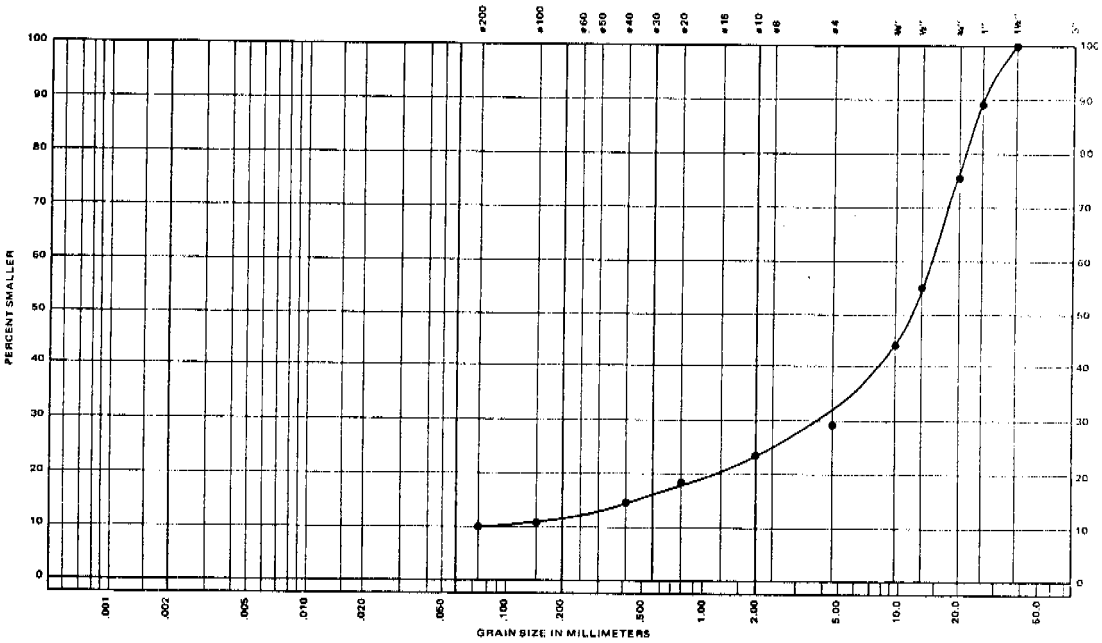


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GW-GM) M/C = 5.5%

PROJECT Granular Resources
JOB No. E666 DATE January 14/74
SAMPLE No. TP 1035-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

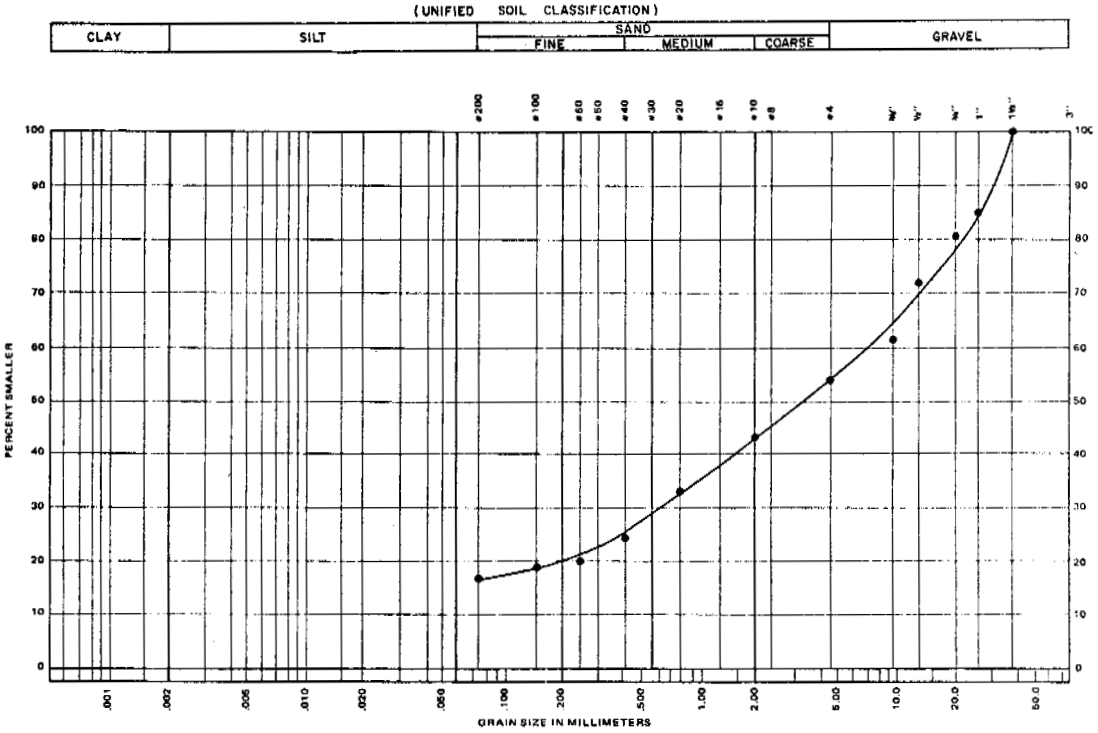


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel with A Trace of Silt (GW-GM)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1035-1
DEPTH 4'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

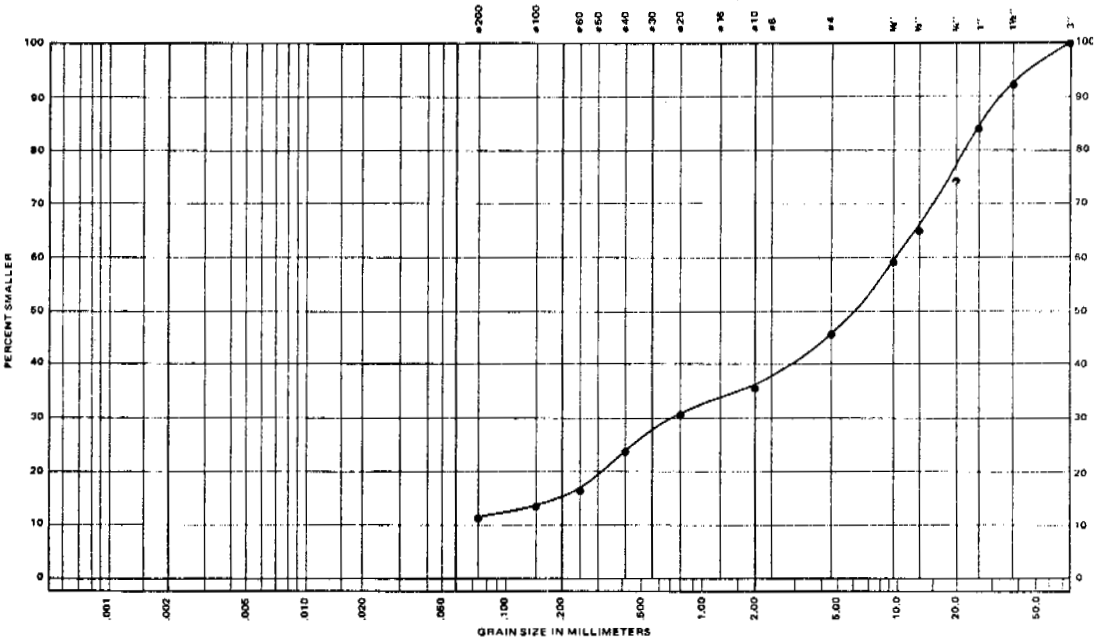


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GM)

PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1035-1
DEPTH 6' + 8'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GP-GM)

PROJECT Granular Resources
JOB No. E666 DATE December 17/73
SAMPLE No. TP 1035-2
DEPTH 3'

PETROGRAPHIC ANALYSIS

Limestone	8%
Dolomite	3%
Sandstone	37%
Chert	1%
Quartzite	13%
Granite	8%
Basalt	21%
Basalt Porphyry	8%
Others	1%

Note: Substantial carbonate coatings exist on approximately 50% of the sample particles.

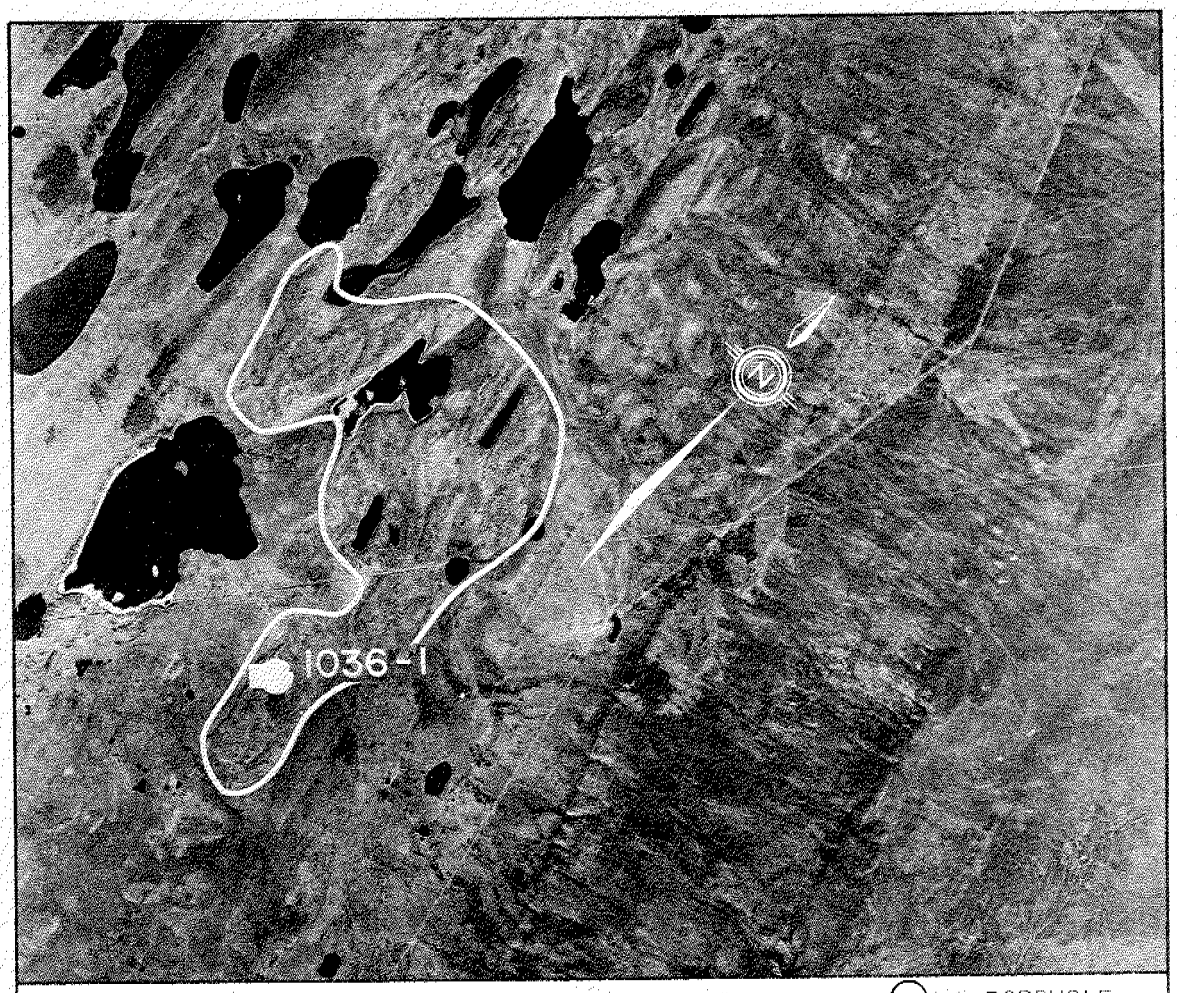
SITE 1036

Location: Site 1036 is situated 8 miles north of the point of confluence of Payne Creek and the Mackenzie River. The proposed highway route is .5 miles west of the site.

Geology: Site 1036 is a fossil outwash.

Material: Gravel and sand, silty, well graded.

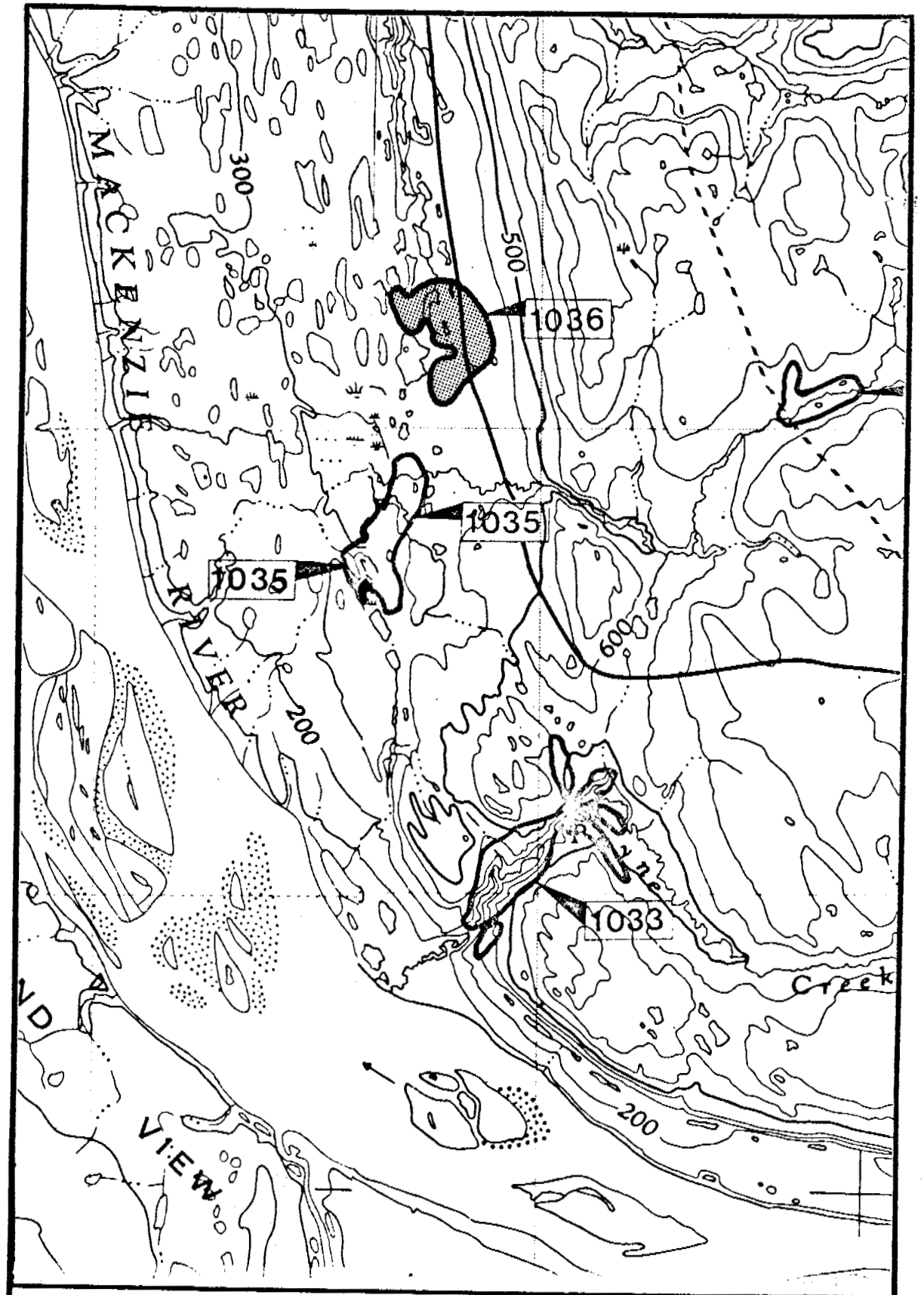
Volume: 2,200,000 cu. yd., volume estimate is conservative.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-25 SCALE: 1" = 3000' (approx.)

Assessment: The outwash gravel at site 1036 is good quality material and a relatively large volume is present. Access is easy and haulage distance short. Permafrost was not found in the drilling; the soil is expected to be unfrozen to at least 20 feet. Overburden is negligible and vegetative cover sparse. The site has a relatively low environmental sensitivity; the main concern centered on maintaining the present hydrologic system. A more detailed drilling program should be undertaken to prove quantity and quality prior to development. Borrow pit development within the general guidelines in this report is suggested.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: ONTARATUE RIVER 106-J

SCALE: 1:125,000

SITE 1036

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing, Domestic, Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 195

SPECIAL CONCERNS: Surrounding swamps and creeks provide good beaver habitat. Existing hydrologic systems should be maintained.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1036 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	OL	TOPSOIL -organic, black	NOT FROZEN		
1	GM	GRAVEL			1
2		-silty, sandy, very dry, light to medium brown.			2
3					3
4		(4') 49% GRAVEL 30% SAND 21% SILT & CLAY			4
5		-sandier			5
6					6
7		END OF HOLE			7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 29/73 LOGGED BY: EBA 161-1 COMPLETION DEPTH: 6.8'

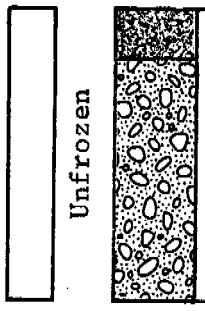
DRILLING METHOD: AUGER THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1036-1



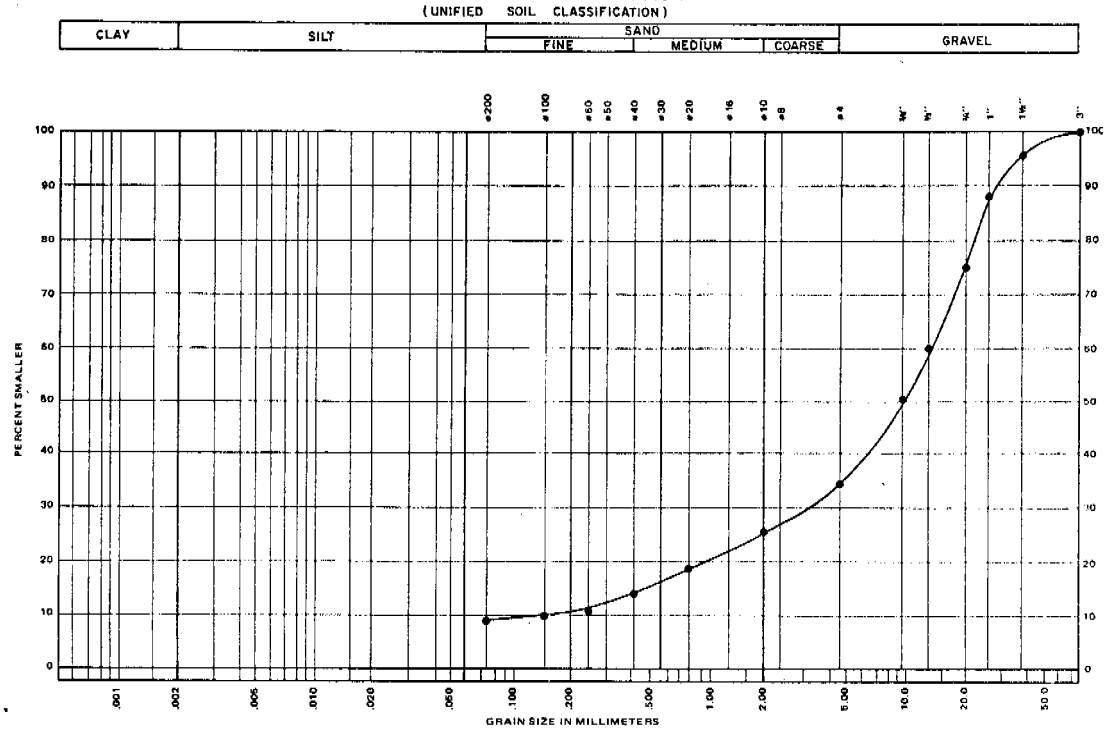
0.0 Moss

0.5

Gravel, sandy — 66% GRAVEL
moist — 25% SAND
some cobbles — 9% SILT & CLAY

3.0

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



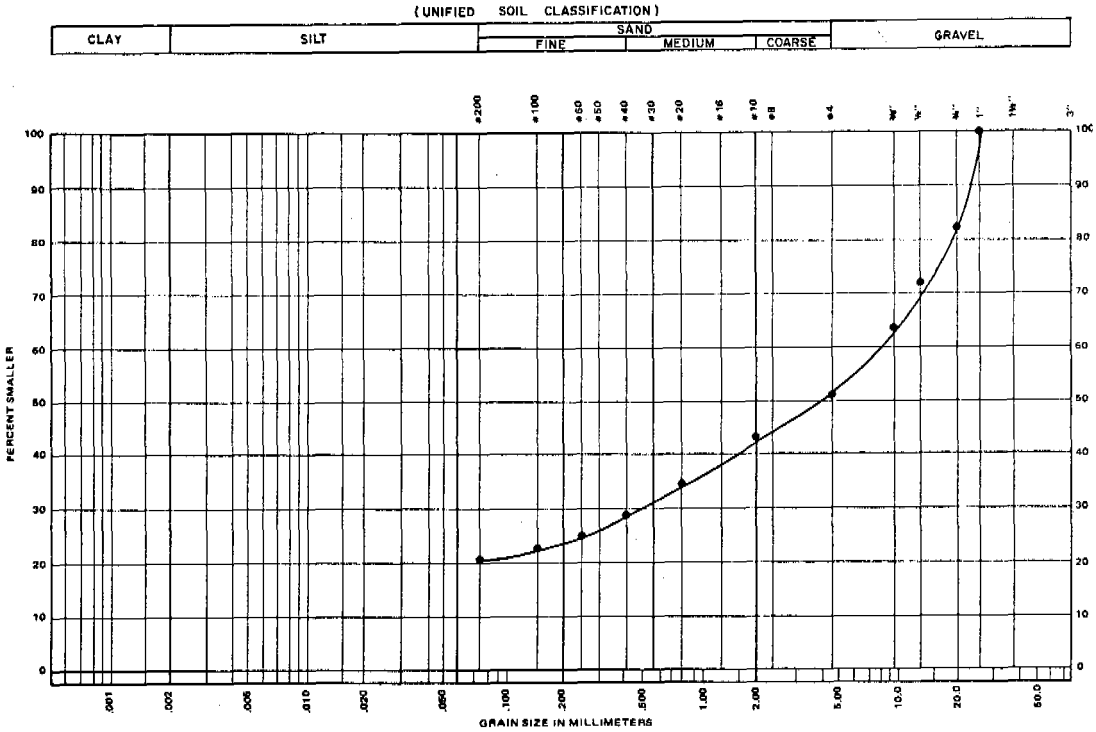
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy gravel with a trace of silt (GM) M/C = 5.3%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1036-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Silty Gravel (GM)

PROJECT Granular Resources

JOB No. E666 DATE

SAMPLE No BH 1036-1

DEPTH 4'

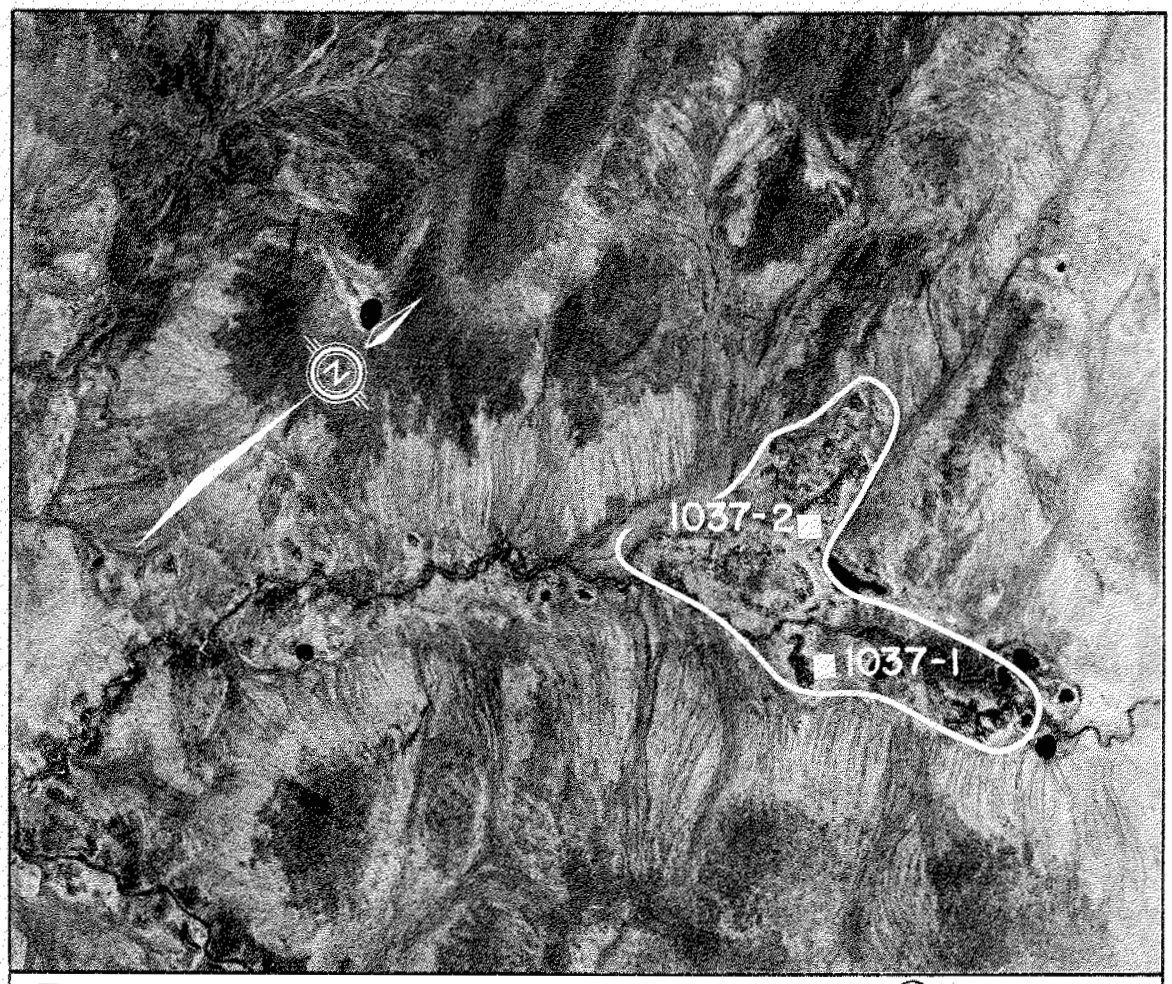
SITE 1037a

Location: Site 1037 is located 10 miles west of the central part of Yeltea Lake. The proposed pipeline route is 2 miles west of the site.

Geology: Site 1037 is a complex of small kames. Composition of the kames is variable.

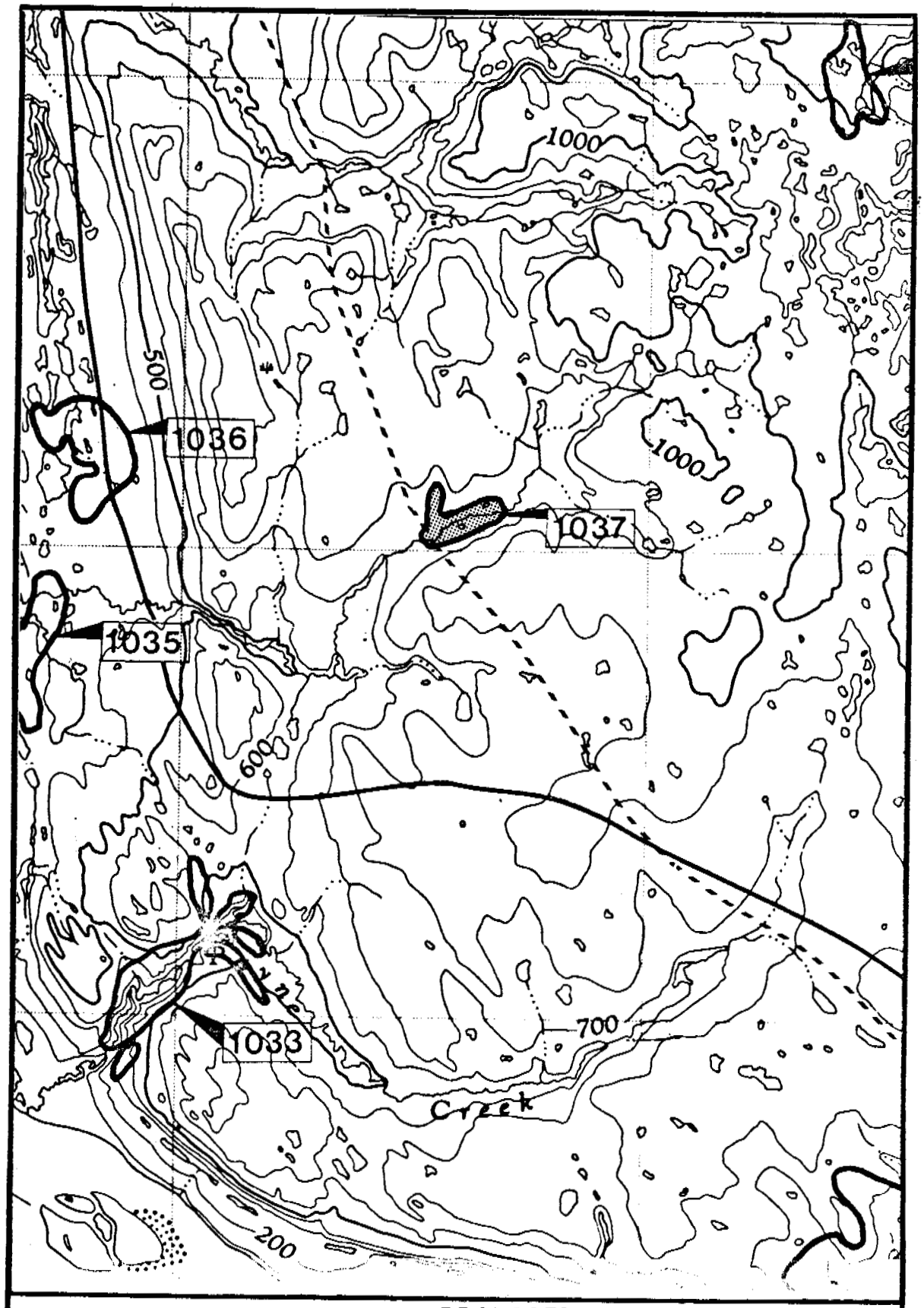
Material: Clayey silt, trace of sand.

Assessment: The area is a kame complex of highly variable composition. Good borrow may exist, however, none was encountered during the field program. Site 1037 is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-27 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I

SCALE: 1:125,000

SITE 1038

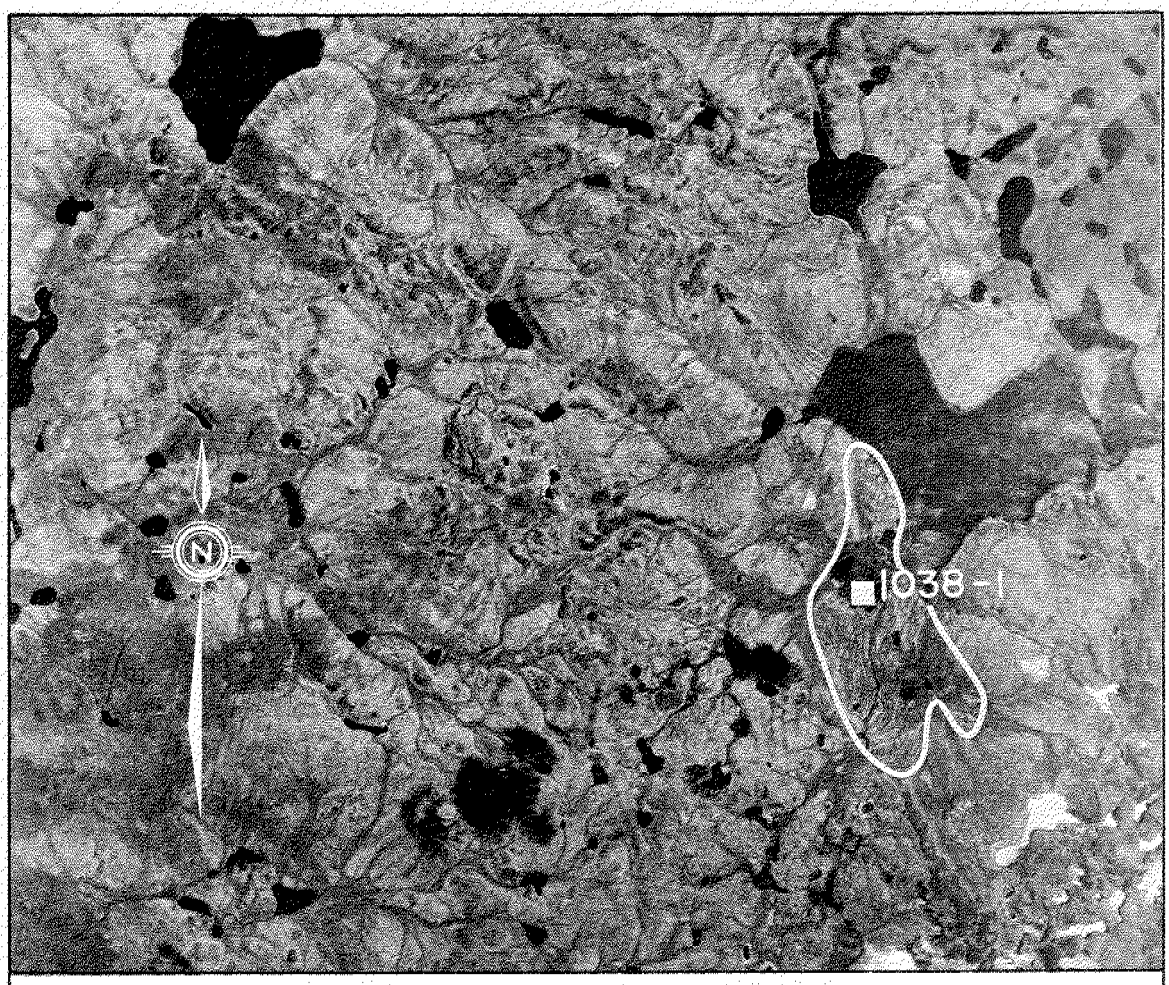
Location: Site 1038 is along the south shore of a large unnamed lake 4 miles west of the northern end of Yeltea Lake. The proposed pipeline route is 8 miles SW of the site.

Geology: Site 1038 is a large braided outwash which is being actively eroded. The material is expected to be quite uniform.

Material: Sandy gravel, trace silt, well graded.

Volume: 3,500,000 cu. yd., volume estimate is conservative.

Area: 720 acres.

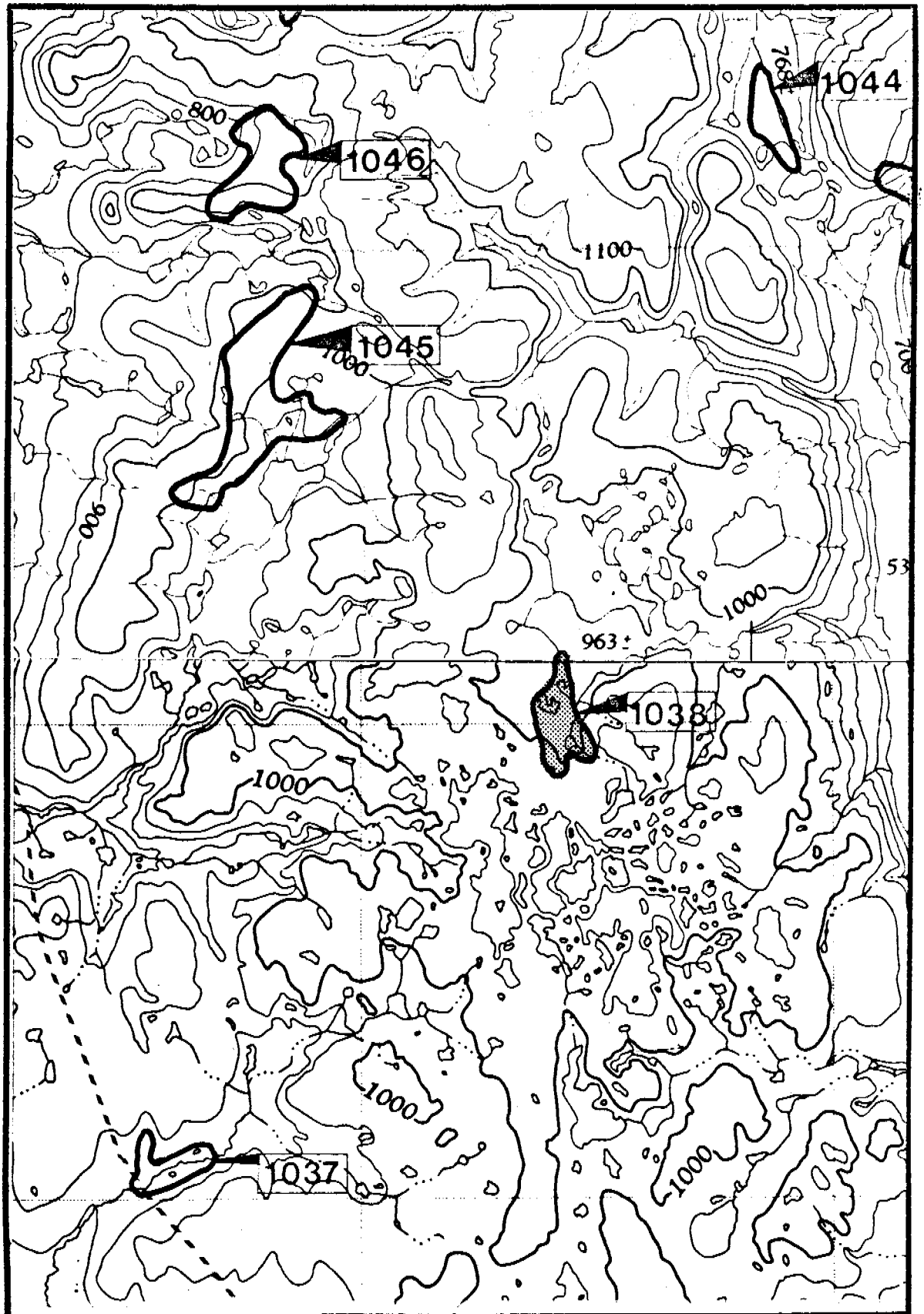


TEST PIT BOREHOLE

AIRPHOTO No. A21584-209 SCALE: 1" = 5500' (approx.)

Drainage: The site is well drained into a nearby lake.

Assessment: Based on test pit data the material at site 1038 was assessed to be of good to fair quality. A considerably large volume of borrow is available at the site but haulage distances are long (minimum 8 miles) and access across thermally sensitive terrain somewhat difficult. The ground is expected to be unfrozen to a depth of at least 10 feet. A 50 foot stand of timber covers the site. The environmental overview gives the site a relatively low rating. A drilling program should be undertaken to determine borrow thickness. The long haulage distance to proposed routes limits feasibility of the site for development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1038

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION (1) 2 3 4 5 Rating: 5	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS (1) 2 3 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Grayling, Pike, Trout-Perch, Lake Trout, Burbot, Suckers, Stickleback Smelt, Sculpin, Goldeye, Chub, Dace, Walleye, Char, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discover.. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing, Domestic, Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control [illegible]

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

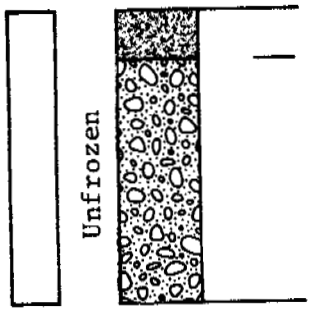
TOTAL INDEX: 205

SPECIAL CONCERNS: Upland area. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

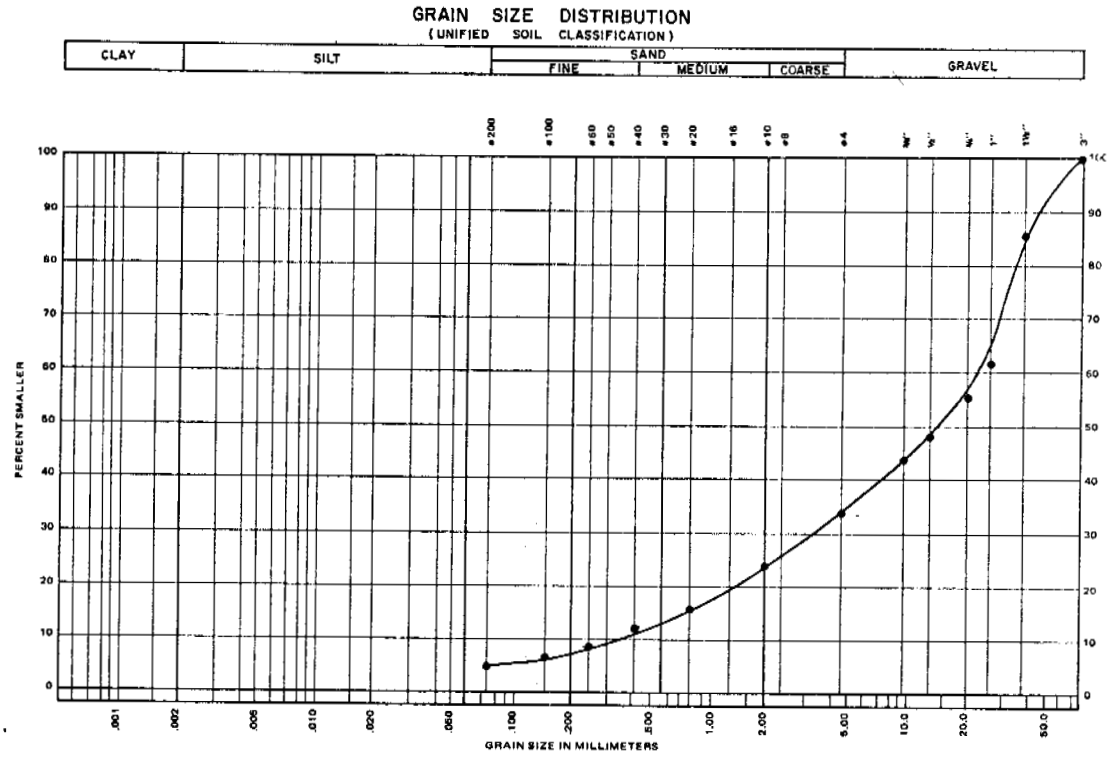
TP 1038-1



0.0 — Peat, dark brown, fibrous

0.5 — Gravel, reddish brown, silty, some sand, large cobbles

3.0



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel, Sandy, Trace Silt. (GW)

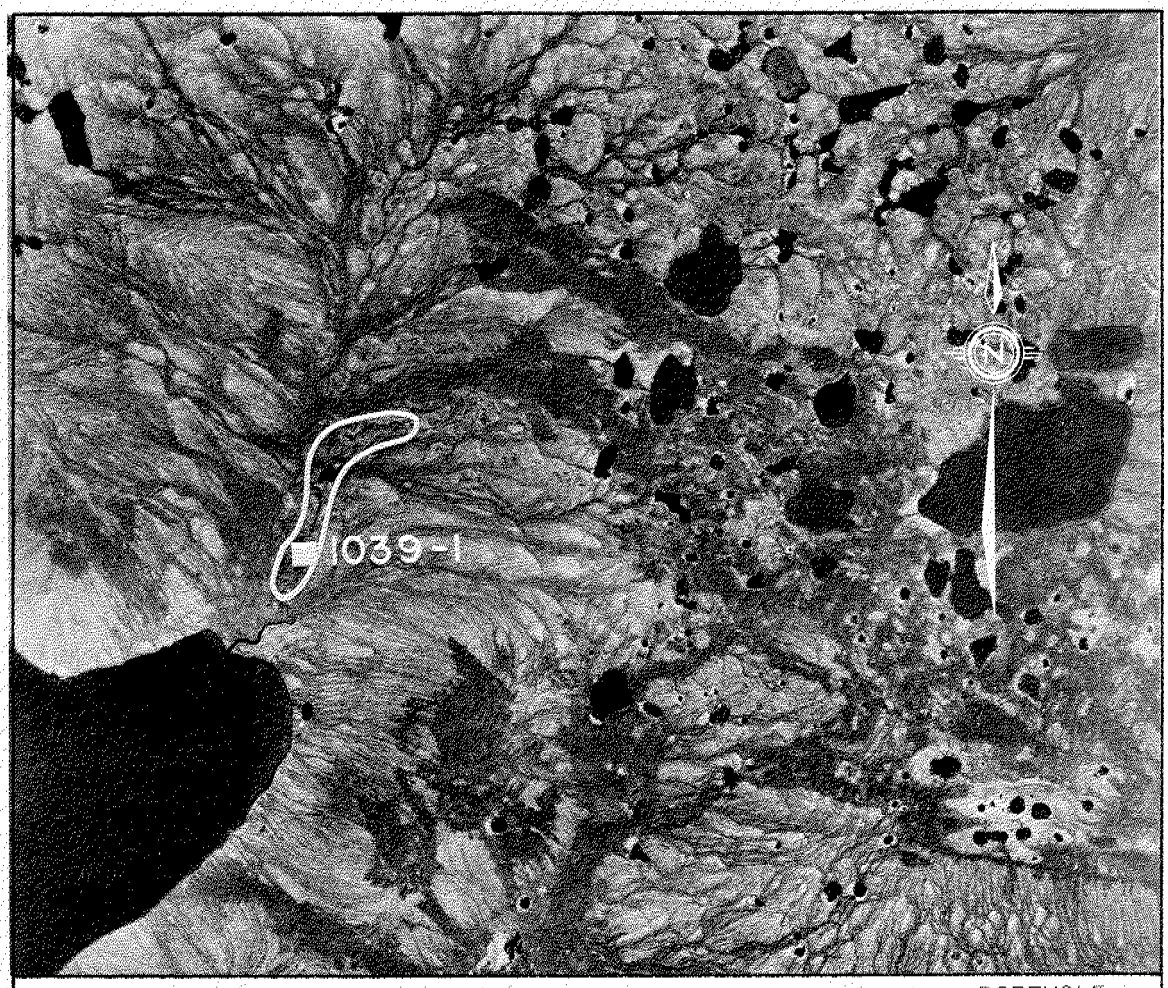
PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1038-1
DEPTH 3'

SITE 1039a

Location: Site 1039 is located one mile NE of the large, east shore bay of Manuel Lake. Proposed pipeline and highway routes are 21 miles SE of the site.

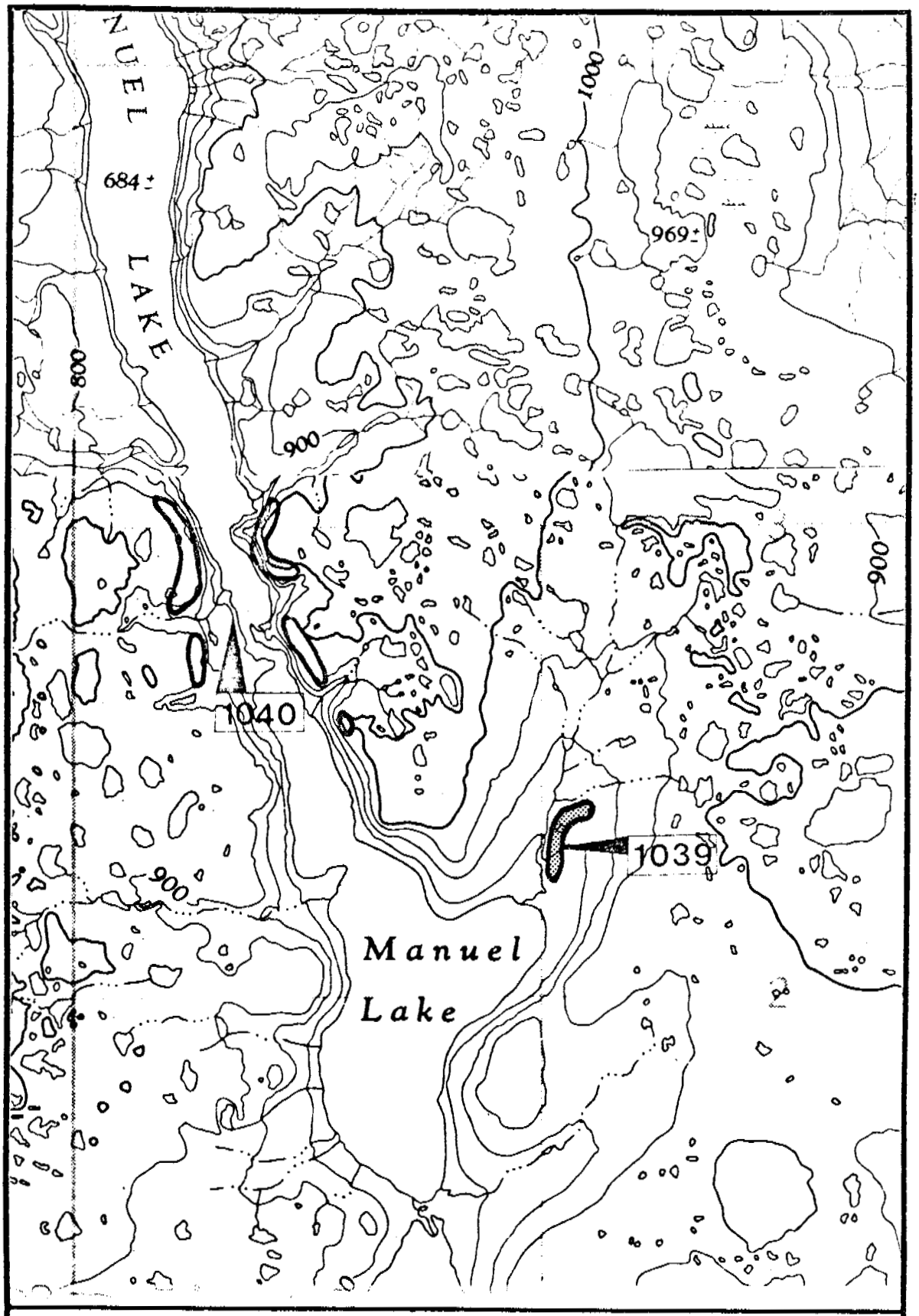
Material: Silt, some sand, some clay.

Assessment: The material is of poor quality and is unsuitable for construction purposes. Site 1039 is not recommended for development.



TEST PIT BOREHOLE

AIRPHOTO No. A22421-104 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1039

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 (4) 5 Rating: 20	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass Legume Seeding. Transplants. Sustained Maintenance. Erosion Control.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 295

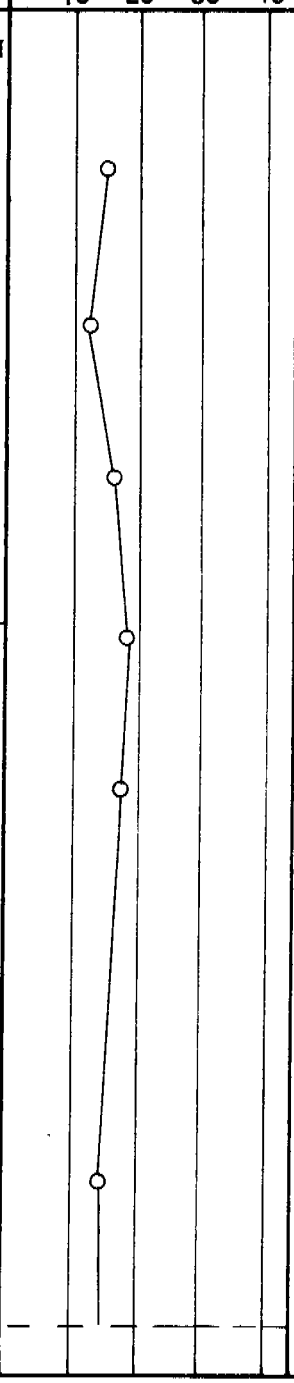
SPECIAL CONCERNS: Straddles tributary on east side of Manuel Lake. Area trapped and fished by Fort Good Hope natives. Buffer zones and siltation controls should protect shoreline areas.

D.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1039 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
		SILT	NOT FROZEN
1		-some fine sand, dry, light brown	
2	SM-ML		
3			
4		-sandy, fine	
5			
6		-some clay, sandy, fine, low plasticity.	
7	ML		
8			FROZEN
9			
10			
11			
12			
13			
14			
15		-some clay, some fine sand	
16			
17			



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Sep. 30/73

LOGGED BY: EBA 313-1

COMPLETION DEPTH: 23.0'

DRILLING METHOD: AUGER

THAW DEPTH: 8.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1039 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	SM-ML	SILT -same -very sandy	Nbn		18
19					19
20	SM	SILT &SAND -very fine, moist, light brown			20
21					21
22					22
23					23
24		END OF HOLE			24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 30/73

LOGGED BY: EBA 313-1

COMPLETION DEPTH: 23.0'

DRILLING METHOD: AUGER

THAW DEPTH: 8. 0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

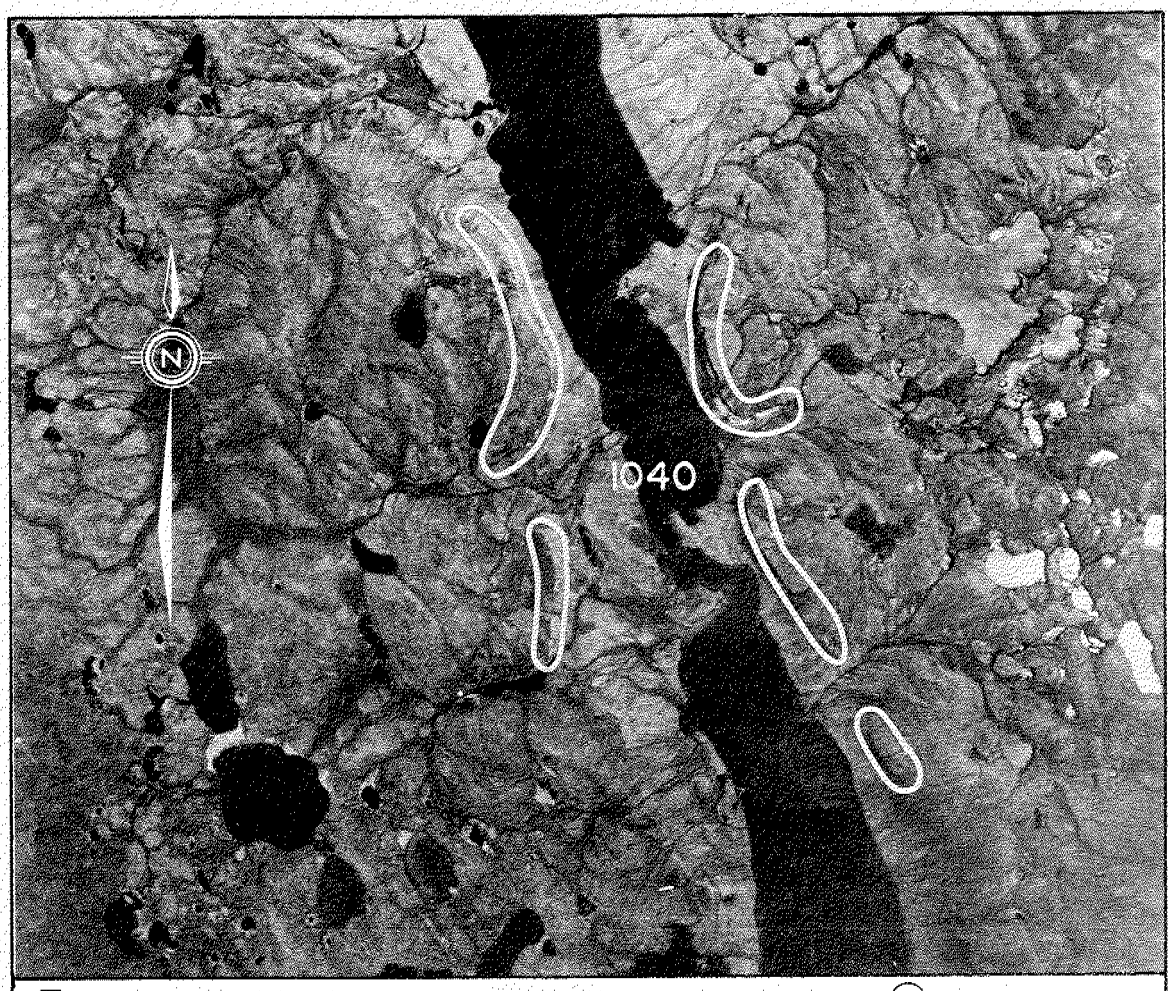
EBA Engineering Consultants Ltd.

SITE 1040a

Location: Site 1040 is situated along the shores of Manuel Lake roughly at the midpoint. Proposed pipeline and highway routes are 21 miles SW of the site.

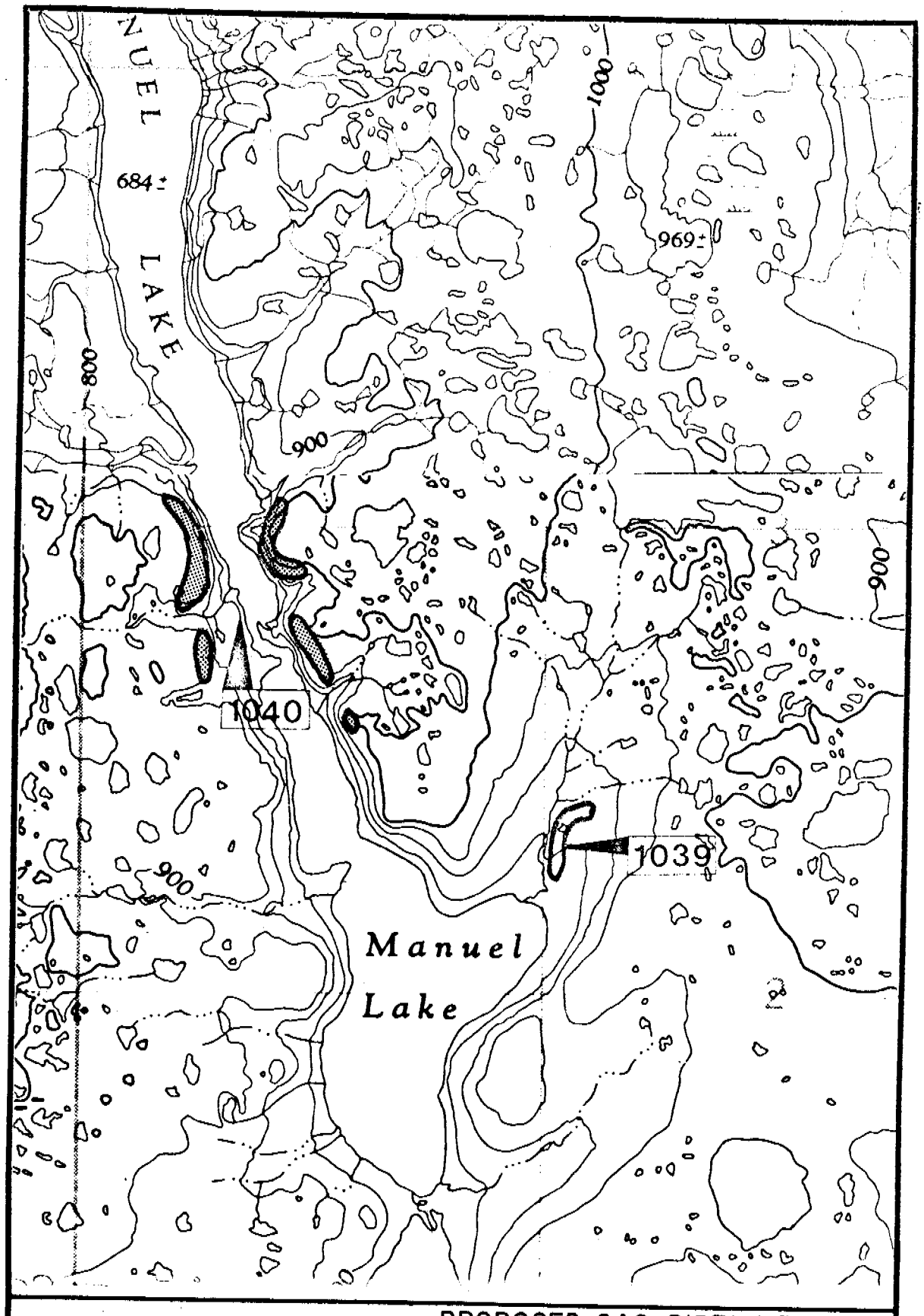
Material: Limestone.

Assessment: Excessively long haulage distances, thick overburden and environmental sensitivity combine to preclude this site from development. The borrow material is of fair quality.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21584-204 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1040

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 3 (4) 5 Rating: 20	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 3 4 (5) Rating: 50	Lakes, Tributaries Mackenzie River: Whitefish — Smelt Grayling — Sculpin Pike — Goldeye Trout-Perch — Chub Lake Trout — Dace Burbot — Walleye Suckers — Char Stickleback — Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 4 (5) Rating: 25	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO -	500

TOTAL INDEX: 365

SPECIAL CONCERNS: Sites on exposed faces, both shores of Manuel Lake. Fishery archaeological and caribou values high. Domestic use of area from Fort Good Hope. Buffer zones, operating restrictions and restoration guidelines may be imposed.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

SITE 1041a

Location: Site 1041 is 6 miles east of the north end of Yeltea Lake. Proposed pipeline and highway routes are located 19 miles SW of the site.

Geology: The material at site 1041 is contained in an outwash delta and an esker.

Material: Gravel, sand, trace of silt, well graded.

Volume: 3,500,000 cu. yd., volume estimate is conservative.

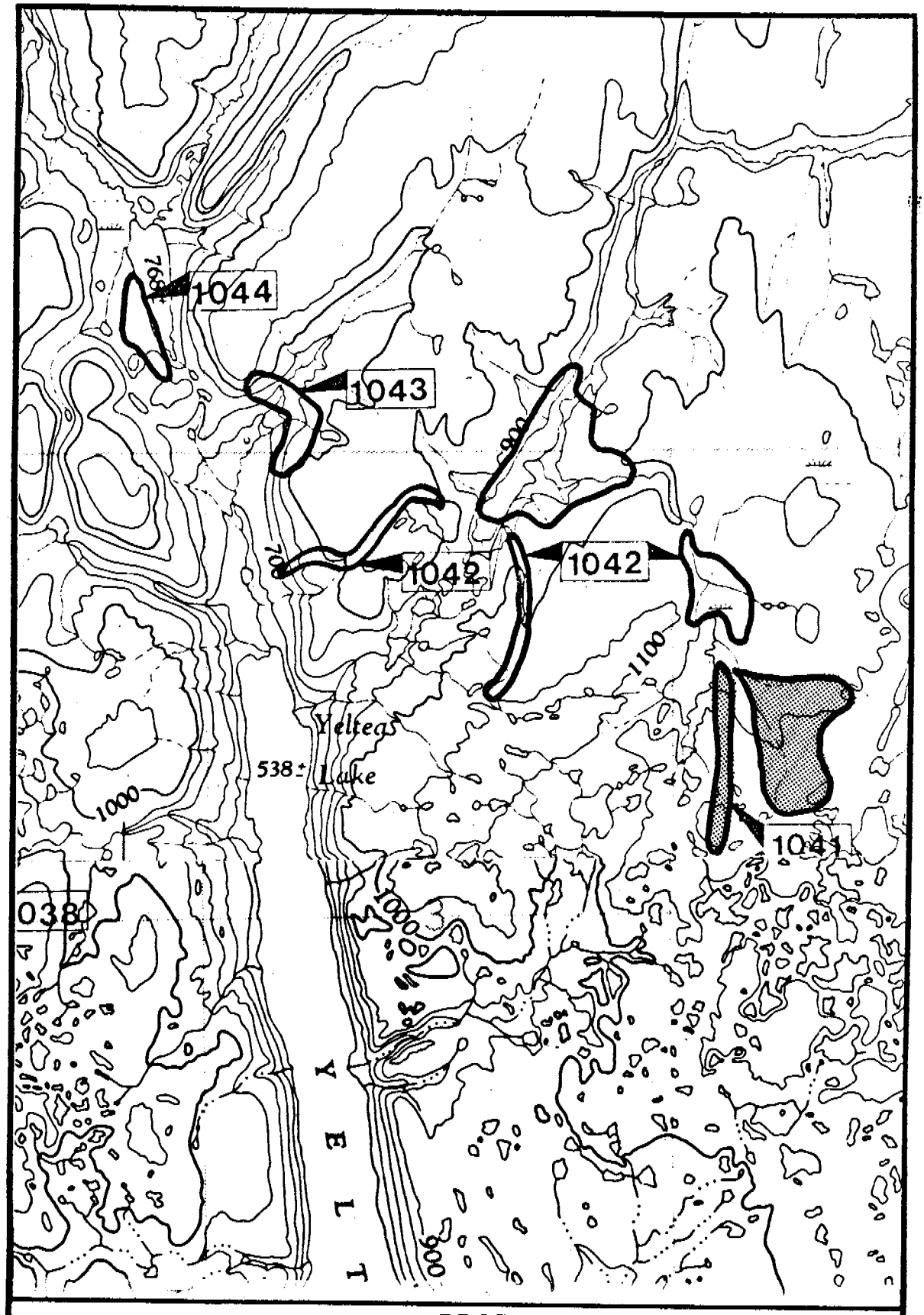
Area: 725 acres.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21584-205 SCALE: 1" = 5500' (approx.)

Drainage: Drainage at the site is fair to poor.

Assessment: The borrow at site 1041 is somewhat variable but is generally of fair to good quality; however, moisture contents are high which would necessitate stockpiling and draining before use. The environmental assessment indicates the site to be moderately sensitive. Excessive haulage distance combined with the anticipated high moisture (ice) content will preclude the site from development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1041

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 (2) 3 4 5 10 Rating:	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) 75 Rating:	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 260

SPECIAL CONCERNS: Upland area near lake complex. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1041 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	GM	COBBLES & GRAVEL -silty	NOT FROZEN		
1	GW GM	GRAVEL -sandy, well graded, medium sized cobbles, light to medium brown. 12.4% O.C.			1
2					2
3		(2') 68% GRAVEL 25% SAND 7% SILT & CLAY			3
4		END OF HOLE			4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 30/73 LOGGED BY: EBA 167-1 COMPLETION DEPTH: 3.0'

DRILLING METHOD: AUGER THAW DEPTH: NONE FOUND

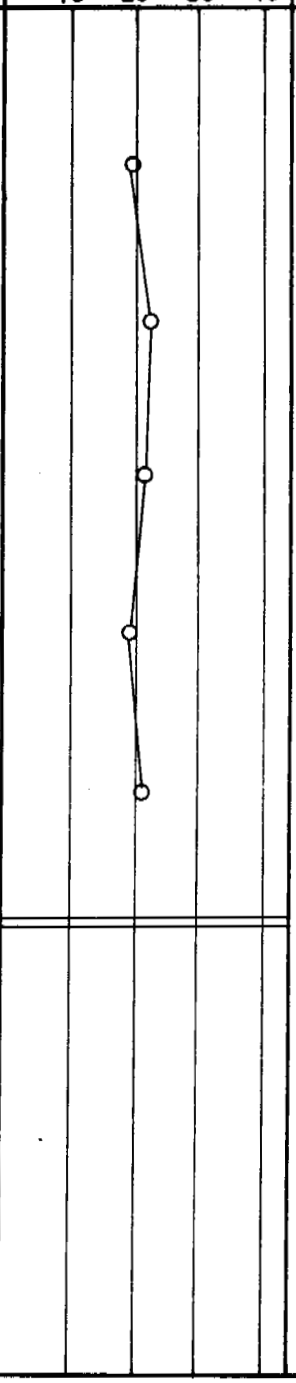
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1041 HOLE NO. 2 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
	ML	SILT -sandy, dry, light brown	NOT FROZEN
1	CL	CLAY -silty, trace gravel, moist, grey	
2			
3		-no gravel, medium plasticity	
4			
5			
6			
7			
8			FROZEN
9		-trace fine gravel, medium plasticity	
10			
11			
12		END OF HOLE	
13			
14			
15			
16			
17			



DATE DRILLED: Sep. 30/73

LOGGED BY: EBA 167-2

COMPLETION DEPTH: 11.8'

DRILLING METHOD: AUGER

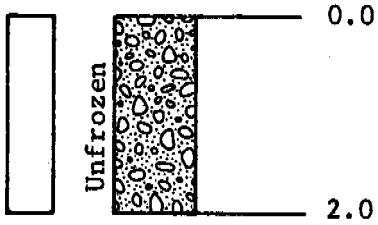
THAW DEPTH: 8.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

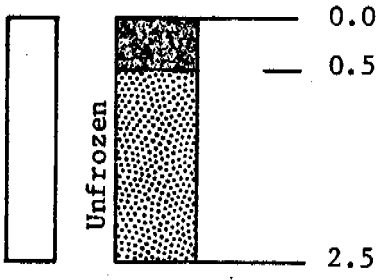
TP 1041-1



Boulder pavement, sand and gravel, brown, well graded, clean

52% GRAVEL
41% SAND
7% SILT & CLAY

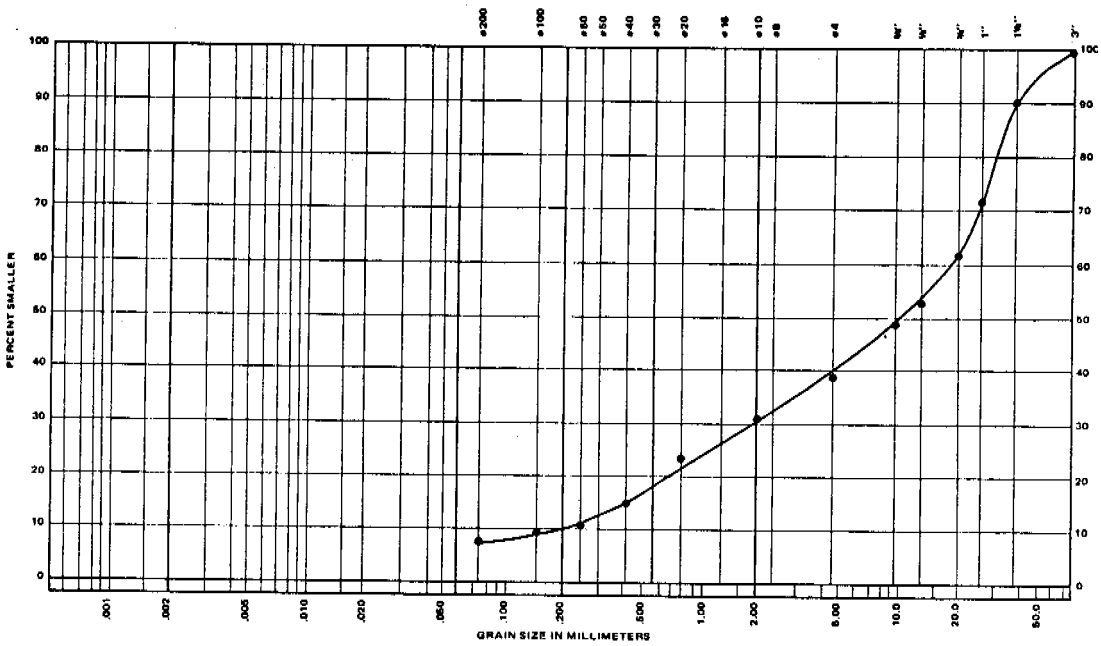
TP 1041-2



Surface silt and organics

Sand, silty
gravelly

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

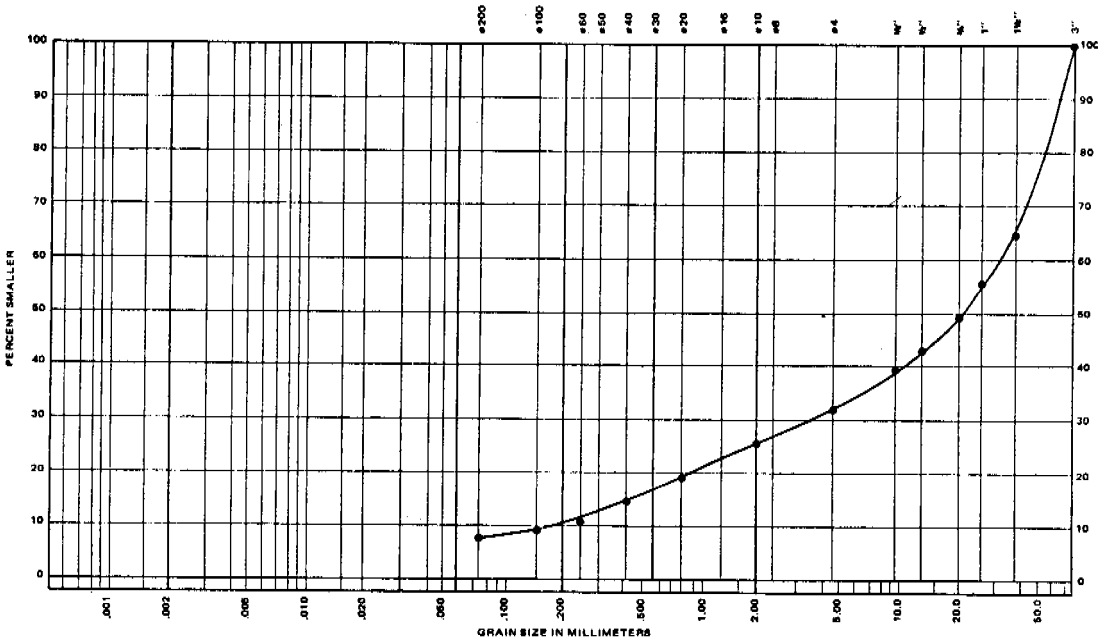


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with a Trace of Silt (GP-GM) M/C = 4%

PROJECT Granular Resources
JOB No. E666 DATE Dec.17/73
SAMPLE No. TP 1041-1
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy,Gravel with a Trace of Silt. (GW-GM)

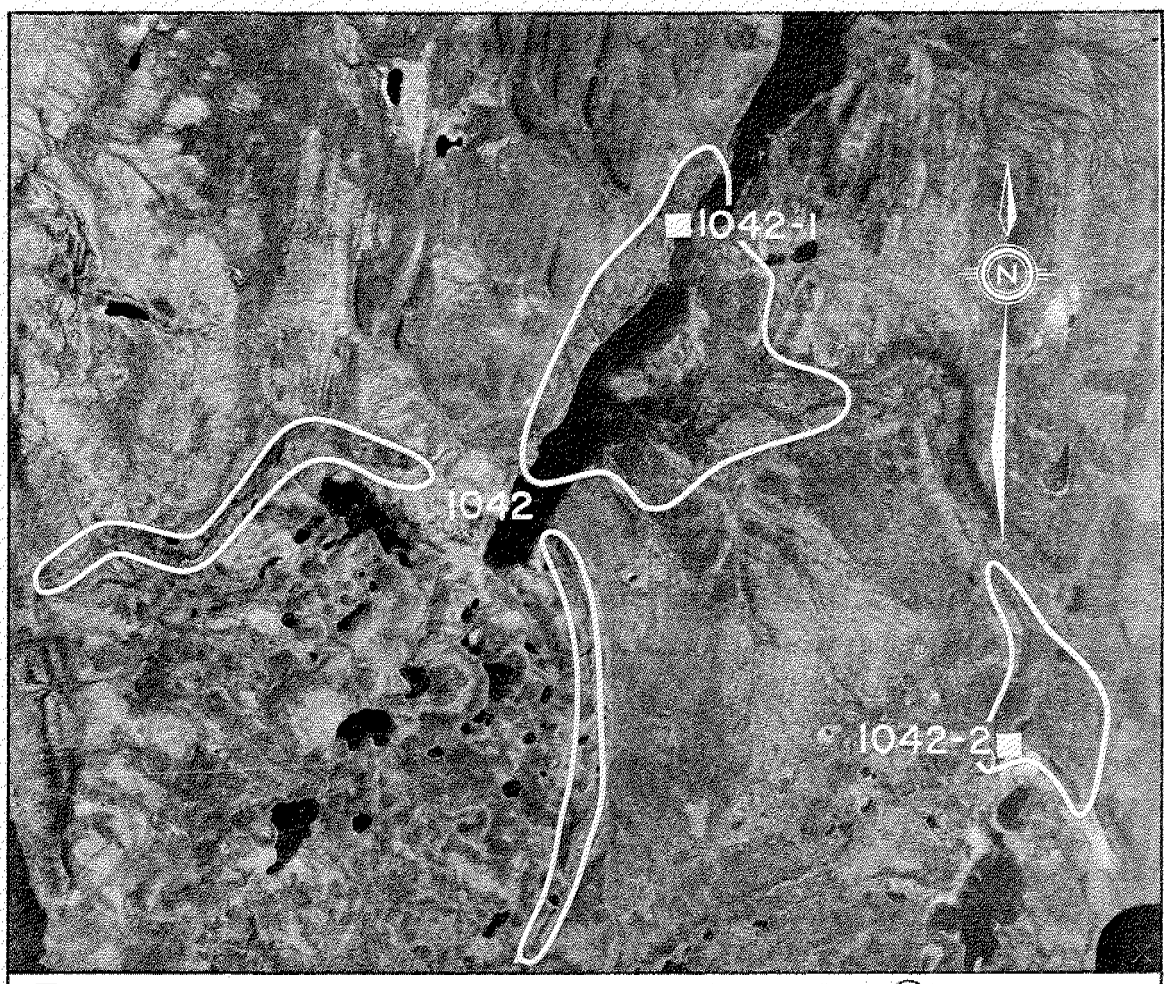
PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1041-1
DEPTH 2'

SITE 1042a

Location: Site 1042 is situated 5 miles NE of the northern tip of Yeltea Lake. Proposed pipeline and highway routes are 20 miles SW of the site.

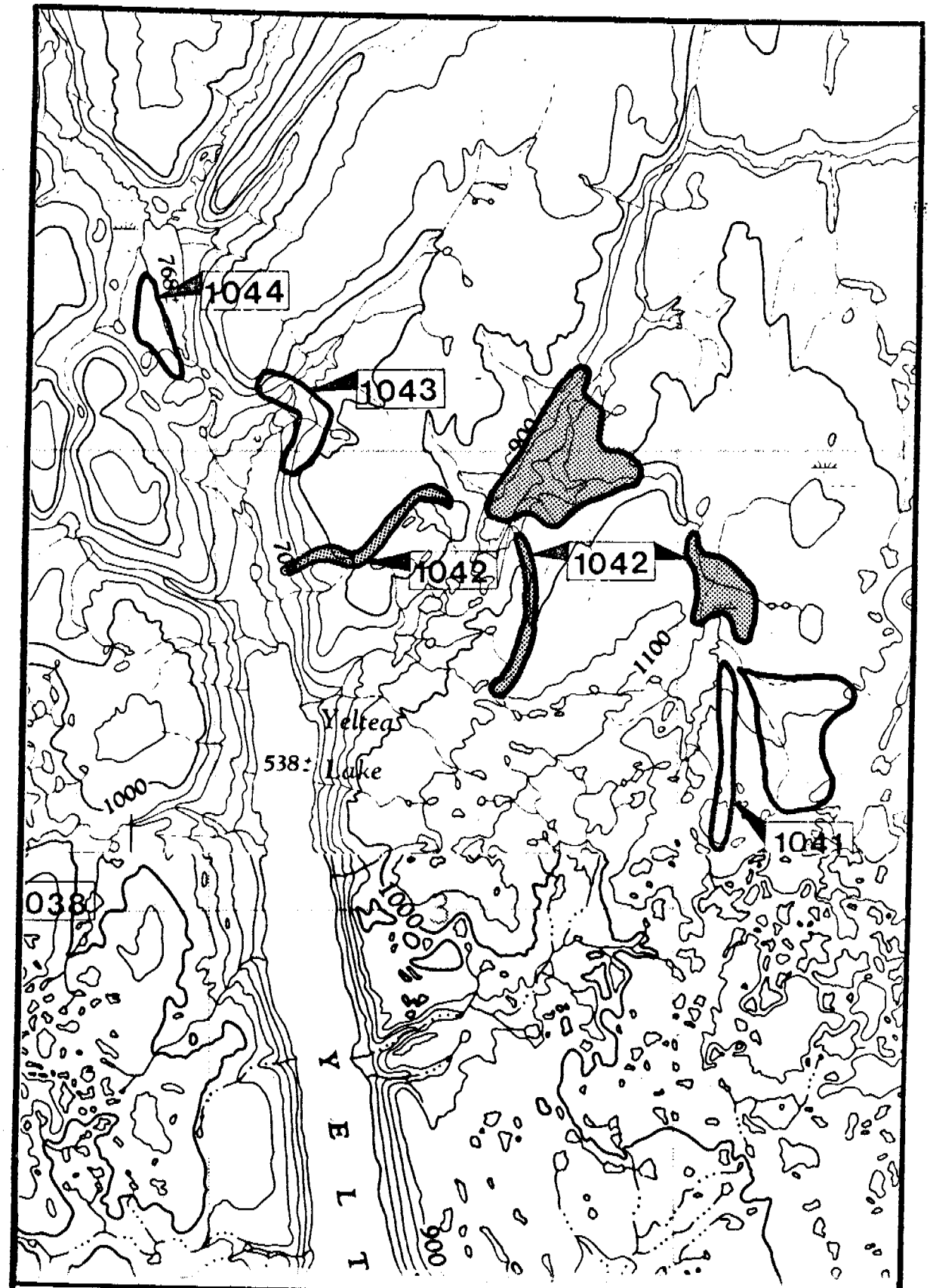
Material: Clayey silt, some sand.

Assessment: The test pit program at site 1042 indicates poor quality material unsuitable for construction purposes. The site is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21538-50 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

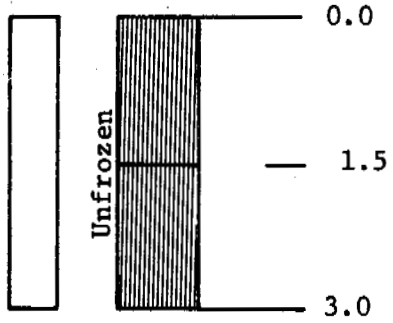
PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

TEST PIT LOG

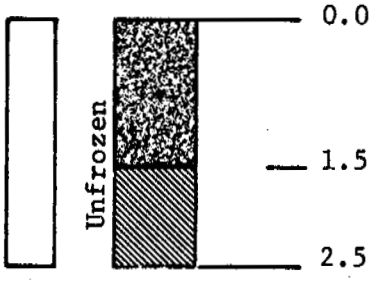
TP 1042-1



Silt, sand to gravelly
brown organic material

Silt, clayey, some sand, grey brown

TP 1042-2



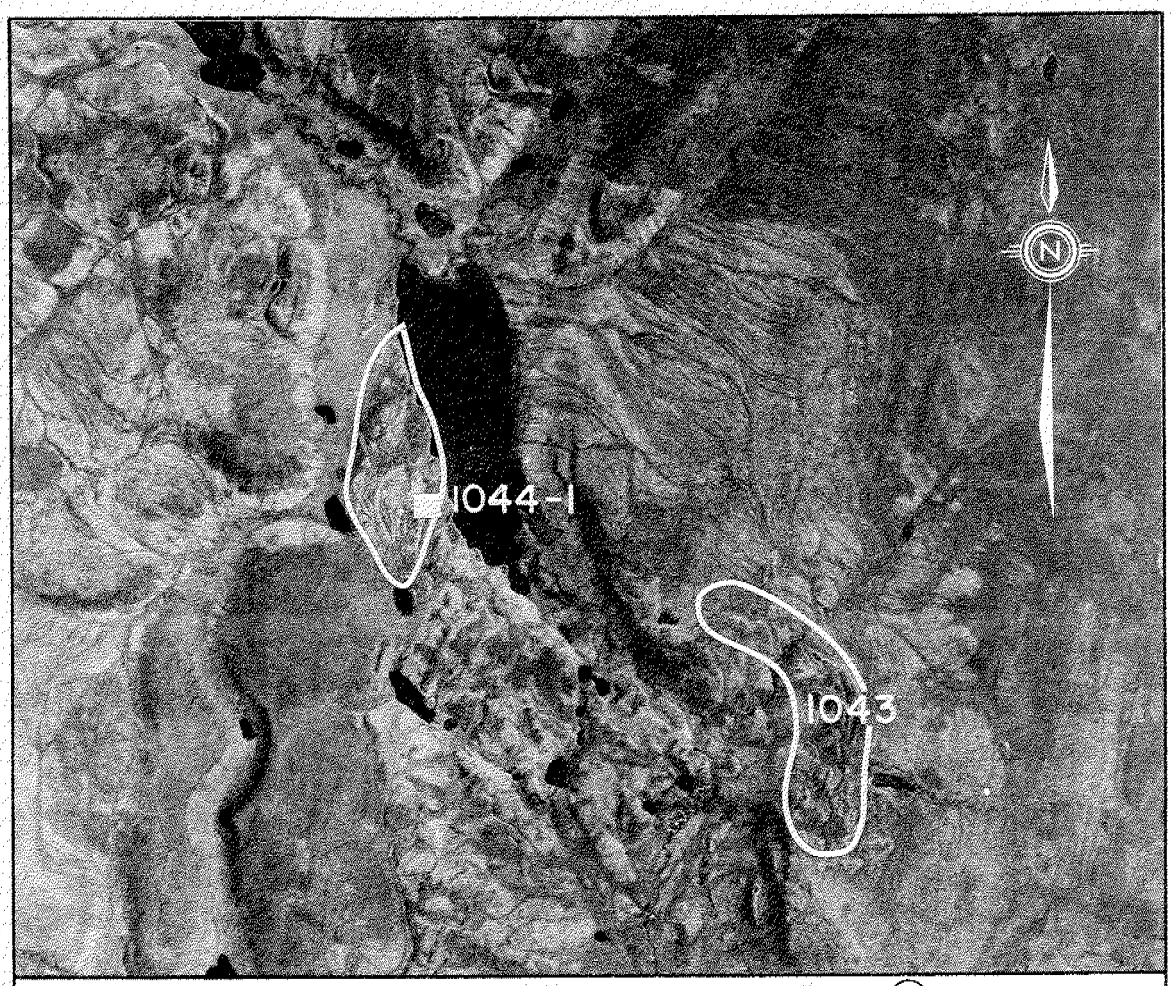
Peat and surface organics,
roots

Till, sandy
clay

SITE 1043a

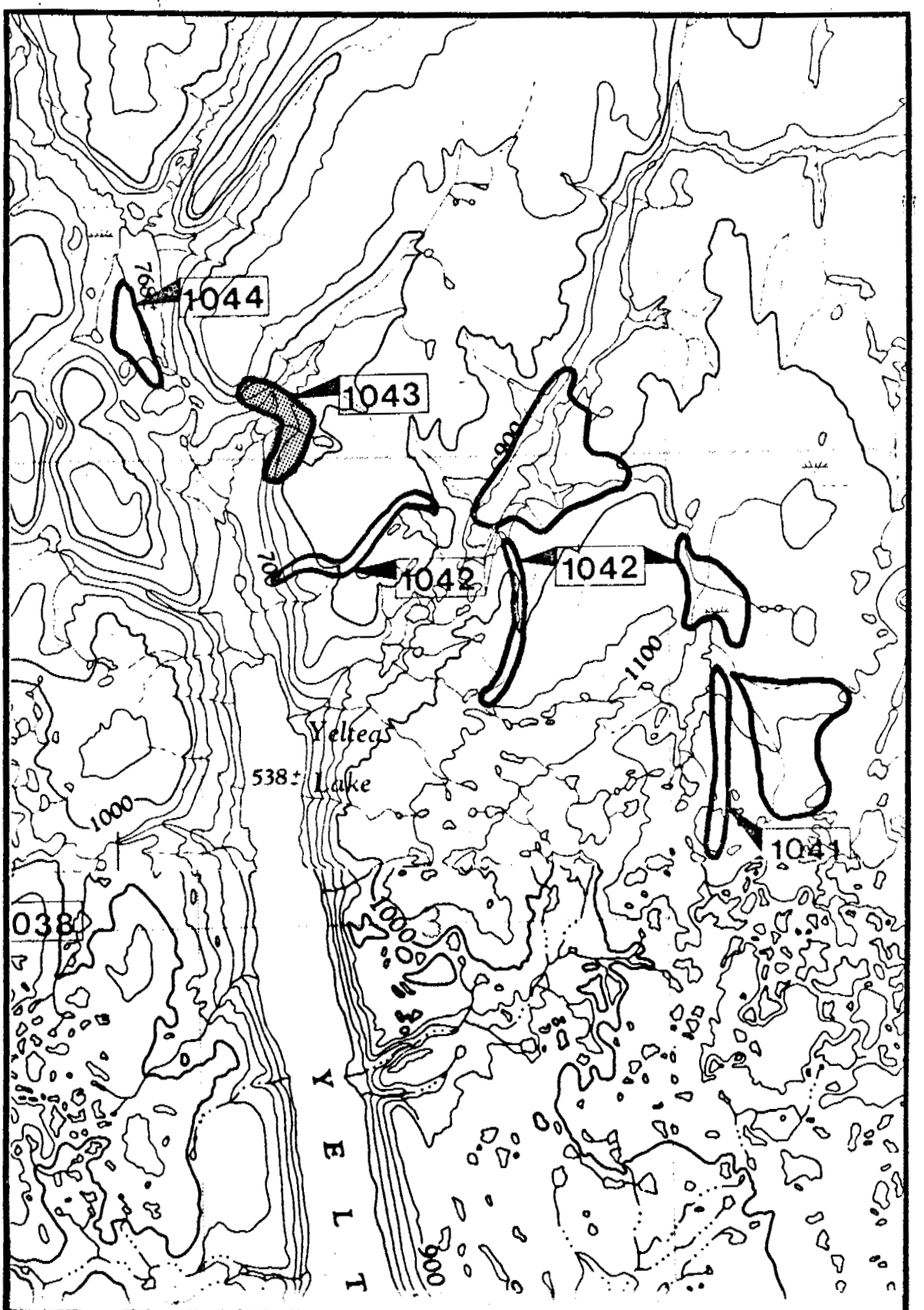
Location: Site 1043 is 3 miles north of Yeltea Lake and 14 miles NEE of the proposed pipeline.

Assessment: Site 1043 was slated for field examination but the helicopter was unable to land at the site. The site is a complex of knobs which may contain good material. The site is situated at too great a distance from proposed route locations to warrant further investigation.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21538-49 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1043

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION (1) 2 3 4 5 Rating: 5	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS (1) 2 3 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 3 (4) 5 Rating: 60	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

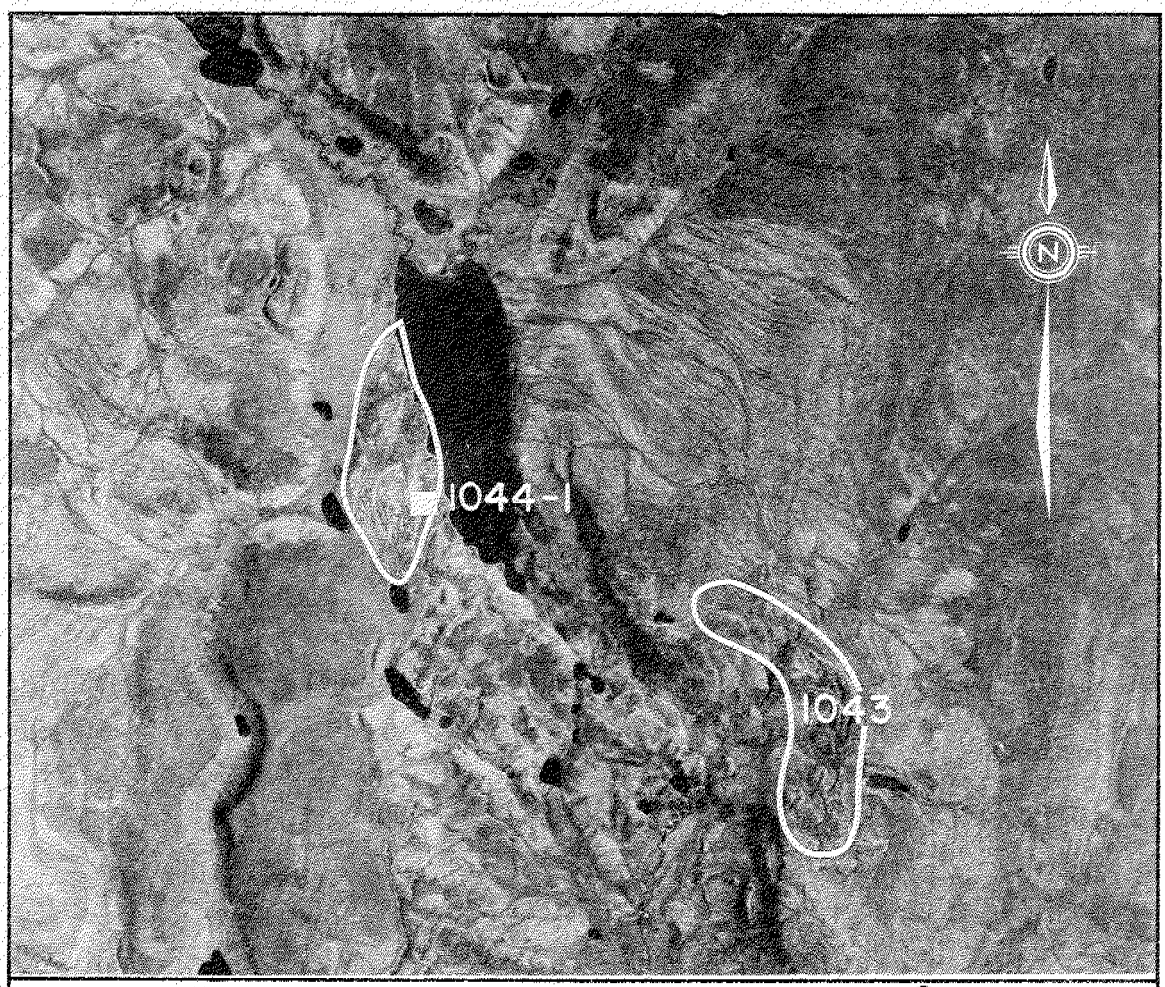
TOTAL INDEX: 235

SPECIAL CONCERNS: Straddles the mouth of a tributary on the east side of Yeltea Lake. Known archaeological site in system. Bank stability is important to fishery values.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

SITE 1044

Location:	Site 1044 is situated along the west bank of an unnamed lake 5 miles north of Yeltea Lake. Proposed pipeline and highway routes are 13 miles west of the site.
Geology:	Site 1044 is a glacial outwash deposit which is expected to be quite uniform.
Material:	Sandy gravel, trace of silt, well graded.
Volume:	1,000,000 cu. yd., volume estimate is conservative.
Area:	200 acres.

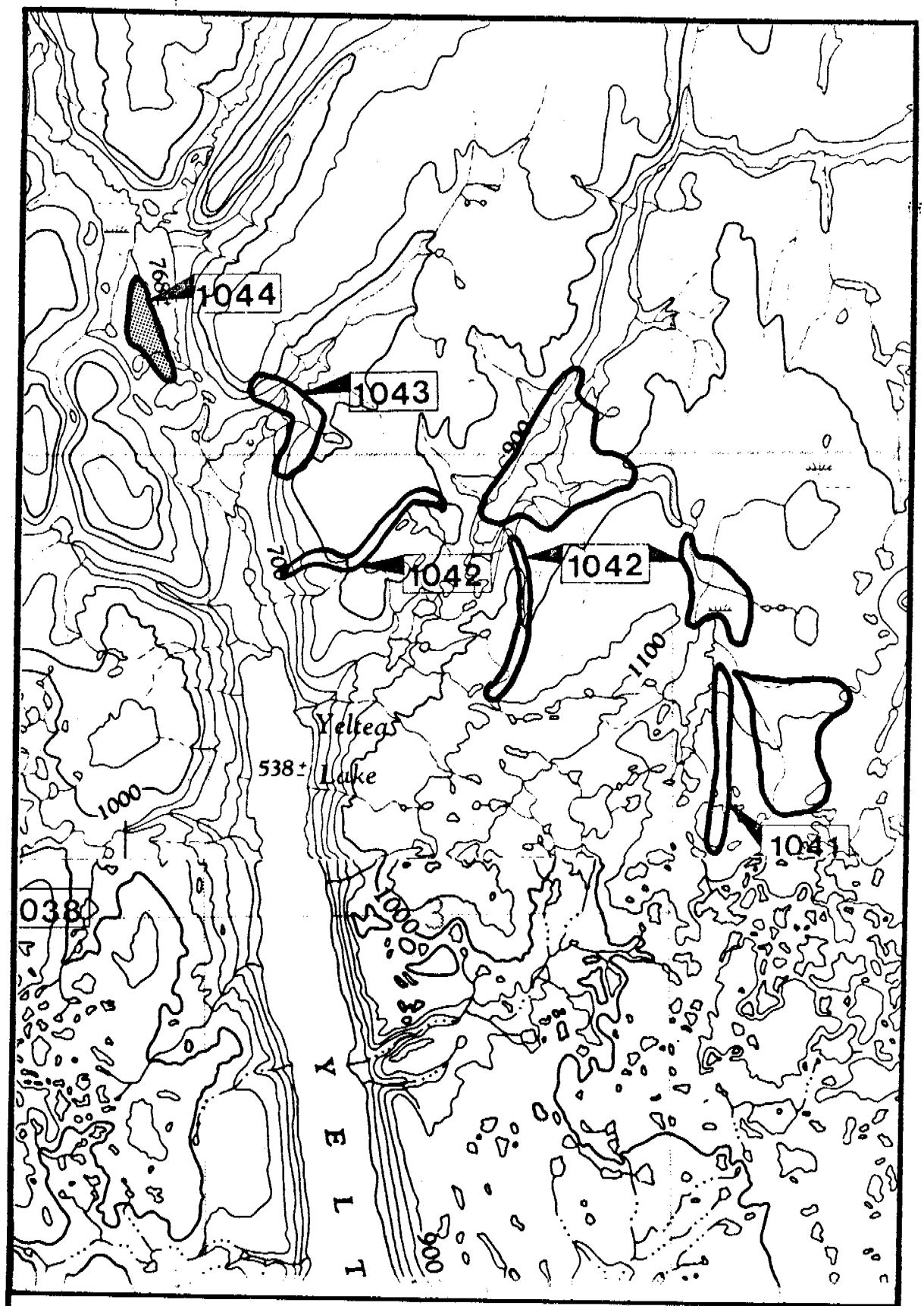


□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21538-49 SCALE: 1" = 5500' (approx.)

Drainage: Drainage at the site is fair.

Assessment: Site 1044 contains a relatively large quantity of good quality borrow which is expected to be vegetative cover of moss, brush and dense spruce will have to be removed for disposal. Access to the site will be difficult since rugged, thermally sensitive terrain must be crossed. Drilling difficulties in the coarse, cobbly material resulted in insufficient data to adequately assess the merits of site development. The current location of proposed transportation routes makes the haulage distance too great to warrant further exploration activity at this site.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1044

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 2 (3) 4 5 Rating: 30	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 3 4 (5) Rating: 25	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 4 (5) Rating: 75	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO -	500

TOTAL INDEX: 275

SPECIAL CONCERNS: On west shore of small lake. Known archaeological sites in Yeltea system. Buffer zone and siltation controls should be used to maintain aquatic values.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1044 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	GP	COBBLES & GRAVEL -some medium brown silt, subrounded & subangular, very dense	NOT FROZEN		1
2					2
3					3
4		END OF HOLE			4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 29/73

LOGGED BY: EBA 158-1

COMPLETION DEPTH: 3.0'

DRILLING METHOD: AUGER

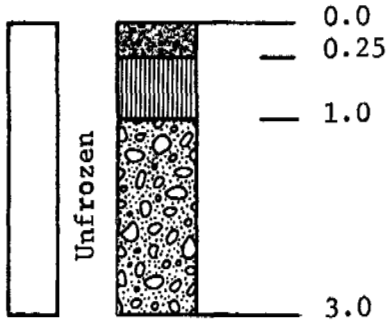
THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1044-1

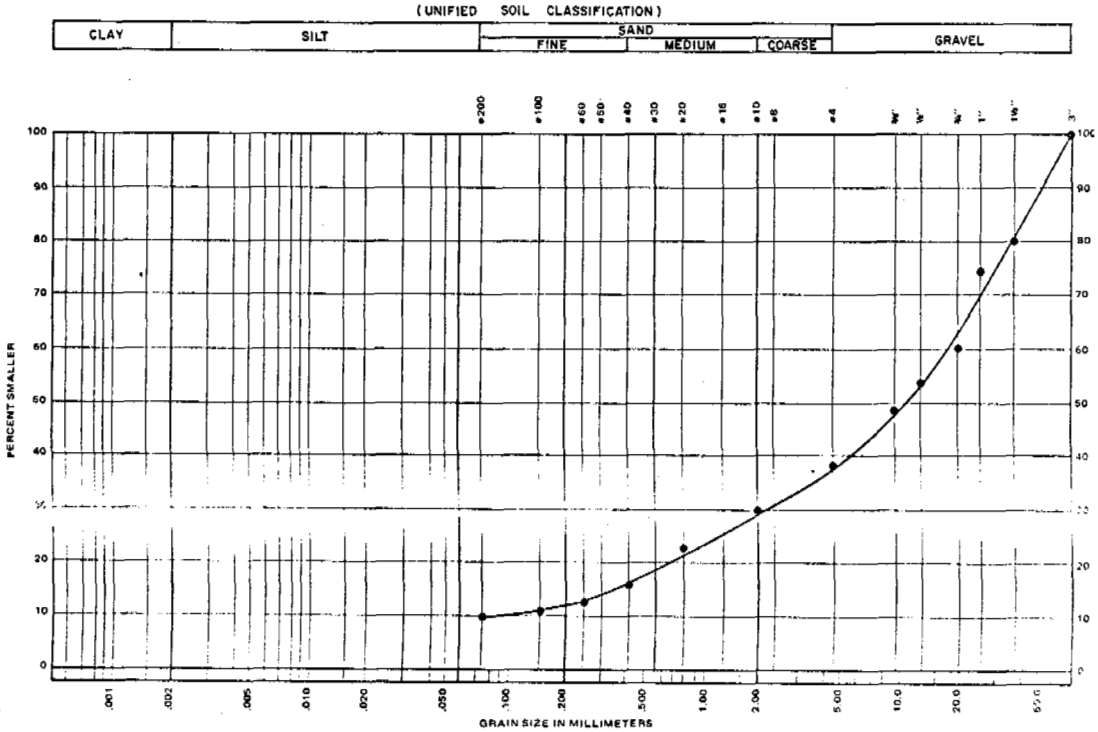


Peat, black fibrous

Silt, light brown

Gravel, Medium brown — 61% GRAVEL
silty — 29% SAND
sandy — 10% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Trace of Silt Sandy Gravel with a (GM) M/C = 5.4%

PROJECT: Granular Resources
JOB No.: E666 DATE: December 16/73
SAMPLE No.: TP 1044-1
DEPTH: 3'

SITE 1045

Location: Site 1045 is situated 8 miles west of the northern tip of Yeltea Lake. Proposed pipeline and highway routes are 7 miles west of the site.

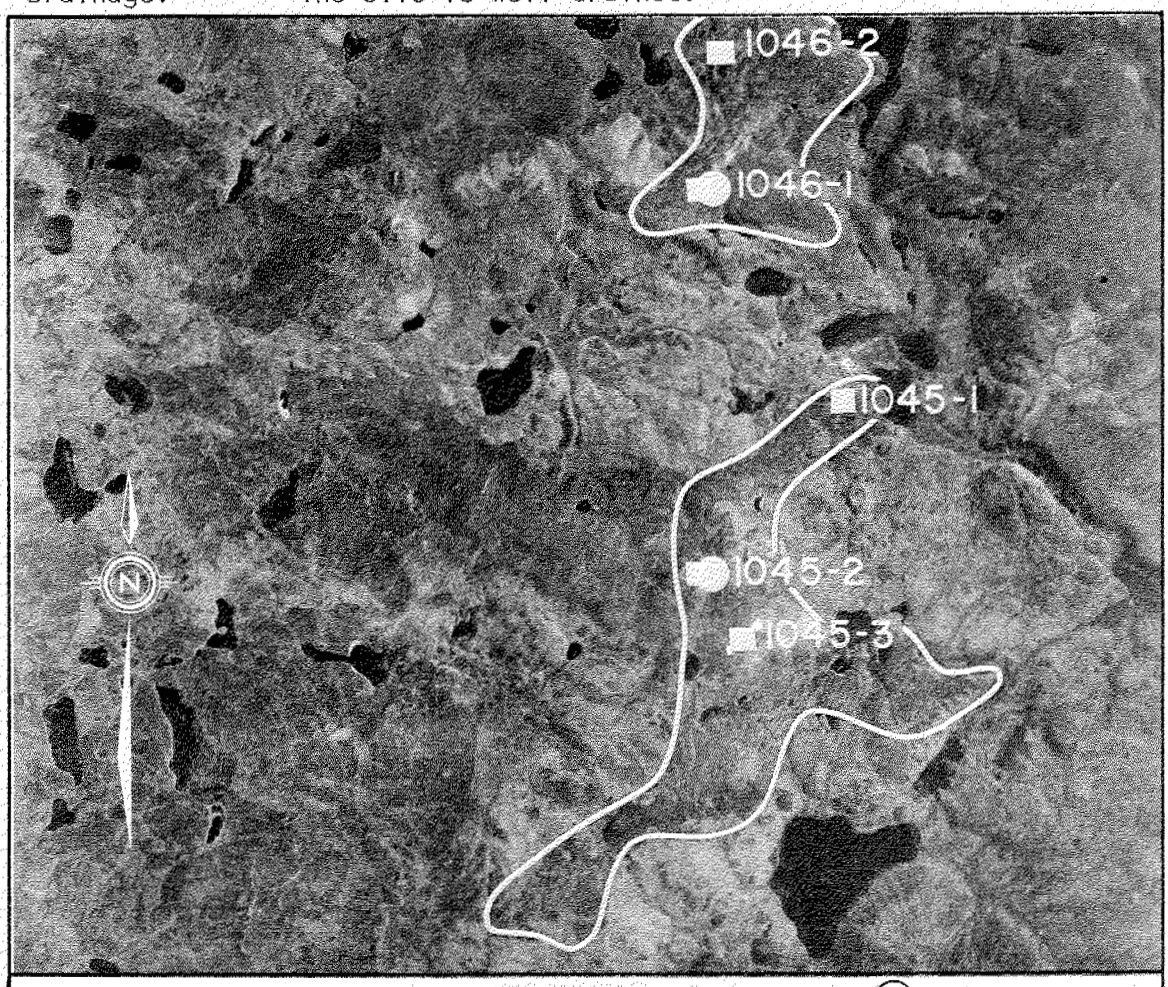
Geology: The material at site 1045 is contained in an outwash deposit.

Material: Gravel and sand, trace of silt, well graded.

Volume: 5,650,000 cu. yd., volume estimate may be optimistic.

Area: 390 acres.

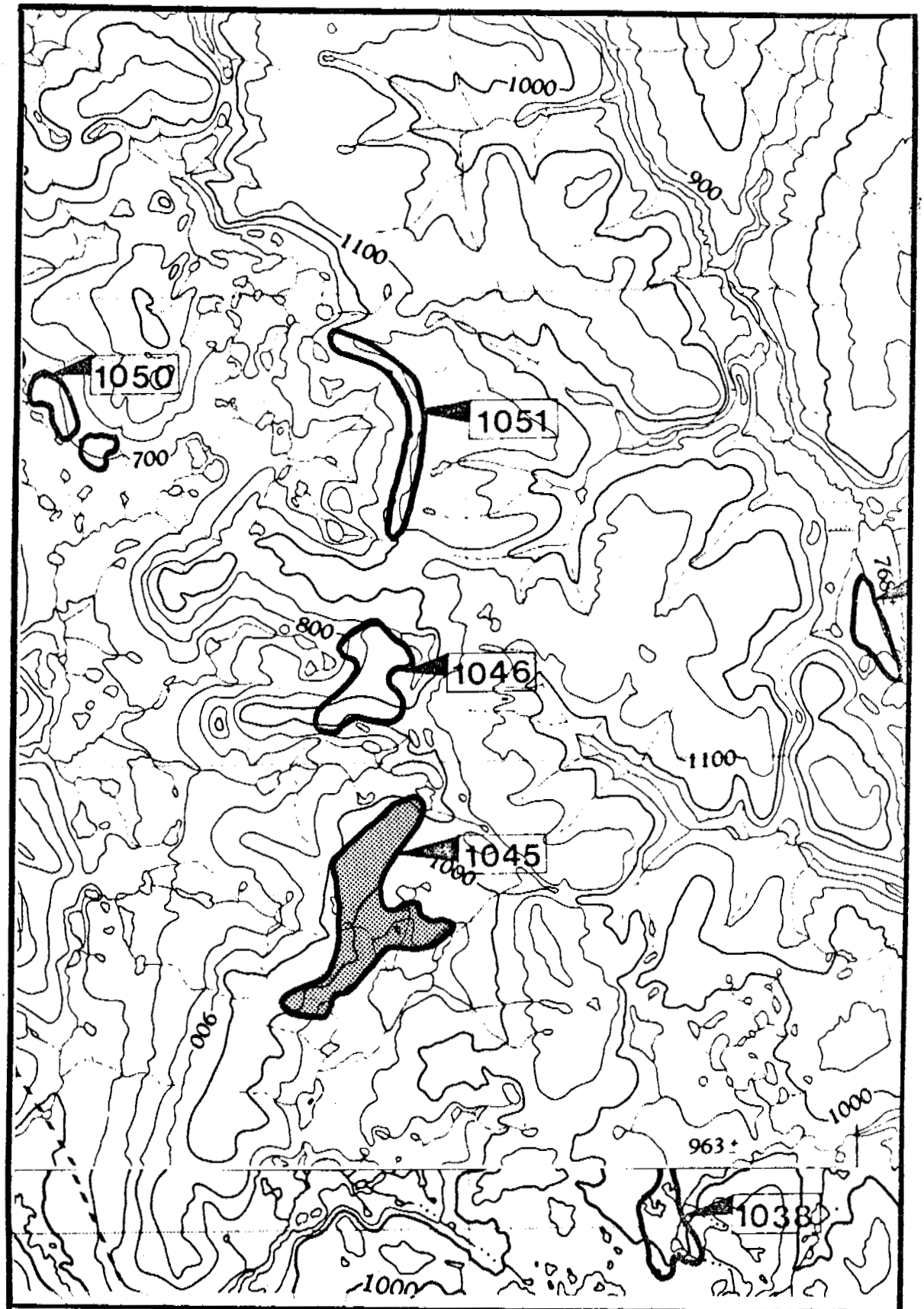
Drainage: The site is well drained.



TEST PIT BOREHOLE

AIRPHOTO No. A21538-47 SCALE: 1" = 5500' (approx.)

Assessment: The borrow at site 1045 is of good quality and dry but is expected to vary considerably over short distances. A large volume of material is available; however, haulage distance (7 miles) is rather long. Overburden is generally only a few inches thick and may easily be stripped and stockpiled during the clearing and grubbing activities. Dense to very dense trees cover the area. Permafrost was encountered at 14 feet; however, the recoverable borrow material is confined to the active layer above the permafrost. The environmental overview has assessed the site to have a low sensitivity. Winter access to the site should not be too difficult; however, the long haulage distance to potential construction sites will determine development feasibility, unless material shortages in the area are critical.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1045

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction. Slumping, Erosion. Stockpiles. Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 175

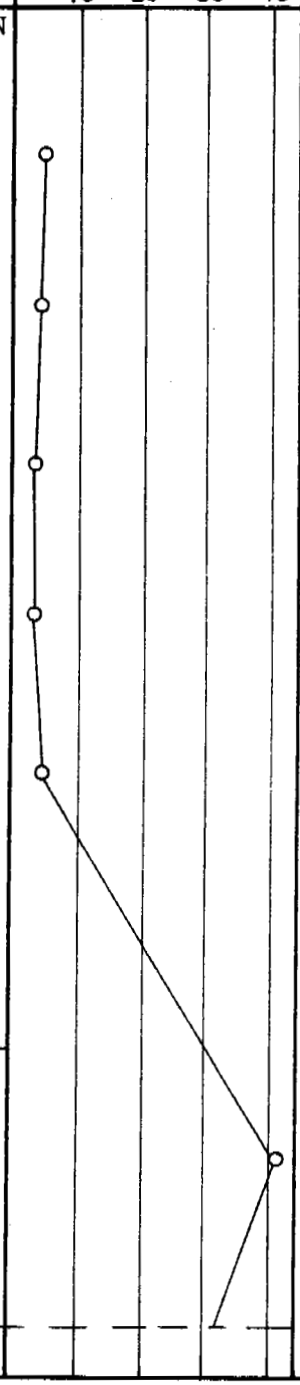
SPECIAL CONCERNS: Upland area. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1045 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1–8	GW	GRAVEL -silty, sandy, fine to medium gravel, average ½", angular and subangular, dry, light to medium brown. (2' - 4') 39% GRAVEL, 58% SAND, 3% SILT & CLAY -gravel fine, ¼" -½" -very silty, gravel very fine. (6') 31% GRAVEL, 46% SAND, 23% SILT & CLAY	NOT FROZEN
9–11	SM	SAND -gravelly, silty, dry light brown.	
12–17	ML	SILT -some fine sand, some clay, wet, slight to low plasticity.	FROZEN



DATE DRILLED: Sep.29/73 | LOGGED BY: EBA 159-2 | COMPLETION DEPTH: 23.5'

DRILLING METHOD: AUGER | THAW DEPTH: 13.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1045 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
		SILT	FROZEN		
18	ML	-same			18
19					19
20					20
21					21
22					22
23					23
24		END OF HOLE			24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 29/73 | LOGGED BY: EBA 159-2 | COMPLETION DEPTH: 23.5'

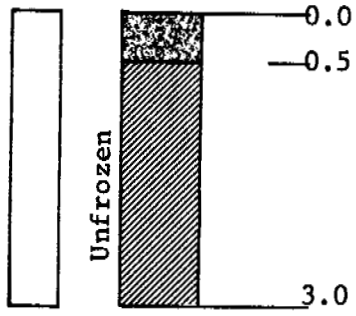
DRILLING METHOD: AUGER | THAW DEPTH: 13.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

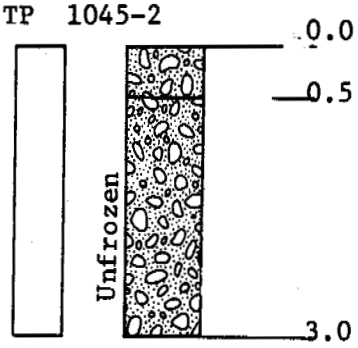
TP 1045-1



Peat, brown, fibrous

Clay, medium brown
medium plasticity
some cobbles
layers of calcium carbonate

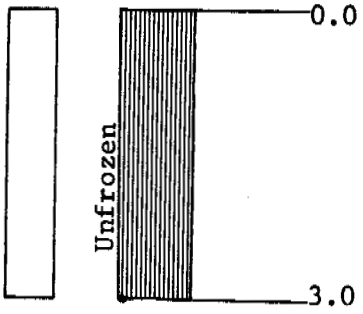
TP 1045-2



Gravel, reddish brown, silty

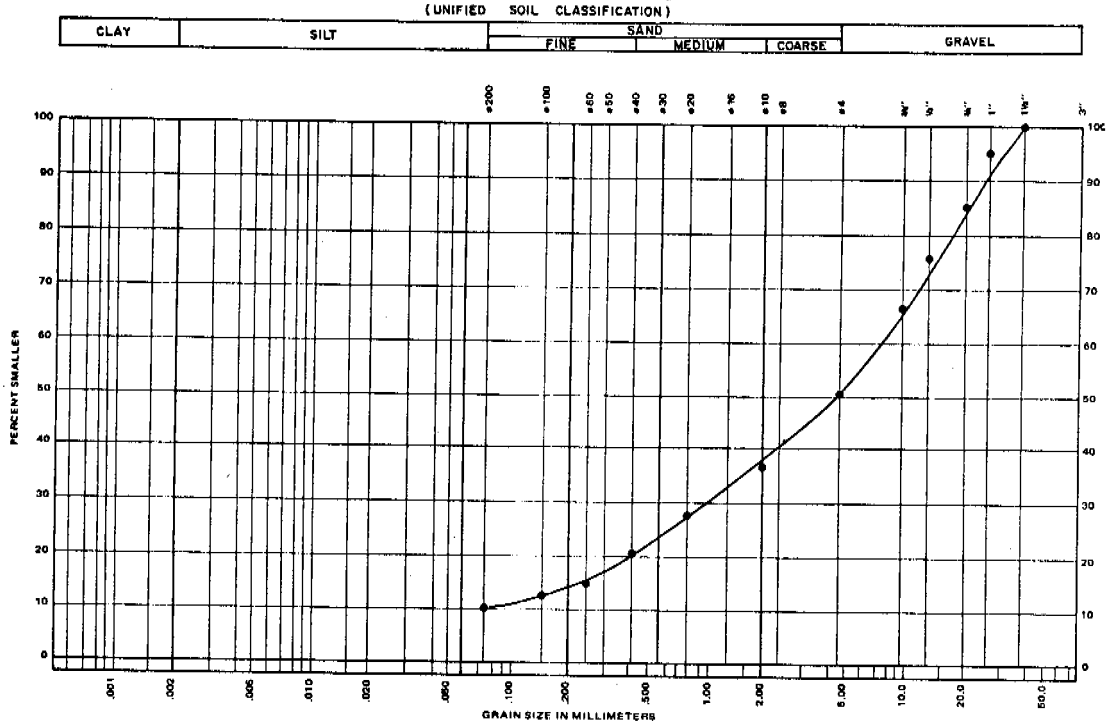
Gravel, medium brown	50% GRAVEL
sandy	40% SAND
some silt	10% SILT & CLAY
well graded	

TP 1045-3



Silt, medium brown	29% GRAVEL
gravelly	35% SAND
	36% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

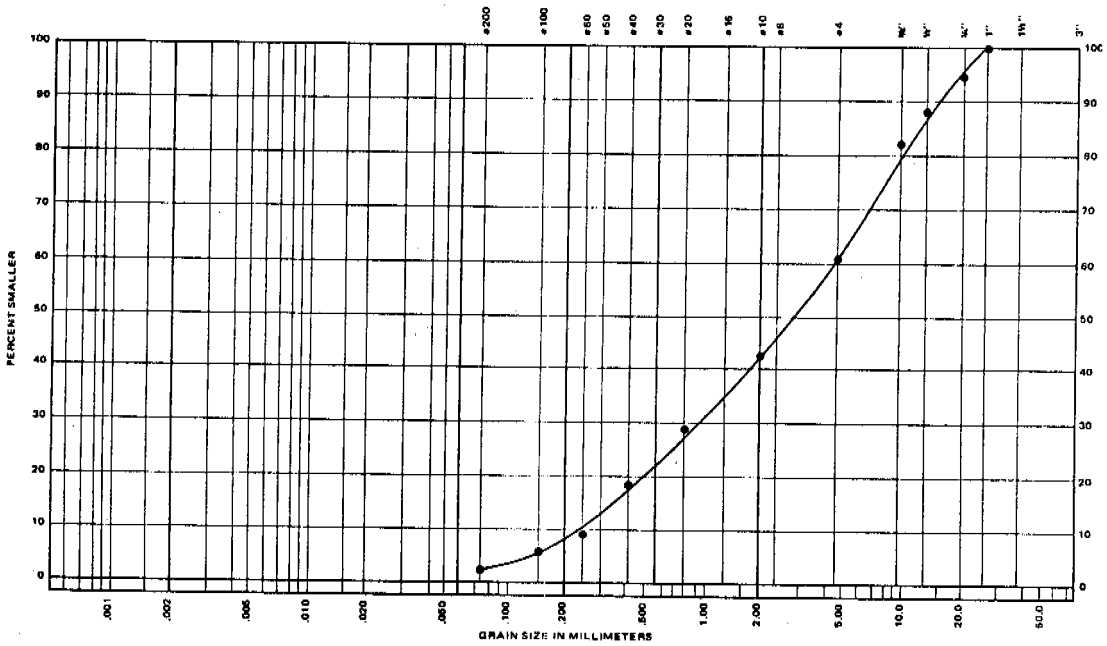


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with a Trace of Silt (GW-GM) M/C = 4.5%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1045-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

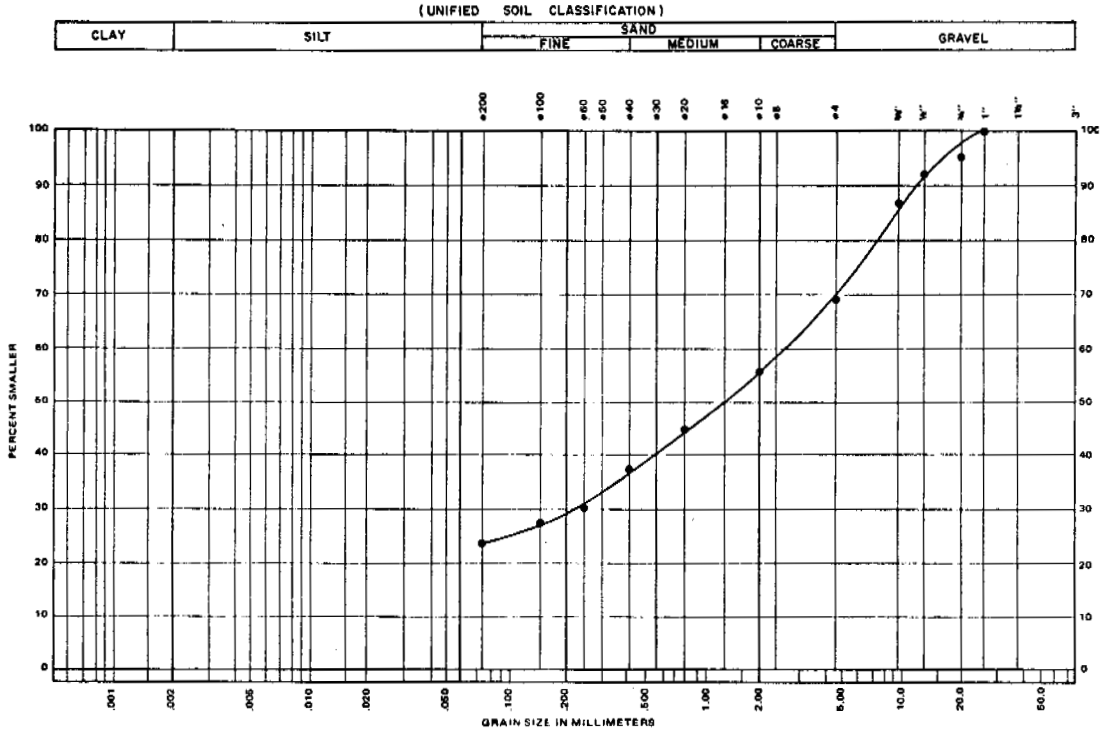


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel with a Trace of Silt (GW)

PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. BH 1045-2
DEPTH 2', 4'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

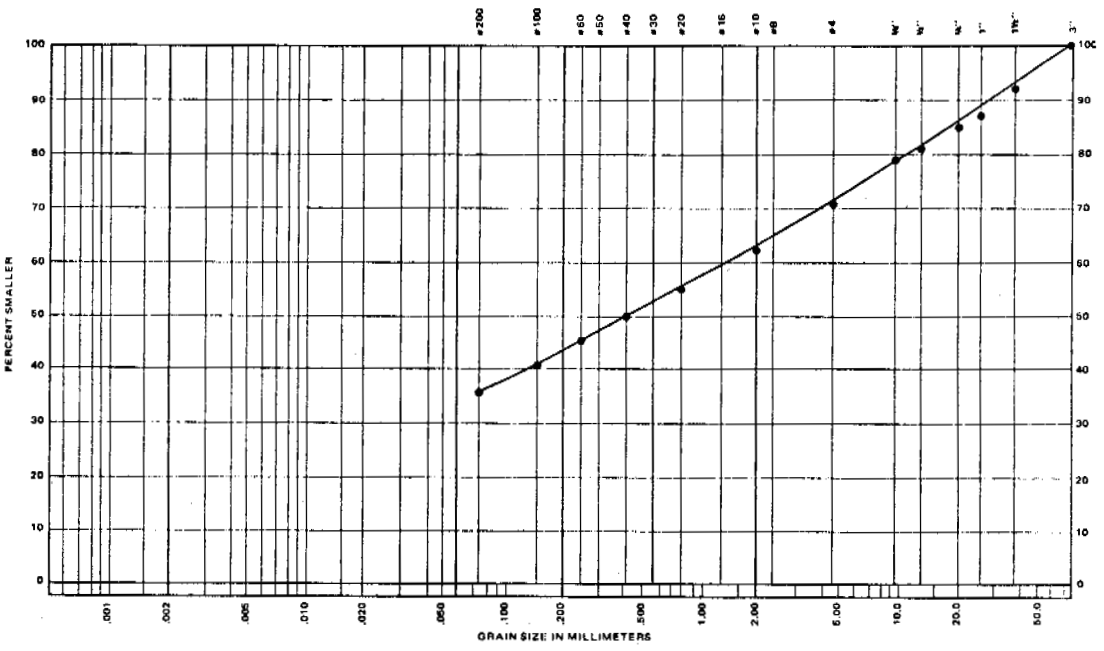


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel Silty (GM-GC)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1045-2
DEPTH 6'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand and Gravel (SM-SC) M/C = 5.6%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1045-3
DEPTH 3'

SITE 1046

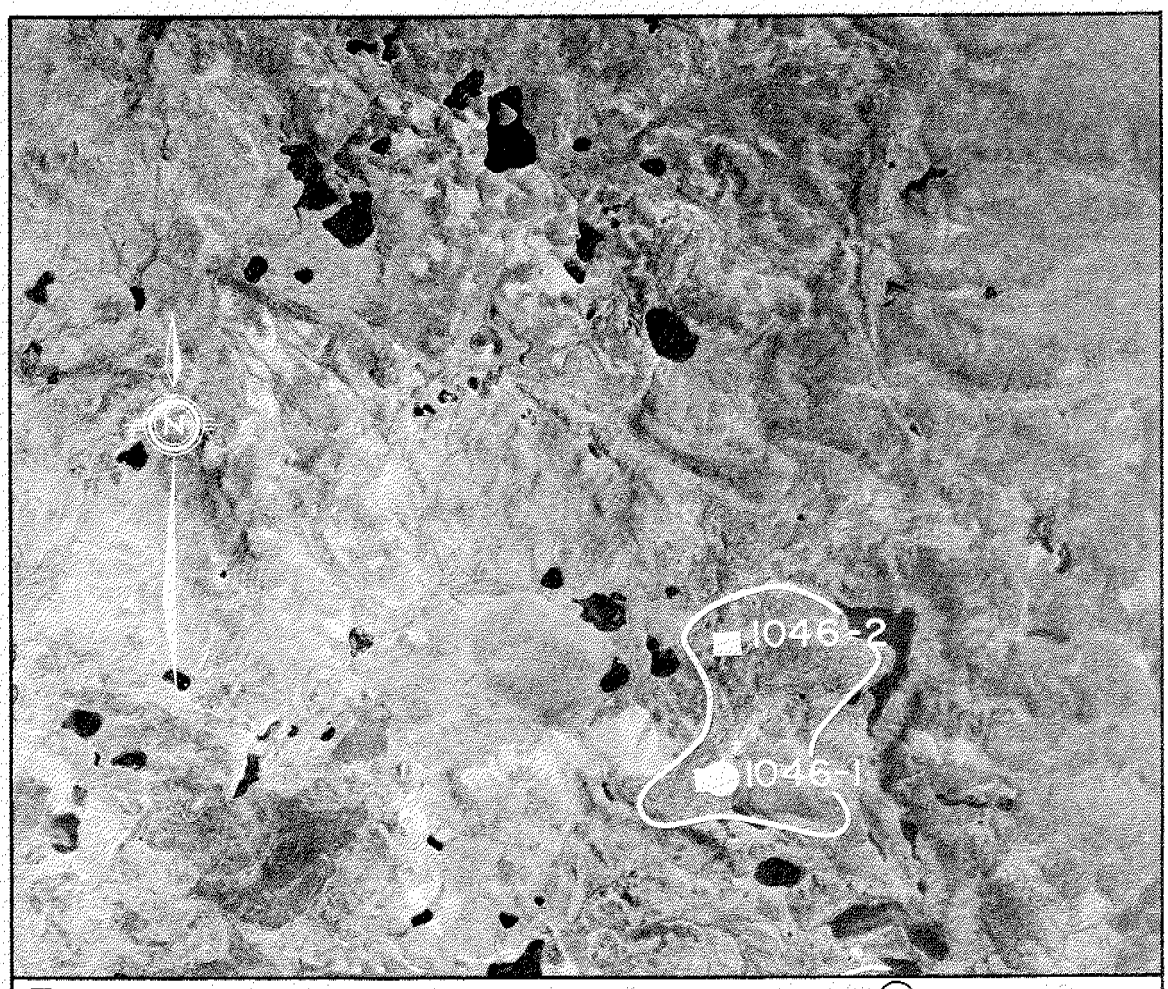
Location: Site 1046 is 9 miles NWW of the northern tip of Yeltea Lake. Proposed highway and pipeline routes pass seven miles west of the site.

Geology: The material encountered at site 1046 is contained in a kame and kame terrace complex. Variation in the material is expected.

Material: Variable from gravelly sand and silt to silty sand and gravel, well graded.

Volume: 1,000,000 cu. yd., volume estimate is conservative.

Area: 100 acres.

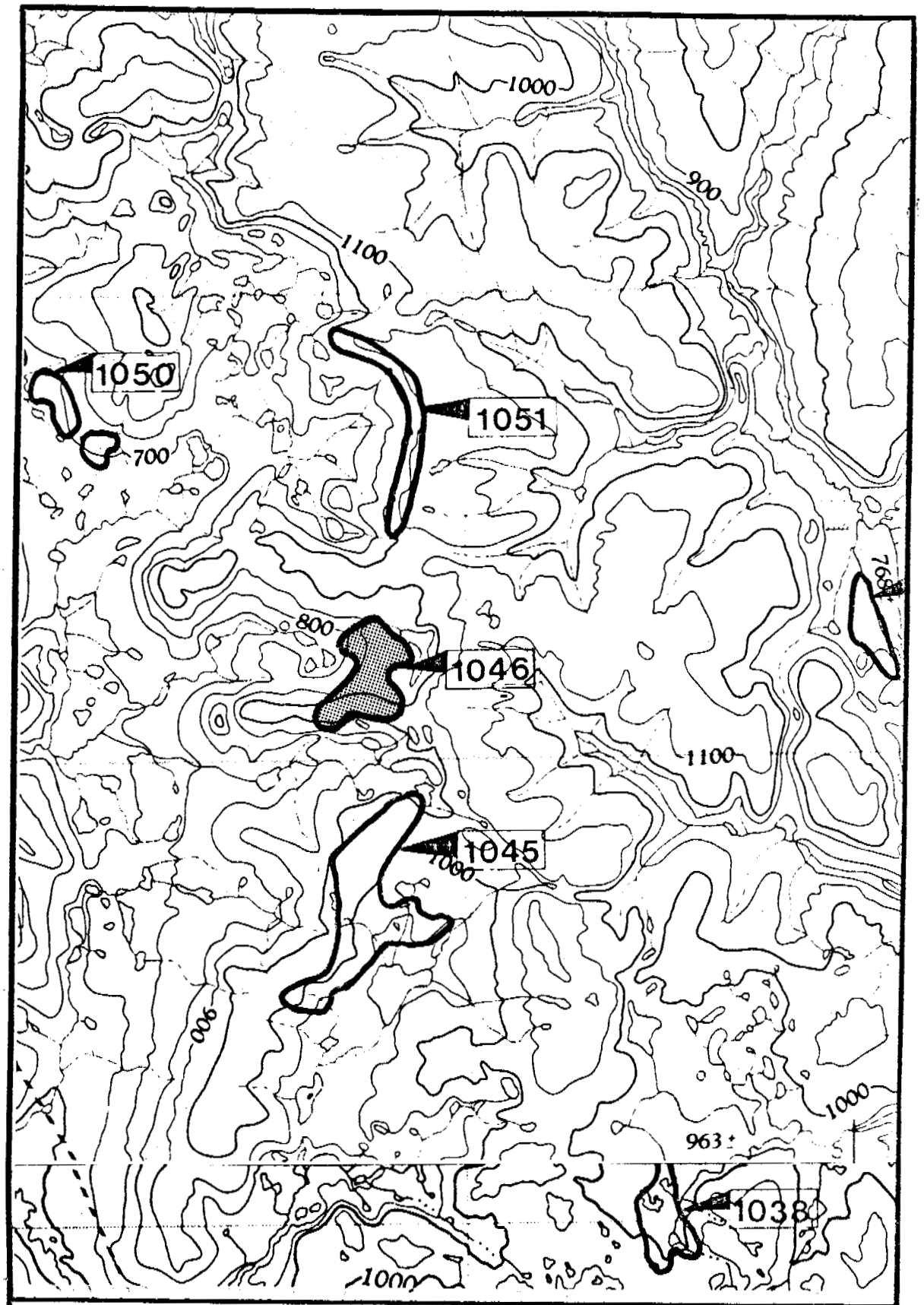


□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21538-47 SCALE: 1" = 5500' (approx.)

ainage: The site is well drained.

sessment: The fairly large volume of borrow at site 1046 varies in quality from fair to good; however, the fines content is expected to be high in some areas. The active layer extends to at least 7 feet. A moderately dense tree cover stands on the site; however, the depth of overburden to be stripped is expected to be several inches. The environmental overview indicates the site to have a low sensitivity. Winter access to the site is over reasonably stable terrain; however, the long haulage distance to the proposed highway will be in the order of 10 15 miles.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1046

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish — Smelt Grayling — Sculpin Pike — Goldeye Trout-Perch — Chub Lake Trout — Dace Burbot — Walleye Suckers — Char Stickleback — Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access, Traplines, Hunting, Fishing, Domestic, Commercial.
15	ASSOCIATED DISTURBANCES 1 2 (3) 4 5 Rating: 45	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration, Grass-Legume Seeding, Transplants, Sustained Maintenance, Erosion Control Systems

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 190

SPECIAL CONCERNS: Upland area. Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1046 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
		SAND & GRAVEL -silty, well graded, dry, light brown, cobbles in first 1½'.	NOT FROZEN		
1					1
2					2
3					3
4		27% GRAVEL			4
		(2' - 6') 41% SAND			
5	GM	31% SILT & CLAY			5
6					6
7					7
		END OF HOLE			
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 29/73

LOGGED BY: EBA 157-1

COMPLETION DEPTH: 7.0'

DRILLING METHOD: AUGER

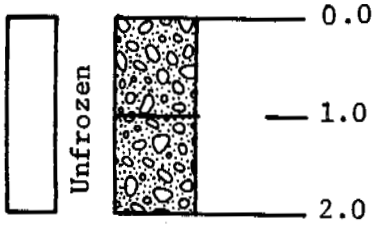
THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

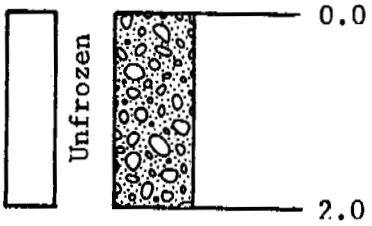
TP 1046-1



Gravel, reddish brown silty, cobbles — 54% GRAVEL, 41% SAND

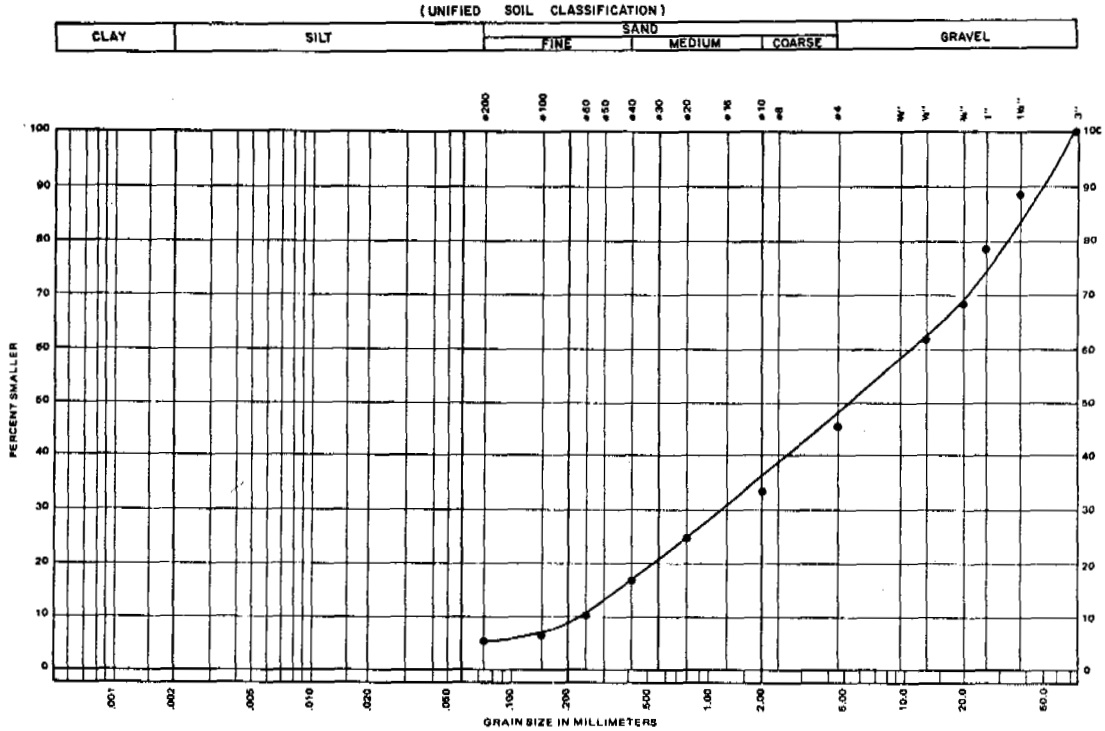
Gravel, medium brown, sandy, some silt, well graded — 5% SILT & CLAY

TP 1046-2



Gravel, medium brown, silty, some sand, well graded — 30% GRAVEL, 53% SAND, 17% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

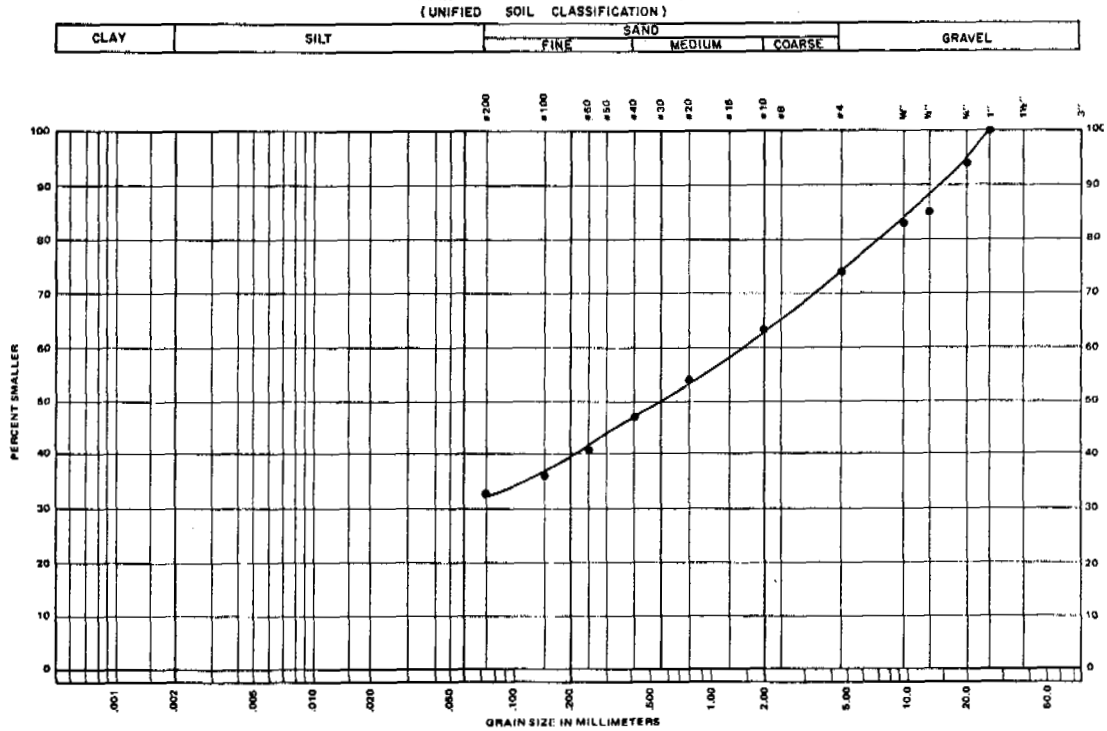


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Gravel and Sand with a Trace of Silt (GW)

PROJECT: Granular Resources
JOB No.: E666 DATE: December 16/73
SAMPLE No.: TP 1046-1
DEPTH: 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



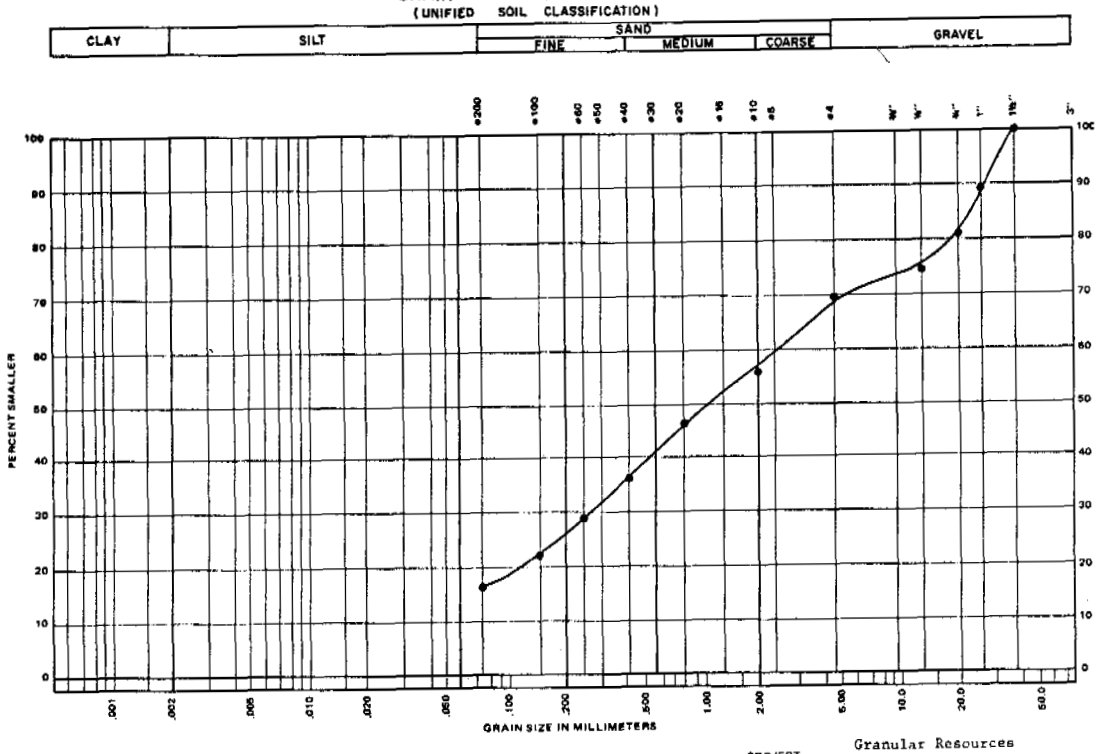
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Sand and Silt, Gravelly (SM-SC)

PROJECT: Granular Resources
JOB No.: E666 DATE:
SAMPLE No.: BH 1046-1
DEPTH: 2' + 4' + 6'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and Some Silt (GM) M/C = 4.2%

PROJECT Granular Resources

JOB No. E666 DATE January 14/74

SAMPLE No. TP 1046-2

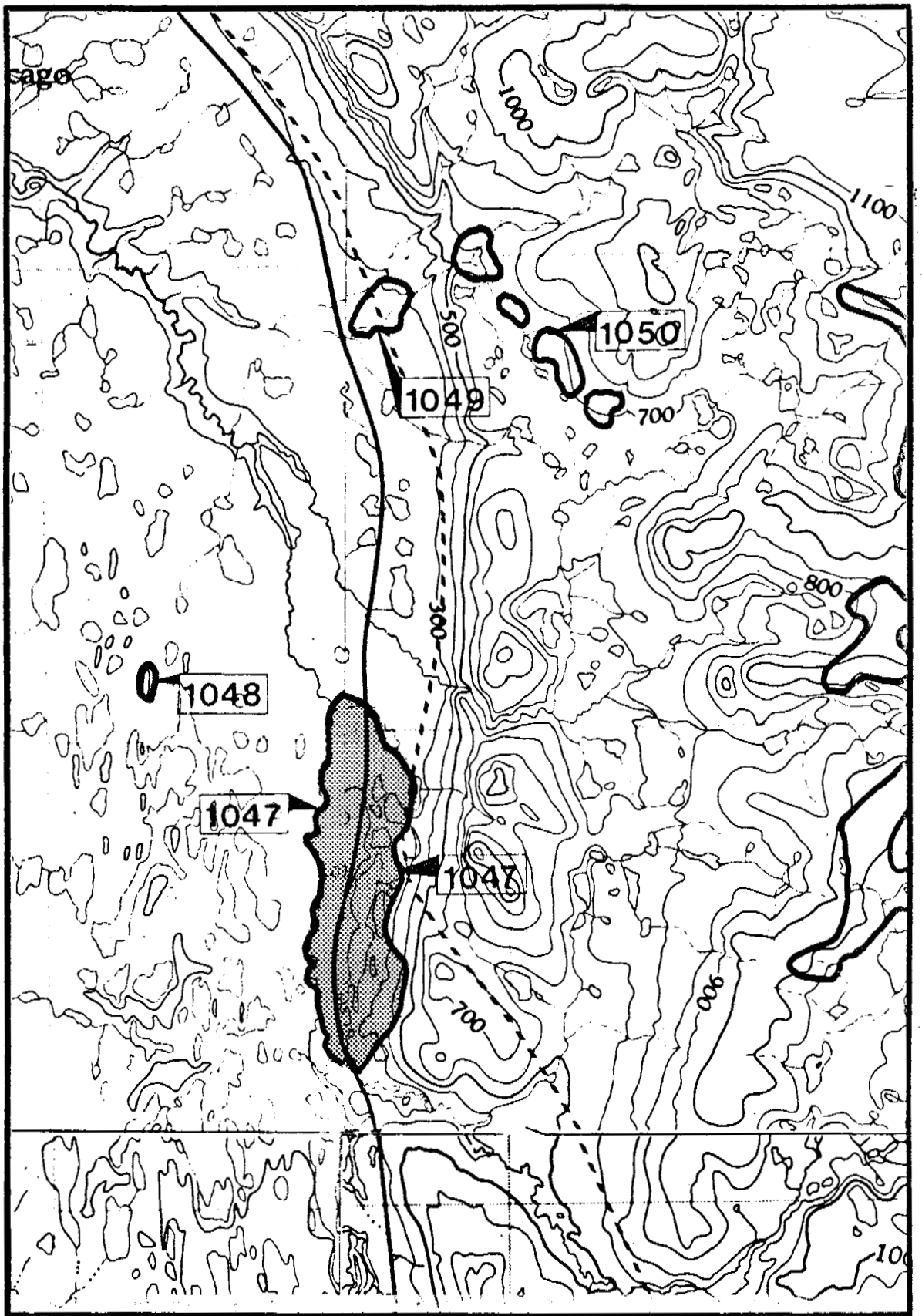
DEPTH 2'

SITE 1047

Location:	Site 1047 is situated 17 miles north of the point of confluence of Payne Creek and the Mackenzie River and 15 1/2 miles west of the northern tip of the Yeltea Lake. The proposed highway route passes across the site and the proposed pipeline route touches the eastern extremity of the site.
Geology:	The material at site 1047 is contained in a large fossil fluvial terrace.
Material:	Variable from sand and gravel with a trace of silt to sand with traces of silt and gravel, grading variable from well graded to poorly graded.
Volume:	42,200,000 cu. yd., volume estimate is realistic.
Area:	1250 acres
Drainage:	Nearby lakes provide excellent drainage.
Assessment:	A very large volume of fair to good quality dry borrow was encountered at site 1047. The proposed highway route crosses the site, therefore haulage distances are minimal and access is excellent. Approximately one foot of silt overburden covers the deposit along with a dense stand of black spruce. The site overburden may be stripped and stockpiled for use in restoration. Permafrost was encountered at a depth of 15 feet. The environmental overview assessed the site a fairly low rating. A drilling program should be undertaken to prove quantities and qualities of borrow present at this site. Development within the general borrow pit guidelines in this report is suggested. Site 1047 appears to be an excellent source of borrow material and is recommended for development.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22890-85 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I, ONTARATUE RIVER 106-J
TRAVAILLANT LAKE 106-O, CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1047

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 215

SPECIAL CONCERNS: On slope above swamp complex. Hydrologic alteration could affect mammal, bird and fish habitat.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1047 HOLE NO. 3 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	SM	SAND -silty, gravelly, fine to medium grained gravel, dry, light brown	NOT FROZEN		1
2					2
3					3
4		(2'-4') 4.3% O. C. 20% GRAVEL 66% SAND 14% SILT & CLAY			4
5					5
6	SM	SAND & SILT -some gravel 4.2% O.C.			6
7					7
8		(6'-10') 14% GRAVEL 48% SAND 38% SILT & CLAY			8
9					9
10		-sandy, gravel fine to medium grained, dry, light brown.			10
11					11
12					12
13					13
14					14
15			FROZEN		15
16					16
17					17

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 156-3 COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER THAW DEPTH: 15.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1047 HOLE NO. 3 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SAND & SILT	FROZEN		18
		-same			
19					19
20	SM	-more gravelly, dry			20
21		END OF HOLE			21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 156-3 COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER THAW DEPTH: 15.0'

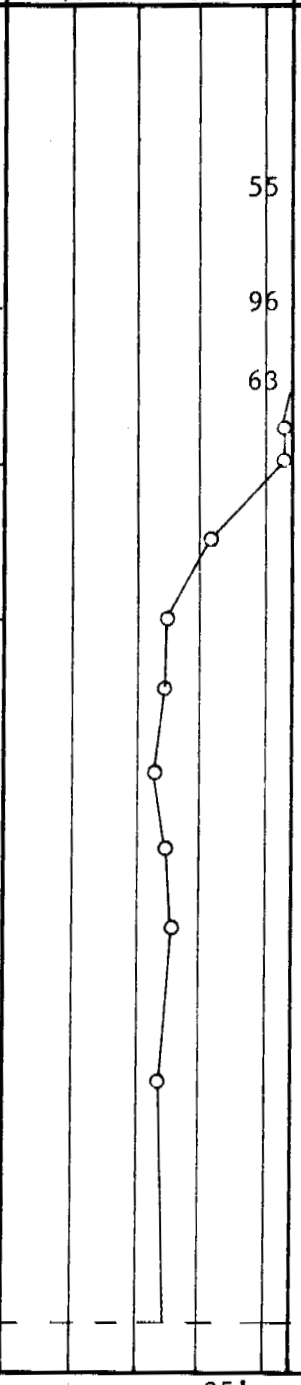
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1047 HOLE NO. 5 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
	PT	PEAT brown fibrous	$V_s - V_x$		
1					1
2	ML/ CL	SILT brown clayey with pockets of organic silt		55	2
3					3
4				96	4
5			$V_s \doteq 30\%$	63	5
6	ML	SILT clayey, brown			6
7			$V_r \mp 5\%$		7
8					8
9		SAND grey, silty, fine	Nbn		9
10					10
11	SM				11
12					12
13					13
14					14
15					15
16					16
17					17



DATE DRILLED: March 15/74 | LOGGED BY: MVPL 72C-76 | COMPLETION DEPTH: 25'

DRILLING METHOD: Failing 200 Air | THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1047 HOLE NO. 5 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18			Nbn		18
19					19
20					20
21					21
22		-grades to silty fine to medium sand			22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: March 15/74 | LOGGED BY: MVPL 72C-76 | COMPLETION DEPTH: 25'

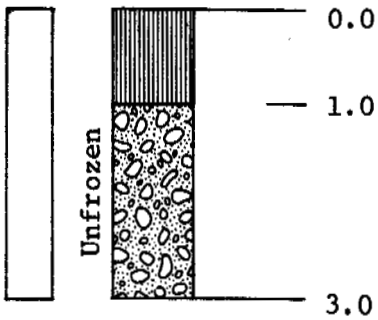
DRILLING METHOD: Failing 200 Air | THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1047-3

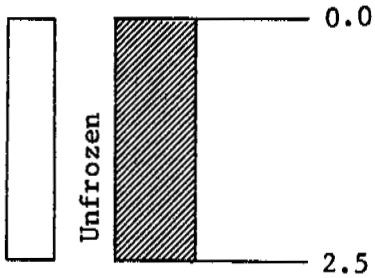


Silt, dark brown, sandy
some organics

Gravel, light brown, sandy, silty

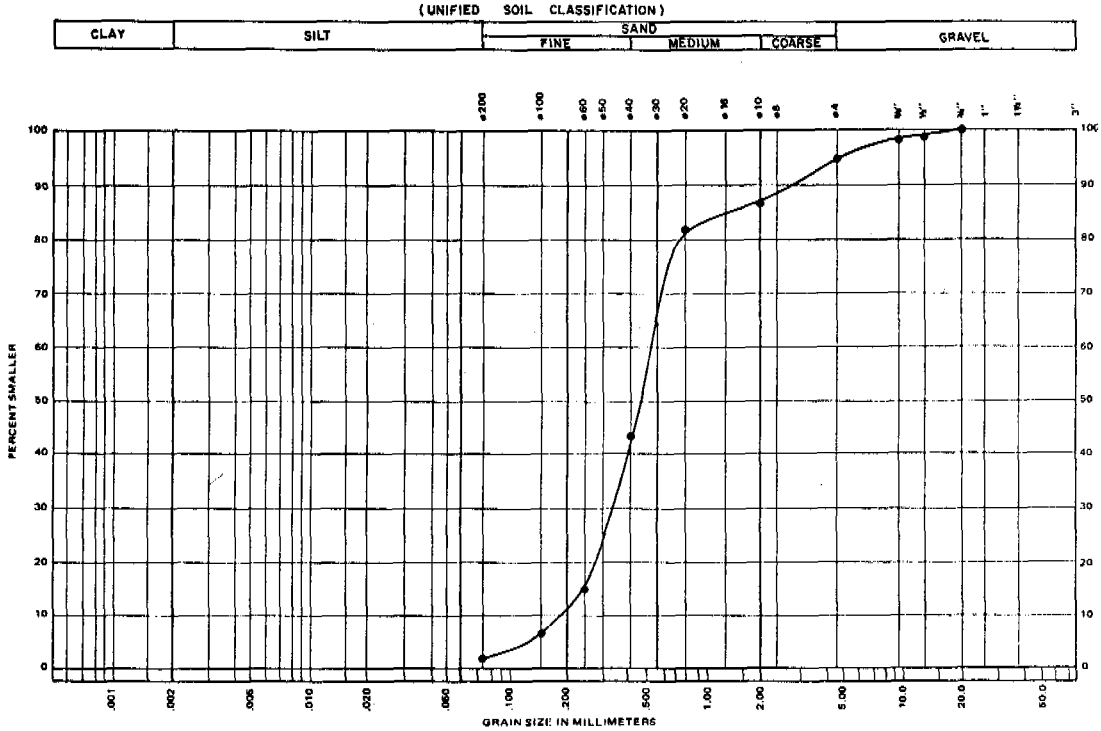
34% GRAVEL
59% SAND
7% SILT & CLAY

TP 1047-4



Clay

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

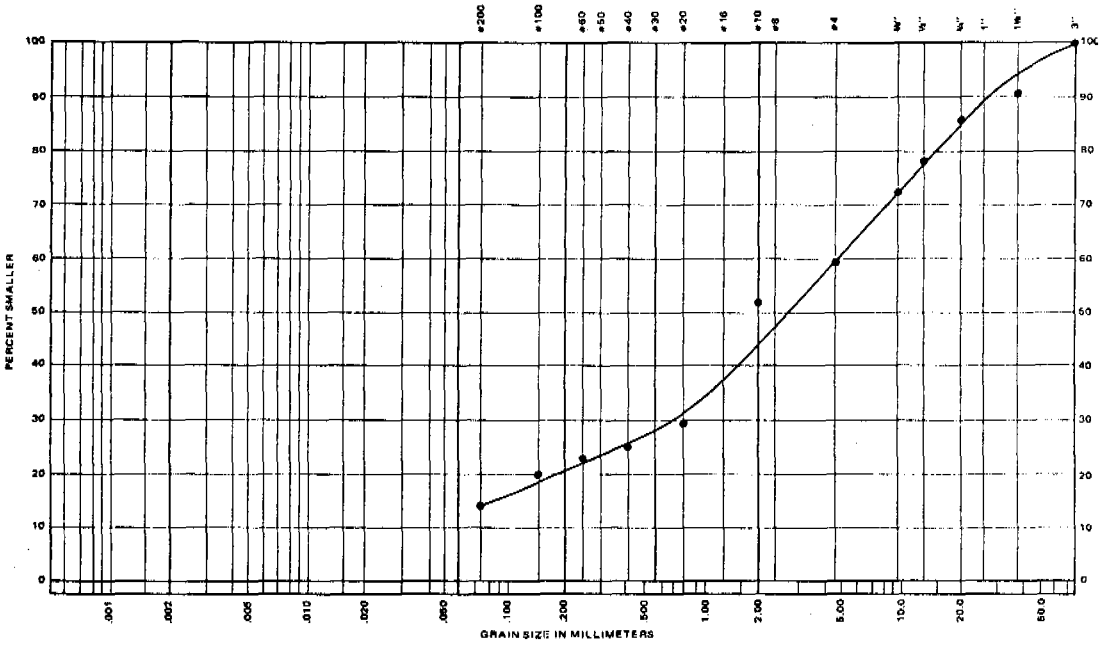


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of Gravel and Silt M/C = 1.7%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1047-1
DEPTH Surface

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

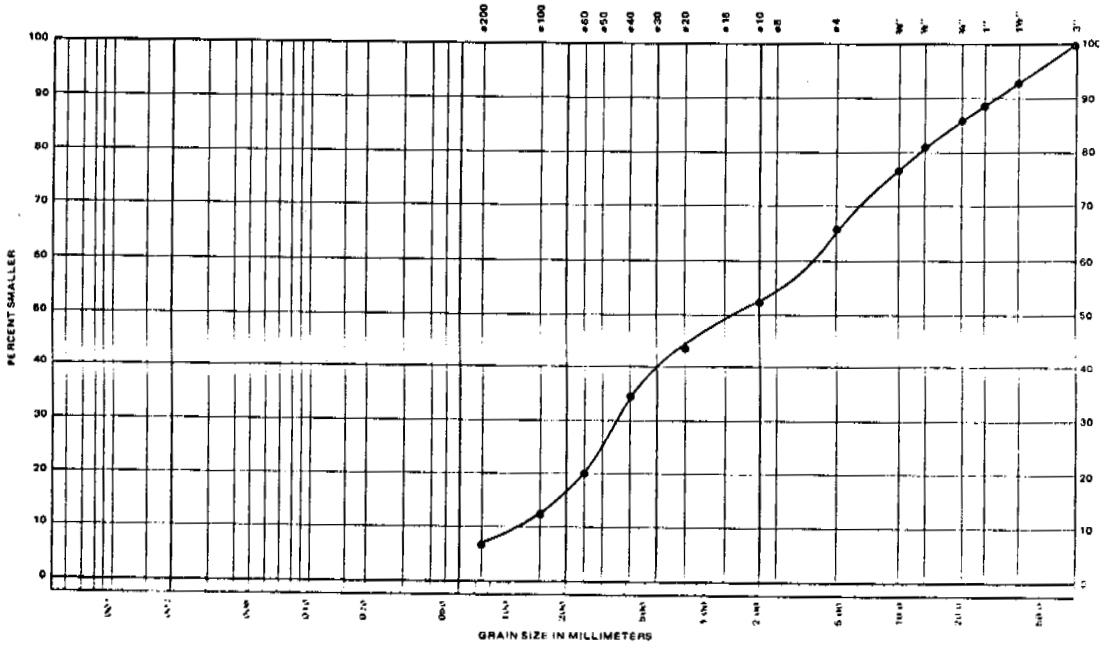


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and Some Silt (GW-GM) M/C = 3.0%

PROJECT Granular Resources
JOB No. E666 DATE January 14/74
SAMPLE No. TP 1047-2
DEPTH Surface

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

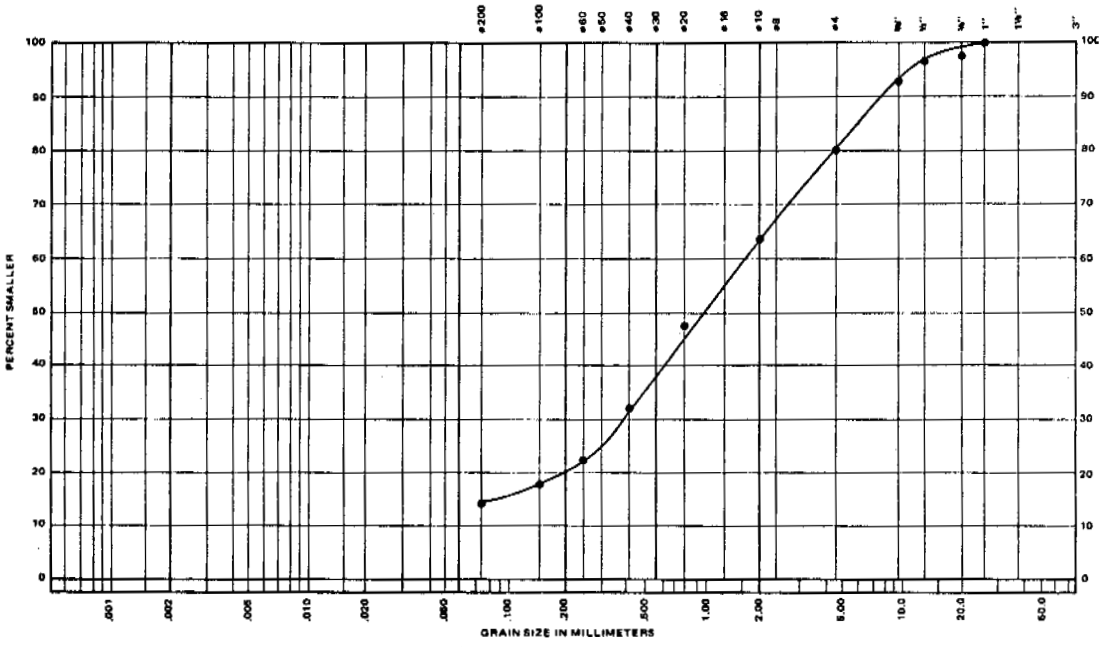


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel with a Trace of Silt (GW-GM) M/C = 1.7%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1047-3
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



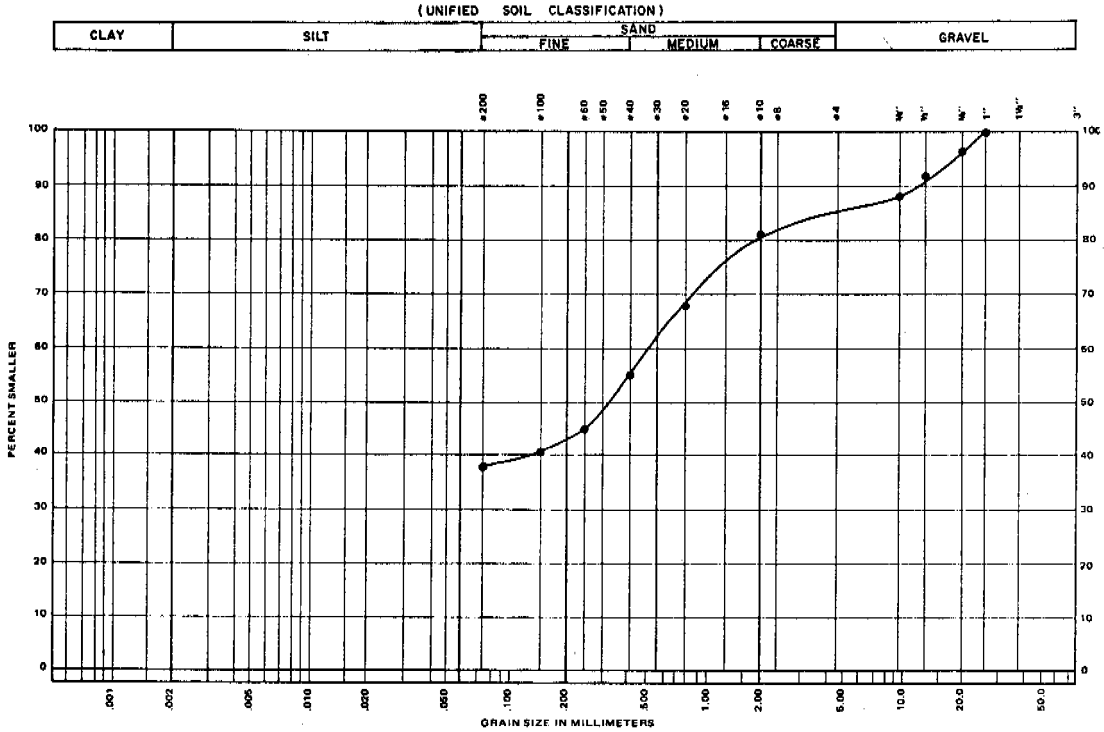
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand, some gravel, some silt (GM)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1047-3
DEPTH 2' + 4'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt and and some Gravel (SM-ML)

PROJECT Granular Resources

JOB No. E666 DATE January 11/74

SAMPLE No. BH 1047-3

DEPTH 6' + 8' + 10'

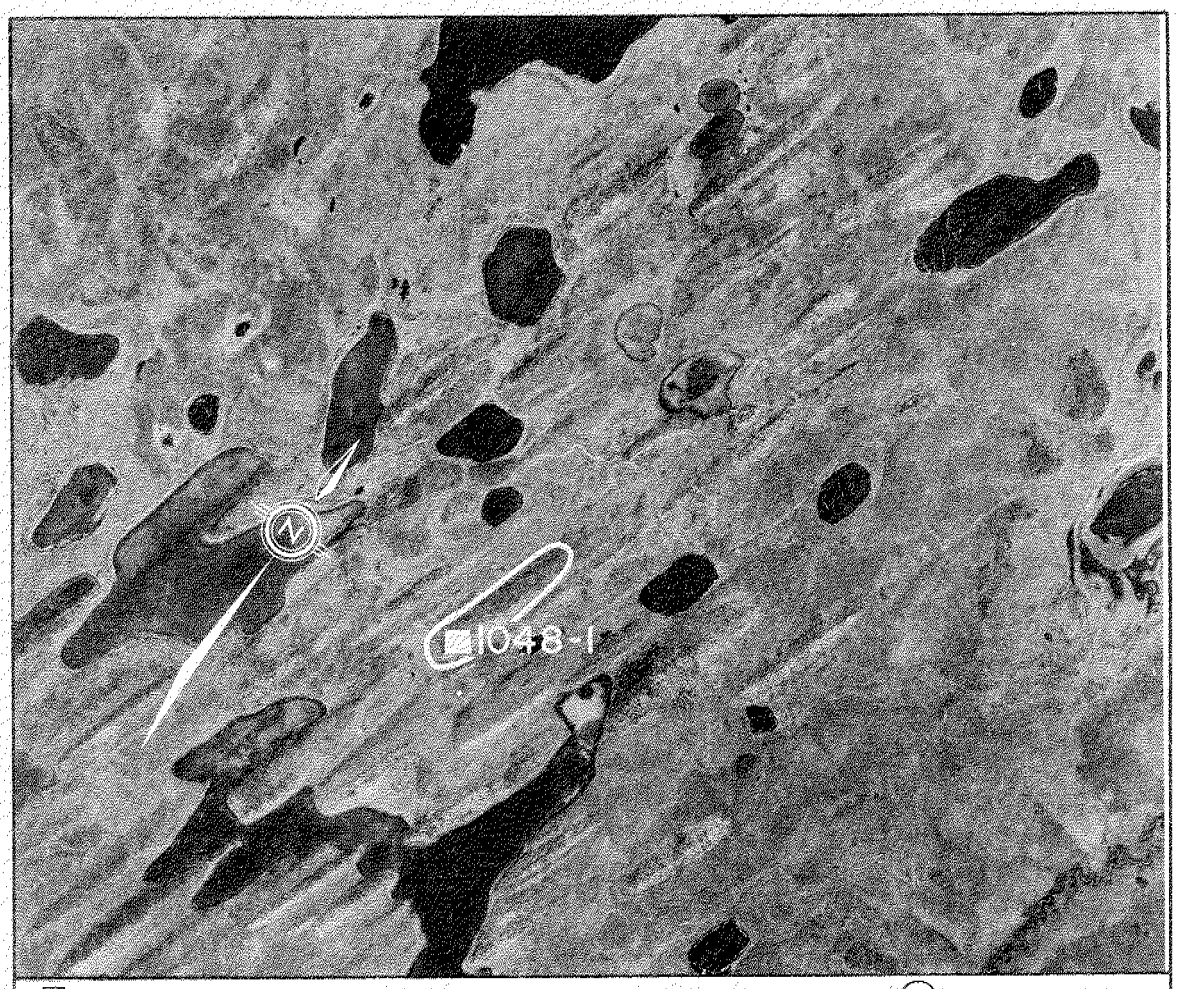
SITE 1048

Location: Site 1048 is 9 miles SSE of Little Chicago. Proposed pipeline and highway routes are 3 miles east of the site.

Geology: Site 1048 is one drumlin in a drumlin field. Drumlins characteristically have a "nose" of sand and gravel up to several tens of feet wide on the down-ice end.

Material: Sand and gravel, some silt, poorly graded.

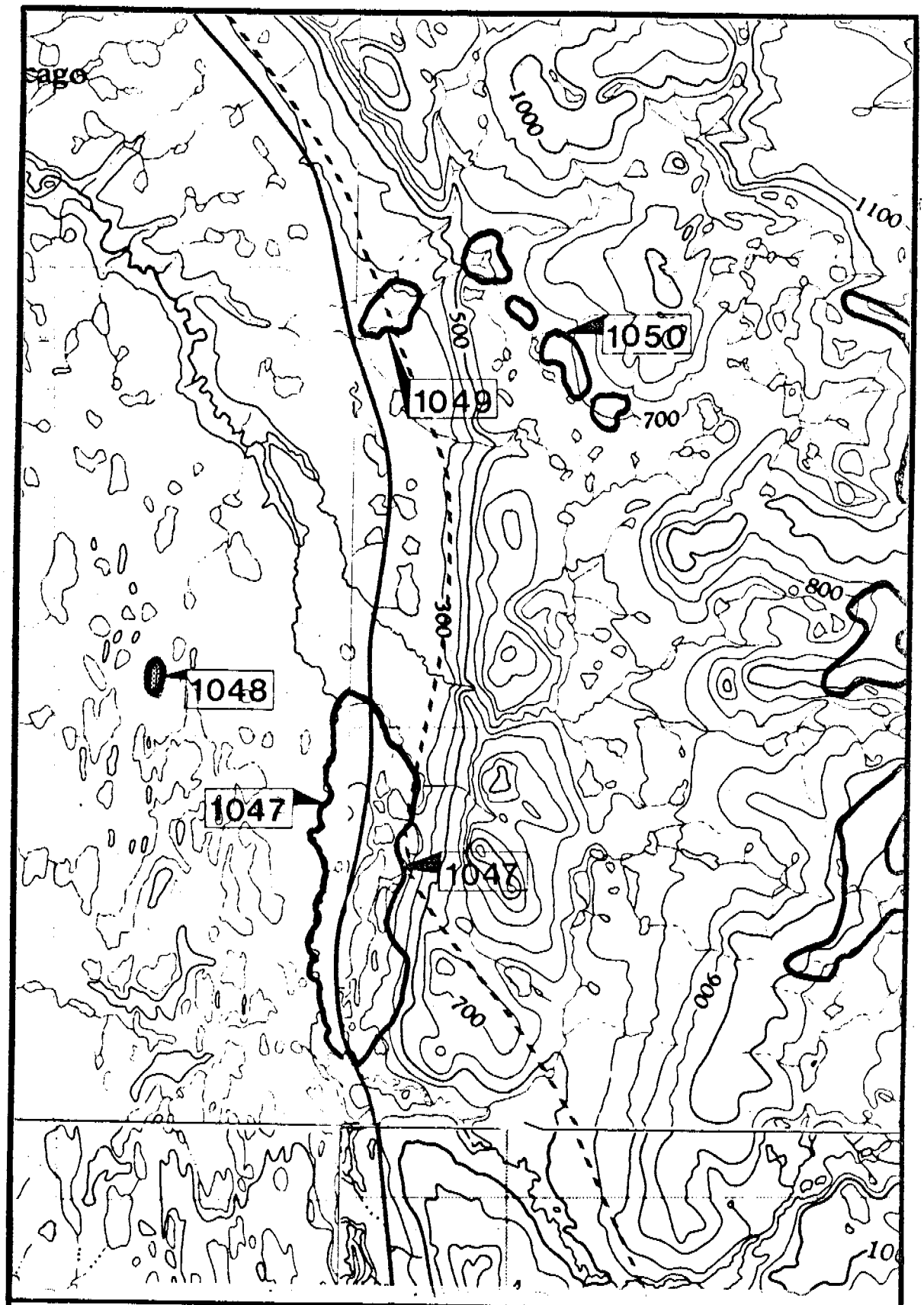
Drainage: The site is well drained.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22890-87 SCALE: 1" = 3000' (approx.)

Assessment: The material investigated at site 1048 was of fair quality. An estimate of the volume of material available will require more detailed field investigation of the drumlin field. Moisture content is acceptable but near the upper limit of acceptability. Dense vegetatitive cover and silt overburden of variable thickness may be anticipated. Permafrost was encountered at 14 feet. Haulage distance to proposed route locations is within acceptable limits and access would not appear to be too difficult. Development recommendations will require a more detailed and extensive field investigation. Site 1048 has a reasonable potential as a source of borrow material for use as random fill.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I, ONTARATUE RIVER 106-J
TRAVAILLANT LAKE 106-O, CANOT LAKE 106-P

SCALE: 1:125,000

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1048 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	SC	SAND -trace to some clay, trace fine gravel, dry to moist light grey brown (orange brown 0'-1')	NOT FROZEN		1
2					2
3					3
4					4
		9.0% O.C.			
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14			FROZEN		14
15		-some clay, moist to wet			15
16					16
17					17

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 315-1 COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1048 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SAND			18
19	SC	- same			19
20					20
21					21
22		END OF HOLE			22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep.28/73

LOGGED BY: EBA 315-1

COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER

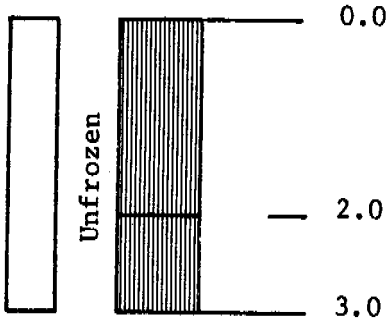
THAW DEPTH: 14.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

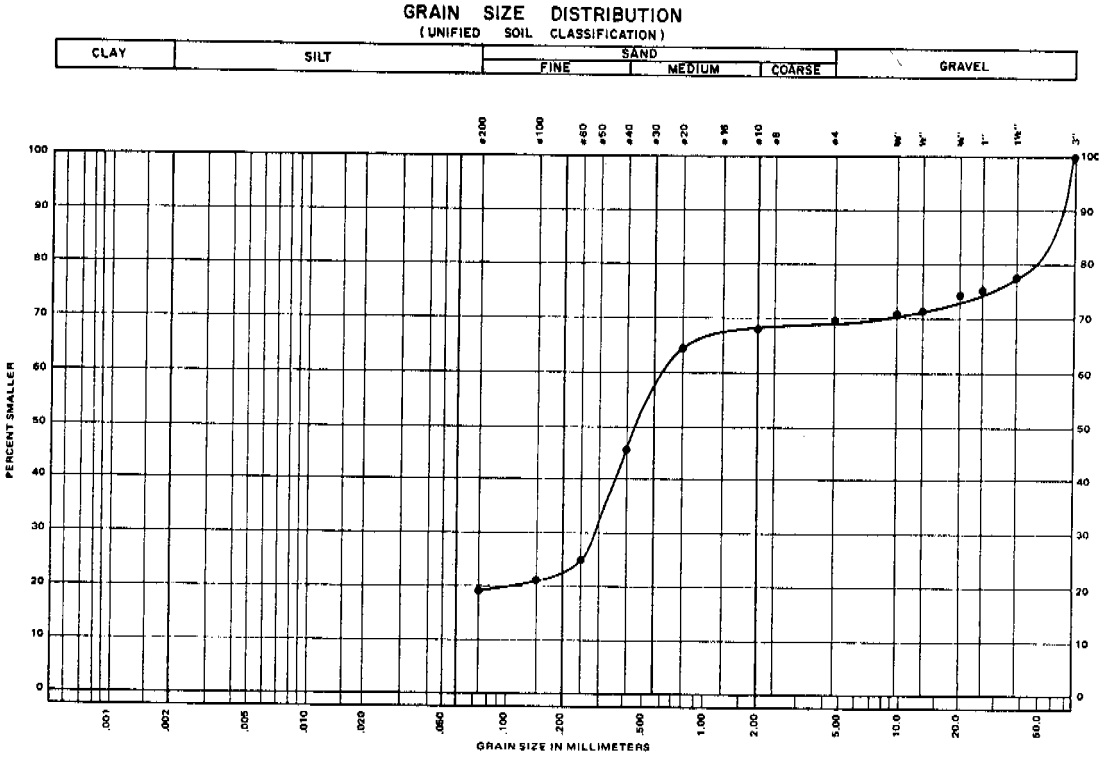
EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1048-1



Silt, medium brown sandy gravelly	31% GRAVEL 50% SAND 19% SILT & CLAY
Silt, grey, clayey, sandy, cobbles	



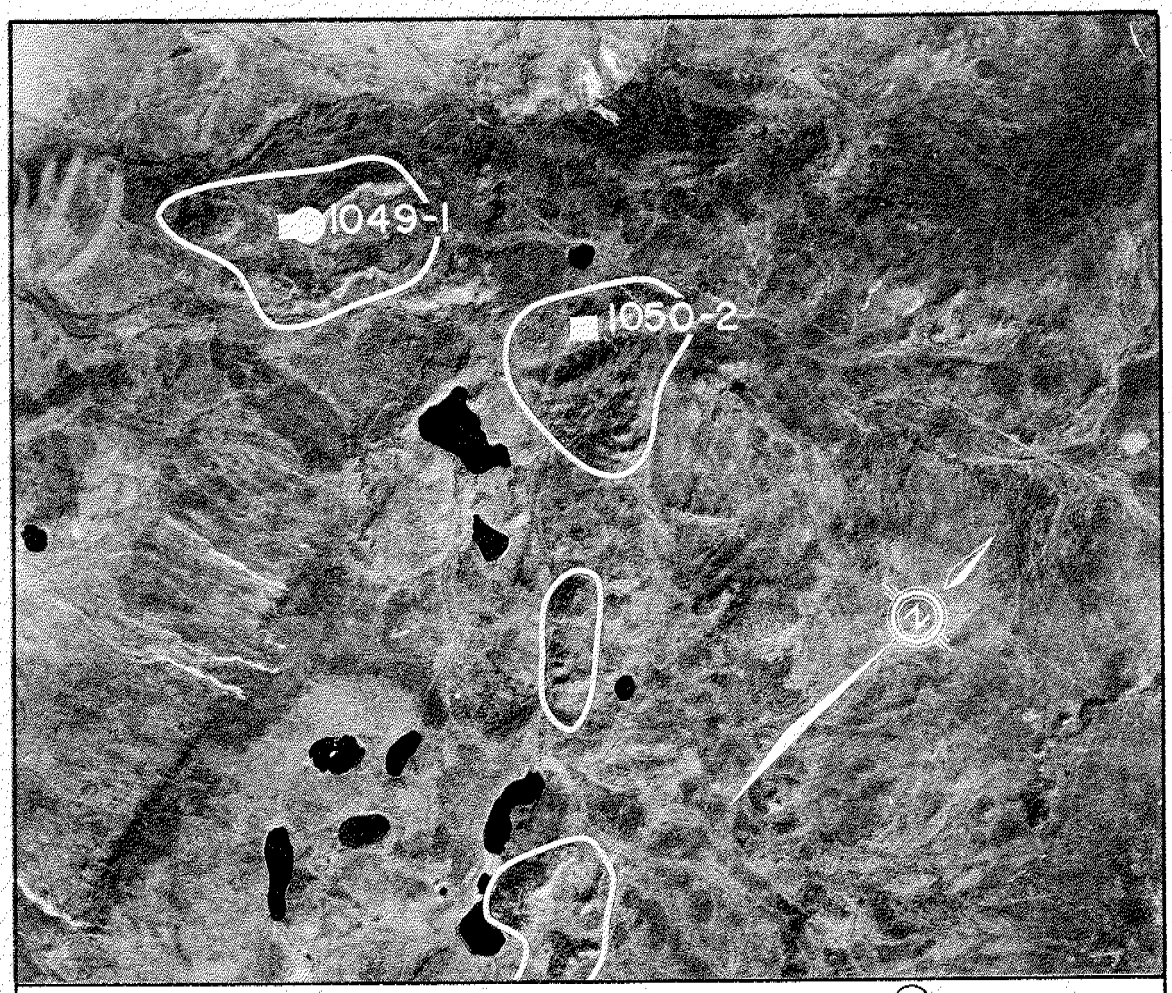
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and some Silt (SP-SM) M/C = 8.9%

PROJECT Granular Resources
JOB No. E666 DATE Jan.14/74
SAMPLE No. TP 1048-1
DEPTH 2'

SITE 1049

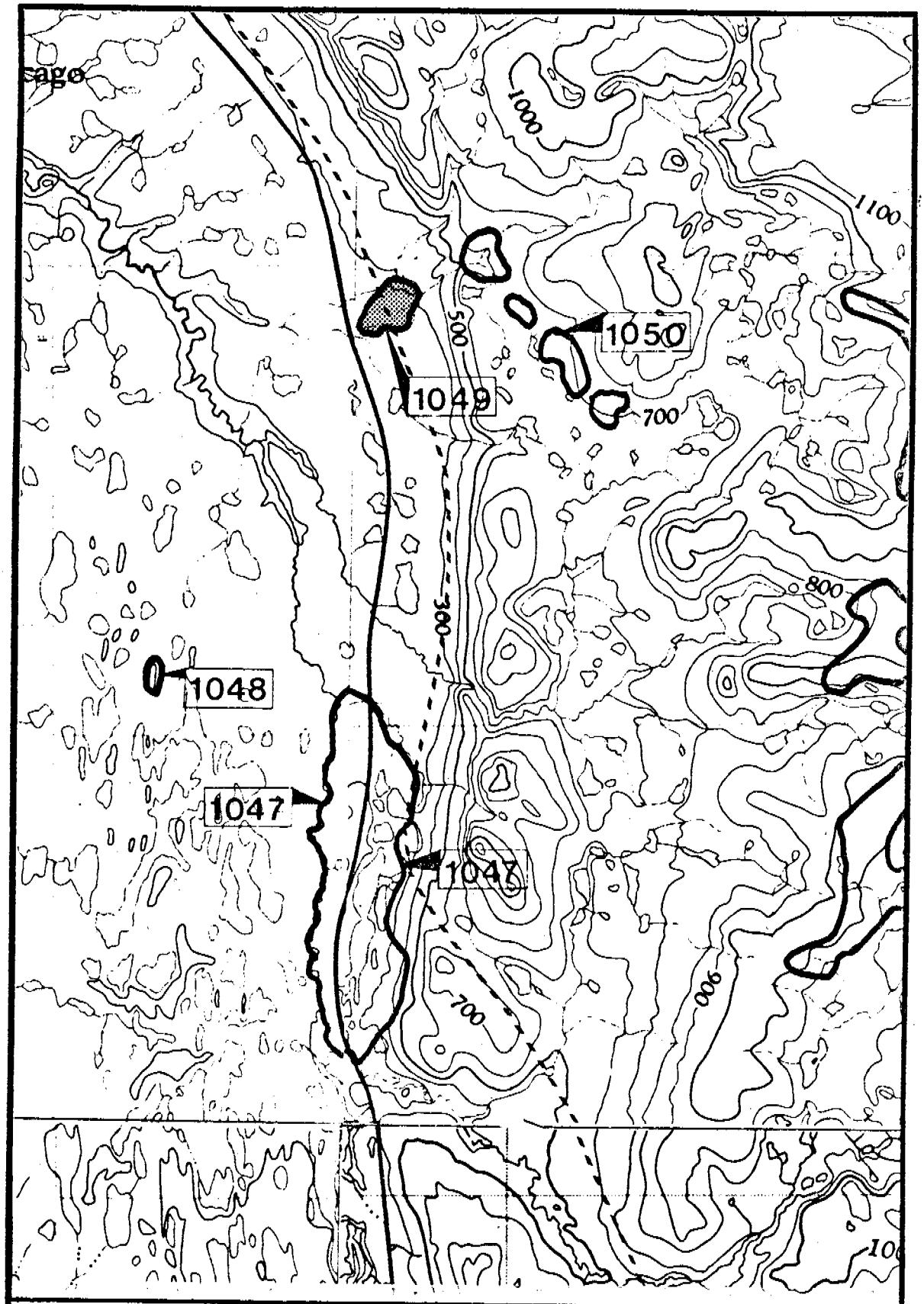
Location:	Site 1049 is located 7 1/2 miles SEE of Little Chicago. Proposed highway and pipeline routes are 1/2 and 1 mile west of the site respectively.
Geology:	The material at site 1049 is contained in a few small, low eskers.
Material:	Gravelly sand, some silt, well graded.
Volume:	175,000 cu. yd., volume estimate is conservative.
Area:	35 acres.
Drainage:	The site is well drained.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22859-166 SCALE: 1" = 3000' (approx.)

Assessment: A small volume of fair quality material was encountered at site 1049. The eskers are located close to proposed routes and access would be easy. Overburden is negligible to very thin peat and silt which can be incorporated into the borrow, however, a dense spruce cover will have to be removed. The ground was unfrozen to the depth of the borrow at the time of the field investigations. The environmental overview has given the site a relatively low environmental sensitivity rating. If there are material shortages site 1049 can be developed as a low volume source of fair quality borrow. Development within the general guidelines and the environmental guidelines contained in this report is suggested.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I, ONTARATUE RIVER 106-J
TRAVAILLANT LAKE 106-O, CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1049

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 (2) 3 4 5 Rating: 20	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION (1) 2 3 4 5 Rating: 15	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES (1) 2 3 4 5 Rating: 15	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 190

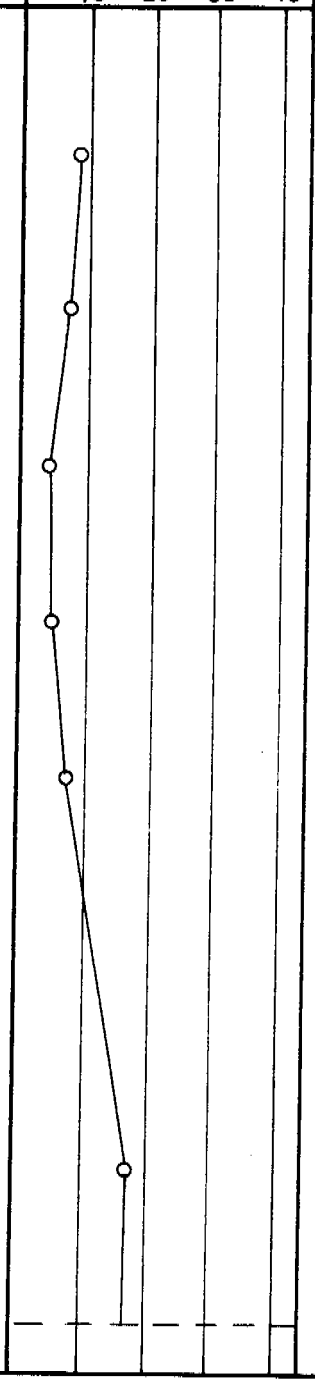
SPECIAL CONCERNS: Upland area. Siltation controls may be required. Avoid drainage alteration to wetlands below. Choice of material removal sites should consider denning requirements.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1049 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	GM	SILT & GRAVEL -coarse, angular & subangular some cobbles.	NOT FROZEN
2, 3, 4, 5	SM	SILT -sandy, some fine to medium sized gravel, dry, light brown 6.1% O.C.	
6, 7, 8, 9, 10, 11, 12, 13, 14	SM	SILT & SAND -sandy, average ½", subangular, dry, light brown. -light to medium brown. (6'+10') 26% GRAVEL, 46% SAND, 28% SILT & CLAY	
15, 16, 17	CL	CLAY -silty, sandy, fine, medium plasticity, grey.	



DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 154-2 COMPLETION DEPTH: 19.0'

DRILLING METHOD: AUGER THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1049 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	CL	CLAY -same	NOT FROZEN		18
19					19
20		END OF HOLE			20
21					21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 154-2 COMPLETION DEPTH: 19.0'

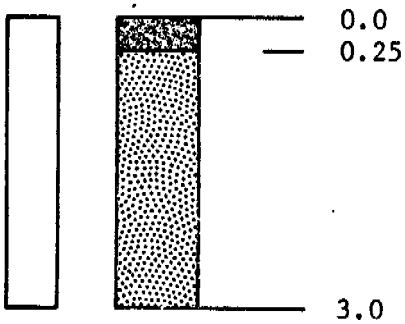
DRILLING METHOD: AUGER THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

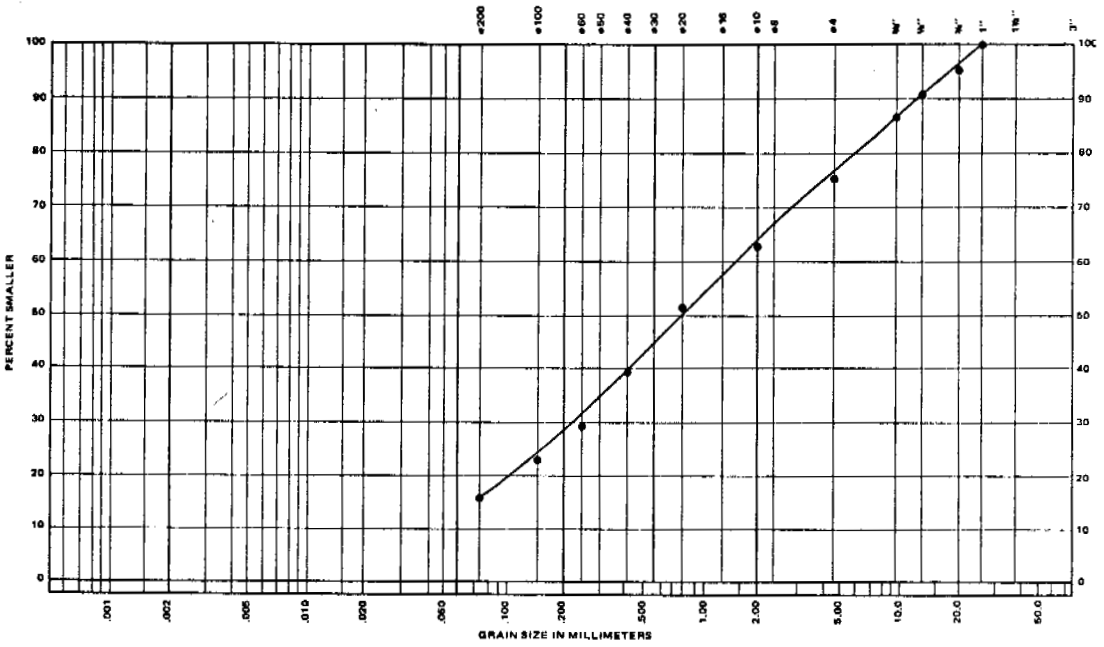
TEST PIT LOG

TP 1049-1



Peat, dark brown	
Sand, medium brown silty gravelly	24% GRAVEL 60% SAND 16% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

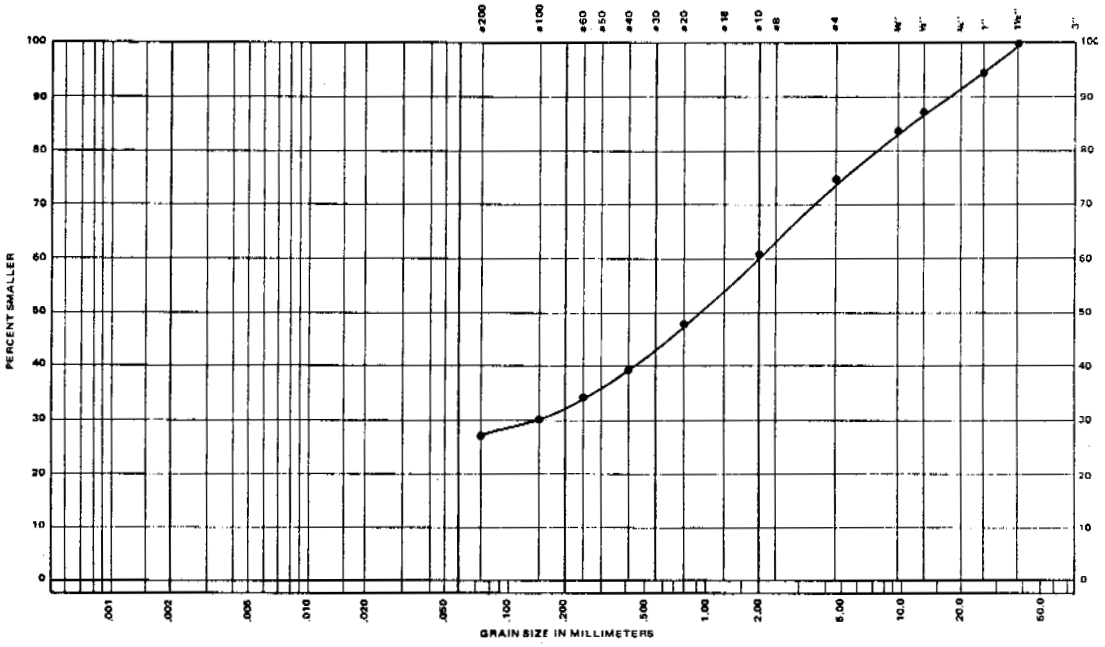


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Sand and Some Silt (GW-GM)

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1049-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Silty Sand (GM-GC)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1049-2
DEPTH 6' + 8' + 10'

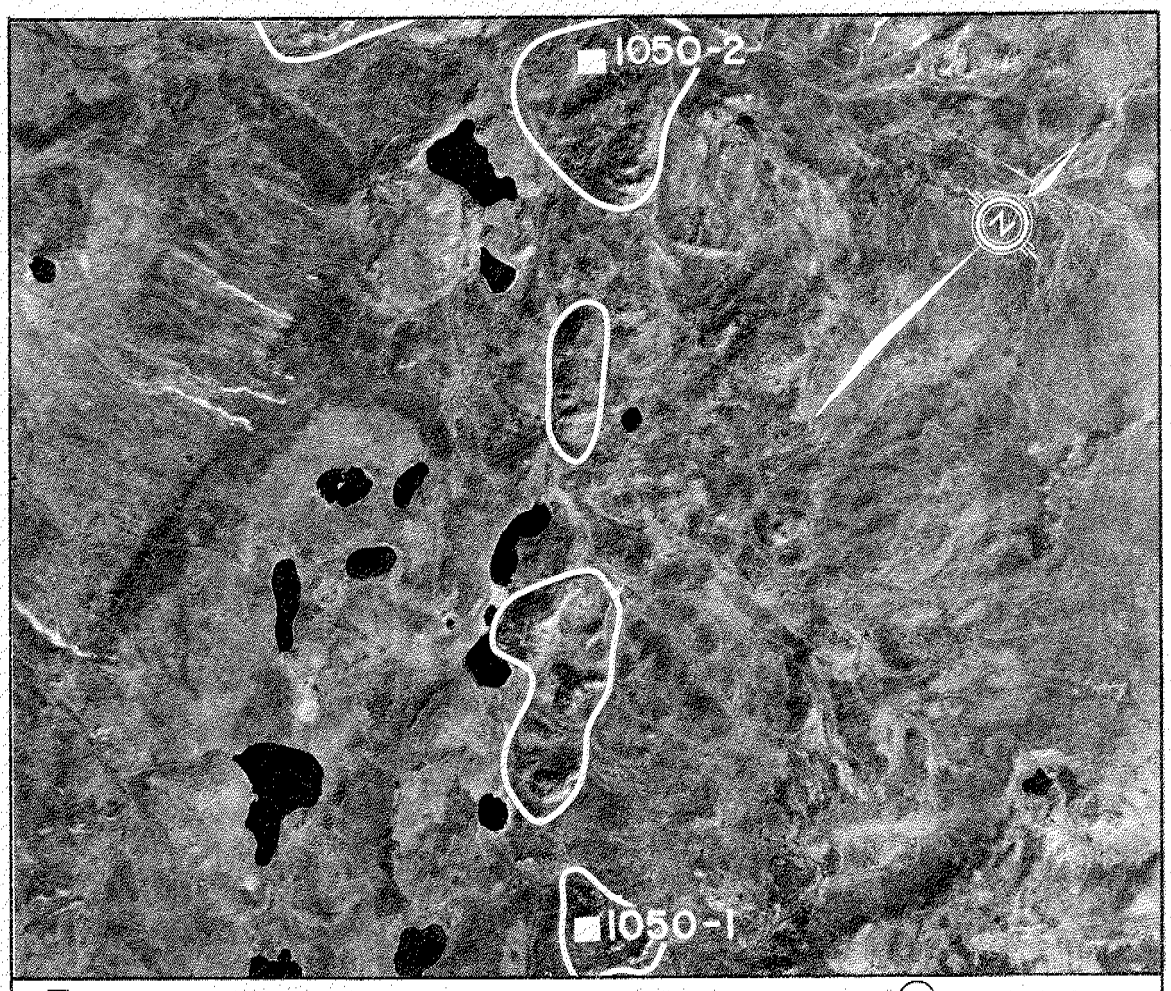
SITE 1050

Location: Site 1050 is 15 miles NW of Yeltea Lake and 10 miles SEE of Little Chicago. Proposed highway and pipeline routes are 2 and 3 miles to the west of the site respectively.

Geology: Site 1050 is a large scattered kame complex. Considerable variation may be expected in the material.

Material: Variable from silty gravel and sand, to sand and gravel with some silt, fairly well graded.

Volume: 1,500,000 cubic yards, reliability of volume estimate is uncertain.



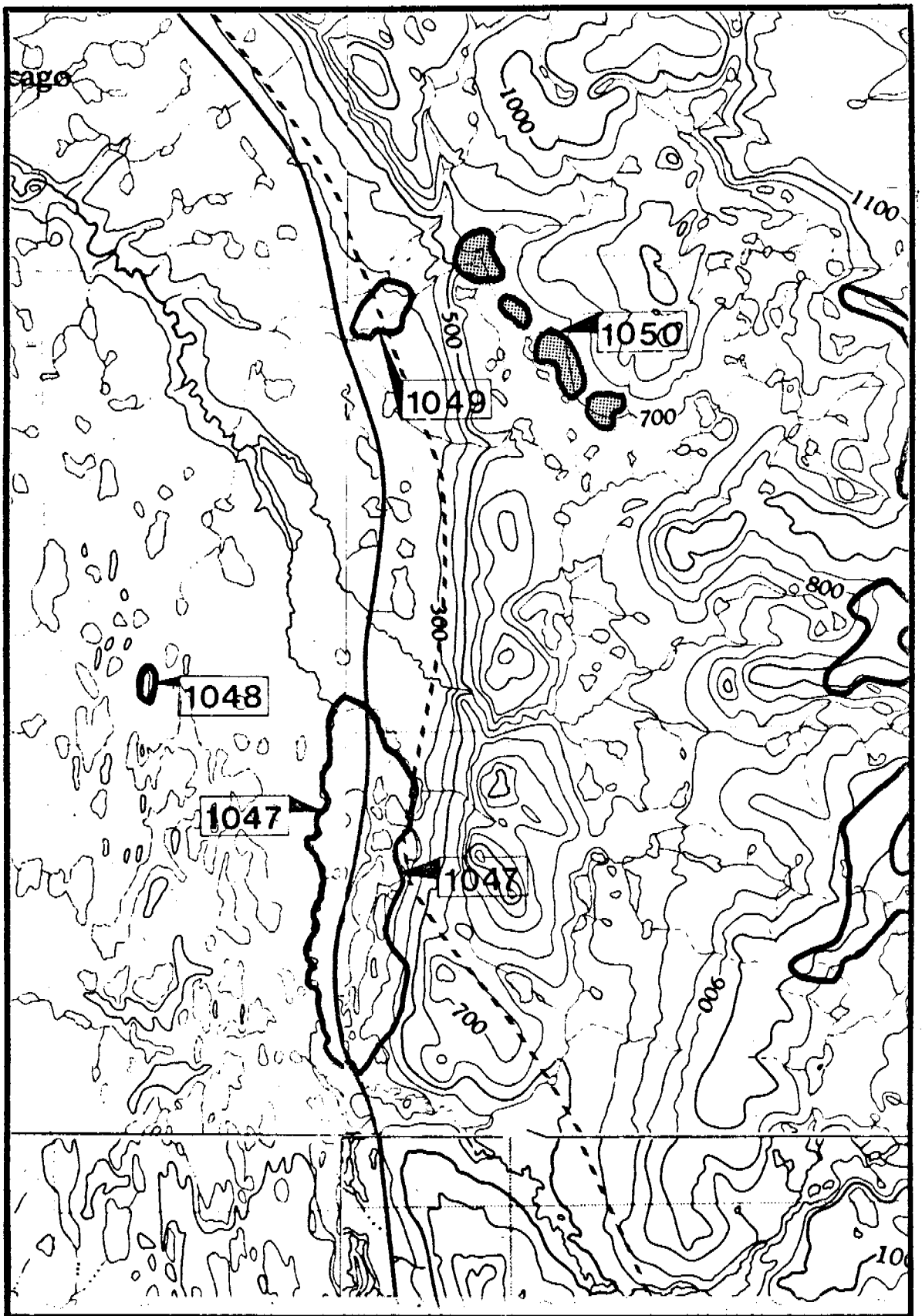
□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22859-166 SCALE: 1" = 3000' (approx.)

Area: 100 acres.

Drainage: The site is well drained.

Assessment: The material examined in this scattered kame complex is of fair quality but considerable variation can be expected. Volume of borrow present will depend on the variation within the material. The site is well within acceptable limits for haulage distances and access should not be too difficult. Overburden thickness varies from one to five feet which would have to be removed and stockpiled for reuse in restoration. A dense spruce and poplar tree cover would require removal and disposal. The environmental overview has rated the site to have a low sensitivity rating. Site 1050 may be considered for development if there are shortages of material. Development within the general guidelines contained within this report and within the environmental guidelines is suggested.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I, ONTARATUE RIVER 106-J
TRAVAILLANT LAKE 106-O, CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1050

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

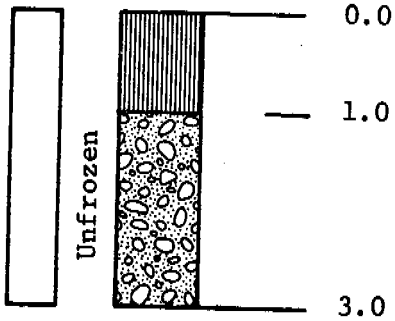
TOTAL INDEX: 200

SPECIAL CONCERNS: Upland area. Siltation controls may be required. Denning sites should be avoided when removing material.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

TEST PIT LOG

TP 1050-1

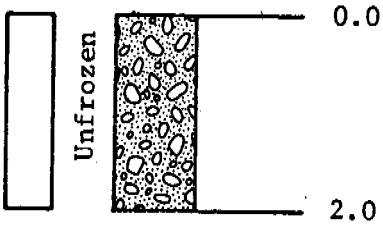


Sand, reddish brown, silty

Gravel, medium brown
silty
sandy

34% GRAVEL
42% SAND
24% SILT & CLAY

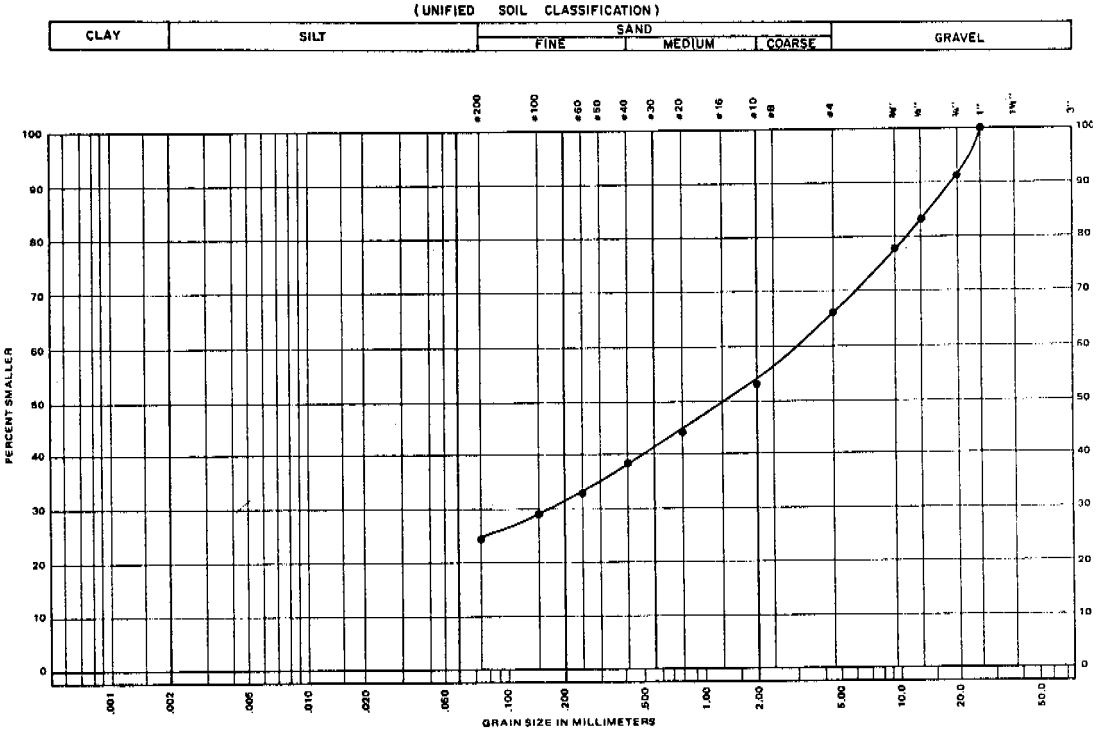
TP 1050-2



Gravel, medium brown
sandy
some silt
well graded

44% GRAVEL
44% SAND
12% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

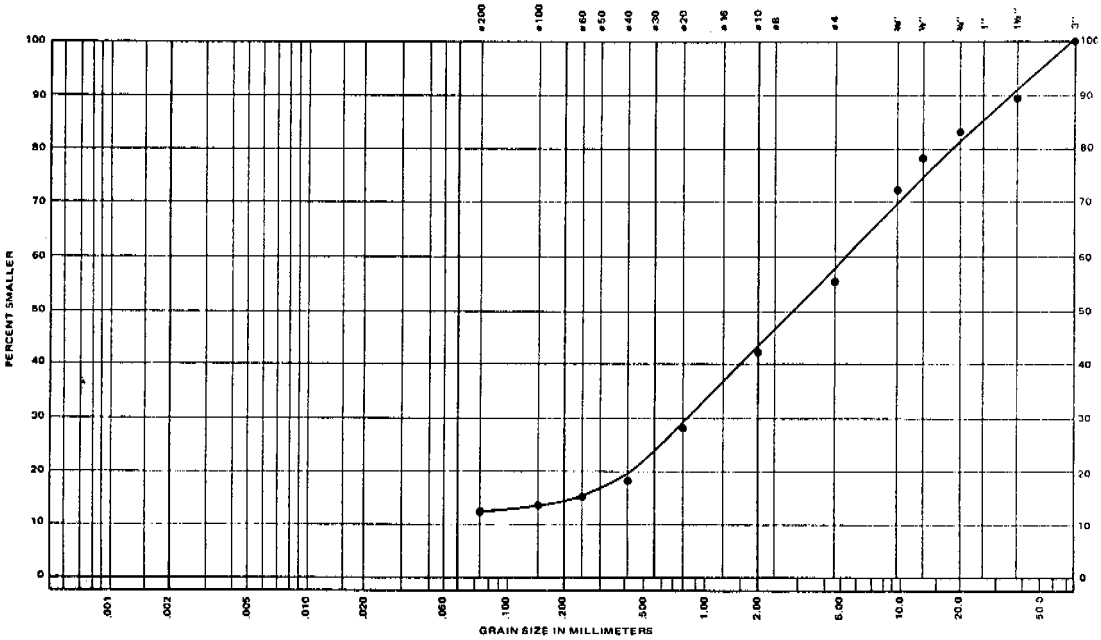


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel, Silty (GM) M/C = 5.3%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1050-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GM) M/C = 3.3%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1050-2
DEPTH 2'

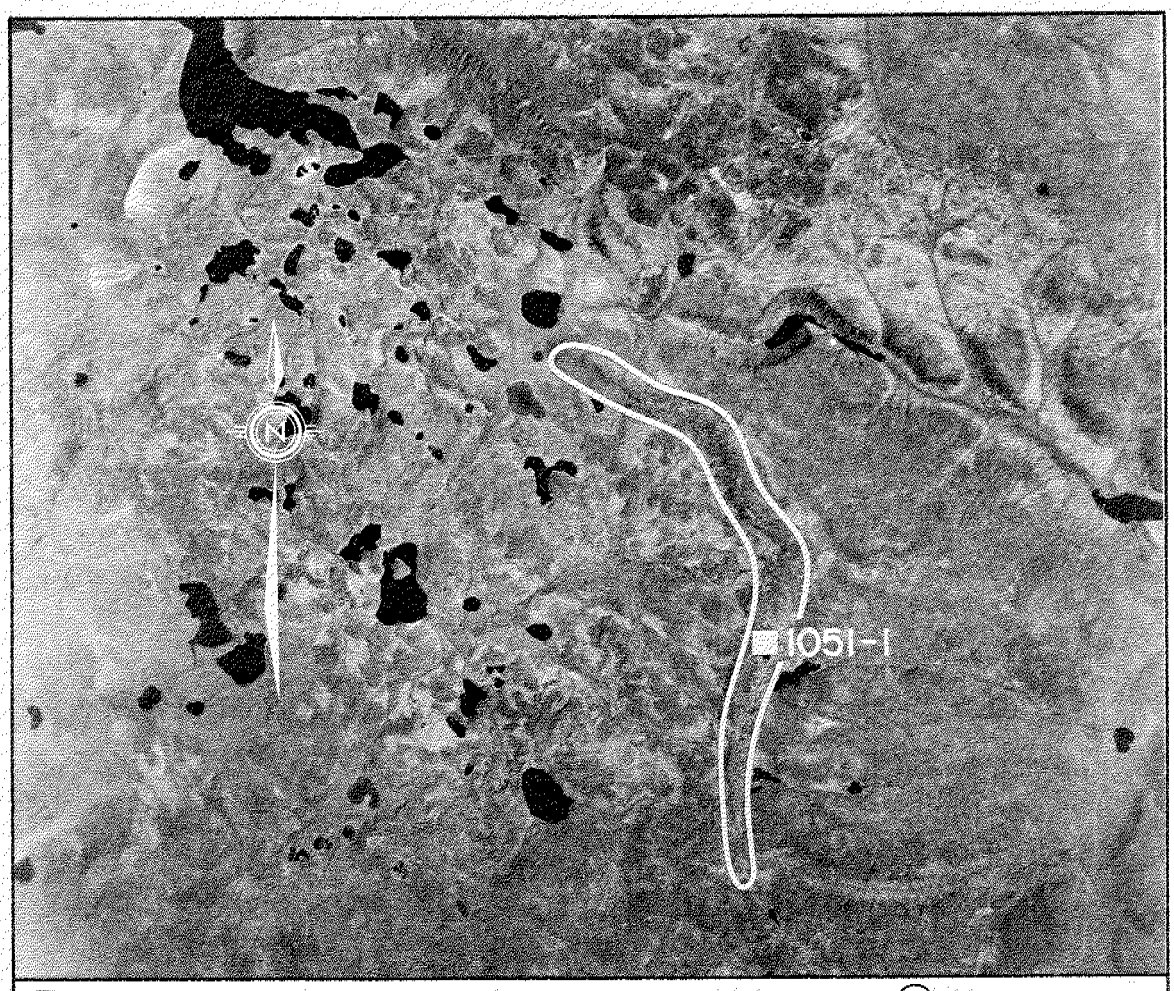
SITE 1051a

Location: Site 1051 is situated 11 miles NW of Yeltea Lake. Proposed pipeline and highway routes are approximately 8 miles west of the site.

Geology: Site 1051 is a long esker.

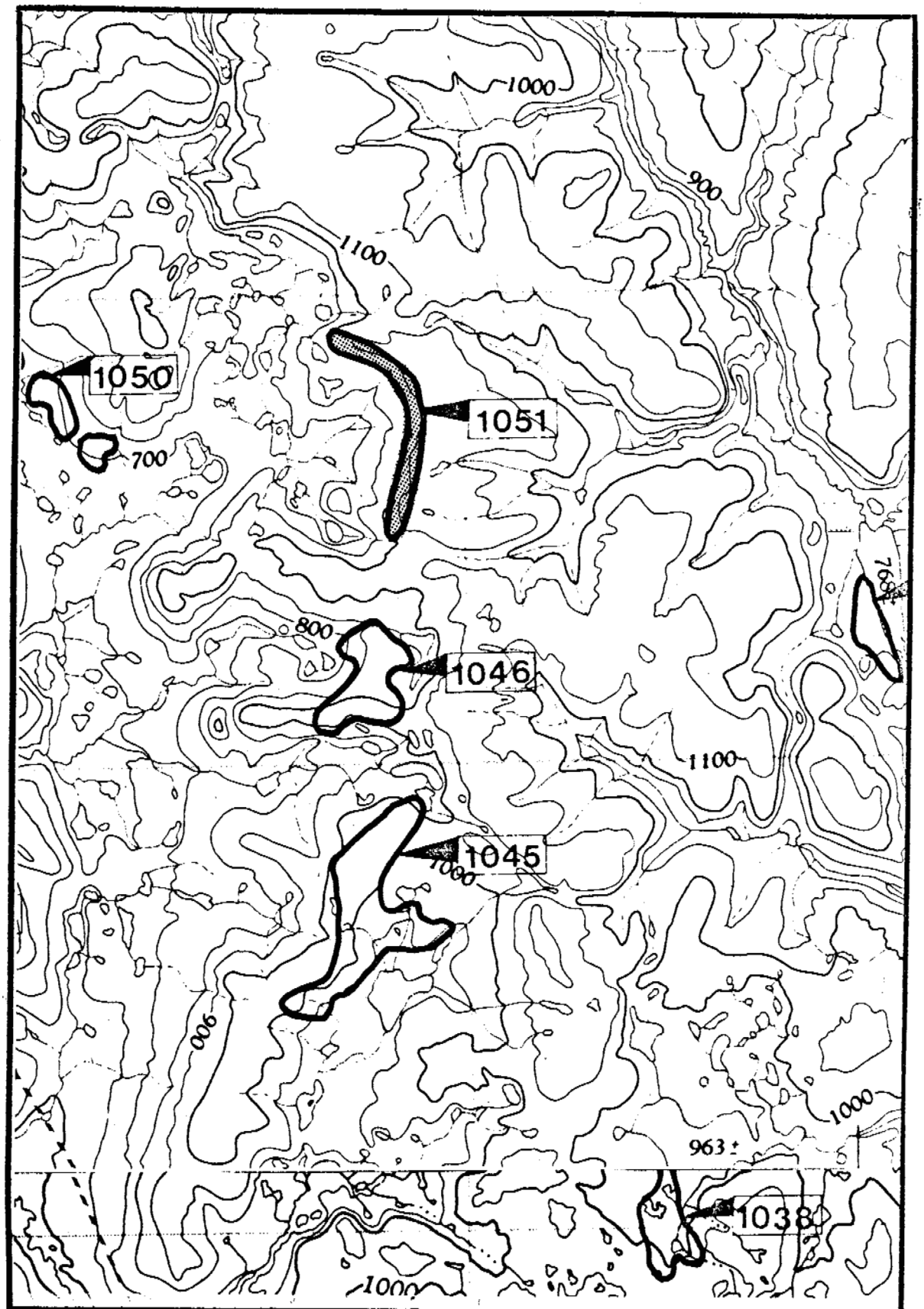
Material: Silt.

Assessment: The material at site 1051 is poor quality and unsuitable for construction purposes. Site 1051 is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21584-191 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

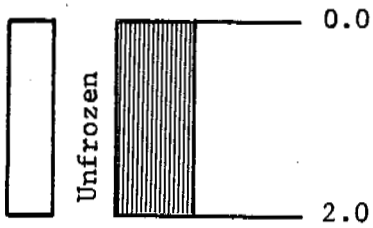
PROPOSED MACKENZIE HIGHWAY

MAPS: FORT GOOD HOPE 106-I
CANOT LAKE 106-P

SCALE: 1:125,000

TEST PIT LOG

TP 1051-1



Silt, light brown
some gravel inclusions
cobbles

SITE 1052

Location: Site 1052 is one mile south of Tutseita Lake. Proposed pipeline and highway routes are 3 miles SW of the site.

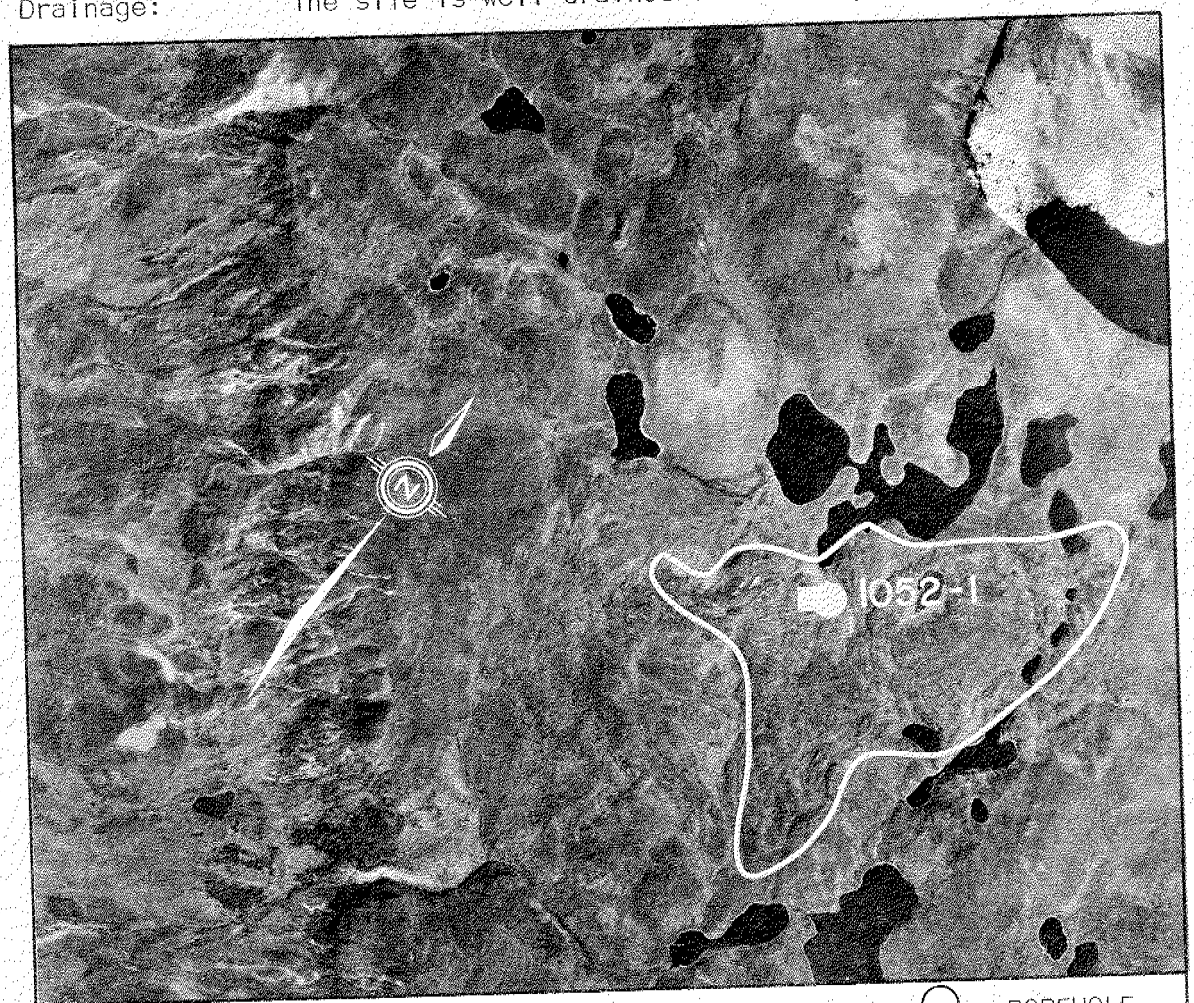
Geology: The material at site 1052 is contained in a number of small eskers and crevasse fillings.

Material: Sand and gravel, trace of silt.

Volume: 120,000 yd.3, volume estimate is reliable.

Area: 16 acres.

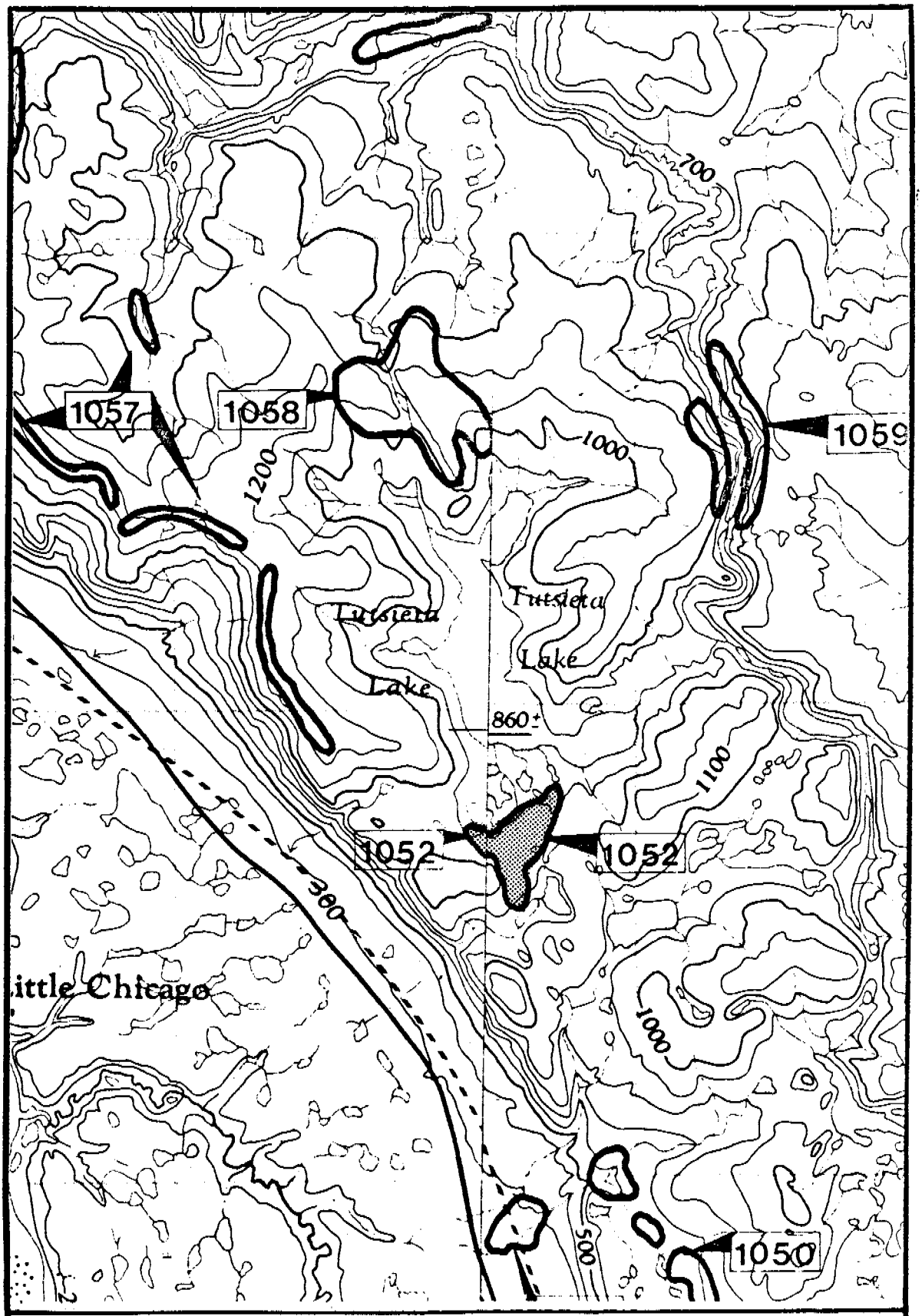
Drainage: The site is well drained into nearby lakes.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22859-169 SCALE: 1" = 3000' (approx.)

Assessment: The fair to good quality sand and gravel at site 1052 is expected to be in the top few feet of several small eskers. Vegetative cover is sparse and overburden negligible. Permafrost was encountered at 12 feet, however, the borrow by winter road is above that depth. Access to the site is relatively easy but haulage distance and the low volume which can be obtained from each of the scattered deposits make the feasibility of development questionable.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1052

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 2 (3) 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 (2) 3 4 5 Rating: 20	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 230

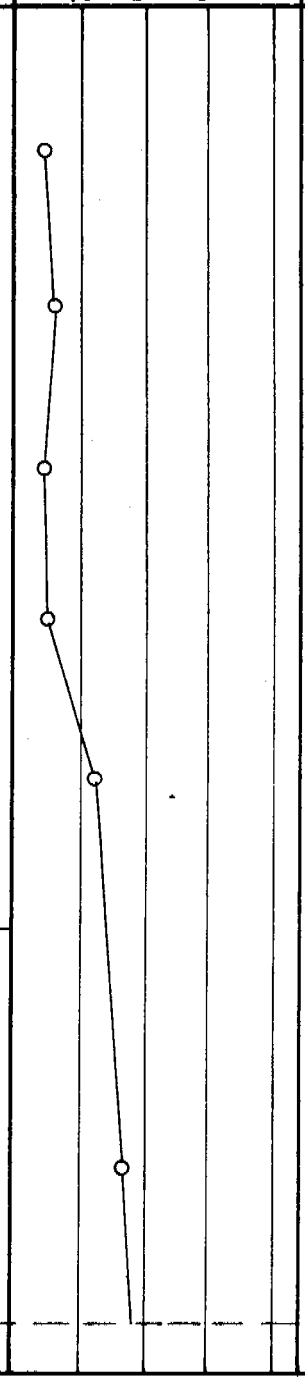
SPECIAL CONCERNS: Straddles lake complex south of Tutsieta Lake. Buffer areas may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1052 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	GP-GM	GRAVEL -sandy, maximum 2", average 1", subangular to sub-rounded. -finer gravel, average ½", dry, light brown. 39% GRAVEL 53% SAND 8% SILT & CLAY (2') -very silty, sandy 14.2% O.C.	NOT FROZEN
5	GM	SILT -gravelly, some sand, dry, light brown - some fine gravel	
10	CL	CLAY -gravelly, some sand, some to trace gravel, dry, grey. -no gravel -less silty	FROZEN
17			



DEPTH (feet): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 153-1 COMPLETION DEPTH: 20.5'

DRILLING METHOD: AUGER THAW DEPTH: 12.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1052 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	CL	CLAY -silty, grey brown, medium plasticity	FROZEN		18
19					19
20		-some silt			20
21		END OF HOLE			21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 153-1 COMPLETION DEPTH: 20.5

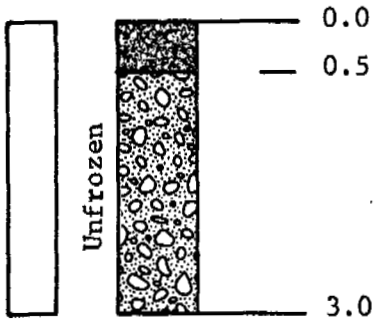
DRILLING METHOD: AUGER THAW DEPTH: 12.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

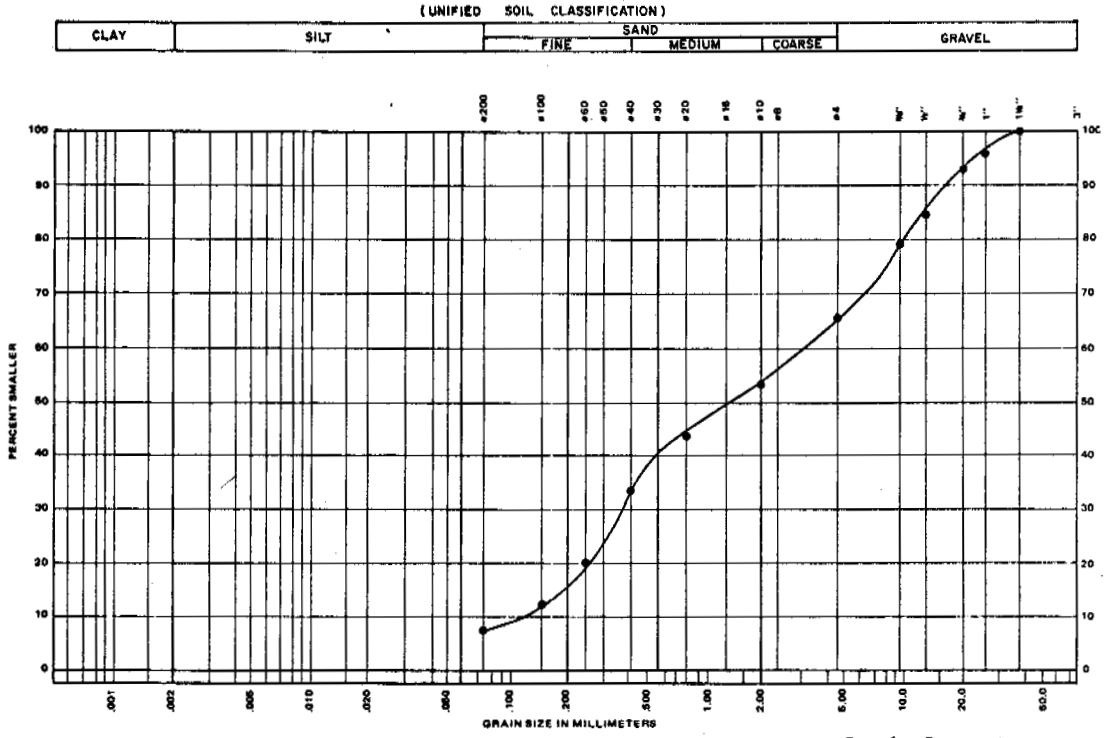
TEST PIT LOG

TP 1052-1



0.0	Moss	
0.5	Gravel, sandy moist dense	35% GRAVEL 57% SAND 8% SILT & CLAY
3.0		

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

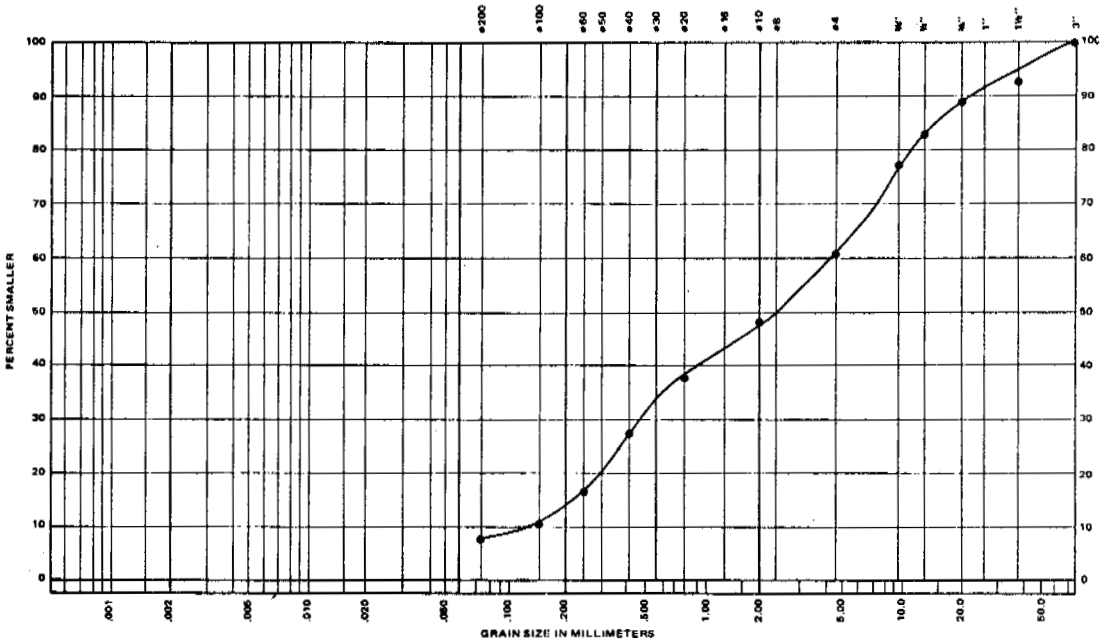


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel with a trace of Silt (GM) M/C = 5.3%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1052-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel with a trace of Silt (GM)

PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1052-1
DEPTH 2'

SITE 1053a

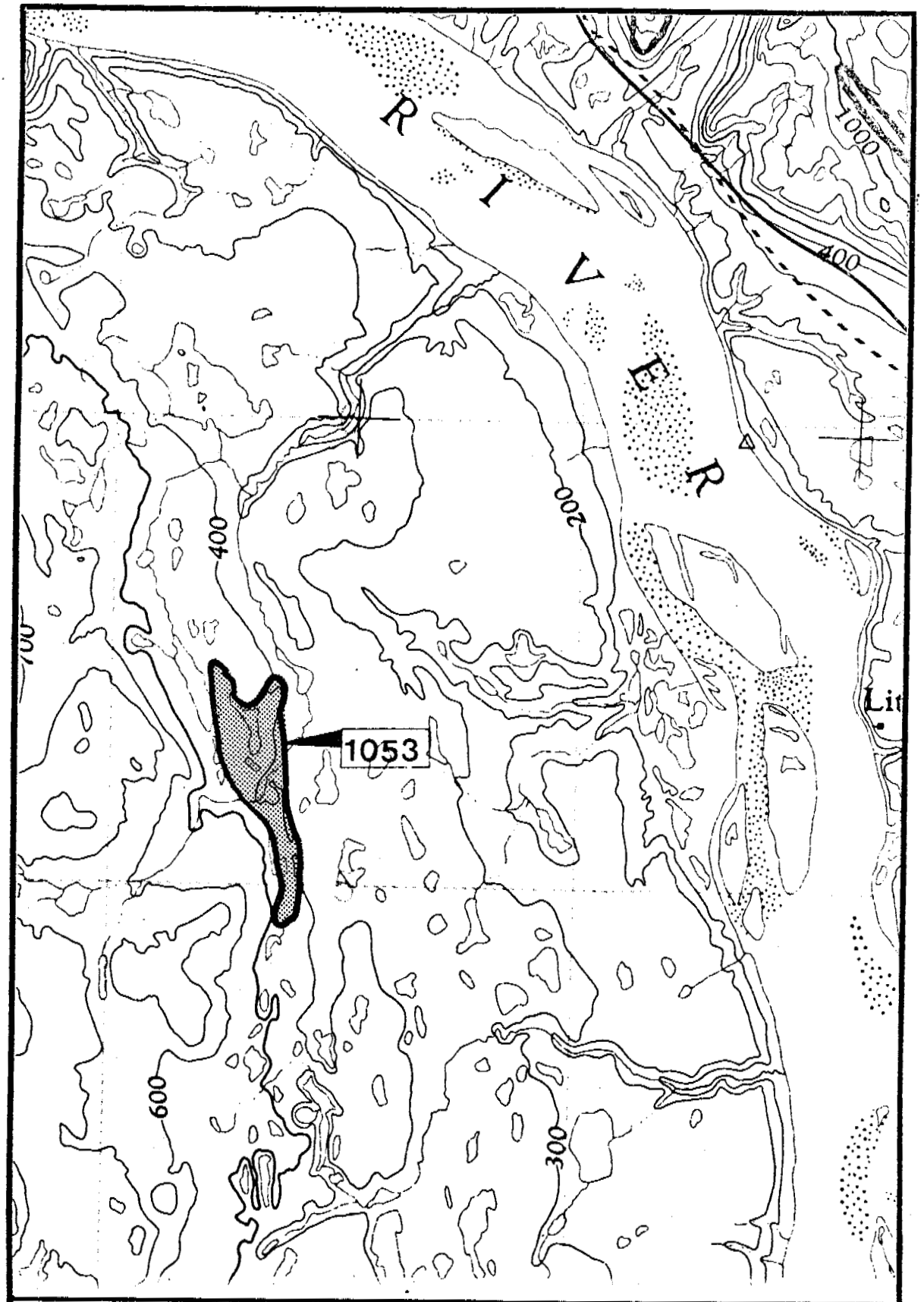
Location: Site 1053 is on the west bank of the Mackenzie River and is 8 miles west of Little Chicago. Proposed pipeline and highway routes are 10 miles NE of the site.

Material: Peat, silt and clay.

Assessment: The material encountered at site 1053 is unsuitable for construction purposes. The site is not recommended for development.

□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A22858-14 SCALE: 1" = 3000' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

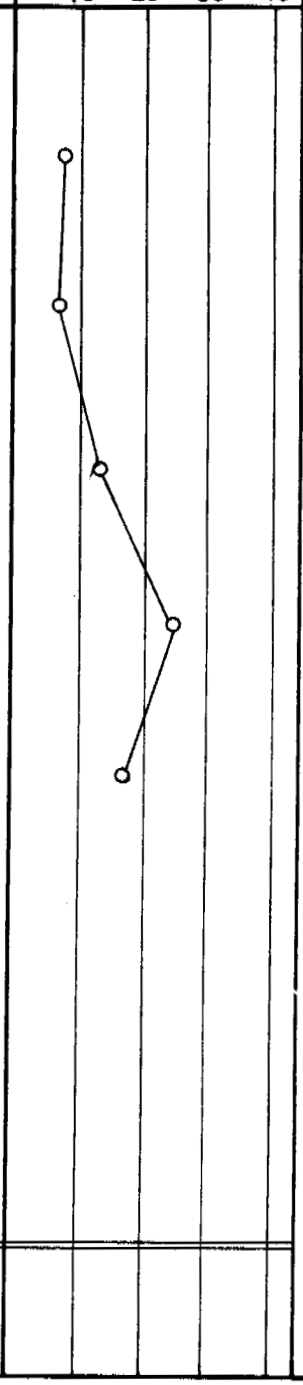
MAPS: TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1053 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	SM	SILT -some fine sand, few coarse sand sized particles, very dry, light brown.	NOT FROZEN		1
2					2
3					3
4					4
5					5
6	ML	-trace clay, grey-brown			6
7					7
8	CL	CLAY -silty, medium plastic, grey			8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17		END OF HOLE			17



DATE DRILLED: Sep. 26/73 LOGGED BY: EBA 149-1 COMPLETION DEPTH: 16.0'

DRILLING METHOD: AUGER THAW DEPTH: NONE FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1053 HOLE NO. 2 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	PT	PEAT -fibrous, dark brown	NOT FROZEN		1
2				320.8	2
3			Nb 10%		3
4		-siltier with depth		279.3	4
5					5
6				278.2	6
7	ML	SILT -some organics, clayier with depth, wet, dark grey brown.	V_x 30%		7
8				59.8	8
9					9
10				46.7	10
11					11
12					12
13			Nb 10%		13
14					14
15					15
16		END OF HOLE			16
17					17

DATE DRILLED: Sep. 27/73 LOGGED BY: EBA 149-2 COMPLETION DEPTH: 16.0'

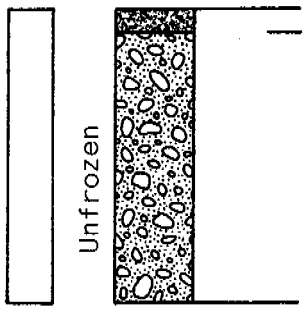
DRILLING METHOD: AUGER THAW DEPTH: 2.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

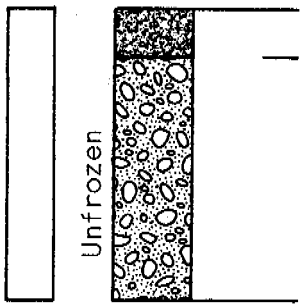
TEST PIT LOG

TP 1053-1



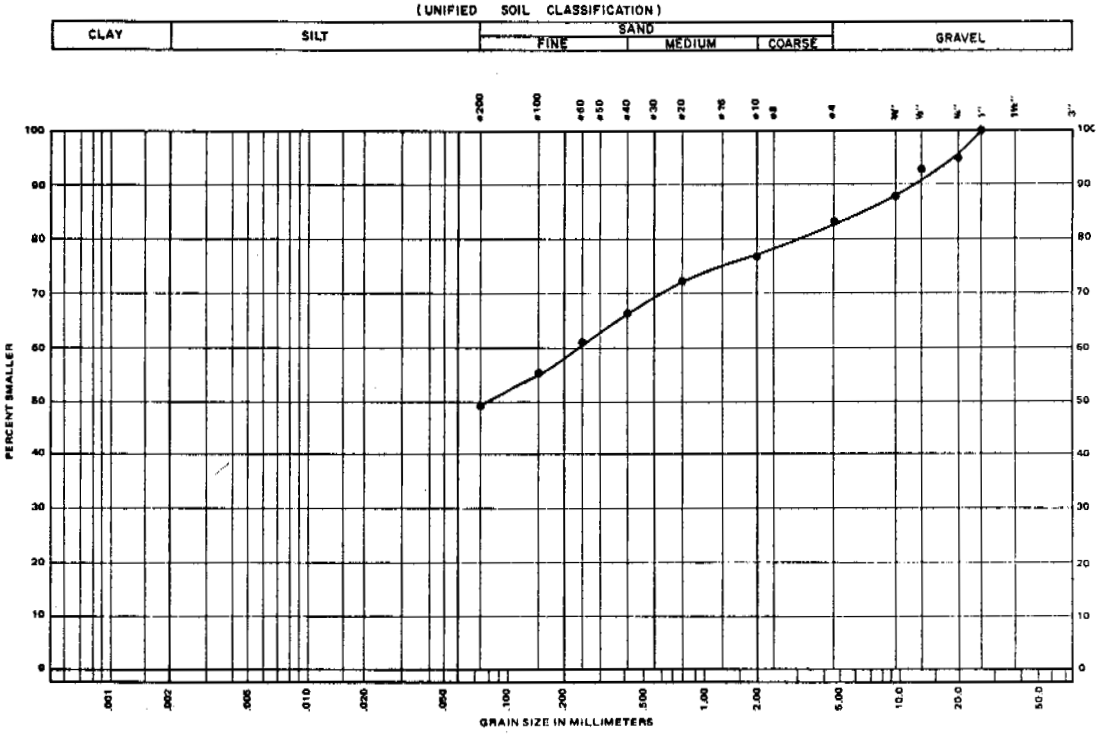
0.0	Moss	
0.25		
	Silt, Sandy, Clayey, (Till)	17% GRAVEL
	some gravel	33% SAND
	light brown	50% SILT & CLAY
3.0		

TP 1053-2



0.0	Moss	
0.5		
	Silt, Sandy, Clayey, (Till)	19% GRAVEL
	grey brown	38% SAND
	moist	43% SILT & CLAY
3.0		

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

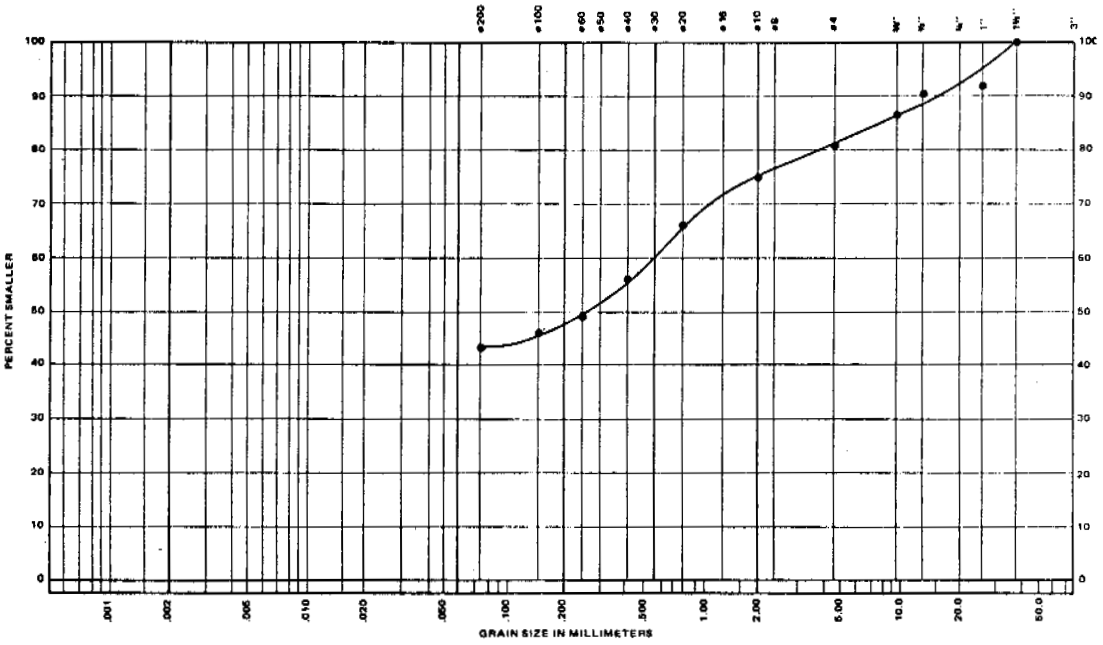


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand and Some Gravel (ML-CL) M/C=8.7%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1053-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand and Some Gravel (ML-CL) M/C = 10.7%

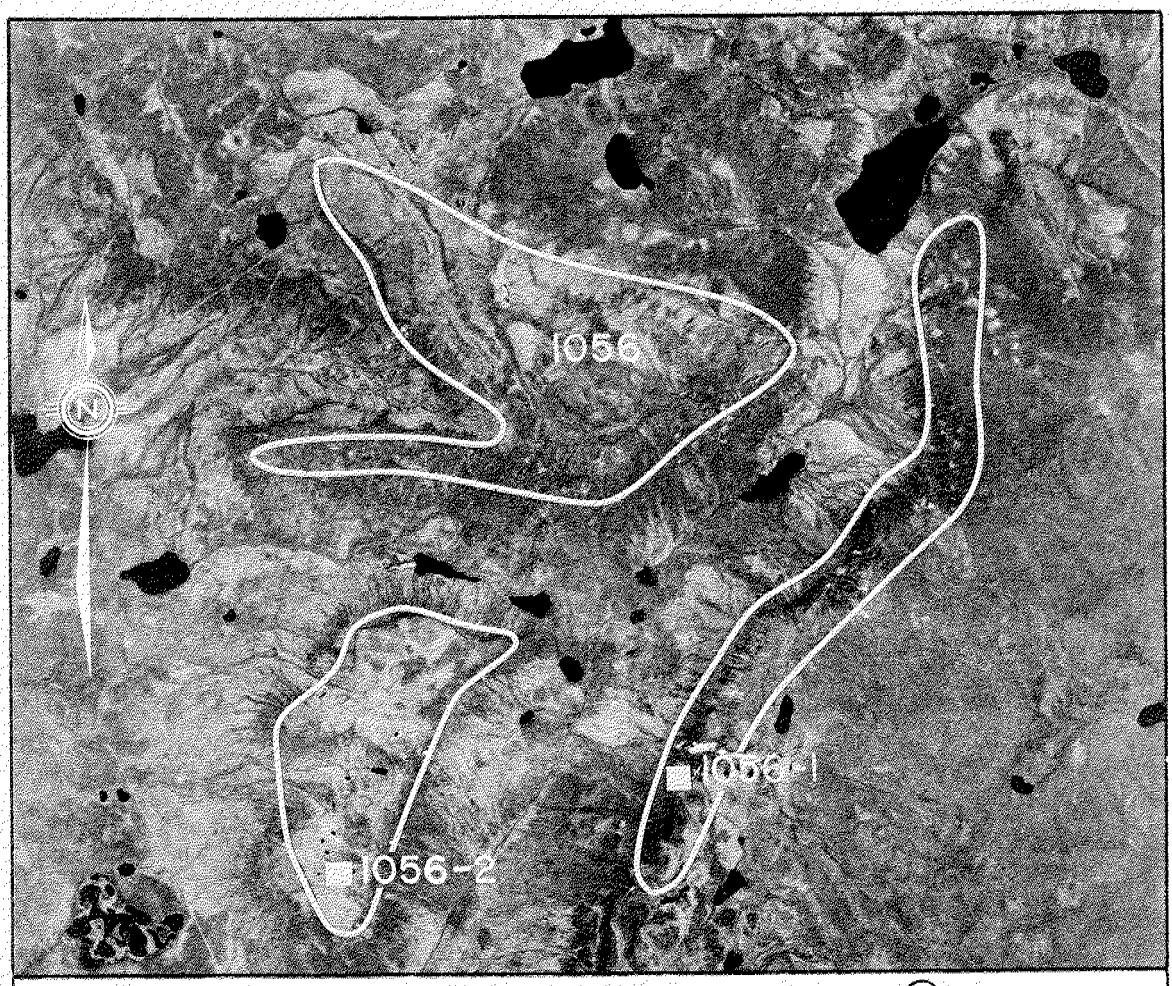
PROJECT Granular Resources
JOB No. E666 DATE January 15/73
SAMPLE No. TP 1053-2
DEPTH 3'

SITE 1056

Location: Site 1056 is approximately 10 miles north of Little Chicago. Proposed pipeline and highway routes are 1 mile south-west of the site.

Material: Shale bedrock.

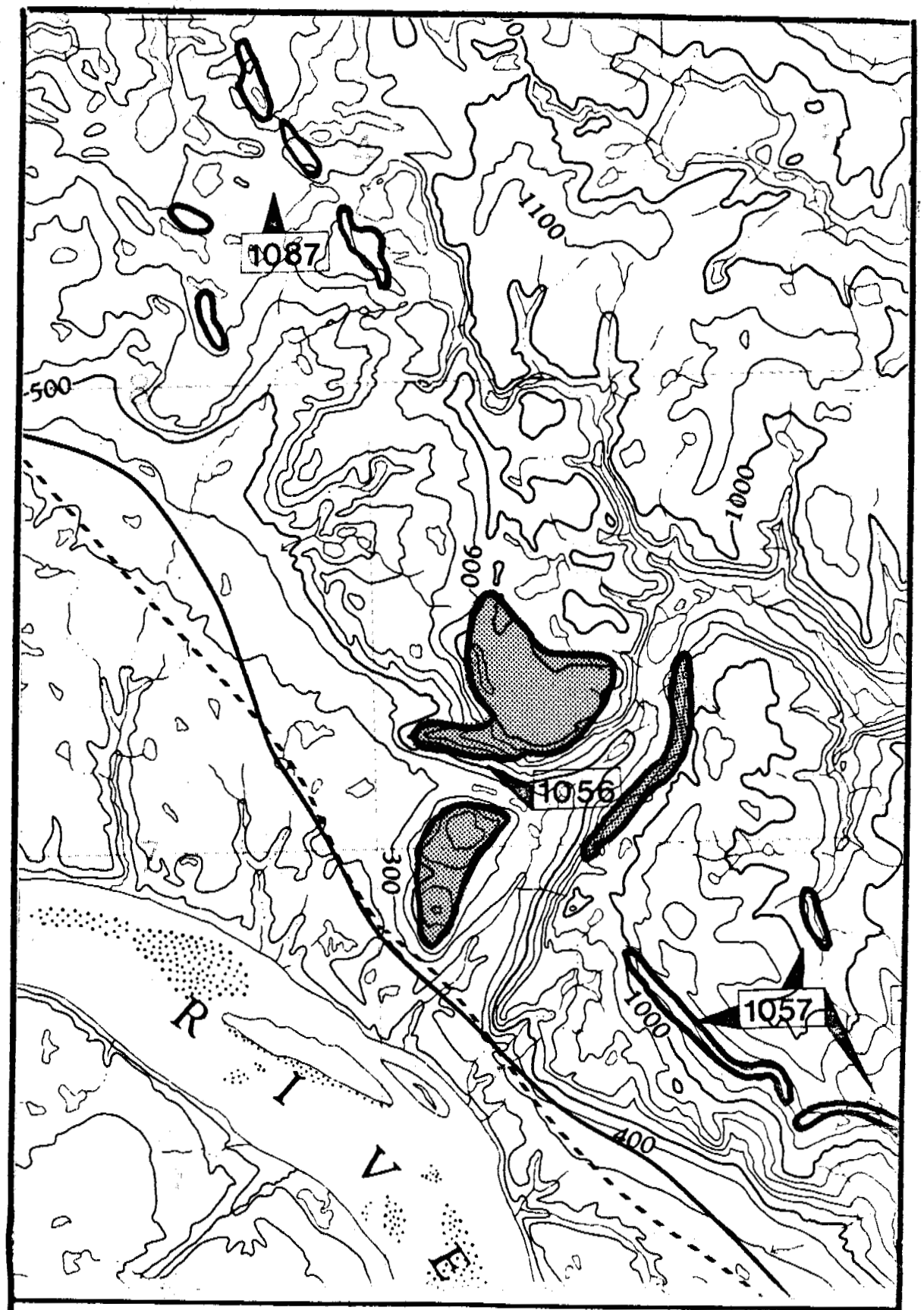
Assessment: The site is overlain with peat varying in thickness from 1/2 to 7 feet thick. The upper 5 feet of the shale is weathered, moist and plastic. The environmental overview has assessed the site to have a moderately high sensitivity. Access to the site is difficult as relatively steep hills will have to be surmounted. The peat overburden and weathered shale will have to be removed and stockpiled



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21585-191 SCALE: 1" = 5500' (approx.)

for use in restoration. The shale at this site is only marginally suitable for construction purposes. The site is recommended for development only if material shortages are critical.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O

SCALE: 1:125,000

SITE 1056

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 (2) 3 4 5 Rating: 20	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 4 (5) Rating: 50	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 2 3 4 (5) Rating: 75	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 3 (4) 5 Rating: 40	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 295

SPECIAL CONCERNS: Upland areas near creek confluence with Mackenzie River. Disturbances have immediate access to Mackenzie.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1056 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	Pt	PEAT -fibrous, brown	NOT FROZEN		1
2			V_r 20%		2
3					3
4				440.4	4
5					5
6				386.6	6
7	br	SHALE -highly weathered, medium to high plasticity, moist, dark grey.	V_r 10%		7
8				48.3	8
9					9
10					10
11		-denser and drier with depth.	V_r 2%		11
12					12
13					13
14			Nbn		14
15					15
16					16
17					17

DATE DRILLED: Sep. 26/73 LOGGED BY: EBA 147-2 COMPLETION DEPTH: 24.0'

DRILLING METHOD: Auger THAW DEPTH: 1.4'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1056 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		SHALE -same	Nbn		18
19					19
20					20
21					21
22					22
23		-possible unweathered			23
24					24
25		END OF HOLE			25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep.26/73 LOGGED BY: EBA 147-2 COMPLETION DEPTH: 24.0'

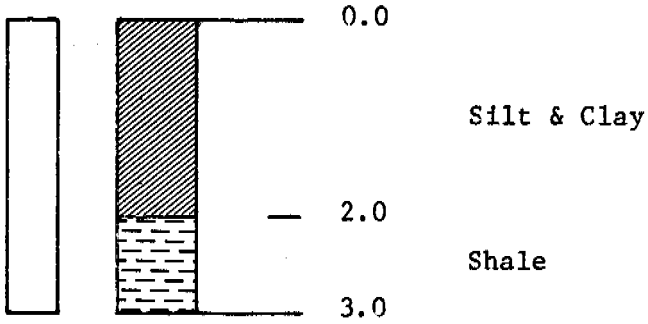
DRILLING METHOD: Auger THAW DEPTH: 1.4'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

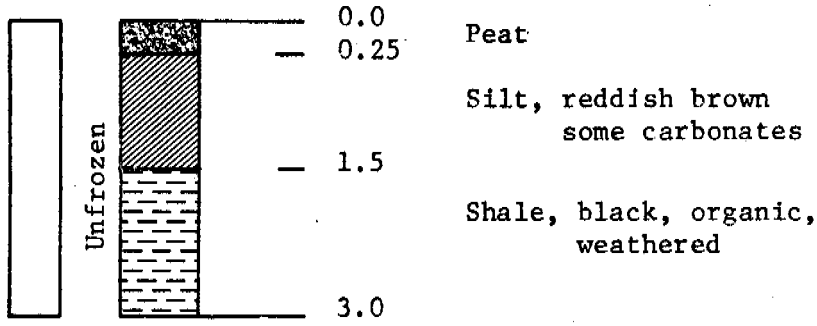
EBA Engineering Consultants Ltd.

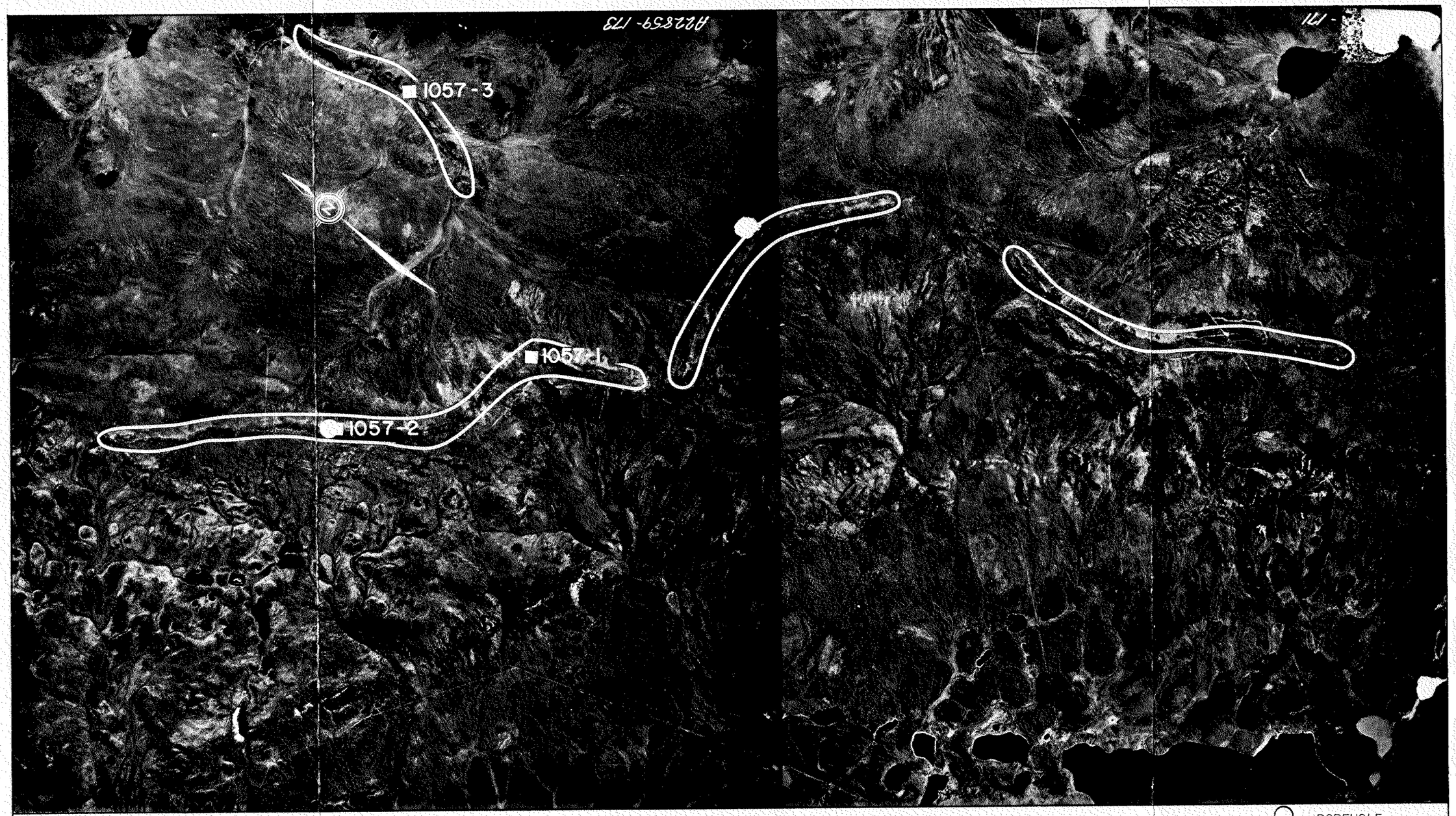
TEST PIT LOG

TP 1056-1



TP 1056-2





□ TEST PIT

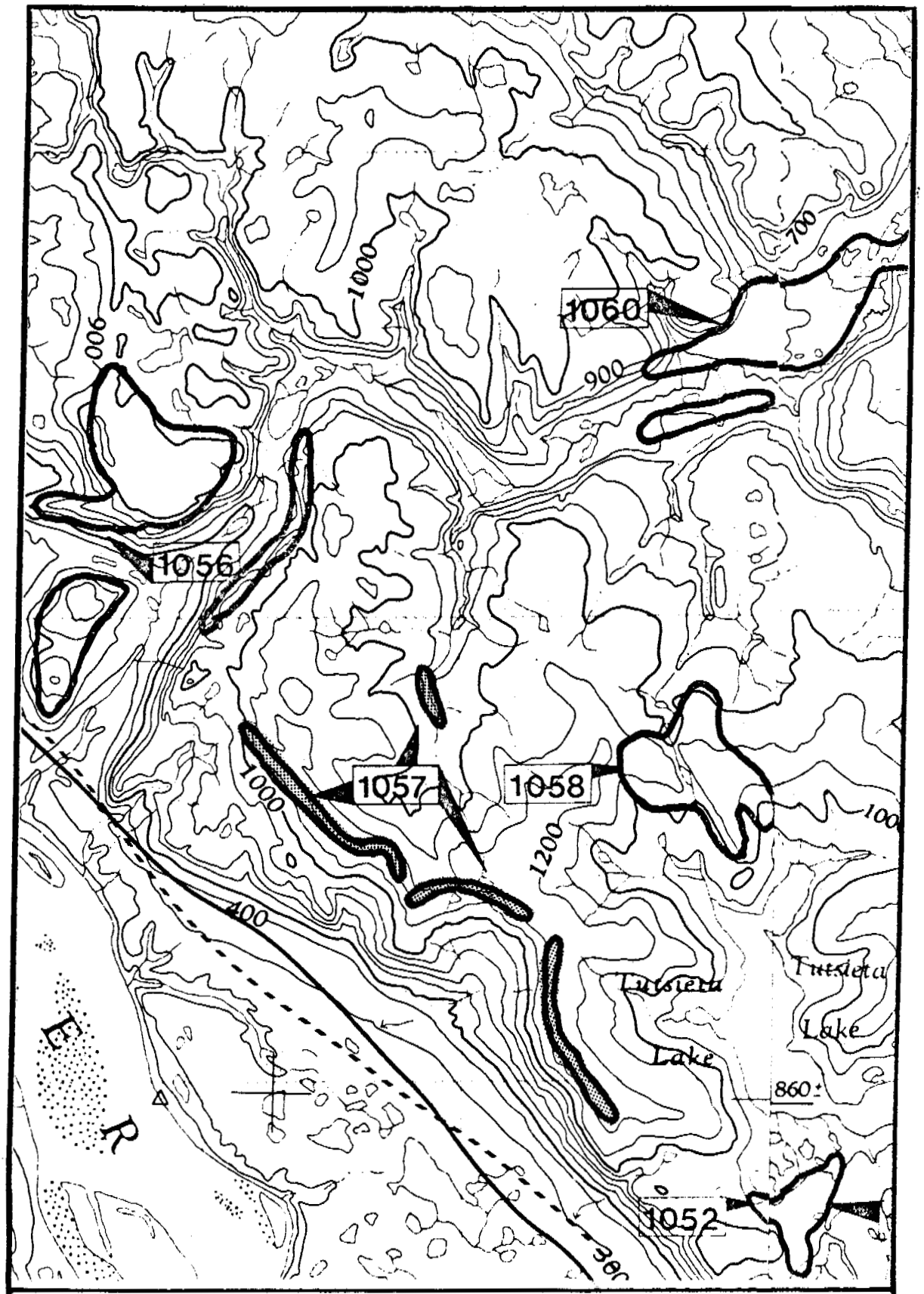
○ BOREHOLE

AIRPHOTO Nos. A22859-171, A22859-173

SCALE: 1" = 3000' (approx.)

SITE 1057

Location:	Site 1057 is a 7 mile long, NW trending, ridge beginning 3 1/2 miles west of Tutsetta Lake. Proposed pipeline and highway routes roughly parallel the site and are 1 1/2 miles west of the site.
Geology:	Site 1057 is a high winding ridge which is possibly a large esker.
Material:	Variable from sandy gravel with some silt to gravelly sand with some silt, fairly well graded.
Volume:	10,500,00 cu. yd., volume estimate is realistic.
Area:	275 acres.
Drainage:	The site is at the top of a hill and is well drained.
Assessment:	A large volume of good quality borrow situated a reasonably short distance from the proposed pipeline and highway routes was encountered at site 1057. Material examined exhibited little variation; however, some local variations should be expected. The ground was found to be unfrozen to a depth of at least 24 feet during the field investigation. The thin overburden can be incorporated into the borrow or stripped during grubbing. Tree cover has been largely burned off however secondary growth will have to be removed. The site has a relatively low environmental sensitivity rating. Prior to development a detailed drilling program should be undertaken to prove quantity and quality of recoverable material. A rather steep hill may present some difficulty with access. Development is recommended within the general guidelines contained within this report.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1057

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 (2) 3 4 5 Rating: 10	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 2 (3) 4 5 Rating: 15	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY (1) 2 3 4 5 Rating: 10	Lakes, Tributaries Mackenzie River: Whitefish / Smelt Grayling / Sculpin Pike / Goldeye Trout-Perch / Chub Lake Trout / Dace Burbot / Walleye Suckers / Char Stickleback / Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY (1) 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS 1 2 3 (4) 5 Rating: 40	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 (2) 3 4 5 Rating: 30	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills, Creek Crossings, Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION 1 2 (3) 4 5 Rating: 30	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Structures.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 210

SPECIAL CONCERNS: Seven mile long development in upland area. Access road should be hidden from highway. Siltation controls may be required.

E.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1057 HOLE NO. 2 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	GC	GRAVEL -clayey, some sand, moist grey	NOT FROZEN		1
2					2
3					3
4		-more clay with depth, loose			4
5					5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14		-wet, interbedding of sandy gravel & clay with some fine gravel.			14
15					15
16					16
17					17

DATE DRILLED: Sep.27/73 LOGGED BY: EBA 150-2 COMPLETION DEPTH: 24.0

DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1057 HOLE NO. 2 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		GRAVEL			18
19		-same			19
20	GC	-very clayey, very wet			20
21					21
22					22
23					23
24					24
25		END OF HOLE			25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep.27/73 LOGGED BY: EBA 150-2 COMPLETION DEPTH: 24.0

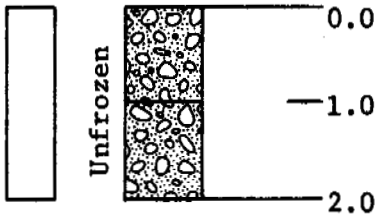
DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1057-1

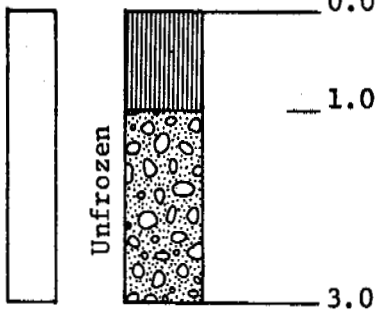


Gravel, reddish brown, silty

Gravel, medium brown, silty

61% GRAVEL
26% SAND
13% SILT & CLAY

TP 1057-2

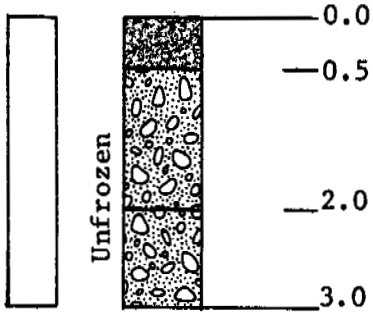


Silt, reddish brown, gravel inclusions

Sand medium brown
clayey, gravelly
medium plasticity

21% GRAVEL
64% SAND
15% SILT & CLAY

TP 1057-3



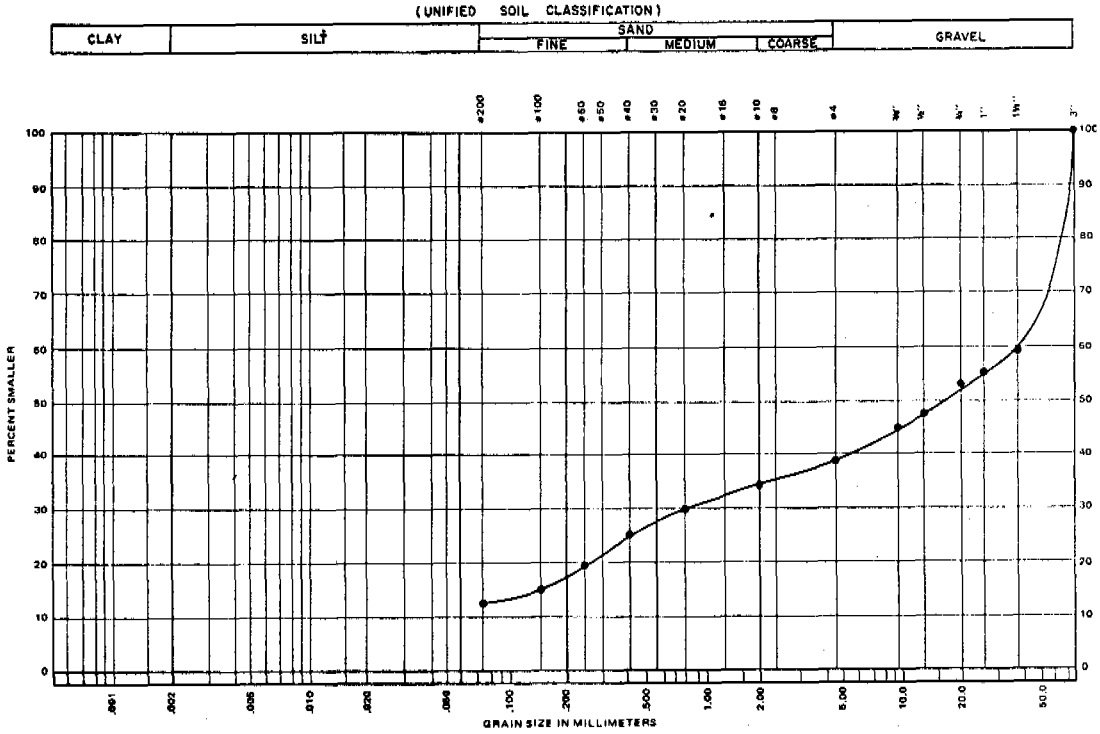
Moss

Gravel light brown
dry
dense

67% GRAVEL
22% SAND
11% SILT & CLAY

Gravel grey

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

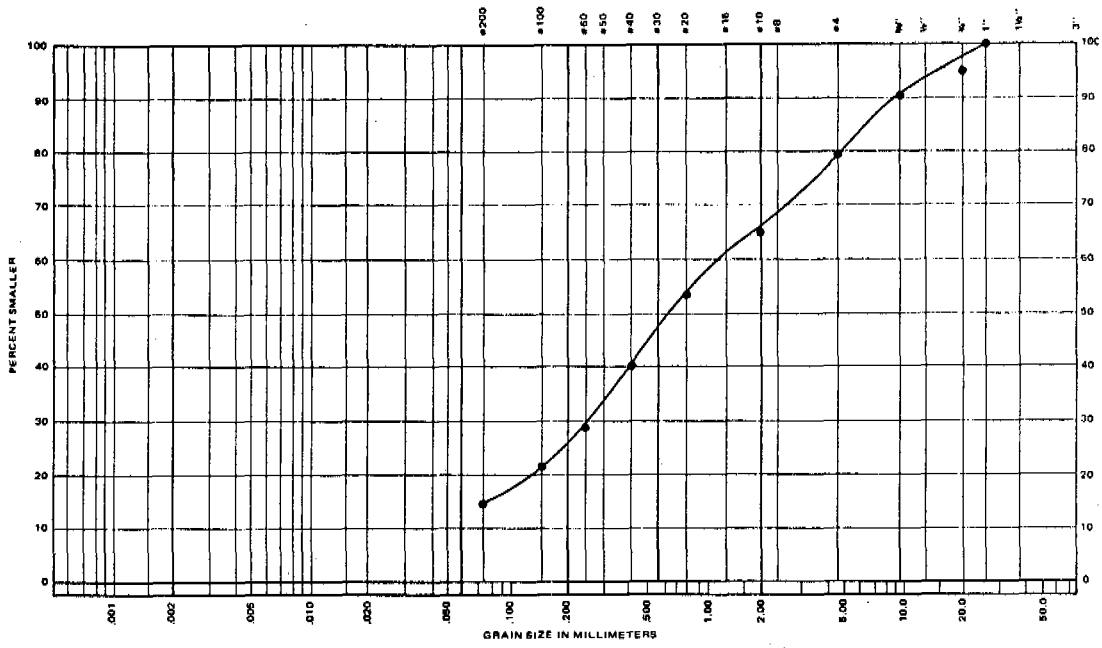


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel and some Silt (GM) M/C = 4.8 - 8.7%

PROJECT Granular REsources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1057-1
DEPTH 2'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

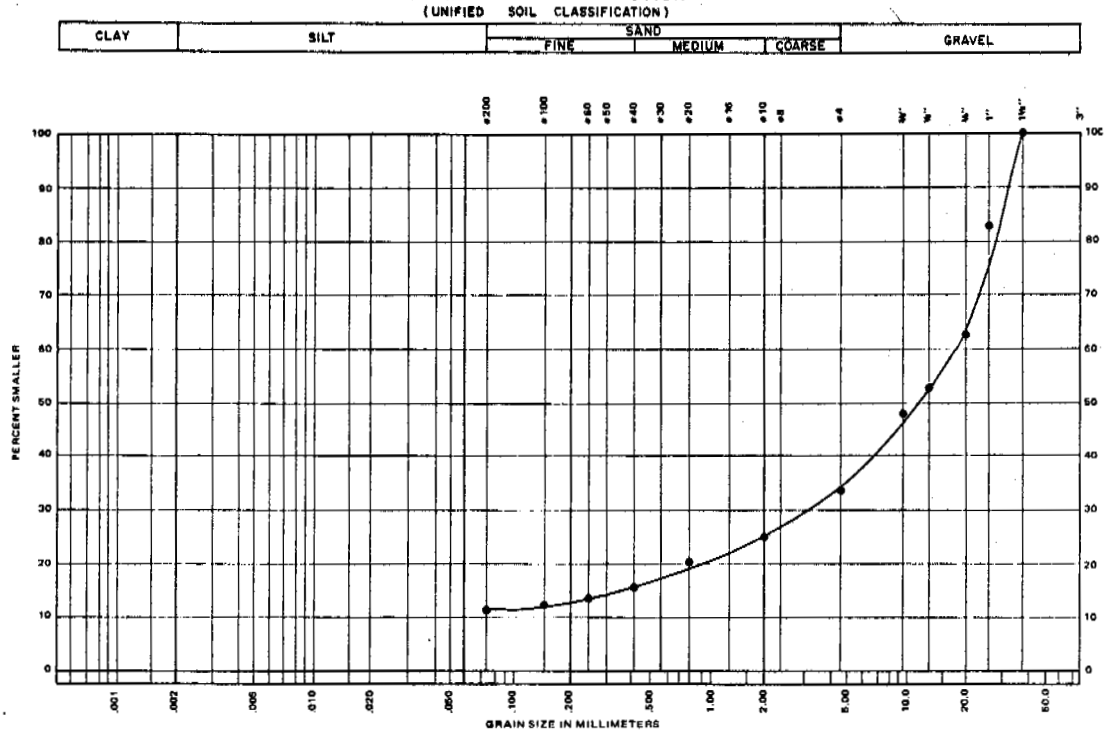


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Sand and Some Silt (GW-GM) M/C = 4.1% - 9.0%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1057-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel and Some Silt (GM)

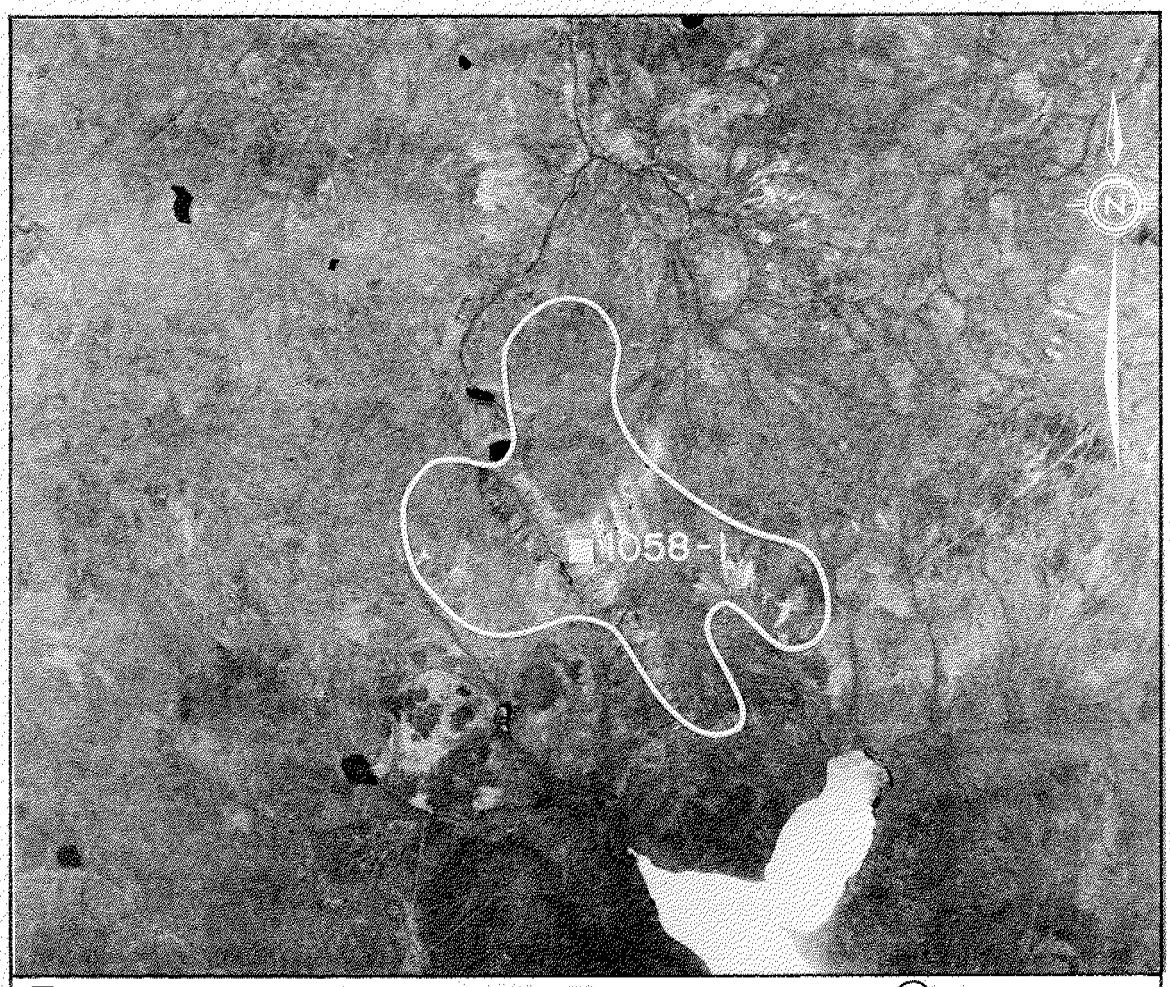
PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. TP 1057-3
DEPTH 2'

SITE 1058

Location: Site 1058 is situated 1/2 mile NW of Tutseita Lake. Proposed pipeline and highway routes are 4 miles SW of the site.

Material: Shale.

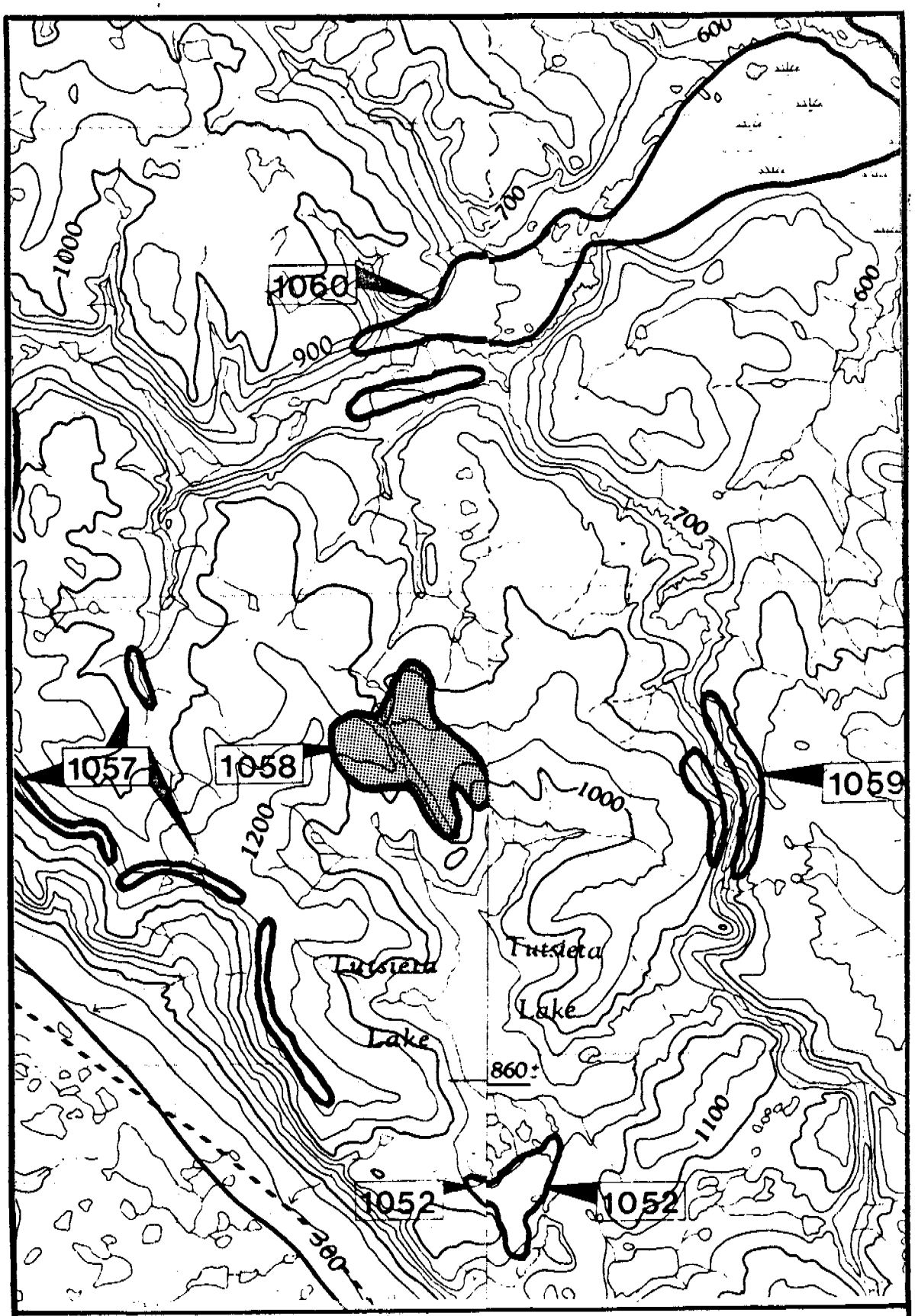
Drainage: The site is well drained into Tutseita Lake.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A1585-193 SCALE: 1" = 5500' (approx.)

Assessment: Four feet of clay and two feet of moist weathered shale overlie hard, dry shale which is suitable as fair quality general fill. Overburden and weathered shale will have to be removed and stockpiled for use in restoration. Haulage distance is somewhat long but within acceptable limits. Access may be difficult because of an 800 ft. elevation difference between the highway and pipeline route and the site. The environmental overview has rated the site to have a low environmental sensitivity. Unless material shortages are critical it is doubtful whether the site should be developed.



SITE LIMITS — — — — PROPOSED GAS PIPELINE
——— PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1058

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN (1) 2 3 4 5 Rating: 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS (1) 2 3 4 5 Rating: 15	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS (1) 2 3 4 5 Rating: 10	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments. Migration Barriers. Eutrophication. Blasting.

R.I.R. - Relative Importance Units - Base of 100 units.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY 1 (2) 3 4 5 Rating: 10	Paleontology Pre-Historic Historic	Probability of Discovery: Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION 1 (2) 3 4 5 Rating: 30	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 (4) 5 Rating: 60	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 190

SPECIAL CONCERNS: Near north-west arm of Tutsieta Lake.
Siltation controls may be required.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1058 HOLE NO. 1 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	CL	CLAY - silty moist, medium to low plasticity, dark grey	NOT FROZEN		1
2					2
3					3
4					4
5		SHALE -weathered, moist, dark grey.			5
6					6
7		- hard, dry, dark grey			7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17		END OF HOLE			17

DATE DRILLED: Oct. 27/73 LOGGED BY: EBA 151-1 COMPLETION DEPTH: 16.0'

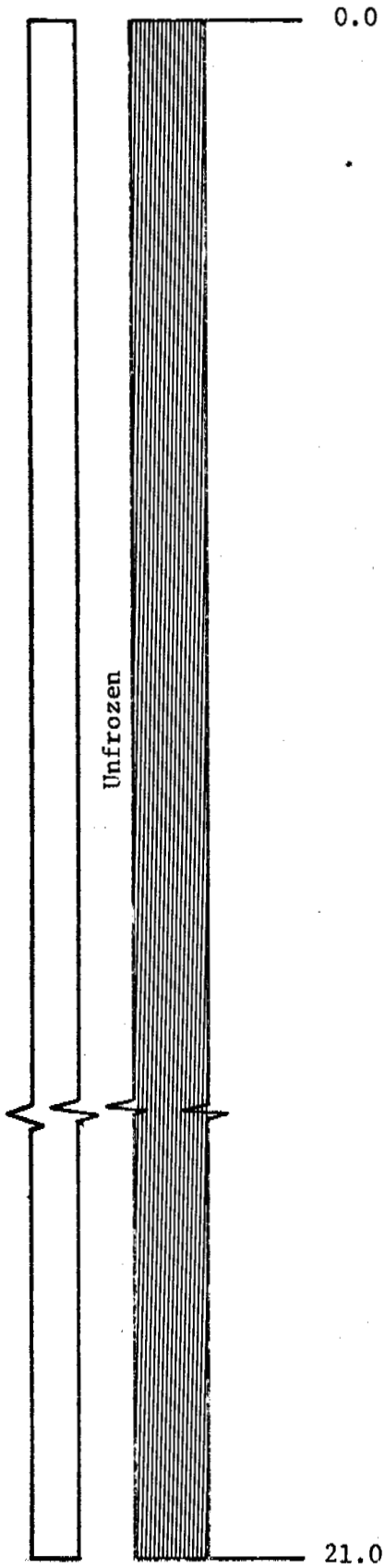
DRILLING METHOD: AUGER THAW DEPTH: NOT FOUND

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SURFACE EXPOSURE LOG

TP 1058-1



Silt, light brown
some sandstone
medium brown

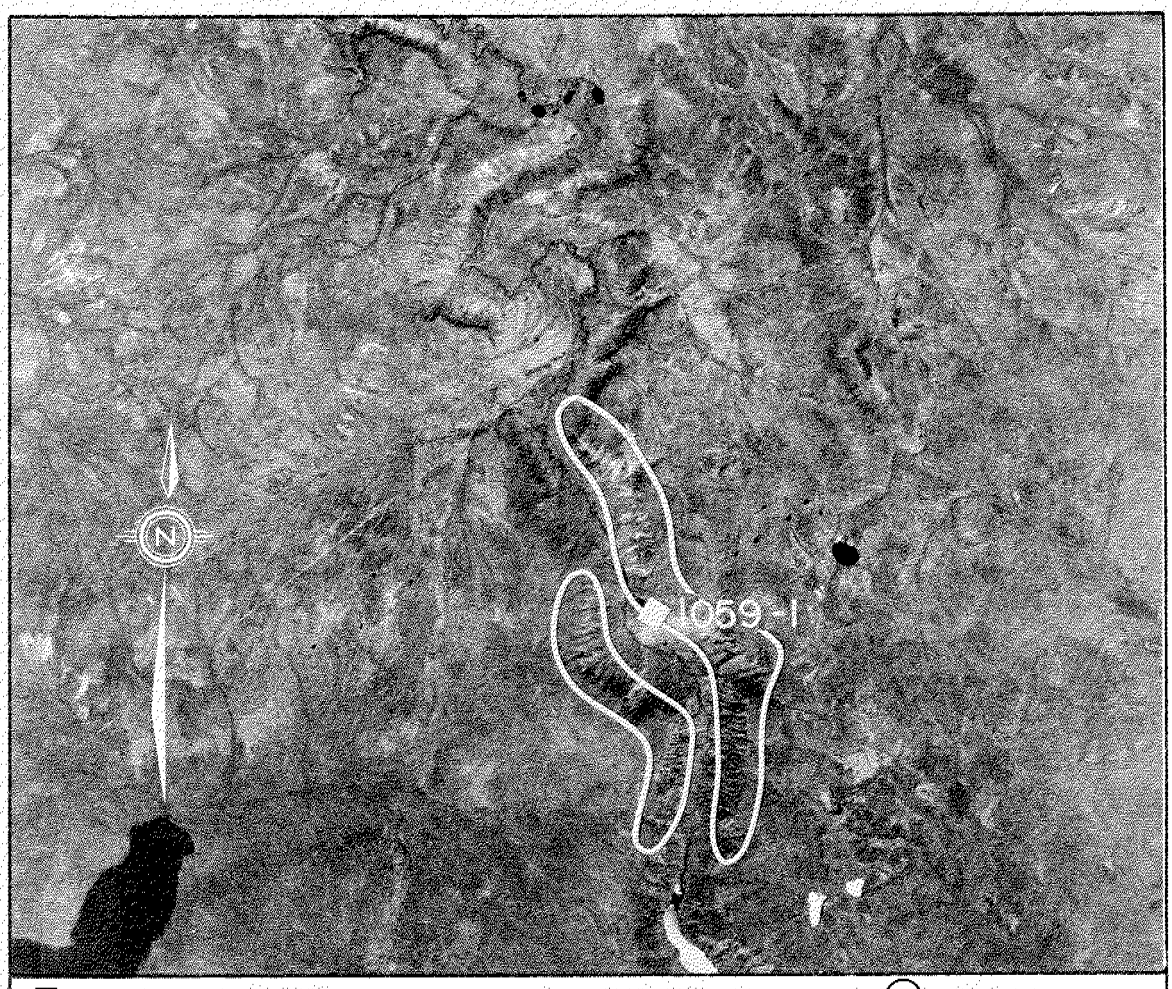
Shale @21'

SITE 1059a

Location: Site 1059 is 3 miles NE of Tutsieta Lake. Proposed pipeline and highway routes are 8 1/2 miles to the SW.

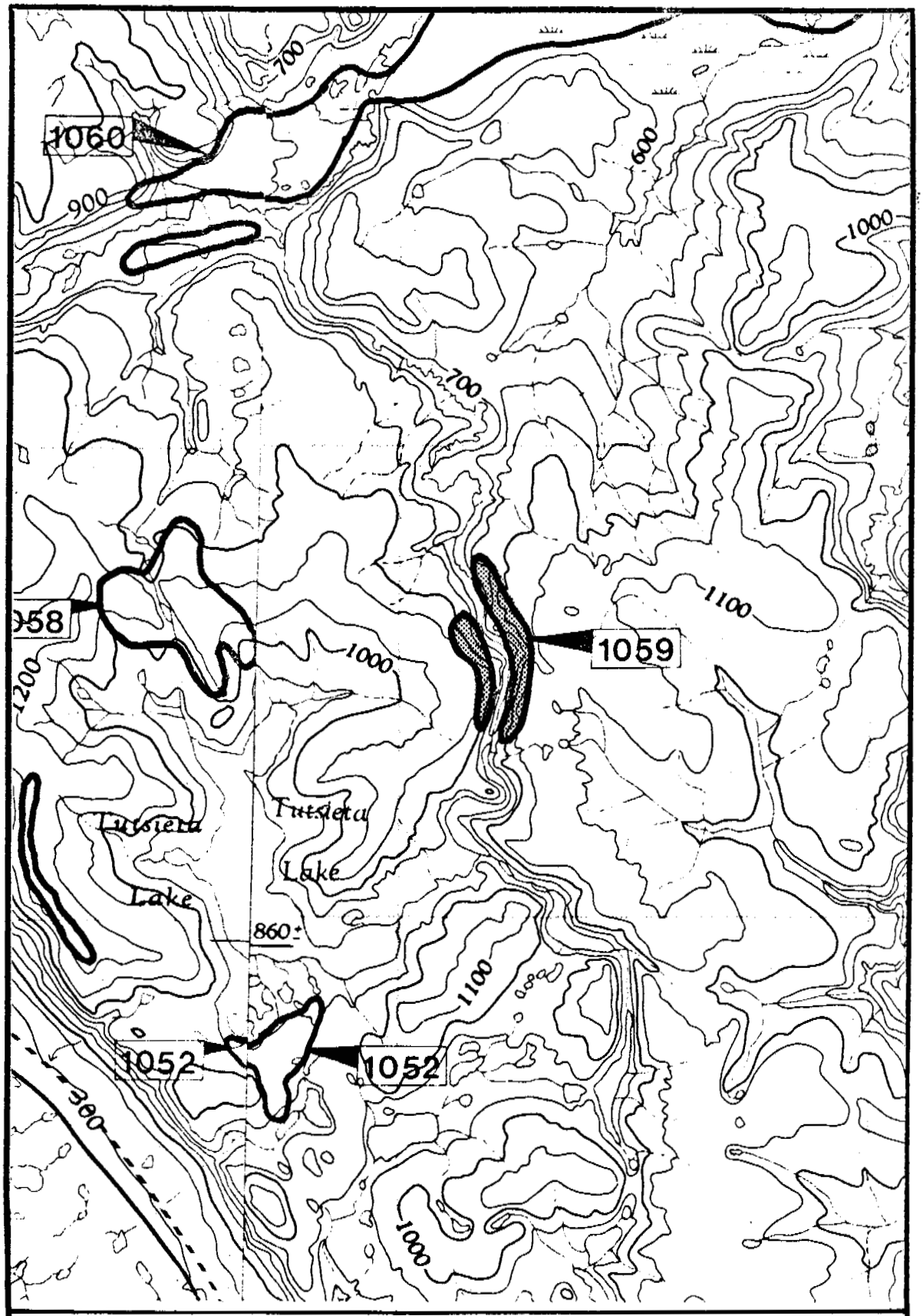
Material: Clay

Assessment: The material at site 1059 is unsuitable for construction purposes therefore site 1059 is not recommended for development.



□ TEST PIT ○ BOREHOLE

AIRPHOTO No. A21585-195 SCALE: 1" = 5500' (approx.)



SITE LIMITS

PROPOSED GAS PIPELINE

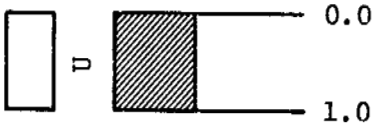
PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O
CANOT LAKE 106-P

SCALE: 1:125,000

TEST PIT LOG

TP 1059-1

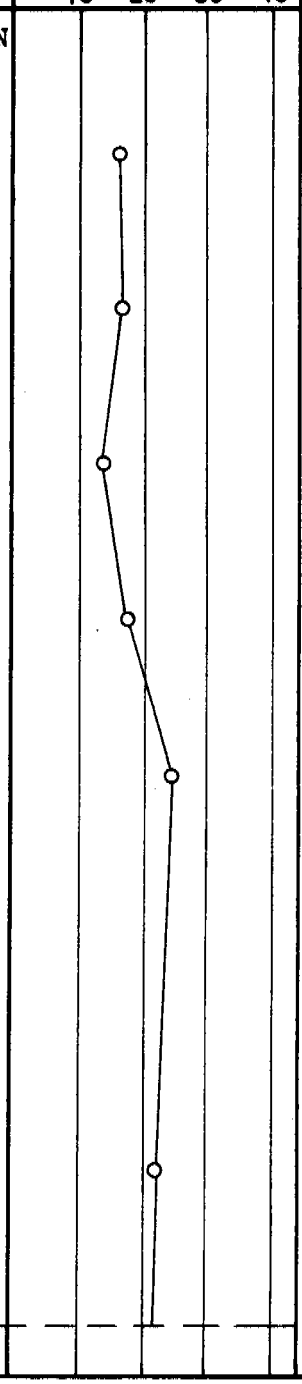


0.0	Clay till
	Till
1.0	

GRANULAR MATERIALS INVENTORY – STAGE III

SITE NO. 1059 HOLE NO. 1 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION
1	ML	SILT -dry, light brown	NOT FROZEN
2	CL	CLAY -silty, medium plasticity, moist, grey	
3			
4			
5			
6		-trace of fine gravel & coarse sand.	
7			
8			
9			
10		-med. plasticity, no gravel or sand, possibly weathered shale	
11	CL		
12			
13			
14			
15		- wet	
16			
17			



DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 152-1 COMPLETION DEPTH: 25.0'

DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1059 HOLE NO. 1 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18		CLAY	NOT FROZEN		18
19		- same			19
20		-drier			20
21	CL				21
22					22
23					23
24					24
25					25
26		END OF HOLE			26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep. 28/73 LOGGED BY: EBA 152-1 COMPLETION DEPTH: 25.0'

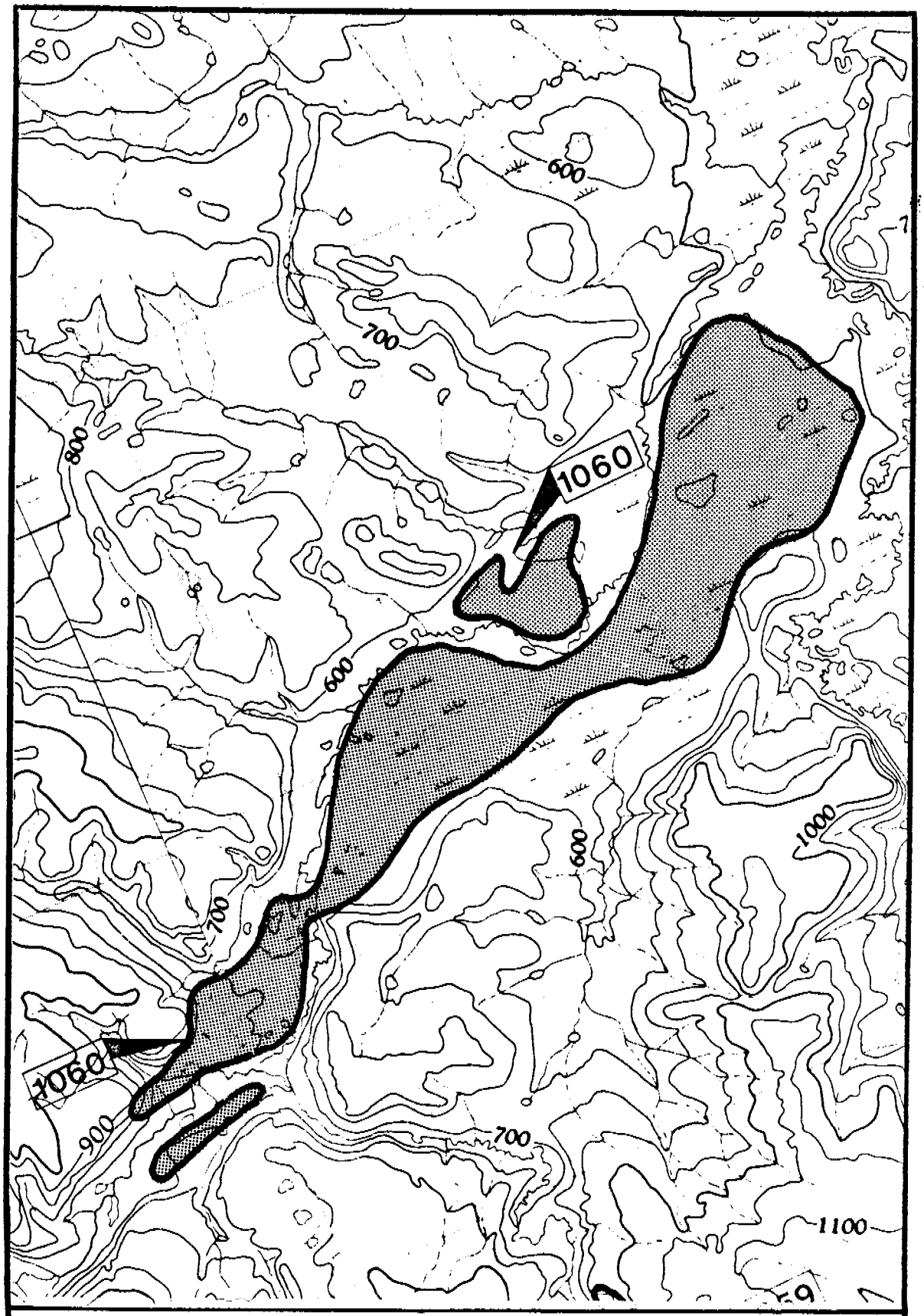
DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

SITE 10

Location:	Site 1060 begins 6 miles north of Tutsetta Lake and extends 16 miles or more to the north east. Proposed pipeline and highway routes are 7 miles SE of the above defined beginning of the site.
Geology:	Site 1060 is a very extensive outwash deposit.
Material:	Variable from sandy gravel with a trace of silt to silty gravelly sand to sandy gravelly silt, generally well graded.
Volume:	80,000,000 cu. yd., volume estimate is conservative.
Area:	2800 acres.
Drainage:	The site is well drained by unnamed creeks and lakes.
Assessment:	An extremely large volume of good and fair quality borrow material is available from site 1060. Selective excavation will yield material suitable for processing into concrete aggregate. Processing will require screening off the fraction above the 1/4 inch selve, washing it and then crushing part of it to obtain a sand fraction. Moisture contents range from 2% to 20% and organic content of the gravel in most instances was found to be high (10 - 20%). Overburden is thin to negligible. Tree cover varies from dense to sparse; sparse areas usually are the result of a burn. One borehole drilled to a depth of 27 feet did not encounter permafrost; others encountered permafrost as shallow as 5 feet. Permafrost distribution is anticipated to be highly sporadic over short distances depending upon surface characteristics and moisture content of the soil. Generally, the high, well drained, sparsely vegetated hills will be free from permafrost lending them most desirable for immediate development. Frozen gravel can be excavated and transported in a frozen state over winter roads however, it would be desirable to stockpile it and allow it to thaw before use. Alternatively, large areas of the pit known to contain permafrost could be stripped the winter preceeding utilization in order to promote thaw and drainage insitu. The environmental rating is in the moderately sensitive range. Access along stream valleys would be relatively easy during winter but haulage distance is rather long. Since good quality borrow materials are scarce in the area and site should be given serious consideration for development.



SITE LIMITS

PROPOSED GAS PIPELINE

PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-O
CANOT LAKE 106-P

SCALE: 1:125,000

SITE 1060

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN 1 2 (3) 4 5 Rating: 15	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION 1 (2) 3 4 5 Rating: 10	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS 1 (2) 3 4 5 Rating: 30	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.
10	BIRDS 1 (2) 3 4 5 Rating: 20	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.
10	FISHERY 1 2 (3) 4 5 Rating: 30	Lakes, Tributaries Mackenzie River: Whitefish, Smelt Grayling, Sculpin Pike, Goldeye Trout-Perch, Chub Lake Trout, Dace Burbot, Walleye Suckers, Char Stickleback, Cisco	Spawning, Nursery, Feeding, Overwintering. Major Migration Route. Siltation of Spawning Areas, Benthic Communities. Toxic Material Spill. Slumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.
5	ARCHAEOLOGY 1 2 (3) 4 5 Rating: 15	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS (1) 2 3 4 5 Rating: 10	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles, Noises.
15	RESOURCE UTILIZATION 1 2 (3) 4 5 Rating: 45	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES 1 2 3 (4) 5 Rating: 60	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations Continued Use For Maintenance.	0-2, 2-5, 5-10, 10+ 0-2, 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. Stockpiles, Waste, Dust.
10	RESTORATION (1) 2 3 4 5 Rating: 10	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

R.I.R. - Relative Importance Units - Base of 100 units.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500

TOTAL INDEX: 245

SPECIAL CONCERNS: Straddles valley bottom drainages.

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, B. C.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1060 HOLE NO. 6 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1		GRAVEL	NOT FROZEN		1
		-clayey, well graded, moist to wet, light grey-brown.			
2	GC				2
3					3
4		14.9% O.C.			4
		32% GRAVEL			
5		(2'+4'+6') 39% SAND			5
	SM	29% SILT & CLAY			
6					6
		-wet			
7					7
8		37% GRAVEL			8
		(8'+10') 29% SAND			
9	GM	34% SILT & CLAY			9
			FROZEN		
10					10
11					11
12		END OF HOLE			12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep.26/73

LOGGED BY: EBA 148-6

COMPLETION DEPTH: 11.0'

DRILLING METHOD: AUGER

THAW DEPTH: 8.3'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1060 HOLE NO. 7 PAGE 1 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1		GRAVEL	NOT FROZEN		1
2	GC	-trace clay, some cobbles, well graded, subangular and subrounded, dry, light brown.			2
3		10.4% O.C.			3
4		(4') 48% GRAVEL 31% SAND 21% SILT & CLAY			4
5					5
6	GP	-finer gravel, very little fines.			6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 26/73 LOGGED BY: EBA 148-7 COMPLETION DEPTH: 27.0'

DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1060 HOLE NO. 7 PAGE 2 OF 2

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
18	GP	GRAVEL -same	NOT FROZEN		18
19					19
20					20
21					21
22	GC	-some clay fines, wet			22
23					23
24					24
25				o	25
26					26
27					27
28		END OF HOLE			28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Sep.26/73 LOGGED BY: EBA 148-7 COMPLETION DEPTH: 27.0'

DRILLING METHOD: AUGER THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1060 HOLE NO. 8 PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT % (10 20 30 40)	DEPTH (feet)
1	OL	ORGANIC SILT -some cobbles, some coarse gravel, dark brown to black.	NOT FROZEN		1
2	GW	GRAVEL -sandy, clayey, few cobbles, maximum 2", average 3/4", subrounded, moist, grey-brown.			2
3					3
4		16.5% O.C.			4
5		(4'+6') 58% GRAVEL 30% SAND 12% SILT & CLAY			5
6	GW-GM	10.0% O. C.	FROZEN		6
7					7
8		END OF HOLE			8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 27/73

LOGGED BY: EBA 148-8

COMPLETION DEPTH: 6.9'

DRILLING METHOD: AUGER

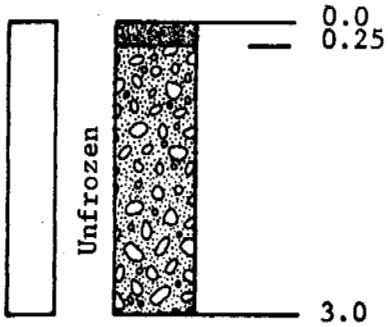
THAW DEPTH: 5.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1060-2

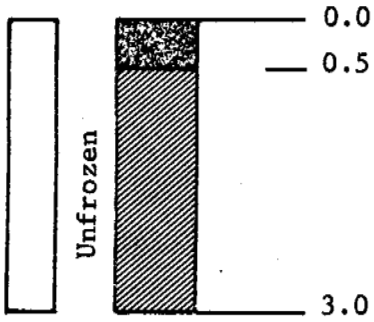


Peat, dark brown, fibrous

Gravel, medium brown, sandy
silty
poorly graded

21% GRAVEL
57% SAND
22% SILT & CLAY

TP 1060-3

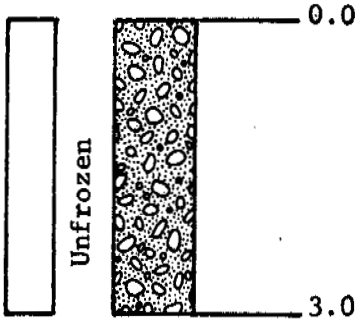


Peat, black, fibrous

Clay, medium brown, silty
high plasticity
odd gravel inclusion
wet

TEST PIT LOG

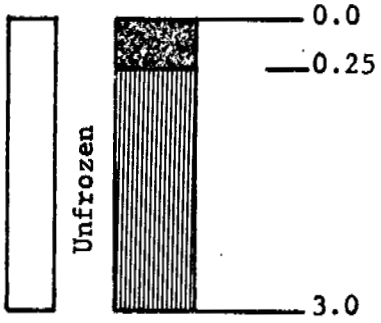
TP 1060-4



Gravel, reddish brown
sandy
well graded
some silt

44% GRAVEL
44% SAND
12% SILT & CLAY

TP 1060-5

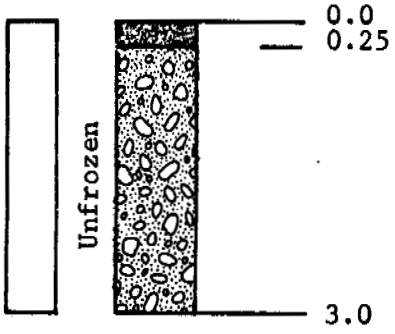


Peat, dark brown, fibrous

Clay, medium brown, silty
gravelly
cobbles
medium plasticity

25% GRAVEL
27% SAND
48% SILT & CLAY

TP 1060-6

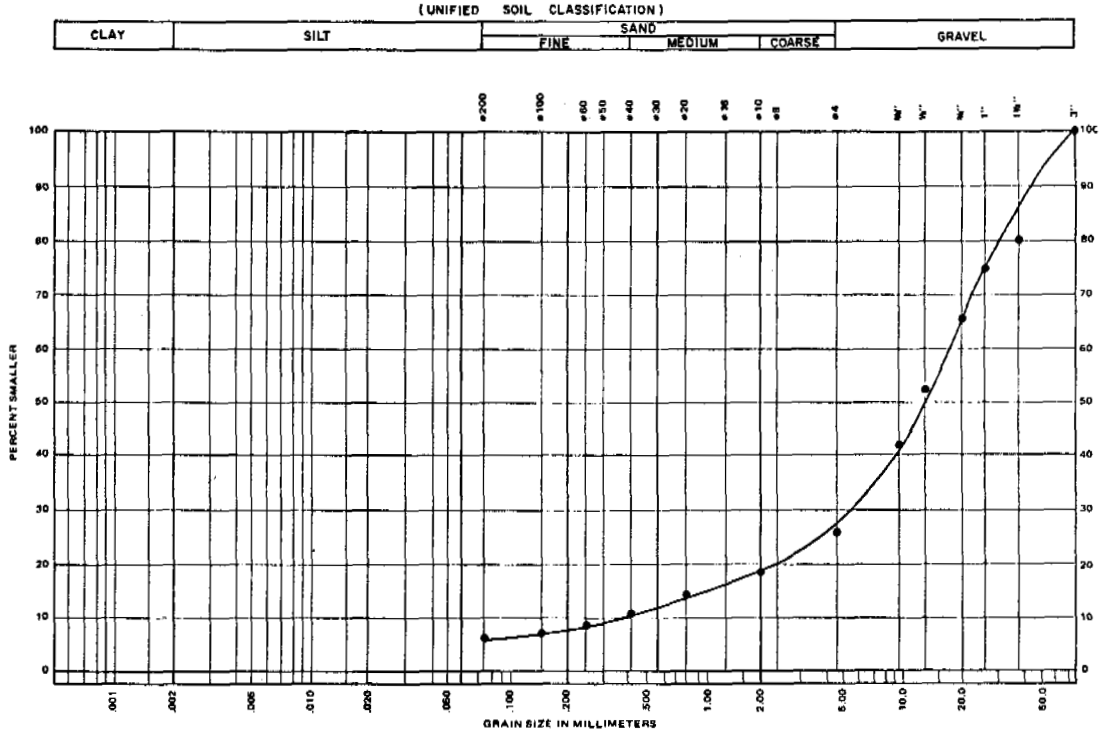


Peat, black, fibrous

Gravel, medium brown, clayey
some layers of carbonates
(glacial till)

59% GRAVEL
29% SAND
12% SILT & CLAY

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

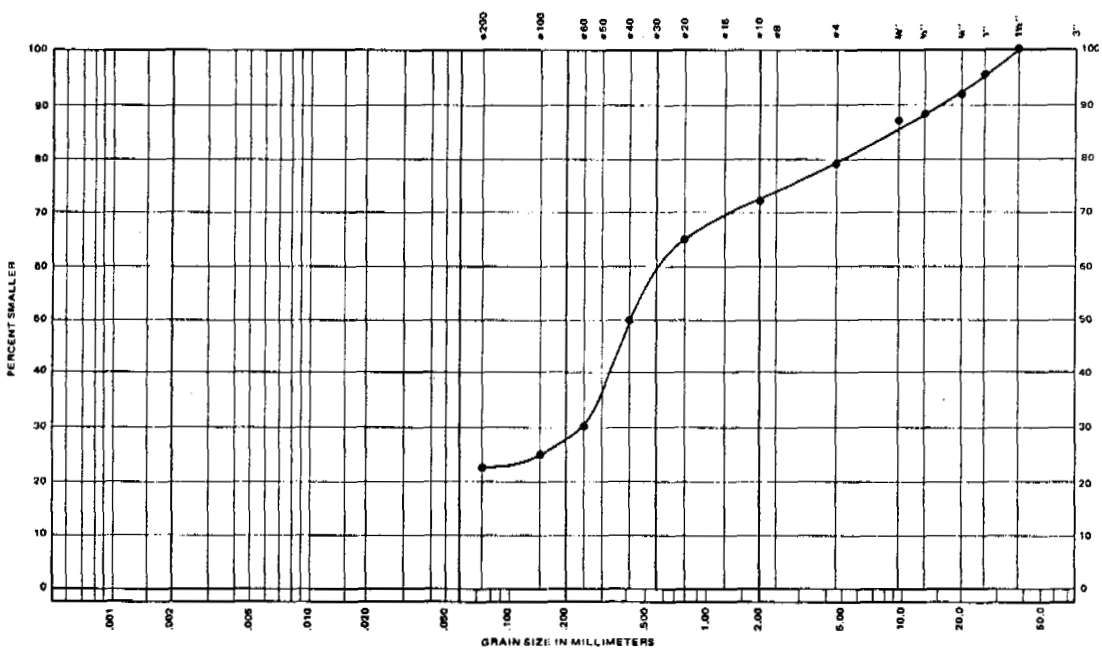


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel with a Trace of Silt (GM) M/C = 1.9%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1060-1
DEPTH Surface

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

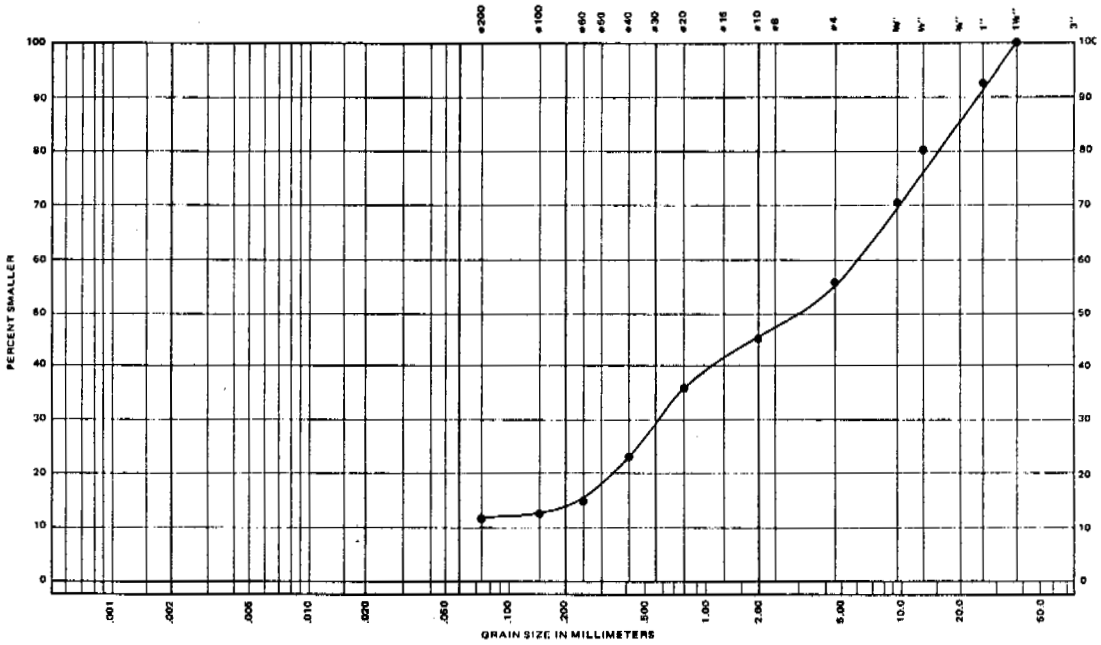


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION (GP-GM) Silty Gravelly Sand M/C = 10%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1060-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

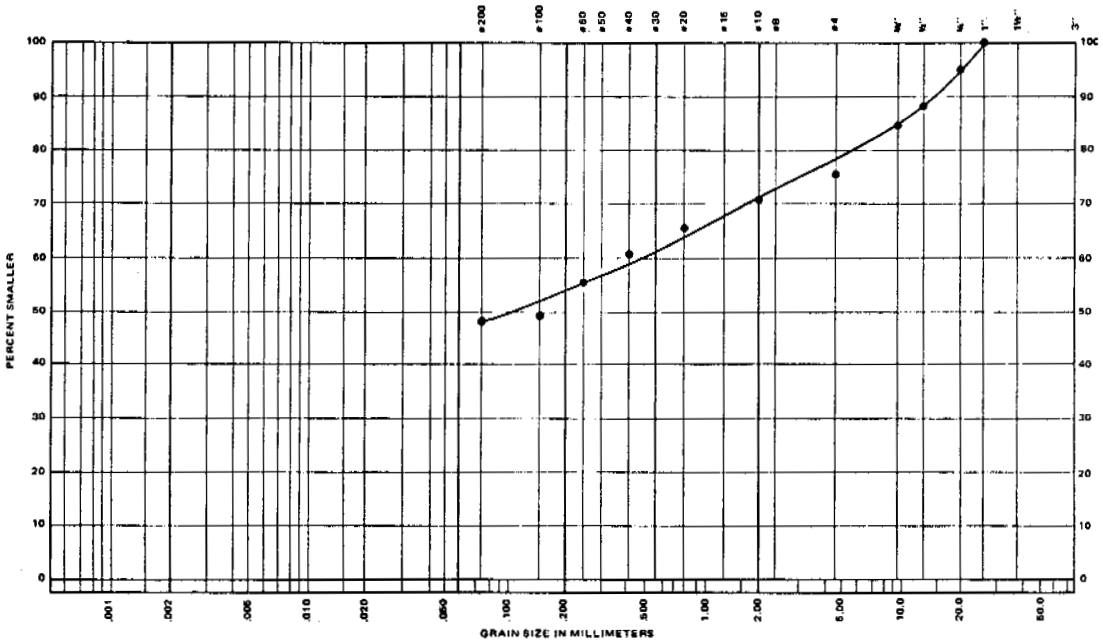


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GM) M/C = 6.9%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1060-4
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

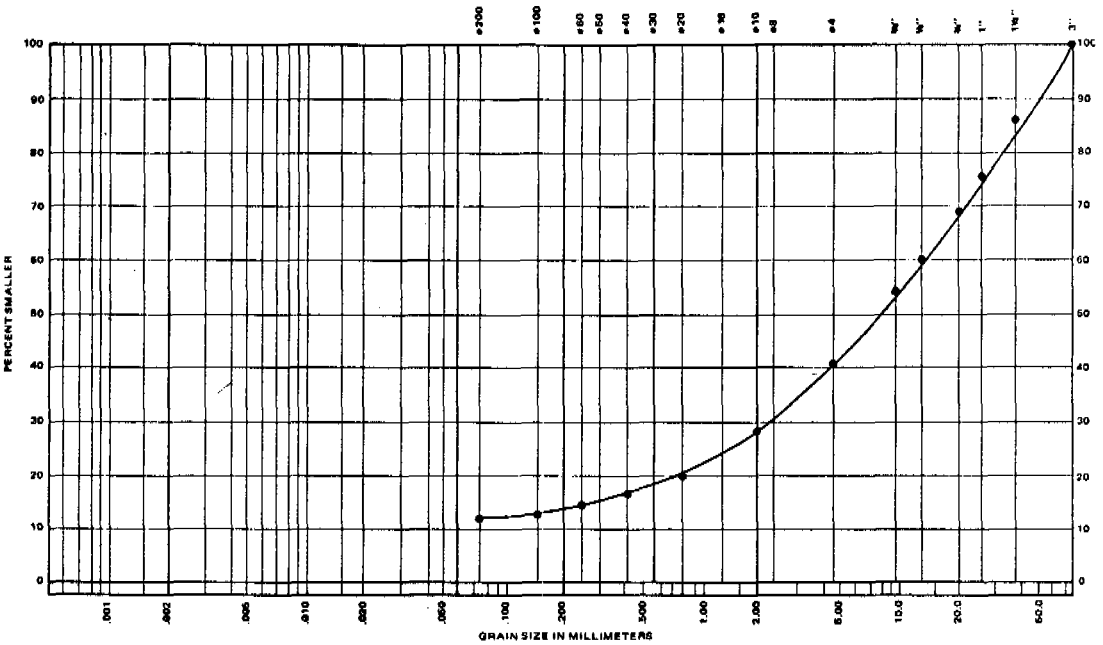


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravelly Silt (ML-CL) M/C = 14.4%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1060-5
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

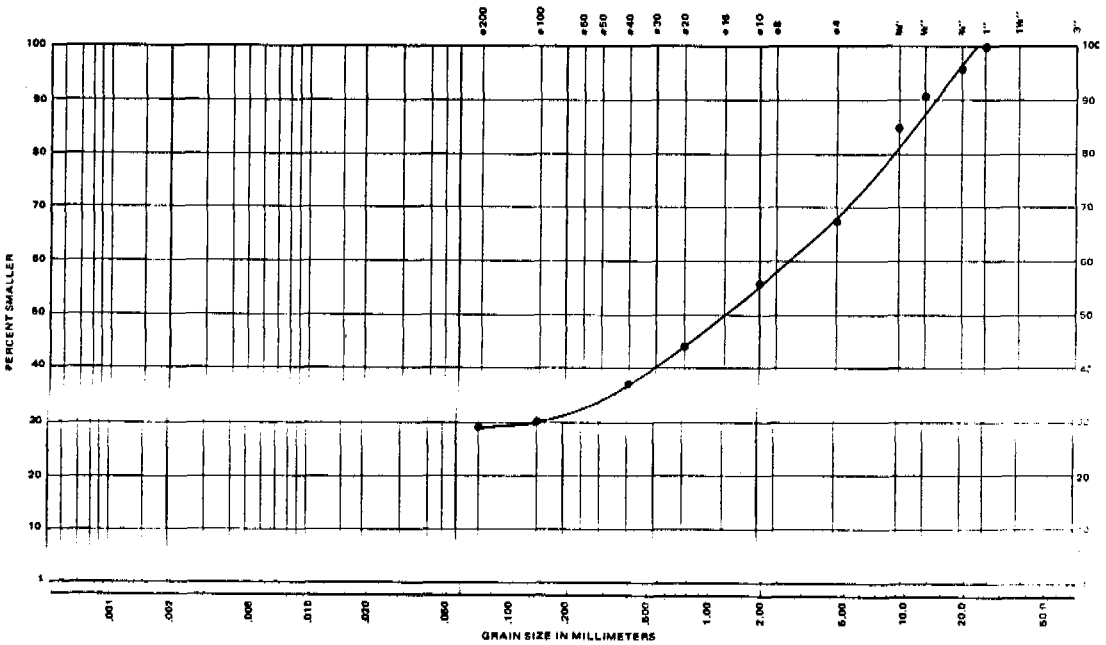


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel and Some Silt (GP-GM) M/C = 6.6%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1060-6
DEPTH 3'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

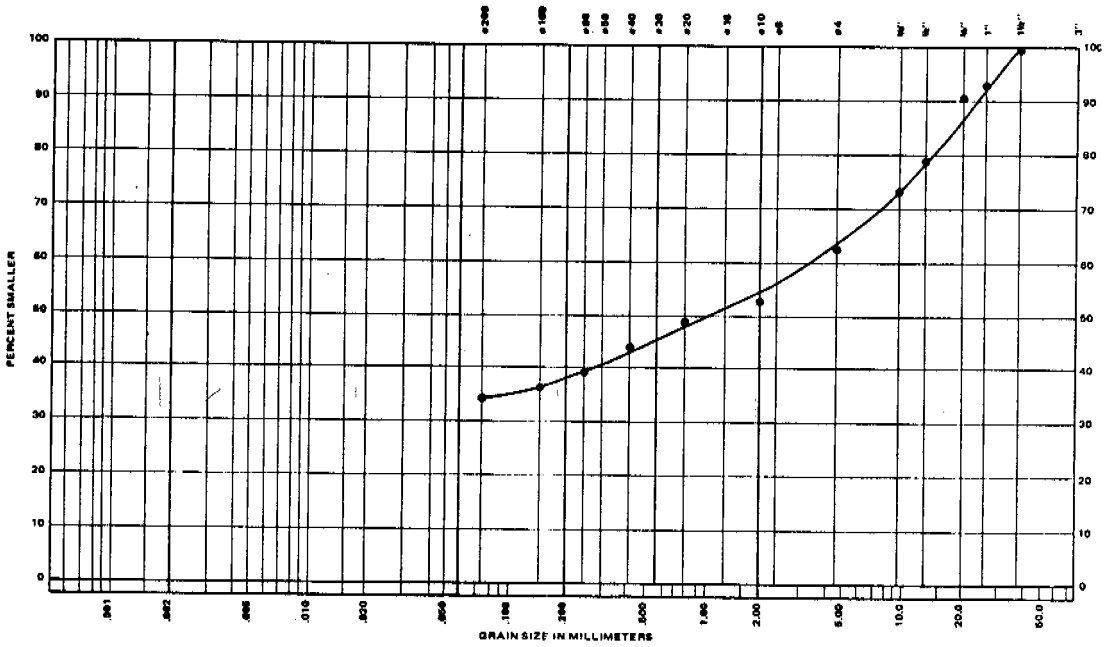


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel, Silty (GM)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1060-6
DEPTH 2' + 4' + 6'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

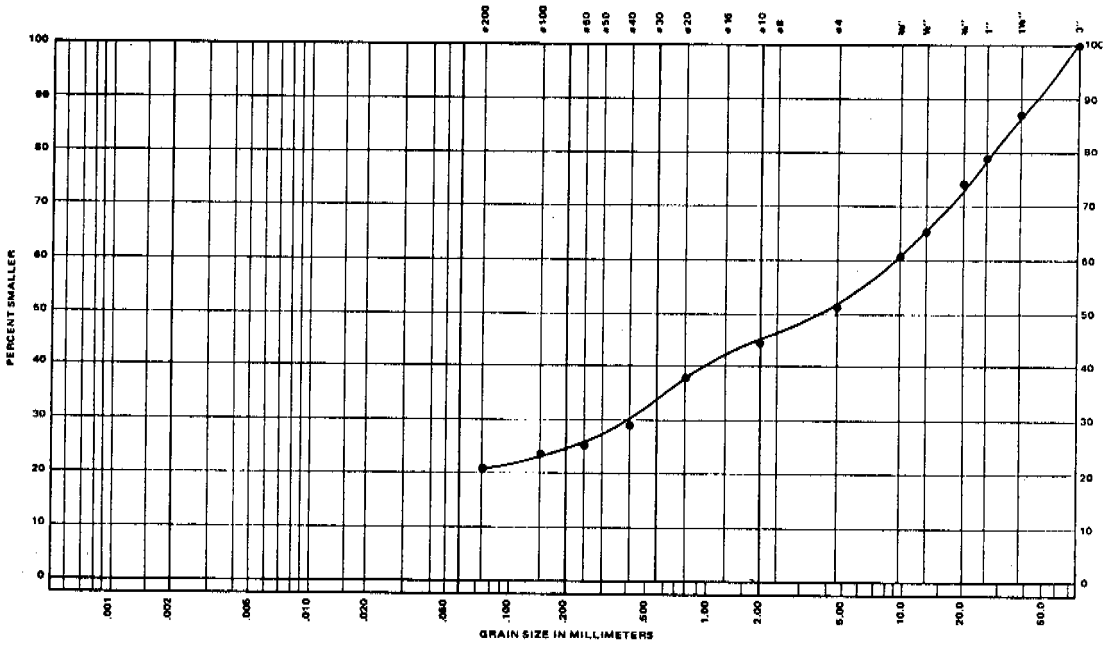


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Gravel, Sandy (GM)

PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1060-6
DEPTH 8' + 10'

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)



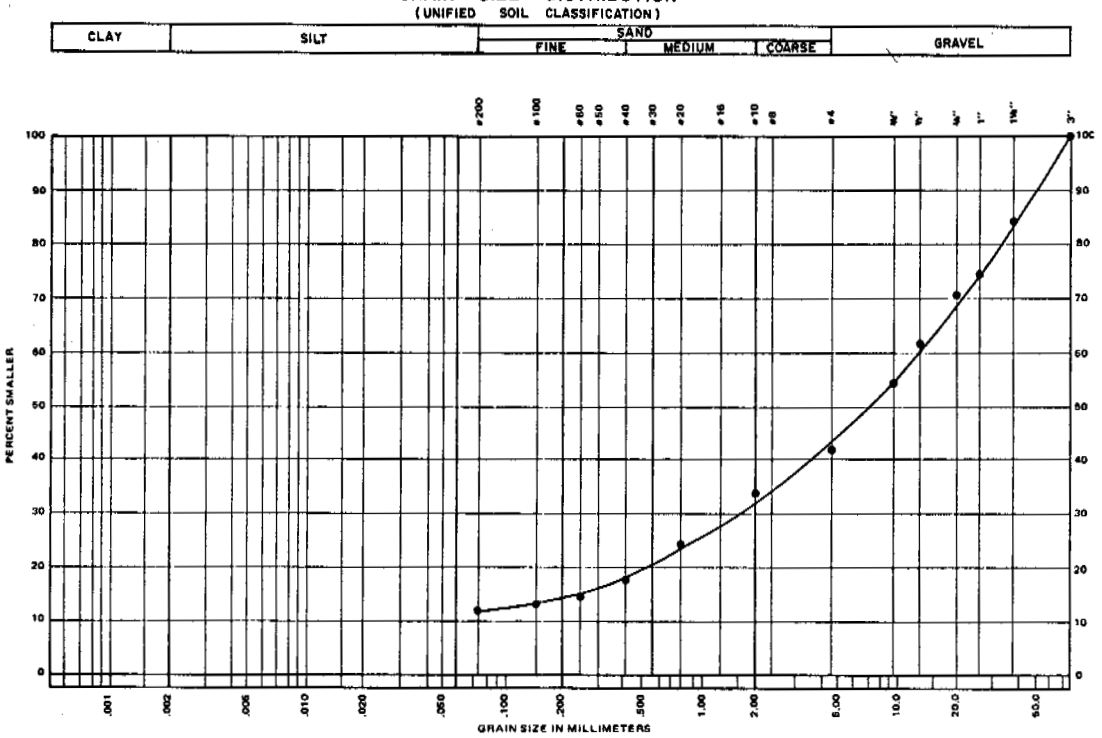
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand, Silty (GM)

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1060-7
DEPTH 4'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and Some Silt (GW-GM)

PROJECT Granular Resources

JOB No. E666 DATE January 11/74

SAMPLE No. BH 1060-8

DEPTH 4'+6'