

GRANULAR MATERIALS INVENTORY Stage III

Volume III



EBA Engineering Consultants Ltd.



F.F. SLANEY & COMPANY LIMITED



D003572

COPY NO. 31

5

GRANULAR MATERIALS INVENTORY STAGE III

VOLUME III

NORTH HALF

SITES 1054, 1055, 1061 - 1110

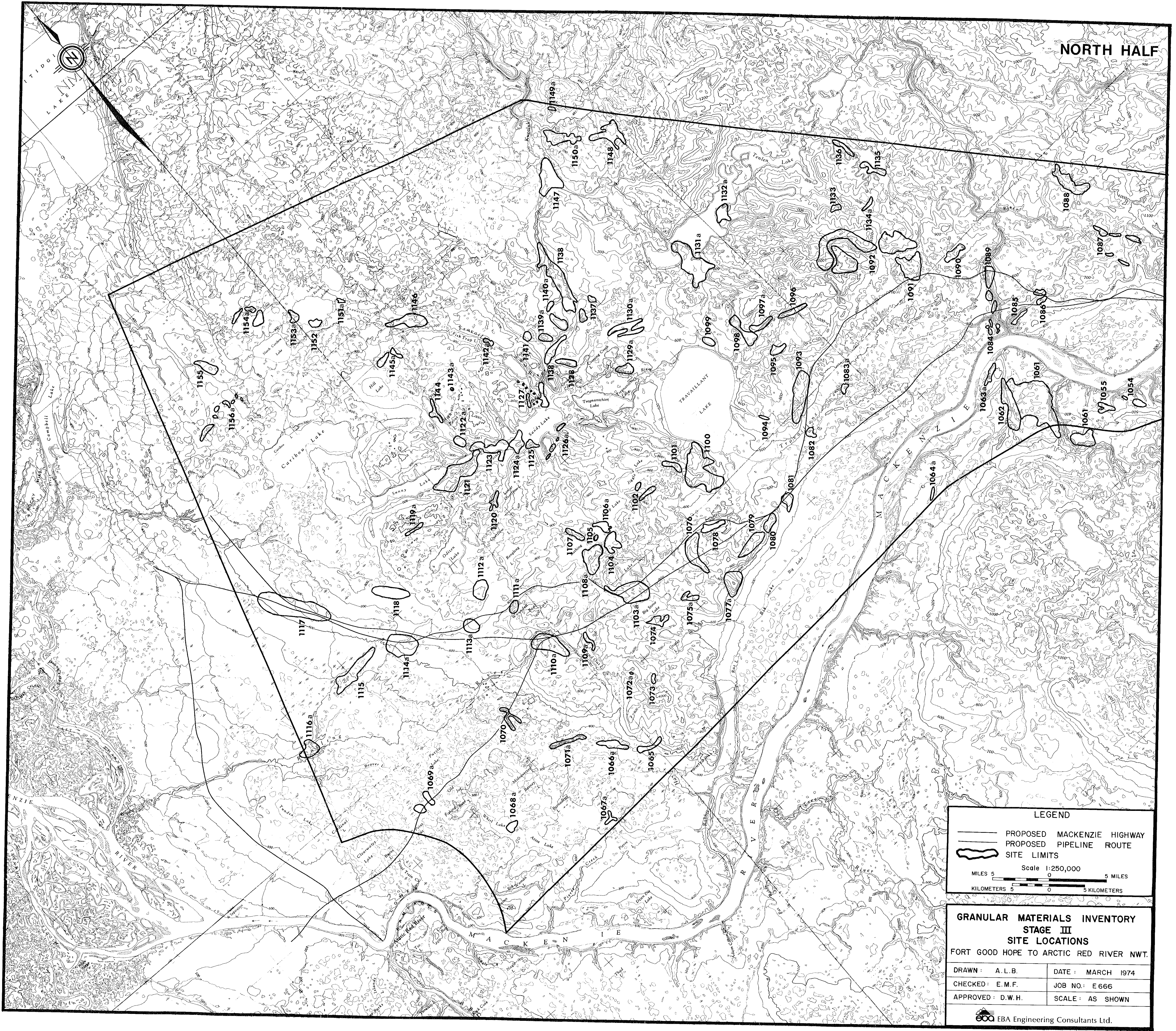
Submitted to:

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

APRIL, 1974



Engineering Consultants Ltd.



NORTH HALF

LEGEND

- PROPOSED MACKENZIE HIGHWAY
- PROPOSED PIPELINE ROUTE
- SITE LIMITS

Scale 1:250,000
MILES 5 0 5
KILOMETERS 5 0 5

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

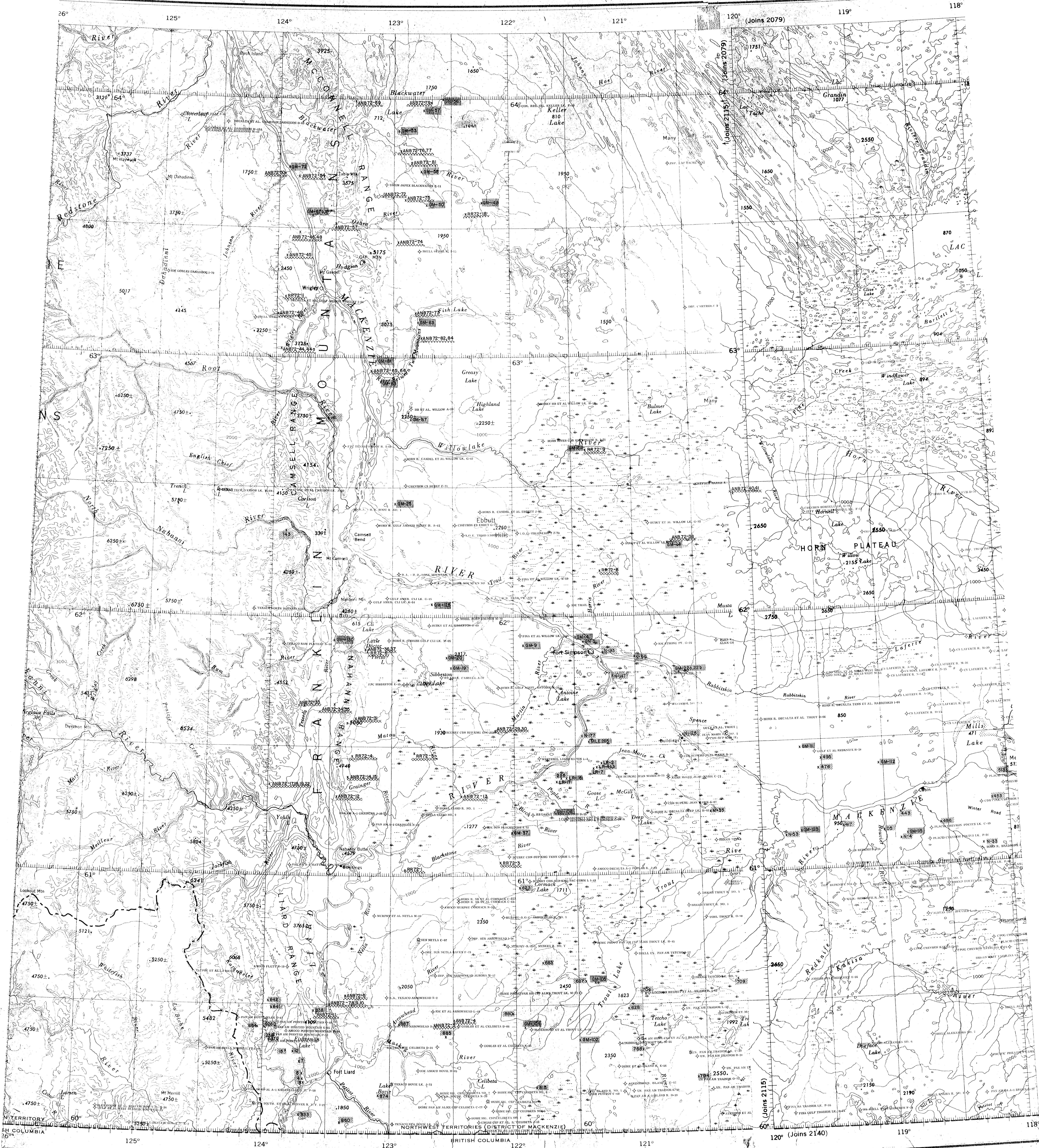
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Site No.	Material Type		Suitability of Material	Estimated Volume (cu. yd.)	Est'd Recov. Depth (feet)	Overburden			Ground Ice (content)	Drainage	Method of Extraction	Min. Haul Dist. (mi.)	Relative Environmental Sensitivity	Assessment
	Description	Sym.				Type	Depth (feet)	Disposal						
1054	Gravelly sand and silt	GP-OM	General Fill to Aggregate	2,000,000	--	Peat	1	Strip and Stockpile	Irregular	Good	Conventional	9	Low - 225	Good Prospect
1055	Gravel and Sand	GP-OM	General Fill	525,000	--	--	Thin	Strip	--	Good	Conventional	9	Low - 205	Fair to Good Prospect
1061	Sand and Gravel	GW-OM	Construction Aggregate	Great	--	--	Thin	Strip	Unfrozen	Variable	Conventional	10	Moderate - 295	Good Prospect
1062	Sand and Gravel	GM	General Fill	Great	--	--	Thin	Strip	Unfrozen	Variable	Conventional	7-12	Moderate - 285	Good Prospect
1063a	Sand	SM	Poor	4,500,000	--	--	Thin	--	Frozen	Good	Conventional	9-5	High - 365	Not Recommended
1064a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	9	N.D.	Not Recommended
1065	Sand and Gravel	--	General Fill	6,000,000	--	--	Thin	--	Unfrozen	Good	Conventional	12	Moderate - 250	Fair Prospect
1066a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	11-16	N.D.	Not Recommended
1067a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	20	N.D.	Not Recommended
1068a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	18	N.D.	Not Recommended
1069a	Silt and Sand	--	Unsuitable	--	--	--	--	--	--	--	--	13	N.D.	Not Recommended
1070	Gravel and Sand	SC	General Fill	N.D.	N.D.	Clay and Peat	1-1 1/2	Strip and Stockpile	Irregular	Fair	Conventional	9	N.D.	Poor to Fair Prospect
1071a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	13 1/2	N.D.	Not Recommended
1072a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	6-7	N.D.	Not Recommended
1073	Silty sand some Gravel	SM	General Fill	4,500,000	10 1/2	Negligible	--	--	Frozen under 10 1/2	Good	Conventional	7-8	Low - 200	Fair Prospect
1074	Sandy silt	--	Unsuitable	N.D.	--	Negligible	--	--	--	Good	Conventional	2-3	N.D.	Poor Prospect
1075a	Silt	--	Unsuitable	--	--	--	--	--	--	--	--	4-5	N.D.	Not Recommended
1076	Sand and Gravel	--	Some Aggregate to General Fill	2,500,000	--	Peat	1 1/2	Strip and Stockpile	Frozen	Good	Conventional	1	Moderate - 270	Good Prospect
1077a	Shale	--	Poor	--	--	Clay	28	--	Frozen	Good	--	4-6	N.D.	Not Recommended
1078	Shale	--	General Fill	N.D.	N.D.	N.D.	Thick	Strip and Stockpile	N.D.	Good	Blast and Quarry	1	Moderate - 255	Fair Prospect
1079	Shale	--	General Fill	N.D.	N.D.	Clay	14	Strip and Stockpile	Not Frozen	Good	Blast and Quarry	2	N.D.	Fair Prospect
1080	Shale	--	General Fill	N.D.	N.D.	Clay and Shale	14	Strip and Stockpile	N.D.	Good	Blast and Quarry	1	Low - 225	Good Prospect
1081	Shale	--	General Fill	N.D.	N.D.	Clay and Shale	11	Strip and Stockpile	N.D.	Good	Blast and Quarry	0	Low - 220	Fair to Good
1082	Sand and Gravel	GW	General Fill	2,200,000	12	Negligible	--	--	Irregular to very High	Fair	Conventional 1/2 with Stockpiling	1	Moderate - 260	Poor Prospect
1083a	Sandy Silt	SM-ML	Unsuitable	N.D.	N.D.	Negligible	--	--	Unfrozen	Fair to Good	--	2-3 1/2	N.D.	Not Recommended
1084	Sand and Gravel	SM	General Fill	2,000,000	7	Topsoil	Thin	Strip and Stockpile	Frozen	Poor to Fair	Rip and Doze	1 1/2-4 1/2	High - 335	Poor Prospect
1085	Sand, Gravelly	GW-OM	General Fill	1,200,000	5	Peat and Silt	1	Strip and Stockpile	Unfrozen	Good	Conventional	1 1/2-3	High - 385	Poor to Fair Prospect
1086	Sand	SP-SM	General Fill	1,300,000	12-15	Negligible	--	--	Frozen at 8 feet	Good	Conventional & Stockpile	0-1 1/2	N.D.	Fair Prospect
1087	Silt, sand and Gravel	GM	General Fill	1,800,000	N.D.	Negligible	Thin	--	Frozen at 8 feet	Good	Conventional & Stockpile	4	Low - 190	Good to Fair Prospect
1088	Sand	SM	General Fill	13,800,000	8	Negligible	Thin	--	Frozen at 8 1/2 feet	Good	Conventional & Stockpile	10	Moderate - 255	Fair Prospect
1089	Sand	SP-SM	General Fill	7,500,000	7	Negligible	Thin	--	Frozen at 7 1/2 feet	Good	Conventional & Stockpile	0	High - 335	Fair to Poor Prospect
1090	Shale	--	General Fill	N.D.	N.D.	Clay and Shale	7-15	Strip and Stockpile	Frozen	Fair	Blast and Quarry	1 1/2-6	Moderate - 275	Good to Fair Prospect
1091	Shale	--	General Fill	N.D.	N.D.	Clay and Shale	7-15	Strip and Stockpile	N.D.	Fair to Good	Blast and Quarry	0	Low - 205	Good to Fair Prospect
1092	Shale	--	General Fill	N.D.	N.D.	Clay and Shale	7-15	Strip and Stockpile	Frozen	Good	Blast and Quarry	3	Low - 195	Fair to Poor Prospect
1093	Shale	--	General Fill	N.D.	N.D.	Weathered Shale	4	Strip and Stockpile	N.D.	Fair to Good	Blast and Quarry	1/2	Low - 225	Good to Fair Prospect
1094	Shale	--	Subgrade Construction	N.D.	N.D.	Clay and Shale	15	Strip and Stockpile	N.D.	Fair	Blast and Quarry	4	Low - 210	Fair to Poor Prospect
1095	Sand	GW-SM	General Fill	N.D.	N.D.	Clay	4	Strip and Stockpile	Unfrozen to 11 ft.	Good	Conventional & Stockpile	3 1/2	Moderate - 265	Fair Prospect
1096	Gravel and Sand	GW-OM	General Fill	1,250,000	N.D.	Peat	0-3	Stockpiled	Unfrozen to 11 ft.	Fair	Conventional	5	Moderate - 260	Fair Prospect
1097a	Clay and Sand	SC	Unsuitable	N.D.	N.D.	N.D.	--	--	N.D.	N.D.	--	6	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						
1098	Sandy Gravel	GW-OM	Concrete Aggregate	13,000,000	N.D.	Negligible	--	--	Unfrozen	Good	Conventional	7	Moderate - 255	Excellent Prospect
1099	Siltstone	--	General Fill	N.D.	N.D.	Silt	5	Strip and Stockpile	Frozen	Good	Blast and Quarry	10	N.D.	Fair to Good Prospect
1100	Shale	--	General Fill	Very Great	N.D.	Clay and Shale	9	Strip and Stockpile	N.D.	Good	Blast and Quarry	5	Moderate - 290	Good Prospect
1101	Sandy Gravel	GM	General Fill & Aggregate	1,700,000	N.D.	Negligible	Thin	--	N.D.	Good	Conventional	6	Moderate - 270	Good Prospect
1102	Gravel and Sand	GM-SM	General Fill	650,000	N.D.	Topsoil and Till	1-4	Strip and Stockpile	Frozen at 5' - 10'	Good	Conventional	5	Moderate - 280	Fair to Good Prospect
1103a	Shale	--	General Fill	N.D.	N.D.	Clay and Weathered Shale	25	--	Frozen	Fair	--	0	Low - 245	Not Recommended
1104	Sand and Gravel	GM-SM	General Fill Some Aggregate	14,300,000	N.D.	Peat and Clay	0-4	Strip and Stockpile	Frozen	Good	Blasting or Ripping	3	Moderate - 315	Good Prospect
1105	Gravel and Sand	GP-OM	General Fill Some Aggregate	286,000	N.D.	Negligible	Thin	--	Unfrozen	Good	Conventional	6	High - 350	Poor Site
1105a	Silt	--	Unsuitable	--	--	N.D.	--	--	Frozen	Good	--	--	N.D.	Not Recommended
1107	Gravel	GM	General Fill	1,000,000	N.D.	Topsoil	Thin	Strip and Stockpile	N.D.	Good	Conventional	6	Moderate - 310	Fair to Good Prospect
1103a	Gravel and Clay	--	Unsuitable	N.D.	N.D.	N.D.	--	--	N.D.	Good	--	1 1/2	Moderate - 315	Not Recommended
1109a	Silt	--	Unsuitable	N.D.	N.D.	N.D.	--	--	N.D.	--	--	5	N.D.	Not Recommended
1110a	Sand and Silt	--	Unsuitable	N.D.	--	N.D.	--	--	Frozen	Good	--	4	Moderate - 260	Not Recommended
1111a	Silt	--	Unsuitable	N.D.	--	N.D.	--	--	N.D.	Fair	--	2	N.D.	Not Recommended
1112a	Shale	--	Unsuitable	N.D.	--	Peat and Till	20	--	N.D.	Fair	--	1 1/2	Low - 180	Not Recommended
1113a	Shale	--	Unsuitable	N.D.	--	Till and wet shale	25	--	High	--	--	0	Low - 210	Not Recommended
1114a	Shale and Siltstone	--	Unsuitable	N.D.	--	Till and wet shale	--	--	N.D.	--	--	1/2	Low - 235	Not Recommended
1115	Sand and Sandstone	--	General Fill	N.D.	N.D.	Clayey Sand	6	Strip and Stockpile	Not Frozen	Poor	Conventional & Quarry	4 1/2	Low - 205	Fair to Good Prospect
1116a	Gravelly Sand	GM-SM	General Fill	65,000	--	Peat	Thin	Strip and Stockpile	Not Frozen	Good	--	12	High - 350	Not Recommended
1117	Shale	--	General Fill	N.D.	N.D.	Silt till	4-10	Strip and Stockpile	N.D.	Fair	Blast and Quarry	0	Low - 195	Good Prospect
1118	Shale	--	General Fill	N.D.	N.D.	Topsoil and till	8-14	Strip and Stockpile	Frozen	Fair	Blast and Quarry	2 1/2	Low - 180	Fair to Good Prospect
1119a	Clay	--	Unsuitable	N.D.	N.D.	N.D.	--	--	N.D.	Good	--	8	N.D.	Not Recommended
1120	Sand and Gravel	GM	Aggregate and Fill	1,500,000	N.D.	Peat, silt and clay	2	Strip and Stockpile	Frozen at 7'	Good	Conventional	8 1/2	High - 340	Good Prospect
1121	Sand and Gravel	GM	Aggregate and Fill	26,500,000	N.D.	Negligible	--	--	Unfrozen to 16'	Good	Conventional	14	High - 340	Good Prospect
1122a	Silt	--	Unsuitable	N.D.	N.D.	N.D.	--	--	Frozen	Fair	--	--	Moderate - 305	Not Recommended
1123	Gravel	GM	Aggregated General Fill	2,200,000	12	Negligible	--	--	Frozen at 9 - 12'	Good	Conventional	13	High - 350	Good Prospect
1124a	Sand and Gravel	GW-SM	General Fill	10,600,000	N.D.	Peat and Silt	3	Strip and Stockpile	Frozen	Poor	Conventional	13	High - 355	Not Recommended
1125	Gravel and Sand	GM	General Fill	N.D.	N.D.	Topsoil	Thin	--	N.D.	Good	Conventional	13	High - 350	Fair Prospect
1126a	Sand and Gravel	GW-OM	General Fill	Small	N.D.	Negligible	Thin	Strip and Stockpile	N.D.	Good	Conventional	13	High - 325	Not Recommended
1127	Sand and Gravel	GM	General Fill	5,700,000	N.D.	Negligible	--	--	Unfrozen to 21"	Good	Conventional	18	High - 365	Fair to Good Prospect
1128	Shale	--	General Fill	Great	N.D.	Clayey Silt	12	Strip and Stockpile	Frozen	Good	Blast and Quarry	20	Moderate - 289	Fair Prospect
1129a	Clay	CL	Unsuitable	N.D.	--	N.D.	--	--	Frozen	Fair	--	15	N.D.	Not Recommended
1130a	Clay	CL	Unsuitable	N.D.	--	N.D.	--	--	--	--	--	18	N.D.	Not Recommended
1131a	Clay (till)	--	Unsuitable	10,000,000	N.D.	N.D.	--	--	Frozen 20%	Good	--	15	High - 380	Not Recommended
1132a	Clayey Sand	SC	Unsuitable	N.D.	N.D.	N.D.	--	--	--	Good	--	14	N.D.	Not Recommended
1133	Sand and Gravel	SW-SM	General Fill	675,000	N.D.	Silt and Peat	Thin	Strip and Stockpile	N.D.	Good	Conventional	8 1/2	Low - 210	Fair Prospect
1134a	Clay	--	Unsuitable	--	--	--	--	--	--	Good	--	7	N.D.	Not Recommended
1135	Sand and Gravel	GM	Concrete Aggregate	15,125,000	6-10	Negligible	Thin	--	Frozen at 8 1/2'	Fair	Conventional	9 1/2	Low - 230	Fair to Good Prospect
1136	Sand and Gravel	SM	General Fill	12,000,000	N.D.	Peat and Silt	Thin	--	Frozen	Poor	Conventional & Stockpile	12	Moderate - 270	Fair to Poor Prospect
1137	Gravel and Sand	SM	General Fill	N.D.	N.D.	Negligible	Thin	--	Unfrozen	Good	Conventional	21	Low - 225	Fair Prospect

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						
1138	Sand and Gravel	GW-OM	Aggregate and General Fill	35,000,000	--	Peat, Silt	0-2	Strip and Stockpile	Frozen at 8 1/2'	Good	Conventional & Stockpile	22	High - 355	Fair to Good Prospect
1139a	Shale	--	General Fill	N.D.	N.D.	N.D.	Deep	--	N.D.	Good	--	21	N.D.	Not Recommended
1140a	Clay	ND	Unsuitable	N.D.	N.D.	N.D.	--	--	N.D.	Fair	--	24	Low - 230	Not Recommended
1141	Sand and Gravel	GW-OM	General Fill	N.D.	N.D.	N.D.	Thin	--	N.D.	Poor	Conventional	24	Moderate - 260	Fair Prospect
1142a	Silt and Sand	--	Unsuitable	N.D.	N.D.	--	--	--	N.D.	--	--	25	Moderate - 295	Not Recommended
1143a	Sand and Gravel	GP-OM	General Fill	Small	N.D.	Negligible	Thin	--	N.D.	Good	Conventional	20	N.D.	Not Recommended
1144	Sand and Gravel	GM	General Fill	N.D.	N.D.	Clay	2	Strip and Stockpile	N.D.	Poor	Conventional & Stockpile	19	Moderate - 310	Fair Prospect
1145a	Sand and Gravel	--	Unsuitable	N.D.	N.D.	Peat and Silt	2	--	N.D.	N.D.	--	24	N.D.	Not Recommended
1146	Sand and Gravel	SM	General Fill	13,500,000	18	Negligible	Thin	--	Frozen	Good	Blasting or Rip	26	Moderate - 270	Fair Prospect
1147	Gravel and Sand	GP-SM	General Fill	16,000,000	--	Peat and Silt	2	Strip and Stockpile	Frozen at 6'	Good	Blast Stockpile	29	Low - 210	Fair Prospect
1148	Gravel and Sand	GP-OM	General Fill	N.D.	N.D.	Topsoil	Thin	--	N.D.	Fair	Conventional	29	Moderate - 265	Fair to Good Prospect
1149a	Clay	--	Unsuitable	N.D.	N.D.	--	--	--	N.D.	N.D.	--	32	N.D.	Not Recommended
1150a	Sand	SP-SM	General Fill	N.D.	N.D.	--	Thin	--	Frozen at 6'	Good	Conventional	25	Low - 205	Not Recommended
1151a	Shale	--	General Fill	N.D.	N.D.	Silt	19	--	Frozen	Poor	--	22	Moderate - 280	Not Recommended
1152a	Sand and Gravel	GP-OM	General Fill	4,200,000	N.D.	Peat and Silt	10	--	Frozen	Fair	--	18	High - 325	Not Recommended
1153a	Sand	GM	General Fill	N.D.	N.D.	Irregular	--	--	N.D.	Poor	--	18	Moderate - 315	Not Recommended
1154a	Sand and Gravel	GC	Unsuitable	N.D.	N.D.	--	--	--	Frozen	Poor	--	15	Moderate - 315	Not Recommended
1155	Shale and Siltstone	--	General Fill	N.D.	N.D.	Silt	8 1/2	Strip and Stockpile	Frozen	Fair	Blast and Quarry	9	Moderate - 280	Fair to Poor Prospect
1156a	Silt	--	Unsuitable	N.D.	N.D.	--	--	--	N.D.	--	--	5	Moderate - 250	Not Recommended

ELEVATIONS IN FEET
(2114) SLAVE RIVER



LOCATION OF SAMPLES FOR GRAIN SIZE ANALYSIS (95N,Q,K,J,G,H,I,B,A,85D,E)

1972 - Mining
1972 - Rutter, Boydell
1971 - Rutter, Manning, Netterville

Base Map, 2nd Edition 1965
ELEVATIONS IN FEET

DECEMBER, 1972

SCALE: 1:500,000

M-97(14)

Fig.1

SITE 1054

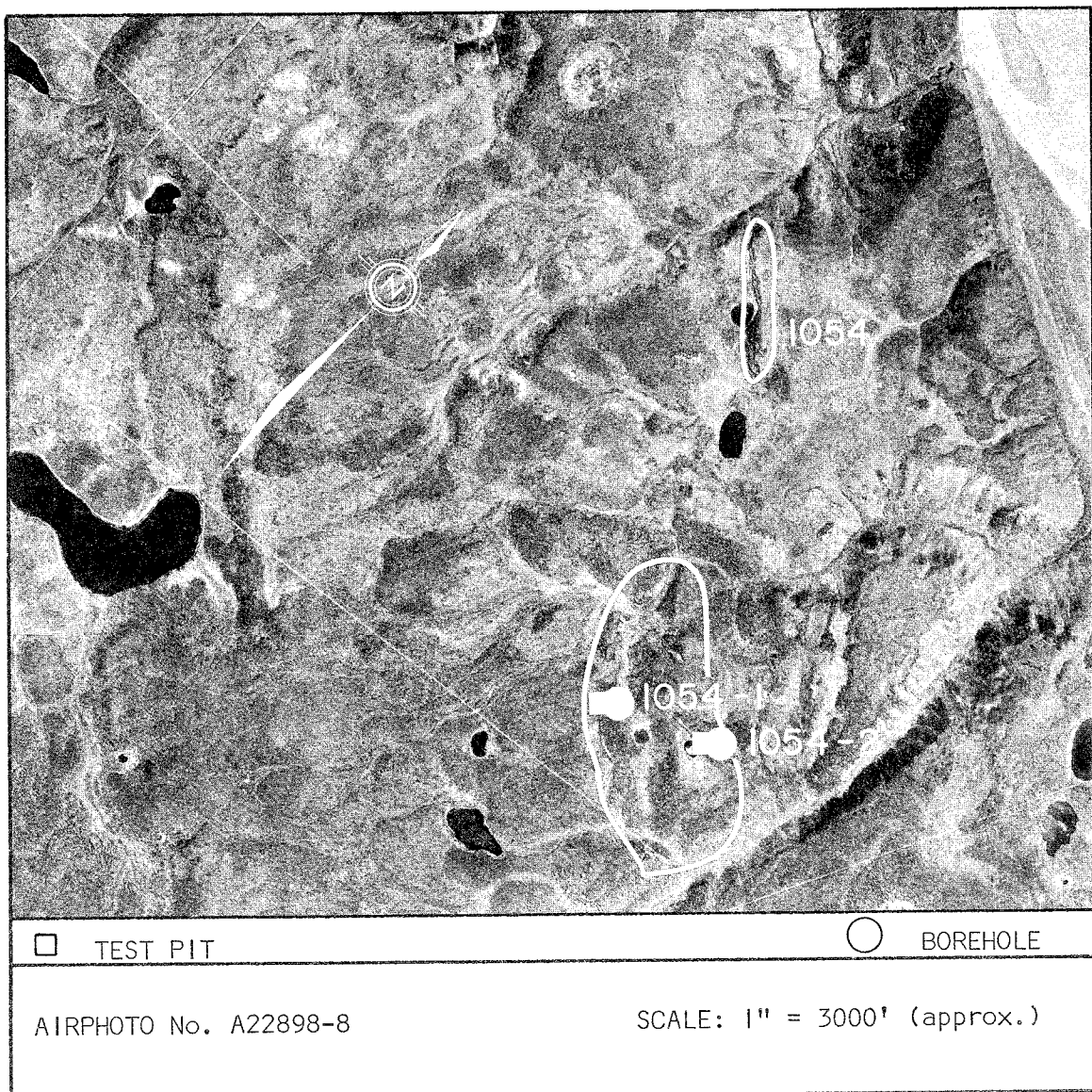
Location: Site 1054 is located 15 miles NW of Little Chicago and on the west bank of the Mackenzie River. Proposed pipeline and highway routes are approximately 9 miles NE of the site.

Geology: The material at site 1054 is contained in an outwash and esker complex.

Material: Gravelly sand and silt, well graded, outwash; gravel and sand, trace silt, well graded, esker.

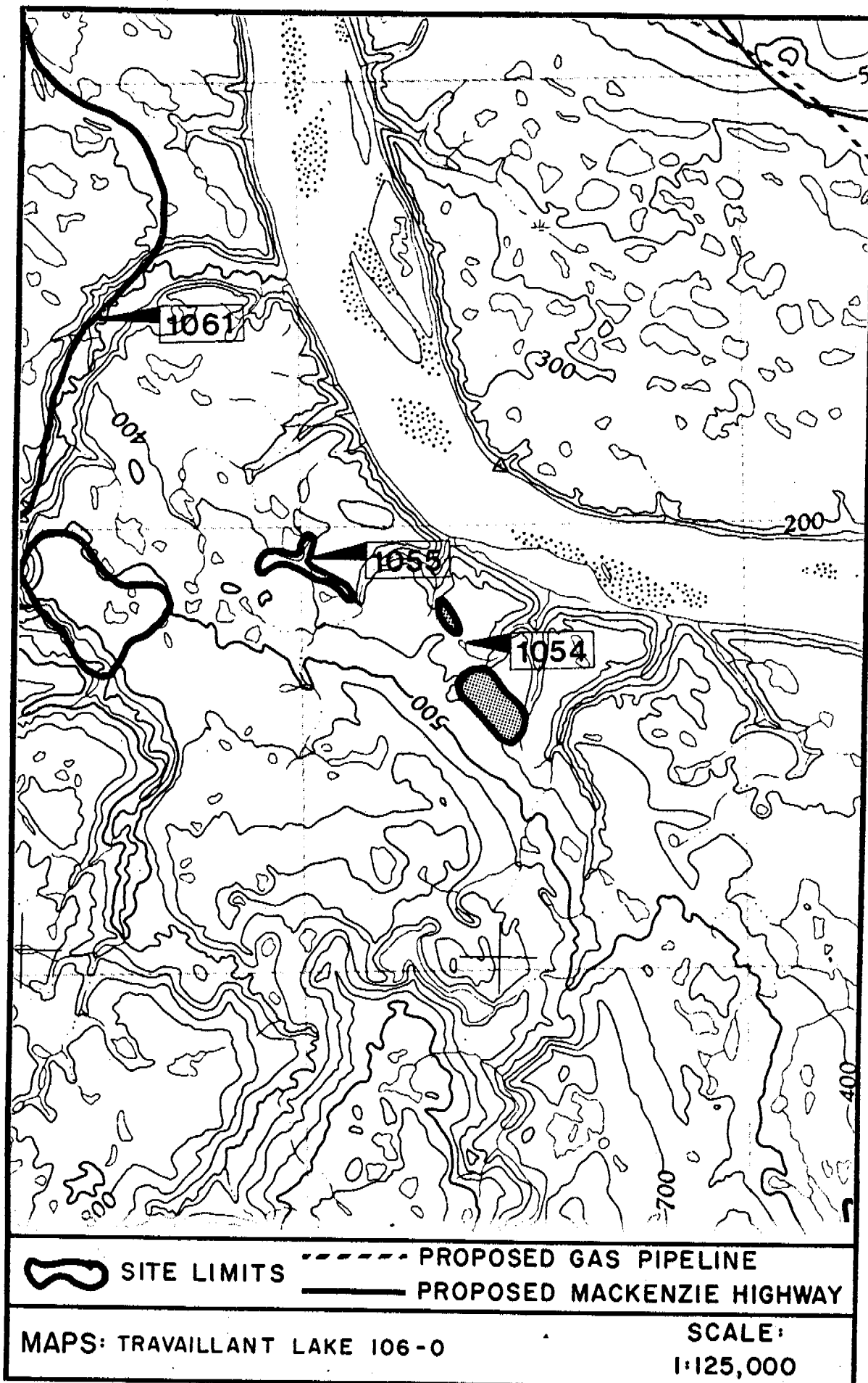
Volume: 2,000,000 cu. yd., volume estimate is conservative.

Area: 200 acres.



Drainage: The site is well drained.

Assessment: Site 1054 contains a substantial quantity of fair to good quality borrow. The outwash material is expected to be uniform however the eskers will probably exhibit some variation. Moisture (ice) content and permafrost depth are variable necessitating stockpiling and draining of selective borrow sources. Selective excavation may yield material suitable, after washing and screening, for use as concrete aggregate. Overburden of a few inches to a foot of peat will have to be stripped off and stockpiled for use in restoration. Tree cover of moderately dense spruce will have to be removed for disposal. Access is difficult because the site is situated on the west bank of the Mackenzie River. Furthermore, a haulage distance in the order of 15 to 18 miles can be expected with an ice bridge across the Mackenzie River required.



SITE 1054 ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS	R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN			5	ARCHAEOLOGY		
1 2 3 4 5	Formation Stability Ice Content	Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.		1 2 3 4 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.	
Rating: 15				Rating: 5			
5	VEGETATION			10	AESTHETICS		
1 2 3 4 5	Aesthetic Value Habitat Value	Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian		1 2 3 4 5	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.	
Rating: 10				Rating: 30			
15	MAMMALS			15	RESOURCE UTILIZATION		
1 2 3 4 5	Unulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dams and Lodges, Special Habitat Use.		1 2 3 4 5	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Trapslines. Hunting. Fishing. Domestic. Commercial.	
Rating: 30				Rating: 15			
10	BIRDS			15	ASSOCIATED DISTURBANCES		
1 2 3 4 5	Waterfowl-Swans, Geese, Ducks Game Birds Raptors Shorebirds Passerine	Migration Pathway, Moulting, Spring Staging, Fall Staging, Nesting-Brooding, Perching, Winter Habitat.		1 2 3 4 5	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations	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.	
Rating: 20				Rating: 60			
10	FISHERY			10	RESTORATION		
1 2 3 4 5	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.		1 2 3 4 5	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.	
Rating: 20				Rating: 20			

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY

MAXIMUM SENSITIVITY

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

TOTAL INDEX : 225

SPECIAL CONCERNS :

Upland area along scarps on west side of Mackenzie River. Bank stability is important to fish and wildlife values. Haul roads must traverse banks and material must cross Mackenzie. Buffer zones and erosion controls recommended.


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY		MAXIMUM SENSITIVITY
100	TO	500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1054		HOLE NO. 1		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	GP	GRAVEL -some cobbles, sand & silt, dense, dry.	NOT FROZEN					1	
2		GRAVEL		○				2	
3		-sandy, silty, fine to medium sized, subangular						3	
4		& subrounded, dry, light brown.		○				4	
5		35% GRAVEL						5	
6	GP-GM	(2' - 8') 54% SAND		○				6	
7		11% SILT & CLAY						7	
8		-very silty, sandy, light grey-brown		○				8	
9								9	
10				○				10	
11								11	
12								12	
13			FROZEN					13	
14								14	
15				○				15	
16								16	
17								17	

DATE DRILLED: Sep. 26/73	LOGGED BY: EBA 146-1	COMPLETION DEPTH: 18.5'
DRILLING METHOD: AUGER		THAW DEPTH: Possibly 13.0'

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1054		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18		GRAVEL -same		0				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: Sep. 26/73		LOGGED BY: EBA 146-1		COMPLETION DEPTH: 18.5'				
DRILLING METHOD: Auger			THAW DEPTH: possible 13.0'					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1054		HOLE NO. 2		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	PEAT -very fibrous, dark brown	NOT FROZEN					1
2	CL	CLAY -gravelly, moist, grey-brown						2
3	GM	GRAVEL -sandy, some cobbles, some silt, dense, sand predominantly coarse, gravel well graded, sub- rounded to subangular, wet, light brown.	Vc low					3
4								4
5								5
6								6
7		(2' - 5') 22% GRAVEL 45% SAND 33% SILT & CLAY						7
8		END OF HOLE						8
9		Unable to drill deeper						9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 25/73

LOGGED BY: EBA
146-4

COMPLETION DEPTH: 5.0'

DRILLING METHOD: AUGER

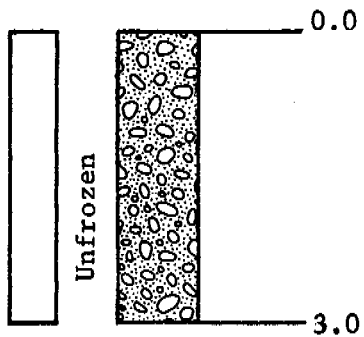
THAW DEPTH: 2.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

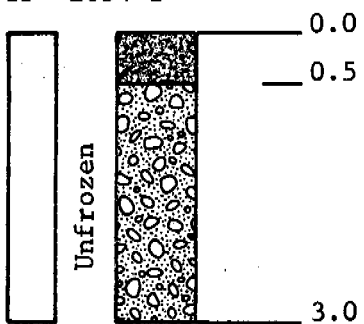
TP 1054-1



Gravel, sandy
dry
dense

58% GRAVEL
37% SAND
5% SILT & CLAY

TP 1054-2

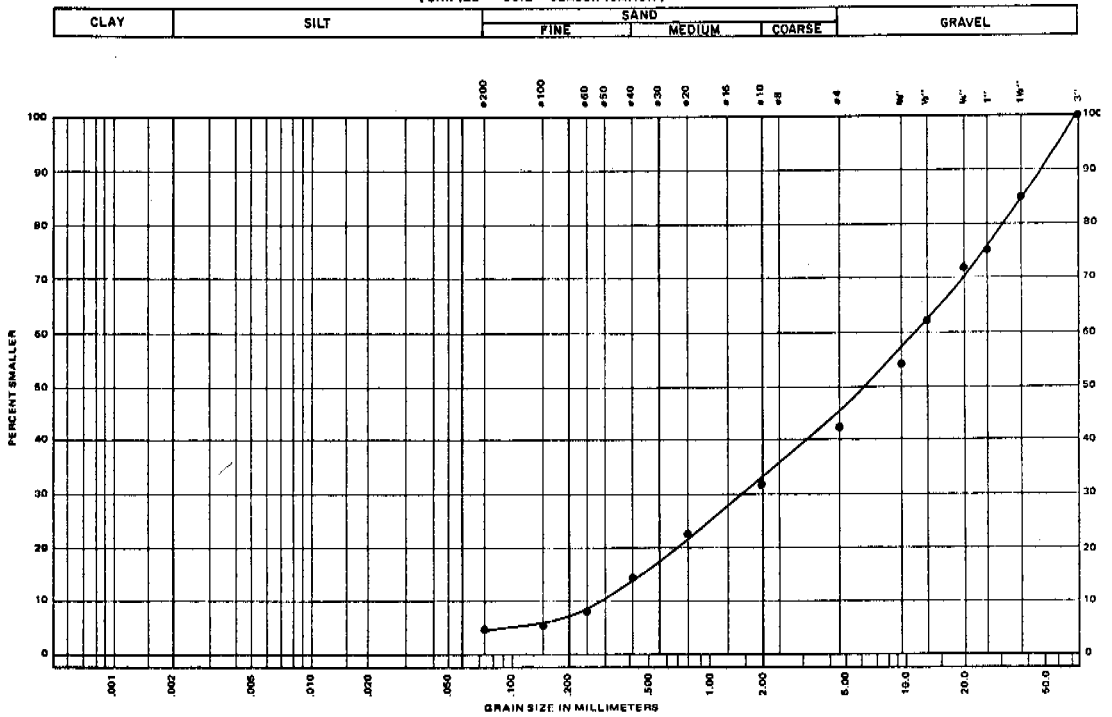


Moss

Gravel, light brown to grey
moist
dense

52% GRAVEL
32% SAND
16% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

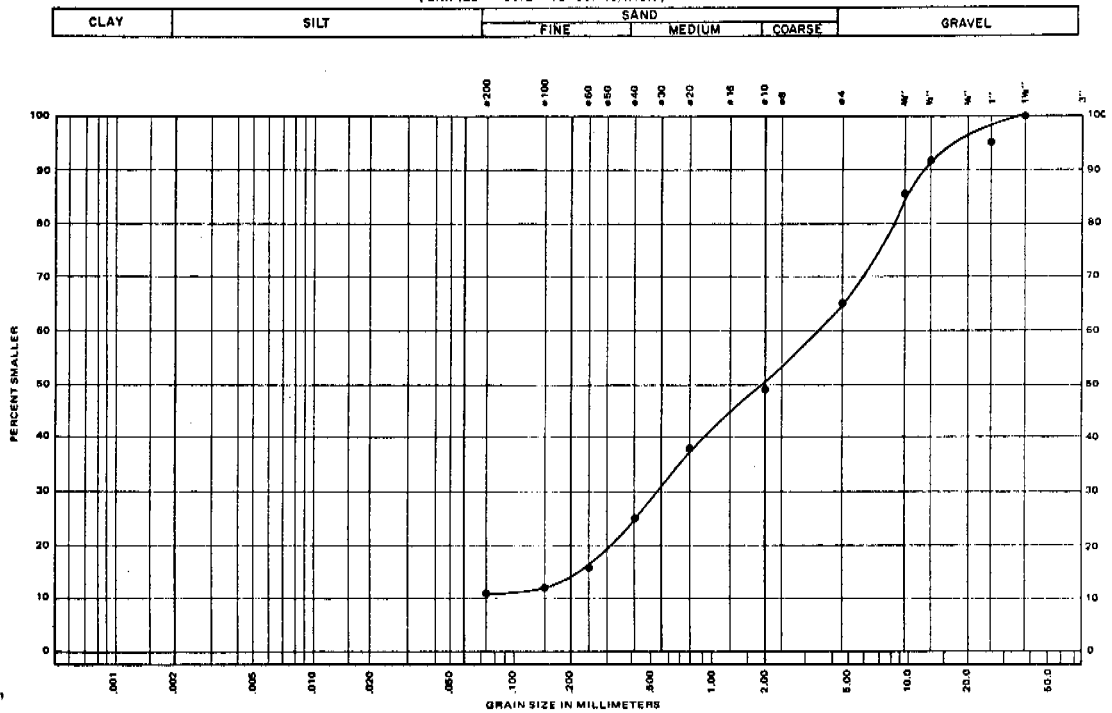


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Gravel and Sand with a trace of silt (GW) M/C = 3.4%

PROJECT: Granular Resources
JOB No. E666 DATE: December 16/73
SAMPLE No. TP 1054-1
DEPTH: 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



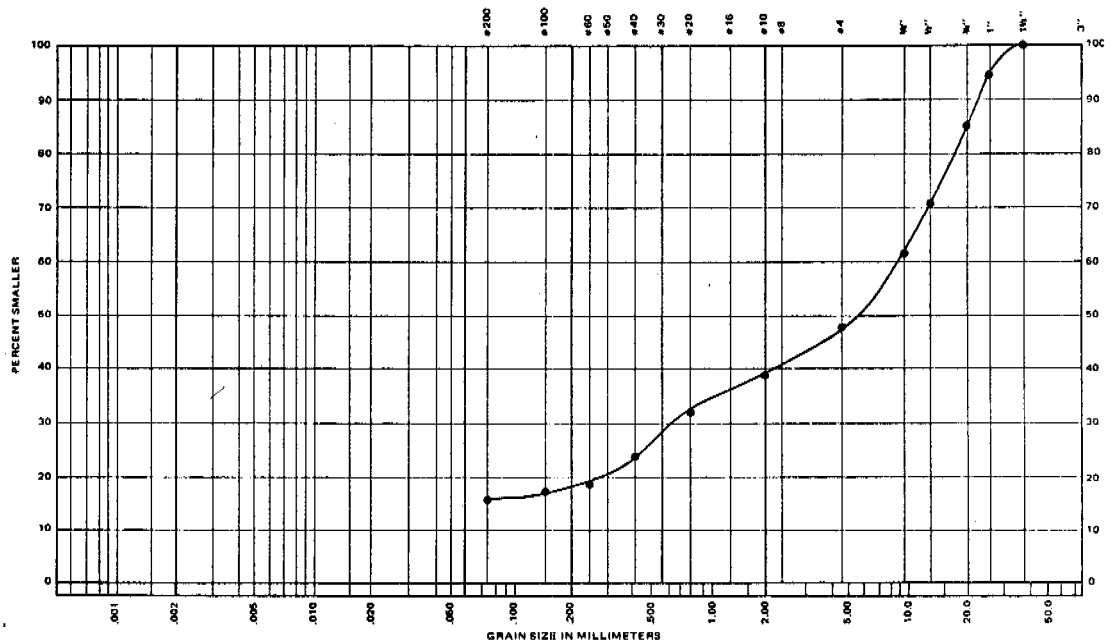
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Sand and Gravel and some silt (GM)

PROJECT: Granular Resources
JOB No. E666 DATE: January 14/74
SAMPLE No. BH 1054-1
DEPTH: 2' - 8'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



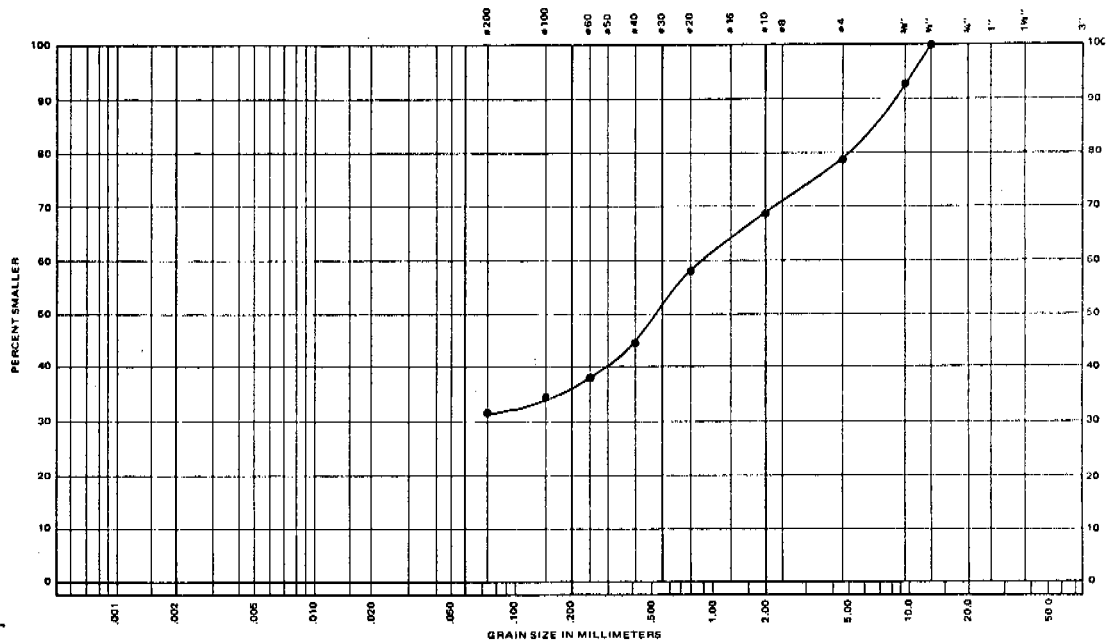
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand
(GM) M/C = 0.5% - 9.3%

PROJECT Granular Resources
JOB No. E666 DATE December 10/77
SAMPLE No. TP 1054-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt, Gravelly
(SM)

PROJECT Granular Resources
JOB No. E666 DATE January 29/78
SAMPLE No. BH 1054-2
DEPTH 2' - 3'

SITE 1055

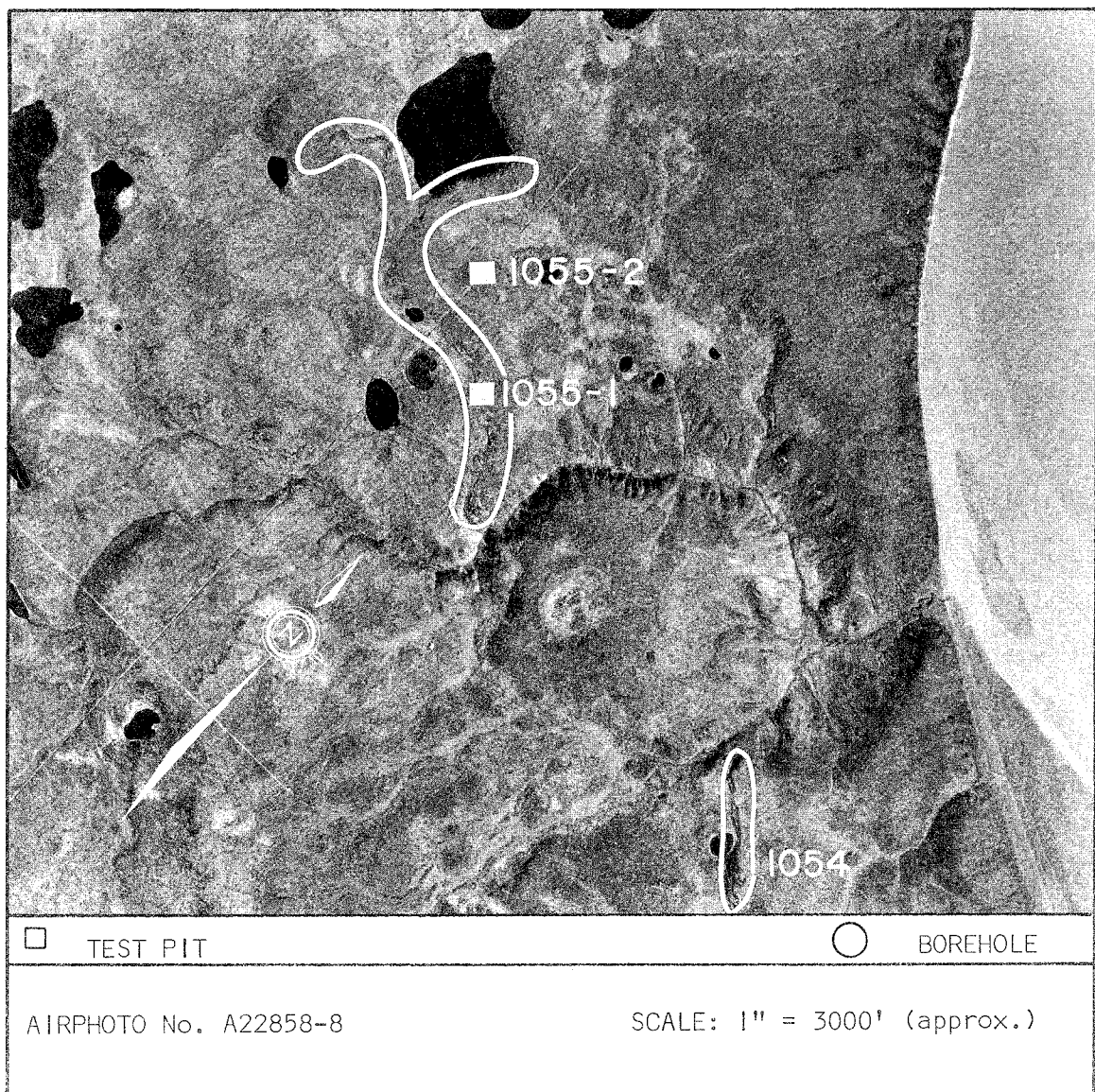
Location: Site 1055 is 19 1/2 miles NW of Little Chicago on the west side of the Mackenzie River. Proposed pipeline and highway routes are 9 miles NE of the site.

Geology: The material at site 1055 is contained in an esker. Significant variation in the material may be expected.

Material: Gravel and sand, some silt, well graded.

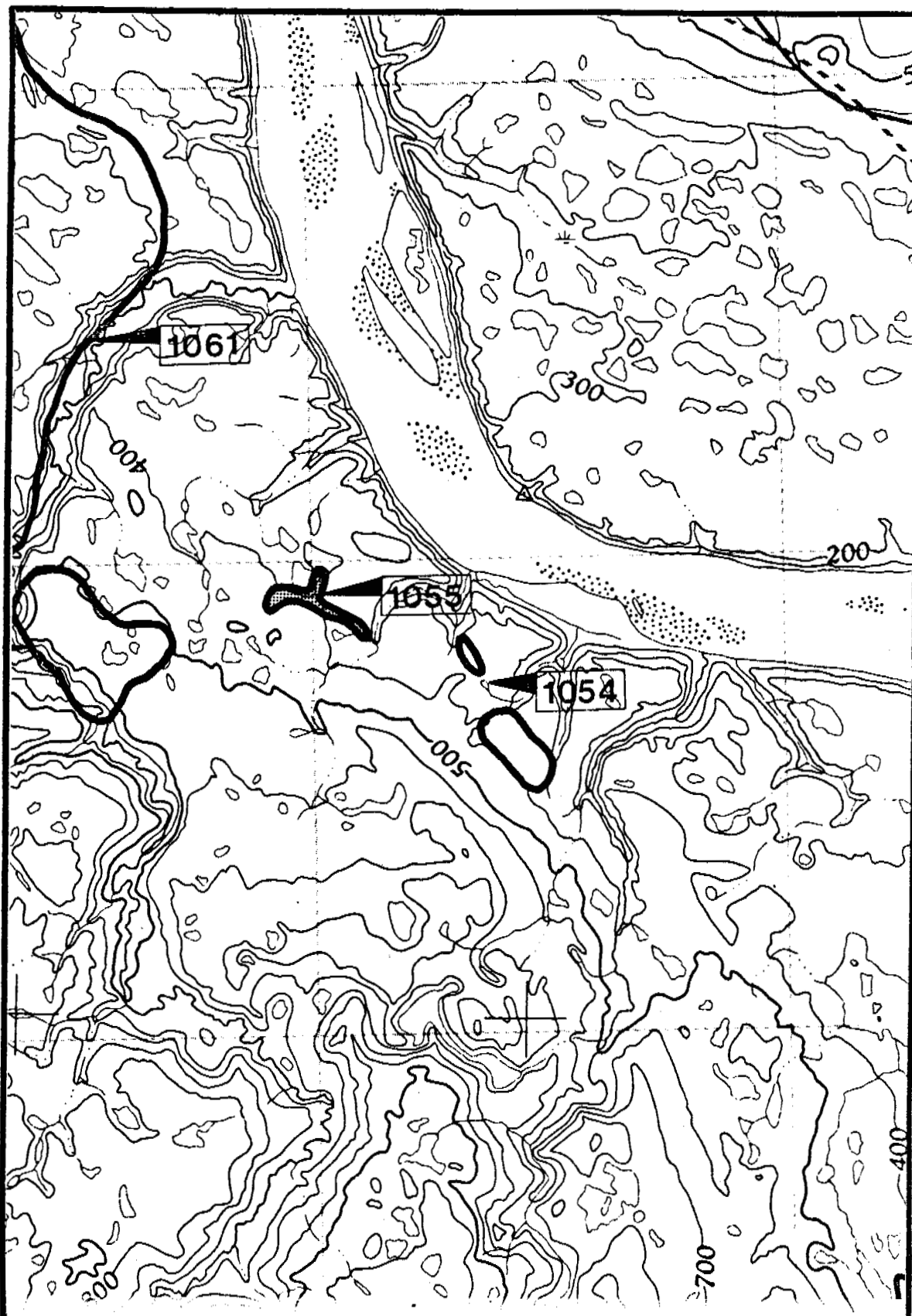
Volume: 525,000 cu. yd.

Area: 55 acres.



Drainage: The site is well drained.

Assessment: Site 1055 contains a moderate volume of good quality material. The site is forested with dense stands of spruce which will have to be removed for disposal. Access is difficult access and long haulage distance (approximately 19 air miles) make feasibility of developing the site doubtful.



SITE LIMITS



PROPOSED GAS PIPELINE



PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 205

SPECIAL CONCERNS :

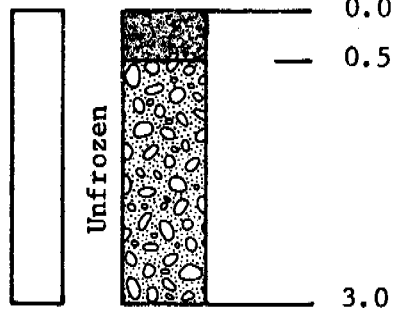
Upland area on west side of Mackenzie.
Material must cross River and roads must
traverse Mackenzie banks. Buffer zones and
erosion controls are recommended.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

TEST PIT LOG

TP 1055-1

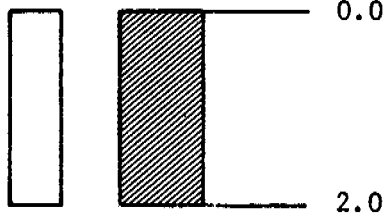


Moss

Gravel, light brown
well graded

62% GRAVEL
33% SAND
5% SILT & CLAY

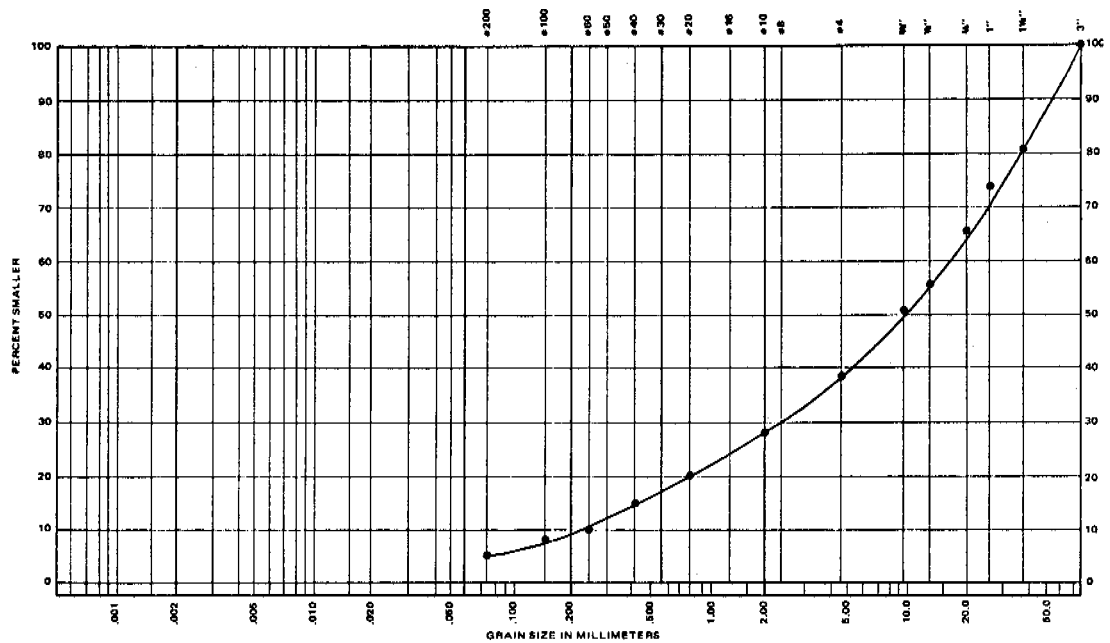
TP 1055-2



Clay, occasional cobble

GRAIN SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
------	------	-----------	-------------	-------------	--------



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand with
a Trace of Silt M/C = 3.5%

PROJECT Granular Resources
JOB No. E666 DATE December 16/73
SAMPLE No. TP 1055-1
DEPTH 3'

SITE 1061

Location: Site 1061 is on the west bank of the Mackenzie River, 5 miles SW of the point of confluence of the Mackenzie and Thunder Rivers. Proposed pipeline and highway routes are 9 and 11 miles NE of the site, respectively.

Geology: Site 1061 is an extensive outwash area.

Material: Variable from gravel and sand with some silt to silty sand with some gravel, wider variations are expected.

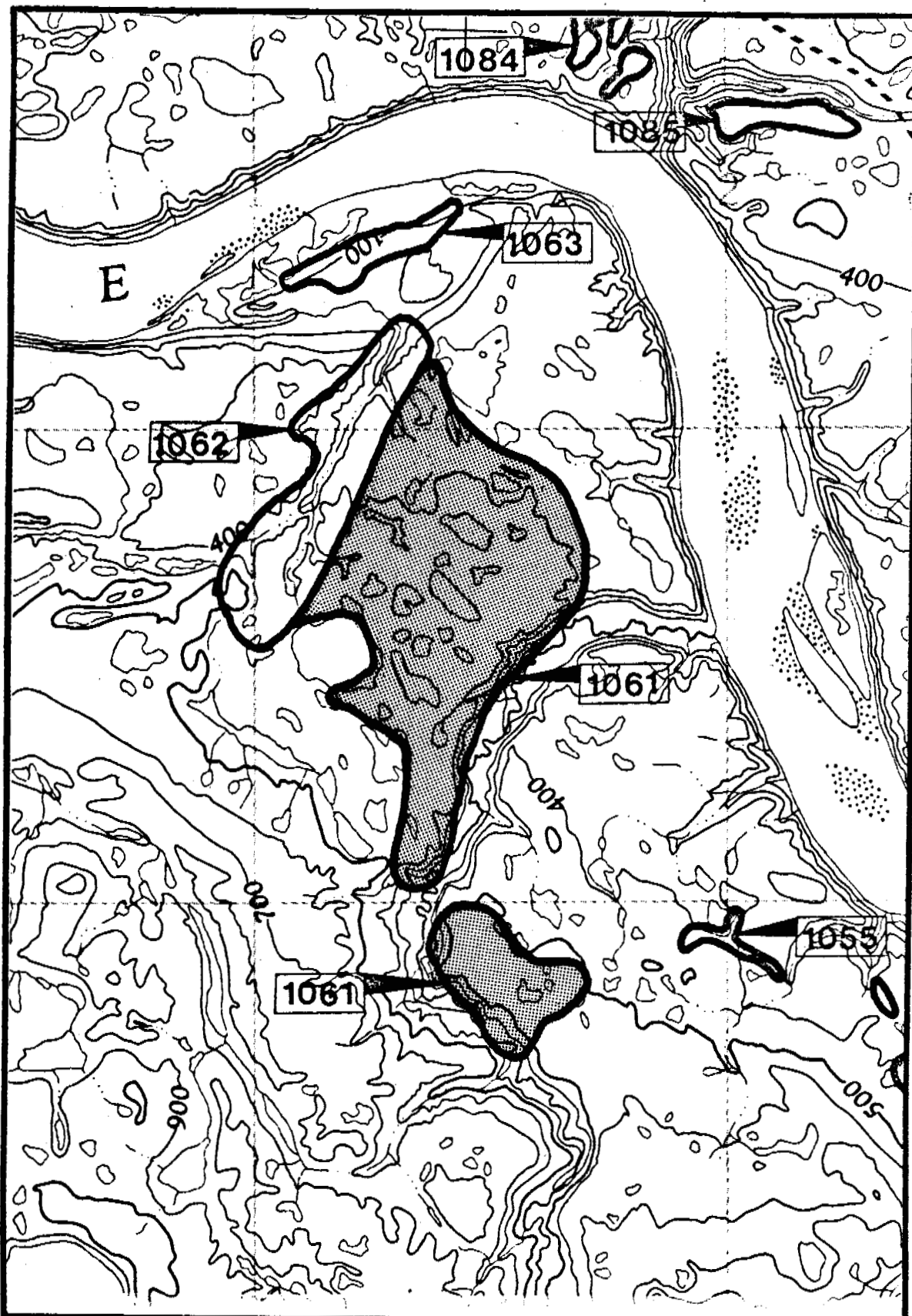
Volume: Extremely large.




Area: 6500 acres.

Drainage: Drainage is variable over such a large site.

Assessment: Site 1061 is an extensive area of outwash which probably contains an extremely large volume of good quality borrow. Considerable variation may be anticipated across the site. The site however, is located on the west bank of the Mackenzie River. Thus a winter road would be required for site development. This would restrict hauling time from the pit to approximately 3 months per year. Access from the river to the proposed highway will be difficult, however, it may be possible to find a route up the Thunder River valley in winter. Environmental concerns suggest a summer borrow operation thus more detailed study of environmental input would be required before borrow pit development. A materials transport system which utilizes barges on the river in summer may be feasible if a very long haul down the river is necessitated by shortage elsewhere.





 SITE LIMITS  PROPOSED GAS PIPELINE
 PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 295

SPECIAL CONCERNS :

On west bank of Mackenzie River. Good moose winter habitat and denning areas present suggest summer borrow operations. Materials must cross Mackenzie.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1061		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	GW	GRAVEL & COBBLES -some sand, some silt, sub- rounded to subangular, dry, light brown.	NOT FROZEN					1
2	GM-GW	GRAVEL & SAND -some silt, dry, light brown 47% GRAVEL (2'+4') 41% SAND 7.1% O.C. 11% SILT & CLAY						2
3								3
4								4
5								5
6	SM	SAND -very silty, gravel fine, dry, medium brown 12% GRAVEL (6'+8'+10') 60% SAND 28% SILT & CLAY						6
7								7
8								8
9								9
10								10
11							11	
12		END OF HOLE						12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 24/73


LOGGED BY: EBA 142-4

COMPLETION DEPTH: 11'

DRILLING METHOD: AUGER

THAW DEPTH: N/A

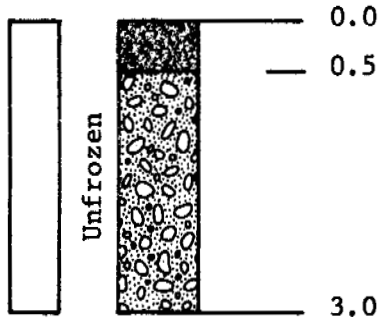
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1061-1



Moss

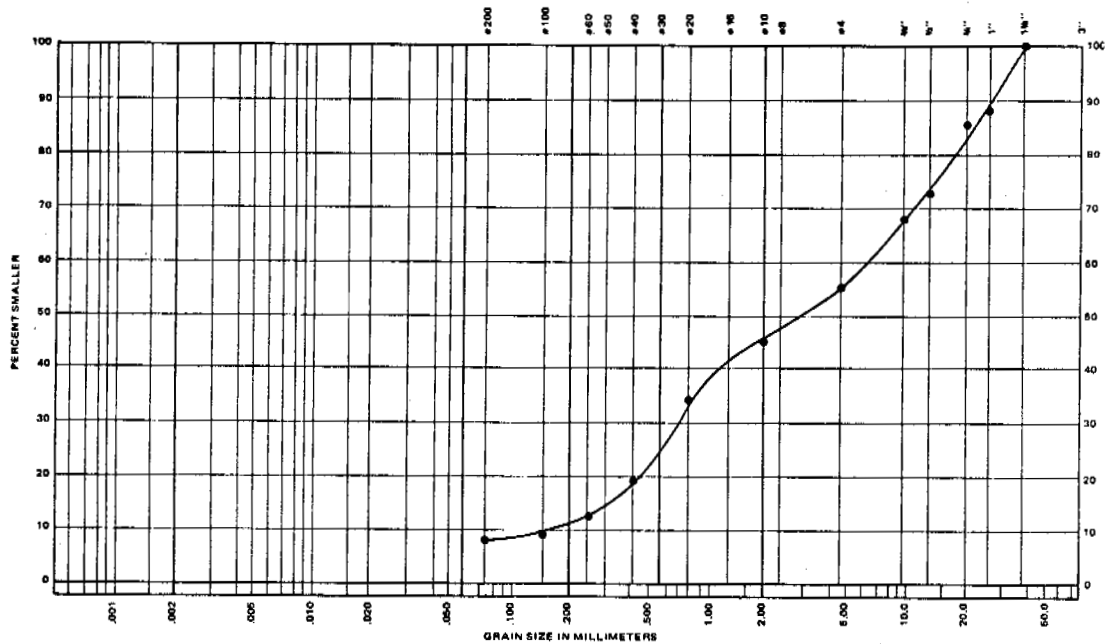
Gravel, light brown
dry
well graded

45% GRAVEL
47% SAND
8% SILT & CLAY

GRAIN SIZE DISTRIBUTION

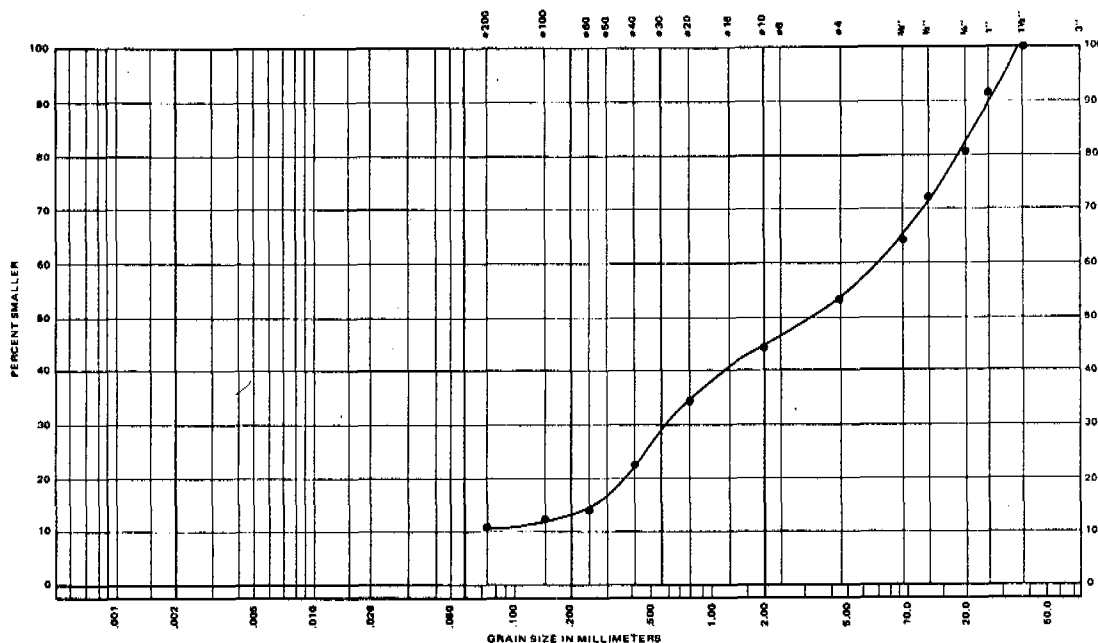
(UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
------	------	-----------	-------------	-------------	--------



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



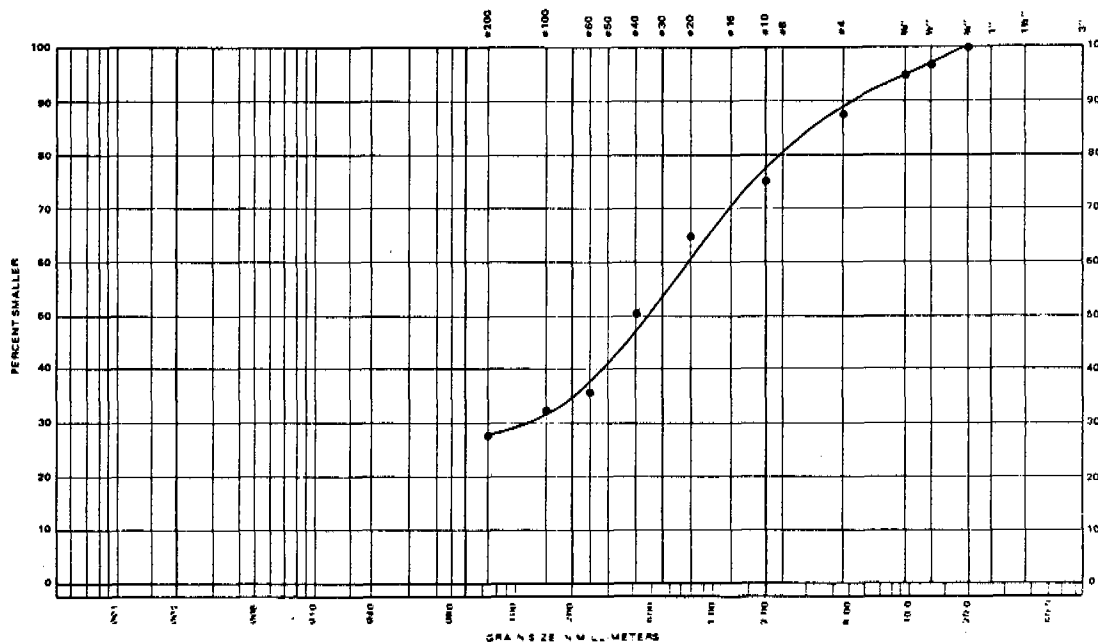
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and sand and
Some Silt (SM-GW)

PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1061-1
DEPTH 2' + 4'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand and
Some Gravel (SM-SC)

PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1061-1
DEPTH 6' + 8' + 10'

SITE 1062

Location: Site 1062 is located on the south side of the Mackenzie River stretching from 4 1/2 to 10 1/2 miles SW of the Thunder River. Proposed pipeline and highway routes are 7 and 12 miles north and north-west respectively.

Geology: The material at site 1062 is contained in a large outwash.

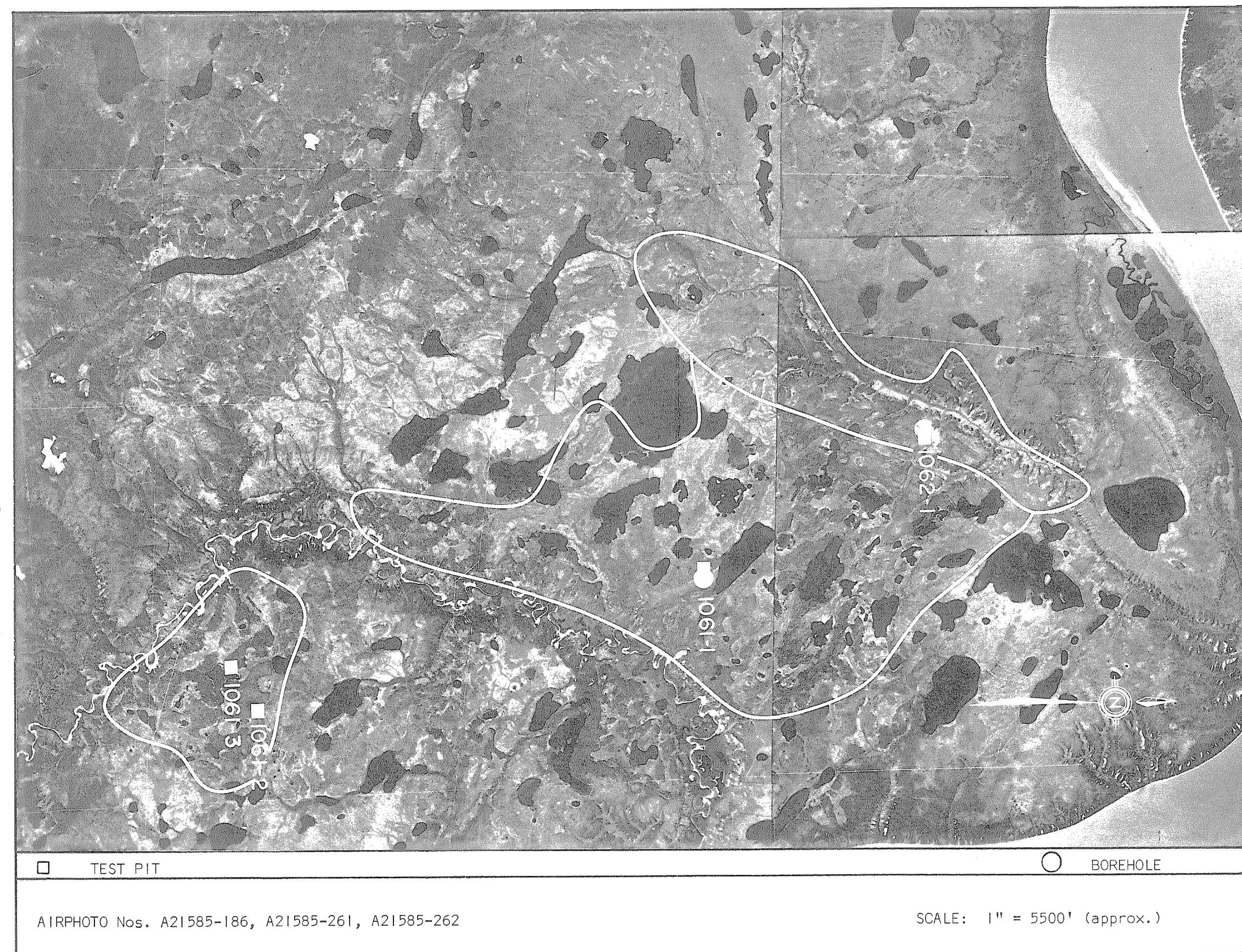
Material: Variable from silty sand to silty gravel and sand.

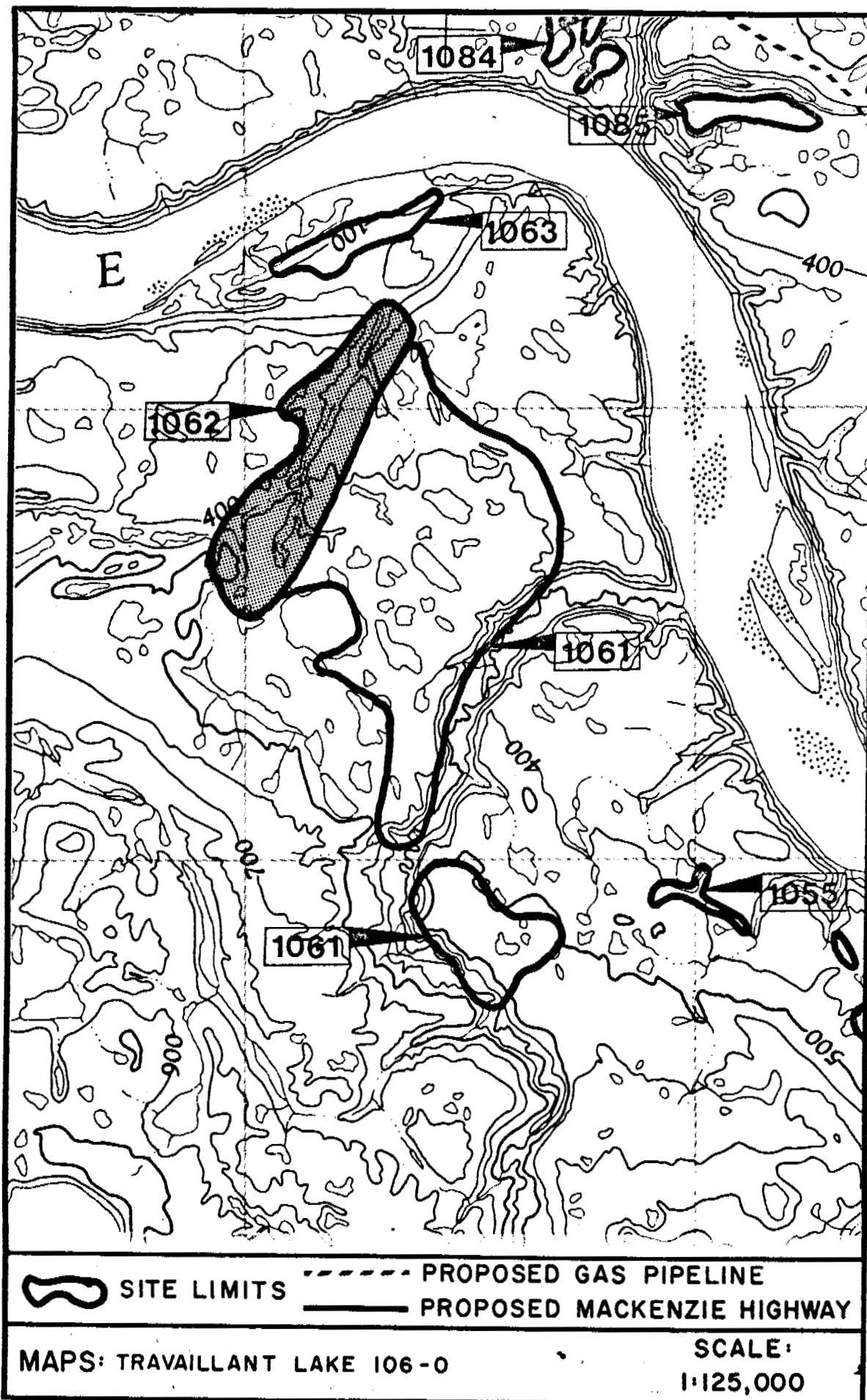
Volume: Very large.

Area: 500 acres.

Drainage: The area is well drained.

Assessment: Access to site 1062 will be difficult because of 200 300 foot cliffs along the Mackenzie River. Haulage distance is long and will be lengthened by the necessity of a circuitous route. Material is variable and much more detailed exploration must be carried out to determine the extent and thickness of borrow areas. Conditions concerning access and development the same as those stated for site 1061.





ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 285

SPECIAL CONCERNS :


On west bank of Mackenzie River. Moose habitat values high. Access roads must traverse Mackenzie banks and cross river.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3	Paleontology	Probability of Discovery.
	4 5	<u>Pre-Historic</u>	Low, <u>Medium</u> , High.
	Rating: 15	<u>Historic</u>	Known Sites.
10	AESTHETICS		
	1 2 3	Visible from:	River, Highway, <u>Air</u> .
	4 5	Physical Dis-	Dust, Waste,
	Rating: 20	turbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
	1 2 3	<u>Fort Good Hope</u>	Improved Access.
	4 5	<u>Arctic Red R.</u>	Traplines.
	Rating: 30	<u>Inuvik</u>	<u>Hunting</u> , <u>Fishing</u> , <u>Domestic</u> , Commercial.
15	ASSOCIATED DISTURBANCES		
	1 2 3	Access Roads	
	4 5	Miles From Highway	0-2, 2-5, 5-10, 10+
	Rating: 75	Miles From Pipeline	0-2, 2-5, 5-10, 10+
		Hydrologic	<u>Cuts and Fills</u> .
		Alterations	<u>Creek Crossings</u> .
			<u>Compaction</u> ,
			<u>Slumping</u> , <u>Erosion</u> .
		Continued Use	Stockpiles,
		For Maintenance.	Waste, Dust.
10	RESTORATION		
	1 2 3	<u>Soil Stabilization</u>	Natural Regeneration.
	4 5	<u>Visual Improvement</u>	Grass-Legume Seeding.
	Rating: 20	<u>Habitat Replacement</u>	Transplants.
			Sustained Maintenance.
			Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1062		HOLE NO. 1		PAGE 1 OF 1	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	SP	SAND	NOT FROZEN		1
2		-trace to some silt, uniform medium-fine grained, dry, light brown.			2
3					3
4					4
5					5
6					6
7			75% SAND (1' - 16') 25% SILT & CLAY	FROZEN	
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					17
		END OF HOLE			
DATE DRILLED: Sep. 25/73		LOGGED BY: EBA 142-1	COMPLETION DEPTH: 17.0'		
DRILLING METHOD: AUGER			THAW DEPTH: 7.3'		
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.		

GRANULAR MATERIALS INVENTORY - STAGE III

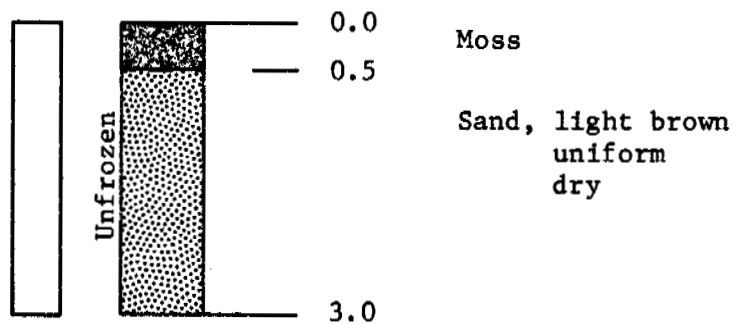
SITE NO. 1062		HOLE NO. 2		PAGE 1 OF 1					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	Pt	PEAT -fibrous, medium brown	NOT FROZEN					1	
2			FROZEN			411.2		2	
3								3	
4						756.4		4	
5								5	
6		- organic silty, foul odour dark brown				102.0		6	
7								7	
8						254.1		8	
9								9	
10						68.1		10	
11			-trace of fine sand						11
12									12
13			-very organic silty						13
14		END OF HOLE						14	
15								15	
16								16	
17								17	

DATE DRILLED: Sep. 24/73	LOGGED BY: EBA 142-3	COMPLETION DEPTH: 13.0'
DRILLING METHOD: AUGER		THAW DEPTH: 1.8'

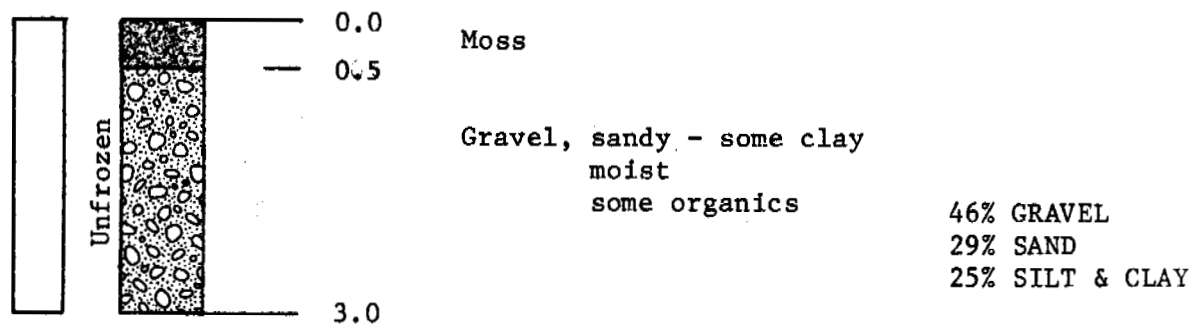
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1062-1



TP 1062-2



CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



PROJECT Granular Resources
JOB No. E666 DATE January 27/74
SAMPLE No. BH 1062-1
DEPTH 1' - 16'

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



PROJECT Granular Resources
 JOB No. E666 DATE December 16/73
 SAMPLE No. TP 1062-2
 DEPTH _____

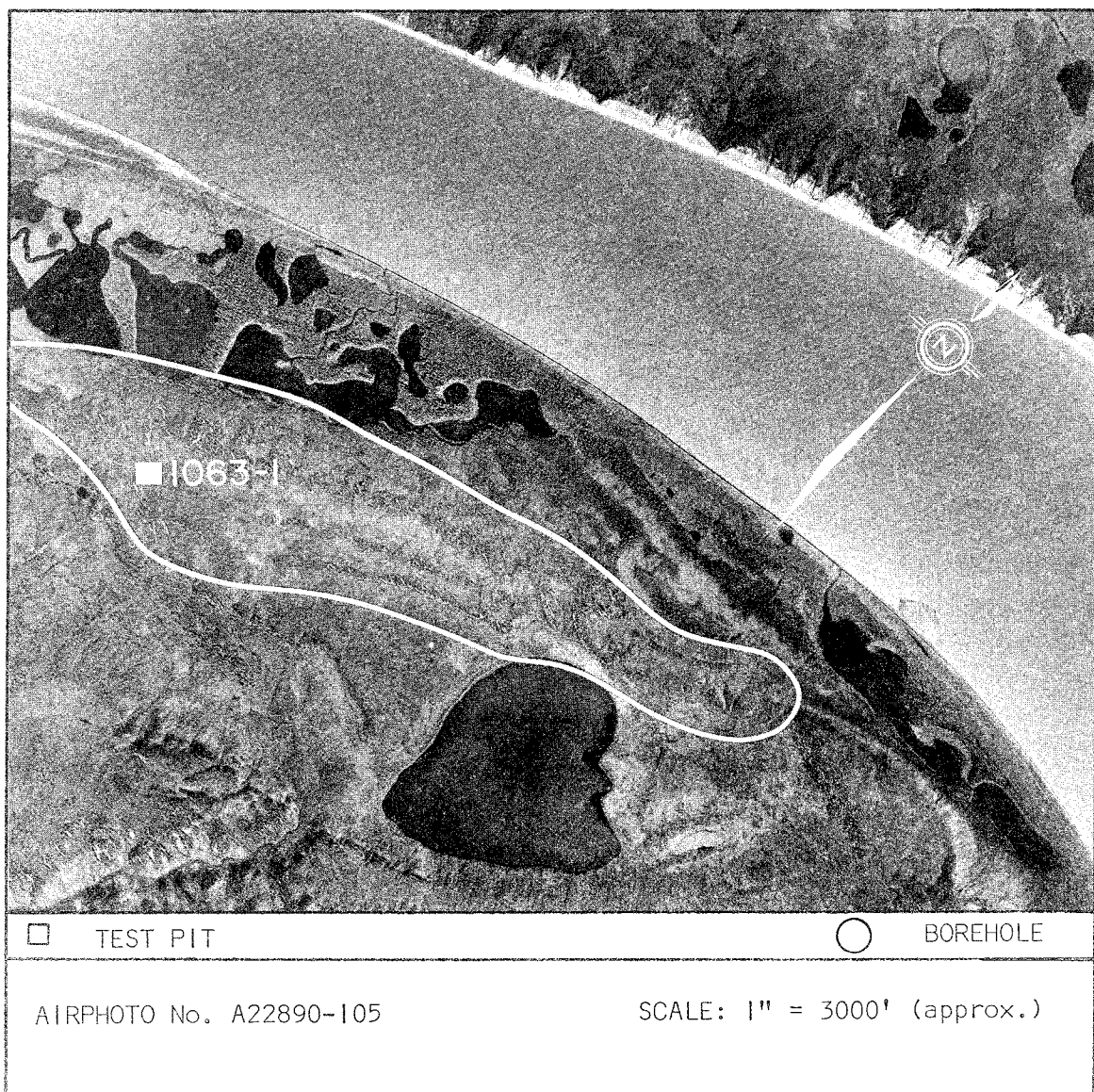
SITE 1063a

Location: Site 1063 is located on the south bank of the Mackenzie River 1 mile south of the river and 4 1/2 miles west of the point of confluence of the Thunder and Mackenzie Rivers. Proposed highway and pipeline routes are 9 and 5 miles north of the site respectively.

Geology: Site 1063 is on a high river terrace along the Mackenzie River.

Material: Fine sand, frozen.

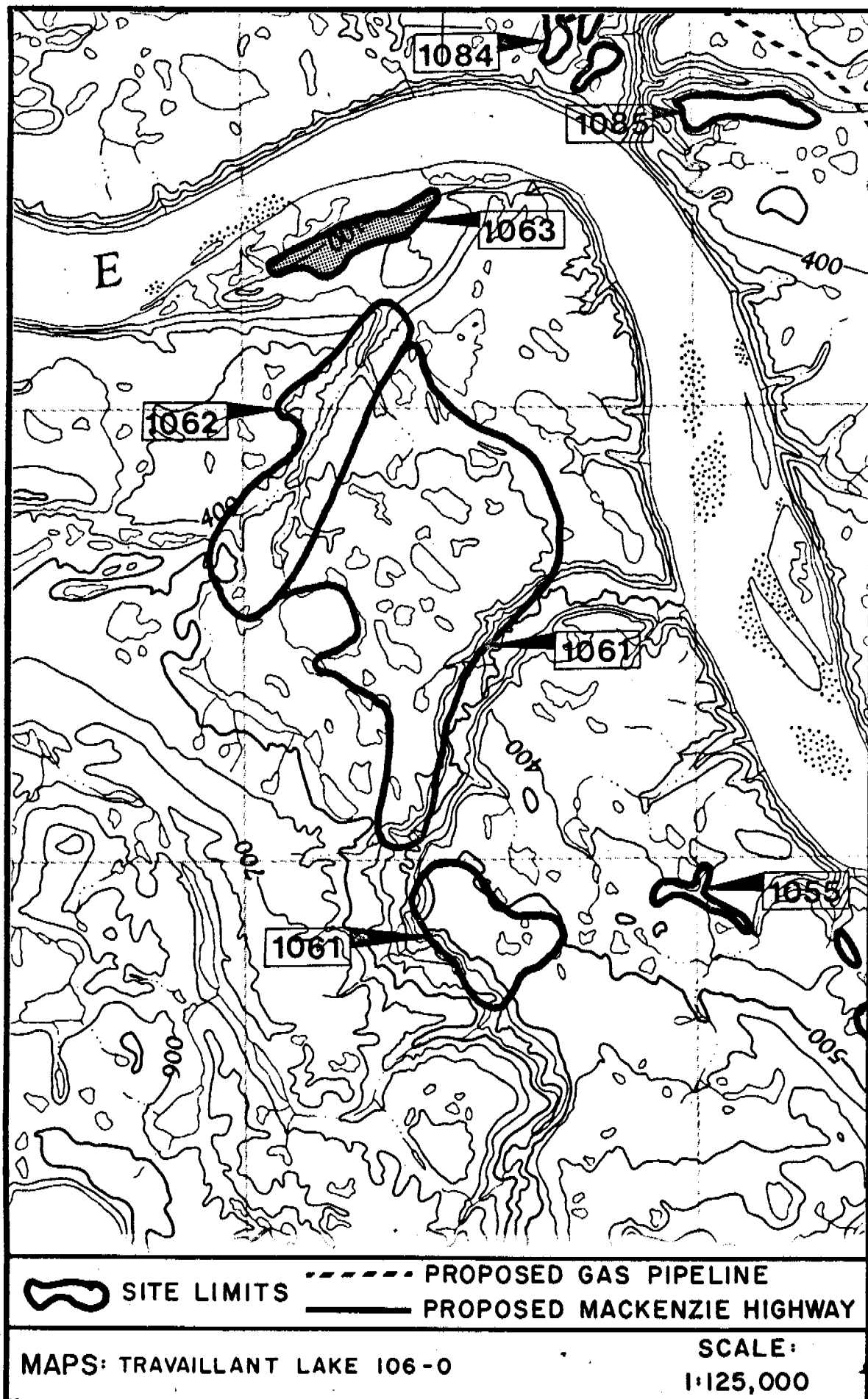
Volume: 4,500,000 cu. yd., volume estimate is probably reliable.



Area: 300 acres.

Drainage: The site is well drained.

Assessment: The material at site 1063 is of poor quality and only marginally useful as general fill. Access is difficult because of the Mackenzie River and haulage distance long. The site is environmentally sensitive. For these reasons site 1063 is not recommended for development.



ENVIRONMENTAL SENSITIVITY INDEX

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL

MAXIMUM

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

TOTAL INDEX : 365

SPECIAL CONCERNS:

On west bank of Mackenzie River. Moose winter habitat adjacent. Effect of development and transportation operations on Mackenzie bank stability is main concern. Material must cross river.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY

100

TO

MAXIMUM
SENSITIVITY

500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1063		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	PEAT -silty, brown	NOT FROZEN					1
2	SM	SAND -some silt, fine grained, moist, light brown						2
3								3
4								4
5	SC	-some clay, grey brown	FROZEN					5
6								6
7								7
8								8
9	SC	SAND & CLAY - some silt, sand fine grained, wet, medium grey brown - drier						9
10								10
11								11
12								12
13								13
14								14
15								15
16						16		
17		END OF HOLE						17

DATE DRILLED: Sep.24/73


LOGGED BY: EBA
142-2

COMPLETION DEPTH: 16.5'

DRILLING METHOD: AUGER

THAW DEPTH: 4.5

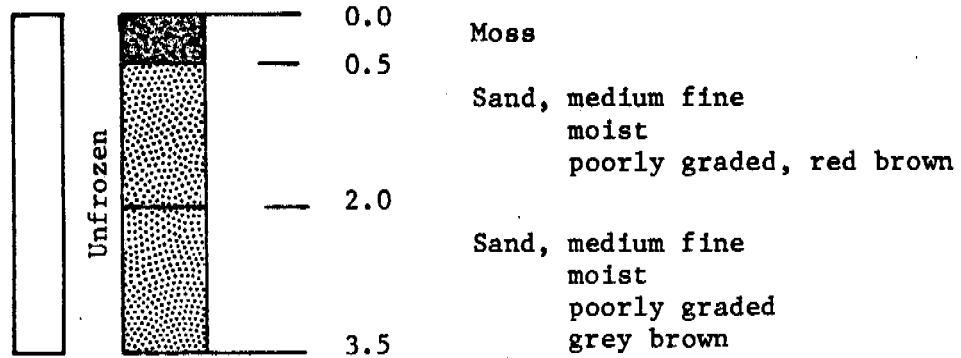
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1063-1

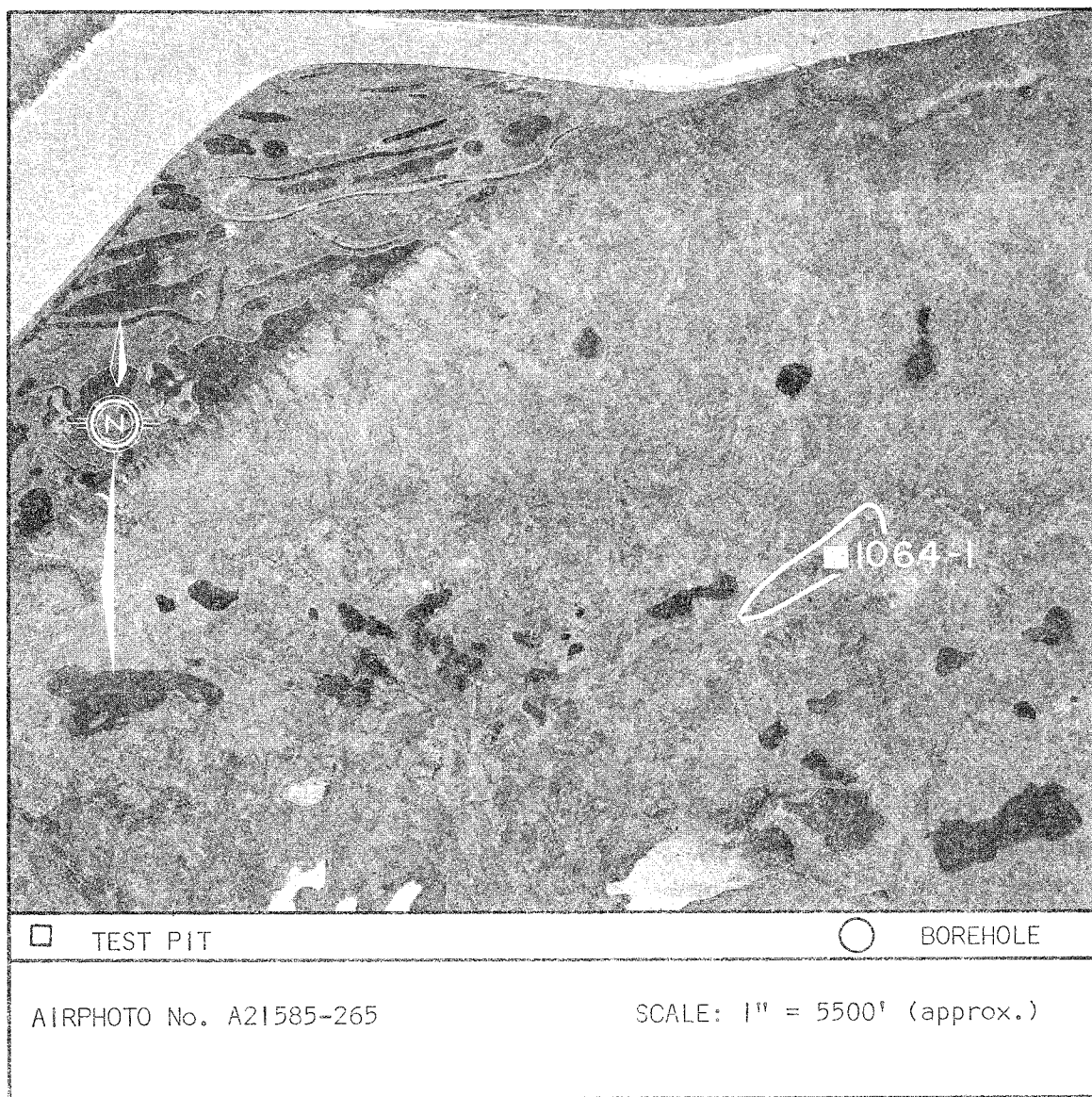


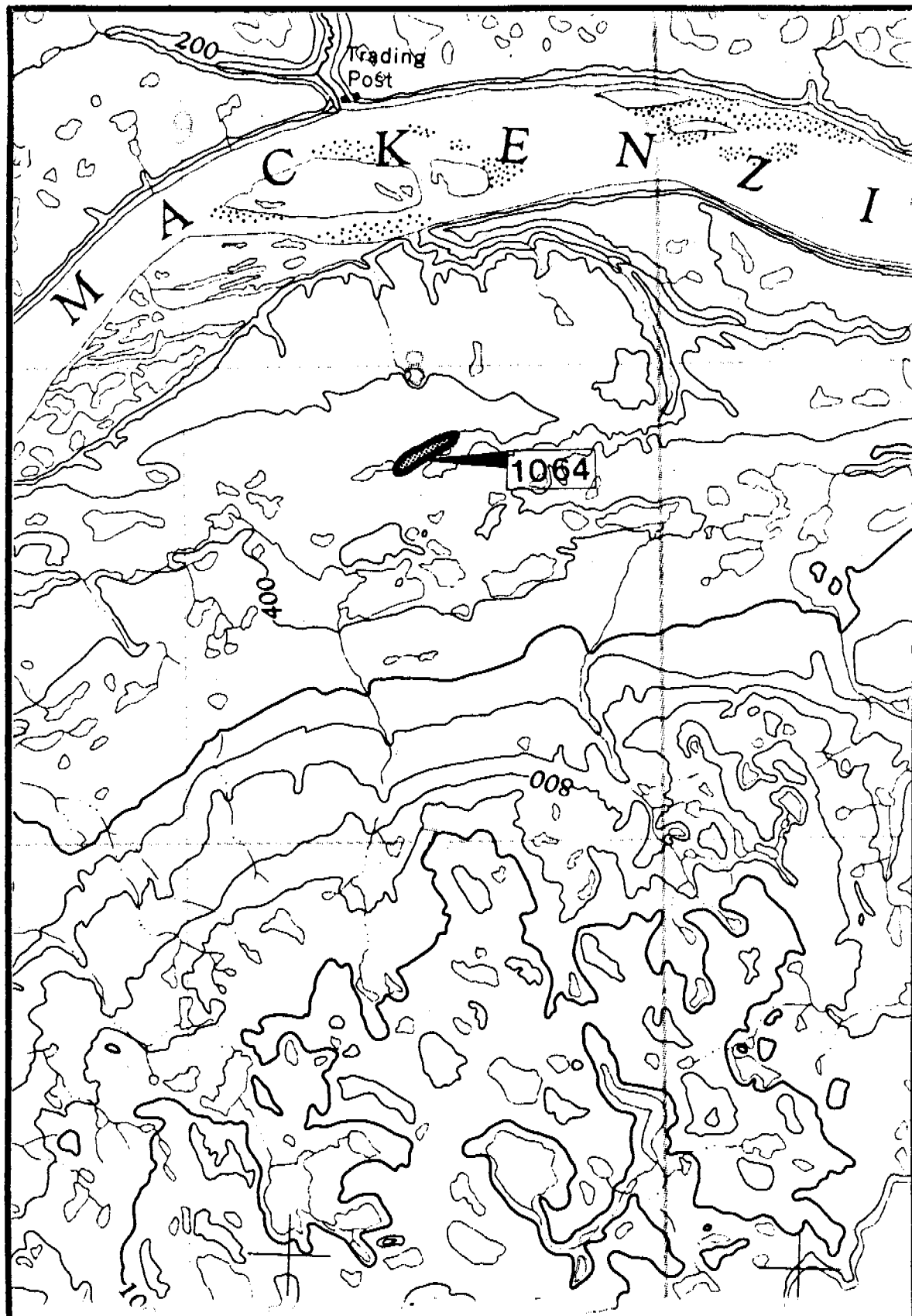
SITE 1064a




Location: Site 1064 is situated on the south side of the Mackenzie River 4 1/2 miles south of the point of confluence of the Travaillant and Mackenzie Rivers. The proposed pipeline route is 9 miles north of the site.

Material: Silt.

Assessment: The material at site 1064 is unsuitable for construction purposes, therefore the site is not recommended for development.



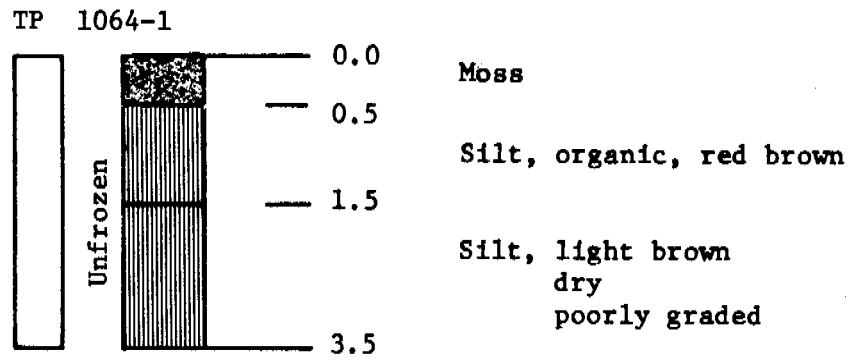


 SITE LIMITS  PROPOSED GAS PIPELINE
 PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

TEST PIT LOG



SITE 1065

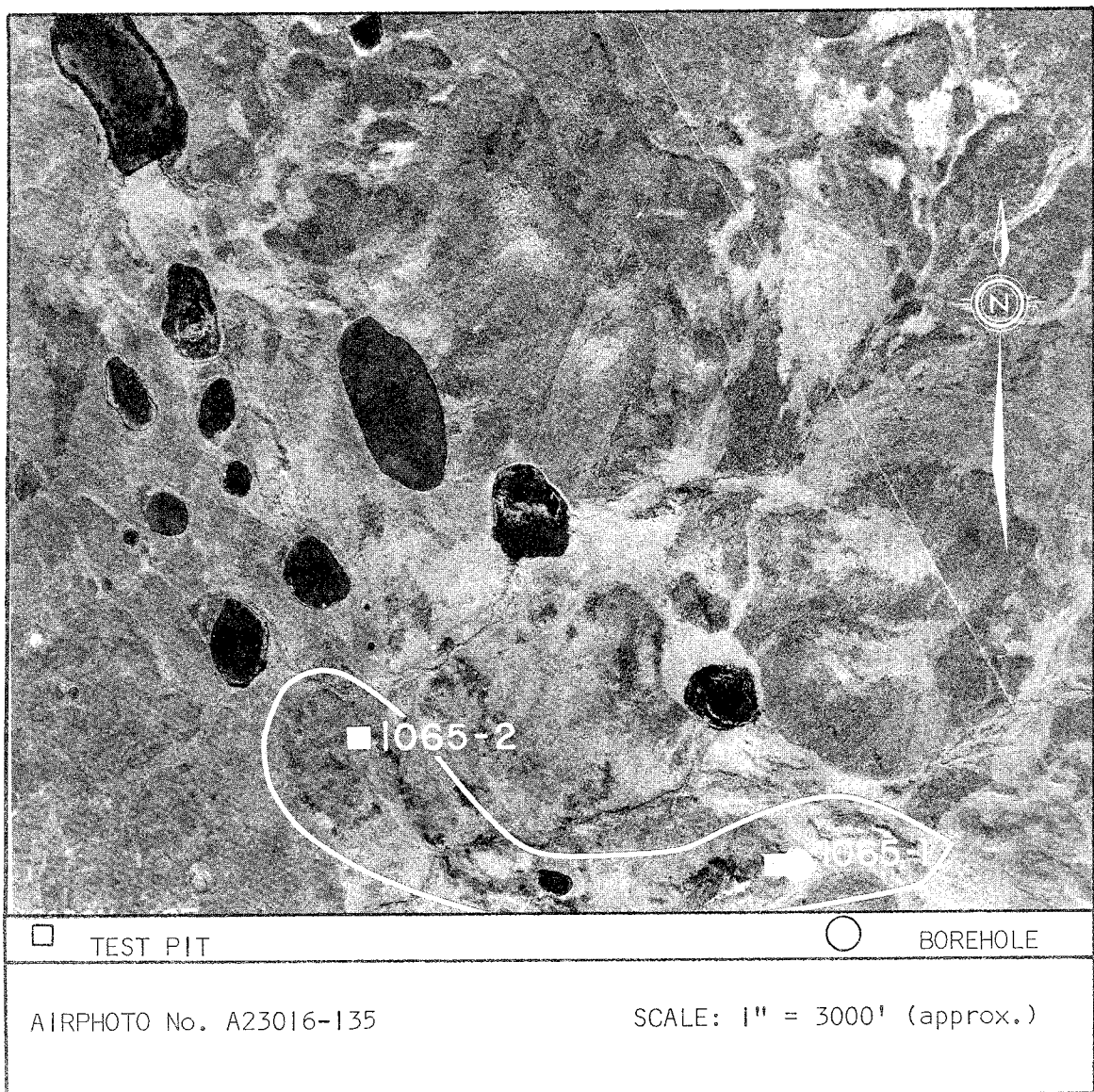
Location: Site 1065 is situated 8 miles south of In and Out Lake. The proposed pipeline route is 12 miles north of the site.

Geology: Site 1065 is an esker-kame ridge. Material is expected to be variable.

Material: Sand and gravel, some silt, with depth gravel content decreases and silt content increases, well graded.

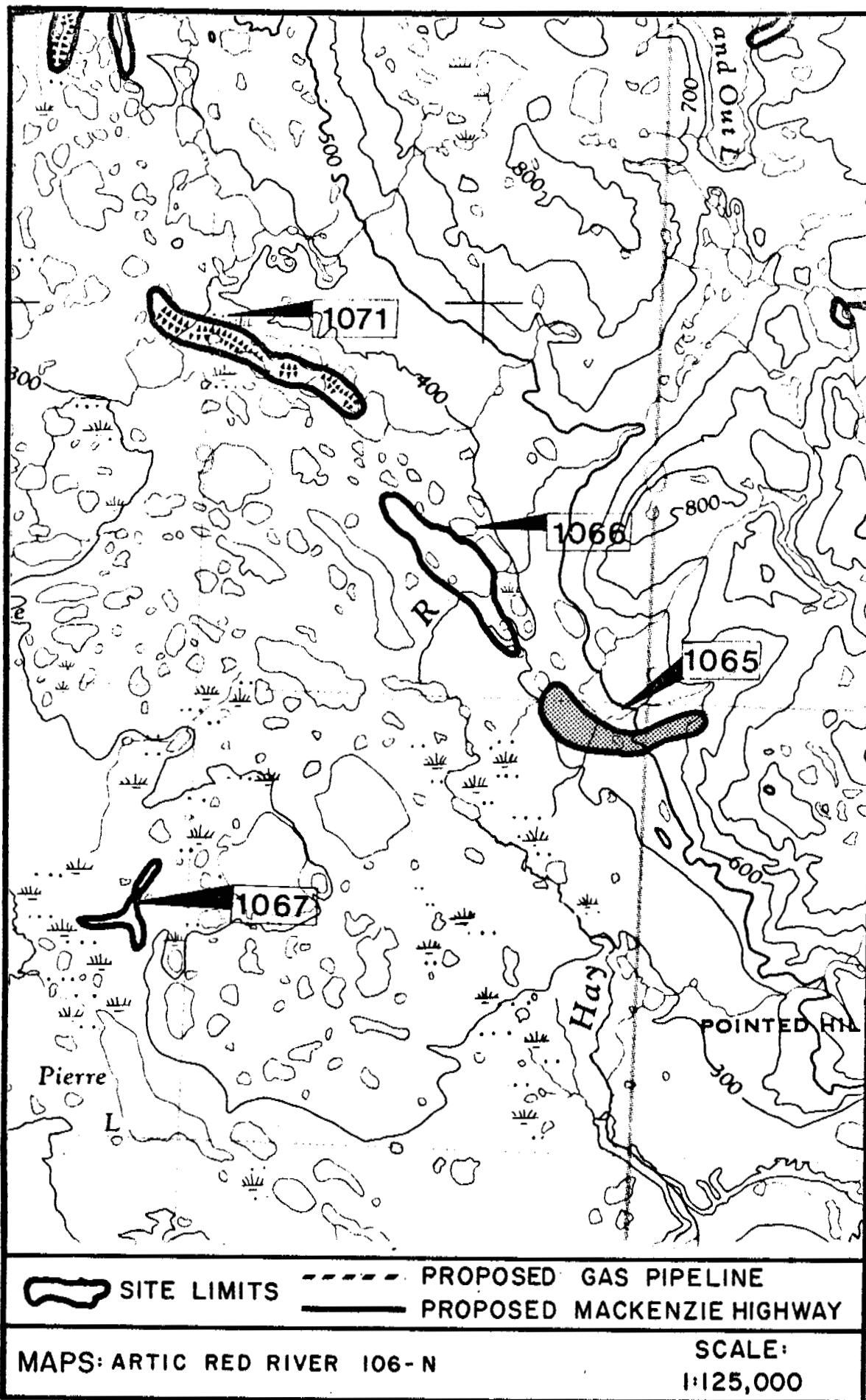
Volume: 6,000,000 cu.yd., estimate seems realistic.

Area: 200 acres.



Drainage: The site is well drained.

Assessment: A relatively large volume of unfrozen sand and gravel suitable as general fill, was encountered at site 1065. The material is very dry which would facilitate handling and compaction during winter construction. The material at the west end of the site is of better quality than that at the east end. Overburden is thin to negligible however moderately dense tree cover will have to be removed. Access to the site crosses thermally sensitive terrain thereby necessitating a winter operation. Haulage distance is very long.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS	R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN			6	ARCHAEOLOGY		
1 2 3	Formation Stability	Flat Land, Terrace, Knoll,		1 2 3	Paleontology	Probability of Discovery.	
4 5	Ice Content	Rolling, Outcrop, Ridge,		4 5	Pre-Historic	Low, Medium, High.	
Rating: 15		Scarp, Overburden Type & Depth, Wet Site, Dry Site.		Rating: 10	Historic	Known Sites.	
5	VEGETATION			10	AESTHETICS		
1 2 3	Aesthetic Value	Marsh		1 2 3	Visible from:	River, Highway, Air	
4 5	Habitat Value	Black Spruce		4 5	Physical Disturbance	Dust, Waste, Stockpiles, Noises.	
Rating: 15		Muskeg		Rating: 10			
		White Spruce		15	RESOURCE UTILIZATION		
		Mixed Conifer		1 2 3	Fort Good Hope	Improved Access.	
		Conifer - Deciduous		4 5	Arctic Red R.	Trappines.	
		Deciduous		Rating: 45	Inuvik	Hunting, Fishing, Domestic, Commercial.	
		Dry Slopes					
		Riparian					
15	MAMMALS			15	ASSOCIATED DISTURBANCES		
1 2 3	Ungulates	Winter Range, Summer Range.		1 2 3	Access Roads		
4 5	Furbearers	Migration Route.		4 5	Miles From Highway	0-2, 2-5, 5-10, 10+	
Rating: 45	Carnivores	Denning Area.		Rating: 60	Miles From Pipeline	0-2, 2-5, 5-10, 10+	
	Small Mammals	Dams and Lodges.			Hydrologic Alterations	Cuts and Fills.	
		Special Habitat Use.				Creek Crossings.	
10	BIRDS					Compaction, Slumping, Erosion.	
1 2 3	Waterfowl-Swans.	Migration Pathway, Moulting.				Stockpiles, Waste, Dust.	
4 5	Geese, Ducks	Spring Staging, Fall Staging.					
Rating: 20	Game Birds	Nesting-Brooding, Perching.					
	Raptors	Winter Habitat.					
	Shorebirds						
	Passerine						
10	FISHERY			10	RESTORATION		
1 2 3	Lakes, Tributaries.	Spawning, Nursery, Feeding.		1 2 3	Soil Stabilization	Natural Regeneration.	
4 5	Mackenzie River:	Overwintering.		4 5	Visual Improvement	Grass-Legume Seeding.	
Rating: 20	Whitefish Smelt	Major Migration Route.		Rating: 10	Habitat Replacement	Transplants.	
	Grayling Sculpin	Siltation of Spawning Areas.				Sustained Maintenance.	
	Pike Goldeye	Benthic Communities.				Erosion Control Systems.	
	Trout-Perch Chub	Toxic Material Spill.					
	Lake Trout Dace	Slumps, Velocity Increments.					
	Burbot Walleye	Migration Barriers.					
	Suckers Char	Eutrophication.					
	Stickleback Cisco	Blasting.					

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


TOTAL INDEX: 250

SPECIAL CONCERNS: Upland area in Rabbit Hay drainage.


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

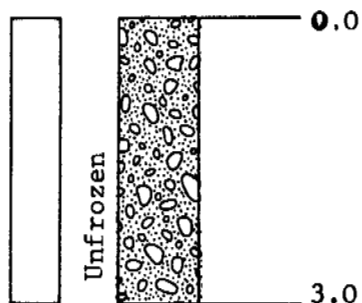
SITE NO. 1065		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	GM	SAND -fine, gravelly, fine to medium, some silt very dry, light brown	UNFROZEN					1
2								2
3								3
4		9.0% O. C. 32% GRAVEL 53% SAND 14% SILT & CLAY (4')						4
5	SM -ML	SAND -fine, silty, trace of fine gravel, very dry, light brown						5
6								6
7								7
8								8
9		-sand fine to medium grained						9
10		-silty, trace of clay, slight plasticity, wet, grey-brown.						10
11								11
12		5% GRAVEL 54% SAND 41% SILT & CLAY (10')						12
13								13
14		-clay increase to some clay drier						14
15								15
16								16
17							17	
DATE DRILLED: Sept.17/73			LOGGED BY: EBA 119-1	COMPLETION DEPTH: 20.5				
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. 1065		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	SM-ML	SAND -same, drier						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: Sept. 17/73		LOGGED BY: EBA 119-1		COMPLETION DEPTH: 20.5'				
DRILLING METHOD: AUGER			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

TEST PIT LOG

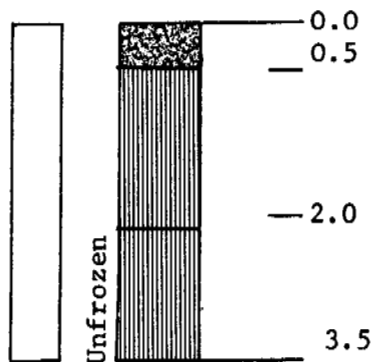
TP 1065-1



Gravel, light brown
dry
well graded

38% GRAVEL
47% SAND
15% SILT & CLAY

TP 1065-2

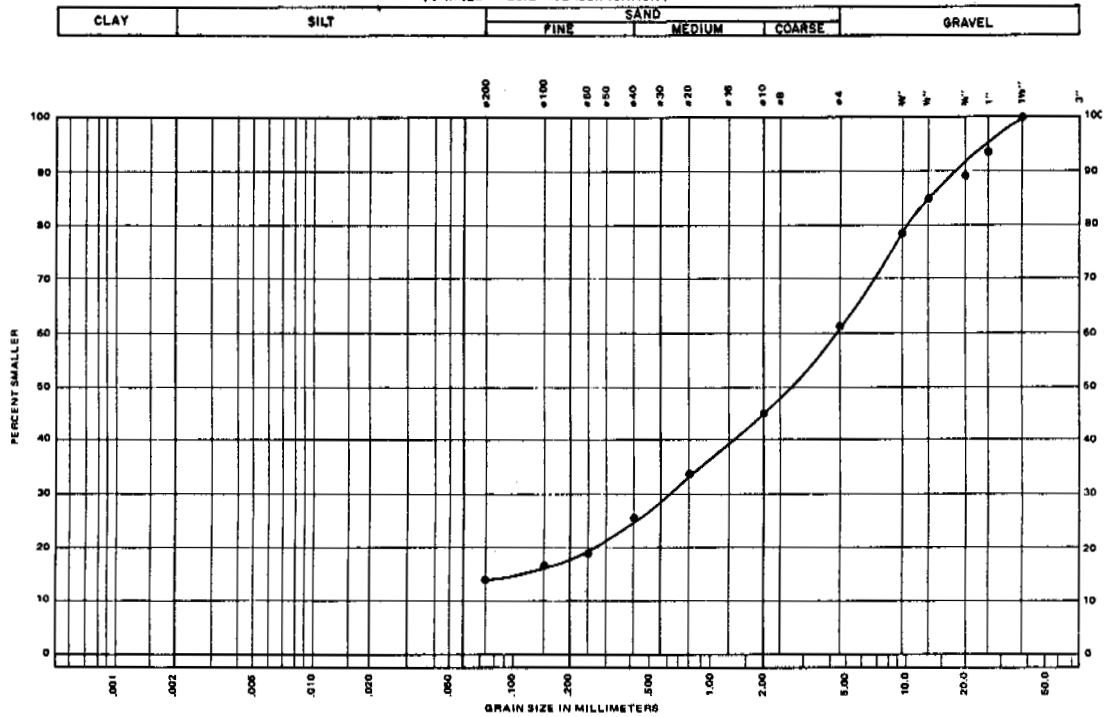


Moss

Silt, red-brown
dry

Silt, grey
dry

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

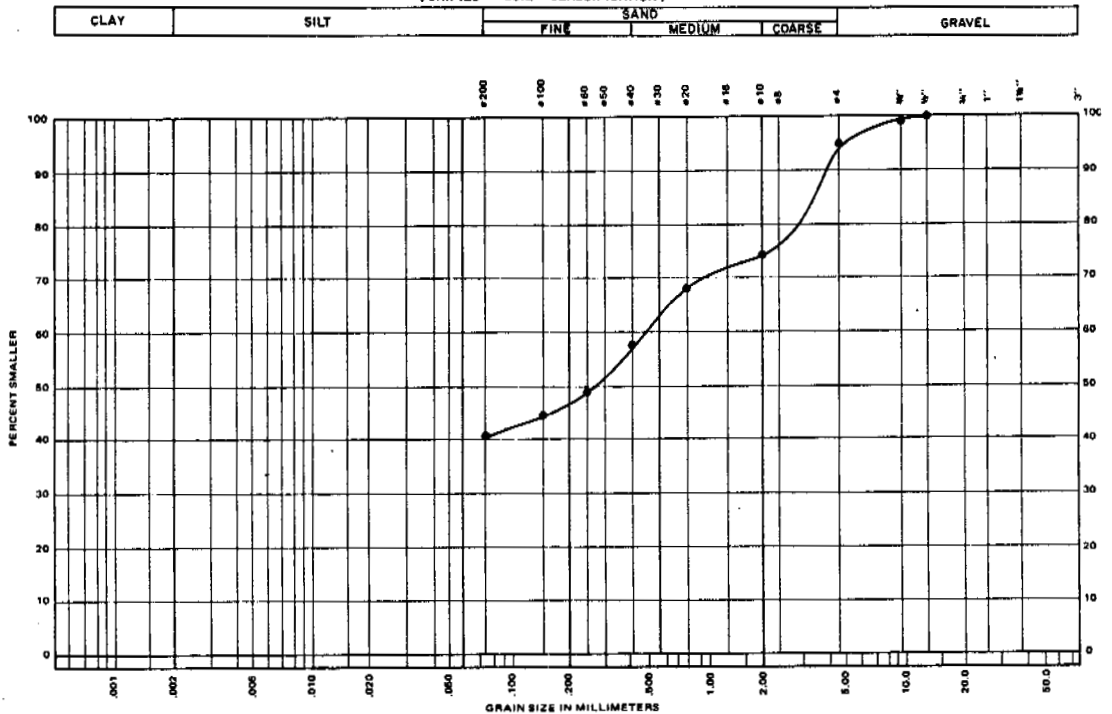


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel
and Some Silt (GM) H/C = 3.8%

PROJECT Granular Resources
JOB No. E-666 DATE Dec. 5/73
SAMPLE No. TP 1065-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



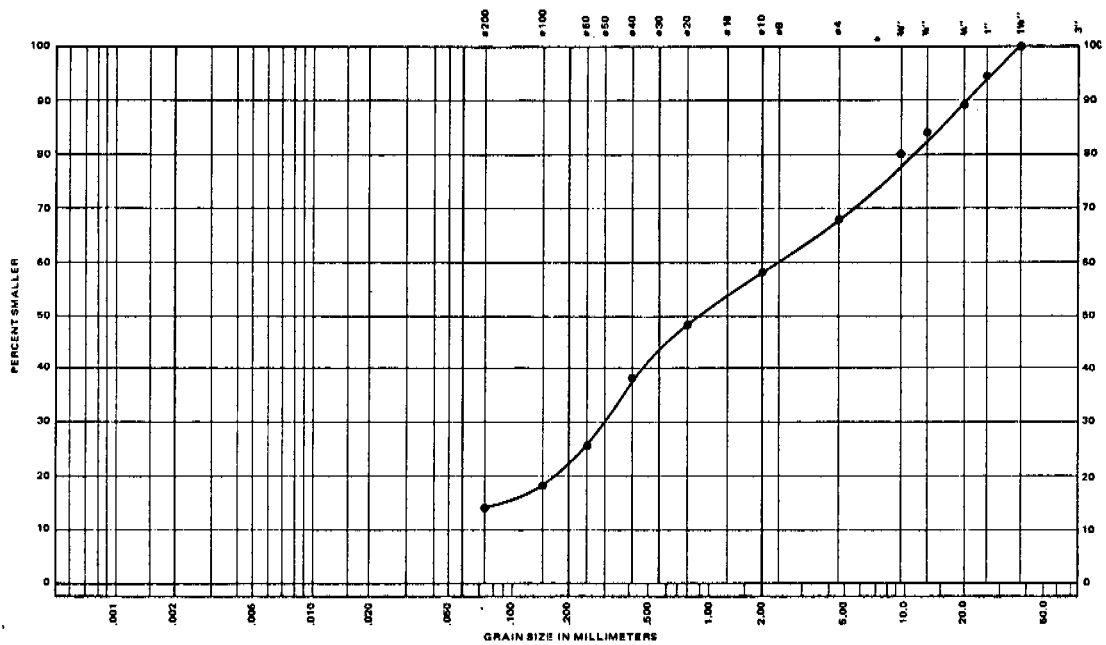
EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E-666 DATE Dec. 17/73
SAMPLE No. BH 1065-1
DEPTH 10'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel
and Some Silt (GM)

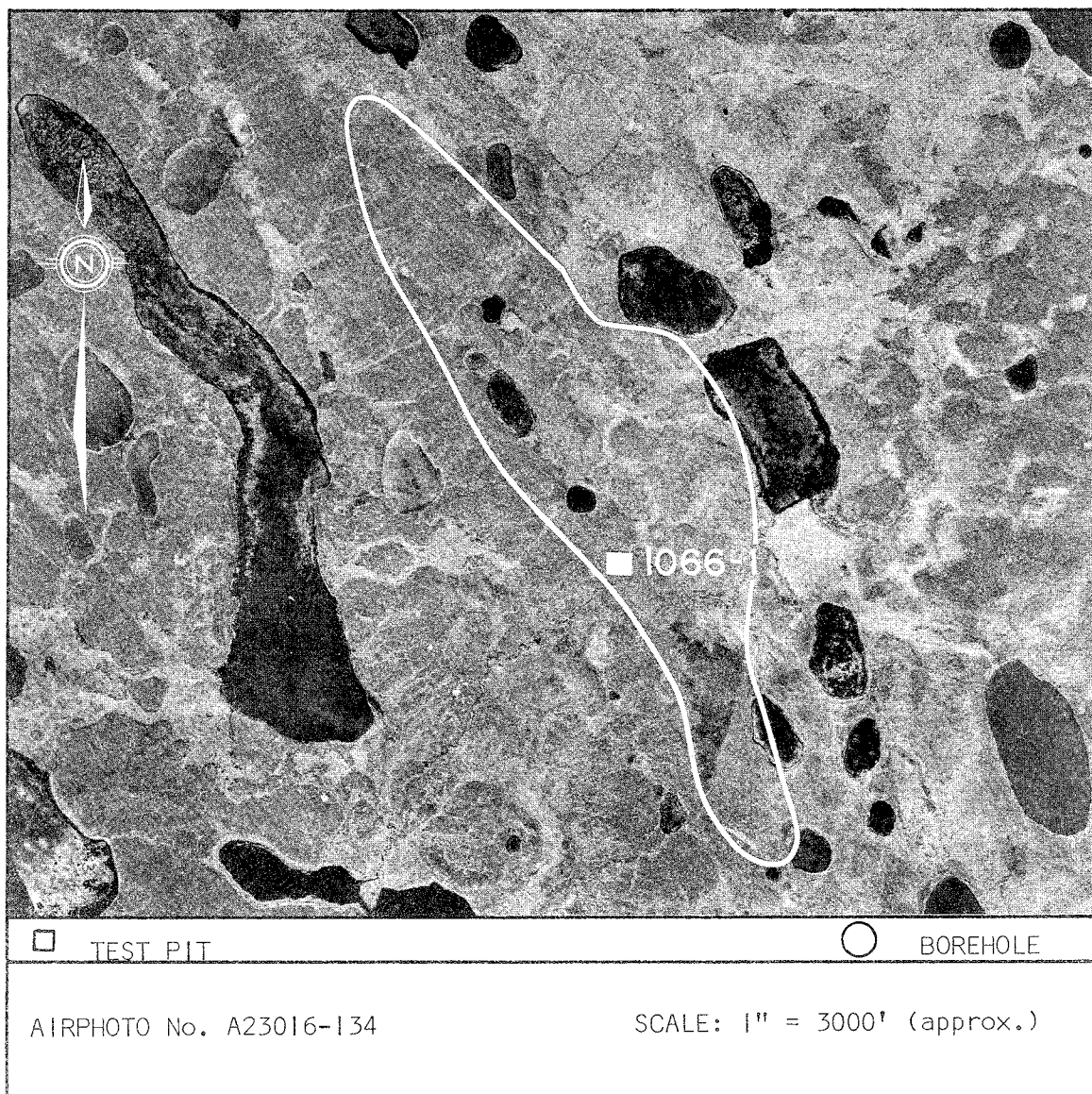
PROJECT Granular Resources
JOB No. E-666 DATE Dec. 20/73
SAMPLE No. BH 1065-1
DEPTH 4'

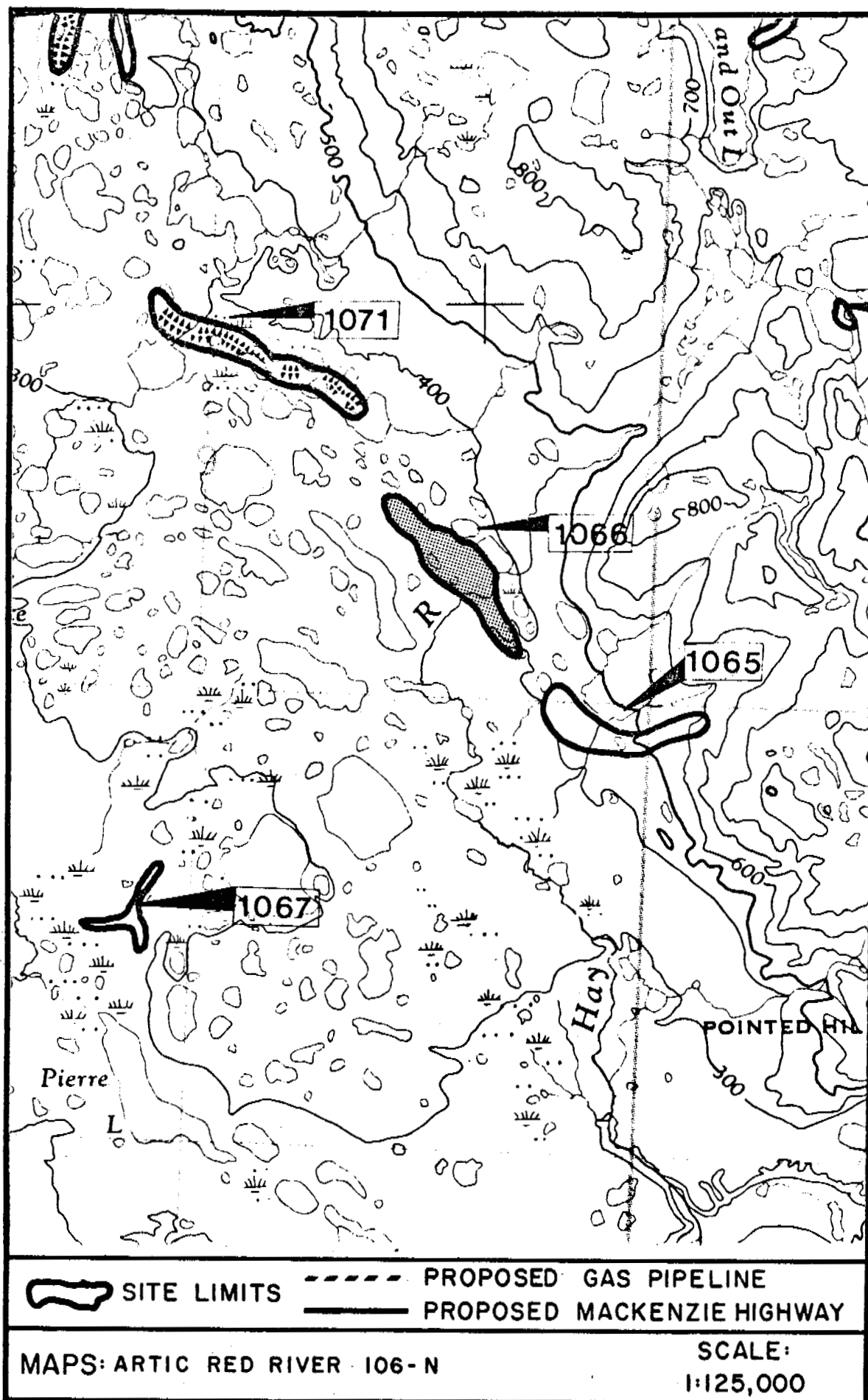
SITE 1066a

Location: Site 1066 is located 19 miles north of the point of confluence of the Rabbit Hay and Mackenzie Rivers. The site is 11 miles south of the proposed pipeline route and 16 miles south of the proposed highway route.

Material: Silt.

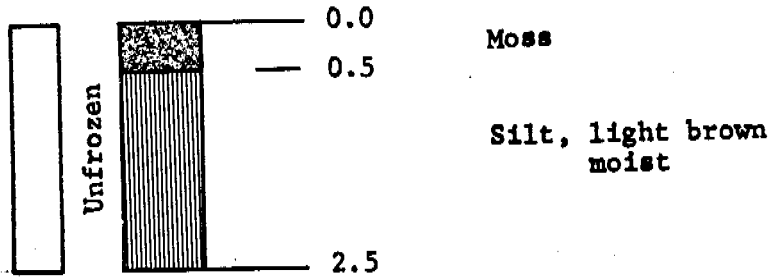
Assessment: The material at site 1066 was determined to be unsuitable for construction purposes. The site is not recommended for development.





TEST PIT LOG

TP 1066-1

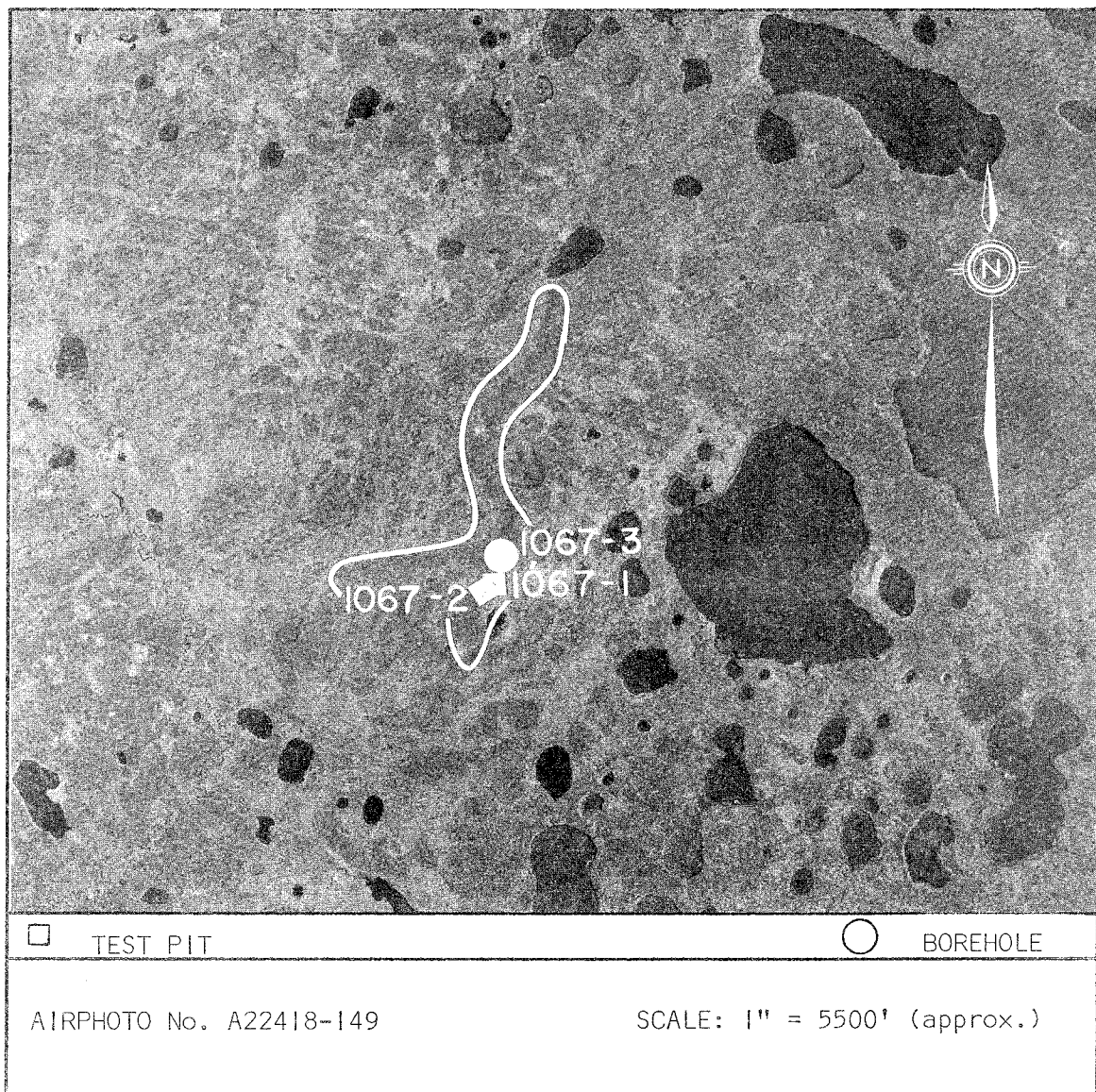


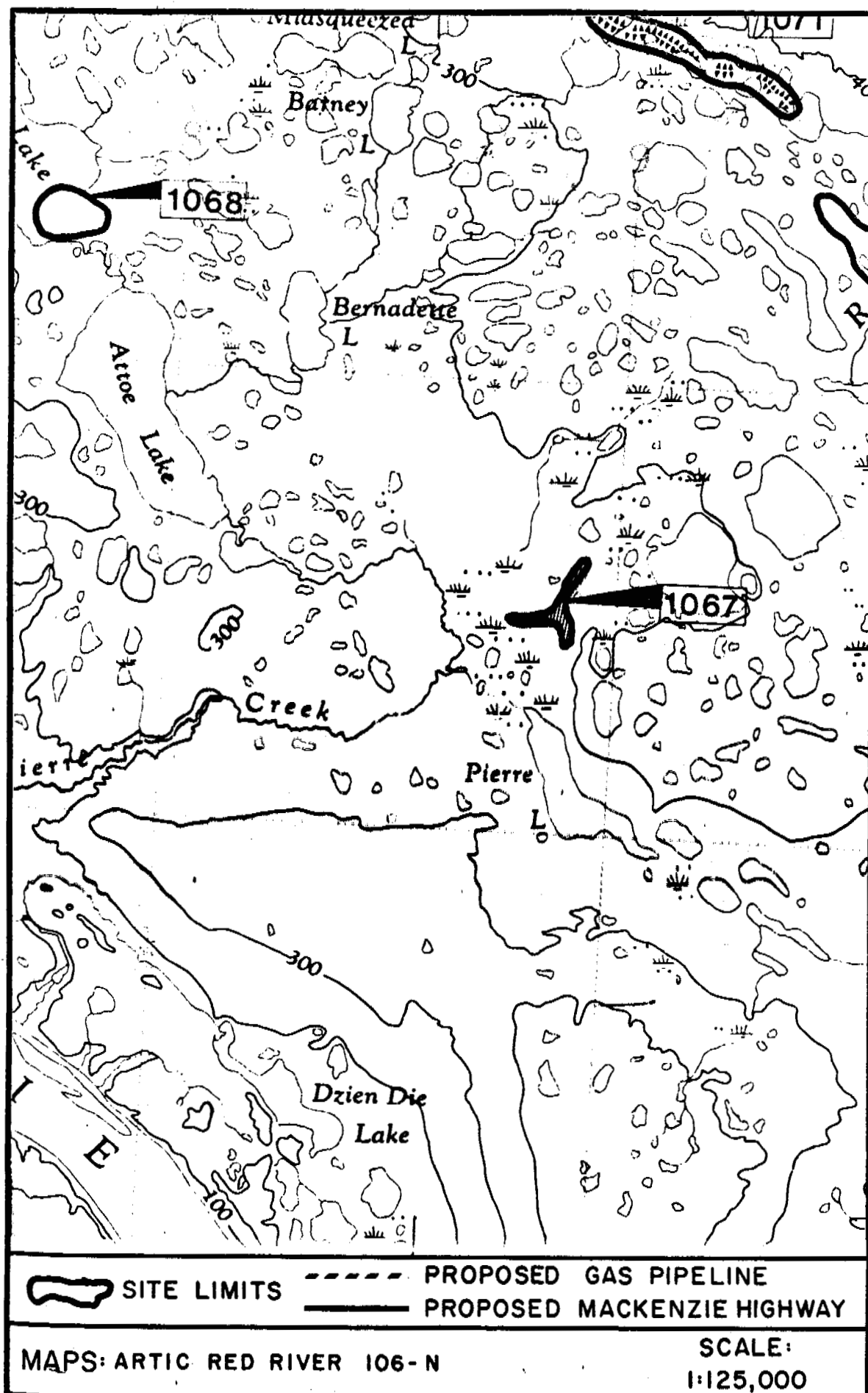
SITE 1067a

Location: Site 1067 is located 12 miles NWW of the point of confluence of Pierre Creek and the Mackenzie River. The proposed western pipeline route lies 10 miles to the north. The proposed northern pipeline and highway routes are 20 miles to the NNE of the site.

Material: Silt.

Assessment: The material at site 1067 is considered unsuitable for engineering purposes, therefore the site is not recommended for development.







GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1067		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SM	SILT -trace to some fine sand, some scattered fine gravel, dry, medium to light brown -finer gravel approaching coarse sand sizes -less gravel	UNFROZEN					1
2								2
3								3
4								4
5								5
6								6
7	CL	CLAY -some fine sand, some silt, low to medium plasticity, wet, grey. -stiffer, moist.						7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17							17	

DATE DRILLED: Sep. 17/73	LOGGED BY: EBA 116-1	COMPLETION DEPTH: 20.0'
DRILLING METHOD: AUGER		THAW DEPTH: N/A

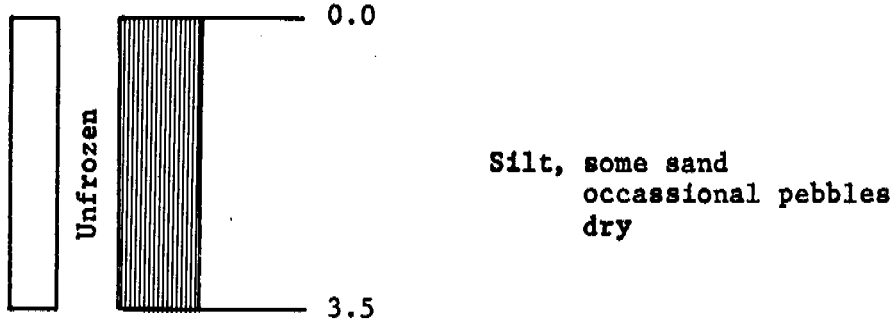
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

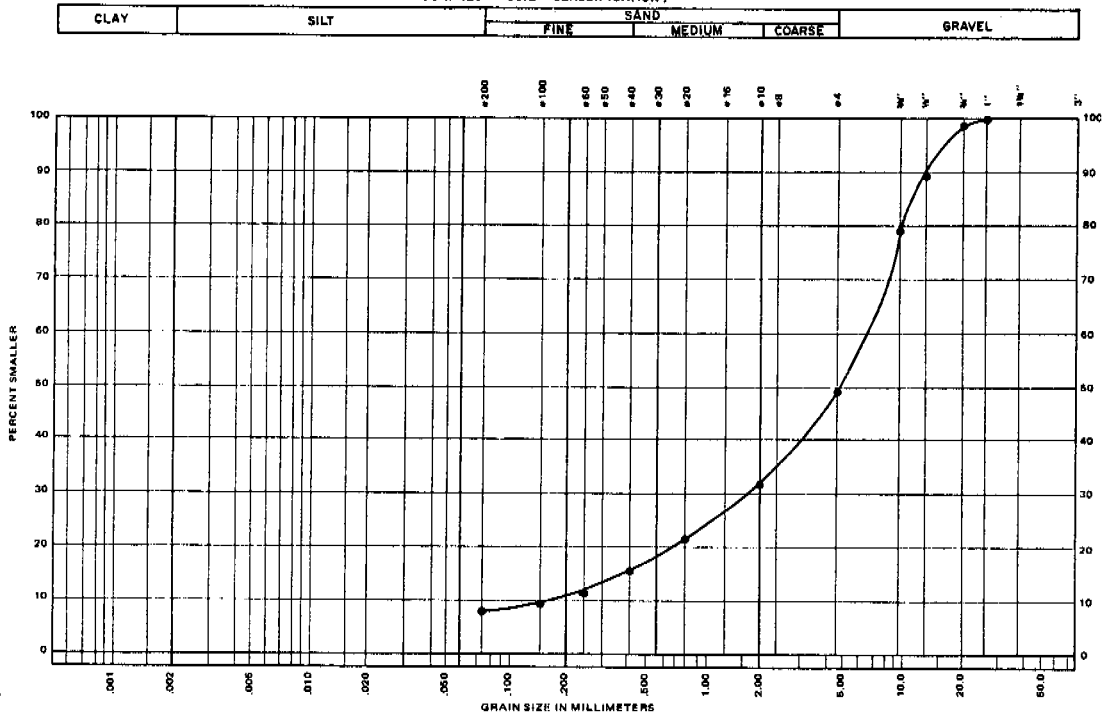
SITE NO. 1067		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	CL	CLAY -same, stiffer						18	
19								19	
20								20	
21		END OF HOLE						21	
22								22	
23								23	
24								24	
25								25	
26								26	
27								27	
28								28	
29								29	
30								30	
31								31	
32								32	
33								33	
34								34	
DATE DRILLED: Sep. 17/73			LOGGED BY: EBA 116-1		COMPLETION DEPTH: 20.0'				
DRILLING METHOD: AUGER			THAW DEPTH: N/A						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

TEST PIT LOG

TP 1067-1



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel With
A Trace of Silt (GM-GM) M/C=4.6%

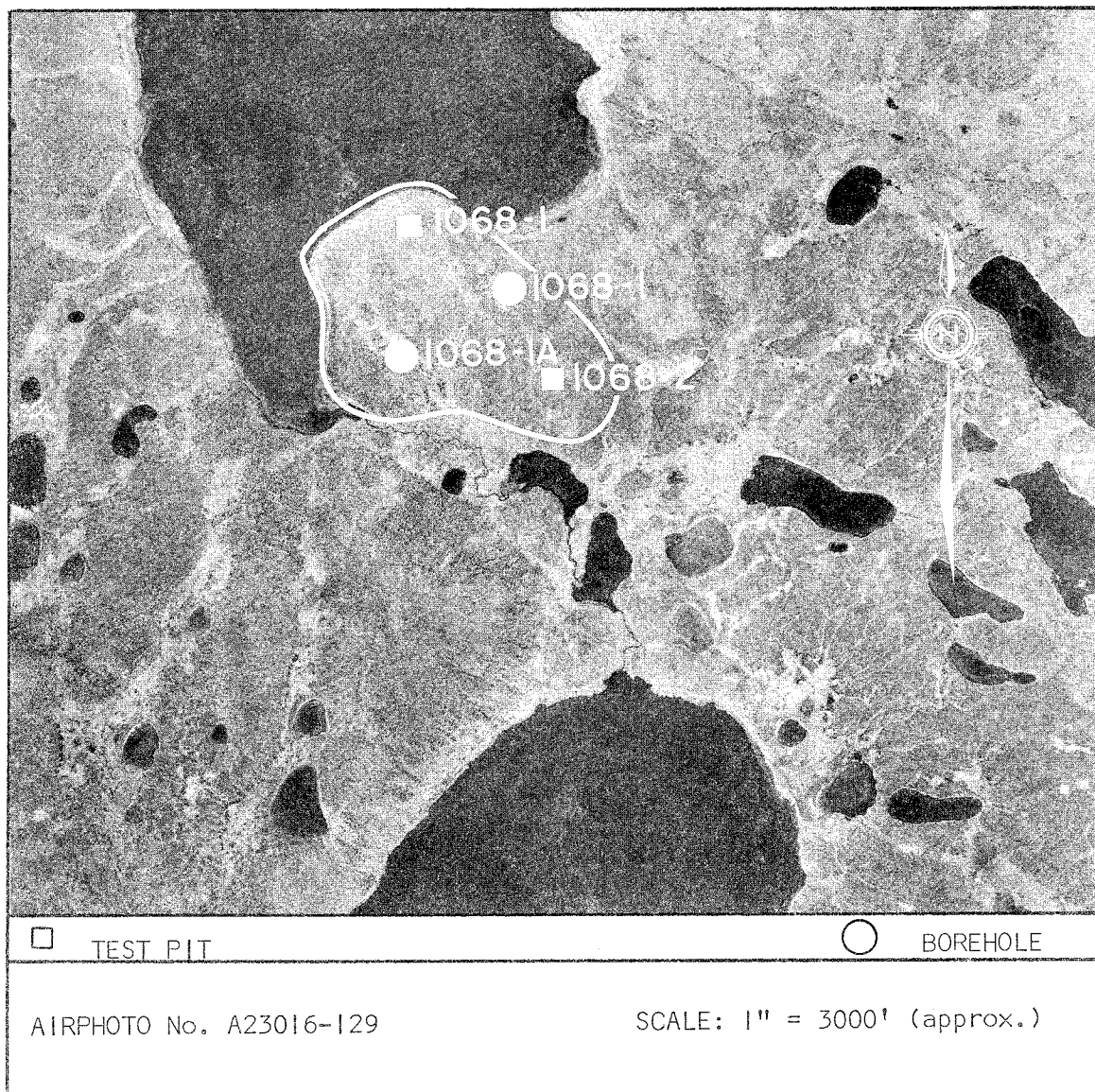
PROJECT Granular Resources
JOB No. E-666 DATE Nov. 13/73
SAMPLE No. TP 1067-2
DEPTH surface (fox den)

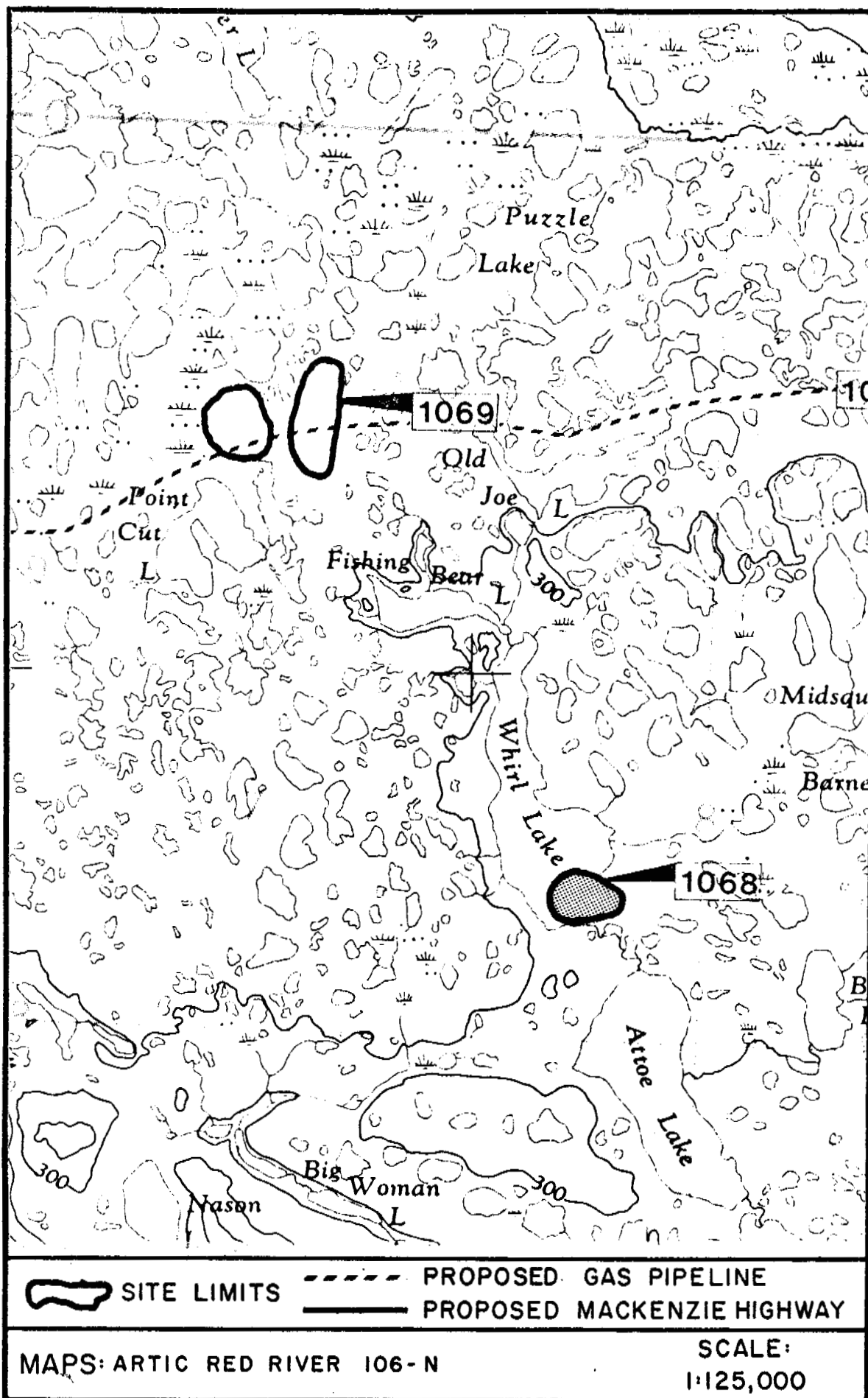
SITE 1068a

Location: Site 1068 is situated on the southern shore of Whirl Lake approximately 6 miles south of the proposed western pipeline route and 18 miles SWW of the proposed northern pipeline and highway routes.

Material: Silt.

Assessment: The material at site 1068 is unsuitable for engineering purposes. The site is not recommended for development.





GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1068		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT-OL	PEAT & ORGANIC SILT -fibrous, moist, dark brown	NOT FROZEN					1
2	SM	SILT -trace of sand, light brown						2
3	SM	SAND -trace of silt, fine grained light brown. -siltier	FROZEN					3
4								4
5								5
6	ML	SILT -trace fine sand, some clay, low plastic, medium brown						6
7	CL	CLAY -some silt, low to medium plasticity, moist to wet, grey-brown						7
8								8
9							9	
10							10	
11							11	
12							12	
13		END OF HOLE						13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 16/73


LOGGED BY: EBA
115-1

COMPLETION DEPTH: 12.0'

DRILLING METHOD: AUGER


THAW DEPTH: 2.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



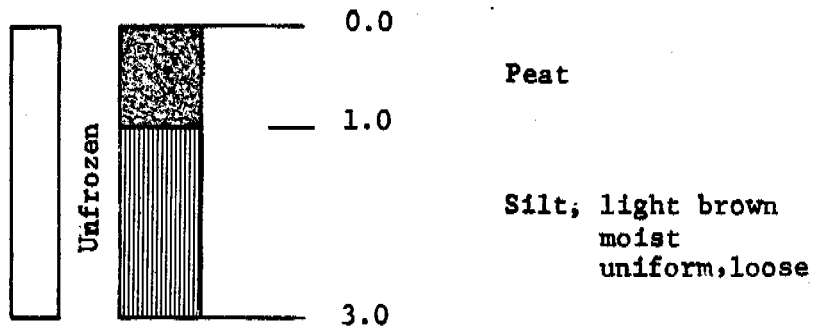
EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1068		HOLE NO. 1A		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	PEAT -fibrous, medium brown	NOT FROZEN					1
2	CL	CLAY -silty, moist, low to med. plasticity, grey-brown	FROZEN					2
3		-decreased silt content, trace to some silt, medium plasticity						3
4							4	
5							5	
6		-trace silt, medium plasticity, grey-brown					6	
7							7	
8						55	8	
9		END OF HOLE						9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
DATE DRILLED: Sep. 16/73			LOGGED BY: EBA 115-1A		COMPLETION DEPTH: 8.3'			
DRILLING METHOD: AUGER			THAW DEPTH: 3.0'					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				

TEST PIT LOG

TP 1068-1

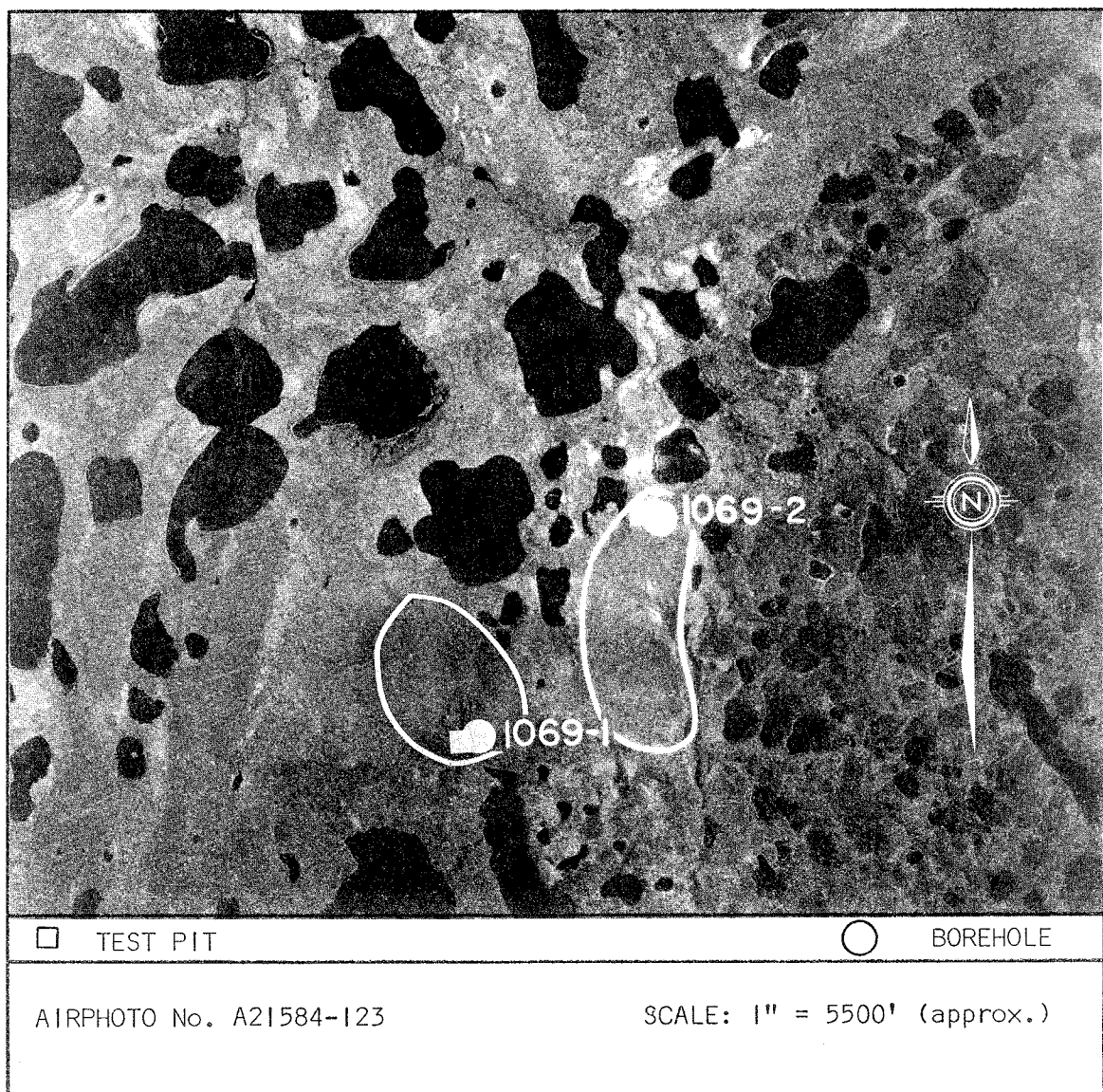


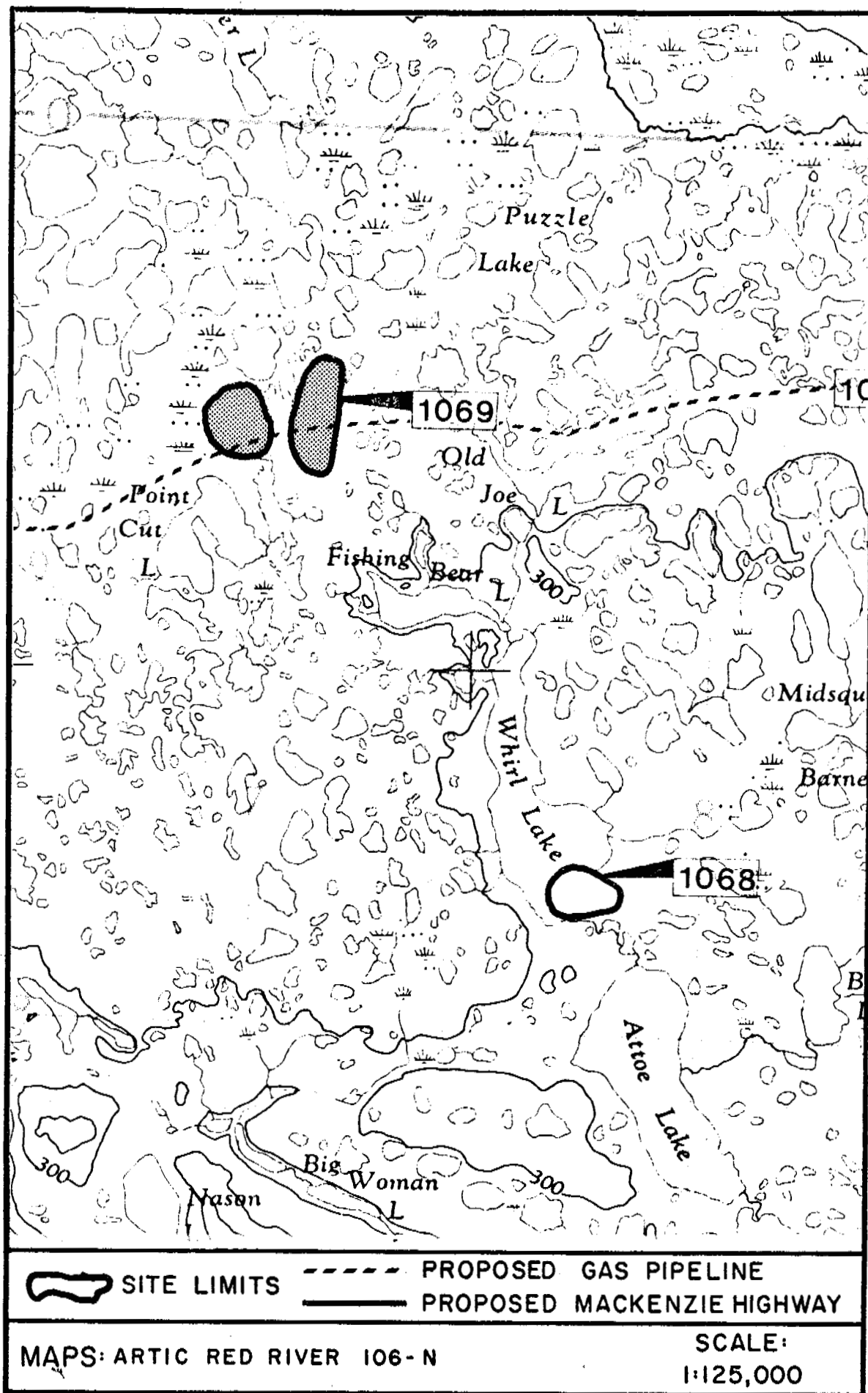
SITE 1069a

Location: Site 1069 is situated 13 miles NE of Arctic Red River. The proposed highway and northern pipeline routes are 13 miles NNE of the site. The site is directly on the proposed western pipeline route.

Material: Silt and sand with some gravel.

Assessment: The material at site 1069 is unsuitable for construction purposes. The site is not recommended for development.





GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1069		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	PEAT -fibrous, wet, medium brown.	UNFROZEN					1
2								2
3		-organic silty, dark brown	V _x -V _r high				322	3
4							560	4
5								5
6	SM	SILT -clayey, sandy, trace to some gravel, low to medium plasticity, wet, grey.					197	6
7								7
8		21% GRAVEL						8
9		(8') 35% SAND						9
		44% SILT & CLAY						
10		END OF HOLE						10
11								11
12								12
13		* VERY POOR DRAINAGE * 4' frozen peat cover						13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep.16/73

LOGGED BY: EBA 114-1

COMPLETION DEPTH: 9.0'

DRILLING METHOD: AUGER

THAW DEPTH: 1.9'

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AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1069		HOLE NO. 2		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	PEAT -very organic silty, dark brown	UNFROZEN					1
2								2
3								3
4	SM	SAND -silty, medium to coarse some fine to medium gravel, moist light to medium brown. 29% GRAVEL						4
5		(4') 55% SAND 16% SILT & CLAY						5
6								6
7	SM	SILT & SAND -trace to some fine rounded gravel, trace clay, wet, medium brown 16% GRAVEL	FROZEN					7
8		(6' + 8') 39% SAND 45% SILT & CLAY						8
9		-increased clay content, low plasticity, grey-brown						9
10		-no gravel content						10
11								11
12								12
13		-grey colour						13
14								14
15								15
16								16
17		END OF HOLE						17

DATE DRILLED: Sep. 16/73 LOGGED BY: EBA 114-2 COMPLETION DEPTH: 15.0'

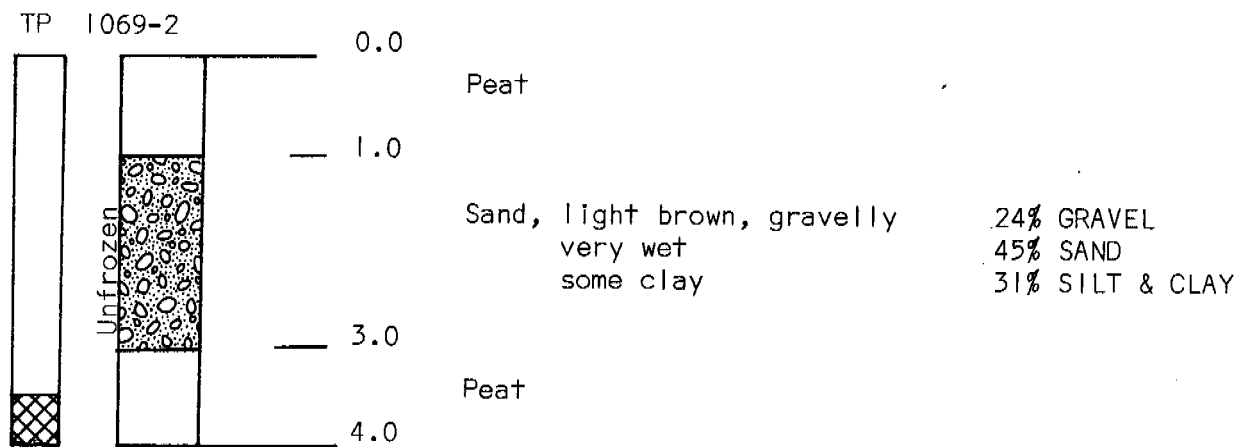
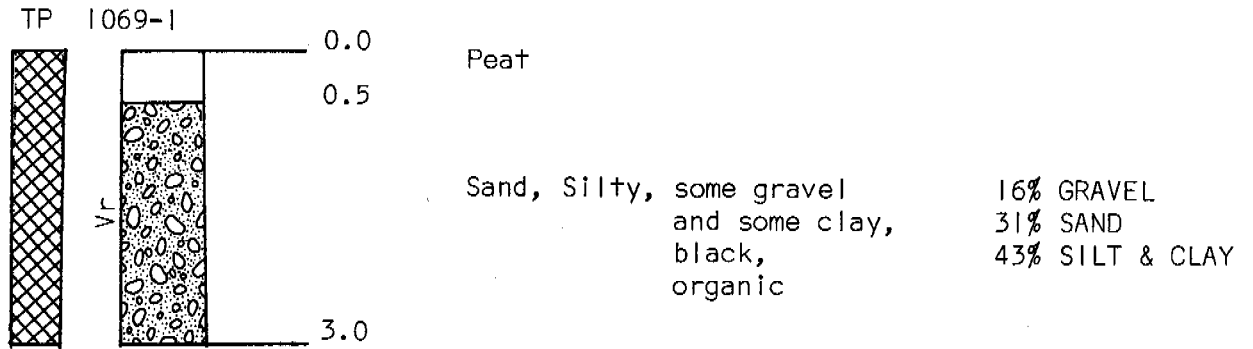
DRILLING METHOD: Auger THAW DEPTH: 6.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



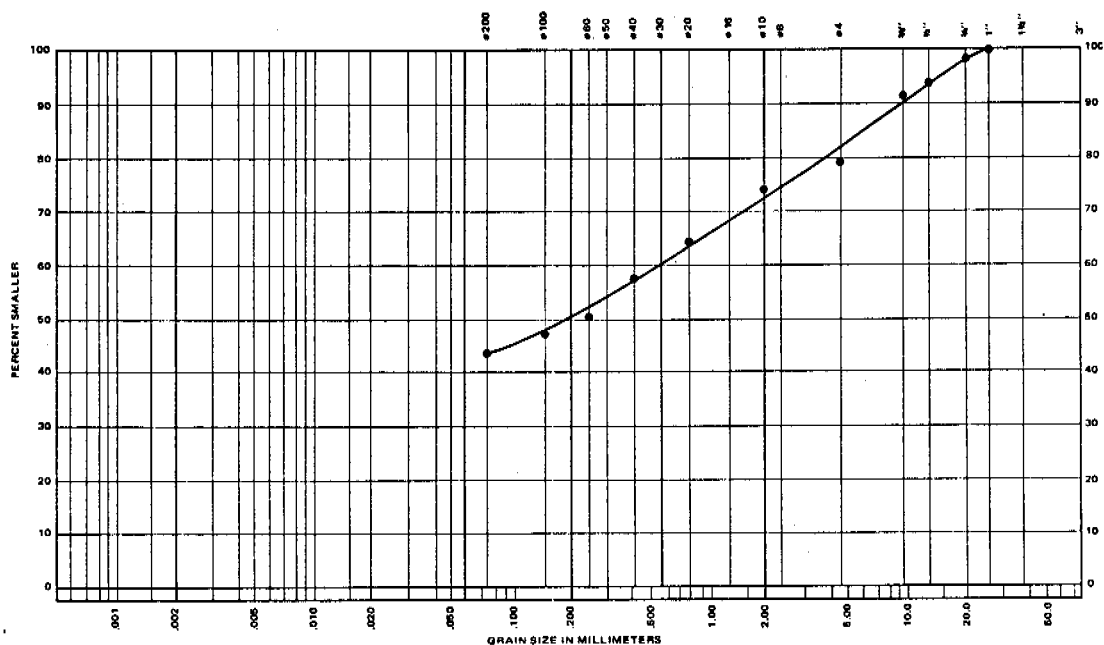
EBA Engineering Consultants Ltd.

TEST PIT LOG



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



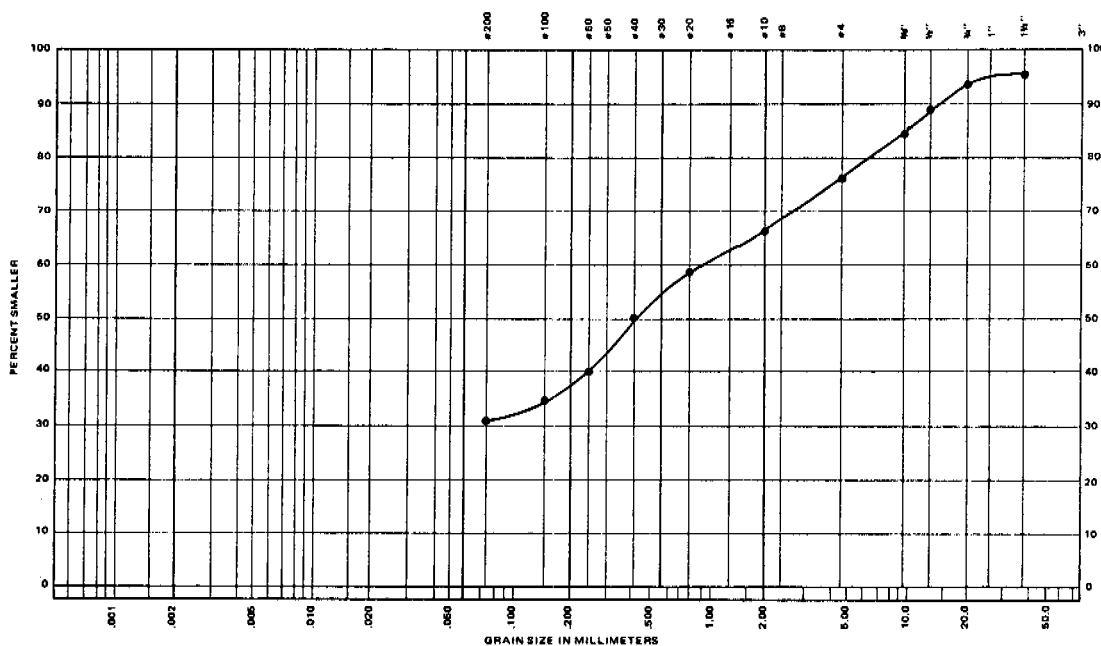
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand and
Some Gravel (SM-RL)

PROJECT Granular Resources
JOB No. E-666 DATE Jan. 11/74
SAMPLE No. BH 1069-1
DEPTH 8'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



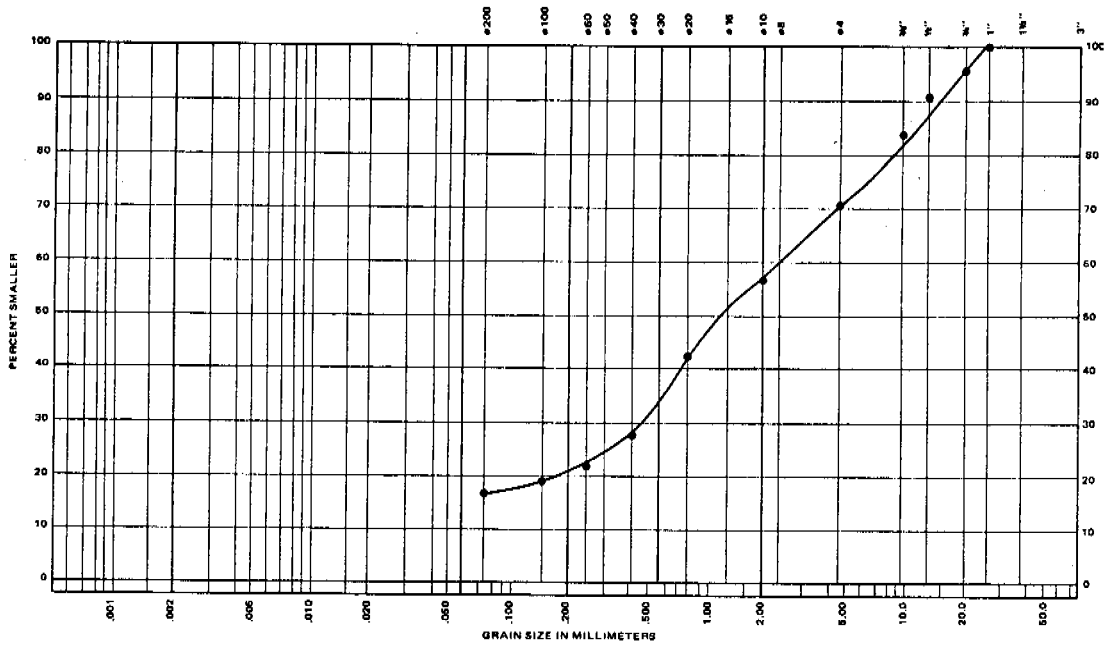
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt
Gravelly (SM) H/C = 13.98

PROJECT Granular Resources
JOB No. E-666 DATE Nov. 13/73
SAMPLE No. TP 1069-2
DEPTH 2'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



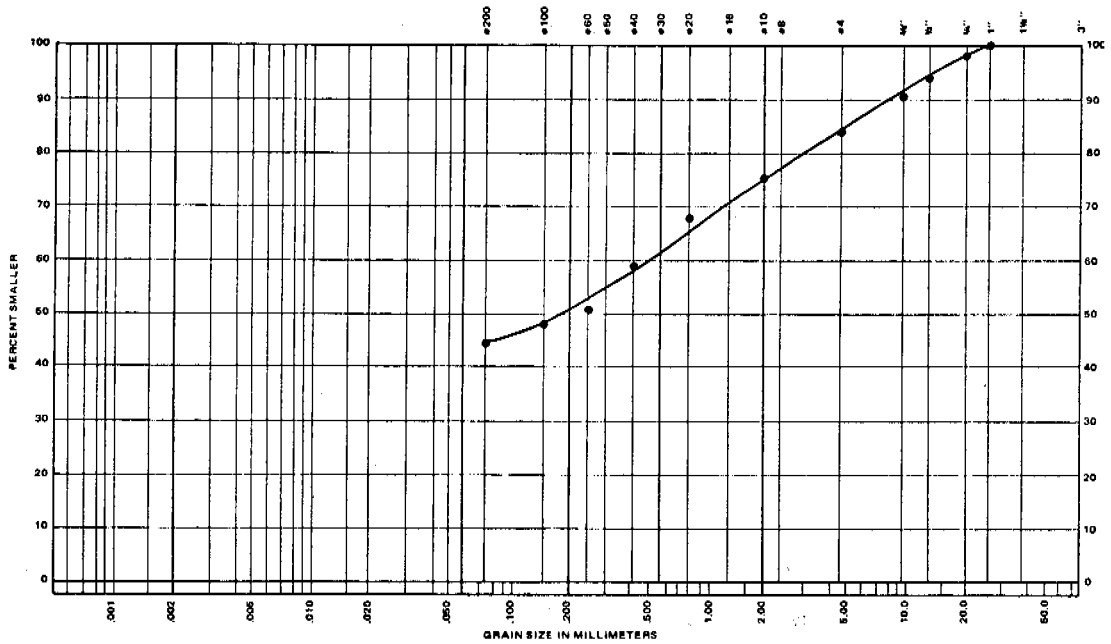
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and
Some Silt (SM)

PROJECT Granular Resources
JOB No. E-666 DATE Dec. 17/73
SAMPLE No. BH 1069-2
DEPTH 4'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand and
Some Gravel (SM)

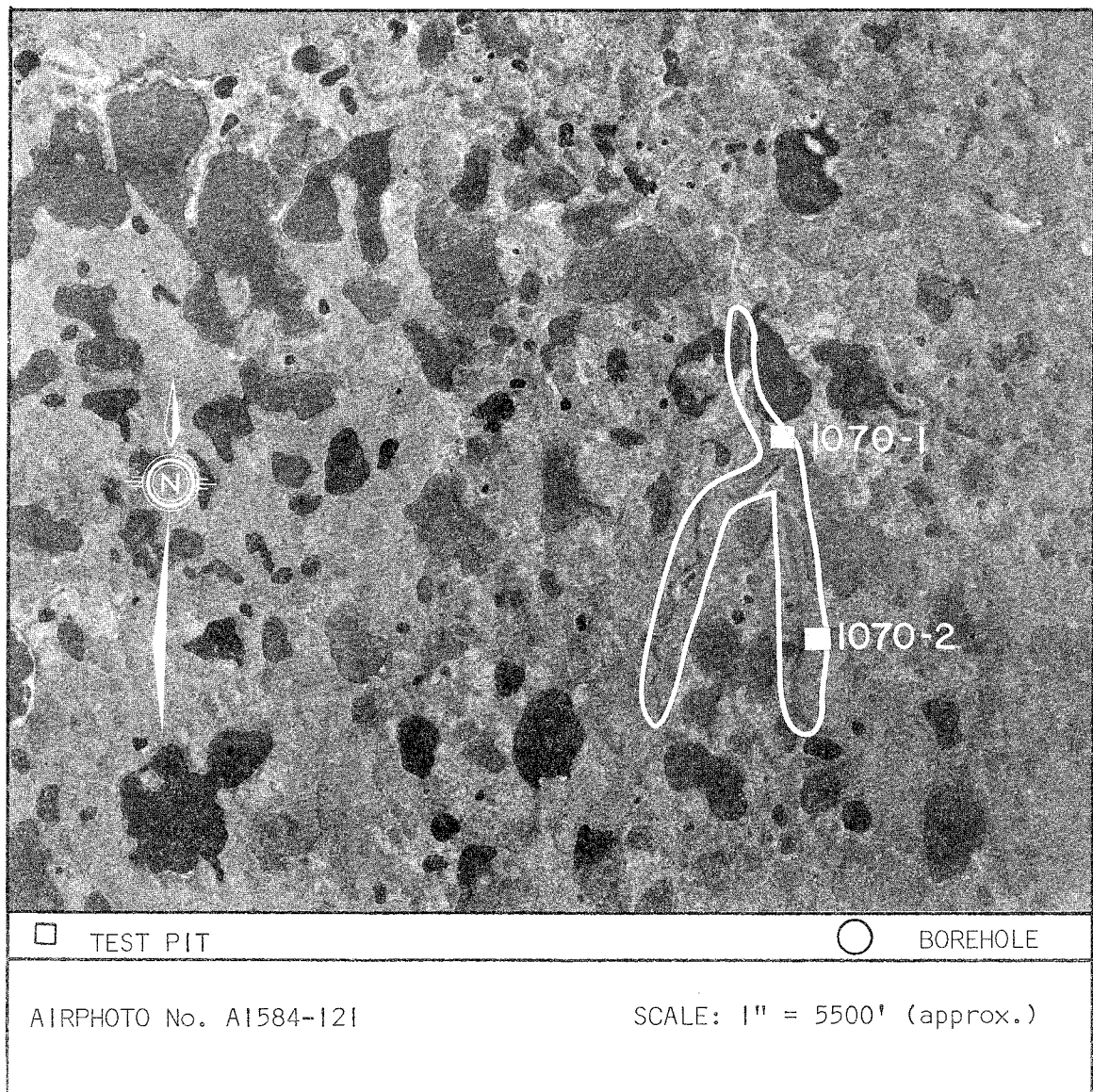
PROJECT Granular Resources
JOB No. E-666 DATE Dec. 17/73
SAMPLE No. BH 1069-2
DEPTH 6' + 8'

SITE 1070

Location: Site 1070 is situated 22 miles NEE of Arctic Red River. The proposed western pipeline crosses the site and the highway route lies 9 miles to the NNE of the site.

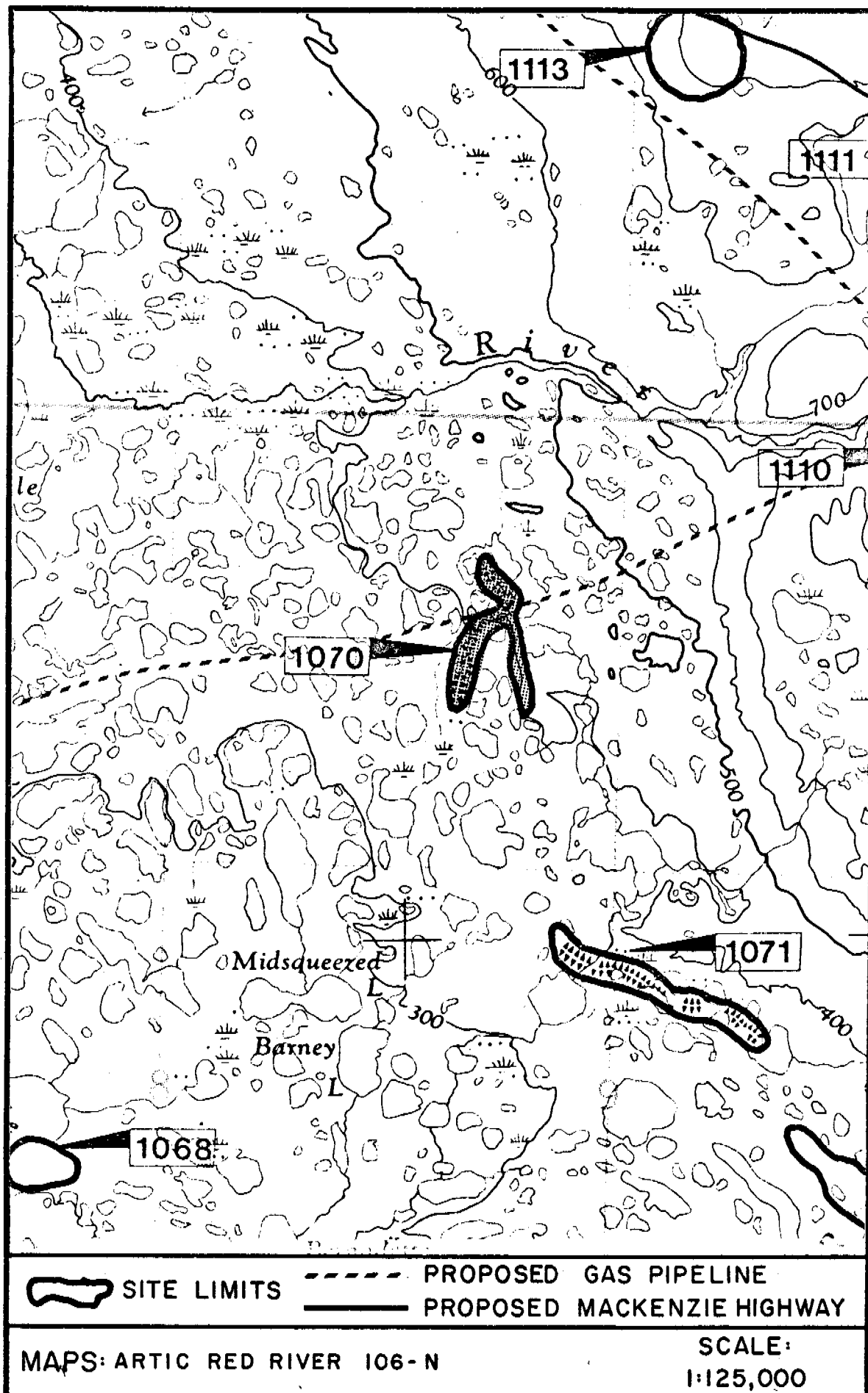
Geology: The material at site 1070 is contained in a relatively large esker.

Material: Clayey gravel to gravel and sand.



Assessment:

The material in this esker is generally of poor quality with small pockets of fair quality material. It is only marginally useful for construction purposes. The site is a poor prospect; however, because of material shortages in the area, the site may warrant further exploration work if the pipeline is to be constructed.



GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1070		HOLE NO. 2		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	ML	SILT -clayey, trace sand, some organics, grey-brown	NOT FROZEN					1
2								2
3								3
4	CL	CLAY -very silty, sandy, some to trace fine gravel, grey	FROZEN V _r					4
5								5
6								6
7		-silty, sandy, some fine to medium gravel						7
8								8
9		-no gravel, brown-grey						9
10								10
11		END OF HOLE						11
12		* 10' WEST & 3½' lower than top of esker						12
13							13	
14							14	
15							15	
16							16	
17							17	

DATE DRILLED: Sep. 17/73


LOGGED BY: EBA 117-2

COMPLETION DEPTH: 10'

DRILLING METHOD: AUGER

THAW DEPTH: 6.5'

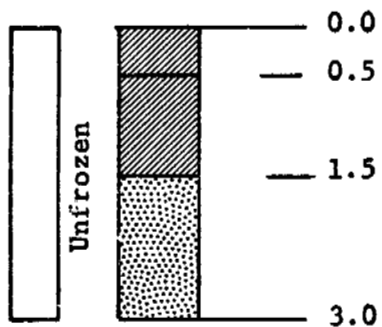
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1070-1

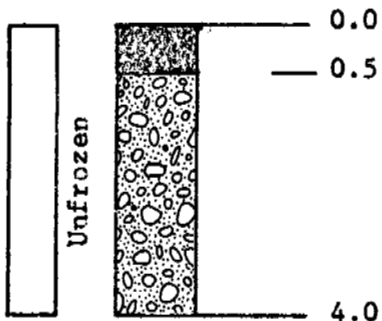


Clay, medium brown, organic

Clay, medium brown, silty
granular inclusions

Sand, medium brown
gravel with silt
well graded pebbles

TP 1070-2



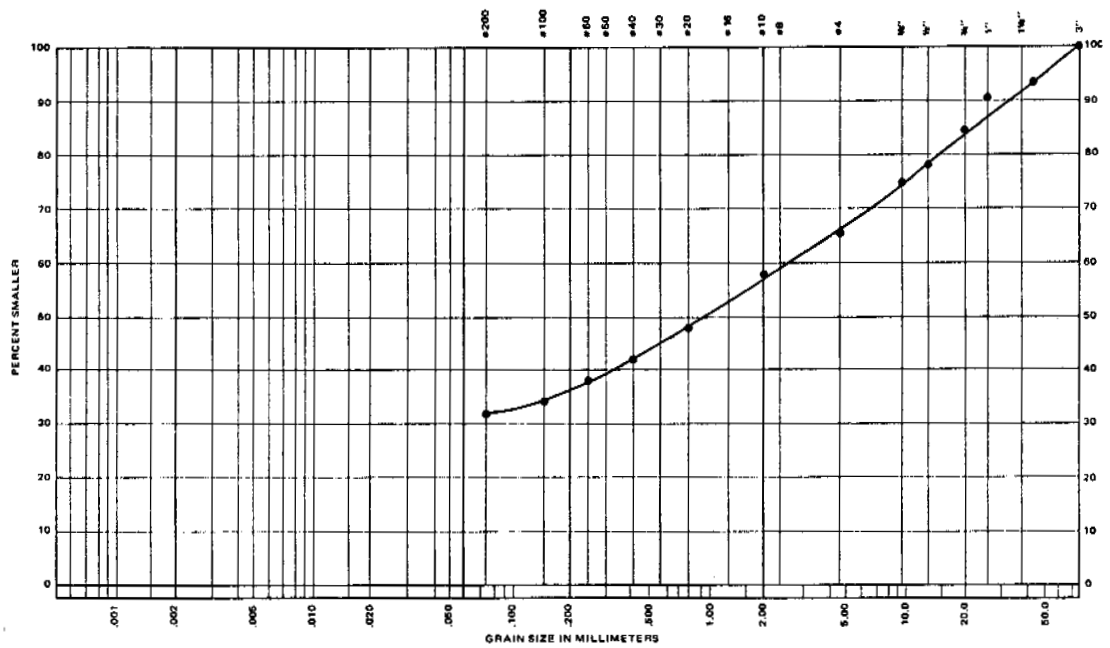
Peat

Sand and gravel,
some silt and clay
moist

32% GRAVEL
33% SAND
35% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand
and Silt (GM) M/C = 7.0%

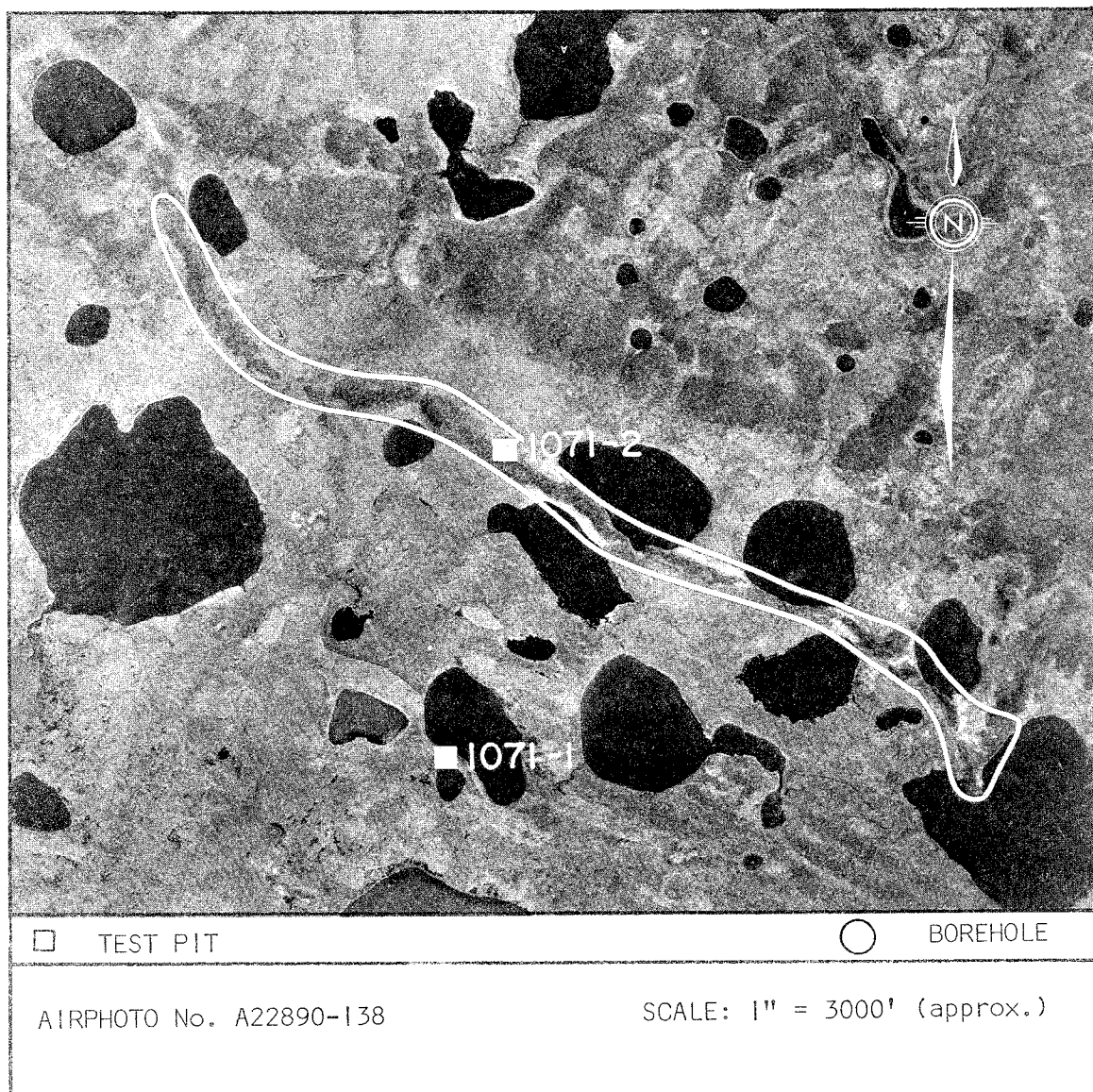
PROJECT Granular Resources
JOB No. E-666 DATE Dec. 5/73
SAMPLE No. TP 1070-2
DEPTH 4'

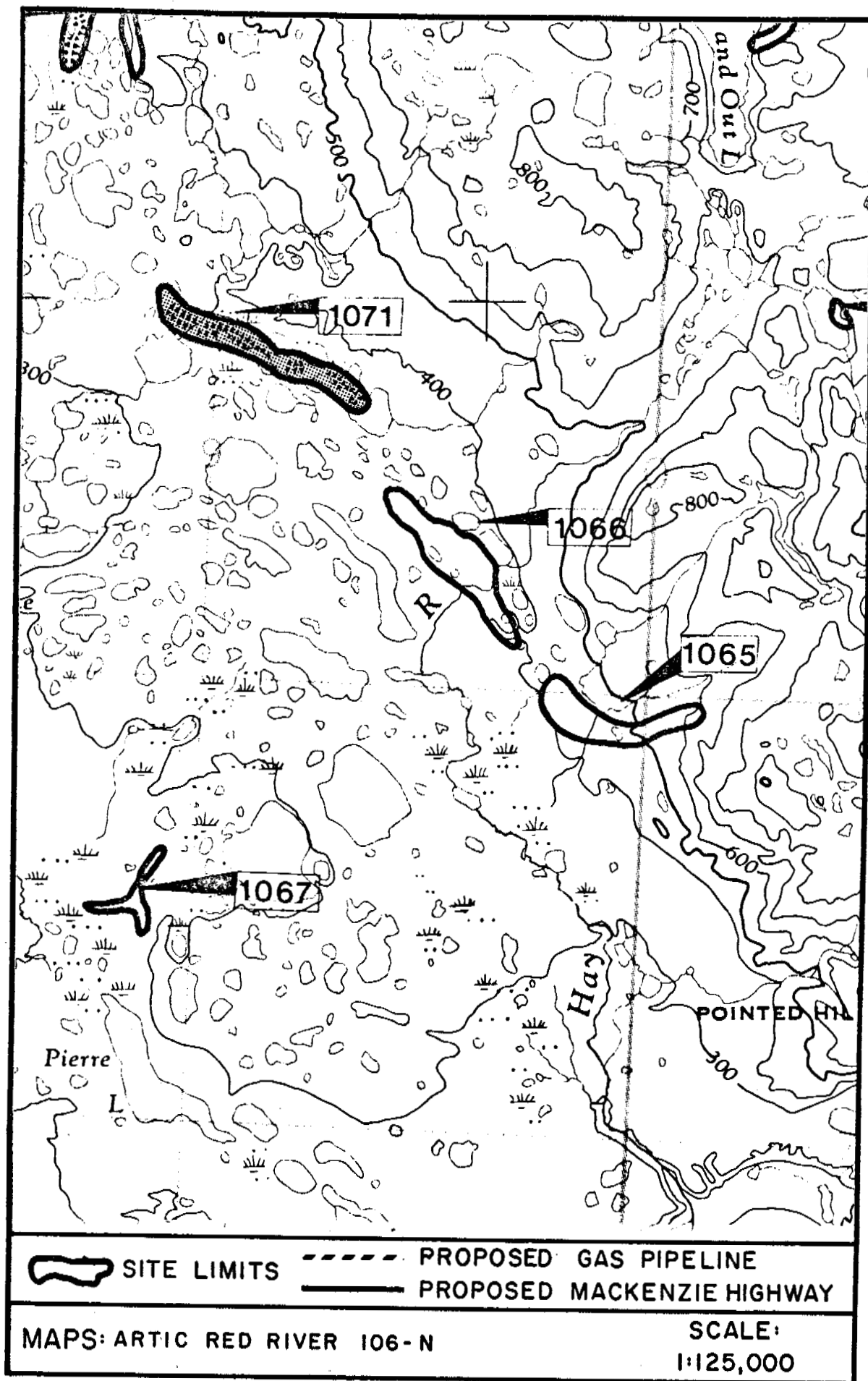
SITE 1071a

Location: Site 1071 is situated 23 miles east of Arctic Red River. The site is 5 miles south of the proposed western pipeline route, and 13 1/2 miles SW of the proposed highway route.

Material: Silt.

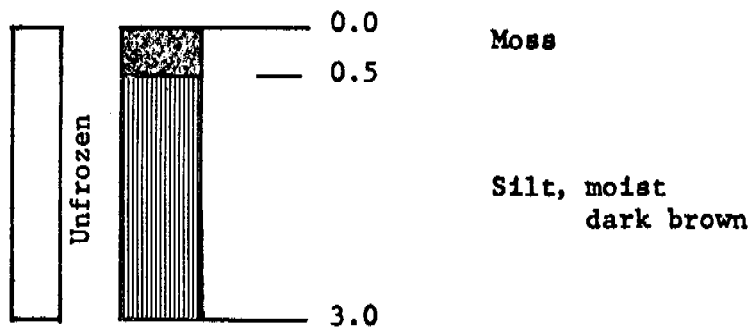
Assessment: The material at site 1071 is unsuitable for construction purposes. The site is not recommended for development.



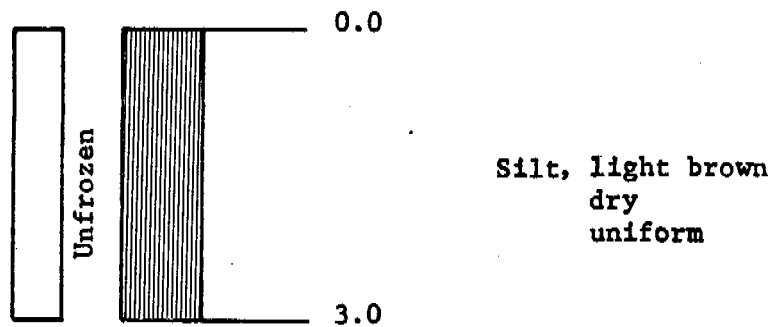


TEST PIT LOG

TP 1071-1



TP 1071-2

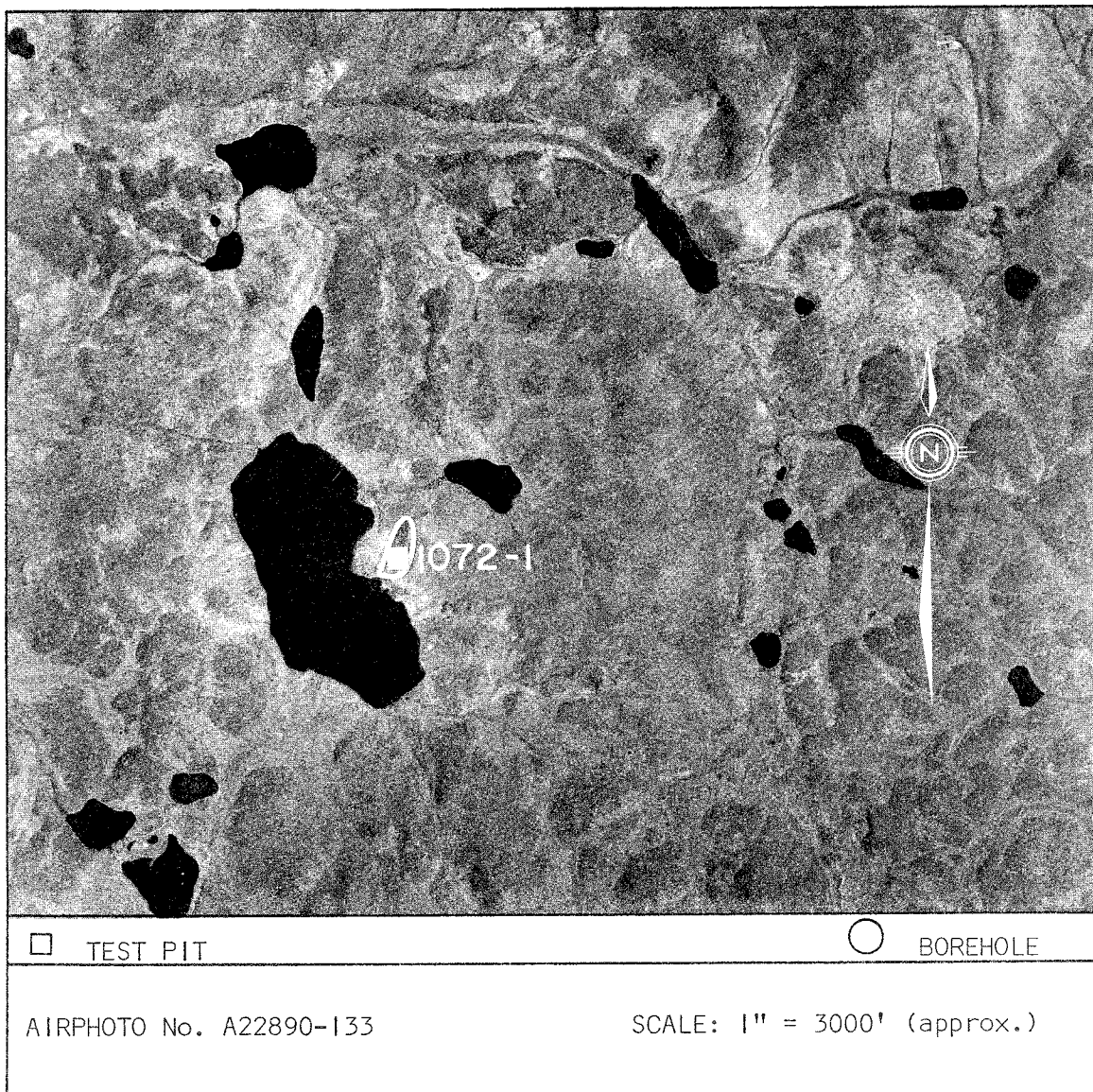


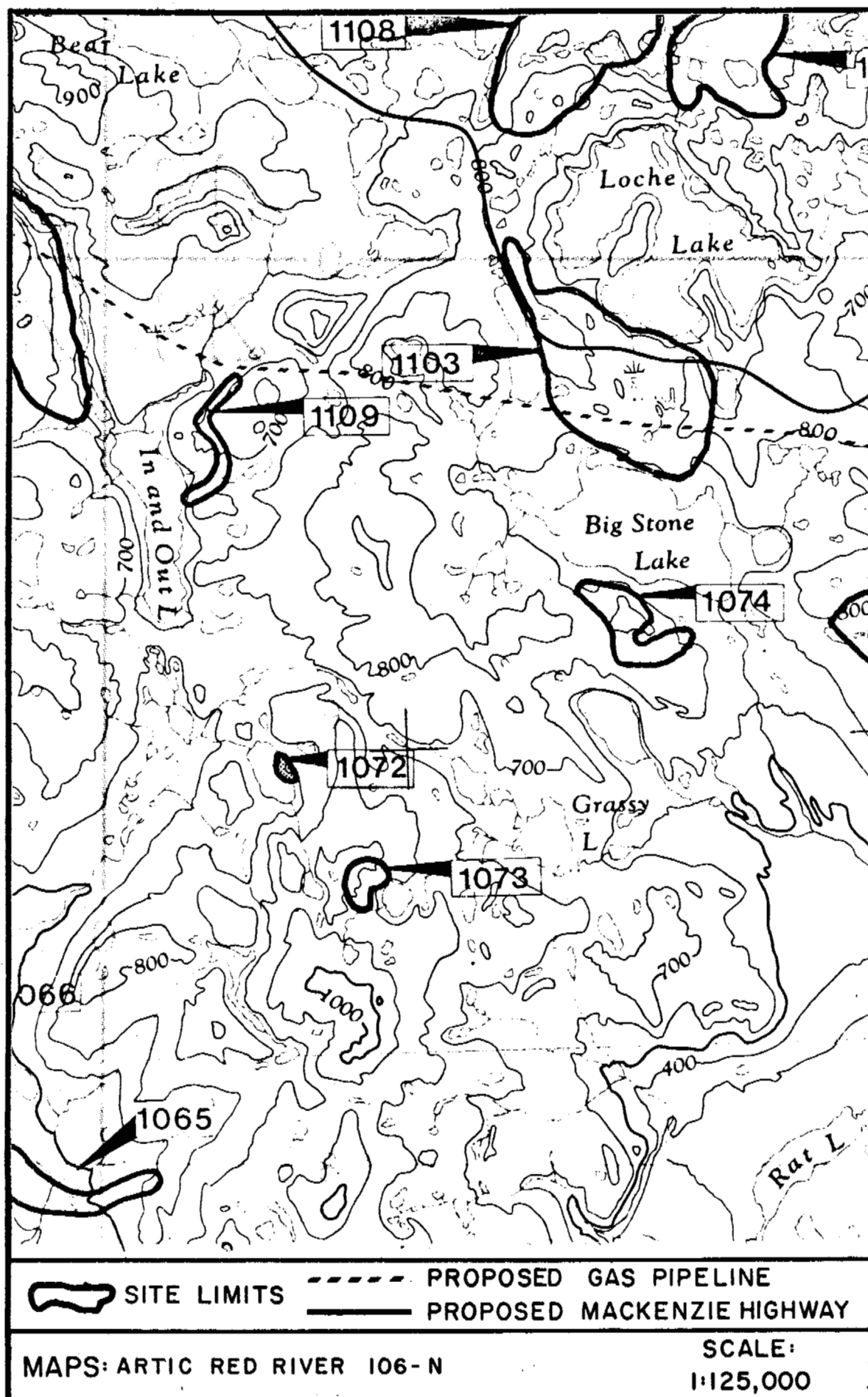
SITE 1072a

Location: Site 1072 is situated 2 miles SE of In and Out Lake. The proposed pipeline and highway routes are 6 and 7 miles NE respectively.

Material: Silt.

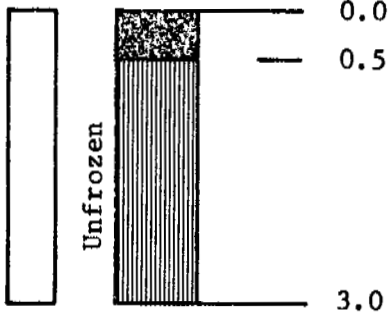
Assessment: The material at this site was found to be unsuitable for construction purposes and therefore the site is not recommended for development.





TEST PIT LOG

TP 1072-1



Moss

Silt, occasional pebbles
organic inclusion
moist

SITE 1073

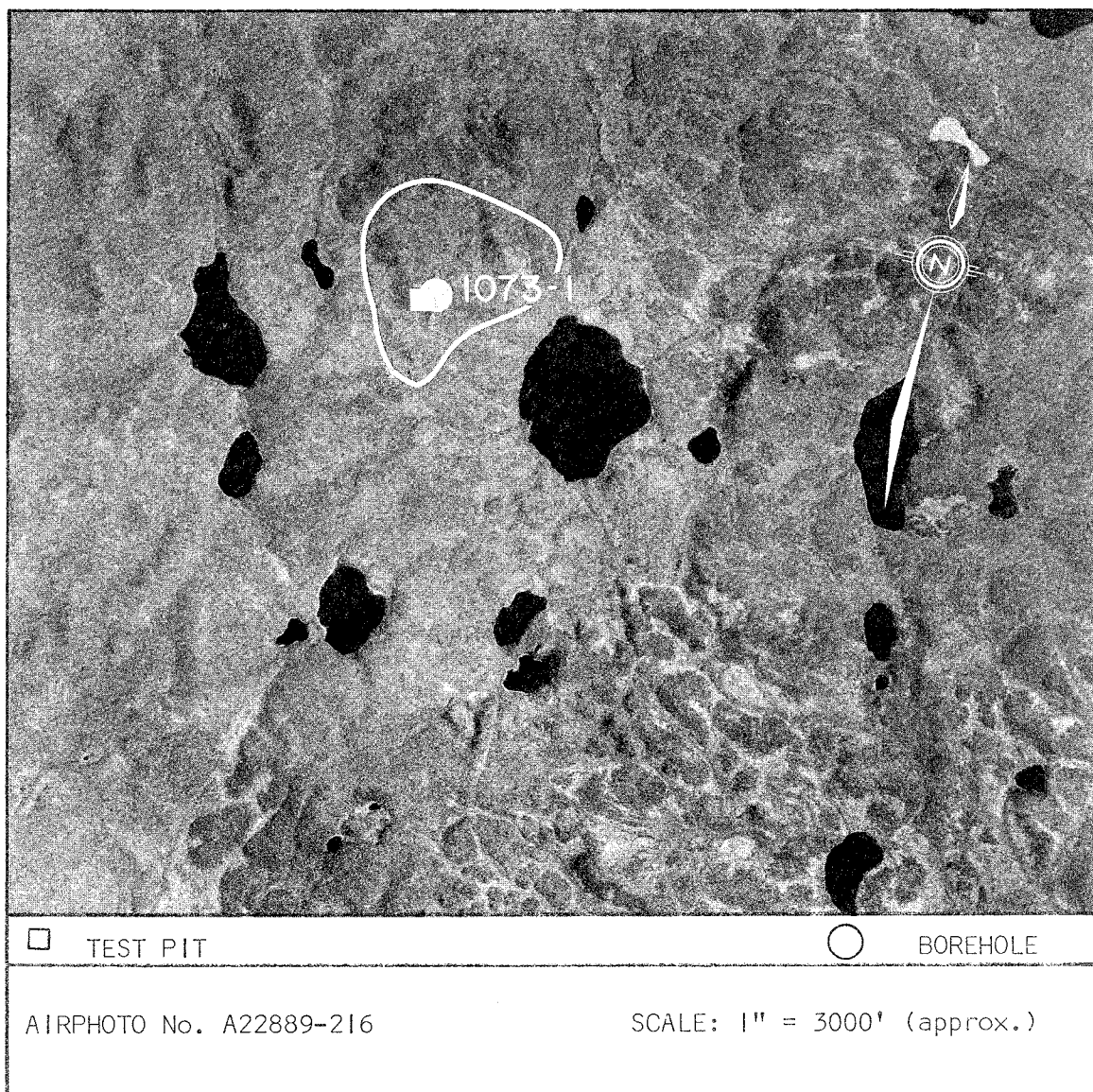
Location: Site 1073 is situated 2 miles west of Grassy Lake. The proposed pipeline and highway routes are 7 and 8 miles NNE respectively.

Geology: Site 1073 is a small kame complex. The material is expected to be variable.

Material: Silty sand, some gravel, well graded.

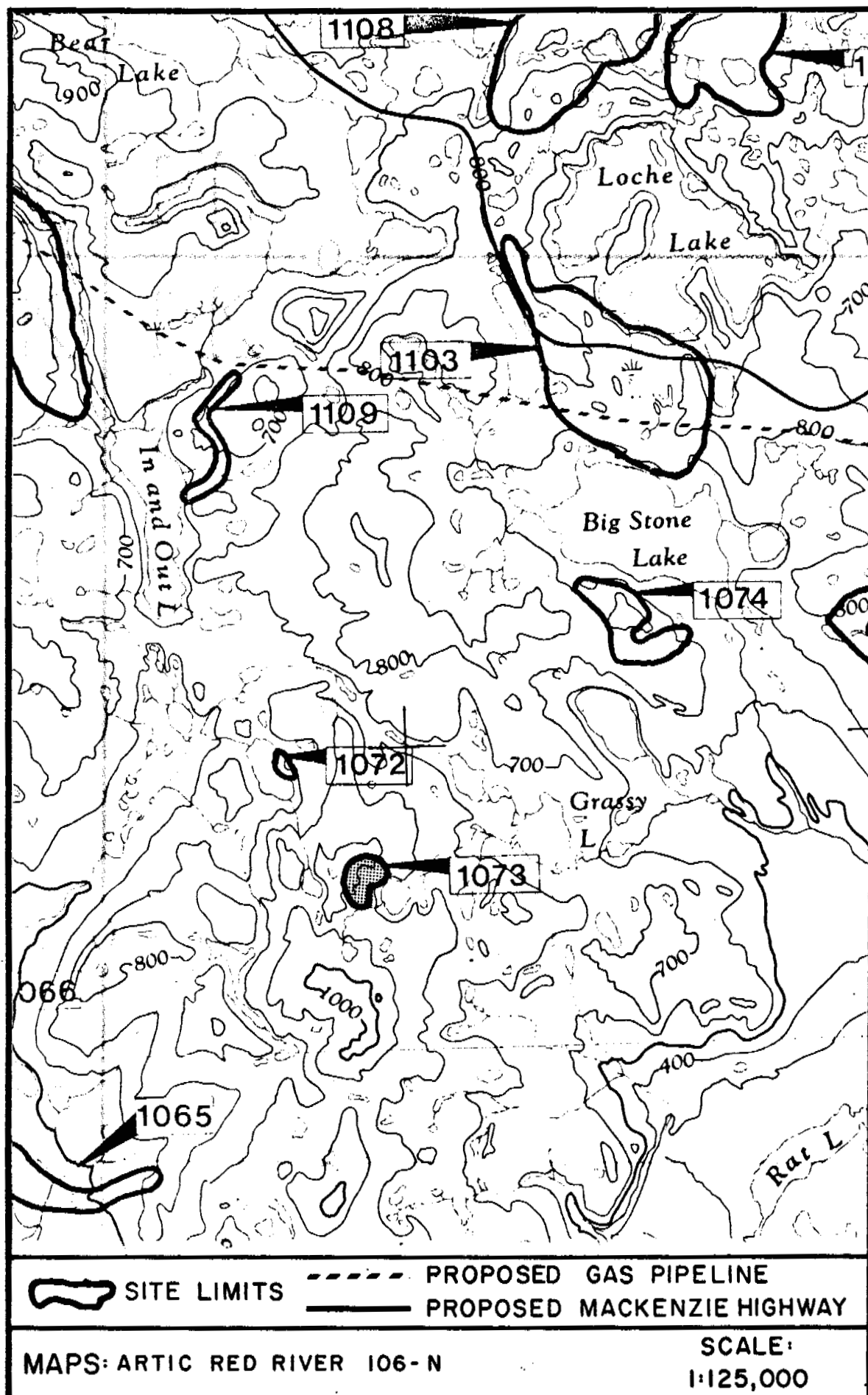
Volume: 4,500,000 cu. yd., reliability of estimate is uncertain.

Area: 300 acres.



Drainage: The site is well drained.

Assessment: The material at site 1073 is of large volume but only of fair to poor quality. The material is only marginally useful as general fill. More drilling is necessary to delimit the deposit and determine the variability. Permafrost was encountered at 10.5 feet. Overburden is negligible and tree cover sparse but shrubs and moss will have to be removed. Site 1073 is a promising source for a large volume of fair quality granular material however haulage distance is rather long.



SITE 1073

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 3 4 5 Rating: <u>20</u>	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: <u>15</u>	Aesthetic Value Habitat Value	Marsh Black Spruce Muskien White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS		
	1 2 3 4 5 Rating: <u>45</u>	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: <u>10</u>	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: <u>10</u>	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.

TOTAL INDEX : 200

SPECIAL CONCERNS: Upland area

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3 4 5 Rating: <u>5</u>	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
10	AESTHETICS		
	1 2 3 4 5 Rating: <u>10</u>	Visible from: Physical Dis- turbance	River, Highway, Air, Dust, Waste, Stockpiles. Noises.
15	RESOURCE UTILIZATION		
	1 2 3 4 5 Rating: <u>30</u>	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES		
	1 2 3 4 5 Rating: <u>45</u>	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: <u>10</u>	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

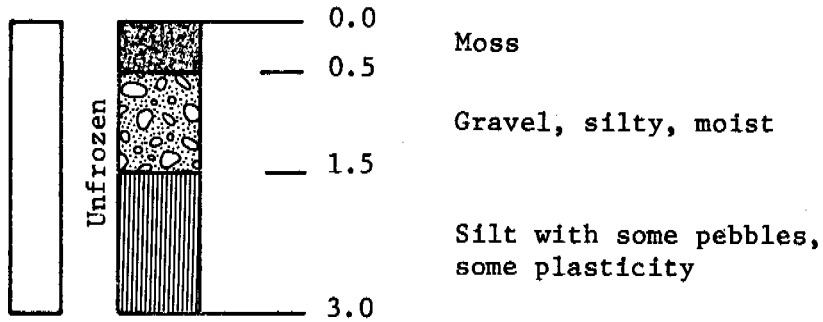
SITE NO. 1073		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SC	SAND	NOT FROZEN					1
2		-sandy, some clay, low plasticity, dry, grey						2
3		-trace to some fine gravel						3
4		SM		6.3% O.C.				
5	15% GRAVEL						5	
6	56% SAND						6	
7	29% SILT & CLAY (4')						7	
8	CL	-becoming very moist	FROZEN					8
9								9
10		CLAY						10
11		-silty, some well graded sand, trace to some fine rounded gravel, wet, grey						11
12								12
13								13
14								14
15								15
16								16
17		END OF HOLE						17

DATE DRILLED: Sep. 19/73	LOGGED BY: EBA 121-3	COMPLETION DEPTH: 16'
DRILLING METHOD: AUGER		THAW DEPTH: 10.5'

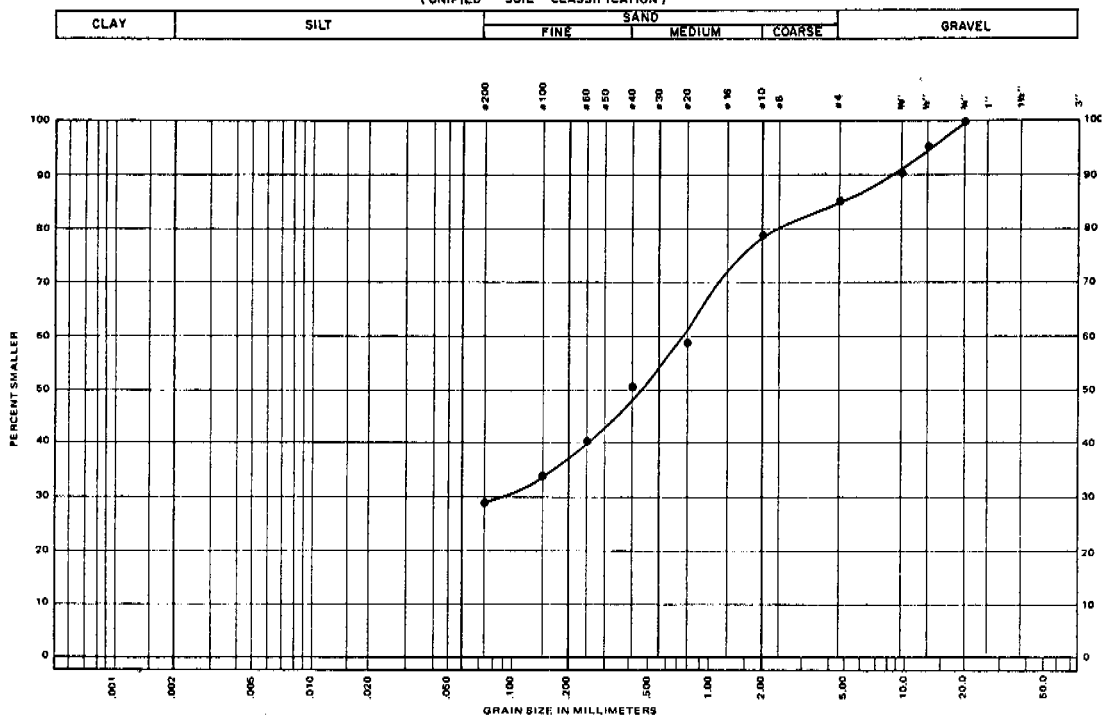
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1073-1



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand and
some Gravel (2%)

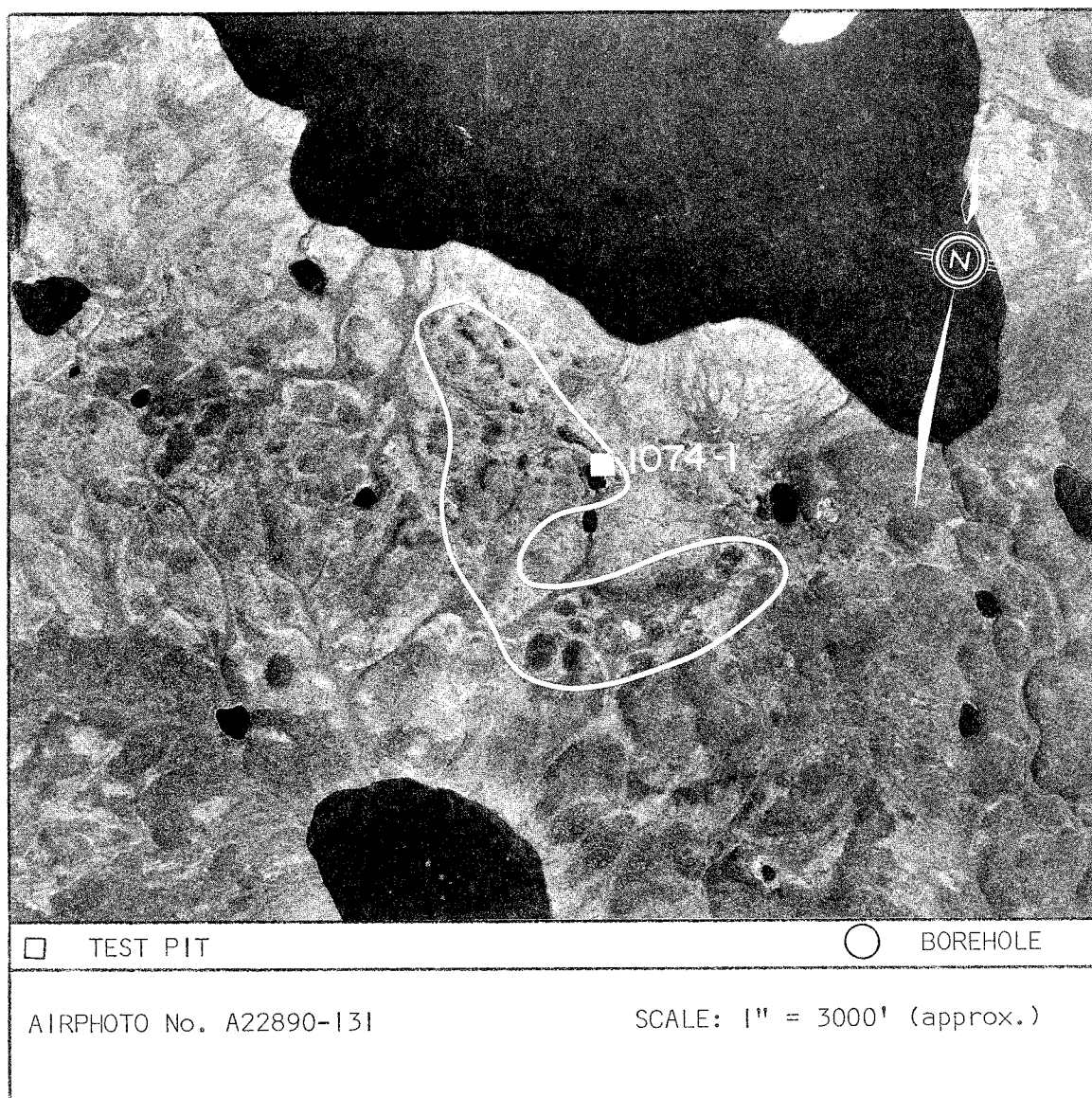
PROJECT Granular Resources
JOB No. E666 DATE Dec. 17/73
SAMPLE No. DH 1073-1
DEPTH 4'

SITE 1074

Location: Site 1074 is situated along the south shore of Big Stone Lake. Proposed pipeline and highway routes are 2 and 3 miles north respectively.

Geology: Site 1074 is a relatively large kame complex. Variation in composition may be expected.

Material: Sandy silt, with a trace of gravel.

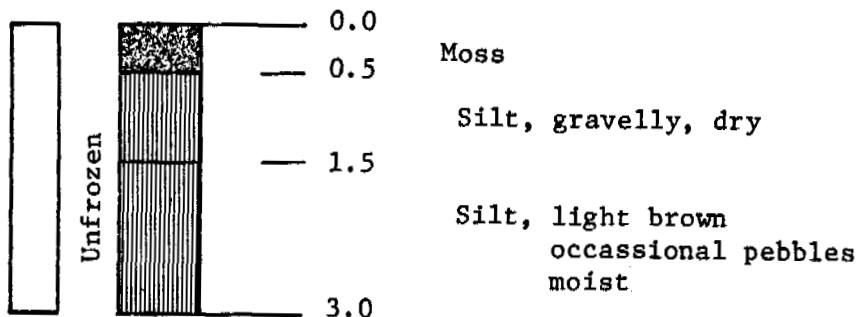


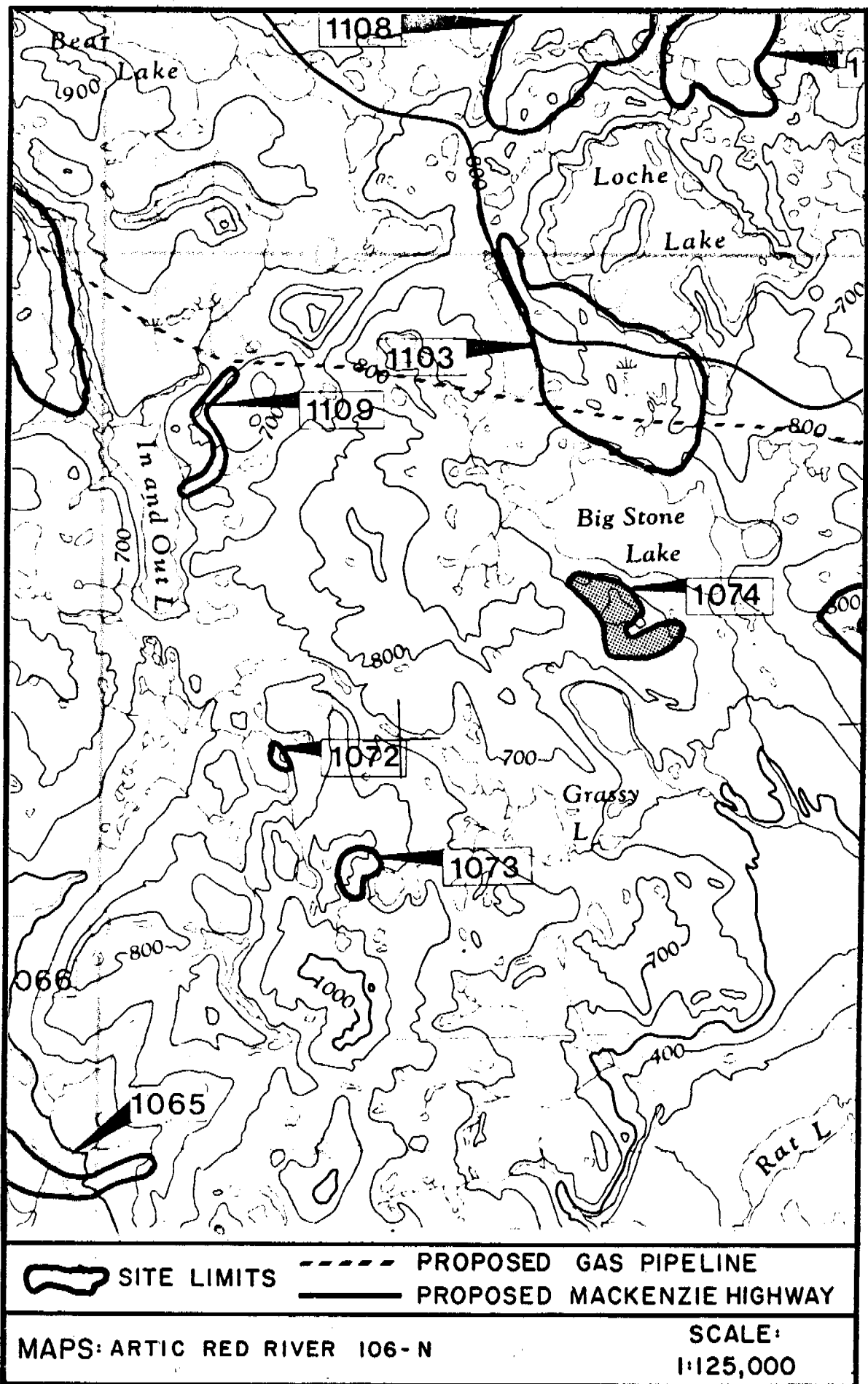
Assessment:

The material examined at site 1074 was unsuitable for construction purposes; however, since ice contact structures tend to vary considerably, it is possible that a more extensive field exploration program will reveal material suitable for use in construction. If materials are in short supply in the area it is recommended that a more detailed drilling program be undertaken to better evaluate site 1074.

TEST PIT LOG

TP 1074-1



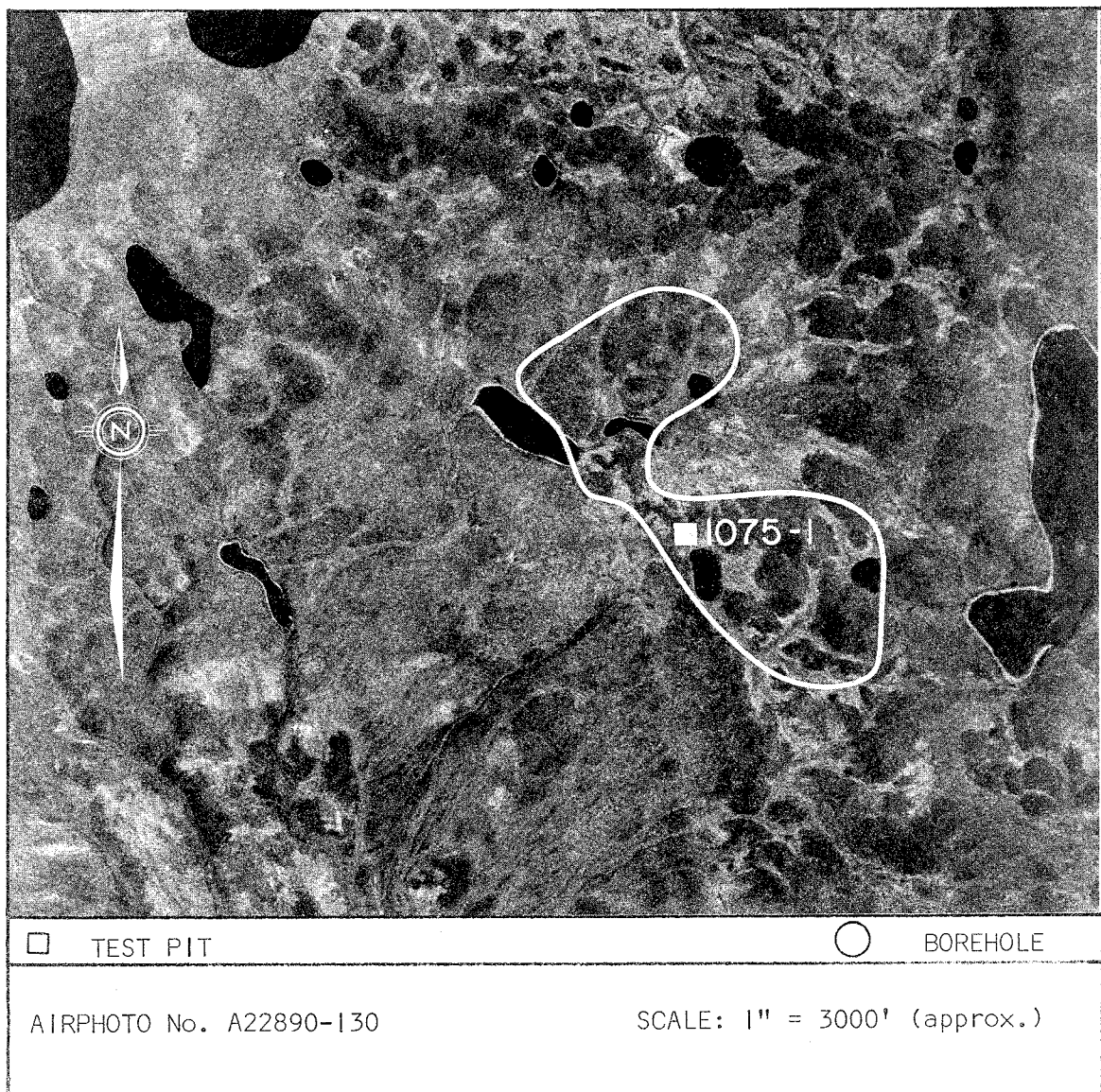


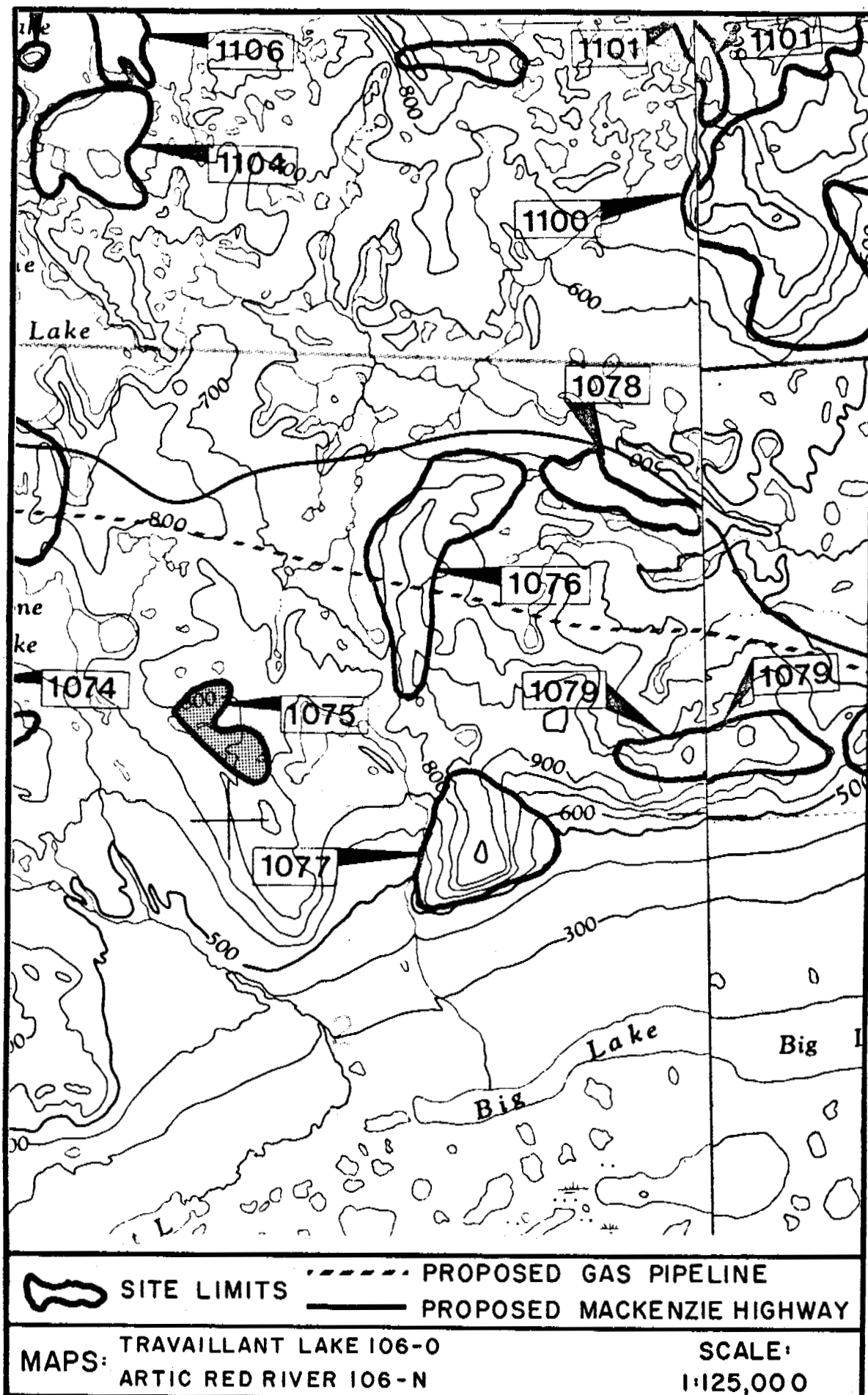
SITE 1075a

Location: Site 1075 is 2 miles SE of Big Stone Lake.
Proposed pipeline and highway routes are 4 and
5 miles north of the site respectively.

Material: Silt.

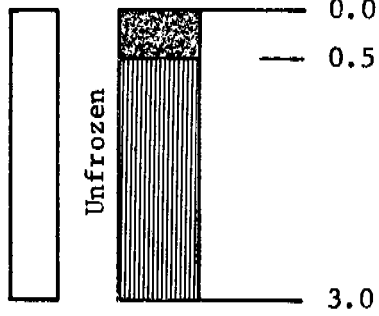
Assessment: The material encountered at site 1075 is
unsuitable for construction purposes. The site
is not recommended for development.





TEST PIT LOG

TP 1075-1



Moss

Silt, light brown
uniform
moist

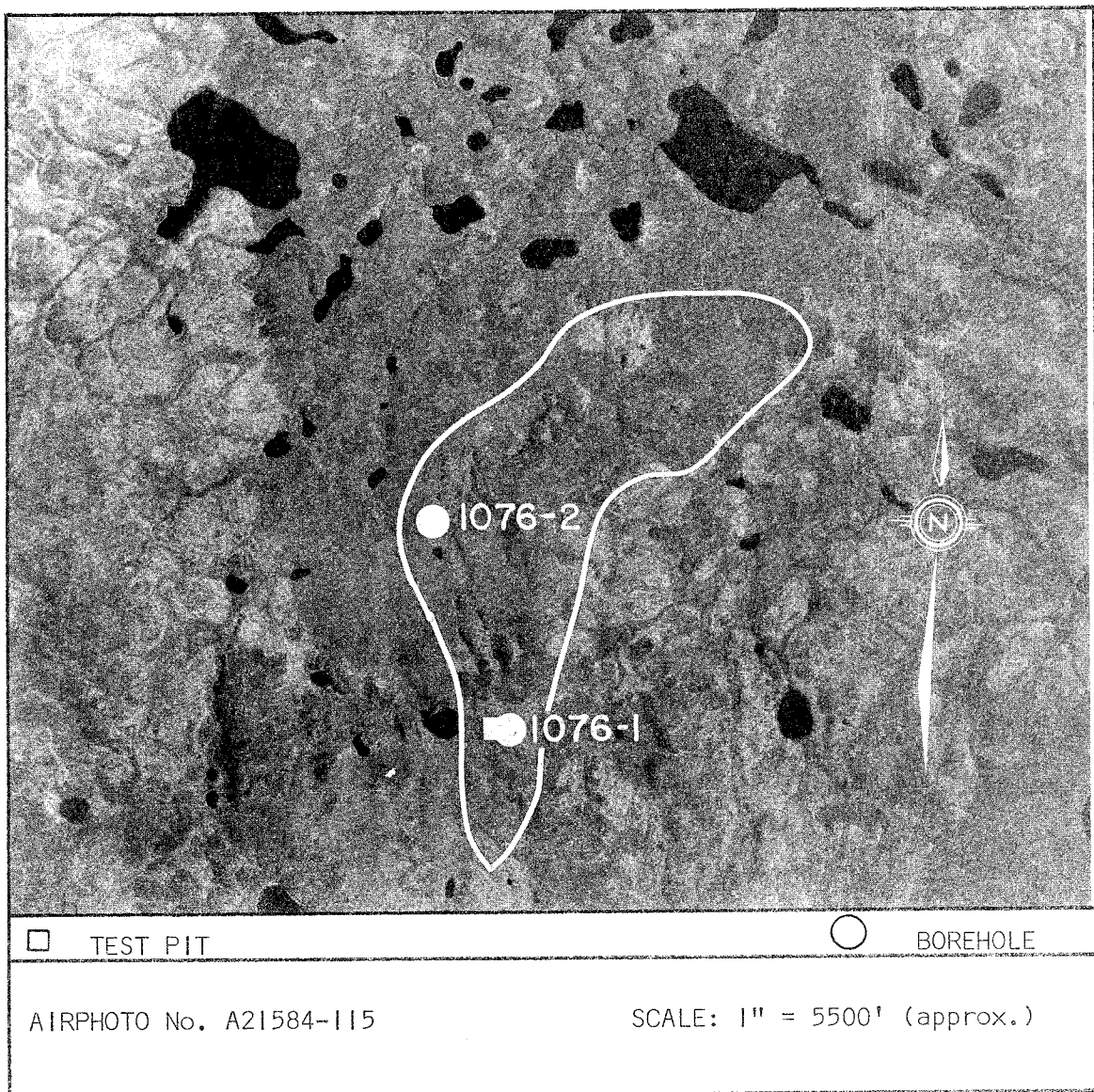
SITE 1076

Location: Site 1076 is 4.5 miles east of Big Stone Lake. The proposed pipeline route crosses the area and the proposed highway route is 1 mile to the north of it.

Geology: Site 1076 is a fossil terrace outwash deposit. The material at the site is an interbedded sequence of sand and gravel.

Material: Sand and gravel, numerous cobbles near the surface, poorly graded.

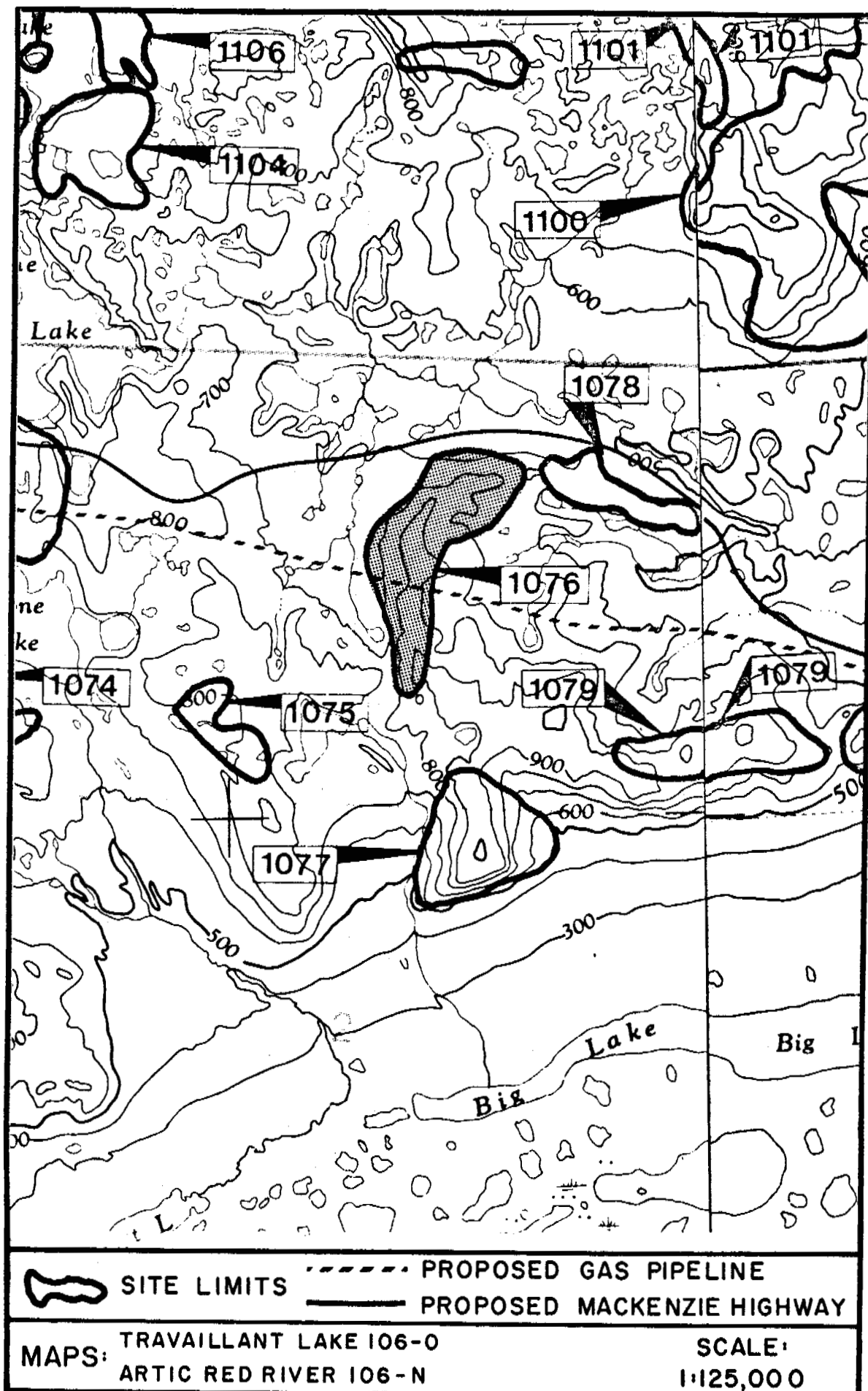
Volume: 2,500,000 cu. yd., estimate is realistic.



Area: 200 acres.

Drainage: The site is well drained.

Assessment: A moderately large quantity of fair to good quality borrow is present at site 1076, although material does tend to be somewhat variable. Overburden is thin but dense spruce tree cover will have to be removed. Drilling to delimit and prove the deposit will be necessary. The environmental overview has rated the site to be moderately sensitive to disturbance; however, care in development will satisfy environmental concerns. Access to the site is excellent and haulage distance reasonable. Site 1076 is recommended for development within environmental and borrow pit development guidelines contained in this report.



ENVIRONMENTAL SENSITIVITY INDEX

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

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


TOTAL INDEX : 270

SPECIAL CONCERNS: Upland area. Disturbances could reach
Travaillant River.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1076		HOLE NO. 1		PAGE 1 OF 1	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
1		COBBLES -some sand & silt, cobb- les angular & subangular, light-brown	Unfrozen		1
2	GW-GM	COBBLES & GRAVEL -silty, sandy, dense, dry, light brown			2
3		78% GRAVEL			3
4		(2') 13% SAND			4
		9% SILT & CLAY			
		19.6% O. C.			
5		<p style="text-align: center;">END OF HOLE</p> <p style="text-align: center;">* too cobbly to auger</p>			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. 19/73		LOGGED BY: EBA 127-1	COMPLETION DEPTH: 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. 1076		HOLE NO. 2		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	OH	ORGANIC	Frozen					1	
2	GM	GRAVEL sandy	Frozen					2	
3								3	
4								4	
5								5	
6								6	
7								7	
8								8	
9								9	
10								10	
11		ICE	ICE					11	
12								12	
13	CL	CLAY -sandy-silty -pebbles -low to medium plastic	Vs					13	
14								14	
15								15	
16								16	
17								17	

DATE DRILLED: Dec 13/73


LOGGED BY: RMH
32

COMPLETION DEPTH: 29'

DRILLING METHOD:

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1076		HOLE NO. 2		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	CL	CLAY -sandy, silty -pebbles -low to medium plasticity	Vs					18
19							19	
20							20	
21							21	
22							22	
23	GC	GRAVEL -clayey-sandy -low plasticity	Vs					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: Dec 13/73


LOGGED BY: RMH
32

COMPLETION DEPTH: 29'

DRILLING METHOD:

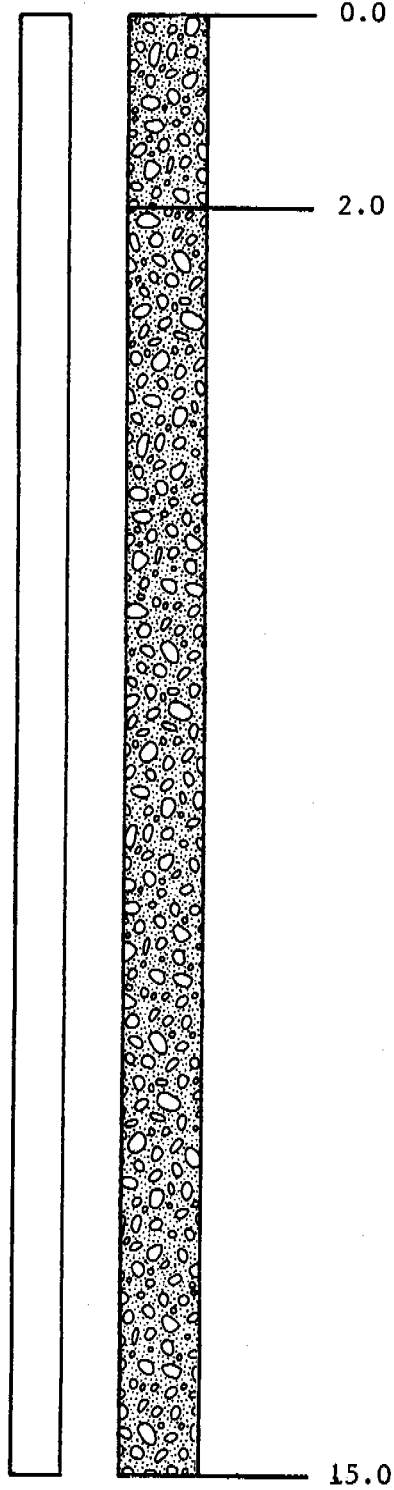
THAW DEPTH: N/A

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 DEPARTMENT OF INDIAN
 AND NORTHERN AFFAIRS


 EBA Engineering Consultants Ltd.

SURFACE EXPOSURE LOG

TP 1076-1

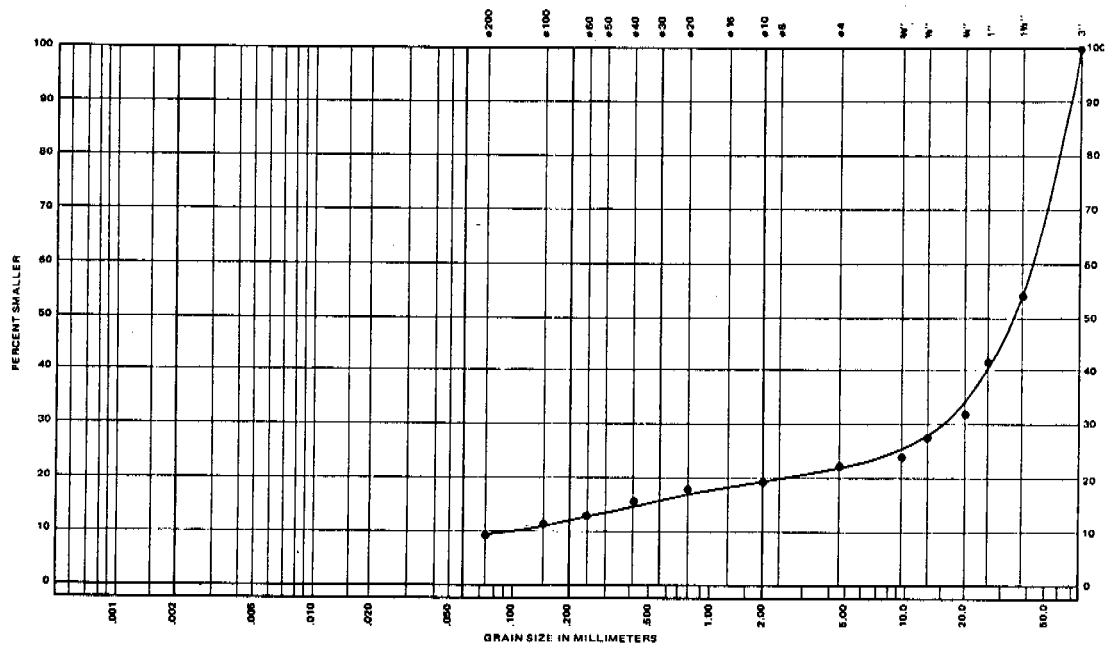


Gravel & Cobbles, medium brown
very silty

Gravel, more cobble
fine sand & silt
cobbles
gravel

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Some Sand
with a trace of Silt

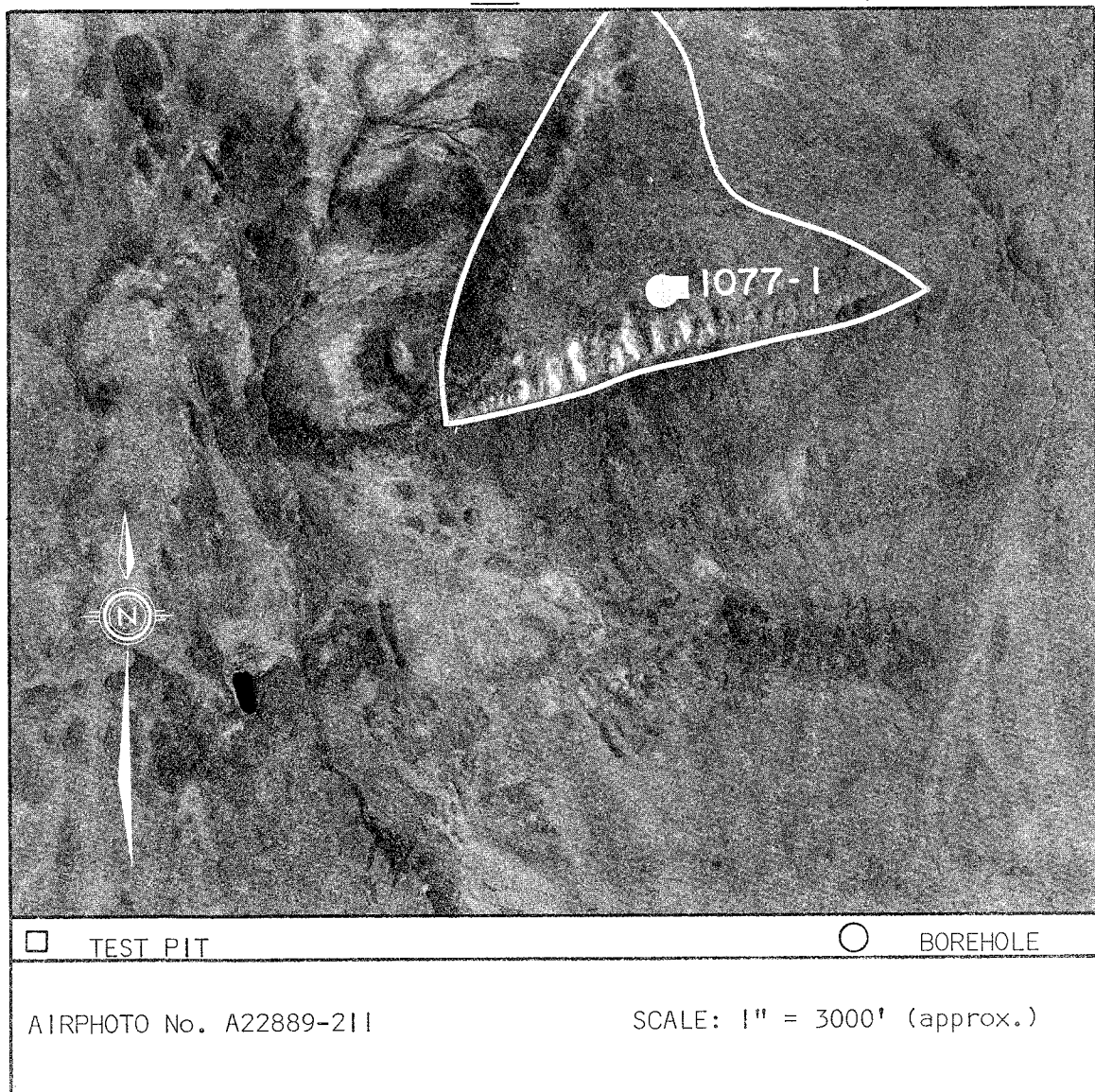
PROJECT Granular Resources
JOB No. E666 DATE January 11/74
SAMPLE No. BH 1076-1
DEPTH 2'

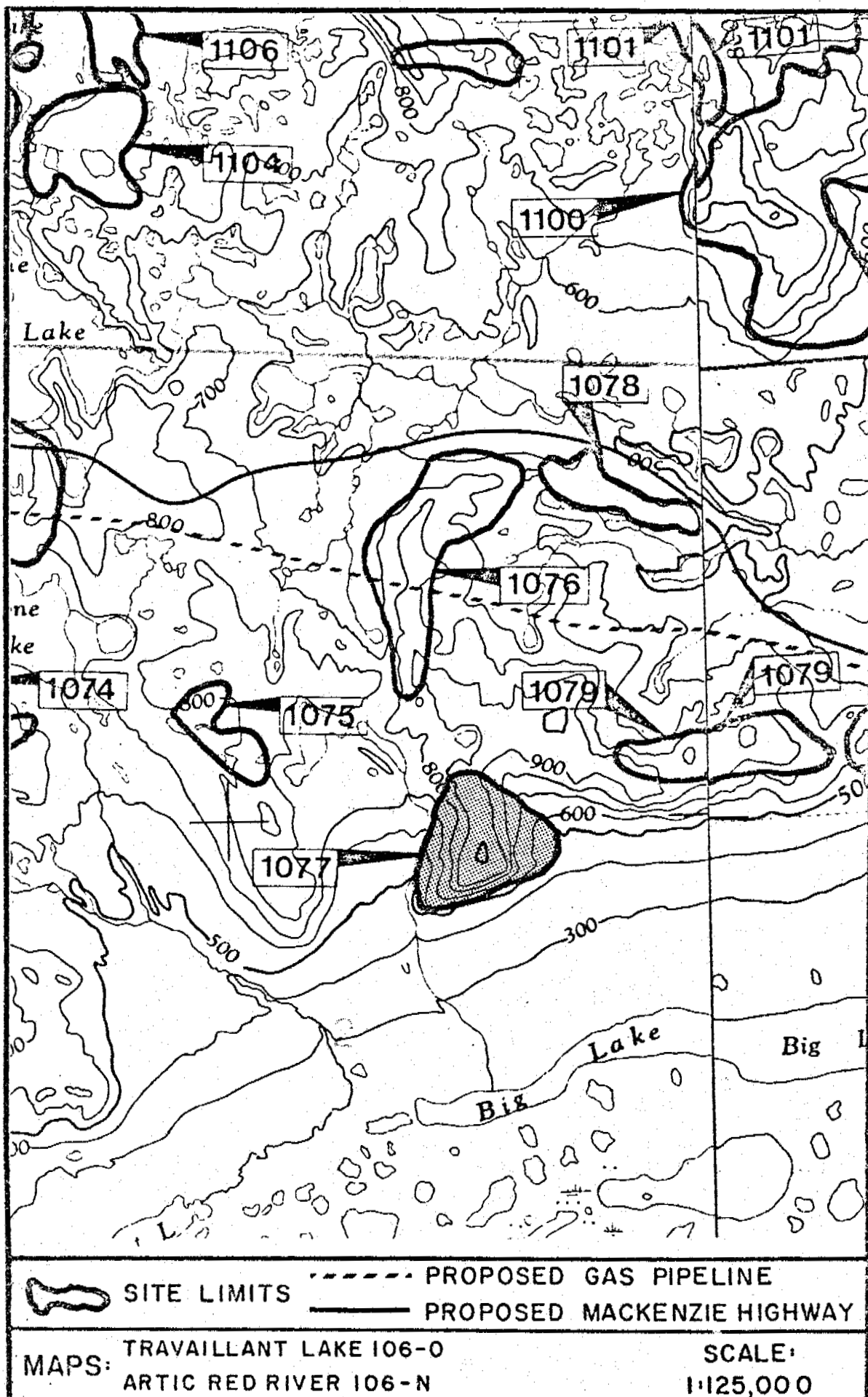
SITE 1077a

Location: Site 1077 is situated 3 miles north of the western end of Big Lake. The proposed highway and pipeline routes are 6 and 4 miles to the north respectively.

Material: Clay over limestone.

Assessment: Clay overburden ranges up to 28 feet thick and is unsuitable for engineering purposes. The shale, which is exposed in a scarp, is suitable for fair to good quality general fill. The site is located a considerable distance from proposed route locations and access to the site crosses thermally sensitive terrain. Winter operations would be essential. Site 1077 is not recommended for development because

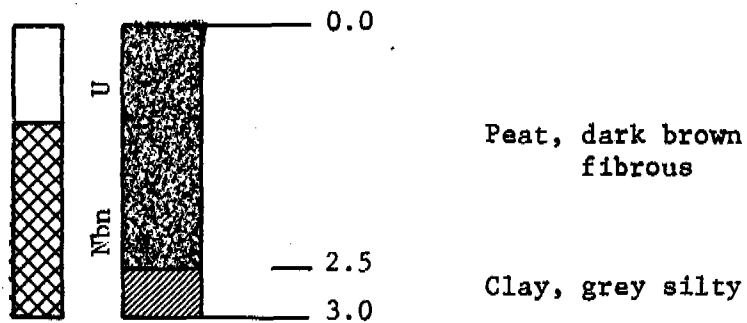




of thick overburden, difficult access and long haulage distance.

TEST PIT LOG

TP 1077-1



GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1077		HOLE NO. 1		PAGE 1 OF 2						
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)		
				10	20	30	40			
1	Pt	PEAT -organic silty, fibrous, wet dark brown	NOT FROZEN					1		
2								2		
3									3	
4								313.5	4	
5	Cl	CLAY -some silt some coarse sand sizes, wet, medium plasticity, grey.	Nbn					5		
6								276.1	6	
7										7
8										8
9	Cl	CLAY -some silt, trace coarse sand sizes, dry, grey, weathered clay shale.						9		
10									10	
11										11
12										12
13										13
14										14
15										15
16										16
17										17

DATE DRILLED: Sep. 18/73


LOGGED BY: ^{EBA}
128-1

COMPLETION DEPTH: 28.0'


DRILLING METHOD: AUGER

THAW DEPTH: 3.0

GOVERNMENT OF CANADA
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AND NORTHERN AFFAIRS


EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

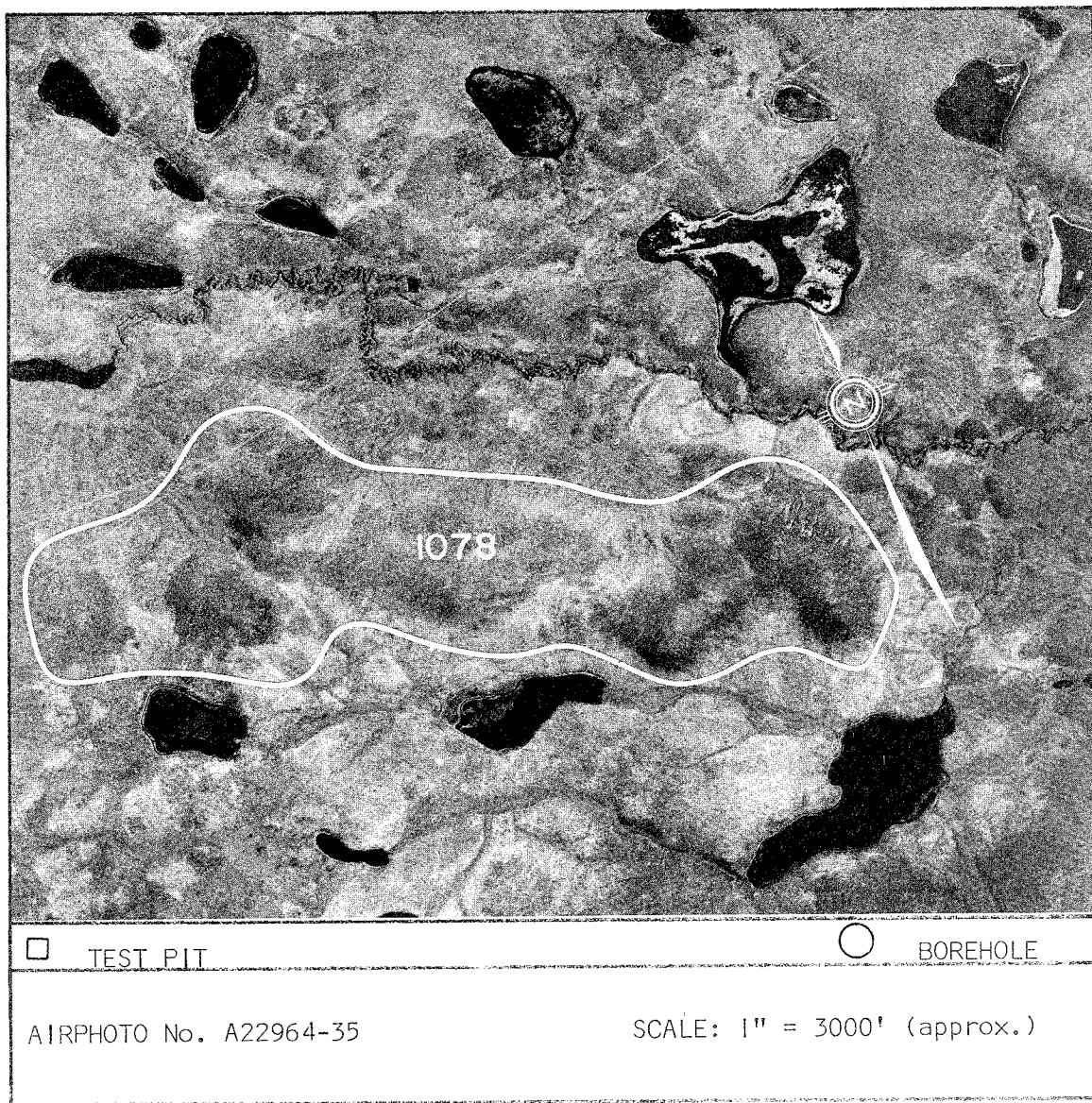
SITE NO. 1077		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	CL	CLAY -same	FROZEN					18
19								19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27
28								28
29		END OF HOLE						29
30								30
31								31
32								32
33								33
34								34
DATE DRILLED: Sep. 18/73		LOGGED BY: EBA 128-1		COMPLETION DEPTH: 28.0'				
DRILLING METHOD: AUGER			THAW DEPTH: 3.0'					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

SITE 1078

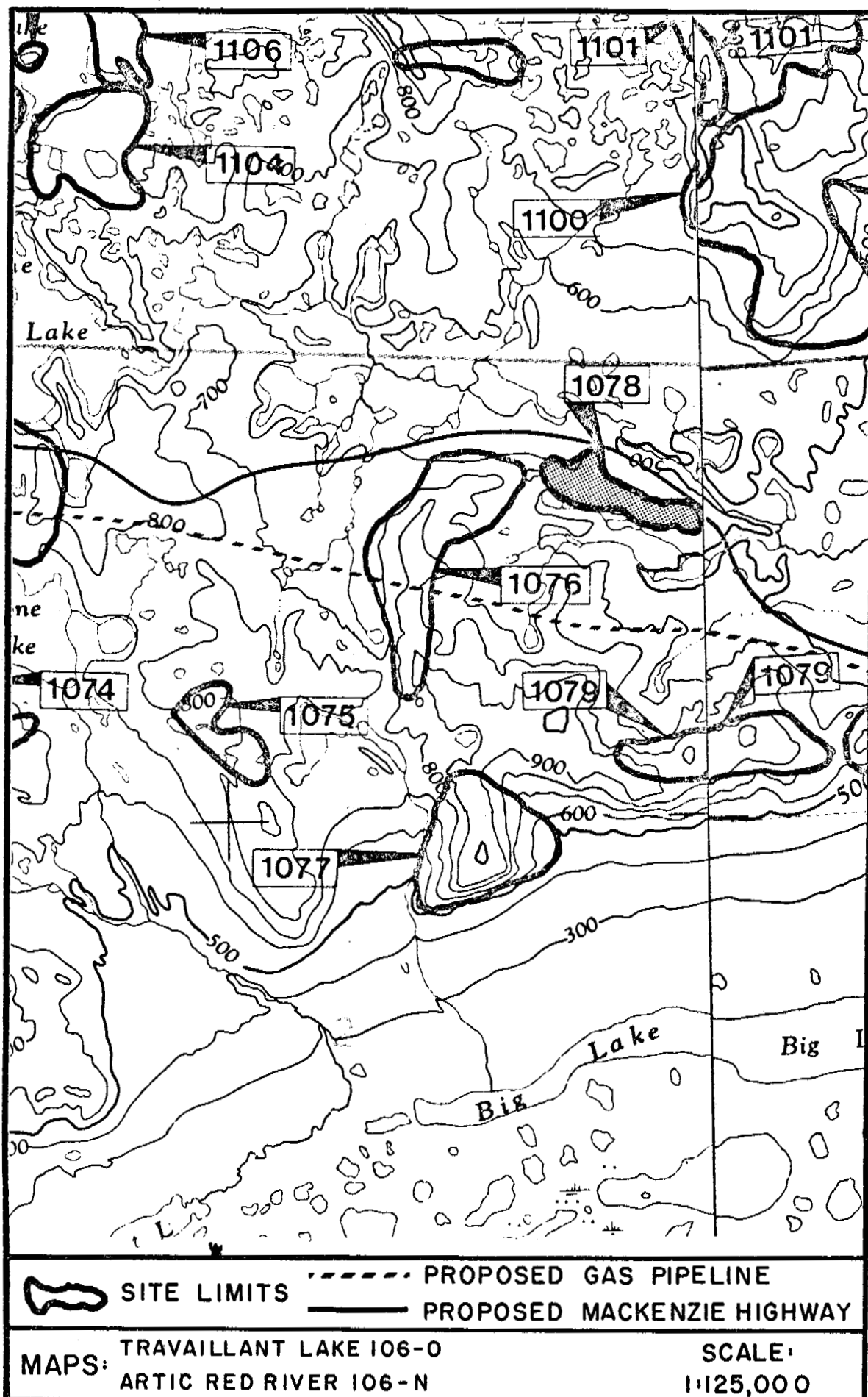
Location: Site 1078 is situated 7 miles south of Jiggle Lake. Proposed pipeline and highway routes pass 1 miles south and 1/2 mile north respectively.

Material: Shale.

Assessment: Site 1078 was interpreted from aerial photographs to be a shale outcrop with a considerable cover of overburden. Drilling will be necessary to delimit the shale and determine overburden thickness. The shale would be suitable for use as fair quality



general fill. The site has a moderately high environmental sensitivity rating. Access to the site crosses thermally sensitive terrain thereby necessitating winter operations. Haulage distance to proposed construction sites is reasonable. Site 1078 has a good potential as a source of shale borrow material.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 255

SPECIAL CONCERNS:

Upland area, Disturbance could reach lower
Travaillant River.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	① 2 3 4 5	Paleontology Pre-Historic <u>Historic</u>	Probability of Discovery. <u>Low</u> , Medium, High. Known Sites.
	Rating: 5		
10	AESTHETICS		
	1 2 3 ④ 5	Visible from: Physical Dis- turbance	River, Highway, Air, Dust, Waste, Stockpiles. Noises.
	Rating: 40		
15	RESOURCE UTILIZATION		
	1 2 3 ④ 5	Fort Good Hope <u>Arctic Red R.</u> Inuvik	<u>Improved Access</u> Traplines. <u>Hunting</u> . <u>Fishing</u> . <u>Domestic</u> . Commercial.
	Rating: 60		
15	ASSOCIATED DISTURBANCES		
	① 2 3 4 5	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations	<u>0-2</u> , 2-5, 5-10, 10+ <u>0-2</u> , 2-5, 5-10, 10+ Cuts and Fills. Creek Crossings. Compaction, Slumping, Erosion. <u>Stockpiles</u> . <u>Waste</u> , <u>Dust</u> .
	Rating: 15		
10	RESTORATION		
	1 2 3 ④ 5	<u>Soil Stabilization</u> <u>Visual Improvement</u> Habitat Replacement	Natural Regeneration. <u>Grass-Legume Seeding</u> . Transplants. Sustained Maintenance. <u>Erosion Control Systems</u> .
	Rating: 40		

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY

100

TO

MAXIMUM
SENSITIVITY

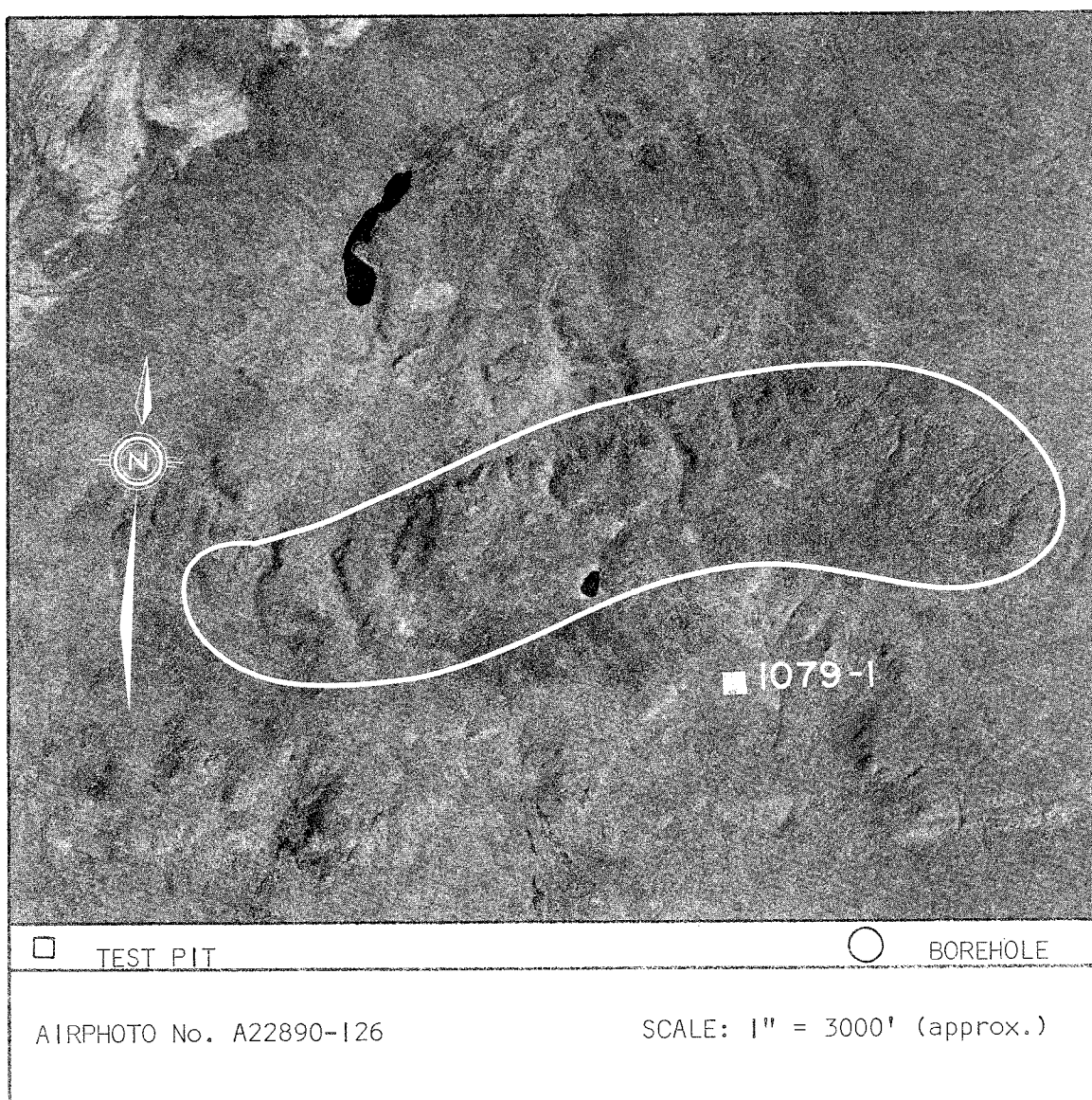
500

SITE 1079

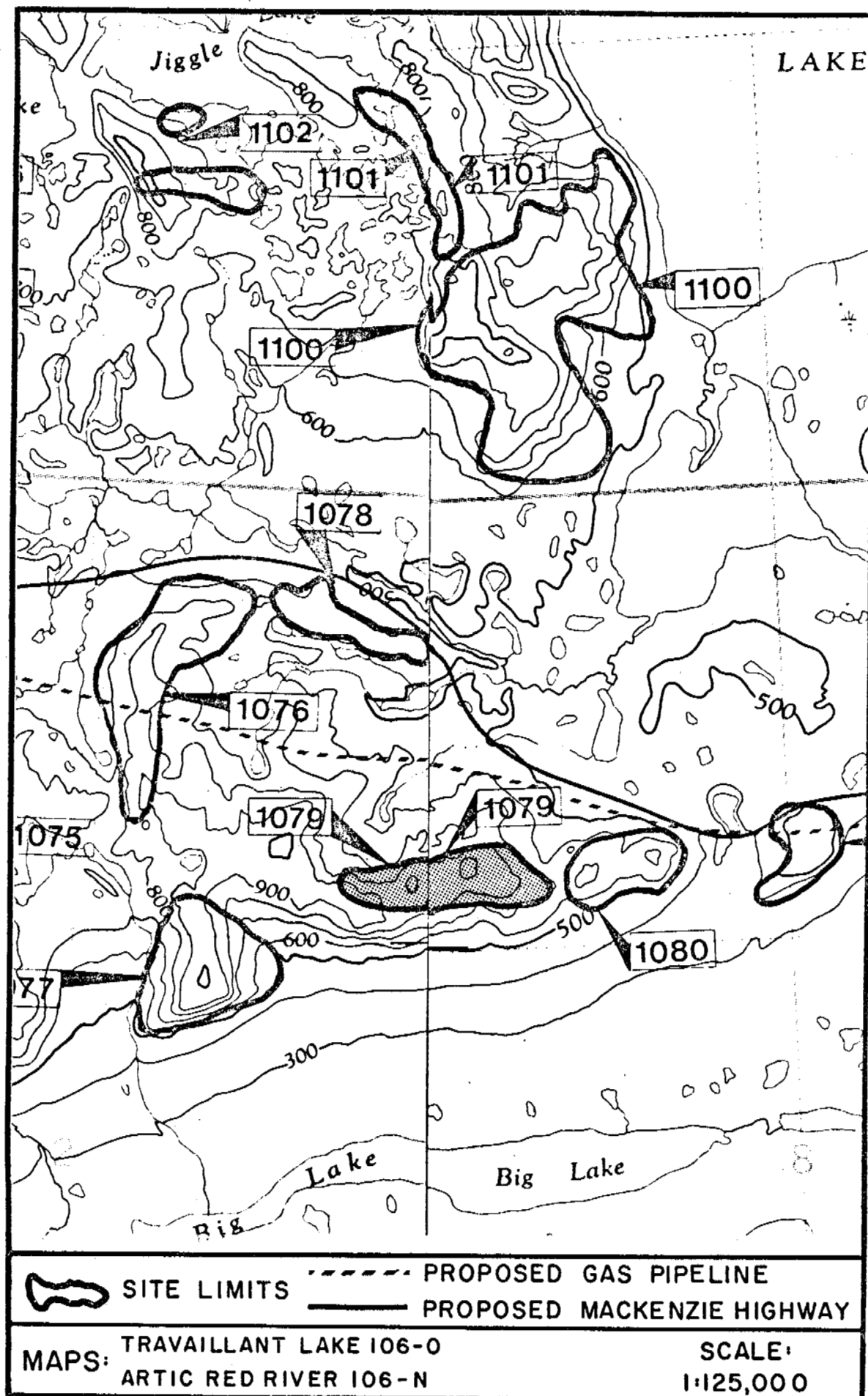
Location: Site 1079 is located 4 miles to the NW of the eastern end of Big Lake. Proposed highway and pipeline routes are 2 miles to the north of the site.

Material: Clay over bedrock (shale).

Assessment: Site 1079 has been outlined on the basis of air photo interpretation as a bedrock area. The bedrock is thought to be shale with a considerable thickness of clay till overburden overlying it. The shale would be suitable for use as fair quality general




fiii. Drilling will be necessary to delimit the deposit and determine overburden thickness. Access to the site crosses thermally sensitive terrain thereby necessitating winter operations. Haulage distance to proposed construction sites is reasonable. Site 1079 has a good potential as a source of shale borrow material.



GRANULAR MATERIALS INVENTORY - STAGE III

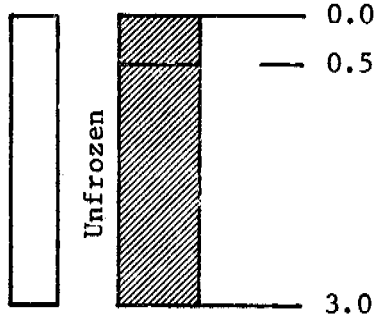
SITE NO. 1079		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	CL	CLAY silty, some sand & some fine gravel, maximum 1/2", dry, medium grey-brown	NOT FROZEN					1
2							2	
3							3	
4		-medium brown					4	
5							5	
6		-increased sand and gravel content					6	
7							7	
8							8	
9							9	
10							10	
11		-grey-brown					11	
12							12	
13	CL	CLAY -grey, dry, weathered shale					13	
14	br	SHALE -clay, light grey					14	
15							15	
16							16	
17		END OF HOLE						17

DATE DRILLED: Sep. 18/73	LOGGED BY: EBA 129-1	COMPLETION DEPTH: 16.5'
DRILLING METHOD: AUGER		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1079-1



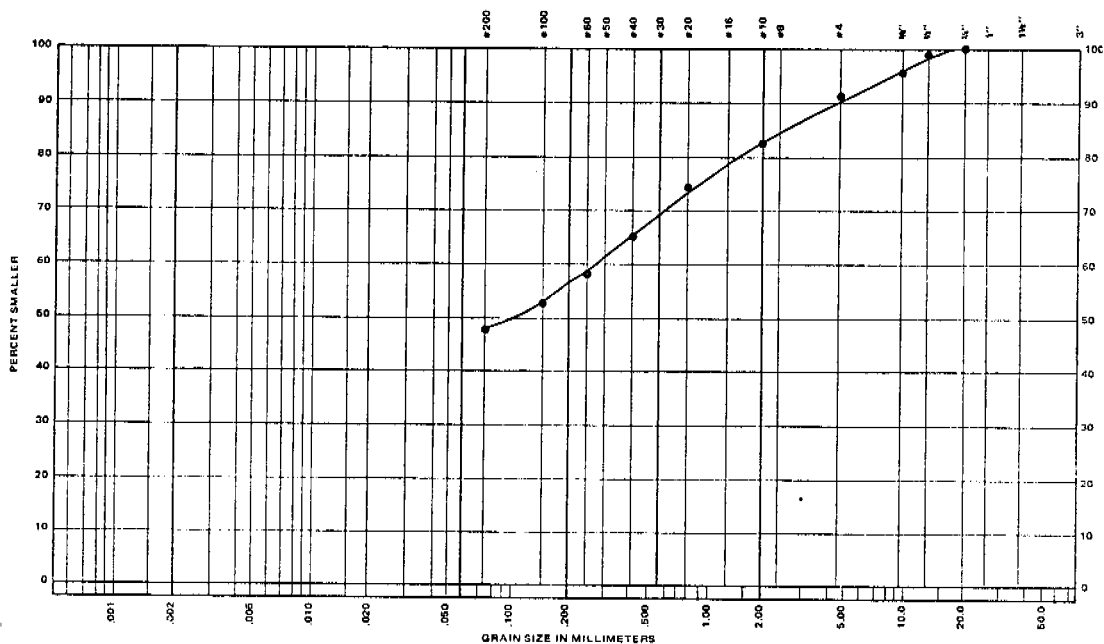
Clay, dark brown, organic

Clay, dark brown
silty
some gravel inclusions
medium plasticity

9% GRAVEL
43% SAND
48% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
------	------	-----------	-------------	-------------	--------



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand with
a Trace of Gravel (SM-MC) M/C=13.0%

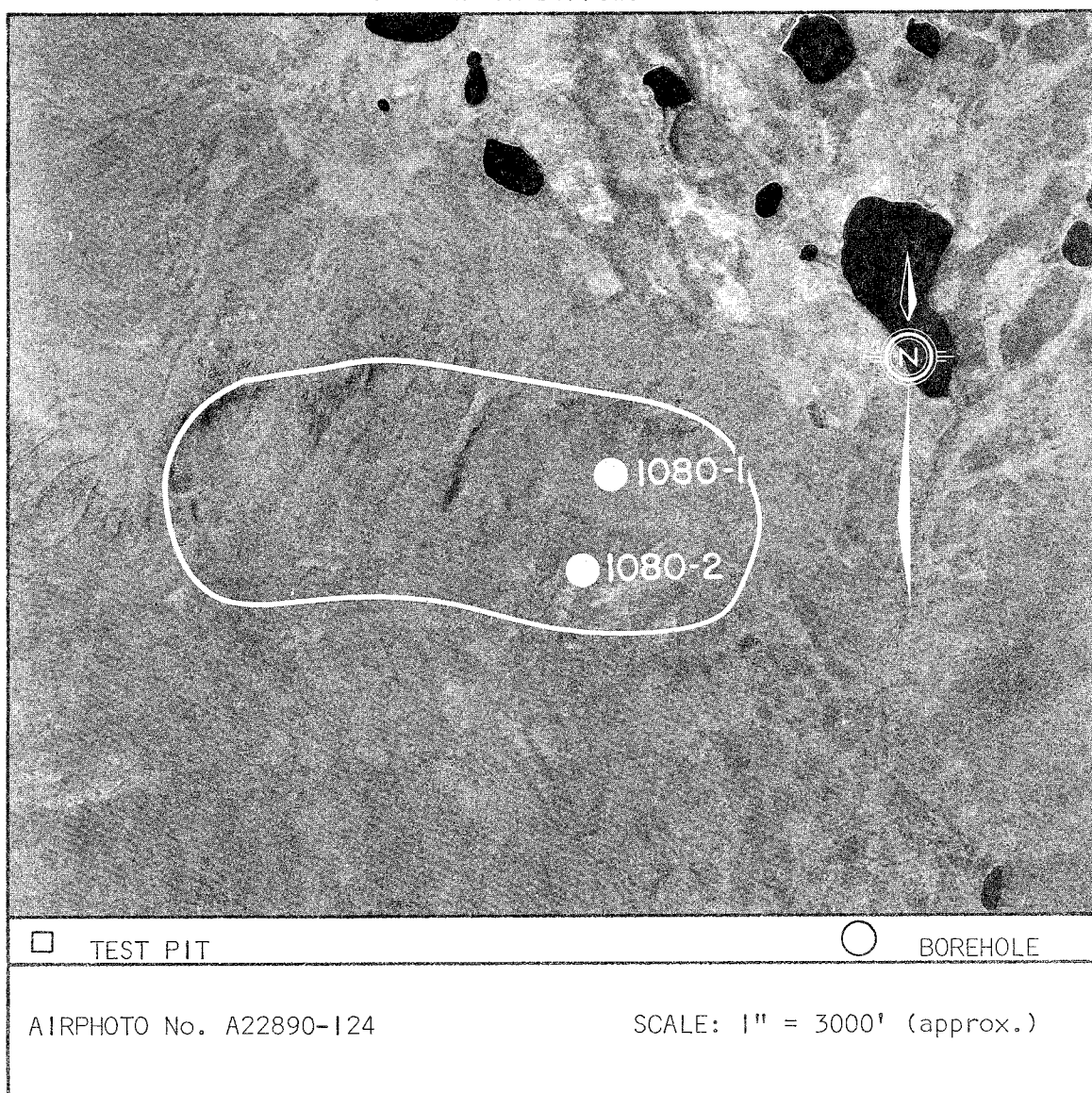
PROJECT Granular Resources
JOB No. I666 DATE December 6/73
SAMPLE No TP 1079-1
DEPTH 3'

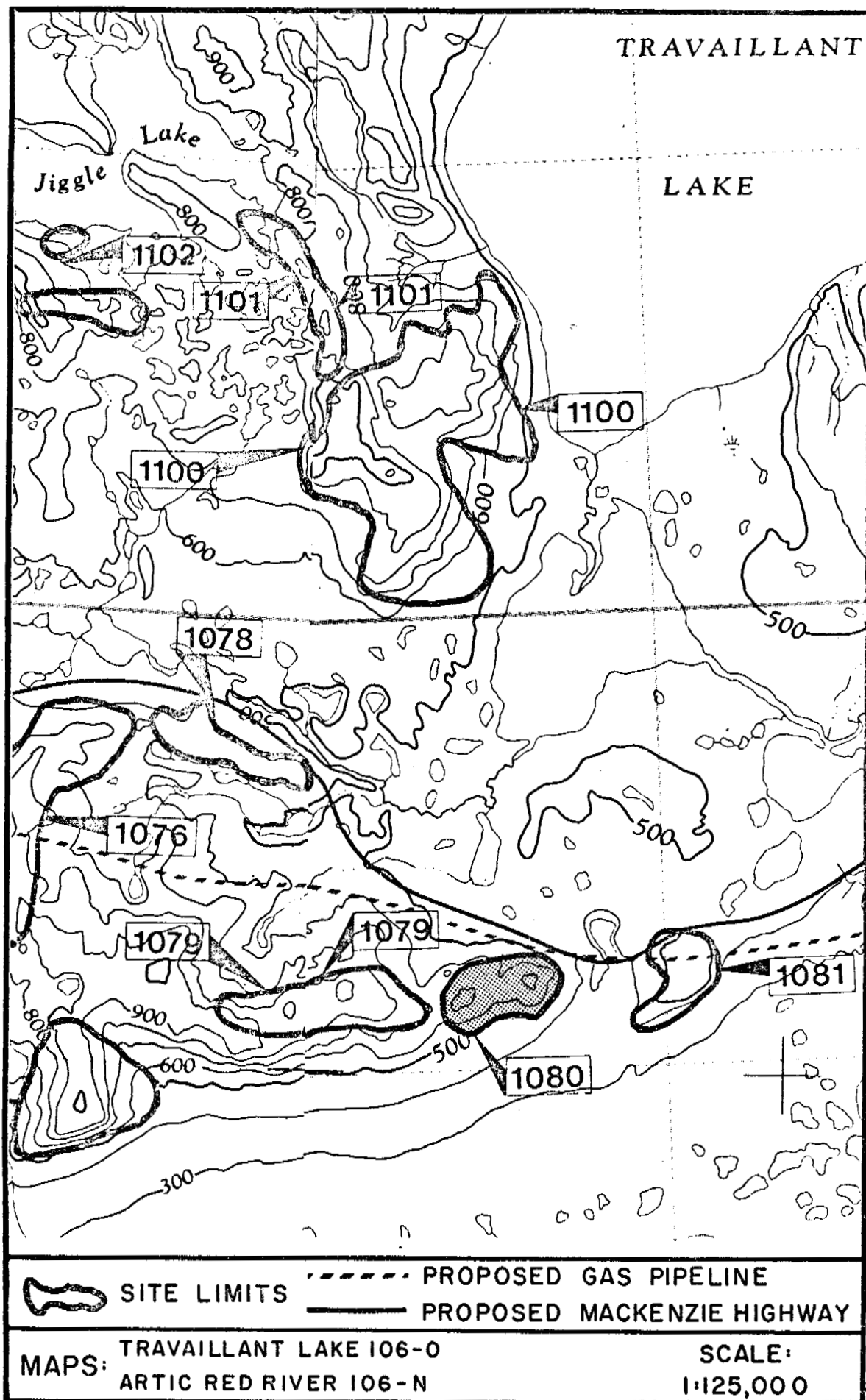
SITE 1080

Location: Site 1080 is located 8 miles south of Travaillant Lake. Proposed pipeline and highway routes are 5 mile north of the site.

Material: Shale.

Assessment: Shale bedrock with 14 feet of weathered shale and clay overburden was encountered at site 1080. Below 15 feet the shale is hard and suitable for fair quality general fill. Access to the site crosses a short span of thermally sensitive terrain; however, haulage distance is short. Drilling will be necessary to better assess overburden thickness and to delimit the outcrop. Site 1080 has a good potential as a source of shale bedrock borrow.





SITE 1080

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 3 4 5	Formation Stability Ice Content	Flat Land, <u>Terrace</u> , Knoll, <u>Rolling</u> , Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, <u>Dry Site</u> .
	Rating: 5		
5	VEGETATION		
	1 2 3 4 5	Aesthetic Value <u>Habitat Value</u>	Marsh <u>Black Spruce</u> Muskeg White Spruce Mixed Conifer <u>Conifer - Deciduous</u> Deciduous Dry Slopes <u>Riparian</u>
	Rating: 10		
15	MAMMALS		
	1 2 3 4 5	Ungulates Furbearers Carnivores <u>Small Mammals</u>	<u>Winter Range</u> , <u>Summer Range</u> , <u>Migration Route</u> , Denning Area, Dams and Lodges, <u>Special Habitat Use</u> .
	Rating: 15		
10	BIRDS		
	1 2 3 4 5	<u>Waterfowl-Swans</u> , <u>Geese, Ducks</u> , <u>Game Birds</u> , Raptors Shorebirds Passerine	<u>Migration Pathway</u> , <u>Moulting</u> , <u>Spring Staging</u> , <u>Fall Staging</u> , <u>Nesting-Brooding</u> , <u>Perching</u> , <u>Winter Habitat</u> .
	Rating: 20		
10	FISHERY		
	1 2 3 4 5	Lakes, <u>Tributaries</u> 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, <u>Slumps</u> , Velocity Increments, Migration Barriers. Eutrophication. Blasting.
	Rating: 10		

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

TOTAL INDEX: 225

SPECIAL CONCERNS: Upland area; Control siltation runoff.

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY
100

MAXIMUM
SENSITIVITY
500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1080		HOLE NO. 1		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	Cl	CLAY, sandy, silty, light grey						1	
2								2	
3								3	
4								4	
5								5	
6								6	
7								7	
8								8	
9								9	
10								10	
11								11	
12								12	
13								13	
14	br	SHALE -dark brown, medium hard, silty						14	
15								15	
16								16	
17								17	

DATE DRILLED: Sep. 1/73


LOGGED BY: DPW 126

COMPLETION DEPTH: 29'

DRILLING METHOD:


THAW DEPTH:

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS




EBA Engineering Consultants Ltd.


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1080		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	br	-grey, hard						18	
19								19	
20		-grey, soft, silty						20	
21								21	
22								22	
23								23	
24		-hard						24	
25								25	
26								26	
27								27	
28		-hard						28	
29								29	
30		END OF HOLE						30	
31								31	
32								32	
33								33	
34								34	
DATE DRILLED: Sep. 1/73			LOGGED BY DPW 126		COMPLETION DEPTH: 29'				
DRILLING METHOD:				THAW DEPTH:					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1080		HOLE NO. 2		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	Organic material	V _s					1
2	Cl	-sandy, silty clay	V _r					2
3								3
4								4
5	CI							5
6	br	SHALE -soft to approximately 15'	Nf					6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17					-medium hard below 15'			
DATE DRILLED: Jun.1/73			LOGGED BY: DPW ₆₂		COMPLETION DEPTH: 25'			
DRILLING METHOD: HELI			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

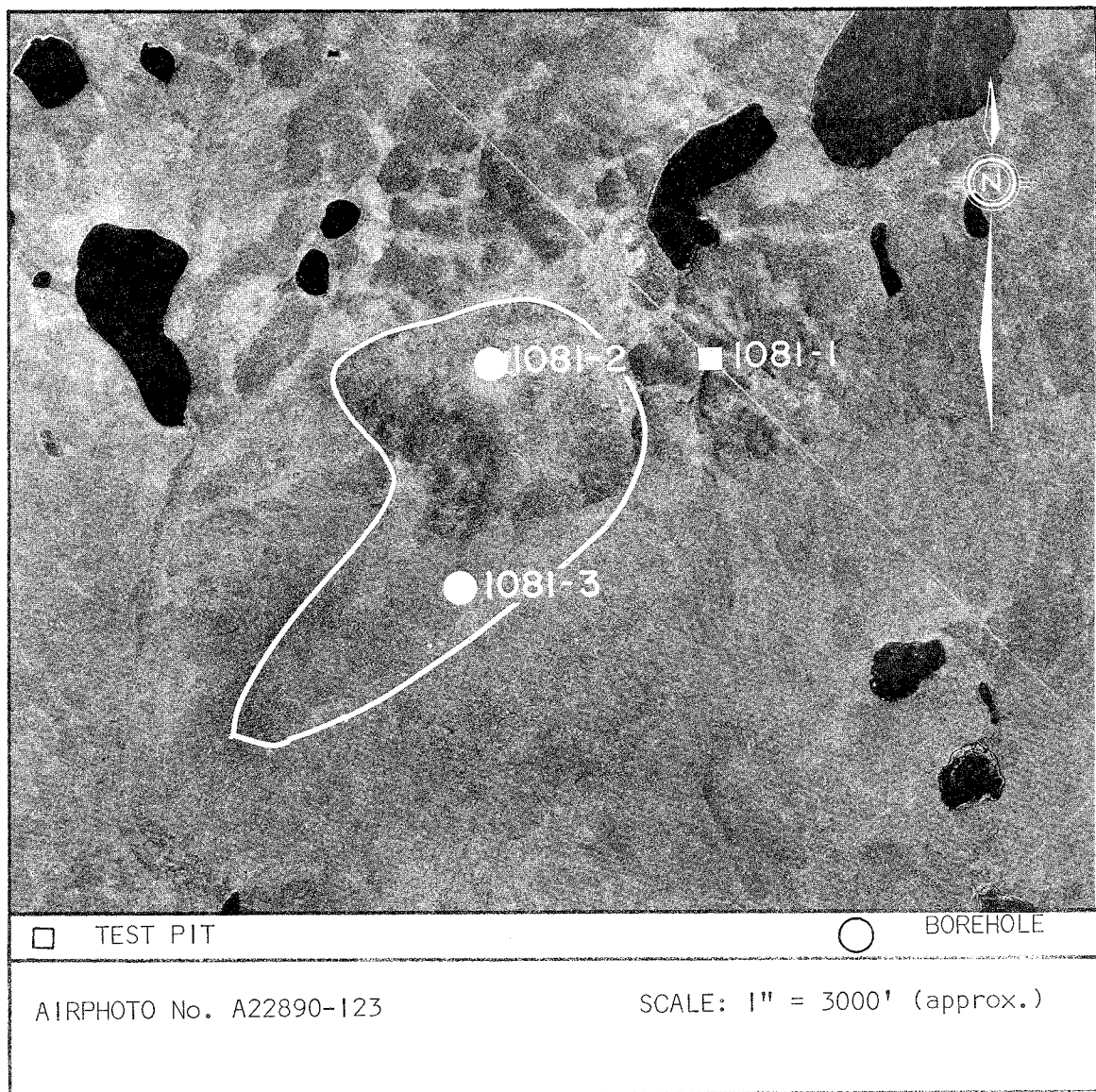
SITE NO. 1080		HOLE NO. 2		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		SHALE -medium hard	Nf	○				18	
19									19
20									20
21						○			21
22									22
23								23	
24				○				24	
25								25	
26		END OF HOLE						26	
27									27
28									28
29									29
30									30
31									31
32									32
33									33
34									34
DATE DRILLED: Jun./73		LOGGED BY: DPW 62		COMPLETION DEPTH: 25'					
DRILLING METHOD: HELI			THAW DEPTH: N/A						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

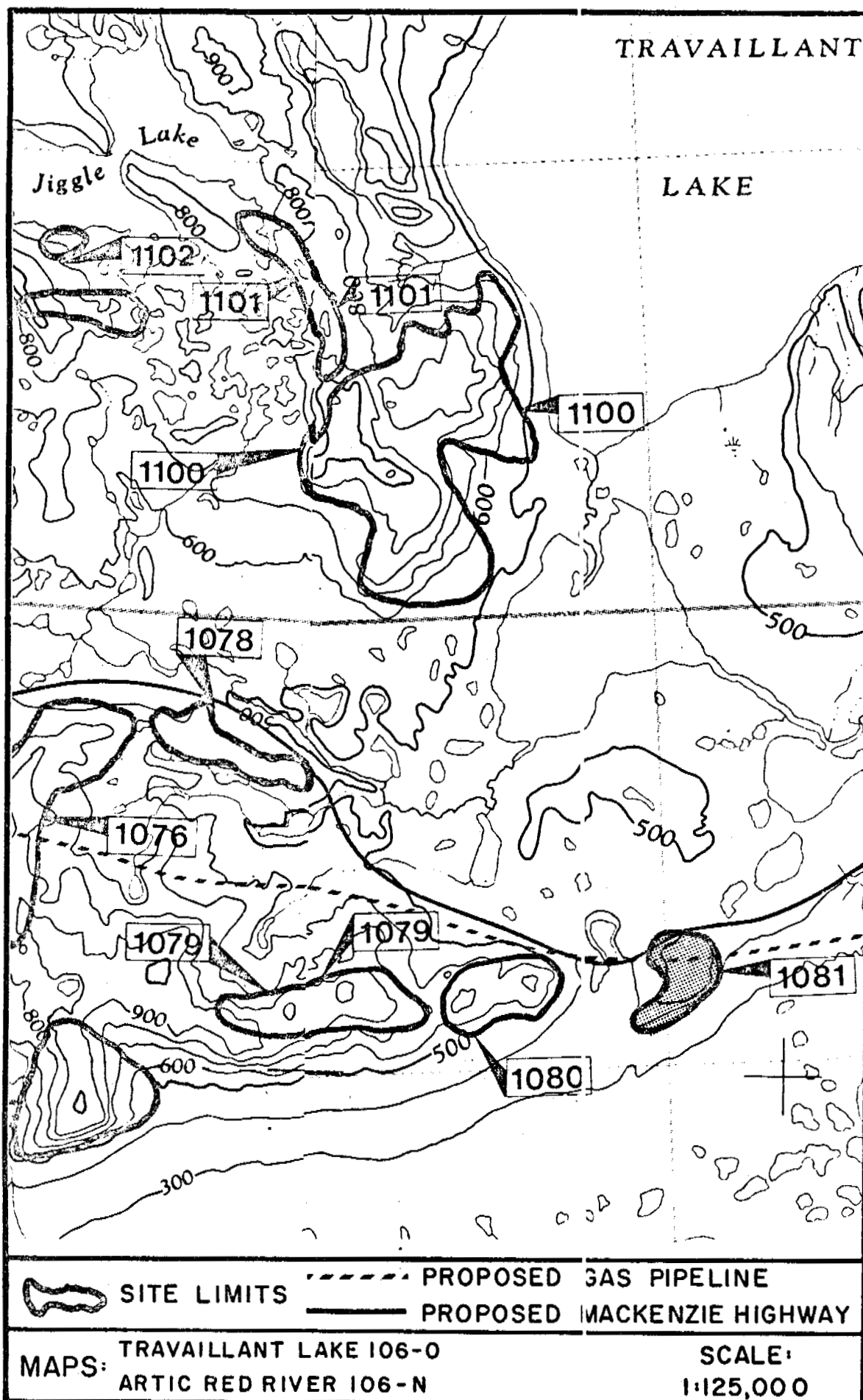
SITE 1081

Location: Site 1081 is 8 miles south of Travaillant Lake. The proposed highway and pipeline routes cross the site.

Material: Shale.

Assessment: Fair to poor quality shale with overburden consisting of 9 feet of clay plus 7 feet of weathered shale, was encountered at site 1081. If materials are in short supply, site 1081 has a fair potential as a source of shale bedrock and warrants further exploration.





ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 220

SPECIAL CONCERNS :


Upland area, Trapping in vicinity. Disturbances may reach lower Travallant River.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3 4 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
	Rating: 5		
10	AESTHETICS		
	1 2 3 4 5	Visible from: Physical Dis- turbance	River, Highway, Air, Dust, Waste, Stockpiles. Noises.
	Rating: 50		
15	RESOURCE UTILIZATION		
	1 2 3 4 5	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Trapslines. Hunting. Fishing. Domestic. Commercial.
	Rating: 30		
15	ASSOCIATED DISTURBANCES		
	1 2 3 4 5	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations	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.
	Rating: 15		
10	RESTORATION		
	1 2 3 4 5	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.
	Rating: 50		


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1081		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1		CLAY -brown silty						1
2								2
3								3
4								4
5								5
6		CLAY AND SHALE -brown						6
7								7
8								8
9								9
10		SHALE -medium-hard, dark brown						10
11								11
12								12
13		-soft, brown						13
14								14
15								15
16		-soft, grey						16
17								17
DATE DRILLED: Sep./73			LOGGED BY: DPW 124		COMPLETION DEPTH: 29'			
DRILLING METHOD:			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1081		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		SHALE						18	
19		-soft to medium-hard, grey						19	
20								20	
21								21	
22								22	
23		-medium-hard to hard, grey						23	
24								24	
25								25	
26		-hard, brown						26	
27								27	
28								28	
29								29	
30		END OF HOLE						30	
31								31	
32								32	
33								33	
34								34	
DATE DRILLED: Sep./73			LOGGED BY: DPW 124		COMPLETION DEPTH: 29'				
DRILLING METHOD:			THAW DEPTH: N/A						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

GRANULAR MATERIALS INVENTORY - STAGE III

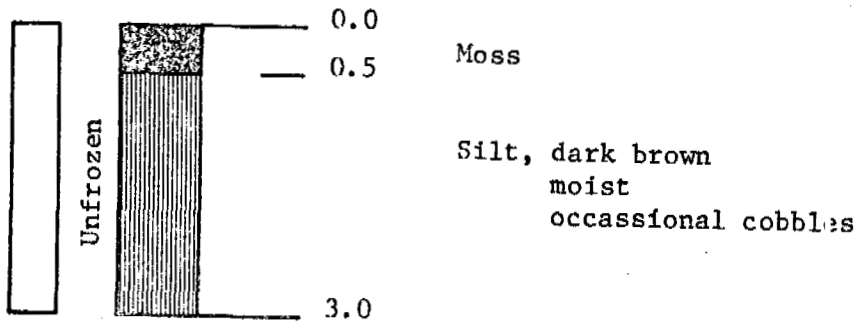
SITE NO. 1081		HOLE NO. 2		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1		CLAY							1
2		-silty, sandy, brown, pebbles							2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10		-silty, sandy, grey-brown							10
11									11
12									12
13		SHALE							13
14		-soft							14
15									15
16									16
17									17
DATE DRILLED: Sep./73			LOGGED BY: DPW 125		COMPLETION DEPTH: 29'				
DRILLING METHOD:				THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1081		HOLE NO. 2		PAGE 2 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
18		SHALE			18
		-medium-hard, grey			
19					19
20					20
21		-medium-hard to hard, grey			21
22					22
23		-hard, grey			23
24					24
25		-soft to medium-hard, grey			25
26					26
27					27
28		-soft, brown			28
29					29
30		END OF HOLE			30
31					31
32					32
33					33
34					34
DATE DRILLED: Sep./73		LOGGED BY: DPW 125		COMPLETION DEPTH: 20'	
DRILLING METHOD:			THAW DEPTH: N/A		
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.		

TEST PIT LOG

TP 1081-1



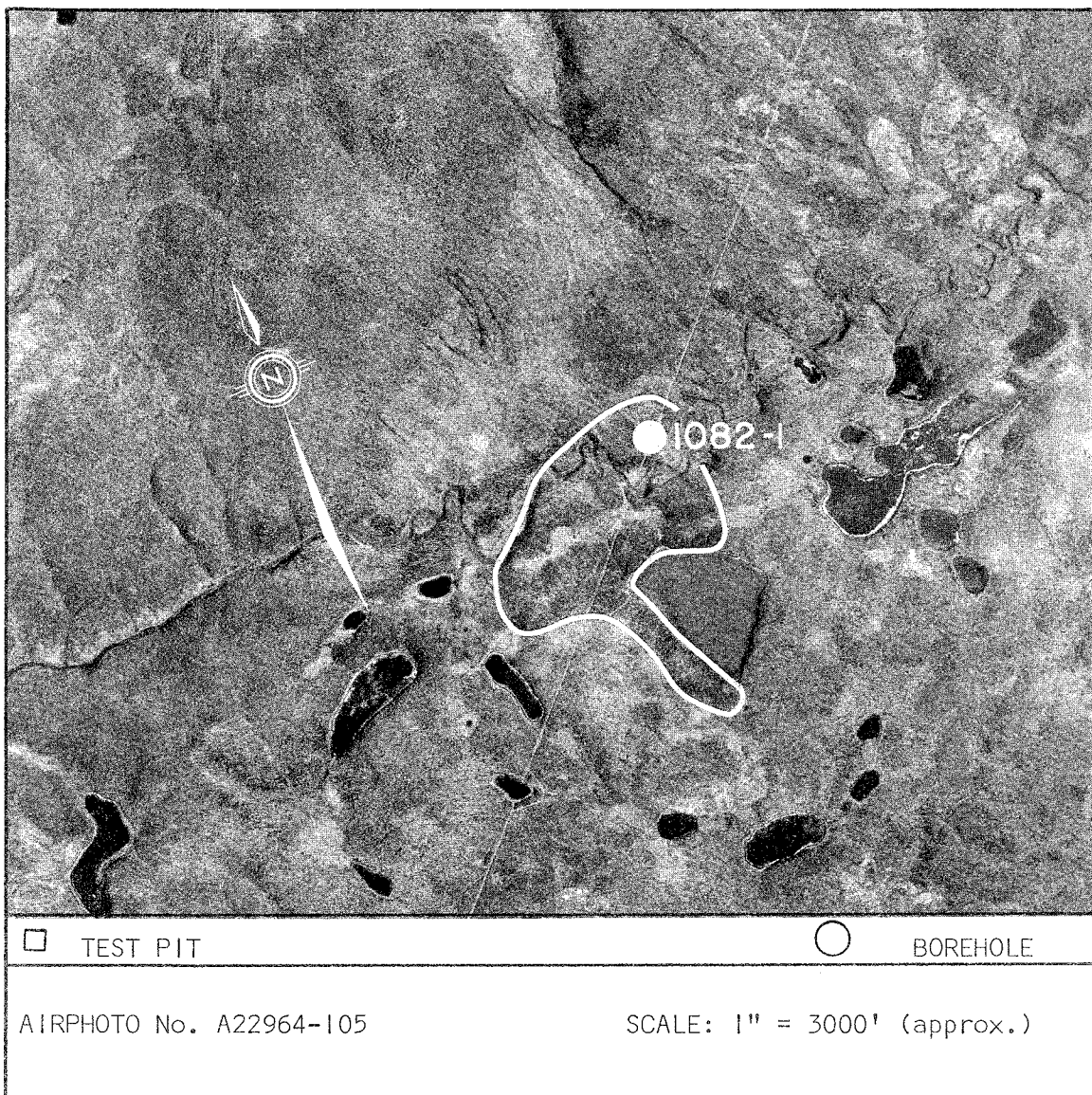
SITE 1082

Location: Site 1082 is situated along the south bank of the Travaillant River and 7 miles NNW of the point of confluence of the Travaillant and Mackenzie Rivers. Proposed pipeline routes are 5 mile north of the site.

Geology: Site 1082 is a kame complex of high, dry kames and wet muskeg filled valleys between. Variation in material may be expected among the kames.

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

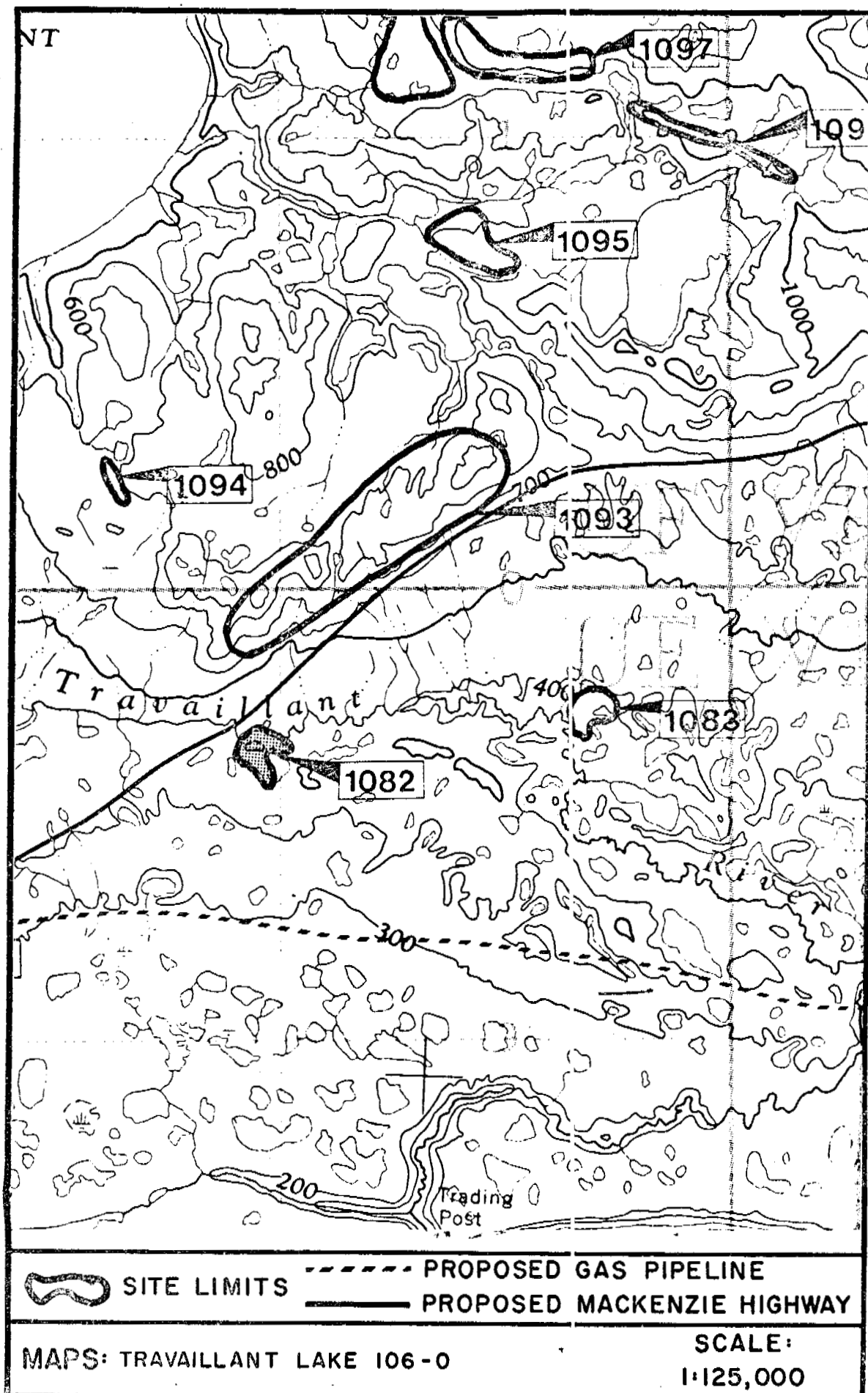
Volume: 2,200,000 cu. yd., reliability of volume estimate is uncertain.



Area: 50 acres.

Drainage: Drainage at the site is fair into the Travailant River.

Assessment: A relatively large volume of material, which is probably suitable for use as general fill, was encountered at site 1082. The site is thermally sensitive with thick ice layers found in the borrow source. Permafrost was encountered a few inches below the surface. Severe thaw subsidence should be expected if the site is stripped of its vegetative cover. Moreover, the soil in its natural conditions is frost unstable, a factor which should be considered prior to sub-grade design or site development. Overburden is thin to negligible but a dense stand of trees covers the site. Access may present some difficulty because of the thermally sensitive terrain; however, the haulage distance is relatively short. A drilling program to assess the extent of the ice layers and prove borrow material quantities and qualities is recommended. If the ice layers are not localized the feasibility of developing site 1082 is very doubtful.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 260

SPECIAL CONCERNS:

Adjacent to south shore of Travaillant River.

Buffer zones and siltation control recommended to protect fishery and human use values.

Road may allow more direct access to Travaillant Lake.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 <u>3</u>	archaeontology	Probability of Discovery:
	4 5 <u>15</u>	pre-Historic	Low, Medium, High.
	Rating: <u>15</u>	Historic	Known Sites.
10	AESTHETICS		
	<u>1</u> 2 3	Visible from:	River, Highway, <u>Air</u> .
	4 5 <u>10</u>	Physical Dis-	Dust, Waste.
	Rating: <u>10</u>	urbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
	1 2 3	Port Good Hope	<u>Improved Access.</u>
	4 <u>5</u>	Arctic Red R.	<u>Traplines.</u>
	Rating: <u>75</u>	nuvil	<u>Hunting.</u>
			<u>Fishing.</u>
			Domestic.
			Commercial.
15	ASSOCIATED DISTURBANCES		
	1 <u>2</u> 3	Access Roads	0-2, 2-5, 5-10, 10+
	4 5 <u>30</u>	Miles from Highway	0-2, 2-5, 5-10, 10+
	Rating: <u>30</u>	Miles From Pipeline	Cuts and Fills.
		Hydrologic	Creek Crossings.
		Alterations	<u>Compaction.</u>
			<u>Slumping, Erosion.</u>
		continued Use	Stockpiles.
		or Maintenance.	Waste, Dust.
10	RESTORATION		
	1 <u>2</u> 3	oil Stabilization	Natural Regeneration.
	4 5 <u>20</u>	visual Improvement	<u>Grass-Legume Seeding.</u>
	Rating: <u>20</u>	Habitat Replacement	Transplants.
			Sustained Maintenance.
			Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY

100

TO


MAXIMUM
SENSITIVITY

500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1082		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SM	SAND silty with pebbles						1
2								2
3	GW	GRAVEL sandy -ice inclusions	Vs					3
4								4
5								5
6								6
7								7
8								8
9								9
10								10
11						11		
12		ICE	ICE					12
13								13
14								14
15								15
16								16
17								17


DATE DRILLED: June 73	LOGGED BY: DPW 26	COMPLETION DEPTH: 30'
DRILLING METHOD: HELI		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1082		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		ICE	ICE					18	
19								19	
20	CI	CLAY sandy silty	Vs					20	
21		till						21	
22								22	
23		ICE	ICE					23	
24								24	
25	CI		FROZEN					25	
26		TILL						26	
27								27	
28								28	
29								29	
30								30	
31								31	
32								32	
33								33	
34								34	

DATE DRILLED: June 73	LOGGED BY: DPW 26	COMPLETION DEPTH: 30'
DRILLING METHOD: HELI		THAW DEPTH: N/A

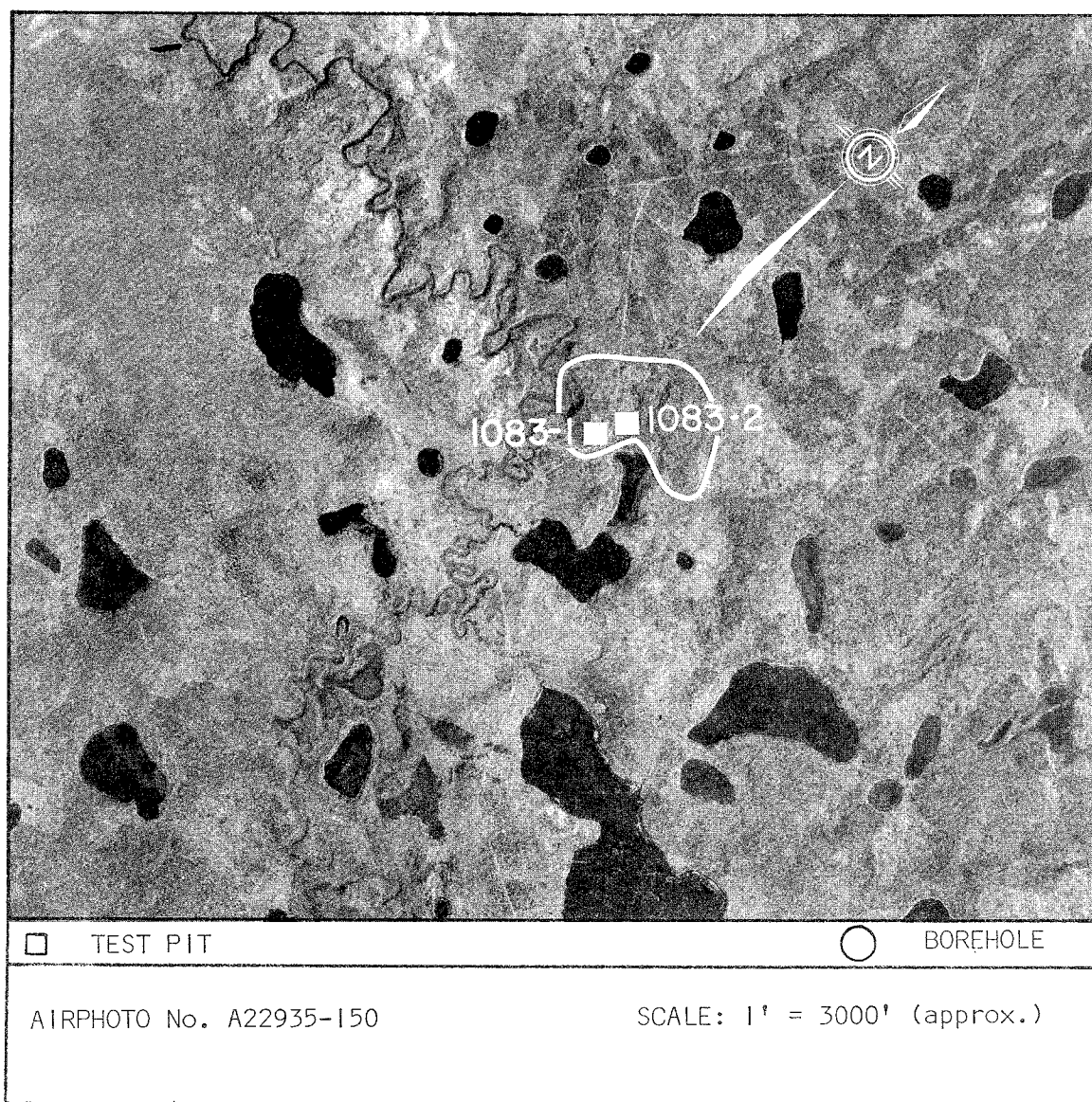
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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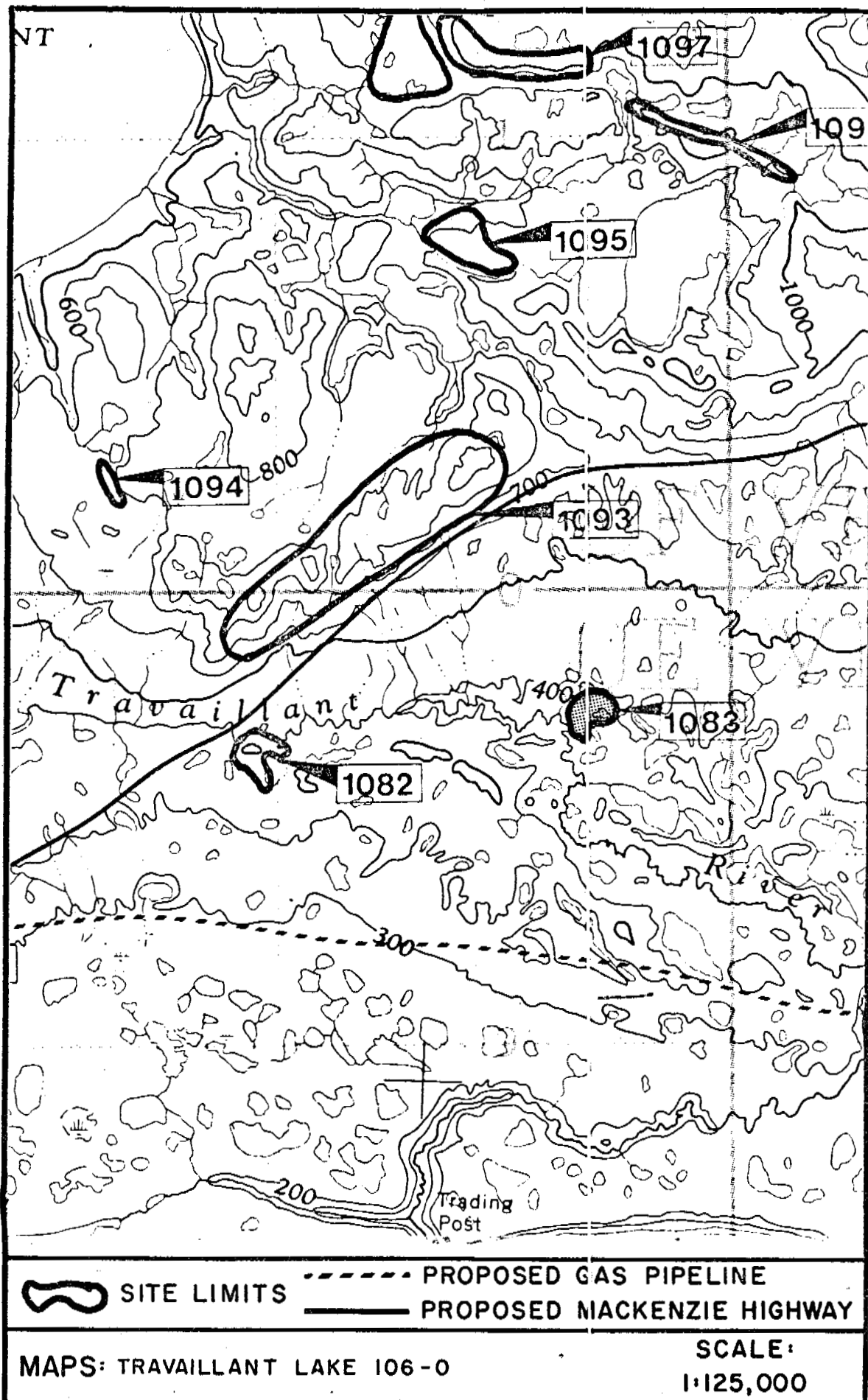
Site 1083a

Location: Site 1083 is situated 8 miles NNE of the point of confluence of the Travaillant and Mackenzie Rivers. The site is 2 miles south-east of the proposed highway route and 3.5 miles north of the proposed pipeline route.

Material: Sandy silt.

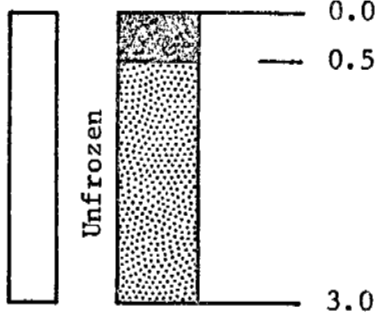
Assessment: The material at site 1083 is unsuitable for construction purposes, therefore the site is not recommended for development.





TEST PIT LOG

TP 1083-1

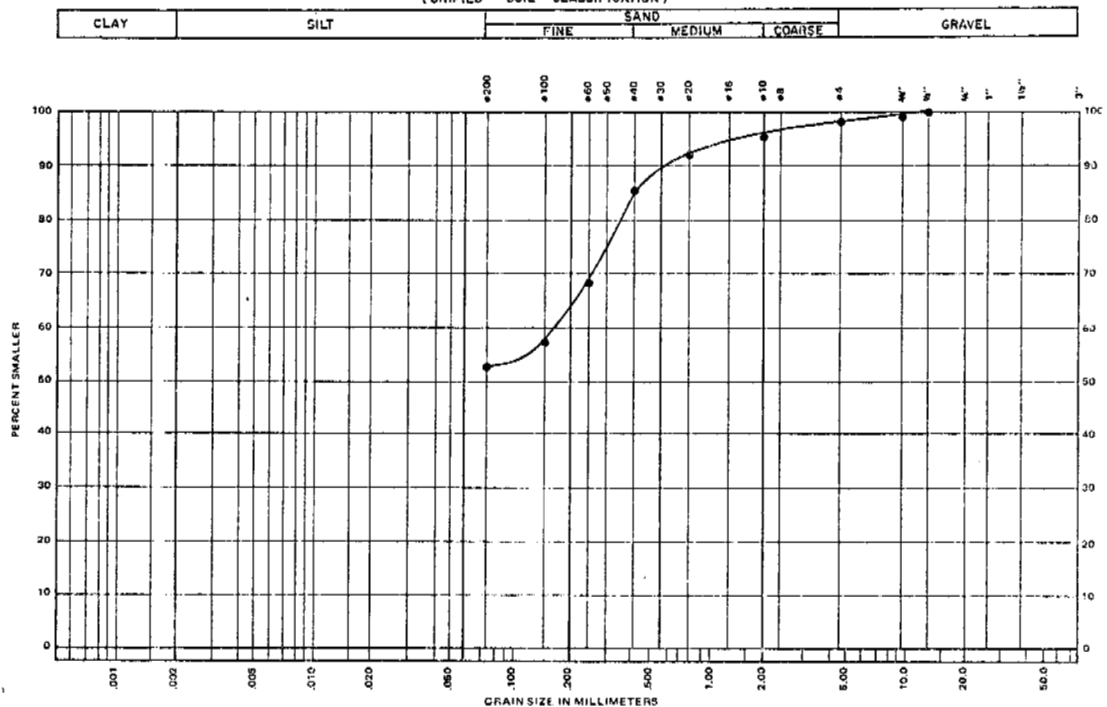


Moss

Sand, silty
dark brown to grey
wet

2% GRAVEL
45% SAND
53% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd. SAMPLE DESCRIPTION Silt and Sand with
a Trace of Gravel (SP-ML). M/C = 22.1%

PROJECT Granular Resources
JOB No. E666 DATE December 6/73
SAMPLE No. TP 1083-1
DEPTH 3'

SITE 1084

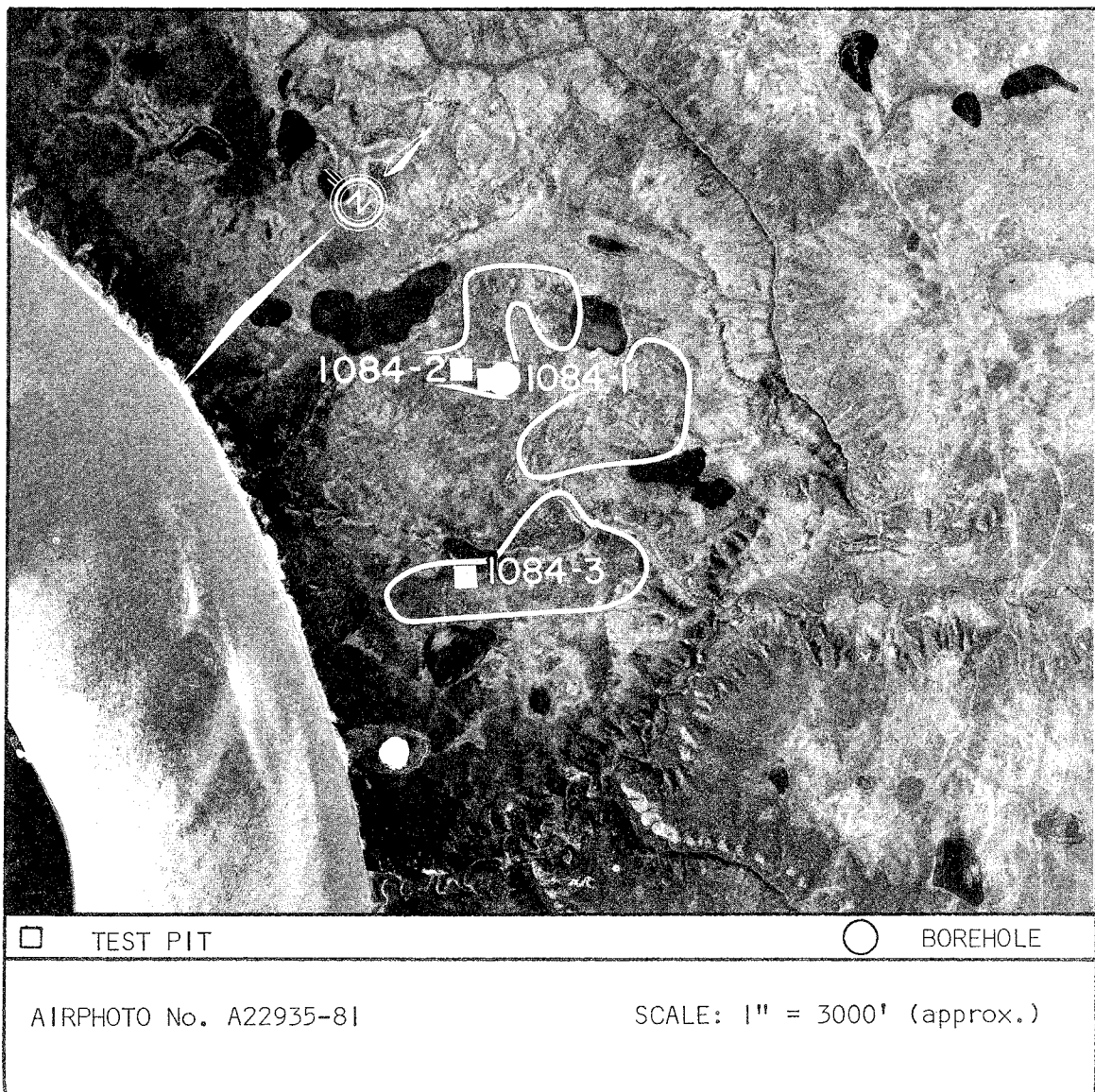
Location: Site 1084 is located 1 miles northwest of the point of confluence of the Thunder and Mackenzie Rivers. Proposed highway and pipeline routes are 4.5 and 1.5 miles NE of the site respectively.

Geology: The material at site 1084 is contained in outwash remnants and is, to some extent, variable.

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

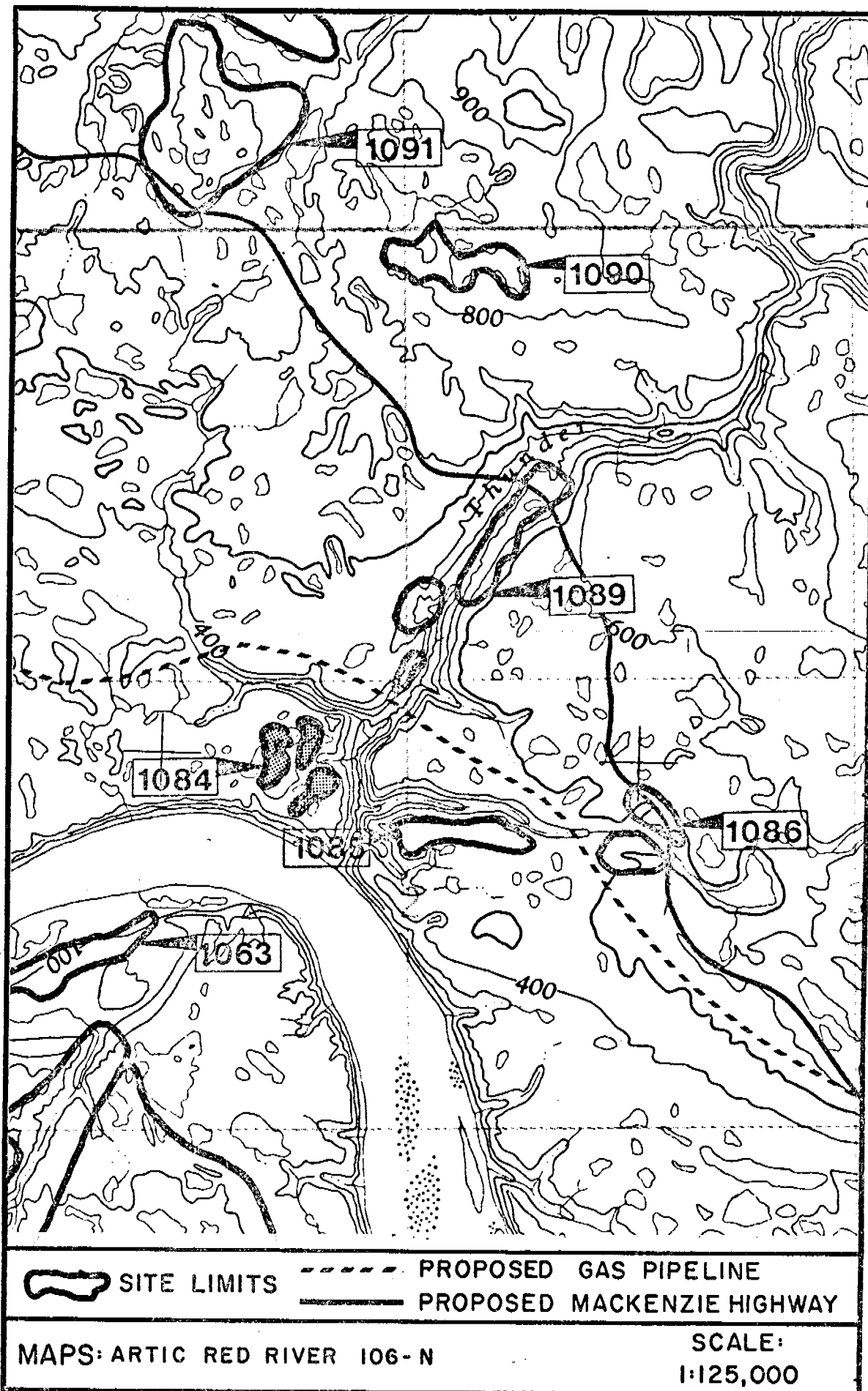
Volume: 2,000,000 cu. yd., volume estimate is probably realistic.

Area: 200 acres



Drainage: Drainage at the site is poor to fair.

Assessment: A moderately large volume of material is available at site 1084 which is of fair quality and, during winter, is readily accessible from proposed pipeline and highway routes. Haulage distance to construction sites is within acceptable limits. Moisture contents are high which will necessitate stockpiling and draining before using the material. The borrow material is approximately 6 feet thick where it was drilled; however, from one place to another borrow thickness is expected to vary considerably. Permafrost depth is approximately 7 feet. Overburden is thin but tree cover varies from moderate to high density. The site has a relatively high environmental sensitivity rating with major concern directed at bank stability. More drilling will be necessary to delimit the deposit prior to development. Development within the general borrow pit development and environmental guidelines contained in this report is suggested.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 3	Formation Stability	Flat Land, <u>Terrace</u> , Knoll,
	4 5	Ice Content	<u>Rolling</u> , Outcrop, Ridge,
	Rating: 10		Scarp, Overburden Type & Depth, <u>Wet Site</u> , Dry Site.
5	VEGETATION		
	1 2 3	Aesthetic Value	<u>Marsh</u>
	4 5	<u>Habitat Value</u>	<u>Black Spruce</u>
	Rating: 15		<u>Muskeg</u>
			White Spruce
			Mixed Conifer
			Conifer - Deciduous
			Deciduous
			Dry Slopes
			<u>Riparian</u>
15	MAMMALS		
	1 2 3	Ungulates	Winter Range, Summer Range,
	4 5	<u>Furbearers</u>	<u>Migration Route</u> ,
	Rating: 45	<u>Carnivores</u>	<u>Denning Area</u> ,
		Small Mammals	Dams and Lodges,
			<u>Special Habitat Use</u> .
10	BIRDS		
	1 2 3	Waterfowl-Swans,	Migration Pathway, Moulting,
	4 5	<u>Geese, Ducks</u>	<u>Spring Staging</u> , Fall Staging,
	Rating: 30	Game Birds	<u>Nesting-Brooding</u> , Perching,
		Raptors	<u>Winter Habitat</u> .
		Shorebirds	
		Passerine	
10	FISHERY		
	1 2 3	Lakes, Tributaries	Spawning, Nursery, Feeding,
	4 5	<u>Mackenzie River</u> :	Overwintering.
	Rating: 50	<u>Whitefish</u> <u>Smelt</u>	<u>Major Migration Route</u> .
		<u>Grayling</u> <u>Sculpin</u>	<u>Siltation of Spawning Areas</u> .
		<u>Pike</u> <u>Goideye</u>	Benthic Communities.
		<u>Trout-Perch</u> <u>Chub</u>	<u>Toxic Material Spill</u> .
		Lake Trout <u>Dace</u>	<u>Slumps</u> , <u>Velocity Increments</u> ,
		Burbot <u>Walleye</u>	<u>Migration Barriers</u> .
		<u>Suckers</u> <u>Char</u>	Eutrophication.
		<u>Stickleback</u> <u>Cisco</u>	Blasting.

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

TOTAL INDEX : 335

SPECIAL CONCERNS:

North shore of mouth of Thunder River. Bear denning, native encampments and grayling migration passage are prime concerns. Raptors may nest in cliffs. Bank stability should be insured.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3	Paleontology	Probability of Discovery.
	4 5	<u>Pre-Historic</u>	Low, Medium, <u>High</u> .
	Rating: 20	<u>Historic</u>	Known Sites.
10	AESTHETICS		
	1 2 3	Visible from:	<u>River</u> , Highway, <u>Air</u> .
	4 5	Physical Disturbance	Dust, Waste,
	Rating: 30		Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
	1 2 3	<u>Fort Good Hope</u>	<u>Improved Access</u> ,
	4 5	Arctic Red R.	<u>Trappings</u> .
	Rating: 75	Inuvik	<u>Hunting</u> ,
			<u>Fishing</u> .
			<u>Domestic</u> .
			<u>Commercial</u> .
15	ASSOCIATED DISTURBANCES		
	1 2 3	Access Roads	
	4 5	Miles From Highway	0-2, 2-5, 5-10, 10+
	Rating: 30	Miles From Pipeline	0-2, 2-5, 5-10, 10+
		Hydrologic	Cuts and Fills.
		Alterations	Creek Crossings.
			<u>Compaction</u> .
			<u>Slumping</u> , <u>Erosion</u> .
		Continued Use	Stockpiles,
		For Maintenance.	Waste, Dust.
10	RESTORATION		
	1 2 3	<u>Soil Stabilization</u>	Natural Regeneration.
	4 5	<u>Visual Improvement</u>	<u>Grass-Legume Seeding</u> .
	Rating: 30	Habitat Replacement	Transplants.
			Sustained Maintenance.
			<u>Erosion Control Systems</u> .


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	MAXIMUM SENSITIVITY
100	500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1084		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	Pt	PEAT -fibrous, medium brown	NOT FROZEN		1
2	SM	SAND -silty, fine grained, light brown, wet.			2
3					3
4		(2'-5') 0% GRAVEL 75% SAND 25% SILT & CLAY -very silty			4
5					5
6	SM	SILT -very sandy, fine grained, light brown	FROZEN		6
7		-sandy, very wet, light to medium brown			7
8					8
9					9
10	SC	CLAY & SAND -sand is fine, wet, grey			
11					11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep, 24/73	LOGGED BY: EBA 141-1	COMPLETION DEPTH: 18.5'
DRILLING METHOD: AUGER		THAW DEPTH: 7.0'

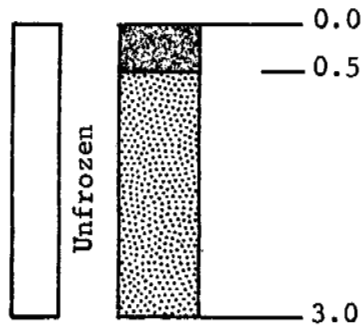
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1084		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	SC	CLAY & SAND				0		18	
		-same							
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: Sep. 24/73		LOGGED BY: EBA 141-1		COMPLETION DEPTH: 18.5'					
DRILLING METHOD: AUGER			THAW DEPTH: 7.0'						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

TEST PIT LOG

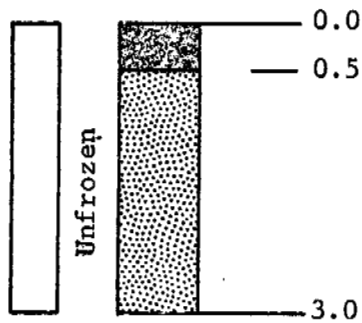
TP 1084-1



Moss

Sand, light grey
wet
contains organics

TP 1084-2



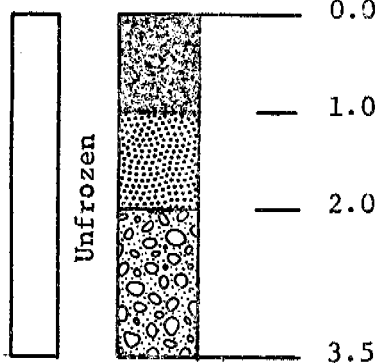
Moss

Sand, light brown
dry
uniform
streaks of grey sand/silt

77% SAND
23% SILT & CLAY

TEST PIT LOG

TP 1084-3



Moss, peat

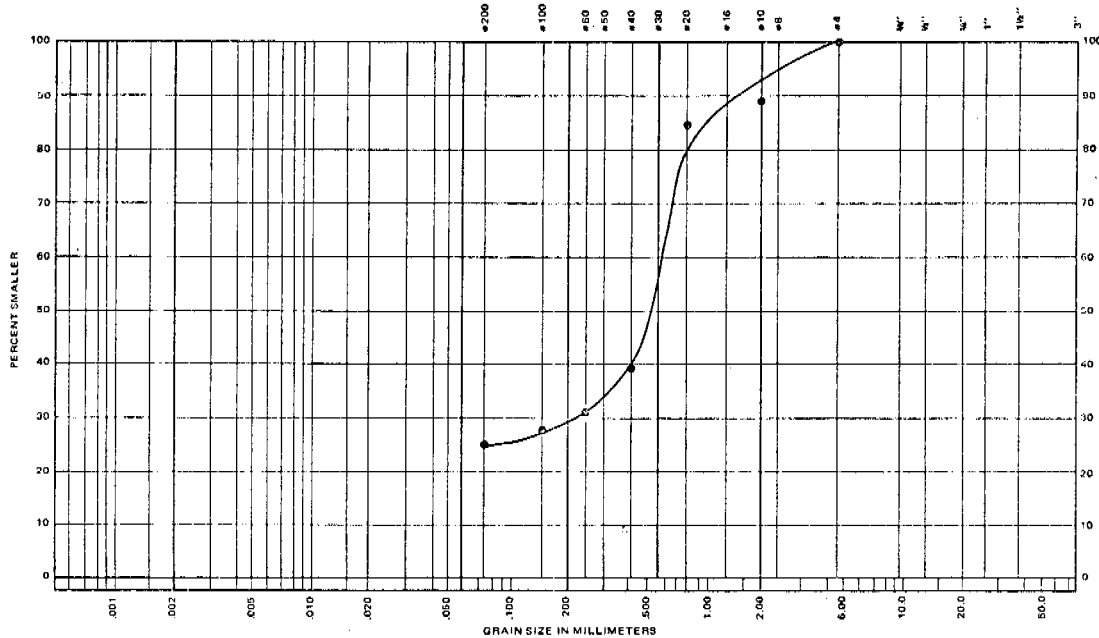
Sand, light brown, moist, organics

Sand and Gravel
grey
moist

35% GRAVEL
52% SAND
13% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	

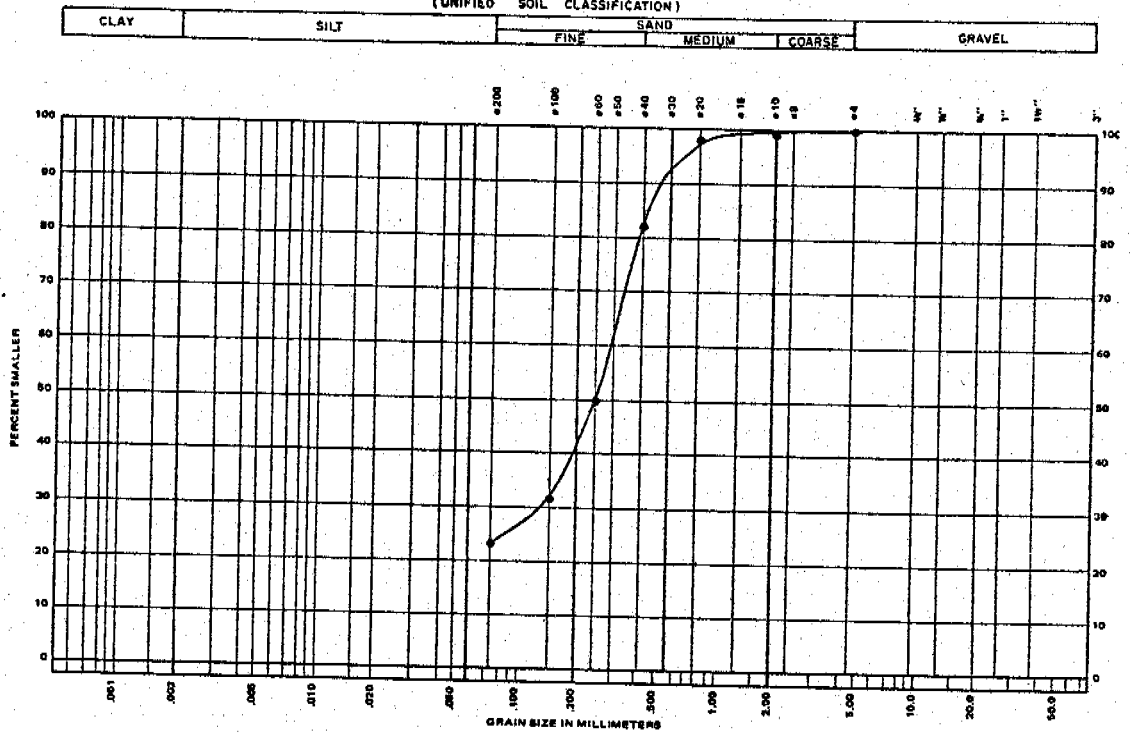


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand (SP-SM)

PROJECT Granular Resources
JOB No. E666 DATE January 29/73
SAMPLE No. BH 1084-1
DEPTH 2' - 5'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

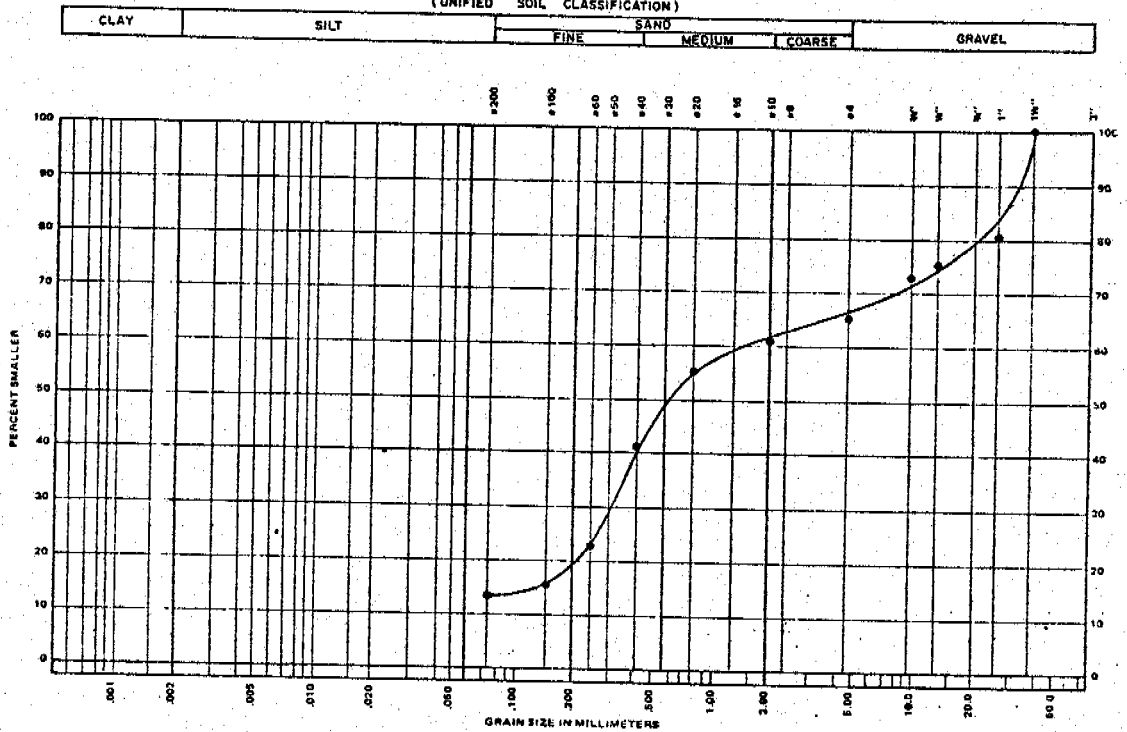


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand (SP-SM)

PROJECT Granular Resources
JOB NO. E666 DATE January 29/74
SAMPLE NO. TP 1084-2
DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel and
Some Silt (GM) M/C=7.1%

PROJECT Granular Resources
JOB NO. E666 DATE December 19/73
SAMPLE NO. TP 1084-3
DEPTH 3.5'

SITE 1085

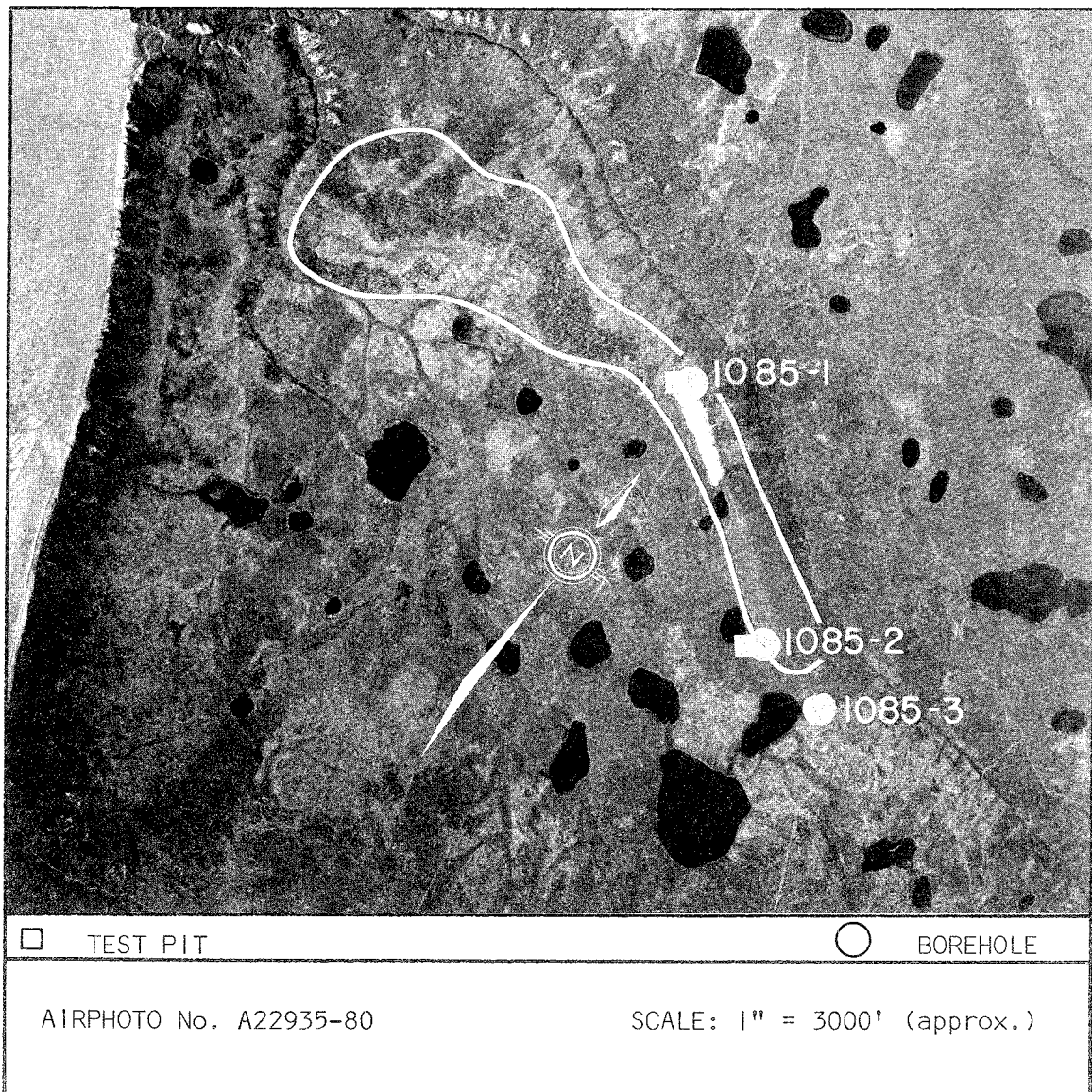
Location: Site 1085 is 2 miles east of the point of confluence of the Thunder and Mackenzie Rivers. Proposed pipeline and highway routes are 1.5 miles north and 3 miles NE of the site respectively.

Geology: The borrow material at site 1085 is contained in thin outwash remnants which are expected to be uniform.

Material: Sand, gravelly, with a trace of silt, well graded.

Volume: 1,200,000 cu. yd., reliability of volume estimate is uncertain.

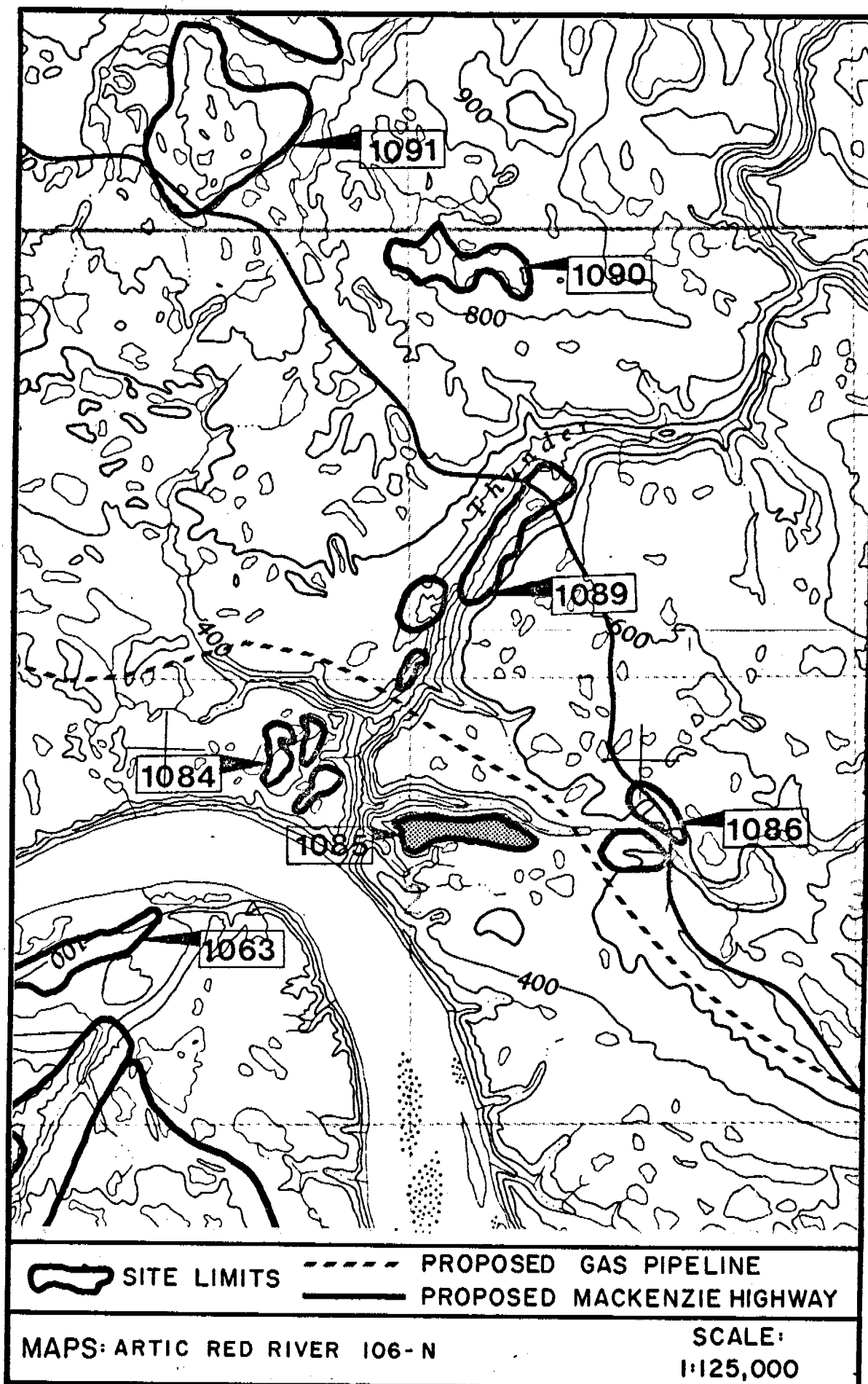
Area: 250 acres.



1085-1

Drainage: The site is well drained.

Assessment: The material encountered at site 1085 is of fair quality and suitable for use as general fill. A moderate volume of material is available but is thin (approximately 4 feet thick) and is spread over a large area. Overburden consists of a few inches to a foot of peat and silt which must be removed and can be stockpiled for use in restoration. Small dense black spruce covers the borrow and will also have to be removed. The site has been assessed a high relative environmental sensitivity rating. An airstrip is located near the midpoint of the site and divides borrow material west of it from unsuitable clay material east of it. Access to the site should be relatively easy and haulage distance is within acceptable limits. Drilling should be undertaken to check variations in borrow thickness and quality. Site 1085 has a promising potential as a source of borrow.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 3	Formation Stability	Flat Land, <u>Terrace</u> , Knoll,
	4 5	Ice Content	<u>Rolling</u> , Outcrop, Ridge,
	Rating: 15		Scarp, Overburden Type & Depth, Wet Site, <u>Dry Site</u> .
5	VEGETATION		
	1 2 3	<u>Aesthetic Value</u>	Marsh
	4 5	<u>Habitat Value</u>	<u>Black Spruce</u>
	Rating: 20		Muskeg
			White Spruce
			<u>Mixed Conifer</u>
			<u>Conifer - Deciduous</u>
			<u>Deciduous</u>
			<u>Dry Slopes</u>
			<u>Riparian</u>
15	MAMMALS		
	1 2 3	<u>Uniquates</u>	<u>Winter Range, Summer Range,</u>
	4 5	<u>Furbearers</u>	<u>Migration Route,</u>
	Rating: 75	<u>Carnivores</u>	<u>Denning Area,</u>
		<u>Small Mammals</u>	<u>Dams and Lodges,</u>
			<u>Special Habitat Use.</u>
10	BIRDS		
	1 2 3	<u>Waterfowl-Swans,</u>	<u>Migration Pathway, Moulting,</u>
	4 5	<u>Geese, Ducks</u>	<u>Spring Staging, Fall Staging,</u>
	Rating: 40	<u>Game Birds</u>	<u>Nesting-Brooding, Perching,</u>
		<u>Raptors</u>	<u>Winter Habitat.</u>
		<u>Shorebirds</u>	
		<u>Passerine</u>	
10	FISHERY		
	1 2 3	<u>Lakes, Tributaries</u>	<u>Spawning, Nursery, Feeding,</u>
	4 5	<u>Mackenzie River:</u>	<u>Overwintering.</u>
	Rating: 40	Whitefish <u>Smelt</u>	<u>Major Migration Route.</u>
		Grayling <u>Sculpin</u>	<u>Siltation of Spawning Areas,</u>
		Pike <u>Goldeye</u>	<u>Benthic Communities.</u>
		Trout-Perch <u>Chub</u>	<u>Toxic Material Spill.</u>
		Lake Trout <u>Dace</u>	<u>Slumps, Velocity Increments,</u>
		Burbot <u>Walleye</u>	<u>Migration Barriers.</u>
		Suckers <u>Char</u>	<u>Eutrophication.</u>
		Stickleback <u>Cisco</u>	<u>Blasting.</u>

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100	TO	500

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

TOTAL INDEX: 385

SPECIAL CONCERNS:

On tributary to Thunder River. Raptors may nest on the steep slopes. Bear and fox dens probably on exposed slopes. Developments should maintain slope stability and insure fish passage.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1085		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-OL	PEAT & ORGANIC SILT -dark brown	NOT FROZEN		1
2	GW-GM	GRAVEL -sandy, some silt, well graded, maximum 2", average			2
3		- 3/4", rounded to subangular, light brown			3
4		-wet at 3 1/2'			4
5		10.5% O.C. 43% GRAVEL (2'+4') 49% SAND 8% SILT & CLAY	5		
6	CL	CLAY -some sand, some fine	6		
7		gravel, maximum 1/2", moist medium plasticity, grey	7		
8		-trace fine gravel	8		
9			9		
10			10		
11			11		
12			12		
13		FROZEN	13		
14		ICE	14		
15		ICE	15		
16		CLAY -some sand, some fine	16		
17		END OF HOLE		17	

DATE DRILLED: Sep. 23/73

LOGGED BY: EBA
140-1

COMPLETION DEPTH: 16.5'

DRILLING METHOD: AUGER

THAW DEPTH: 12.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1085

HOLE NO. 2

PAGE 1 OF 1

DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	Pt-OL	PEAT & ORGANIC SILT -dried, dark brown	NOT FROZEN		1
2	CL	CLAY -silty, some sand, moist, medium plasticity, medium grey-brown. -trace fine gravel, some silt, medium to low plasticity. - med. plasticity -some sand & fine gravel, grey	NOT FROZEN		2
3					3
4					4
5					5
6					6
7					7
8					8
9			FROZEN		9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17		END OF HOLE			17

DATE DRILLED: Sep. 23/73


LOGGED BY: EBA
140-2

COMPLETION DEPTH: 16.5'

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. 1085		HOLE NO. 3		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	CL	CLAY	Vx					18
19								19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27
28								28
29			Vr					29
30								30
31	ML	-occassional lenses of grey silt						31
32								32
33								33
34								34

DATE DRILLED: March 18/72


LOGGED BY: MVP
72C-92

COMPLETION DEPTH: 40'


DRILLING METHOD: Failing 1000 Air

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

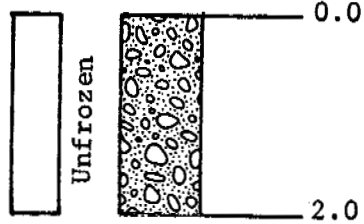

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1085		HOLE NO. 3		PAGE 1 OF 2		
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)	
				10 20 30 40		
1	PT	PEAT -brown, fibrous	Vx		1	
2						2
3						3
4	CL	CLAY -grey silty				4
5		-occassional sand and fine gravel				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: Mar. 18/72			LOGGED BY: MVP 72C-92	COMPLETION DEPTH: 40'		
DRILLING METHOD: Failing 1000 Air			THAW DEPTH: N/A			
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.			

TEST PIT LOG

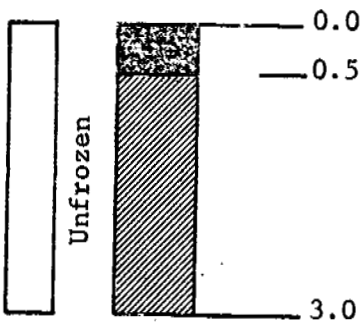
TP 1085-1



Sand, light brown
well graded
dry
gravelly

27% GRAVEL
64% SAND
9% SILT & CLAY

TP 1085-2



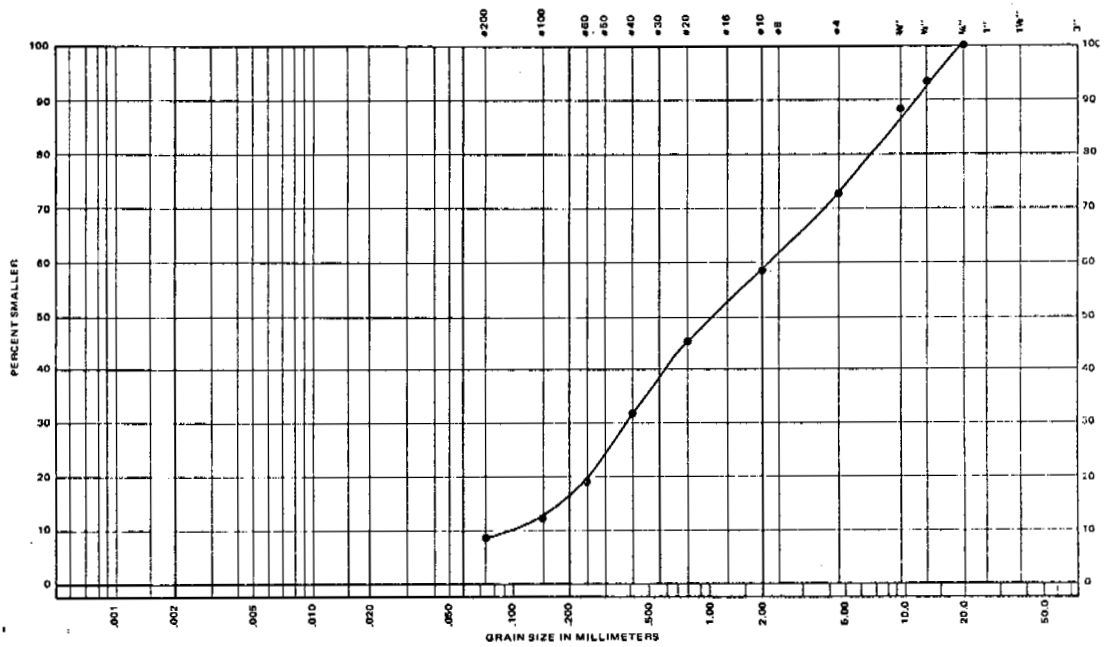
Moss, black, fibrous

Silty Clay, medium plasticity
grey brown
occassional pebbles

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

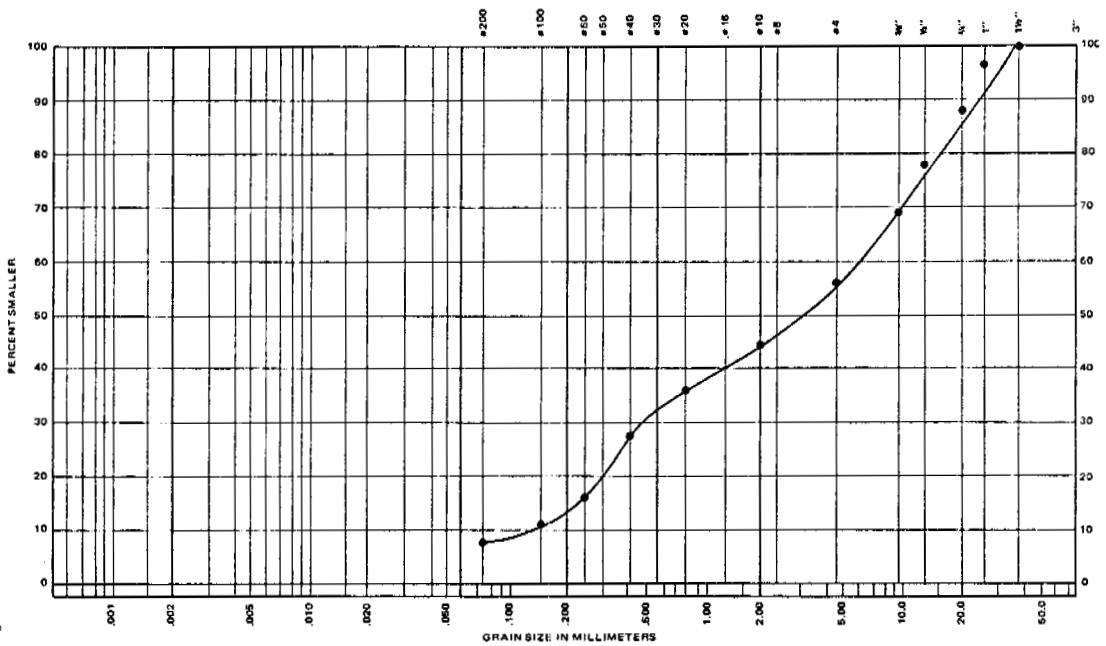
SAMPLE DESCRIPTION Gravelly Sand with
a Trace of Silt (GW-GM) M/C=3%

PROJECT Granular Resources
JOB No. F666 DATE December 16/73
SAMPLE No. TP 1085-1
DEPTH 2'

GRAIN SIZE DISTRIBUTION

(UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E666 DATE
SAMPLE No. BH 1085-1
DEPTH 2' + 4'

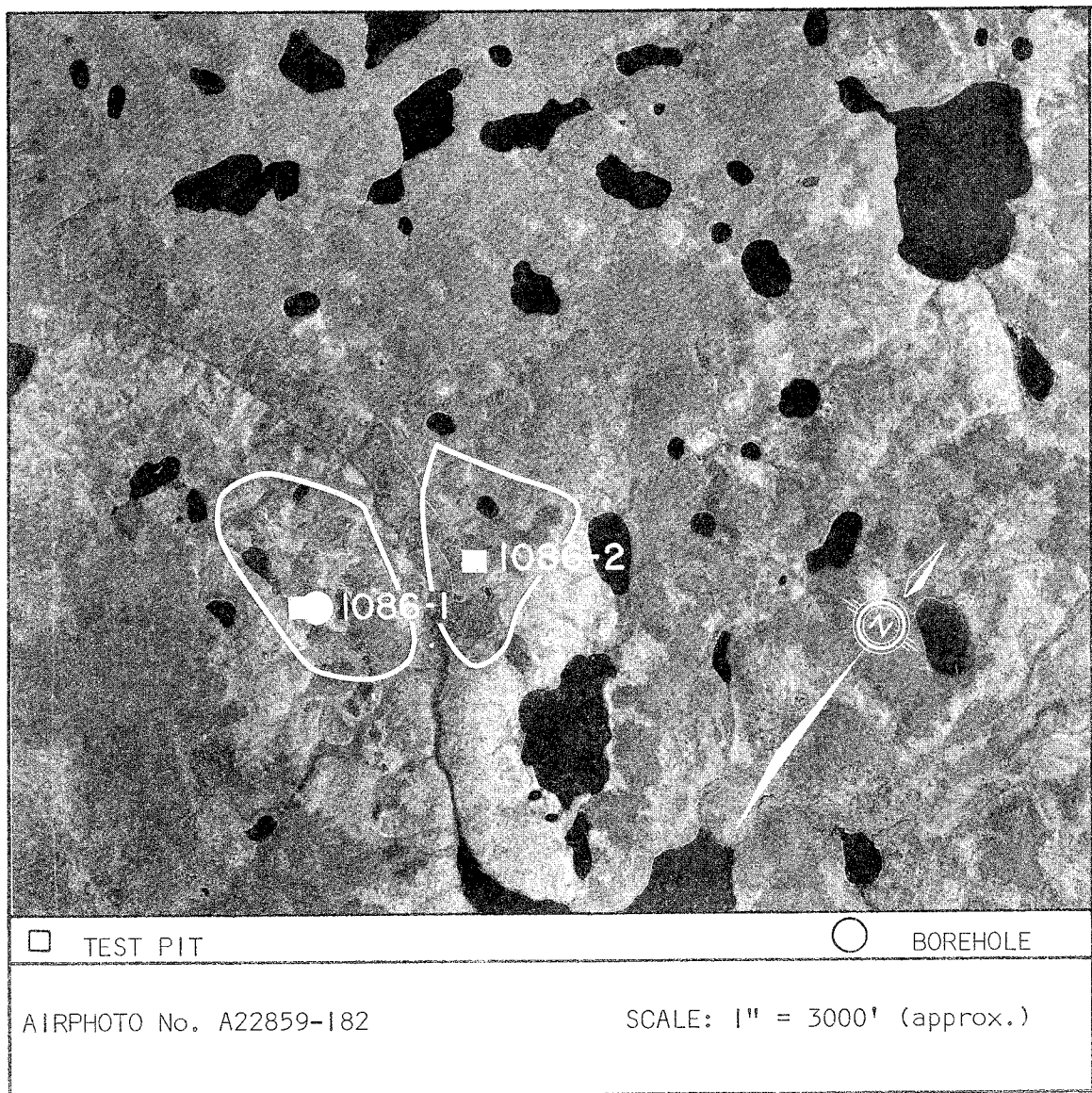
SITE 1086

Location: Site 1086 is located 5.5 miles east of the point of confluence of the Thunder and Mackenzie Rivers. Proposed highway and pipeline routes are on the site and 1.5 miles SW of the site respectively.

Geology: The material at site 1086 is contained in a small kame complex. Some variation in composition may be anticipated.

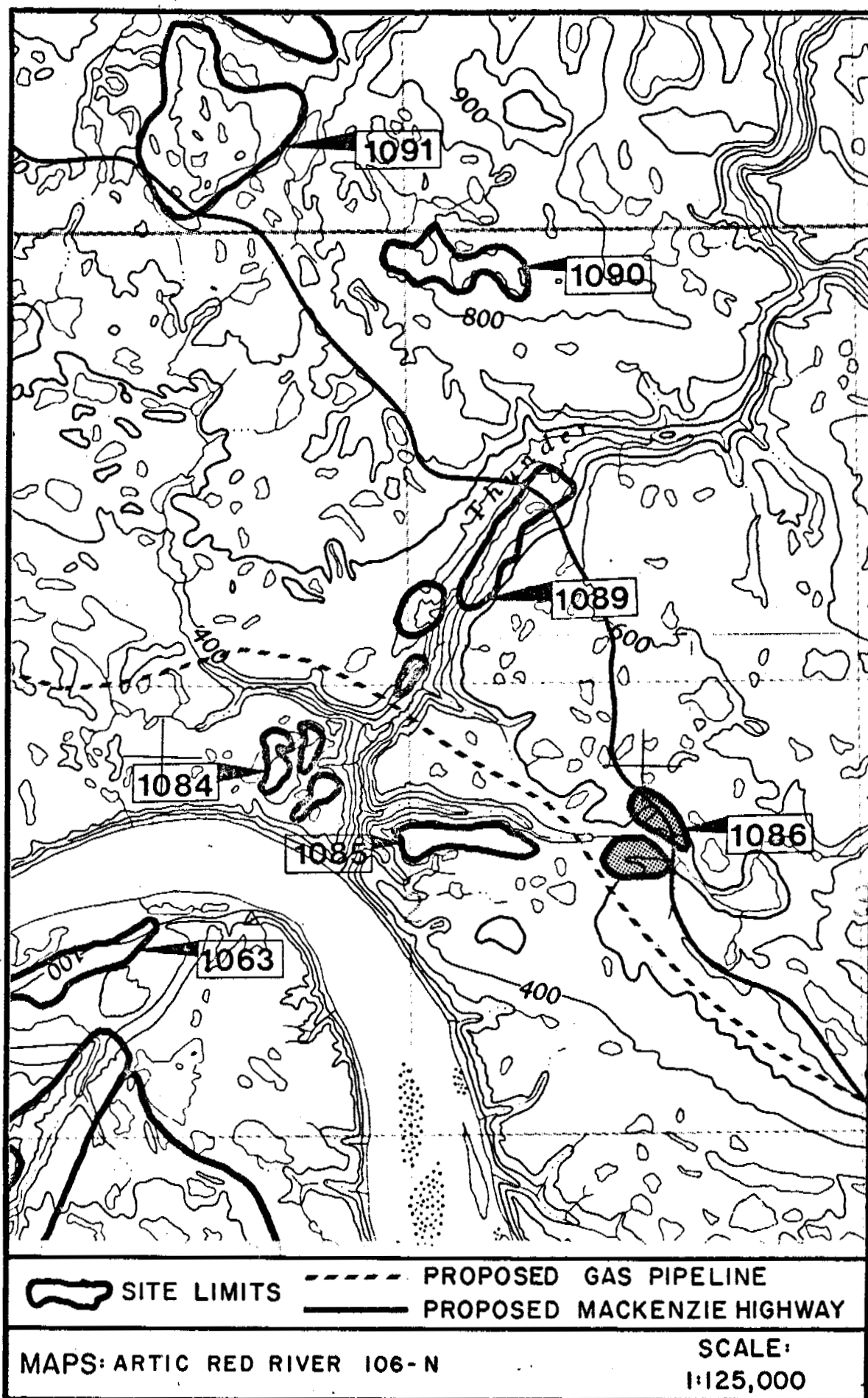
Material: Sand, silt content variable, trace gravel, poorly graded.

Volume: 1,300,000 cu. yd., volume estimate is realistic.



Assessment:


Site 1086 has a considerable volume of poor to fair quality borrow available. Natural moisture contents range up to 20% which will necessitate stockpiling and draining of borrow prior to use. Haulage distance is reasonable and access relatively easy. Overburden is thin to negligible; however, tree and bush cover will have to be removed for disposal. Drilling showed the ground to be unfrozen to a depth of at least 8 ft. A detailed drilling program will be necessary to determine quantities and qualities of material at the site.




GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1086		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1		SAND	NOT FROZEN		1
2		-trace fine gravel, medium-			2
3		fine grained sand, moist,			3
4		light brown (light orange			4
5		brown for 0'-1')			5
6	SP-SM	5.4% O.C.			6
7		3% GRAVEL			7
8		88% SAND			8
9		9% SILT & CLAY			9
10			FROZEN		10
11	SM	-trace to some silt			11
12		1% GRAVEL			12
13		77% SAND			13
14		22% SILT & CLAY			14
15		- silty, wet			15
16					16
17					17

DATE DRILLED: Sep. 25/73	LOGGED BY: EBA 143-1	COMPLETION DEPTH: 19.0'
DRILLING METHOD: AUGER		THAW DEPTH: 8.0'

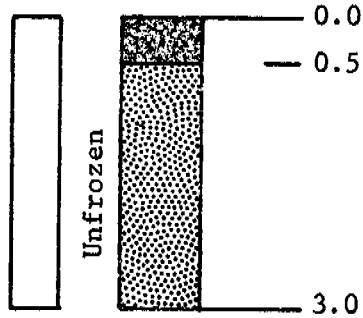
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1086		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	SM	SAND -same						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. 25/73		LOGGED BY: EBA 143-1		COMPLETION DEPTH: 19.0'					
DRILLING METHOD: AUGER				THAW DEPTH: 8.0'					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

TEST PIT LOG

TP 1086-1

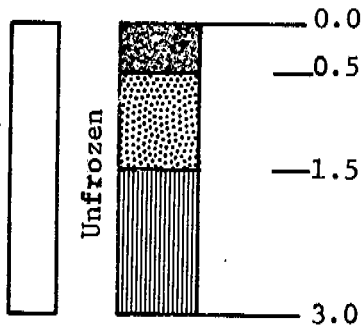


Moss

Sand, some pebbles
moist
light brown

5% GRAVEL
87% SAND
8% SILT & CLAY

TP 1086-2



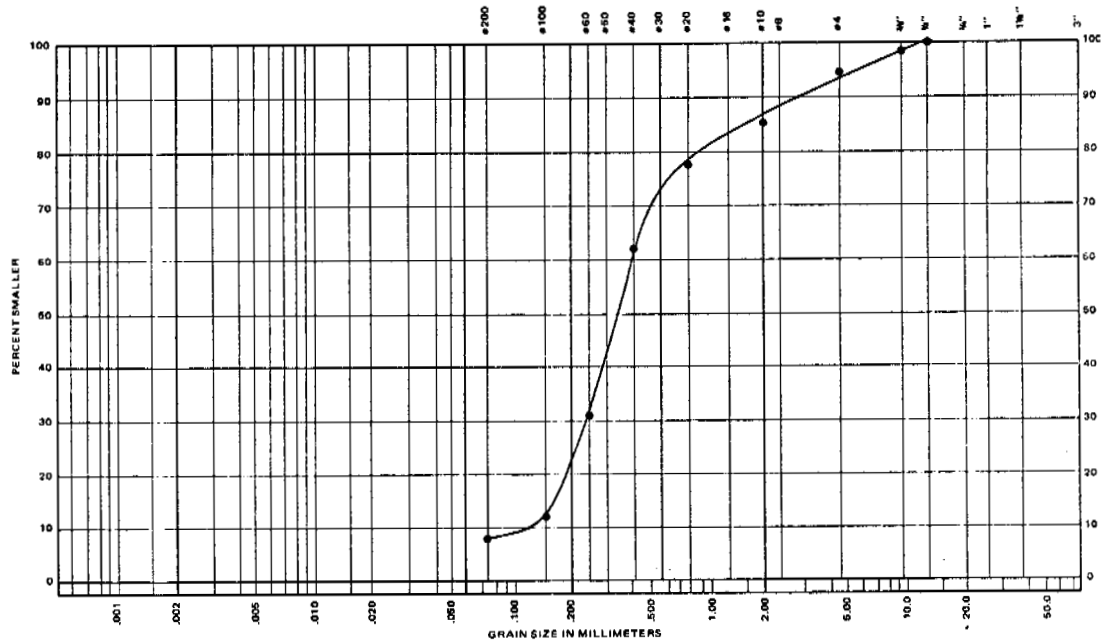
Moss

Sand, light brown, occasional pebbles
moist

Silt, grey brown
dry
uniform

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



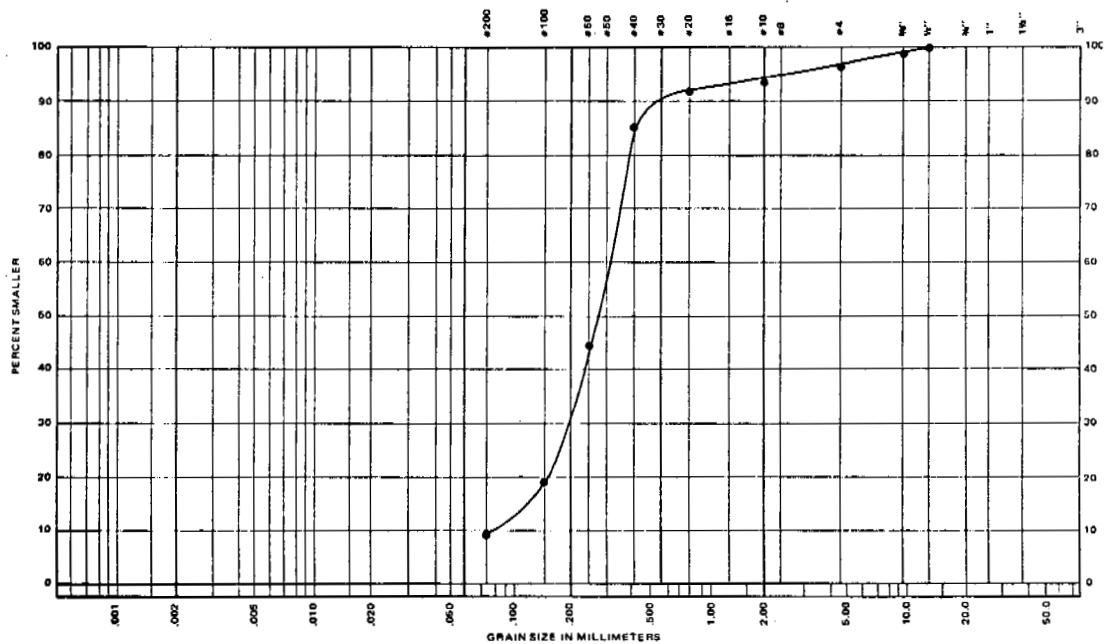
EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E666 DATE December 10/73
SAMPLE No. TP 1086-1
DEPTH J

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



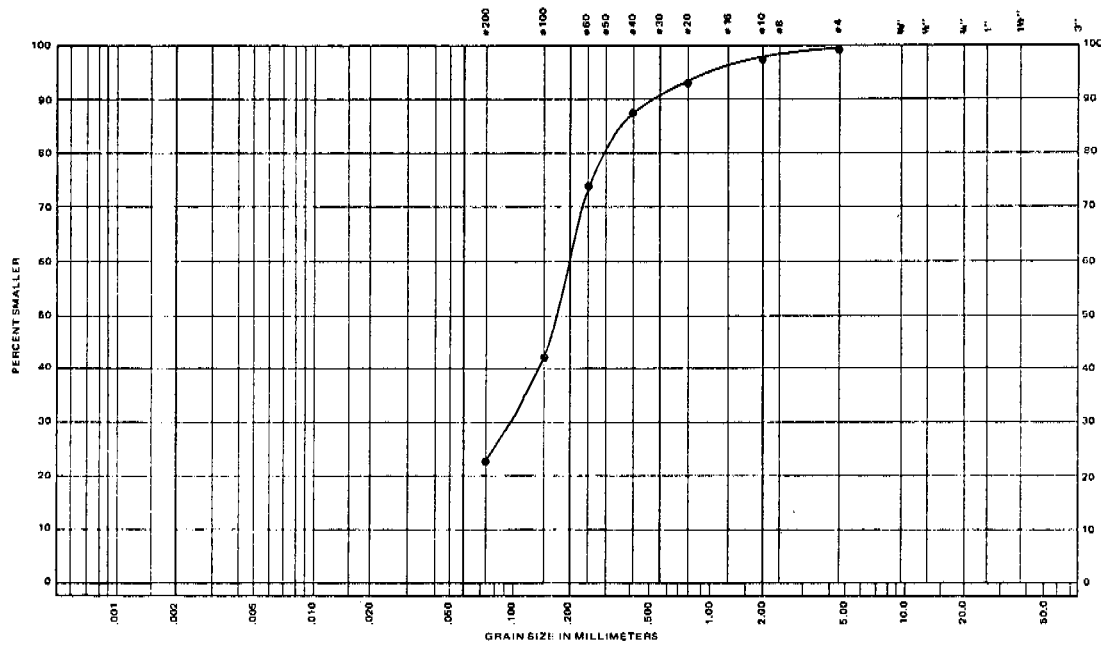
EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. DATE
SAMPLE No. BH 1086-1
DEPTH 2' + 4' + 6'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Sand with a Trace of Gravel (SM)

PROJECT Granular Resources

JOB No. E-666 DATE _____

SAMPLE No. BH 1086-1

DEPTH 8' + 10'

SITE 1087

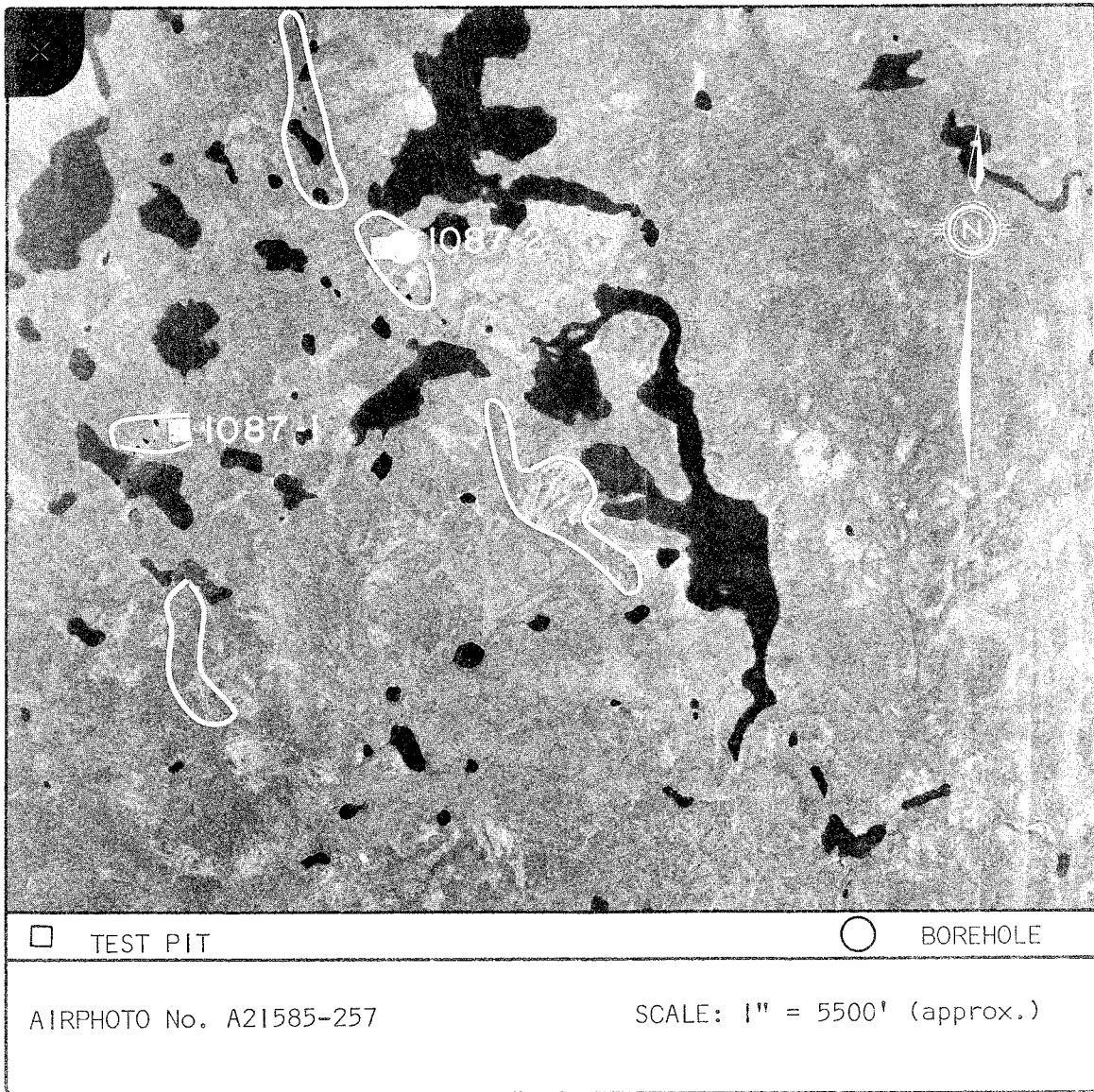
Location: Site 1087 is located 16 miles NW of Tutseita Lake. Proposed pipeline and highway routes are 4 miles SW of the site.

Geology: Site 1087 is a complex of small scattered kames which exhibit considerable variation in composition.

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

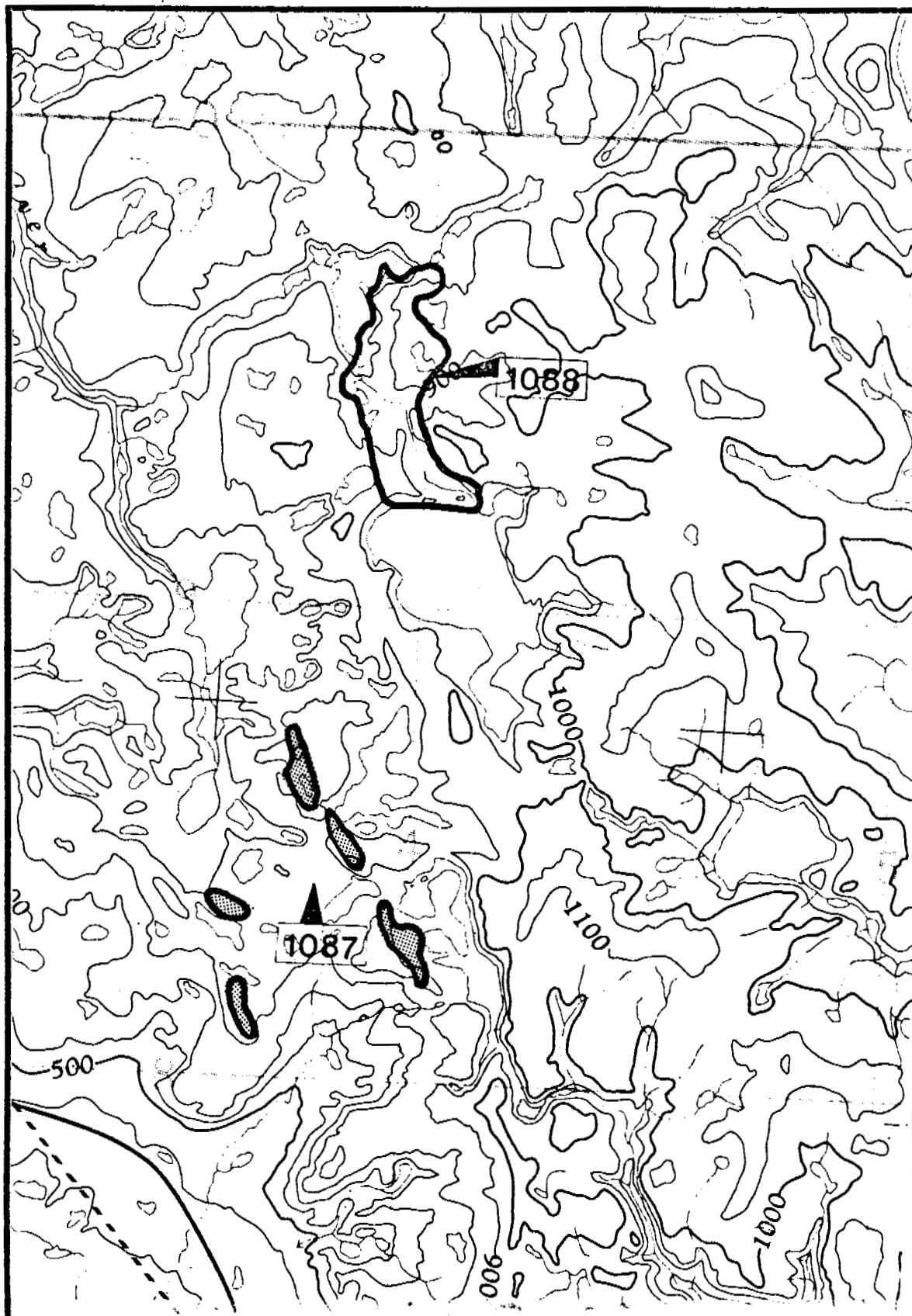
Volume: 1,800,000 cu. yd., reliability of volume estimate is uncertain.

Area: 100 acres.

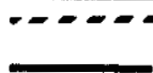


Drainage: The site is well drained.

Assessment: Quantities and qualities of potential sources of borrow at site 1087 are uncertain due to variability in the material. However there is a good potential for the presence of a considerable quantity of fair to good quality borrow. Natural moisture contents are variable from 5% to 15% which will necessitate stockpiling and draining before use. Overburden is negligible; however, dense birch and spruce will have to be removed for disposal. Permafrost was encountered at a depth of 8 feet. The site has a low environmental sensitivity and haulage distance is within acceptable limits. More drilling will be necessary to delimit the borrow source.



SITE LIMITS



PROPOSED GAS PIPELINE



PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX :

190

SPECIAL CONCERNS :

Upland area. Buffer strips suggested to protect pothole lakes.

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


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100	TO	500

GRANULAR MATERIALS INVENTORY - STAGE III

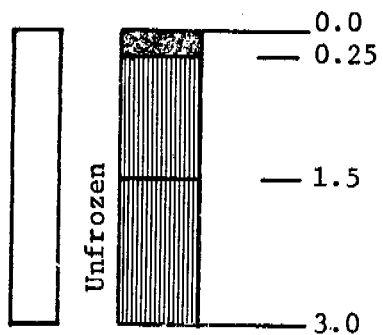
SITE NO. 1087		HOLE NO. 2		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	GM	GRAVEL -silty, sandy, some cobbles subrounded to subangular, light brown.	NOT FROZEN					1
2								2
3		-very clayey, some sand, angular & subangular, moist grey.						3
4	GC	11.4% O.C. 18% GRAVEL (2'+4') 43% SAND 39% SILT & CLAY						4
5								5
6		GRAVEL & SAND -silty, trace of clay, gravel fine to medium, angular to subangular, dry, grey brown.						6
7								7
8								8
9	GM	(6'+8') 35% GRAVEL 40% SAND 25% SILT & CLAY						9
10	SM	(10') 26% GRAVEL 46% SAND 28% SILT & CLAY						10
11								11
12		END OF HOLE						12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 25/73	LOGGED BY: EBA 145-2	COMPLETION DEPTH: 11.0'
DRILLING METHOD: AUGER	THAW DEPTH: 8.2'	

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1087-1

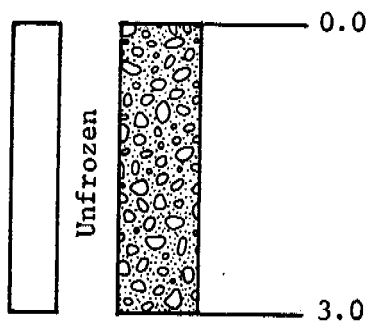


Peat

Silt, reddish brown, some clay
low plasticity, some gravel particles

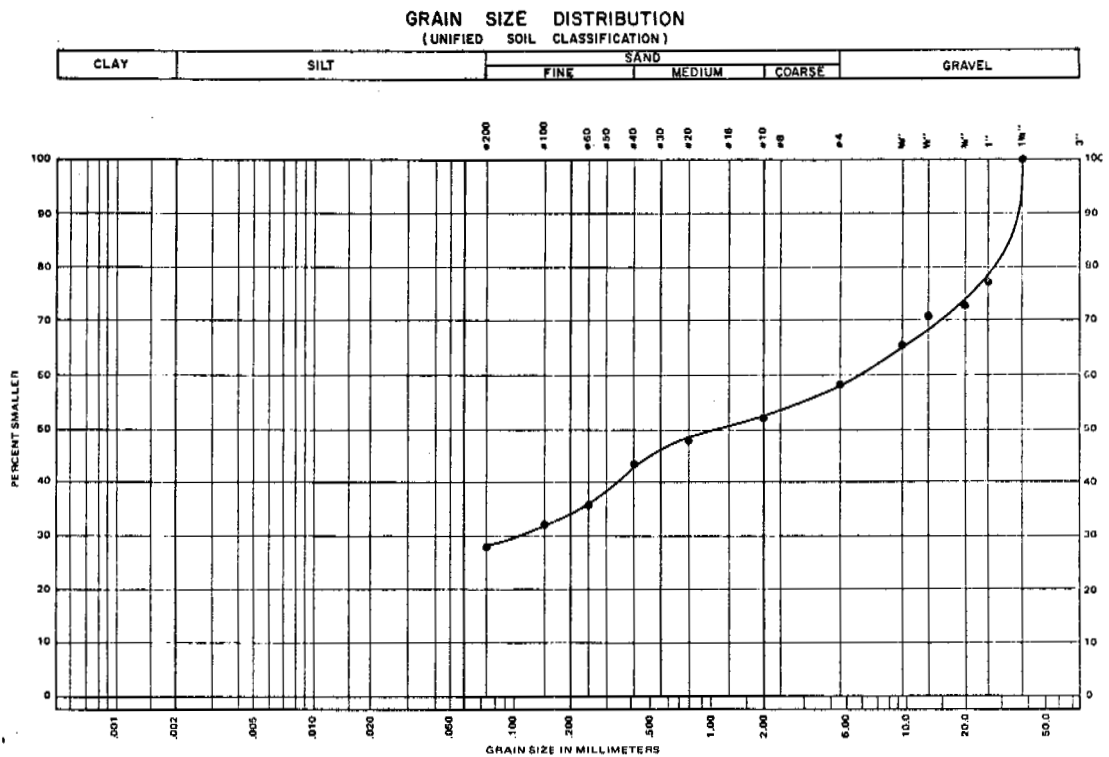
Silt, grey, low plasticity
carbonate layers

TP 1087-2



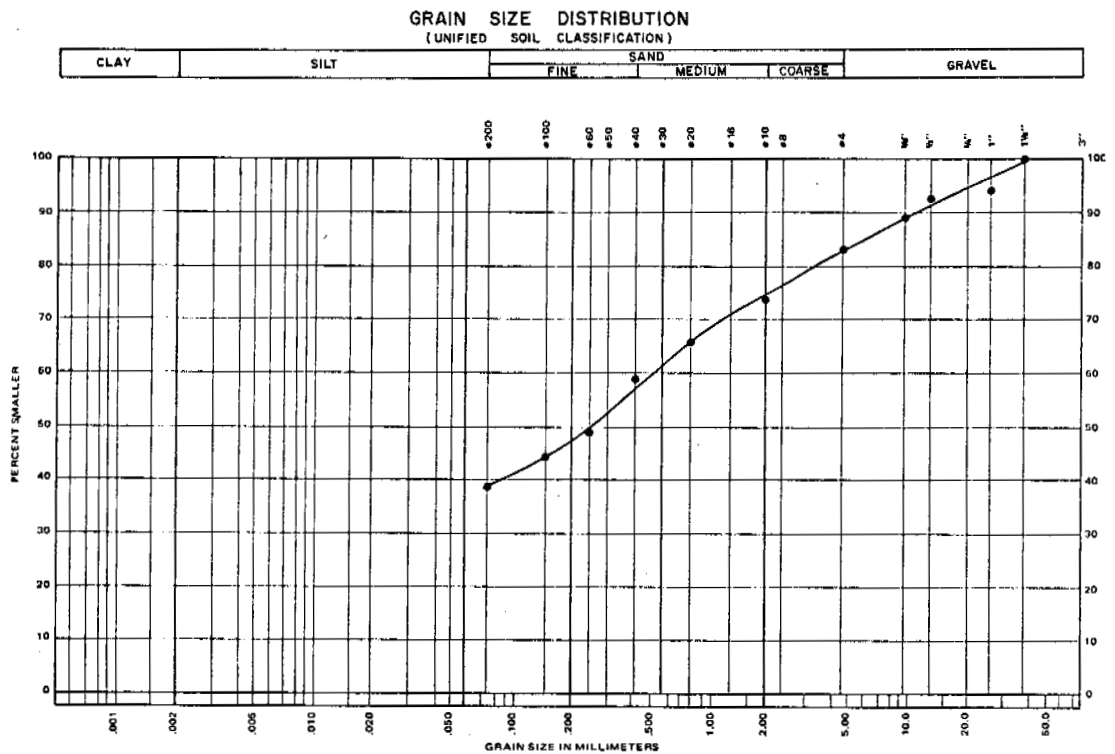
Gravel, reddish brown
clayey
calcareous
cobbles

42% GRAVEL
30% SAND
28% SILT & CLAY



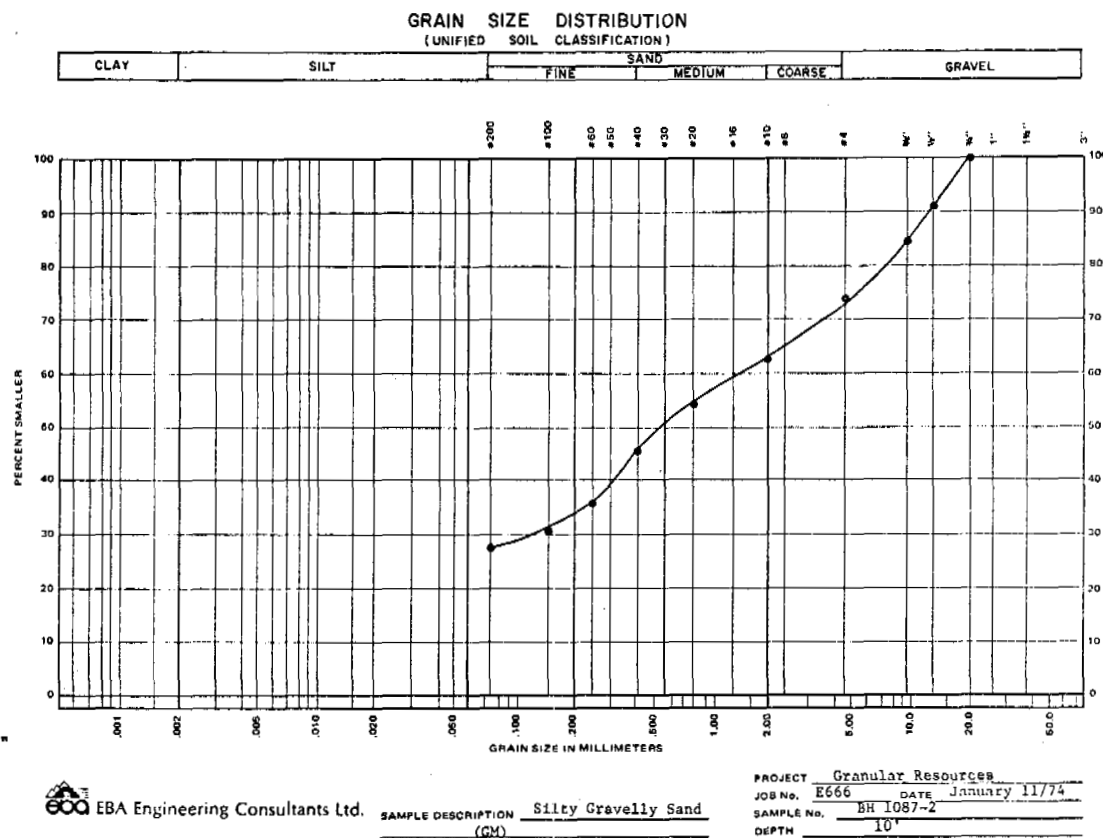
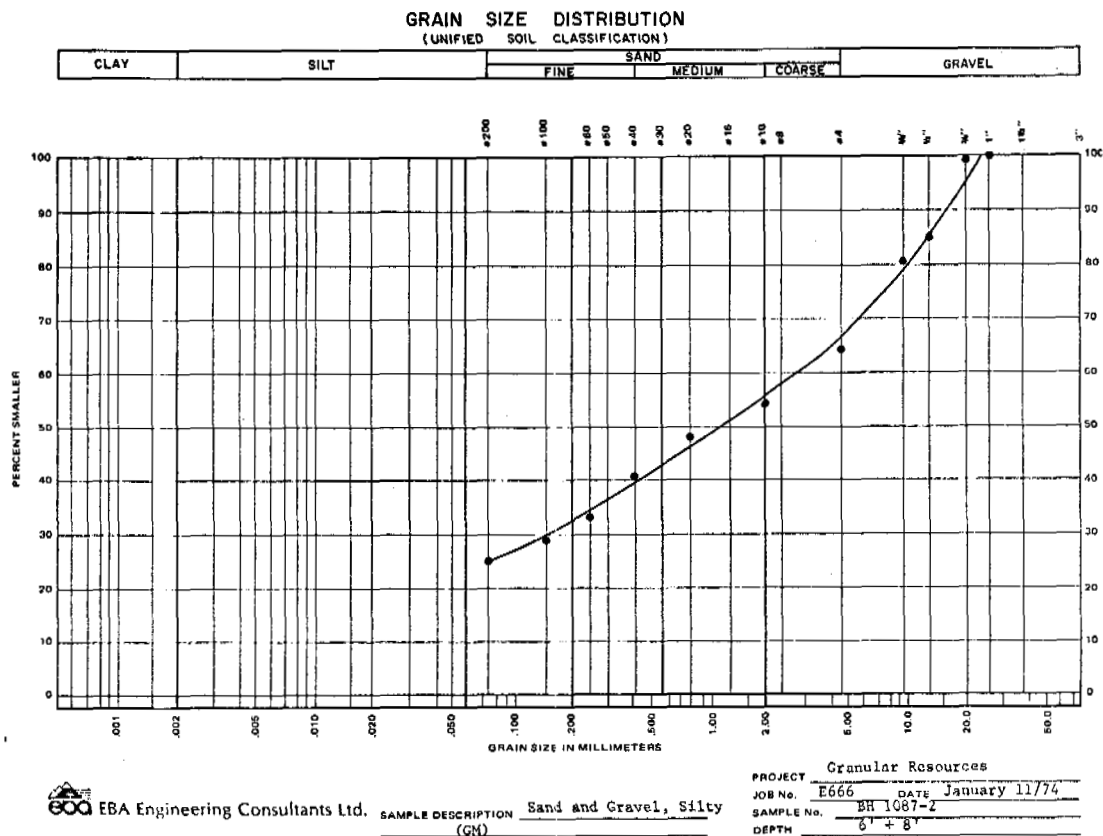
PROJECT Granular Resources
 JOB No. E666 DATE December 10/73
 SAMPLE No. TP 1087-2
 DEPTH 3'

EBA Engineering Consultants Ltd. SAMPLE DESCRIPTION Gravel and Sand, Silty
 (GC) M/C = 9.3%



PROJECT Granular Resources
 JOB No. E666 DATE January 11/74
 SAMPLE No. SH 1087-2
 DEPTH 2' + 4'

EBA Engineering Consultants Ltd. SAMPLE DESCRIPTION Sand and Silt and
 Some Gravel (GC)



SITE 1088

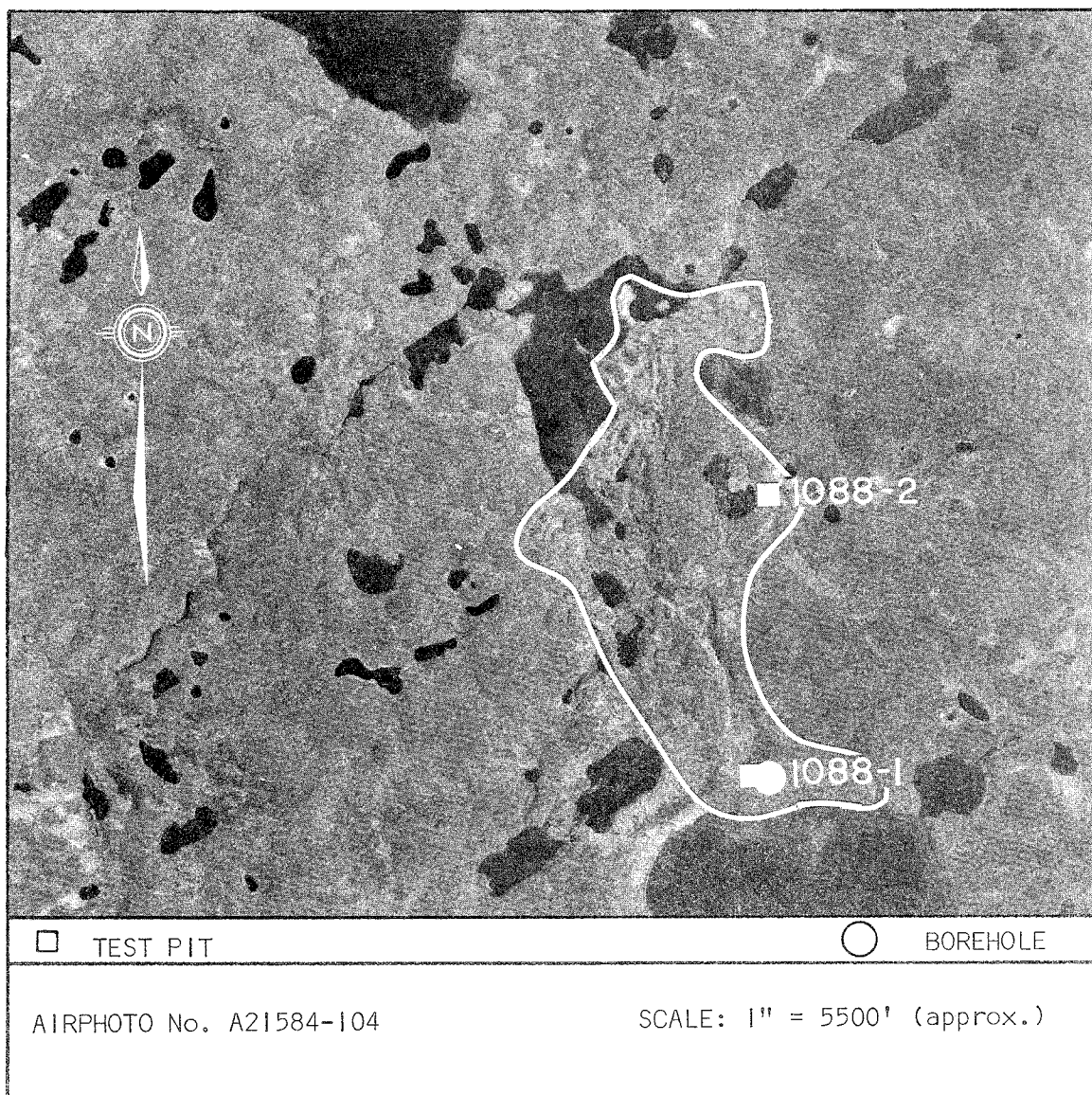
Location: Site 1088 is 15 miles NNE of the point of confluence of the Thunder River and Mackenzie River. Proposed pipeline and highway routes are situated 10 miles SW of the site.

Geology: The material at site 1088 is contained in a large kame terrace. Variation within the deposit is anticipated.

Material: Sand, some silt and a trace of gravel.

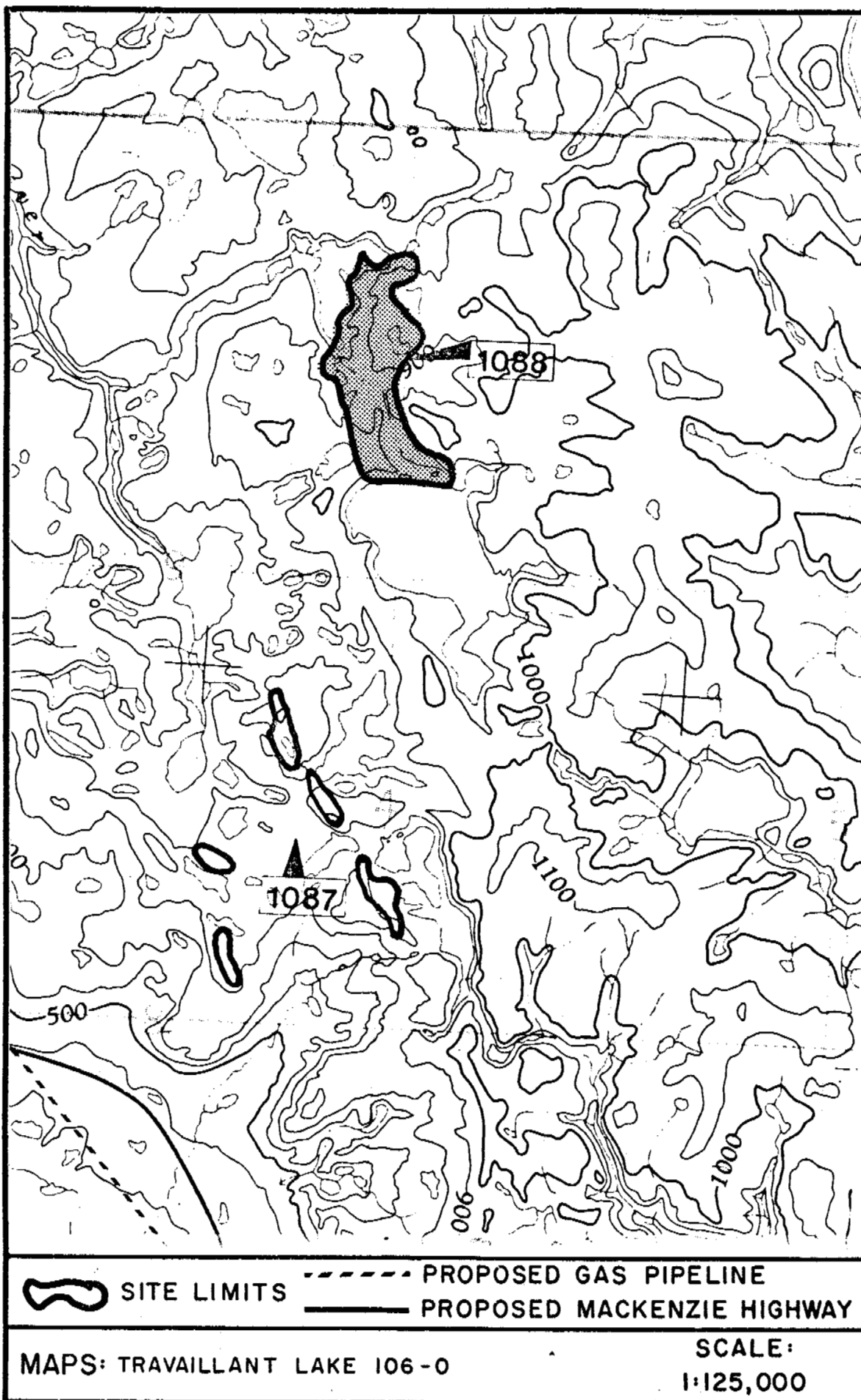
Volume: 13,800,000 cu. yd., reliability of volume estimate is uncertain.

Area: 1400 acres.



Drainage: Drainage of the site is fair to poor. High areas are dry.

Assessment: The material sampled at site 1088 was of fair quality but, with the natural variability in such ice contact deposits, more drilling may reveal material of better quality. A large volume of borrow is available from the site. Overburden is thin to negligible but dense tree cover will have to be removed. Permafrost was encountered at a depth of 8.5 feet. The site has a moderately high environmental sensitivity rating. Access to the site crosses rugged and thermally sensitive terrain and haulage distance to proposed construction sites is long. Under the present circumstances development of site 1088 is doubtful.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS	R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN			5	ARCHAEOLOGY		
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.		1 2 3 4 5 Rating: 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High, Known Sites.	
5	VEGETATION			10	AESTHETICS		
1 2 3 4 5 Rating: 20	Aesthetic Value Habitat Value	Marsh Black Spruce Muskog White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian		1 2 3 4 5 Rating: 10	Visible from: Physical Dis- turbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.	
15	MAMMALS			15	RESOURCE UTILIZATION		
1 2 3 4 5 Rating: 45	Ungulates Furbearers Carnivores Small Mammals	Winter Range, Summer Range, Migration Route, Denning Area, Dens and Lodges, Special Habitat Use.		1 2 3 4 5 Rating: 15	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Trapslines. Hunting. Fishing. Domestic. Commercial.	
10	BIRDS			15	ASSOCIATED DISTURBANCES		
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.		1 2 3 4 5 Rating: 60	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations	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	FISHERY			10	RESTORATION		
1 2 3 4 5 Rating: 40	Lakes, Tributaries, Mackenzie River: Whitefish Smelt Grayling Pike Trout-Perch Lake Trout Burbot Suckers Stickleback	Spawning, Nursery, Feeding, Overwintering, Major Migration Route, Siltation of Spawning Areas, Benthic Communities, Toxic Material Spill, Slumps, Velocity Increments, Migration Barriers, Eutrophication, Blasting.		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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

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

TOTAL INDEX : 255

SPECIAL CONCERNS:

Flanks lakes on Thunder River headwater.
Buffer zones and siltation controls recommended
to protect aquatic values.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1088		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SM	SAND -very silty, dry, orange-brown.	NOT FROZEN					1
2	SM	SAND -some silt, some fine gravel, sand medium grained, dry light grey-brown						2
3							3	
4		87% SAND (2') 13% SILT & CLAY						4
5		-very silty, no gravel, some very coarse sand sized particles						5
6		66% SAND (4'+6'+8') 34% SILT & CLAY						6
7		-very silty, fine, some clay, damp, medium grey-brown						7
8	SM-SC							8
9							9	
10		SILT & SAND	FROZEN					10
11		-fine grained, some clay, grey-brown						11
12		SILT						12
13		-some fine sand, some clay, grey						13
14							14	
15	-trace sand						15	
16							16	
17		END OF HOLE						17

DATE DRILLED: Sep.25/73

LOGGED BY: EBA 144-1

COMPLETION DEPTH: 17.0'

DRILLING METHOD: AUGER

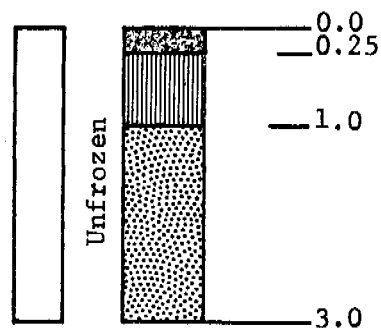
THAW DEPTH: 8.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1088-1



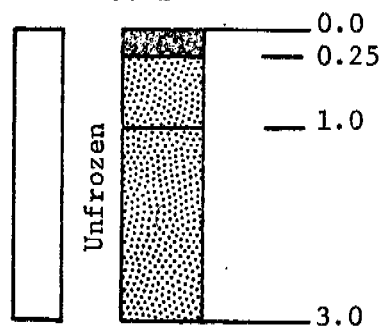
Peat, dark brown, fibrous

Silt, reddish brown, low plasticity

Sand, dark brown, silty
fine to coarse grained
trace of gravel

6% GRAVEL
76% SAND
18% SILT & CLAY

TP 1088-2



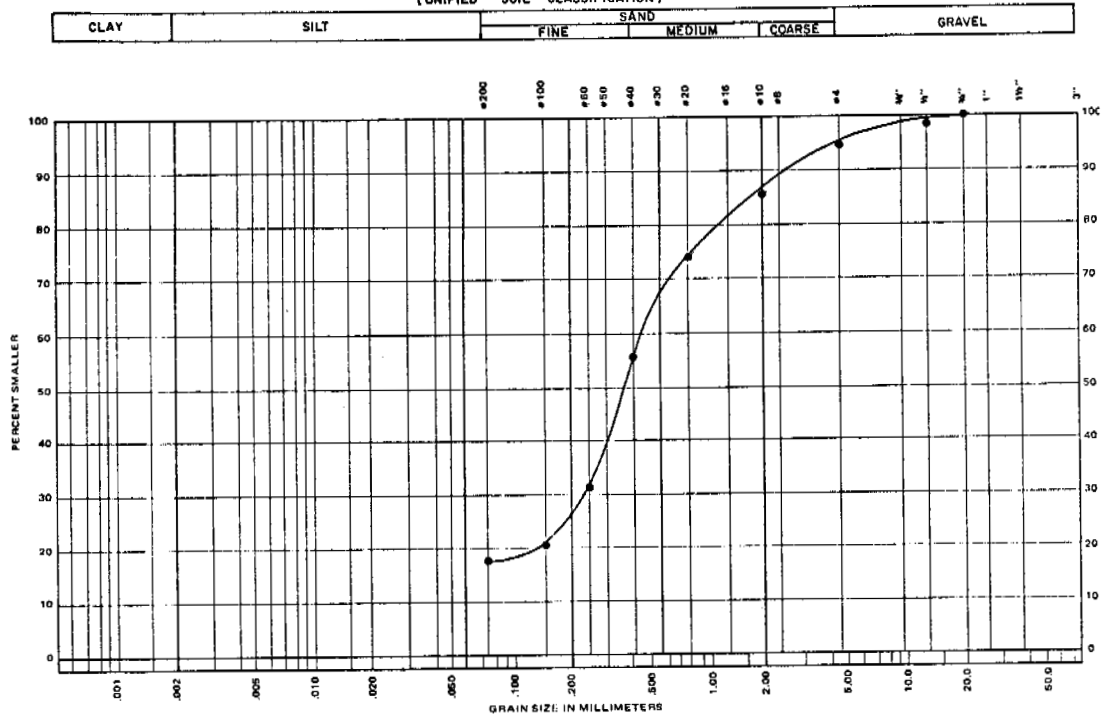
Peat, dark brown, fibrous

Sand, light brown, some clay
medium plasticity

Sand, dark brown, fine to
coarse grained

99% SAND
1% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

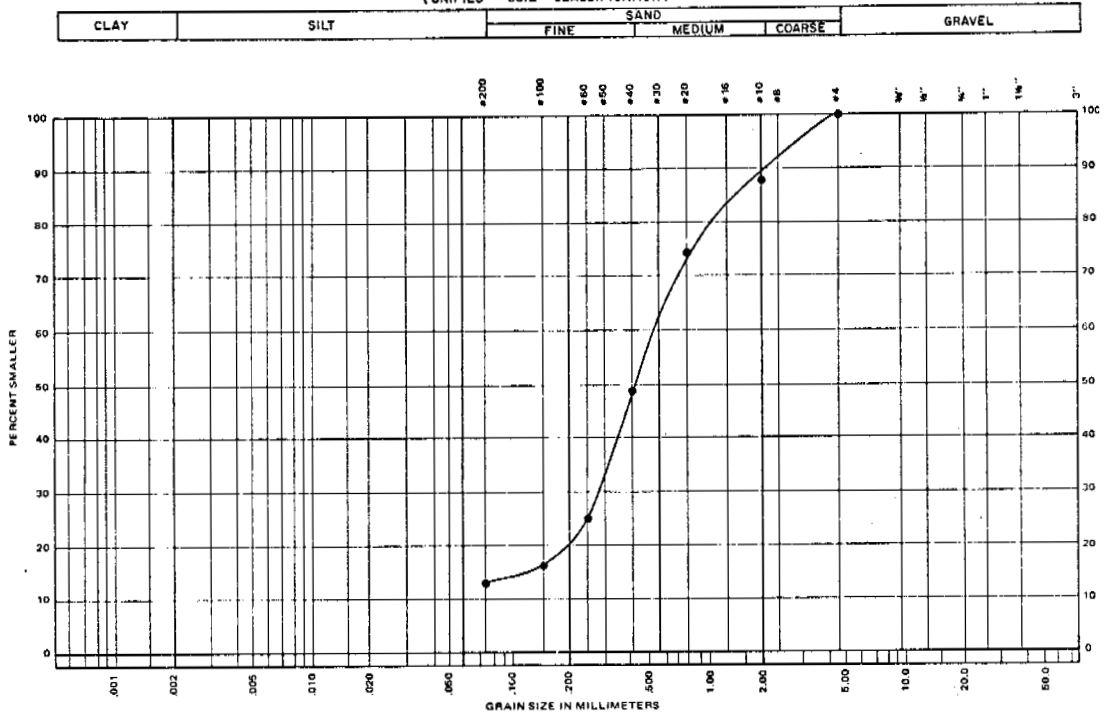


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Some Silt
with a Trace of Gravel (SP-SM) M/C=7.1%

PROJECT Granular Resources
JOB No. E666 DATE December 10/73
SAMPLE No. TP 1088-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

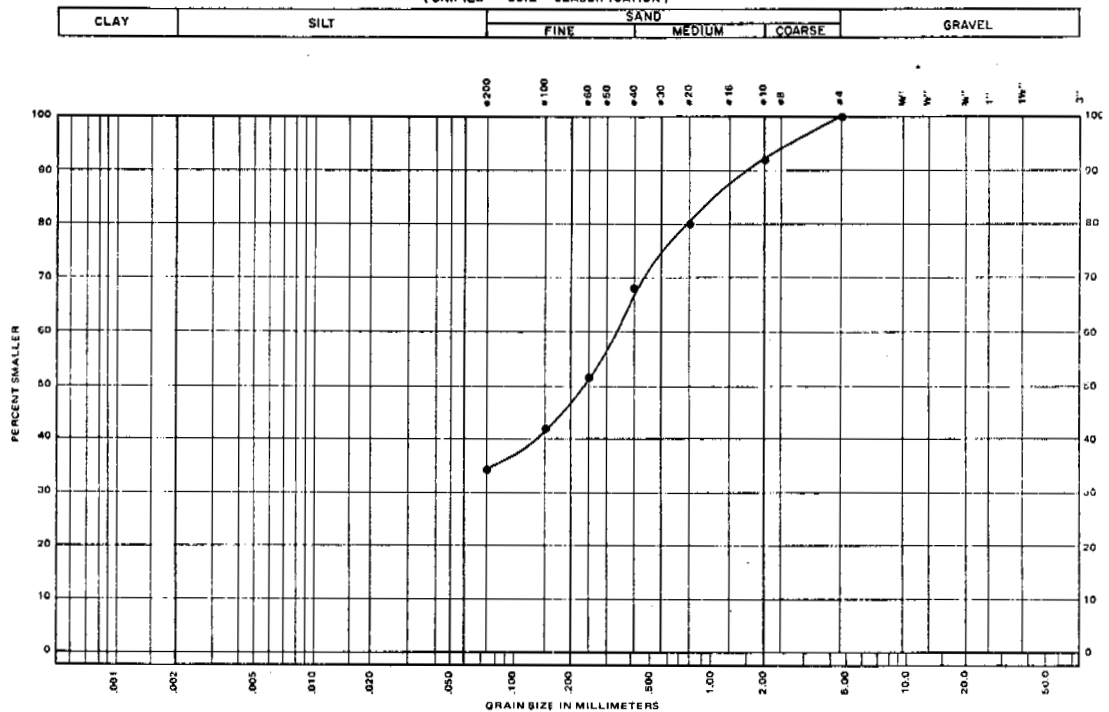


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Some Silt
(SP)

PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. BH 1088-1
DEPTH 2'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

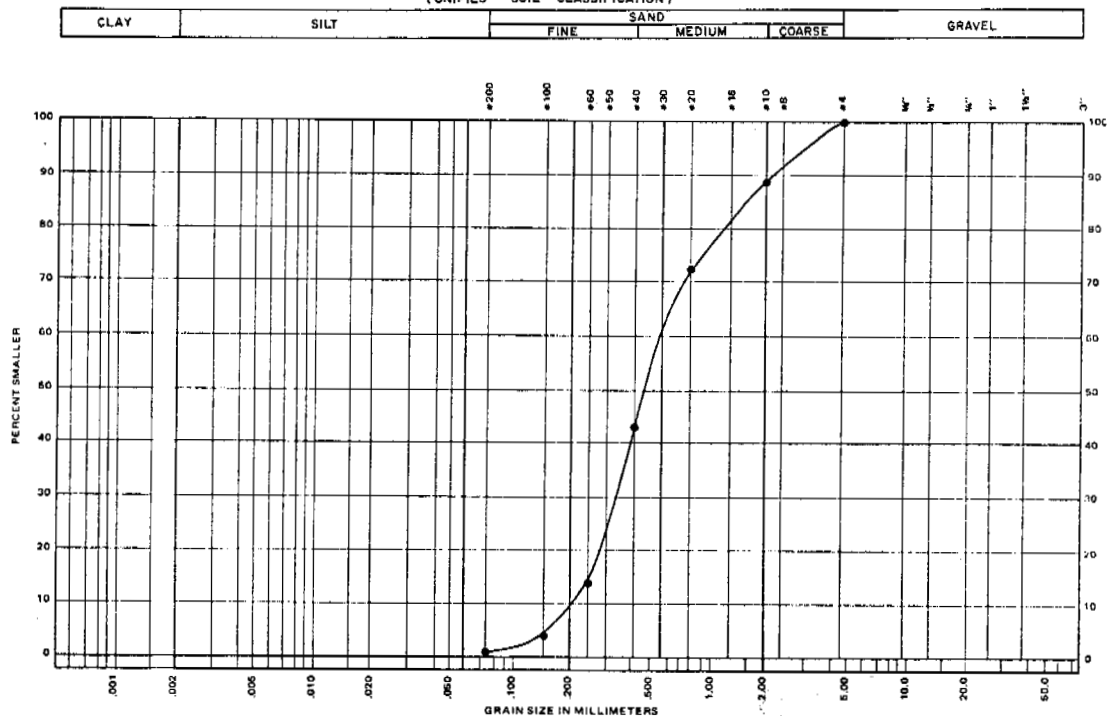


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt (SM-SC)

PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. BH 1088-1
DEPTH 4' + 6' + 8'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of Silt (SP)

PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. TP 1088-2
DEPTH 3'

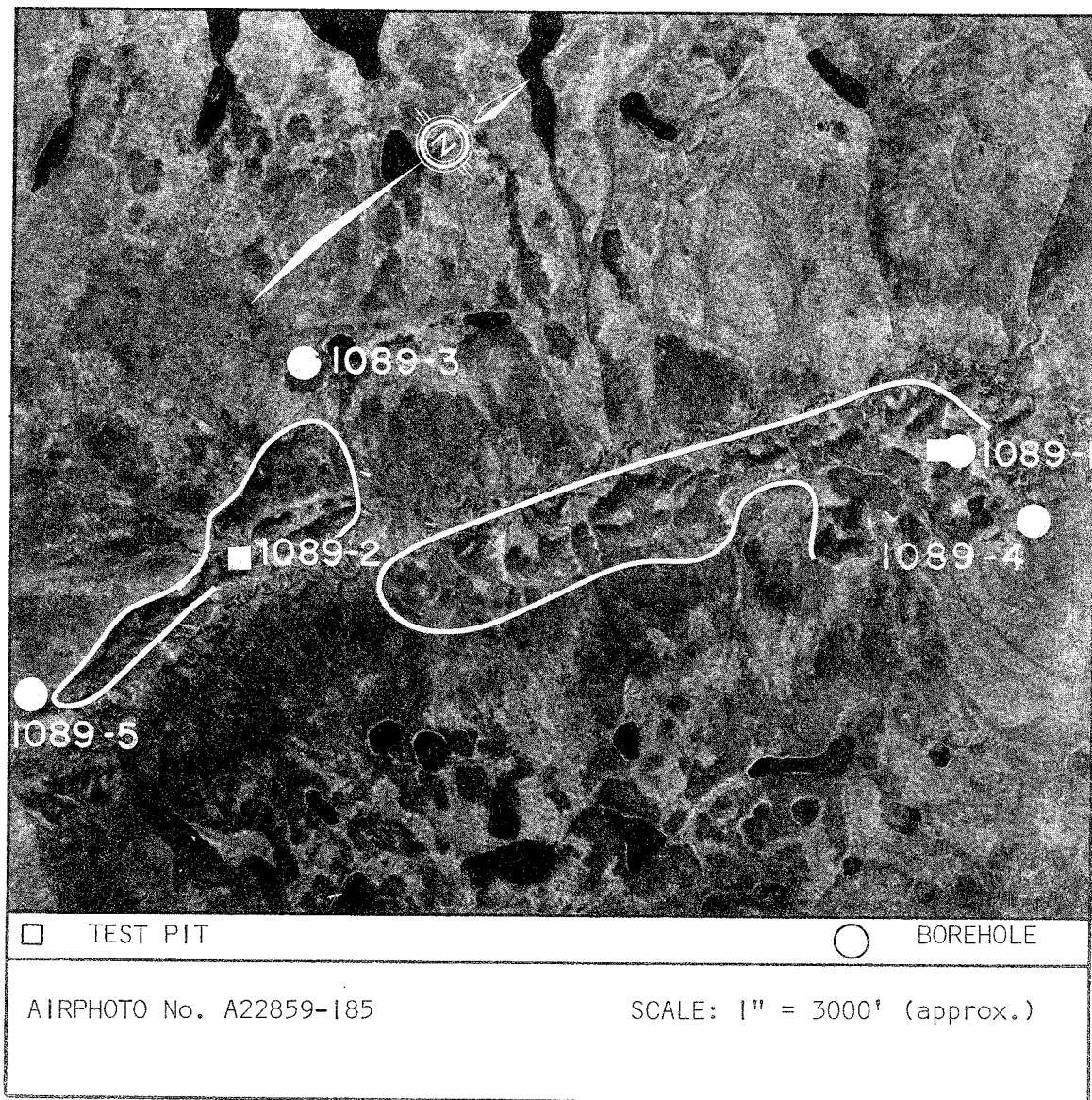
SITE 1089

Location: Site 1089 lies along the south bank of the Thunder River 4 miles from its point of confluence with the Mackenzie River. The proposed highway route crosses the northern tip of the site while the proposed pipeline route touches the southern tip.

Geology: Site 1089 is an extensive, eroded, kame - kame terrace complex. Significant variation in material composition within the deposit are anticipated.

Material: Sand, trace silt, gravel content is variable, poorly graded.

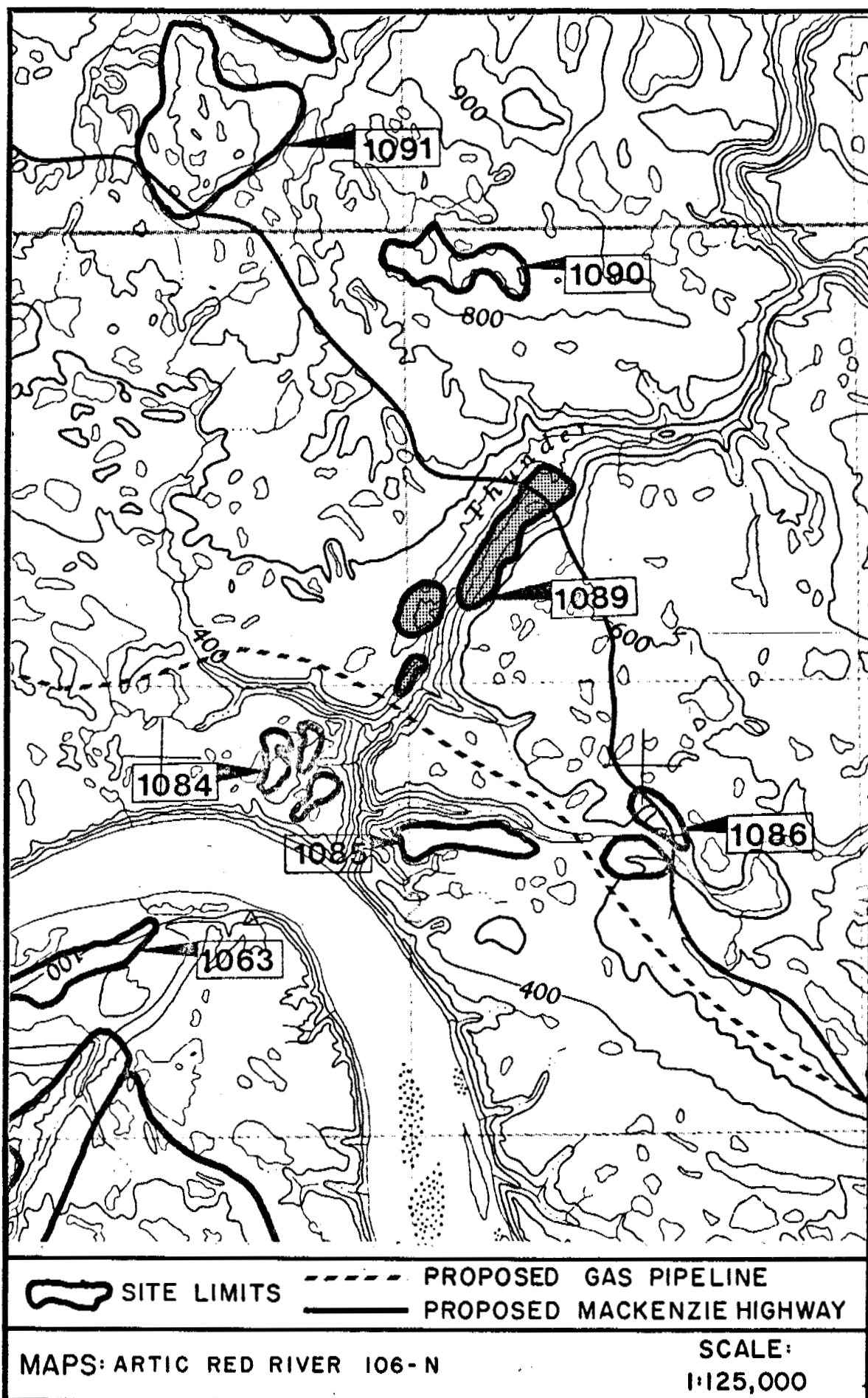
Volume: 7,500,000 cu. yd., volume estimate seems realistic.



Area: 300 acres.

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

Assessment: Site 1089 contains a large volume of fair quality borrow and is located very close to proposed pipeline and highway routes. Moisture content of the frozen sand is high thus material from this borrow source will have to be stockpiled and drained before use. Alternatively, the pit could be stripped and thawed in place during a summer construction season. Overburden is thin to negligible but tree cover of medium to high density will have to be removed for disposal. Permafrost was encountered at a depth of 7 1/2 ft. The site has a high environmental sensitivity rating. In view of the marginal quality, high moisture content and frozen condition, site 1089 is recommended for development only if other borrow sources are in very short supply in the region.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
1 2 3	Formation Stability	Flat Land, Terrace, Knoll,	
4 5	Ice Content	Rolling, Outcrop, Ridge,	
Rating: 15		Scarp, Overburden Type & Depth, Wet Site, Dry Site.	
5	VEGETATION		
1 2 3	Aesthetic Value	Marsh	
4 5	Habitat Value	Black Spruce	
Rating: 15		Muskeg	
		White Spruce	
		Mixed Conifer	
		Conifer - Deciduous	
		Deciduous	
		Dry Slopes	
		Riparian	
15	MAMMALS		
1 2 3	Ungulates	Winter Range, Summer Range,	
4 5	Furbearers	Migration Route,	
Rating: 45	Carnivores	Denning Area,	
	Small Mammals	Dams and Lodges,	
		Special Habitat Use.	
10	BIRDS		
1 2 3	Waterfowl-Swans,	Migration Pathway, Moulting,	
4 5	Geese, Ducks	Spring Staging, Fall Staging,	
Rating: 20	Game Birds	Nesting-Brooding, Perching,	
	Raptors	Winter Habitat.	
	Shorebirds		
	Passerine		
10	FISHERY		
1 2 3	Lakes, Tributaries	Spawning, Nursery, Feeding,	
4 5	Mackenzie River:	Overwintering,	
Rating: 50	Whitefish	Major Migration Route,	
	Grayling	Siltation of Spawning Areas,	
	Pike	Benthic Communities,	
	Trout-Perch	Toxic Material Spill.	
	Lake Trout	Slumps, Velocity Increments,	
	Burbot	Migration Barriers,	
	Suckers	Eutrophication,	
	Stickleback	Cisco	

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

TOTAL INDEX : 335

SPECIAL CONCERNS :


Northshore of Thunder River. Important grayling spawning area. Bank stability is required to maintain denning sites and fish migration passage.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
1 2 3		Paleontology	Probability of Discovery.
4 5		<u>Pre-Historic</u>	Low, <u>Medium</u> , High.
Rating: 15		<u>Historic</u>	Known Sites.
10	AESTHETICS		
1 2 3		Visible from:	River, Highway, <u>Air</u> .
4 5		Physical Dis-	Dust, Waste,
Rating: 50		turbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
1 2 3		<u>Fort Good Hope</u>	Improved Access.
4 5		<u>Arctic Red R.</u>	<u>Traps</u> .
Rating: 60		Inuvik	<u>Hunting</u> .
			<u>Fishing</u> .
			<u>Domestic</u> .
			<u>Commercial</u> .
15	ASSOCIATED DISTURBANCES		
1 2 3		Access Roads	0-2, 2-5, 5-10, 10+
4 5		Miles From Highway	<u>0-2</u> , 2-5, 5-10, 10+
Rating: 15		Miles From Pipeline	Cuts and Fills.
		Hydrologic	Creek Crossings.
		Alterations	Compaction.
			Slumping, Erosion.
		<u>Continued Use</u>	<u>Stockpiles</u> ,
		<u>For Maintenance</u>	<u>Waste, Dust</u> .
10	RESTORATION		
1 2 3		<u>Soil Stabilization</u>	Natural Regeneration.
4 5		<u>Visual Improvement</u>	<u>Grass-Legume Seeding</u> .
Rating: 50		Habitat Replacement	<u>Transplants</u> .
			<u>Sustained Maintenance</u> .
			Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1089		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	SP-SM	SAND	NOT FROZEN		1
2		-some silt. some fine gravel, sand well graded, dry, light brown.			2
3					3
4		7% GRAVEL (0'-24') 81% SAND 12% SILT & CLAY			4
5		-sand more uniform medium grained			5
6		-medium-fine grained, moist to wet			6
7					7
8	SM		FROZEN		8
9					9
10		-silty, wet			10
11					11
12					12
13					13
14					14
15					15
16					16
17					17
DATE DRILLED: Sep. 23/73		LOGGED BY: EBA 139-1		COMPLETION DEPTH: 24.0'	
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. 1089		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	SP-SM	SAND	FROZEN		<div style="text-align: center;">○</div>			18
		-same						19
19		-trace to some silt,						20
20		sand fine to coarse						21
21		grained, trace fine gravel,						22
22								23
23								24
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. 23/73	LOGGED BY: EBA 139-1	COMPLETION DEPTH: 24.0'
DRILLING METHOD: AUGER		THAW DEPTH: 7.5'

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1089		HOLE NO. 3		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	ORGANIC MATERIAL	Vs					1
2	OH CI	CLAY -sandy, silty -wet on thawing						2
3								3
4								4
5	CI	CLAY -sandy, silty -till -medium plasticity -moist to damp on thawing	Vx					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: June /73


LOGGED BY: DPW
36

COMPLETION DEPTH: 15'

DRILLING METHOD: HELI


THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS




EBA Engineering Consultants Ltd.


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1089		HOLE NO. 4		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	ORGANIC MATERIAL						1
2								2
3								3
4	ML	CLAY-SILT -wet on thawing						4
5								5
6								6
7								7
8								8
9		ICE						9
10								10
11	ML	SILT -sandy clay -very wet zones on thawing						11
12								12
13								13
14								14
15								15
16								16
17								17
DATE DRILLED: June /73			LOGGED BY: DPW 46		COMPLETION DEPTH: 30'			
DRILLING METHOD: HELI			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1089		HOLE NO. 4		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		SILT -sandy clay -very wet zones on thawing				○		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: June /73			LOGGED BY: DPW 46		COMPLETION DEPTH: 30'				
DRILLING METHOD: HELI				THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1089		HOLE NO. 5		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	PEAT -brown silty						1
2								2
3	ML	SILT -brown, clayey with a trace of sand and gravel				65		3
4								4
5								5
6								6
7	C1	CLAY -grey silty						7
8								8
9								9
10	CL							10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
DATE DRILLED: Mar 19/72			LOGGED BY: MVPL 72C-94		COMPLETION DEPTH: 40'			
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

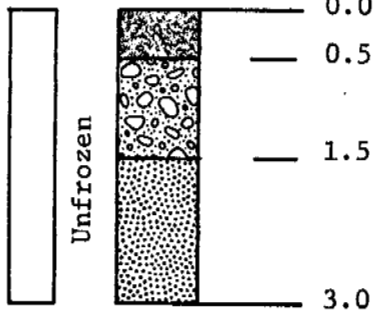
SITE NO. 1089		HOLE NO. 5		PAGE 2 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
18	CL	CLAY			18
19					19
20					20
21		-occassional fine gravel			95 21
22					22
23					23
24					24
25					25
26					26
27					27
28					28
29					29
30					30
31					31
32					32
33					33
34					34

DATE DRILLED: Mar 19/72	LOGGED BY: MVPL 72C-94	COMPLETION DEPTH: 40'
DRILLING METHOD: Falling 1000 Air		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1089-1



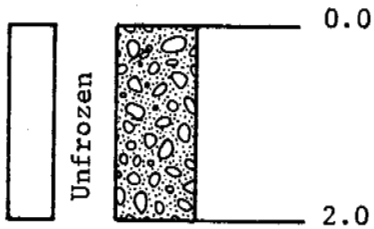
Moss

Sandy Gravel, dry

Sand, dry
occassional pebbles

6% GRAVEL
85% SAND
9% SILT & CLAY

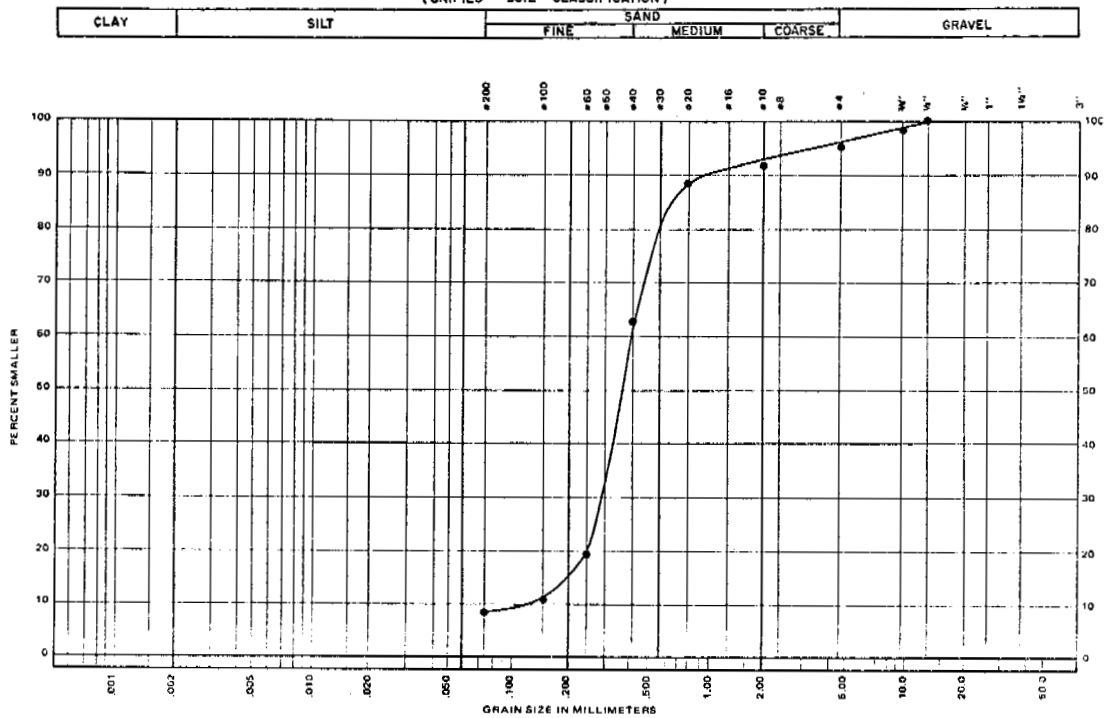
TP 1089-2



Sand and Gravel, dry
light brown

38% GRAVEL
56% SAND
6% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

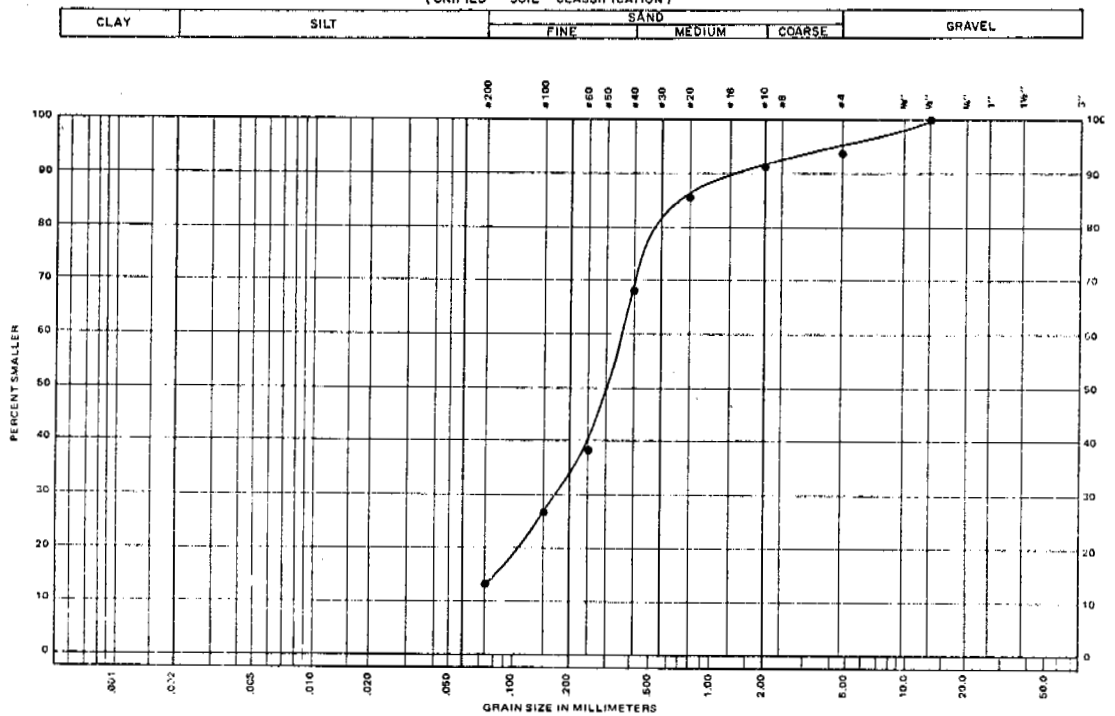


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand with a Trace of
Silt and Gravel (SP-SM) W/C=3.0%

PROJECT Granular Resources
JOB No. E666 DATE December 15/73
SAMPLE No. 1P 1089-1
DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



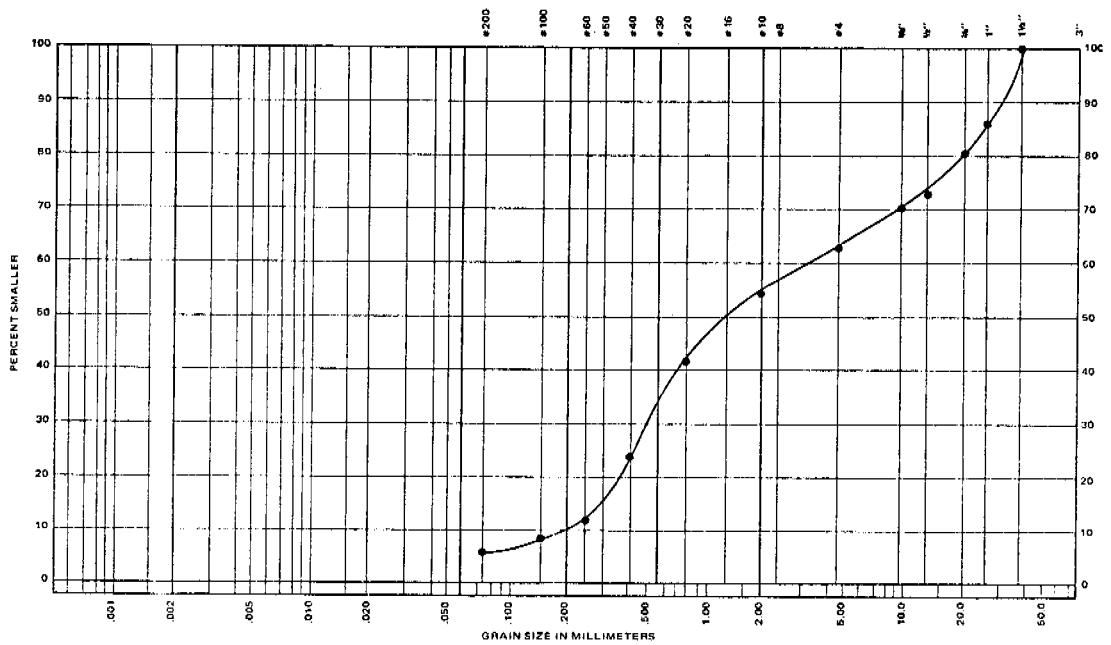
EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E666 DATE January 29/74
SAMPLE No. BH 1089-1
DEPTH 0' - 24'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
------	------	-----------	-------------	-------------	--------



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel
With a Trace of Sil (GV) M/Ca 2.1%

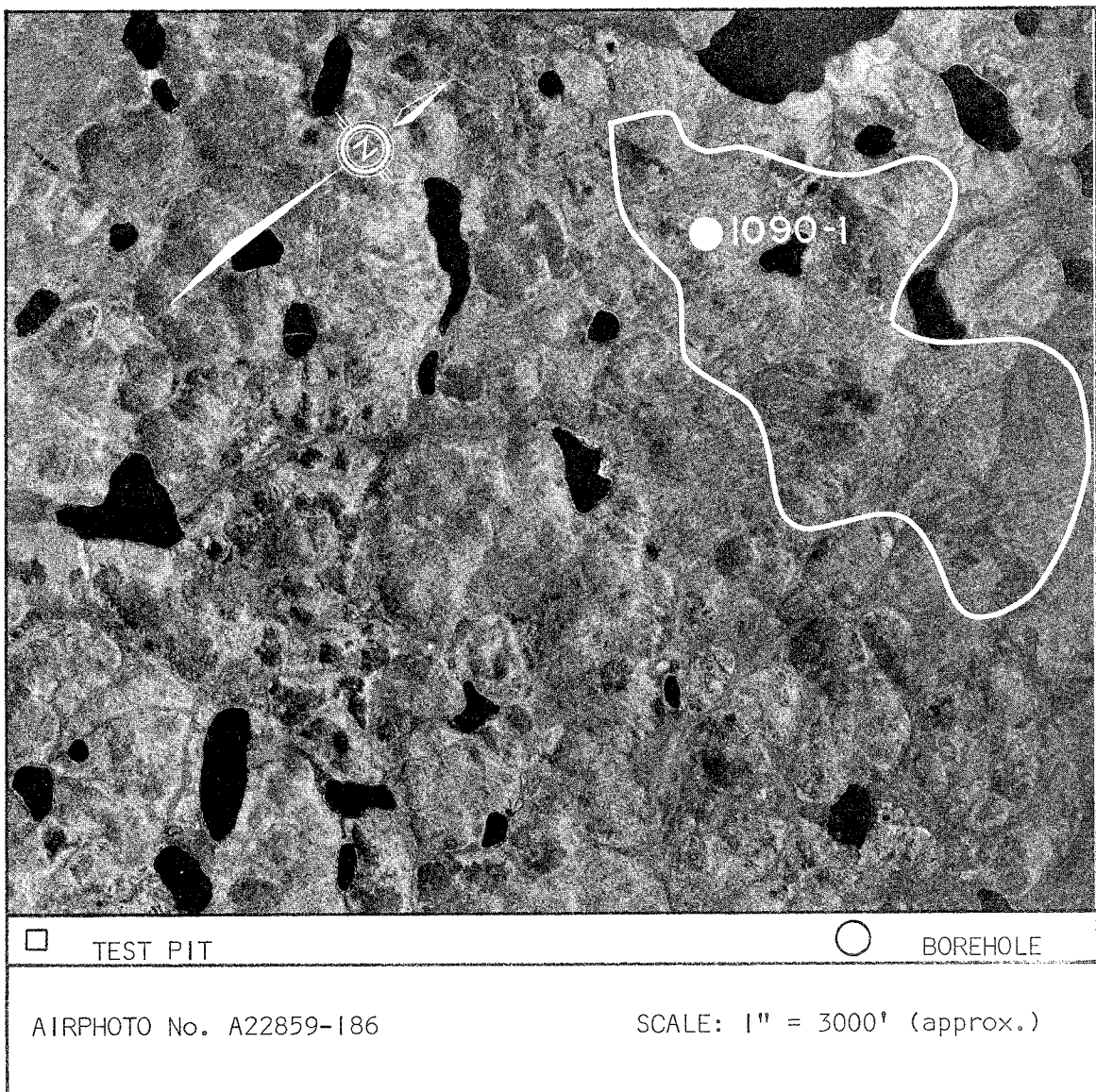
PROJECT Granular Resources
JOB No. 6666 DATE December 6/73
SAMPLE No TP 1089-2
DEPTH 3'

SITE 1090

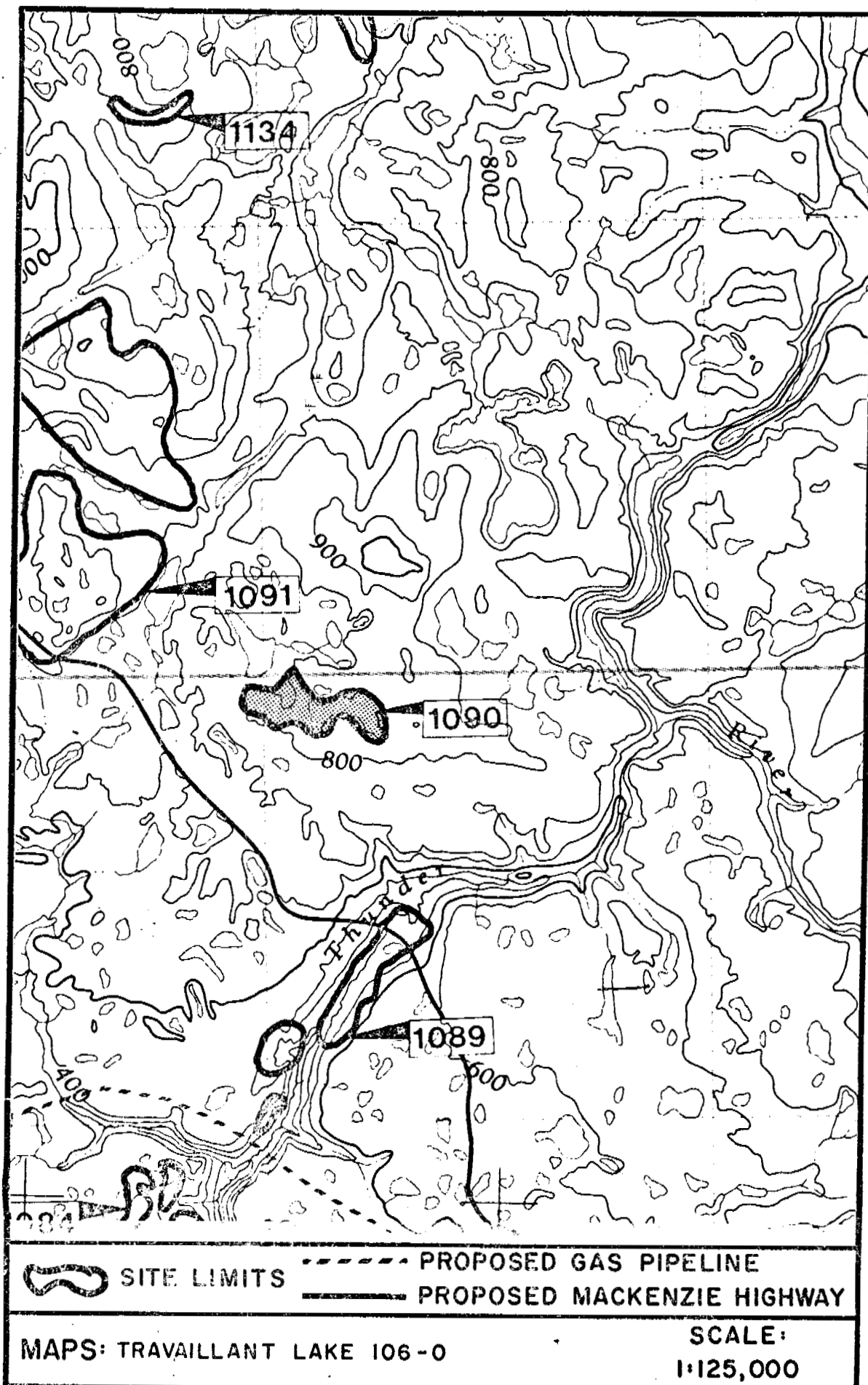
Location: Site 1090 is situated 8 miles north of the point of confluence of the Mackenzie and Thunder Rivers. Proposed highway and pipeline routes are 1 1/2 miles west and 6 miles south of the site respectively.

Material: Shale.

Assessment: Fair quality shale bedrock borrow was encountered in the drilling program however overburden of clay and weathered shale varies in thickness from 7 to 15 ft. A drilling program to determine overburden thickness should be undertaken. Access to the site



crosses thermally sensitive terrain but would not be difficult in winter. Haulage distance to the proposed highway route is within acceptable limits. Tree cover is of moderate to high density and permafrost was encountered just below the surface. If there are material shortages in the vicinity site 1090 may be developed as a source of shale borrow.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3	Paleontology	Probability of Discovery,
	4 5	Pre-Historic	Low, Medium, High.
	Rating: 10	Historic	Known Sites.
10	AESTHETICS		
	1 2 3	Visible from:	River, Highway, Air.
	4 5	Physical Dis-	Dust, Waste,
	Rating: 20	turbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
	1 2 3	Fort Good Hope	Improved Access.
	4 5	Arctic Red R.	Trapslines.
	Rating: 60	Inuvik	Hunting.
			Fishing.
			Domestic.
			Commercial.
15	ASSOCIATED DISTURBANCES		
	1 2 3	Access Roads	
	4 5	Miles From Highway	0-2, 2-5, 5-10, 10+
	Rating: 45	Miles From Pipeline	0-2, 2-5, 5-10, 10+
		Hydrologic	Cuts and Fills.
		Alterations	Creek Crossings.
			Compaction.
			Slumping, Erosion.
		Continued Use	Stockpiles.
		For Maintenance.	Waste, Dust.
10	RESTORATION		
	1 2 3	Soil Stabilization	Natural Regeneration.
	4 5	Visual Improvement	Grass-Legume Seeding.
	Rating: 10	Habitat Replacement	Transplants.
			Sustained Maintenance.
			Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

TOTAL INDEX: 275

SPECIAL CONCERNS:

Upland area north of Thunder River. Potential bear denning. Access routes along river valley may restrict fish and wildlife passage.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1090		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	OL-CI	ORGANIC MATERIAL AND SILTY CLAY	Vs					1
2	CI	CLAY silty -wet on thawing						2
3								3
4								4
5								5
6								6
7	br	SHALE -soft to approximately 15' medium to hard	NF					7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: June /73

LOGGED BY: DPW
45

COMPLETION DEPTH: 30'


DRILLING METHOD: HELI

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

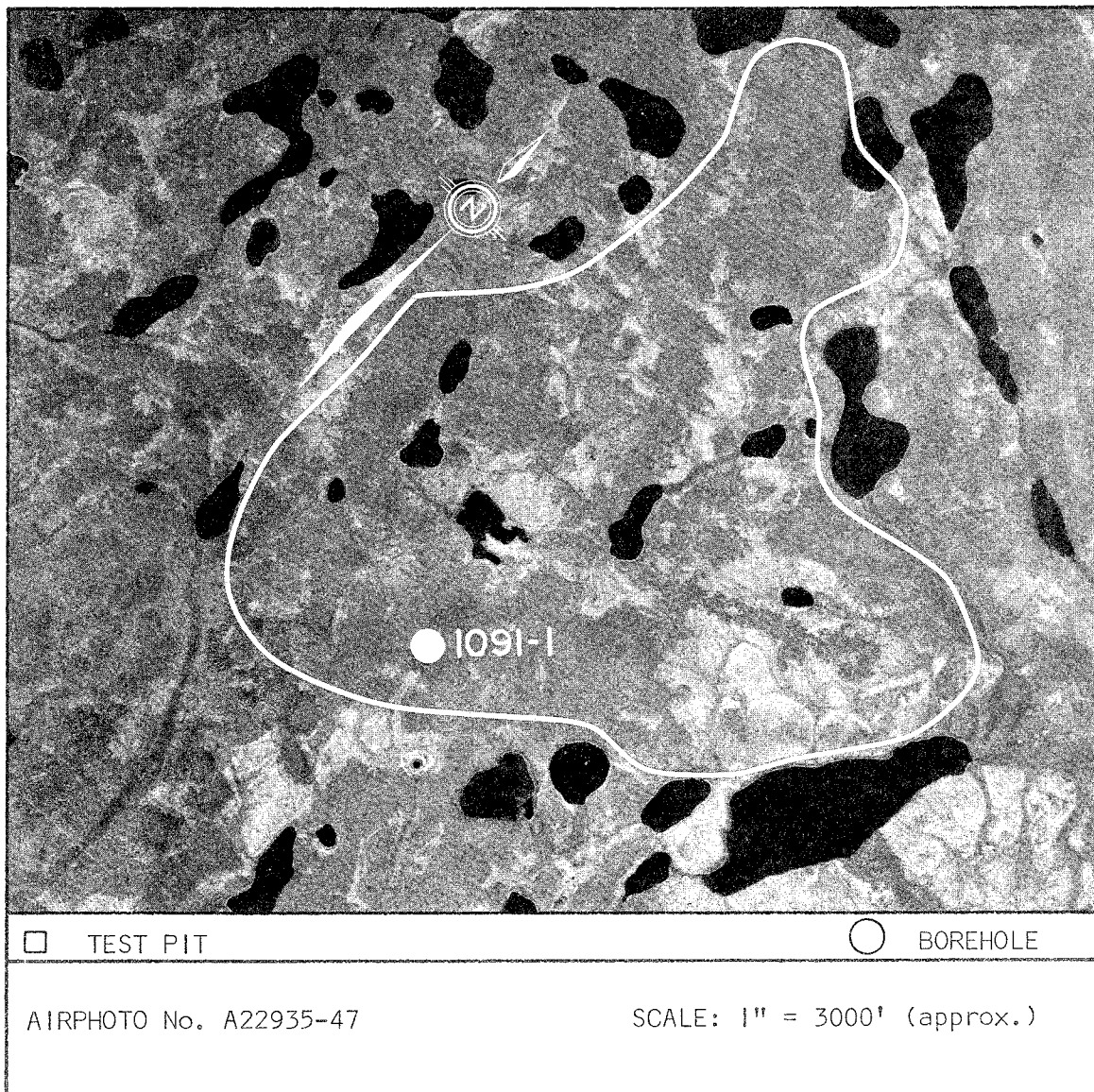
SITE NO. 1090		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18		SHALE	Nf					18
19		-medium to hard						19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27
28								28
29								29
30								30
31								31
32								32
33								33
34								34
DATE DRILLED: June /73			LOGGED BY: DPW 45		COMPLETION DEPTH: 30'			
DRILLING METHOD: HELI			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

SITE 1091

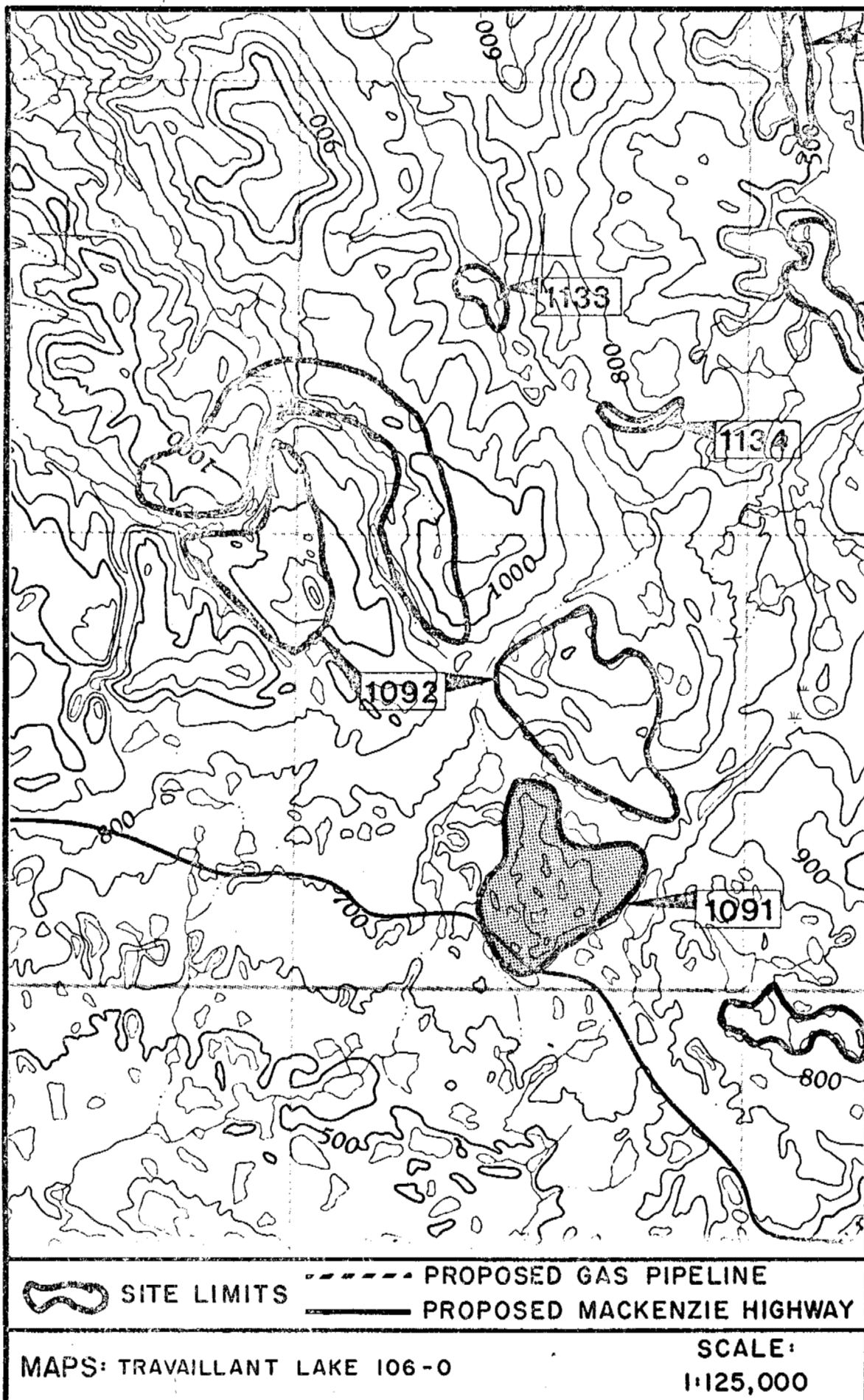
Location: Site 1091 is 10 miles north of the point of confluence of the Mackenzie and Thunder Rivers. The proposed highway route crosses the tip of the site.

Material: Shale.

Assessment: The shale at site 1091 is suitable for fair quality borrow and may be used in sub-grade construction. Haulage distance is minimal and access will be provided as the highway route crosses the site. Overburden is clay and weathered shale varying in thickness from 7 to 15 feet. A



drilling program should be undertaken to assess overburden/weathered shale thickness in more detail. The site has been assigned a relatively low environmental sensitivity rating. A thin active layer over shallow permafrost depth is anticipated. Site 1091 is a promising source of bedrock borrow material.



SITE 1091 ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
1	2	3	Formation Stability
4	5		Ice Content
	Rating: 10		Flat Land, Terrace, Knoll, Rolling, Outcrop, Ridge, Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION		
1	2	3	Aesthetic Value
4	5		Habitat Value
	Rating: 10		Marsh Black Spruce Muskeg White Spruce Mixed Conifer Conifer - Deciduous Deciduous Dry Slopes Riparian
15	MAMMALS		
1	2	3	Ungulates
4	5		Furbearers
	Rating: 45		Carnivores Small Mammals
10	BIRDS		
1	2	3	Waterfowl-Swans,
4	5		Geese, Ducks
	Rating: 10		Game Birds Raptors Shorebirds Passerine
10	FISHERY		
1	2	3	Lakes, Tributaries
4	5		Mackenzie River:
	Rating: 20		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. Flumps, Velocity Increments, Migration Barriers. Eutrophication. Blasting.

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

TOTAL INDEX: 205

SPECIAL CONCERNS:


Upland area. Siltation controls may be required.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
1	2	3	Paleontology
4	5		Pre-Historic
	Rating: 5		Historic
10	AESTHETICS		
1	2	3	Visible from:
4	5		Physical Dis-
	Rating: 10		turbance
15	RESOURCE UTILIZATION		
1	2	3	Fort Good Hope
4	5		Arctic Red R.
	Rating: 45		Inuvik
			Improved Access. Traplines. Hunting. Fishing. Domestic. Commercial.
15	ASSOCIATED DISTURBANCES		
1	2	3	Access Roads
4	5		Miles From Highway
	Rating: 30		Miles From Pipeline
			Hydrologic
			Alterations
			Continued Use
			For Maintenance.
10	RESTORATION		
1	2	3	Soil Stabilization
4	5		Visual Improvement
	Rating: 20		Habitat Replacement
			Natural Regeneration. Grass-Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE


MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1091		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	OH	ORGANICS			1
2					2
3	CL	CLAY sandy & silty, brown			3
4					4
5					5
6					6
7					7
8		SHALE brown, soft to medium hard			8
9					9
10					10
11					11
12		brown, soft			12
13					13
14					14
15		light brown, medium hard to hard			15
16					16
17					17
DATE DRILLED: Sept./73			LOGGED BY: DPW 136		COMPLETION DEPTH: 30'
DRILLING METHOD: HELI			THAW DEPTH: N/A		
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.		

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1091		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		SHALE light brown, soft to medium hard		○					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

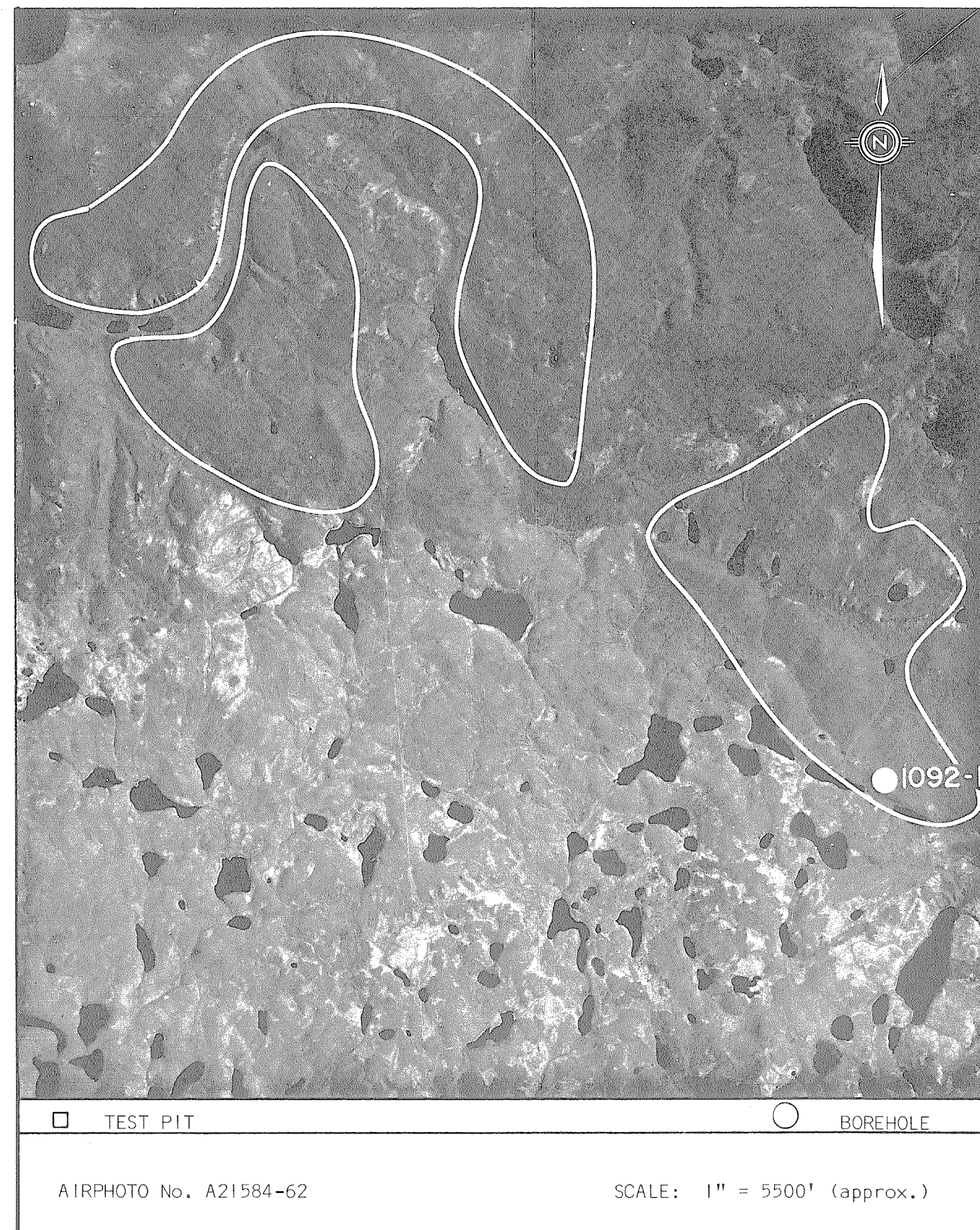
DATE DRILLED: Sept./73	LOGGED BY: DPW 136	COMPLETION DEPTH: 30'
DRILLING METHOD: HELI		THAW DEPTH: N/A
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS		 EBA Engineering Consultants Ltd.

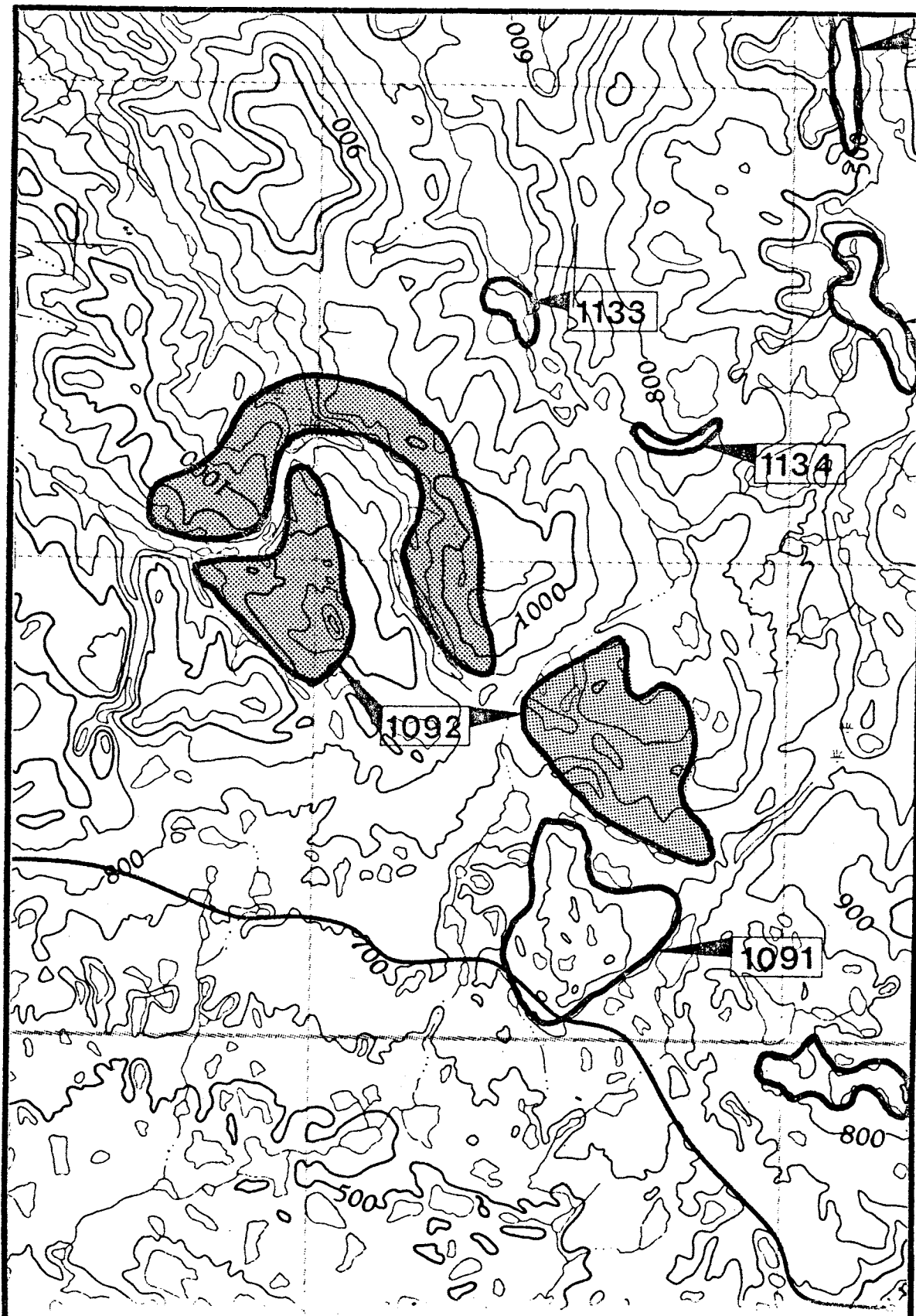
SITE 1092

Location: Site 1092 is roughly 12 miles north of the point of confluence of the Mackenzie and Thunder Rivers. Proposed highway and pipeline routes are approximately 3 and 10 miles south of the site, respectively.

Material: Shale.

Assessment: The shale at site 1092 is suitable as fair quality borrow but has 7 to 15 feet of clay and weathered shale overburden covering it. The haulage distance is within acceptable limits and winter access will not be difficult. The environmental sensitivity rating is low. A drilling program to determine overburden/weathered shale thickness should be undertaken. Permafrost was encountered just below the surface of the ground. Moisture contents are high to a depth of 15 feet. Unless material shortages are critical it is questionable whether development of site 1092 is feasible.





SITE LIMITS



PROPOSED GAS PIPELINE



PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

TOTAL INDEX: 195

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

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1092		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	PT -OH	ORGANIC MATERIAL AND ORGANIC SILTY CLAY	FROZEN		1
2					2
3					3
4					4
5	ML -CL	SILTY CLAY OR CLAY SILT -wet on thawing	Vs Vr		5
6					6
7					7
8					8
9					9
10					10
11					11
12					12
13	SHALE -soft -becoming slightly harder with depth	Nf		13	
14				14	
15				15	
16				16	
17				17	

DATE DRILLED: June 73


LOGGED BY: DPW 47

COMPLETION DEPTH: 30'

DRILLING METHOD: HELI


THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



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GRANULAR MATERIALS INVENTORY - STAGE III

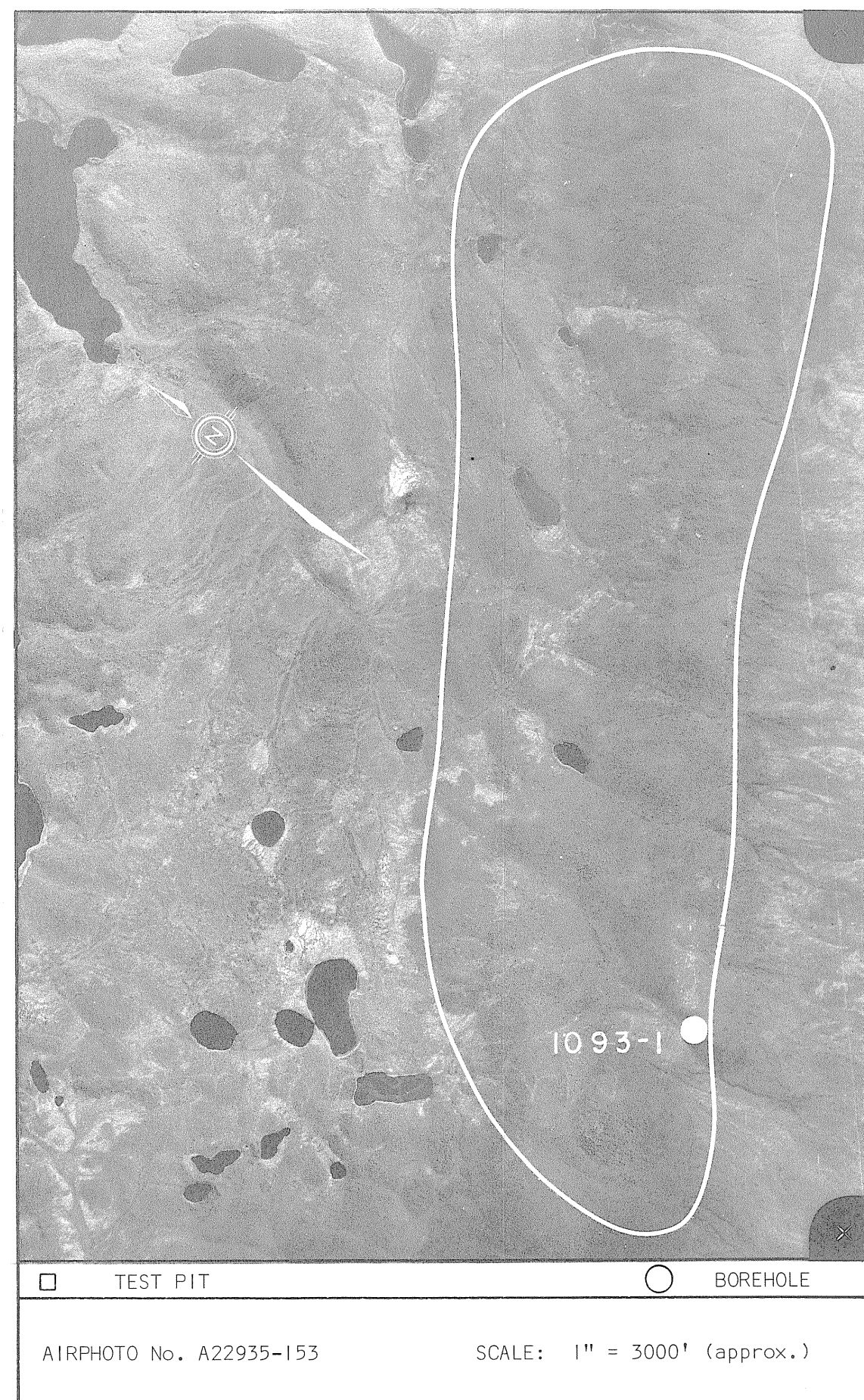
SITE NO. 1092		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18		SHALE -soft -becoming slightly harder with depth	Nf	○				18
19				○				19
20				○				20
21				○				21
22				○				22
23				○				23
24				○				24
25				○				25
26				○				26
27				○				27
28				○				28
29				○				29
30				○				30
31				○				31
32				○				32
33				○				33
34				○				34
DATE DRILLED: June 73		LOGGED BY: DPW 47		COMPLETION DEPTH: 30'				
DRILLING METHOD: HELI				THAW DEPTH: N/A				
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				

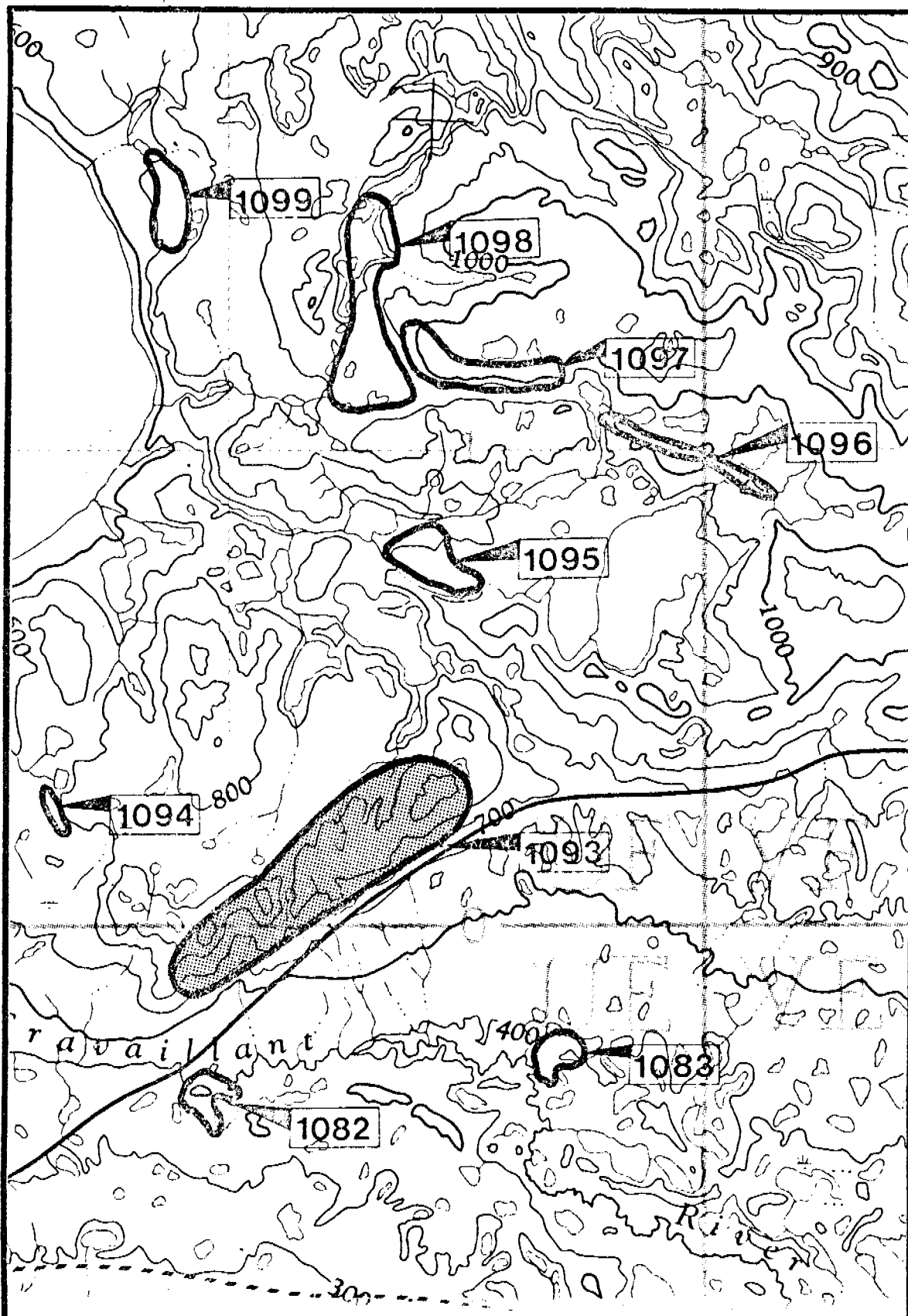
SITE 1093

Location: Site 1093 is a long NE - SW trending ridge of shale located 6 miles SE of Travaillant Lake. The proposed highway route is 1/2 mile SE of the site.

Material: Shale.

Assessment: Site 1093 is a long shale ridge. Overburden/weathered shale thickness is expected to be variable from a few to several feet. A drilling program should be undertaken to better assess the overburden/weathered shale thickness. Tree cover is dense and will have to be removed prior to development. Access to the site crosses thermally sensitive terrain which will probably necessitate winter operations. Haulage distance however is short. The shale is of fair quality and suitable for use in sub-grade construction. Site 1093 has a promising potential as a source of shale bedrock borrow material.





SITE LIMITS



PROPOSED GAS PIPELINE



PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 225


SPECIAL CONCERNS:

Upland area north of Travaillant River. Hard road may provide access to Travaillant River for natives and visitors. Operations should be regulated to protect this fishery.


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1093		HOLE NO. 1		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1		WEATHERED SHALE silt							1
2				2					
3				3					
4				4					
5		SHALE							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: Sept. /73		LOGGED BY: DPW 123	COMPLETION DEPTH: 30'						
DRILLING METHOD:			THAW DEPTH:						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

GRANULAR MATERIALS INVENTORY - STAGE III

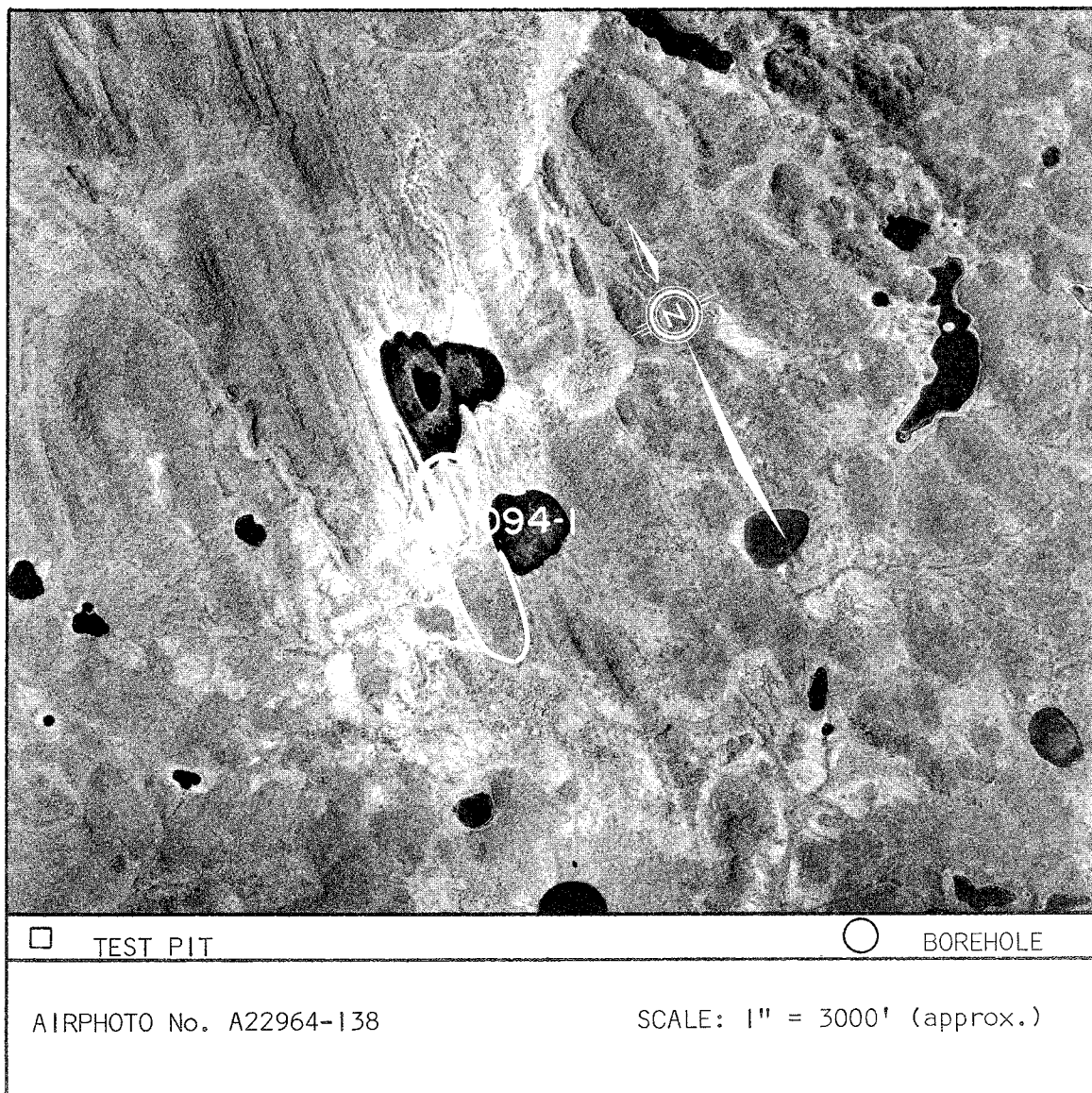
SITE NO. 1093		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18		SHALE same		○				18	
19				○				19	
20				○				20	
21								21	
22								22	
23								23	
24								24	
25					○			25	
26								26	
27								27	
28								28	
29							29		
30				○				30	
31								31	
32								32	
33								33	
34								34	
DATE DRILLED: Sept/73			LOGGED BY: DPW 123		COMPLETION DEPTH: 30'				
DRILLING METHOD:				THAW DEPTH:					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

SITE 1094

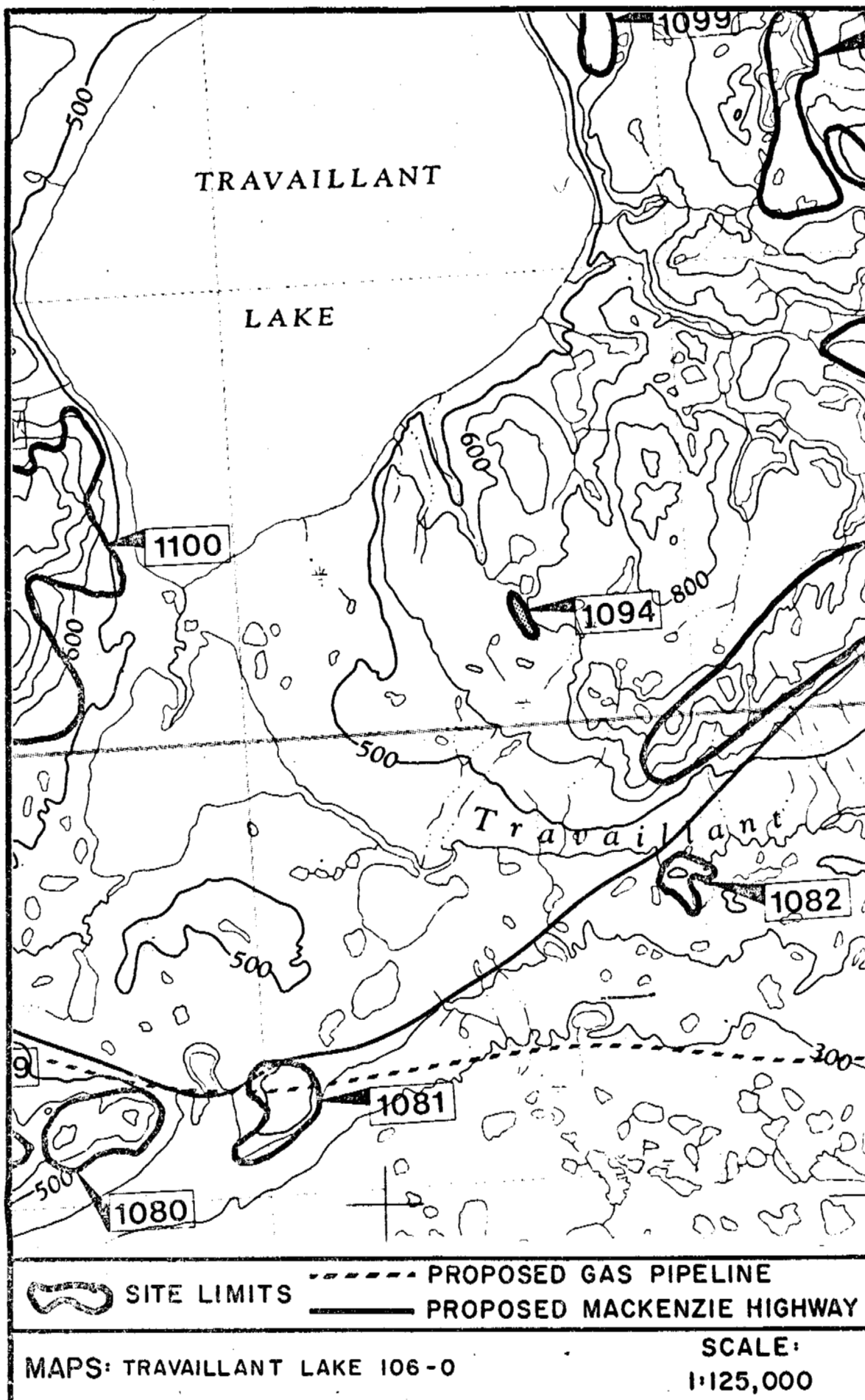
Location: Site 1094 is located 3 miles south-east of Travaillant Lake. The proposed highway route is 4 miles south of the site.

Material: Shale.

Assessment: The shale borrow at site 1094 is of fair quality suitable for use in the construction of sub-grades. The volume of material available is relatively low and silty clay overburden and weathered shale to



a depth of 15 feet overlie and medium hard shale. Access to the site is relatively easy but haulage distance is long. Unless material shortages are critical it is doubtful whether it is feasible to develop the site.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 210

SPECIAL CONCERNS:

Upland area. Shale with 15 feet of overburden.
Organic materials should be returned to pit.
Avoid drainage alteration.

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1094		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	CL	SILTY CLAY AND SHALE -possibly some sandstone			1
2					2
3					3
4					4
5					5
6	br	SHALE -soft to 15' -medium to hard below 15'			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: June /73


LOGGED BY: DPW
58

COMPLETION DEPTH: 30'

DRILLING METHOD: HELI

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1094		HOLE NO. 1		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	br	SHALE -medium to hard						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: June 73			LOGGED BY: DPW 58		COMPLETION DEPTH: 30'			
DRILLING METHOD: HELI			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			EBA Engineering Consultants Ltd.					

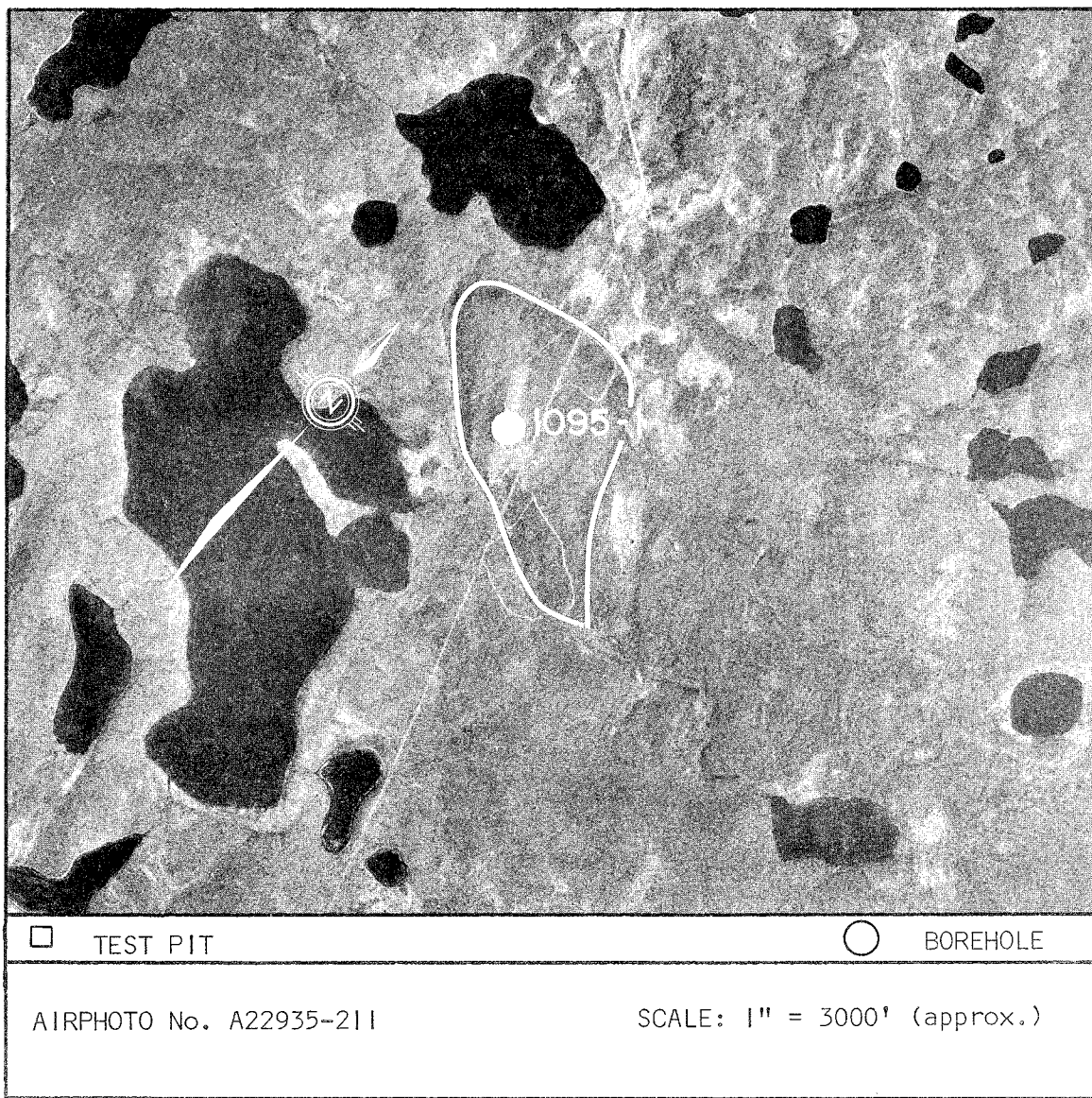
SITE 1095

Location: Site 1095 is located 4 miles SSE of Travaillant Lake. The proposed highway route is 3 1/2 miles SE of the site.

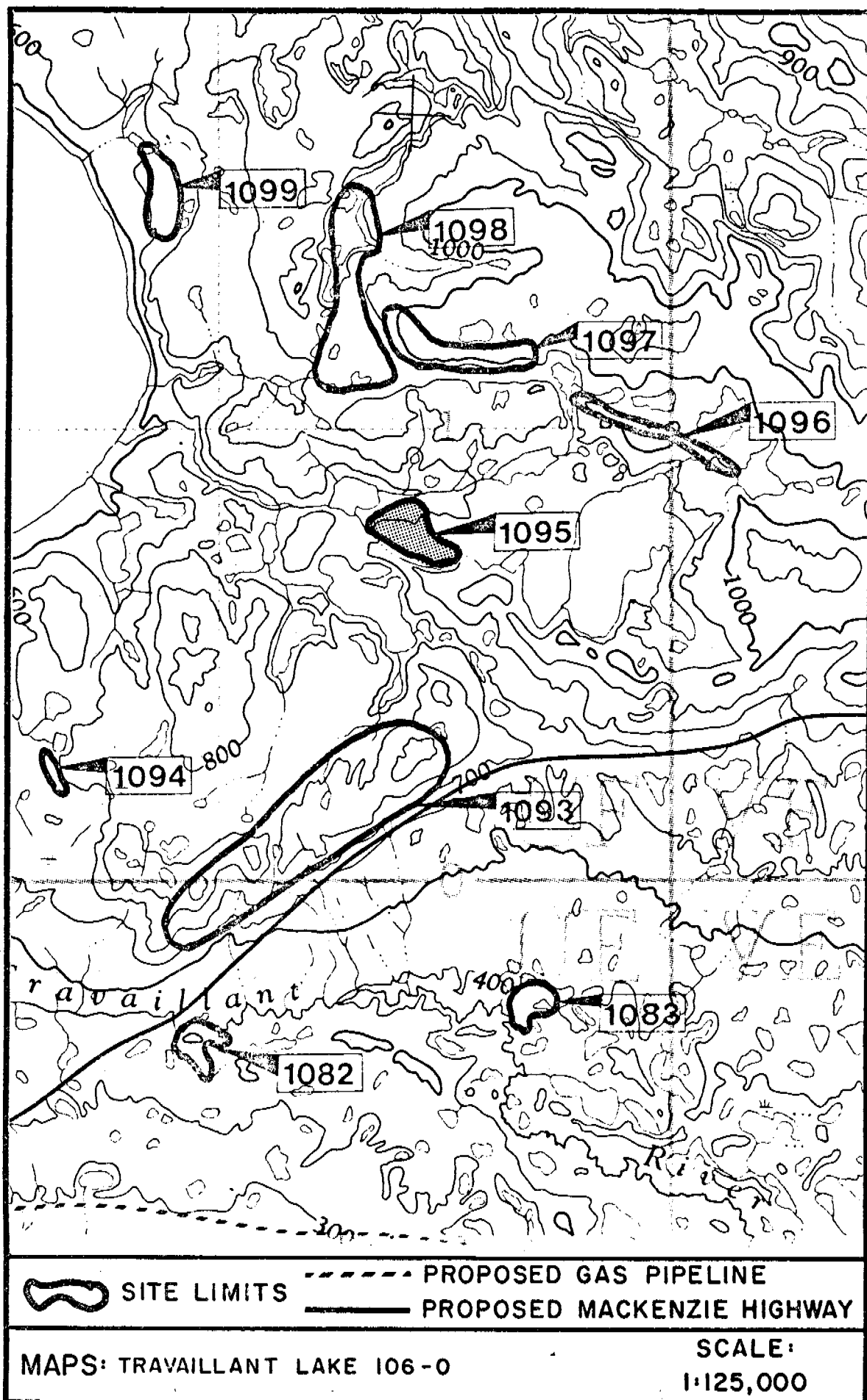
Geology: The material at site 1095 is thought to be outwash overlain by 4 feet of clay (lacustrine?).

Material: Sand and gravelly sand.

Assessment: At site 1095, air photo interpretation suggests a relatively large volume of material to be available. The sand is suitable for use as fair quality general fill. Overburden consists of 4 feet of clay which



will have to be removed and stockpiled for use in restoration. Tree cover is dense and will have to be removed for disposal. Moisture content of the borrow is marginally acceptable and the soil is unfrozen to at least a depth of 11 feet. Access to the site crosses rolling and some thermally sensitive terrain but should not be difficult in winter. Haulage distance is within acceptable limits. An airstrip is located on the site. Further drilling will be necessary to assess the borrow depth and quality, however, site 1095 is promising as a source of material.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 265

SPECIAL CONCERN:

Upland area in lake complex. Whistling Swans use area for spring staging and moulting. Buffer zones and siltation controls are recommended.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1095		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	CI	CLAY organic sandy silty -low to medium plastic	UNFROZEN					1
2								2
3								3
4								4
5	GW-SM	SAND AND GRAVELLY SAND -non-plastic -damp -hole caving @11'						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: June /73


LOGGED BY: DPW 53

COMPLETION DEPTH: 11'

DRILLING METHOD: HELI

THAW DEPTH: N/A

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

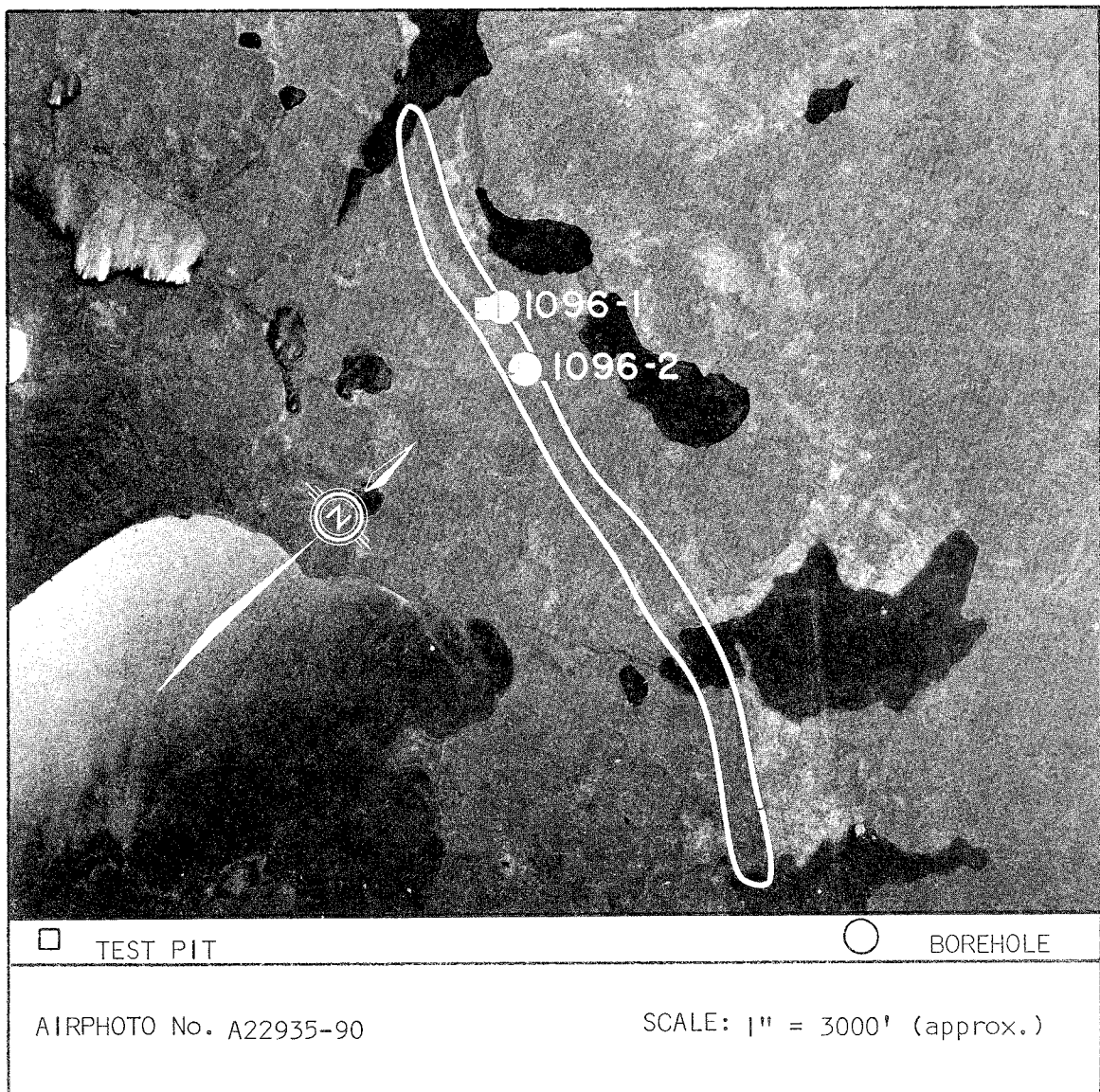
SITE 1096

Location: Site 1096 is 7 miles east of Travailant Lake. The proposed highway route is 4 1/2 miles south of the site while the proposed pipeline route is 12 miles south.

Geology: The structure containing the material at site 1096 is a long straight ridge which is probably a crevasse infilling. The material exhibits some variability.

Material: Gravel and sand, silt content variable, fairly well graded.

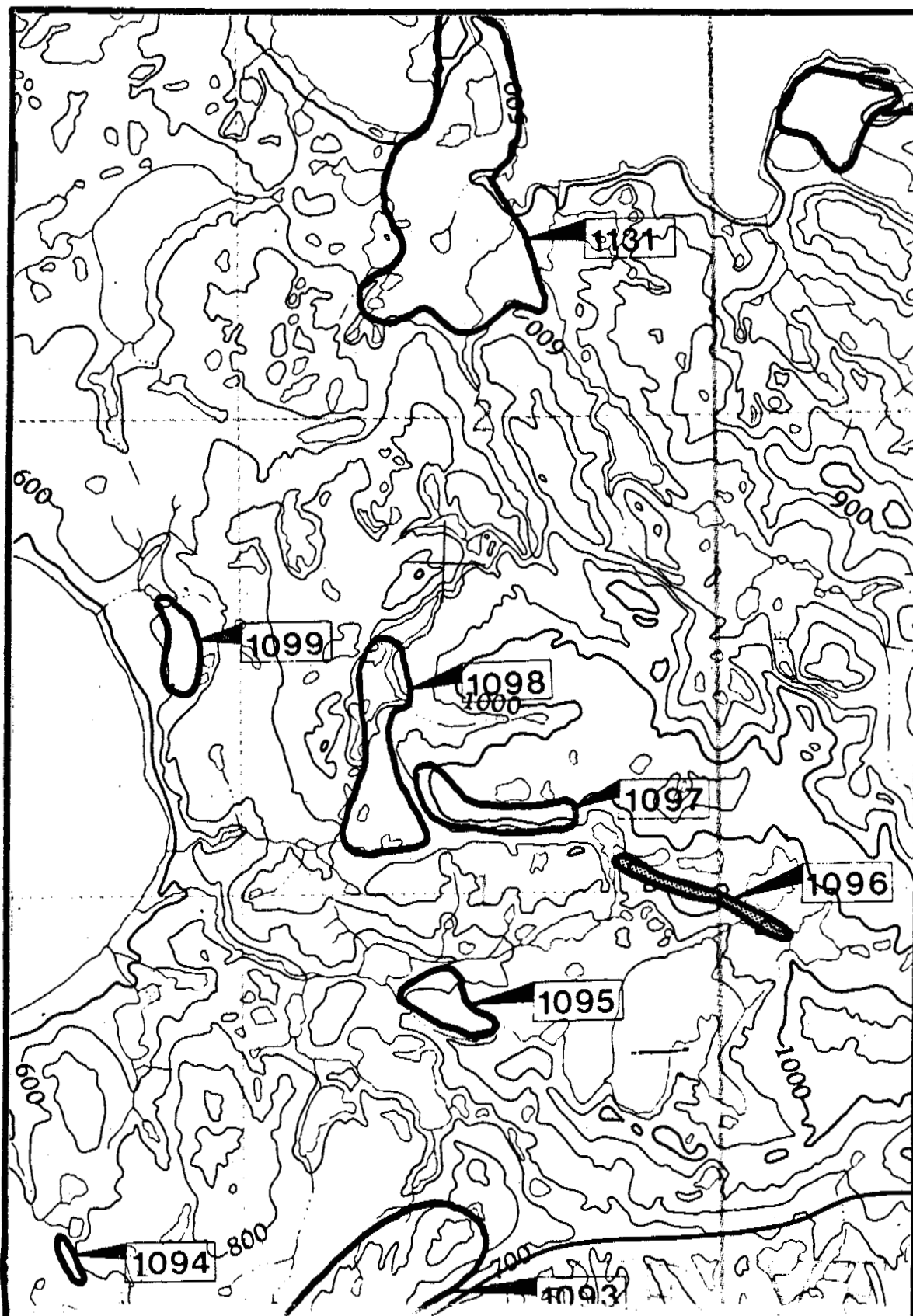
Volume: 1,250,000 cu. yd., reliability of volume estimate is uncertain.






Area: 90 acres.

Drainage: The site itself is dry however the ground around it is wet.

Assessment: Site 1096 contains a moderate quantity of good quality borrow. Access does not appear to be difficult but haulage distance will be somewhat long. Overburden is variable in thickness and material type and will have to be removed and stockpiled for use in restoration. Tree cover at the site is sparse because of recent forest fires. Permafrost depth is unknown but the ground is thawed for at least 11 ft. The environmental overview has assessed the site to be moderately sensitive; however, care during development should satisfy environmental concerns. More drilling will be necessary to delineate the deposit. Site 1096 is recommended for development only if materials are in short supply.



 SITE LIMITS
  PROPOSED GAS PIPELINE
 PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 260

SPECIAL CONCERNS : Surrounds upland lakes. Buffer strips recommended.

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY

100

MAXIMUM
SENSITIVITY


TO

500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1096		HOLE NO. 1		PAGE 1 OF 1	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1		GRAVEL -silty, some fine sand, light grey-brown	NOT FROZEN		1
2					2
3					3
4		-silty, sandy, gravel angular to subangular			4
5		12.0% O.C. 61% GRAVEL (4') 17% SAND			5
6		22% SILT & CLAY			6
7		CLAY -very gravelly, silty, some sand, moist, low plasticity, grey			7
8					8
9		-gravel finer, sand fine to coarse.			9
10					10
11		END OF HOLE			11
12					12
13					13
14					14
15					15
16					16
17					17

DATE DRILLED: Sep. 13/73	LOGGED BY: EBA 126-5	COMPLETION DEPTH: 10.5'
DRILLING METHOD: AUGER		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1096		HOLE NO. 2		PAGE 1 OF 1					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	OL-ML	ORGANIC MATERIAL, SILT AND PEBBLES	UNFROZEN					1	
2								2	
3								3	
4								4	
5	SM	SAND						5	
6		silty with gravel						6	
7		-non-plastic						7	
8		-hole caving						8	
9		-no frost						9	
10		27% GRAVEL						10	
11		(8') 48% SAND						11	
12		25% SILT & CLAY					12		
13							13		
14							14		
15							15		
16							16		
17							17		

DATE DRILLED: June 73


LOGGED BY: DPW 55

COMPLETION DEPTH: 11'

DRILLING METHOD: HELI

THAW DEPTH: N/A

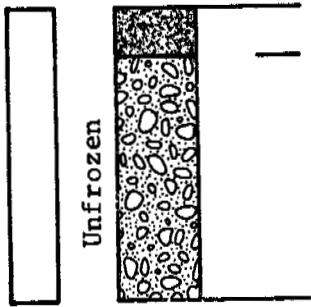
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1096-1



0.0

Moss

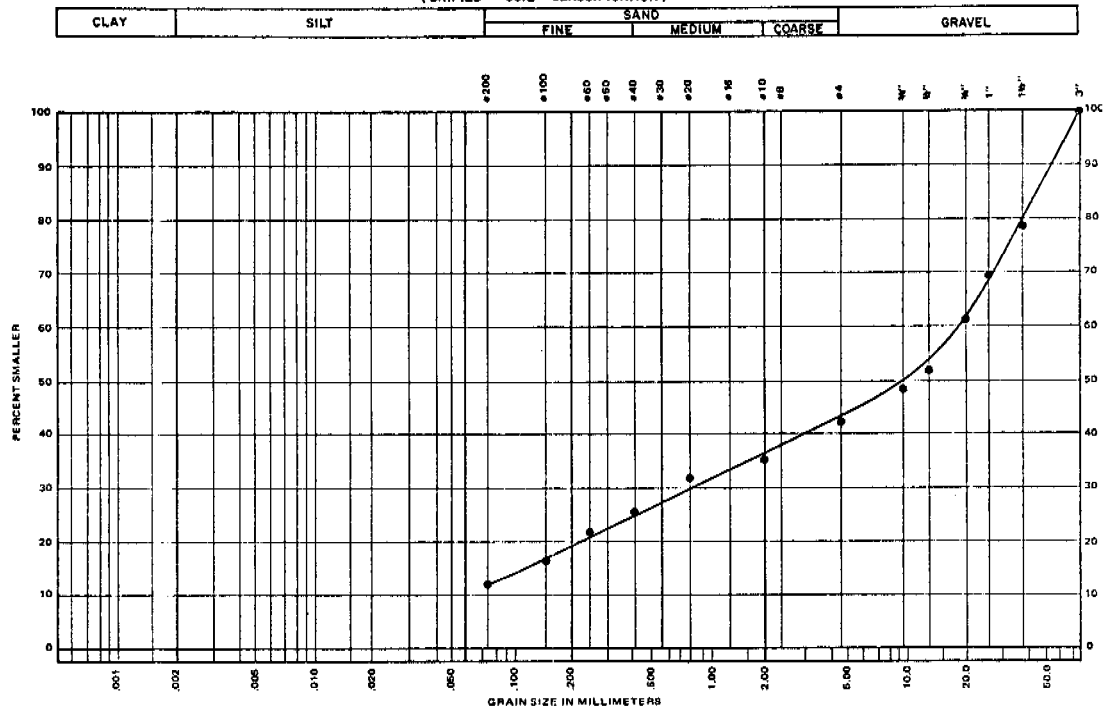
0.5

Gravel, silty
dry
siltier with depth

58% GRAVEL
30% SAND
12% SILT & CLAY

3.0

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand and
some Silt. (GW-GM) M/C = 9.3%

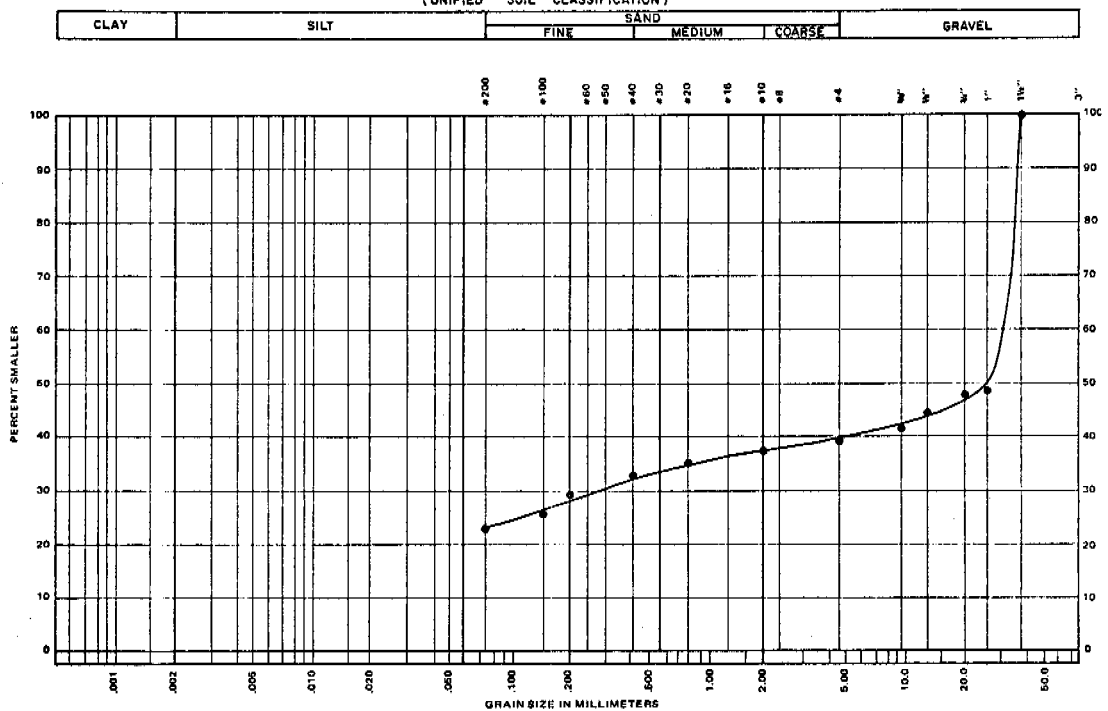
PROJECT Granular Resources

JOB No. E666 DATE December 16/73

SAMPLE No. TP 1096-1

DEPTH 3'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silty Gravel and
some Sand (GM-GV)

PROJECT Granular Resources

JOB No. E666 DATE December 18/73

SAMPLE No. RH 1096-1

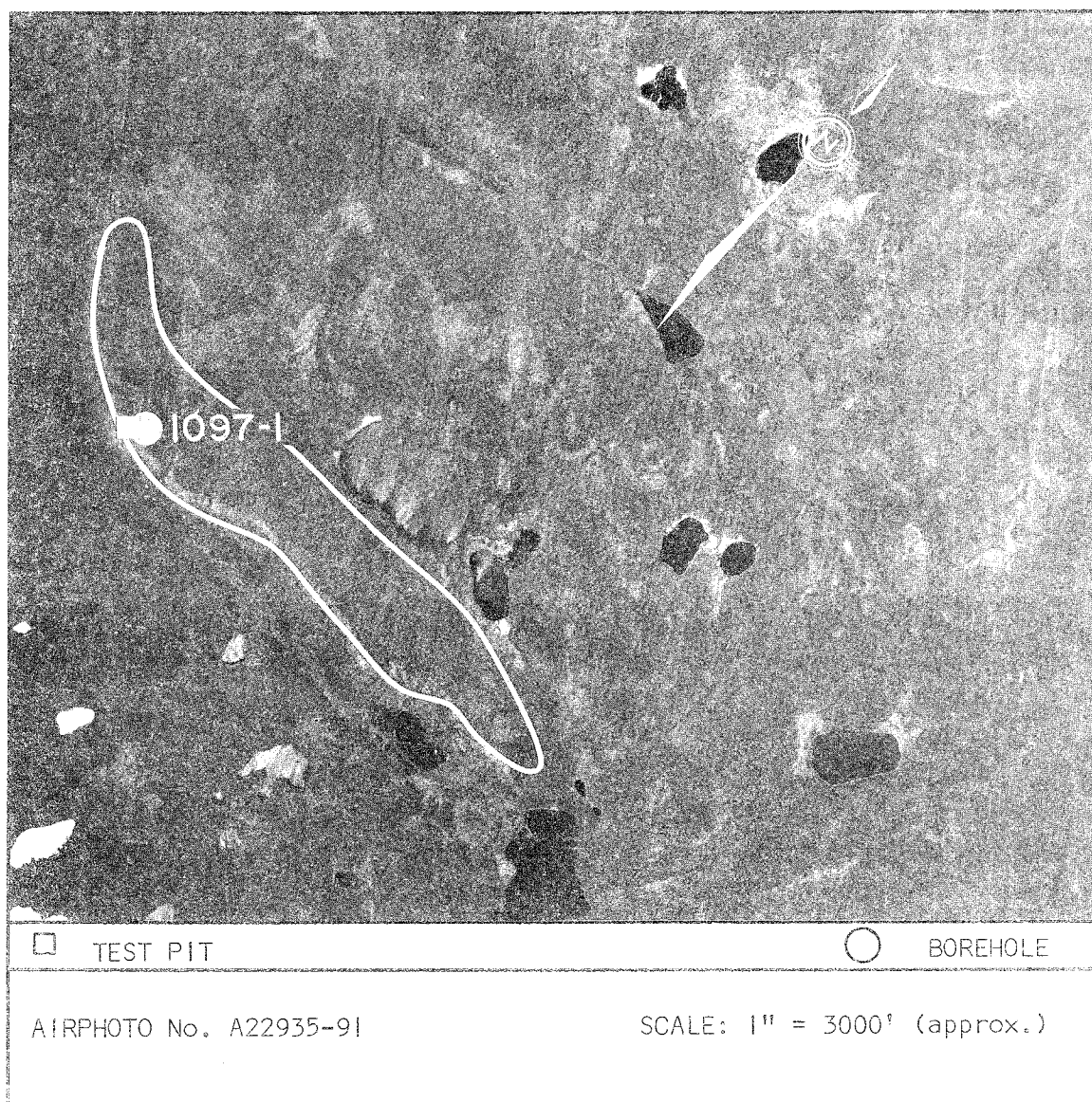
DEPTH 4'

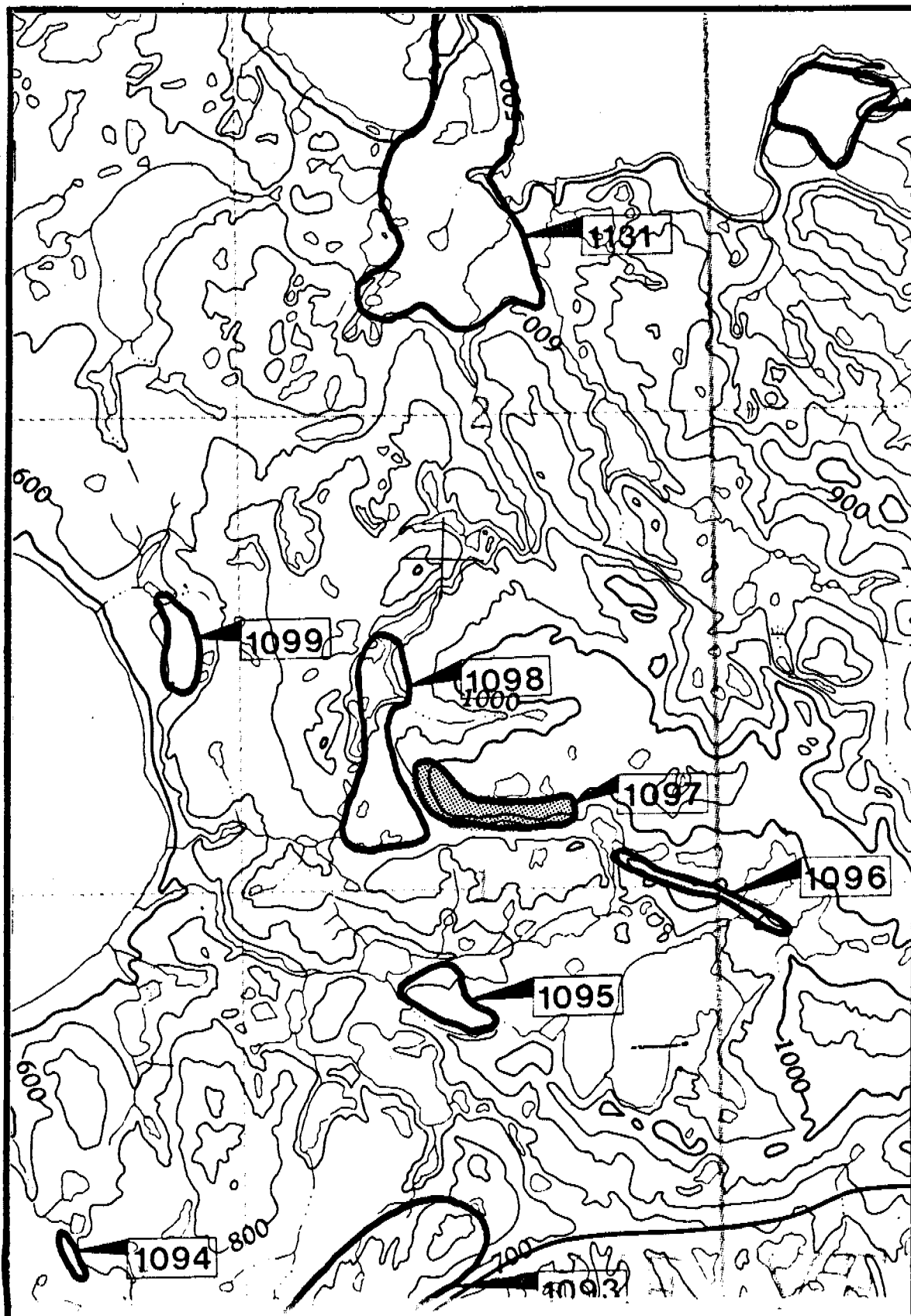
SITE 1097a

Location: Site 1097 is located approximately 4 miles east of Travaillant Lake. The proposed pipeline and highway routes are 12 and 6 miles to the south of the site, respectively.

Material: Clay and sand.

Assessment: The material at site 1097 is unsuitable for construction purposes and therefore the site is not recommended for development.





SITE LIMITS



PROPOSED GAS PIPELINE




PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

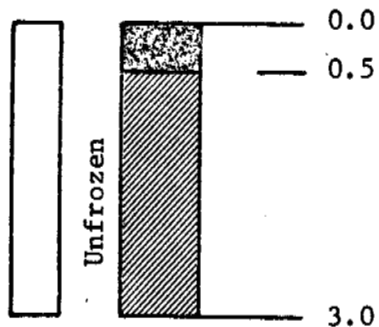
SCALE:
1:125,000

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1097		HOLE NO. 1		PAGE 1 OF 1	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
	Pt	PEAT	NOT FROZEN	10 20 30 40	
1	ML	SILT -trace to some fine sand, trace clay, trace gravel, dry, medium brown.			1
2					2
3					3
4					4
5					5
6					6
7		-sandy, trace clay, dry light brown			7
8		7% GRAVEL (6') 41% SAND 52% SILT & CLAY			8
9		-some clay			9
10					10
11		-clayey			11
12				12	
13		END OF HOLE			13
14					14
15					15
16					16
17					17
DATE DRILLED: Sep. 14/73		LOGGED BY: EBA 126-2		COMPLETION DEPTH: 12.0'	
DRILLING METHOD: AUGER			THAW DEPTH: N/A		
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.		

TEST PIT LOG

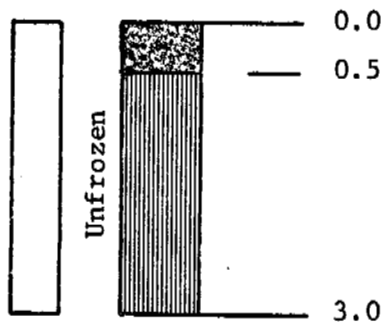
TP 1097-1



Peat, dark brown, organic

Clay, grey, silty 8% GRAVEL
 medium plasticity 40% SAND
 gravel inclusions 52% SILT & CLAY

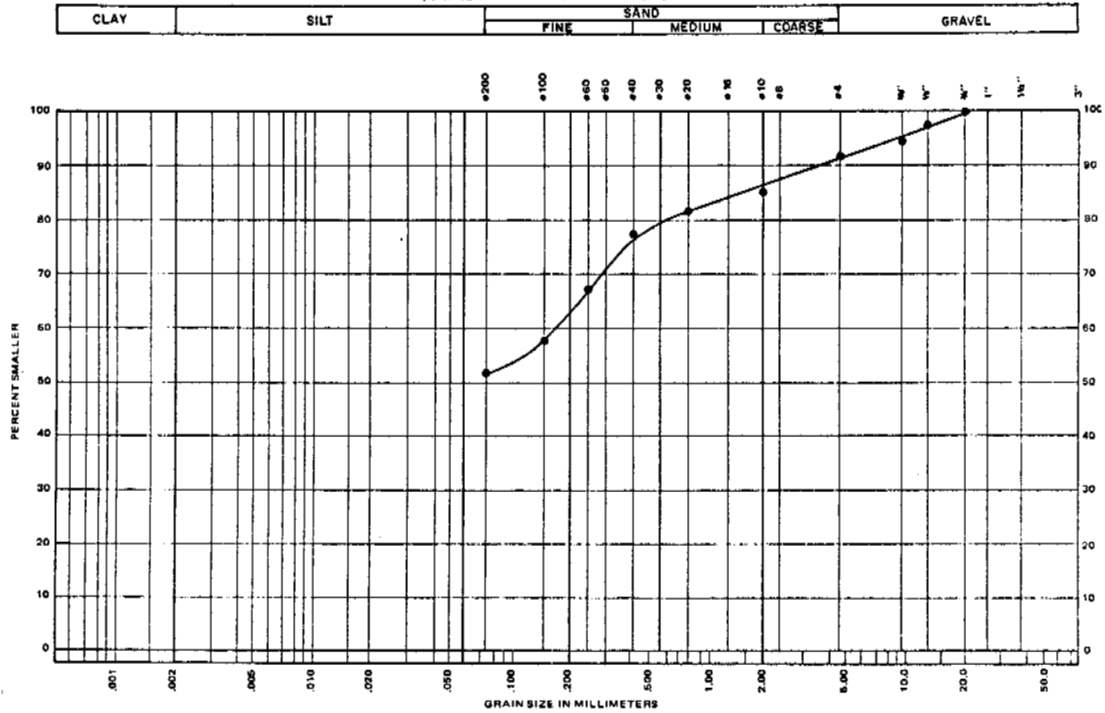
TP 1097-2



Moss

Silt, brown to grey
 wet
 uniform

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

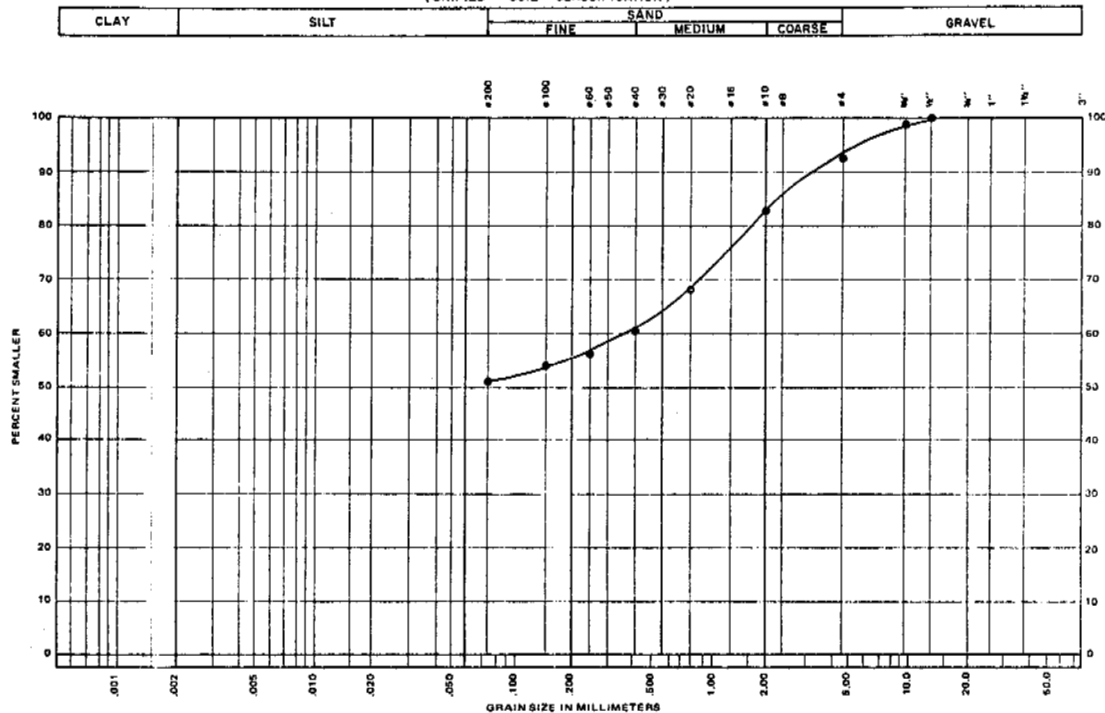


EBA Engineering Consultants Ltd.

PROJECT Granular Resources
JOB No. E666 DATE December 7/73
SAMPLE No. TP 1097-1
DEPTH 3'

SAMPLE DESCRIPTION Silt and Sand with
a Trace of Gravel (ML-CL) M/C=0.72-12.4%

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

PROJECT Granular Resources
JOB No. E666 DATE January 30/74
SAMPLE No. BH 1097-1
DEPTH 6'

SAMPLE DESCRIPTION Silt and Sand with
a Trace of Gravel (ML-CL)

SITE 1098

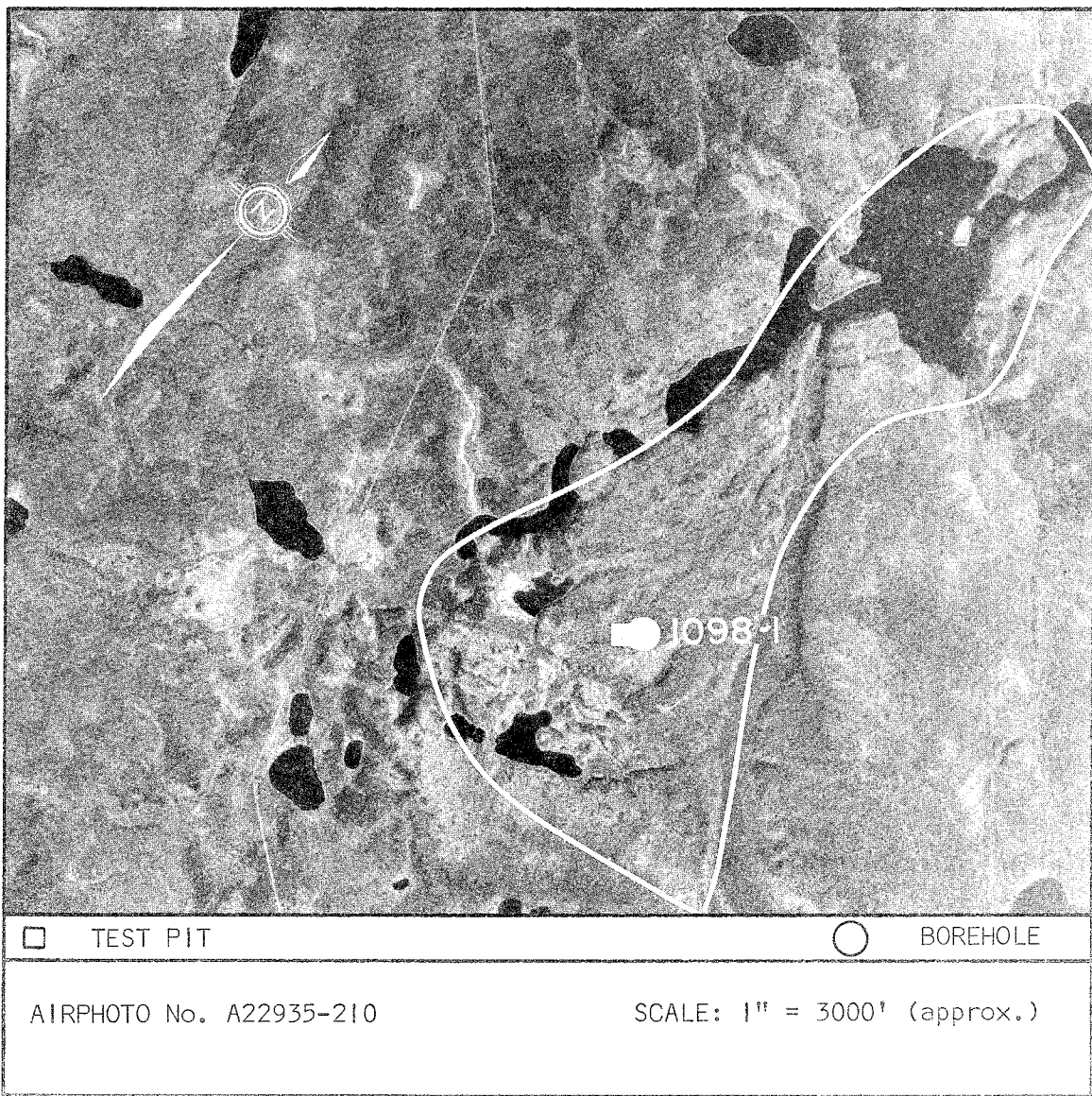
Location: Site 1098 is situated 2 1/2 miles east of Travaillant Lake. The proposed highway route is 7 miles south-east of the site.

Geology: The material at site 1098 is contained in an extensive outwash deposit. The material is expected to be quite uniform.

Material: Sandy gravel, with a trace of silt, well graded.

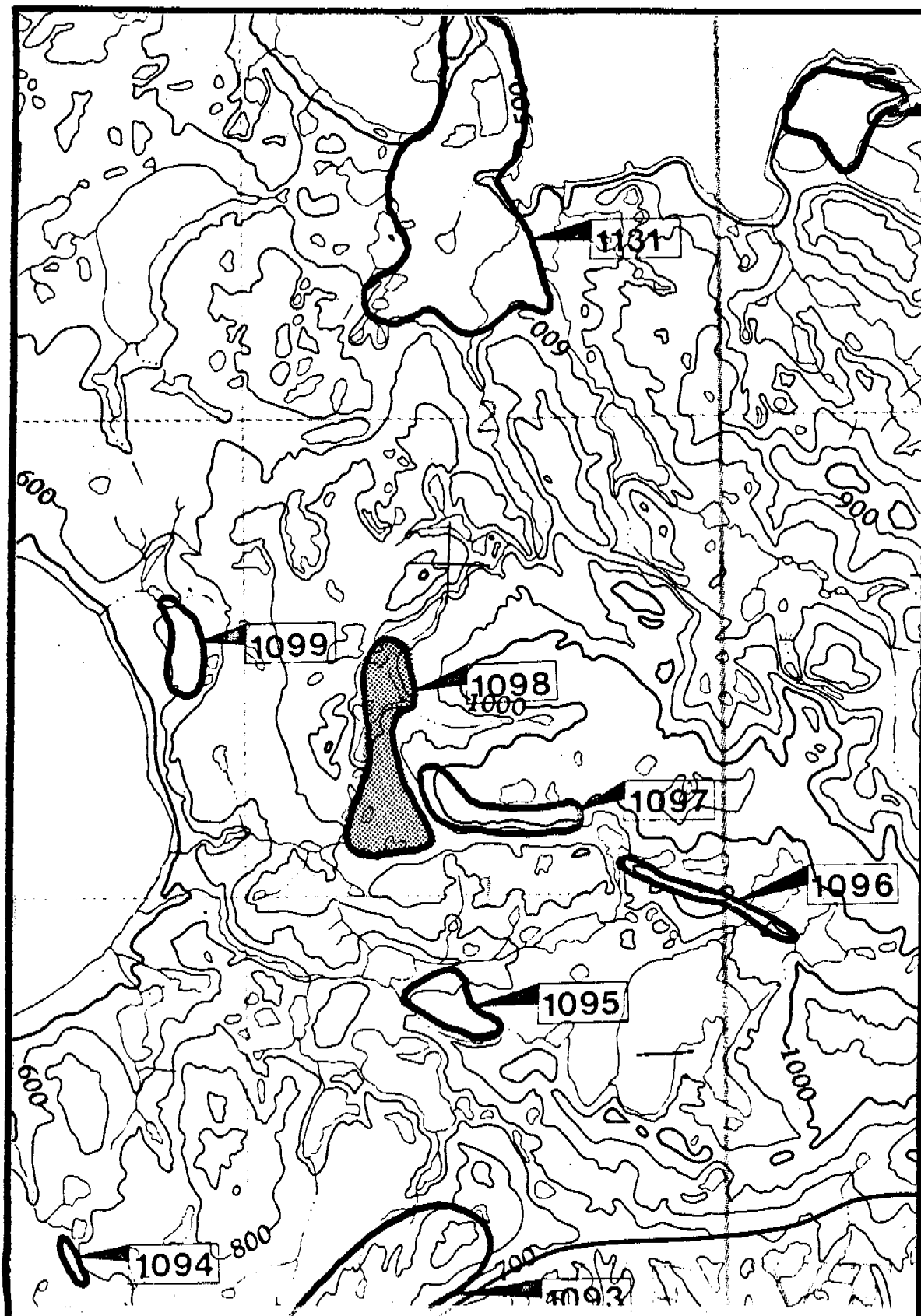
Volume: 13,000,000 cu. yd., estimate may be conservative.

Area: 400 acres.



Drainage: The site is well drained into the lakes around it.

Assessment: A large volume of good quality borrow was encountered at site 1098. The material is believed to be uniform and overburden is negligible. The site would be an excellent source of well graded gravel suitable for topping a shale sub-grade. The gravel could be processed for concrete aggregate after removal of fines by washing and screening. The site is covered with dense spruce which will have to be removed for disposal. Permafrost was not encountered in boreholes 21 feet deep. Access during winter would be easy but haulage distance is rather long. The environmental overview has assessed the site to be moderately sensitive however care in development should satisfy environmental concerns. More drilling will be necessary to prove the deposit. Site 1098 is promising source of borrow material but the haulage distance to presently located construction projects may make the feasibility of development questionable.



 SITE LIMITS  PROPOSED GAS PIPELINE
 PROPOSED MACKENZIE HIGHWAY

MAPS: TRAVAILLANT LAKE 106-0

SCALE:
1:125,000

ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 255

SPECIAL CONCERNS :

Surrounds upland lake. Buffer zones may be required.

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


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1098		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	GP-GM	GRAVEL -silty to some silt, some sand, odd cobble, gravel maximum 3", average 1", subangular to subrounded, very dry, light brown	NOT FROZEN					1
2							2	
3							3	
4		73% GRAVEL (2'+4') 17% SAND 10% SILT & CLAY					4	
5							5	
6							6	
7	78% GRAVEL (6'+8') 20% SAND 2% SILT & CLAY						7	
8							8	
9							9	
10	-gravel decrease in size & quantity, angular and sub-angular, sandy, silty, dry, light brown						10	
11							11	
12							12	
13		67% GRAVEL (10'+15") 21% SAND 8% SILT & CLAY					13	
14	GW-GM						14	
15		-gravel coarser again, dry					15	
16							16	
17							17	

DATE DRILLED: Sep. 14/73	LOGGED BY: EBA 126-1	COMPLETION DEPTH: 21.0'
DRILLING METHOD: AUGER		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1098		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
	GW-GM	GRAVEL -same							
18	SM	SAND -silty, some gravel, dry, light brown							18
19									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. 14/73		LOGGED BY: EBA 126-1		COMPLETION DEPTH: 21.0'					
DRILLING METHOD: AUGER			THAW DEPTH: N/A						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



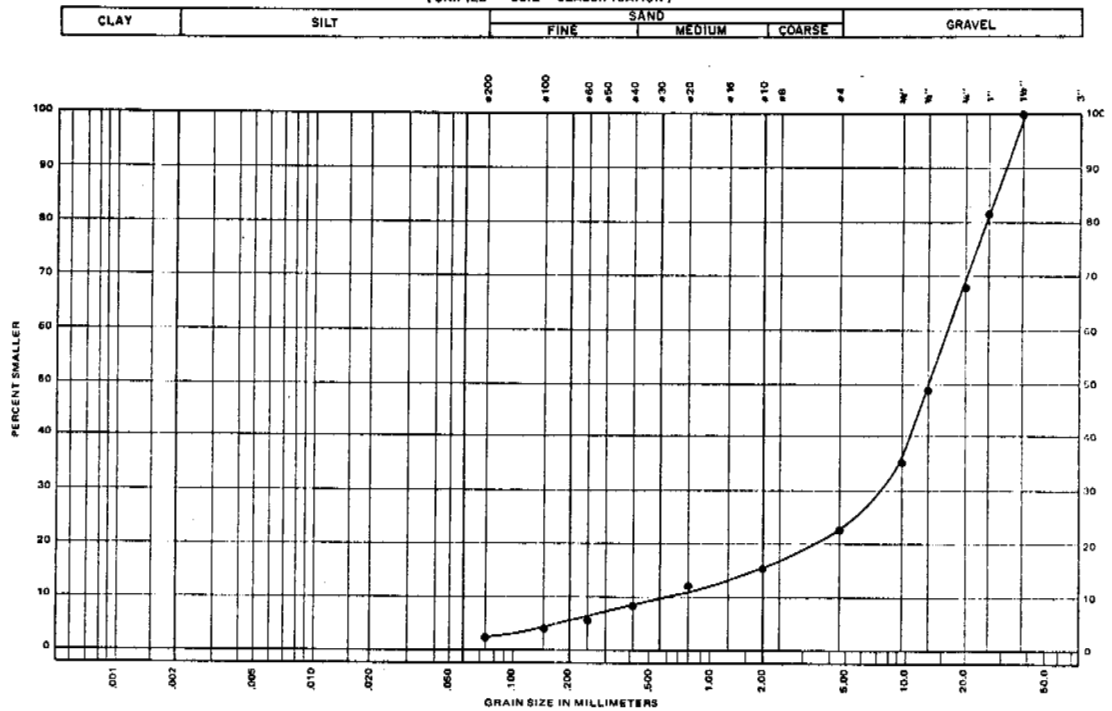
DEPTH surface sample

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



DEPTH 2' + 4'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



PETROGRAPHIC ANALYSIS

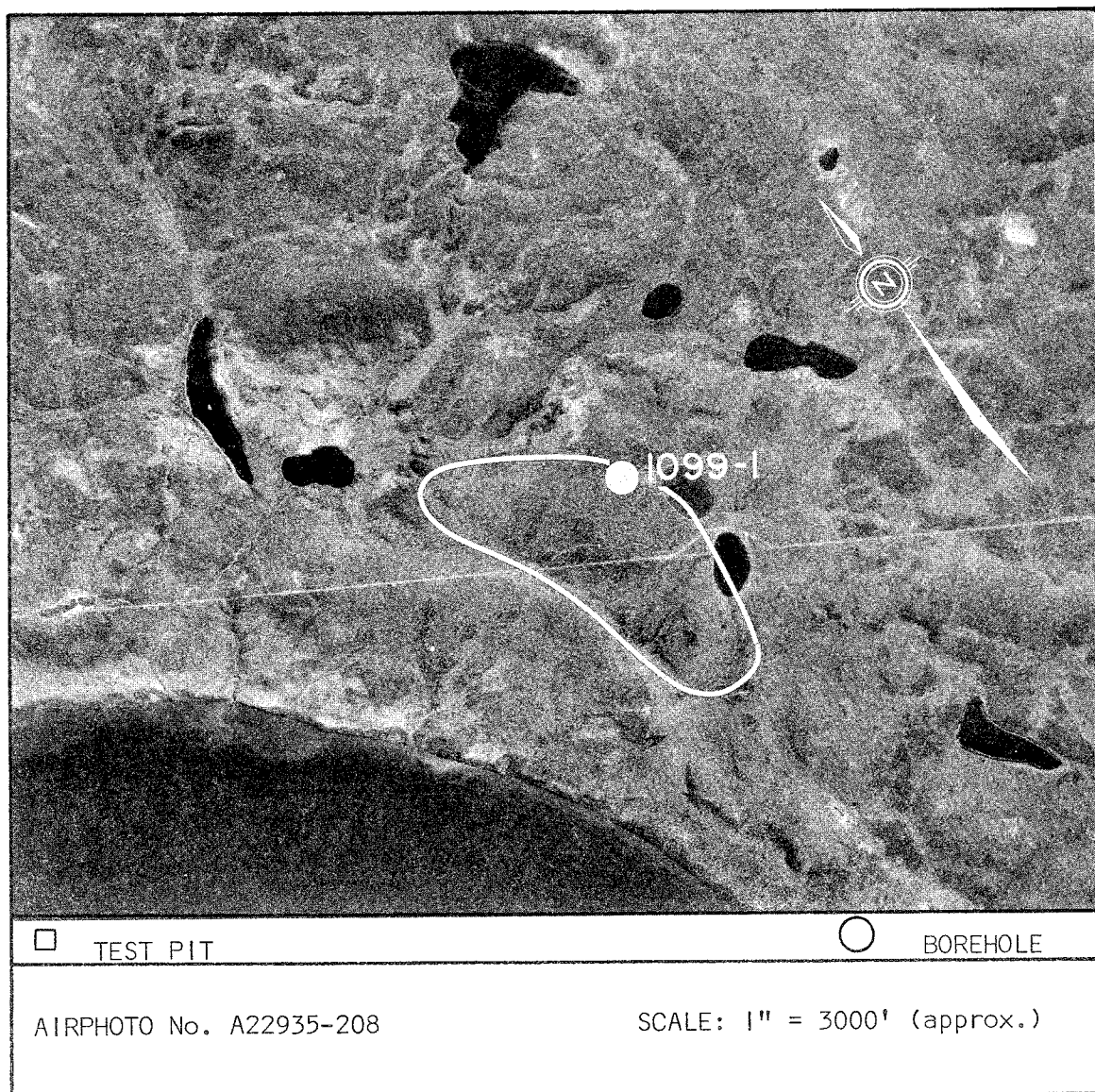
Sandstone - Greywacke	36 %
Chert - Jasper - Flint	10 %
Quartzite	1.5%
Granite	.5%
Basalt	50 %
Others	2 %

SITE 1099

Location: Site 1099 is located one mile NE of Travaillant Lake. The proposed highway route is 10 miles SE of the site.


Material: Siltstone.

Assessment: The area has numerous small outcrops of siltstone bedrock overlain with approximately 5 feet of silt overburden. The siltstone is suitable as fair quality general fill and can be used for the construction of sub-grades. The silt overburden will




have to be stripped and stockpiled for use in restoration. Dense tree cover will, as well, have to be removed. Access to the site is difficult and crosses thermally sensitive terrain. Haulage distance to the site is very long. Under the present circumstances the haulage distance and difficult access make the feasibility of developing the site doubtful.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1099		HOLE NO. 1		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	CL-ML	SILT -brown organic	Vx					1	
2								2	
3								3	
4								4	
5	br	SILTSTONE -brown silt weathered -grey, fractured, firm	Nbn					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: Mar. 20/72			LOGGED BY: MVP 72C-104		COMPLETION DEPTH: 30'				
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

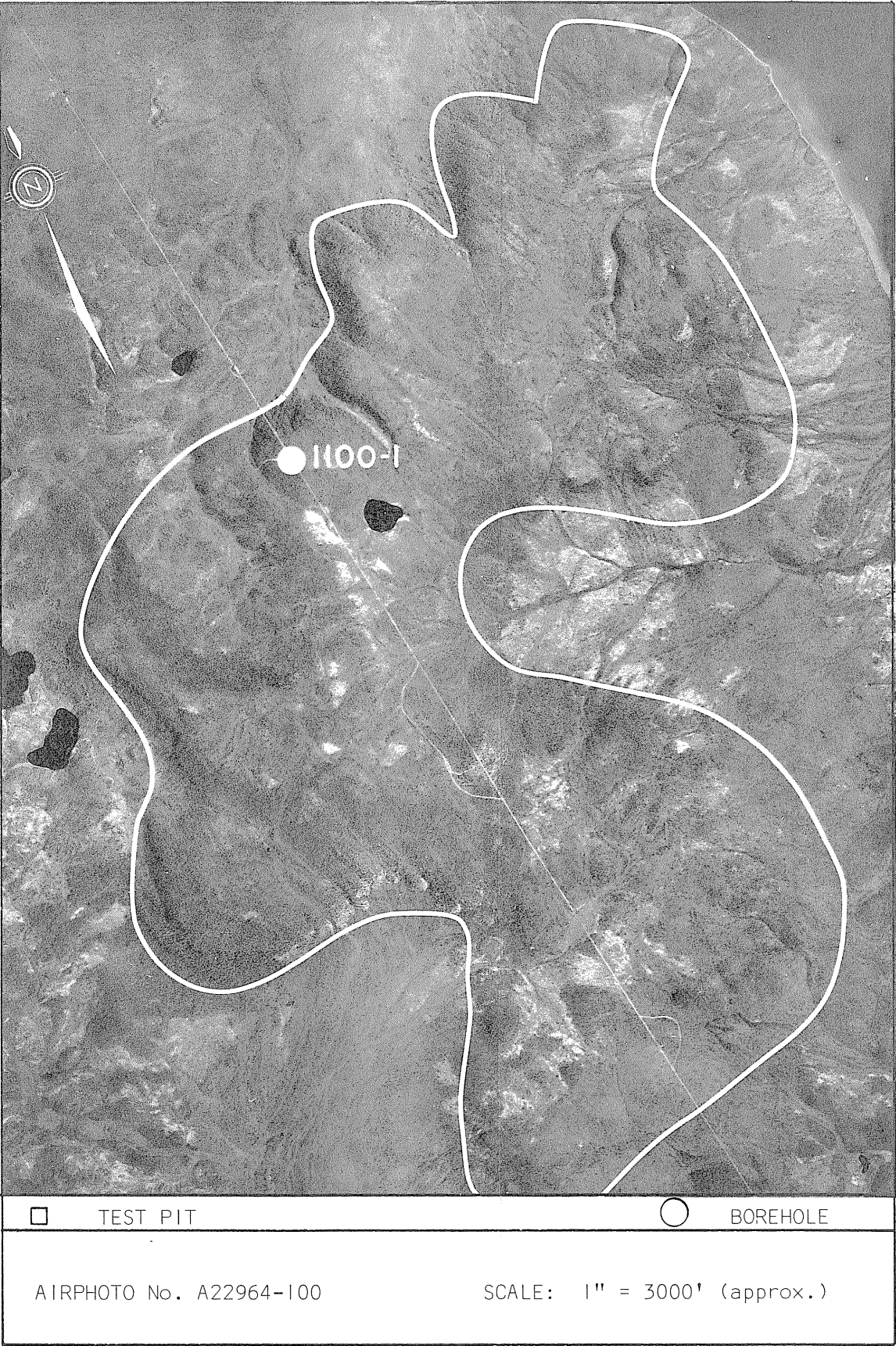
SITE NO. 1099		HOLE NO. 1		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	br	SILTSTONE -grey, fractured, firm	Nbn					18	
19								19	
20								20	
21								21	
22								22	
23								23	
24								24	
25								25	
26								26	
27								27	
28								28	
29								29	
30								30	
31								31	
32								32	
33								33	
34								34	
DATE DRILLED: Mar. 20/72			LOGGED BY: MVP 72C-104		COMPLETION DEPTH: 30'				
DRILLING METHOD: Failing 1000 Air				THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

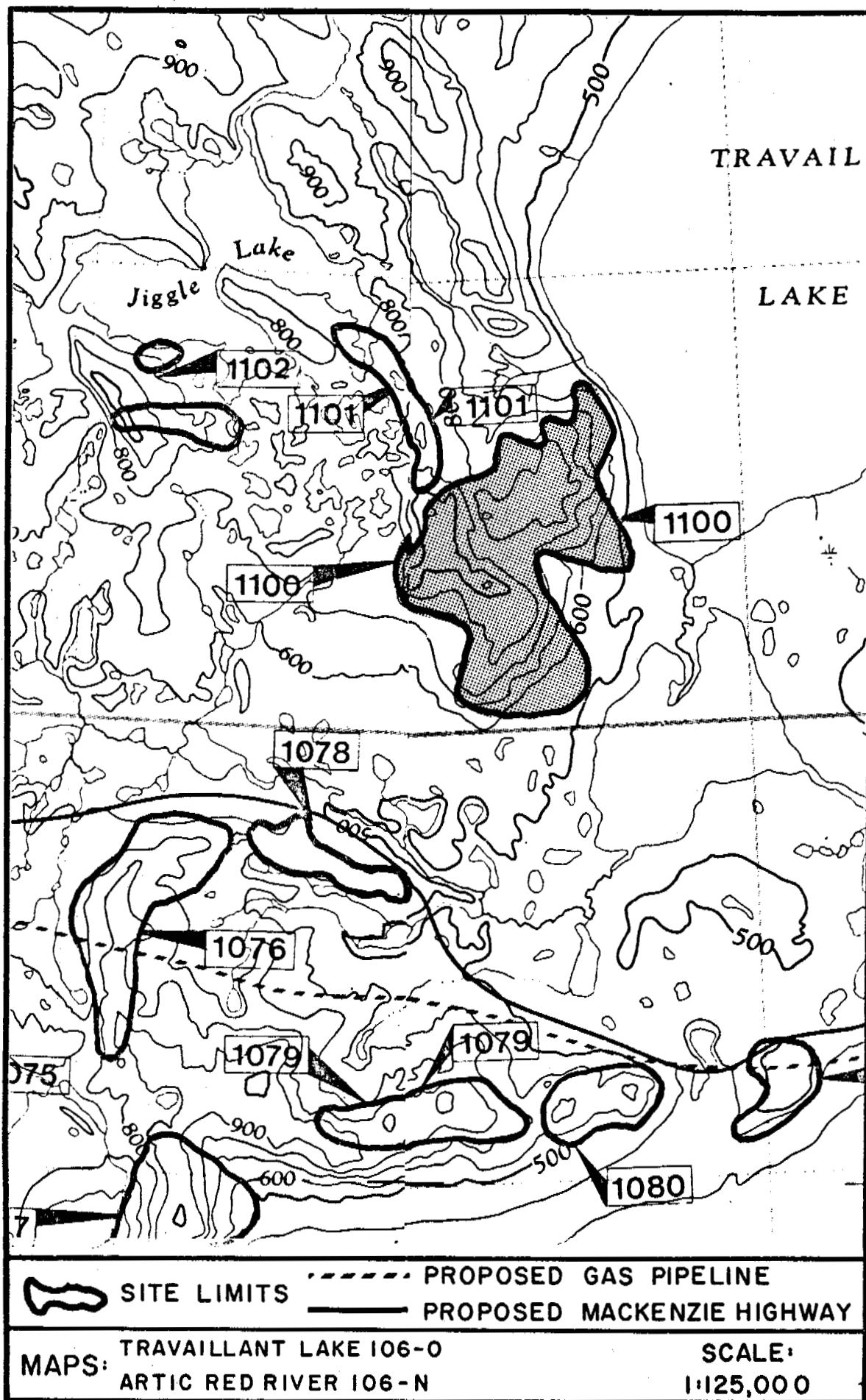
SITE 1100

Location: Site 1100 is situated 3 miles south-west of Travaillant Lake and 4 miles south-east of Jiggle Lake. The proposed highway route is 5 miles south-west of the site.

Material: Shale, soft to hard.

Assessment: The shale at site 1100 is of fair quality suitable for use in sub-grade construction. The indication that shale is present at shallow depth is prevalent on a region of large aerial extent. An almost unlimited volume of material is available and overburden thickness has been found to be approximately 6 feet. Haulage distance is on the fringe of reasonable limits and access crosses thermally sensitive terrain, thereby necessitating winter operations. If material is in short supply site 1100 is a promising source but more exploration to assess overburden thickness and outcrop limits will be necessary before development can be considered.





SITE 1100

ENVIRONMENTAL SENSITIVITY INDEX

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

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

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
1 2 3		Paleontology	Probability of Discovery.
4 5		<u>Pre-Historic</u>	Low, <u>Medium</u> , High.
Rating: 15		<u>Historic</u>	Known Sites.
10	AESTHETICS		
1 2 3		Visible from:	River, Highway, <u>Air</u> .
4 5		Physical Dis-	Dust, Waste,
Rating: 20		turbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
1 2 3		Fort Good Hope	<u>Improved Access.</u>
4 5		<u>Arctic Red R.</u>	<u>Traplines.</u>
Rating: 60		Inuvik	<u>Hunting.</u>
			<u>Fishing.</u>
			<u>Domestic.</u>
			Commercial.
15	ASSOCIATED DISTURBANCES		
1 2 3		Access Roads	
4 5		Miles From Highway	0-2, 2-5, <u>5-10</u> , 10+
Rating: 30		Miles From Pipeline	0-2, 2-5, <u>5-10</u> , 10+
		Hydrologic	Cuts and Fills.
		Alterations	Creek Crossings.
			<u>Compaction.</u>
			<u>Slumping, Erosion.</u>
		Continued Use	Stockpiles,
		For Maintenance.	Waste, Dust.
10	RESTORATION		
1 2 3		<u>Soil Stabilization</u>	Natural Regeneration.
4 5		<u>Visual Improvement</u>	Grass-Legume Seeding.
Rating: 30		Habitat Replacement	Transplants.
			Sustained Maintenance.
			Erosion Control Systems


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100	TO	500


TOTAL INDEX: 290

SPECIAL CONCERNS: Upland area west of Travailant Lake. Buffer zones are recommended.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1100		HOLE NO. 1		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	CI	CLAY -sandy silty -moist on thawing						1
2								2
3								3
4								4
5								5
6	br	SHALE -soft to hard						6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								
DATE DRILLED: June /73			LOGGED BY: DPW 74	COMPLETION DEPTH: 30'				
DRILLING METHOD: HELI			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1100		HOLE NO. 1		PAGE 2 OF 2						
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)		
				10	20	30	40			
18	br	SHALE -soft to hard		○				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: June /73			LOGGED BY: DPW 74	COMPLETION DEPTH: 30'						
DRILLING METHOD: HELI			THAW DEPTH: N/A							
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.							

SITE 1101

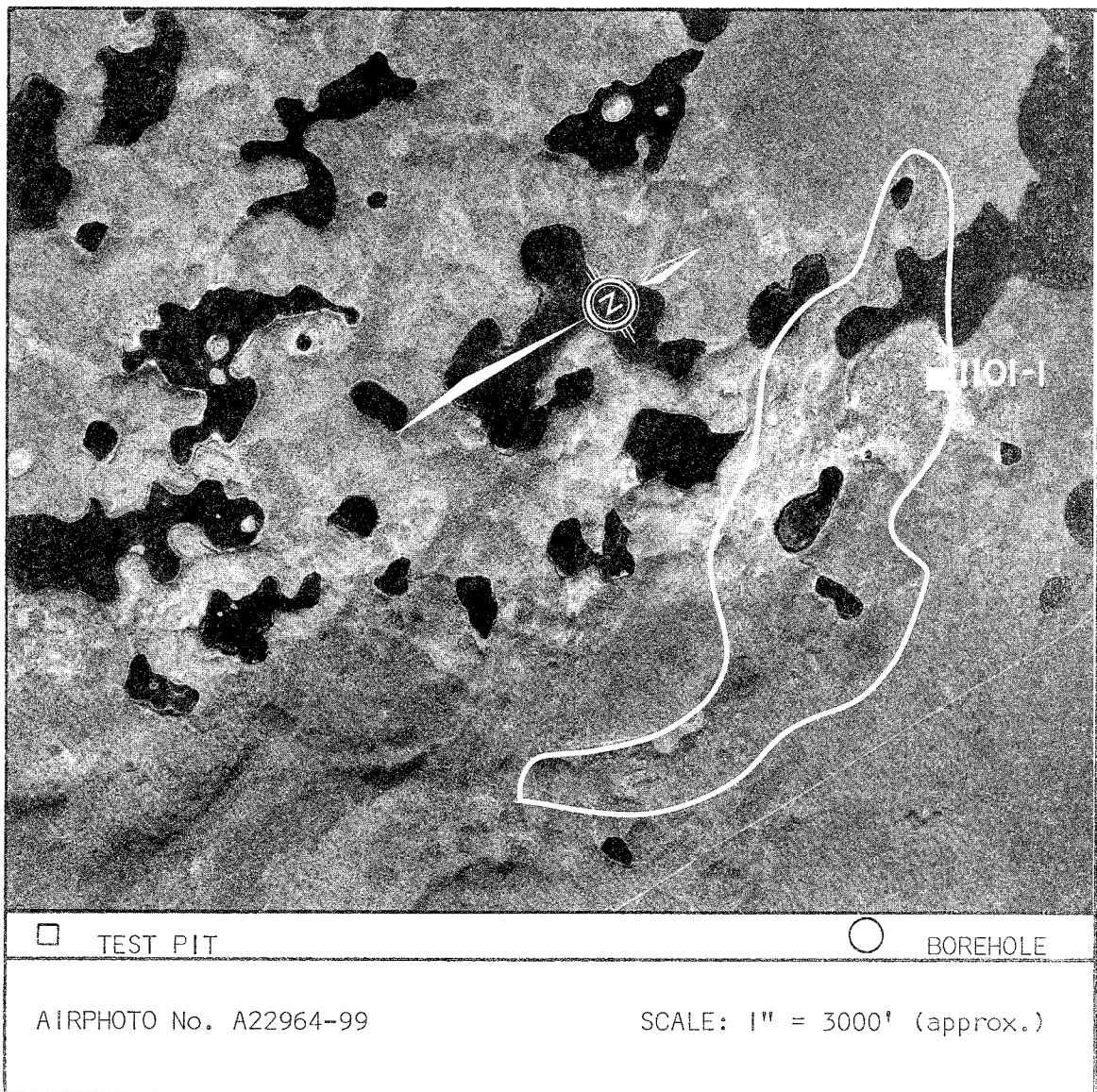
Location: Site 1101 is located at the tip of the eastern bay of Jiggle Lake. The proposed highway route is 6 miles south of the site and the proposed pipeline route is 8 1/2 miles south.

Geology: Site 1101 is an intermittent outwash and kame deposit. The outwash is expected to be reasonably uniform material however the kames are expected to exhibit considerable variability.

Material: Sandy gravel, some silt, well graded.

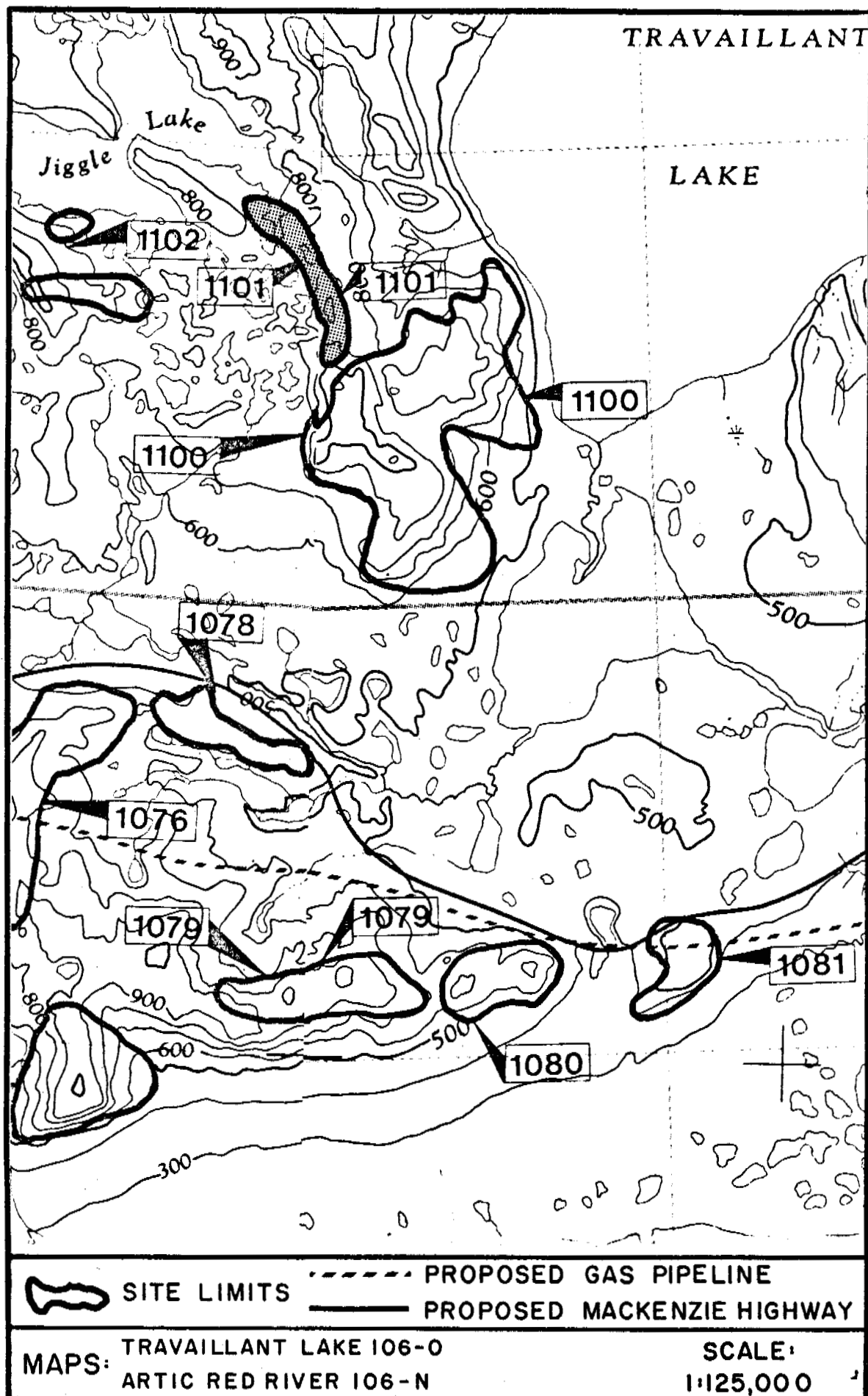
Volume: 1,700,000 cu. yd., estimate is conservative.

Area: 350 acres.



Drainage: The site is well drained into Jiggle Lake.

Assessment: Site 1101 contains a considerable volume of good quality borrow. The test pitting program carried out at the site should be supplemented with a drilling program to better delineate material quantities. The soil from the test pit was found to be very wet probably indicating that the permafrost table is very close to the bottom of the pit (3 feet). Overburden is thin to negligible but dense spruce would have to be removed. The outwash plateau stands 15-20 feet above lake level and care to minimize siltation would be necessary. Winter operation would probably be most suitable as access to the site crosses thermally sensitive terrain; however, haulage distance from the site is long. The environmental overview has assessed the site to be moderately sensitive. Unless materials are in very short supply, the feasibility of developing the site questionable.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 270

SPECIAL CONCERNS :

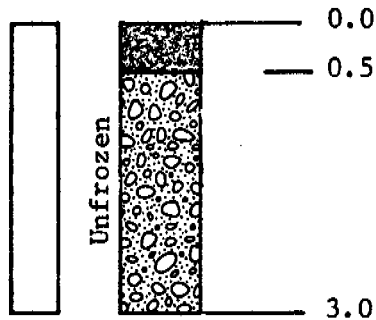
Near east arm of Jiggle Lake. Whistling Swans utilize this area for spring staging (May 10-June 20), and moulting. Buffer zones and siltation controls may be required to protect lowland areas.

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

TEST PIT LOG

TP 1101-1

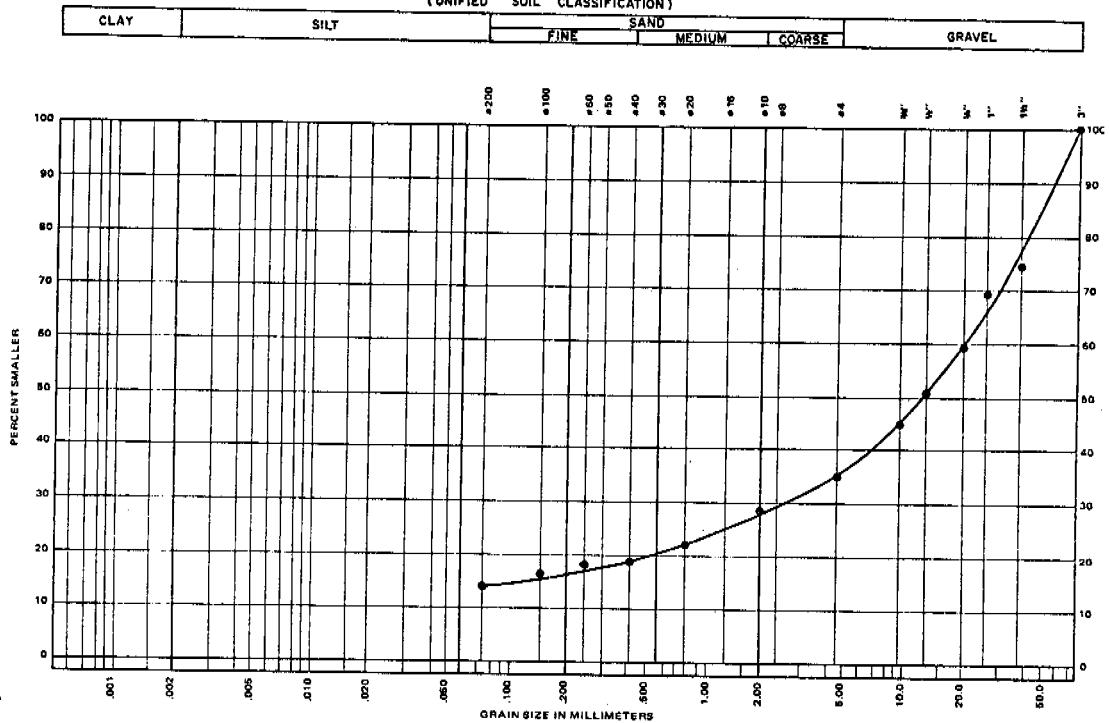


Moss

Gravel, very wet
light grey

65% GRAVEL
21% SAND
14% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION: Sandy Gravel and
some Silt. (GM) MC = 11.5%

PROJECT: Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP - 1101-1
DEPTH 3'

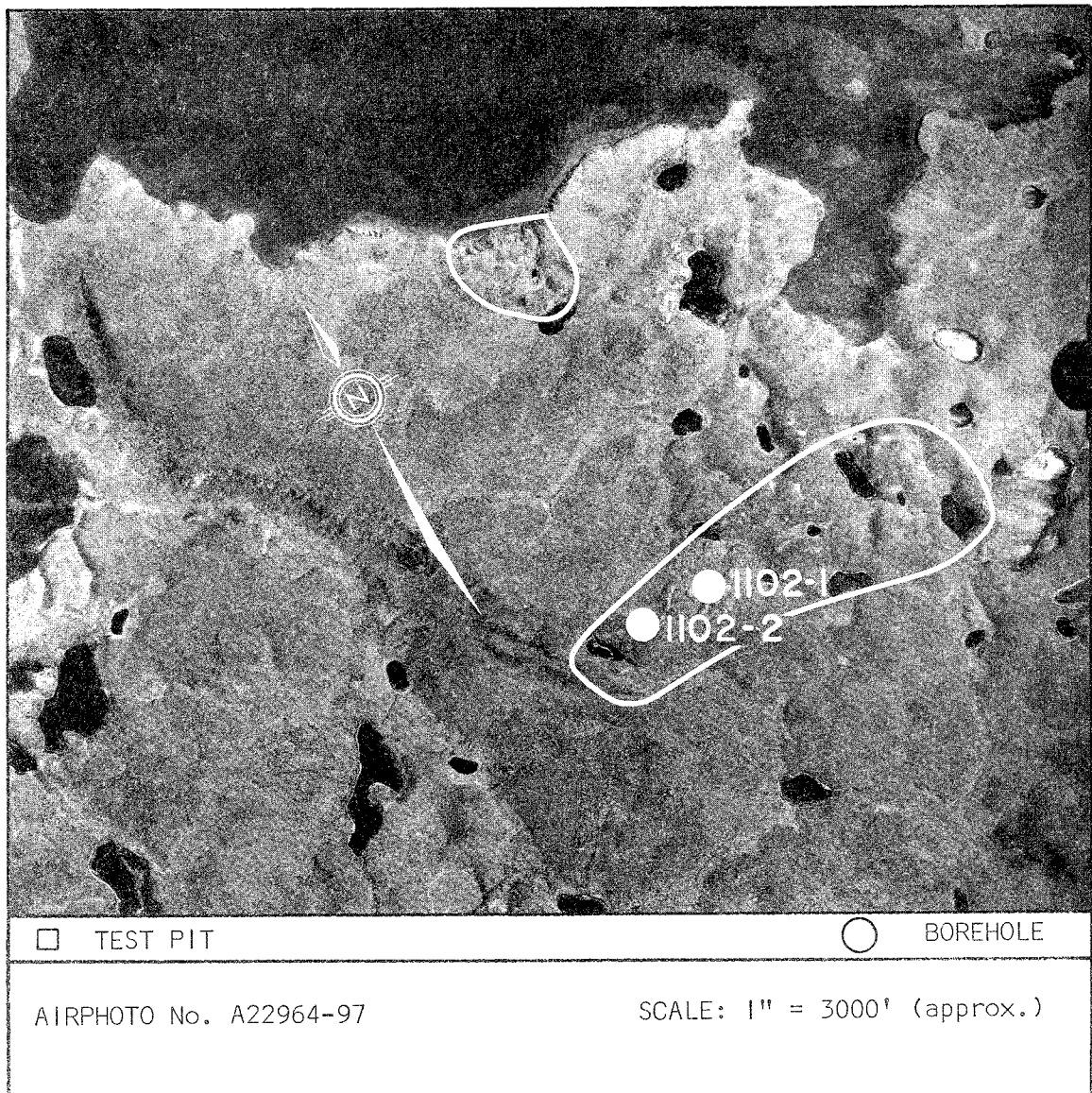
SITE 1102

Location: Site 1102 is located one mile south of the west bay of Jiggle Lake. Proposed pipeline and highway routes are 5 and 6 1/2 miles south of the site respectively.

Geology: Site 1102 is a scattered complex of small kames. The material is expected to exhibit considerable variability.

Material: Gravel and sand, some silt.

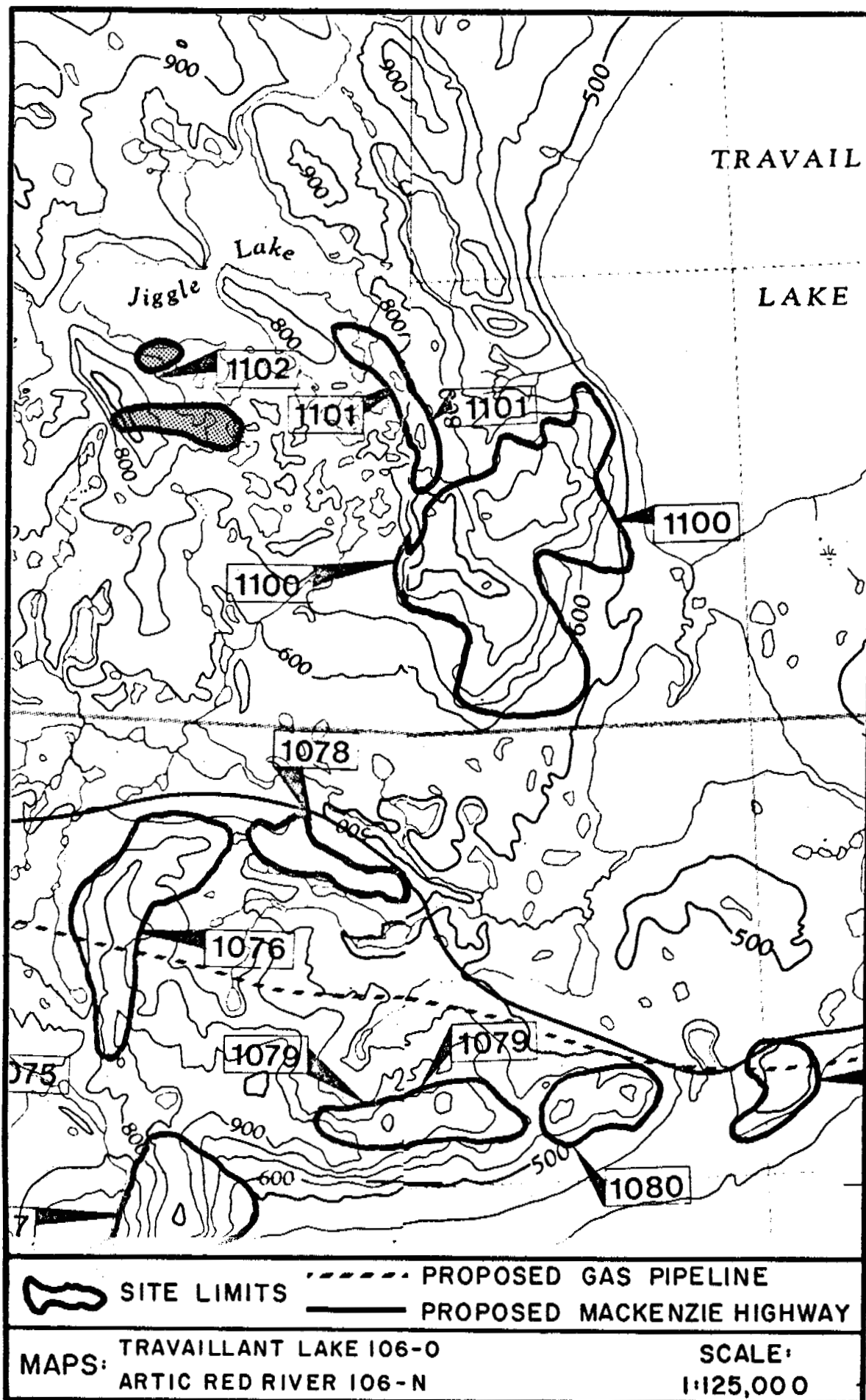
Volume: 650,000 cu. yd., reliability of the volume estimate is uncertain because of expected variability in material quality.



Area: 65 acres.

Drainage: The site is well drained.

Assessment: Site 1102 apparently contains a moderate quantity of fair quality borrow however more drilling will be necessary to prove the deposit. Overburden is thin to negligible however a stand of dense spruce will have to be removed. Permafrost depth is variable, ranging from 5 feet to greater than 10 feet. Haulage distance is on the outer fringe of acceptable limits and access will be difficult because of hills, ridges and thermally sensitive terrain. Winter operations would be necessary. Unless material shortages are critical it is doubtful whether it is feasible to develop site 1102.



ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 280

SPECIAL CONCERNS:

Site on southwest shore of Jiggle Lake. Sloping area.
Recommend buffer zones and siltation control to protect
shoreline values.

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY

100

TO

MAXIMUM
SENSITIVITY

500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1102		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT-OL	PEAT & ORGANIC SILT dark brown	NOT FROZEN					1
	GM	GRAVEL silty, some cobbles & sand						
2	GM	GRAVEL -silty, some fine sand, gravel maximum 2½", gravel average 1", subangular to subrounded, dry, light brown.						2
3								3
4		49% GRAVEL 26% SAND						4
5		9.7% O.C. 25% SILT & CLAY (4' + 6')						5
6	SC	SAND & CLAY -silty, some gravel, sand fine to coarse grained, medium plasticity, wet, grey-brown. -clay content increasing	FROZEN					6
7								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: Sep. 19/73


DRILLING METHOD: AUGER

LOGGED BY: EBA
122-4

COMPLETION DEPTH: 16.0'

THAW DEPTH: 7.0'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1102		HOLE NO. 2		PAGE 1 OF 1					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	CL-SC (2')	SILT-SAND-CLAY-GRAVEL some organic (2') 13% GRAVEL 43% SAND 45% SILT & CLAY	UNFROZEN					1	
2								2	
3								3	
4	GW-SM (6')	GRAVEL-SAND some clay (6') 17% GRAVEL 43% SAND 40% SILT AND CLAY						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: June/73


LOGGED BY: DPW
75

COMPLETION DEPTH: 10'

DRILLING METHOD: HELI

THAW DEPTH: Not Found

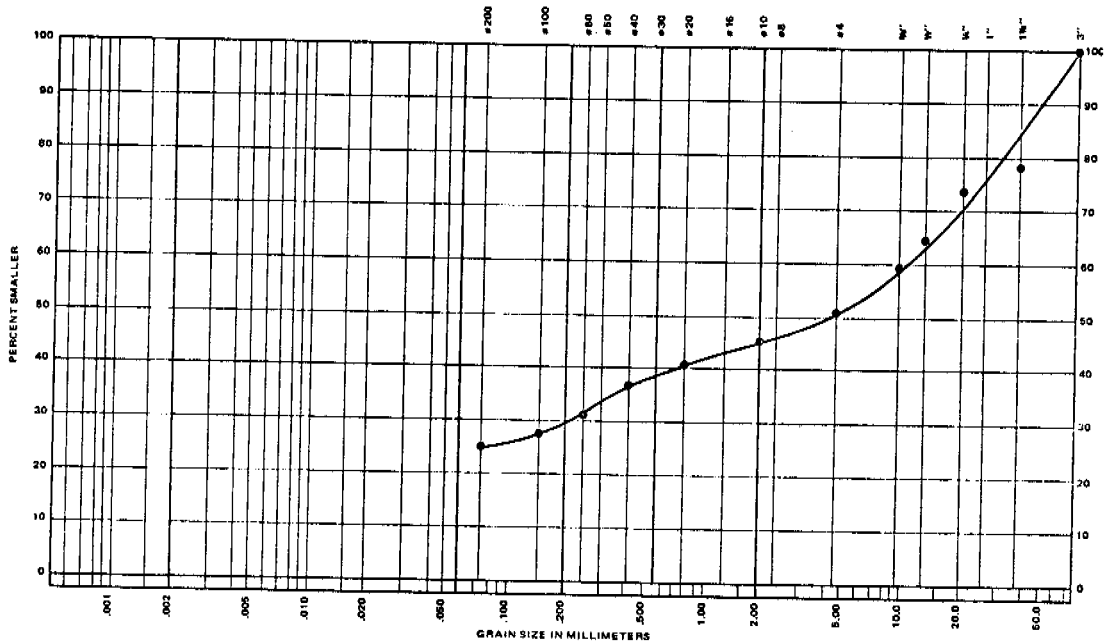
GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
------	------	-----------	-------------	-------------	--------



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Silty, Gravel.
(CR)

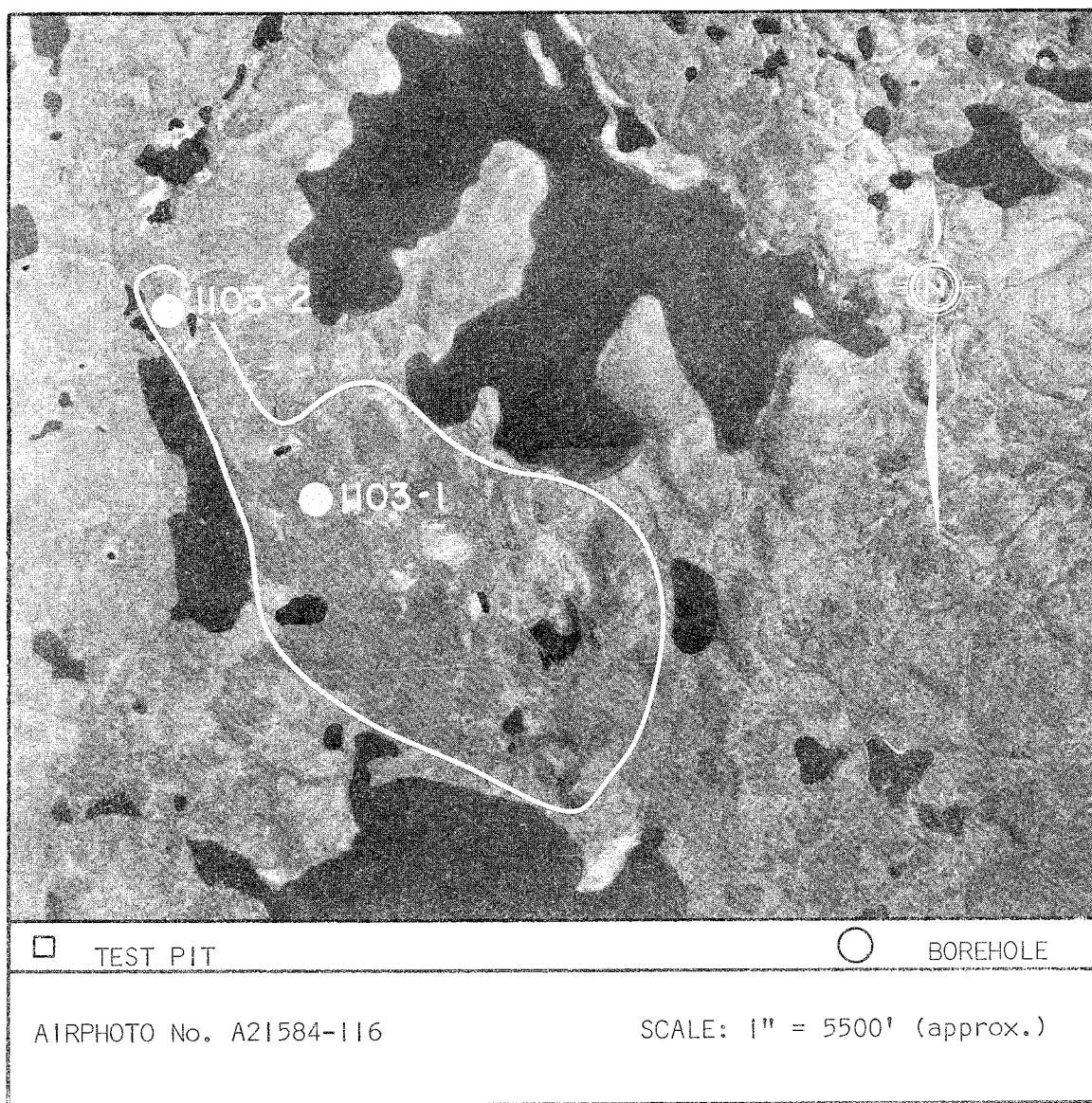
PROJECT Granular Resources
JOB No. E666 DATE Jan. 11/74
SAMPLE No. BH 1102-1
DEPTH 4' + 6"

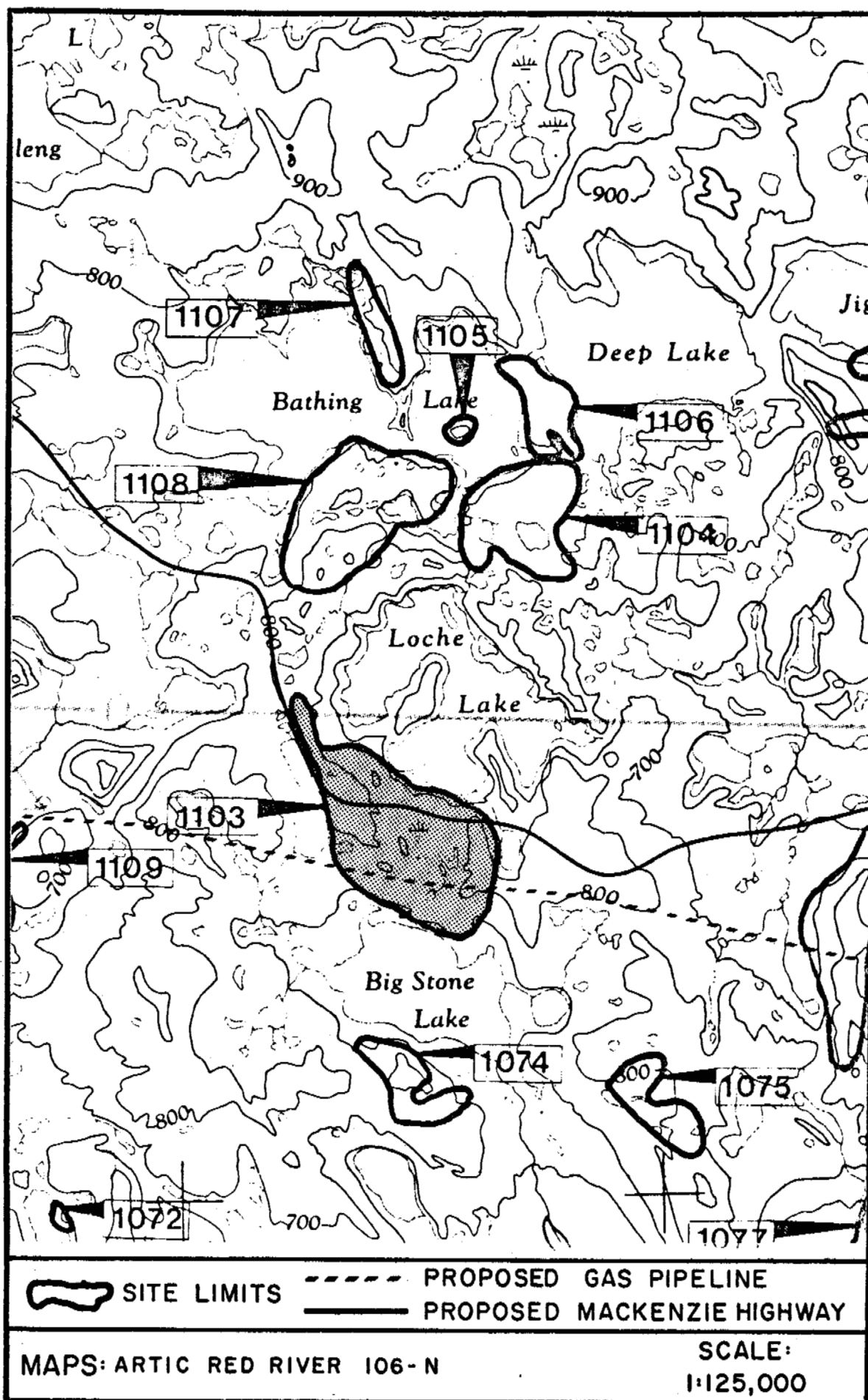
SITE 1103a

Location: Site 1103 is situated 1/2 mile SW of Loche Lake. The proposed highway route passes over the site.

Material: Shale.

Assessment: The shale bedrock at site 1103 is suitable for use as fair quality general fill. Its primary use would be in the construction of sub-grades. The shale is overlain by clay and weathered shale, the thickness of which, ranges to at least 25 feet. Access is easy and haulage distance short because the highway route passes over the site. Permafrost was encountered just below the surface. The site is not recommended for development.





ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX: 245

SPECIAL CONCERNS: Adjacent to west shore of Loche Lake. Buffer zones and siltation controls recommended to protect shoreline values.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 3 4 5	Paleontology Pre-Historic Historic	Probability of Discovery. Low, Medium, High. Known Sites.
	Rating: 10		
10	AESTHETICS		
	1 2 3 4 5	Visible from: Physical Disturbance	River, Highway, Air. Dust, Waste, Stockpiles. Noises.
	Rating: 30		
15	RESOURCE UTILIZATION		
	1 2 3 4 5	Fort Good Hope Arctic Red R. Inuvik	Improved Access. Traplines. Hunting, Fishing, Domestic, Commercial.
	Rating: 45		
15	ASSOCIATED DISTURBANCES		
	1 2 3 4 5	Access Roads Miles From Highway Miles From Pipeline Hydrologic Alterations	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.
	Rating: 15		
10	RESTORATION		
	1 2 3 4 5	Soil Stabilization Visual Improvement Habitat Replacement	Natural Regeneration. Grass/Legume Seeding. Transplants. Sustained Maintenance. Erosion Control Systems.
	Rating: 40		


NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1103		HOLE NO. 1		PAGE 1 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
				10 20 30 40	
1	PT-OH	ORGANIC MATERIAL	Vs		1
2	CL	CLAY -sandy silty -till -low plasticity -wet on thawing			2
3					3
4					4
5					5
6	br	SHALE -soft -becoming medium hard below 25'	Nf		6
7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15
16					16
17					


DATE DRILLED: June /73	LOGGED BY: DPW 40	COMPLETION DEPTH: 30'
DRILLING METHOD: HELI		THAW DEPTH: N/A

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1103		HOLE NO. 1		PAGE 2 OF 2							
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)			
				10	20	30	40				
18	br	SHALE soft -becoming medium hard below 25'			○			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: June /73		LOGGED BY: DPW 40		COMPLETION DEPTH: 30'							
DRILLING METHOD: HELI				THAW DEPTH: N/A							
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.							

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1103		HOLE NO. 2		PAGE 1 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1	OH	ORGANIC MATERIAL -silty clay						1	
2								2	
3								3	
4	CI	CLAY -silty -very soft shale below 5-6' -medium plasticity	Vs					4	
5							5		
6							6		
7							7		
8							8		
9							9		
10							10		
11	br	SOFT SHALE	Vr					11	
12								12	
13								13	
14								14	
15								15	
16								16	
17								17	
DATE DRILLED: June/73			LOGGED BY: DPW 13		COMPLETION DEPTH: 30'				
DRILLING METHOD: HELI			THAW DEPTH: N/A						
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.						

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1103		HOLE NO. 2		PAGE 2 OF 2						
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)		
				10	20	30	40			
18	br	SOFT SHALE	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: June/73			LOGGED BY: DPW 13		COMPLETION DEPTH: 30'					
DRILLING METHOD: HELI			THAW DEPTH: N/A							
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.						

SITE 1104

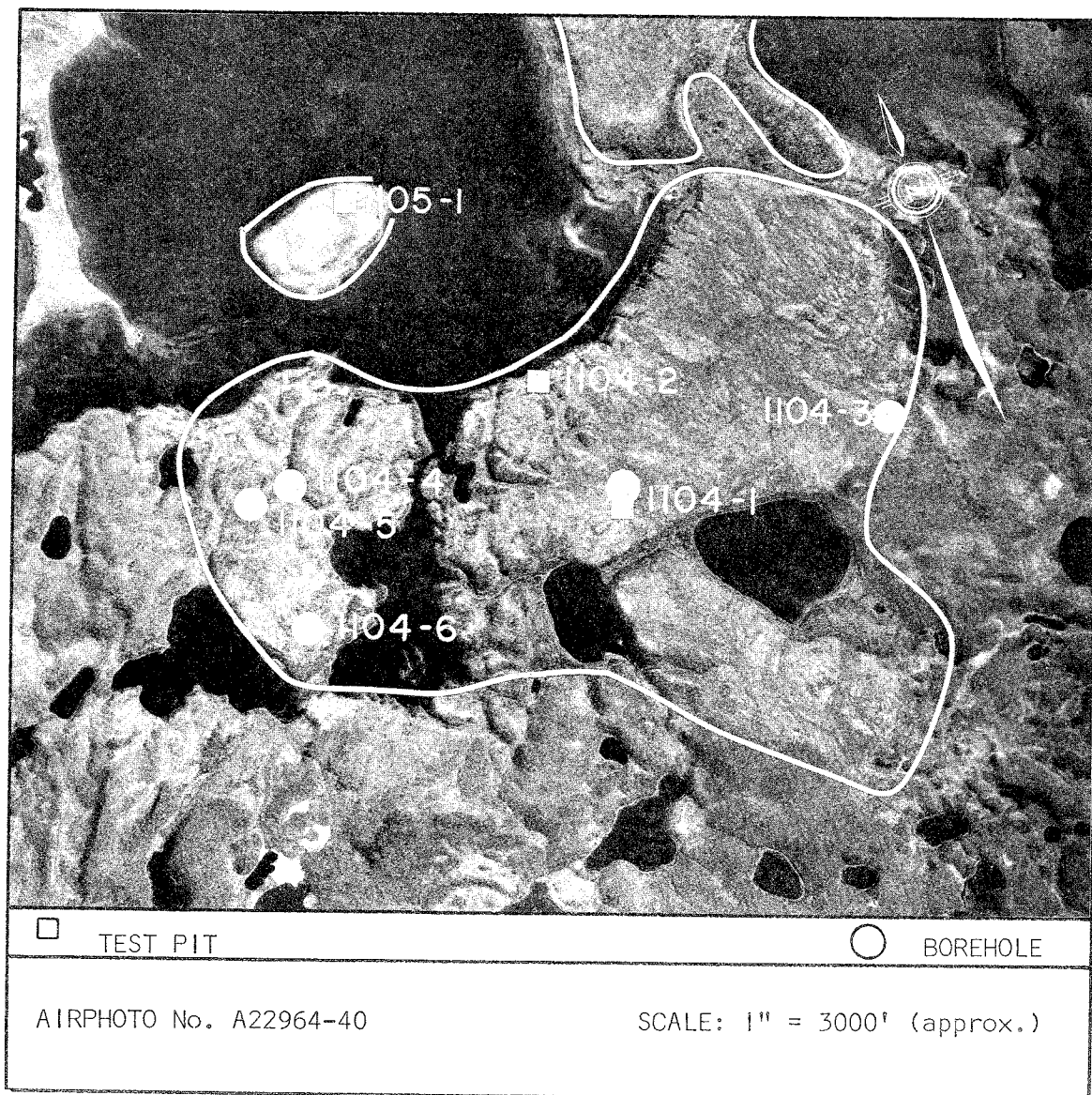
Location: Site 1104 is located along the south-east shore of Bathing Lake. The proposed highway route is 3 miles west of the site and the pipeline route is 5 miles south of the site.

Geology: Site 1104 is an extensive outwash area. The material is expected to be quite uniform.

Material: Silty sand and gravel, silt content increases with depth, well graded.

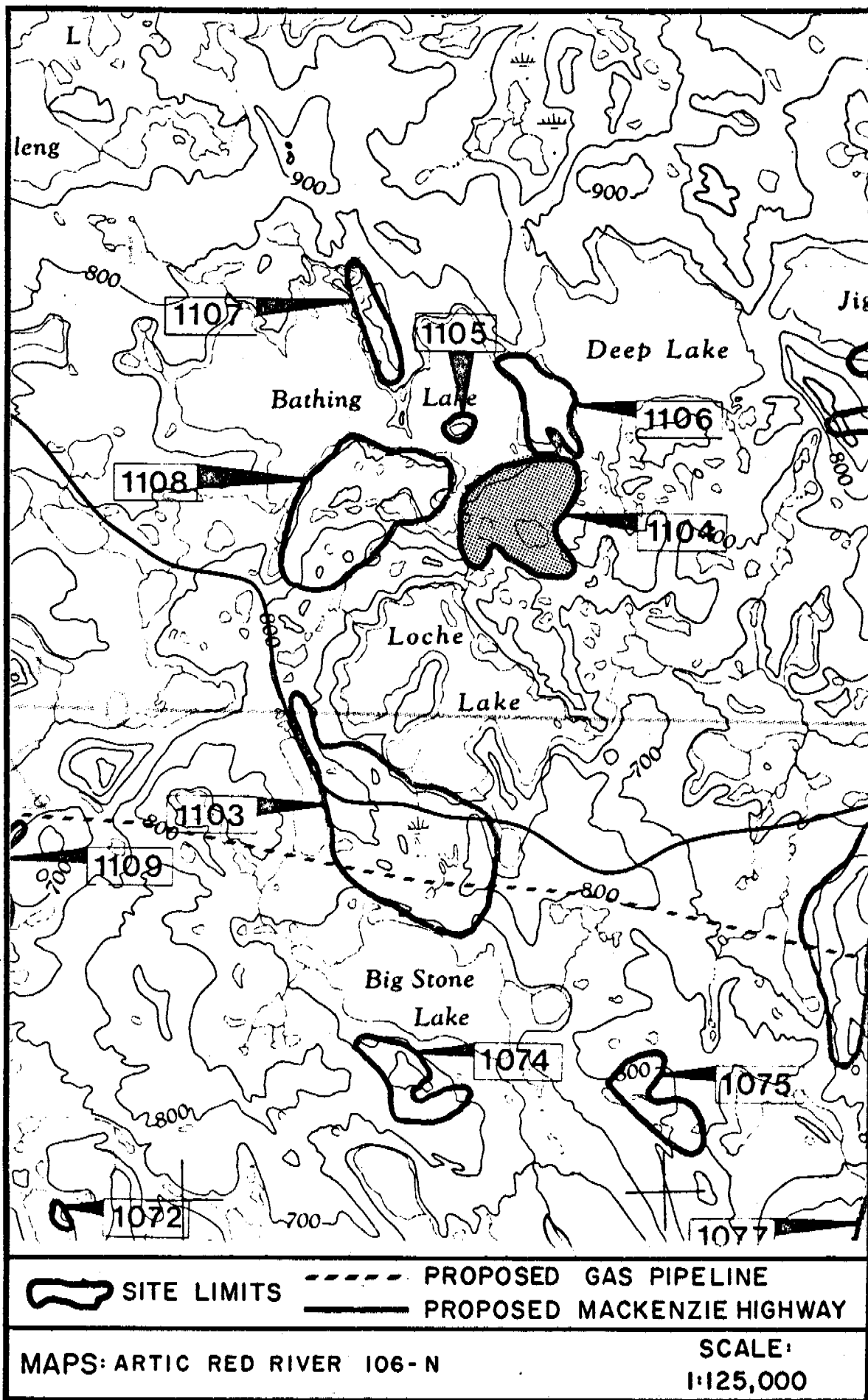
Volume: 14,300,000 cu. yd., estimate seems realistic.

Area: 1000 acres.



Drainage: The site is well drained.

Assessment: A very large volume of fair to good quality borrow was encountered at site 1104. The material is of relatively uniform composition and is located within acceptable limits for haulage distances. Access to the site does not appear to be difficult. Peat and clay overburden of variable thickness must be removed and stockpiled for reuse in restoration. Tree cover varies from sparse to medium density and will have to be removed for disposal. Permafrost was encountered just below the surface which may necessitate blasting to excavate the gravel. Moisture contents of some of the borrow material are high; stockpiling and draining of these materials will be necessary. The site has a relatively high environmental sensitivity rating. Site 1104 is an excellent source of borrow material and is recommended for development. General borrow pit guidelines are contained in this report.



ENVIRONMENTAL SENSITIVITY INDEX

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

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

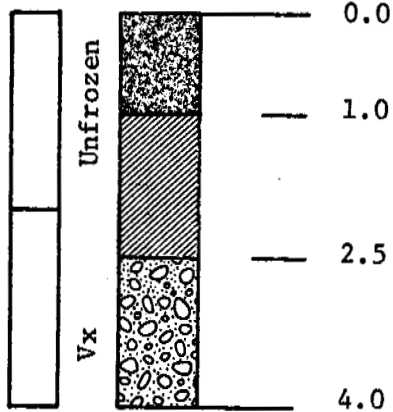
TOTAL INDEX : 315

SPECIAL CONCERNS:

Along south-east shore of Bathing Lake -Whistling Swans utilize this area for spring staging (May 10-June 20) and moulting by non-breeders. Fishery and wildlife values require consideration in development plan.

TEST PIT LOG

TP 1104-1



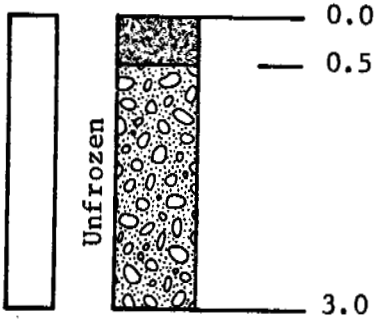
Peat

Clay, some stones

Clayey gravel, wet
light brown

32% GRAVEL
40% SAND
28% SILT & CLAY

TP 1104-2



Moss

Gravel, grey
very wet

O.C. = 10.5%

65% GRAVEL
26% SAND
9% SILT & CLAY

1104-5

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1104		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	PT	PEAT -silty, fibrous, brown	NOT FROZEN					1
2	ML	SILT- dry, light brown						2
3	GM SM	GRAVEL -gravelly, sandy, trace clay, slight plasticity, wet, light to medium brown. 8.6% O.C. 68% GRAVEL (2.5') 19% SAND 13% SILT & CLAY 15% GRAVEL (4' - 12') 54% SAND 31% SILT & CLAY	FROZEN					3
4								4
5								5
6								6
7								7
8								8
9								9
10								10
11								11
12								12
13		END OF HOLE						13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 22/73


LOGGED BY: EBA
122-2

COMPLETION DEPTH: 12.0'

DRILLING METHOD: AUGER

THAW DEPTH: 2.0'


GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS



EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1104		HOLE NO. 3		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1		GRAVEL -sandy, silty						1
2								2
3								3
4								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: Sept. 22/73	LOGGED BY: DPW 76	COMPLETION DEPTH: 10'
DRILLING METHOD:		THAW DEPTH: N/A
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS		 EBA Engineering Consultants Ltd.

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1104		HOLE NO. 4		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
	OH	ORGANIC		10	20	30	40	
1			Heavy Ice Lenses					1
2	CL	CLAY						2
3		-silty sandy, pebbles	Vs					3
4		-organic						4
5		-low plasticity						5
6								6
7	GM	GRAVEL						7
8		-silty-sandy						8
9		-wet						9
10		-non plastic						10
11			Vx					11
12								12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: Dec 10/73

LOGGED BY: RMH
G21

COMPLETION DEPTH: 17'


DRILLING METHOD:

THAW DEPTH: N/A


GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

EBA Engineering Consultants Ltd.


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1104		HOLE NO. 5		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
	OH	ORGANIC	Ice Lenses	10	20	30	40	
1	GM-GC	GRAVEL - silty-sandy	Vs					1
2								2
3								3
4								4
5								5
6								6
7								7
8			Vx					8
9								9
10								10
11								11
12			Vs					12
13								13
14								14
15								15
16			Vx					16
17						17		
DATE DRILLED: Dec 10/73			LOGGED BY: RMH G18A	COMPLETION DEPTH: 25'				
DRILLING METHOD:				THAW DEPTH: N/A				
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				

GRANULAR MATERIALS INVENTORY - STAGE III


SITE NO. 1104		HOLE NO. 5		PAGE 2 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
18	GM-GC	GRAVEL -silty, sandy -clayey from 20'	Vx Vs	<div style="text-align: center;">○</div>				18
19								19
20								20
21								21
22								22
23				<div style="text-align: center;">○</div>				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: Dec 10/73			LOGGED BY: RMH G18A		COMPLETION DEPTH: 25'			
DRILLING METHOD:			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

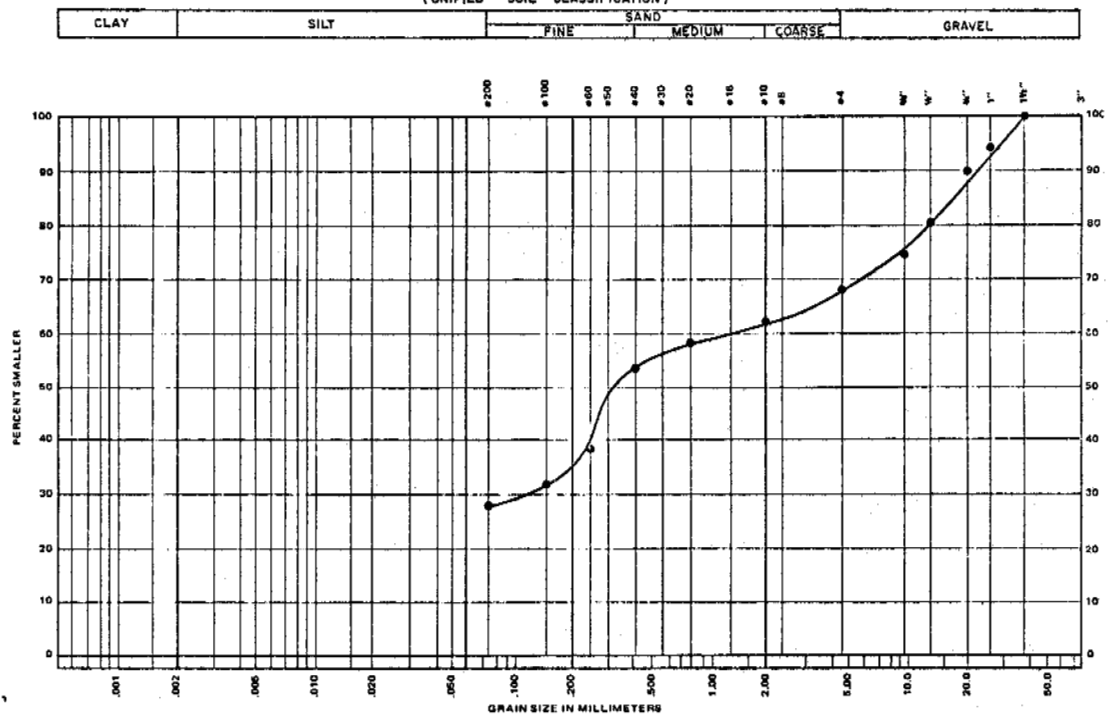
SITE NO. 1104		HOLE NO. 6		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	OH	ORGANIC -silt -clay -gravel	Vs Heavy Ice					1
2								2
3								3
4								4
5	GM	GRAVEL -silty sandy -wet						5
6								6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
DATE DRILLED: Dec. 10/73			LOGGED BY: RMH G23A		COMPLETION DEPTH: 26'			
DRILLING METHOD:			THAW DEPTH: N/A					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS			 EBA Engineering Consultants Ltd.					

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1104		HOLE NO. 6		PAGE 2 OF 2					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
18	GM	GRAVEL -silty sandy -wet	Vs					18	
19								19	
20								20	
21								21	
22								22	
23	CI-CH	CLAY -gravelly -silty sandy	Ice					23	
24			Vs				47	24	
25								25	
26								26	
27								27	
28								28	
29								29	
30								30	
31								31	
32								32	
33								33	
34								34	

DATE DRILLED: Dec 10/73	LOGGED BY: RMH G23A	COMPLETION DEPTH: 26'
DRILLING METHOD:		THAW DEPTH: N/A
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS		 EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

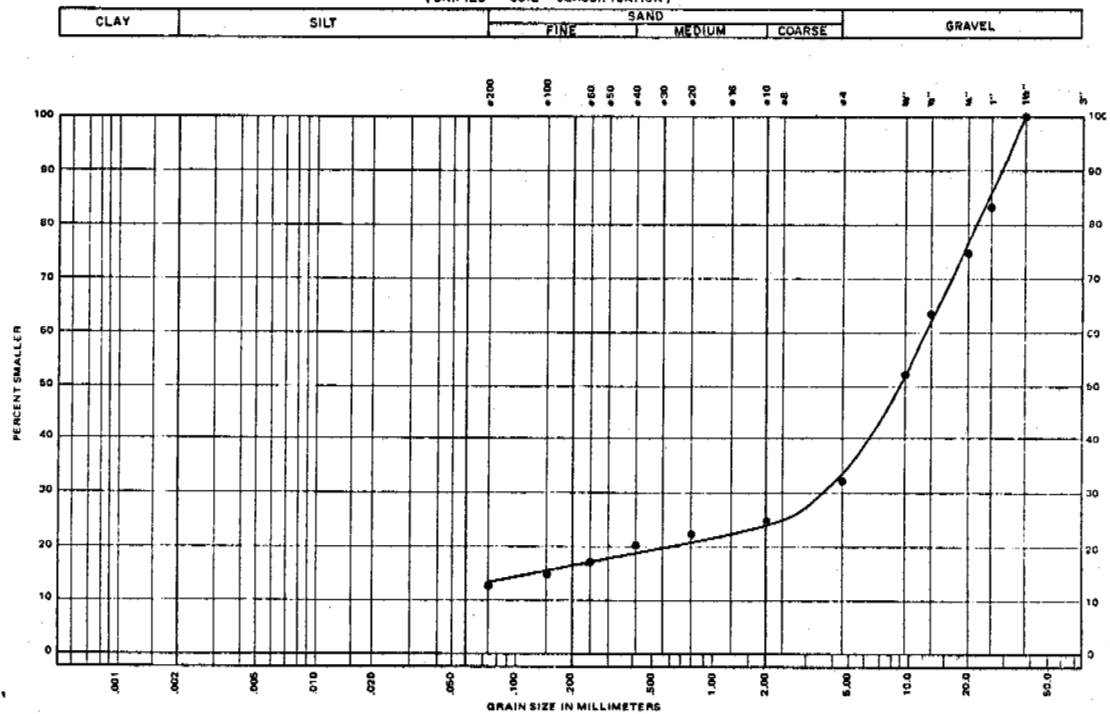


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Gravel
Silty. (SM) M/C = 13.7%

PROJECT Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP 1104-1
DEPTH 4'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



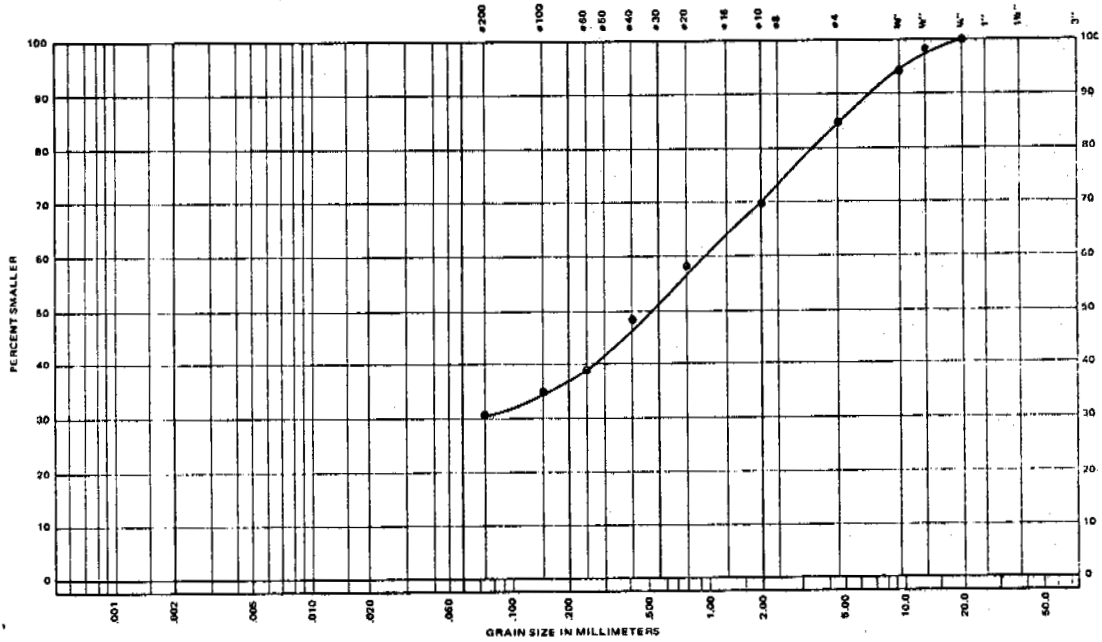
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel and
some Silty. (GM)

PROJECT Granular Resources
JOB No. E666 DATE Dec. 18/73
SAMPLE No. BH 1104-1
DEPTH 2.5'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



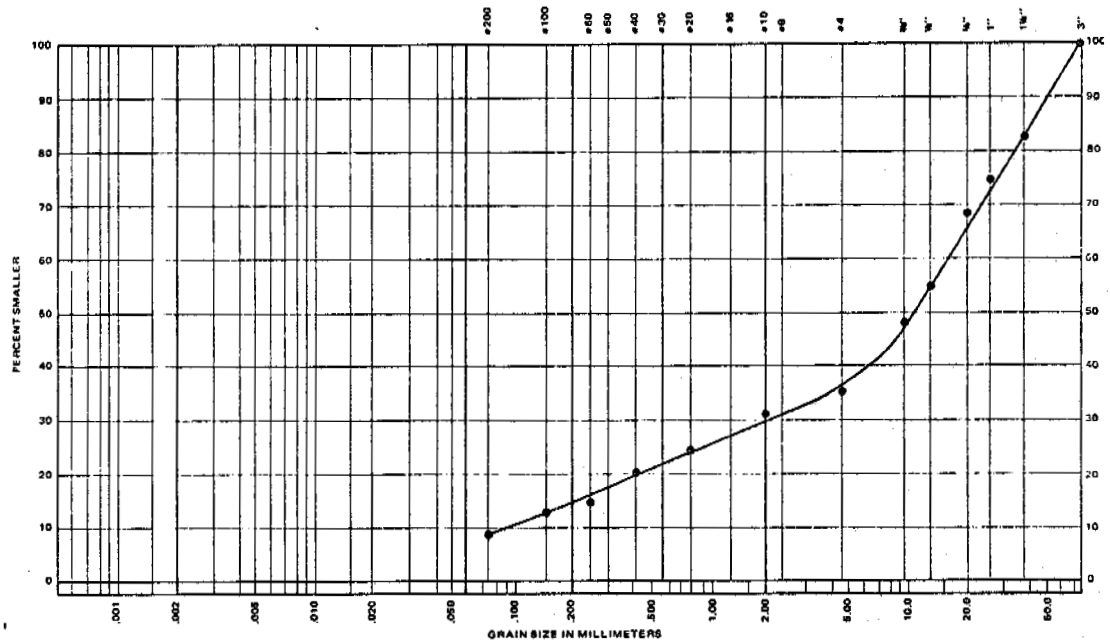
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and Silt and some Gravel (SM)

PROJECT Granular Resources
JOB No. E666 DATE Dec. 18/73
SAMPLE No. BB 1104-1
DEPTH 6' - 12'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP 1104-2
DEPTH 3'

SITE 1105

Location: Site 1105 is a small island in Bathing Lake. Proposed highway and pipeline routes pass 6 miles to the south of the site.

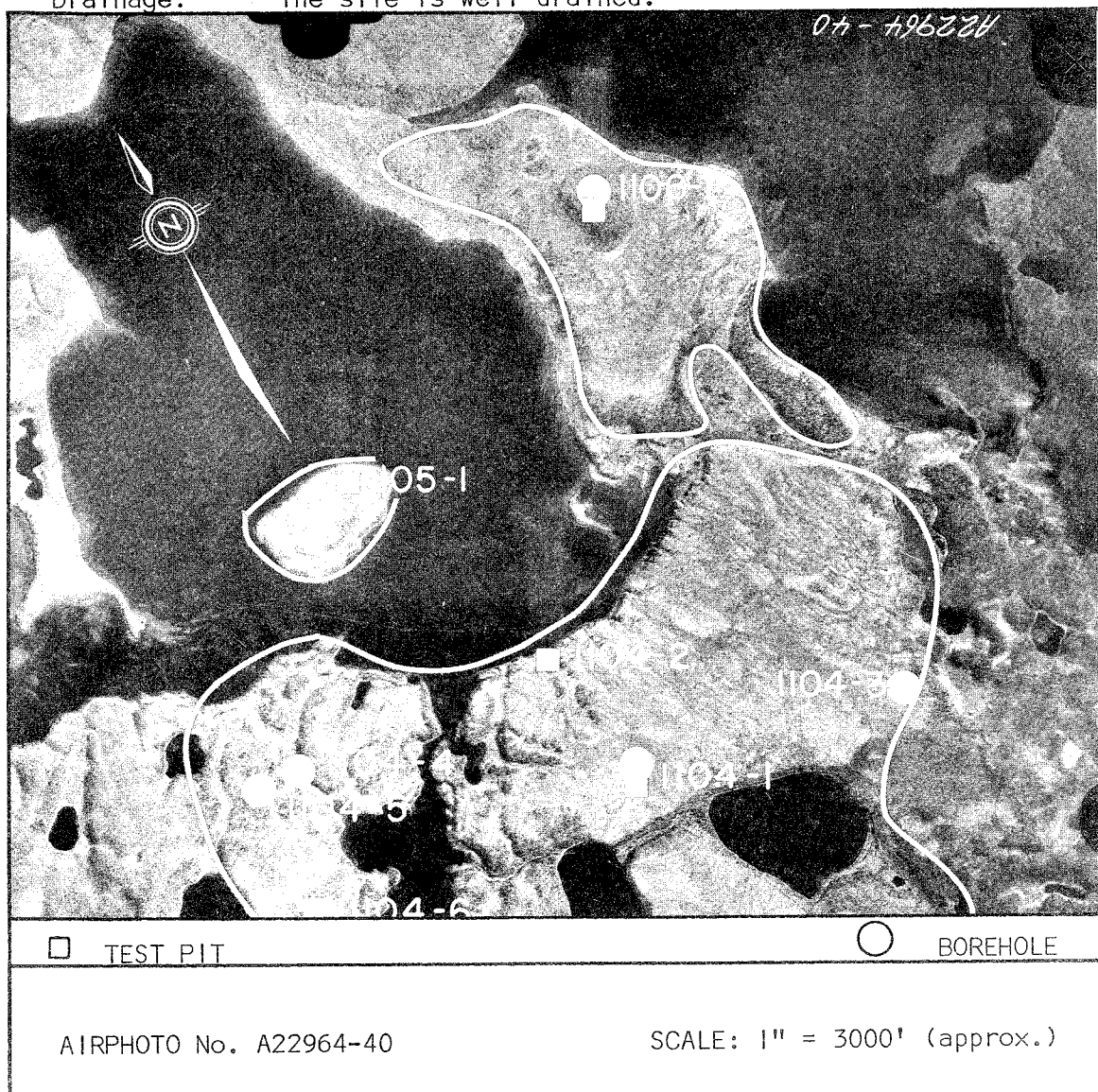
Geology: Site 1105 is an outwash remnant in the middle of Bathing Lake.

Material: Gravel, some sand, trace silt, poorly graded, high organic content near surface.

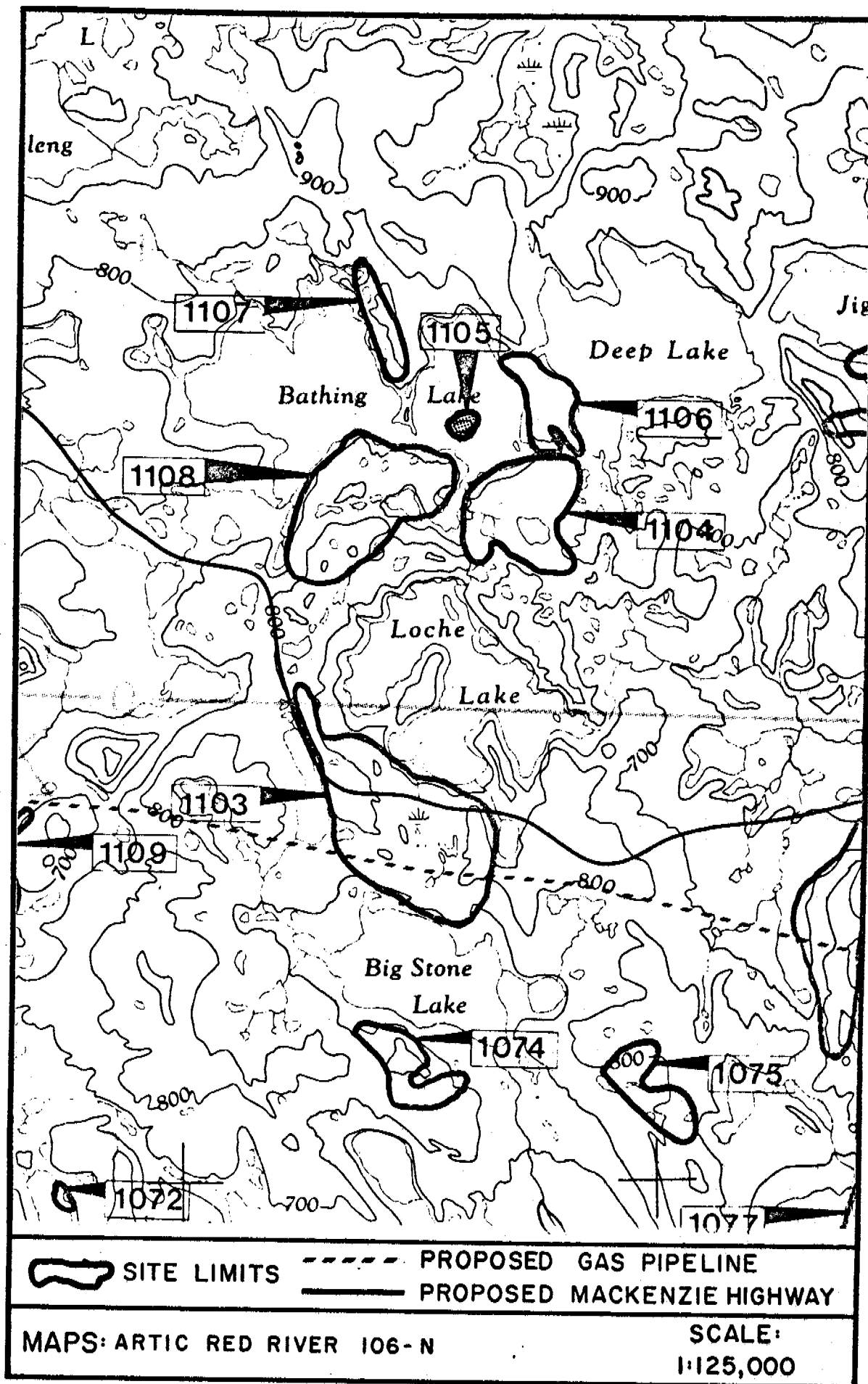
Volume: 286,000 cu. yd., estimate is conservative.

Area: 60 acres.

Drainage: The site is well drained.



Assessment: The borrow is good quality material however because the site is an island it has a high environmental sensitivity rating. Access to the site in winter should not be difficult but haulage distance is long. Overburden is thin to negligible and vegetative cover sparse. Site 1105 is a good source of borrow but because of its environmental sensitivity should be considered for development only as a last resort.



SITE 1105

ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
1 2 3		Formation Stability	<u>Flat Land, Terrace, Knoll.</u>
4 5	10	Ice Content	<u>Rolling, Outcrop, Ridge,</u> <u>Scarp, Overburden Type &</u> <u>Depth, Wet Site, Dry Site.</u>
	Rating: 10		
5	VEGETATION		
1 2 3		<u>Aesthetic Value</u>	<u>Marsh</u>
4 5	10	<u>Habitat Value</u>	<u>Black Spruce</u> <u>Muskeg</u> <u>White Spruce</u> <u>Mixed Conifer</u> <u>Conifer - Deciduous</u> <u>Deciduous</u> <u>Dry Slopes</u> <u>Riparian</u>
	Rating: 10		
15	MAMMALS		
1 2 3		<u>Ungulates</u>	<u>Winter Range, Summer Range,</u>
4 5	45	<u>Furbearers</u>	<u>Migration Route,</u>
	Rating: 45	<u>Carnivores</u>	<u>Denning Area,</u>
		<u>Small Mammals</u>	<u>Dams and Lodges,</u> <u>Special Habitat Use.</u>
10	BIRDS		
1 2 3		<u>Waterfowl-Swans,</u>	<u>Migration Pathway, Moulting,</u>
4 5	50	<u>Geese, Ducks</u>	<u>Spring Staging, Fall Staging,</u>
	Rating: 50	<u>Game Birds</u>	<u>Nesting-Brooding, Perching,</u>
		<u>Raptors</u>	<u>Winter Habitat.</u>
		<u>Shorebirds</u>	
		<u>Passerine</u>	
10	FISHERY		
1 2 3		<u>Lakes, Tributaries</u>	<u>Spawning, Nursery, Feeding,</u>
4 5	50	<u>Mackenzie River:</u>	<u>Overwintering.</u>
	Rating: 50	<u>Whitefish</u> Smelt	<u>Major Migration Route.</u>
		<u>Grayling</u> Sculpin	<u>Siltation of Spawning Areas,</u>
		<u>Pike</u> Goldeye	<u>Benthic Communities.</u>
		<u>Trout-Perch</u> Chub	<u>Toxic Material Spill.</u>
		<u>Lake Trout</u> Dace	<u>Slumps, Velocity Increments,</u>
		<u>Burbot</u> Walleye	<u>Migration Barriers.</u>
		<u>Suckers</u> Char	<u>Eutrophication.</u>
		<u>Stickleback</u> Cisco	<u>Blasting.</u>

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

TOTAL INDEX : 350

SPECIAL CONCERNS :

Island in Bathing Lake. Much of area would be removed. Whistling Swans utilize this area for staging during spring migration (May 10-June 20) and for moulting (July to August). Should be considered only as late alternative.

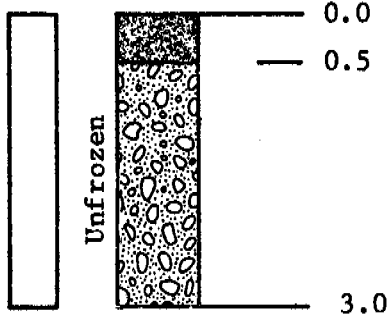
R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
1 2 3		<u>Paleontology</u>	<u>Probability of Discovery.</u>
4 5	20	<u>Pre-Historic</u>	<u>Low, Medium, High,</u>
	Rating: 20	<u>Historic</u>	<u>Known Sites.</u>
10	AESTHETICS		
1 2 3		<u>Visible from:</u>	<u>River, Highway, Air.</u>
4 5	30	<u>Physical Dis-</u>	<u>Dust, Waste,</u>
	Rating: 30	<u>turbance</u>	<u>Stockpiles.</u>
			<u>Noises.</u>
15	RESOURCE UTILIZATION		
1 2 3		<u>Fort Good Hope</u>	<u>Improved Access.</u>
4 5	60	<u>Arctic Red R.</u>	<u>Trapslines.</u>
	Rating: 60	<u>Inuvik</u>	<u>Hunting.</u>
			<u>Fishing.</u>
			<u>Domestic.</u>
			<u>Commercial.</u>
15	ASSOCIATED DISTURBANCES		
1 2 3		<u>Access Roads</u>	
4 5	45	<u>Miles From Highway</u>	<u>0-2, 2-5, 5-10, 10+</u>
	Rating: 45	<u>Miles From Pipeline</u>	<u>0-2, 2-5, 5-10, 10+</u>
		<u>Hydrologic</u>	<u>Cuts and Fills.</u>
		<u>Alterations</u>	<u>Creek Crossings.</u>
			<u>Compaction,</u>
			<u>Slumping, Erosion.</u>
		<u>Continued Use</u>	<u>Stockpiles.</u>
		<u>For Maintenance.</u>	<u>Waste, Dust.</u>
10	RESTORATION		
1 2 3		<u>Soil Stabilization</u>	<u>Natural Regeneration.</u>
4 5	30	<u>Visual Improvement</u>	<u>Grass-Legume Seeding.</u>
	Rating: 30	<u>Habitat Replacement</u>	<u>Transplants.</u>
			<u>Sustained Maintenance.</u>
			<u>Erosion Control Systems.</u>

NOTE: SENSITIVITY INDEX RANGE

MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100	TO	500

TEST PIT LOG

TP 1105-1

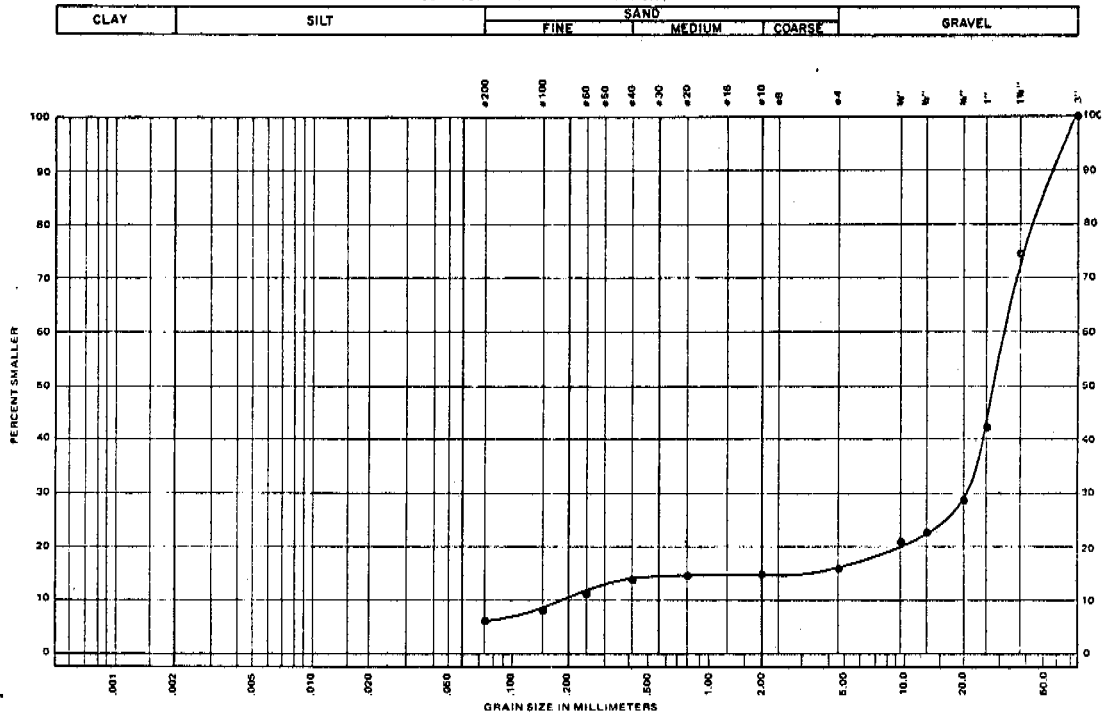


Moss

Gravel, light brown
dense
moist

84% GRAVEL
10% SAND
6% SILT & CLAY

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and some Sand
with a trace of silt. (GP-GH)

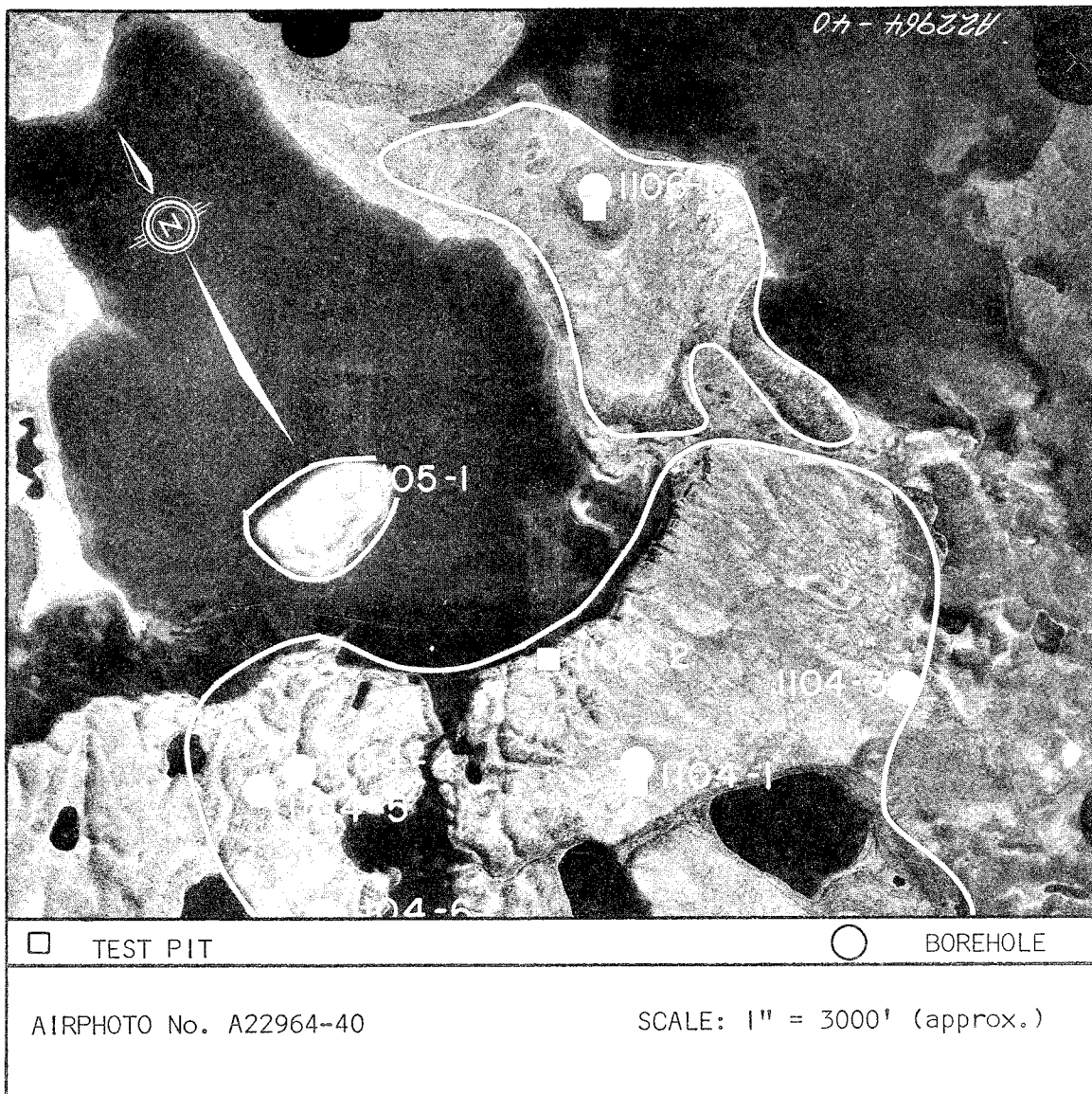
PROJECT Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP 1105-1
DEPTH 3'

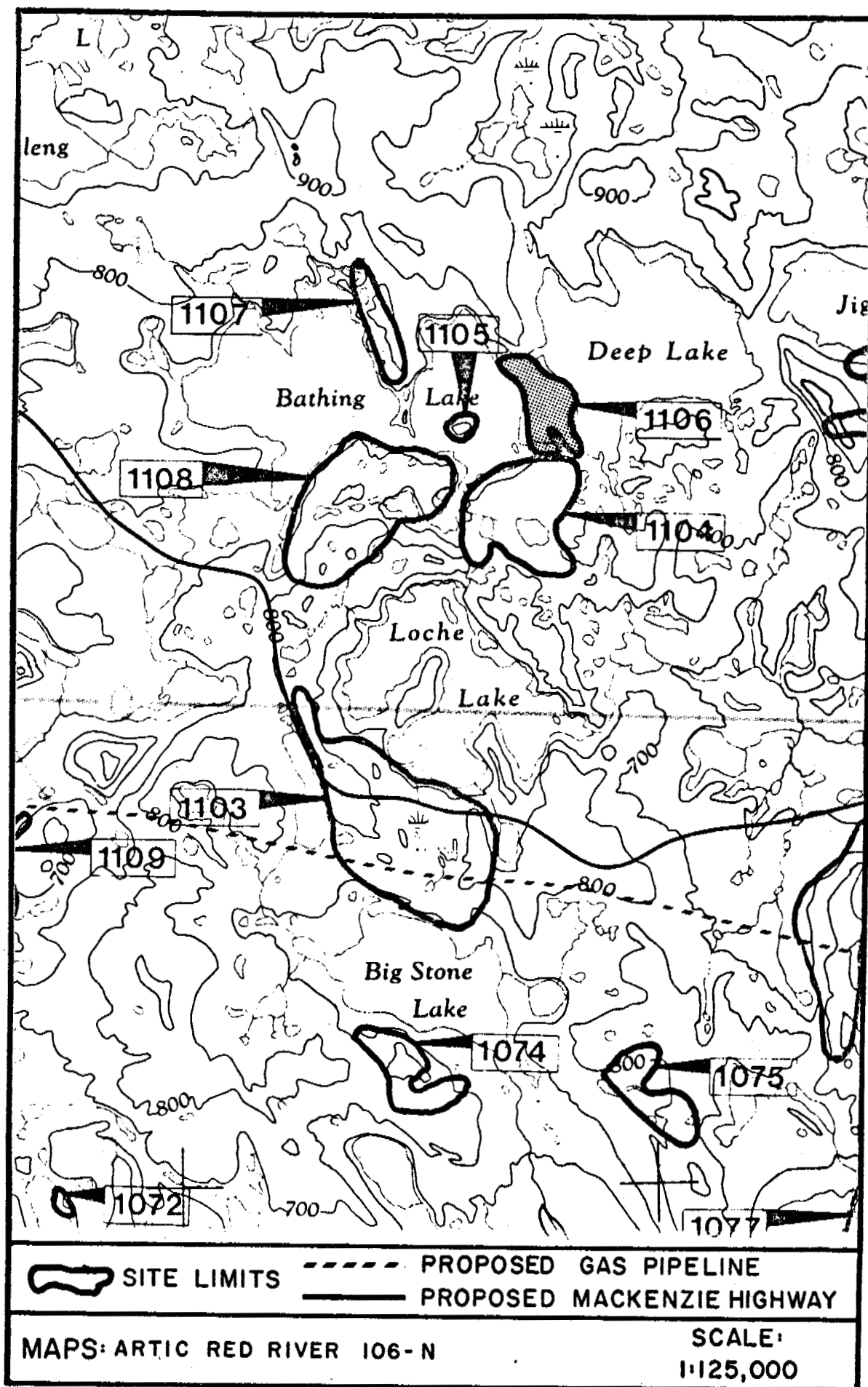
SITE 1106a

Location: Site 1106 is located between Deer and Bathing Lakes. The site is 5 miles NW of the proposed highway route and 7 miles NW of the proposed pipeline route.

Material: Silt.

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






GRANULAR MATERIALS INVENTORY - STAGE III

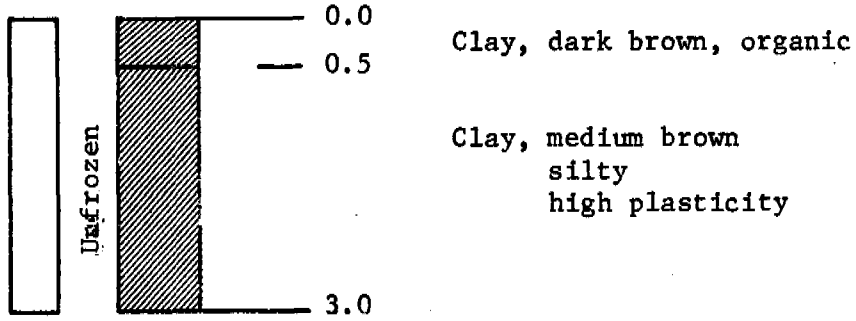
SITE NO. 1106		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	PEAT -fibrous, brown -organic silty, dark brown	NOT FROZEN					1
2	CL	CLAY -silty, medium grey-brown, medium plastic -less silty	FROZEN					2
3				3				
4				4				
5				5				
6				6				
7				7				
8				8				
9				9				
10				10				
11				11				
12				12				
13				13				
14				14				
15				15				
16								
17		END OF HOLE						17

DATE DRILLED: Sep. 21/73	LOGGED BY: EBA 122-1	COMPLETION DEPTH: 16.0'
DRILLING METHOD: AUGER		THAW DEPTH: 1.9'

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
--	--

TEST PIT LOG

TP 1106-1



SITE 1107

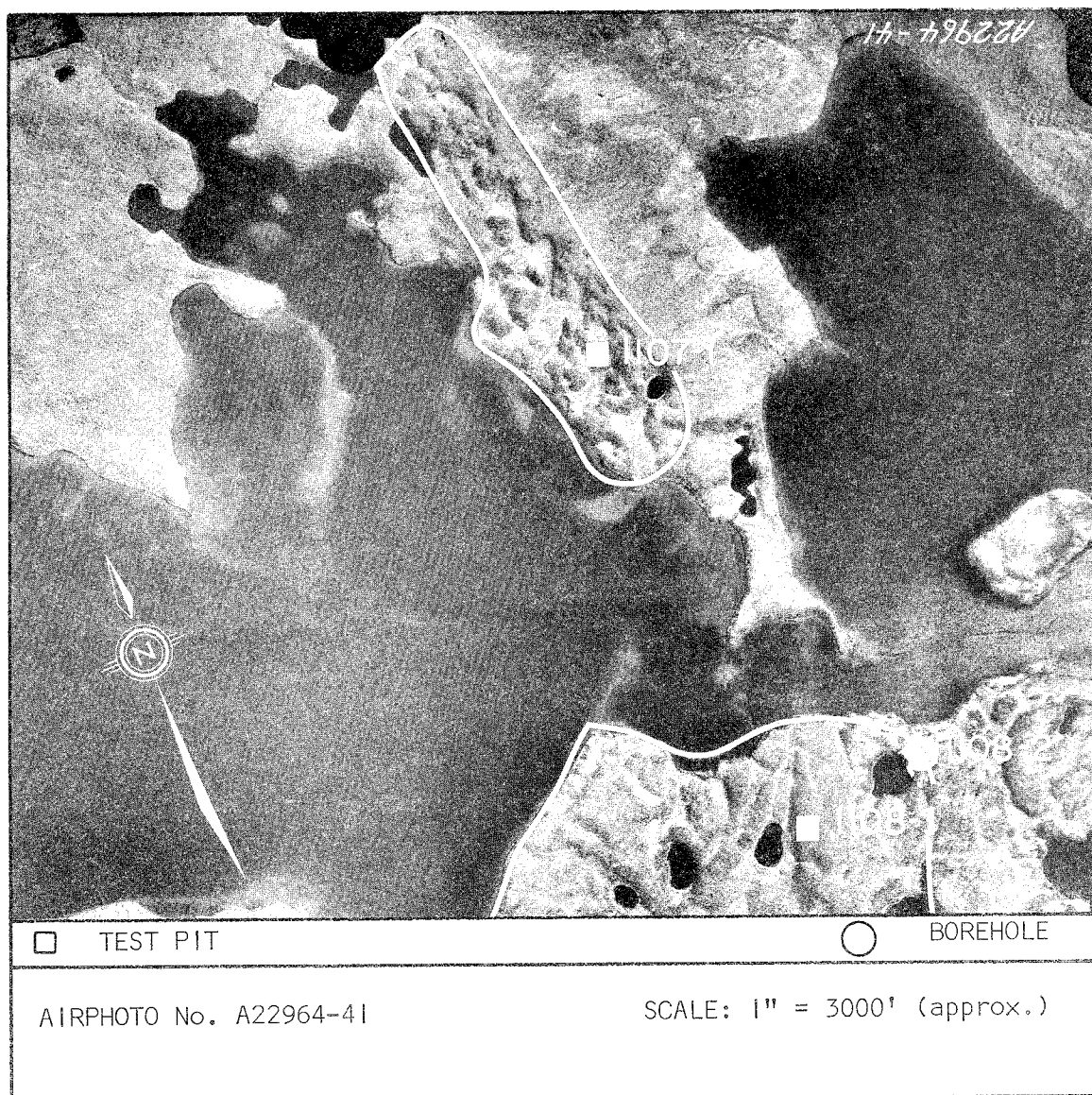
Location: Site 1107 is located along the north shore of Bathing Lake. Proposed highway and pipeline routes are 6 and 7 miles to the south of the site respectively.

Geology: Site 1107 is a large kame esker complex. Kames within the complex are large and are expected to exhibit considerable variation.

Material: Sandy, silty gravel, well graded.

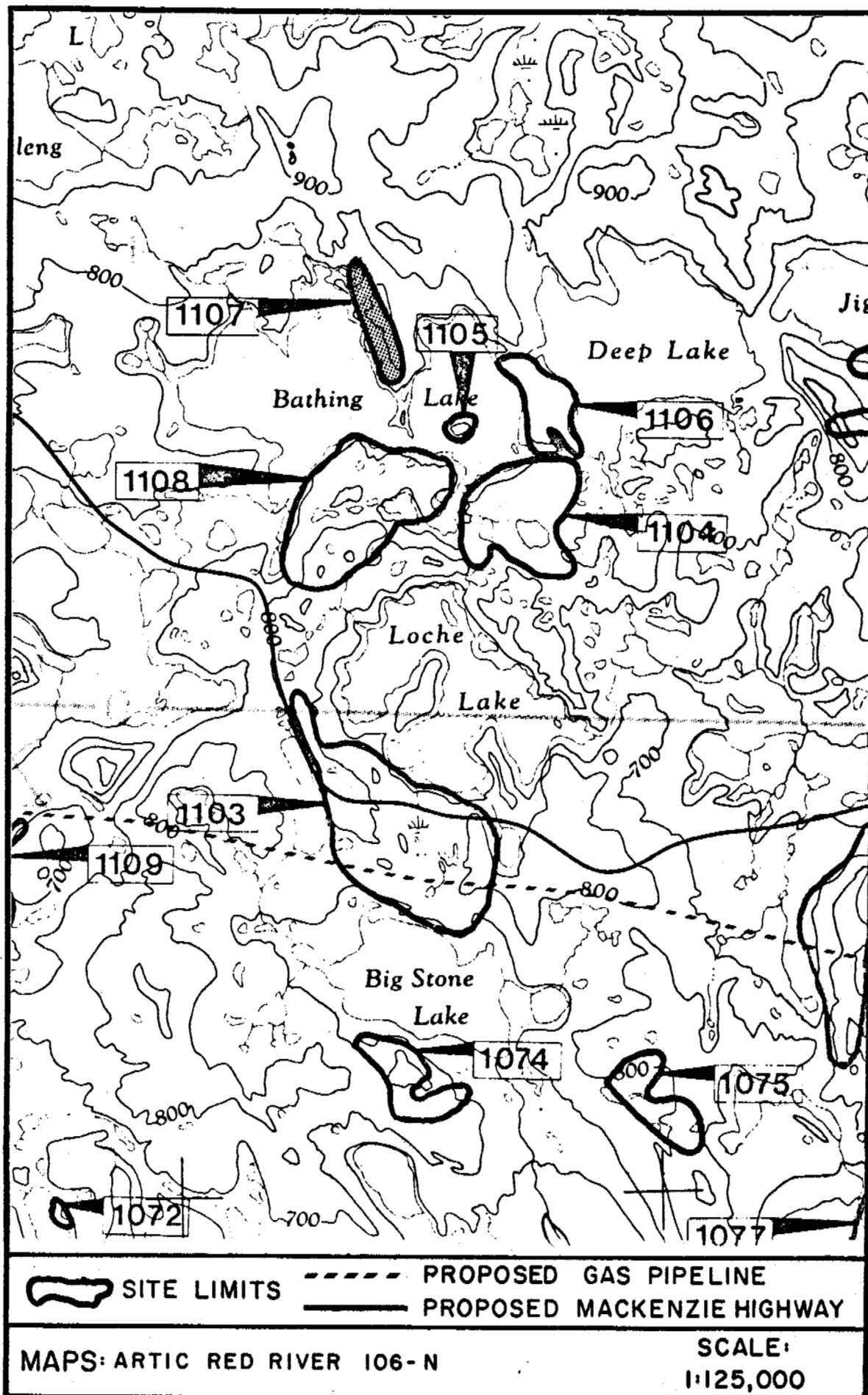
Volume: 1,000,000 cu. yd., estimate may be optimistic.

Area: 200 acres.



Drainage: The site is well drained.

Assessment: The borrow investigated at site 1107 was of good quality however it is expected to be variable from deposit to deposit. A more detailed drilling program will be necessary to accurately assess the quality and quantity of borrow material present. Access to the site crosses hilly terrain and is somewhat difficult and haulage distance is quite long. The environmental sensitivity rating is relatively high.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 (3)	Formation Stability	Flat Land, Terrace, Knoll,
	4 5	Ice Content	Rolling, Outcrop, Ridge,
	Rating: 15		Scarp, Overburden Type & Depth, Wet Site, Dry Site.
5	VEGETATION		
	1 (2) 3	Aesthetic Value	Marsh
	4 5	Habitat Value	Black Spruce
	Rating: 10		Muskeg
			White Spruce
			Mixed Conifer
			Conifer - Deciduous
			Deciduous
			Dry Slopes
			Riparian
15	MAMMALS		
	1 2 (3)	Ungulates	Winter Range, Summer Range,
	4 5	Furbearers	Migration Route.
	Rating: 45	Carnivores	Denning Area.
		Small Mammals	Dams and Lodges.
			Special Habitat Use.
10	BIRDS		
	1 2 3	Waterfowl-Swans,	Migration Pathway, Moulting,
	4 (5)	Geese, Ducks	Spring Staging, Fall Staging,
	Rating: 50	Game Birds	Nesting-Brooding, Perching,
		Raptors	Winter Habitat.
		Shorebirds	
		Passerine	
10	FISHERY		
	1 2 3	Lakes, Tributaries	Spawning, Nursery, Feeding,
	(4) 5	Mackenzie River:	Overwintering.
	Rating: 40	Whitefish	Major Migration Route.
		Smelt	Siltation of Spawning Areas,
		Grayling	Benthic Communities.
		Sculpin	Toxic Material Spill.
		Goldeye	Slumps, Velocity Increments,
		Pike	Migration Barriers.
		Trout-Perch	Eutrophication.
		Chub	Blasting.
		Lake Trout	
		Dace	
		Burbot	
		Walleye	
		Suckers	
		Char	
		Stickleback	
		Cisco	

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

TOTAL INDEX : 310

SPECIAL CONCERNS:

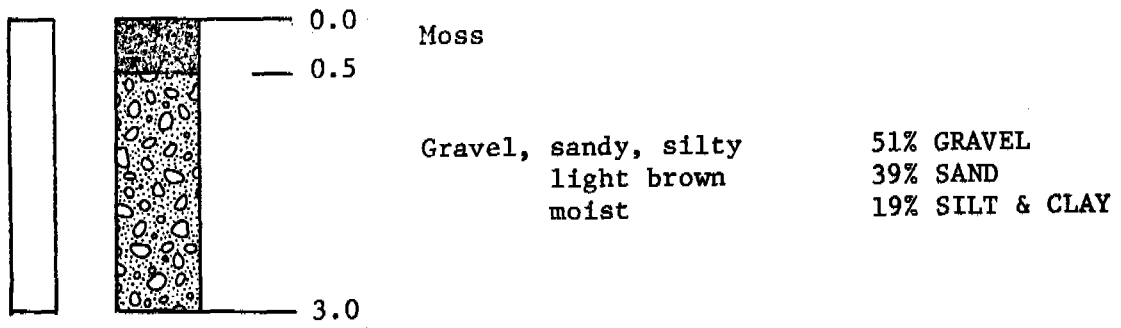
On north shore of Bathing Lake: - Whistling Swans utilize the area for spring staging (May 10-June 20) and moulting. Access road would cross lake. Fish and mammal values indicate that buffer zones, siltation controls and habitat replacement should be considered.

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

NOTE: SENSITIVITY INDEX RANGE

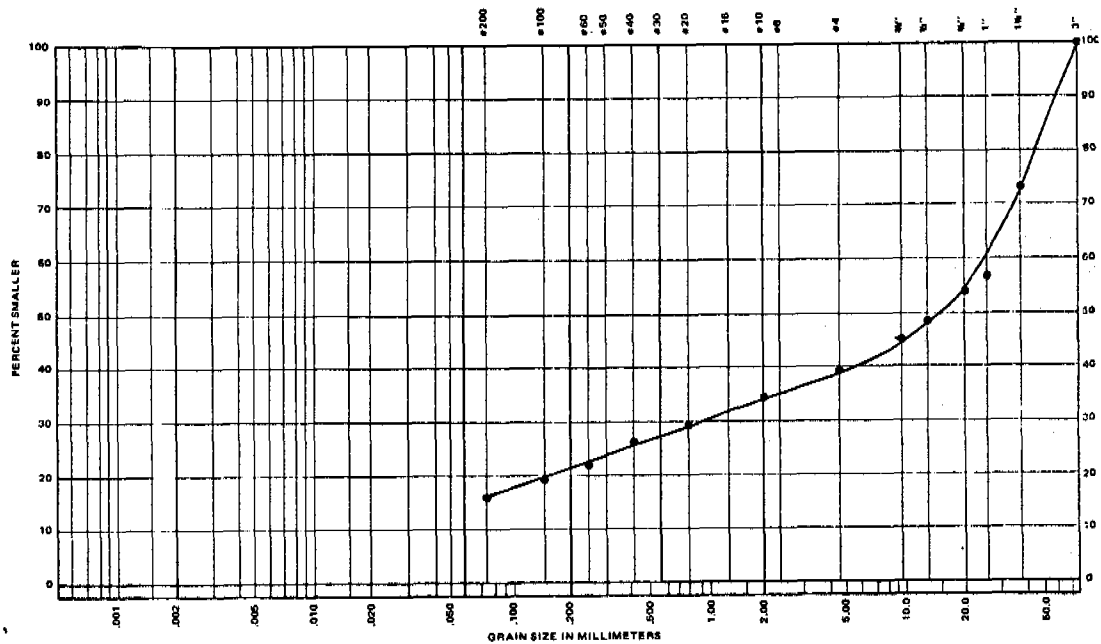
MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100		500

TEST PIT LOG



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



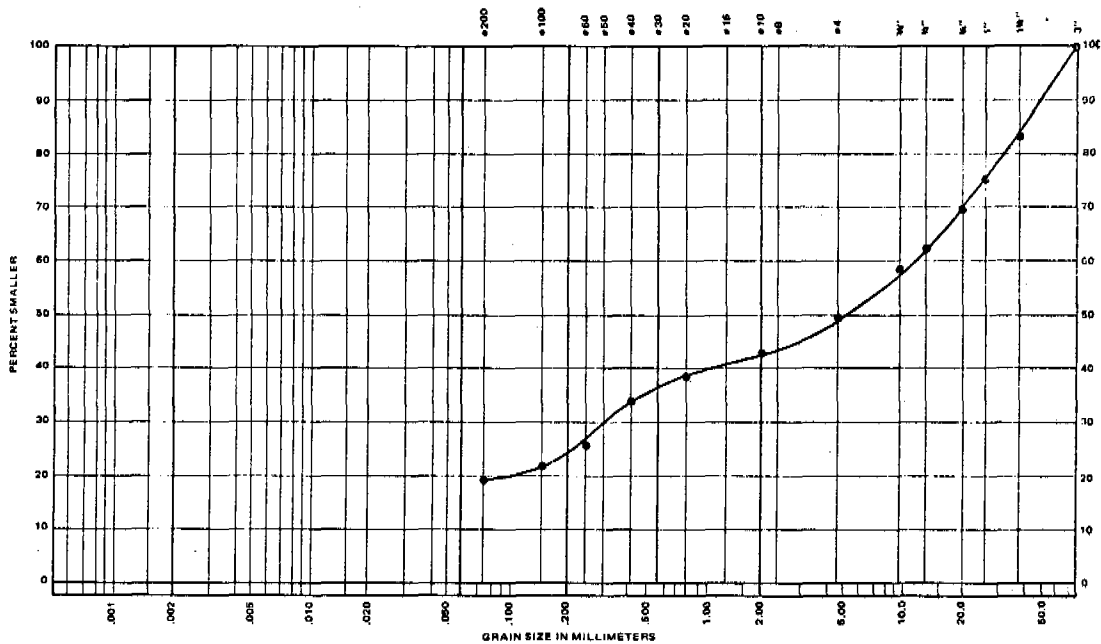
EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sandy Gravel
and some Silt (GM) M/C - 5.2%

PROJECT Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP 1107-1
DEPTH 0.5'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravel and Sand
and some Silt (GM) M/C - 8.0%

PROJECT Granular Resources
JOB No. E666 DATE Dec. 16/73
SAMPLE No. TP 1107-1
DEPTH 3'

SITE 1108a

Location: Site 1108 is located between Loche Lake and Bathing Lake. The proposed highway route is 1 1/2 miles west of the site.

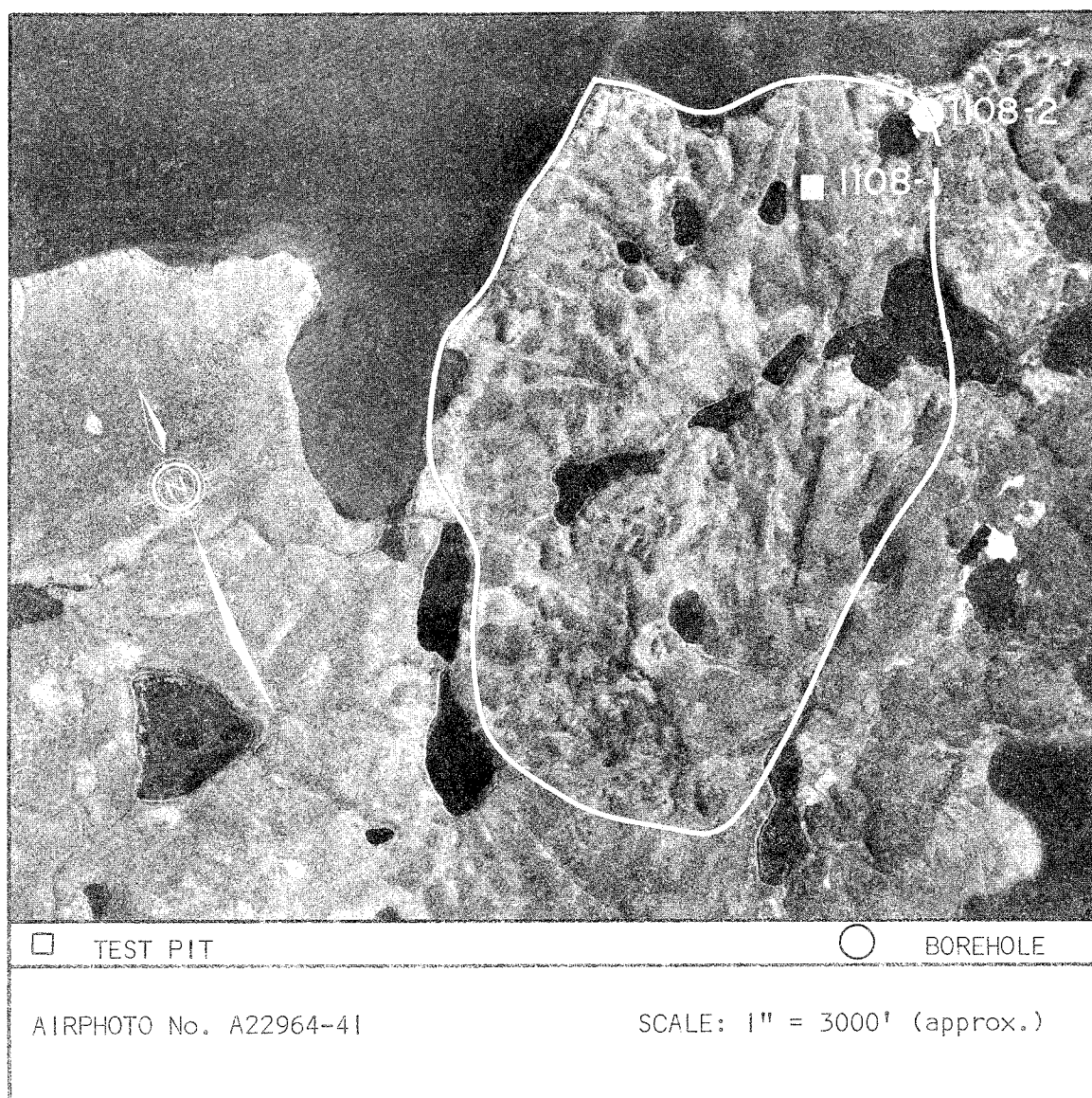
Geology: Site 1108 is an extensive kame complex which is expected to exhibit considerable variation.

Material: Gravel and clay.

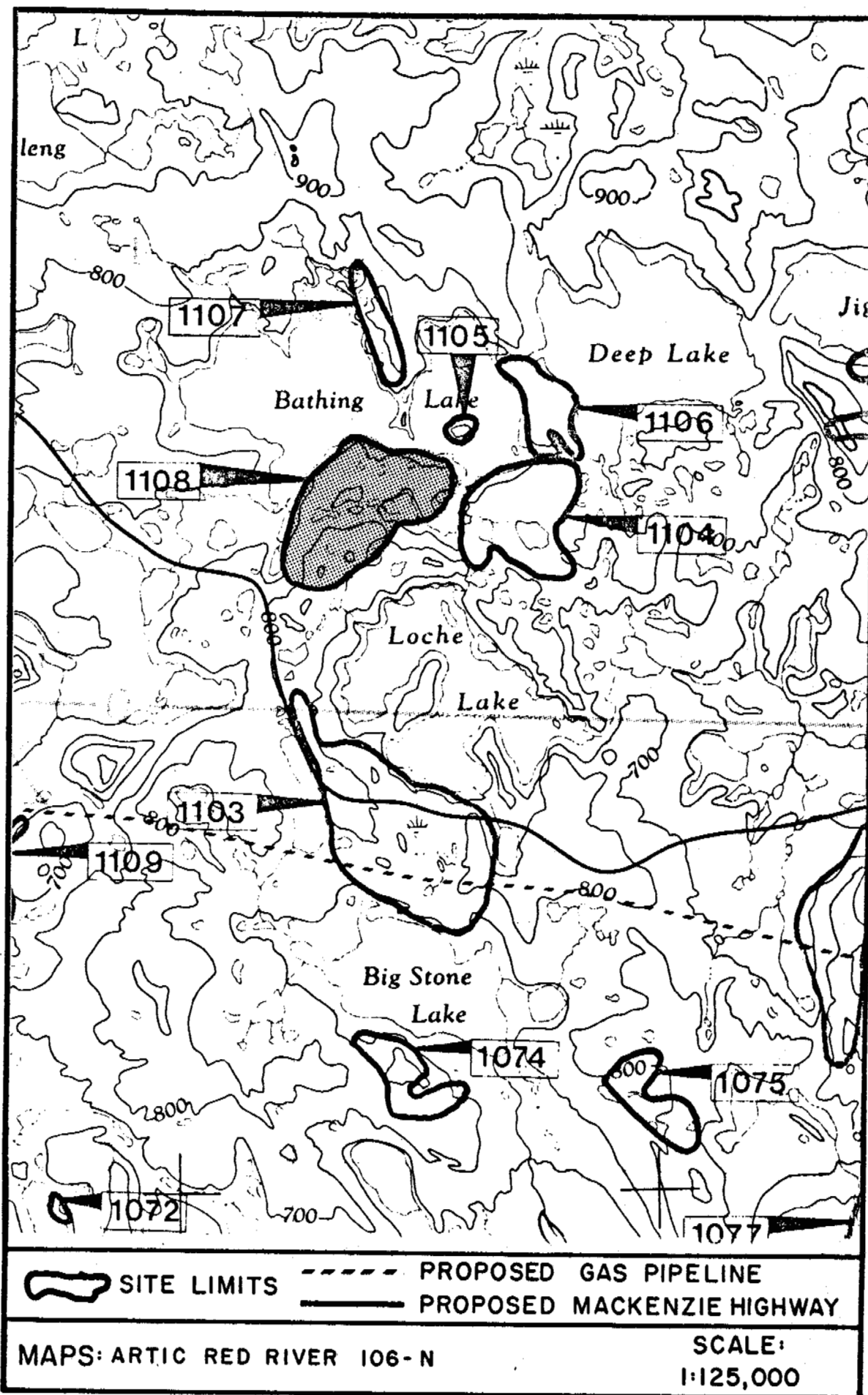
Volume: Uncertain because of variability in material.

Area: 750 acres.

Drainage: The site is well drained.



Assessment: Investigation of this site by RM Hardy and Associates at this site revealed the material to be generally of poor quality and unsuitable for construction purposes. Small, localized pockets of sand and gravel do exist, however, they are not large enough to warrant exploitation. Site 1108 is not recommended for development.



ENVIRONMENTAL SENSITIVITY INDEX

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	TERRAIN		
	1 2 (3)	Formation Stability	Flat Land, Terrace, Knoll,
	4 5	Ice Content	<u>Rolling</u> , Outcrop, <u>Ridge</u> , Scarp, Overburden Type & Depth, Wet Site, <u>Dry Site</u> .
	Rating: 15		
5	VEGETATION		
	1 2 (3)	Aesthetic Value	Marsh
	4 5	<u>Habitat Value</u>	<u>Black Spruce</u> <u>Muskeg</u> <u>White Spruce</u> <u>Mixed Conifer</u> <u>Conifer - Deciduous</u> <u>Deciduous</u> <u>Dry Slopes</u> <u>Riparian</u>
	Rating: 15		
15	MAMMALS		
	1 2 (3)	<u>Ungulates</u>	<u>Winter Range</u> , <u>Summer Range</u> ,
	4 5	<u>Furbearers</u>	<u>Migration Route</u> ,
	Rating: 45	<u>Carnivores</u>	<u>Denning Area</u> ,
		Small Mammals	<u>Dens and Lodges</u> , <u>Special Habitat Use</u> .
10	BIRDS		
	1 2 (3)	<u>Waterfowl-Swans</u> ,	<u>Migration Pathway</u> , <u>Moulting</u> ,
	4 5	<u>Geese, Ducks</u>	<u>Spring Staging</u> , <u>Fall Staging</u> ,
	Rating: 30	<u>Game Birds</u>	<u>Nesting-Brooding</u> , <u>Perching</u> ,
		<u>Raptors</u>	<u>Winter Habitat</u> .
		<u>Shorebirds</u>	
		<u>Passerine</u>	
10	FISHERY		
	1 2 3	<u>Lakes, Tributaries</u>	<u>Spawning, Nursery, Feeding</u> ,
	(4) 5	<u>Mackenzie River</u> :	<u>Overwintering</u> .
	Rating: 40	<u>Whitefish</u> Smelt	<u>Major Migration Route</u> .
		<u>Grayling</u> Sculpin	<u>Siltation of Spawning Areas</u> ,
		<u>Pike</u> Goldeye	<u>Benthic Communities</u> .
		<u>Trout-Perch</u> Chub	<u>Toxic Material Spill</u> .
		<u>Lake Trout</u> Dace	<u>Slumps, Velocity Increments</u> ,
		<u>Burbot</u> Walleye	<u>Migration Barriers</u> .
		<u>Suckers</u> Char	<u>Eutrophication</u> .
		<u>Stickleback</u> Cisco	<u>Blasting</u> .

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

TOTAL INDEX : 315

SPECIAL CONCERNS:


On south shore of Bathing Lake. Area utilized by Whistling Swans during spring migration (staging) May 10-June 20, and for moulting (July-August). Seasonal restrictions of operation, buffer zones and siltation control may be required.

R.I.R.	QUALITY ASSESSMENT	PARAMETERS	ELEMENTS
5	ARCHAEOLOGY		
	1 2 (3)	Paleontology	Probability of Discovery.
	4 5	<u>Pre-Historic</u>	Low, <u>Medium</u> , High.
	Rating: <u>15</u>	<u>Historic</u>	Known Sites.
10	AESTHETICS		
	1 (2) 3	Visible from:	River, Highway, <u>Air</u> .
	4 5	Physical Dis-	Dust, Waste,
	Rating: <u>20</u>	turbance	Stockpiles.
			Noises.
15	RESOURCE UTILIZATION		
	1 2 3	Fort Good Hope	<u>Improved Access.</u>
	4 (5)	<u>Arctic Red R.</u>	<u>Traps</u> .
	Rating: <u>75</u>	Inuvik	<u>Hunting.</u>
			<u>Fishing.</u>
			<u>Domestic.</u>
			<u>Commercial.</u>
15	ASSOCIATED DISTURBANCES		
	1 (2) 3	Access Roads	0-2, <u>2-5</u> , 5-10, 10+
	4 5	Miles From Highway	<u>0-2</u> , 2-5, 5-10, 10+
	Rating: <u>30</u>	Miles From Pipeline	Cuts and Fills.
		Hydrologic	Creek Crossings.
		Alterations	Compaction,
			Slumping, Erosion.
		Continued Use	Stockpiles,
		For Maintenance.	Waste, Dust.
10	RESTORATION		
	1 2 (3)	<u>Soil Stabilization</u>	Natural Regeneration.
	4 5	<u>Visual Improvement</u>	<u>Grass-Legume Seeding.</u>
	Rating: <u>30</u>	<u>Habitat Replacement</u>	<u>Transplants.</u>
			Sustained Maintenance.
			Erosion Control Systems.

NOTE: SENSITIVITY INDEX RANGE

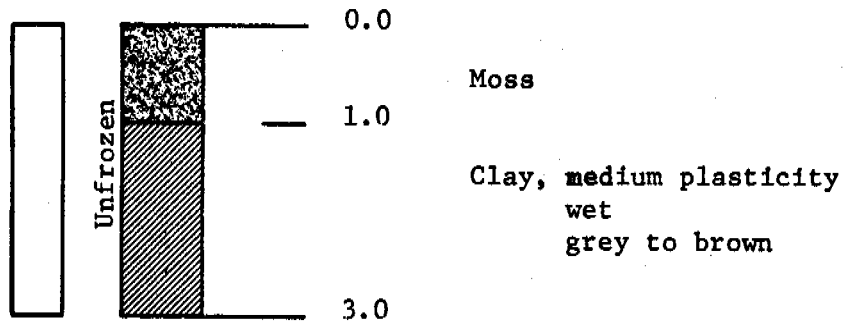
MINIMAL SENSITIVITY	TO	MAXIMUM SENSITIVITY
100	TO	500

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1108		HOLE NO. 2		PAGE 1 OF 1					
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)	
				10	20	30	40		
1		CLAY gravelly, silty						1	
2				2					
3		GRAVEL						3	
4				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:			LOGGED BY: DPW 65		COMPLETION DEPTH: 10'				
DRILLING METHOD:				THAW DEPTH:					
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.					

TEST PIT LOG

TP 1108-1

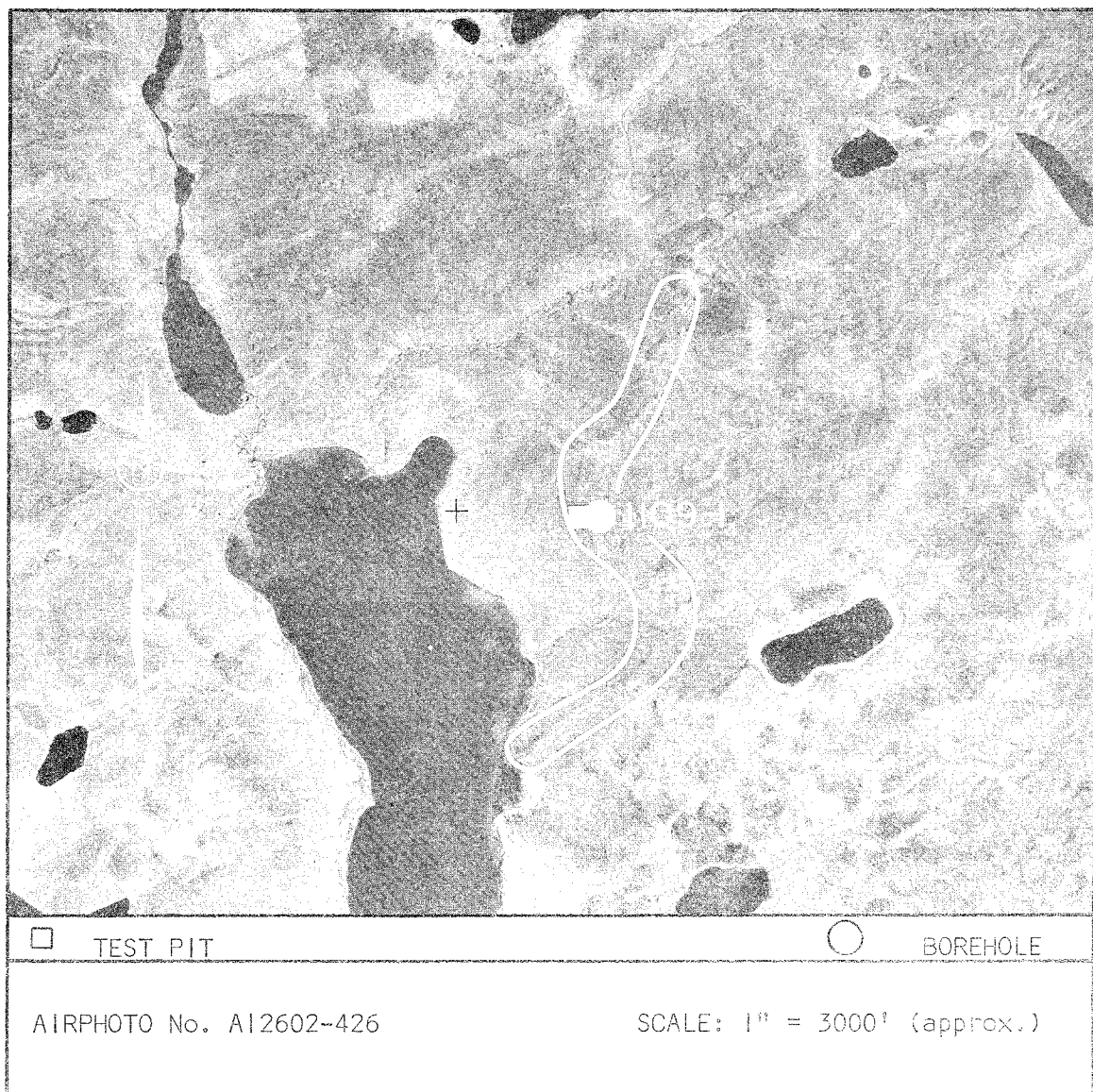


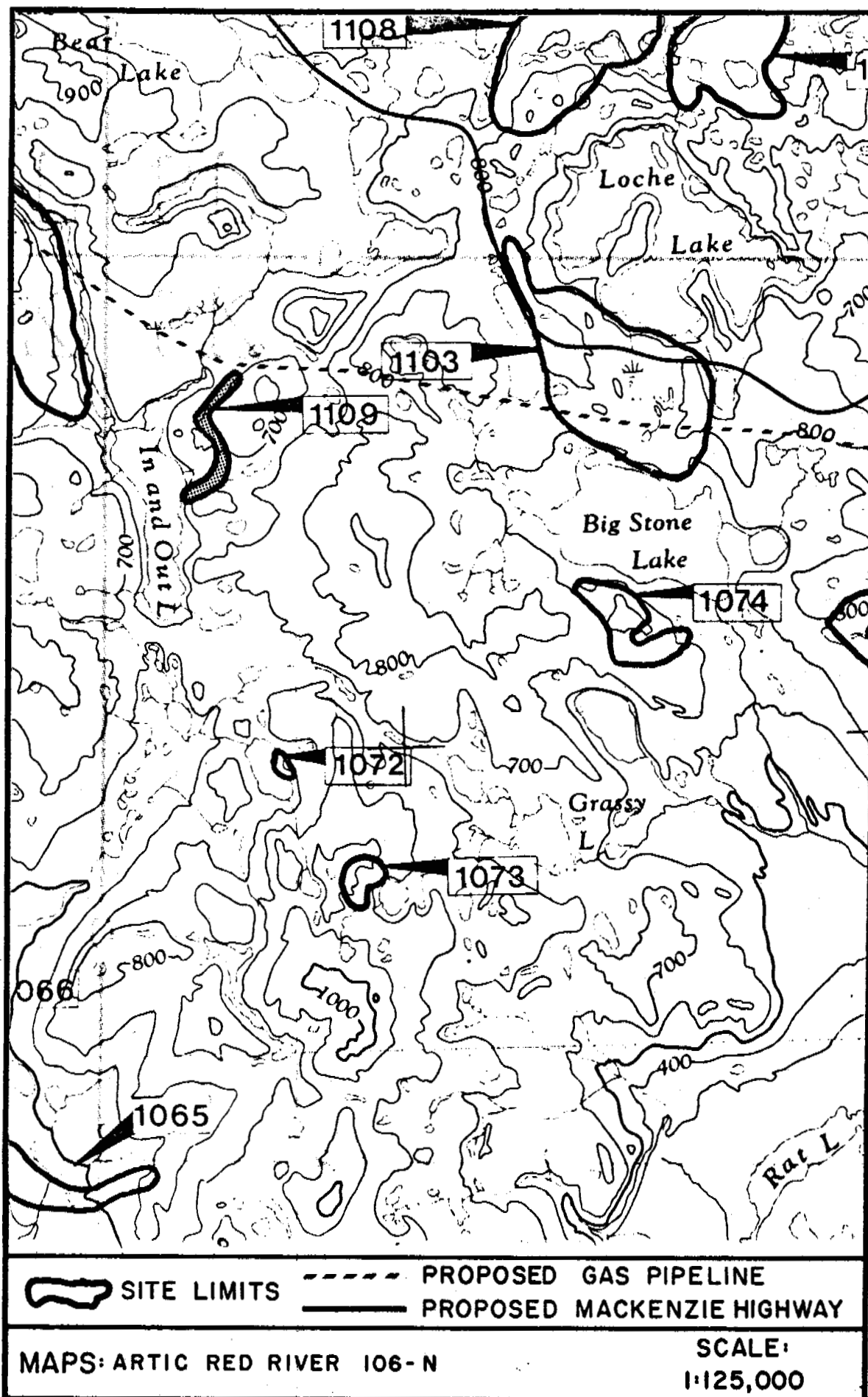
SITE 1109a

Location: Site 1109 is located on the north-east corner of In and Out Lake, one mile south of the proposed pipeline route and 5 miles south of the proposed highway route.

Material: Silt.

Assessment: The material at site 1109 is unsuitable for construction purposes and therefore the site is not recommended for development.






GRANULAR MATERIALS INVENTORY - STAGE III

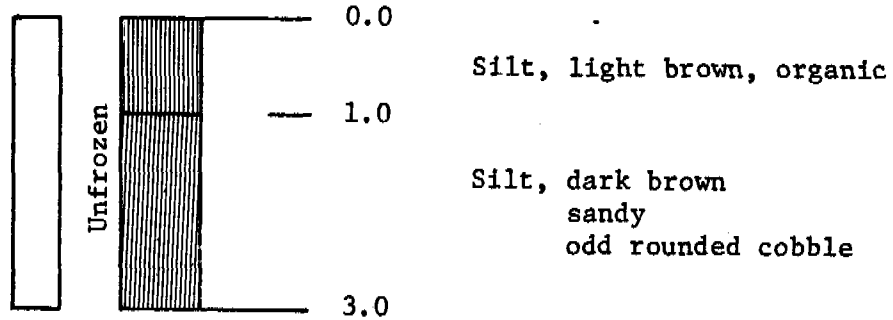
SITE NO. 1109		HOLE NO. 1		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	Pt	PEAT- fibrous, dark brown	UNFROZEN					1
2	ML	SILT -clayey, medium plasticity medium brown						2
3								3
4	CL	CLAY -sandy, some silt, medium plasticity	Vs=30-35%					4
5								5
6								6
7								7
8								8
9		END OF HOLE						9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17

DATE DRILLED: Sep. 19/73	LOGGED BY: EBA 121-1	COMPLETION DEPTH: 8.5
DRILLING METHOD: HELI DRILL		THAW DEPTH: 5.0

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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TEST PIT LOG

TP 1109-1

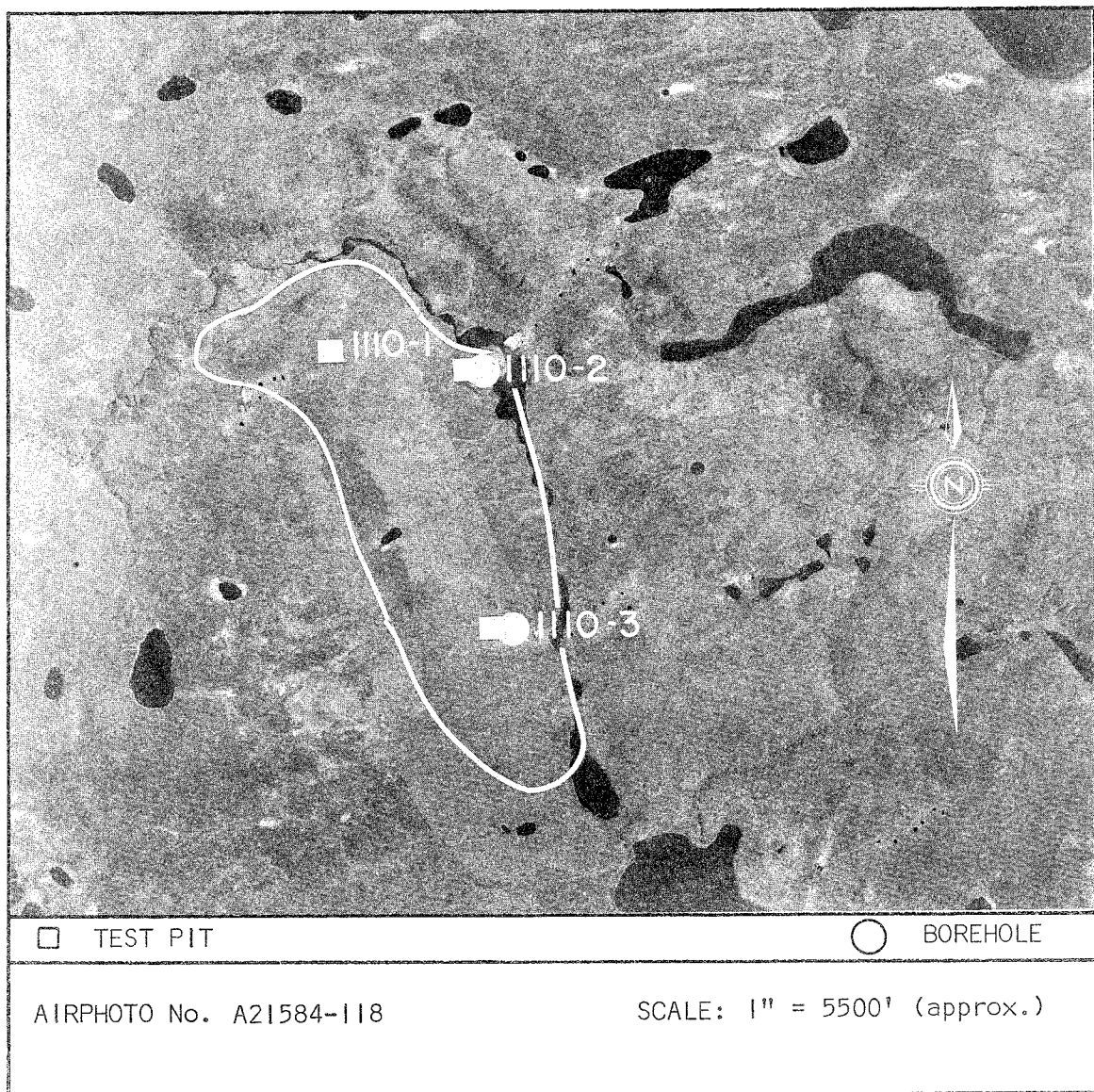


SITE 1110a

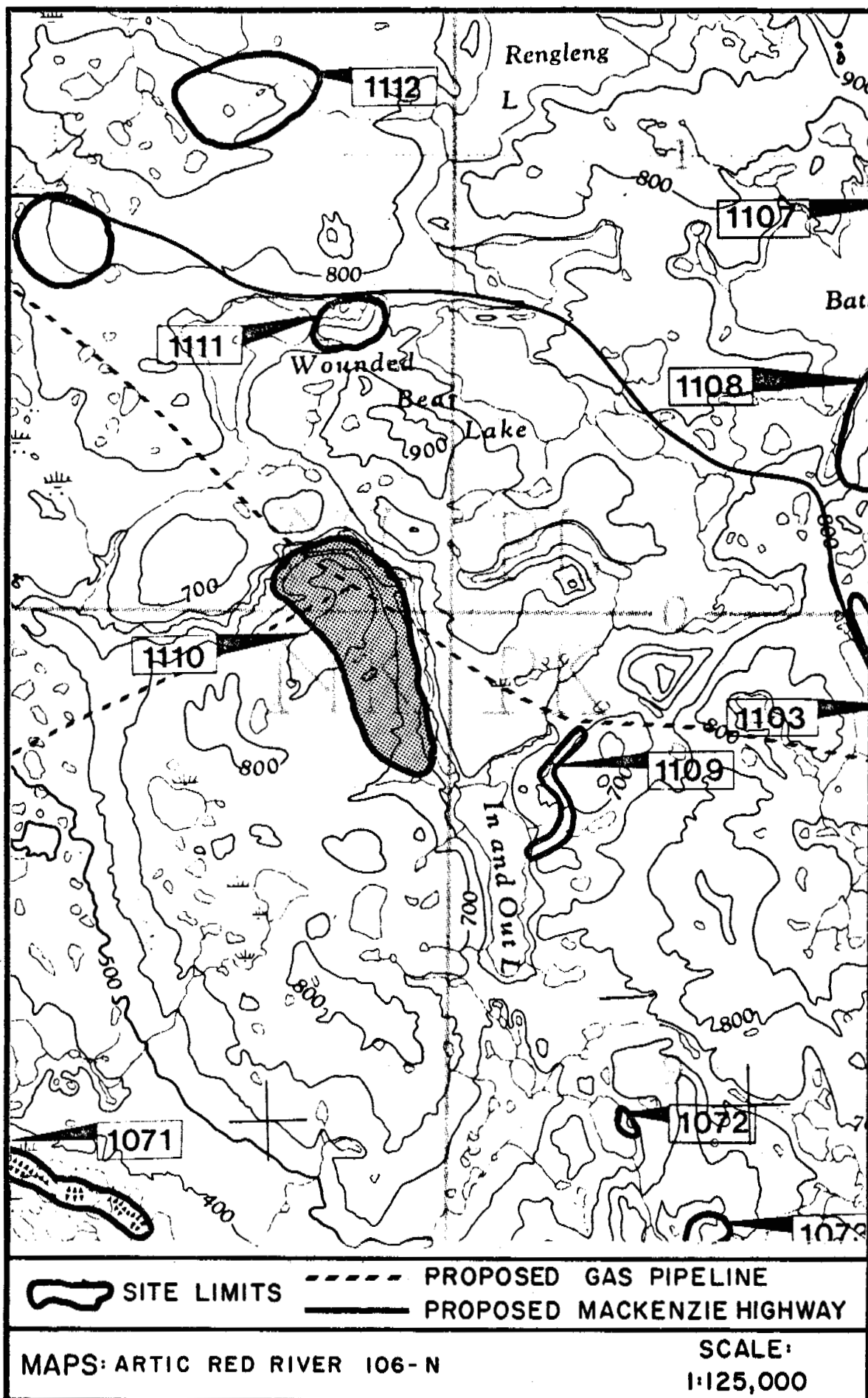
Location: Site 1110 is situated from one to four miles north of In and Out Lake. The proposed pipeline route crosses the site and the proposed highway route is 4 miles to the north of the site.

Material: Variable from gravelly silt and sand to silt.

Assessment: The material at site 1110 is generally of poor quality and unsuitable for construction purposes. The site is not recommended for development.



1110-1



SITE 1110 ENVIRONMENTAL SENSITIVITY INDEX

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

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

TOTAL INDEX : 260

SPECIAL CONCERNS :

Upland area near In and Out Lake. Recommend siltation controls and buffer zones.

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

NOTE: SENSITIVITY INDEX RANGE

MINIMAL
SENSITIVITY


100

TO

MAXIMUM
SENSITIVITY

500


GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1110		HOLE NO. 2		PAGE 1 OF 2				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SM	SILT -gravelly, medium brown	NOT FROZEN					1
2		24% GRAVEL						2
3		(2'-4') 33% SAND						3
4		43% SILT & CLAY						4
5	CL	6.2% O.C.	V _s ≈ 35%					5
6		CLAY -silty, sandy, some gravel, grey						6
7								7
8								8
9	SW-SM	SAND -some silt, sand coarse & angular, uniform grained.						9
10		19% GRAVEL						10
11		(9.5') 73% SAND						11
12	CL	6.2% O. C. 8% SILT & CLAY						12
13		CLAY -silty, some sand, coarse and angular, grey.						13
14								14
15								15
16								16
17								17
DATE DRILLED: Sep. 19/73			LOGGED BY: EBA 120-2	COMPLETION DEPTH: 25'				
DRILLING METHOD: HELI DRILL				THAW DEPTH: 4'				
GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS				 EBA Engineering Consultants Ltd.				

GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1110		HOLE NO. 2		PAGE 2 OF 2	
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %	DEPTH (feet)
18	CL	CLAY -same		<div style="display: flex; justify-content: space-between;"> 10 20 30 40 </div> <div style="position: relative; height: 100px;"> <div style="position: absolute; top: 0; left: 50%; transform: translate(-50%, -50%);">○</div> <div style="position: absolute; top: 20%; left: 50%; transform: translate(-50%, -50%);">○</div> <div style="position: absolute; top: 30%; left: 50%; transform: translate(-50%, -50%);">○</div> <div style="position: absolute; top: 40%; left: 50%; transform: translate(-50%, -50%);">○</div> </div>	18
19					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: Sep. 19/73	LOGGED BY: EBA 120-2	COMPLETION DEPTH: 25.0'
DRILLING METHOD: HELI DRILL		THAW DEPTH: 4.0'

GOVERNMENT OF CANADA DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS	 EBA Engineering Consultants Ltd.
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GRANULAR MATERIALS INVENTORY - STAGE III

SITE NO. 1110		HOLE NO. 3		PAGE 1 OF 1				
DEPTH (feet)	UNIFIED GROUP SYMBOL	SOIL DESCRIPTION	GROUND ICE DESCRIPTION	MOISTURE CONTENT %				DEPTH (feet)
				10	20	30	40	
1	SM-ML	SILT -sandy, fine to medium grained, medium brown.	NOT FROZEN					1
2								2
3								3
4								4
5	SM	SAND - silty, fine to medium, angular gravel sizes, medium brown. 15% GRAVEL (5'+7.5') 70% SAND 6.4% O.C. 15% SILT & CLAY						5
6								6
7								7
8								8
9	CL	CLAY -sandy, some angular gravel particles, grey	FROZEN					9
10								10
11								11
12								12
13								13
14		END OF HOLE						14
15								15
16								16
17								17

DATE DRILLED: Sep. 19/73


LOGGED BY: EBA
120-3

COMPLETION DEPTH: 13

DRILLING METHOD: HELI DRILL

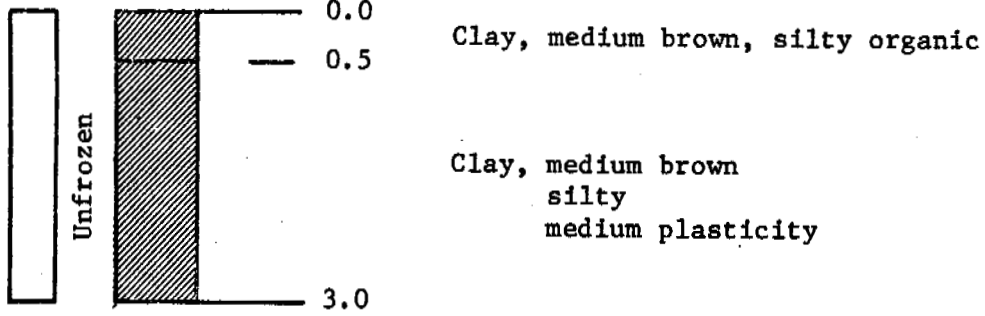
THAW DEPTH: 7.5'

GOVERNMENT OF CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

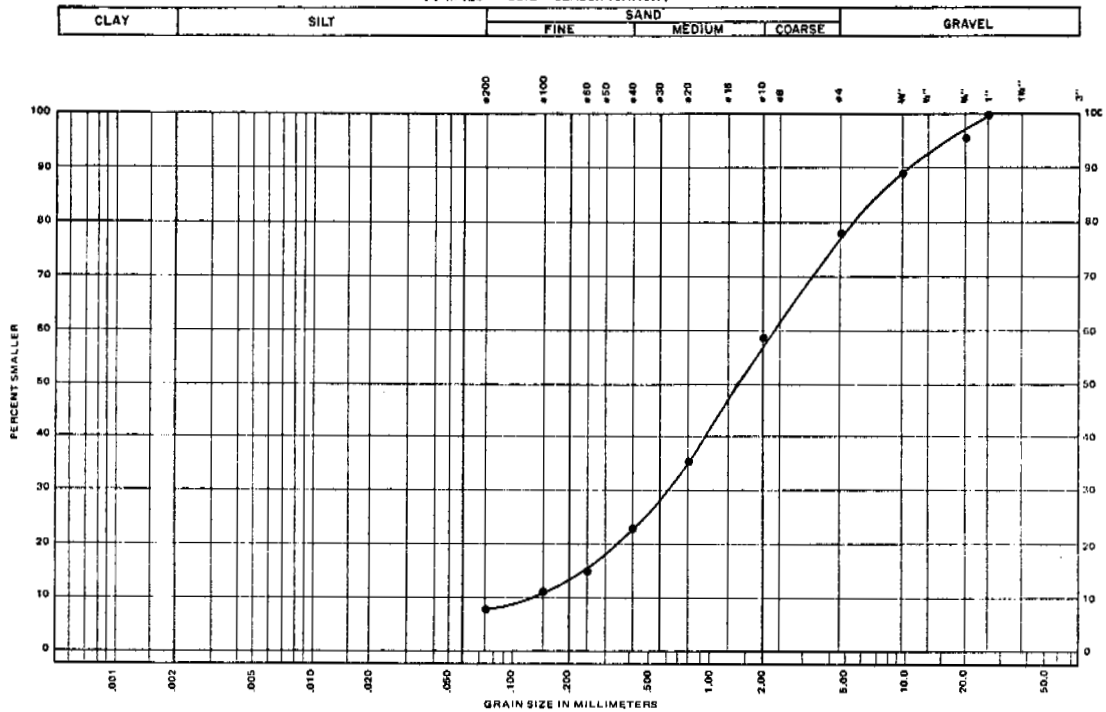

EBA Engineering Consultants Ltd.

TEST PIT LOG

TP 1110-1



GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

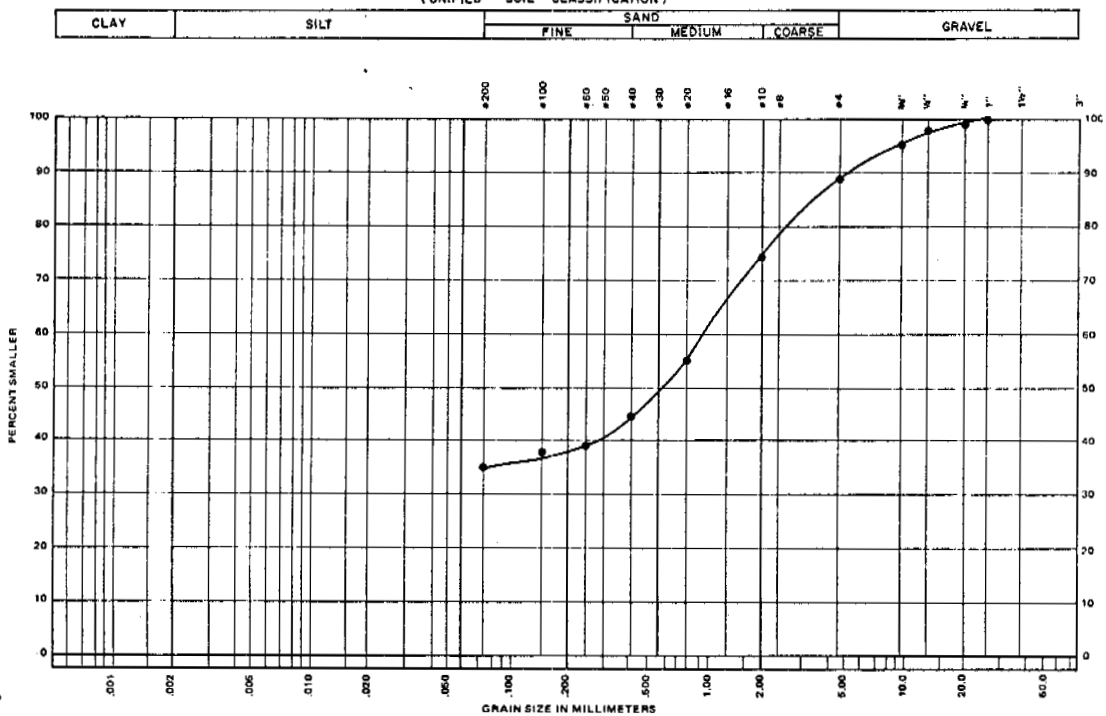


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Gravelly Sand with
a trace of silt (SW-SM)

PROJECT Granular Resources
JOB No. E666 DATE Dec. 6/73
SAMPLE No. TP 1110-2
DEPTH surface

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

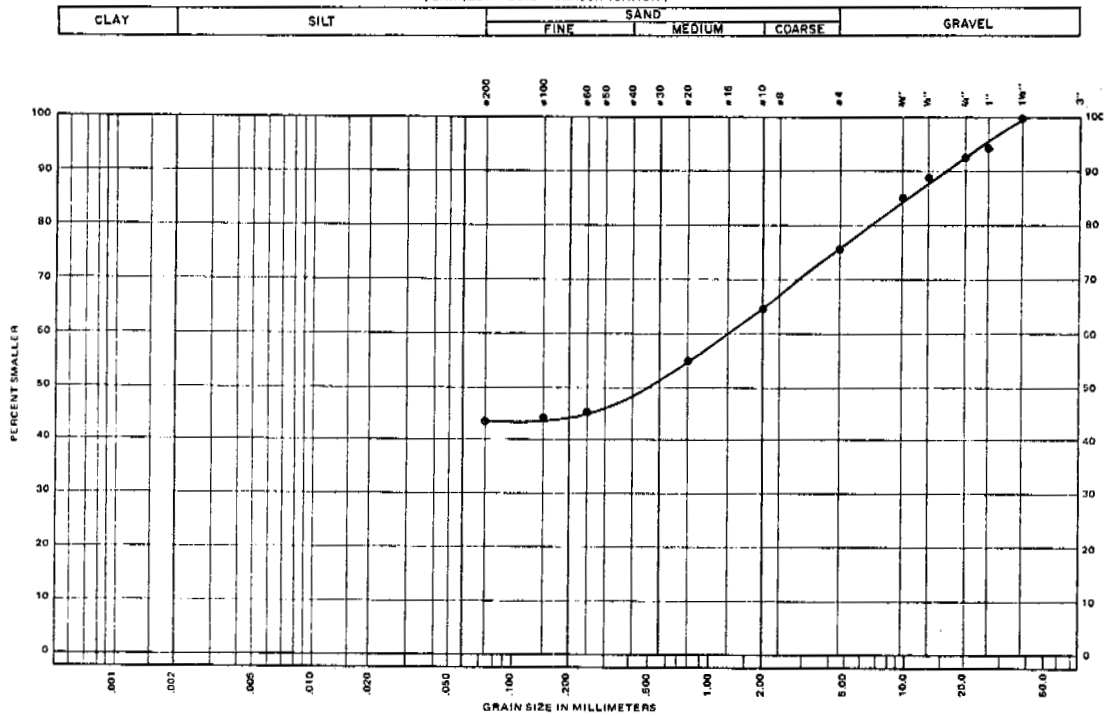


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and silt
and some Gravel (sh) M/C = 3.8%

PROJECT Granular Resources
JOB No. E666 DATE Dec. 17/73
SAMPLE No. TP 1110-2
DEPTH 12' - 14.5'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

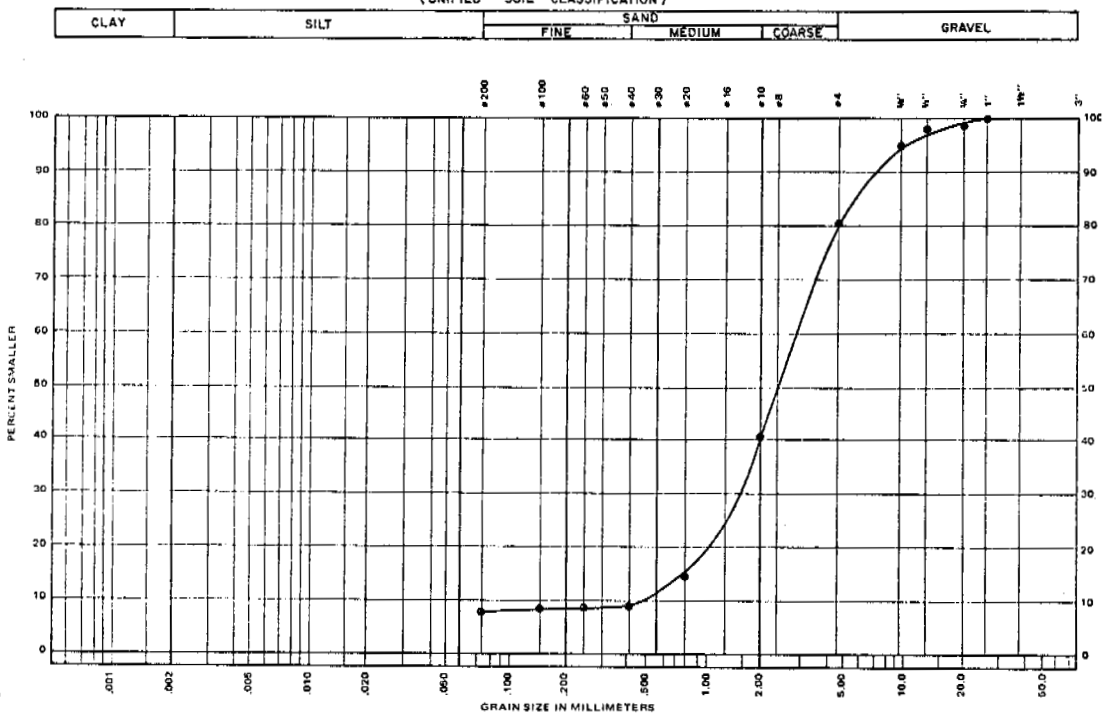


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Silt and Sand
Gravelly, (SM)

PROJECT Granular Resources
JOB No. E666 DATE 11/10/73
SAMPLE No. BH 1110-2
DEPTH 2' - 4'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

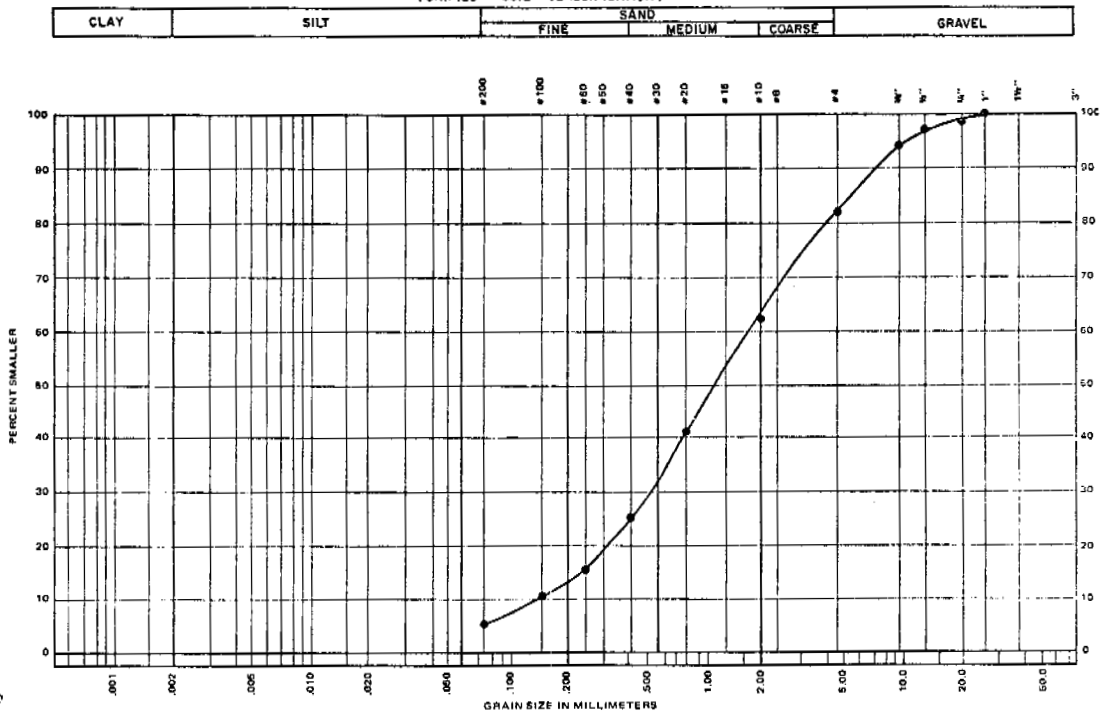


EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and some
Gravel with a trace of Silt (SW-SM)

PROJECT Granular Resources
JOB No. E666 DATE Dec. 17/73
SAMPLE No. BH 1110-2
DEPTH 9.5'

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)

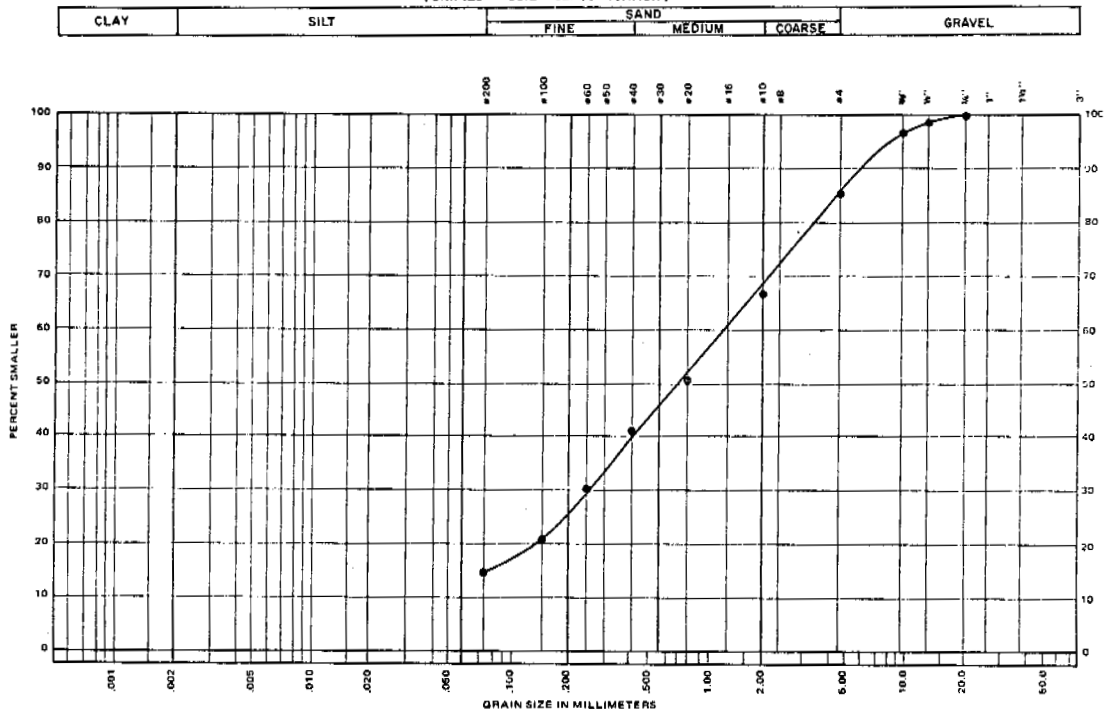


EBA Engineering Consultants Ltd.

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

PROJECT Granular Resources
JOB No. E666 DATE Dec. 5/73
SAMPLE No. TP 1110-3
DEPTH surface

GRAIN SIZE DISTRIBUTION (UNIFIED SOIL CLASSIFICATION)



EBA Engineering Consultants Ltd.

SAMPLE DESCRIPTION Sand and some Silt
and Gravel (SM) M/C = 7%

PROJECT Granular Resources
JOB No. E666 DATE Dec. 17/73
SAMPLE No. BH 1110-3
DEPTH 5' and 7.5'