REPORT

TEST HOLE LOGS

DEMPSTER HIGHWAY PIPELINE ROUTE

AL0889

DECEMBER 20, 1977

KLOHN LEONOFF CONSULTANTS LTD.
Civil · Geotechnical · Hydraulic

December 20th, 1977

OUR FILE NO.: AL0889

Foothills Pipe Lines Ltd.
1600 Bow Valley Square Two
205 - 5th Avenue Southwest
Calgary, Alberta
T2P 2V7

Attention: Dr. F.C. Yip, P. Eng.

Dear Sir:

Re: 1977 Dempster Highway Pipeline Drilling Program

This report entitled "Test Hole Logs Dempster Highway Pipeline Route" contains the detailed test hole logs and classification data for the drilling program done between Whitehorse and Carmacks during September and October, 1977. This is a data report only. An assessment of the test holes will be made at a later date.

This report is divided into three sections. Section A contains the test hole logs and grain size curves for hole numbers 77-1 to 77-25 inclusive. A truck mounted Failing 1000 drill rig was used to drill these holes. Section B contains the test hole logs and grain size curves for hole numbers 77-201 to 77-224 inclusive. These holes were drilled with a Mayhew 200 drill rig transported by a Bell 205 helicopter. Section C contains the topographic maps with the test hole locations.

Yours very truly,

KLOHN LEONOFF CONSULTANTS LTD.

J. Roy, P. Eng.

JR/gm

SYMBOLS AND TERMS USED IN THE REPORT

ADDITIONAL SYMBOLS

⊙ - moisture content

■ - unconfined strength as per spring calibrated pocket penetrometer

B - disturbed bag sample

SY - undisturbed SHELBY TUBE sample

SPT - Standard Penetration Test (6 in. Blow Counts)

BURMISTER CLASSIFICATION SYSTEM

STANDARD TERMS FOR IDENTIFYING COHESIVE SOILS

DEGREE OF PLASTICITY	PLASTICITY INDEX	WRITTEN IDENTIFICATION
Non to slight plastic	0 - 5	Silt
Low	5 - 10	Silt and Clay
Medium High	10 - 30 30 or more	Clay and Silt Clay

STANDARD TERMS FOR IDENTIFYING COHESIONLESS SOILS

MAJOR SOIL COMPONENTS >50% BY Wt.	MINOR SOIL COMPONENTS	MINOR SOIL PROPORTIONS	PROPORTION DEFINITION BY Wt.
GRAVEL SAND SILT	gravel sand silt	and	35 to 50%
		some	20 to 35%
		little	10 to 20%
		trace	1 to 10%

EXAMPLE:

	PROPORTIONS
GRAVEL	> 50%
-some sand	20 to 35%
-little silt	10 to 20%

SOIL STRENGTH GUIDELINE

POCKET PENETROMETER FOR COHESIVE SOILS	
UNCONFINED COMPRESSIVE STRENGTH T/Ft.^{2}	CONSISTENCY
0.25	Very Soft
0.25 - 0.50	Soft
0.5 - 1.0	Firm
1.0 - 2.0	Stiff
2.0 - 4.0	Very Stiff
>4.0	Hard

STANDARD PENETRATION TEST FOR COHESIONLESS SOILS	
BLOWS / 6 inches	DENSITY
0 - 2	Very Loose
2 - 5	Loose
5 - 15	Med. Dense
15 - 25	Dense
>25	Very Dense

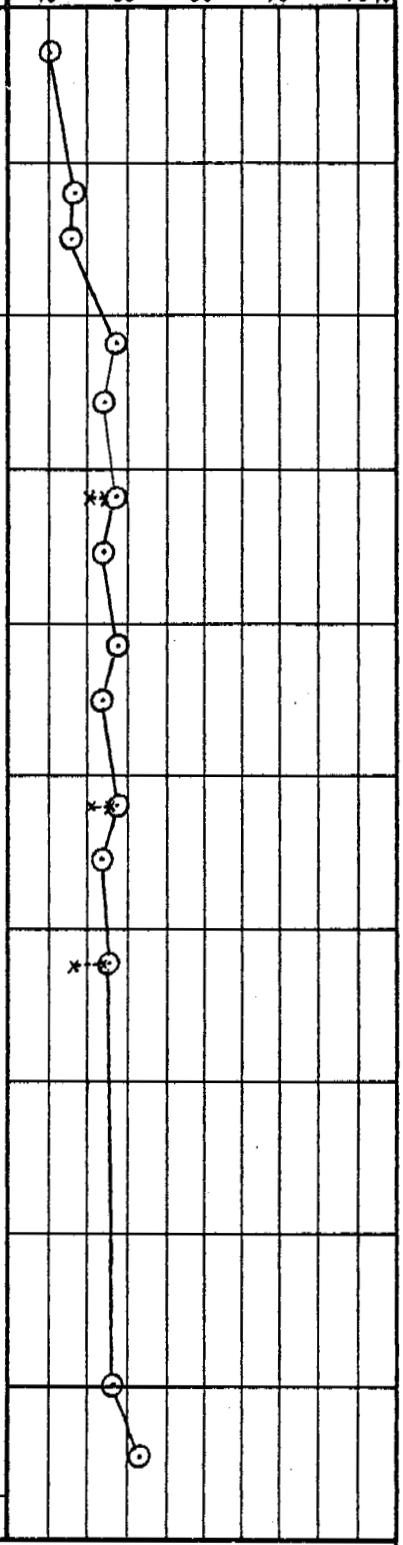
TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 19 Appendix C
							ELEVATION
	B		1				0.08 Organic Cover
1		4					SILT & CLAY - trace fine sand - trace rootlets - slight plasticity - rusty sand laminations - greyish brown
	SPT	4 3	2				
	B		3				
2		3					2.0
	SPT	2 2	4				SILT AND CLAY - trace of coarse sand - trace of fine gravel - sand laminations & layers - clay laminations - slight to low plasticity - grey with rusty seams of oxide - soft to firm
	B		5				
3		2					
	SPT	2 3	6				
	B		7			NF	
4							
	SY		8				
	B		9				
5		1					
	SPT	1 3	10				← 10cm. layer of fine sand
	B		11				
6		3					
	SPT	2 2	12				
7							
8							
9	B		13				
		2					
	SPT	2 2	14				9.7m.
10							END OF HOLE (Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT X — WATER CONTENT 0 — LIQUID LIMIT X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 352.0, 1.2 miles L. of C.L.
HOLE No. 77-1
DATE Sept. 3/77 PLATE

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

NOTES:

1. Hole located beside a small dirt road about 300 m. west of Mayo Highway. Flat ground.
2. Hole surrounded with trembling aspen (8m.) and pasture grass.
3. Hole augered to 9.7 m.
4. No free water encountered but fairly wet below 2 m.
5. Piezometer standpipe installed to 6.4 m.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 352.0, 1.2 miles L. of C.L.
HOLE No. 77-1
DATE Sept. 3/77 PLATE

Klohn Leonoff Consultants Ltd.

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JOB No. AL0889

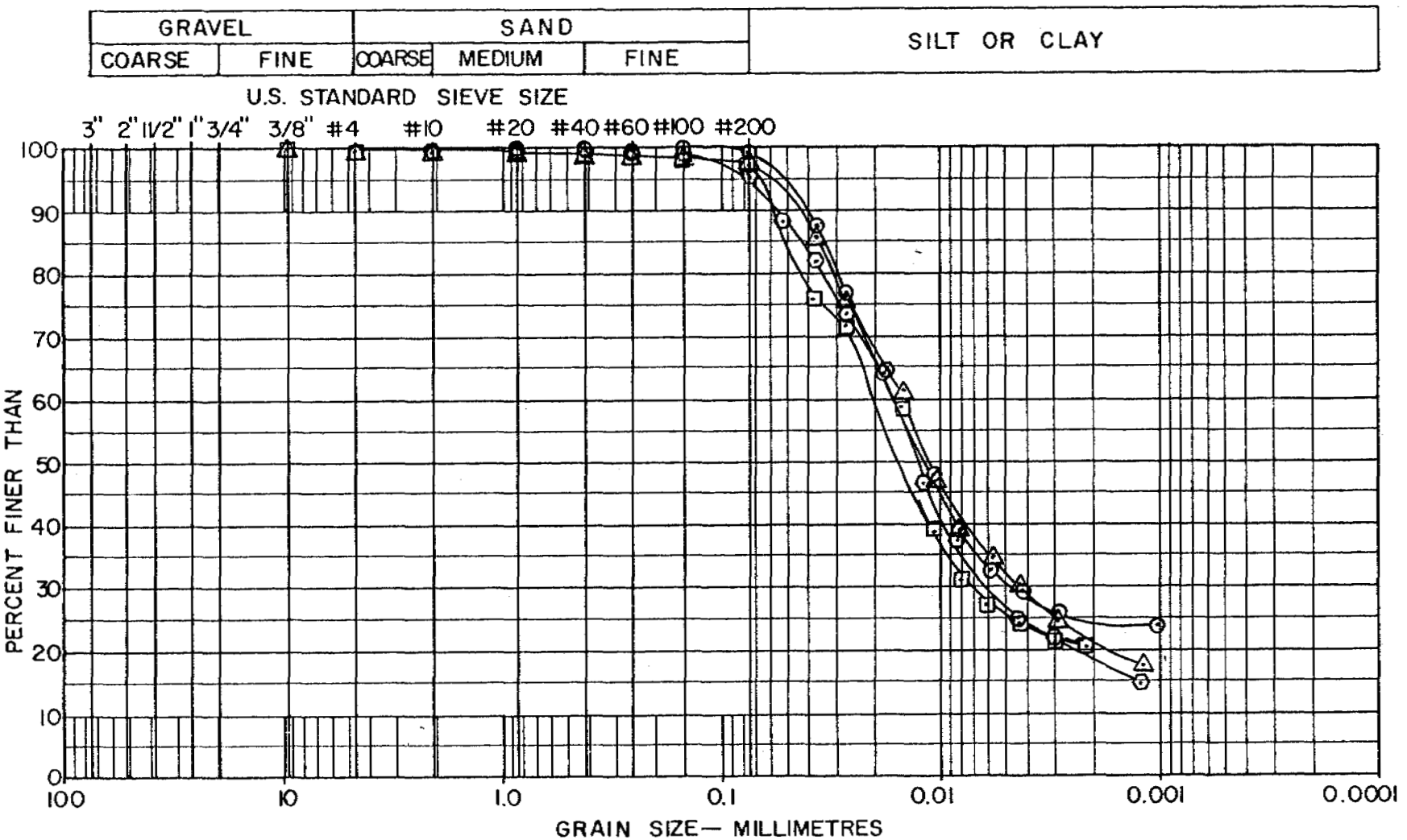
PROJECT Dempster Highway Pipeline

LOCATION

HOLE No. 77-1 DEPTH

DATE November 1977

GRAIN SIZE CURVE



REMARKS:

- ⊙—⊙ Sample 3 at 1.5 m.
- ⊡—⊡ Sample 6 at 3.0 m.
- △—△ Sample 10 at 5.0 m.
- ⊙—⊙ Sample 12 at 6.0 m.

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		1
	B		2
2	B		3
	SPT	15 26 28	4
3		6 16	
	SPT	21	5
4			
	SPT	15 23 20	6
5			
		18	
6	SPT	26 42	7
7			
	SPT	17 54 39	8
8			
9			
	SPT	31 46 63	9
10			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.1 TOPSOIL
SILT AND SAND
0.6 - rusty brown

GRAVEL AND SAND
- some silt
- cobbles
- layered
- brown and grey

NF.

← layer of grey sand

← layer of grey sand

6.7

← trace of shale
← layer of sand

SILT AND CLAY
- some sand
- little gravel
- low plastic
- rusty specks
- brownish grey

(Till)

9.45 m

END OF HOLE (Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 347.3, .4 mile L. of C.L.
HOLE No. 77-2
DATE Sept. 1/77 PLATE

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Located about 15m. from access road to microwave tower and 60 m. east of Mayo Highway.
2. Flat ground. White spruce to 18 m. A few trembling aspen to 12m. A few Lodgepole pine to 18m. Highway cuts into silty gravel.
3. Hole augered to 1.75m. Drilling mud used from 1.75m. to 9.45 m.
4. Piezometer installed to 5.7 m.

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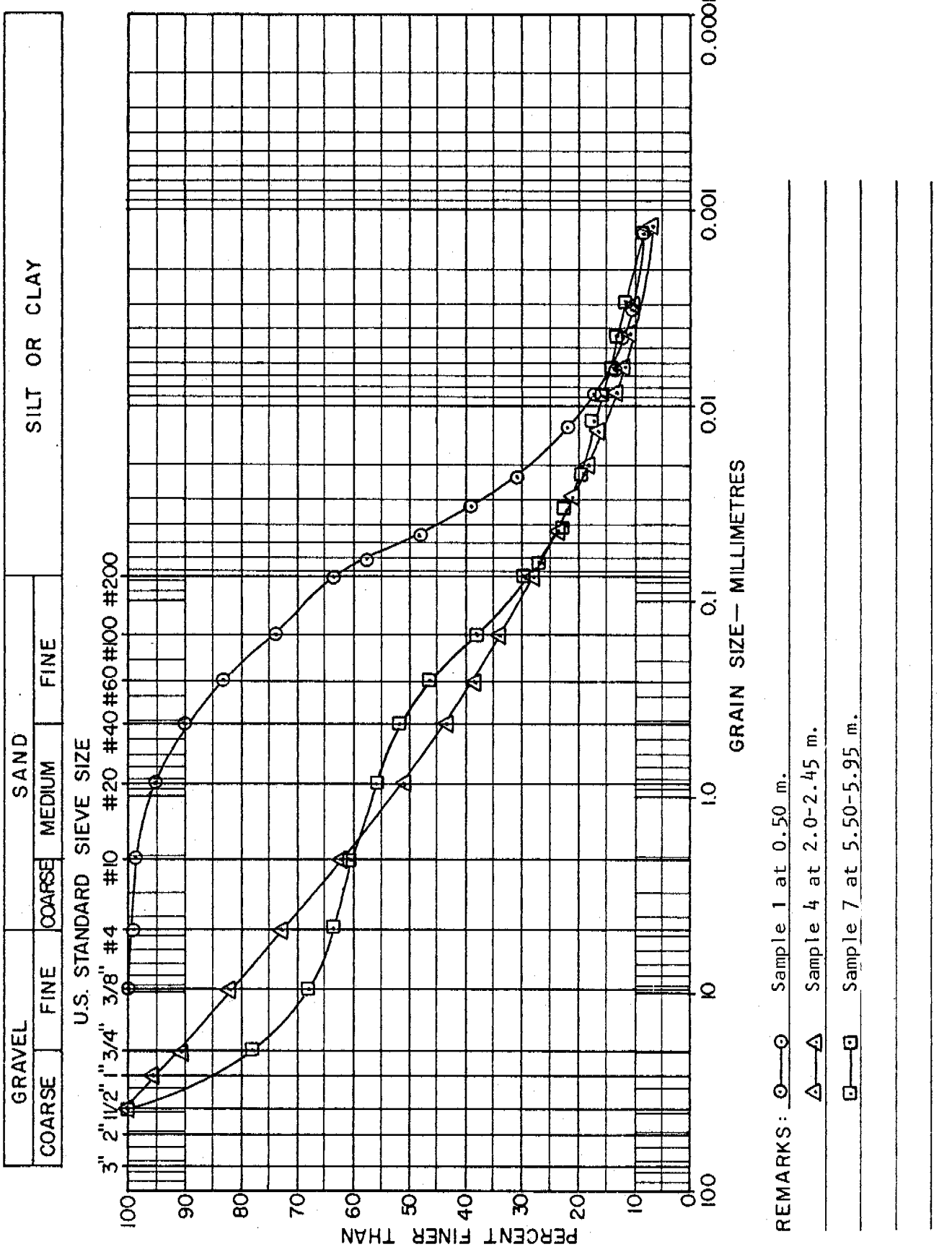
JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 347.3, .4 mile L. of C.L.
HOLE No.	77-2
DATE	Sept. 1/77 PLATE

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-2 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		1
	SPT	53/7cm	2
	B		3
2	B		4
3			
4		31/80/10cm	
	SPT		5
	B		6
5	B		7
6	B		8
	B		9
7			

SYMBOL

PERMAFROST

N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE] UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

SILT
- some sand
- trace gravel

1.2 gravel

1.5 SILT & SAND-trace of gravel

BEDROCK — NF

poorly consolidated sandstone layer

6.5 m.

END OF HOLE

Notes:
1. Hole located in undisturbed ground, 45m. east of Mayo Hwy.
2. Flat ground. Trembling aspen to 8m., white spruce to 10m.
3. Hole augered to 1.5m. Air used as drilling fluid below 1.5 m.
4. Refusal to split spoon on gravel at 1.0 m.

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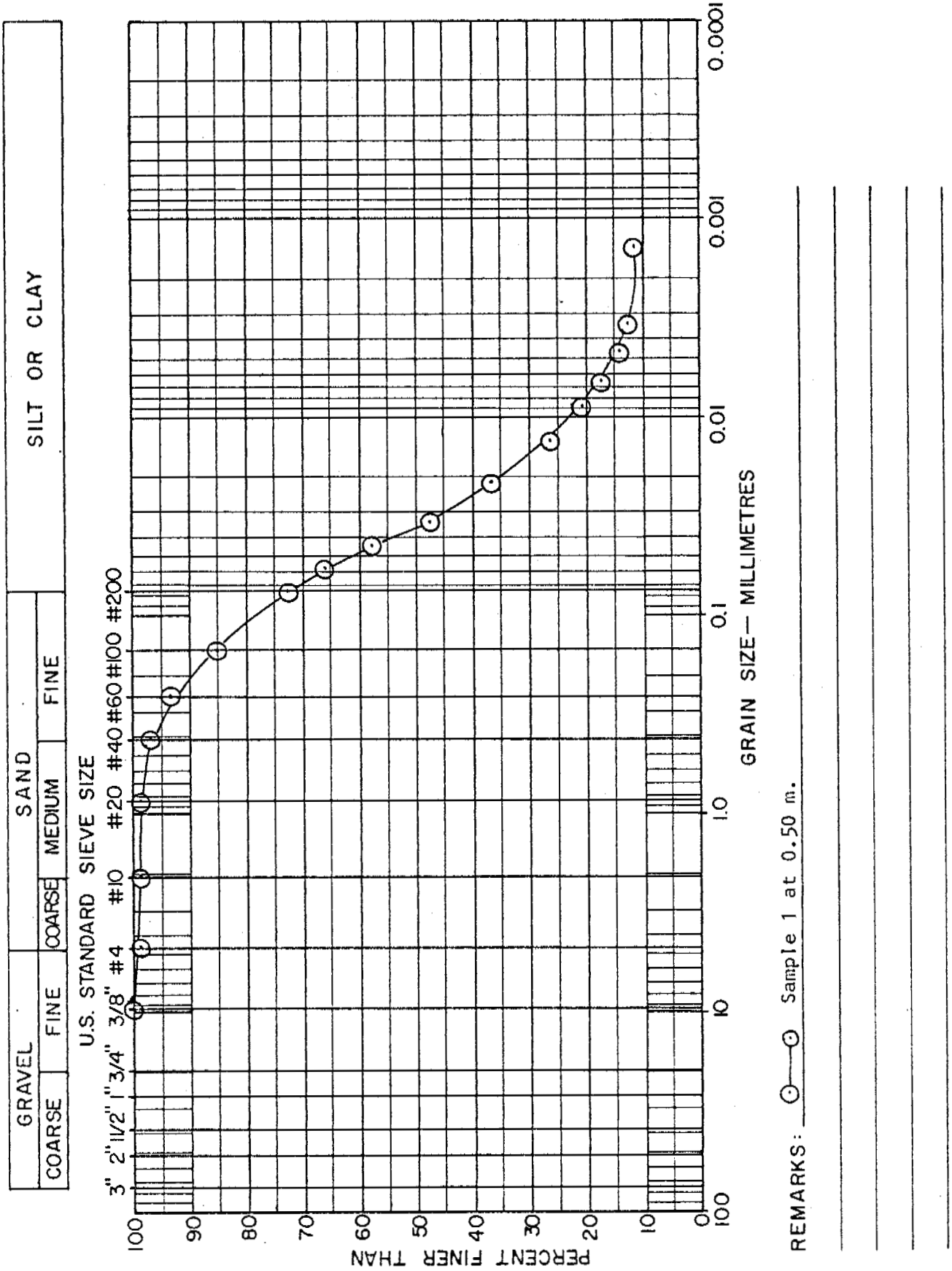
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 342.5, .3 mile L. of C.L.
HOLE No. 77-3
DATE Sept.2/77 PLATE

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-3 DEPTH
DATE	Dec./77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

DEPTH	TYPE	BLOW / 15 cm.	No.
	B		1
1		4	
	SPT	6	2
		7	
	B		3
2		6	
	SPT	4	4
		10	
	B		5
3		7	
	SPT	12	6
		18	
	B		7
4		18	
	SPT	32	8
		37	
5	B		9
6		64	
	SPT	14 cm.	10
7		26	
	SPT	50	11
		54	
8		33	
	SPT	57	12
9			
10			

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 18 Appendix C

ELEVATION

COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 — ● FIELD VANE △ LAB VANE ▽ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT — X — 0 — X — 10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

SILT AND CLAY
- some sand (Fill)

0.75

SILT AND CLAY
- some sand
- little gravel
- stiff (Till-like)

1.75

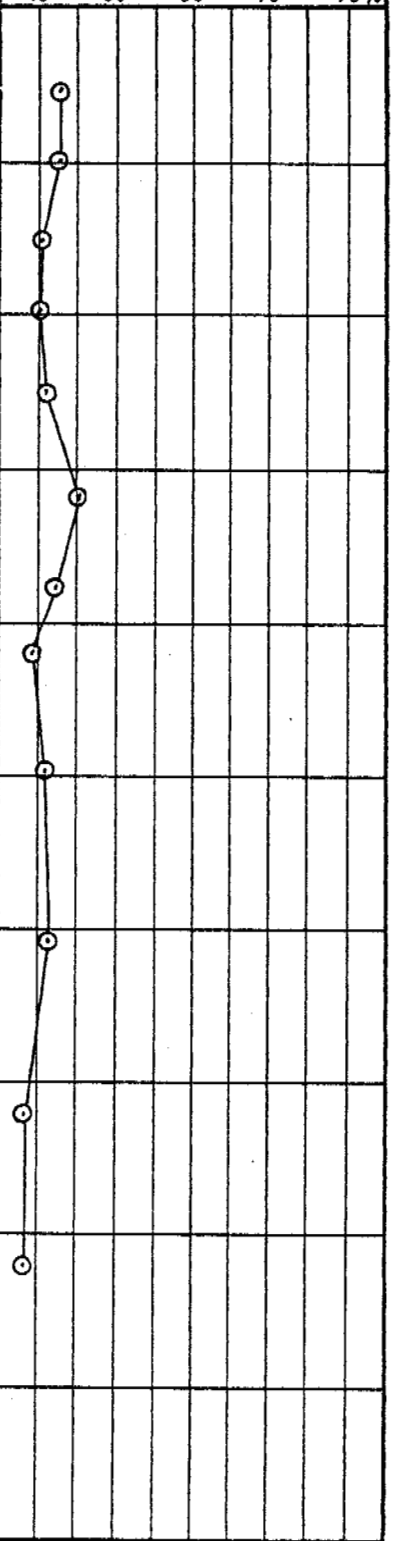
SAND
- fine
- and silt
- little gravel
- grey

NF.

9.0 m.

END OF HOLE

(Cont'd.)



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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 340.7, .4 mile R. of C.L.
HOLE No. 77-4
DATE Sept. 2/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT X — WATER CONTENT — 0 — LIQUID LIMIT X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located 40 m. west of Mayo Highway and 45 m. south of creek
2. Hummocky ground slopes 4° toward the creek. Ground surface covered with shrubs, white spruces, to 20 m.
3. Hole augered up to 6.0 m. Air used as drilling fluid below 6.0 m.
4. Samples after 8.5m. could not be recovered due to caving.
5. Piezometer installed to 3.0 m.

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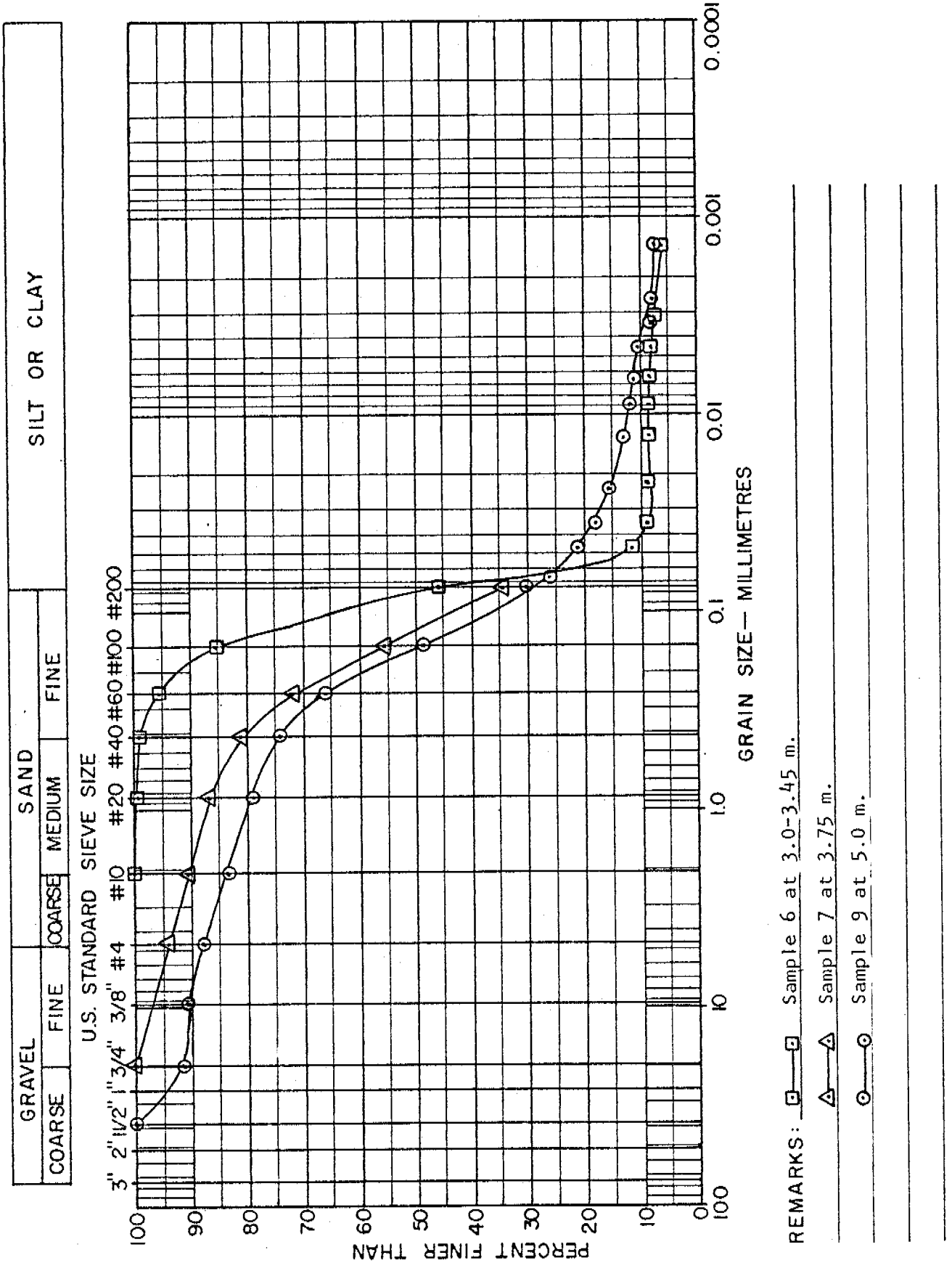
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 340.7,.4 mile R. of C.L.
HOLE No. 77-4
DATE Sept. 2/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No. 77-4	DEPTH
DATE	Dec/77

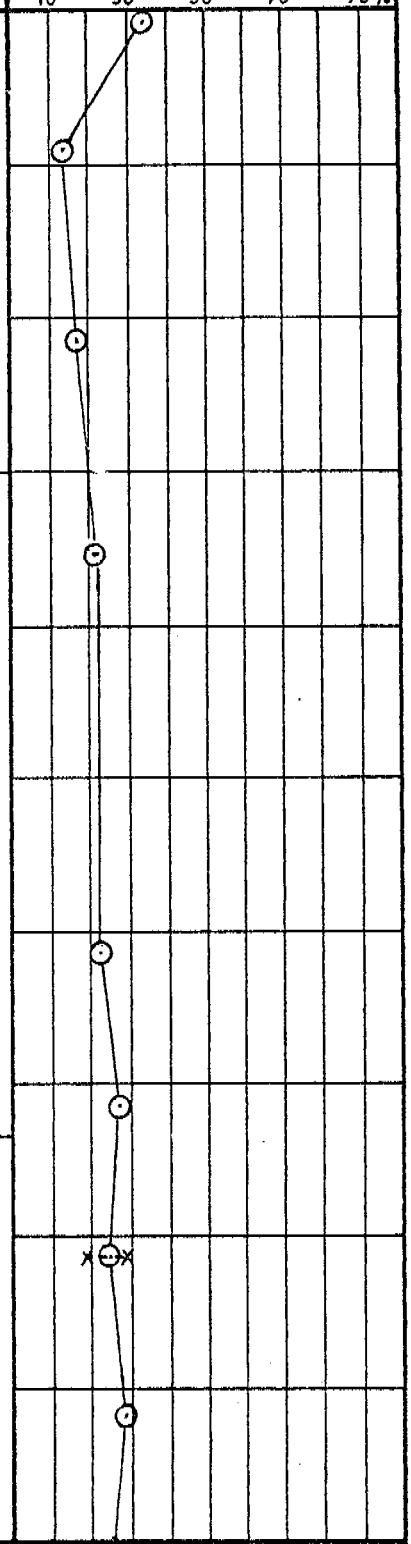
TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 19 Appendix C
							ELEVATION
1	SY		1				0.1 Organic Cover SAND - fine - some silt - trace of gravel - brown
2	SPT	6 7 7	2				
3							3.0
4	SY SPT	1 3 4	3 4			NF	SILT AND SAND - trace of clay - slight plasticity - layers of fine gravel - grey
5	SPT	1 2 2	5				
6		4					
7	SPT	5 5	6				
8	SPT	3 3 2	7				7.3
9	SY		8				SILT AND CLAY - trace of fine sand - low plasticity - laminations of sand & clay - sand layers - soft to firm - grey
10	SPT	3 4 4	9				(cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
FIELD VANE △ LAB VANE UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-5
DATE Sept. 3/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	8 7 8	10				
11							
			11				AS ABOVE
12							
			12				
13							
-	SPT	2 3 3	13			NF	
14							
15							
16							
	SPT	8 15 13	14				gravel layer
17							
18							
19							
	SPT	7 7 5	15				
20							(cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-5
DATE Sept. 3/77 PLATE

METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
21							AS ABOVE
						NF	
22		1					
		2					
23	SPT	2	16				22.5m.
							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ☐ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

NOTES:

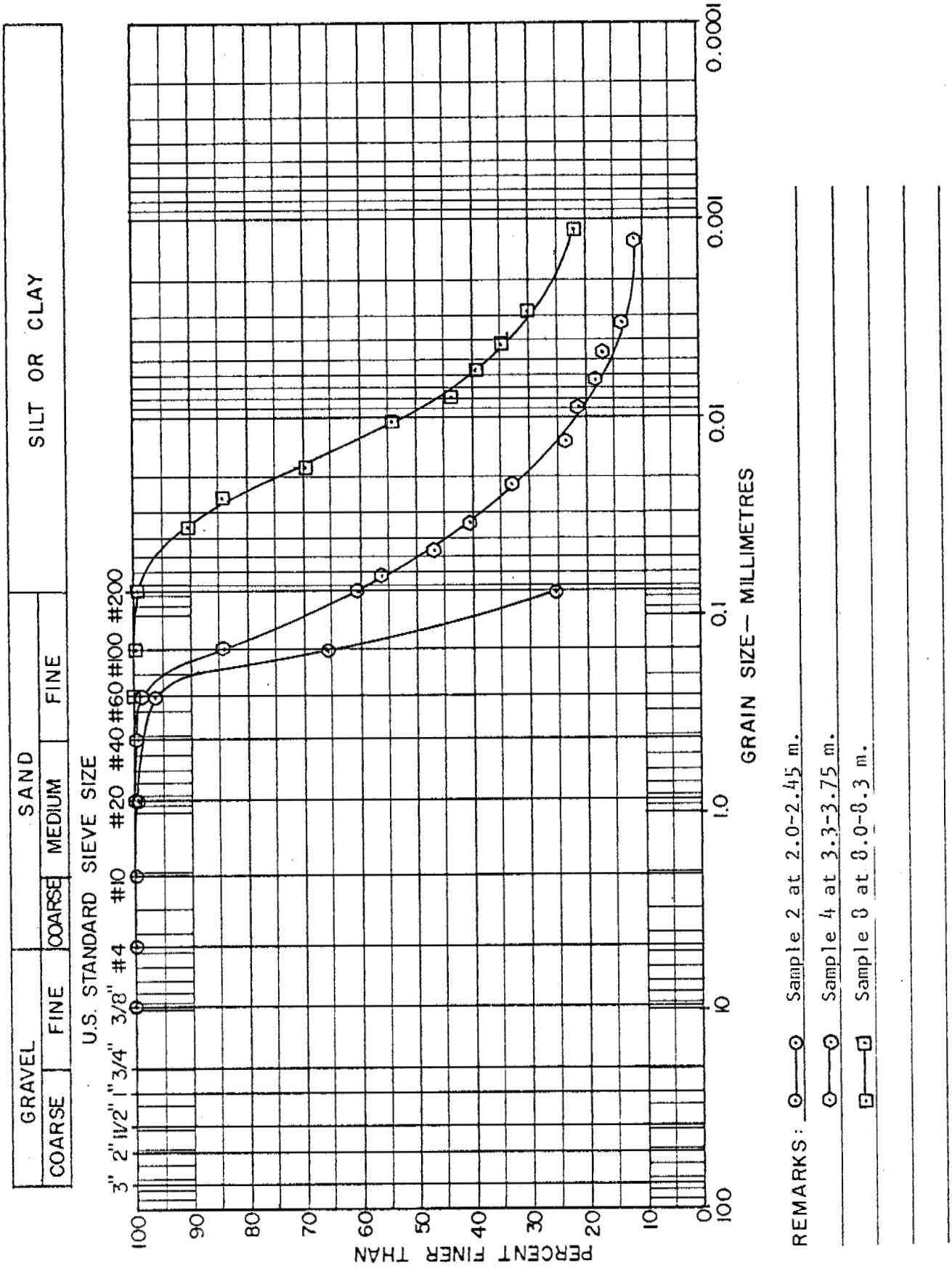
1. Hole located at 3 km. east of Mayo Highway and 30 m. west of Yukon river. Flat ground surface.
2. Hole surrounded by short pasture grass, mountain cranberry, trembling aspen (5-6m.), white spruce (6-9m.) (some around 20m. high about 40m. west of hole).
3. Mud drilling from 0.5m.
4. Free water at 2.4m. in a well located 1km. south of hole.
5. Sample No's. 3, 5, 11 & 12 not recovered due to caving.
6. Piezometer standpipe installed to 6.0 m..

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-5
DATE Sept. 3/77 PLATE

U.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-5 DEPTH
DATE	November 1977

TEST HOLE LOG

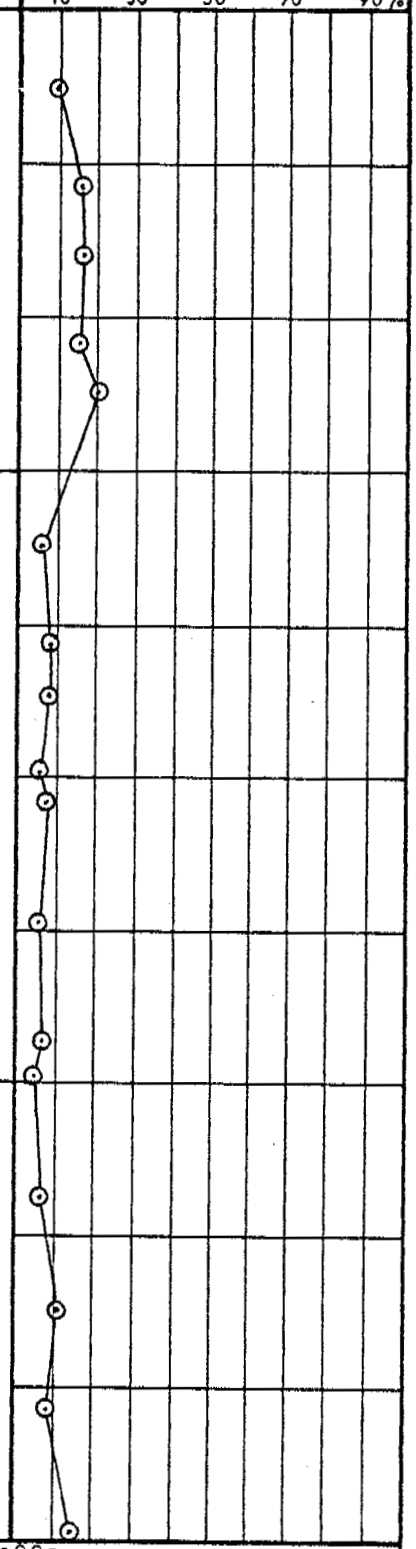
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
					PERMAFROST		LOCATION Sheet No. 18 Appendix C
							ELEVATION
							0.10 TOPSOIL
1	B		1				SILT AND CLAY - little sand - little gravel - low plasticity - brown to 1.5 m. then grey
		8					
	SPT	10	2				
		12					
2	B		3				
		7					
	SPT	7	4				
		4					
3	B		5				
		7					3.0
	SPT	12	6				SAND AND GRAVEL - trace to little silt - brown
4	B	16	7				
		8					
	SPT	54/	8			NF.	
5	B	10cm	9				
	B		10				
		28					
6	SPT	35	11				
		58					
	B		12				
		30					
7	SPT	34	13				7.0
		40					
	B		14				SAND - and silt and clay - some gravel (Till)
		34					
8	SPT	54/	15				
		1.5 cm.					
	B		16				
9		50					
	SPT	54/	17				
		7.5 cm.					
10	B		18				10.0 m. (Cont'd.)

END OF HOLE

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 342.1, 0.1 mile R. of C.L.
HOLE No. 77-6
DATE Sept. 20/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA: DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST: N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▨ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

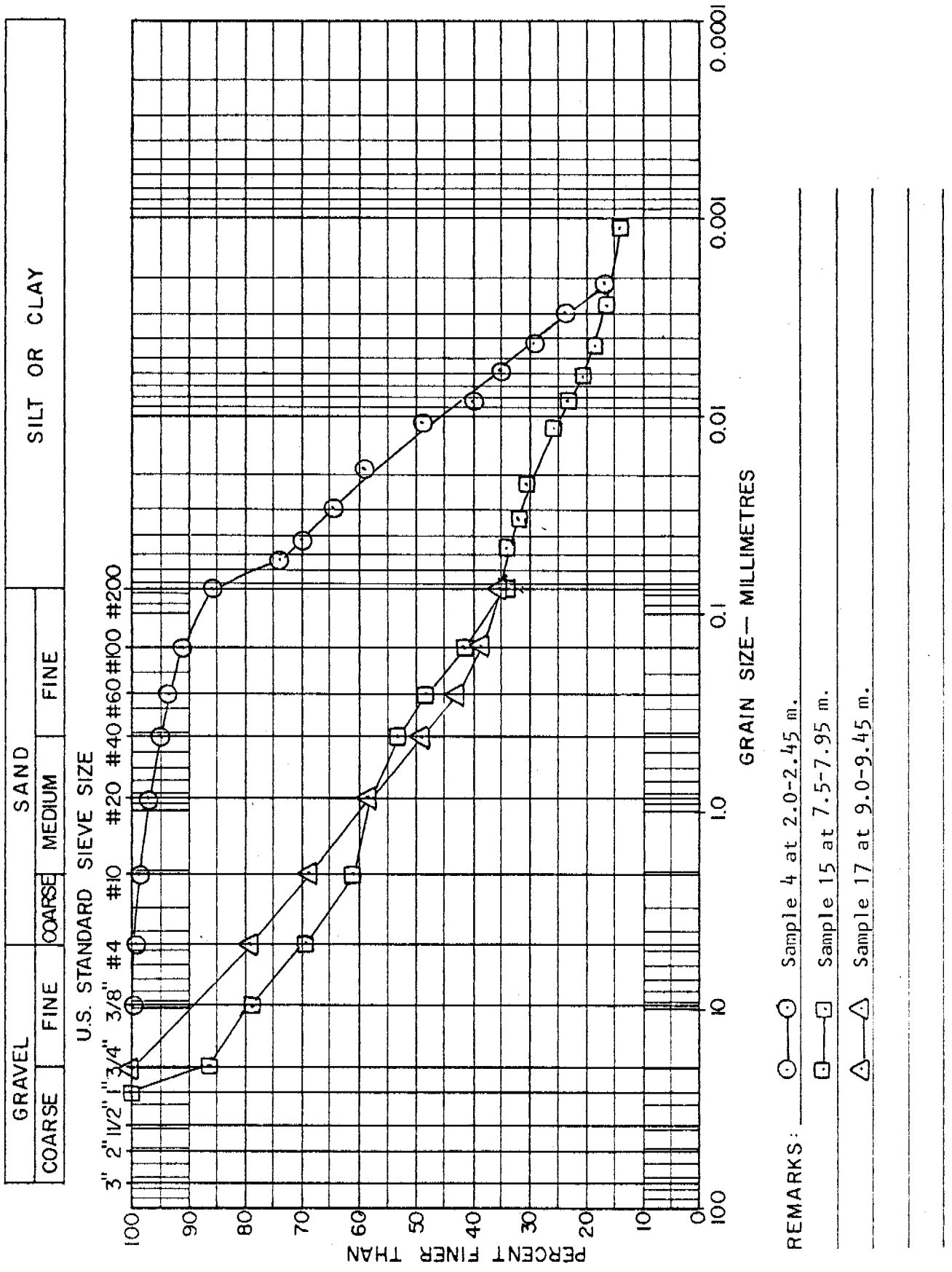
1. Hole located 15 m. northwest of Mayo Highway.
2. Terrain slopes 5° towards the highway. Ground surface covered with shrubs, white spruces 3m., Lodgepole pines and mountain cranberry.
3. Hole augered up to 4.0 m. Air used as drilling fluid below 4.0 m.
4. Water encountered at 9.0 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 342.1, .1 mile R. of C.L.
HOLE No. 77-6
DATE Sept. 20/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-6 DEPTH
DATE	Dec./77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B	3	1
	SPT	6 7	2
2	B	3	3
	SPT	5 5	4
3	B	6	5
	SPT	6 9	6
4	B	4	7
	SPT	6 6	8
5	B	5	9
	SPT	9 9	10
6	B	5	11
	SPT	7 14	12
7		15	
	SPT	38 47	13
8		15	
	SPT	54/4cm.	14
	SPT	Bounding	15
9			
10			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

ORGANIC SILT
- roots (Fill)

0.5

CLAY AND SILT
- trace fine sand
- trace of gravel
- medium plasticity
- laminations of fine sand
- brown to 3m. then grey

NF.

4.0

GRAVEL
- some silt
- little sand
- cobbles
- grey

9.0 m.

END OF HOLE

(Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

105

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 337.4, .7 mile R. of C.L.
HOLE No. 77-7
DATE Sept. 4/77 PLATE

F.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located 30 m. from Mayo Highway.
2. Flat ground. Ground surface covered with short pasture grass shrubs; white spruces to 25 m.
3. Hole augered up to 5.5 m. Drilling mud used from 5.5 to 9.0m.

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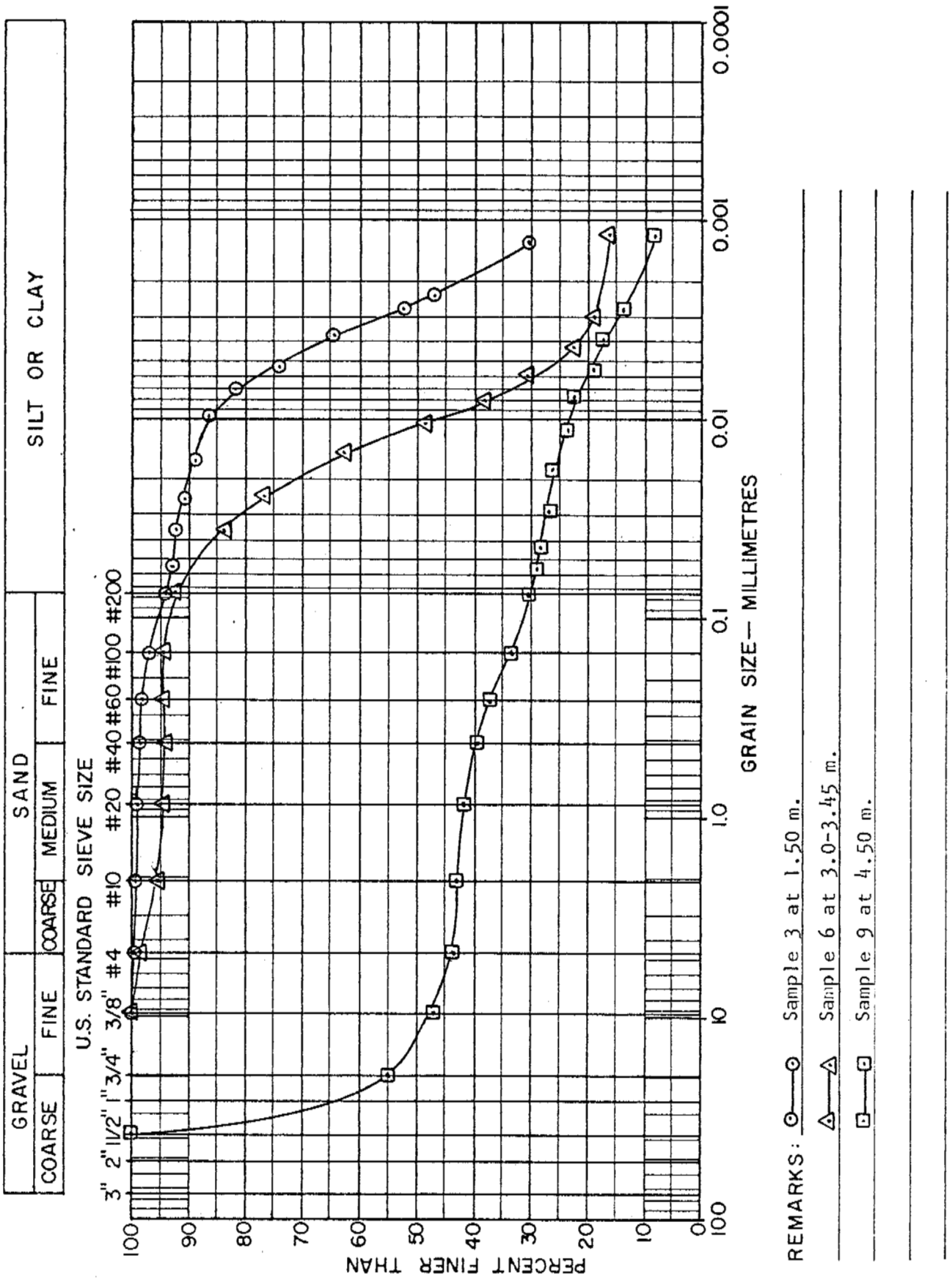
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 337.4, .7 mile R. of C.L.
HOLE No. 77-7
DATE Sept. 4/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-7 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B	10	1
	SPT	17 18	2
	B		3
2		9	
	SPT	16 16	4
	B		5
3		10	
	SPT	17 17	6
4		18	
	SPT	27 54	6A
	SY		7
5			
		24	
	SPT	24 23	8
6			
		24	
	SPT	34 29	9
7			
		18	
8	SPT	39 51	10
		35	
	SPT	39 49	11
9			
		14	
	SPT	32 53	12
10			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

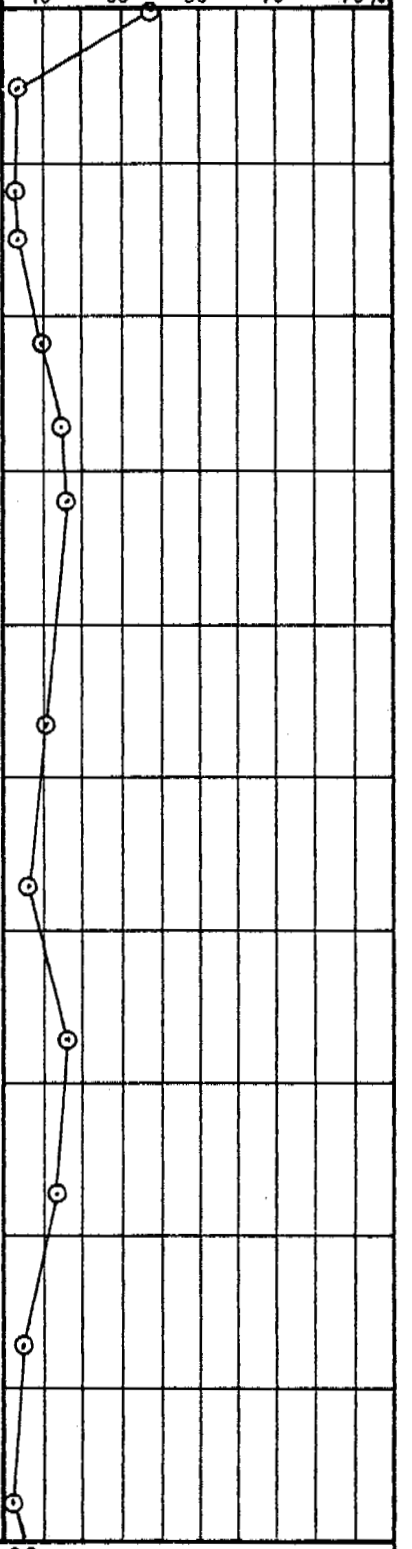
GRAVEL AND SAND
- trace to little silt
- sand stratifications
- brown

NF.

10.0 m. (Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▦ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 336.4, .3 mile R. of C.L.
HOLE No. 77-8
DATE Sept.4/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	SPT	29 37 54fo 10cm	13
11			
12			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF

LOCATION

ELEVATION

DESCRIPTION OF MATERIAL

GRAVEL AND SAND
- some silt
10.75 m. (Till-like)

END OF HOLE

Notes:

1. Hole located at 0.5 km north of 43.0 km. post on Mayo Highway by the side of a trail.
2. Flat ground. Small hillock on north side. Ground surface covered wtih shrubs & dry grass. White spruces, lodgepole pine to 1.5 m. and trembling aspen to 8.0 m.
3. Hole augered up to 1.5 m. Drilling mud used from 1.5 to 10.75 m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▦ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

NP

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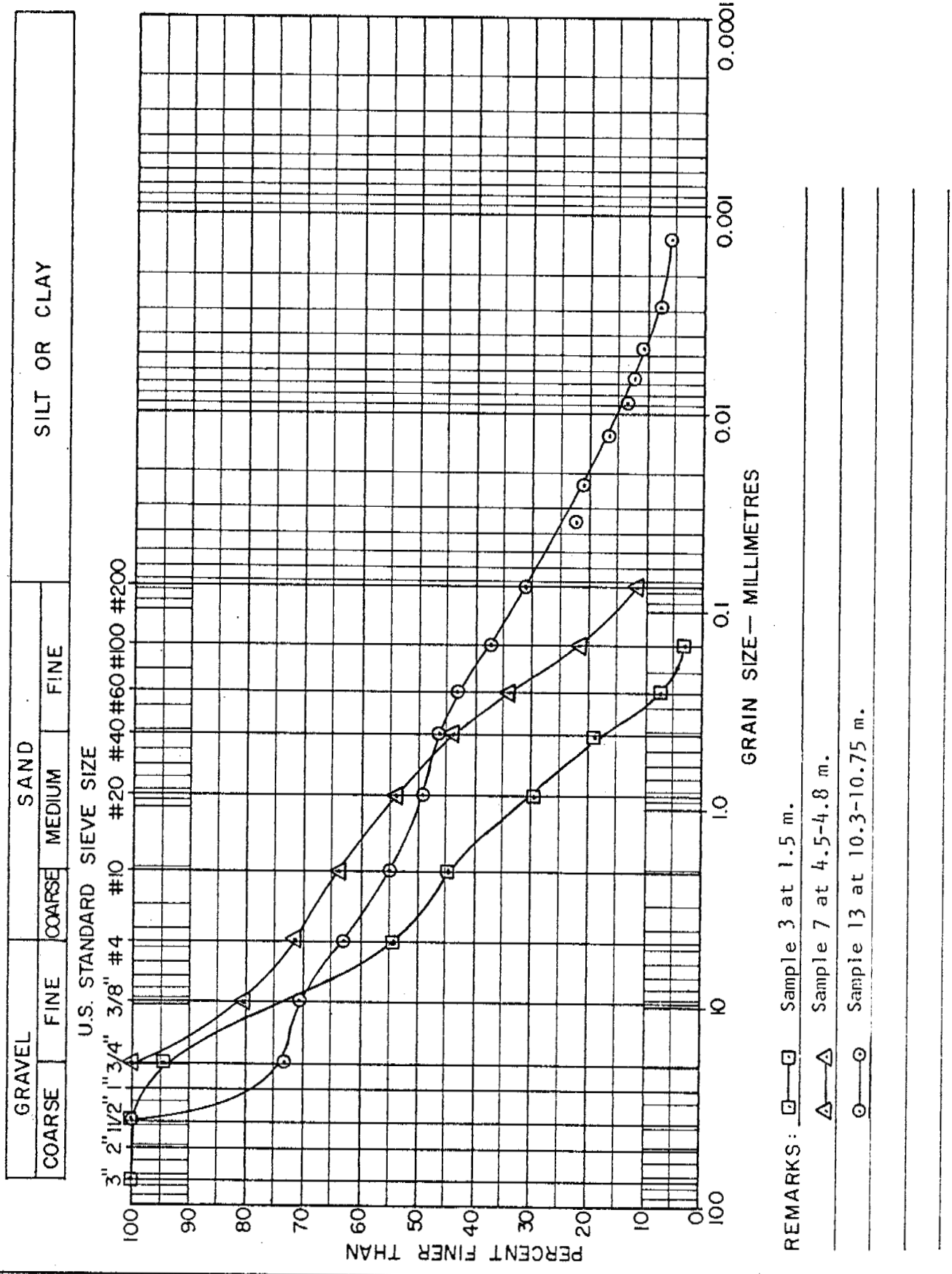
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 336.4, .3 mile R. of C.L.
HOLE No. 77-8
DATE Sept.4/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-8 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
1	B		1
	SPT	5	
		9	2
		11	
	B		3
2			
3		14	
	SPT	42	4
		45	
	B		5
4		15	
	SPT	22	6
		27	
		18	
5	SPT	25	7
		26	
6			
		16	
	SPT	26	8
		27	
7			
		54	
8	SPT	60	9
9	SPT	68	
10			

SYMBOL

PERMAFROST

N.R.C. CLASS

N.F. or F.

LOCATION Sheet No. 18 Appendix C

ELEVATION

DESCRIPTION OF MATERIAL

0.1 TOPSOIL

SILT AND SAND
- little clay

0.75

SILT AND CLAY
- sand laminations & layers
- organic inclusions

1.5

SILT AND CLAY & SAND
- little gravel
- cobbles
- low plasticity
- very stiff
- brown

(Till)

NF.

7.2

GRAVEL

9.15 m.

END OF HOLE

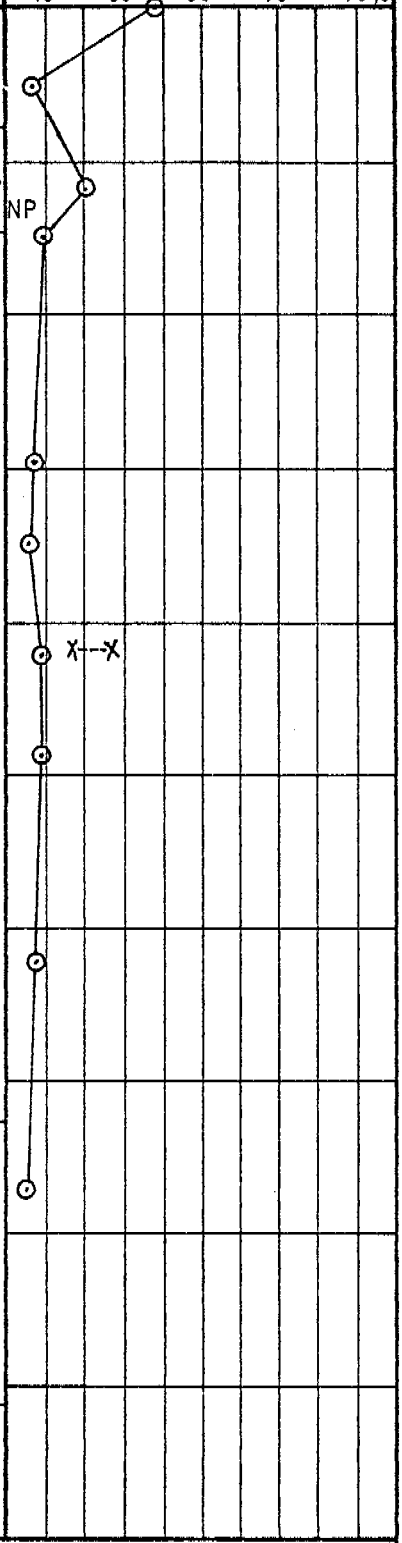
(Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

NP

X--X



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 332.8, .5 mile R. of C.L.
HOLE No. 77-9
DATE Sept. 5/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ☒ UNCONF.
HT. DROP 76 cm.							ELEVATION	
SAMPLE DATA					N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — — — — — 0 — — — — — X 10 30 50 70 90%
DEPTH	TYPE	BLOW 15 cm.	No.					

Notes:

1. Hole located 45 m. south of 49 km. post on Mayo Highway and about 30 m. east of hwy in disturbed ground.
2. Hummocky ground. Ground surface covered with moss, shrubs trembling aspen to 2.0 m.
3. Hole augered up to 3.5 m. Air used as drilling fluid below 3.5 m.
4. Refusal to split spoon at 9.15 m. on gravel or boulders.
5. Hole dry on completion.

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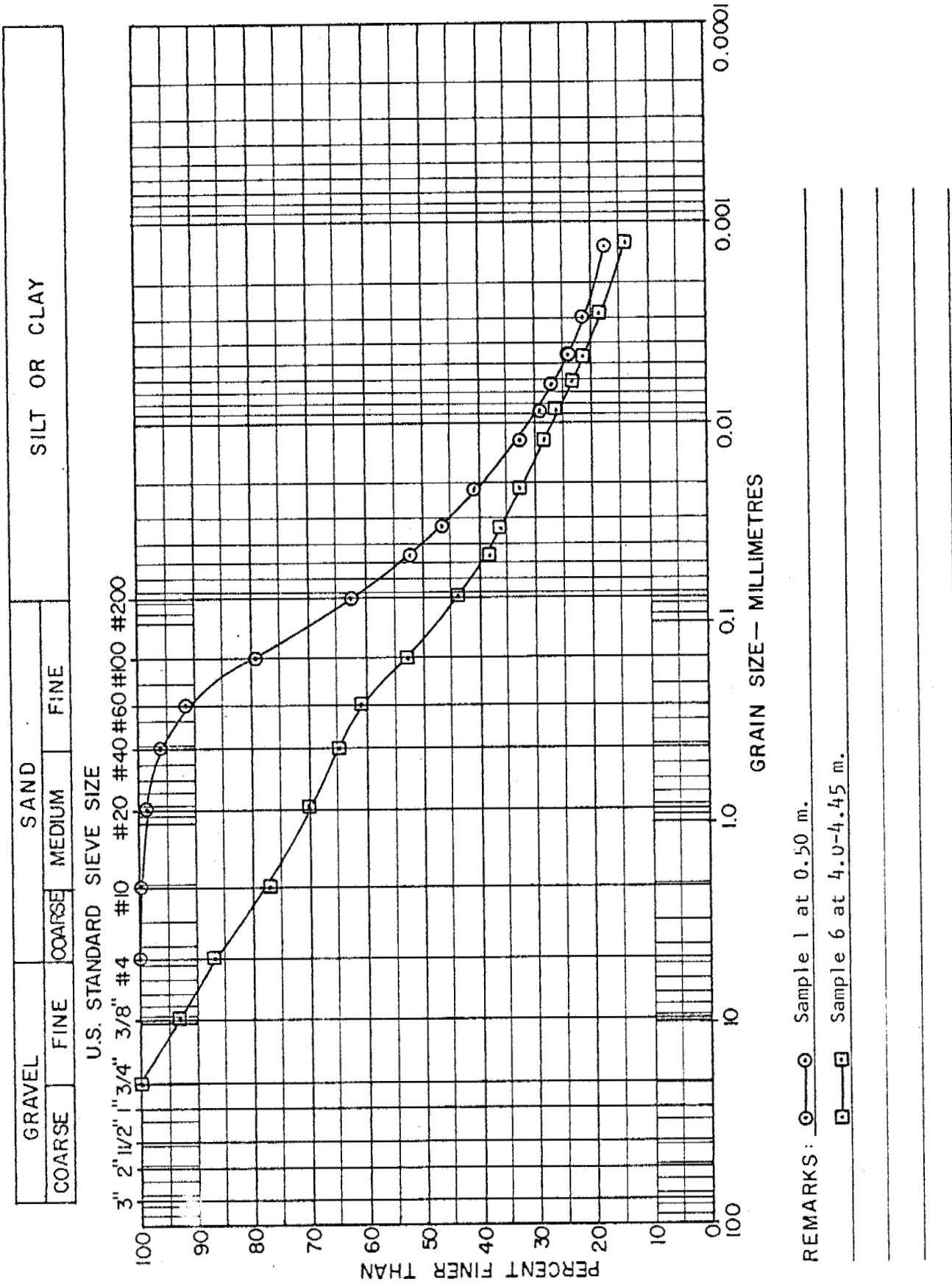
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 332.8,.5 mile R. of C.L.
HOLE No. 77-9
DATE Sept. 5/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.

CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-9 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		1
1		6	
	SPT	10	2
		10	
	B		3
2		13	
	SPT	21	4
		21	
	B		5
3		18	
	SPT	22	6
		22	
4		12	
	SPT	17	7
		14	
		34	
5	SPT	56	8
		52	
6	SPT	48	9
		39	
7	SPT	55 for 12 cm.	10
8	SPT	Bouncing	11
9			

SYMBOL | PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 17 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 TOPSOIL

CLAY AND SILT
- some sand
- trace to little gravel
- trace of organics
- medium plasticity

1.8 (Fill)

GRAVEL AND SAND
- trace to little silt
- brown

NF

5.1

SAND AND GRAVEL
- little silt and clay
- cobbles and boulders
- grey

(Till)

Bedrock or boulder

8.65 m.

END OF HOLE

(Cont'd)

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 329.4, .3 mile R. of C.L.
HOLE No. 77-10
DATE Sept. 5/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA: DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST: N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ⊠ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Located about 25.0 m. north-east of Mayo Highway, and about 2 m. away from cut on sloping ground.
2. Terrain slopes 25° westerly. Ground surface covered with short grass, shrubs, moss, white spruce 25 to 30 m. and trembling aspen to 10 m. Some boulders located nearby.
3. Hole augered up to 2.5 m. Air used as drilling fluid from 2.5 m. to 3.5 m. Drilling mud used from 3.5 m. to 8.65m.
4. Sample Nos. 11 & 12 could not recover.

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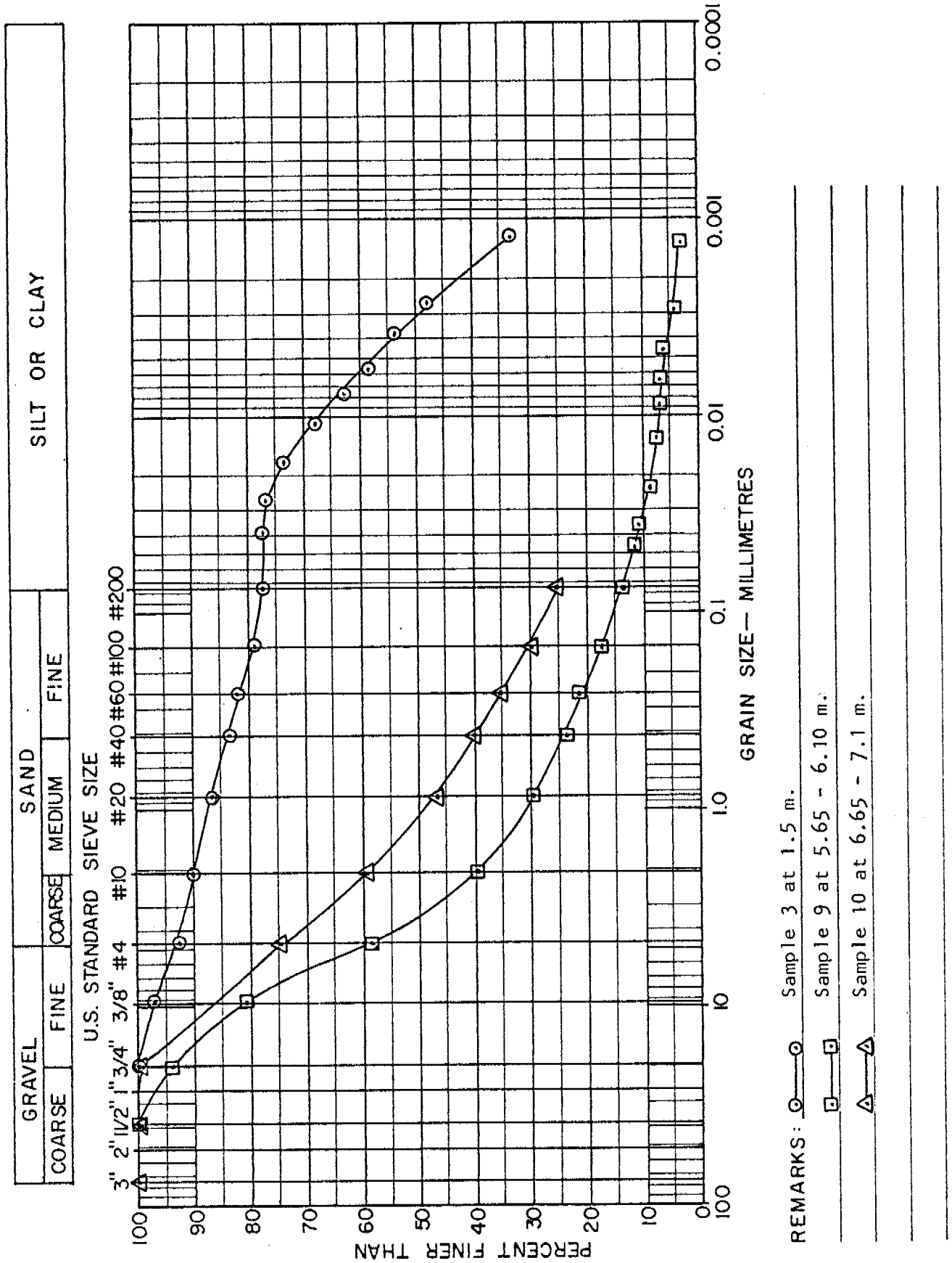
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 329.4, .3 mile R. of C.L.
HOLE No. 77-10
DATE Sept. 5/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeling
LOCATION	
HOLE No. 77-10	DEPTH
DATE Dec/77	

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
1	B	4	1
2	SPT	6 6	2
	B		3
		8	
3	SPT	6	4
	B	5	5
		7	
4	SPT	11 13	6
	B		7
		11	
5	SPT	13 15	8
	B		9
		10	
6	SPT	12 15	10
	B		11
		10	
7	SPT	15 16	12
	B		13
		10	
	SPT	14 19	14
	B		15

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF

LOCATION Sheet No. 17 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 TOPSOIL
SILT
- little sand
- trace of clay
- trace of organics
- light brown

1.1
SILT
- coarse
- some sand
- trace of clay
- light brown

2.5
CLAY AND SILT
- trace sand

3.0
SILT AND CLAY
- little sand
- low plasticity
- light grey brown

7.5m.
END OF HOLE

Notes:
1. Hole located 80m. west of Mayo Hwy. at Km. Post 65.8.
2. Flat ground. Vegetation of shrubs, white spruce trees 20-25m., and trembling aspen.
3. Hole augered up to 7.5m.
4. Hole dry on completion.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

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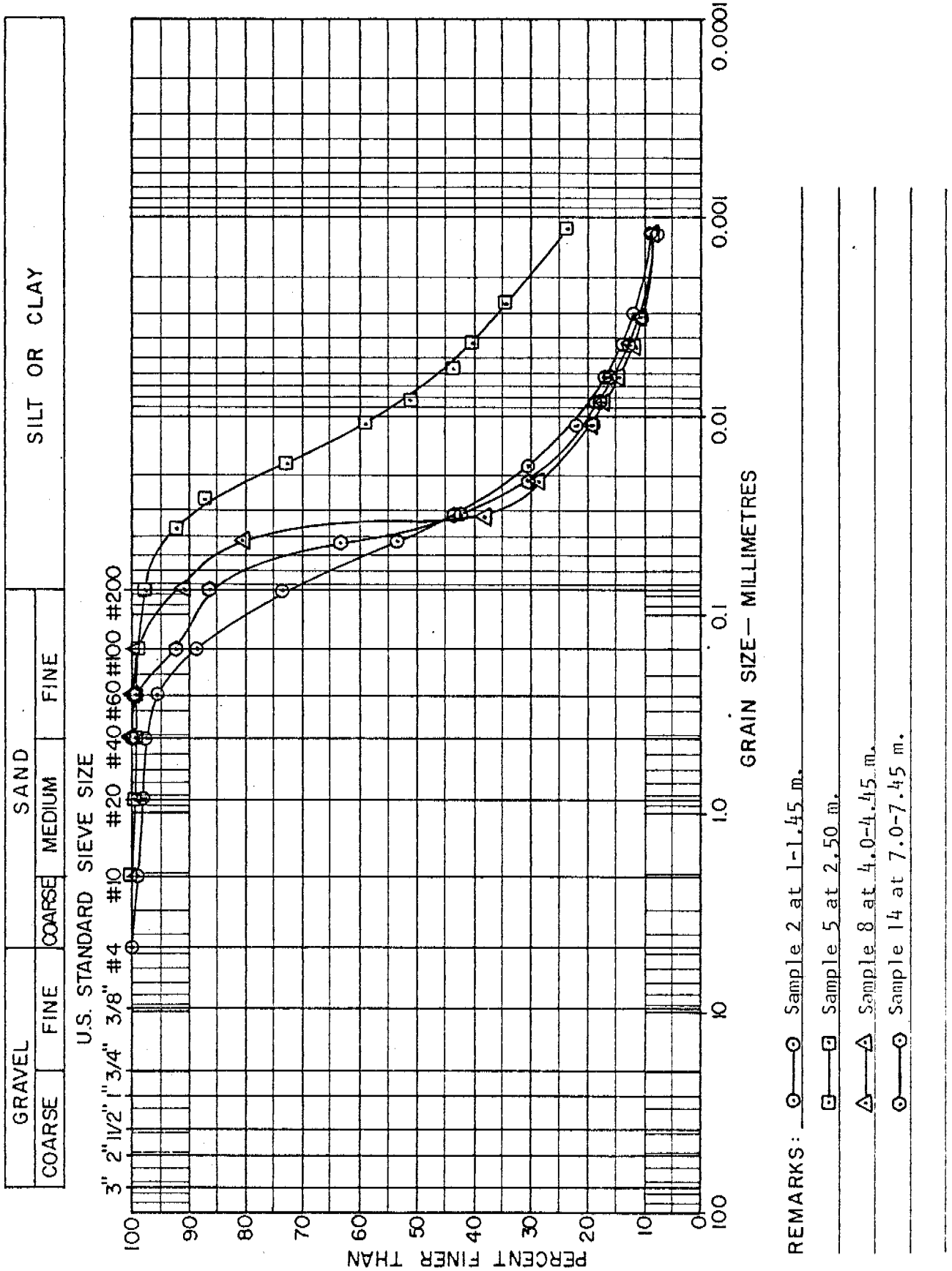
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP322.0, 0.8 mile R. of C.L
HOLE No. 77-11
DATE Sept. 6/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-11 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 17 Appendix C
							ELEVATION
	B		1				0.1 Organic Cover
1		4					SILT AND SAND - little gravel - brown
							1.0
	SPT	5 5	2				SAND AND SILT - some gravel - trace of clay - slight plasticity - rusty silt & sand pockets - brown
	B		3				
2		6					(Till like)
	SPT	8 10	4				
	B		5				
3		18					
	SPT	43	6			NF	
	B	49	7				
4							
		38					
	SPT	62	8				
5							
		43					
	SPT	65 for 13cms	9				
6							
		41					
	SPT	54 for 7 cms	10				← gravel layer
7							7.1 m.
	SPT	54	11				END OF HOLE
		for 6cms					
8							

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:
1. Hole located about 450 m. east of Mayo Highway.
2. Terrain slopes 10° towards south Ground surface covered with shrubs, mountain cranberry, white spruces 20 to 25m. and trembling aspen 20-25m.
3. Hole augered up to 3.5m.. Air used as a drilling fluid from 3.5m. to 7.1m.
4. Hole dry upon completion.

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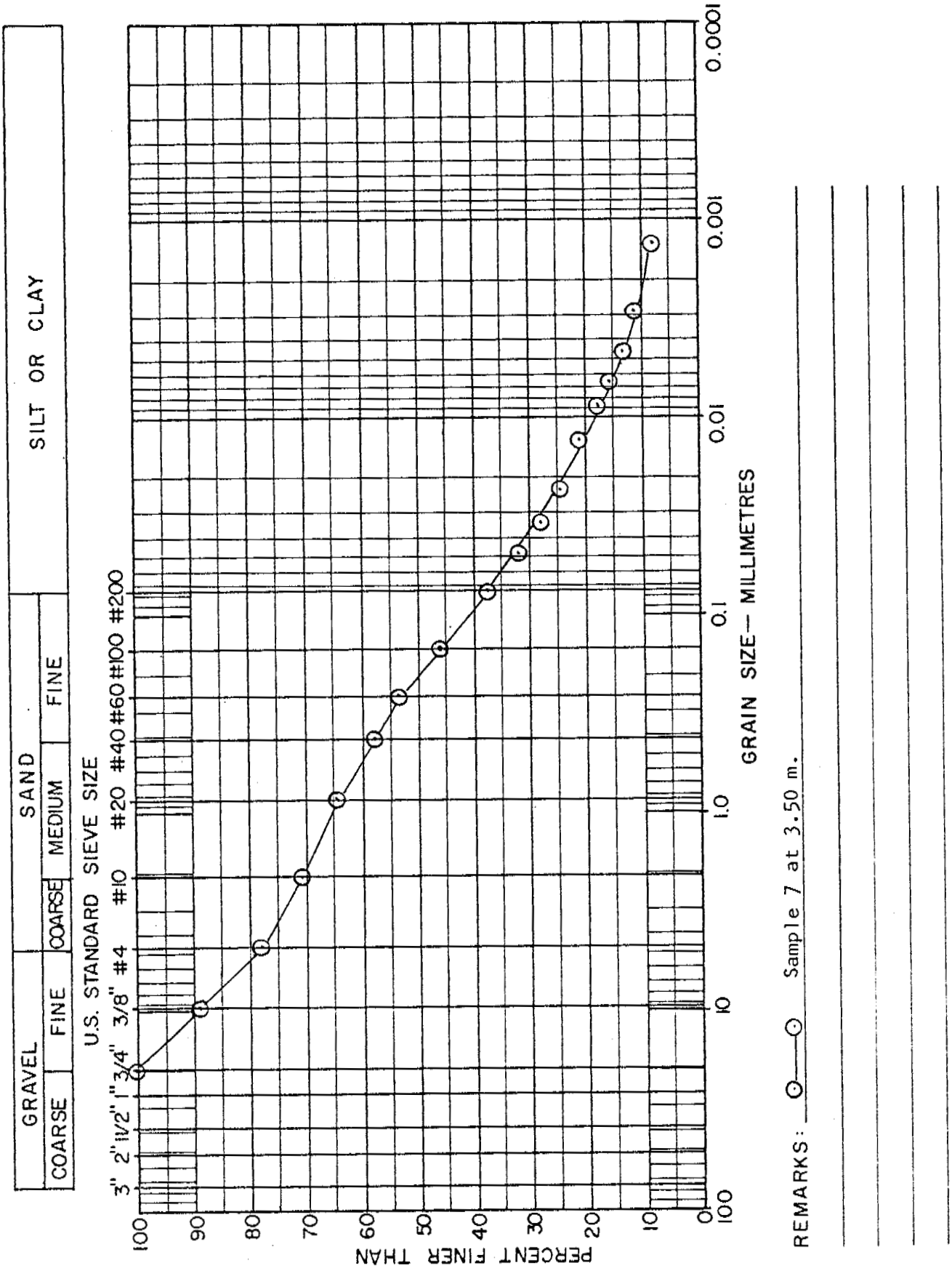
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP315.2, 0.4 mile R of C.L.
HOLE No.	77-12
DATE	Sept. 6/77 PLATE

.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-12 DEPTH
DATE	Dec./77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

LOCATION Sheet No. 16 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — — 0 — — — — — — X
10 30 50 70 90%

SAMPLE DATA DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							0.1 TOPSOIL
	B		1				
1		23					
		26					
	SPT	29	2				GRAVEL - some sand - trace to little silt
		18					
2		28					
	SPT	25	3				
		11					
		23					
3	SPT	24	4			NF	
		9					
	SPT	24	5				← -silt and clay laminations
4		27					
	SPT	17	6				
		33					
5		33					
		32					
	SPT	32	7				
6		68					
	SPT	for 15cm	8				6.45 m.
							END OF HOLE

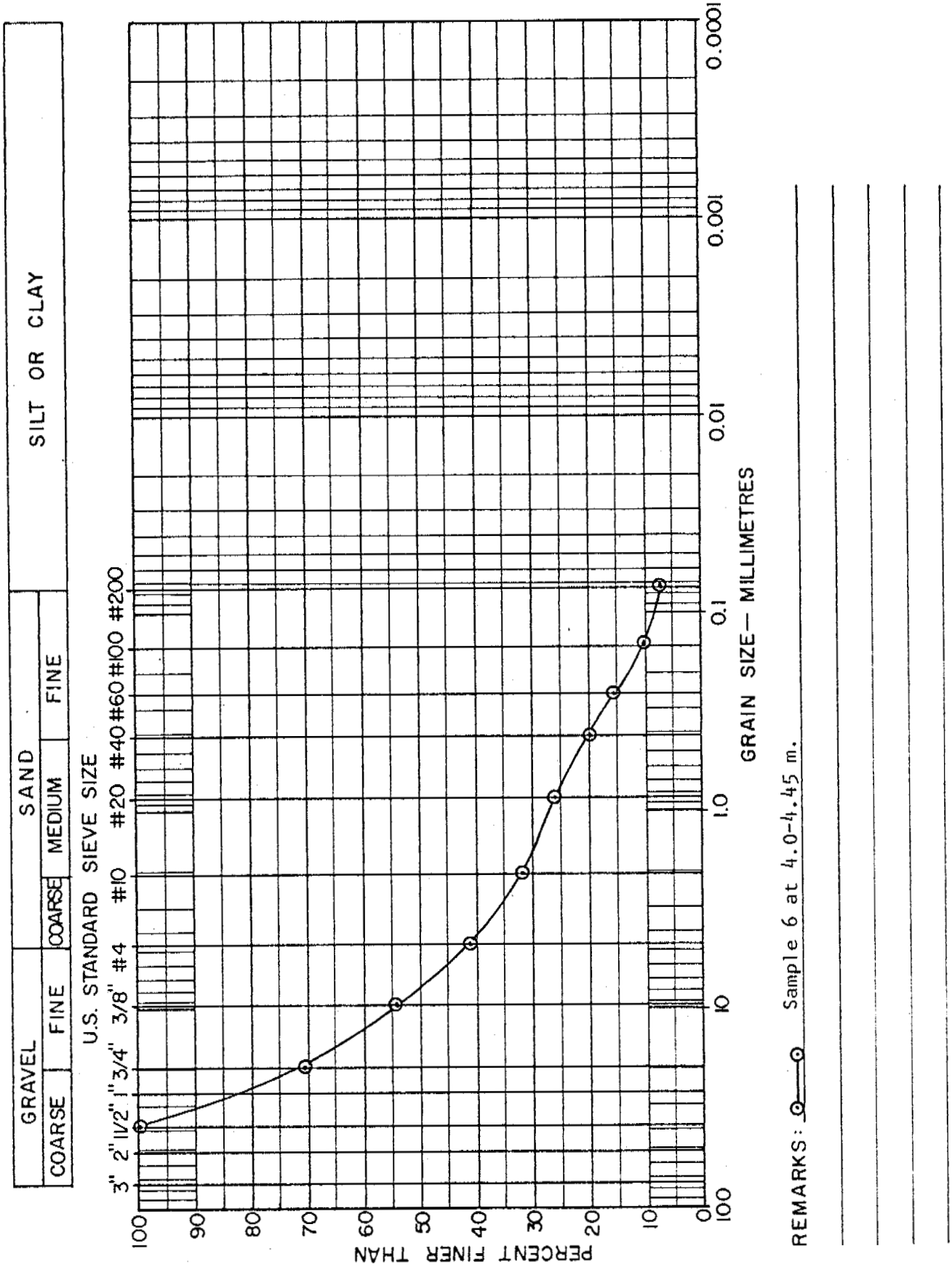
Notes:
1. Hole located about 50m. north-east of Braeburn Airship
2. Flat ground. Vegetation consists of shrubs, mountain cranberry & trembling aspen 8 to 10 m.
3. Hole augered up to 0.5m.. Drilling mud used from 0.5m. to 6.45m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP309.4, 0.2 mile R. of C.L.
HOLE No. 77-13
DATE Sept. 9/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-13 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

LOCATION Sheet 16 Appendix C
ELEVATION

PERMAFROST

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 30 50 70 90%

SAMPLE DATA				SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15 cm.	No.				
1	SPT	8 12 14	1				0.1 TOPSOIL GRAVEL AND SAND - some silt - brownish grey
	SY		2				
2	SPT	10 7	3				
3	SPT	2 4 6 40	4				3.0
4	SPT	22 29 26	5			NF	SILT AND CLAY & SAND - trace to little gravel - slight to low plasticity - rusty silt & sand pockets - brownish grey - stiff (Till)
	SPT	25 37 40	6				
5	SPT	29 41 52 for 12cm	7				
6	SPT	30 42 51	8				
7	SPT	61 for 13cm	9				
8	SPT	53 for 5cm.	10				
	SPT	62	11				8.15 m.
9							END OF HOLE (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 304.9,.5 mile R. of C.L.
HOLE No.	77-14
DATE	Sept.7/77 PLATE

K.L.C - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:

1. Hole located at Km post 96 and 300 m. east of Mayo Highway powerline pole.
2. Hummocky ground. Vegetation consists of white spruces, trembling aspen, and mountain cranberry. Gravel exposure 12 m. north of hole. Terrain about 50m. off the hole, sloping westwardly.
3. Drilling mud used from 0.0 m. to 8.15 m.

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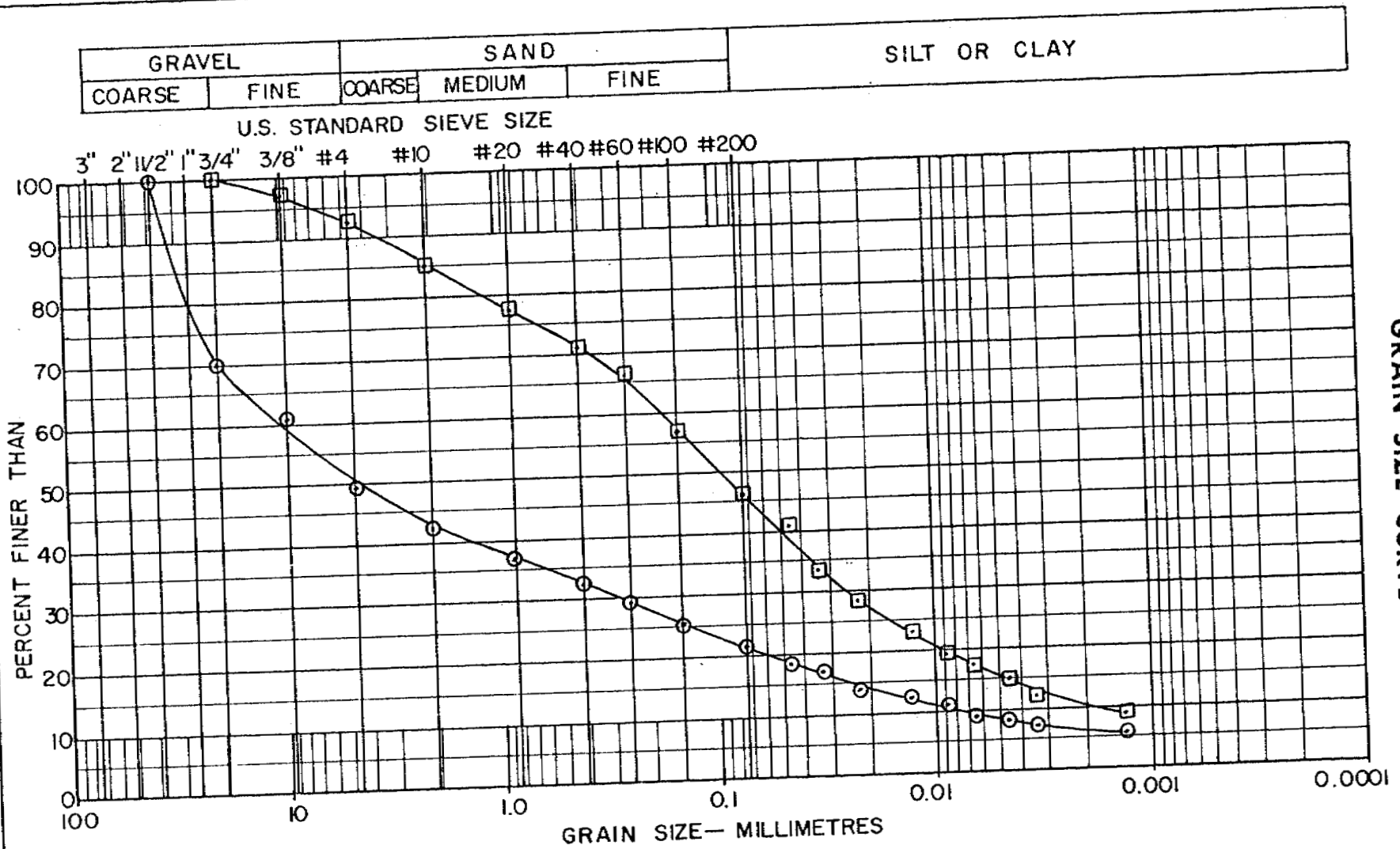
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 304.9, .5 mile R. of C.L.
HOLE No. 77-14
DATE Sept. 7/77 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION
HOLE No. 77-14 DEPTH
DATE Dec/77

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample 4 at 2.50-2.95 m.

⊡—⊡ Sample 9 at 6.0-6.45 m.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	SPT	7, 11, 12	1
	SY		2
2	SPT	7, 7, 10	3
3	SPT	22, 29, 43	4
4	SPT	16, 53	5
	SPT for	8cm	
	SPT for	32, 52 10cm	6
5	SPT	53	7
6	SPT	63 for 12cm	8
7	SPT	11, 14, 19	9
	SPT	15, 21, 29	10
8	C		11
9	C		12
10	C		13
	C		14

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	3.2 Partially frozen
Vr Vx Nbn	7.5
Vx Nbn	

LOCATION Sheet No. 16 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

GRAVEL & SAND
- fine to coarse
- trace of silt
- layered with gravely sand
- cobbles

7.1

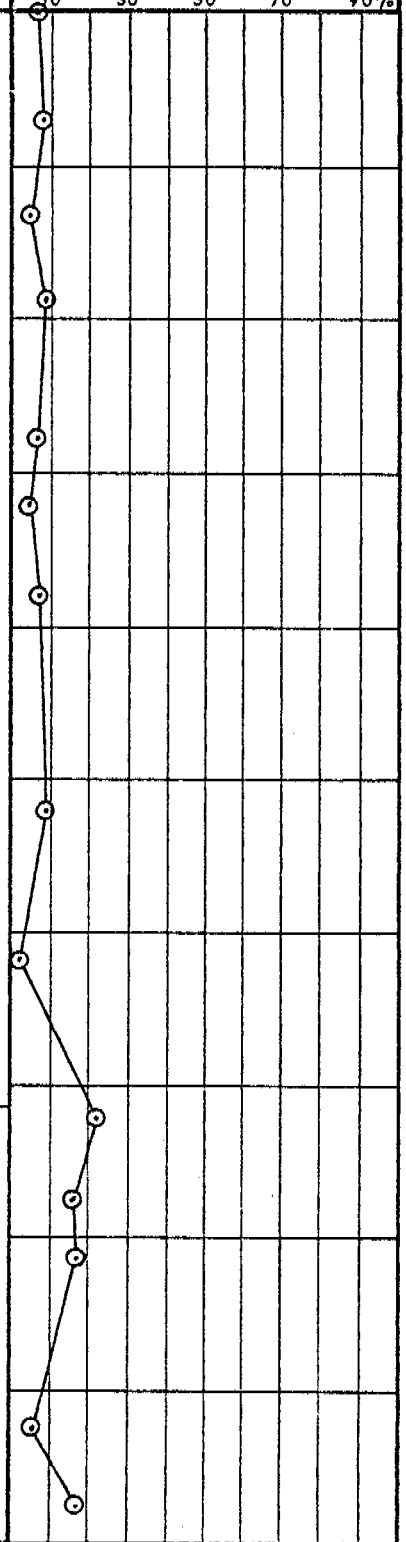
SAND AND SILT
- little to some gravel
- non plastic
- trace of oxidation
- pockets and lenses of sand and silt
- grey

← -gravel layer

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 299.1, .6 mile R. of C.L.
HOLE No.	77-15
DATE	Sept. 7-9/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	C	34	15				As above.
		34					
11	SPT	37	16				
		19					
	SPT	63	17				11.45 m.
		72					END OF HOLE
12							

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

Notes:
1. Hole located 160 m. northwest of Mayo Highway at Km post 104.4
2. Flat ground. Ground surface covered with trembling aspen 7 m., a few tiny white spruces and willows. Gravel exposures about 20 m. north of hole. Polygonal cracks noticed on ground surface near the hole.
3. Drilling mud used from 0.0 m. to 11.45 m.
4. Thermistors installed at 0.5m., 1.5 m., 3.0 m and 4.5m.

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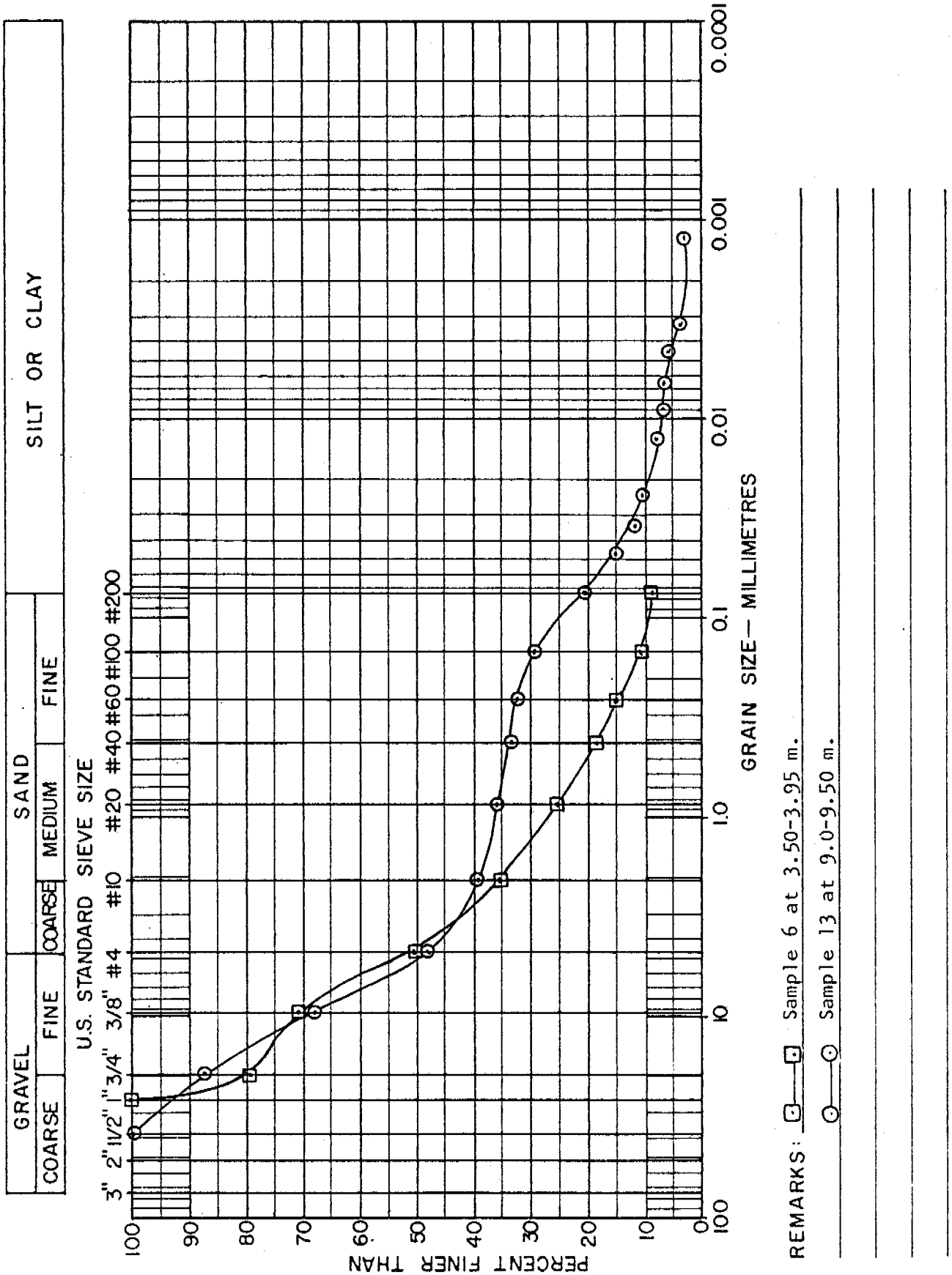
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 299.1,.6 mile R. of C.L.
HOLE No. 77-15
DATE Sept.9/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.

CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-15 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
PERMAFROST
LOCATION Sheet No. 15 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

SAMPLE DATA DEPTH	TYPE	BLOW / 15 cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
							0.1 TOPSOIL SAND - some gravel - little silt 0.8 - trace of organics
	B		1				
1		9					
	SPT	14	2				GRAVEL - fine to coarse
		21					
	SY		3				gravely sand
2		15					
		17					
	SPT	19	4				
		12					2.5
	SPT	16	5				SAND - fine to coarse - little gravel - trace of silt - stratified with sandy gravel - layers of fine sand - light brown
3		20					
		8					
	SPT	8	6				
		12					
	SY		7				
4		12				NF	
	SPT	9	8				
		8					
	SY		9				
5		4					
		5					
	SPT	4	10				
		9					
	SPT	11	11				
6		9					
		6					
	SPT	7	12				
		8					
7		9					7.0
	SPT	10	13				SAND - fine - trace to little silt - trace gravel - grey
		11					
8		11					
	SPT	11	14				
		12					
9		10					
	SPT	11	15				
		12					
10							(Cont'd.)

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 292.2, .4 mile R. of C.L.
HOLE No. 77-16
DATE Sept. 8/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	23 20 22	16			NF	As above. 10.45 m
11							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▦ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:

1. Hole located 100 m. north of a pond and about 115.6 km post on Mayo Highway.
2. Hummocky ground. Ground surface covered with trembling aspen 10 m., white spruces 20-30 m. in height northeast of hole.
3. Hole augered to 0.5 m. Drilling mud used from 0.5 m. to 10.45m.

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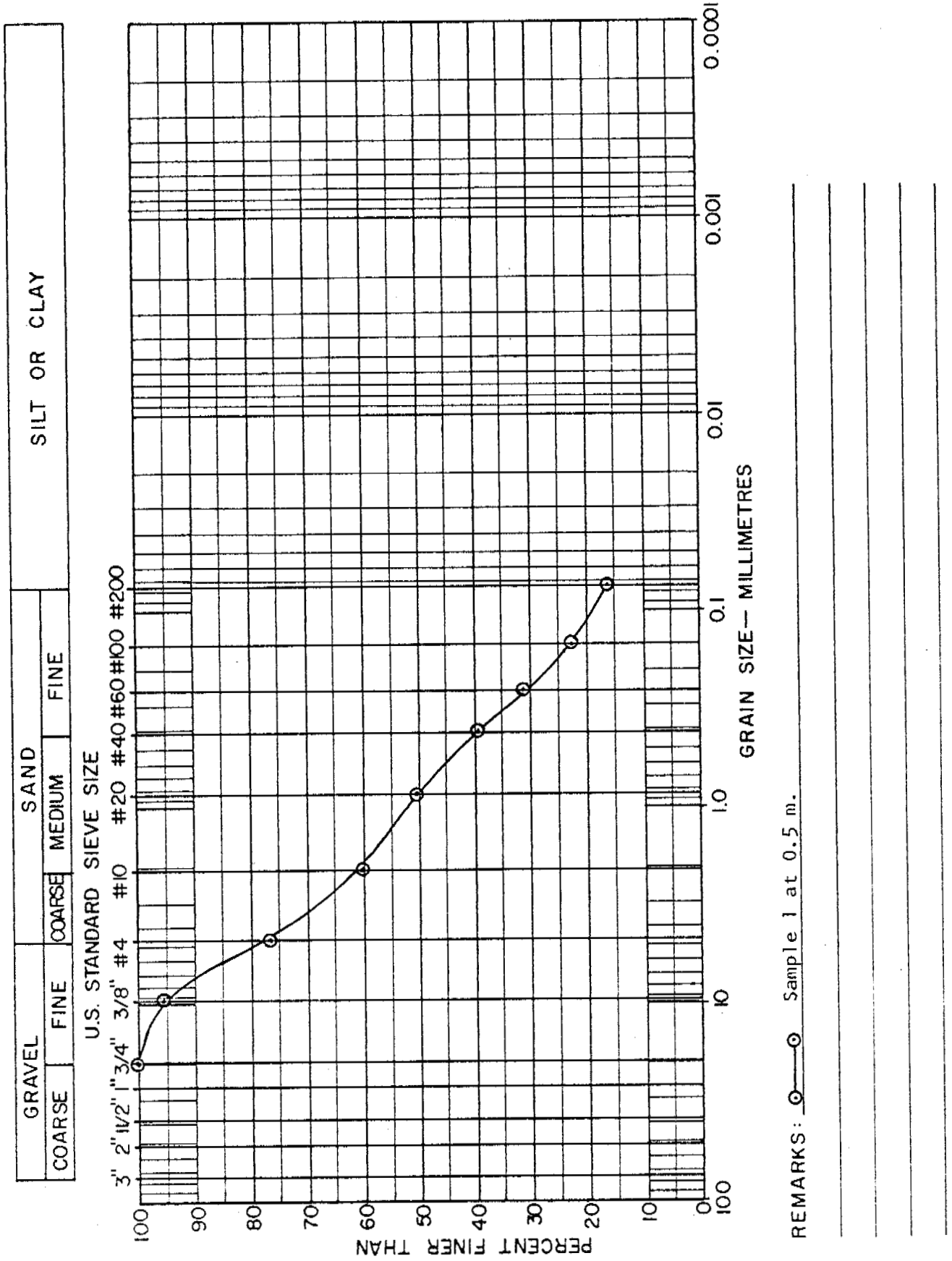
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 292.2,.4 mile R. of C.L.
HOLE No. 77-16
DATE Sept.8/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-16 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		1
1		16	
	SPT	9	2
		8	
	B		3
2		9	
	SPT	21	4
		43	
		32	
3	SPT	35	5
		28	
	SPT	17	6
		21	
		32	
	SPT	17	
		22	7
4		21	
	SPT	20	
		36	8
		42	
	SPT	17	
		18	9
5		28	
	SPT	14	10
		22	
		70	
		for	
6		12cm	
		70	
	SPT	for	11
		8cm	
	SPT	20	
		25	12
7		36	
		14	
	SPT	26	13
		26	
		27	
		27	14
8	SPT	26	
	SY		15
9	C		16
	C		17
	SPT	16	
		31	17
10		27	A

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
	3.2
	partially frozen
Vx	
Vr	
Nbn	

LOCATION Sheet No. 15 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.1 TOPSOIL
VOLCANIC ASH
SILT - little sand
0.75 - trace organics

SAND - fine to coarse
- little gravel
- trace of silt
1.75 - brown

GRAVEL
- fine to coarse
- little sand
- trace of silt
- grey

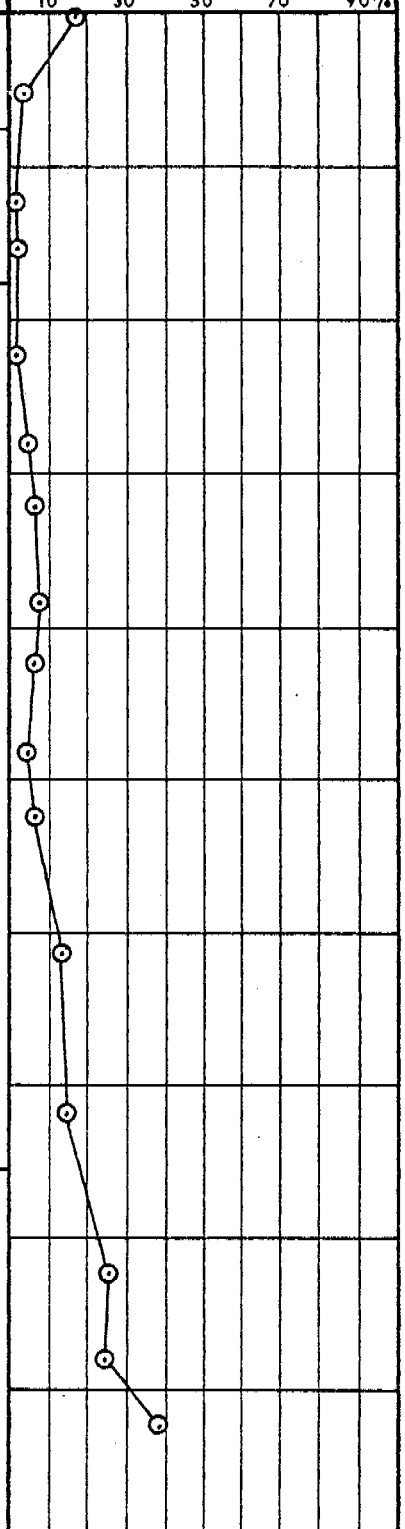
7.50

SILT AND CLAY
- little sand
- trace gravel
- low plasticity
- laminations of sand & silt
- light brown

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
FIELD VANE △ LAB VANE ⊡ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 289.3,.1 mile L. of C.L.
HOLE No. 77-17
DATE Sept. 10/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
11	SPT	7 8 9	18
12	SY		19
13	SPT	11 11 15	20
14			
15			
16	SPT (pushed)		21
17			
18			
19			
20			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
N	
	NF

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊞ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

As above.

← soft

Notes:
1. Hole located about 150 m. south west of Mayo Hwy. and 300 m south of camp site.
2. Flat ground. Surrounding terrain is hummocky. Ground surface covered with shrubs, white spruces 8-9 m and trembling aspen 7-8 m.
3. Hole augered up to 1.5m. Air used as a drilling fluid from 1.5m. to 2.5m. Drilling mud used from 2.5m. to 20.0 m.

20.0 m END OF HOLE

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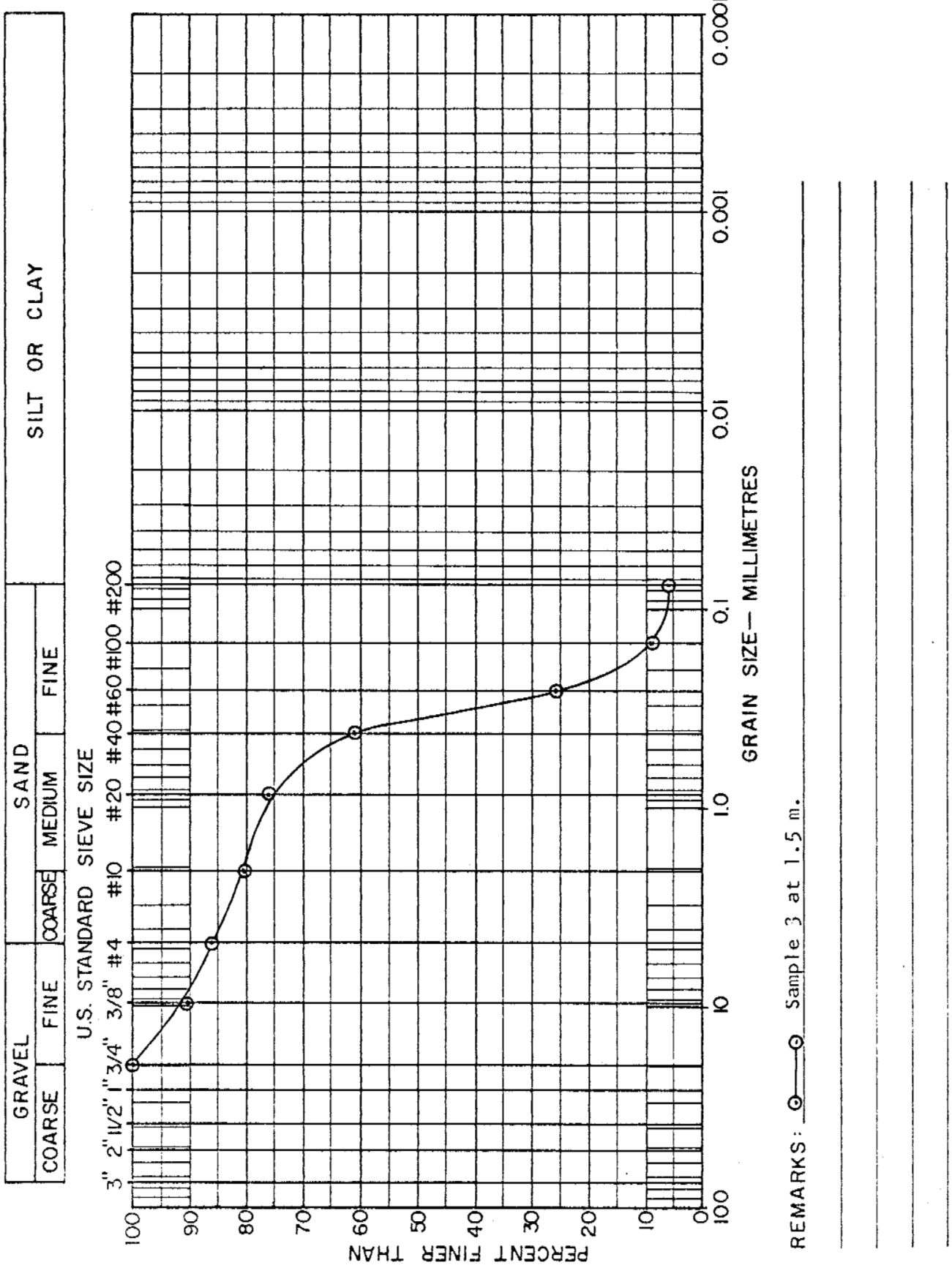
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 289.3, .1 mile L. of C.L.
HOLE No. 77-17
DATE Sept. 10/77 PLATE

K.L.C - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-17 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

LOCATION Sheet No. 15 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW 15 cm.	No.		N.R.C. CLASS	N.F. or F.	
							0.12 TOPSOIL
1	B	2	1				SILT AND SAND - trace of gravel - trace of organics - dark brown (Fill?)
2	SPT	3 4	2				NP
	B		3				
3	SPT	2 2	4				
	B	3	5				3.0
4	SPT	2 4 7	6				SAND - fine - some silt - trace of clay - trace of gravel - silt laminations & layer - light brown
	B		7				
5	SPT	6 8 4	8			NF	
	B		9				
6	SPT	3 4 4	10				— silt and clay lenses
	B		11				
7	SPT	14 22 23	12				
	B		13				
8	SPT	17 20 11	14				
	B		15				
9	SPT	23 46 38	16				8.1 GRAVEL AND SAND - trace of silt - stratified with sand - light brown
	SPT	24 26 21	17				
10	SPT	13 41 54for 10cm	18				9.45 m END OF HOLE (Cont'd.)

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 284.2,.2mile R. of C.L.
HOLE No. 77-18
DATE Sept.11/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA: DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST: N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ⊕ FIELD VANE △ LAB VANE □ UNCONF.
PLASTIC LIMIT X — WATER CONTENT 0 — LIQUID LIMIT X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located about 7-8m. north of Mayo Hwy near KM Post 128.6.
2. Flat ground. Vegetation consists of willows and white spruces to 25.0m. A hill located east of the hole supports a vegetation of white spruces and trembling aspen to 7m. A cut 4m. high and 200m. wide is located at the foot of this hill. Gravel, sand and silt and some boulders are exposed in the cut.
3. Hole augered to 8.5m. Air used as drilling fluid from 8.5m. to 9.45m.

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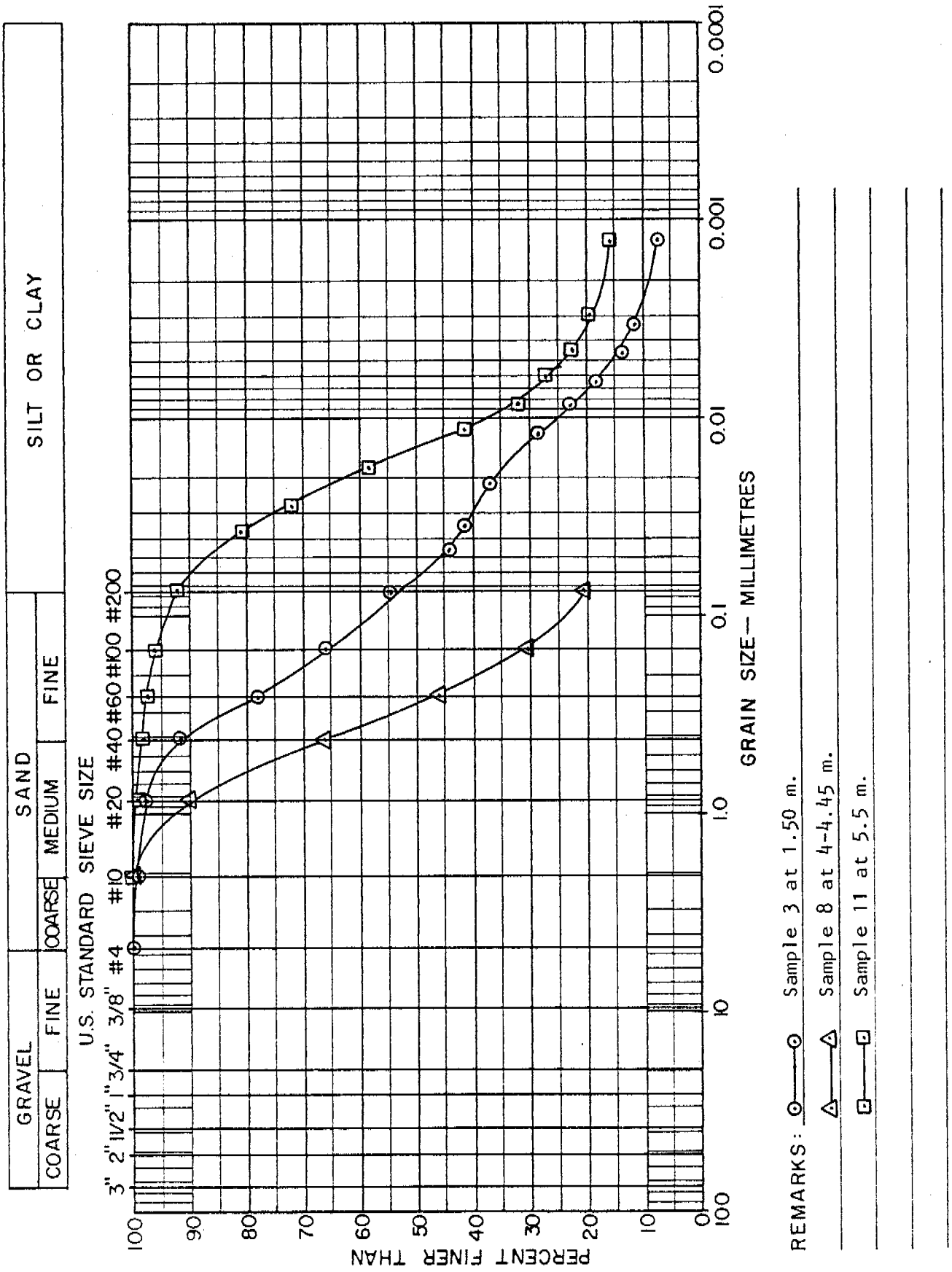
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 284.2,.2 mile R. of C.L.
HOLE No. 77-18
DATE Sept.11/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No. 77-18	DEPTH
DATE Dec/77	

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
LOCATION Sheet 15 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

SAMPLE DATA DEPTH	TYPE	BLOW 15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							0.15 ORGANIC COVER
	B		1			NF.	SAND - trace of silt - trace of organics - brown
1		13				1.0	1.0
	SPT	19	2		Vx		SAND AND GRAVEL - trace of silt - lenses of organics and silt
	B	19	3				
2	C		4				2.0 - brown
	C		5		Nbn		SAND - trace to little silt - trace of gravel - laminated & stratified with silt & organics - brown to 7.0m. then grey
3	C		6		Nbn Vx Vc		
	C		7				
					Vr Vs		← Ice lenses ½mm-1mm spaced @ 2mm-5mm.
4	C		8				
	C		9				
	C		10				← some silt
5	C						← Ice lenses ½mm-1mm spaced @ 3mm-7mm.
	C		11		Vr Vx		
6	C		12		Vc		
	C		13				
7	C		14		Vs		
	C		15		Nbn		
8	C		16				
	C		17				8.5
	C		18				GRAVEL AND SAND - trace of silt - layered with fine to medium sand - brownish grey (Cont'd.)
9							
	SPT	90 for 10cm	19		Vc		
10							

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 281.1,.8mile R. of C.L.
HOLE No.	77-19
DATE	Sept.11/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

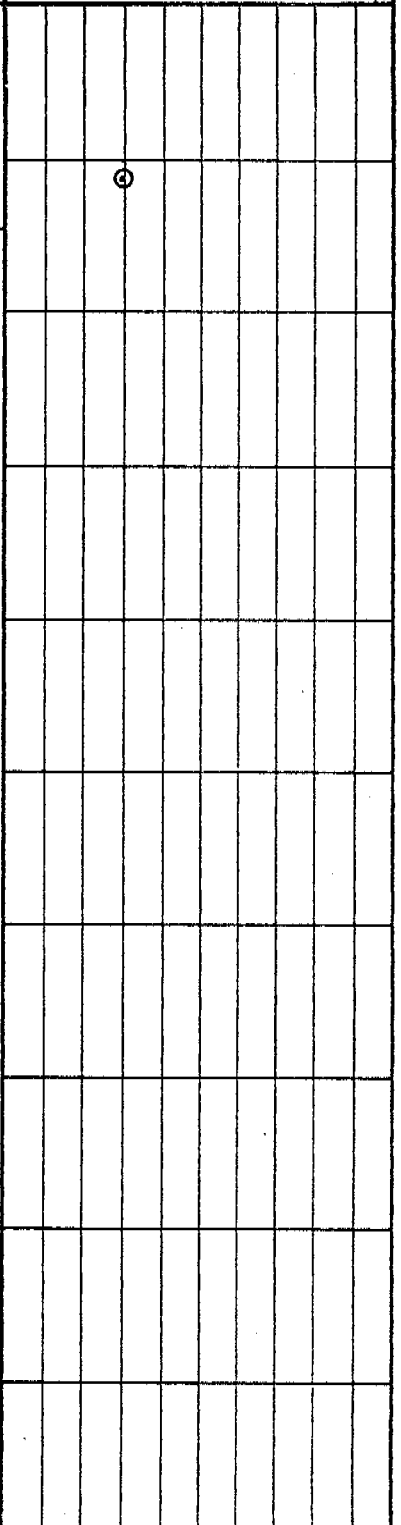
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	96 for 12.5 cm.	20		N		As above.
11	SPT	60 63	21				sand layer 11.45 m.
							END OF HOLE
12							Notes: 1. Hole located 20 m. north of Mayo Hwy. at Km Post 133.5. 2. Hummocky ground. Vegetation consists of shrubs, mountain cranberry and white spruces to 10-12 m. 3. Hole augered up to 1.5 m. cored from 1.5 to 11.45 m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ☐ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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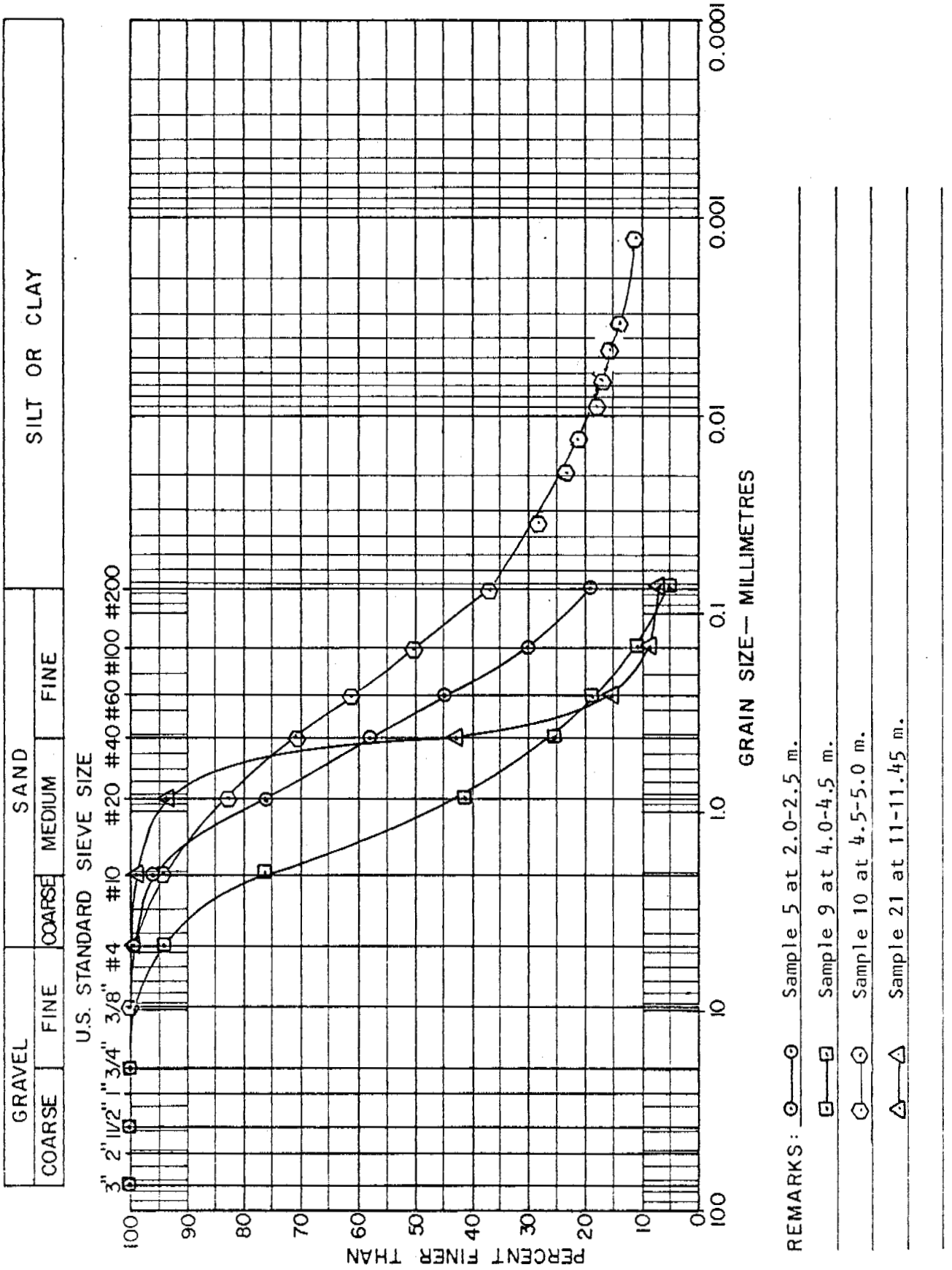
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 281.1,.8 mile R. of C.L.
HOLE No. 77-19
DATE Sept.11/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-19 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

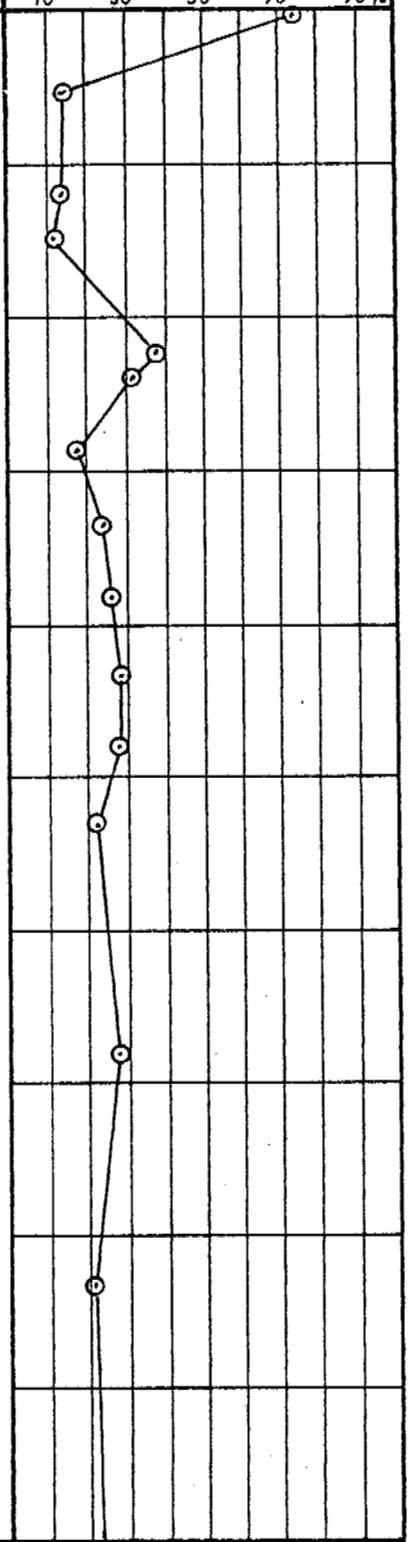
PERMAFROST

LOCATION Sheet No. 15 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
							0.1 ORGANIC COVER
	B		1			NF	
1		9					
	SPT	13 18	2				
	B		3			1.75	
2		42					
	SPT	62	4				
	C		5				
3	C		6		Nbn		SAND - fine to medium - trace to little silt - brown to 1.75m. and then grey
	C		7		Vx		
4	C		8		Vc		
	C		9				
5	C		10				
	C		11				
6	C		12				
	C		13				
7	C		14				
	C		15				
8	C		16				
	C		17				
9	C		18				
	C		19				
10							(Cont'd.)



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 276.2,.6 miles R. of C.L.
HOLE No. 77-20
DATE Sept.13/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	50 87	20				As above.
							— some gravel
11	SPT	90 for 10cm	21				11.45 m
							END OF HOLE
12							

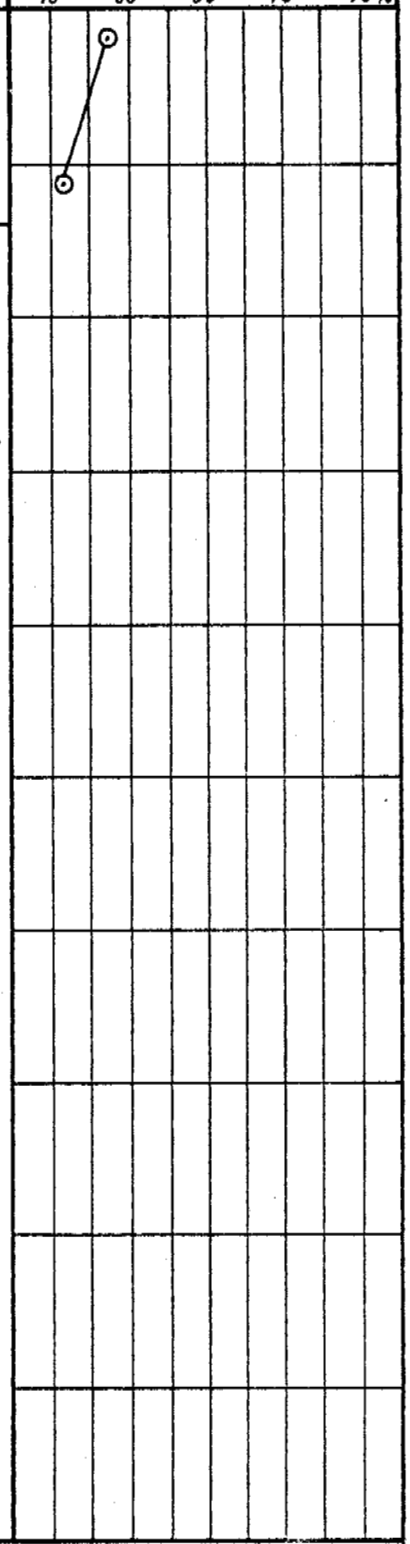
Notes:

1. Hole located 20m. northwest of Mayo Hwy. near 140.4 Km. Post.
2. Flat ground. Ground surface covered with shrubs, short grass, moss, white spruces 20-25m. and few tiny trembling aspen 2-3m.
3. Hole augered up to 2.5m. Cored from 2.5m. to 9.5m. Air used as a drilling fluid from 9.5m. to 11.45m.
4. Thermistors installed at 0.5m., 1.5m., 3.0m., and 6.0m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊡ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — — 0 — — — — — — X
10 30 50 70 90%



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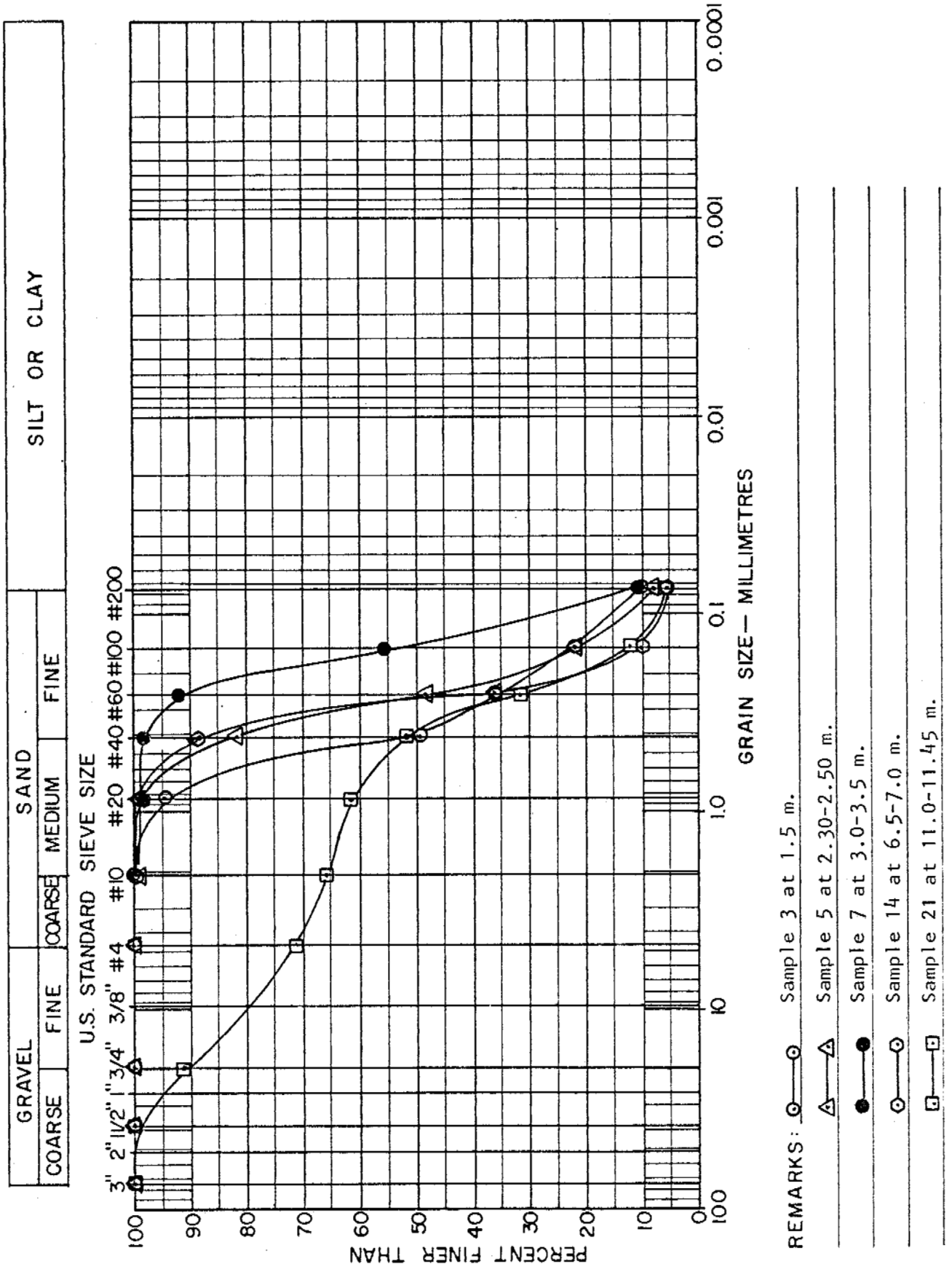
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 276.2,.6 mile R. of C.L.
HOLE No. 77-20
DATE Sept.13/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-20 DEPTH
DATE	Dec/77

FROZEN BULK DENSITY TEST RESULTS

HOLE NO. 77-20

Sample No.	Sample Depth (M)	Frozen Bulk Density KG/M^3	Frozen Bulk Density PCF
10	4.5-5.0	1639.0	102.0

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1			
	SY		1
		7	
2	SPT	12	2
		21	
	SY		3
		13	
3	SPT	11	4
		6	
	SY		5
		7	
4	SPT	9	6
		10	
	SY		7
		10	
5	SPT	11	8
		12	
	SY		9
		8	
6	SPT	9	10
		10	
	SY		11
7			
		7	
	SPT	7	12
8		7	
		9	
	SPT	6	13
9		12	
	SY		14
10			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 15 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

SAND
- some silt
- little gravel
- trace of clay
- slight plasticity
- stratified with fine sand and silt
- very stiff
- brown up to 1.5m. and then grey

(Till-like)

NF

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

2.27
2.27
2.27

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 275.4,.6 mile R. of C.L.
HOLE No. 77-21
DATE Sept.14/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
PERMAFROST
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▦ UNCONF.

SAMPLE DATA				SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT X — WATER CONTENT 0 — LIQUID LIMIT X (10 30 50 70 90%)
DEPTH	TYPE	BLOW 15 cm.	No.					
11	SPT (pushed)		15				As above.	
12								
13						NF		
14	SPT (pushed)		16					
15								
16		35						
	SPT	35	17				sand layer	
17		37					16.45 m.	
							END OF HOLE	

Notes:
1. Hole located 7-8m from Mayo Hwy in a low area and 0.15km south of a gravel pit.
2. Terrain slopes 35% between hole & hwy and 20% westwardly. An open cut 200m long & 1-5m high located on the east side of the hole. Vegetation consists of willows, shrubs, trembling aspen & tiny white spruces. White spruces 10-15m at 15m west of hole.
3. Drilling mud used from 0m. to 16.45m.

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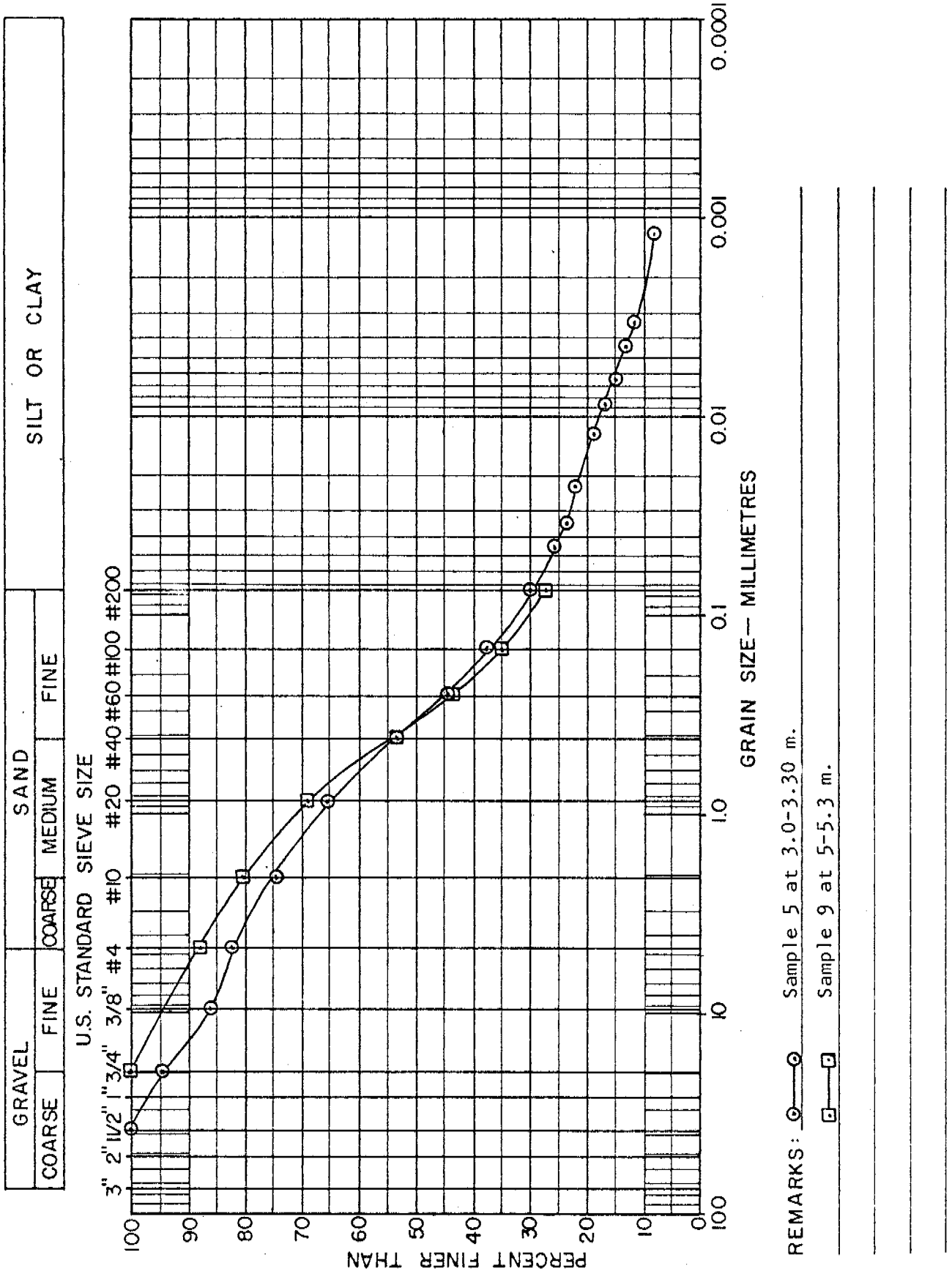
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 275.4, .6 miles R. of C.L.
HOLE No. 77-21
DATE Sept. 14/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-21 DEPTH
DATE	Dec/77

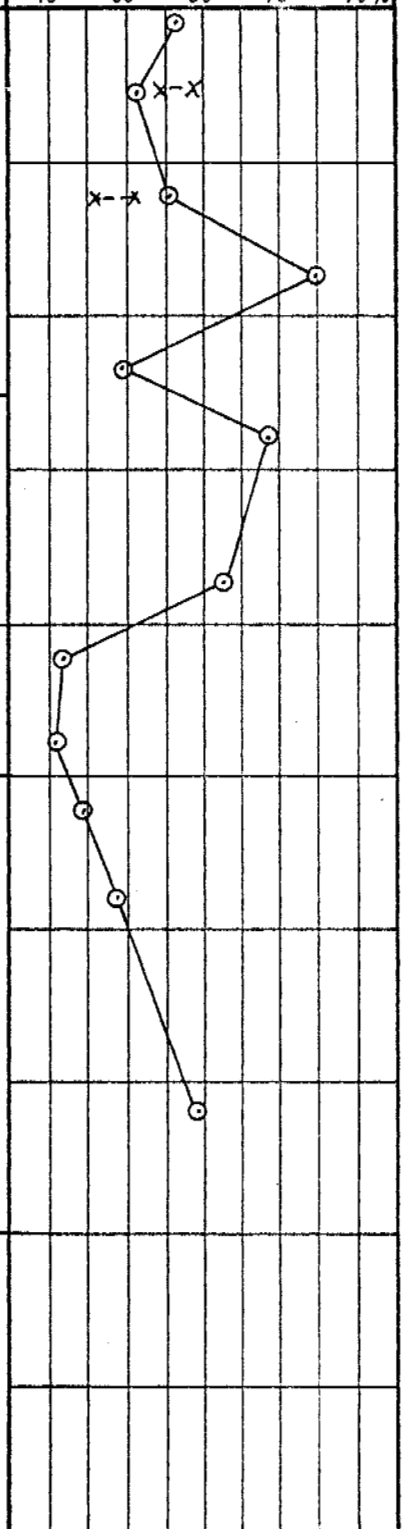
TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 14 Appendix C
							ELEVATION
							0.1 TOPSOIL
1	B		1			NF	SILT AND CLAY - some sand - little gravel - low plasticity - laminations & lenses of organics - laminations of sand - greyish brown
		2				1.0	
	SPT	8 16	2				ice&soil
2	C		3		Vr Vs		ice&soil
	C		4		Vx		some sand and gravel
							2.5
3	C		5				ice&soil SILT AND CLAY - little sand - trace of organics - stratified with gravel - low plasticity - grey
	C		6		Nbn Vr		
4	C		7		Vs		ice&soil
							4.0
	C		8		Vr Vx		GRAVEL - fine to coarse - some sand - trace to little silt - grey
5	SPT	70 80for 12.5 cm.	9		Nf		
							5.0
	SPT	32 31 46	10				some gravel SAND - fine - and silt - trace of gravel - trace of organics - laminated & stratified - brown
6	SPT	23 30 21	11		Vc		
	C		12		Vx		
							6.5
7		12				partially frozen	
	SPT	13 16	13				
8							8.0 m.
9							END OF HOLE
							(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 267.4, .7 mile R. of C.L.
HOLE No. 77-22
DATE Sept. 14/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located about 15-18m. on west side of Mayo Hwy. near Km Post 139.8.
2. Hummocky surface. Vegetation consists of willow bushes.
3. Hole augered to 1.5m. Cored from 1.5-4.25m. Drilled with air from 4.25m. to 6.0m. Cored from 6.0 to 6.5m. and drilled with air from 6.5 to 8.0m.
4. Water started flowing out of the hole at 8.0 m.

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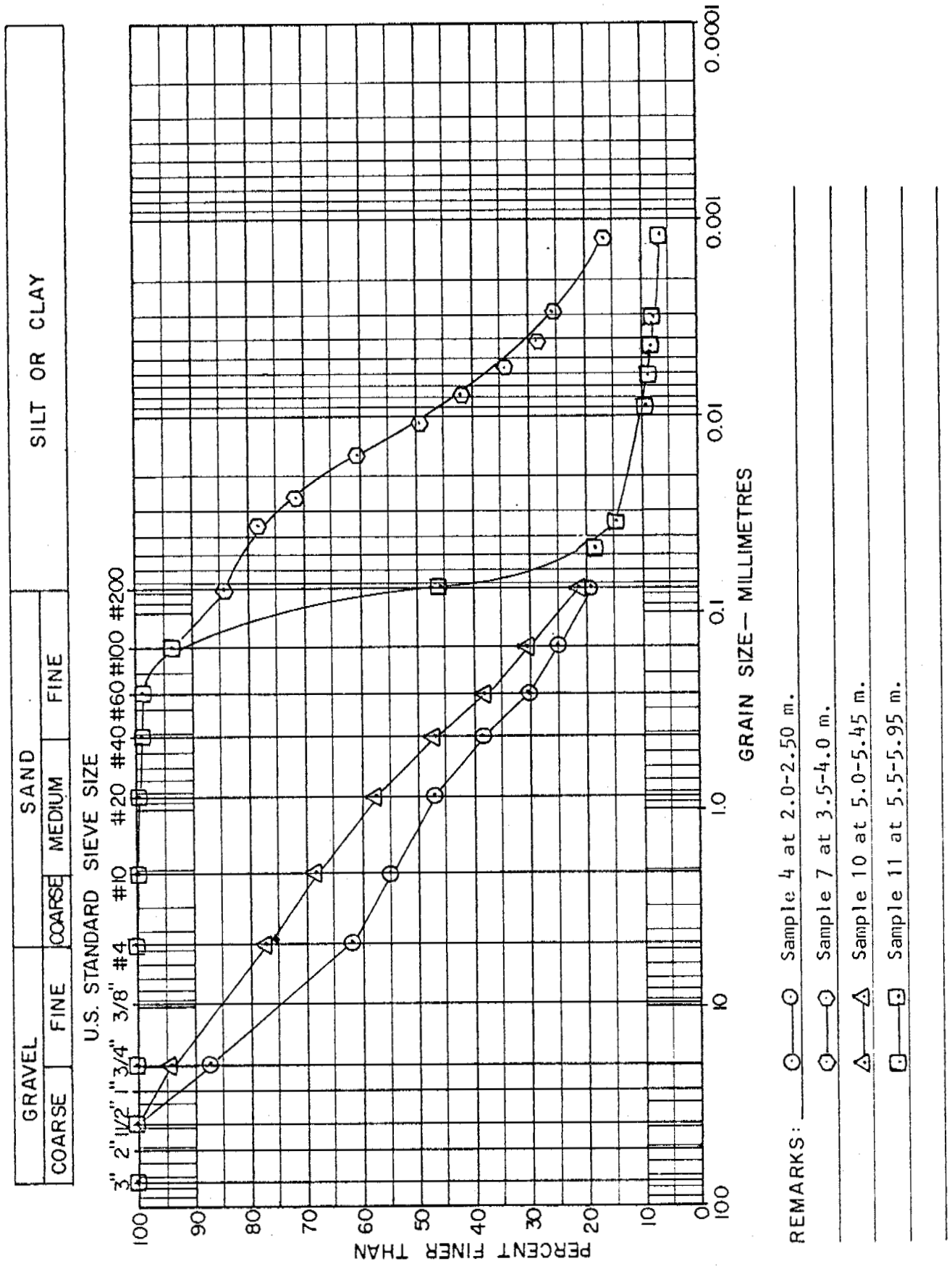
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 267.4, .7 mile R. of C.L.
HOLE No. 77-22
DATE Sept. 14/77 PLATE

S.I. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-22 DEPTH
DATE	Dec./77

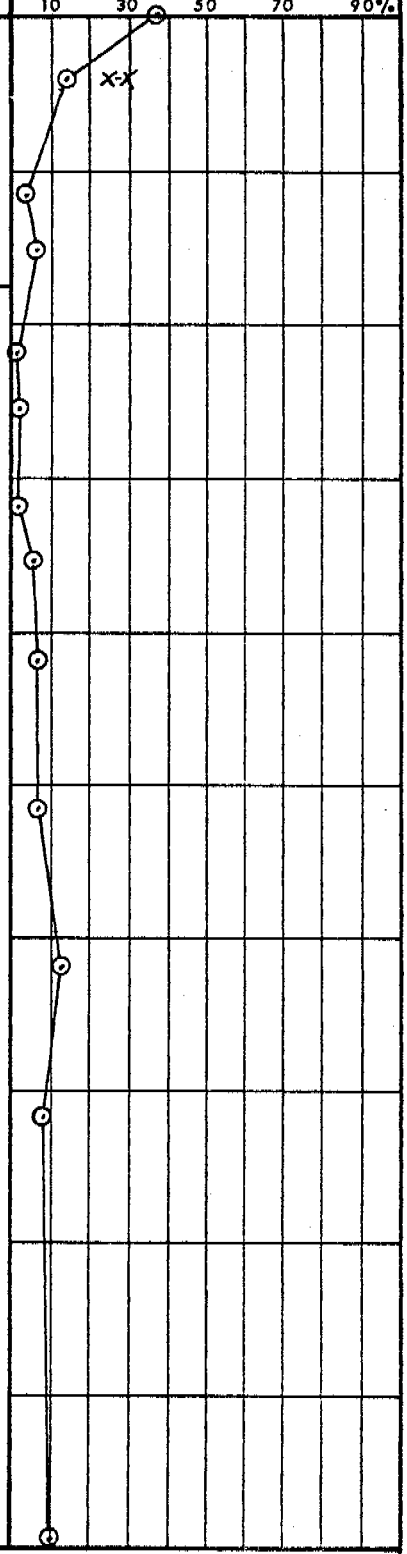
TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 14 Appendix C
							ELEVATION
							0.15 TOPSOIL
1	B		1				SILT - trace to little sand - slight plasticity - light brown
		7					
		10					
	SPT	12	2				
	B		3				1.75
2		14					
	SPT	28	4				
		21					
	B		5				
3		12					
		18					GRAVEL
	SPT	18	6				- fine to coarse
		27				NF	- some sand
	SPT	80 for 14 cm	7				- trace of silt
4							- sand layers
							- grey
	SPT	43	8				
		43					
5							
	SPT	38	9				
		44					
							← sand and silt layer
6							
		20					
	SPT	16	10				
		11					
7		6					
	SPT	6	11				
		4					
8							
		8					
	SPT	5	12				
		4					
9							
							(Cont'd.)
10							

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊡ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 261.7, .1 mile L. of C.L.
HOLE No. 77-23
DATE Sept.15/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▩ UNCONF.

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT X——0——X 10 30 50 70 90%
DEPTH	TYPE	BLOW 15 cm.	No.		N.R.C. CLASS	N.F. or F.		
11	SPT	10 10 7	13				As above.	
12						NF		
13								
14	SPT (pushed)		14					
15		25						
	SPT	20 12	15				15.45 m.	⊙
16							END OF HOLE	

Notes:

1. Hole located 10-12m. northwest of Campbell Hwy. near Km 165.2.
2. Flat ground. Gravel pit located about 30m. east of hole. Vegetation consists of white spruces to 15m., trembling aspen to 15m., honey suckle & shrubs.
3. Hole augered up to 3.0m. Drilling mud used from 3.0m. to 15.45m.
4. Loss of circulation below 8.0m.
5. Piezometer installed to 8.83m.

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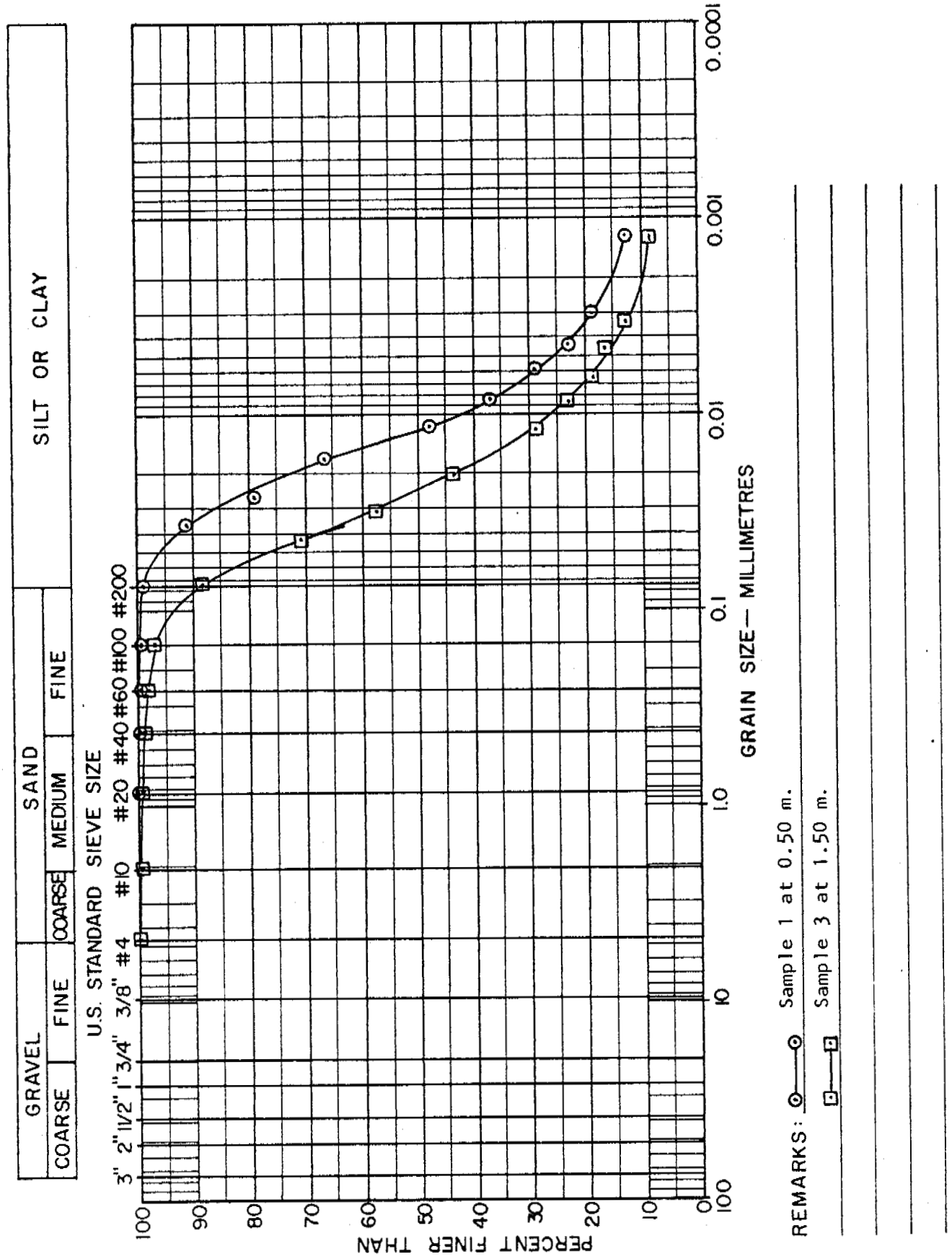
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 261.7,.1 mile L. of C.L.
HOLE No. 77-23
DATE Sept.15/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-23 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		1
1		4	
	SPT	3	2
		5	
	B		3
2		7	
	SPT	7	4
		3	
	B		5
3		4	
		7	
	SPT	9	6
	B		7
4		21	
	SPT	53	8
		7cm	
5		26	
	SPT	28	9
		33	
6		30	
	SPT	40	10
		33	
7		25	
	SPT	65	11
8		23	
	SPT	45	12
		67	
9			

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 14 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 TOPSOIL
SAND
- some silt
- trace of gravel
- trace of organic
- some gravel
1.45

SILT AND CLAY & SAND
- little gravel
- slight plasticity
- brown

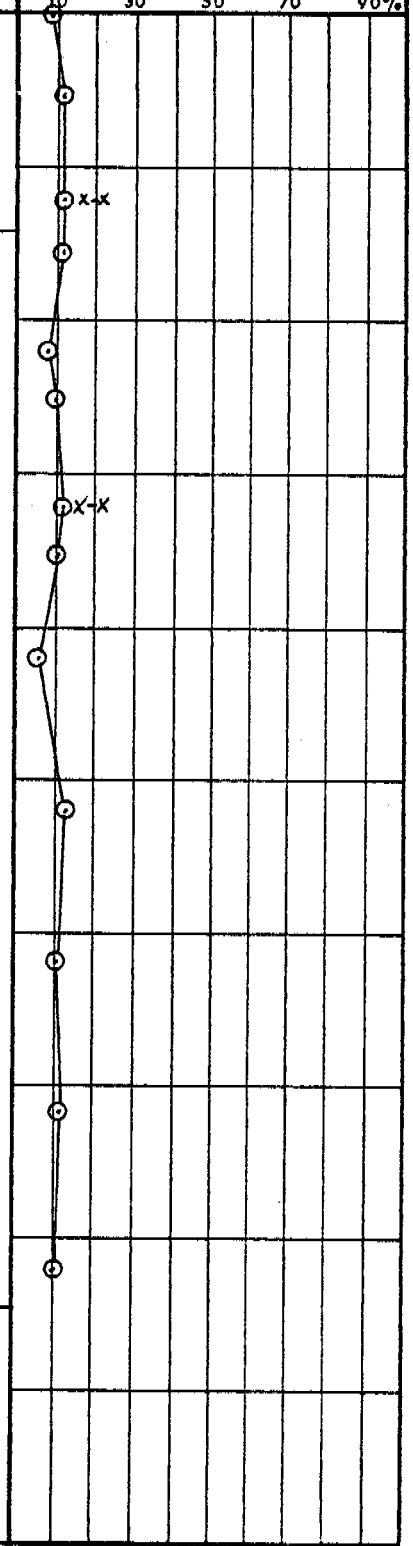
(Till)

NF.

8.45 m.

END OF HOLE

(Cont'd.)



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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 258.4,.1 mile R. of C.L.
HOLE No. 77-24
DATE Sept.15/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located about 1km. north of Mayo Highway.
2. Terrain slopes 30% towards north Vegetation consists of shrubs, willows, white spruces to 15-20m. and lodgepole pines to 7-10m.
3. Hole augered up to 4.0m. Air used as drilling fluid from 4.0 m. to 8.45m.

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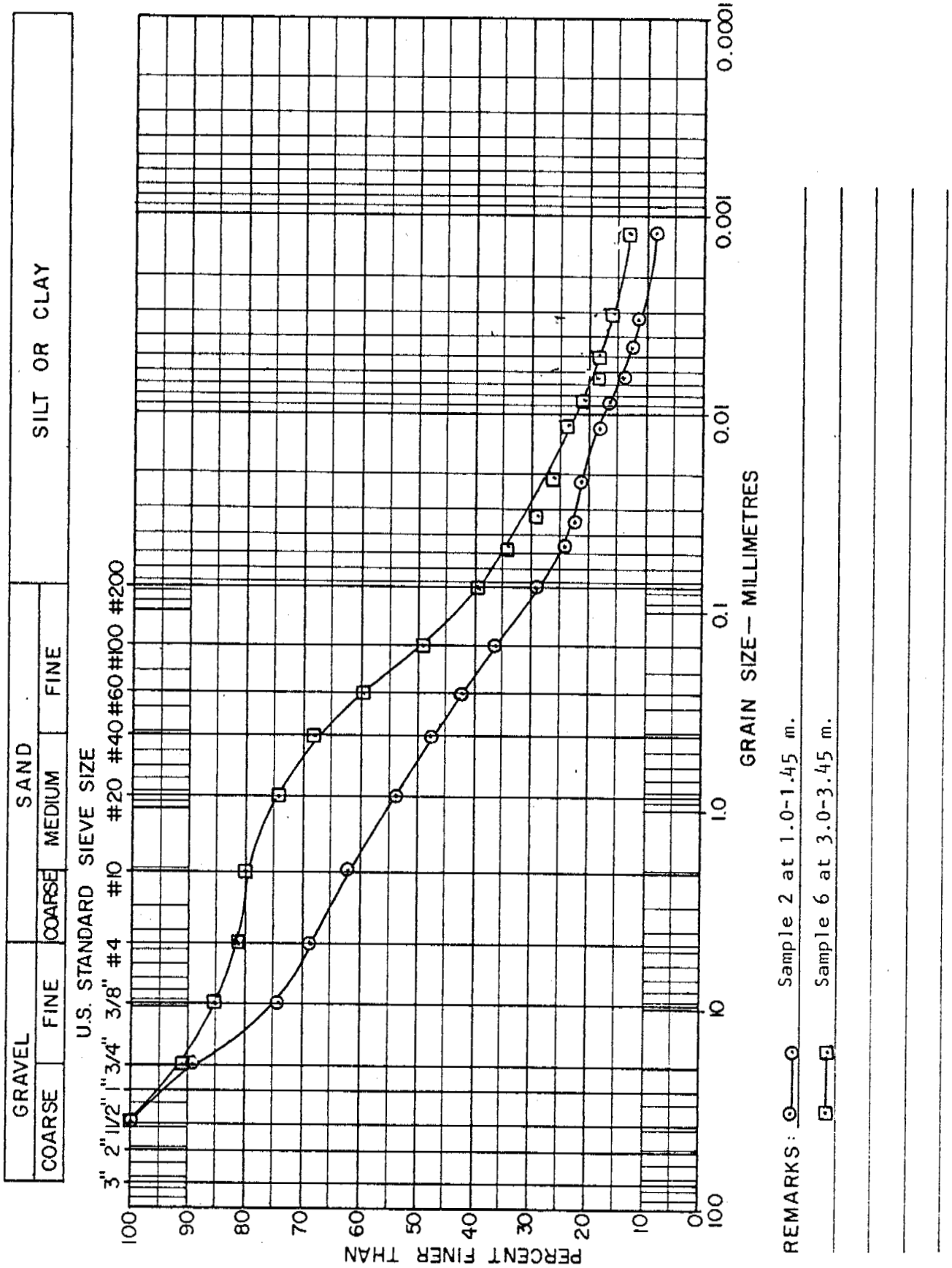
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 258.4, .1 mile R. of C.L.
HOLE No. 77-24
DATE Sept. 15/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-24 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
		18	
	SPT	52	2
2		65	
	SPT	for 10cm	3
		65	
	SPT	for 10cm	4
3			
4	C		5
	C		6
		80	
5	SPT	for 10cm	7
	SPT		
6			
7			
8			
9			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.75
Nf Vx Vc	
	4.5
	NF
	5.3

LOCATION Sheet No. 14 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

PEAT — 0.75

trace siltstone

SAND AND SILT
- some gravel
- brown

BEDROCK — 8.0 m.

END OF HOLE

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

241
149

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 257.0, .1 mile R. of C.L.
HOLE No. 77-25
DATE Sept.15/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located about 500 m. north-east of Mayo Hwy. near Km 172.5.
2. Hummocky ground. Terrain slopes 5% to south about 5-6m. from hole. Vegetation consists of shrubs, willows and white spruces to 18-20m.
3. Hole augered up to 1.0m. Air used as drilling fluid from 1.0 to 3.5m. Cored from 3.5 to 4.5 m. Air used as drilling fluid from 4.5m. to 8.0m.

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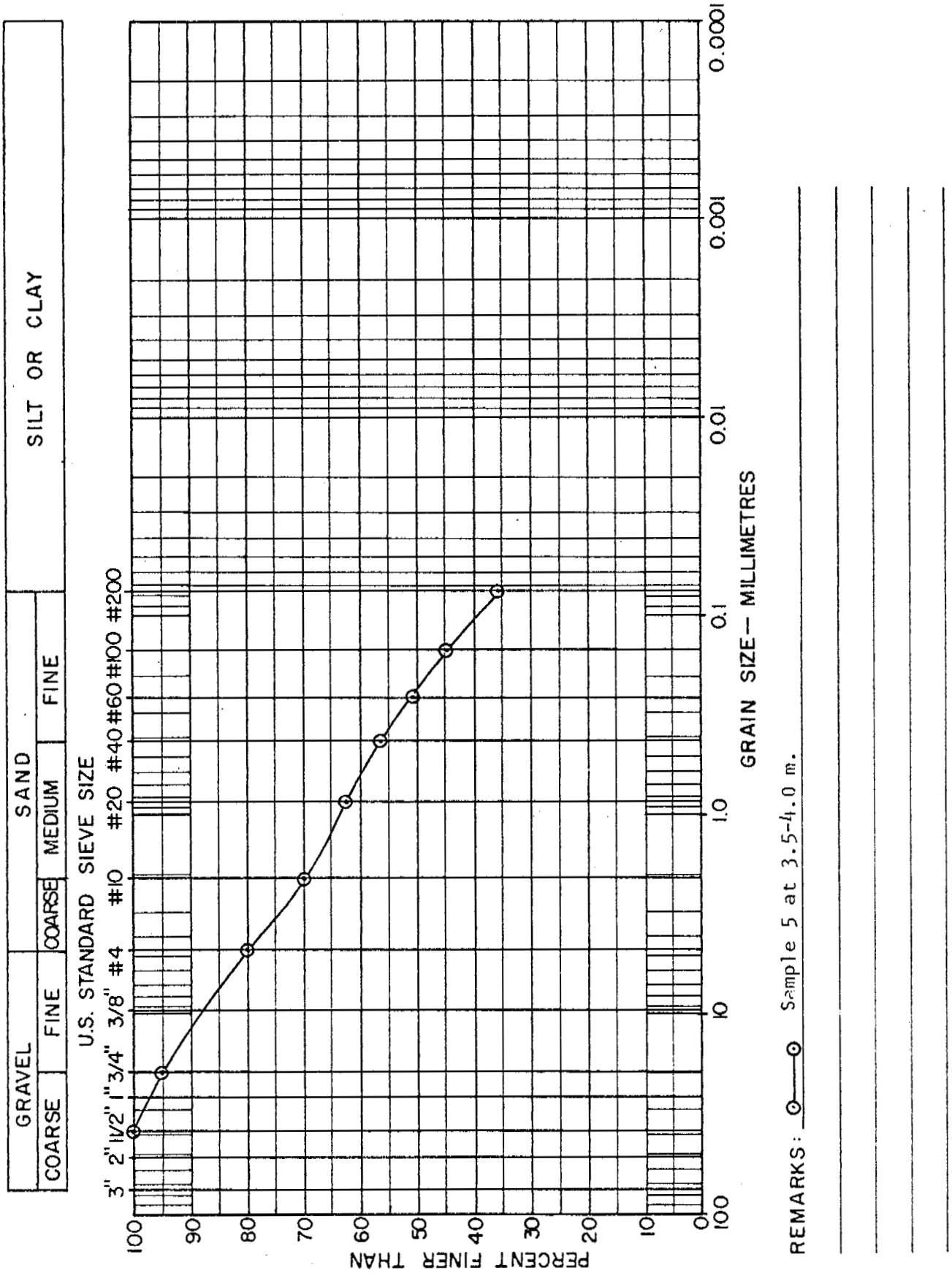
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 257.0, .1 mile R. of C.L.
HOLE No. 77-25
DATE Sept. 15/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-25 DEPTH 3.5-4.0
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1			
2	SPT	5, 16, 18	1
3	SPT	5, 5, 4	2
4	SPT	2, 2, 2	3
5	SPT (pushed)		4
6	SPT (pushed)		5
7			
8	SPT (pushed)		6
9			
10	SPT (pushed)		7

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 19 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.08 Organic cover

SILT AND CLAY
- trace to little sand
- slight to low plasticity
- sand & clay laminations
- clay & silt pockets
- soft to firm
- grey with rusty specks

3.0

SILT AND CLAY
- trace to little sand
- low plasticity
- soft
- grey

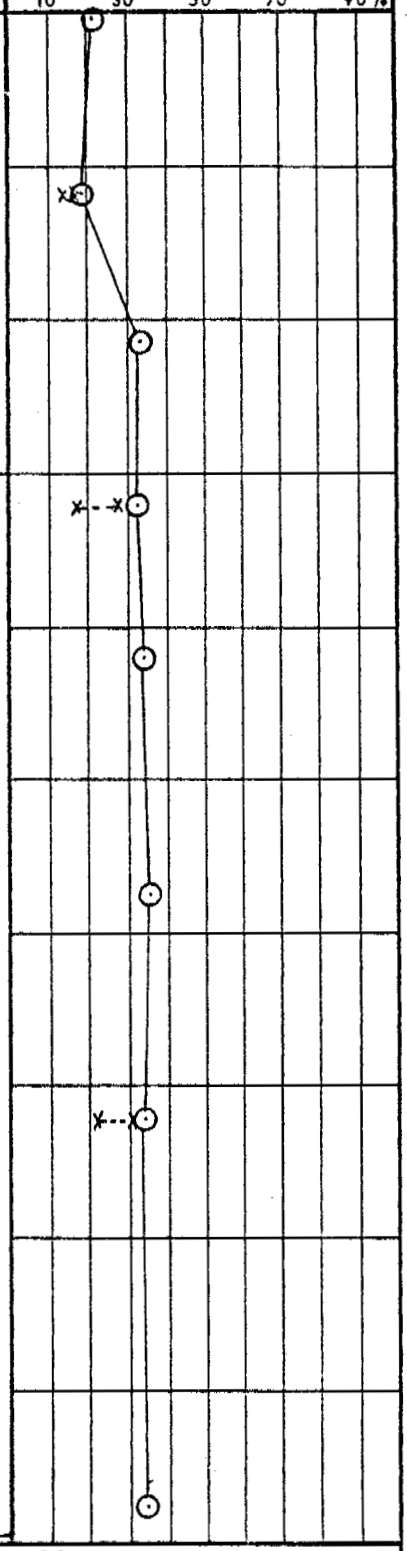
NF

NOTES:
1. Hole located at 45.0m. south-east of lake. Flat ground surface.
2. Hole surrounded with short grass.
3. Ground surface relatively soft.
4. Free water encountered at about 0.5m. below ground surface.
5. Penetration rod pushed for sample No. 4, 5, 6, & 7.
6. Hole drilled with water

9.95m. END OF HOLE

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
10 30 50 70 90%



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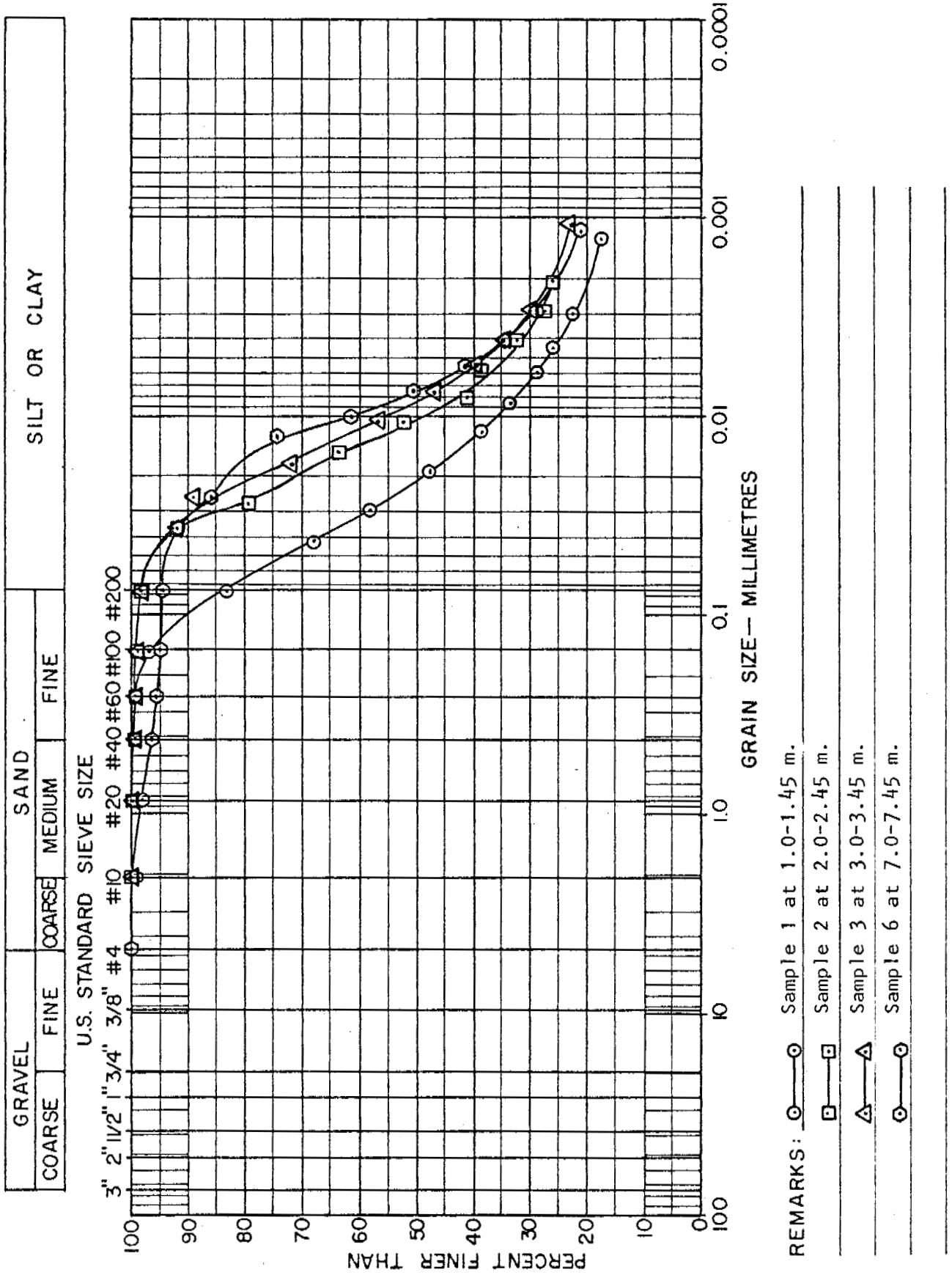
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 356.4, 1.4 miles L. of C.L.
HOLE No. 77-201
DATE Sept. 2/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-201 DEPTH
DATE	November 1977

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW / 15 cm.	No.
1	B	9	1
	SPT	10 12	2
2	B	6	3
	SPT	7 9	4
3	B	4	5
	SPT	5 6	6
4		10	
	SPT	20 30	7
5			
6	SPT	10 15 18	8
7		9	
	SPT	7 9	9
8			
9		8	
	SPT	18 23	10
10			

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 19 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊡ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 Organic cover

SAND
- fine
- little to some silt
- trace rootlets
- brown

1.75

SAND
- fine
- trace to some silt
- coarse sand laminations (20mm)
- loose to 4.0m., dense from 4.0m. to 7.0m.
- grey

NF

5.0 —— Few layers of fine gravel

7.0

SILT AND CLAY
- trace to little sand
- slight to low plasticity
- sand laminations & layers (15 cm.)
- clay laminations
- soft to firm
- grey

(cont'd.)

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-202
DATE Sept. 2/77 PLATE

M.E. = METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11		15					AS ABOVE
	SPT	14 20	11				
12							
13							
14							
		15					
	SPT	17 21	12			NF	
15							
16							
17		10					
		14					
	SPT	25	13				
18							
19							
20							(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-202
DATE Sept. 2/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
PERMAFROST
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▯ UNCONF.

SAMPLE DATA DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT X / WATER CONTENT 0 / LIQUID LIMIT X (10 30 50 70 90%)
21		9 22 21	14			NF	AS ABOVE 21.45m.	
22							END OF HOLE	

NOTES:

1. Hole located 300 m. east of Yukon river. Hole drilled on OLD river bank about 7.0 m. above ancient flood plain and 12 m. from crest.
2. Hole surrounded by spruce tress to 18.0 m.
3. Mud drilling from 3.0 m.
4. Thermistors installed at 0.5m, 1.5m., 3.0m. and 6.0m.

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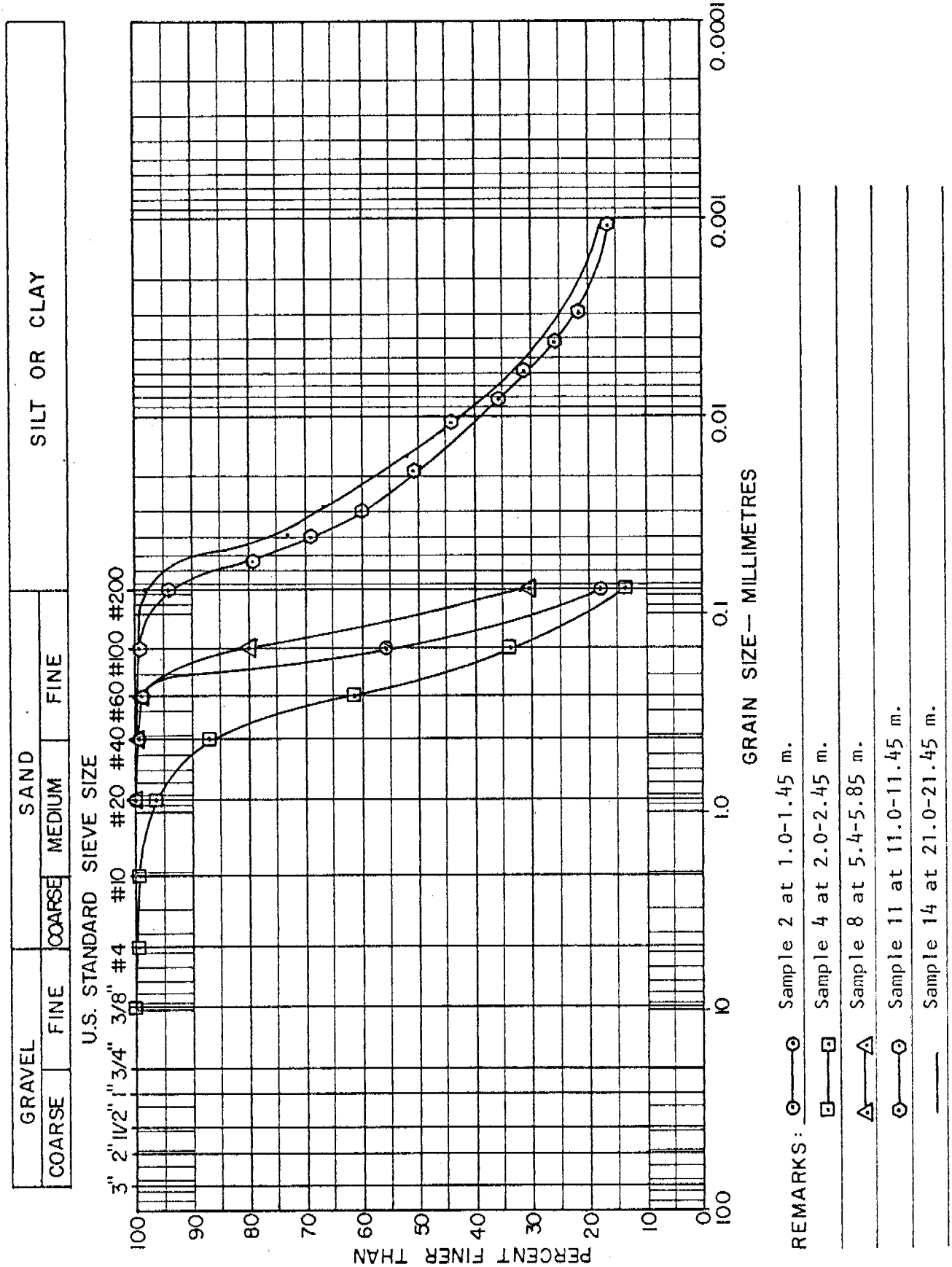
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Yukon River Crossing
HOLE No. 77-202
DATE Sept. 2/77 PLATE

GRAIN SIZE CURVE



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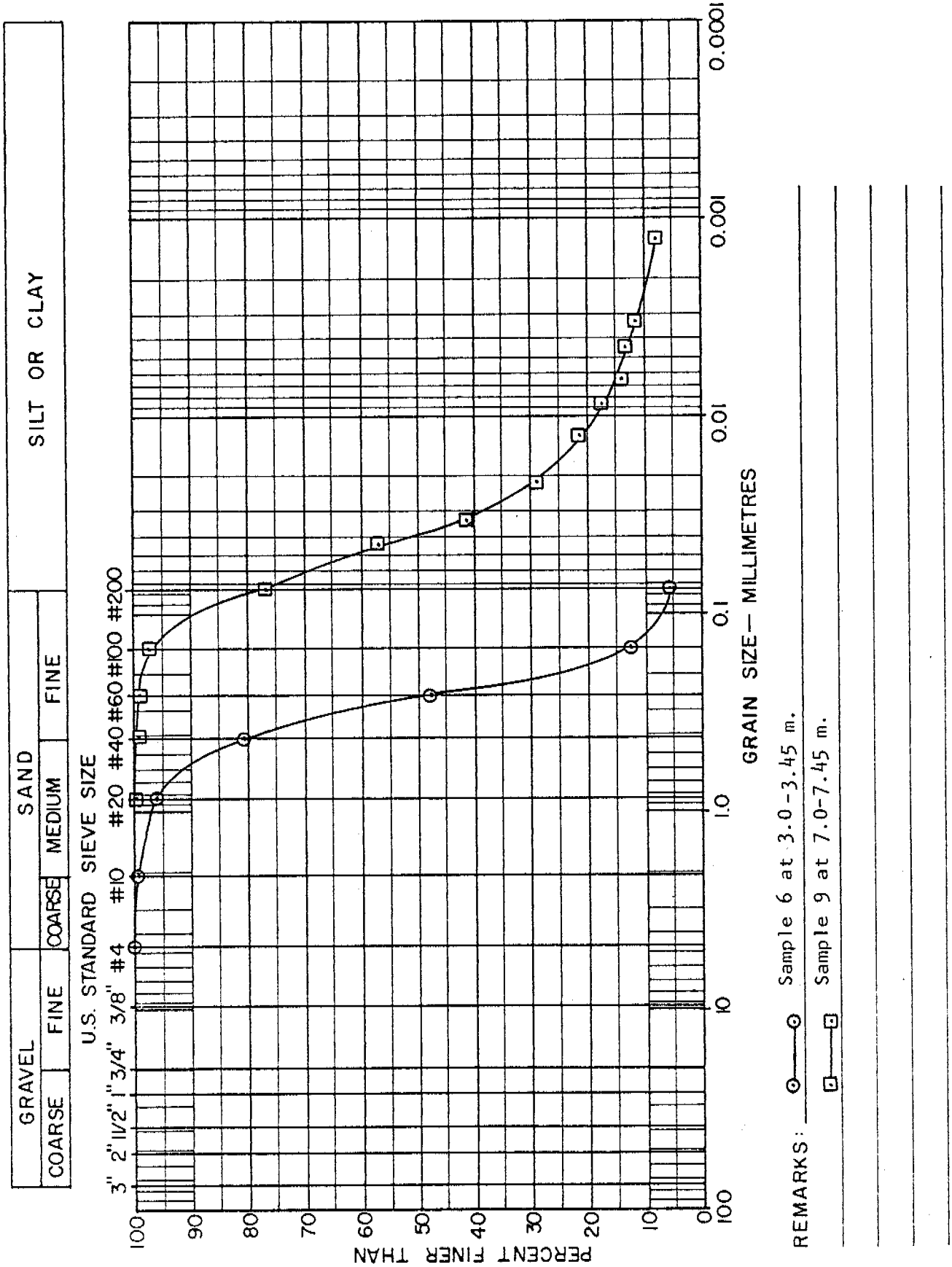
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-202 DEPTH
DATE	November 1977

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-202 DEPTH
DATE	November, 1977

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA

DEPTH	TYPE	BLOW / 15 cm.	No.
1	B		1
	SPT	8 10	2
	B	13	3
2		5	
	SPT	12	4
	B	17	5
3			
	SPT	3 5 7	6
4		3	
	SPT	5 6	7
5			
6	SPT	2 2 2	8
7		2	
	SPT	2 3	9
8			
9		4 4	
	SPT	7	10
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF

LOCATION Sheet No. 19 Appendix C

ELEVATION

DESCRIPTION OF MATERIAL

0.1 Organic cover

SILT AND CLAY
- trace of sand
- low plasticity
- laminations of sand
- laminations of clay (1-3mm)
- soft to firm
- brown to 4m. then grey

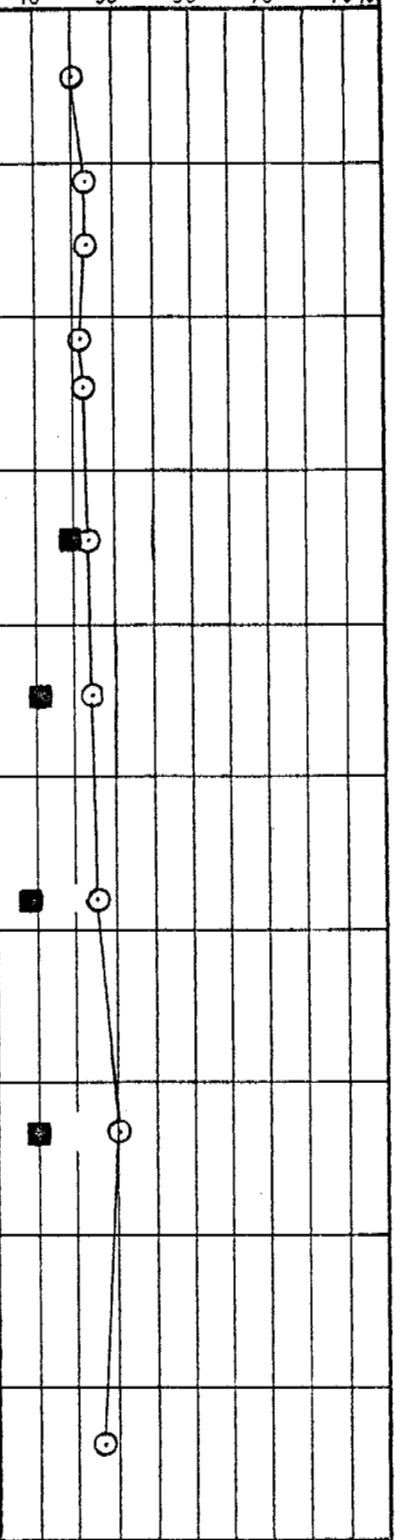
NOTES:
1. Hole located 30 m. from swamp.
2. Vegetation consists of spruces to 18m., poplar to 15m. and sparse pines to 18 m.
3. Ground surface generally flat.
4. Free water encountered at 3m.
5. Hole augered to 3m.. Water used as drilling fluid below 3m.

9.45m.

END OF HOLE

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE □ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
x — — — — — 0 — — — — — x
10 30 50 70 90%



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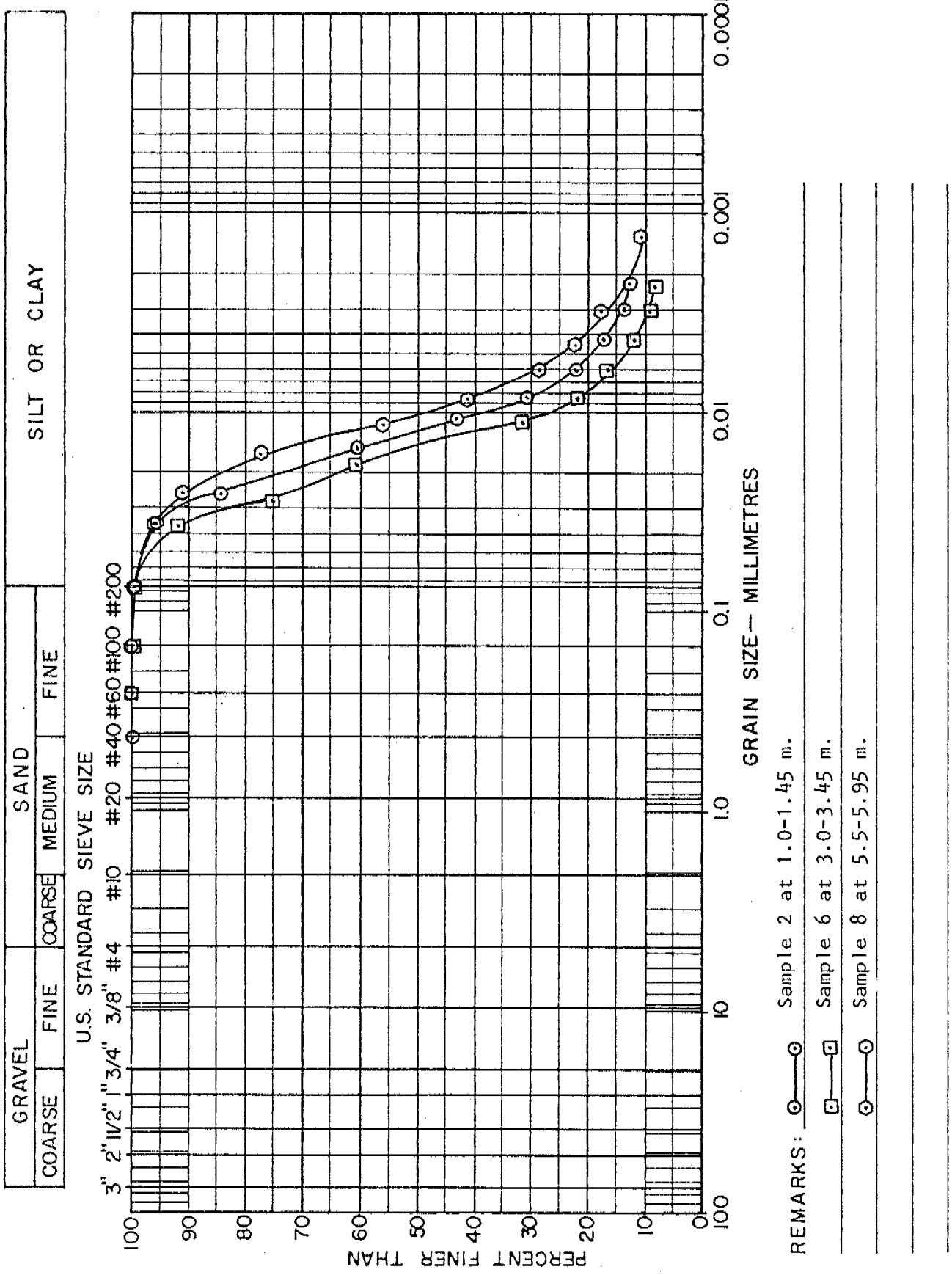
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 360.7, 0.2 mile R. of C.L.
HOLE No. 77-203
DATE Sept. 4/77 PLATE

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-203 DEPTH
DATE	November 1977

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B	4	1
	SPT	5	2
	B	7	3
2		21	
	SPT	16	4
	B	25	5
3	SPT	23	6
4			
5			
6			
7	SPT	35	7
		35	
		60 for 10 cm.	
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	1.2

LOCATION Sheet No. 18 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 ORGANIC COVER

ORGANIC SILT AND CLAY & SAND
- trace of gravel
- wood and rootlets
- dark brown

1.8

SILT AND CLAY
- some sand
- little gravel
- grey

(TILL)

3.0

GRAVEL AND SAND
- trace silt
- layers of fine sand

6.0

SILT AND CLAY
- little to some sand
- trace gravel
- low plastic
- few laminations
- grey

interbedded with gravel

8.5 m

END OF HOLE

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▼ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

158

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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 351.8, .5 mile R. of C.L.
HOLE No.	77-204
DATE	Sept. 4/77 PLATE

I.S. = METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

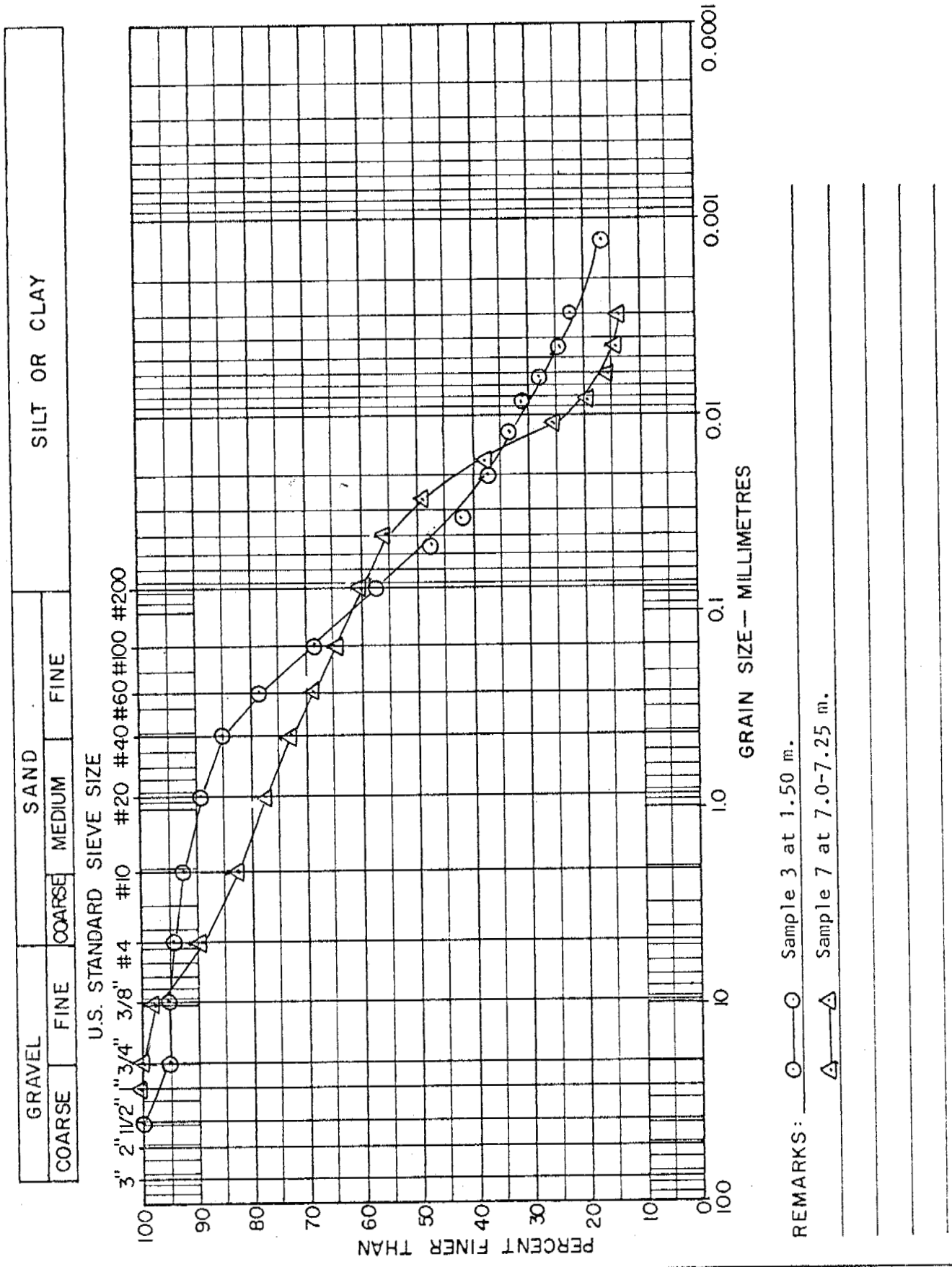
1. Hole located on old slide. Ground surface sloping 18% to the northeast.
2. Vegetation consists of spruces to 17 m. and small willows.
3. Hole augered to 3 m. Mud drilling used from 3 m. to 8.5 m.
4. Hole caving in at 8 m.
5. Thermistors installed at 0.5, 1.5, 3.0, 4.5 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highwey Pipeline
LOCATION	MP 351.8, .5 mile R. of C.L.
HOLE No.	77-204
DATE	Sept. 4/77 PLATE

U.S. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-204 DEPTH
DATE	

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
	SPT	29 40 for 7.5 cm.	2
2			
3			
4	B		3
5			
6			

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
⊙ FIELD VANE △ LAB VANE ⊡ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.05 ORGANIC COVER

GRAVEL AND SAND
- little silt
- layered with gravely silt
- trace of organics

1.3

NF.

GRAVEL
- fine to coarse
- little sand
- little silt
- grey

5.6 m.

END OF HOLE

Notes:
1. Hole located 30 m. north of ravine on a 1-2% slope to the northeast.
2. Burnt area. Poplars to 4-5 m.
3. Drilling mud used from 0.5 to 5.6 m.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 349.5, .1 mile L.of C.L.
HOLE No. 77-205
DATE Sept.5/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION Sheet No. 18 Appendix C ELEVATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ⊗ UNCONF.
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — — — — — O — — — — — X 10 30 50 70 90%
	B		1				GRAVEL AND SILT - some sand	⊙
0.5								
1								
2							GRAVEL - fine to coarse - some sand and silt - cobbles	
3	B		2			NF.		
4								
5								
5.5 m.								
6							END OF HOLE	

Notes:
1. Hole located on the slope of a small hill sloping 2% to the south and southwest.
2. Burnt area. Sparse spruces to 14 m. Grass cover and small shrubs.
3. Drilling mud used from 0.5 to 5.5 m.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 344.6, 0.1 mile R. of C.L.
HOLE No. 77-206
DATE Sept. 5/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B	7	1
	SPT	13 15	2
2		3	
	SPT	6 12	3
3		7	
	SPT	8 12	4
4		9	
	SPT	13 19	5
5		7	
	SPT	28 34	6
6			
7			
8			
9			

SYMBOL

PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION Sheet No. 18 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.15 TOPSOIL

SILT
- trace of sand
- trace of gravel
- stratified with sand
- grey brown

sand layer

2.5

SAND AND SILT
- little gravel
- trace of organics
- trace of oxidation
- grey brown

NF 4.0

sandy silt

GRAVEL
- fine to medium
- some silt
- little sand
- trace of clay
- sand and silt layers
- grey

8.5m.

END OF HOLE

(cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▯ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

NP

10

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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP338.9, 0.1 mile R. of C.L
HOLE No.	77-207
DATE	Sept. 6/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.	SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE "1" UNCONF
HT. DROP 76 cm.				ELEVATION	
SAMPLE DATA		N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — 0 — X; 10 30 50 70 90%
DEPTH TYPE BLOW/15cm. No.		CLASS			

Notes:

1. Site located south of Fox Lake in a low area with north-south ridges to the east and west. Poorly drained area.
2. Burnt area, sparse spruces to 20-25 m., poplars and fir to 6-7m.
3. Drilling water used from 0.5 to 8.5m.
4. Water table at approximately 0.75m.
5. Thermistors installed at 0.5, 1.5, 3.0, and 4.5m.

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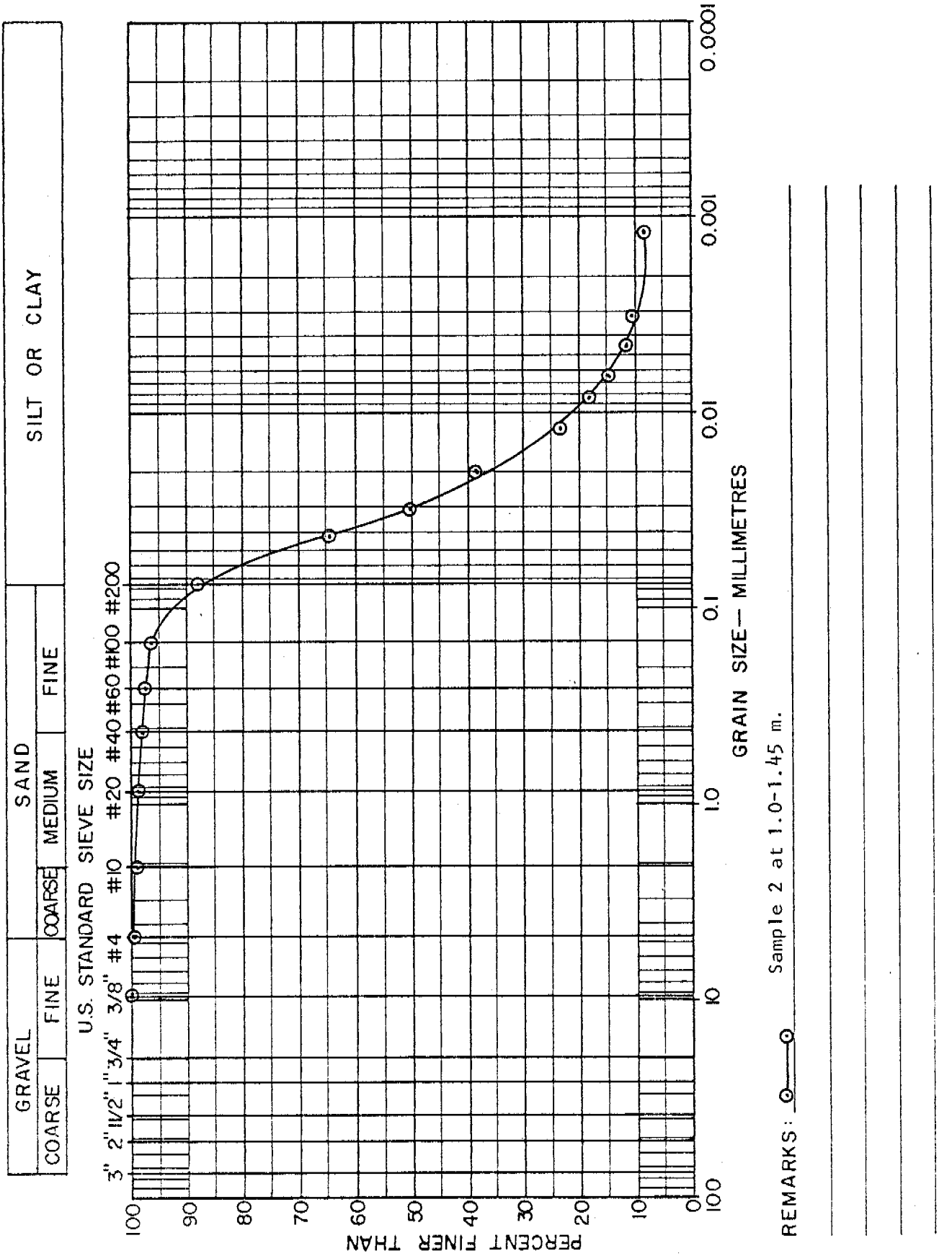
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP338.9, 0.1 mile R. of C.L.
HOLE No.	77-207
DATE	Sept. 6/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-207 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION Sheet No. 18 Appendix C	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▣ UNCONF.
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	ELEVATION	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X——0——X 10 30 50 70 90%
							DESCRIPTION OF MATERIAL	
1	B		1				0.1 TOP SOIL	
	B		2					
2	SPT	19 28 33	3			NF	GRAVEL - fine to coarse - some sand - little silt and clay - occasional cobble - dense	X-X
3	SPT	19 18 18	4					
4								
5								
							5.5 m.	
6							END OF HOLE	

Notes:

1. Hole located in a clearing. Ground surface sloping 5% to the southeast towards a dried up pond.
2. In the immediate vicinity the vegetation consists of white spruces to 30 m. A burnt area to the west support a vegetation birch.
3. Drilling mud used from 1.5 to 5.5 m.
4. Spoon bouncing on cobble at 5.5 m.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 335.1, 0.2 mile R. of C.L.
HOLE No. 77-208
DATE Sept. 6/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

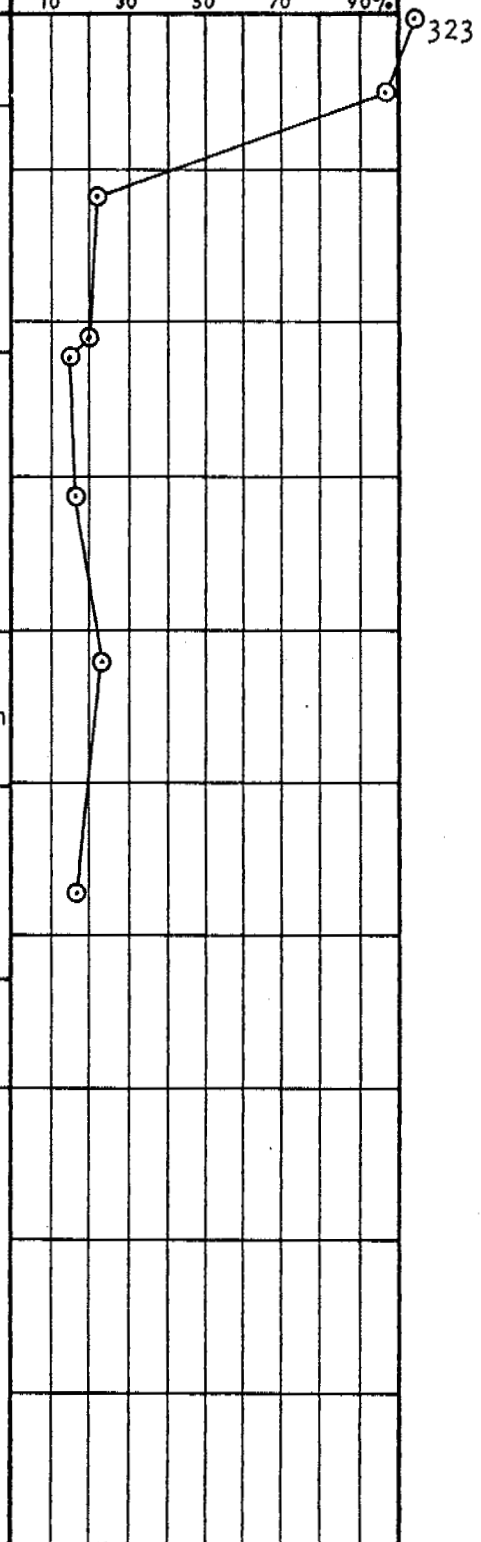
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
						NF.	ORGANIC SILT - rootlets - black
	B		1				0.5
1							-gravel SAND AND SILT - trace to little gravel - dark grey
		11			Vs, Vr		
	SPT	20	2				
		15					
2							
		39			Nbe		
	SPT	45	3				2.2
		for 8cm.					Gravel layer
3							SAND - fine - trace of silt - silt laminations - grey
		50					
	SPT	63	4		Nbe		
4							4.0
		29					SILT - little sand - trace of clay - sand & silt stratification - grey
	SPT	14	5				
		22					5.0
5							Gravel SAND - fine to coarse - trace of silt - trace of gravel - stratified with gravel and silt - grey
		19					
	SPT	27	6			NF	
6		36					6.0
							GRAVEL
7							7.0 m
							END OF HOLE
8							Notes: 1. Hole located to the north of a lake in a muskeg area with ridges 8m. high on the east and 3m. high on the west. 2. Poorly drained area. Vegetation of white spruces to 25m and birches to 13m along ridges. 3. Drilling mud used from 2.2-5m. 4. Casing used to prevent loss of drilling mud. 5. Loss of drilling fluid @ 6.0 m.

LOCATION Sheet No. 18 Appendix C
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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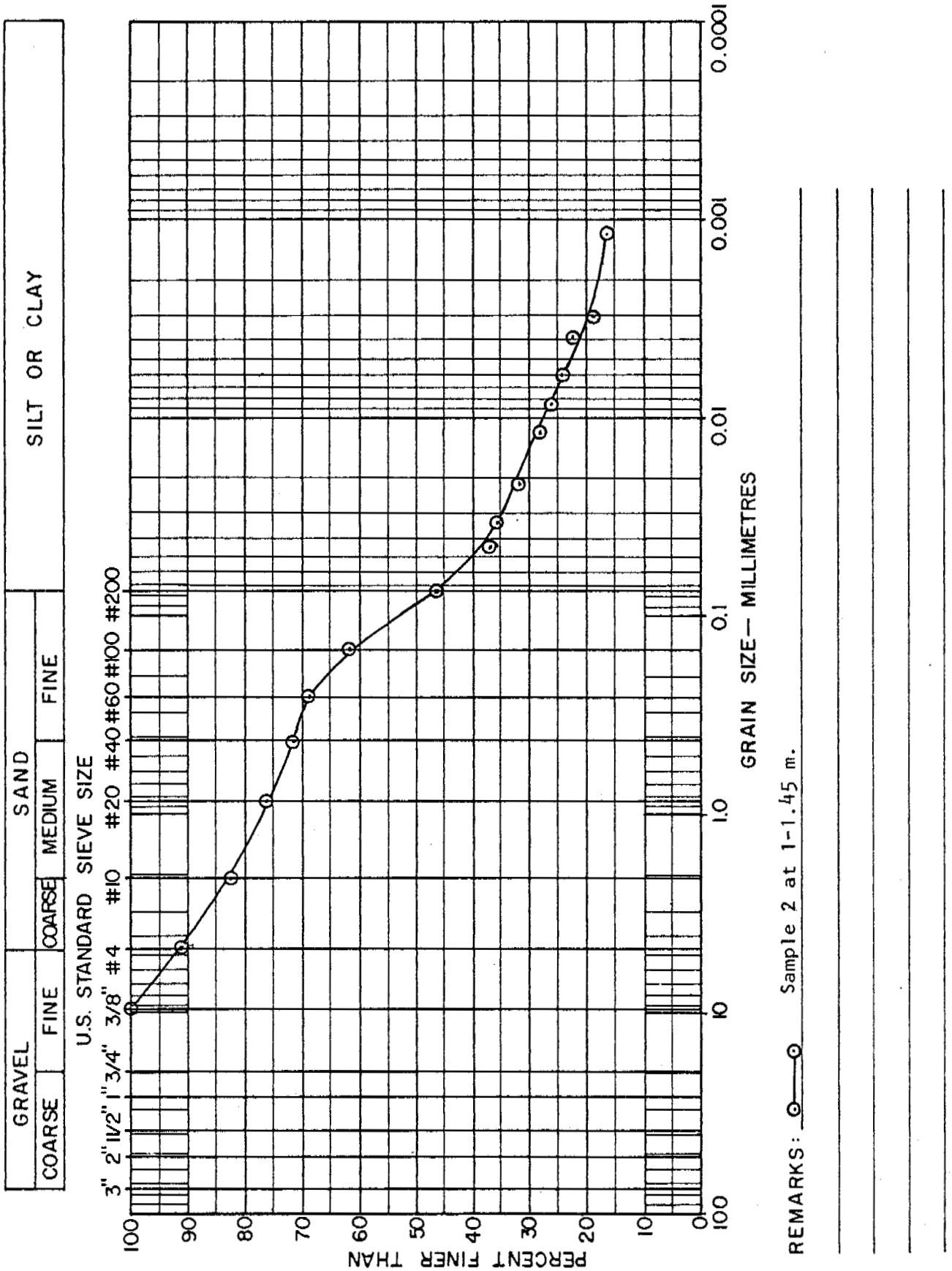
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 332.2 C.L.
HOLE No. 77-209
DATE Sept. 7/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-209 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		1
1		22	
	SPT	24	2
		26	
2		48	
	SPT	53	3
		42	
3		40	
	SPT	45	4
		Ref.	
4		28	
	SPT	60 for 8cm.	5
5			
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0-3
Vr	
N	

LOCATION Sheet No. 17 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

ORGANIC SILT AND CLAY
- trace of sand
- rootlets
- black
- silt layer

1.5

GRAVEL
- some sand
- little silt
- brown

5.6 m.

END OF HOLE

Notes:
1. Hole located to the northeast end of Fox Lake. Ground surface sloping 2-8% to the southwest.
2. Thick moss cover. Spruce trees to 13 m.
3. Drilling mud used from 1.45 to 5.6 m.
4. Slight surface drainage across the site in a westerly direction Water ponded on ground surface.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

313
163
127

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 323.9,0.2 mile L. of C.L.
HOLE No. 77-210
DATE Sept.7/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B	10	1
2	SPT	22 32	2
3	SPT	19 39 40 for 10cm.	3
4	SPT	31 46	4
5	SPT	25 47	5
6	SPT	33 42 50	6
7	SPT	24 63	7
8			
9	SPT	43 67	8
10			

SYMBOL

PERMAFROST

N.R.C. CLASS: ICE

N.F. or F.: NF. 1.0

LOCATION Sheet No. 17 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.1 TOPSOIL

SILT AND CLAY
- trace of sand
- rootlets, organics
- low to medium plastic

1.2 - grey

ICE
- silt and clay inclusions

silt and clay with fine gravel

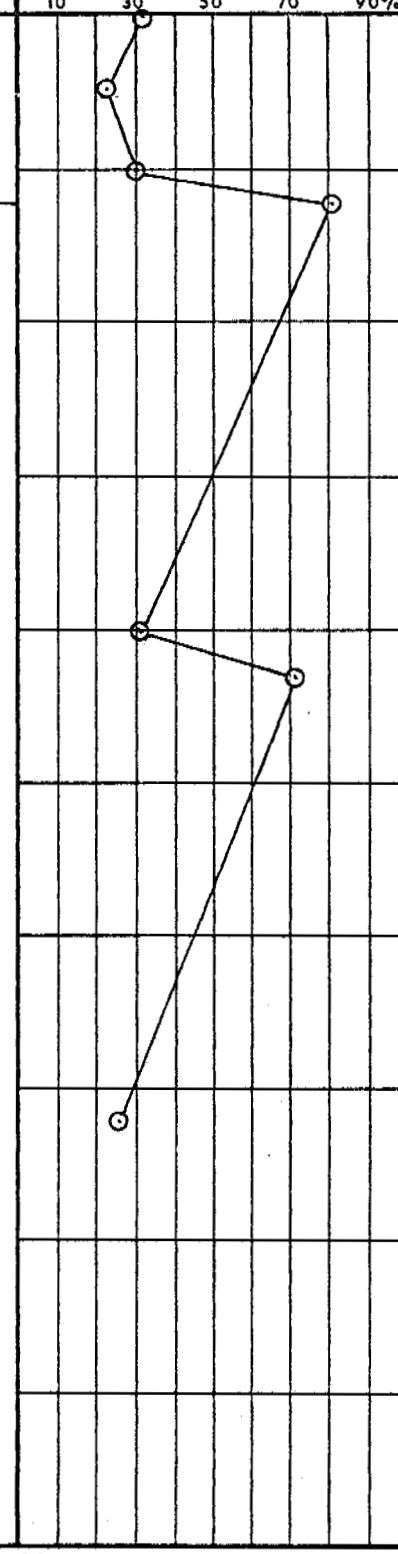
silt and clay

silt and clay with fine gravel

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 323.2,0.5 mile R. of C.L.
HOLE No. 77-211
DATE Sept.8/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	22 10 3	9		ICE		As above.
11							silt and clay with fine gravel 11.0
	SPT	7 12 19	10				SILT AND CLAY - trace of sand - trace of gravel - grey
12							11.95 m.
							END OF HOLE

Notes:
1. Hole located to the northwest end of Fox Lake on a northwest southeast ridge approx. 7 m. above the surrounding thermokarst ponds.
2. Vegetation consists mainly of white spruces up to 16m. in height.
3. Water used as drilling fluid from 1.5m. to 11.95m.
4. Drainage along ridges to the southeast.
5. Thermistors installed at 0.5, 1.5, 3.0 and 6.0 m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT X — WATER CONTENT 0 — LIQUID LIMIT X
10 30 50 70 90%

⊙

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 323.2,0.5 mile R. of C.L.
HOLE No. 77-211
DATE Sept.8/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION Sheet No. 17 Appendix C
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▦ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.5m ORGANIC COVER

END OF HOLE

Notes:

1. Site located on a bench. The ground surface slopes 5% to the southwest in the immediate vicinity of the hole. Further from the hole, the ground surface slopes at gradients exceeding 100%.
2. Vegetation in the vicinity consists of spruce and birch trees up to 8-10m. in height.
3. Refusal on bedrock or boulder below 0.5 m.

1
2
3

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 321.4, 0.2 mile R. of C.L.
HOLE No. 77-212
DATE Sept. 8/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		1

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF

LOCATION Sheet No. 17 Appendix C
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 ORGANIC COVER

0.6 SILT - layered with sand

1.0 GRAVEL - some sand

BEDROCK

2.7 m. END OF HOLE

Notes:
1. Hole located 60 m. east of service road for communication tower on hill side. The ground surface slopes 2-3% in a northerly direction.
2. Vegetation consists of small shrubs, spruce and fir trees to 12 m. in height.
3. Drilling mud used from 1.0 to 2.7 m.
4. Cobbles and fractured bedrock exposed on road.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 319, 0.9 mile R. of C.L.
HOLE No. 77-213
DATE Sept. 8/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		1
1	C		2
2			
3	SPT	70 for 10cm.	3
	B		4
4			
5			
	B		5
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.75
Vr	
Vx	
Vr	
N	

LOCATION Sheet No. 17 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

ORGANIC SILT AND PEAT
- black

1.5

GRAVEL
- fine to medium
- some sand
- little silt

5.5 m.

END OF HOLE

Notes:
1. Hole located on a flat, poorly drained area with a pond to the east.
2. Vegetation consists of small shrubs to 2 m. and spruces to 3-4 m. in the immediate vicinity of the hole. Further from the hole, spruce trees to 20-25 m. in height.
3. Drilling mud used from 1.5 to 5.5 m.

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

206
391
461

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 315.6 C.L.
HOLE No. 77-214
DATE Sept. 9/77 PLATE

L.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
	B		1
1			2
2	SPT	60 / 120	3
3			
4			
5	B		4
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Vr	
N	

LOCATION Sheet No. 17 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 ORGANIC COVER

0.5 SILT, - trace of gravel

GRAVEL
- fine to coarse
- some sand
- little silt
- layers of coarse gravel
- brown

5.7 m.

END OF HOLE

Notes:
1. Hole located on 3-4% grade sloping to the north and flattening out further from the hole.
2. Vegetation consists of shrubs 1-1.5m. tall and spruce trees to 15 m.
3. Drilling mud used from 1.0 to 5.7 m.
4. Hole caving in during drilling.

111

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 316.1,0.2 mile L. of C.L.
HOLE No. 77-215
DATE Sept. 9/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		1
	B		2
2		17	
		32	
	SPT	36	3
3			
		50	
	SPT	52	4
		56	
4			
		50	
	SPT	75	5
		90 for 10cm.	
5			
		59	
		65	
6	SPT	50	6
		for 8cm.	
7			
		35	
8	SPT	75 for 10cm.	7
9			
	B		8
10			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 16 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.3 SILT
- trace of sand

SILT AND CLAY
- some gravel
- little sand
- trace of oxidation
- brown

(Till-like)

5.0

CLAY AND SILT
- little sand
- high plastic
- oxidized inclusions
- blue grey & rusty brown

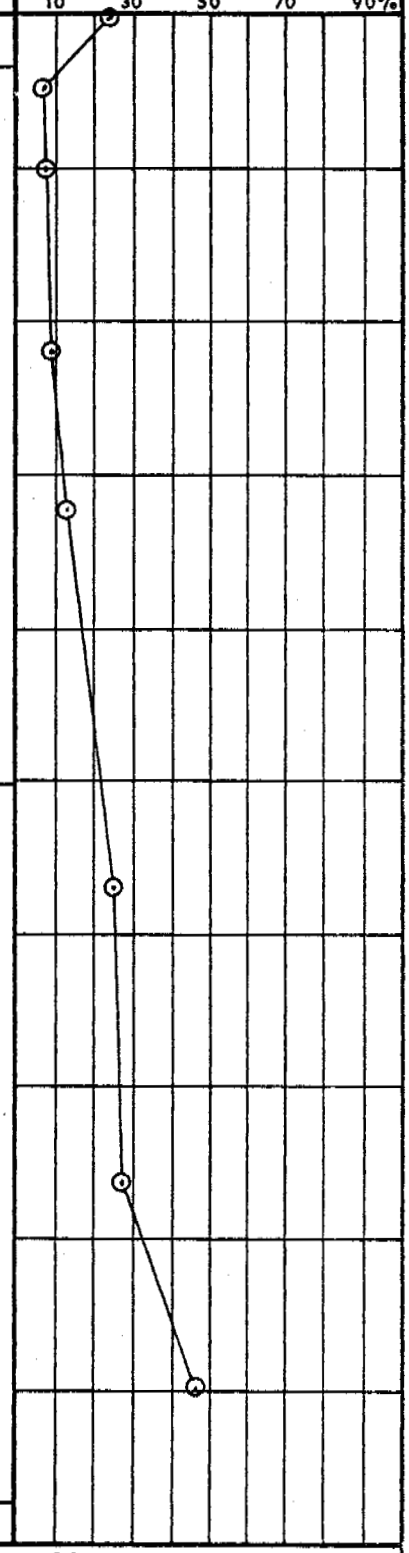
(Bentonitic)

9.7m.

END OF HOLE (cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 314, C.L.
HOLE No. 77-216
DATE Sept. 10/77 PLATE

S.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
HT. DROP 76 cm.							ELEVATION	
SAMPLE DATA					N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — — — — — 0 — — — — — X 10 30 50 70 90%
DEPTH	TYPE	BLOW/15 cm.	No.					

Notes:

1. Hole located near the top of a hill. Ground surface slopes 3% to the northeast.
2. Burnt area. Shrubs 1-1.5m., in height and sparse white spruces.
3. Drilling mud used from 1.0 to 9.7m.
4. Free water at approx. 1.5m.

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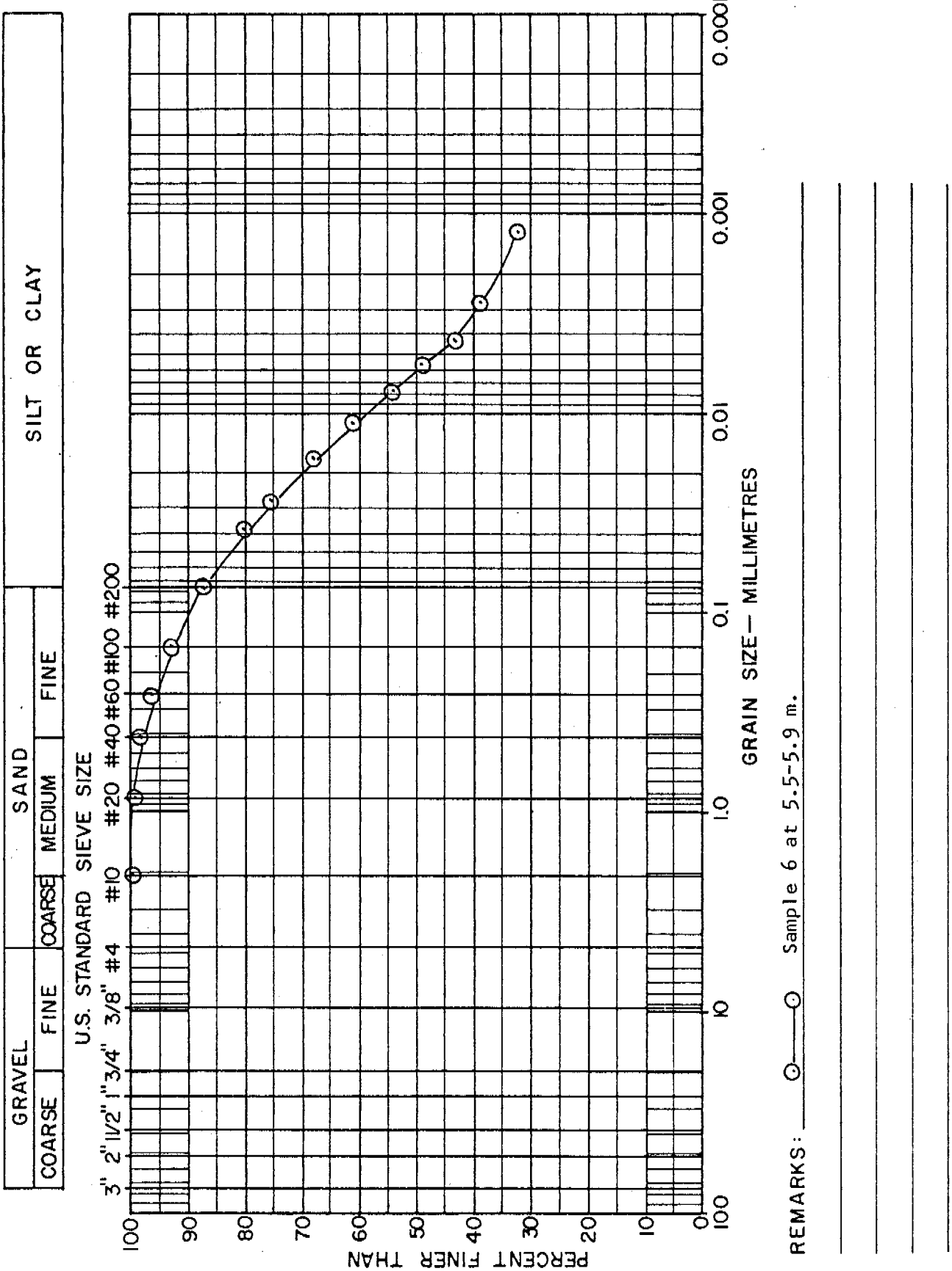
JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 314, C.L.
HOLE No.	77-216
DATE	Sept. 10/77 PLATE

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-216 DEPTH
DATE	

TEST HOLE LOG

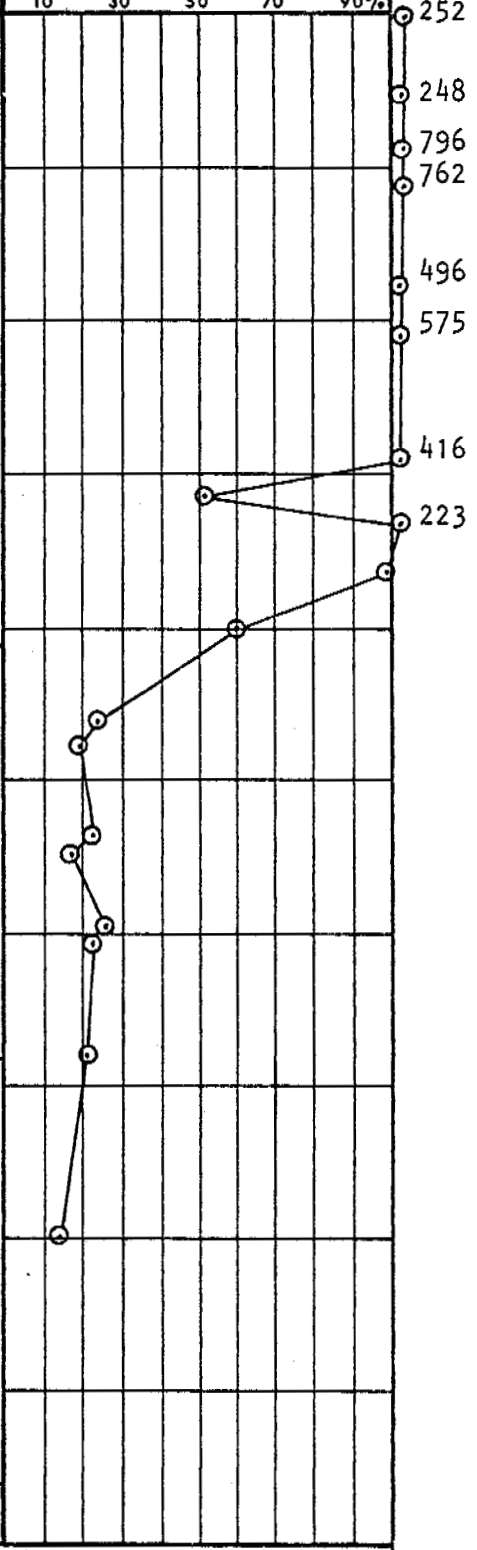
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
						NF	PEAT
	B		1			0.6	- organic silt layers
1							- dark brown
	C		2		Vr Vs Vx		
	C		3				← (Ice lenses ¼-3mm. spaced @ 1-15mm.)
2							
	C		4		Vr, Vs Vx		← (Ice lenses 1-3mm. spaced @ 2-5mm.)
3							
	C		5		Vr		← (Ice lenses ¼-3mm. spaced @ 1-20mm.)
	C		6		Vs		SILT AND SAND
4							- organic laminations
						4.1	
	C		7				SAND
5							- fine to coarse
	C		8		Nbn		- trace to little silt
							- sand and silt laminations
6	C		9				- greyish brown
	C		10				← trace of sandstone
7						6.75	
							GRAVEL
8							- little to some sand
	B		11		N		
9							
	SPT for	62 10cm	12			9.6m.	
10							END OF HOLE (Cont'd.)

LOCATION Sheet No. 16 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



L.L.C. - METRIC

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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 309.2, C.L.
HOLE No.	77-217
DATE	Sept.10/77 PLATE

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA: DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST: N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located in a valley which slopes gently to the southwest.
2. Burnt area. Vegetation of shrubs. The surrounding ridges, white spruce trees and poplars to 14m.
3. Drilling mud used from 6.75 m. to 9.6 m.
4. Thermistors installed at 0.5, 1.5, 3.0 and 6.0 m.

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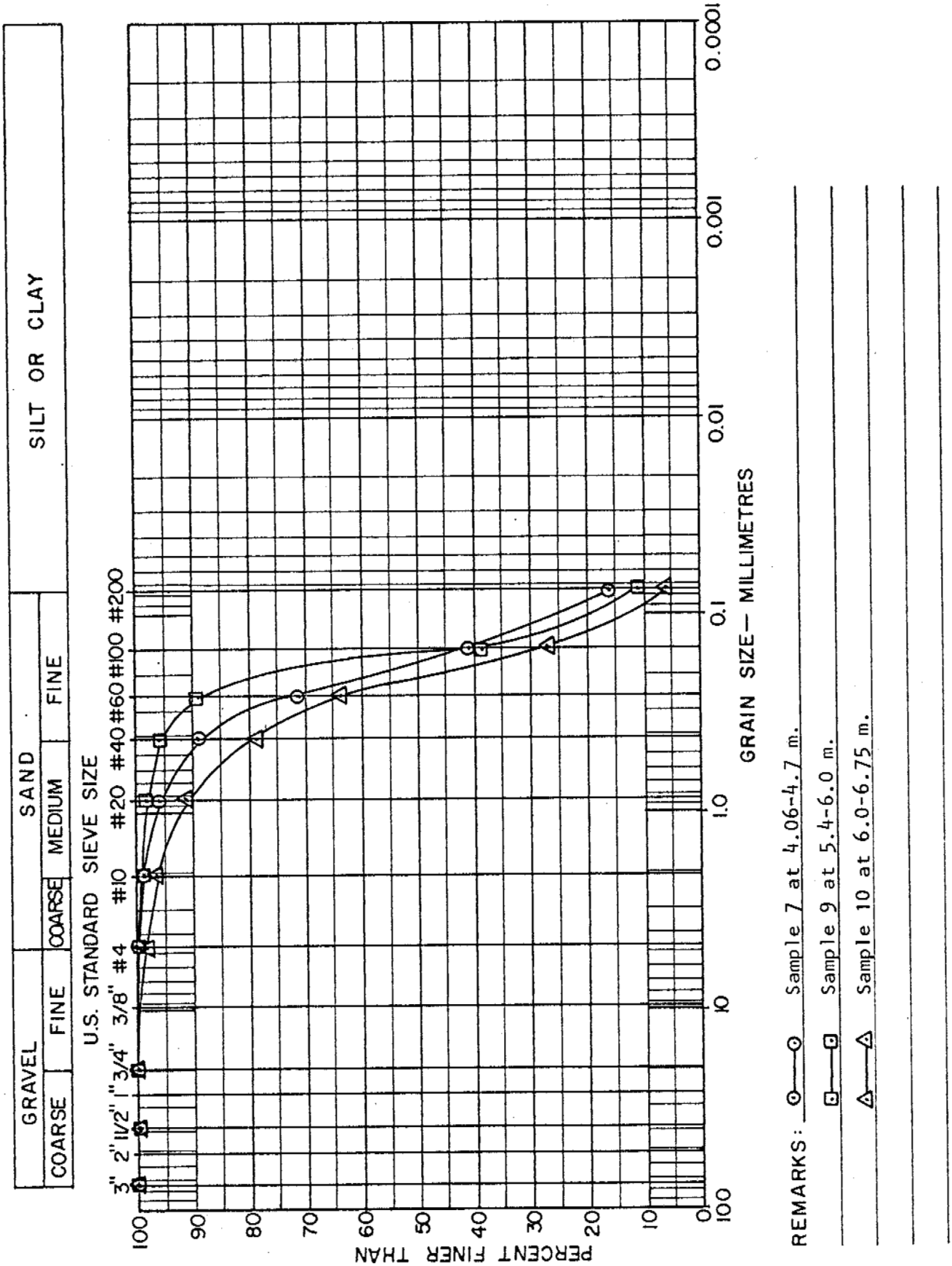
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 309.2 C.L.
HOLE No. 77-217
DATE Sept. 10/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No. 77-217	DEPTH
DATE	Dec/77

FROZEN BULK DENSITY TEST RESULTS

HOLE NO. 77-217

Sample No.	Sample Depth (M)	Frozen Bulk Density KG/M^3	Frozen Bulk Density PCF
5	2.7-3.4	1338.3	83.4

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
2	SPT	11 15 24	2
3	SPT	32 53 35	3
4	SPT	45 88	4
5			
6			

SYMBOL

PERMAFROST
N.R.C. CLASS
N.F. or F.

LOCATION Sheet No. 16 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.2 TOPSOIL

GRAVEL AND SAND
- some silt and clay
- rusty sand pockets
- grey

1.85

NF.

SILT AND CLAY
- little sand
- little gravel
- low plasticity
- grey
(till-like)

3.3

GRAVEL- fine to coarse
- some sand
- little silt
- rusty sand pockets
- brown

4.5

BEDROCK

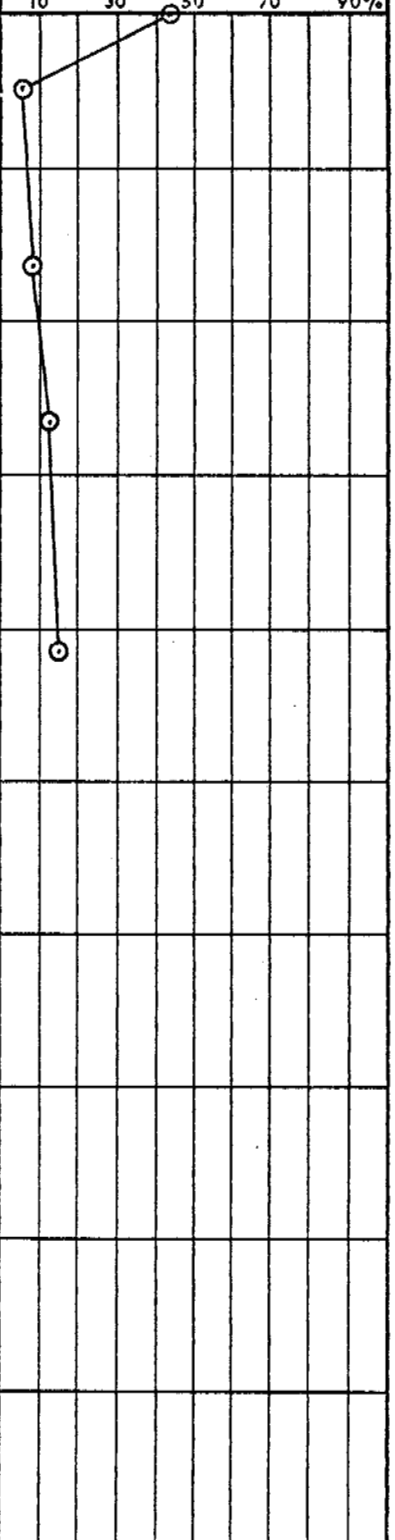
5.5 m.

END OF HOLE

Notes:
1. Hole located on a flat area, 100 m. south of a ravine.
2. Spruce trees to 8 m.
3. Drilling mud used from 0.5 to 5.5 m.
4. Bedrock exposed in ravine at a depth of 3-6 m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 307, 0.1 mile R. of C.L.
HOLE No. 77-218
DATE Sept. 11/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
2	SPT	11, 15, 16	2
3	SPT	18, 23, 33	3
4	SPT	53, 59, 53	4
5	SPT	100	5
6	SPT	70, 96	6
7	SPT	80 for 10cm	7
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Nbn	
N	

LOCATION Sheet No. 16 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.1 ORGANIC COVER
VOLCANIC ASH

GRAVEL
- fine to coarse
- little to some sand
- little silt
- brown

1.75 silt layer

SAND
- fine
- some silt
- layers of silt

3.95

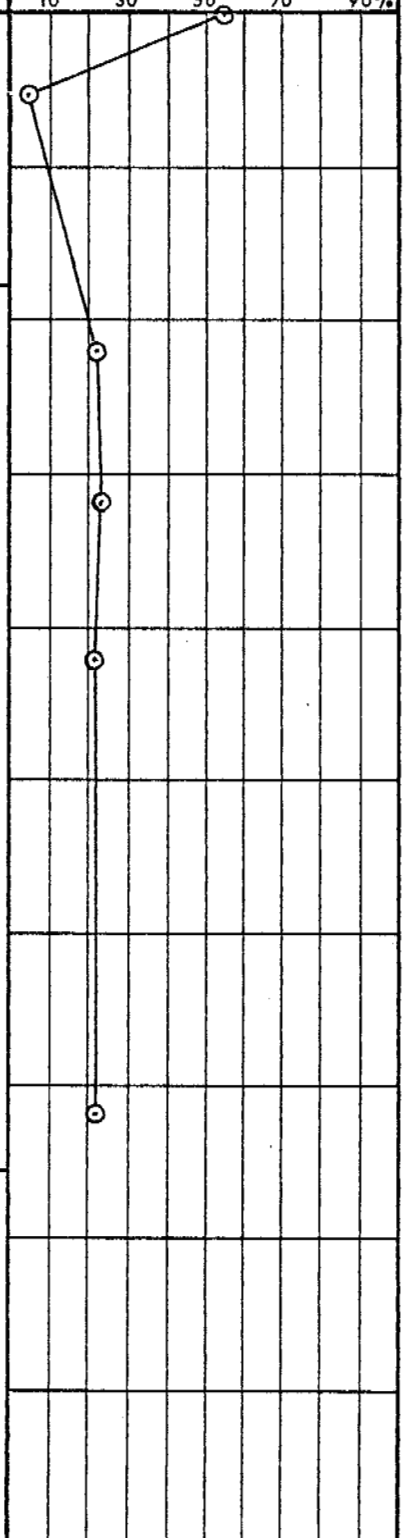
7.5

GRAVEL
- some sand

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 301.5, C.L.
HOLE No.	77-219
DATE	Sept.11-12/77 PLATE

L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION / ELEVATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▦ UNCONF.
DEPTH	TYPE	BLOW 15 cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (X — 0 — X) 10 30 50 70 90%
11					N		As above. 11.5 m.	
12							END OF HOLE Notes: 1. Hole located in a ravine on a terrace dropping off 4-5 m. to the southwest. 2. Burnt poplars to 4 m., white spruces to 16 m. and shrubs. 3. Drilling mud used from 0.5 to 11.5 m. 4. Boulders exposed at edge of terrace. 5. Poorly drained area. Water table at about 1-2m.	

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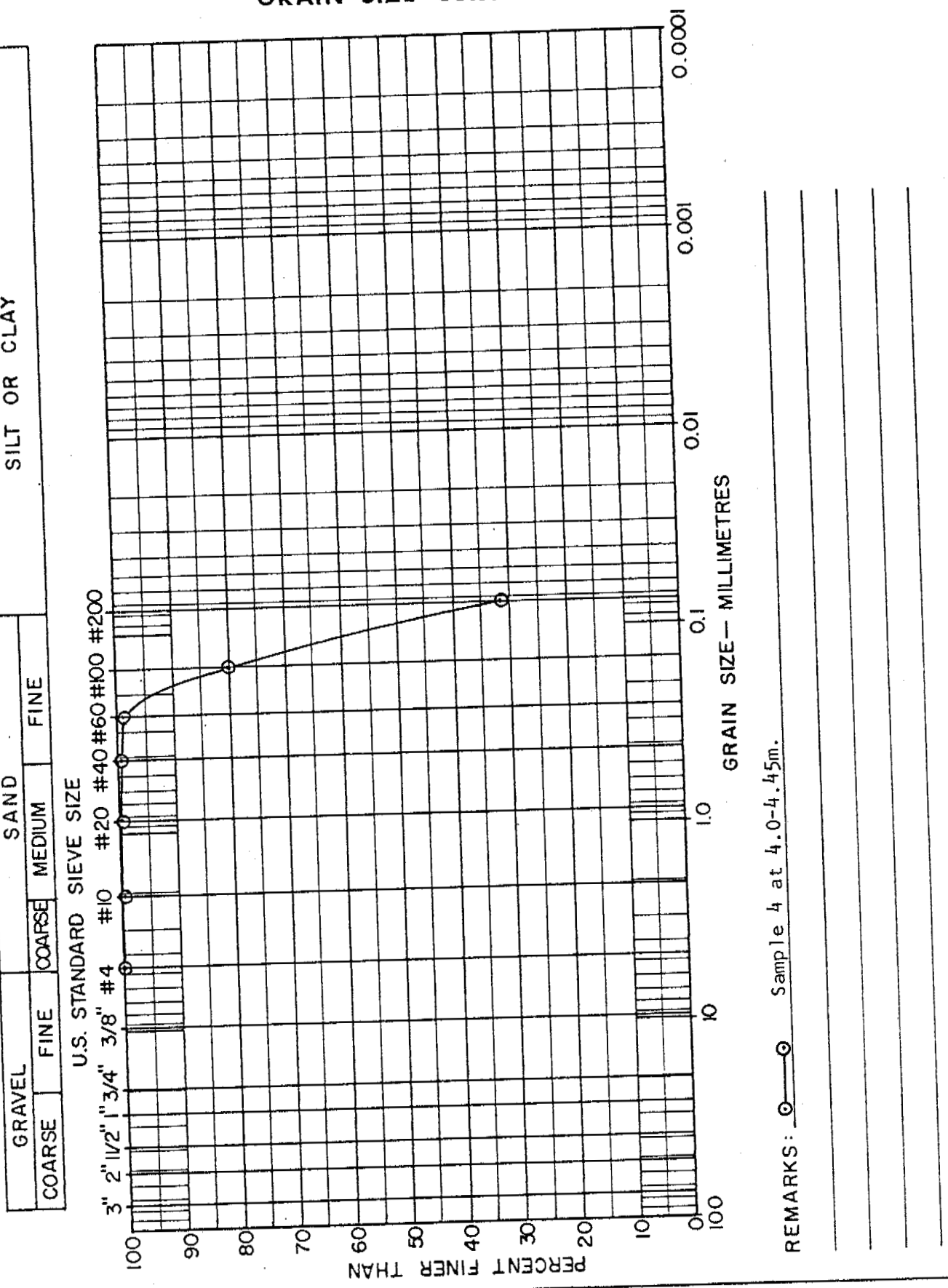
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 301.5 C.L.
HOLE No. 77-219
DATE Sept.11-12/77 PLATE

S.I.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-219 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
	B		1
1	B		2
	B		3
2	B		4
	B		5
3			
4	SPT	80 for 10cm	6
5			
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.

LOCATION Sheet No. 16 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.1 ORGANIC COVER
SILT AND SAND
0.6 - trace of gravel - brown

GRAVEL
- fine to coarse
- some sand
- trace to little silt
- cobbles

3.75

SILTSTONE
- black

(Bedrock)

5.5 m.

END OF HOLE

Notes:
1. Hole located on gently sloping ground (1-2%) to the northeast.
2. Shrubs in the immediate vicinity of hole. Spruce trees to 30 m. in surrounding area.
3. Drilling mud used from 2.5 to 5.5 m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

157

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JOB No. AL0889
PROJECT Dempster Highway pipeline
LOCATION MP 297 C.L.
HOLE No. 77-220
DATE Sept.19/77 PLATE

K.L.C - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
2			
3			
4			
5	B		2
6			
7			
8	B		3
9			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.

LOCATION Sheet No. 15 Appendix C
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ☐ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X ------ 0 ------ X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1 TOPSOIL
VOLCANIC ASH

GRAVEL
- fine to coarse
- some sand
- little silt

8.5 m.

END OF HOLE

(Cont'd.)

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 293.3, .1 mile L. of C.L.
HOLE No. 77-221
DATE Sept. 13/77 PLATE

C.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ⊠ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located on a terrace, 25 m. north of edge.
2. Poplars to 10 m. Sparse patches of grass.
3. Drilling mud used from 0.75 to 8.5 m.
4. Loss of drilling fluid below 4 m.
5. Piezometer installed.

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JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 293.3, .1 mile L. of C.L.
HOLE No. 77-221
DATE Sept. 13/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

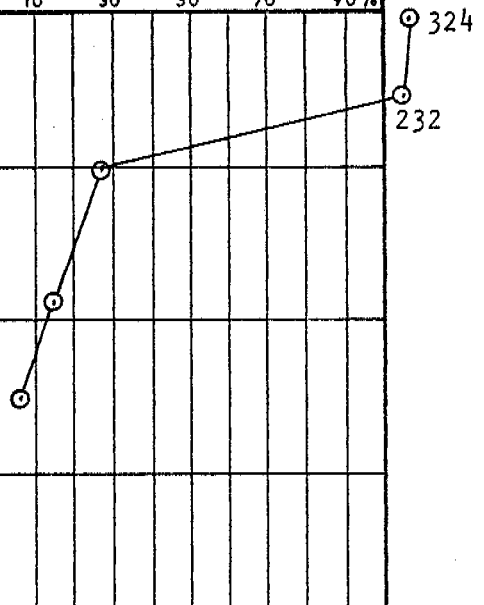
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 15 Appendix C
							ELEVATION
	B		1				ORGANIC SILT AND PEAT
							0.6 - black
1						NF	
	B		2				GRAVEL
							- fine to coarse
							- some sand
						2.0	- little to some silt & clay
2							- stratified with sand
	B		3		N		3.0 - brown
	B		4				
3							
		16					
		16					
4	SPT	22	5				
5							
						NF	Sand layer
6							
7							
8							
	B		6				8.5m.
9							END OF HOLE

(cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▦ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 285.1, C.L.
HOLE No. 77-222
DATE Sept. 13/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.

SYMBOL

PERMAFROST
N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located on a flat low lying swampy area.
2. Grass and peat tussocks in the immediate vicinity of hole. Spruce trees to 20-25m. and shrubs in surrounding area.
3. Drilling mud used from 2.5 to 8.5 m.
4. Poorly drained area
5. Water raised to 0.15 from the ground surface during drilling.

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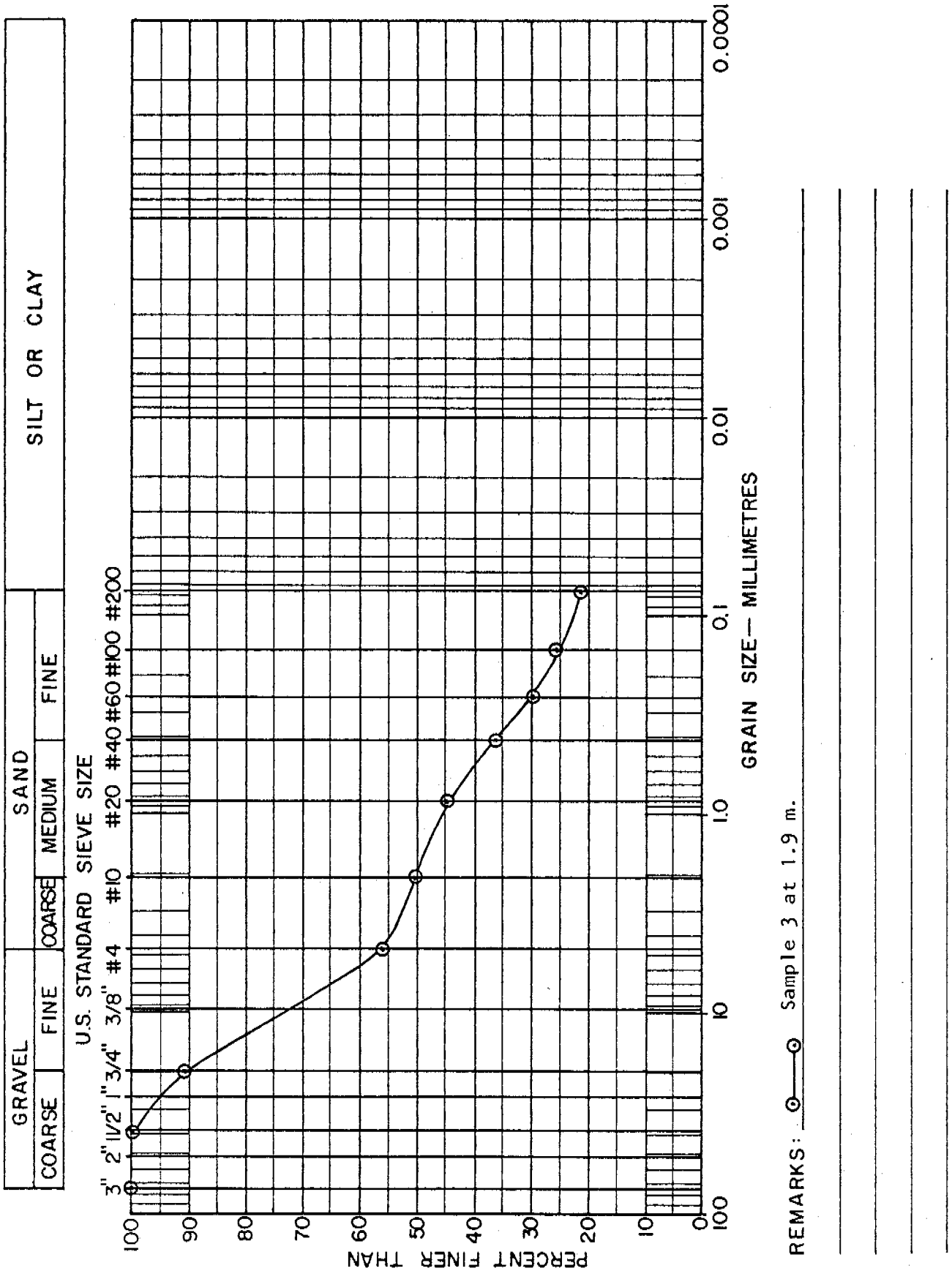
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP 285.1, C.L.
HOLE No. 77-222
DATE Sept. 13/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-222 DEPTH
DATE	Dec/77

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
1	B		1
	C		2
2	C		3
	C		4
3	C		5
4	C		6
5	C		7
	C		8
6	B		10
7			
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.5
Nbn vx	
Vr Vs Nbn	
Vr Vs Nbn	
Vs Vr	
Vx Nbn	
Vx	
N	

LOCATION Sheet No. 15 Appendix C
ELEVATION

DESCRIPTION OF MATERIAL

0.2 ORGANIC COVER
SILT
- little sand

0.5

SAND
- fine to medium
- little silt
- organics laminations
- brown

1.3

SILT
- little to some sand
- trace of organics
- slight to low plasticity
- stratification & laminations of sand
- organic lenses & laminations
- brown

white silt layer

(ice lenses 1/4mm. spaced @ 1-5mm)

← sand layer

← trace of fine gravel

(ice lenses 1/4mm. spaced @5-30mm)

4.2

SAND
- little to some silt
- trace of fine gravel
- stratifications and laminations of silt
- brown

(ice lenses 1/4-2mm. spaced 5-20mm.)

6.75

GRAVEL
- fine to coarse
- little sand
- little silt
- brown

(cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

240
188

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JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP 284.1, 0.2 mile R.ofC.L.
HOLE No.	77-223
DATE	Sept. 13/77 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11					N		As above.
							11.5m.
12							END OF HOLE

LOCATION
ELEVATION

Notes;

1. Hole located in a swampy area. Terrain slopes 1% to the north.
2. Vegetation of white spruces to 14m.
3. Drilling mud used from 6.8 to 11.5 m.
4. Thermistors installed at 0.5, 1.5, 3.0, and 6.0 m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▩ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

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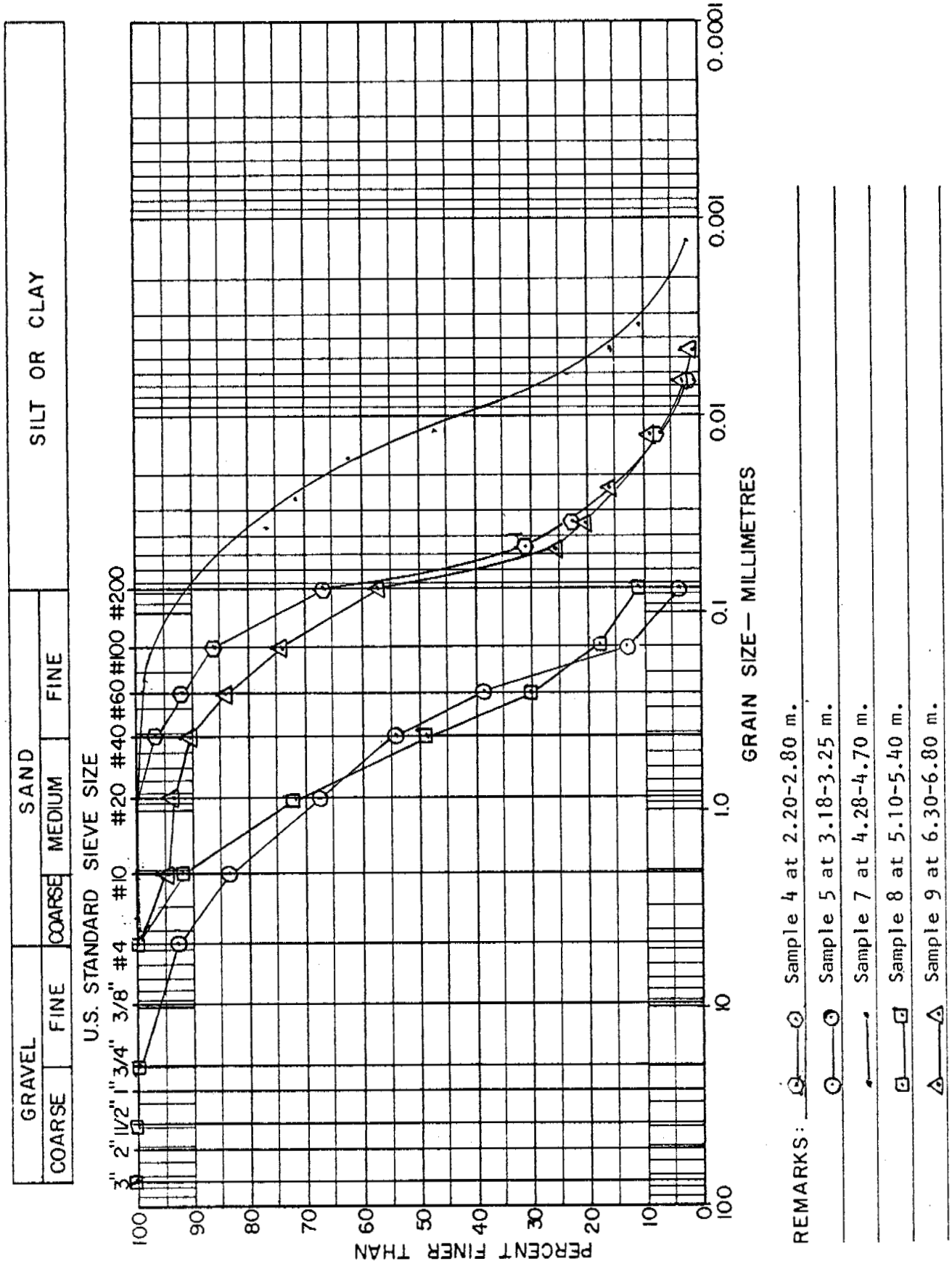
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION Mp284.1, 0.2 mile R. of C.L
HOLE No. 77-223
DATE Sept. 13/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No.	77-223 DEPTH
DATE	Dec./77

FROZEN BULK DENSITY TEST RESULTS

HOLE NO. 77-223

Sample No.	Sample Depth (M)	Frozen Bulk Density KG/M^3	Frozen Bulk Density PCF
5	2.8-3.5	1948	121.3
7	4.2-5.1	1800.9	112.2

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
							LOCATION Sheet No. 15 Appendix C
							ELEVATION
	B		1				0.1 ORGANIC COVER SILT & CLAY 0.6 - little sand
1	B		2				GRAVEL AND SAND - fine to coarse - trace of silt
	B		3				
2	B		4				
3	B		5				
4						NF	
5							
6	SPT	18 18 14	6				
7							
8							7.9
							SAND - fine to coarse - some gravel
9	SPT	9 13 16	7				8.95m.
							END OF HOLE

(cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ☐ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

161

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	MP281.6, 0.8 mile R. of CL
HOLE No.	77-224
DATE	Sept. 15/77 PLATE

L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ▣ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Hole located on flat ground adjacent to a dried up pond.
2. Willow bushes 2-3 m. in height
3. Drilling mud used from 3.0 to 8.95m.
4. Free Water encountered at 3m.

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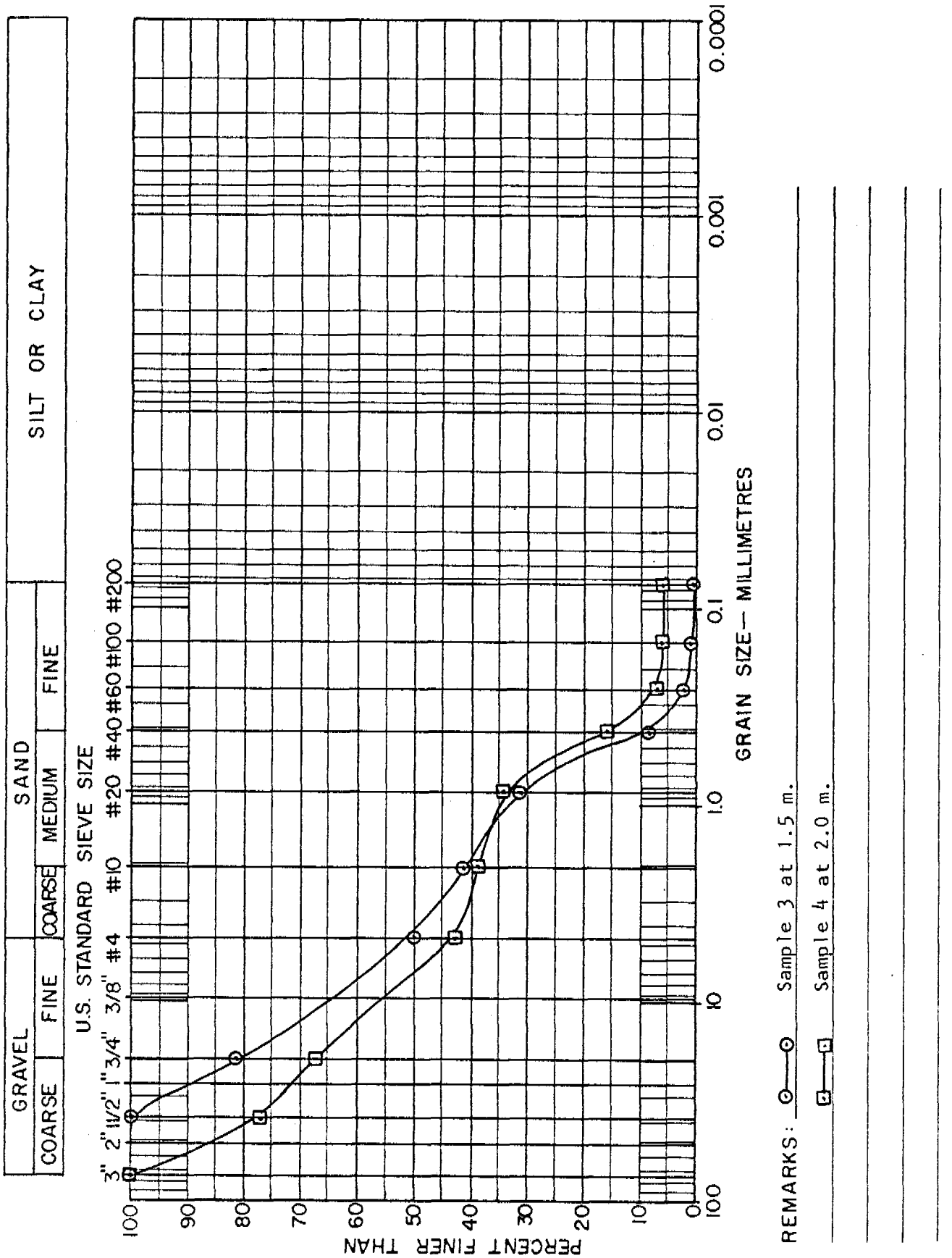
JOB No. AL0889
PROJECT Dempster Highway Pipeline
LOCATION MP281.6, 0.8 mile R. of C.L.
HOLE No. 77-224
DATE Sept. 15/77 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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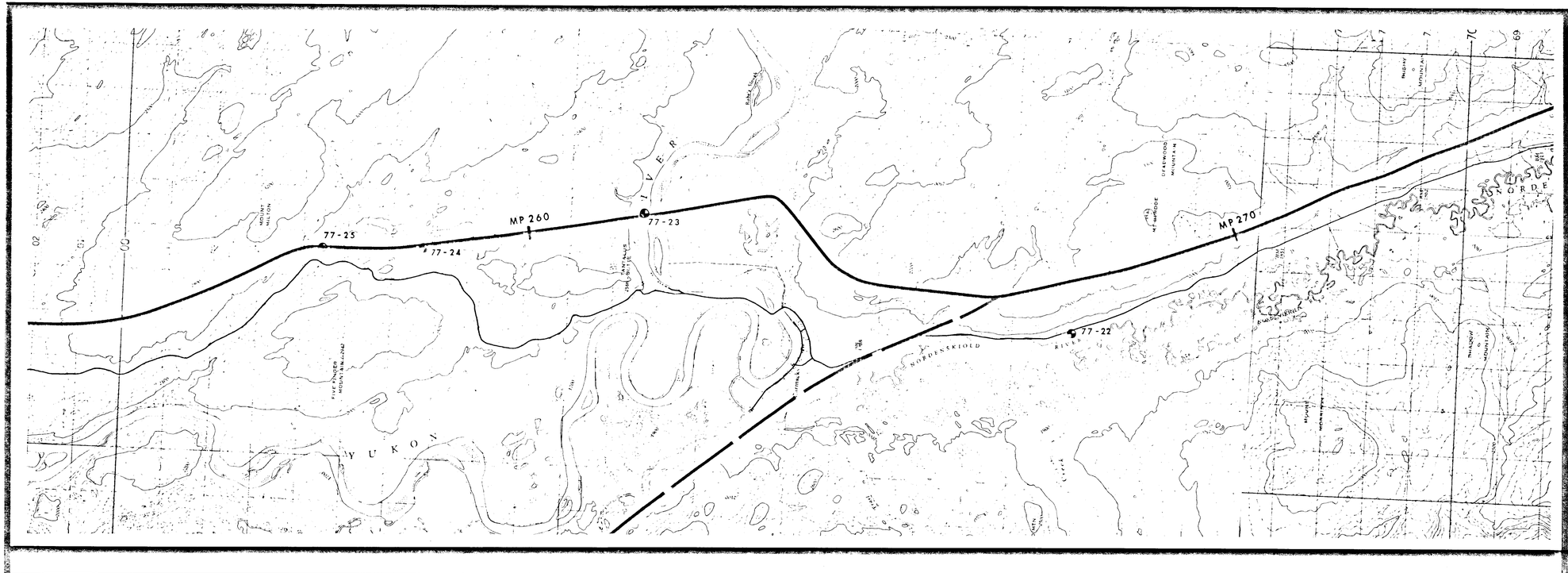
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0889
PROJECT	Dempster Highway Pipeline
LOCATION	
HOLE No. 77-224	DEPTH
DATE	Dec/77



FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4" : 1 MILE

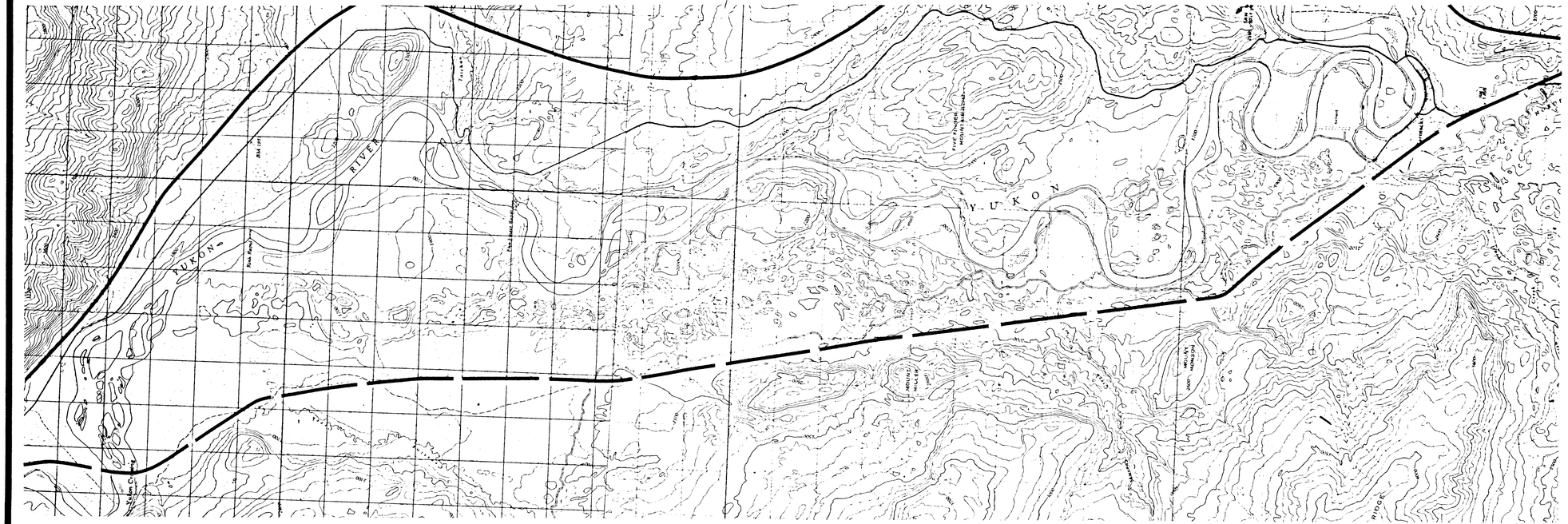
Sheet 14 of 33

● - TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC



FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4" : 1 MILE

Sheet 14B of 33

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

KLOHN LEONOFF CONSULTANTS LTD.
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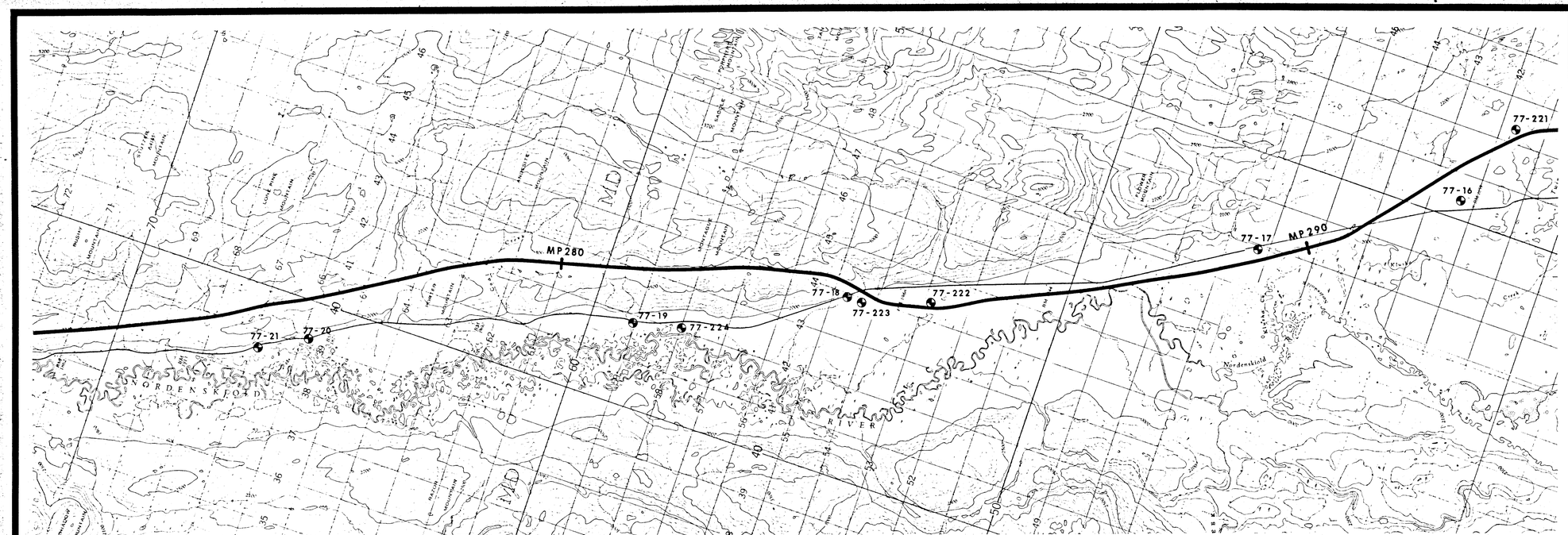

FOOTHILLS PIPE LINES (YUKON) LTD.

1 0 1 2

SCALE : 1 50,000 or 1 1/4 " : 1 MILE

Sheet 15 of 33

● - TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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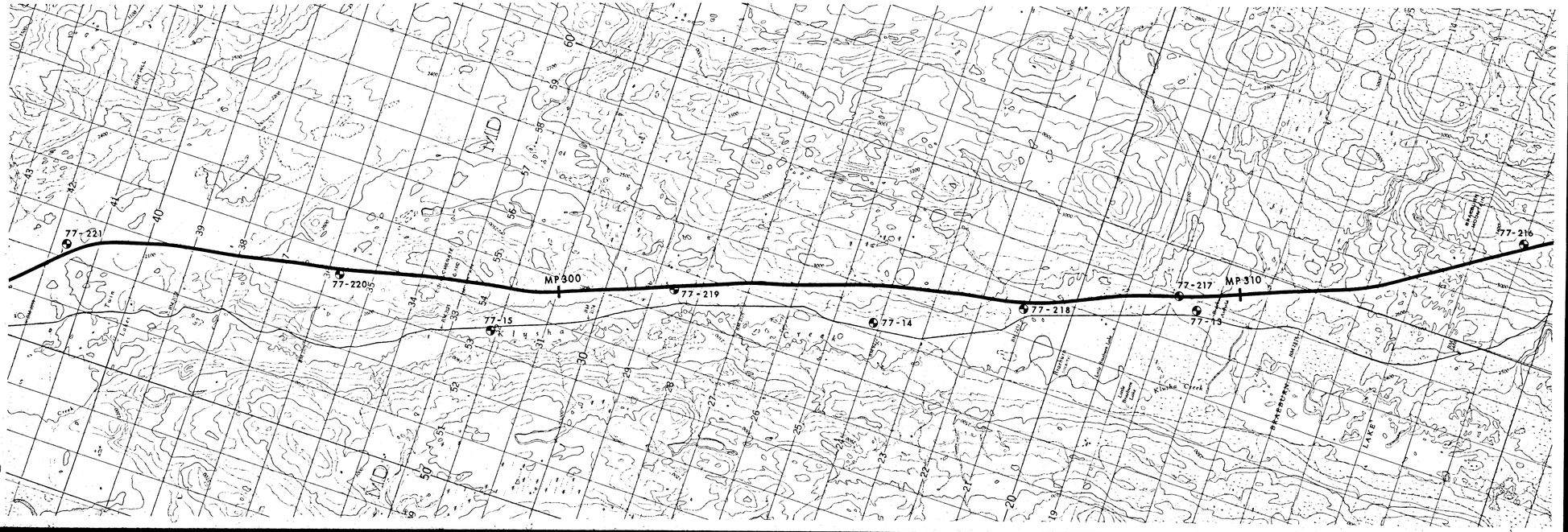

FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4" : 1 MILE

Sheet 16 of 33

● - TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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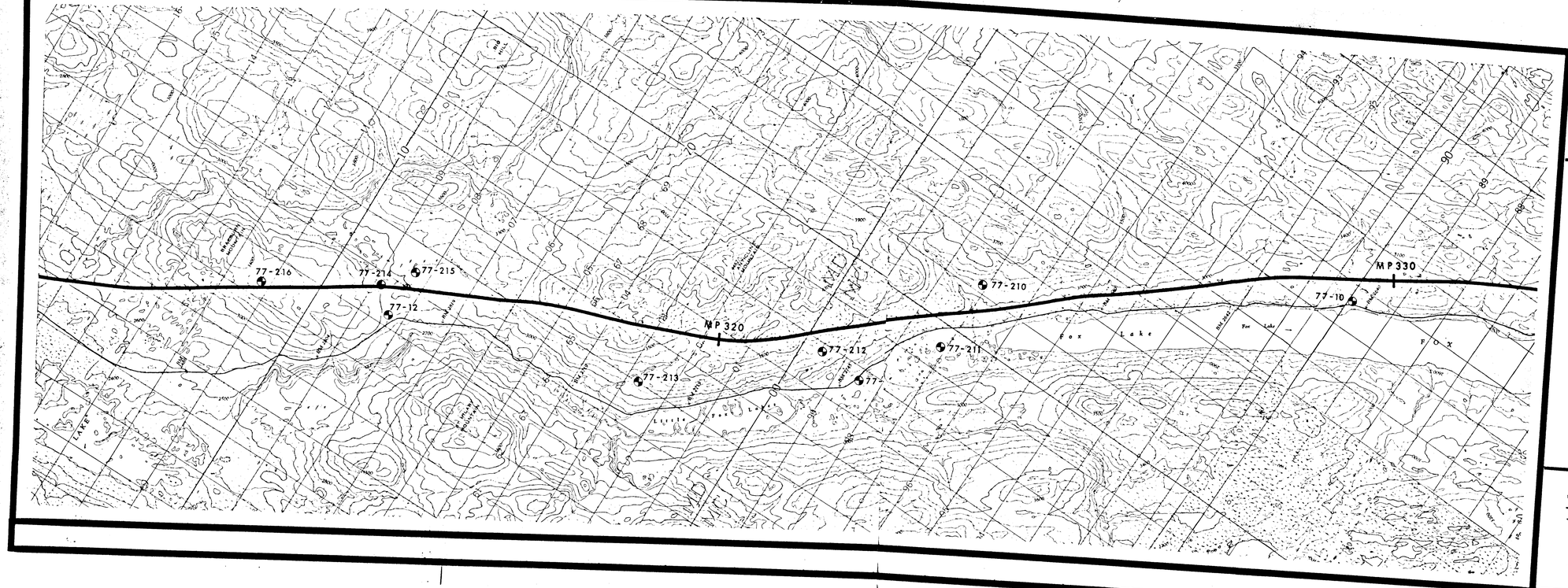

FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4 " : 1 MILE

Sheet 17 of 33

● - TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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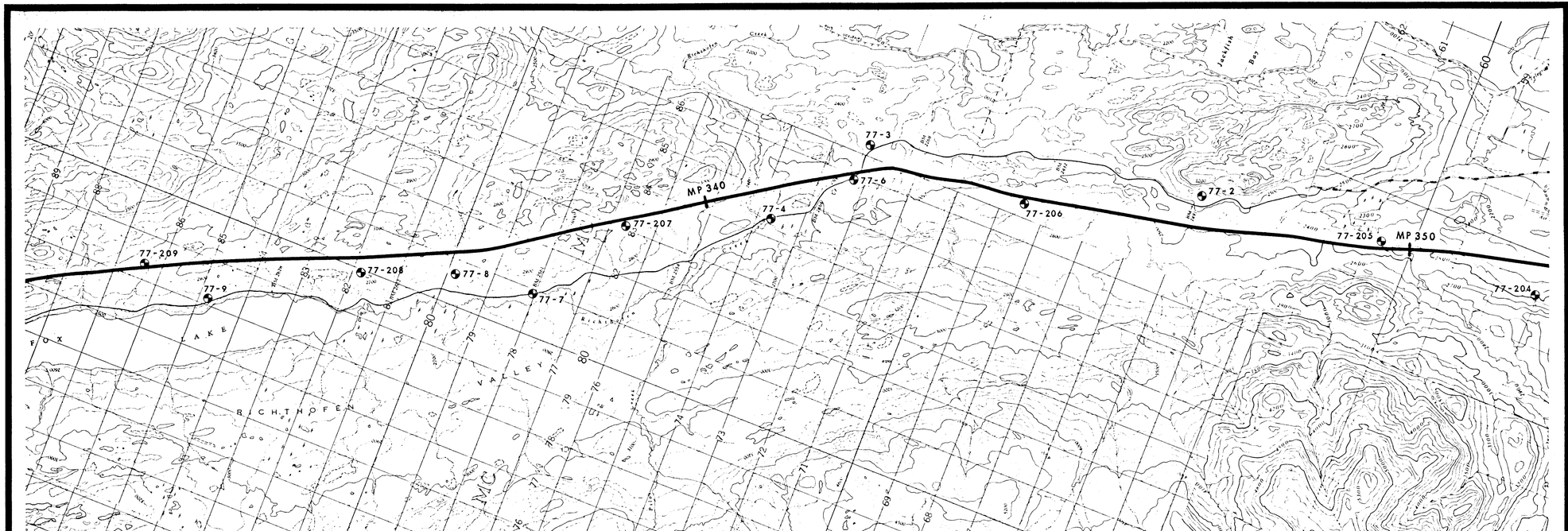

FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4" : 1 MILE

Sheet 18 of 19

- TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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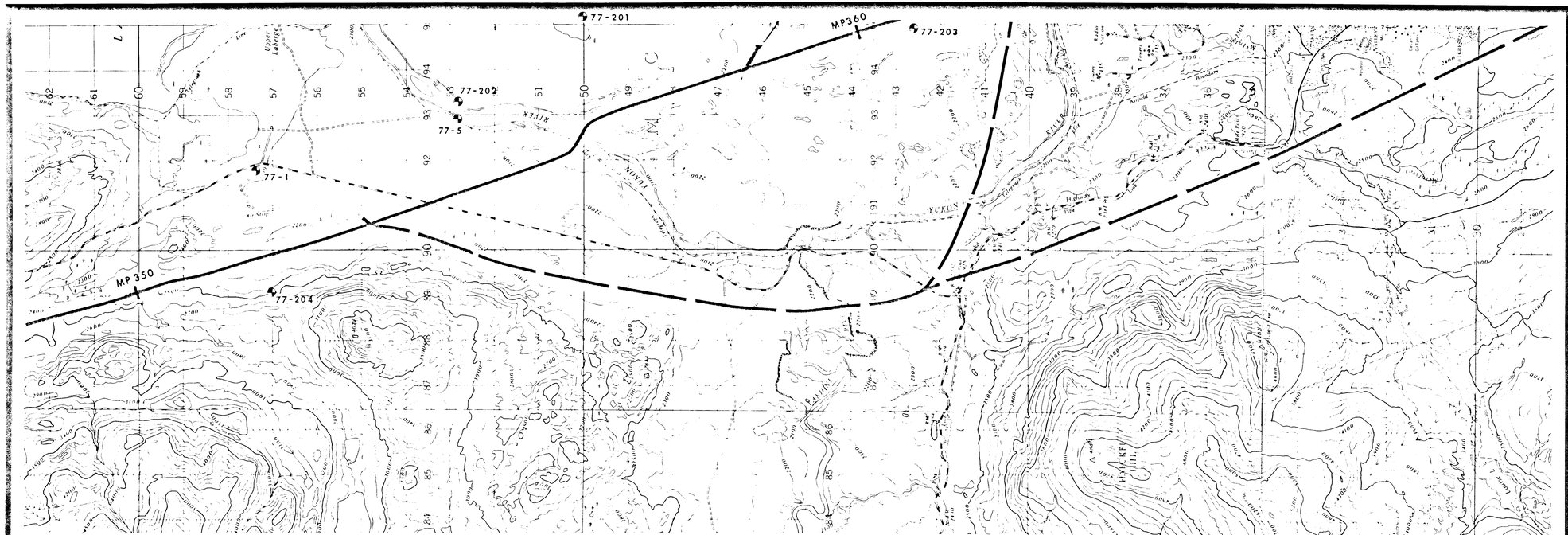

FOOTHILLS PIPE LINES (YUKON) LTD.

SCALE : 1 50,000 or 1 1/4 " : 1 MILE

Sheet 19 of 19

- TEST HOLE

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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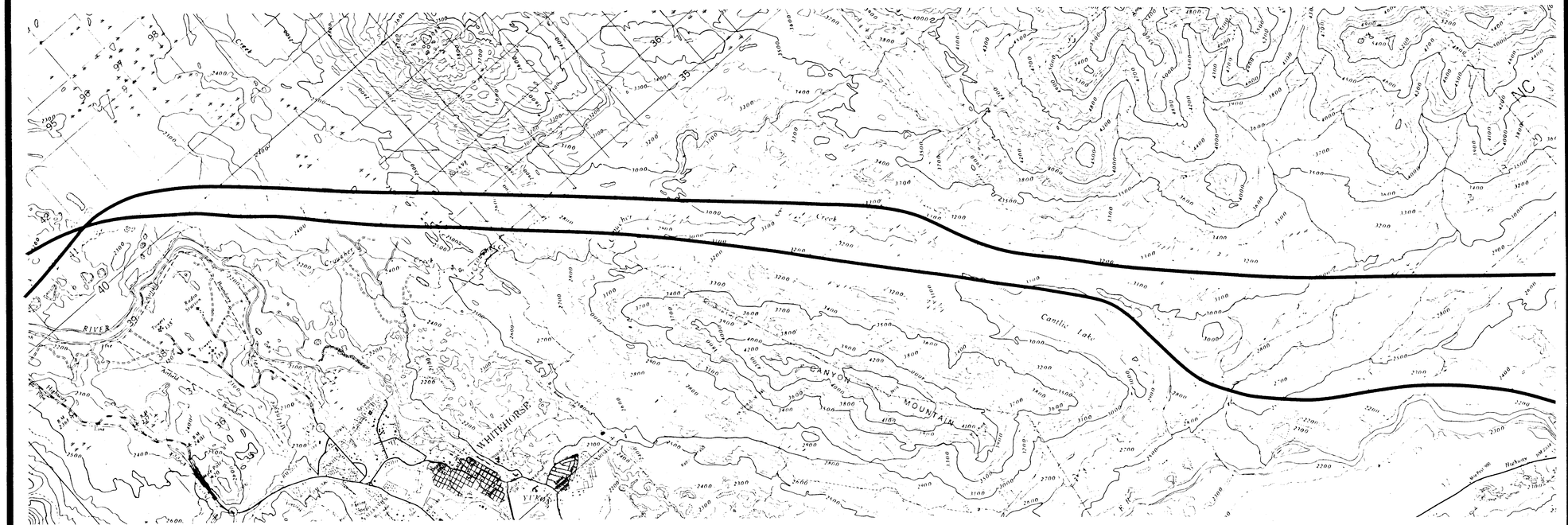

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SCALE : 1 50,000 or 1 1/4" : 1 MILE

Sheet 20 of 33

PIPELINE LEGEND

- PIPELINE ROUTE
- HIGHWAYS
- ACCESS ROAD
- COMPRESSOR STATION
- MATERIAL STORAGE AREA
- CONSTRUCTION CAMP
- HEAD OFFICE
- AREA OFFICE

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