GEOTECHNICAL INVESTIGATION

C E N T E R L I N E

TEST HOLE LOGS

PROPOSED MACKENZIE HIGHWAY

M I L E 4 5 0 - 5 4 5

Underwood McLellan and Associates Limited

Appendix F

D001619

NORTHERN ENVIRONMENTAL
B- 2886,b
REFERENCE COLLECTION
PROTECTION BRANCH

EXPLANATION OF FIELD AND LABORATORY TEST DATA USED ON TEST HOLE LOG SHEETS

These pages present an explanation of the terms and symbols used in summarizing field and laboratory results on the Drill Hole Logs.

DEPTH

This column refers to the depth in feet below the existing ground surface.

SAMPLE TYPE

This column refers to the sample depth interval and the sample condition and type. The following symbols were utilized to define the sample type:

- [T] Shelby tube sample
- [P] Split-spoon penetrometer sample
- [C] Core sample
- [N] Disturbed grab sample

PENETRATION RESISTANCE

This test is conducted in the field to determine the insitu relative density of cohesionless soils and the consistency of cohesive soils. The "N" value or blow count is the number of blows from a 140 lb. hammer dropped 30 inches (free fall) which is required to drive a 2" O.D. split-spoon type sampler 12 inches into the undisturbed soil.

17/23

UNIFIED SOIL SYMBOL

All soils are classified according to the Unified Soil Classification System which is outlined on Page 5 of this Appendix.

SOIL DESCRIPTION

This column includes a detailed description of soil types and indicates changes in soil strata.

LIMITS OF FROZEN GROUND

The depth intervals over which frozen and unfrozen ground were encountered have been indicated by F and UF respectively.

ICE DESCRIPTION

The ground ice in permafrost was classified according to the National Research Council System. This permafrost classification system is outlined on Page 6 of this Appendix.

The excess ice content was estimated by field laboratory technicians. This estimate is shown in the ice description as a percentage of the total sample.

NATURAL WATER CONTENT

The natural water content is indicated by a circle at various depths. It is expressed as a percentage of the dry soil weight.

ATTERBERG LIMITS

The plastic and liquid limits are shown along with the moisture content by a horizontal bar. The lower moisture content of the bar indicate the plastic limit whereas the upper portion

indicates the liquid limit. Atterberg limits are utilized to assist classification of cohesive soils and estimate their insitu consistency.

GRAIN-SIZE ANALYSIS

The proportions of clay, silt, sand and gravel obtained from hydrometer and sieve analysis are summarized. The actual grain size curves have been included with the Test Hole Logs.

WET DENSITY

The wet or bulk density of penetrometer samples is the total weight of the sample divided by the volume and is expressed in lbs. per cubic foot.

DRY DENSITY

The dry density is the dry soil weight divided by the volume and is expressed in lbs. per cubic foot.

TEST HOLE NUMBERING SYSTEM

Test holes have been designated by mileage, type and number. The letter symbols and numbers in the following examples;

543B632B, 544C448A, 545S441A

indicate:

The initial number is the highway mileage. The following letters B, C and S denote a borrow pit, centreline and structure test hole respectively. The next number is the test hole number and the final letters A or B denote drilling performed by Mayhew 1000 or Heli Drill respectively.

MUSKEG CLASSIFICATION

The National Research Council muskeg classification system developed by Radforth has been utilized to partially classify muskeg deposits. Muskegs have only been classified into three basic groups based on their predominant characteristics. A brief summary of the Radforth System is given on Page 7 of this Appendix.

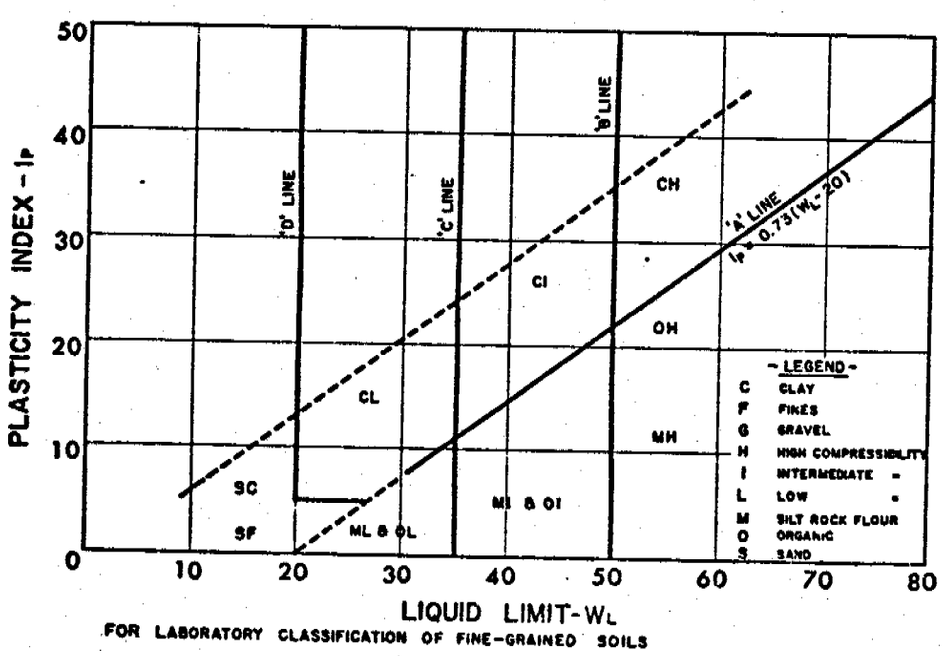
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, MUCK, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

SOIL CLASSIFICATION CHART

PLASTICITY CHART



FOR LABORATORY CLASSIFICATION OF FINE-GRAINED SOILS

NATIONAL RESEARCH COUNCIL PERMAFROST CLASSIFICATION SYSTEM

Permafrost ground ice occurs in three basic conditions including non-visible, visible (less than one inch in thickness) and clear ice.

A. Non-visible - N

N_f - poorly bonded or friable frozen soil

N_{bn} - well bonded soil, no excess ice

N_{be} - well bonded soil, excess ice

B. Visible - V (less than 1" thick)

V_x - individual ice crystals or inclusions

V_c - ice coatings on particles

V_r - random or irregularly oriented ice formations

V_s - stratified or oriented ice formations

C. Visible Ice - (greater than 1" thick)

Ice - ice with soil inclusions

Ice + Soil - ice without soil inclusions.

A more complete description of this system is included in NRC publication TM 79.

NATIONAL RESEARCH COUNCIL MUSKEG CLASSIFICATION SYSTEM

PREDOMINANT CHARACTERISTIC	CATEGORY	NAME
Amorphous-granular	1.	Amorphous-granular peat
	2.	Non-woody, fine-fibrous peat
	3.	Amorphous-granular peat containing woody fine fibres
	4.	Amorphous-granular peat containing woody fine fibres
	5.	Peat, predominantly amorphous-granular, containing non-woody fine fibres, held in a woody, fine fibrous framework
	6.	Peat, predominantly amorphous-granular, containing woody fine fibres, held in a woody, coarse-fibrous framework
	7.	Alternate layering of non-woody, fine fibrous peat and amorphous-granular peat containing non-woody fine fibres
Fine-fibrous	8.	Non-woody, fine-fibrous peat containing a mound of coarse fibres
	9.	Wood, fine fibrous peat held in a woody, coarse-fibrous framework
	10.	Woody particles held in a non-woody, fine-fibrous peat
	11.	Woody and non-woody particles held in fine-fibrous peat
Coarse-fibrous	12.	Woody, coarse-fibrous peat
	13.	Coarse fibres criss-crossing fine-fibrous peat
	14.	Non-woody and woody fine-fibrous peat held in a coarse-fibrous framework
	15.	Woody mesh of fibres and particles enclosing amorphous-granular peat containing fine fibres
	16.	Woody, coarse-fibrous peat containing scattered woody chunks

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

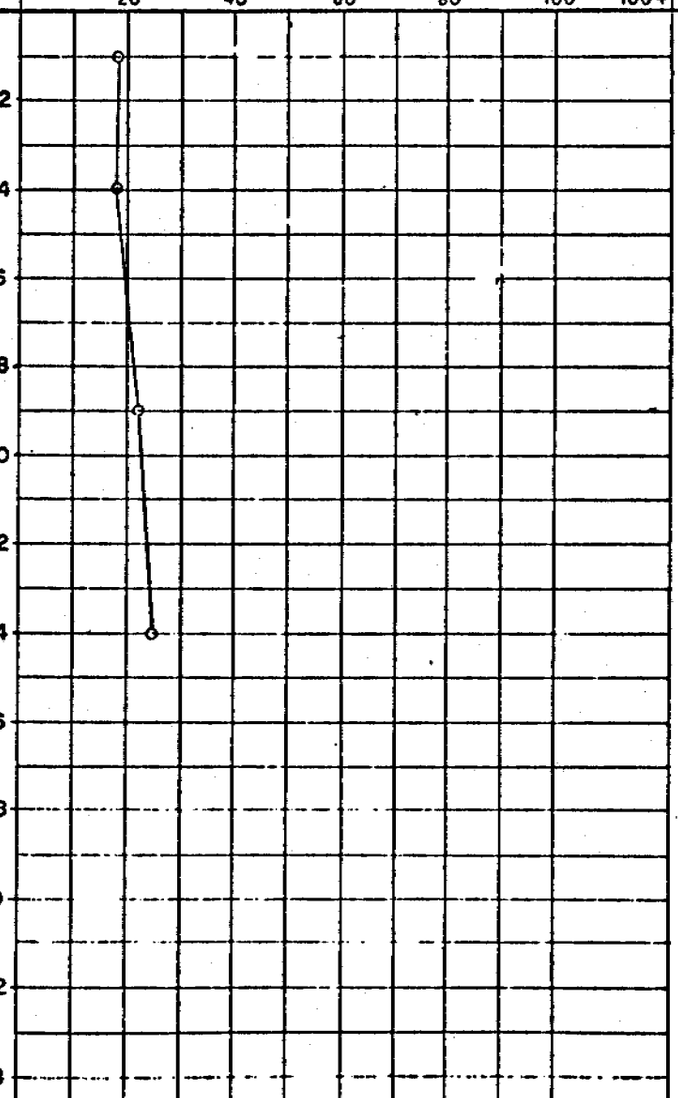
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 355+00	OFFSET: ℄
CKD D.A.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE, POPLAR, ASPEN	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
449	C	89B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PT	PEAT 2"	F	
2		P			ML	CLAY		Nf
4		P				SILTY, SOME SAND		
6								NO EXCESS ICE
8						SILTY		
10		P						
12					CL	TRACE OF SILT WHITE SILTS FAINTLY STRATIFIED		
14		P						Nf
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



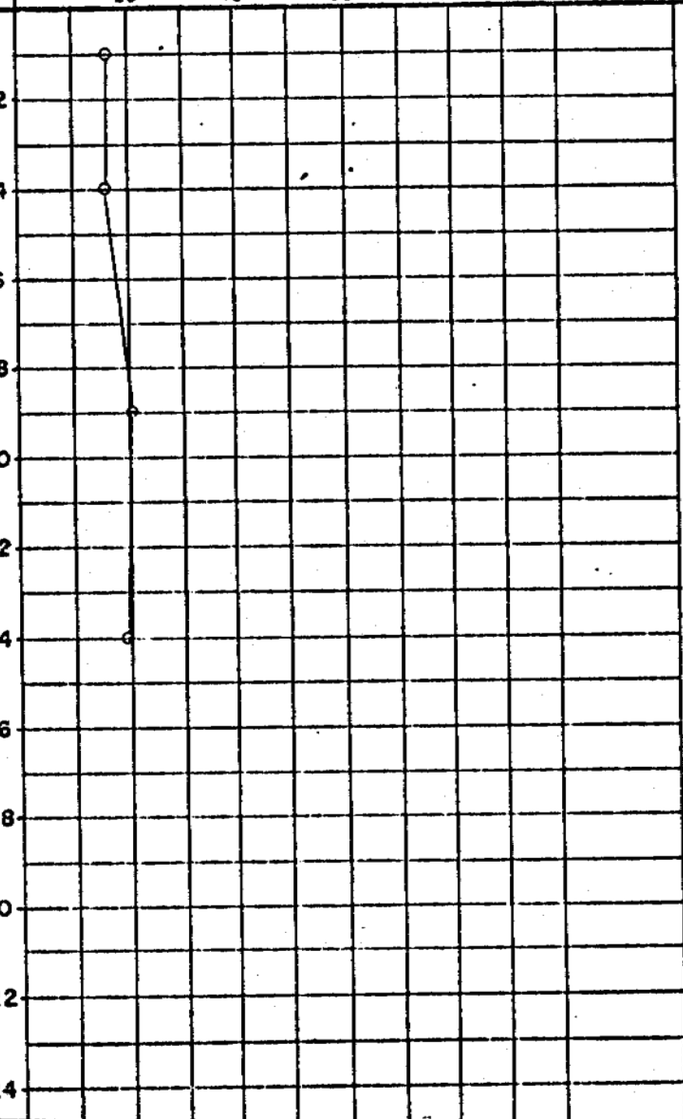
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 365+00	OFFSET: ℄
CKD: DGP	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR — GOOD	VEGETATION: SPRUCE, BIRCH, ASPEN	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
449	C	88B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PT	PEAT - 2"	F	
2		P				CLAY		Nf
4						SILTY, SOME GRAVEL		
6					CL			
8								NO EXCESS ICE
10		P						
12						SILTY		Nf
14		P						
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

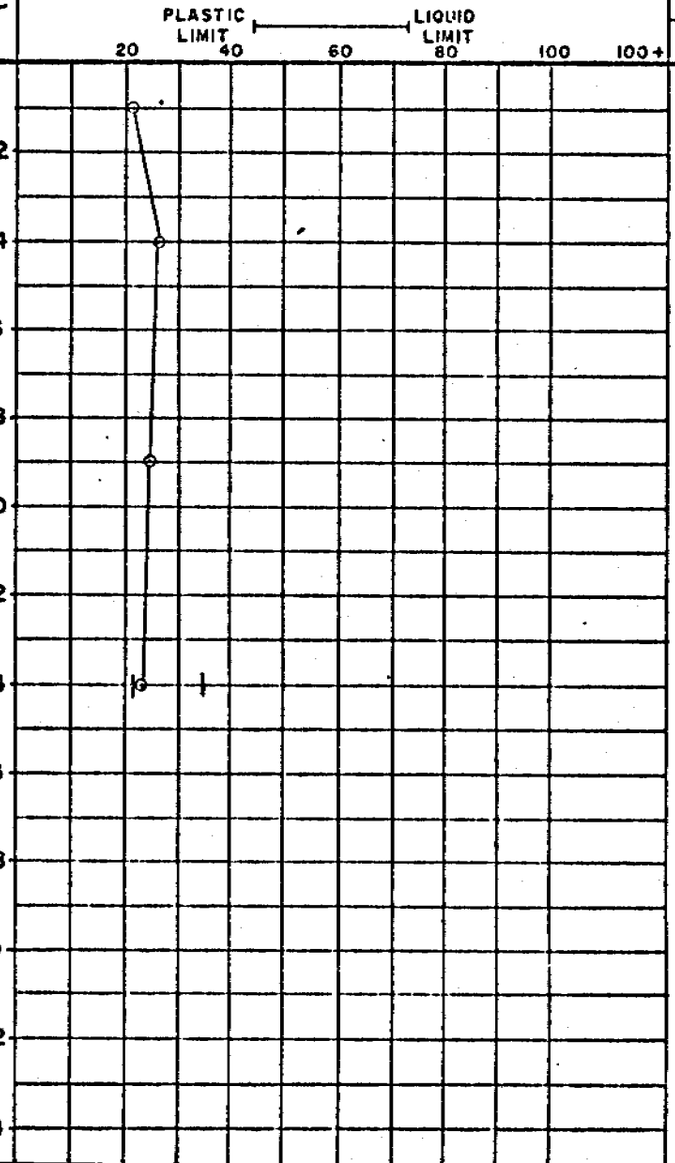
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 375+00	OFFSET: ℄
CKD: D.G.D	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: WILLOWS, BIRCH TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
450	C	873

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT - 1"	F				
2		P				CLAY		Vr			
					CL	LIGHT COLORED, SILTY					
4		P				SMALL ICE CRYSTALS			118.8	93.7	
6											
8						DARK, SILTY		< 2% EXCESS ICE			
10		P							117.0	94.2	
12					CL	ICE CRYSTALS		Vr			
14		P							117.8	96.5	
16						END OF HOLE					
18											
20											
22											
24											

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS			
CLAY %	SILT %	SAND %	GRAVEL %

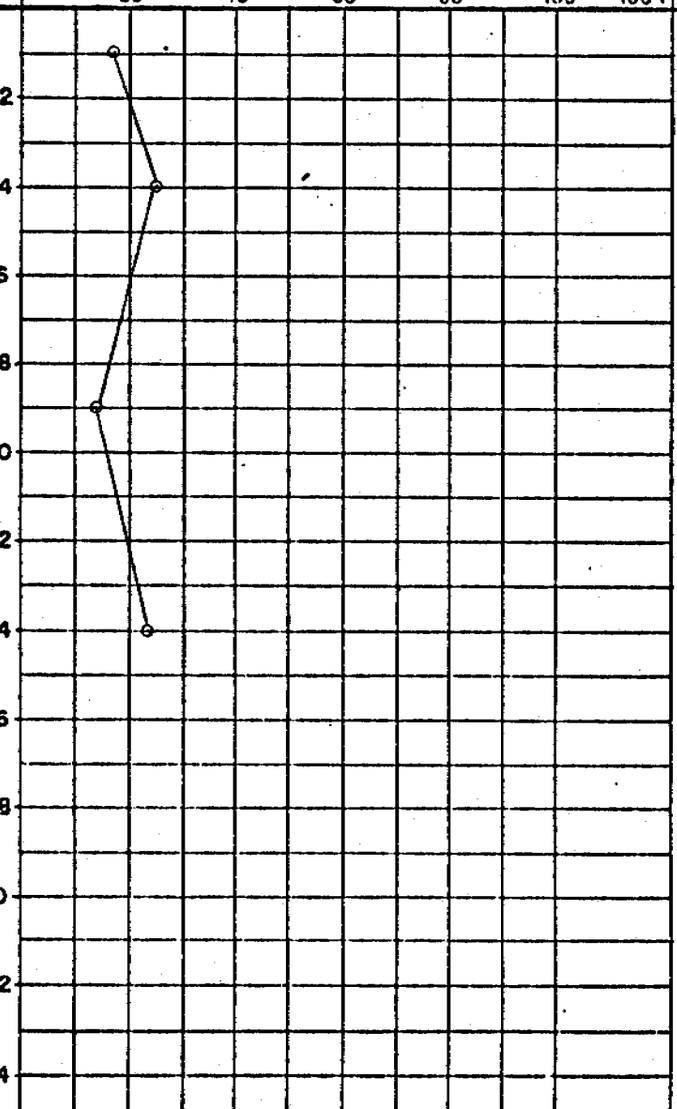
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 385+00	OFFSET: ℄
CKD: D.S.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: WILLOW, BIRCH 70 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
450	C	86B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					PT	PEAT – 2"	F									
2		P				CLAY		< 2 % EXCESS ICE	2							
4		P			CL	LIGHT & DARK SOFT, SILTY		Vr	4							
6						ICE CRYSTALS			6							
8									8							
10					GC	GRAVEL CLAYEY		Nbn	10							
						CLAY										
12					CL				12							
14		P						Vr	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



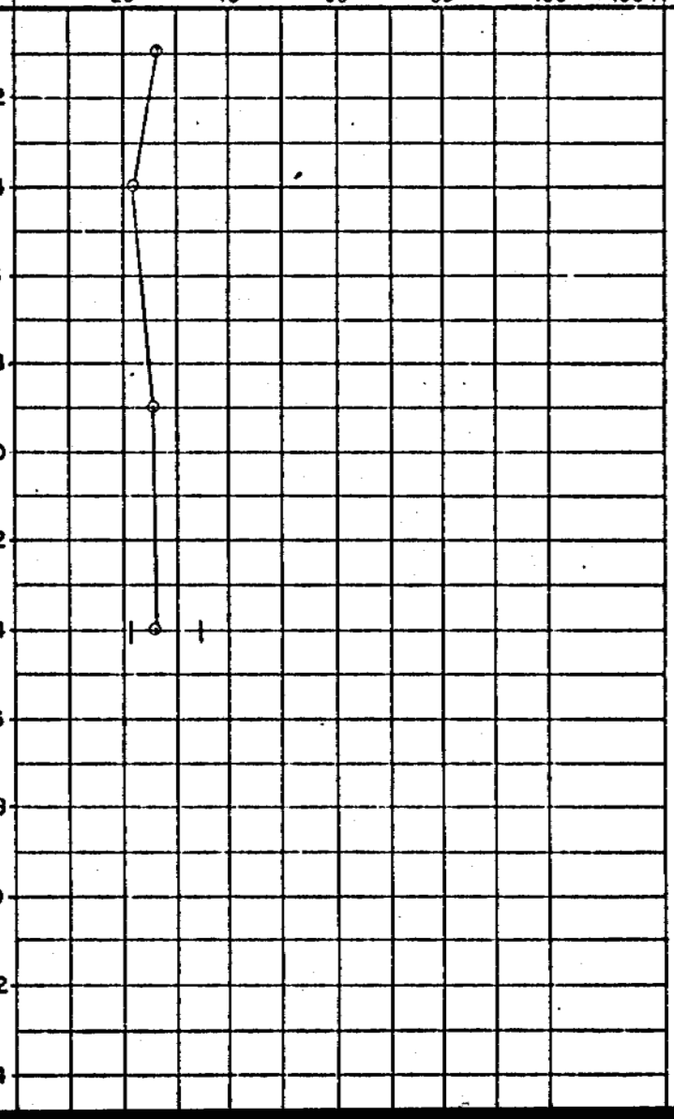
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 395+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG:	SURFACE DRAINAGE: GOOD	VEGETATION: WILLOWS, SPRUCE, BIRCH	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
450	C	858

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT – 1/2"	F								
2		P				CLAY		Vr					115.1	87.2	
4		P				SILTY, ICE CRYSTALS									
6					CL			< 2% EXCESS ICE							
8															
10		P				STRATIFIED							115.7	91.8	
12															
14		P				SILTY ICE CRYSTALS		Vr					111.3	88.5	
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

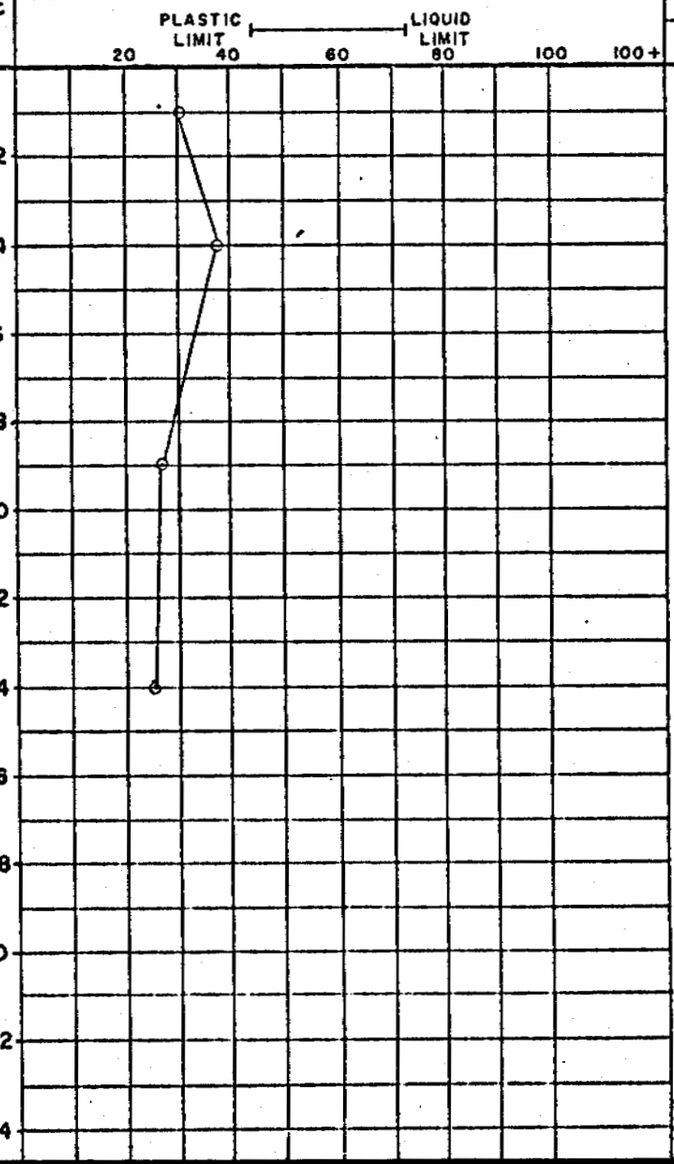
DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 405+00	OFFSET: ℄
CKD: DGP	TECH: DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: WILLOW, BIRCH TO 25'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
450	C	84B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT – 2"	F								
2		P				CLAY		Vr							
4		P													
6					CL	ICE CRYSTALS		< 2% EXCESS ICE							
8															
10		P											112.2	88.0	
12															
14		P						Vr					111.3	88.8	
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

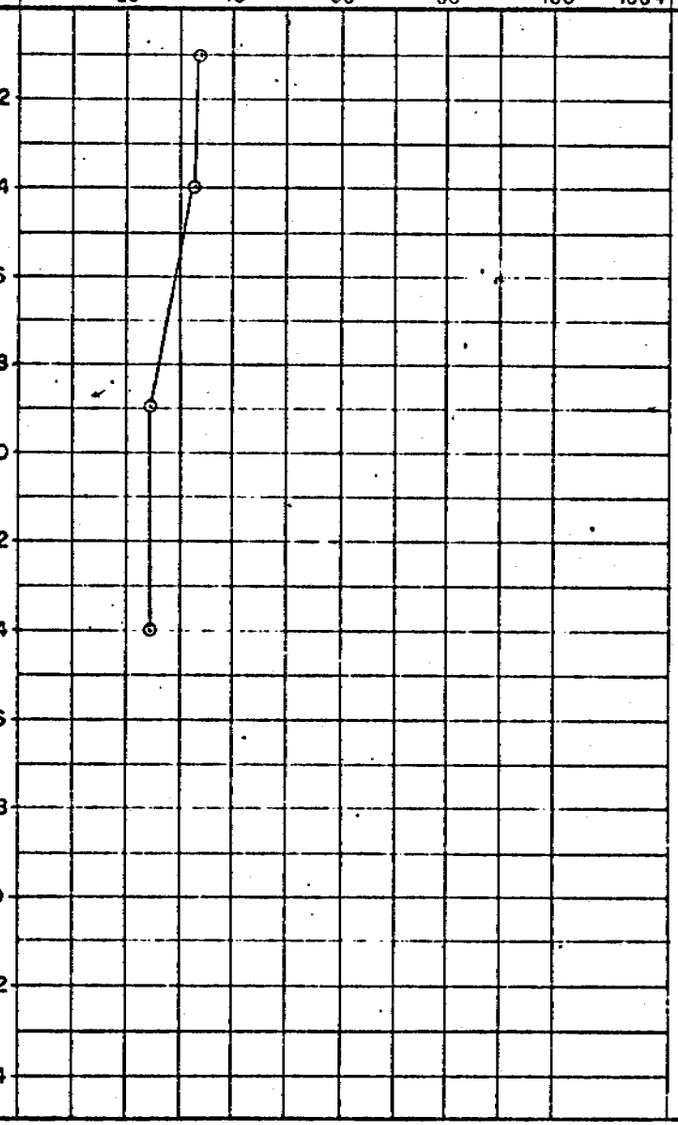


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M.	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 415+00	OFFSET: Q
CKD D.G.P	TECH DM.	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE, POPLAR, BIRCH TO 30'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
450	C	83 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT — 1"	F								
2		P				CLAY		Vr							
						SILTY, ICE CRYSTALS									
4		P											118.3	89.4	
6					CL			< 2% EXCESS ICE							
8															
10		P													
12															
14		P				SILTY, ICE CRYSTALS		Vr					117.9	95.2	
16						END OF HOLE									
18															
20															
22															
24															



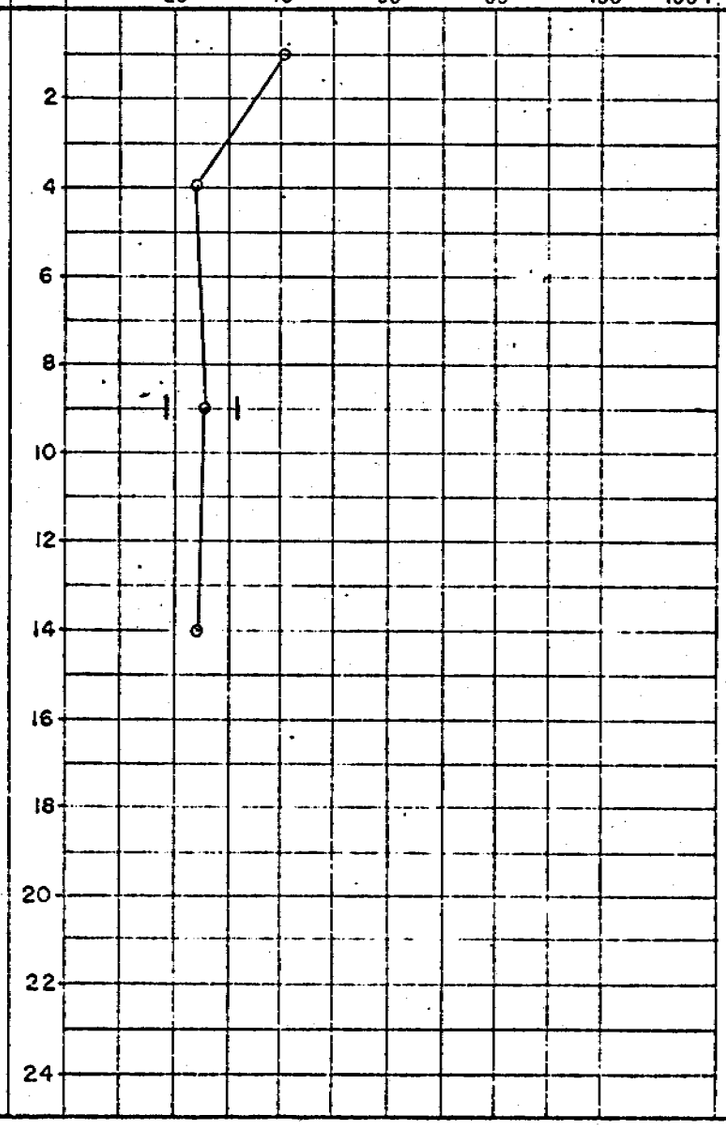
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 425+00	OFFSET: ℄
CKD D6P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NOVEEP
451	C	828

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F								
2		P				CLAY		Vr					98.5	70.0	
						LIGHT COLORED SILTY									
4		P				DARK @ 3'									
6															
8					CL	SILTY, SOME ICE CRYSTALS		Vr < 2% EXCESS ICE							
10		P											117.9	93.6	
						STICKY, SILTY									
12						TRACE OF GRAVEL									
14		P						Vr					122.5	98.9	
16						END OF HOLE									
18															
20															
22															
24															



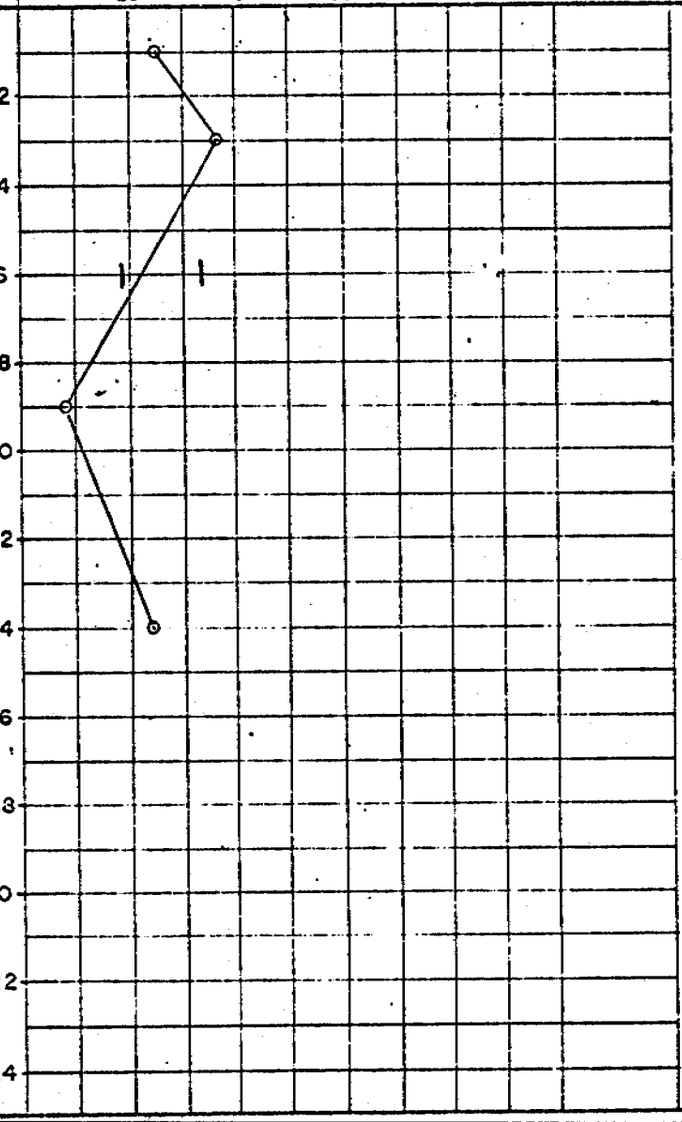
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN A E.W	FIELD ENG R.S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 435+00	OFFSET: ℄
CKD D.G.P.	TECH DM	RIG AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION: SPRUCE & POPLAR TO 40'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
451	C	92A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					CL	CLAY HARD, BROWN ICE CRYSTALS	F	Vr							
4		P				VERY STICKY AND WET	UF	< 2% EXCESS ICE							
6															
8					CH	BROWN, FIRM NO VISIBLE ICE CRYSTALS									
10															
12					ML	SILT BROWN, MOIST NO ICE CRYSTALS									
14															
16						END OF HOLE									
18															
20															
22															
24															



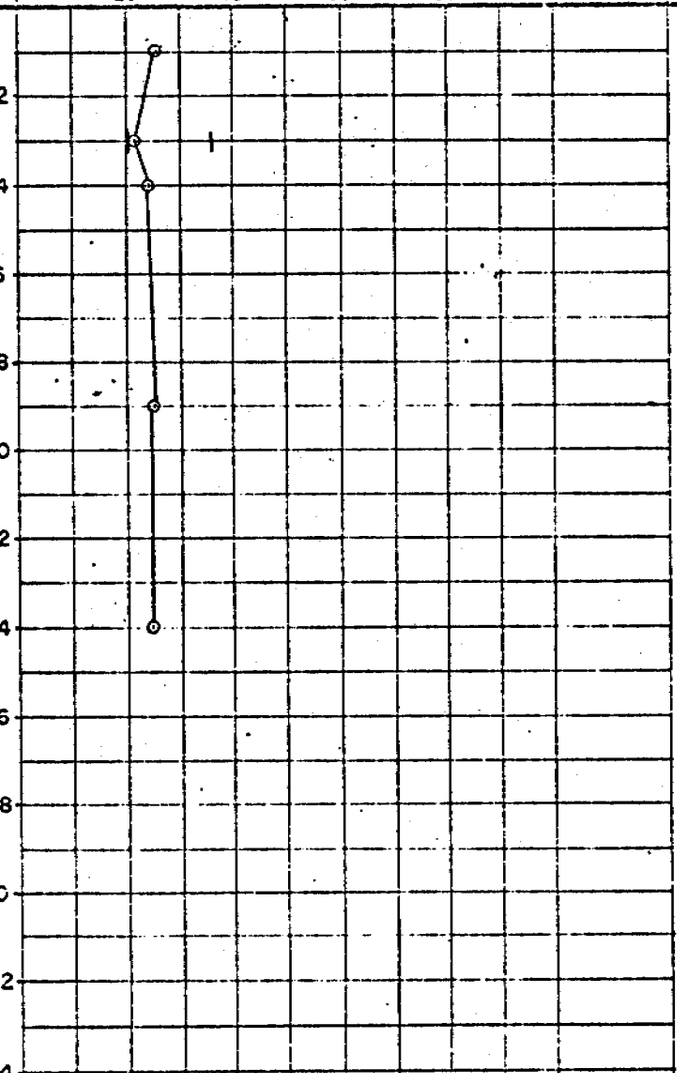
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 445+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
451	C	91A2

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2		T			CL	CLAY HARD, LIGHT BROWN ICE CRYSTALS	F	Vr
4					To	DARK, FIRM, SILTY MOIST, NO VISIBLE ICE		Nbe
6								
8						DARK, FIRM, MOIST SILTY		
10						NO VISIBLE ICE		Nbe
12					CH			
14						FIRM, MOIST, SILT NO VISIBLE ICE		Nbe
16						END OF HOLE		
18								
20								
22								
24								



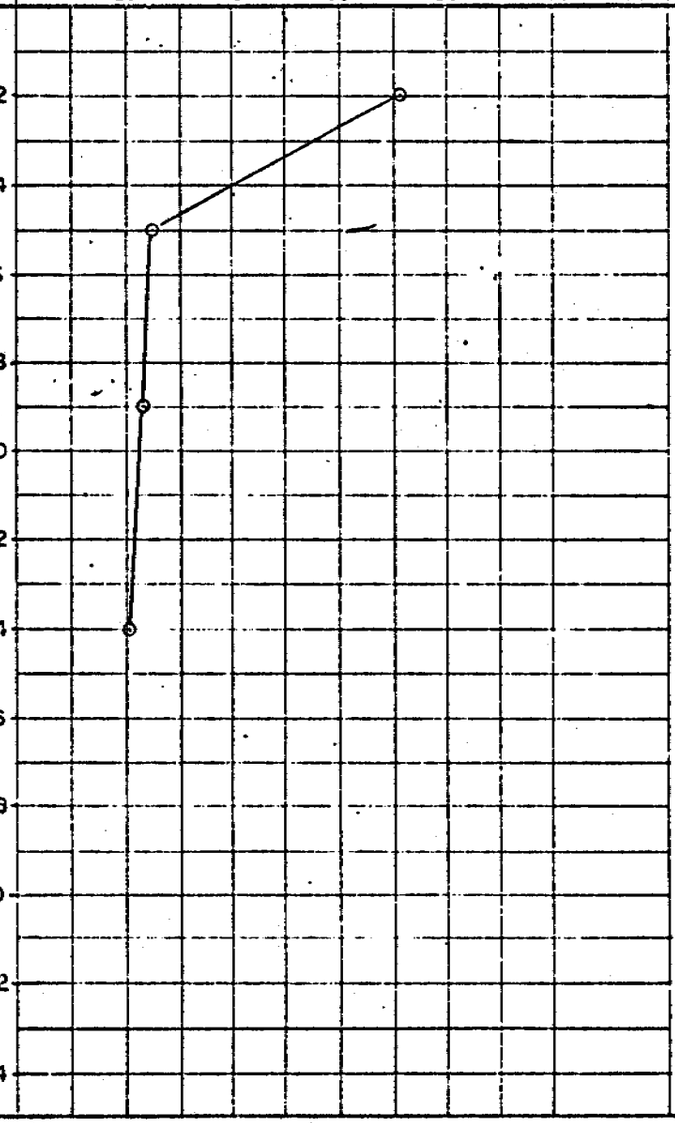
DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 455+00	OFFSET: ℄
CKD D.G.P	TECH DM	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
451	C	91A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					OL	PEAT CLAY MIXTURE	F	Nbn							
2						CLAY							120.7	99.2	
4								Vr							
6		T				BROWN ICE LENSES 1/4"									
8					CL										
10						GREYISH, SILTY		Nbn							
12															
14						GREYISH		Nbn							
16						END OF HOLE									
18															
20															
22															
24															

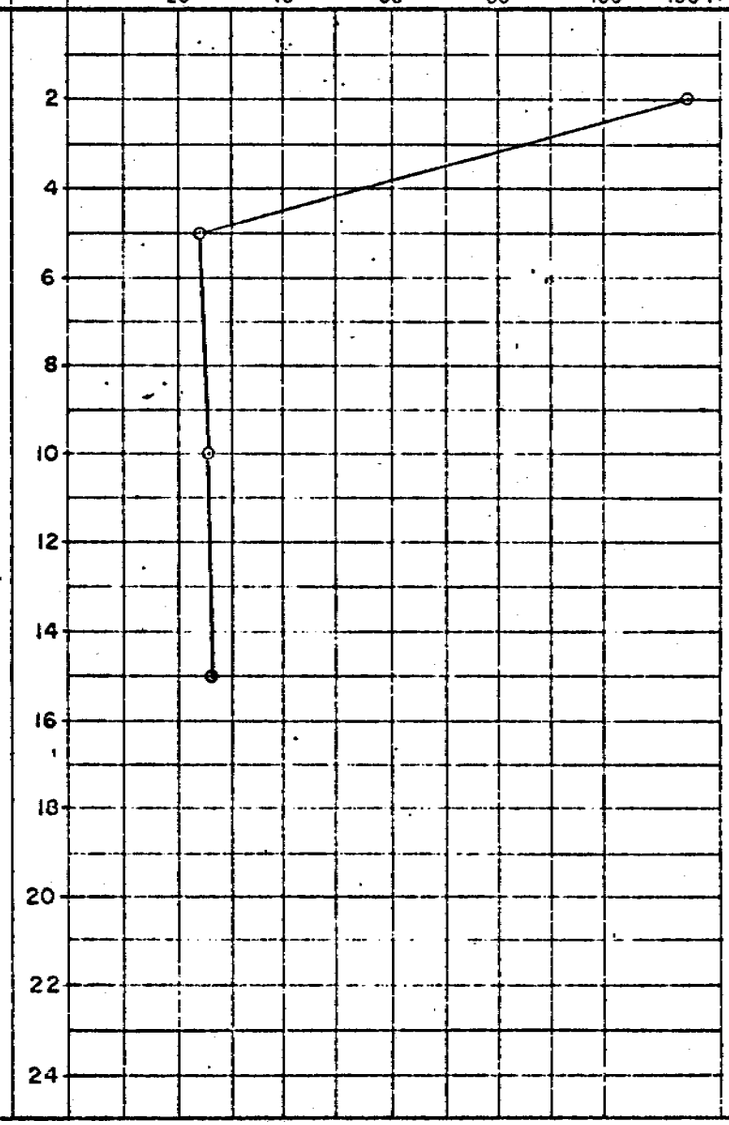


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 465+00	OFFSET ℄
CKD DGP	TECH DM	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
451	C	90A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT	F	
2								
4						CLAY		Nbn
6						GREY, SILTY		
8					CH			
10		T				GREY, ICE LENSES 1/4"		Vr < 2% EXCESS ICE
12								
14						GREY		Vr
16						END OF HOLE		
18								
20								
22								
24								



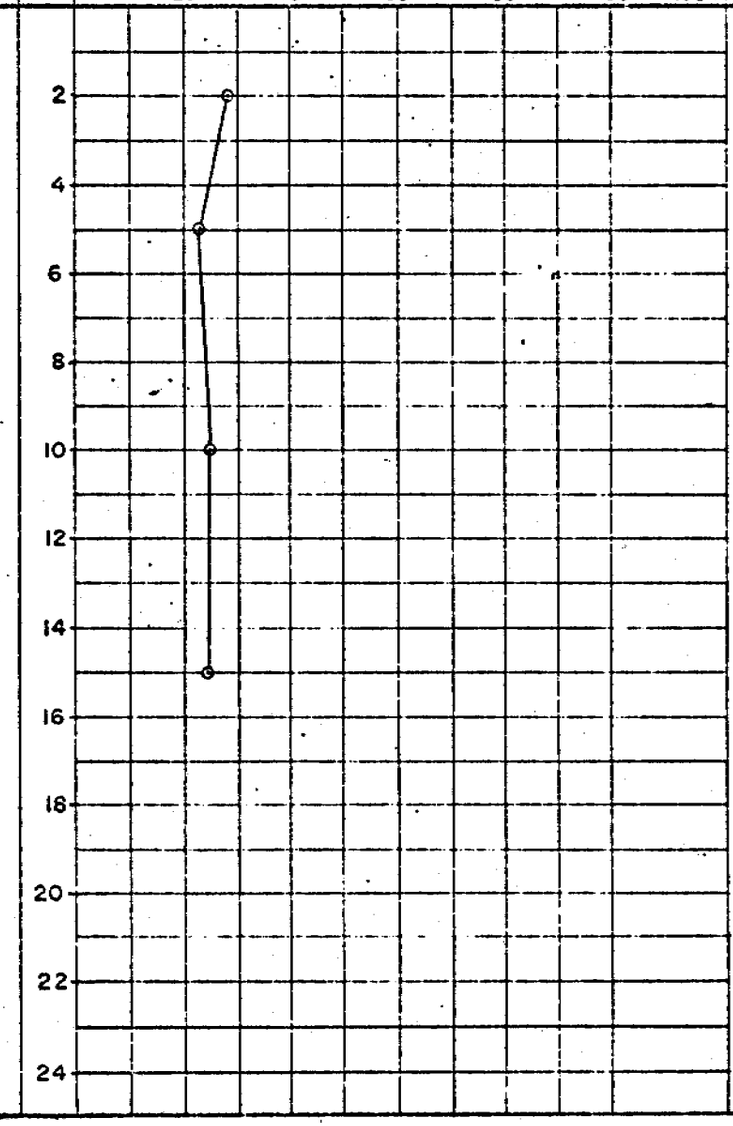
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 475+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
451	C	89A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2		T			Pt	PEAT MUSKEG, ORGANIC WET, ICE LENSES 1/16"	F						110.3	86.1	
4						CLAY		Vr							
6						BROWN, SOME SAND									
8					CL			Nbn							
10						BROWN SILTY									
12						LIGHT BROWN									
14								Nbn							
16						END OF HOLE									
18															
20															
22															
24															

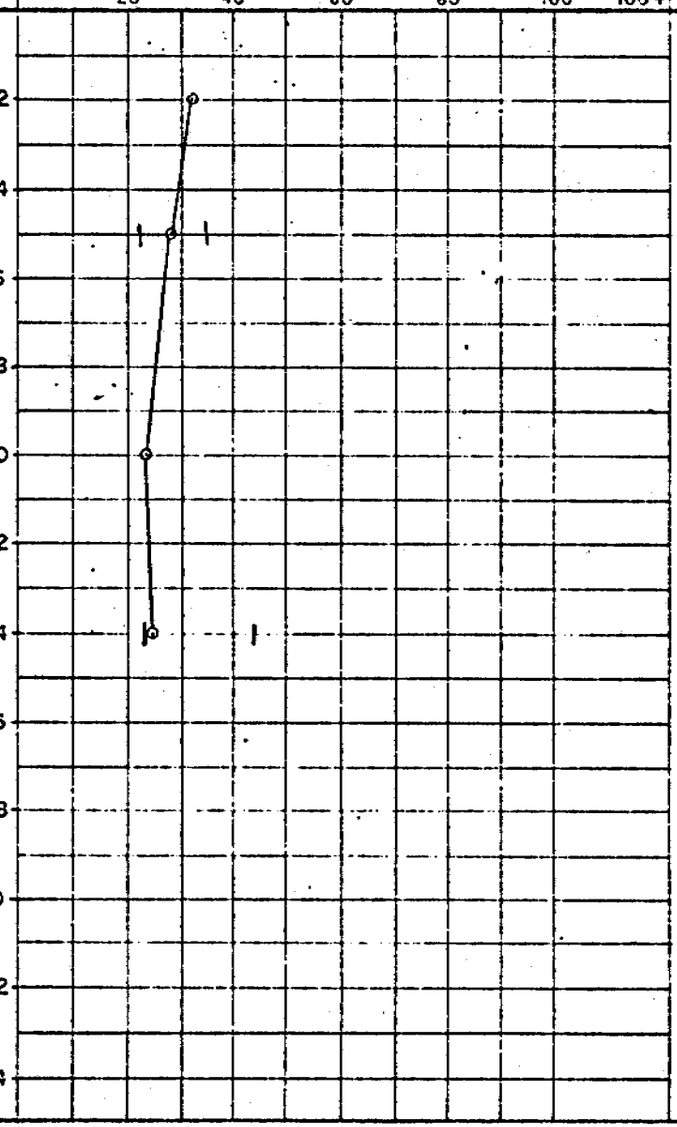


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG T.S.	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 485+00	OFFSET ℄
CKD D.G.P	TECH DM	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION:	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
452	C	88A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F								
2					OL	MUSKEG, SILTY		Vr							
4															
6		T				BROWN, ICE LENSES 1/16"		< 2% EXCESS ICE					115.4	87.2	
8								Nbn							
10					CL	GREY									
12															
14		T				ICE LENSES 1/4" BROWN		Vr					126.4	102.5	
16						END OF HOLE									
18															
20															
22															
24															

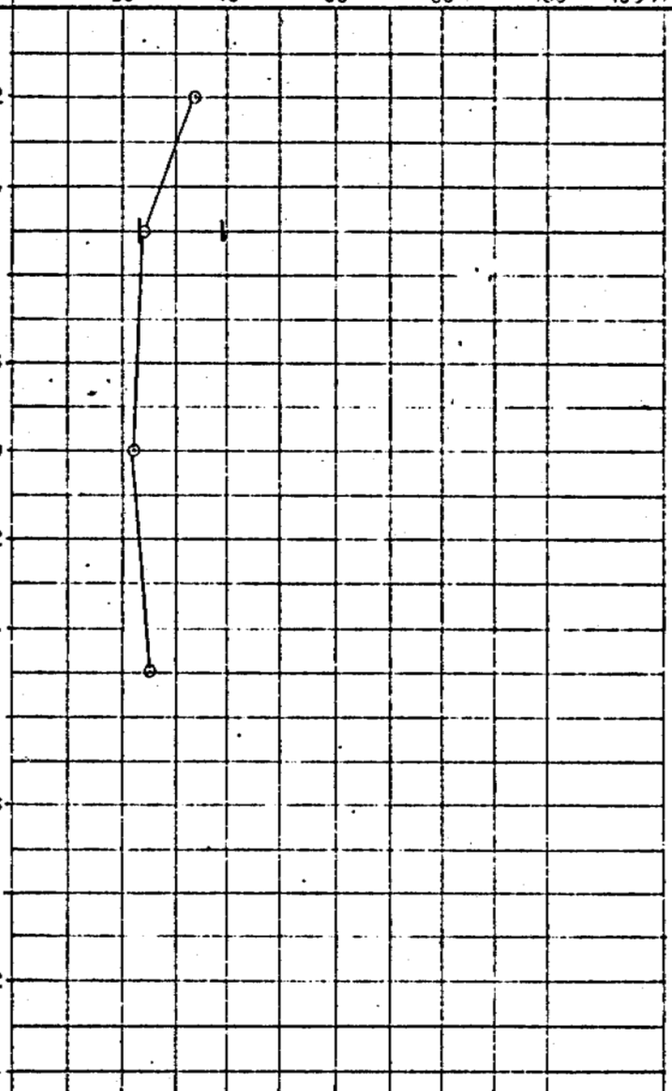


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 495+00	OFFSET: ℄
CKD: D G P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
452	C	87A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT LIGHT BROWN GRANULAR	F	Nbn							
2						CLAY									
4						BROWN		Vr							
6		T											125.7	98.0	
8					CL			Nbn							
10															
12						DARK GREY									
14								Nbn							
16						END OF HOLE									
18															
20															
22															
24															

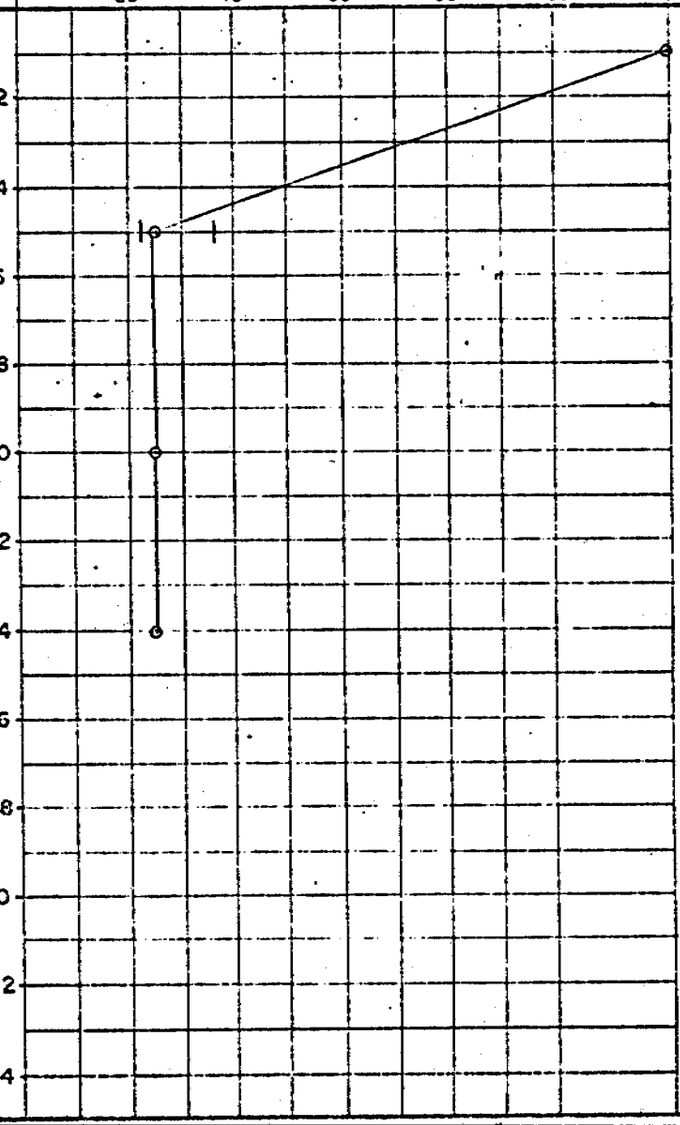


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 505+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
452	C	86A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT MUSKEG, BLACK, WET GRANULAR	F	Nbe	2							
4						CLAY			4							
6		T				DARK BROWN ICE LENSES 1/16"		Vn < 2% EXCESS ICE	6					122.5958		
8					CL				8							
10						GREYISH BROWN, SILTY		Nbn	10							
12									12							
14						GREYISH BROWN, SILTY			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

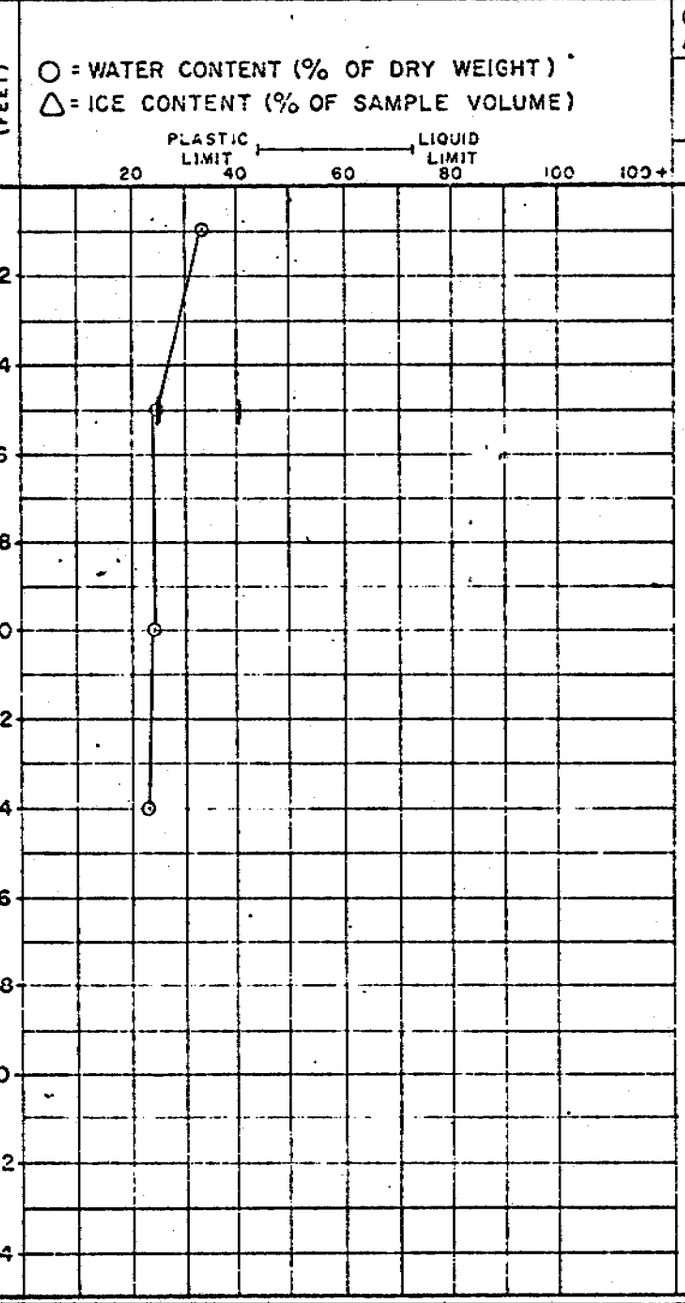


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG. T.S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 515+00	OFFSET ℄
CKD DGP	TECH DM	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
452	C	85A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT BROWN — BLACK	F								
2						CLAY		Vr							
4						DARK BROWN, SILTY							1239	98.9	
6		T				ICE LENSES 1/16"		< 2% EXCESS ICE Vr							
8					CL			Nbn							
10						BROWN, SILTY									
12															
14						DARK BROWN, SILTY NO VISIBLE ICE		Nbn							
16						END OF HOLE									
18															
20															
22															
24															



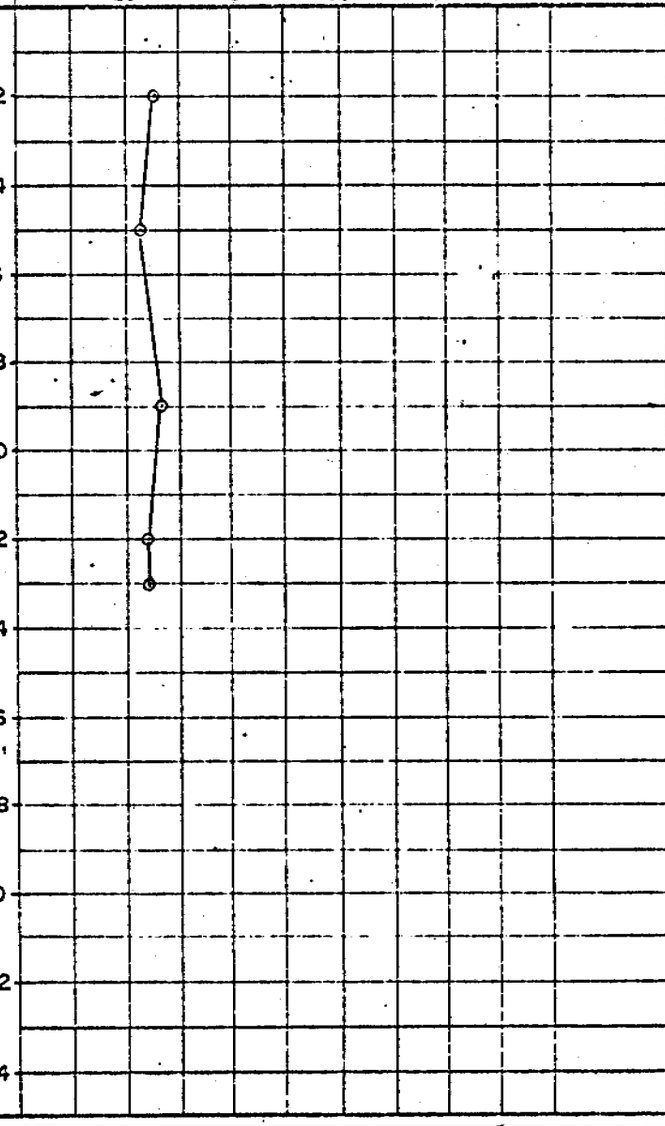
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 18/12/72	AIRPHOTO NO:	CHAINAGE: 525+00	OFFSET: ℄
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: WEST TO EAST	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
452	C	84A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F									
2									2							
						CLAY										
4						BROWN, SILTY			4							
		T												124.1	100.0	
6						ICE VISIBLE		Vr	6							
					CL			Nbn								
8									8							
						BROWN, SILTY										
10									10							
12									12							
						SILTY										
14						DARK BROWN, SILTY		Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

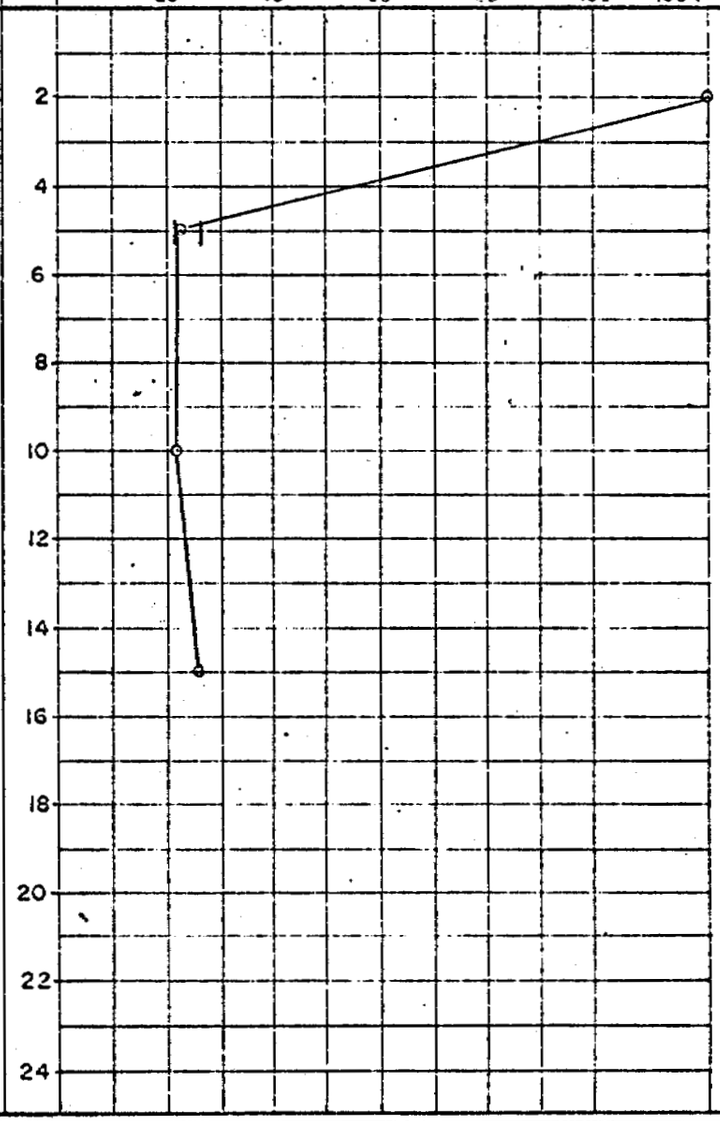


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE 535400	OFFSET L
CKD D.G.P	TECH D.M.	RIG AIR	SURFACE DRAINAGE: WEST TO EAST	VEGETATION: STUNTED CONIFER	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
453	C	83A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT DARK, BLACK	F								
2					OL	CLAY		Vr							
4						LIGHT BROWN, ICE LENSES 1/16"		< 2% EXCESS ICE					188	97.3	
6		T													
8								Nbn							
10					CL	LIGHT BROWN, SILTY									
12						DARK BROWN, SILTY									
14								Nbn							
16						DARK BROWN, SILTY									
18						END OF HOLE									
20															
22															
24															

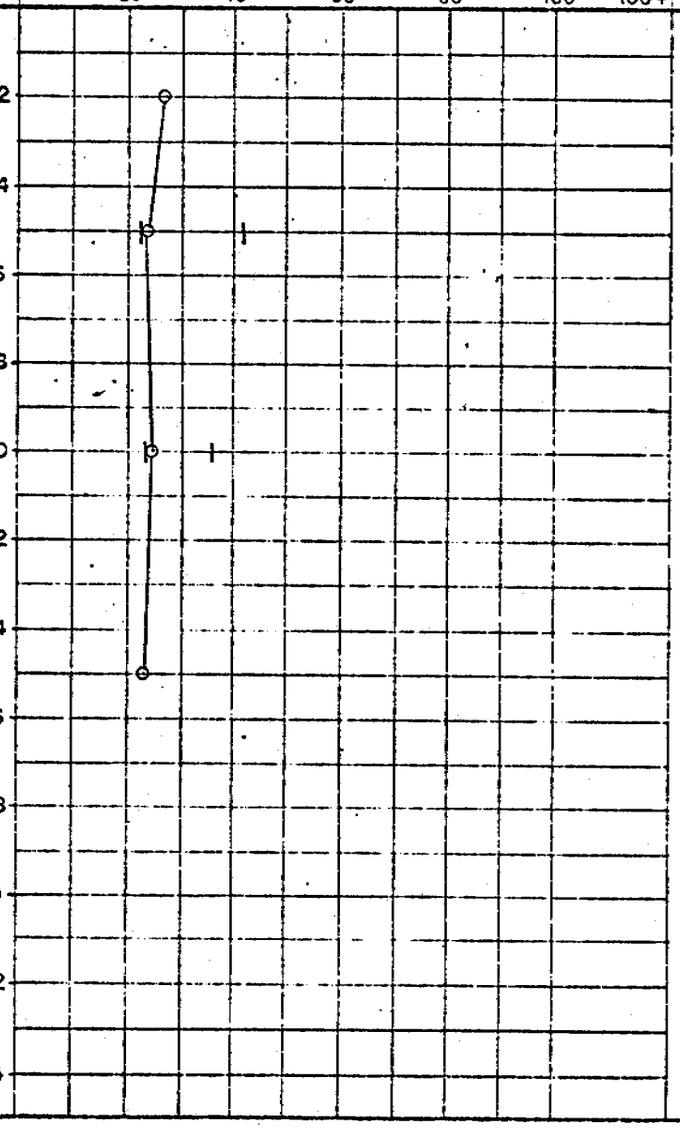


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 545+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION:	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
453	C	82A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						CLAY	F								
						BROWN, TRACE OF SAND		Nbn							
4															
6		T			CL	NO ICE							125.3	101.7	
8								Vi							
10		T				BROWN, VISIBLE ICE LENSES 1/16"							127.9	102.5	
12															
14						BROWN, NO VISIBLE ICE		Nbn							
16						END OF HOLE									
18															
20															
22															
24															

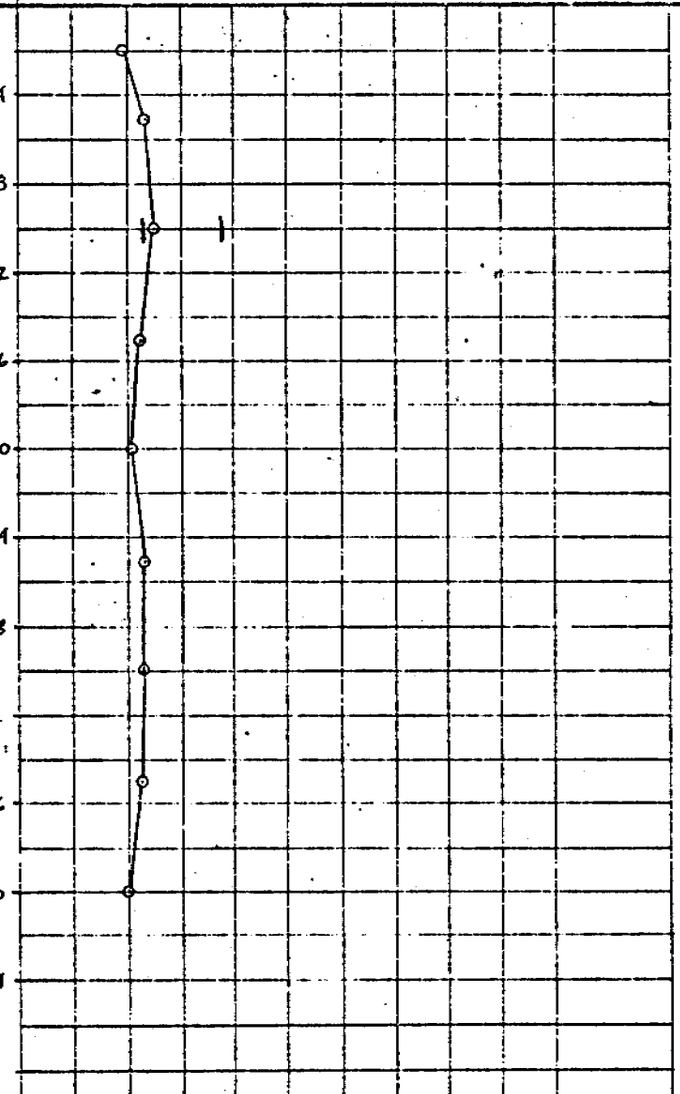


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 555+00	OFFSET ℄	TEST HOLE
CKD D.G.P	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: S → N STEEP	VEGETATION: SPRUCE & POPLAR	ELEV	

MILE	B,C,S	NUMBER
453	C	97A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F	Nbe							
4					CL	SANDY									
8						BROWN, SILTY									
8		T											123.1	99.5	
12															
16															
20		P				GREY, 1/2" ICE		< 5% EXCESS ICE							
24															
28								Vh							
32															
36					CL										
40		P													
44						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

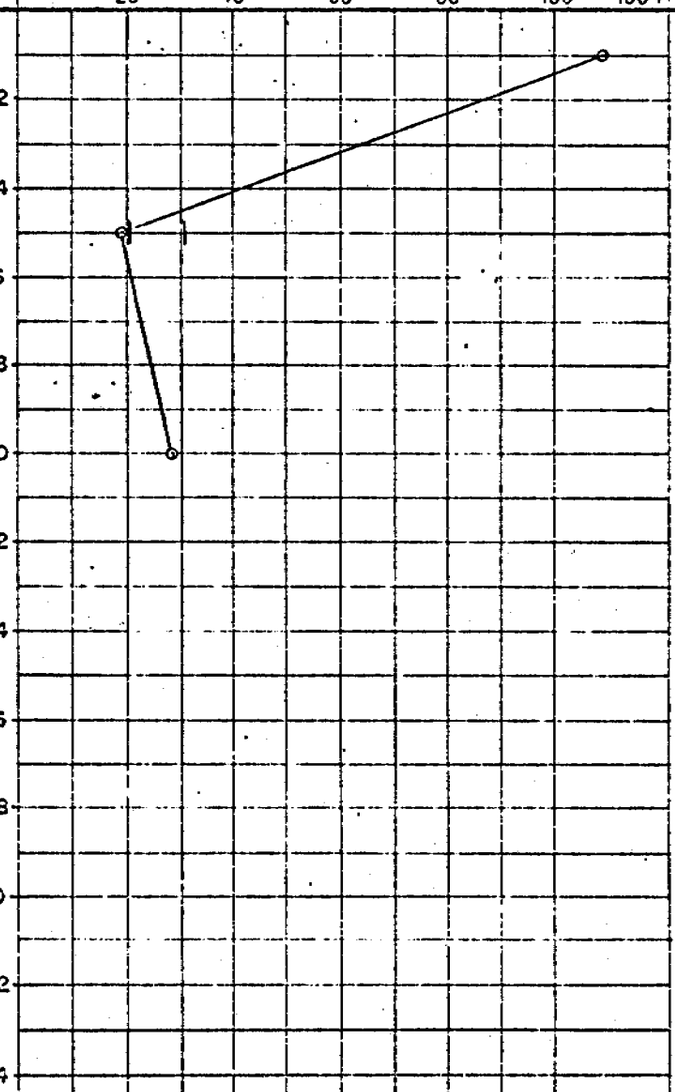
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. T.S.	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 565+00	OFFSET: ℄
CKD D.G.P	TECH: DM	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 40'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
453	C	98A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT	F								
4						CLAY		Vr					110.3	90.5	
6		T													
8					CL	LIGHT BROWN, ICE SILTY									
10															
12															
14		P				1/4" LAYER OF ICE		Vr							
16						END OF HOLE									
18															
20															
22															
24															



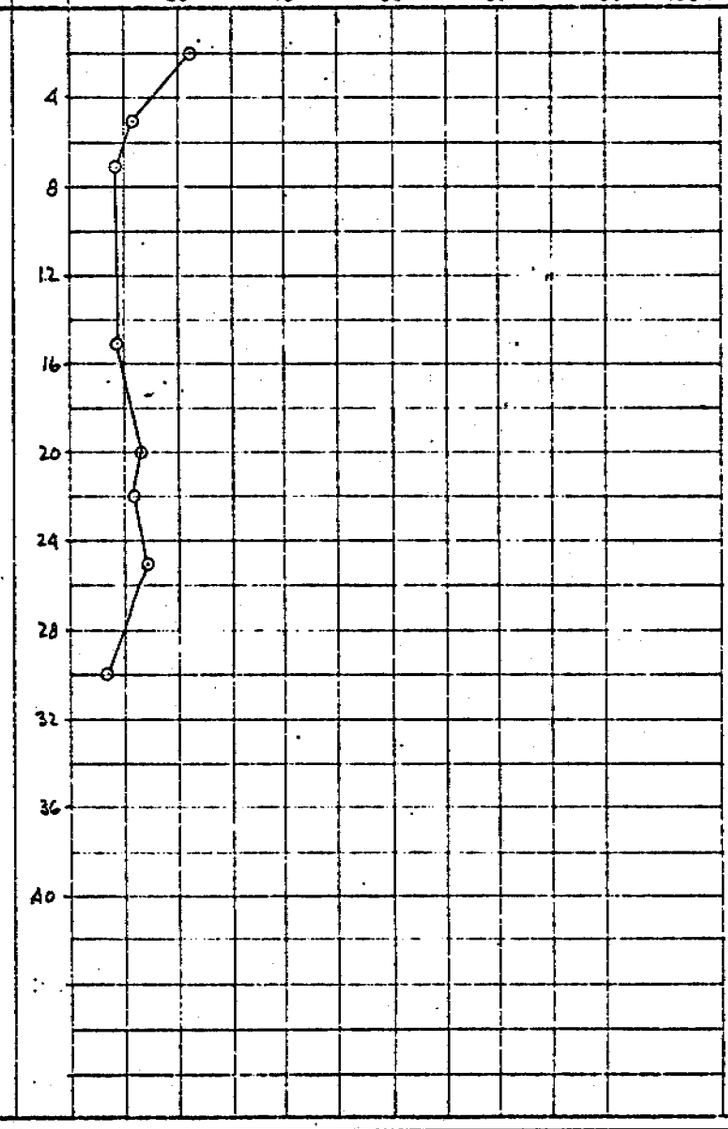
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 575+00	OFFSET: ℄
CKD D6P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
453	C	99A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - MOSS	F	
					ML	SILT - BROWN, SANDY, GRAVEL		
4					GM	GRAVEL SILTY, COBBLES		
						CLAY		
8								
12								
16					CL	BROWN, SILTY SAND & GRAVEL		Vr
20								
24								
28						GREY, SILTY WITH SAND & GRAVEL		
32						END OF HOLE		
36								
40								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

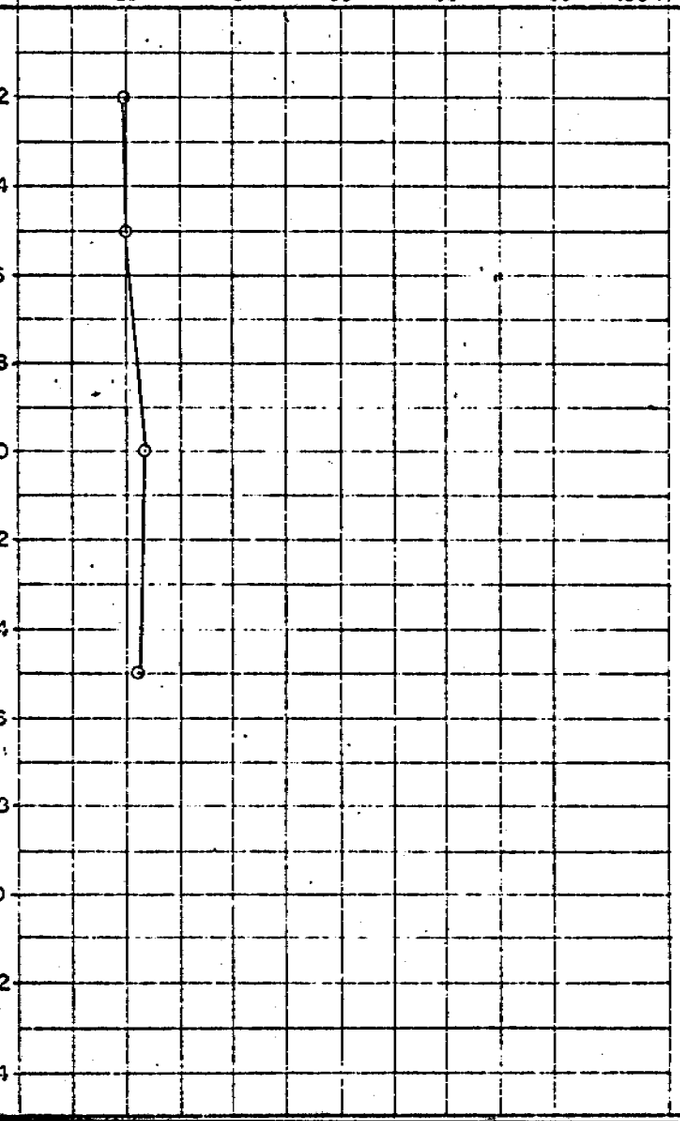
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 9/12/72	AIRPHOTO NO:	CHAINAGE: 585+00	OFFSET: ℄
CKD: D G P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: NORTH	VEGETATION: SPRUCE TO 40'	ELEV

TEST HOLE

MILE	E,C,S	NUMBER
454	C	100A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F	Nbn								
2		✓			SC	SILTY, TRACE OF SAND			2							
4									4							
6		✓				SILT			6							
8						SANDY			8							
10		✓			ML	SAND SEAM		Nf	10							
12									12							
14		✓				SANDY			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG RS	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 594+00	OFFSET ℄
CKD DGP	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION: POPLAR & SPRUCE (SPARSE)	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
454	C	95A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						SILT	UF		2							
4						SANDY, GRAVELLY			4							
6									6							
8									8							
10						GRAVEL			10							
12						SILTY WITH BOULDERS			12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+

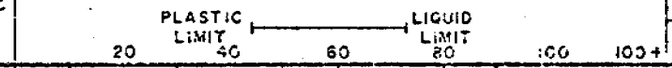
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S.	DATE DRILLED 9/12/72	AIRPHOTO NO:	CHAINAGE: 604+00	OFFSET: ℄
CKD D.G.P.	TECH D.M	RIG AIR	SURFACE DRAINAGE: NORTH	VEGETATION: SPRUCE & POPLAR	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
454	C	96A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY SANDY	UF	
4						GRAVEL		
					GP			
8						COARSE SAND		
12						BOULDERS		
16								
20					SP			
24								
28					GP	COARSE, BOULDERS		
32						END OF HOLE		
36								
40								
44								
48								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4							
8							
12							
16							
20							
24							
28							
32							
36							
40							
44							
48							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Coarse sand with gravel

Location

Hole 454-C-94A Depth 14' - 15'

Technician Date Dec. 8, 1972

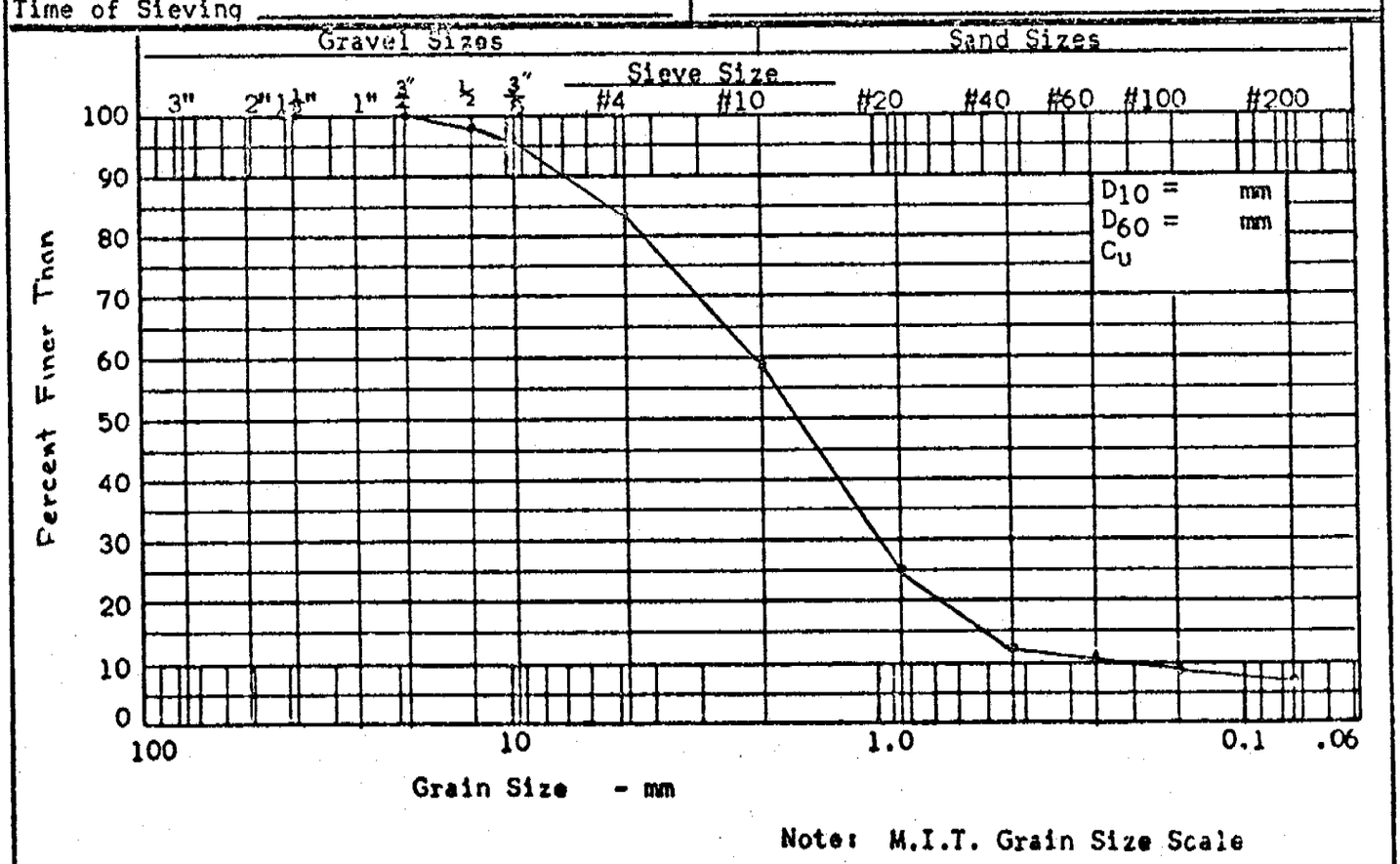
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			100.0	
Wt. Dry		1/2	12.70			97.0	
		3/8	9.52			96.0	
	4	.185	4.76			83.9	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			59.34	
Wt. Dry + Tare	20	.0331	.840			25.1	
Tare	40	.0165	.420			12.2	
Wt. Dry	60	.0097	.250			10.2	
	100	.0059	.149			9.5	
	200	.0029	.074			8.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



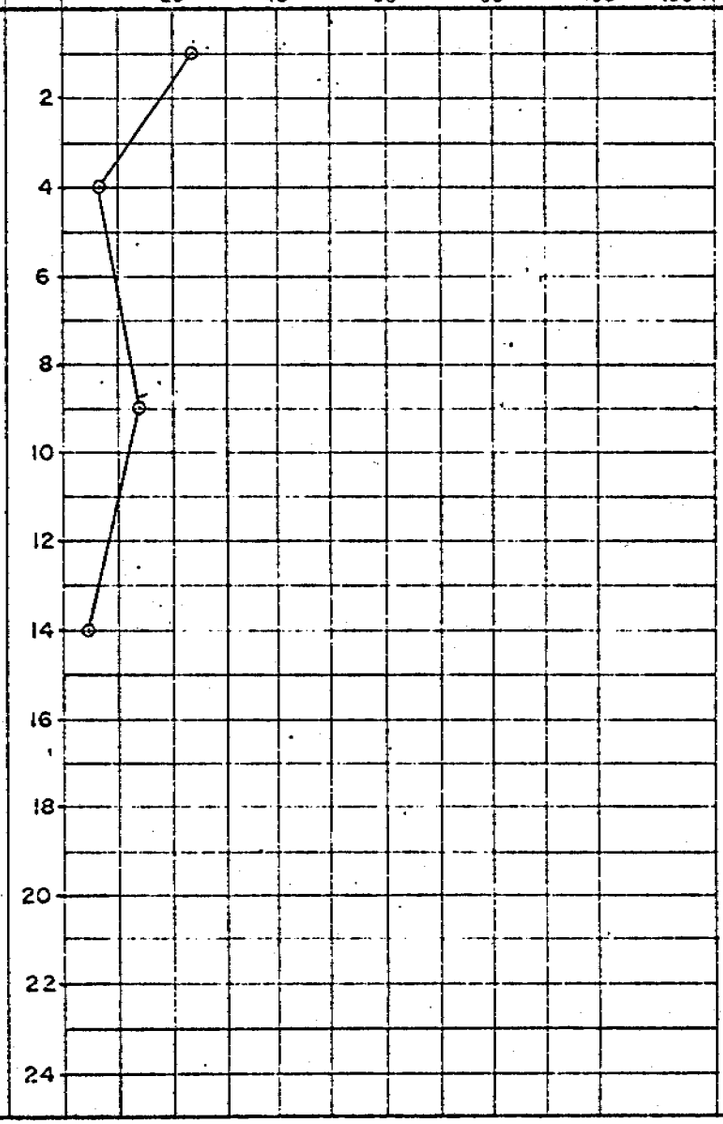
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W.	FIELD ENG R S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 608+00	OFFSET ℄
CKD D.G.P.	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION:	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
454	C	94A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - 2"	UF	
2					SM	SAND FINE, SILTY TO MEDIUM WITH CLAY		
4					SC			
6						COARSE WITH GRAVEL AND CLAY		
8								
10					SW			
12								
14						SILTY		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
	8	51	41			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Coarse Sand, some gravel
Location
Hole 454-S-101A Depth 9' - 10'
Technician Date Dec.11, 1972

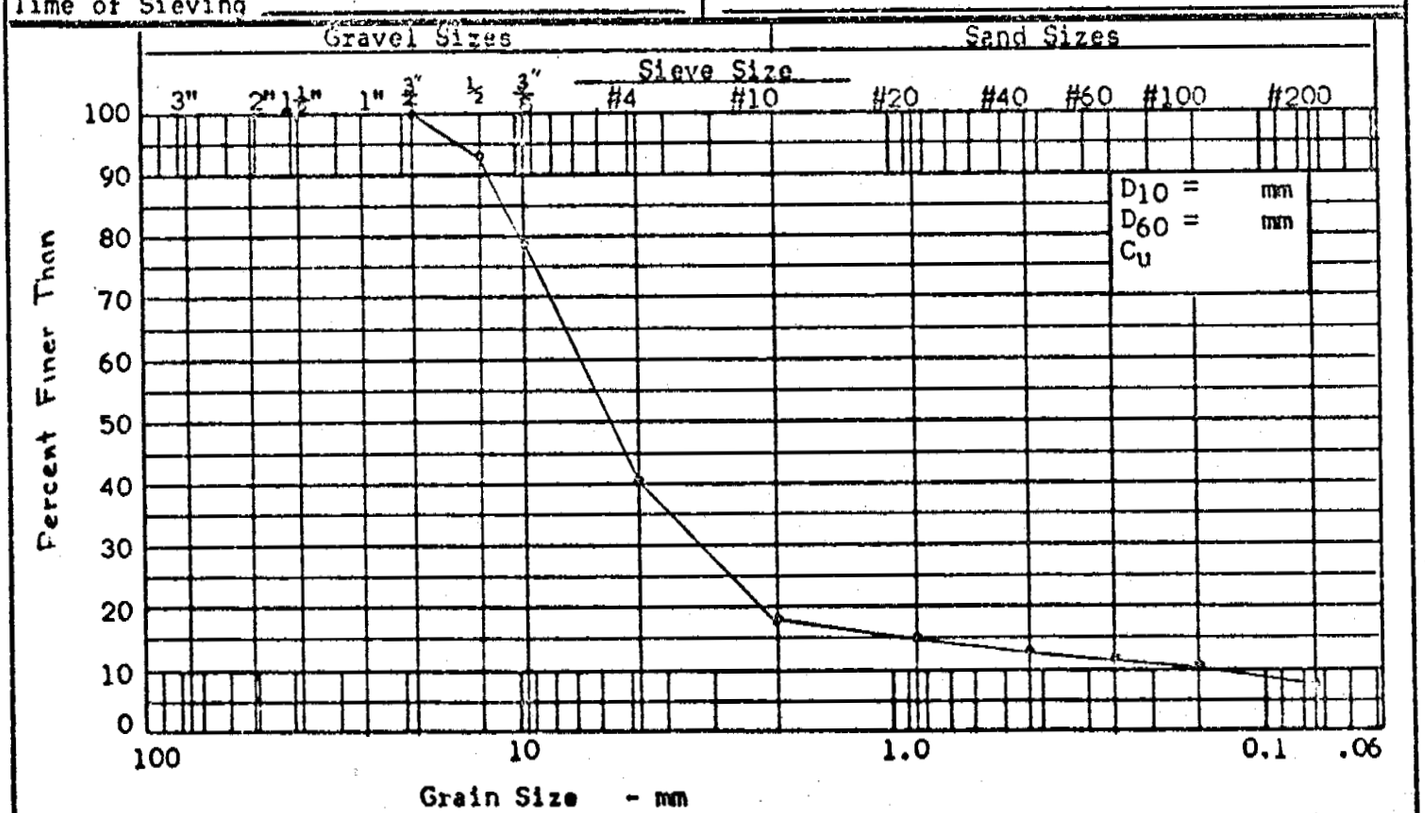
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			93.0	
Wt. Dry		3/8	9.52			79.0	
	4	.185	4.76			40.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			18.4	
Wt. Dry + Tare	20	.0331	.840			15.1	
Tare	40	.0165	.420			13.8	
Wt. Dry	60	.0097	.250			12.7	
	100	.0059	.149			10.8	
	200	.0029	.074			7.8	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

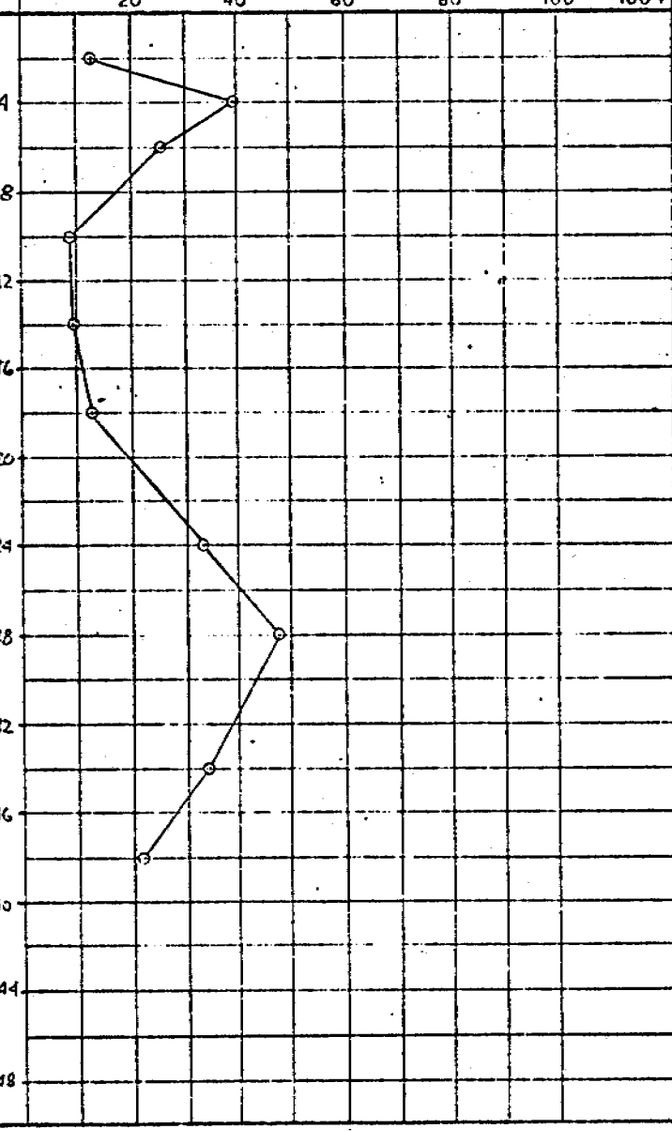
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG. RS	DATE DRILLED 11/12/72	AIRPHOTO NO:	CHAINAGE: 611+00	OFFSET: ℄
CKD DGP	TECH: DM.	RIG AIR	SURFACE DRAINAGE: NORTH	VEGETATION: NONE	ELEV 302.82

TEST HOLE

MILE	B,C,S	NUMBER
454	5	101A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR MUSKEG	UF									
4					ML To OL	SILT CLAYEY, TRACES OF ORGANIC, SANDY			4							
		P														
8					SP	SAND COARSE, SOME SILT SOME GRAVEL			8	8	10	82				
12									12							
16						WATER TABLE @ 15'			16							
20									20							
24									24							
28					SM	FINE - MEDIUM, SILTY TRACES OF GRAVEL VERY WET			28							
32									32							
36									36							
40						CLAY HARD, SHALE LIKE			40							
44						END OF HOLE			44							
48									48							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG T.S	DATE DRILLED 11/12/72	AIRPHOTO NO:	CHAINAGE 611+90	OFFSET ℄	TEST HOLE
CKD DGP	TECH DM	RIG AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV 282.9	MILE 454 / B,C,S S / NUMBER 102A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT BLACK TOPSOIL	SF	
					GP	GRAVEL COARSE WATER TABLE @ 4'		
8								
16					CL	CLAY GREYISH BROWN		
24						GRAVEL	F	Nbn
32					GP			Nf
40						MAINLY COARSE WITH THIN SEAMS OF FINE GRAVEL		
48								
56								
64					GW			
72					CL	CLAY - SANDY, DARK BLUE		Nf
80						END OF HOLE		
88								
96								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
8							
16							
24							
32							
40							
48							
56							
64							
72							
80							
88							
96							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clay, coarse sandy gravel
Location	
Hole	454-S-93A Depth 9' - 10'
Technician	Date Dec. 8, 1972

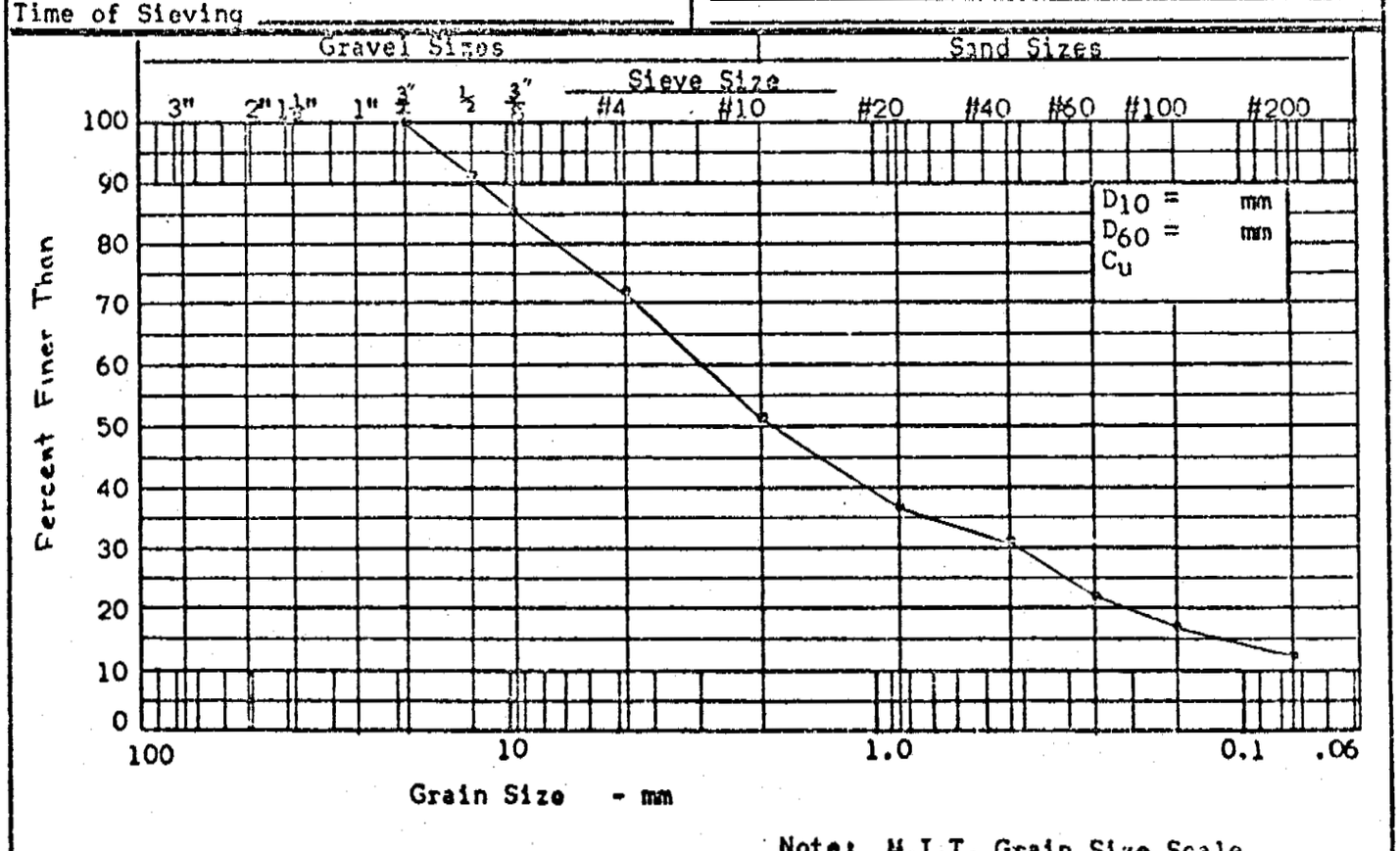
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			91.8	
Wt. Dry		3/8	9.52			85.1	
	4	.185	4.76			72.4	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			50.5	
Tare No.	20	.0331	.840			37.4	
Wt. Dry + Tare	40	.0165	.420			30.7	
Tare	60	.0097	.250			22.5	
Wt. Dry	100	.0059	.149			17.5	
	200	.0029	.074			12.86	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

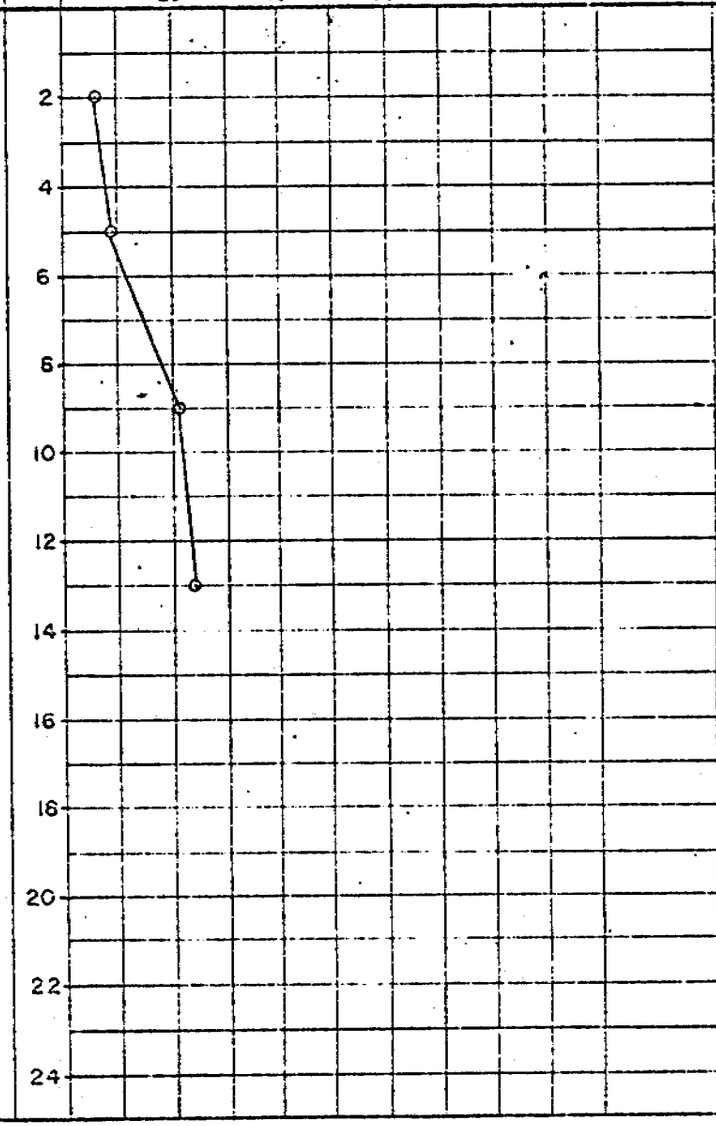


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG: R.S	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 612+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION: SHRUBS	ELEV: 3282.00	MILE: 454 · B,C,S: S · NUMBER: 93A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GM	GRAVEL VERY WET, CLAYEY	UF								
4															
6						COARSE SAND									
8						CLAYEY, COARSE SAND IN WATER (DIRTY)									
10									13		38	49			
12					GC	CLAY MIXTURE IN WATER									
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG D.M	DATE DRILLED 10/1/73	AIRPHOTO NO:	CHAINAGE: 614+25	OFFSET: ℄
CKD D.G.P	TECH	RIG:	SURFACE DRAINAGE: WEST TO EAST	VEGETATION: POPLAR & CONIFER TO 40'	ELEV 283.3

TEST HOLE

MILE	B,C,S	NUMBER
454	S	129 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SAND	UF	
8					GW	GRAVEL BOULDERS, FINE		
16								
						SANDY CLAY LENSE COARSE, SOME COBBLES		
24							F	Nf
						GREY BROWN CLAY LENSE		
32								
40						COARSE WITH SAND STONE LENSES		
48								
56								Nbn
64					CH	CLAY BROWN, MED - HIGH PLASTIC, TRACE OF SAND		
72						VERY HARD BLUISH GREY SOME SAND HIGH PLASTIC		Nbn
80						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
8							
16							
24							
32							
40							
48							
56							
64							
72							
80							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Clayey Gravel
Location
Hole 454-S-130A Depth 20'
Technician Date Jan.30/73

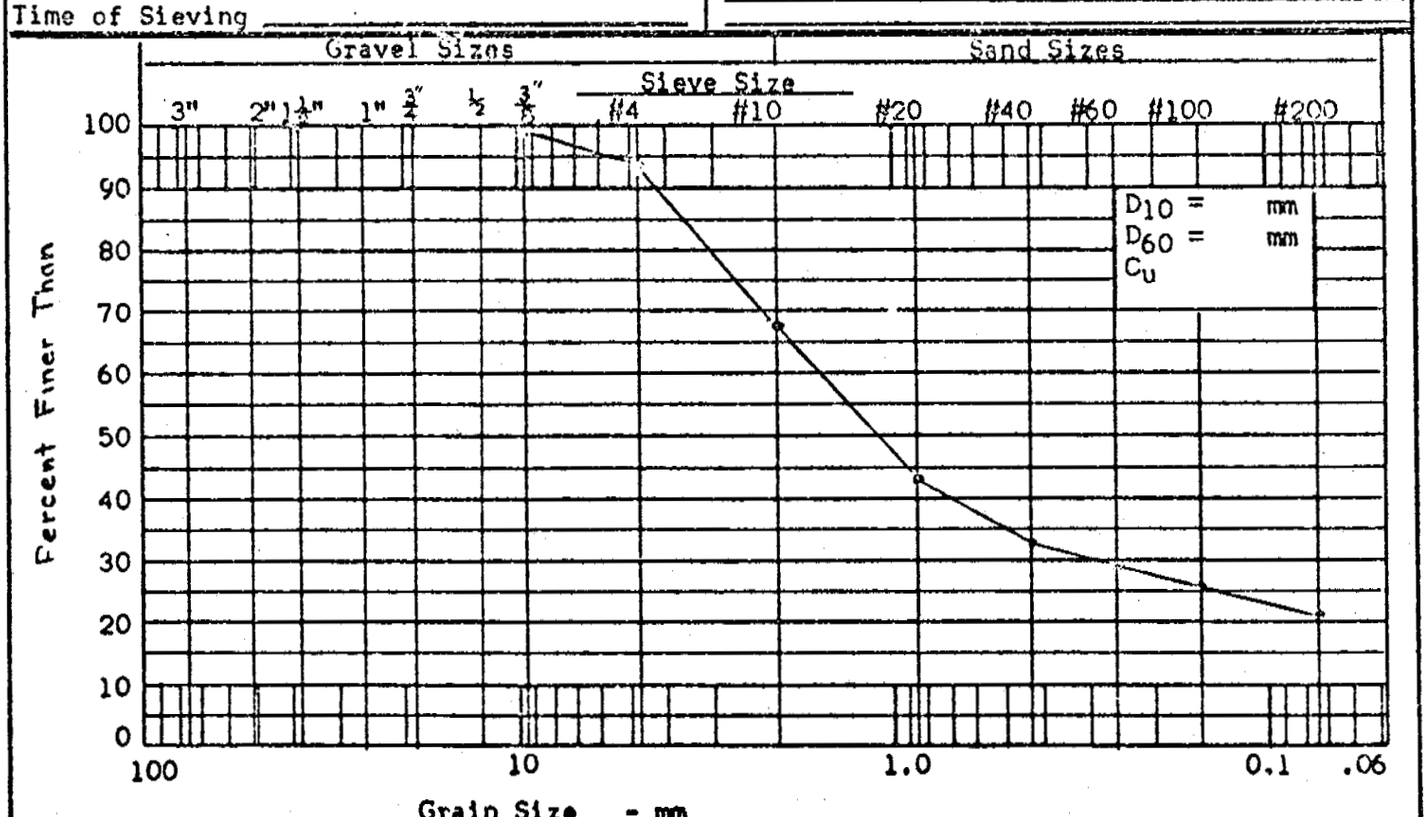
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			99.2%	
	4	.185	4.76			94.0%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			67.9%	
Tare No.	20	.0331	.840			43.4%	
Wt. Dry + Tare	40	.0165	.420			32.8%	
Tare	60	.0097	.250			29.1%	
Wt. Dry	100	.0059	.149			25.3%	
	200	.0029	.074			21.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Clayey Gravel
Location
Hole 454-S-130A Depth 25'
Technician Date Jan.26/73

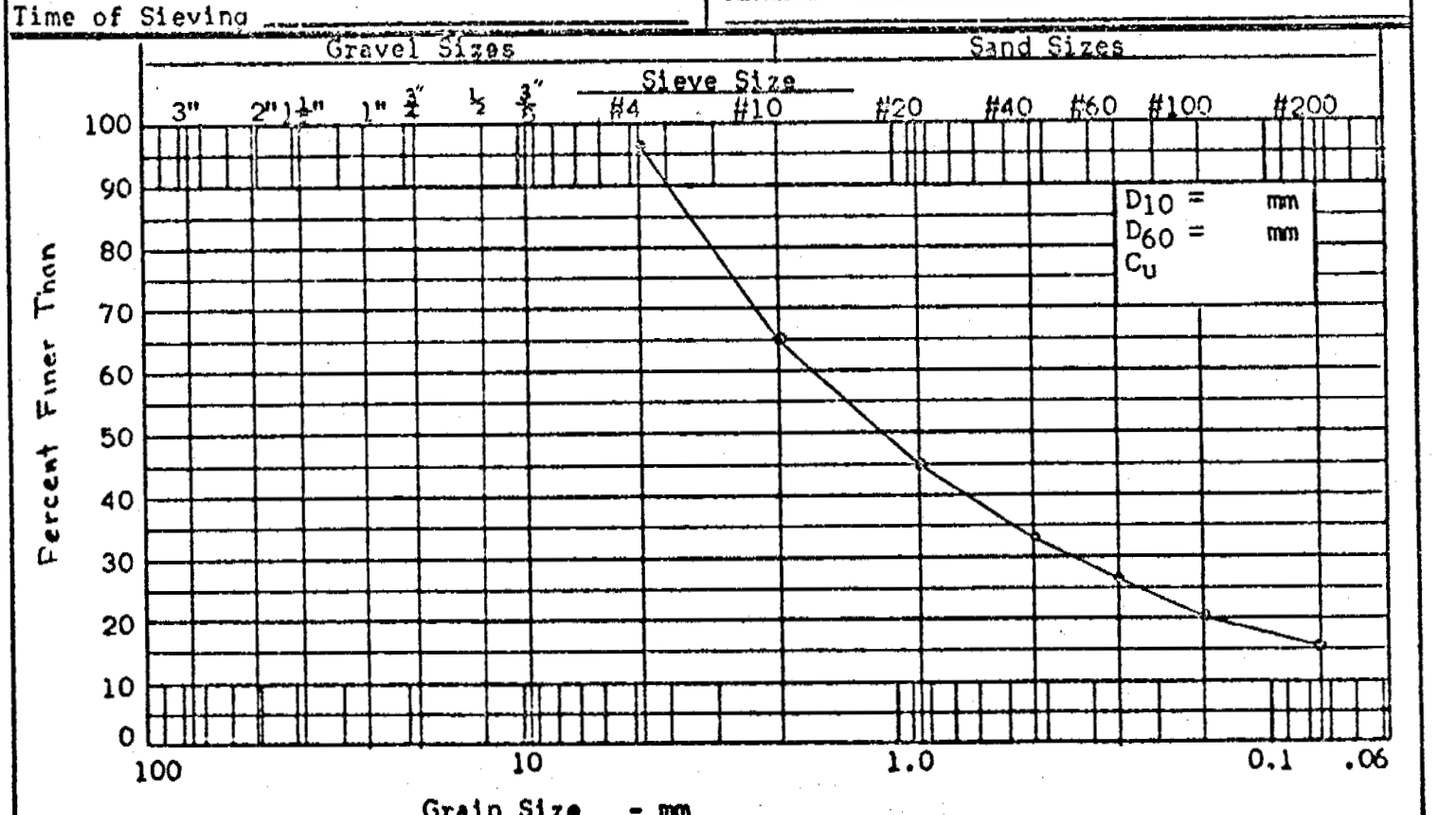
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			96.4%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			65.1%	
Tare No.	20	.0331	.840			45.2%	
Wt. Dry + Tare	40	.0165	.420			33.7%	
Tare	60	.0097	.250			26.5%	
Wt. Dry	100	.0059	.149			20.5%	
	200	.0029	.074			15.7%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Clayey Gravel
Location
Hole 454-S-130A Depth 25'-26'
Technician Date Jan.26/73

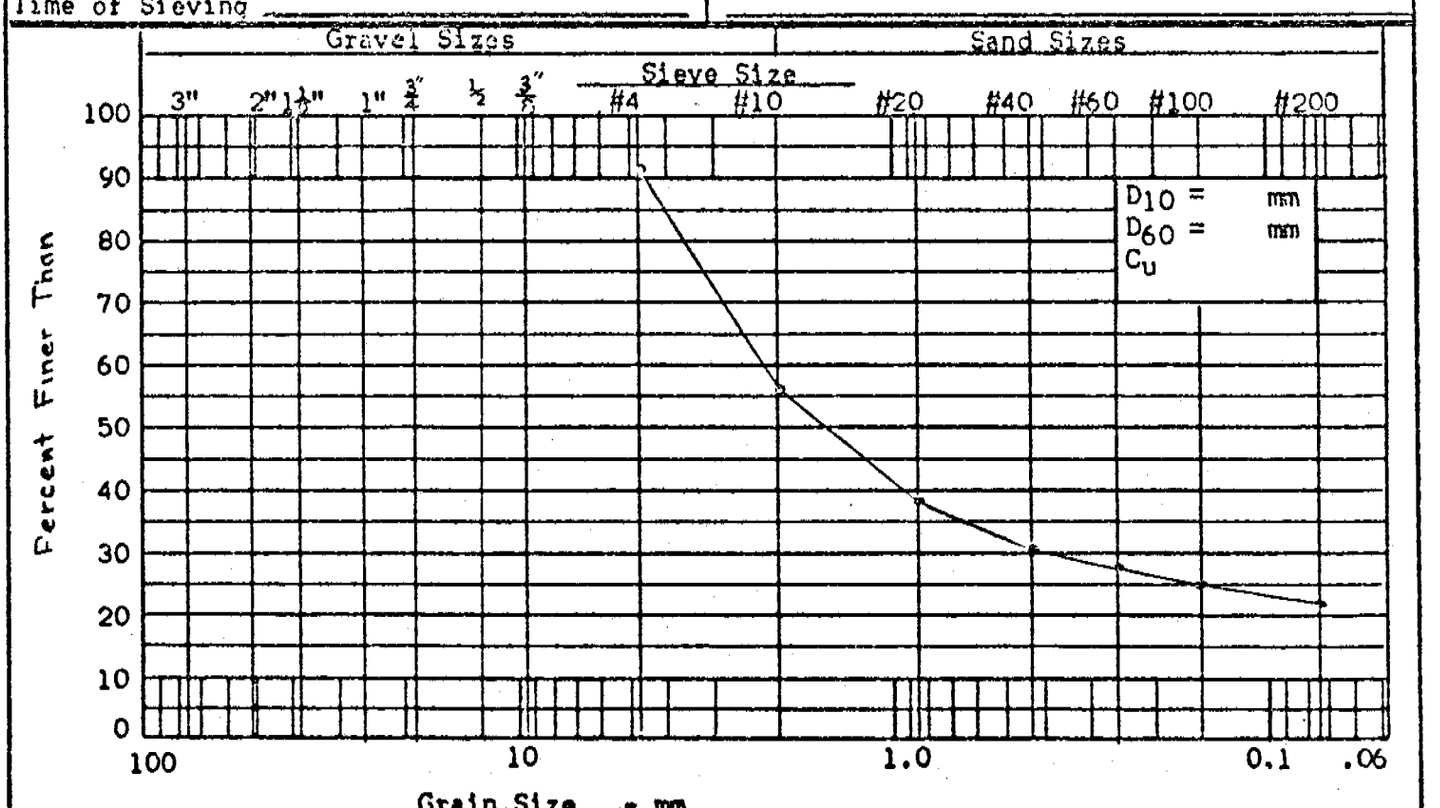
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			91.2%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			55.9%	
Tare No.	20	.0331	.840			38.2%	
Wt. Dry + Tare	40	.0165	.420			30.9%	
Tare	60	.0097	.250			27.9%	
Wt. Dry	100	.0059	.149			25.0%	
	200	.0029	.074			22.1%	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Clayey Gravel
Location
Hole 454-S-130A Depth 26'-28'
Technician Date Jan.30/73

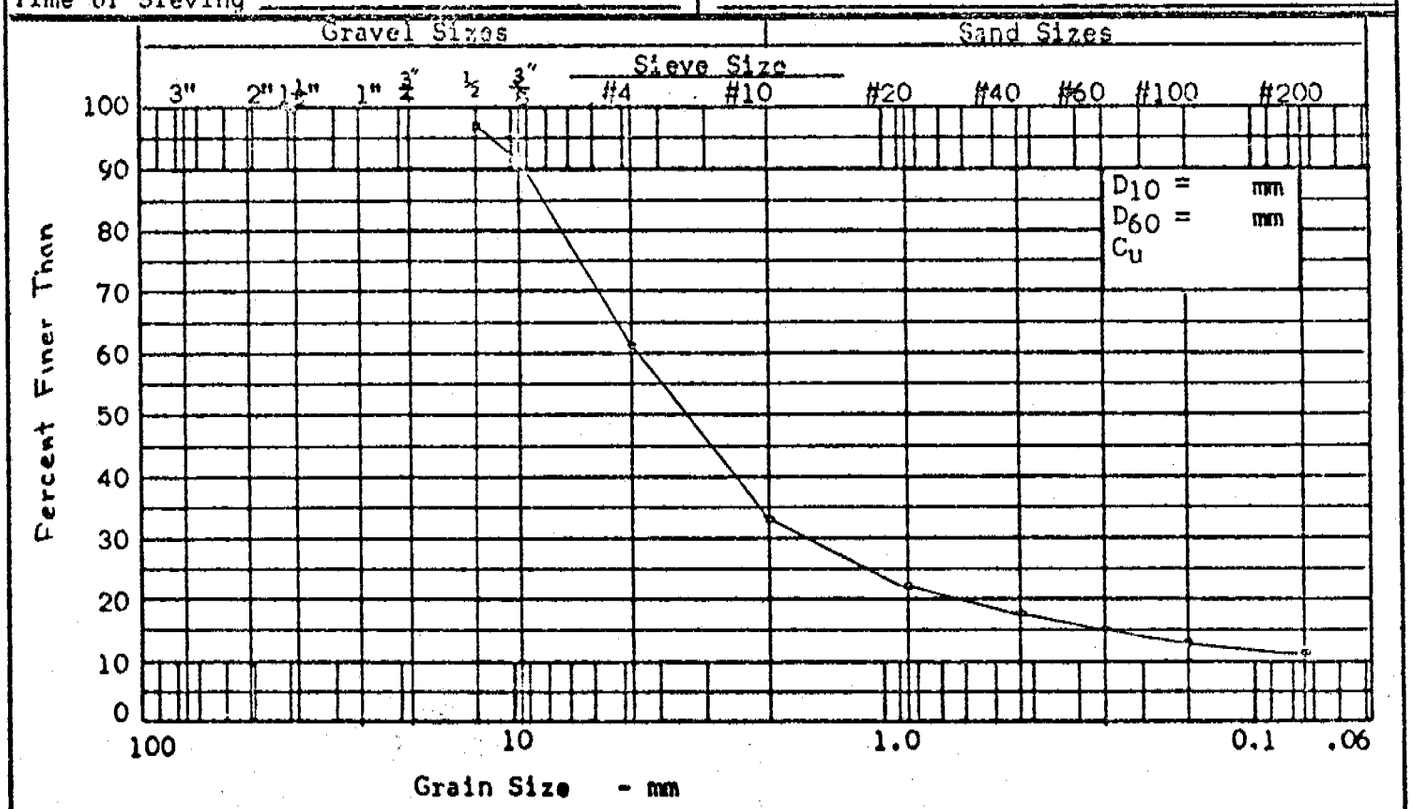
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			97.3%	
Wt. Dry		3/8	9.52			91.8%	
	4	.185	4.76			61.2%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			33.7%	
Wt. Dry + Tare	20	.0331	.840			22.4%	
Tare	40	.0165	.420			17.6%	
Wt. Dry	60	.0097	.250			15.7%	
	100	.0059	.149			13.7%	
	200	.0029	.074			11.8%	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Clayey Gravel
Location
Hole 45-4-S-130A Depth 30'
Technician Date Jan.26/73

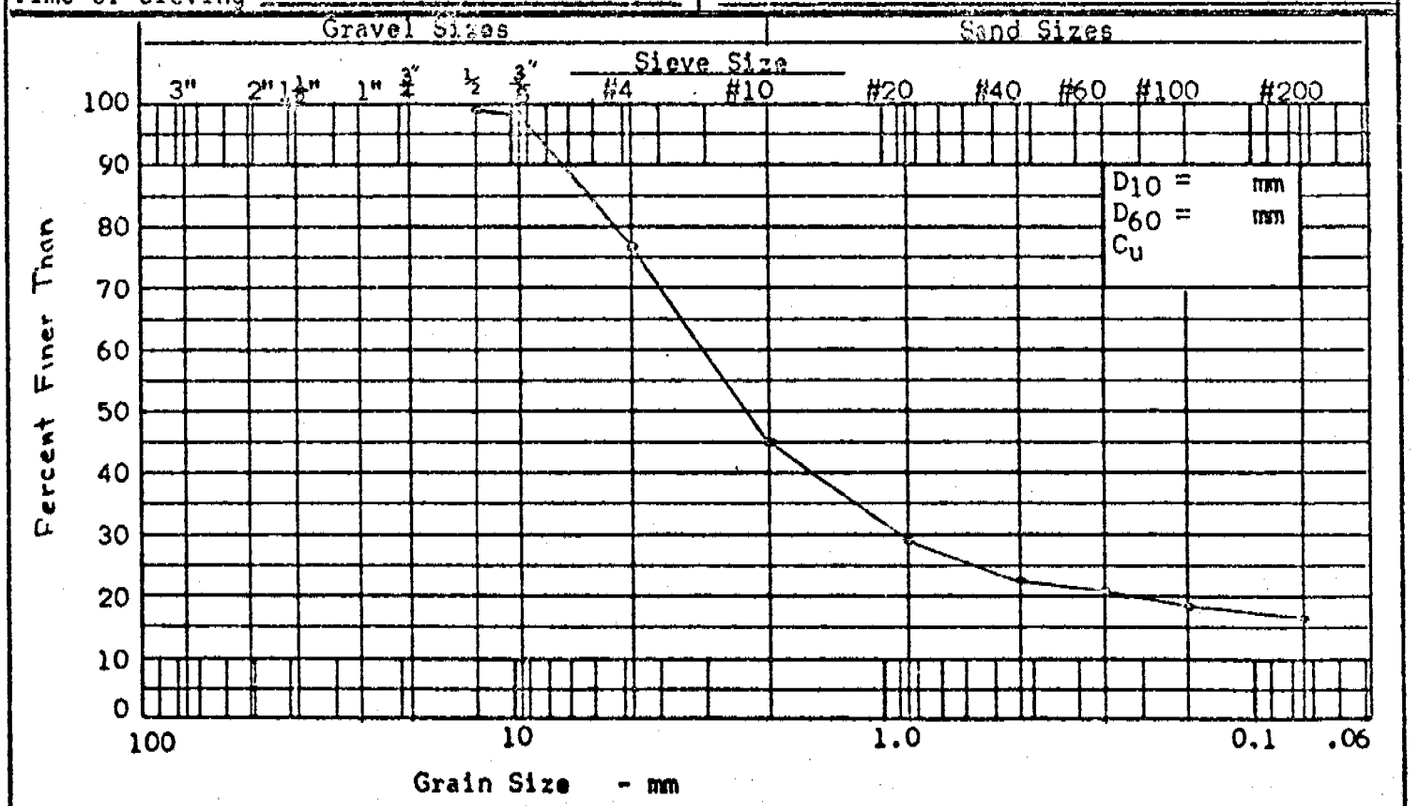
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			99.8%	
Wt. Dry		3/8	9.52			98.6%	
	4	.185	4.76			76.7%	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			45.3%	
Tare No.	20	.0331	.840			29.2%	
Wt. Dry + Tare	40	.0165	.420			22.8%	
Tare	60	.0097	.250			20.8%	
Wt. Dry	100	.0059	.149			18.9%	
	200	.0029	.074			16.9%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

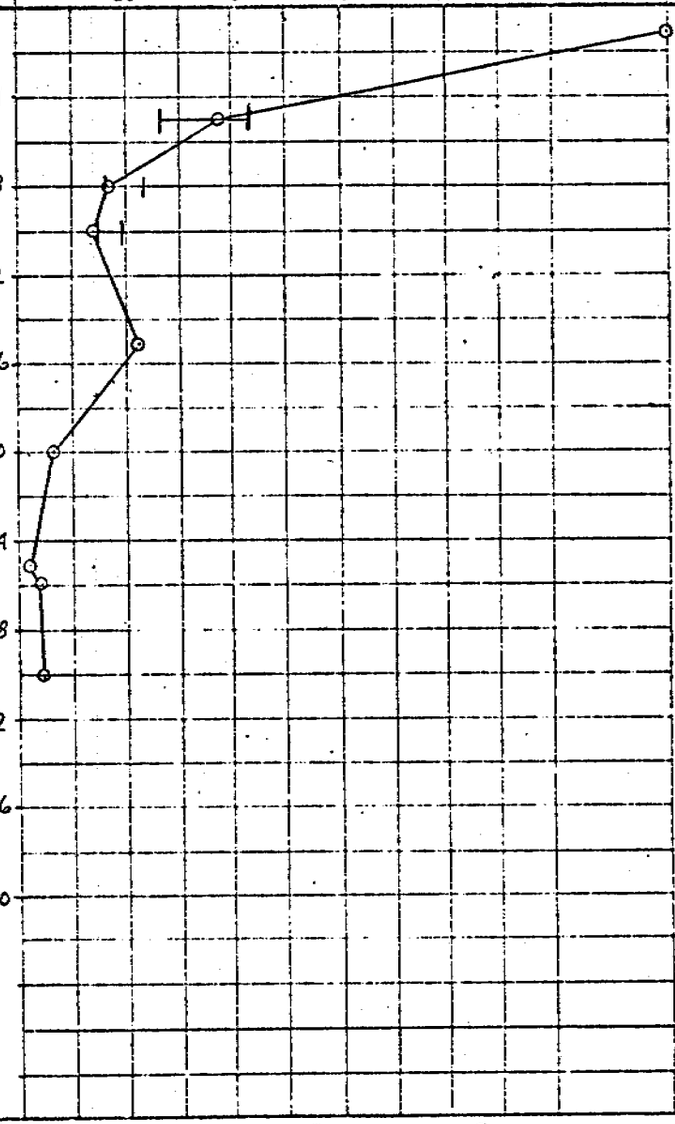
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN: A.E.W.	FIELD ENG: D.M.	DATE DRILLED: 11/1/73	AIRPHOTO NO:	CHAINAGE: 617+00	OFFSET:
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & CONIFER TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
454	S	130 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4		P			OL	SILT GRANULAR, SOME ORGANIC	F	Nbn	4					105.2	76.0	SO_4 = 0.07%
8		P			CL	CLAY SILTY; NO VISIBLE ICE LENSES, SANDY DRY			8							
12									12							
16		P				GRAVEL SILTY CLAY, COARSE, COBBLES			16							
20									20	21	57	32				HARD DRILLING
24					GC				24	16 22	49 34	35 44				
28									28	12 17	22 28	66 55				
32					GW	LOOSE, COARSE			32							
36						END OF HOLE			36							
40									40							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

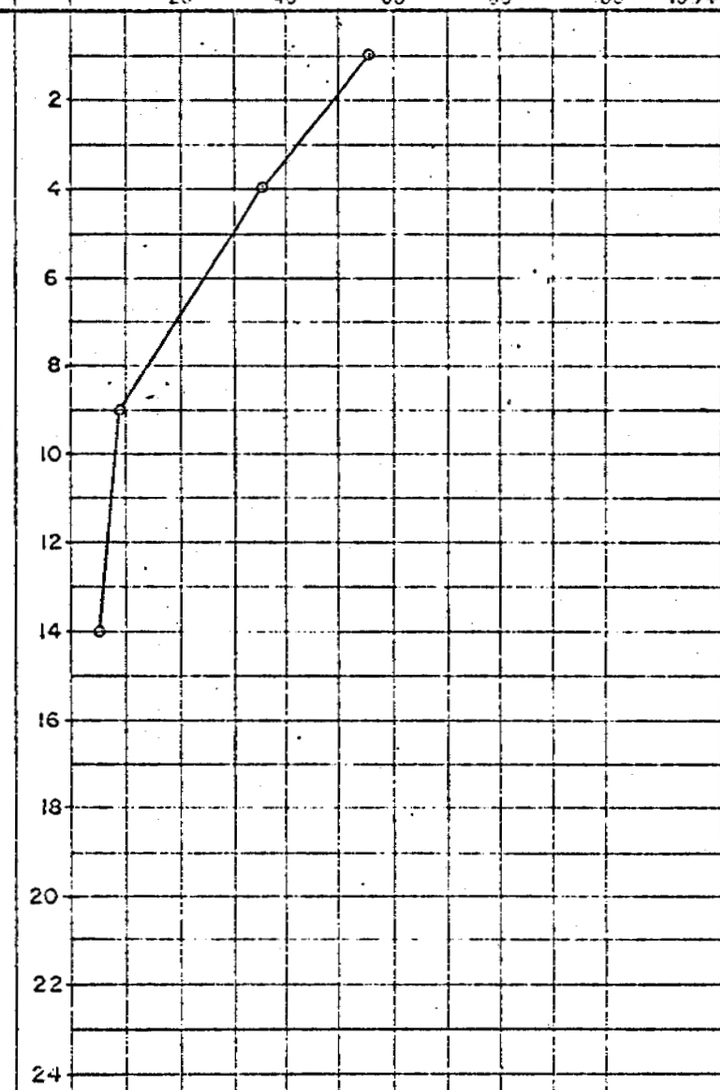
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DRN A.E.W	FIELD ENG B.M.	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 619+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE, POPLAR, WILLOW	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
454	C	658

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F								
2						CLAY									
						SILTY, ICE CRYSTALS STICKY, SOFT									
4					CL										
6															
8															
10						SAND									
					SM	SOME CLAY AND GRAVEL									
12															
14						SAND & ROCK CUTTINGS									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with some clay and gravel
Location	
Hole 454-C-64B	Depth 4' - 5'
Technician	Date Dec. 7, 1972

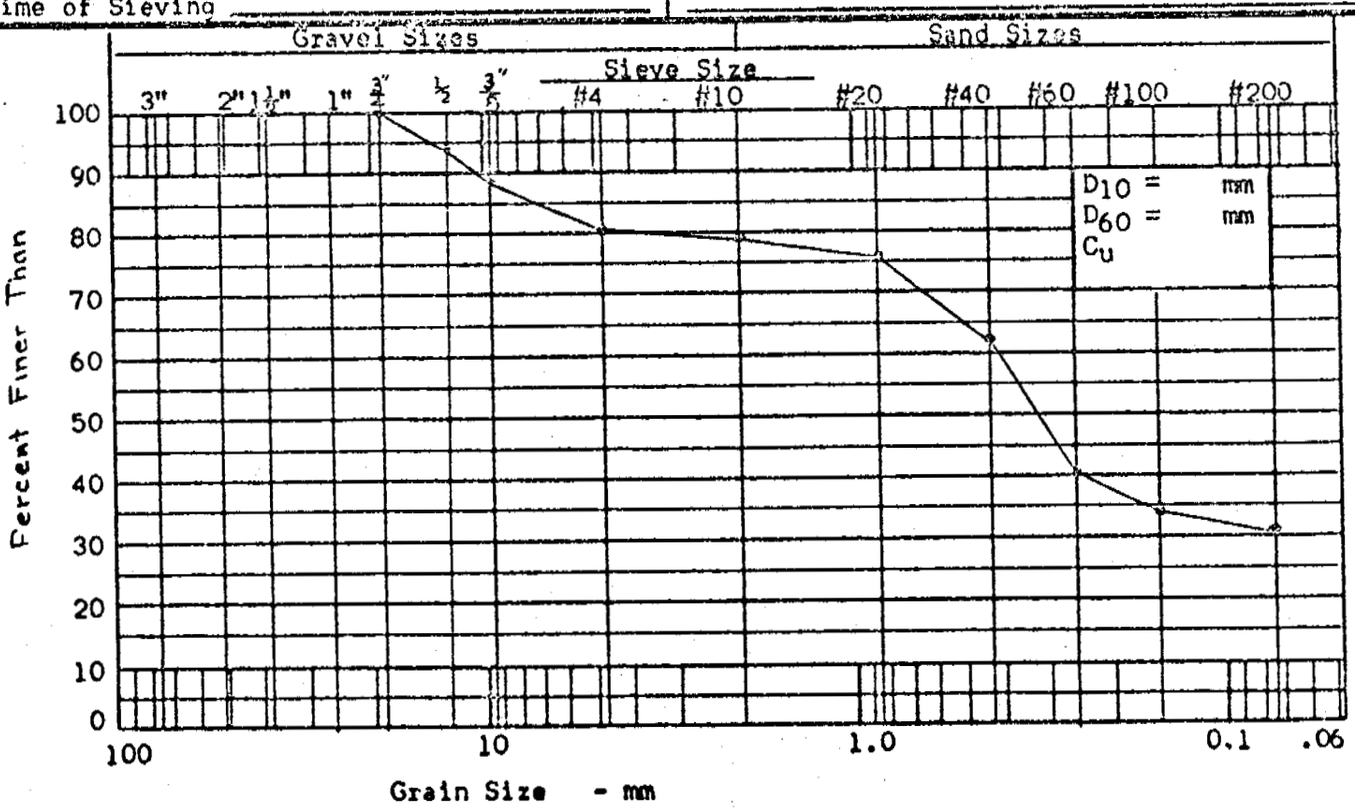
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			100.0	
Wt. Dry		1/2	12.70			94.3	
		3/8	9.52			88.8	
	4	.185	4.76			80.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			77.9	
Wt. Dry + Tare	20	.0331	.840			25.9	
Tare	40	.0165	.420			62.6	
Wt. Dry	60	.0097	.250			40.2	
	100	.0059	.149			34.7	
	200	.0029	.074			31.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

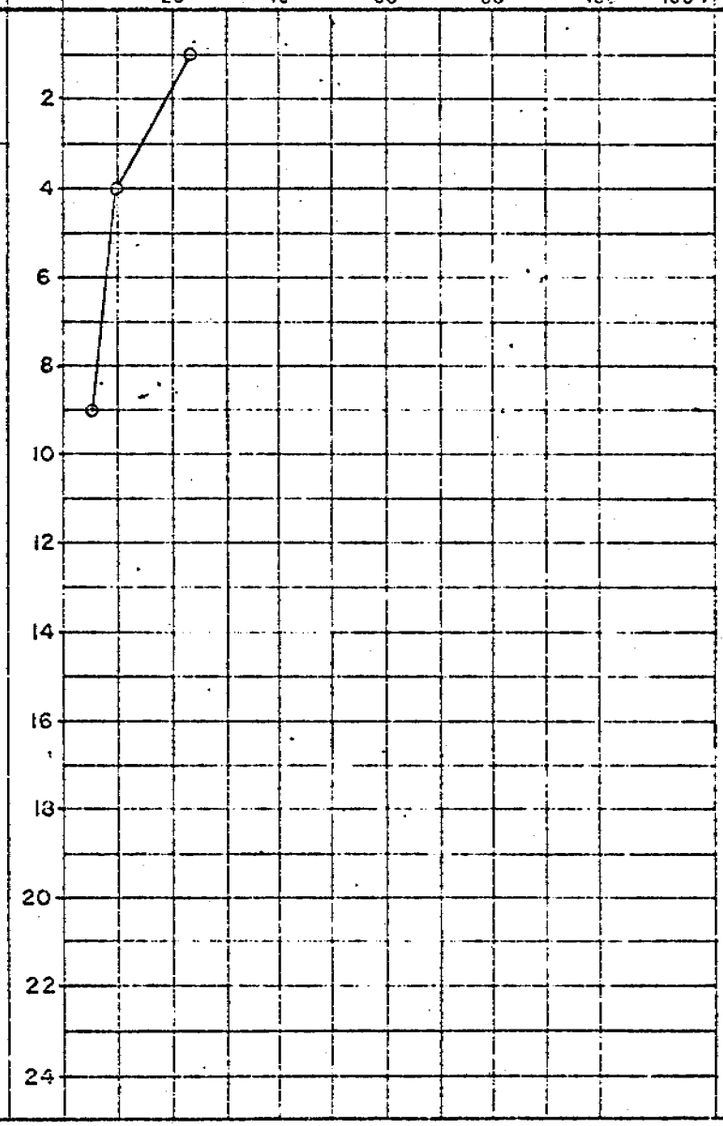
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE 626+00	OFFSET ℄
CKD D.G.P	TECH D.M.	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 40'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
454	C	648

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F								
2					SM	SAND SOME CLAY & GRAVEL	UF								
4									31		47	22			
6															
8															
10					SP	MORE GRAVELLY									
12						END OF HOLE									
14															
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Coarse Gravel
Location
Hole 454-S-131A Depth 5'
Technician Date Jan. 26/73

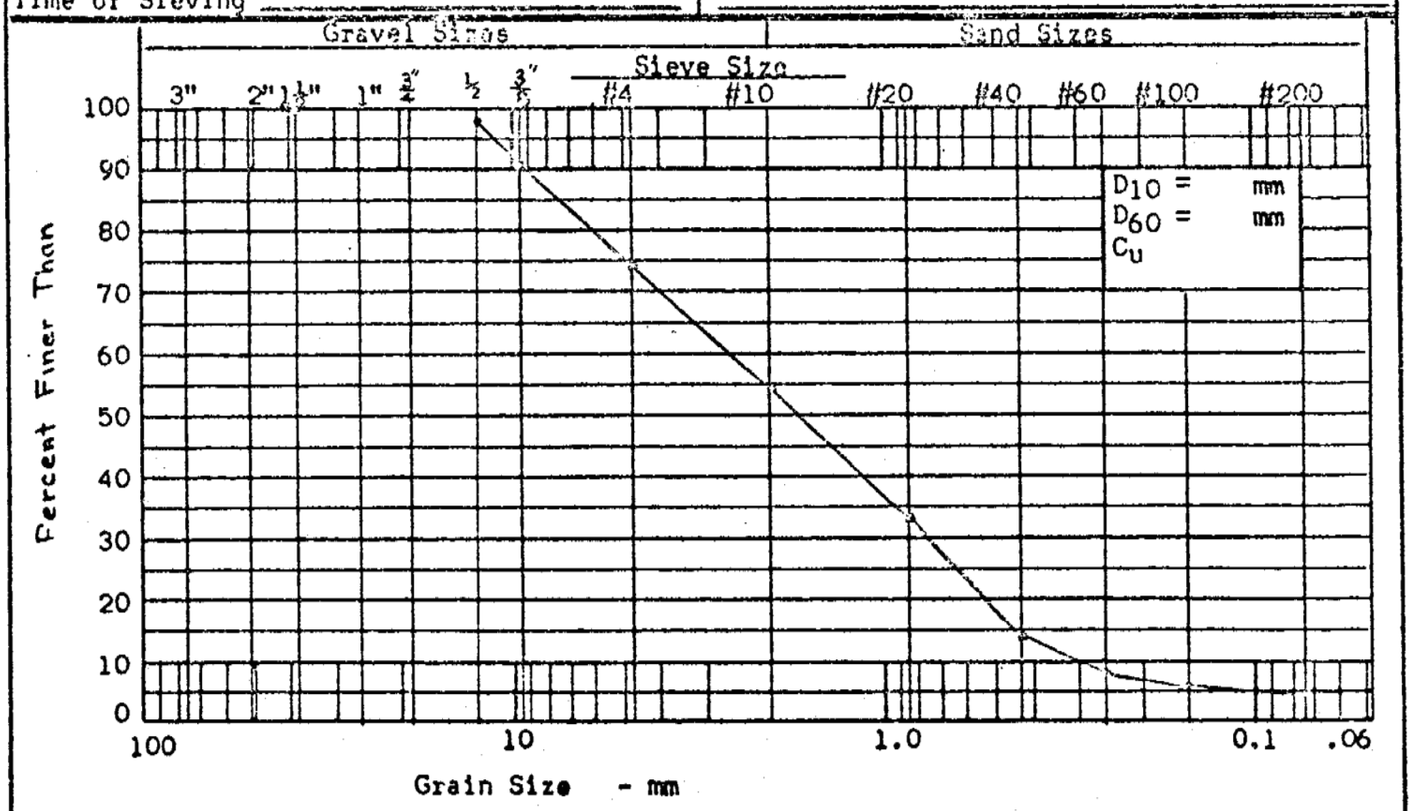
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			98.3%	
Wt. Dry		3/8	9.52			90.2%	
	4	.185	4.76			74.7%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			54.6%	
Tare No.	20	.0331	.840			33.9%	
Wt. Dry + Tare	40	.0165	.420			14.4%	
Tare	60	.0097	.250			8.6%	
Wt. Dry	100	.0059	.149			6.3%	
	200	.0029	.074			4.6%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Fine Gravel
Location
Hole 454-S-131A Depth 10'
Technician Date Jan.26/73

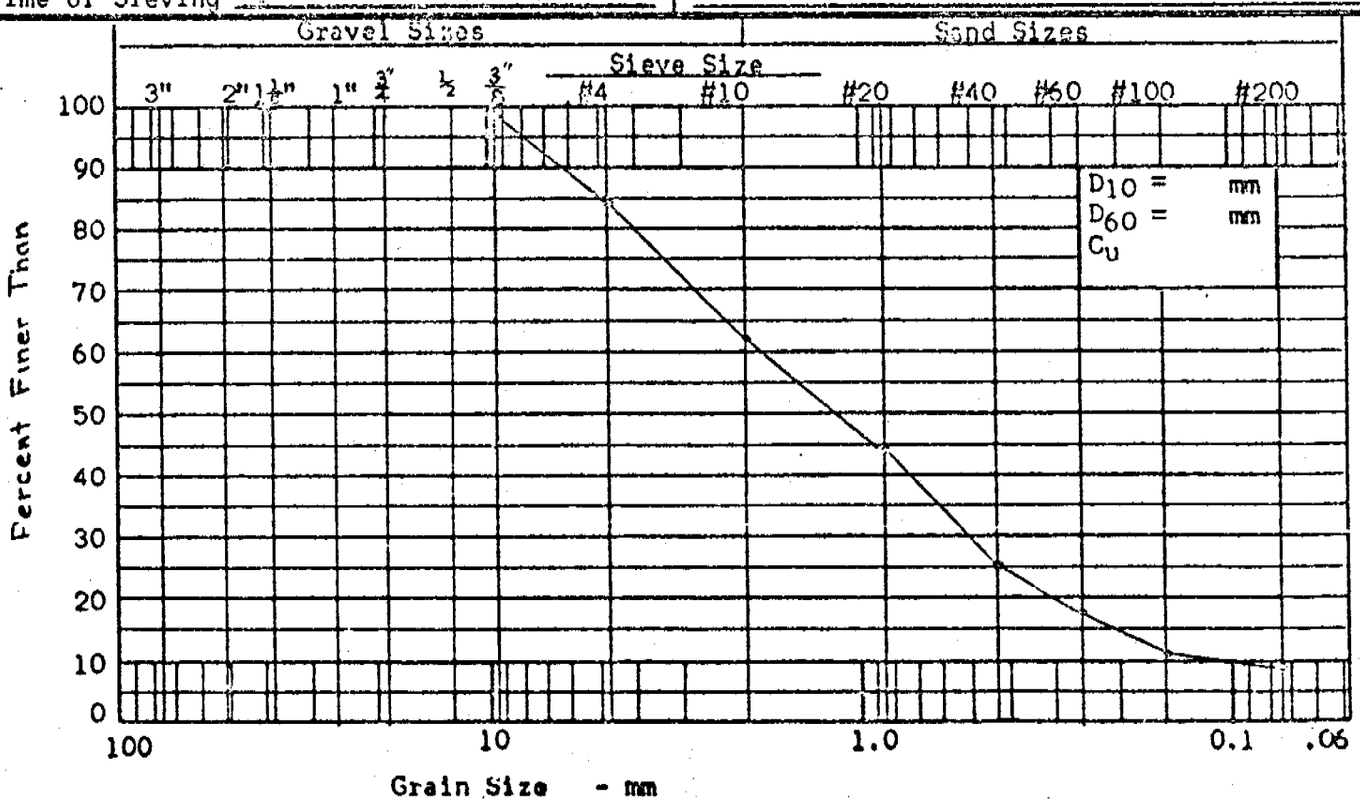
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			98.4%	
	4	.185	4.76			84.8%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			63.0%	
Wt. Dry + Tare	20	.0331	.840			44.4%	
Tare	40	.0165	.420			25.5%	
Wt. Dry	60	.0097	.250			17.9%	
	100	.0059	.149			12.9%	
	200	.0029	.074			9.4%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Fine Gravel
Location
Hole 454-S-131A Depth 10'
Technician Date Jan.26/73

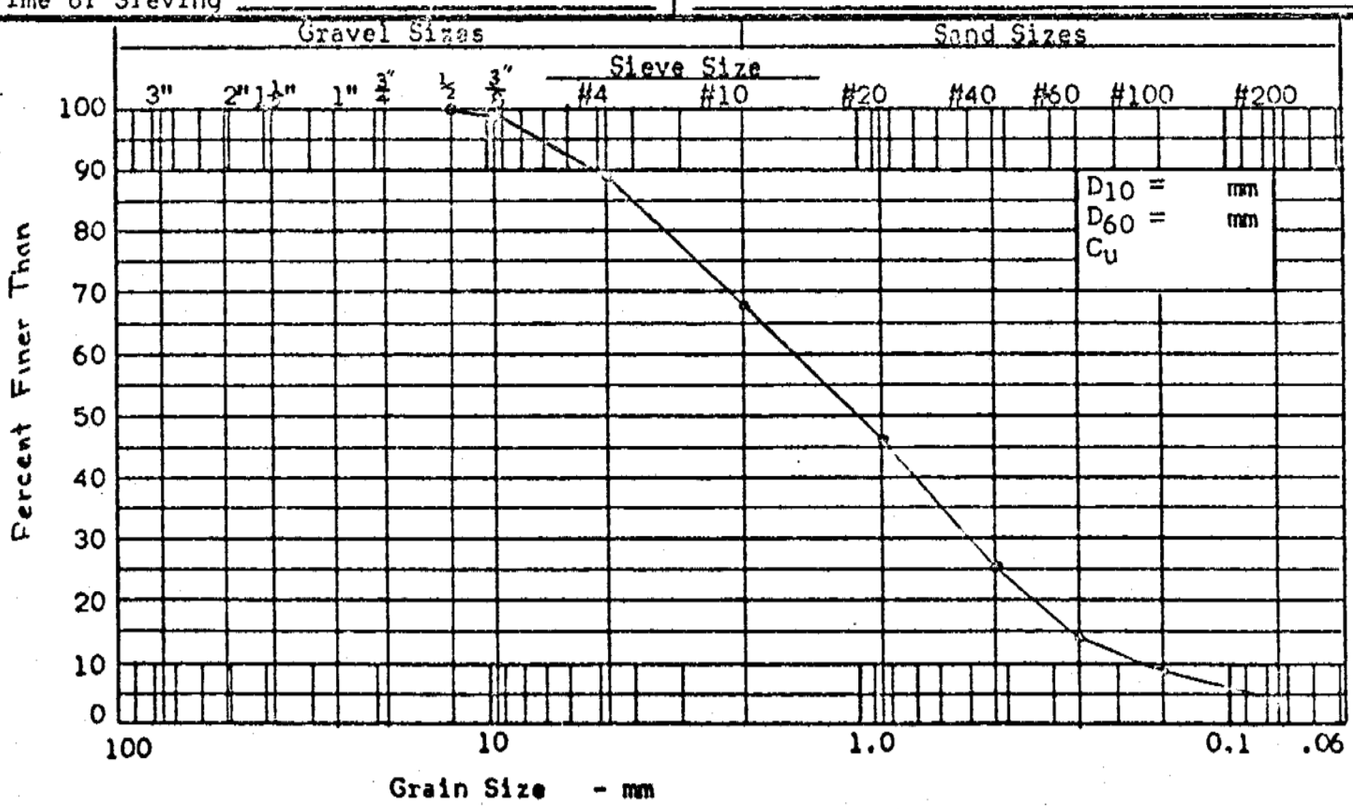
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100%	
Wt. Dry		3/8	9.52			98.8%	
	4	.185	4.76			89.4%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			67.6%	
Tare No.	20	.0331	.840			46.4%	
Wt. Dry + Tare	40	.0165	.420			25.1%	
Tare	60	.0097	.250			14.4%	
Wt. Dry	100	.0059	.149			9.0%	
	200	.0029	.074			4.9%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 454-S-131A Depth 15'-18'
Technician Date Jan. 26/73

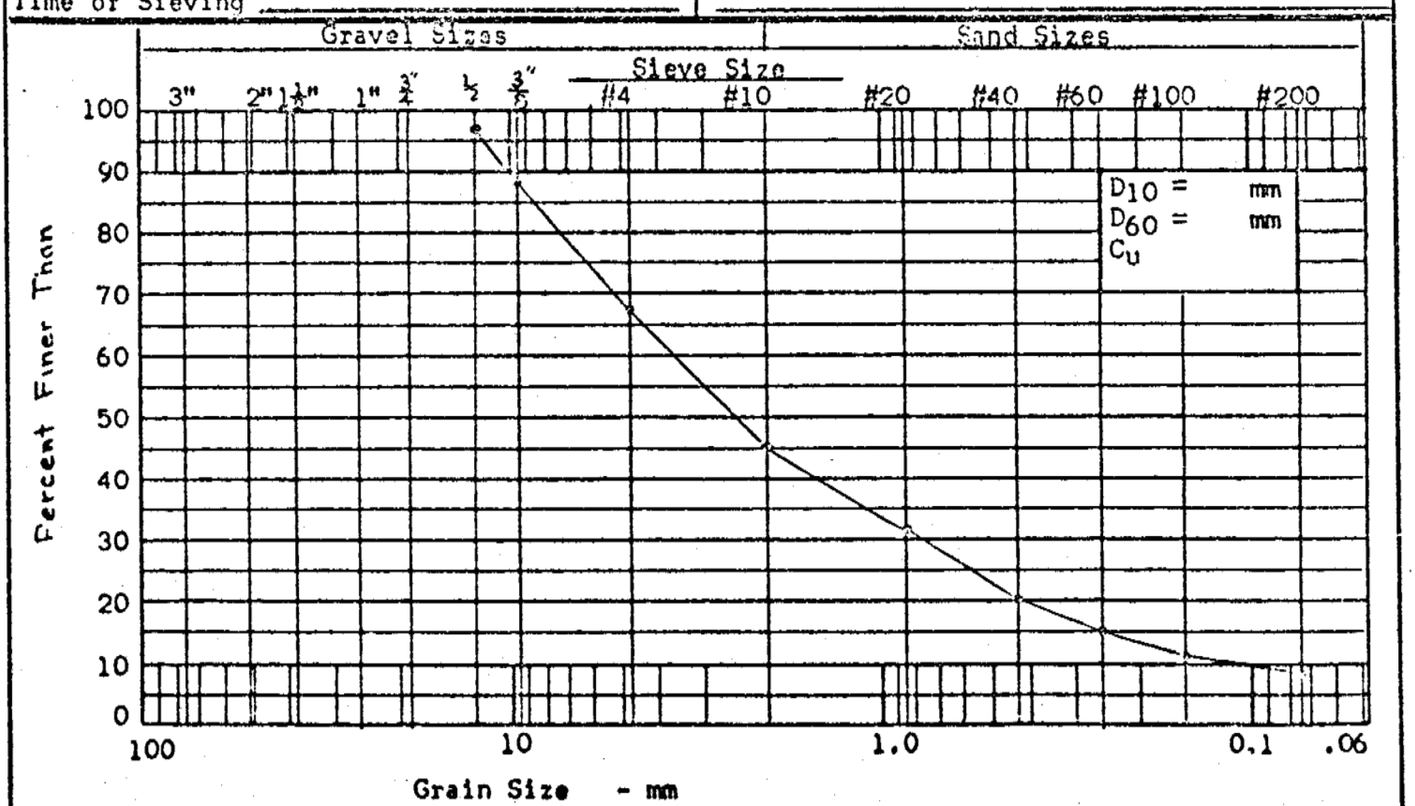
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			96.6%	
Wt. Dry		3/8	9.52			88.4%	
	4	.185	4.76			67.9%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			45.6%	
Tare No.	20	.0331	.840			31.6%	
Wt. Dry + Tare	40	.0165	.420			20.5%	
Tare	60	.0097	.250			15.6%	
Wt. Dry	100	.0059	.149			11.8%	
	200	.0029	.074			8.9%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy Gravel
Location
Hole 454-S-131A Depth 20'
Technician Date Jan.30/73

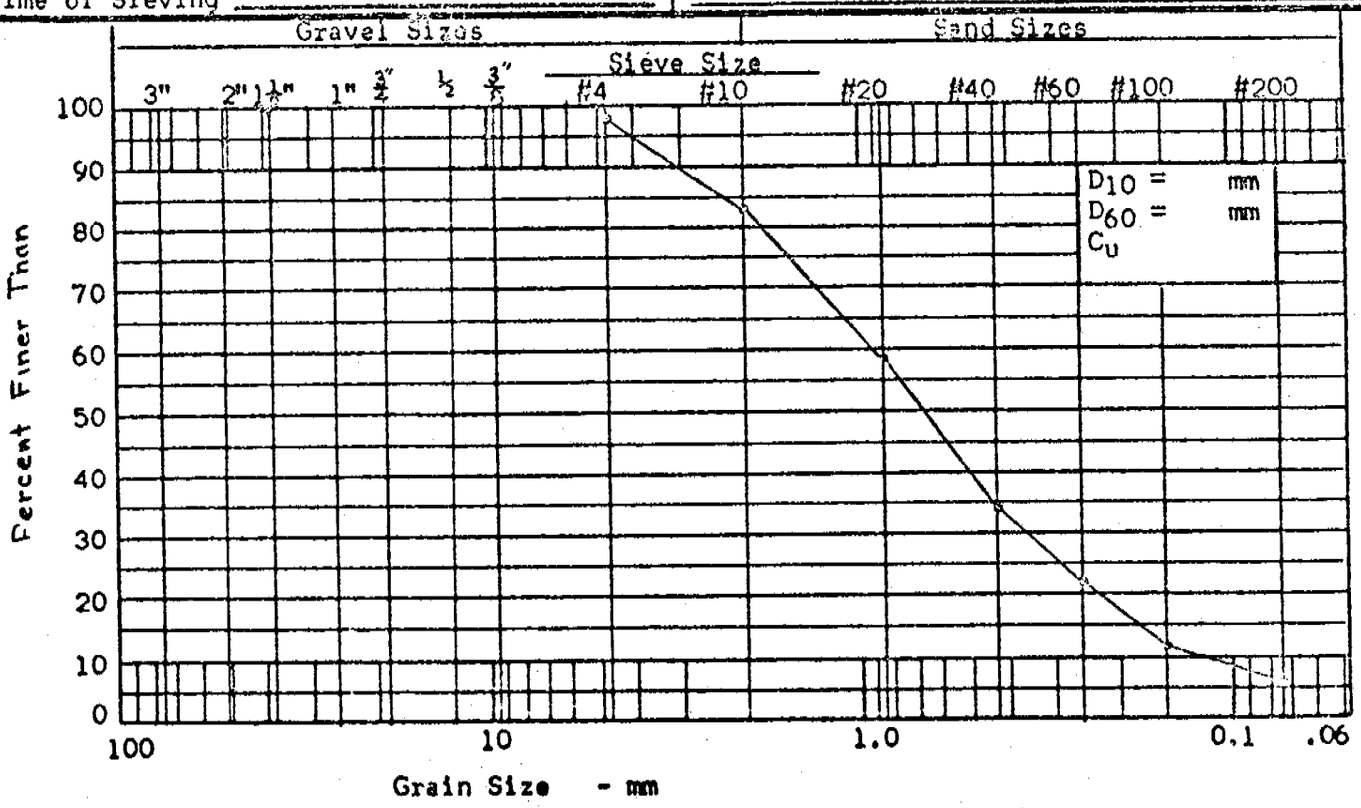
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			98.2%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			83.8%	
Wt. Dry + Tare	20	.0331	.840			58.2%	
Tare	40	.0165	.420			34.2%	
Wt. Dry	60	.0097	.250			21.7%	
	100	.0059	.149			11.6%	
	200	.0029	.074			6.2%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy Gravel
Location
Hole 454-S-131A Depth 23'-25'
Technician Date Jan. 30/73

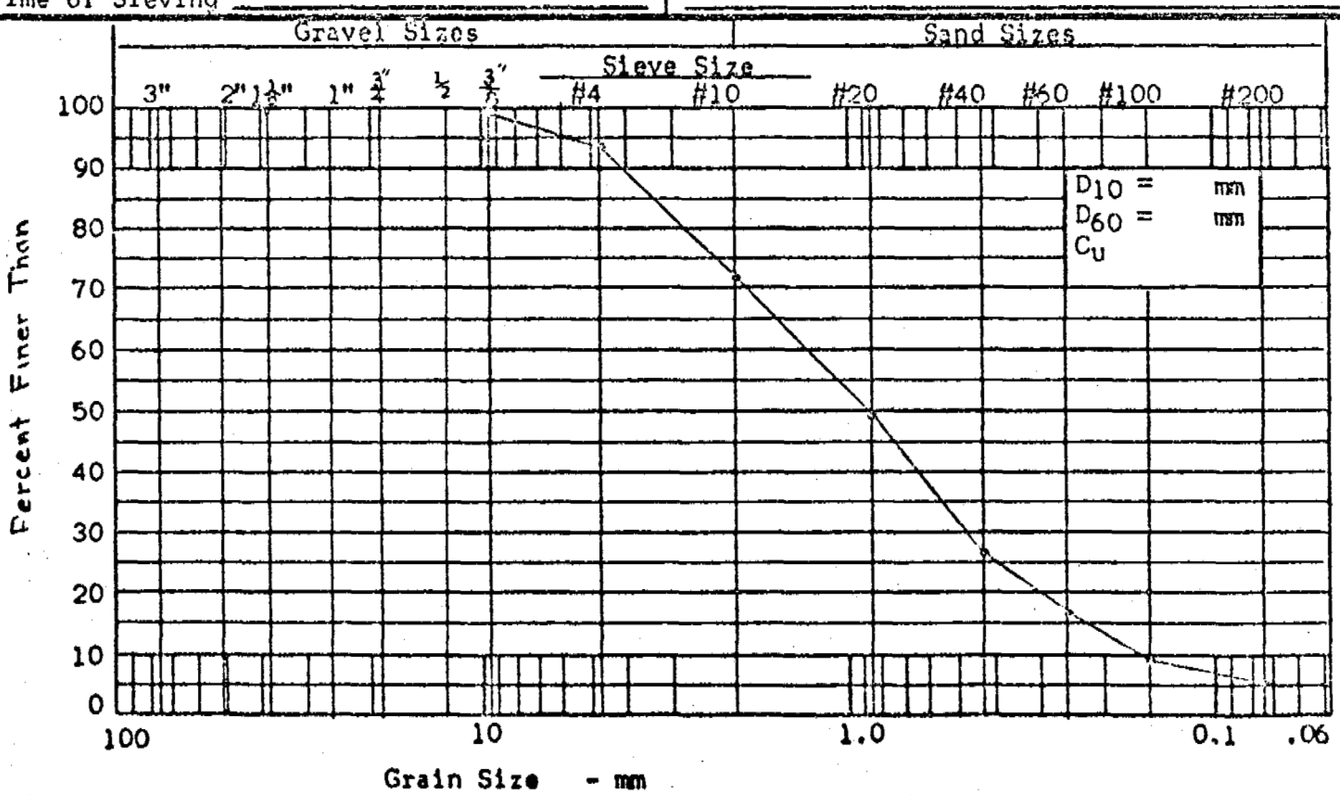
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			99.5%	
	4	.185	4.76			93.7%	
Passing	4						
Initial Dry Weight passing No. 4	10	.079	2.000			71.2%	
Tare No.	20	.0331	.840			49.0%	
Wt. Dry + Tare	40	.0165	.420			26.5%	
Tare	60	.0097	.250			16.5%	
Wt. Dry	100	.0059	.149			9.0%	
	200	.0029	.074			5.6%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

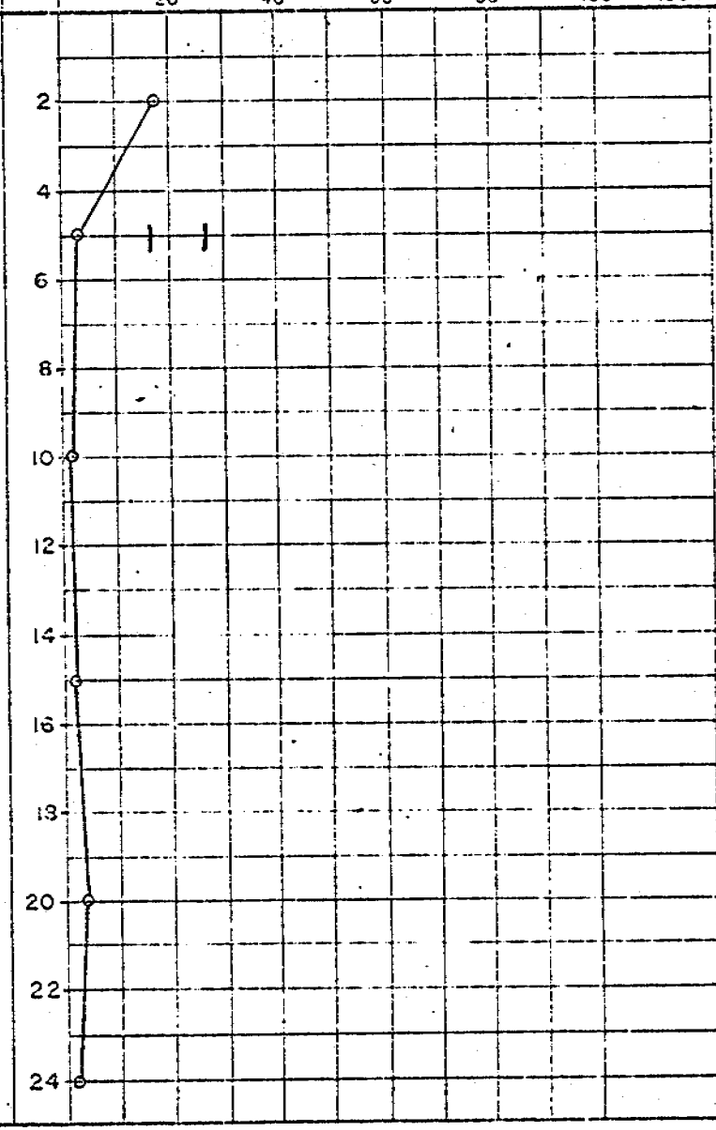


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 12/1/73	AIRPHOTO NO:	CHAINAGE: 629+00	OFFSET: ℄	TEST HOLE
CKD D G P	TECH D M	RIG AIR	SURFACE DRAINAGE:	VEGETATION: CONIFER & POPLAR TO 30'	ELEV	MILE 454 · B,C,S S · NUMBER 131A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						TILL	F	SEASONAL							
						SILTY	UF								
2					GM	GRAVEL									
4															
6						COARSE, DRY			5		50	45			SO_4 = 0.07%
8															
10					GP				9		54	46			
12						FINE GRADED, DRY									
14															
16						MED COARSE			9		36	54			
18															
20					GW				6		78	22			
22															
24					SW	MED. COARSE SAND			6		65	35			
						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel, trace of silt.
Location	
Hole 455-C-80A	Depth 9' - 10'
Technician	Date Dec.7, 1972

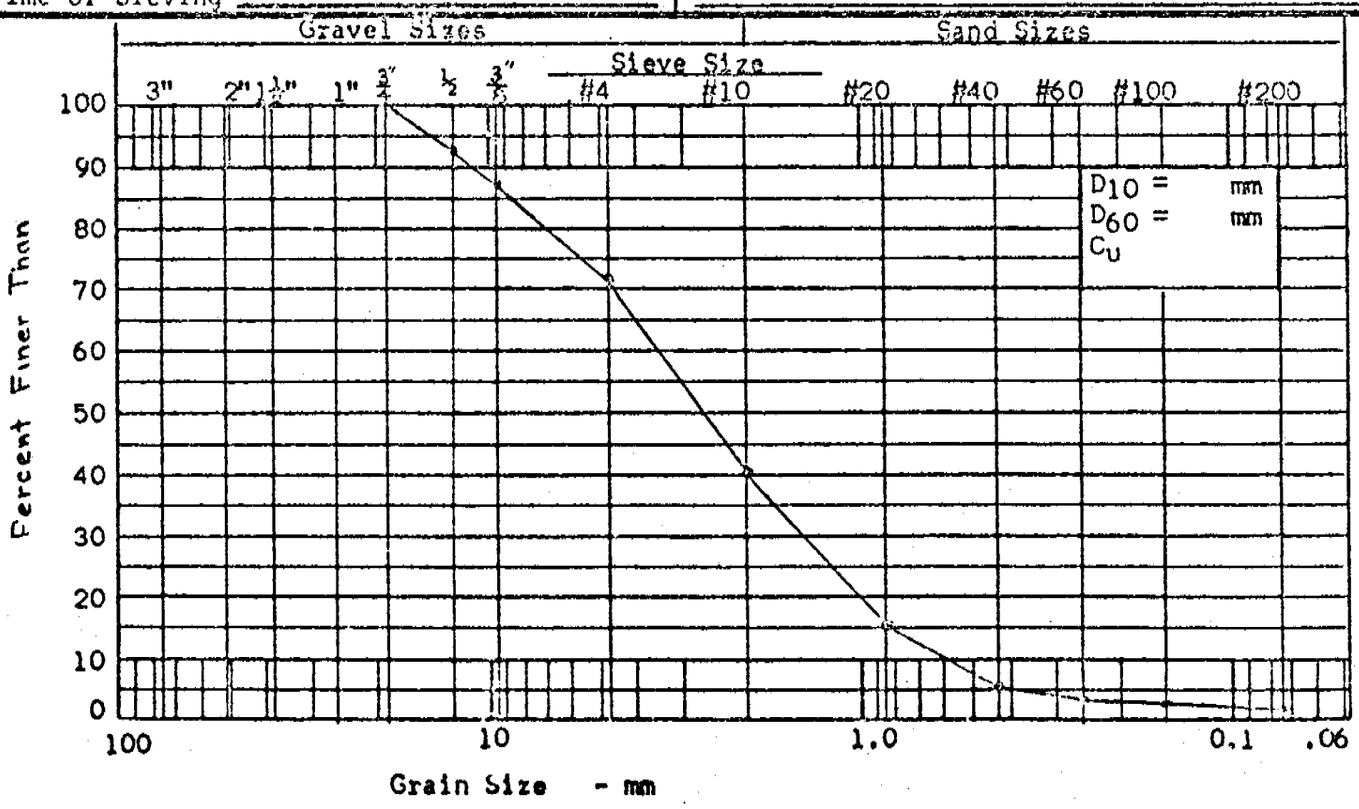
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			92.7	
Wt. Dry		3/8	9.52			87.4	
	4	.185	4.76			70.9	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			40.8	
Tare No.	20	.0331	.840			15.6	
Wt. Dry + Tare	40	.0165	.420			5.7	
Tare	60	.0097	.250			3.7	
Wt. Dry	100	.0059	.149			2.5	
	200	.0029	.074			1.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: RS	DATE DRILLED: 7/12/72	AIRPHOTO NO:	CHAINAGE: G.P. + 00	OFFSET:
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE & [illegible] TO 20'	ELEV

TEST HOLE

MILE	E.C.S	NUMBER
455	C	81A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT – 2" ORGANIC	F										
2					GP	GRAVEL DRY, TRACE OF SILT			2								
4						ROCKS, SANDY	UF		4								
6									6								
8									8								
10					GP	DRY, WITH SILT			10			1	40	59			
12						SAND			12								
14					SP	DRY, MED. COARSE TRACE OF GRAVEL			14								
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole 455-C-62B	Depth 5' - 6'
Technician	Date Dec. 2, 1972

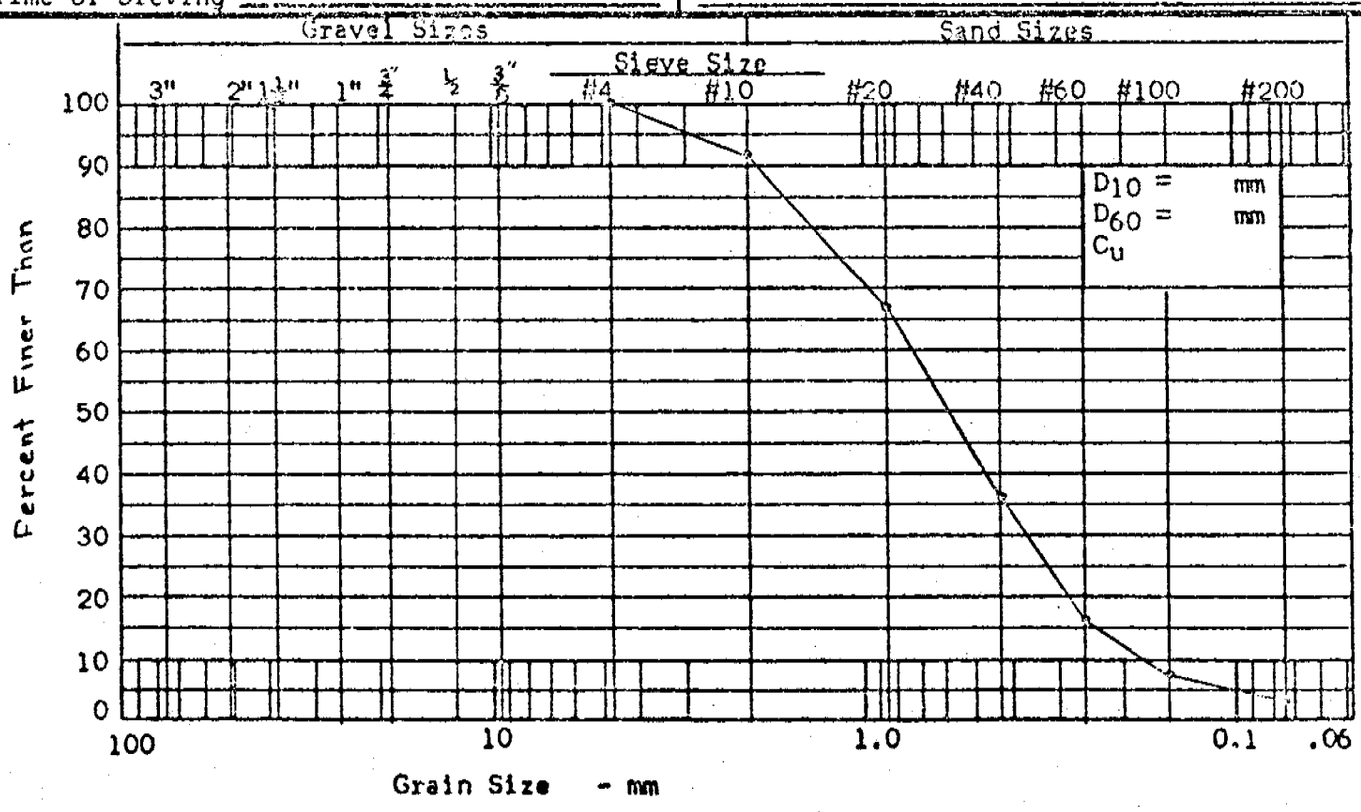
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			91.9	
Wt. Dry + Tare	20	.0331	.840			67.4	
Tare	40	.0165	.420			36.4	
Wt. Dry	60	.0097	.250			16.7	
	100	.0059	.149			7.9	
	200	.0029	.074			3.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

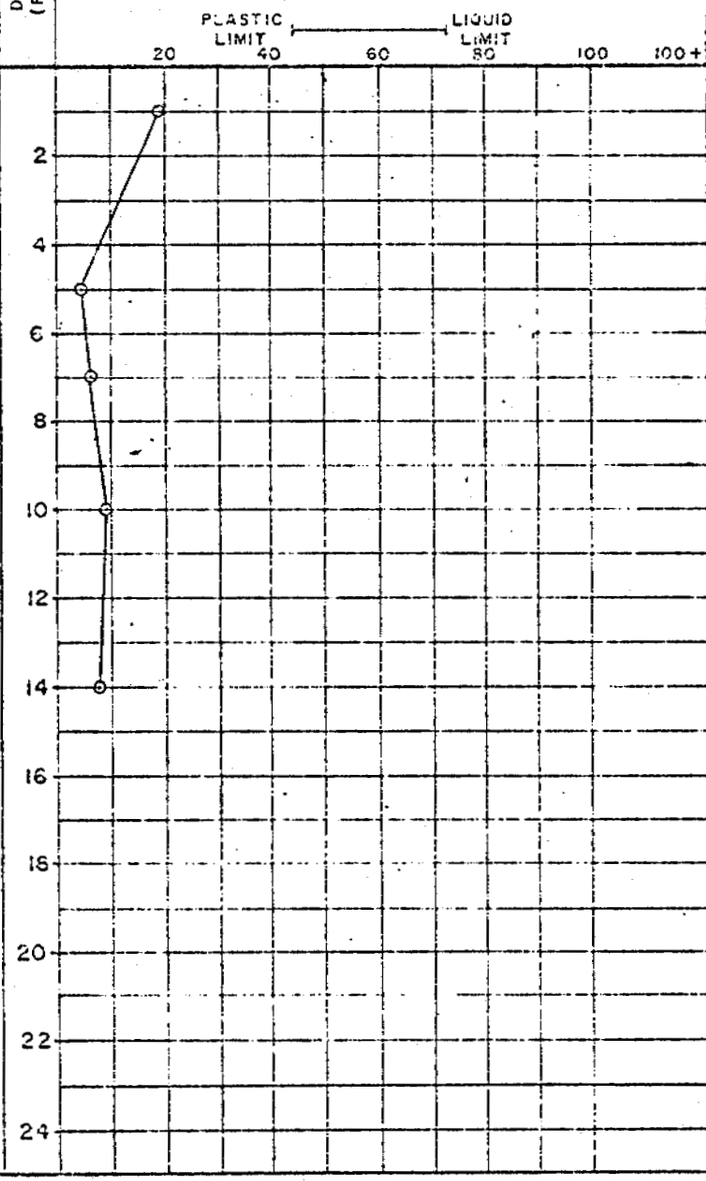
DWN A.E.W	FIELD ENG: B.M	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 645+00	OFFSET 2
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
455	C	623

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					SM	SAND SOME SILT, GRAVEL	F	
							UF	
					SP	SILT & CLAY		
						SMALL ROCKS AND CLAY		
						END OF HOLE		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		
		68	8		

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 455-C-61B Depth 8' - 11'
Technician Date Dec. 9, 1972

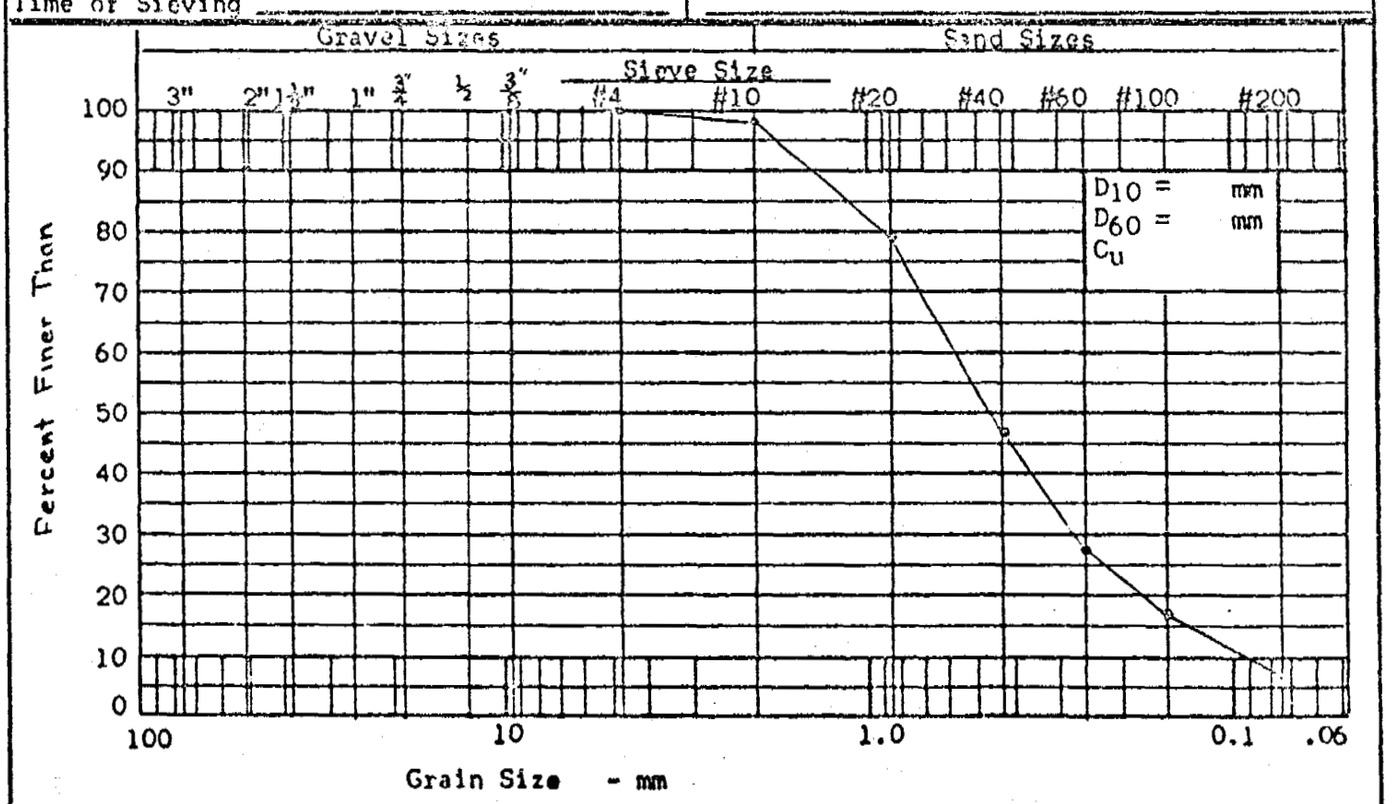
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			98.0	
Tare No.	20	.0331	.840			79.7	
Wt. Dry + Tare	40	.0165	.420			47.3	
Tare	60	.0097	.250			28.7	
Wt. Dry	100	.0059	.149			17.1	
	200	.0029	.074			7.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

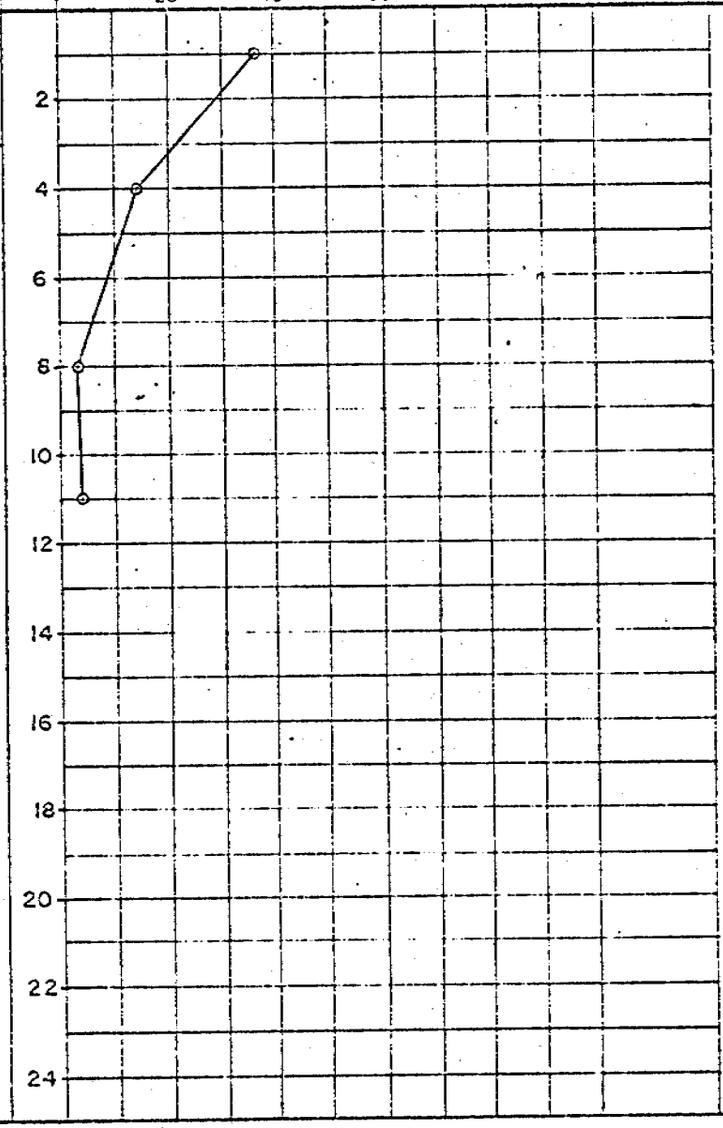
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN. A.E.W	FIELD ENG. B.M.	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 655400.	OFFSET: ℄
CKD D.G.P	TECH. D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & SPRUCE TO 30' ELEV.	

TEST HOLE

MILE	B,C,S	NUMBER
455	C	61B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - GRANULAR MUSKEG	F								
2					SM	SILT SANDY									
4						SAND SILTY, SOME GRAVEL	UF								
6															
8															
10					SM	GRAVEL AND OCCASIONAL ROCKS			7		91	2			
12															
14						END OF HOLE									
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole	455-C-60B Depth 4-5'
Technician	Date 6/12/72

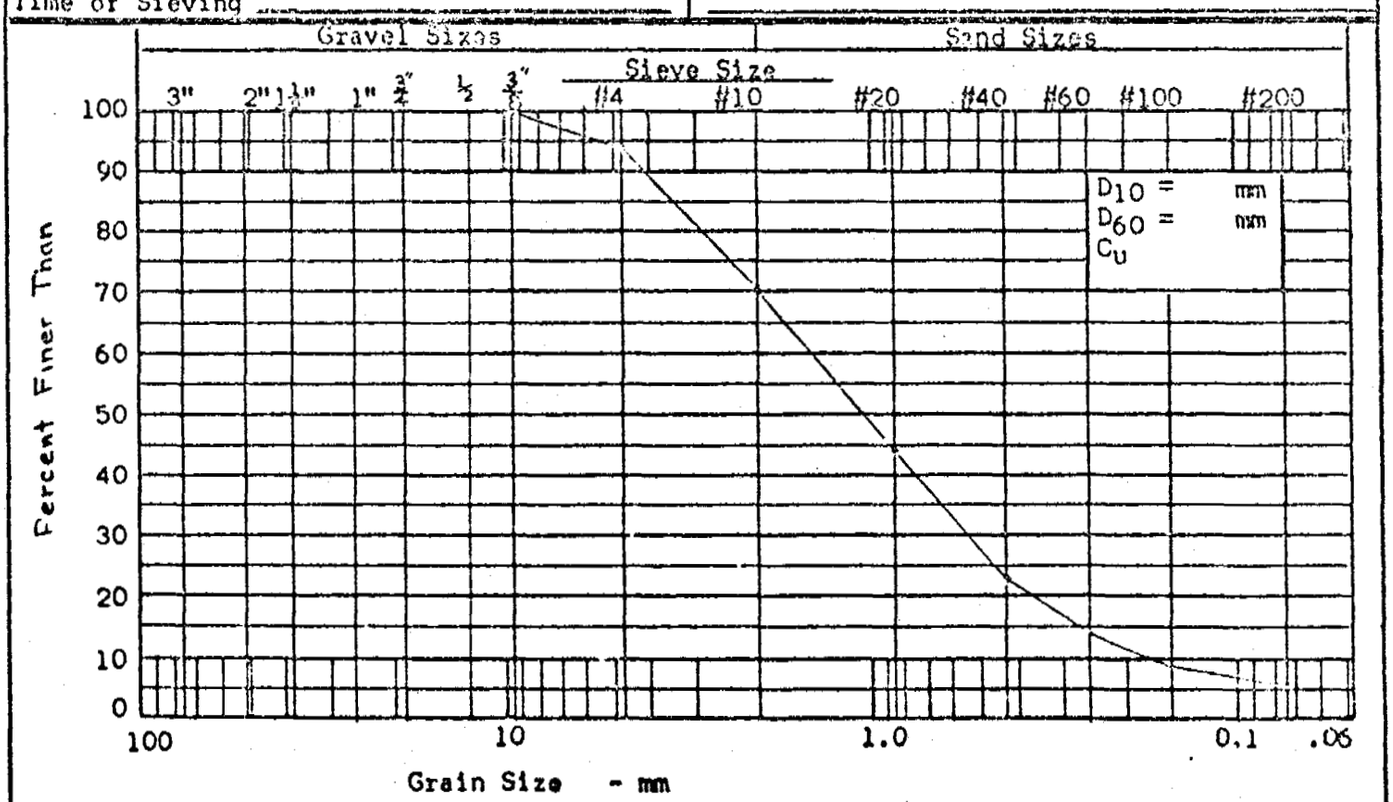
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100.0	
	4	.185	4.76			94.2	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			70.23	
Wt. Dry + Tare	20	.0331	.840			44.3	
Tare	40	.0165	.420			22.5	
Wt. Dry	60	.0097	.250			13.9	
	100	.0059	.149			9.2	
	200	.0029	.074			5.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

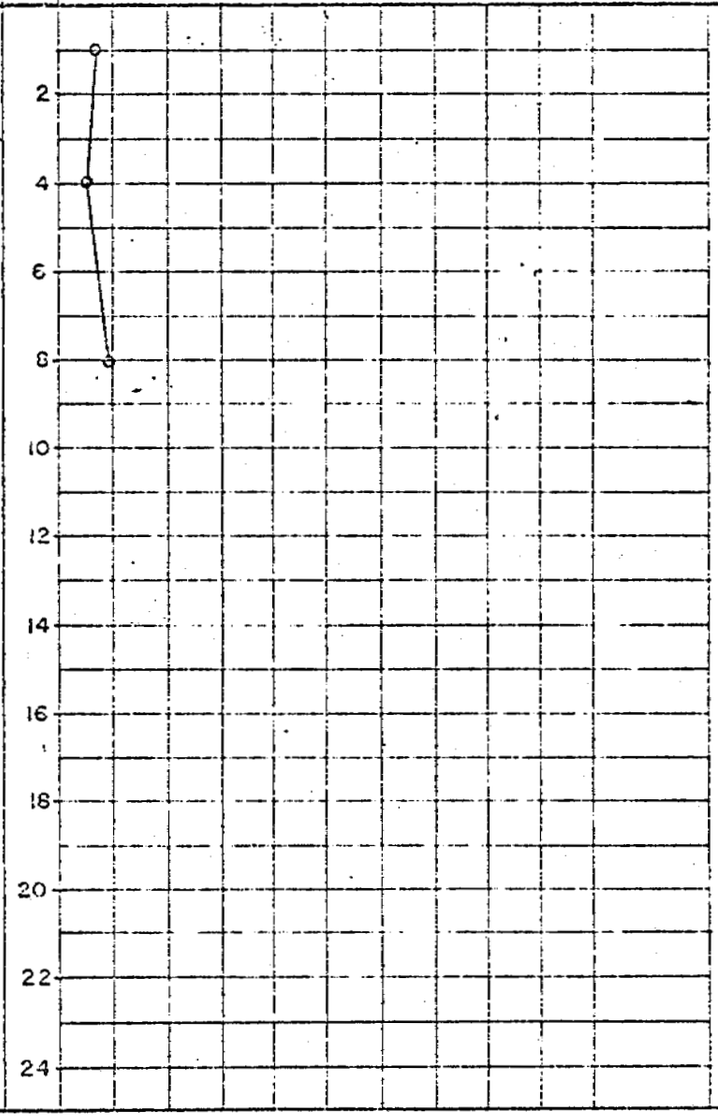
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 666+00	OFFSET: ℄
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN -25'-30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
455	C	603

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	DEAT - 2" / MUSKEG, GRANULAR	F								
2					SM	SAND GRAVEL & SILT									
4							UF			S	65	30			
6					GP	GRAVEL COBBLES									
8															
10						END OF HOLE									
12															
14															
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 455-C-59B Depth 7' - 8'
Technician Date Dec. 6, 1972

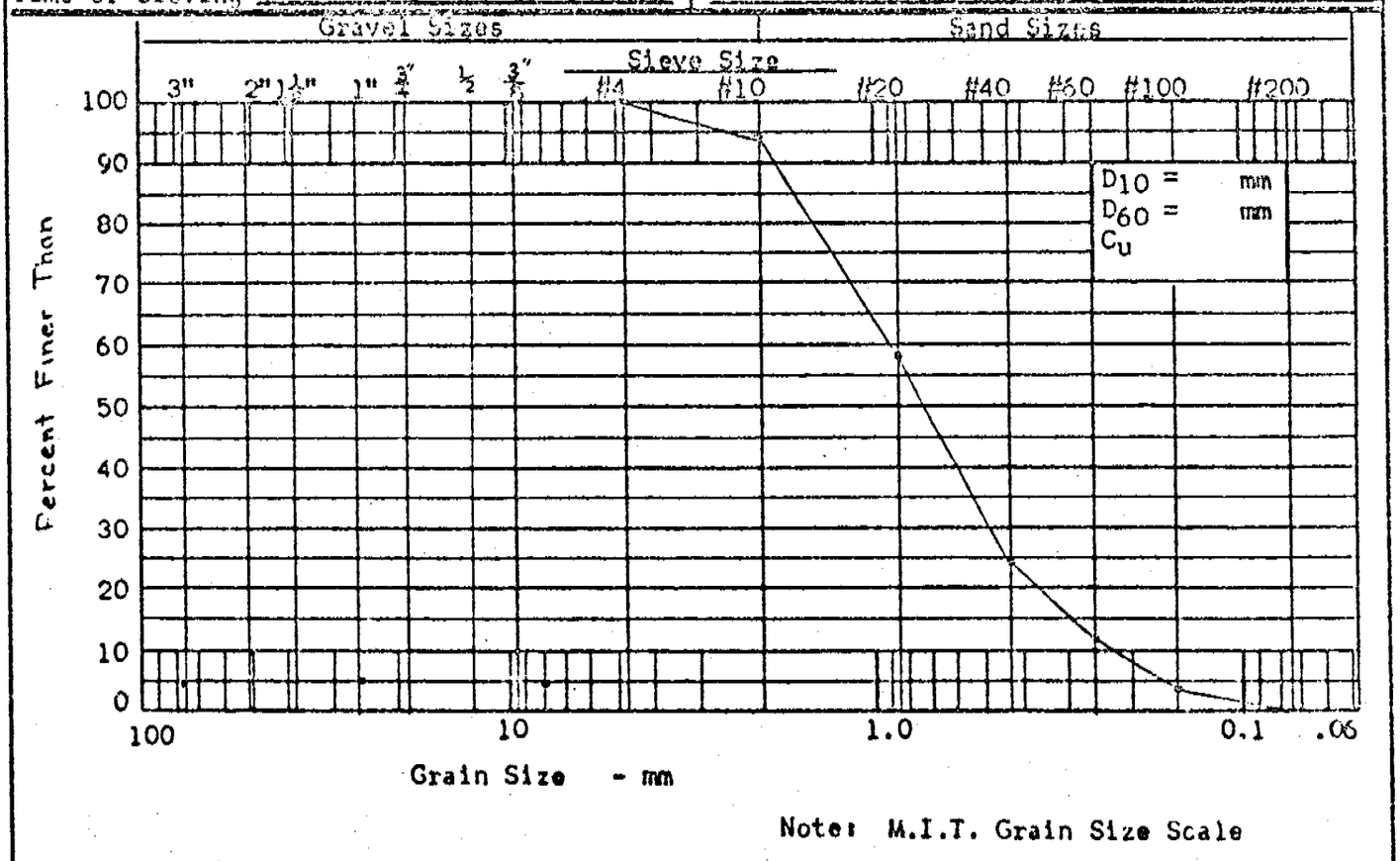
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			94.5	
Wt. Dry + Tare	20	.0331	.840			58.1	
Tare	40	.0165	.420			24.1	
Wt. Dry	60	.0097	.250			12.7	
	100	.0059	.149			7.1	
	200	.0029	.074			3.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

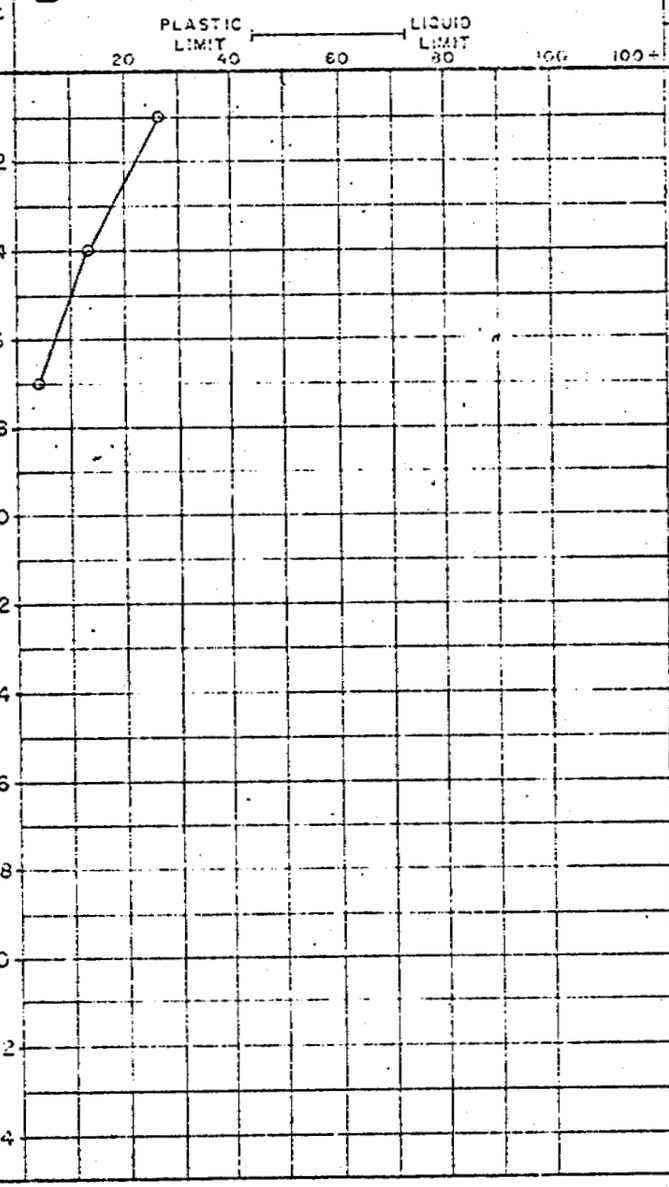
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE 675+00	OFFSET 2
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & SPRUCE TO 25' ELEV	

TEST HOLE

MILE	B,C,S	NUMBER
455	C	598

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					VL	PEAT	F								
					CL	CLAY									
2						SAND		Nf							
4					SP	SOME GRAVEL									
6															
8						GRAVEL			4		91	5			
10					GP	COBBLES & BOULDERS									
12						SAND LAYER		Nf							
14						END OF HOLE									
16															
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole 455-C-79A	Depth 14' - 15'
Technician	Date Dec. 9. 1972

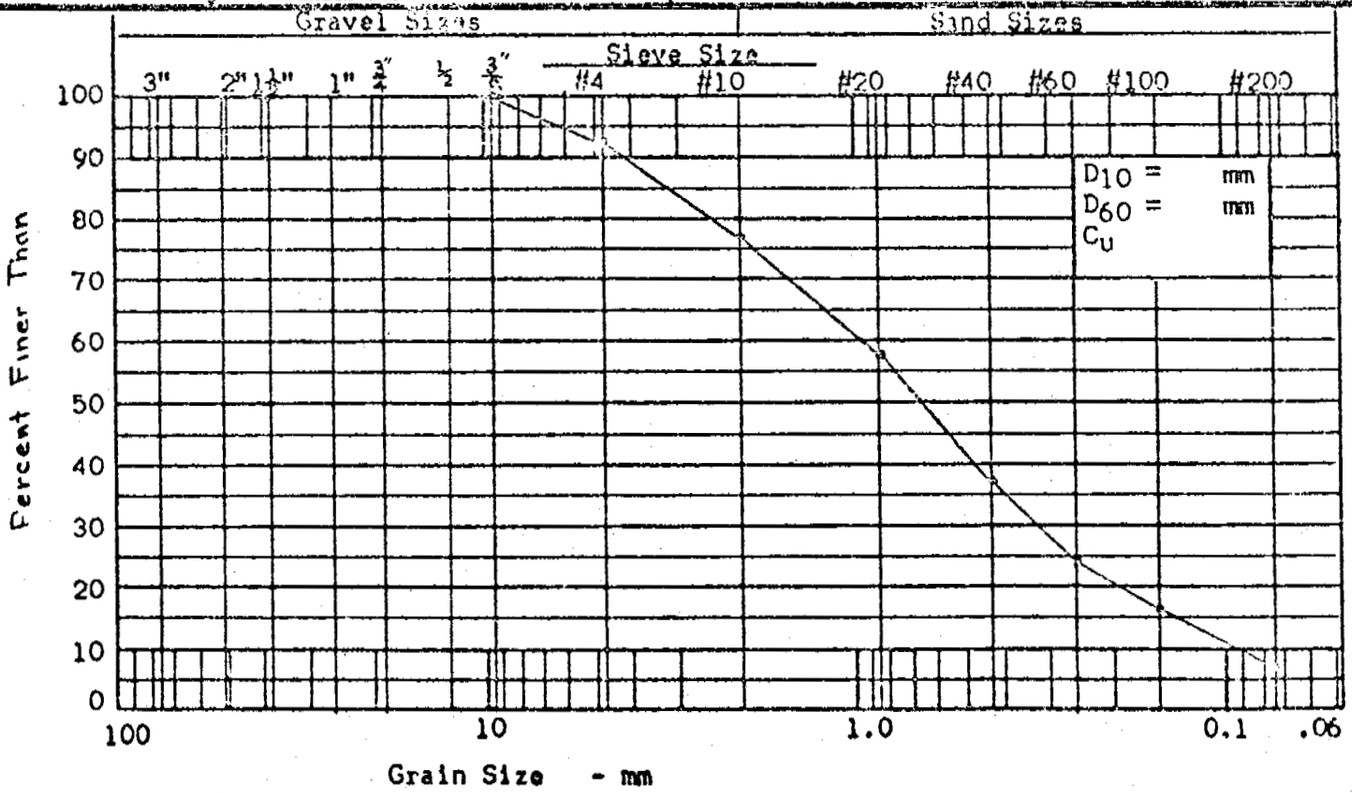
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100.0	
	4	.185	4.76			92.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			77.2	
Tare No.	20	.0331	.840			57.9	
Wt. Dry + Tare	40	.0165	.420			37.6	
Tare	60	.0097	.250			24.1	
Wt. Dry	100	.0059	.149			16.7	
	200	.0029	.074			7.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

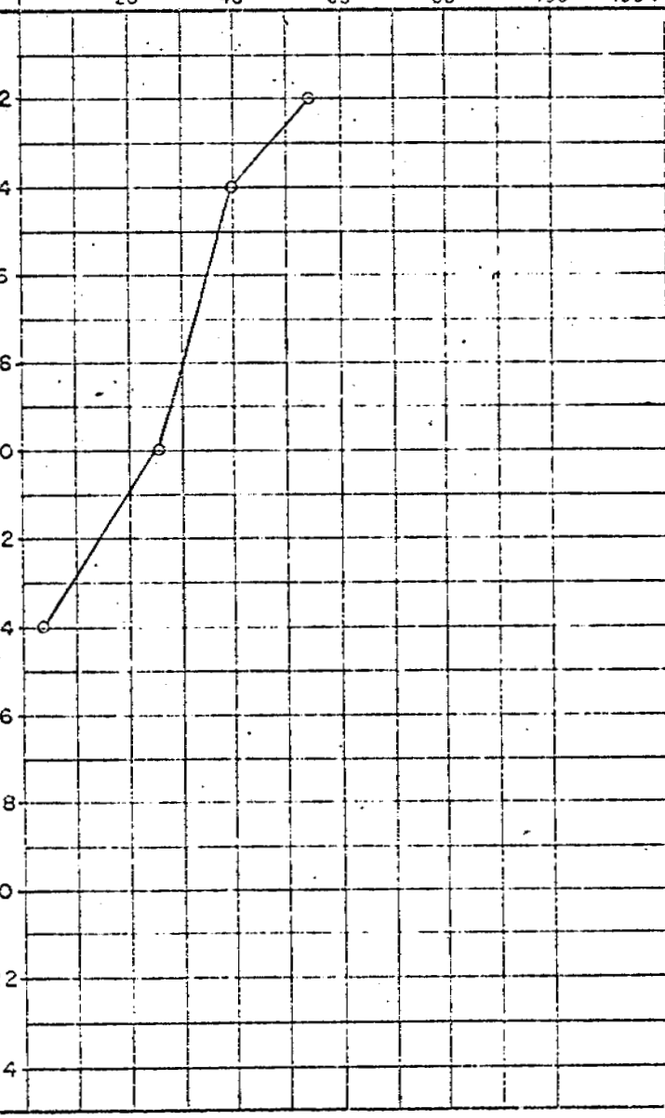
DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 7/12/72	AIRPHOTO NO:	CHAINAGE: 685700	OFFSET: ℄
CKD: DSP	TECH: DM.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: DENSE SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
455	C	79A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT MUSKEG	F								
2–4		P			CL	CLAY HARD, LIGHT BROWN ICE CRYSTALS, TRACES OF MUSKEG	UF								
8–10					ML	SILT LIGHT BROWN EXTREMLY HARD									
12–14					SP	SAND DRY, BOULDERS			8		69	23			
16						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

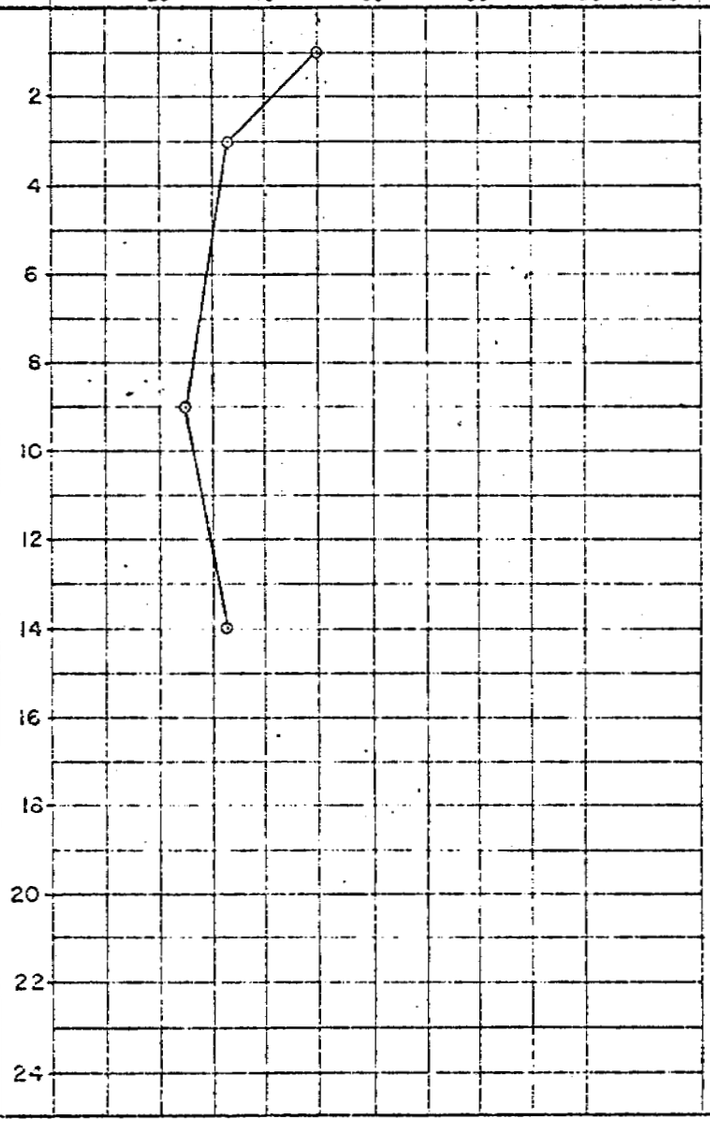
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R S	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 605+00	OFFSET: ℄
CKD D.G.P	TECH D M	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: SPRUCE & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
456	C	72 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT GRANULATED, MUSKEG SILT MIXTURE	F	
2								
4		P			CL	CLAY	UF	
6						WET, SOFT, MUSKEG		
					To	HIGH ORGANIC CONTENT		
8					OL			
10						VERY SOFT, MOIST LIGHT BROWN, SILTY		
12								
14					CL	LIGHT GREY, FAIRLY SOFT MOIST, TRACES OF SILT		
16						END OF HOLE		
18								
20								
22								
24								



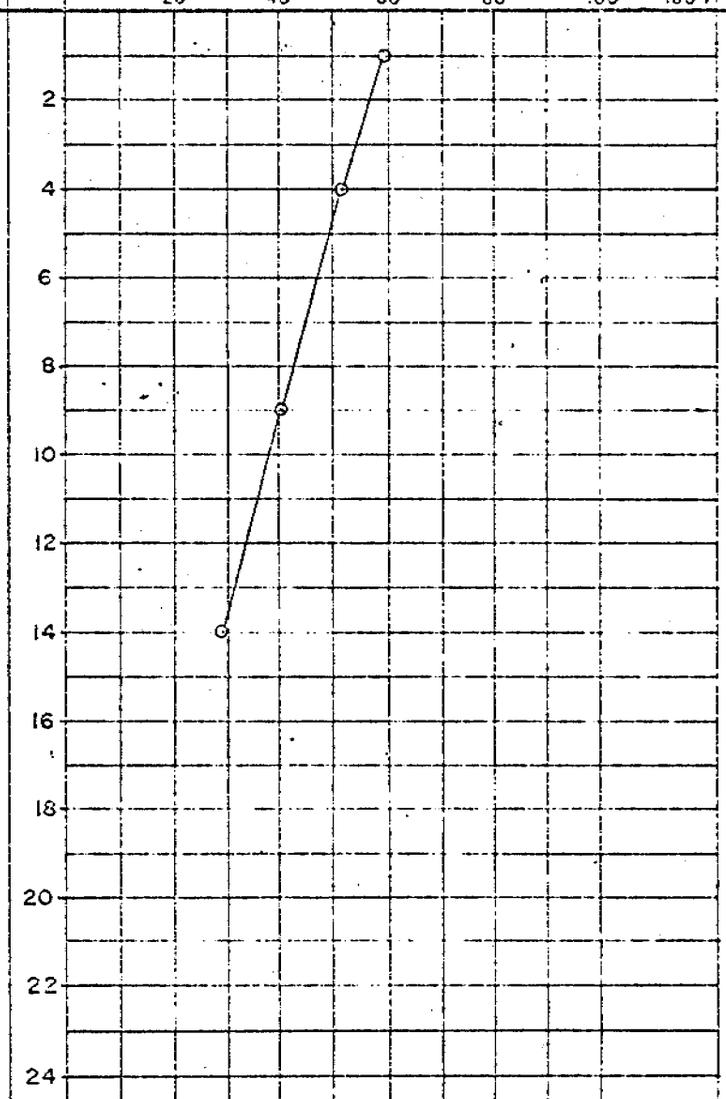
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG B.M.	DATE DRILLED 8/12/72	AIRPHOTO NO.	CHAINAGE 705+00	OFFSET ℄
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE GOOD	VEGETATION SPRUCE TO 40'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
456	C	773

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT – 1" ORGANIC	F	
2						CLAY		
					OL	ICE CRYSTALS		Vr
4						MUSKEG		
6								
					TO			
8						SOME SAND		
10								
12						SILT, VERY HARD		
					CL	ICE CRYSTALS		Vr
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

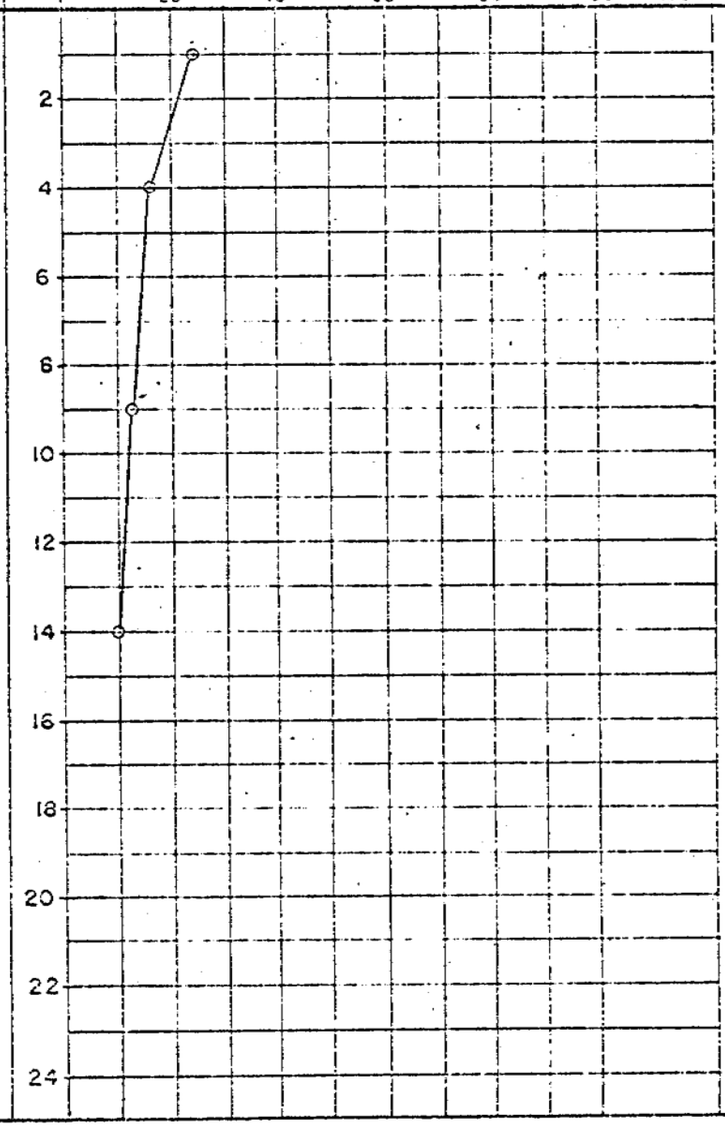
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG B.M.	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 715+60	OFFSET: ℄
CKD D.G.P	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
456	C	768

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC	F	
2		P				CLAY SOME ORGANIC GRAVEL		
4					CL			
6						GRAVEL		
8						SAND CLAY, GRAVEL		
10					SC			
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

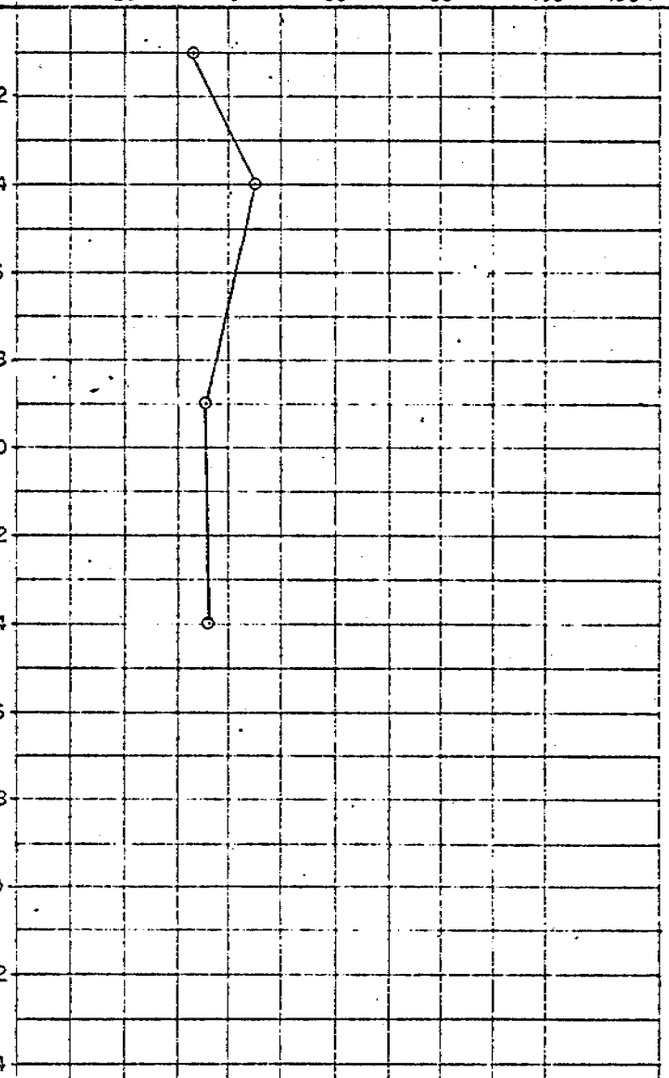
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M.	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 725+00	OFFSET: ℄
CKD DGP	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE, ASPEN, WILLOW	ELEV

TEST HOLE

MILE	S,C,S	NUMBER
456	C	75S

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT ORGANIC									
						CLAY	F								
2		P													
						DARK, SILTY									
4		P				TRACE OF MUSKEG		Vr							
6															
						STICKY									
8															
								< 5% EXCESS ICE							
10		P				SOME ICE CRYSTALS DARK									
12															
								Vr							
14		P				SOME ICE CRYSTALS								76.6	
16						END OF HOLE									
18															
20															
22															
24															

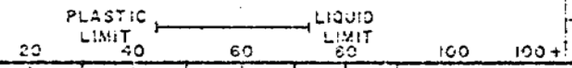


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 735+00	OFFSET: ℄	TEST HOLE
CKD D6 P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: SOUTH	VEGETATION: POPLAR, SPRUCE, WILLOW	ELEV	MILE 456 / B,C,S C / NUMBER 748

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - 2" ORGANIC	F									
2		P			Pt	CLAY		Vr	2							
4		P				LIGHT COLORED TO DARK ICE CRYSTALS, SOME MUSKEG			4							
6					TO			< 5%	6					92.0	58.9	
8					OL	DARK, ICE LENSES 3/8"		EXCESS ICE	8							
10		P							10							
12								Vr	12							
14		P			CL	ICE CRYSTALS			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

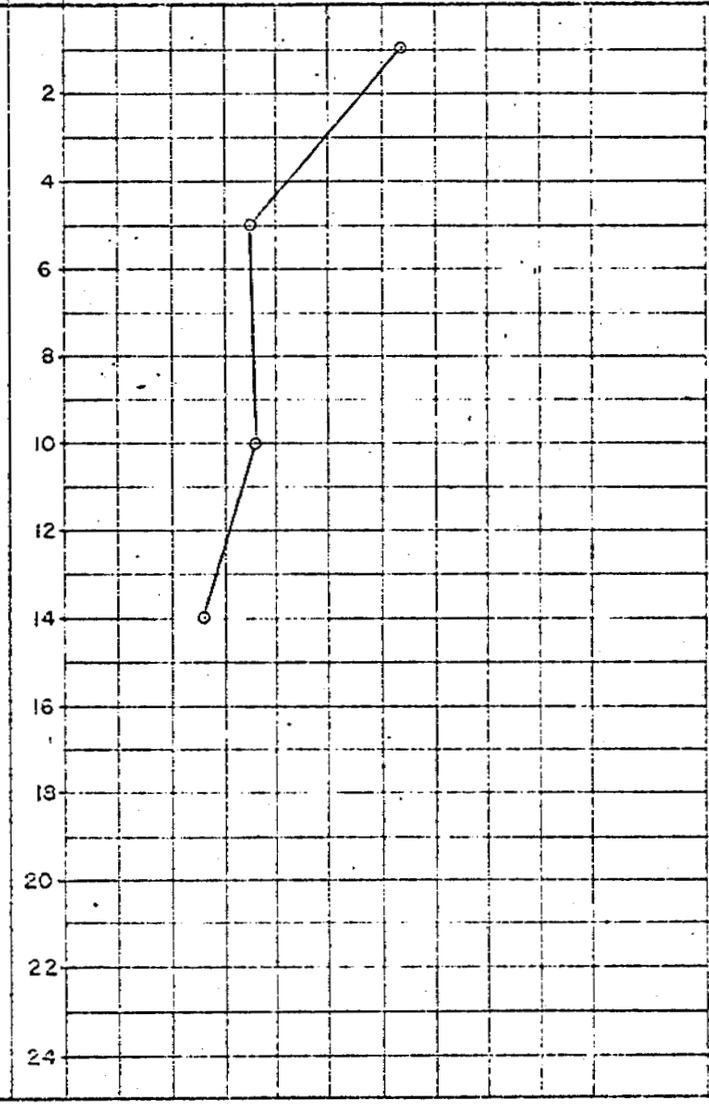
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M.	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 745+00	OFFSET: ℄
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
457	C	73B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2		P			CL	CLAY SANDY, SOME EXCESS ICE, LAYERING, BROWN ICE LENSES	F	Vs							
4															
6		P			SC	SAND FINE, LITTLE EXCESS ICE, SOME CLAY		< 2% EXCESS ICE							
8								Vr							
10		P			CL	CLAY GREY, LITTLE EXCESS ICE, WELL BONDED									
12															
14		P				ICE LENSES, LAYERING		Vs					113.0	88.4	
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

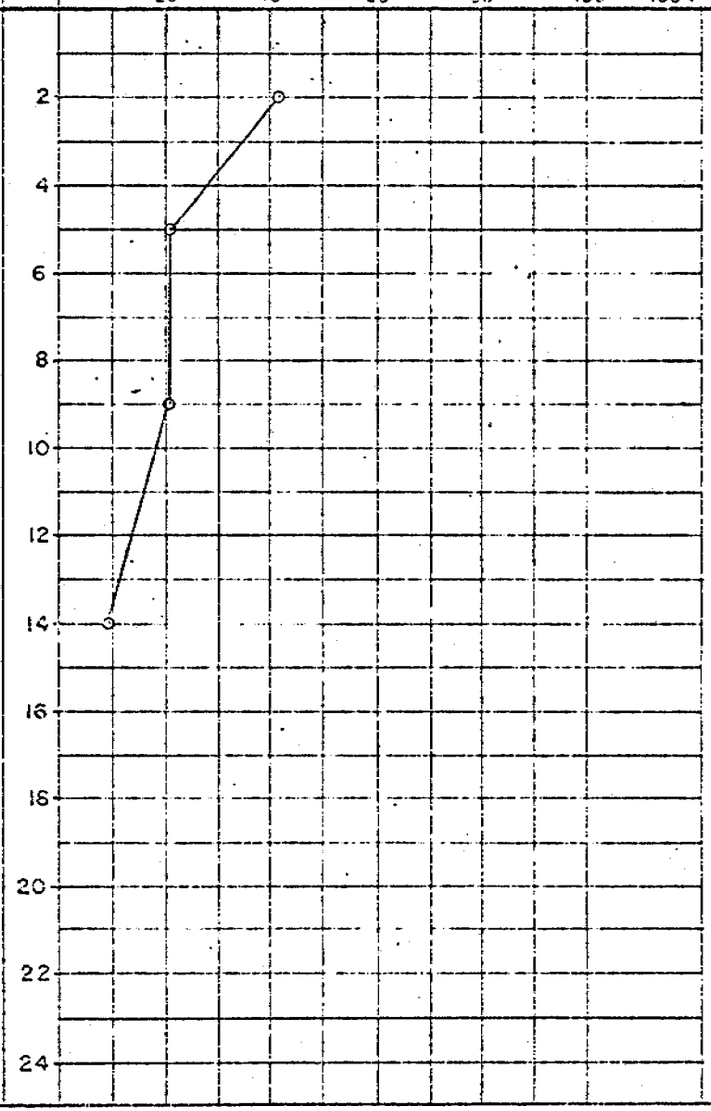
DWN A.E.W. | FIELD ENG. B.M. | DATE DRILLED 7/12/72 | AIRPHOTO NO: | CHAINAGE 755+00 | OFFSET ℄

CKD D.G.P | TECH D.M | RIG AIR | SURFACE DRAINAGE: FAIR | VEGETATION: SPRUCE TO 20' | ELEV

TEST HOLE

MILE	B,C,S	NUMBER
457	C	72B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT GRANULAR MUSKEG	F	
2		P			CL	CLAY SOME SAND, EXCESS ICE. LENSES TO 1/8"		Vs < 5% EXCESS ICE
4								
6		P			SM	SAND SILTY, FINE LITTLE VISIBLE ICE		Nbe
8								
10						SOME GRAVEL		
12								
14					SP			Nbn
16						END OF HOLE		
18								
20								
22								
24								



GRAIN SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.N	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO.	CHAINAGE 765+00	OFFSET 1
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV.

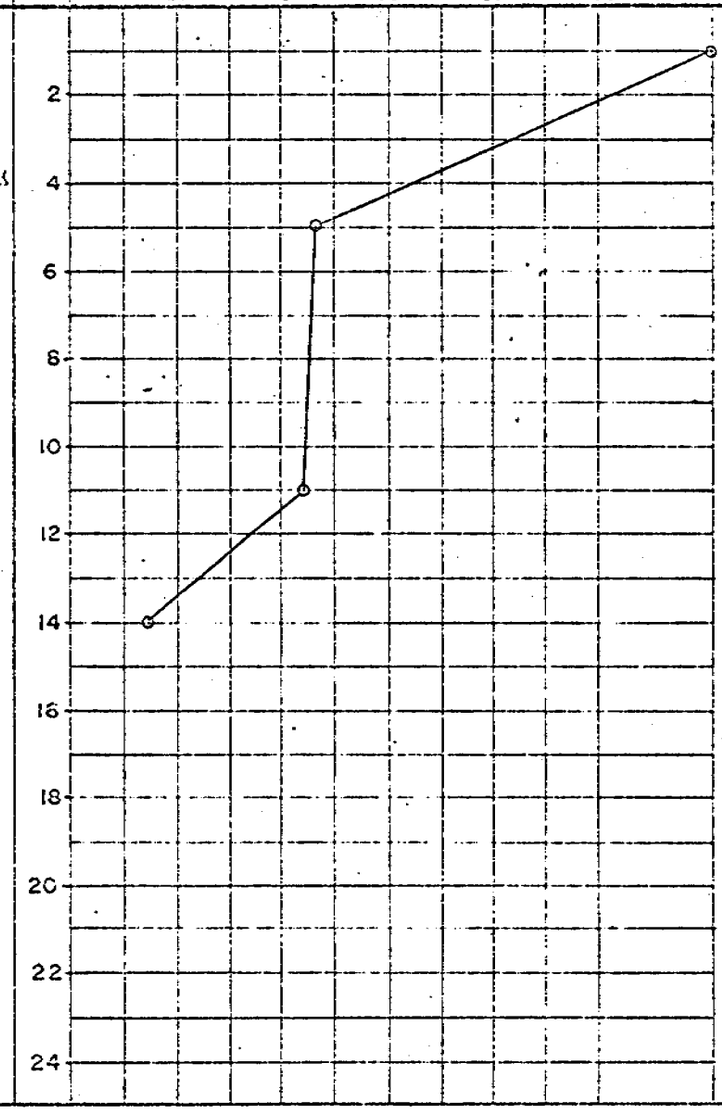
TEST HOLE

MILE	B,C,S	NUMBER
457	C	71B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	PEAT MOSS, ROOTS	F				
2		P				CLAY					
						BROWN, ICE LENCES 1/4"		Vr			
4						SOME SAND, SOME LAYERING, WELL BONDED		ICE CRYSTALS 10%			
6		P			CL						
8											
10						ICE INCLUSIONS TO 1" WOOD CHIPS, FIBRE		Vs	66.7	59.8	
12		P									
14					GM	GRAVEL QUITE DRY COBBLES		Nbe			
16						END OF HOLE					
18											
20											
22											
24											

GRAIN-SIZE ANALYSIS

CLAY %	SILT %	SAND %	GRAVEL %



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

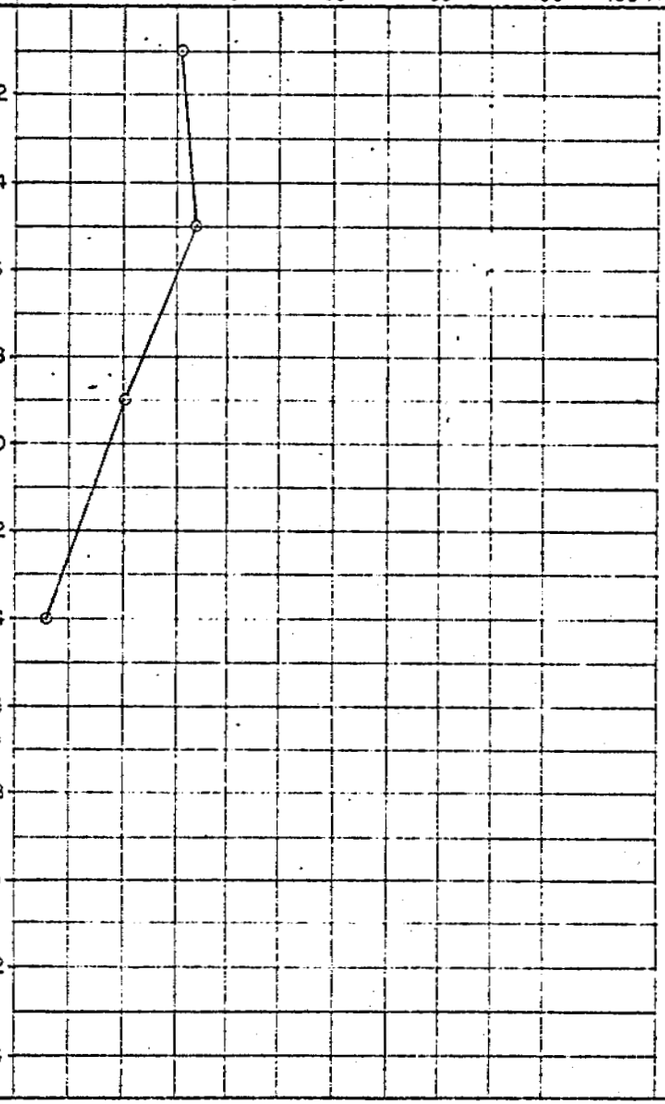
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 775+00	OFFSET L
CKD D.G.P	TECH D.M	RIG: A/R	SURFACE DRAINAGE:	VEGETATION: SPRUCE TO 25'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
457	C	70B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - MOSS, ROOTS	F								
2		P				CLAY									
4					CL	BROWN, EXCESS ICE INCLUSIONS TO 1/4"		Vr ICE CRYSTALS 10%					110.0	82.1	
6		P				SANDY, WELL BONDED BROWN									
8						GRAVEL		Nbe							
10					GP	SAND									
12						GRAVEL, COBBLES		Nf							
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

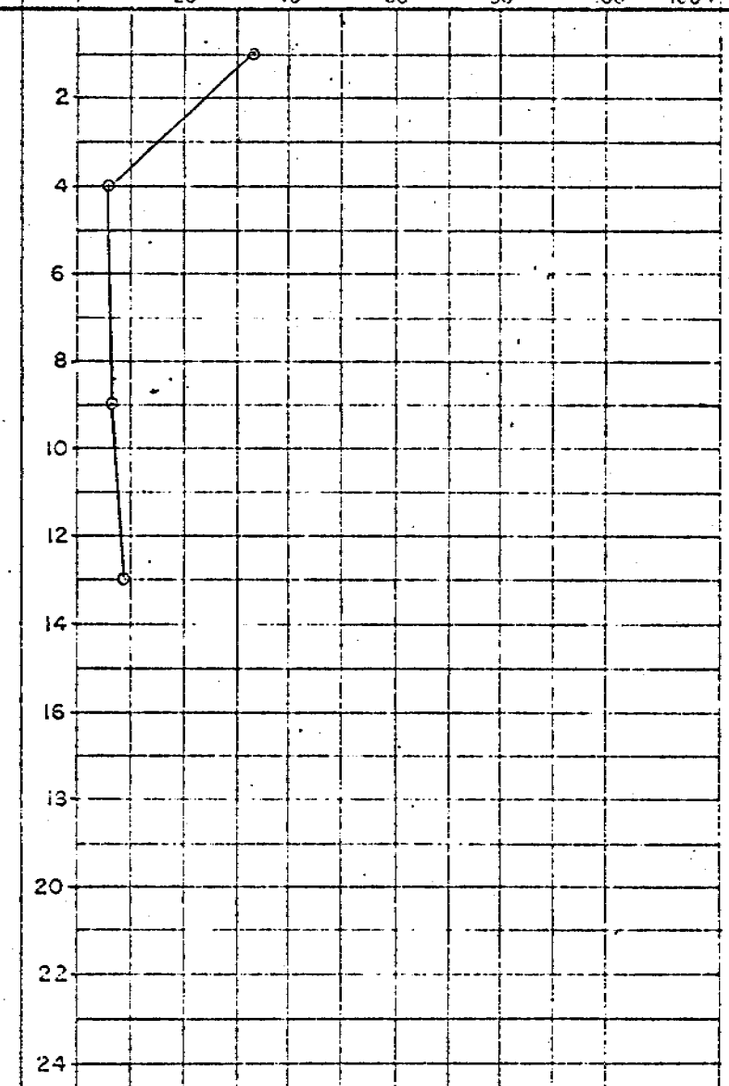
DAN A.E.W | FIELD ENG: B.M | DATE DRILLED: 7/12/72 | AIRPHOTO NO: | CHAINAGE: 73 5400 | OFFSET: ℄

CKD DGP | TECH: D.M. | RIG: AIR | SURFACE DRAINAGE: GOOD | VEGETATION: ASPEN & SPRUCE TO 20' ELEV

TEST HOLE

MILE	B,C,S	NUMBER
457	C	698

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT COARSE, FIBROUS MUSKEG, ROOTS, MOSS	F								
					SM	SILT – SAND, SOME GRAVEL									
2						GRAVEL									
						SOME COBBLES, DRY									
4															HARD DRILLING
6								Nf							
8					GP										
10						SOME COBBLES									
12															
						SAND									
14						GRAVEL		Nf							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy Clay
Location
Hole 458-C-68B Depth 9'-10'
Technician Date Jan.11/73

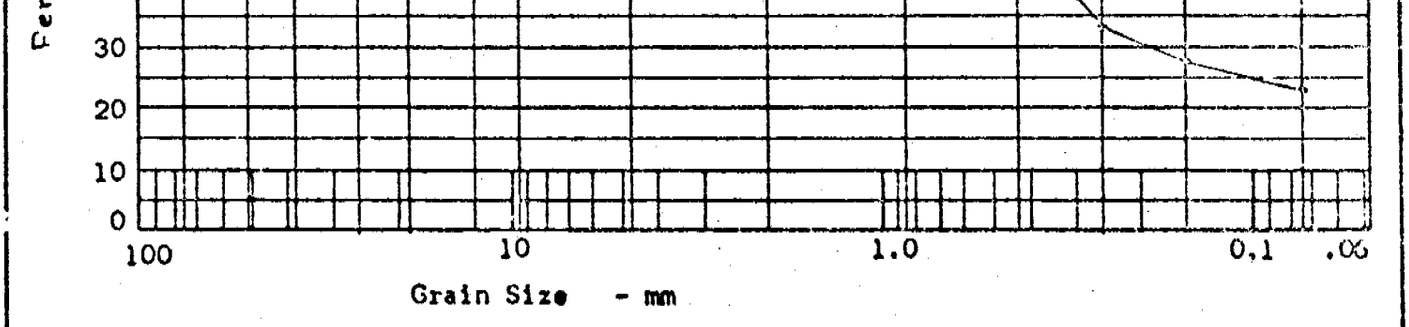
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100%	
	4	.185	4.76			82.6%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			72.6%	
Tare No.	20	.0331	.840			64.2%	
Wt. Dry + Tare	40	.0165	.420			49.5%	
Tare	60	.0097	.250			33.8%	
Wt. Dry	100	.0059	.149			27.6%	
	200	.0029	.074			23.3%	
Passing	200					0	

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

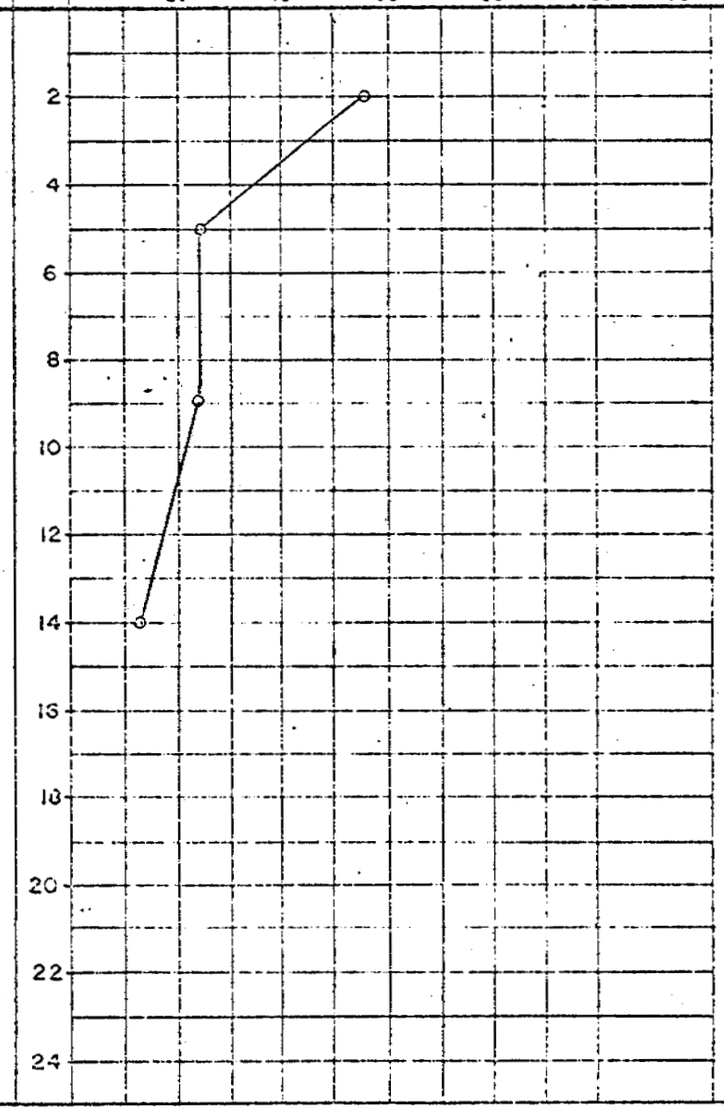
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 795+00	OFFSET: L
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
458	C	663

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT COARSE, FIBROUS MUSKEG, ROOTS, MOSS	F								
2		P			CL	CLAY COARSE SAND, WET PLASTIC, WELL BONDED NO EXCESS ICE, SOME ROCKS TO 3/4"		<2% EXCESS ICE					121.0	98.2	
4															
6		P						Nbn							
8						ICE INCLUSIONS SANDY		Vr							
10						NOT LAYERED									
12								Nbn					109.0	77.5	
14					GP	GRAVEL SANDY		Nf							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

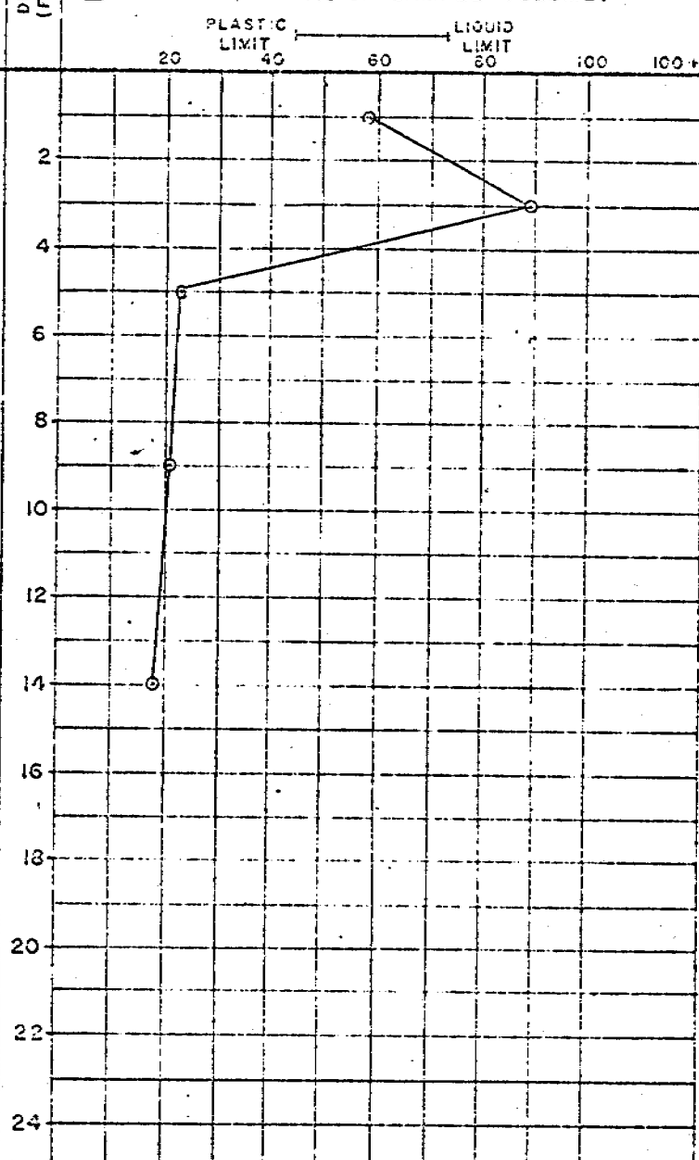
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 805+00	OFFSET: ℄
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
458	C	673

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT COARSE, FIBROUS MUSKEG, MOSS, ROOTS	F	
2		P			OL	CLAY DARK BROWN, RANDOM ICE CRYSTALS, WELL BONDED		Nbe
4					Pt	PEAT BLACK, GRANULAR POWDERY, SOME SAND, WET		Vn
6		P			CL	CLAY BROWN, NO EXCESS ICE WELL BONDED, COARSE SAND		ICE CRYSTALS 10%
8								Nbn
10		P				SANDY WITH OCCASIONAL ROCKS		
12								
14					GC	GRAVEL SANDY WELL GRADED		Nf
16								
18						END OF HOLE		
20								
22								
24								



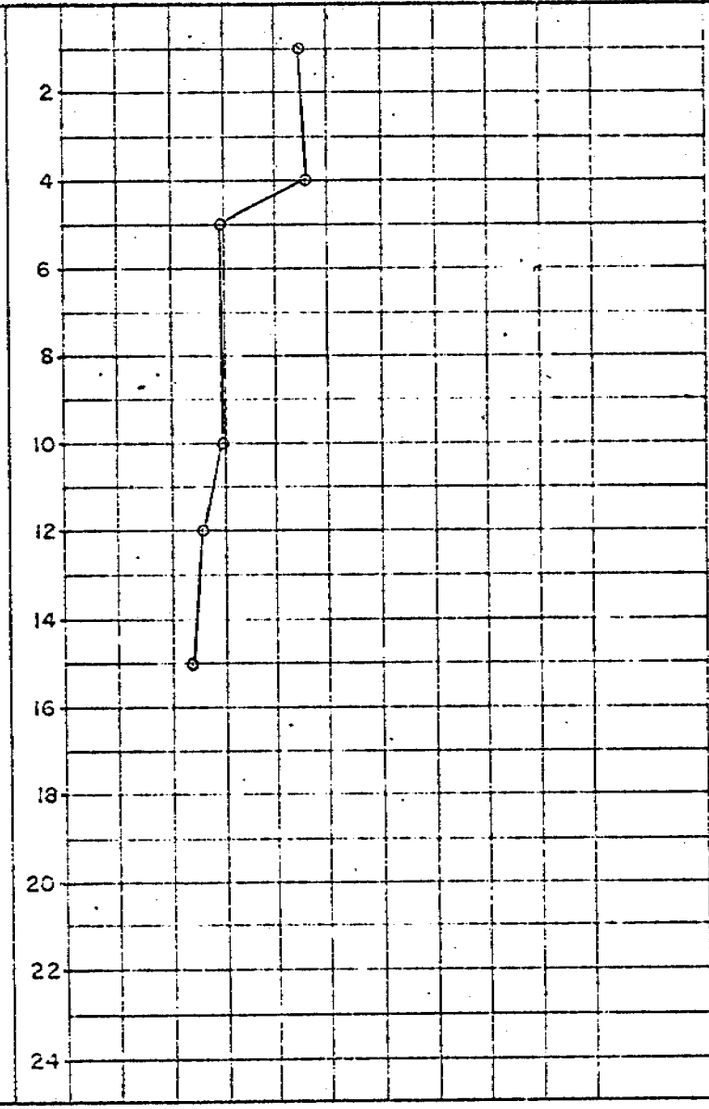
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A E W	FIELD ENG B M	DATE DRILLED 7/12/72	AIRPHOTO NO:	CHAINAGE: 815400	OFFSET ℄
CKD D G P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
458	C	663

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT COARSE, FIBROUS, ROOTS MOSS, MUSKEG	F									
2						CLAY BROWN, EXCESS ICE			2							
4						SOME SAND, SOME LAYERING		Vr	4							
6		P			CL	RANDOM ICE CRYSTALS			6							
8								<5% EXCESS ICE	8							
10		P				STIFF, BROWN		Nbe	10							
12					SP	SAND POORY GRADED		Nf	12							
14						CLAY LAYERED, WELL BONDED			14					120.0	98.4	
16		P			CL	PLASTIC, BROWN, RANDOM ICE CRYSTALS		Nbe	16							
18						END OF HOLE			18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

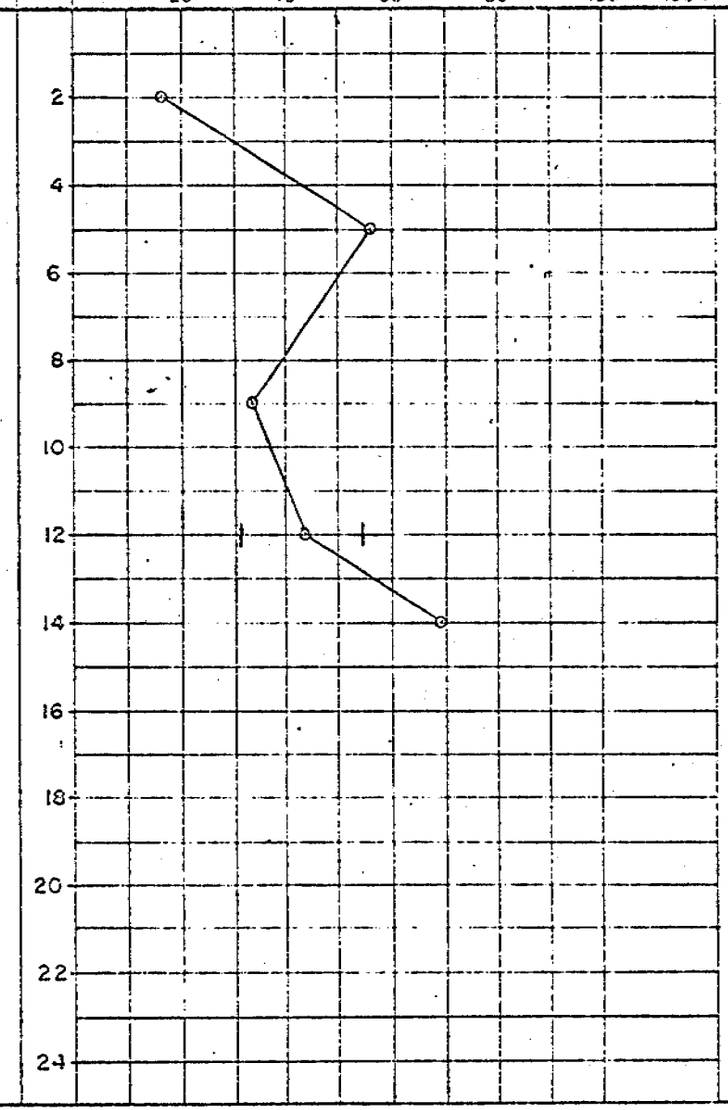
DWN A.E.W | FIELD ENG T.S. | DATE DRILLED 6/12/72 | AIRPHOTO NO: | CHAINAGE 825400 | OFFSET:

CKD D.G.P | TECH D.M. | RIG AIR | SURFACE DRAINAGE: LEVEL | VEGETATION: SPRUCE TO 40' | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
458	C	77A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F								
2						CLAY									
4						BROWN		Nbe							
6															
8					CL										
10						MED. BROWN									
12															
14		T				THIN ICE LENSES		Nbe							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG. B.M.	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 835+00	OFFSET ℄
CKD D.G.P	TECH. D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15' BUSH	ELEV.

TEST HOLE

MILE	E,C,S	NUMBER
458	C	763

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2		P			Pt	PEAT COARSE, FIBROUS, MUSKEG, ROOTS, GRANULAR	F								
4					OL	CLAY BROWN, CLUMPY SOME EXCESS ICE INCLUSIONS		Vx							
6		P				MUSKEG GRANULAR		< 5% EXCESS ICE					103.0	76.2	
8						CLAY BROWN, CLUMPY, EXCESS ICE AS INCLUSIONS WOODY FIBRE		Vx							
10		P			SP	SAND WELL BONDED, SOME CLAY NO EXCESS ICE		Nbn					101.1	79.2	
14					GP	GRAVEL SOME COBBLES									
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

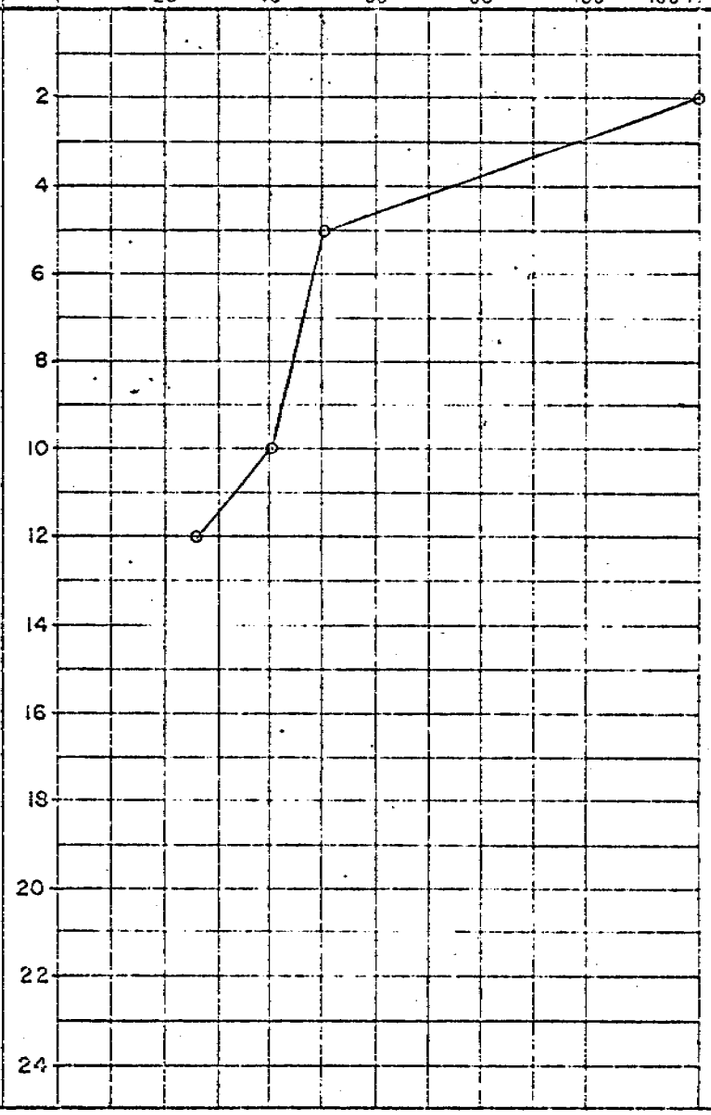
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M.	DATE DRILLED 8/12/72	AIRPHOTO NO:	CHAINAGE: 815+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
459	C	798

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - COARSE, FIBROUS MOSS, ROOTS, MUSKEG	F								
2		P			Pt	CLAY LIGHT BROWN, ORGANIC BLACK, ROOTS, COARSE FIBROUS MUSKEG, RANDOM ICE CRYSTALS							78.0	29.6	
4															
6		P.				COARSE, FIBROUS MUSKEG ORGANIC CLAY, BLACK COARSE FIBROUS MUSKEG		Vr					106.5	70.6	
8						CLAY ORGANIC, GREY SOME EXCESS ICE		< 5% EXCESS ICE Nbn							
10		P			OL	CLUMPY, GREY, SOME WOOD FIBRE, NO EXCESS ICE WEAKLY BONDED							100.0	71.9	
12								Nbe							
14					CL	SILTY BROWN COBBLES									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravelly Sand
Location
Hole 459-C-80B Depth 9'-10'
Technician Date Dec.11/72

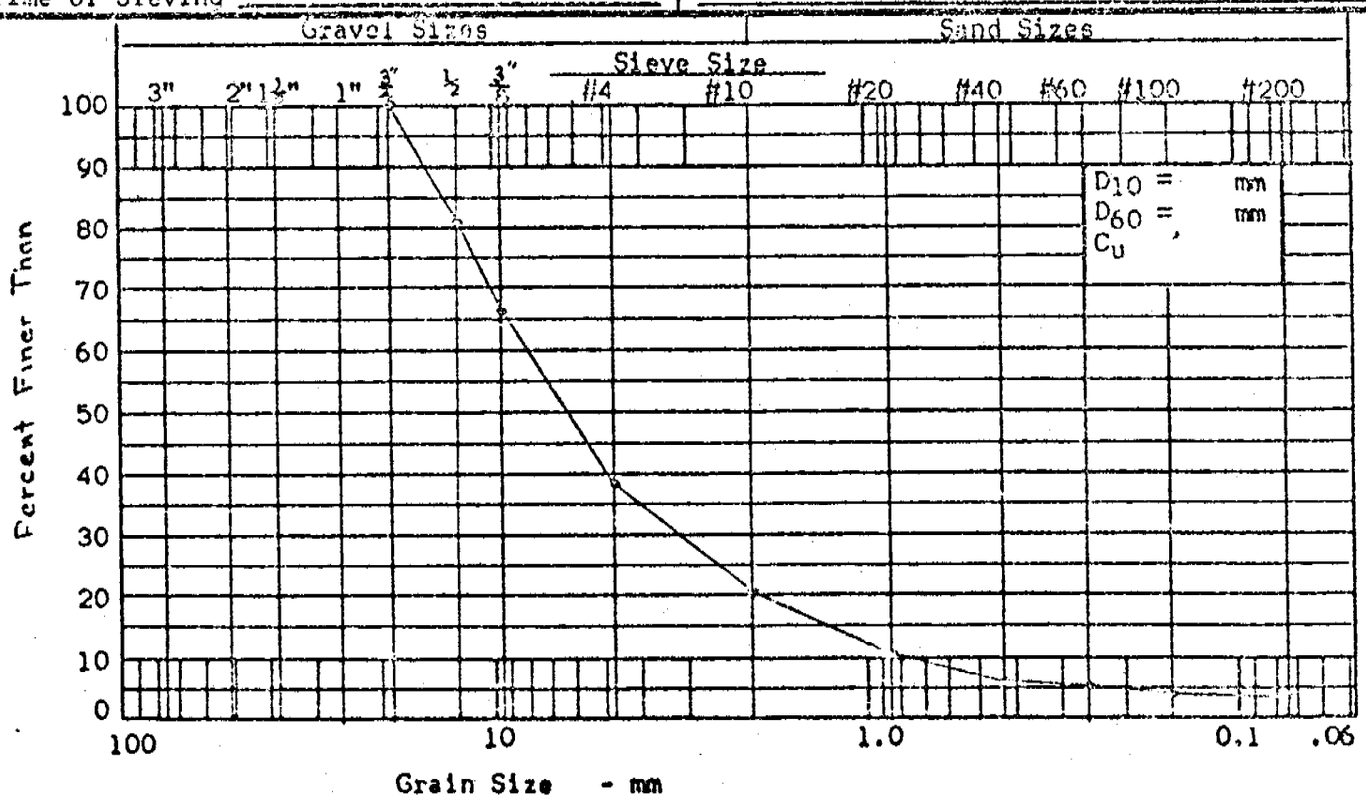
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			80.6%	
Wt. Dry		3/8	9.52			66.0%	
	4	.185	4.76			38.8%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			20.5%	
Tare No.	20	.0331	.840			10.4%	
Wt. Dry + Tare	40	.0165	.420			6.1%	
Tare	60	.0097	.250			5.0%	
Wt. Dry	100	.0059	.149			4.4%	
	200	.0029	.074			3.7%	
Passing	200					0	

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

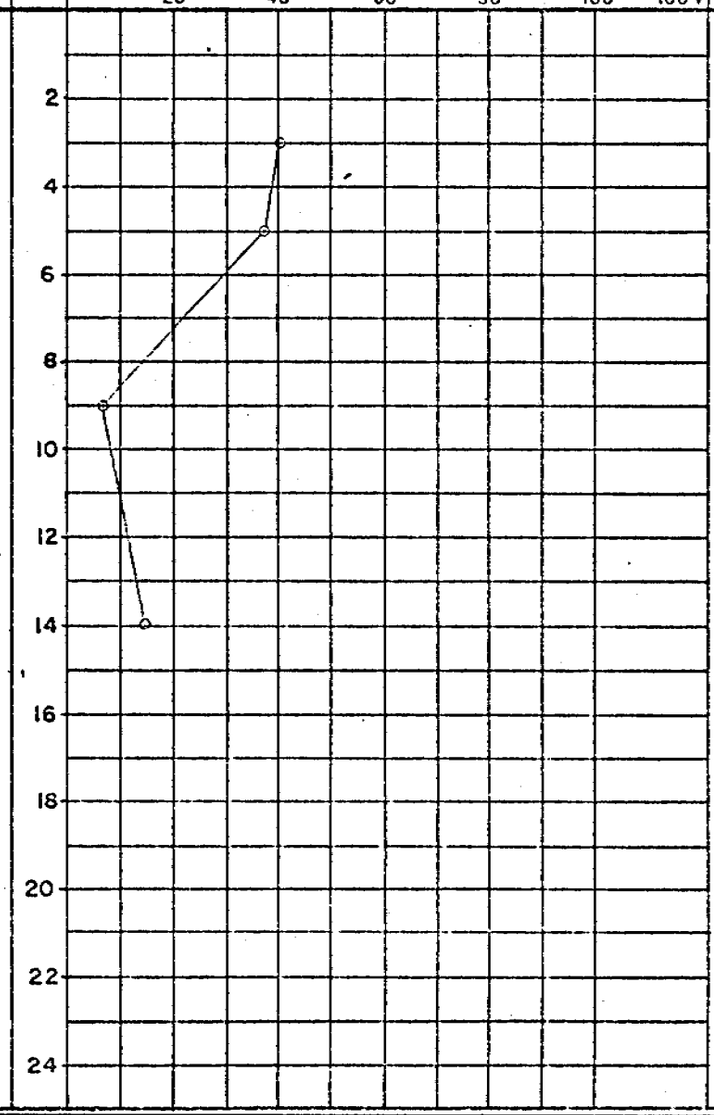
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 855+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 25'	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
459	C	833

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						SILT	F								
2								Vr							
						FINE SAND									
4													76.8	69.0	
					SM								102.2	74.1	
6						FINE, SANDY									
8															
								Vr							
10									4		17	79			
						SAND									
12					SP	COARSE, GRAVELLY		Nf							
						SAND									
14					SM	SILTY, LITTLE CLAY TRACE OF GRAVEL		Nf							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 8/12/72	AIRPHOTO NO:	CHAINAGE: 865+00	OFFSET:
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & ASPEN	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
459	C	81B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - COARSE, FIBROUS, MOSS ROOTS	F									
2					SP	SAND - FINE, SOME GRAVEL DRY		Nbe	2							
4						GRAVEL			4							
6					GP	SOME SAND, DRY			6							
8								Nf	8							
10									10							
12						END OF HOLE			12							
14									14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

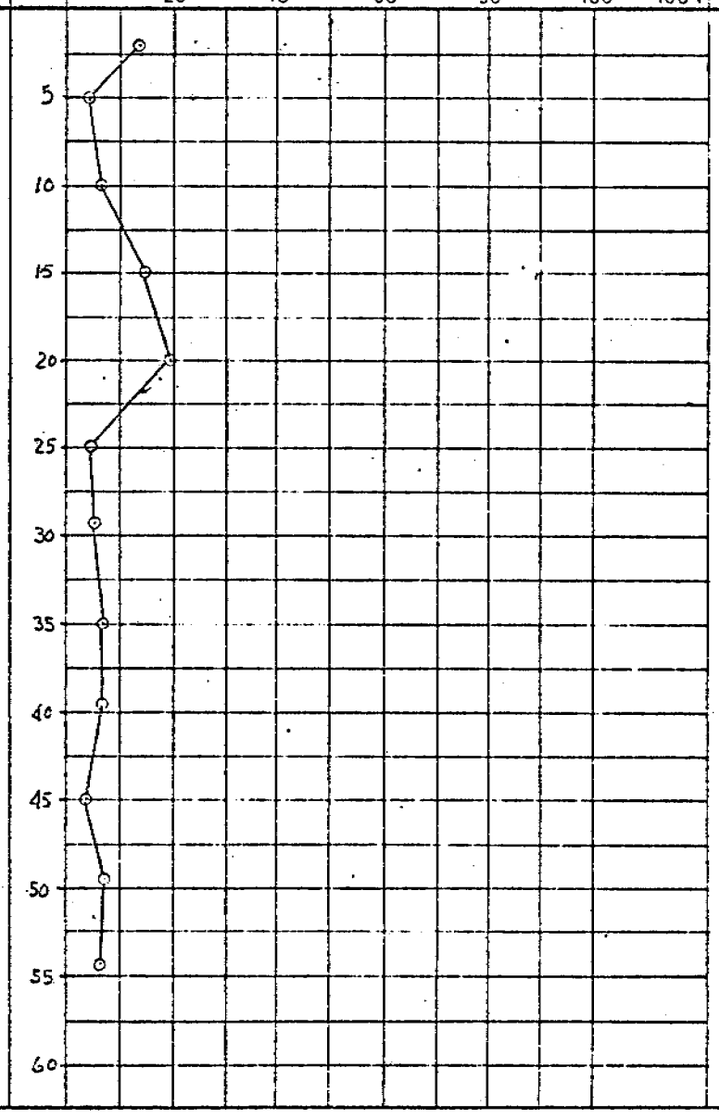
20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E W	FIELD ENG T. S.	DATE DRILLED 12/2/72	AIRPHOTO NO:	CHAINAGE: 874 +00	OFFSET: 2
CKD J G P	TECH D M	RIG AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 40'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
459	C	103A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					ML	SILT LIGHT BROWN, SANDY	F								
5					GM	GRAVEL LIGHT BROWN, SANDY SILTY		Nf							
10					SP	SAND BROWN, MED COARSE SOME GRAVEL, DRY				3	60	37			
15															
20															
25						SANDY		Nf							
30					GC	GRAVEL BROWN, COARSE, SOME CLAY									
35															
40															
45					GP	FINE, BROWN		Nf							
50					GC	CLAY BROWN, SANDY, GRAVEL COARSER WITH DEPTH		Nf							
55															
60						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole	459-S-124A Depth 12'-13½'
Technician	Date

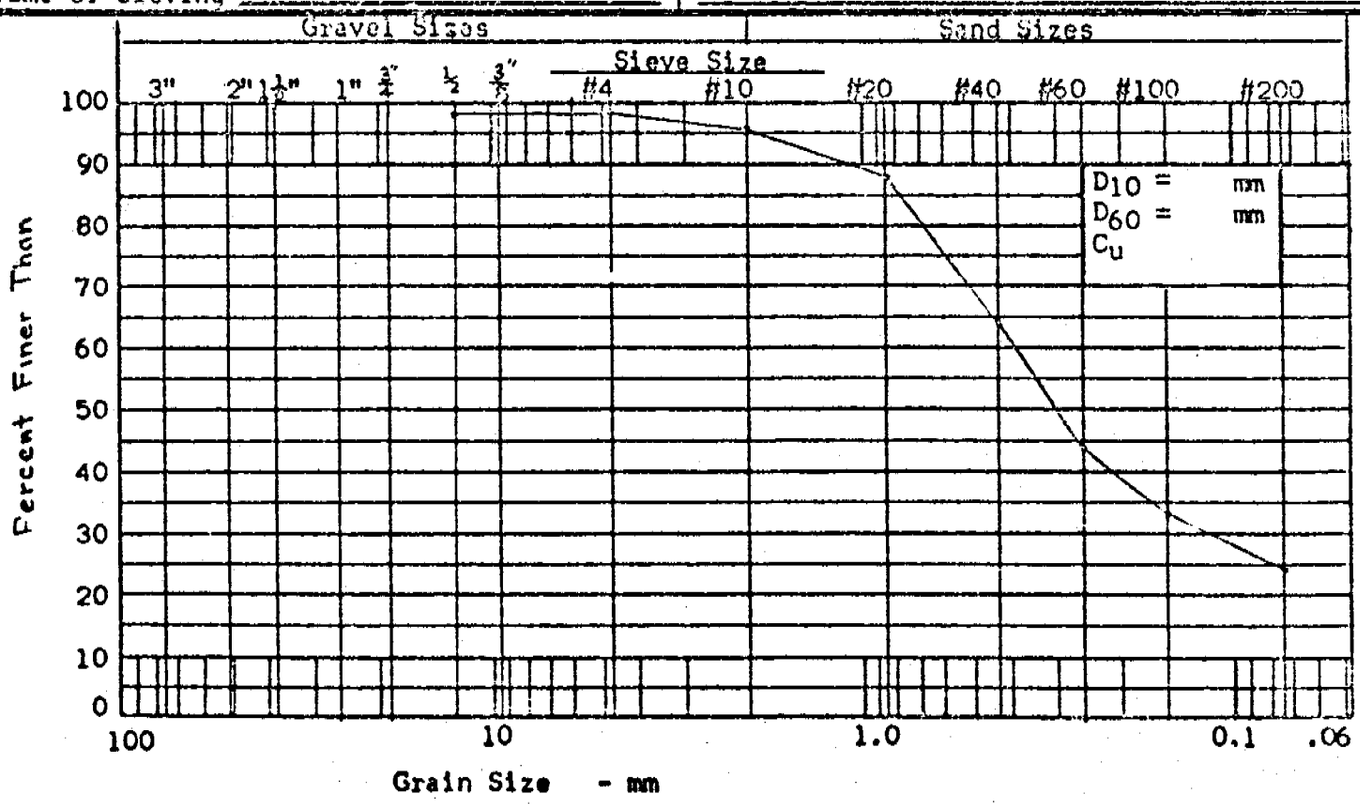
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			97.7	
Wt. Dry		3/8	9.52			97.7	
	4	.185	4.76			97.2	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			95.5	
Tare No.	20	.0331	.840			88.4	
Wt. Dry + Tare	40	.0165	.420			64.3	
Tare	60	.0097	.250			43.9	
Wt. Dry	100	.0059	.149			32.9	
	200	.0029	.074			24.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty Sand
Location	
Hole	450-S-124A Depth 14' - 15'
Technician	Date

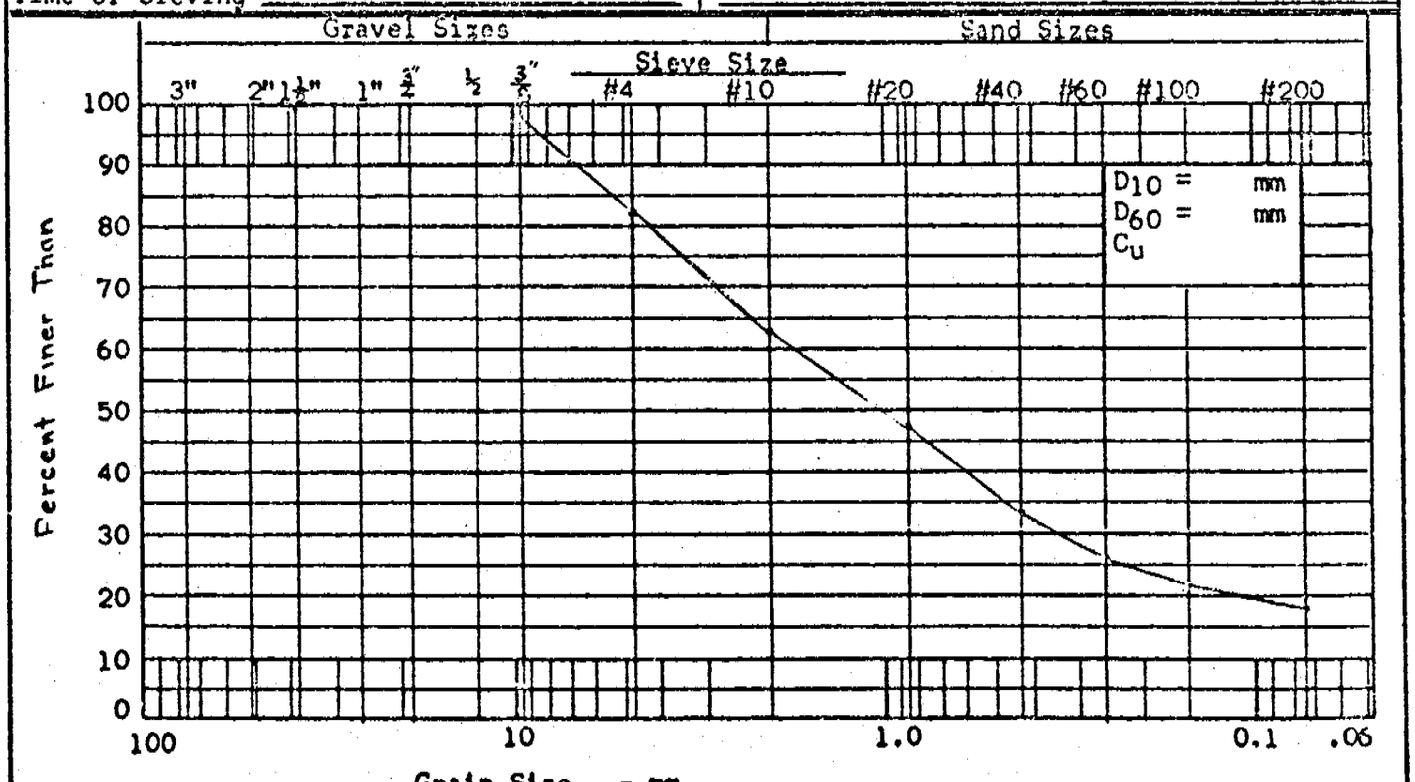
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			97.4	
	4	.185	4.76			82.1	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			62.6	
Tare No.	20	.0331	.840			46.8	
Wt. Dry + Tare	40	.0165	.420			33.2	
Tare	60	.0097	.250			26.0	
Wt. Dry	100	.0059	.149			22.1	
	200	.0029	.074			17.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty Sandy Gravel
Location	
Hole	459-S-124A Depth 19 - 20'
Technician	Date 26/1/73

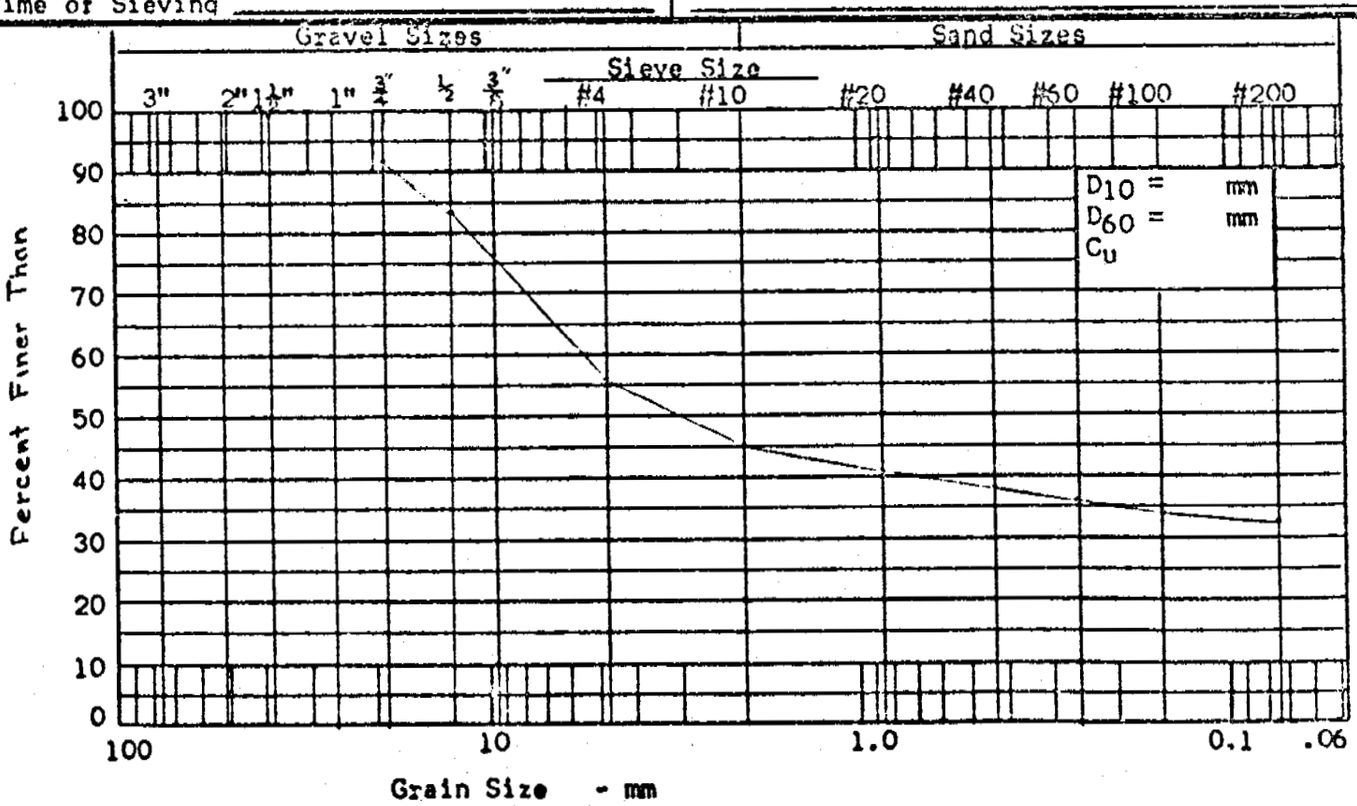
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			91.6	
Tare		1/2	12.70			83.5	
Wt. Dry		3/8	9.52			76.7	
	4	.185	4.76			55.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			45.7	
Tare No.	20	.0331	.840			41.6	
Wt. Dry + Tare	40	.0165	.420			38.8	
Tare	60	.0097	.250			36.6	
Wt. Dry	100	.0059	.149			34.7	
	200	.0029	.074			32.4	
Passing	200						

Description of Sample _____

Method of Preparation _____

Remarks: _____

Time of Sieving _____



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey Gravel
Location	
Hole	4[illegible]9-S-124A Depth 24 - 25'
Technician	Date 26/1/73

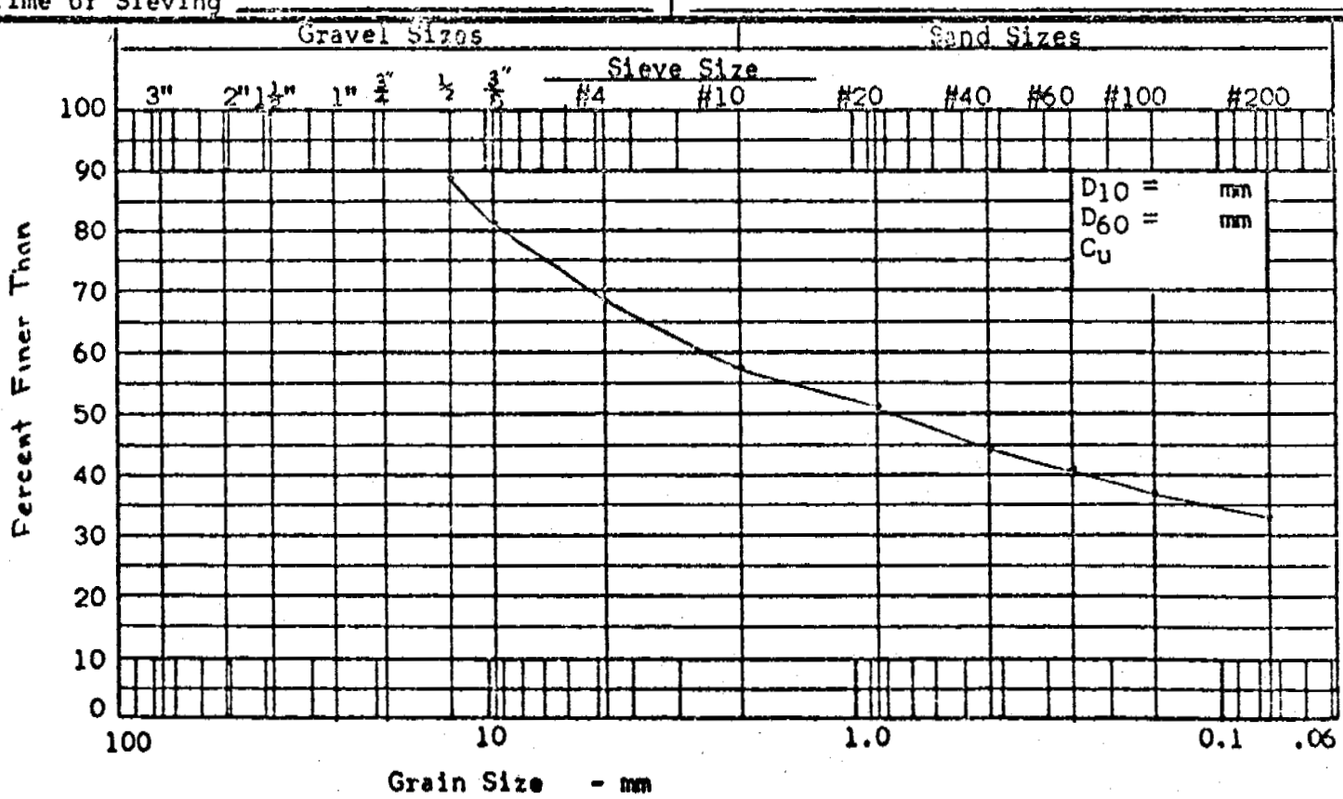
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			88.3	
Wt. Dry		3/8	9.52			81.2	
	4	.185	4.76			68.6	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			57.5	
Tare No.	20	.0331	.840			50.5	
Wt. Dry + Tare	40	.0165	.420			44.6	
Tare	60	.0097	.250			40.5	
Wt. Dry	100	.0059	.149			36.9	
	200	.0029	.074			32.8	
Passing	200						

Description of Sample _____

Method of Preparation _____

Remarks: _____

Time of Sieving _____



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

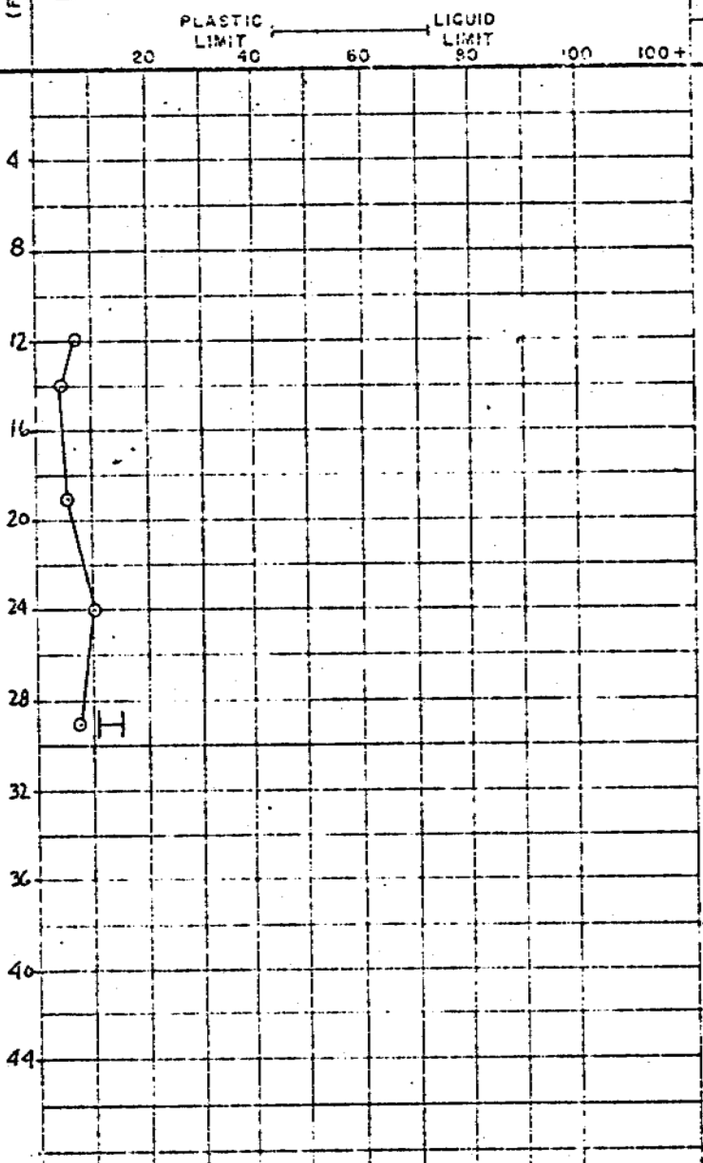
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN: A.E.W.	FIELD ENG: R.S.	DATE DRILLED: 9/1/73	AIRPHOTO NO:	CHAINAGE: 879+70	OFFSET: 50' E OF ℄	TEST HOLE
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: CONIFER TO 40'	ELEV: 295.4	

MILE	B,C,S	NUMBER
459	S	124 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4		P			Pt	PEAT ORGANIC, GRANULAR	F UF						68.4	113.3	
8					SP	SAND FINE, MOIST									
12		P							25	71	4				
16					GC	GRAVEL MED. COARSE SAND SILTY, BOULDERS CLAYEY			18	45	27				
20									32	14	54				
24									33	25	42				
28					SC	SAND CLAYEY									
32															
36															
40					GC	GRAVEL CLAYEY									
44						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Sand
Location
Hole 459-S-132A Depth 5'
Technician Date Jan. 26/73

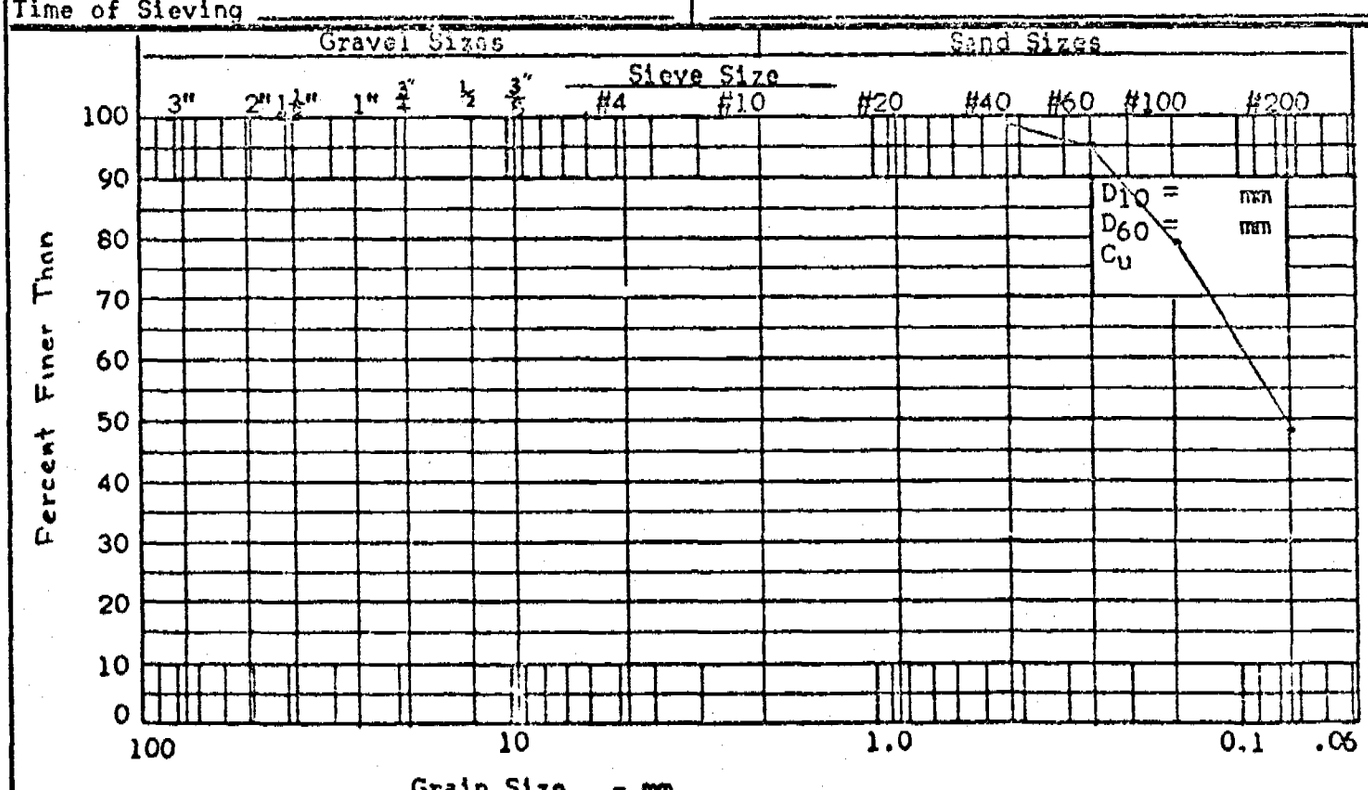
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000				
Wt. Dry + Tare	20	.0331	.840				
Tare	40	.0165	.420			99.1%	
Wt. Dry	60	.0097	.250			95.5%	
	100	.0059	.149			79.5%	
	200	.0029	.074			48.2%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Sandy Gravel
Location
Hole 459-S-132A Depth 8'-10'
Technician Date Jan. 26/73

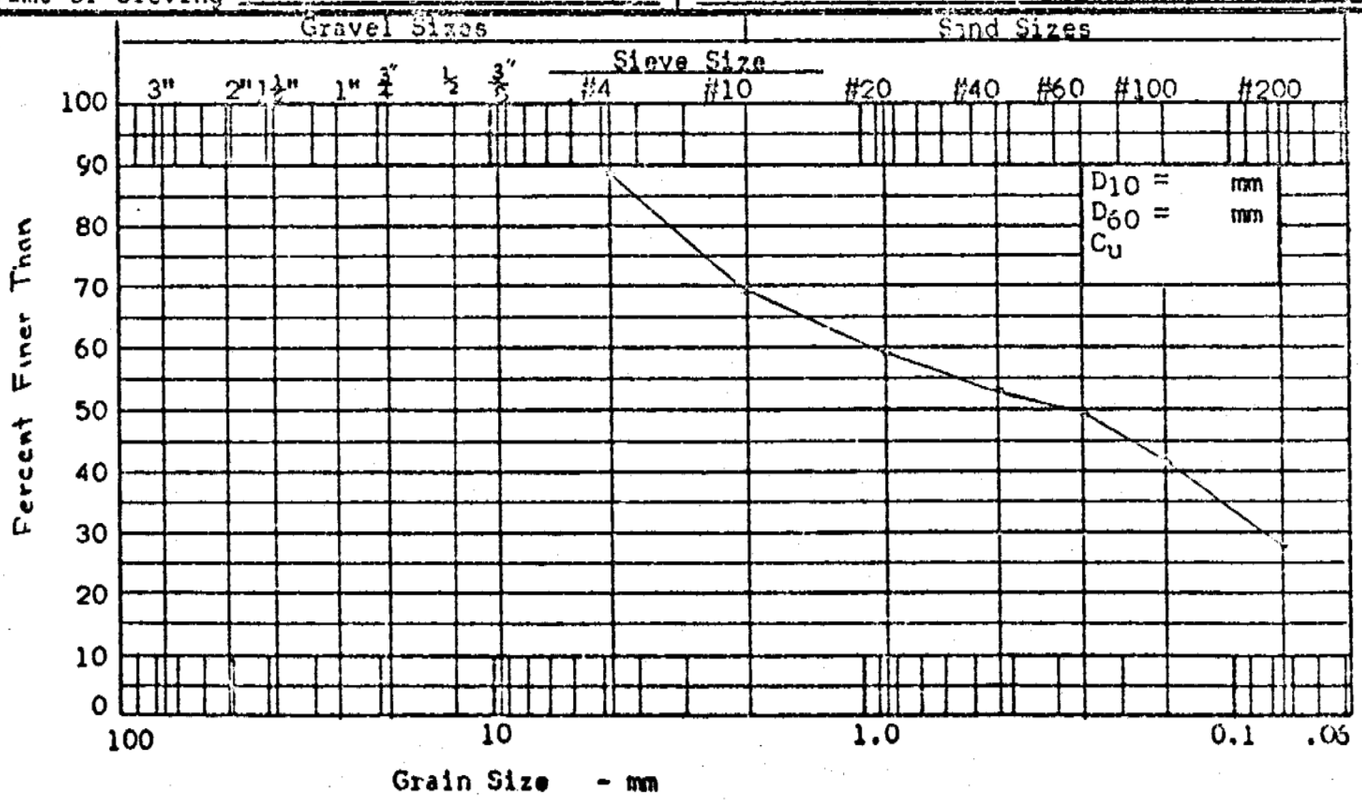
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			88.9%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			69.1%	
Wt. Dry + Tare	20	.0331	.840			59.3%	
Tare	40	.0165	.420			53.1%	
Wt. Dry	60	.0097	.250			49.4%	
	100	.0059	.149			42.0%	
	200	.0029	.074			28.4%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 459-C-103A Depth 10'
Technician Date Dec.12/72

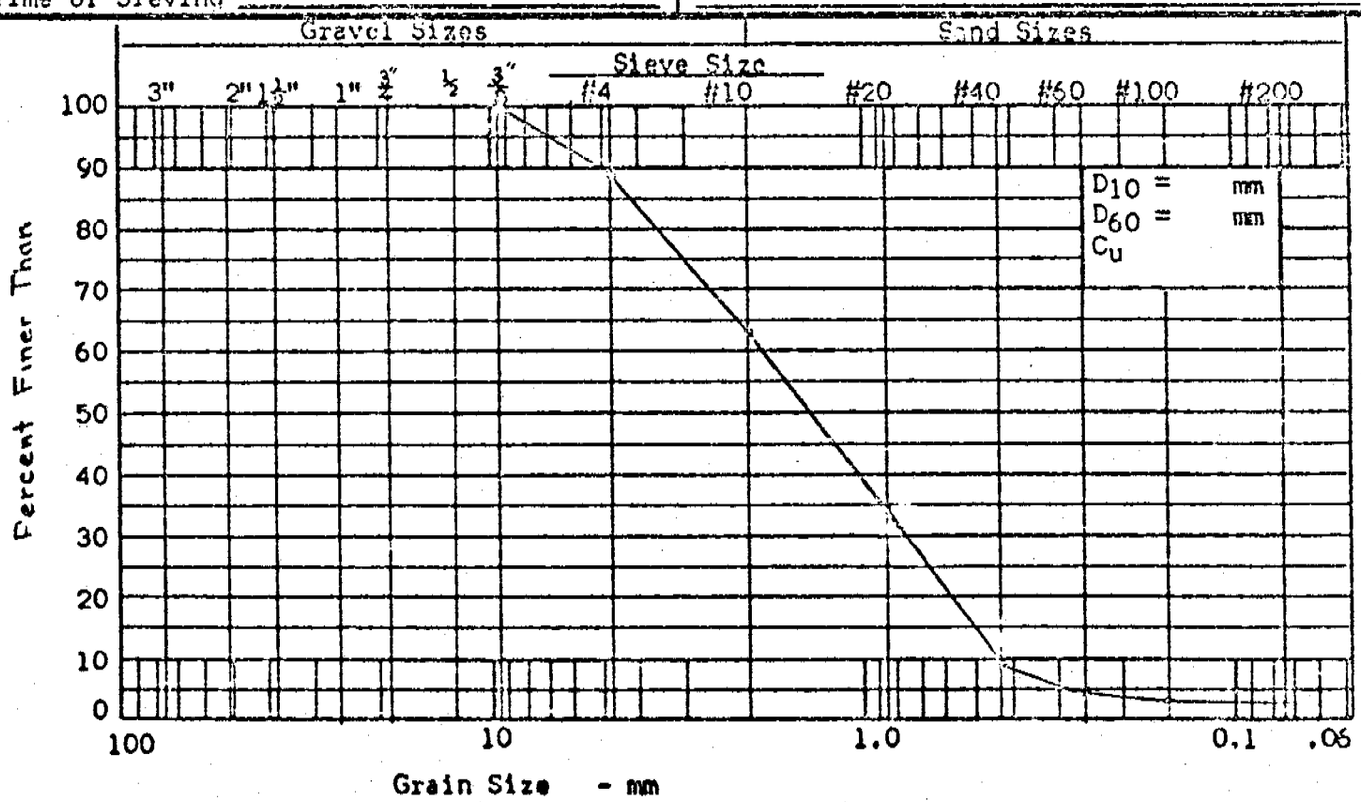
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100%	
	4	.185	4.76			88.8%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			62.8%	
Wt. Dry + Tare	20	.0331	.840			34.5%	
Tare	40	.0165	.420			9.9%	
Wt. Dry	60	.0097	.250			4.6%	
	100	.0059	.149			3.5%	
	200	.0029	.074			2.8%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Sandy Gravel
Location
Hole 459-S-132A Depth 15'
Technician Date Jan. 30/73

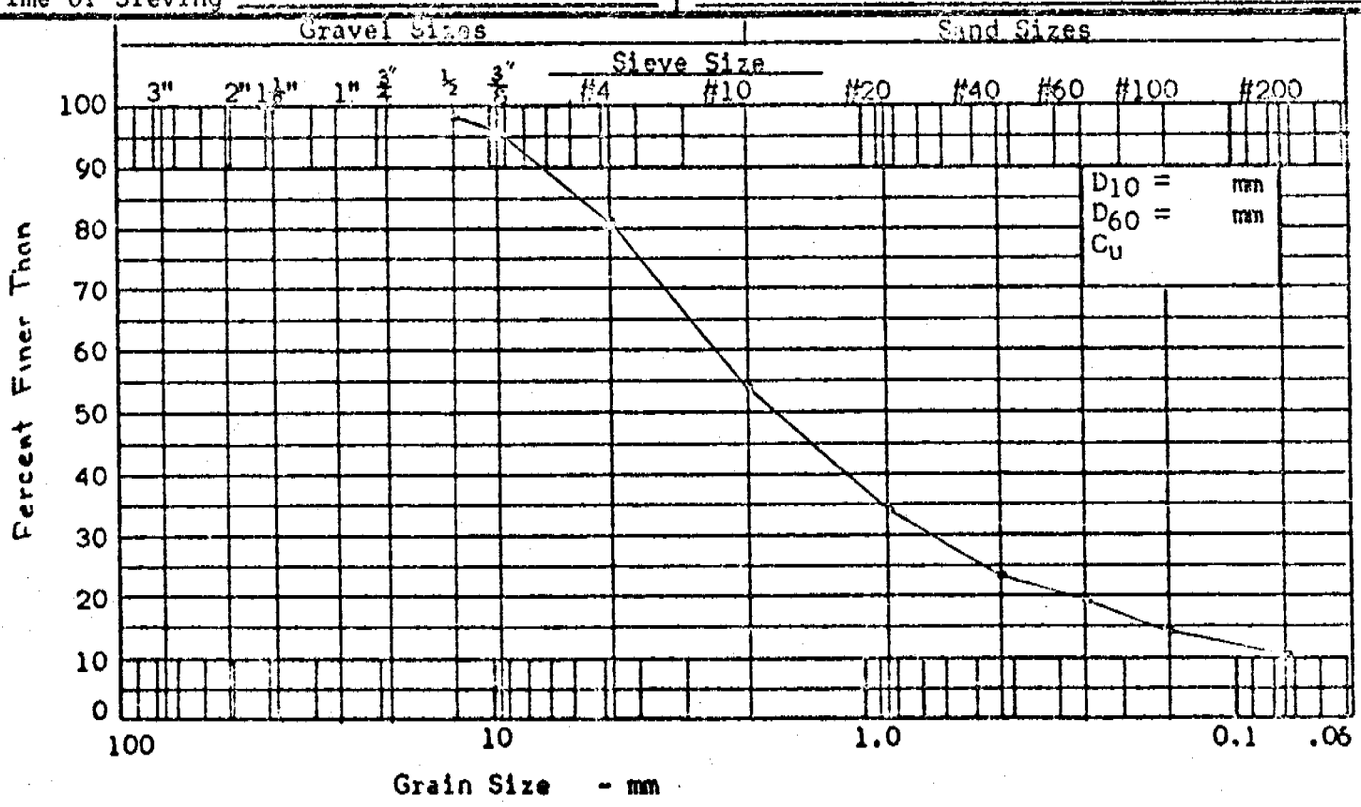
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			98.5%	
Wt. Dry		3/8	9.52			96.2%	
	4	.185	4.76			81.4%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			54.6%	
Wt. Dry + Tare	20	.0331	.840			34.7%	
Tare	40	.0165	.420			23.0%	
Wt. Dry	60	.0097	.250			18.1%	
	100	.0059	.149			14.8%	
	200	.0029	.074			11.0%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, Sandy Gravel
Location
Hole 459-S-132A Depth 20'
Technician Date Jan. 30/73

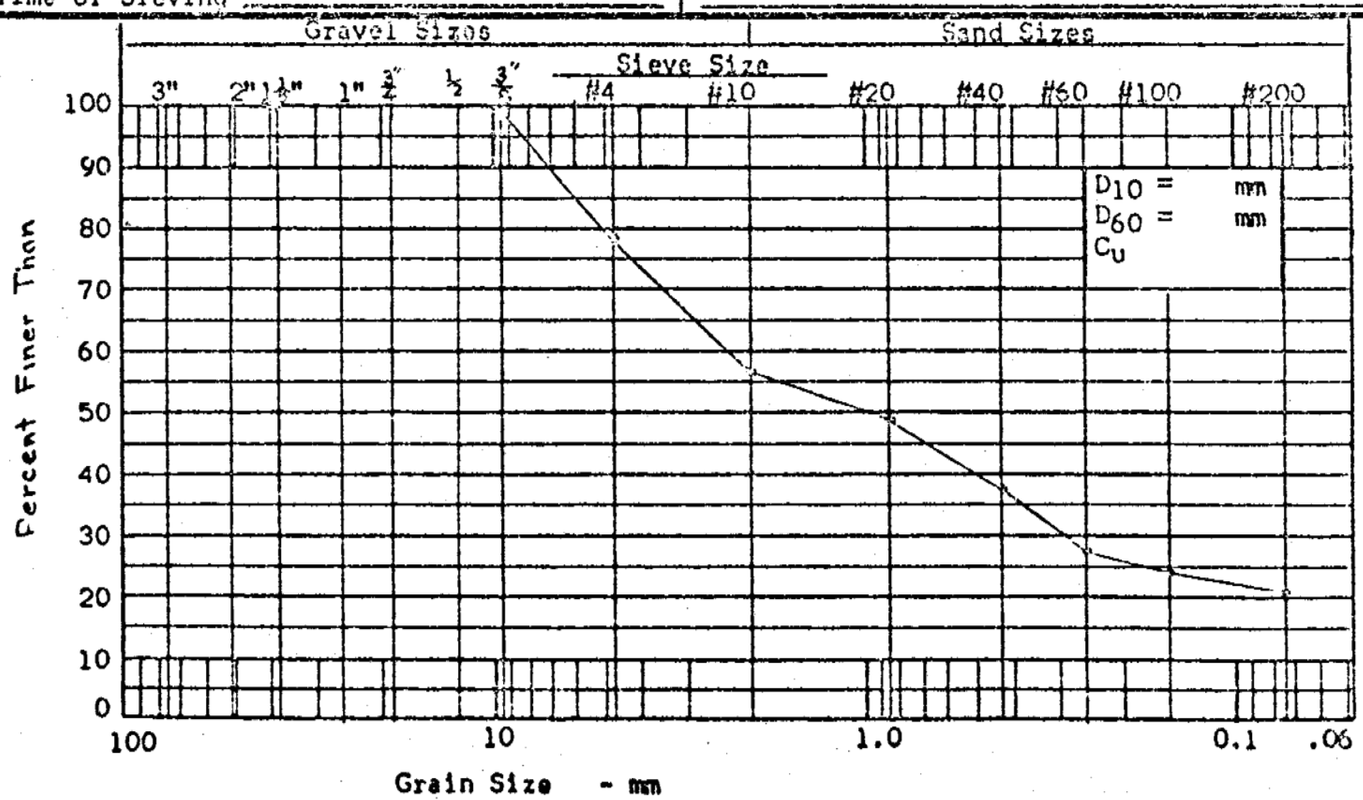
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			98.7%	
	4	.185	4.76			78.3%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			56.4%	
Tare No.	20	.0331	.840			49.5%	
Wt. Dry + Tare	40	.0165	.420			37.8%	
Tare	60	.0097	.250			27.6%	
Wt. Dry	100	.0059	.149			24.2%	
	200	.0029	.074			20.7%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty, sandy gravel
Location	
Hole	459-S-132A Depth 25'
Technician	Date

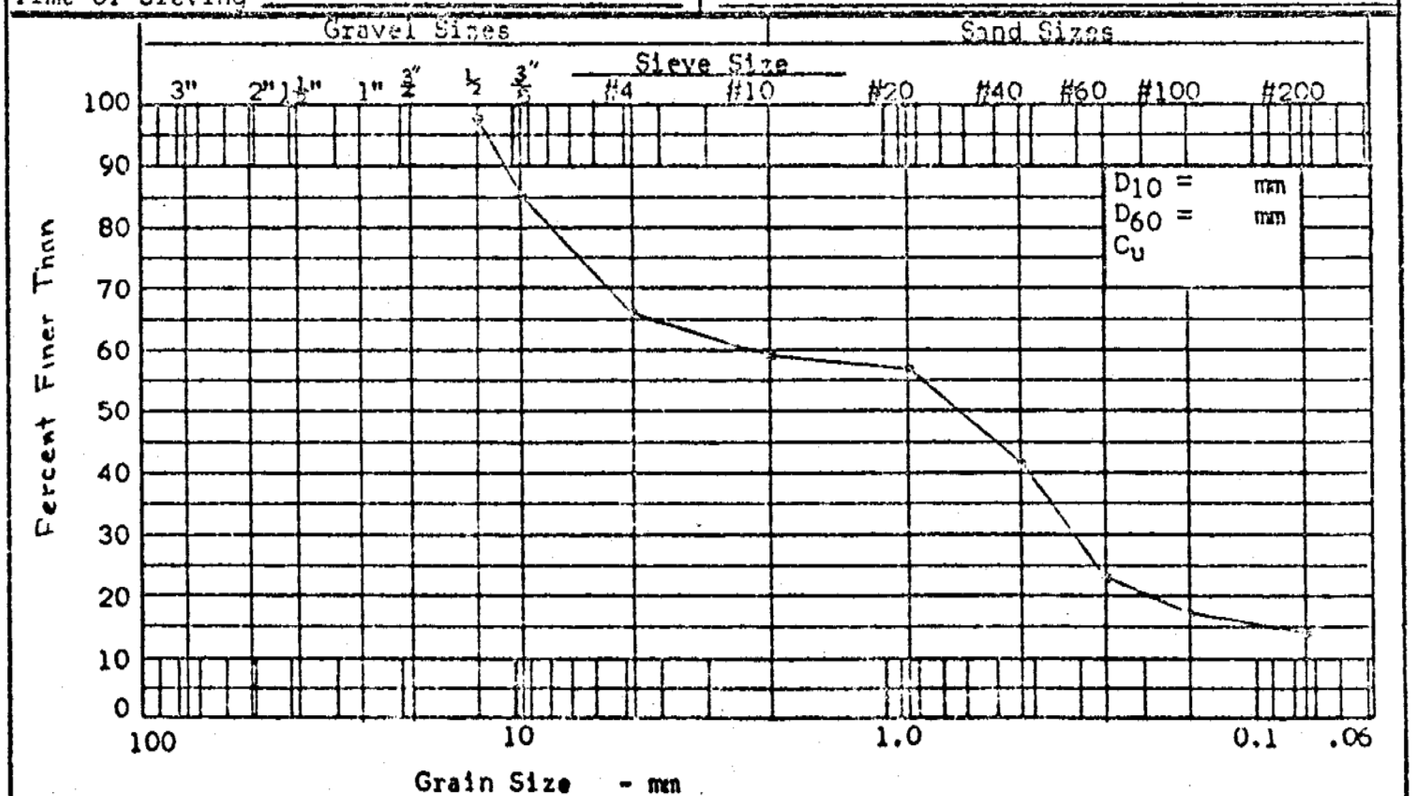
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			97.3	
		3/8	9.52			85.2	
	4	.185	4.76			66.1	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			59.9	
Wt. Dry + Tare	20	.0331	.840			56.4	
Tare	40	.0165	.420			41.6	
Wt. Dry	60	.0097	.250			23.7	
	100	.0059	.149			17.5	
	200	.0029	.074			14.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy Clay
Location	
Hole	459-S-132A Depth 30
Technician	Date

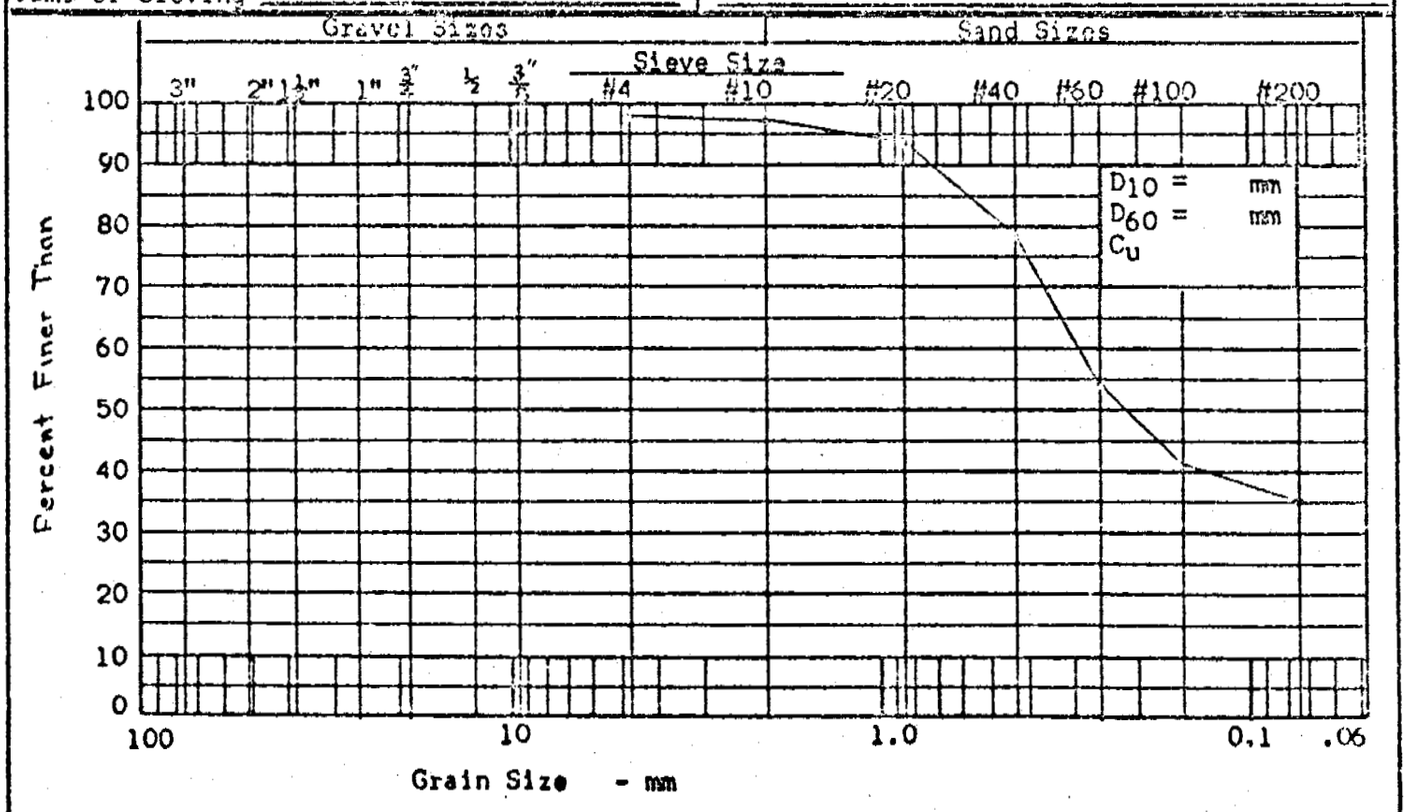
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			98.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			97.2	
Wt. Dry + Tare	20	.0331	.840			94.4	
Tare	40	.0165	.420			78.9	
Wt. Dry	60	.0097	.250			54.4	
	100	.0059	.149			41.7	
	200	.0029	.074			35.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey gravel
Location	
Hole	459-S-132A Depth 35'
Technician	Date

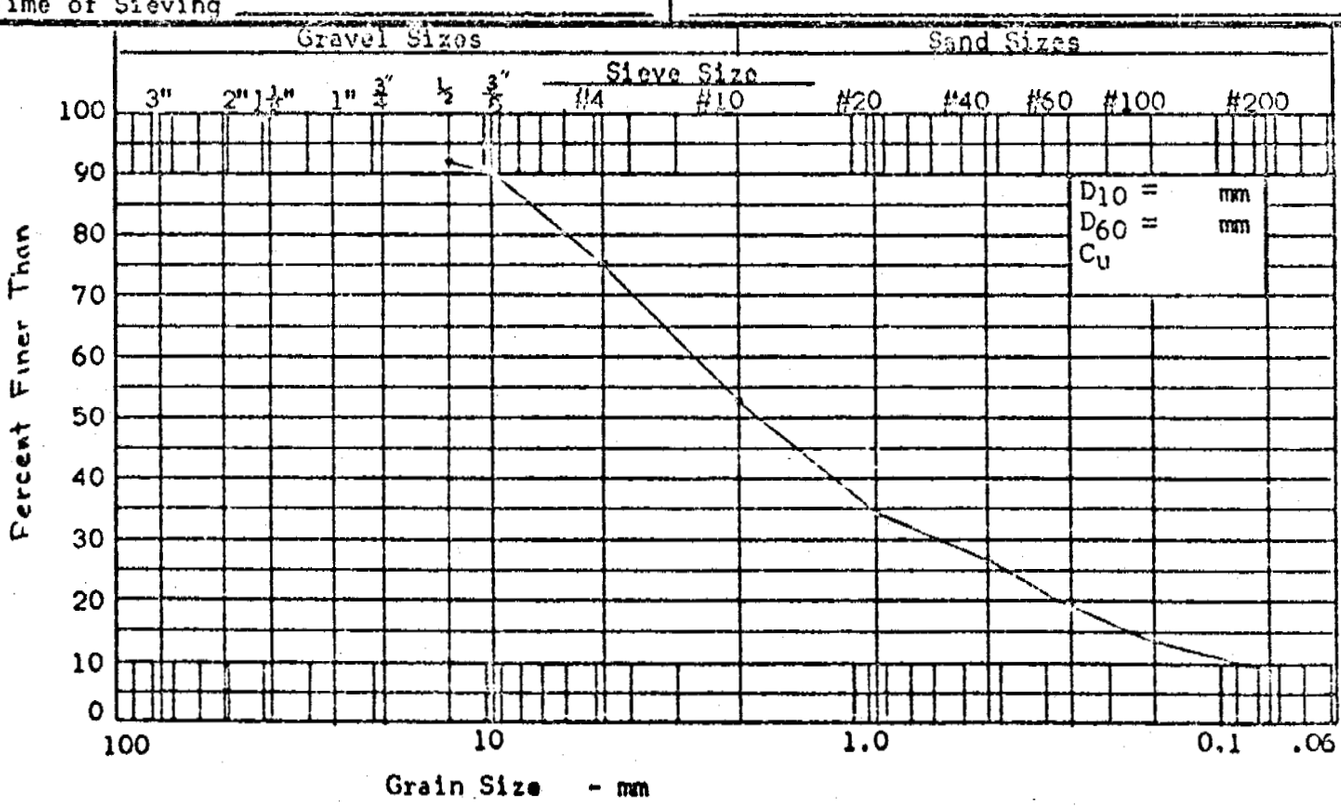
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			92.1	
Wt. Dry		3/8	9.52			90.1	
	4	.185	4.76			75.4	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			52.7	
Tare No.	20	.0331	.840			34.5	
Wt. Dry + Tare	40	.0165	.420			27.1	
Tare	60	.0097	.250			19.7	
Wt. Dry	100	.0059	.149			13.8	
	200	.0029	.074			8.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey Gravel
Location	
Hole	459-C-132A Depth 40'
Technician	Date

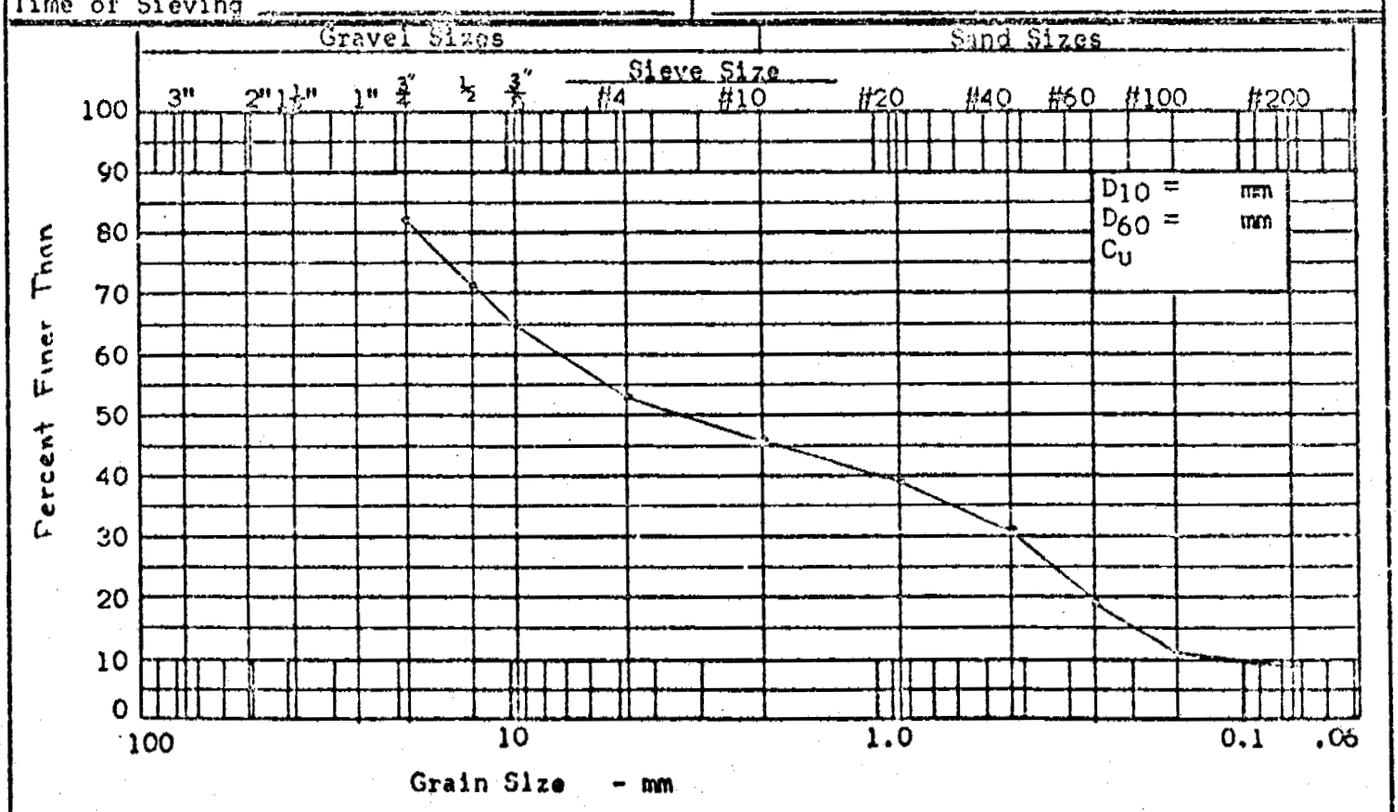
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			81.9	
Tare		1/2	12.70			70.7	
Wt. Dry		3/8	9.52			65.2	
	4	.185	4.76			53.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			45.7	
Tare No.	20	.0331	.840			39.1	
Wt. Dry + Tare	40	.0165	.420			30.8	
Tare	60	.0097	.250			19.2	
Wt. Dry	100	.0059	.149			12.3	
	200	.0029	.074			9.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

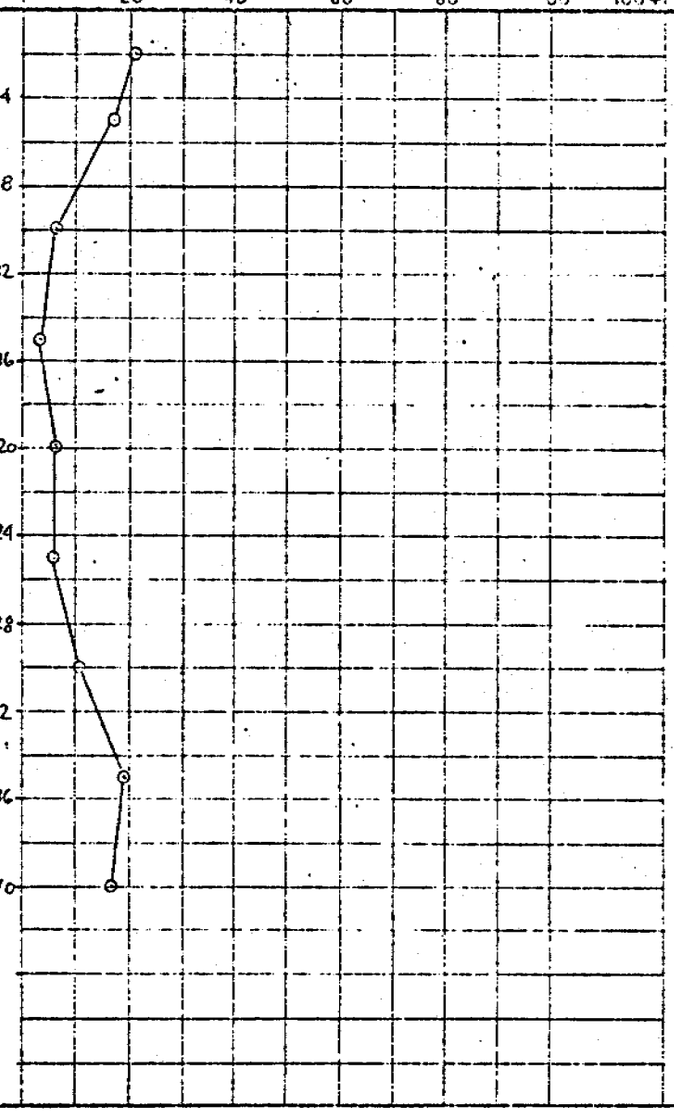
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. T.S.	DATE DRILLED 12/1/73	AIRPHOTO NO:	CHAINAGE: 881470	OFFSET
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: CONIFER TO 30'	ELEV: 29385

TEST HOLE

MILE	B,C,S	NUMBER
459	S	132 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT - MUSKEG	F								
						SILT SANDY									
						SAND									
4					SM	DRY, SILTY			48		51	1			SO_4 = 0.07%
8						HARD ROCK									
12						GRAVEL			28		41	31			
16						SILTY, SANDY			11		44	45			
20					GM		UF		21		35	44			
24									14		46	40			
28						CLAY GREY, FINE SAND			35		62	3			
32						GRAVEL									
36					GM	CLAYEY, COARSE			9		44	47			SAND MAY BE WASHED AWAY. LOST HOLE ON RODDING STEM HOLE REDRILLED TO 90' (SEE NEXT PAGE)
40						END OF HOLE			9		37	54			



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.N	FIELD ENG: DM	DATE DRILLED: 12/1/73	AIRPHOTO NO:	CHAINAGE: 861+70	OFFSET	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & CONIFER TO 45	ELEV: 293.85	MILE: 459 B,C,S: S NUMBER: 132A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT FIBROUS MUSKEG	F									
					SP	SAND FINE		Nbn								
8					GP	GRAVEL SOME BOULDERS			8							
16									16							
					SP	SAND LITTLE CLAY										
24									24							
32						GRAVEL ▽	UF	FREE WATER	32							
							F									
40					GW	COARSE SAND			40							
48						CLAY MIXED WITH SAND LENSES			48							
56									56							
64					GP	FINE, SAND LENSES		Nbn	64							
						SANDSTONE LAYER @ 62'										
72						CLAY			72							
80					CH	BLUISH GREY, MED PLASTIC, SANDSTONE OR SHALE LAYERS		Nbn	80							ROCKS IN SAMPLE ARE FROM WALLS, AS CLAY COMING UP.
88						SHALE VERY HARD, SANDSTONE			88							
96						END OF HOLE			96							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ——— LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with some clay
Location	
Hole	4[illegible]-S-123A Depth 19' - 20'
Technician	Date

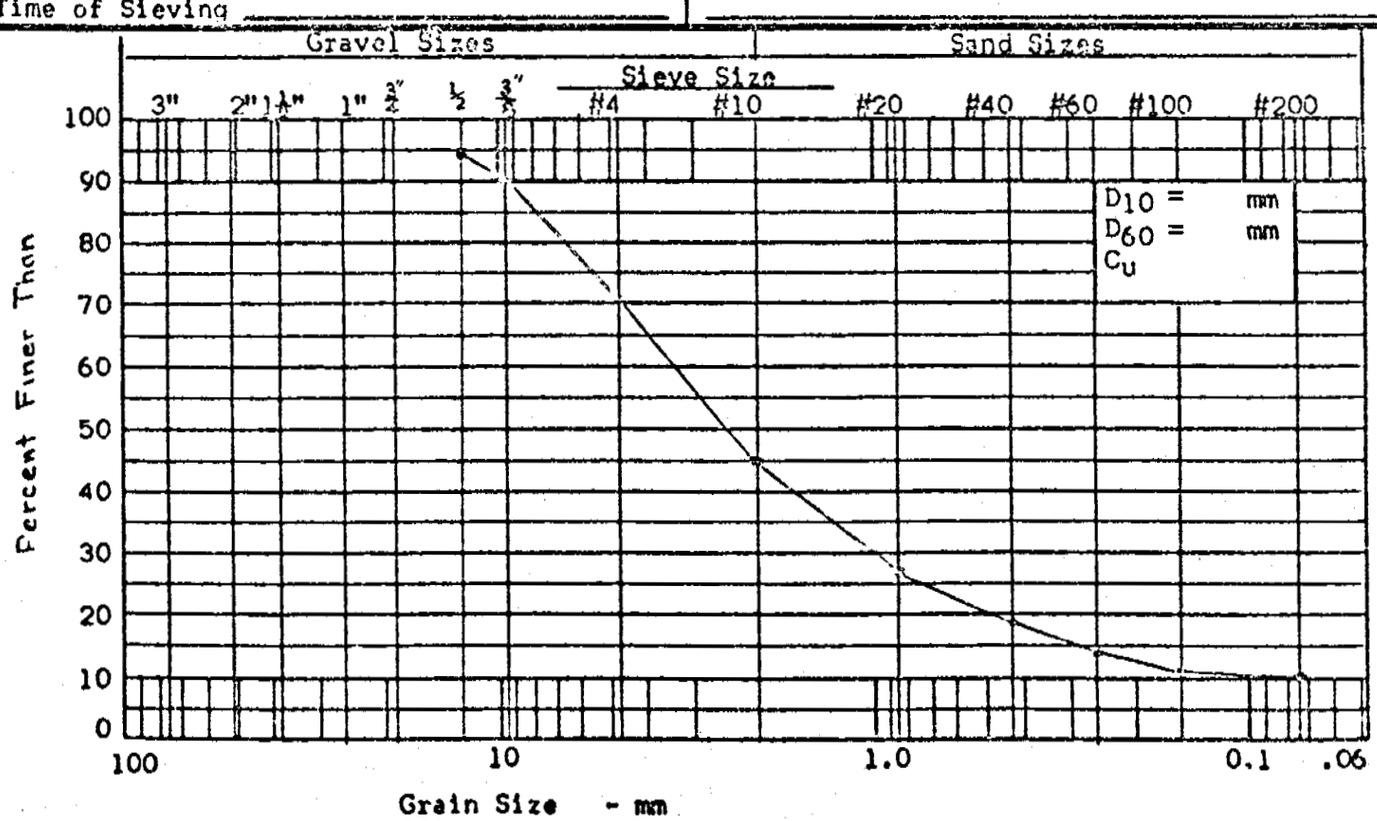
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			94.7	
Wt. Dry		3/8	9.52			90.0	
	4	.185	4.76			70.9	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			45.2	
Tare No.	20	.0331	.840			27.7	
Wt. Dry + Tare	40	.0165	.420			18.1	
Tare	60	.0097	.250			14.4	
Wt. Dry	100	.0059	.149			12.2	
	200	.0029	.074			10.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with some clay
Location	
Hole	4[illegible]-S-123A Depth 23' - 25'
Technician	Date

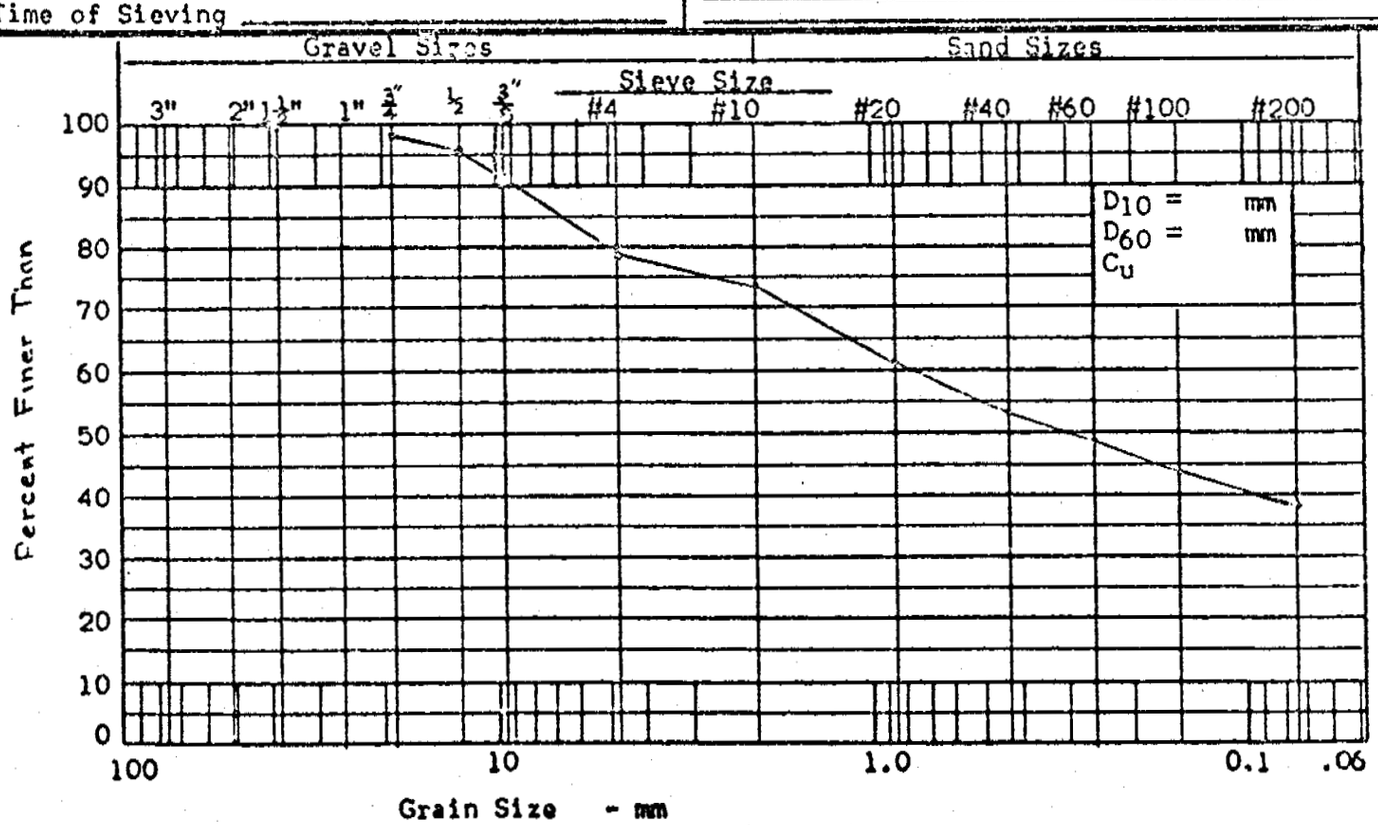
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			98.4	
Tare		1/2	12.70			96.5	
Wt. Dry		3/8	9.52			92.0	
	4	.185	4.76			78.4	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			73.8	
Tare No.	20	.0331	.840			61.4	
Wt. Dry + Tare	40	.0165	.420			53.6	
Tare	60	.0097	.250			48.5	
Wt. Dry	100	.0059	.149			43.9	
	200	.0029	.074			38.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey till
Location	
Hole	459-S-123A Depth 29'-30'
Technician	Date

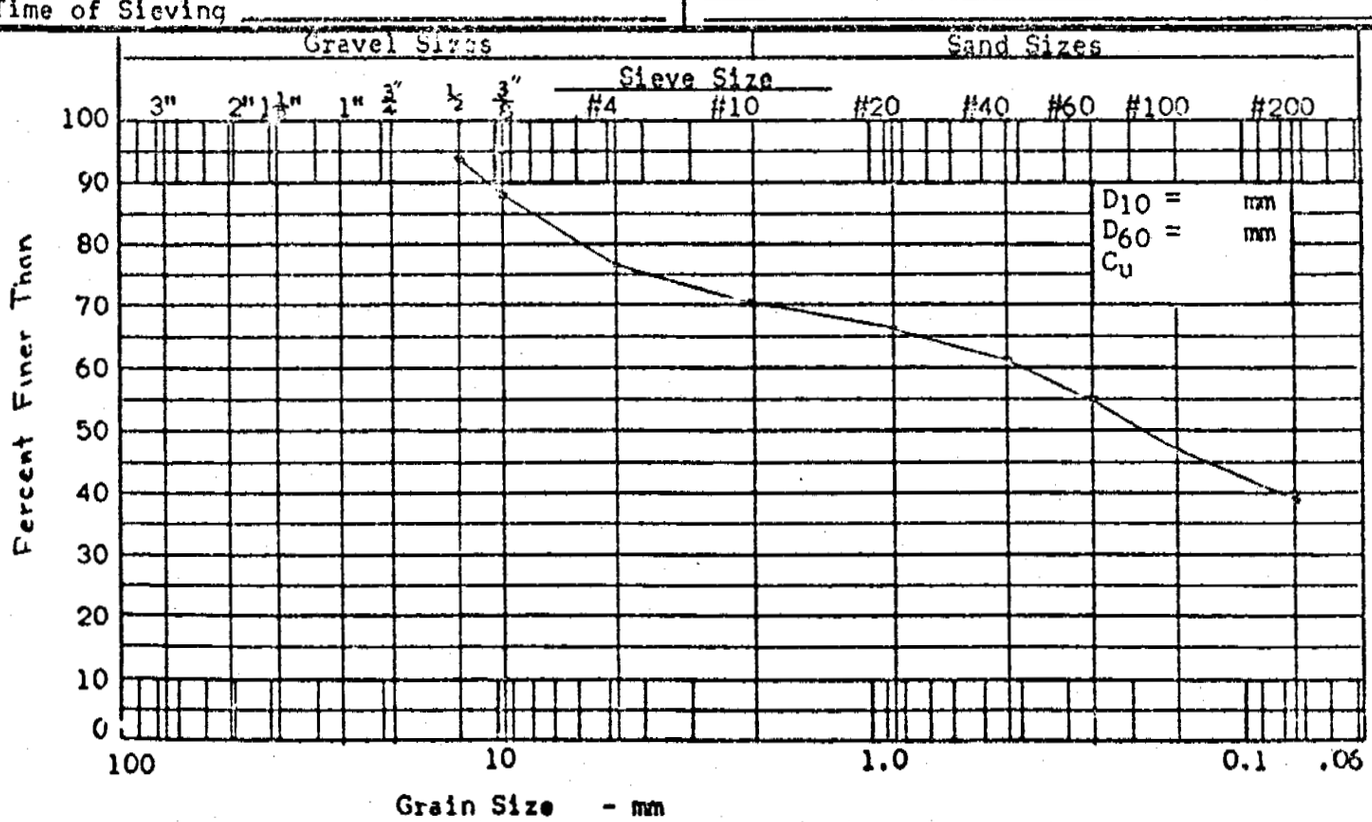
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			94.3	
Wt. Dry		3/8	9.52			87.1	
	4	.185	4.76			76.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			70.2	
Tare No.	20	.0331	.840			66.2	
Wt. Dry + Tare	40	.0165	.420			61.4	
Tare	60	.0097	.250			55.3	
Wt. Dry	100	.0059	.149			47.7	
	200	.0029	.074			39.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey till
Location	
Hole	459-S-123A Depth 34'-35'
Technician	Date

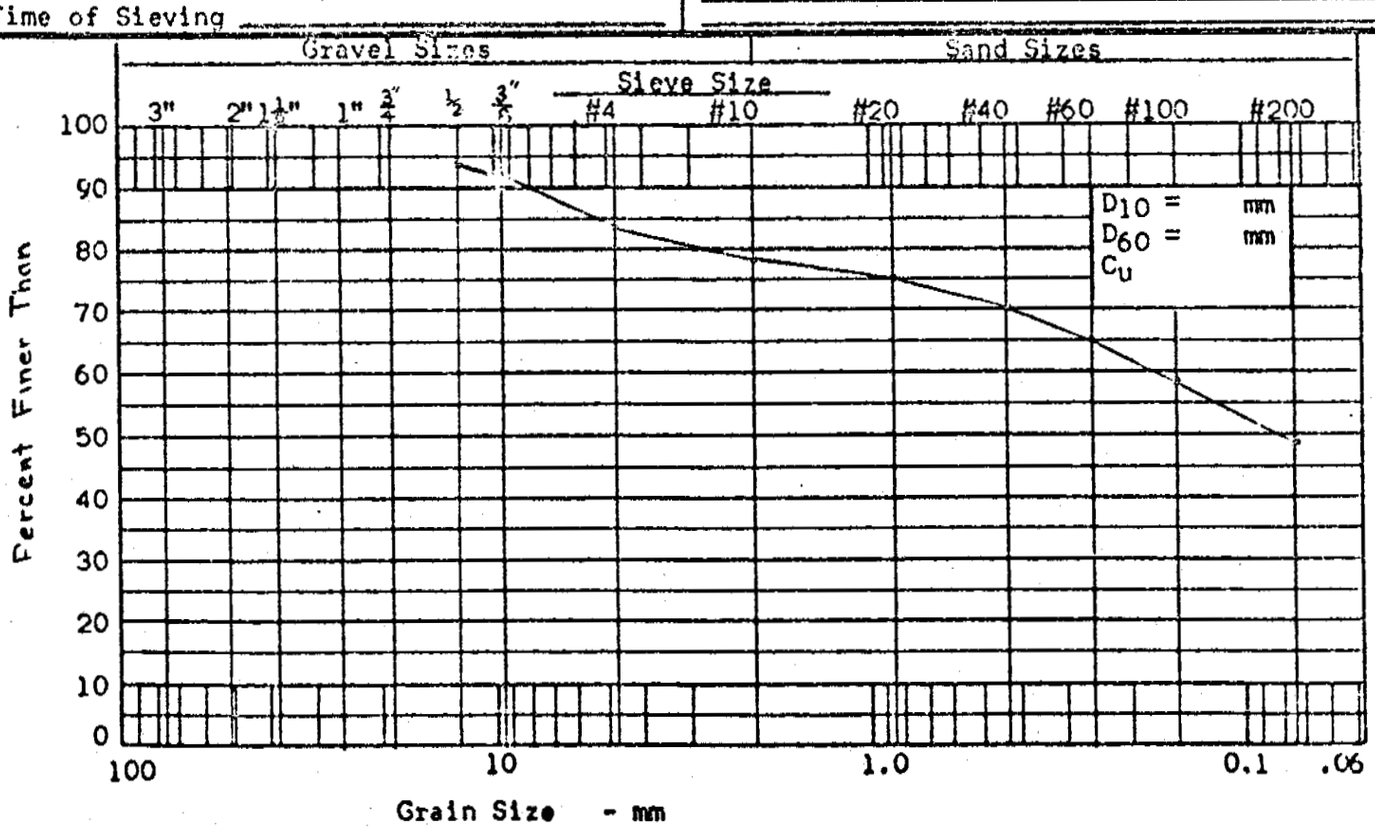
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			93.8	
Wt. Dry		3/8	9.52			91.9	
	4	.185	4.76			84.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			78.6	
Tare No.	20	.0331	.840			75.1	
Wt. Dry + Tare	40	.0165	.420			70.5	
Tare	60	.0097	.250			65.0	
Wt. Dry	100	.0059	.149			58.3	
	200	.0029	.074			49.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty Sand
Location	
Hole	4ED-S-123A Depth 39' - 40'
Technician	Date

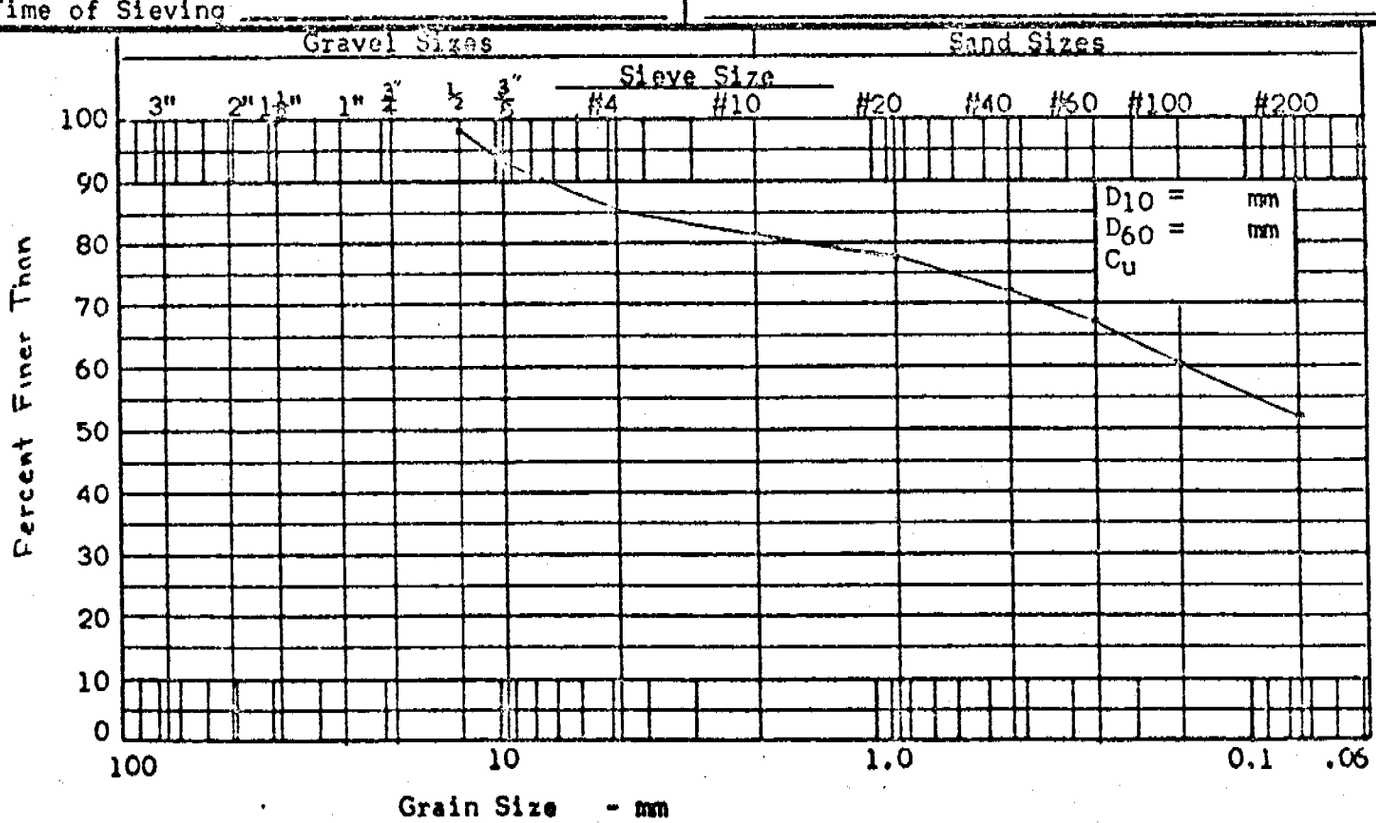
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			98.3	
Wt. Dry		3/8	9.52			93.4	
	4	.185	4.76			85.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			81.2	
Tare No.	20	.0331	.840			78.0	
Wt. Dry + Tare	40	.0165	.420			72.7	
Tare	60	.0097	.250			67.0	
Wt. Dry	100	.0059	.149			60.0	
	200	.0029	.074			52.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



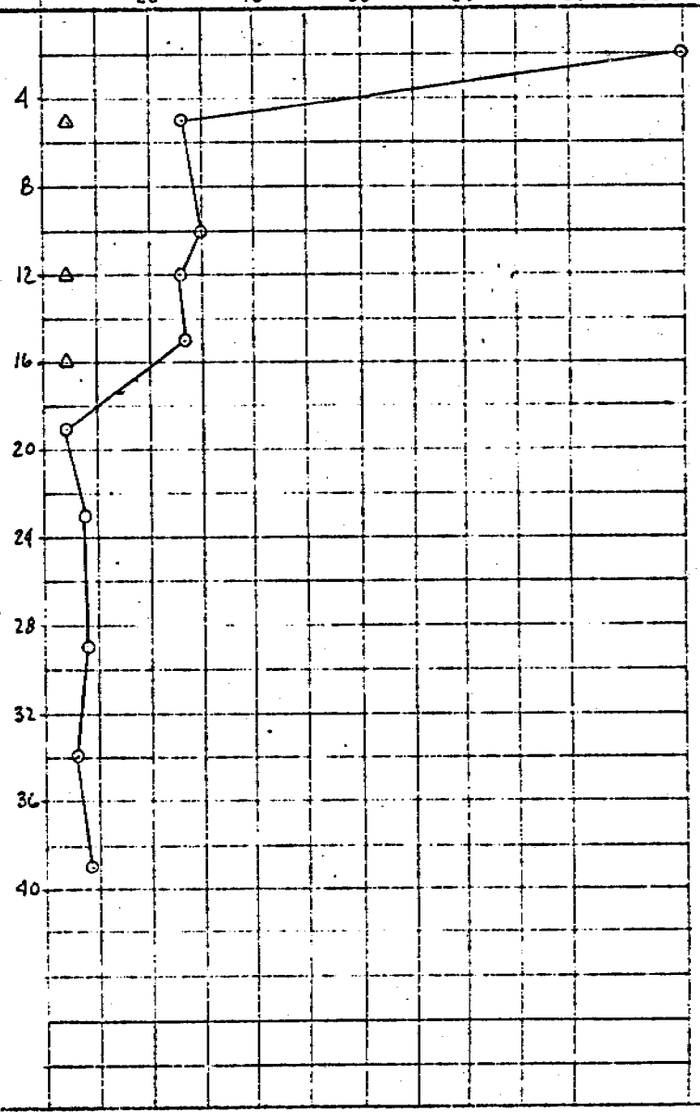
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG R.S.	DATE DRILLED 9/1/73	AIRPHOTO NO:	CHAINAGE 885100	OFFSET 50' L of ℄	TEST HOLE
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: SOUTH	VEGETATION: CONIFER TO 50'	ELEV 337.98	

MILE	B.C.S. NUMBER
459	S 123A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F								
4		T			OL	SILT FINE SAND, LITTE CLAY VERY SOFT WHEN THAWED		Nbe					113.3	88.7	
		P													
8						SANDY, HARD									
12		P			CL	CLAY HARD WITH SILT AND SAND SEAMS		Vr					114.2	90.1	
16		P											117.5	92.4	
20					SM	SAND COARSE, SANDY WITH SOME CLAY BOULDERS		Vr							
24															
28					GC	TILL FIRM, CLAYEY									
32															
36						LESS CLAY, SOFTER SILTY, DRY, COARSE SAND									
40						END OF HOLE									

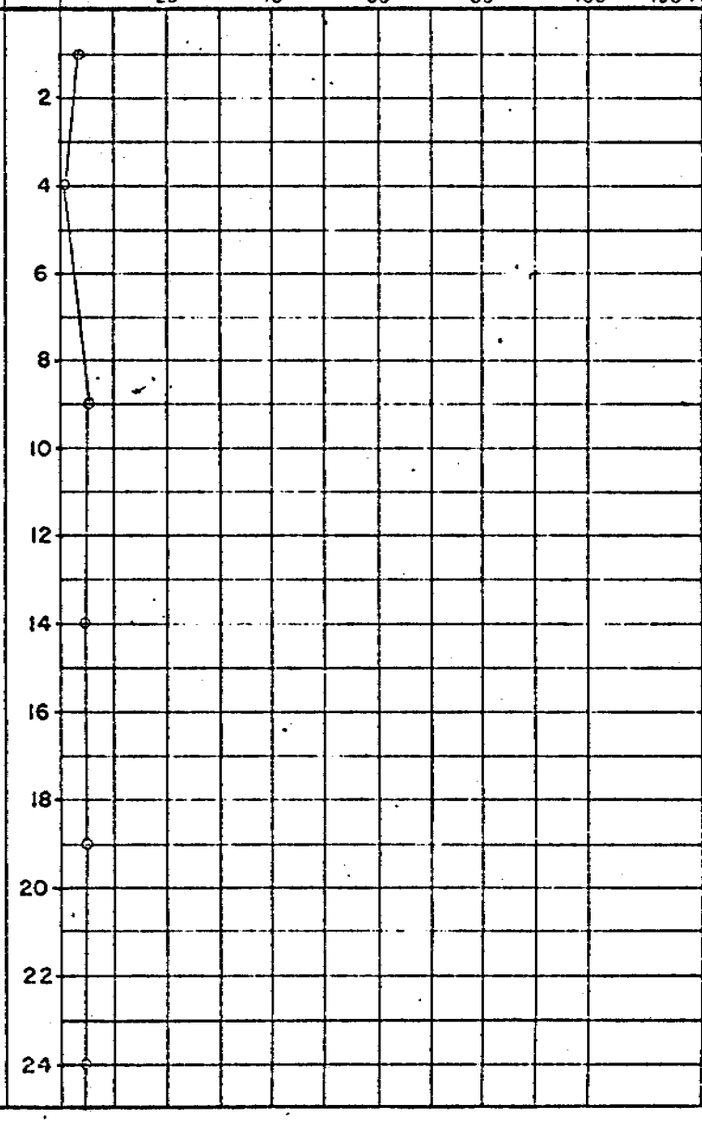


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S.	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 856+00	OFFSET: L
CKD DGP	TECH D.M	RIG AIR	SURFACE DRAINAGE: NORTH – SOUTH	VEGETATION: SPRUCE TO 25'	ELEV 348.69

TEST HOLE		
MILE	B,C,S	NUMBER
459	C	764

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	UF								
2						COARSE, BOULDERS									
4					GP										
6						SANDY, POORLY GRADED									
8															
10						SILT									
12															
14															
16					GC	SANDY WITH BOULDERS									
18															
20															
22															
24						END OF HOLE @ 35'									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravelly Sand
Location
Hole 459-C-98B Depth 4'-5'
Technician Date Dec.12/72

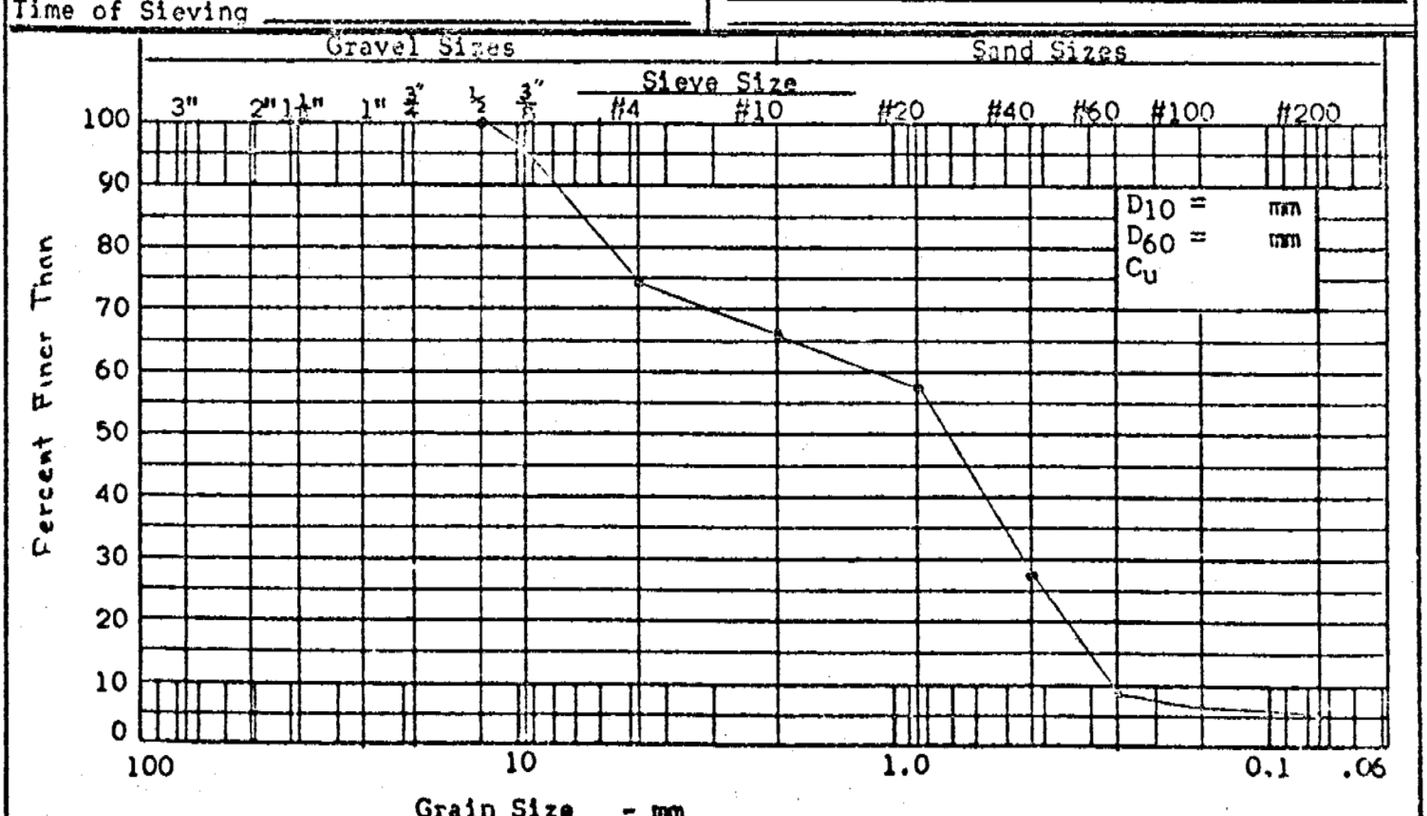
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100%	
Wt. Dry		3/8	9.52			96%	
	4	.185	4.76			74.3%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			66%	
Wt. Dry + Tare	20	.0331	.840			57.8%	
Tare	40	.0165	.420			27.5%	
Wt. Dry	60	.0097	.250			9.3%	
	100	.0059	.149			6.6%	
	200	.0029	.074			5.2%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

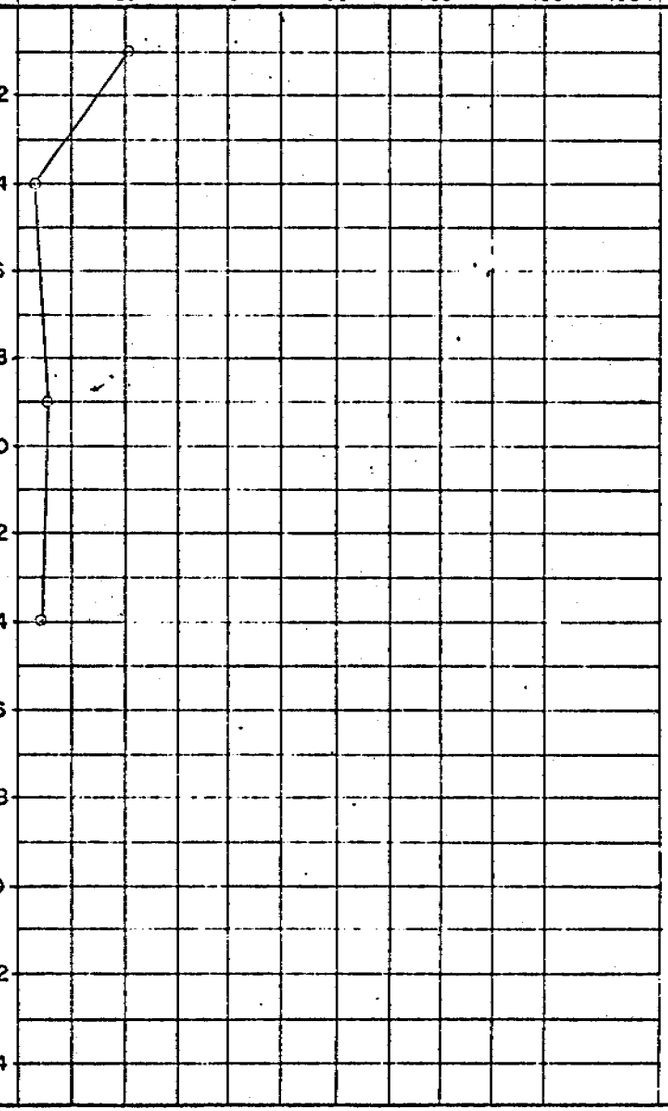
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 12/12/72	AIRPHOTO NO:	CHAINAGE: 805+00	OFFSET: ℄
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
459	C	9A B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT COARSE, GRANULAR MUSKEG, MOSS, ROOTS	F								
2					SM	SAND REDDISH, GRAVEL, SILT									
4						BROWN, GRAVEL		Nf	5	61	34				
6						WHITE, GRAVELLY									
8					GP	GRAVEL SOME LARGE SIZES COBBLES, SILTY									
10															
12								Nf							
14															
16						END OF HOLE									
18															
20															
22															
24															

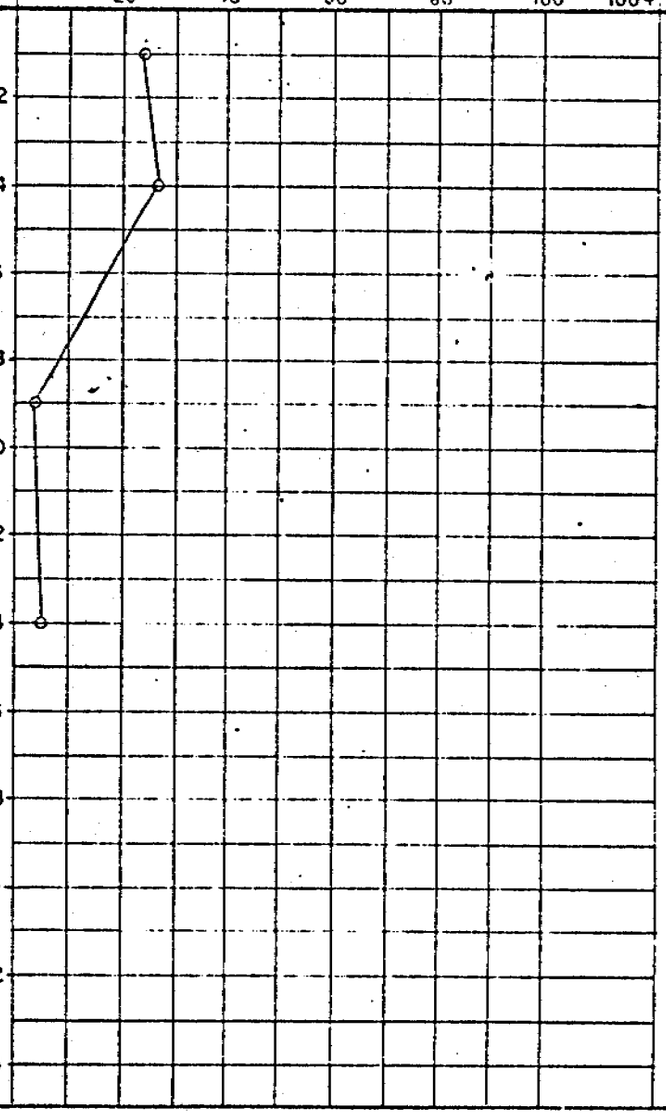


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN AEW	FIELD ENG BM	DATE DRILLED 12/12/12	AIRPHOTO NO:	CHAINAGE: 905+00	OFFSET: ℄
CKD DGP	TECH DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
450	C	998

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT COARSE, FIBROUS, GRANULAR	F									
2						SAND			2							
						BROWN, SOME SILT FEW PEBBLES										
4					SM			Nbn	4							
6						GRAVELLY			6							
8						BROWN, SILTY			8							
10						GRAVEL		Nf	10							
12					GM	BROWN, SANDY			12							
14								Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



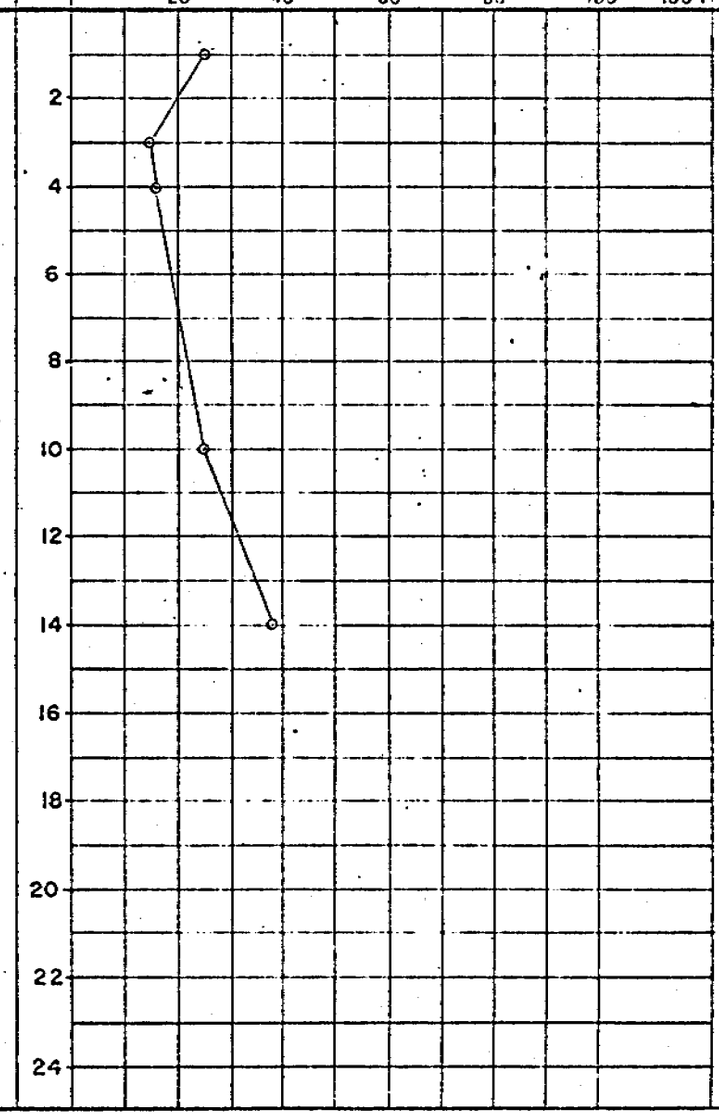
GRAIN-SIZE ANALYSIS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 12/12/72	AIRPHOTO NO:	CHAINAGE: 015+00	OFFSET: L
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
460	C	1005

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT COARSE, FIBROUS	F	
2					ML	SILT SOME CLAY, SANDY		
4					SM	SAND SILTY		
6						SILT SANDY, ODD PEBBLE		
8						SAND		
10					SP	MEDIUM COARSE TO MEDIUM FINE		
12						COBBLES & BOULDERS		
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel
Location	
Hole 460-C-75A	Depth 15'
Technician	Date

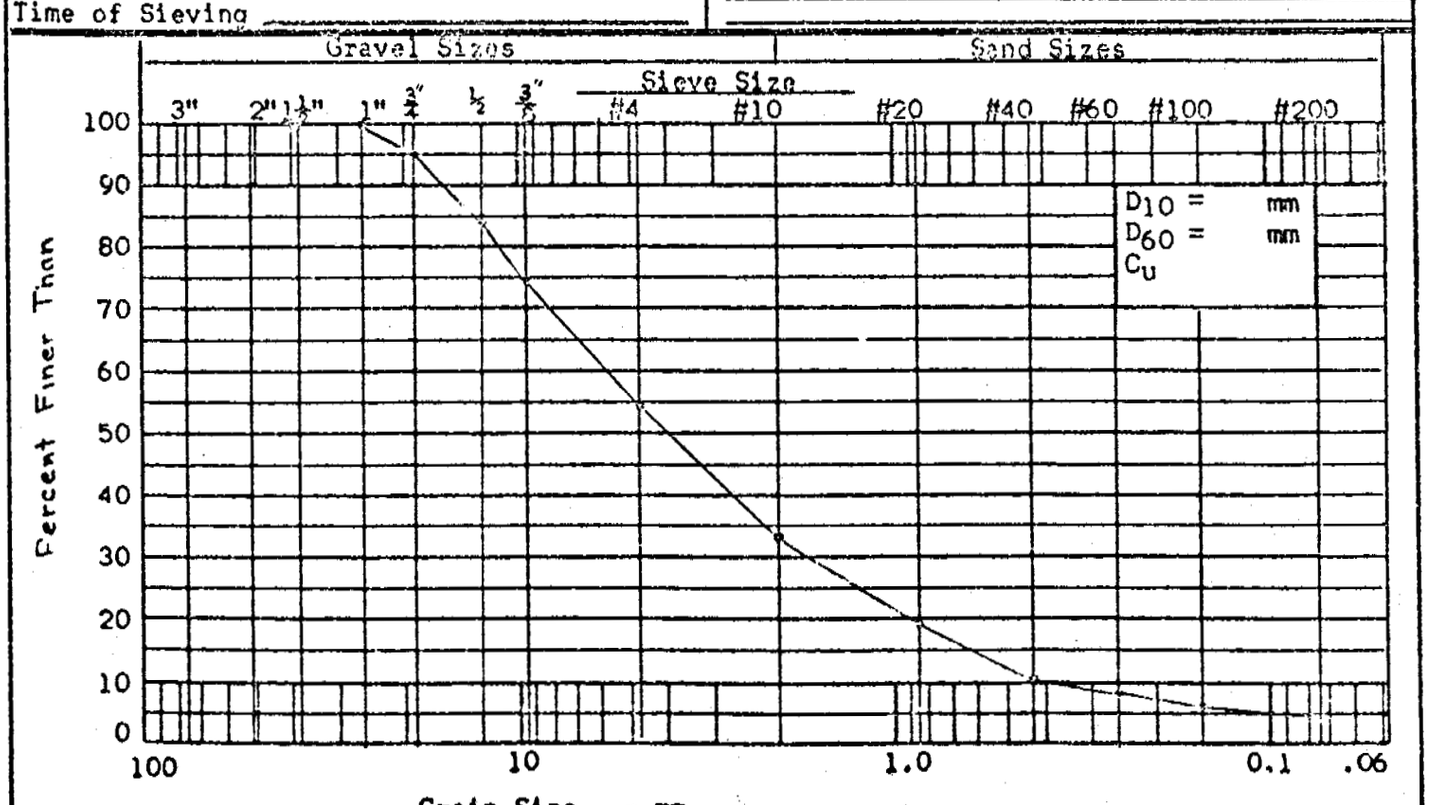
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100%	
Wt. Dry + Tare		3/4	19.10			95.3%	
Tare		1/2	12.70			84.4%	
Wt. Dry		3/8	9.52			74.9%	
	4	.185	4.76			54.7%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			33.8%	
Wt. Dry + Tare	20	.0331	.840			19.6%	
Tare	40	.0165	.420			10.6%	
Wt. Dry	60	.0097	.250			8.4%	
	100	.0059	.149			6.6%	
	200	.0029	.074			4.8%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

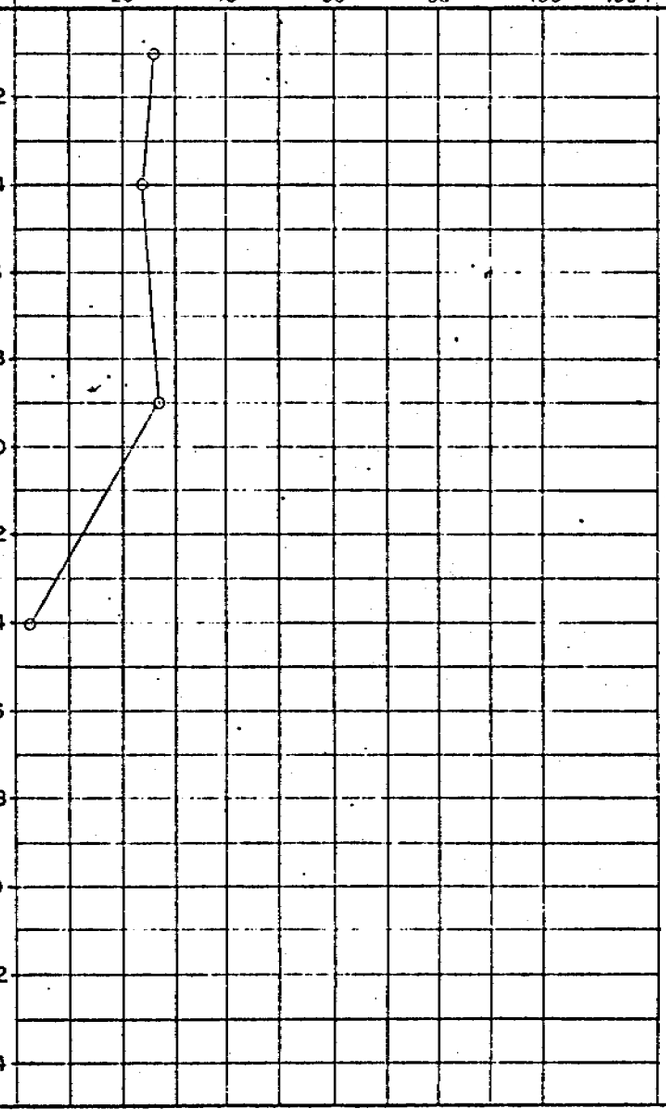
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 6/12/72	AIRPHOTO NO:	CHAINAGE: 925+00	OFFSET:
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
430	C	75A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GC	GRAVEL BOULDERS	UF									
2									2							
					To	HARD SILT & CLAY										
4									4							
6									6							
8					GW	COARSE			8							
10					SP	SAND COARSE, PEBBLES			10							
12									12							
14					GP	GRAVEL COARSE, DRY			14							
16						END OF HOLE			16		5	29	66			
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R S	DATE DRILLED: 6/12/72	AIRPHOTO NO:	CHAINAGE: 935+00	OFFSET: L
CKD: D.G.P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
460	C	74F

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR, MUSKEG	F	Nf								
2									2							
4		P				CLAY BROWN, RANDOM ICE		< 2% EXCESS ICE Vn	4					104.1	72.8	
6					CL				6							
8									8							
10						HARD, SILTY, BROWN ICE CRYSTALS			10							
12								Vx	12							
14					GC	GRAVEL DRY SOME CLAY		Nf	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

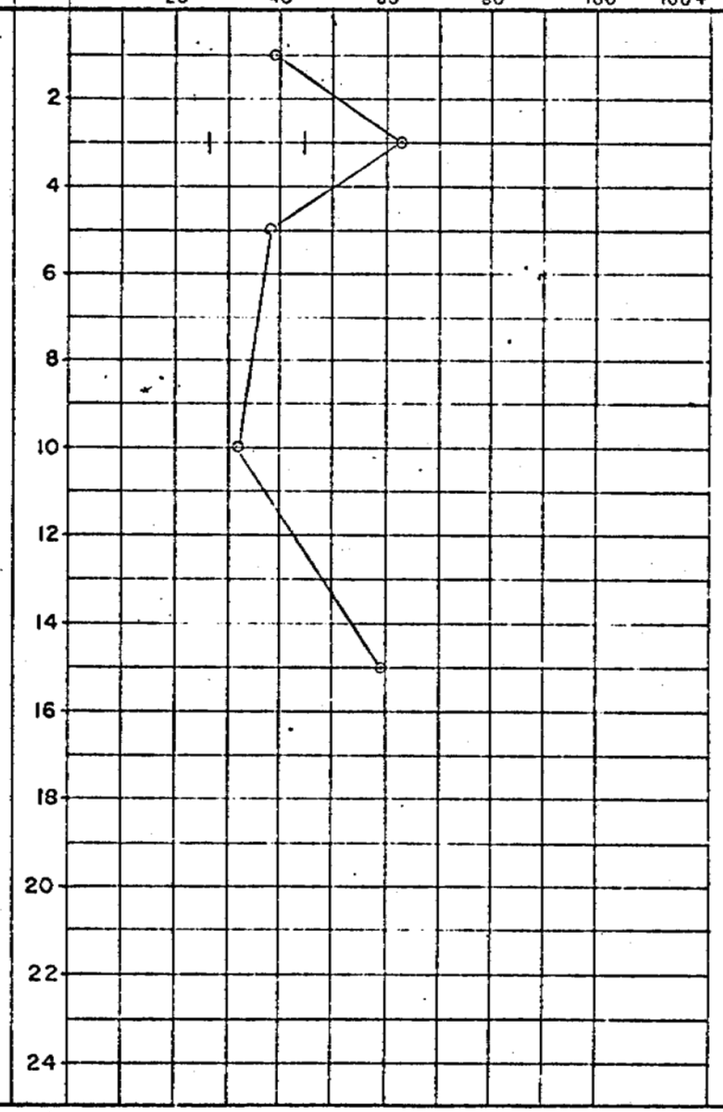
GRAIN-SIZE ANALYSIS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S.	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 945+00	OFFSET: ℄
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
460	C	73 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - GRANULAR MUSKEG	F								
2						CLAY									
		P			CH	HARD, DRY		Vx					21.9	57.9	
4						ICE CRYSTALS									
6					70										
8						SILTY, LIGHT BROWN DRY		Nbn							
10					CL										
12															
14					GC	GRAVEL SOME CLAY		Nbn							
16						END OF HOLE									
18															
20															
22															
24															

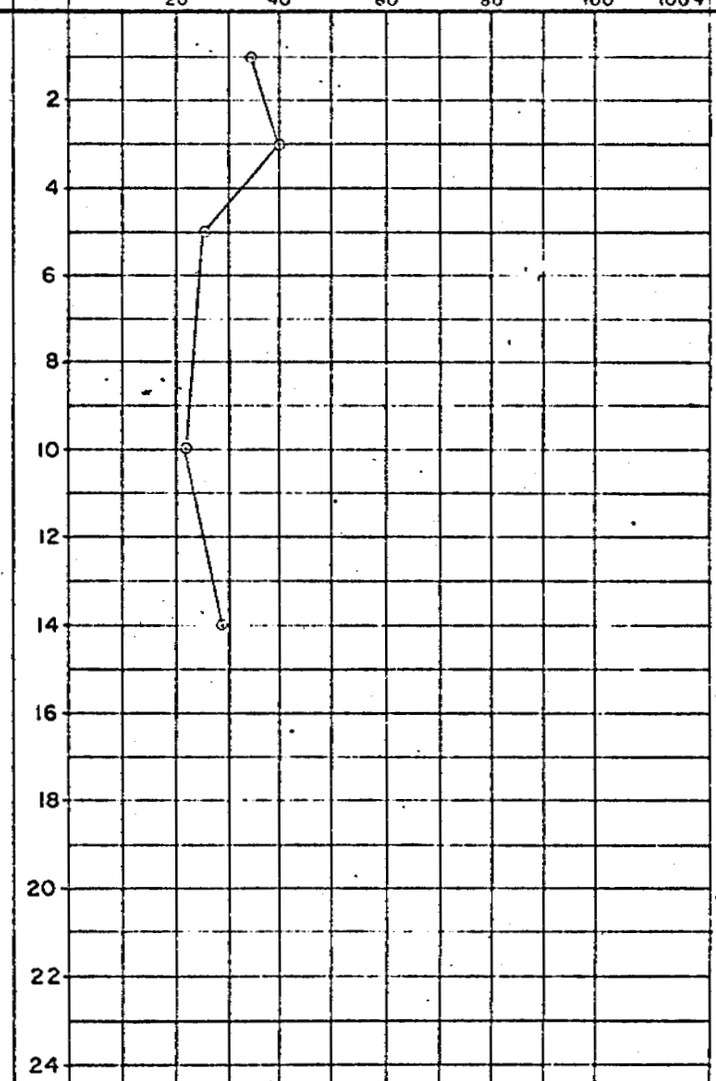


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: P.S	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 955+00	OFFSET: 2
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
461	C	72-A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - COARSE, FIBROUS	F								
2						CLAY		Vr							
		P			CL	LIGHT BROWN, SILTY MIXED WITH MUSKEG									
4															
6						SAND									
8															
10					SM	FINE, SILTY VERY HARD		Nf							
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

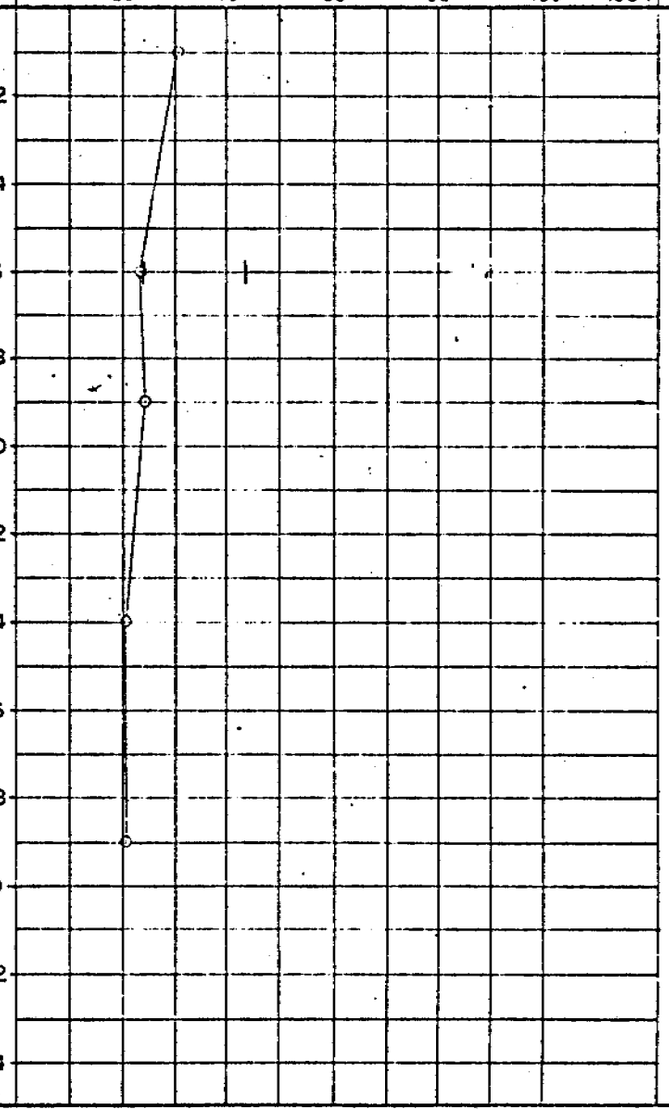


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG RS	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 965+00	OFFSET ℄
CKD DGP	TECH D.M.	RIG AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
461	C	71 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - GRANULAR MUSKEG	-ft	
2						CLAY		Vr
4								
6		P				LIGHT BROWN, SILTY COBBLES		
8					ML			
10								
12								
14						HARD, BROWN FEW PEBBLES		
16								Vr
18								
20								
22						END OF HOLE		
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

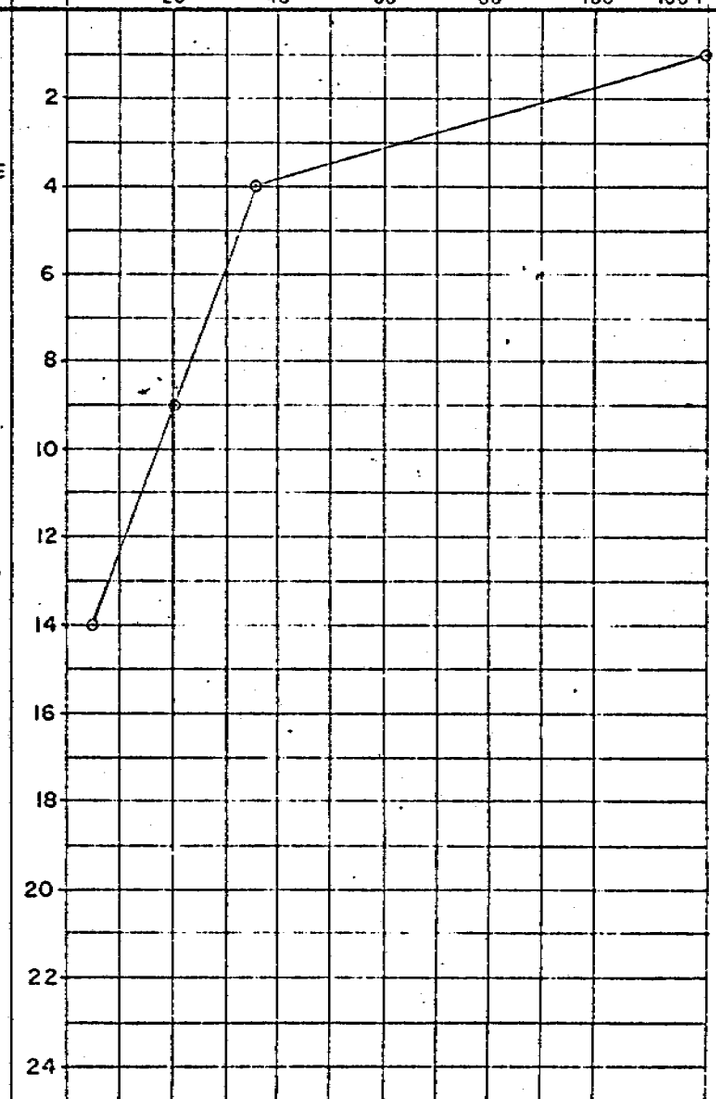
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E W	FIELD ENG: B.M.	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: 970+00	OFFSET
CKD D G P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
461	C	53B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
		P			Pt	PEAT ORGANIC ICE CRYSTALS	F	Vr
2								
4		P			CL	CLAY SILTY, GRAVEL ICE CRYSTALS		<5 % EXCESS ICE
6								
8								
10								Vr
12					GP	GRAVEL LITTLE CLAY		
14								Nbn
16						END OF HOLE		
18								
20								
22								
24								



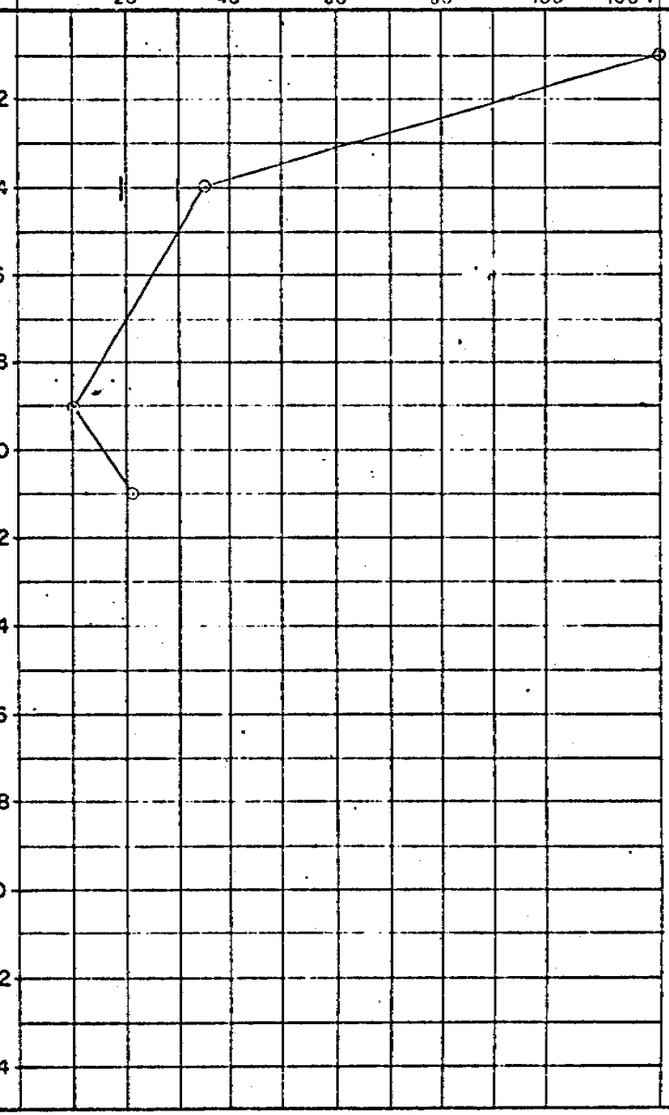
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 6/12/72	AIRPHOTO NO:	CHAINAGE: 980+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
461	C	575

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
		P			Pt	PEAT ORGANIC	F								
2						CLAY									
4		P													
6						ICE CRYSTALS									
8					CL			Vn							
10						LITTLE GRAVEL									
12															
14								Nbn							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 12/1/73	AIRPHOTO NO:	CHAINAGE: 986+00	OFFSET 10' W OF ℄
CKD D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV

TEST HOLE

MILE	S.C.S	NUMBER
461	S	1973

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR, MUSKEG	F								
2		T			CL	CLAY BROWN, CLUMPY									
4		T				EXCESS ICE							113.0	85.9	
6					SC	SAND EXCESS ICE									
8															
10		T													
12															
14		T				HARDER							111.2	87.5	
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

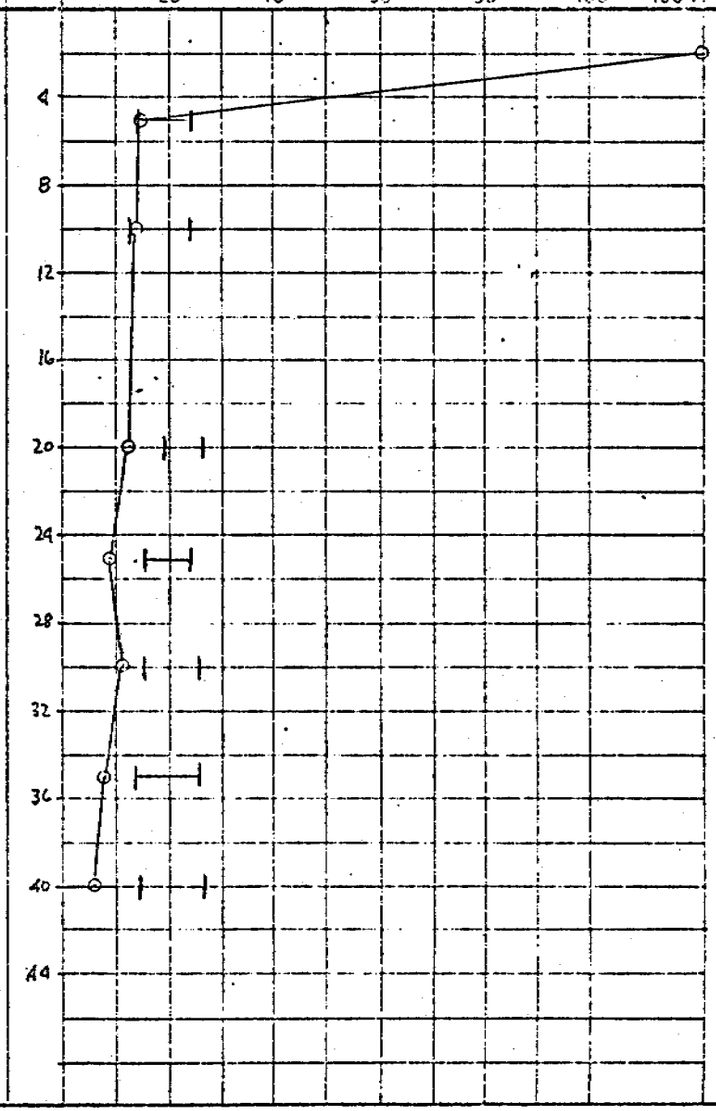
PLASTIC LIMIT — LIQUID LIMIT
20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 13/1/73	AIRPHOTO NO:	CHAINAGE: 9+93.43	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: E → W	VEGETATION: WILLOWS, CONIFER TO 20' ELEV.	

TEST HOLE		
MILE	B,C,S	NUMBER
461	S	135F

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR MUSKEG	F								
4						TILL									
8						BROWN CLAY, SOME ISOLATED ROCKS AND COBBLES		Vr							
12		P													
16															
20		P						ICE LENSES TO 1/4"							
24						COARSE GRAVEL AND COBBLES									
28															
32								Vr							
36						SOME SMALL ROCKS IN CLAY									
40															
44						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel
Location	
Hole 461-S-122A	Depth 5'
Technician	Date Jan.11/73

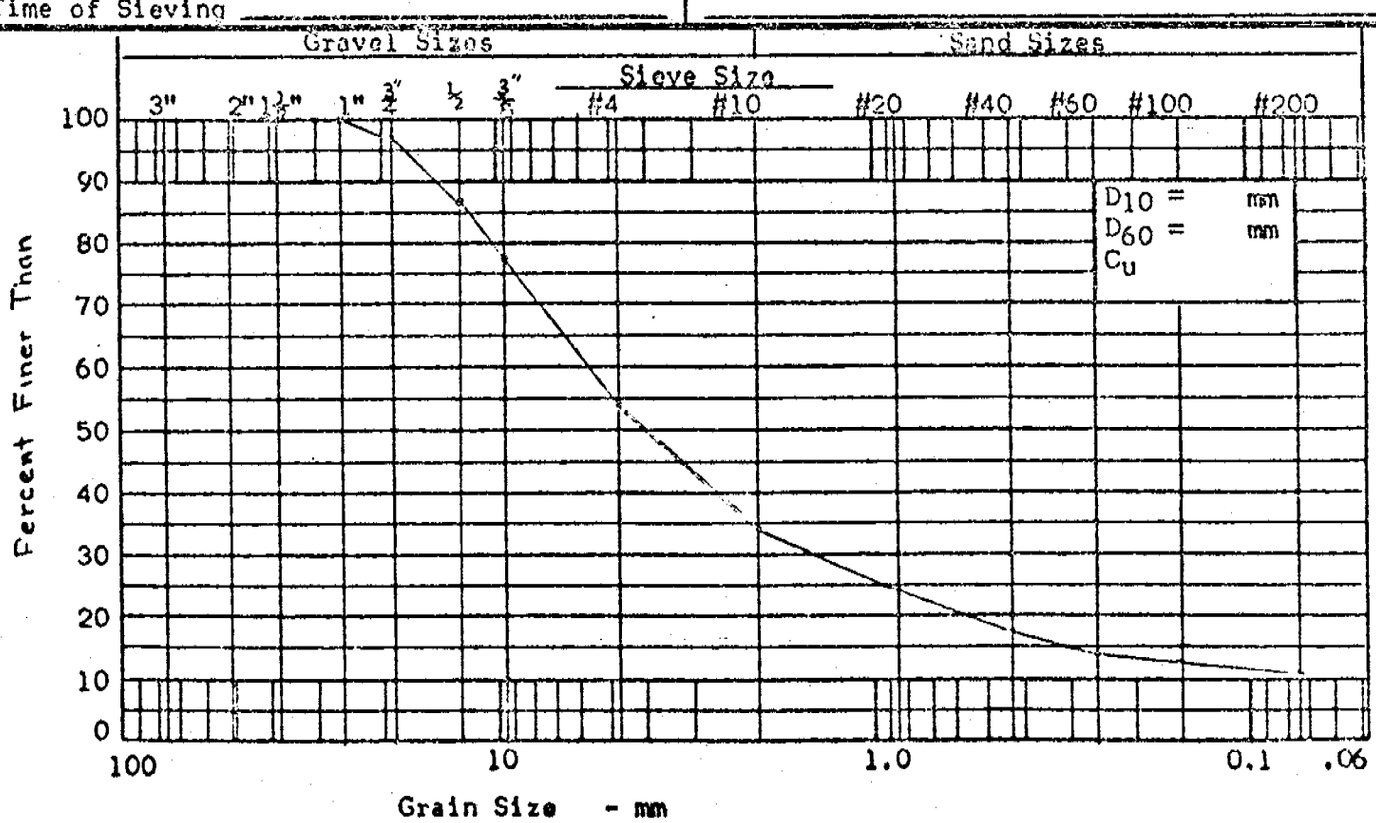
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			97.2	
Tare		1/2	12.70			86.8	
Wt. Dry		3/8	9.52			77.7	
	4	.185	4.76			54.5	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			34.2	
Tare No.	20	.0331	.840			24.1	
Wt. Dry + Tare	40	.0165	.420			17.2	
Tare	60	.0097	.250			14.1	
Wt. Dry	100	.0059	.149			12.3	
	200	.0029	.074			10.5	
Passing	200					0	

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



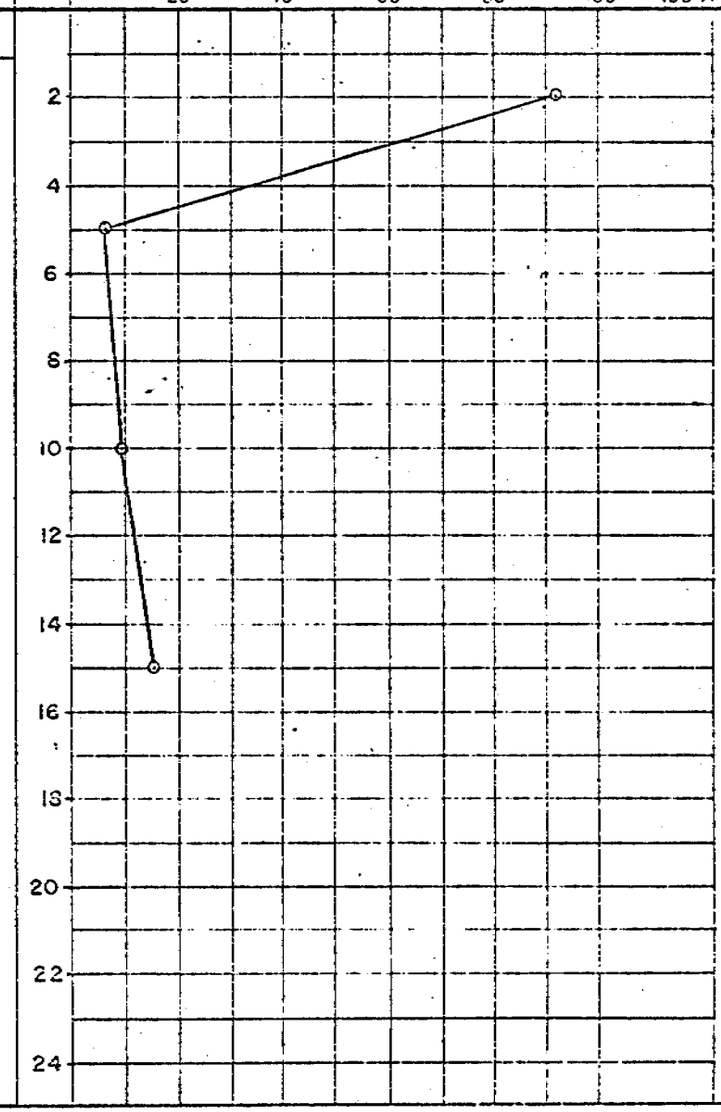
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: T.S.	DATE DRILLED: 8/1/73	AIRPHOTO NO:	CHAINAGE: 989+50	OFFSET: ℄
CKD: DGP	TECH: DM	RIG: AIR	SURFACE DRAINAGE: E-W CREEK BED	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
461	S	122 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					CL	CLAY BROWN	F								
2							UF								
						GRAVEL									
4															
6					GP	SANDY, WET			11		23	66			
8															
10									11		39	50			
12															
14					SM	SAND SILTY, WET			17		61	22			
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy, Gravel
Location	
Hole 461-S-122A	Depth 5'
Technician	Date 11/1/73

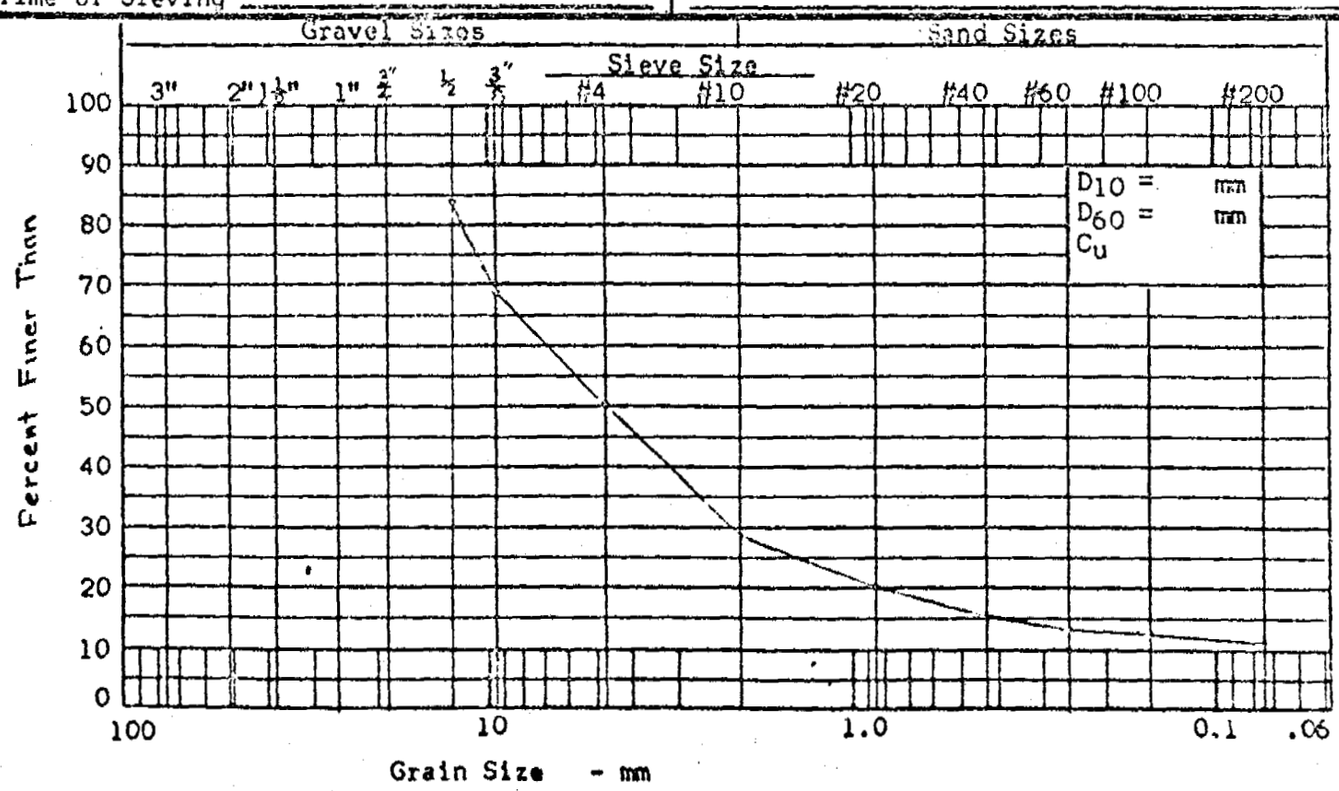
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			84.1	
Wt. Dry		3/8	9.52			68.8	
	4	.185	4.76			50.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			28.8	
Wt. Dry + Tare	20	.0331	.840			20.0	
Tare	40	.0165	.420			15.3	
Wt. Dry	60	.0097	.250			13.5	
	100	.0059	.149			12.4	
	200	.0029	.074			11.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy, Gravel
Location	
Hole	461-S-122A Depth 10'
Technician	Date 26/1/73

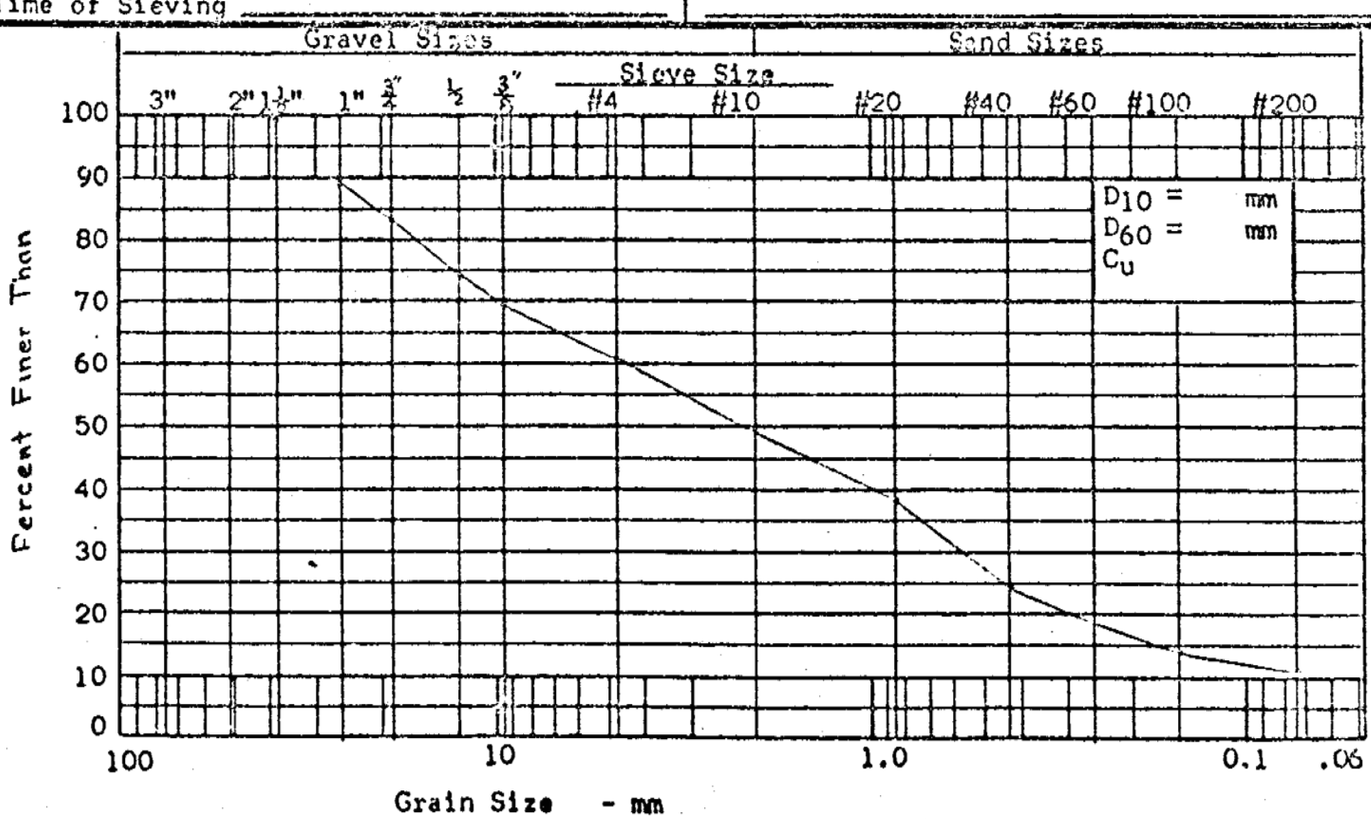
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			89.2	
Wt. Dry + Tare		3/4	19.10			83.2	
Tare		1/2	12.70			74.9	
Wt. Dry		3/8	9.52			69.5	
	4	.185	4.76			61.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			49.9	
Tare No.	20	.0331	.840			38.3	
Wt. Dry + Tare	40	.0165	.420			24.5	
Tare	60	.0097	.250			18.3	
Wt. Dry	100	.0059	.149			14.4	
	200	.0029	.074			11.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty Sand
Location	
Hole 461-S-122A	Depth 15'
Technician	Date 26/1/73

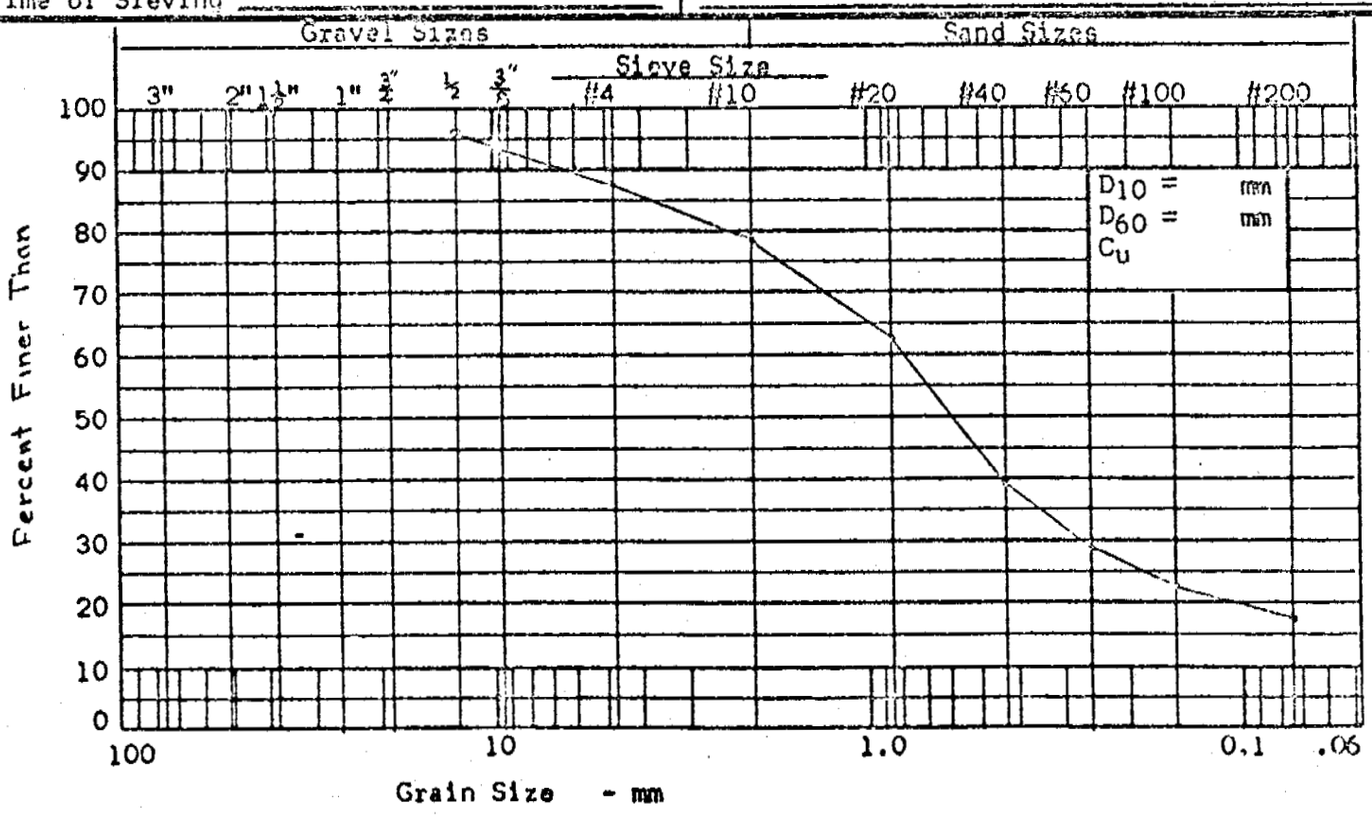
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			96.3	
Wt. Dry		3/8	9.52			93.1	
	4	.185	4.76			87.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			78.0	
Tare No.	20	.0331	.840			62.5	
Wt. Dry + Tare	40	.0165	.420			39.8	
Tare	60	.0097	.250			29.0	
Wt. Dry	100	.0059	.149			22.4	
	200	.0029	.074			17.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy, silty gravel
Location	
Hole 461-S-121A	Depth 20'
Technician	Date Jan30/73

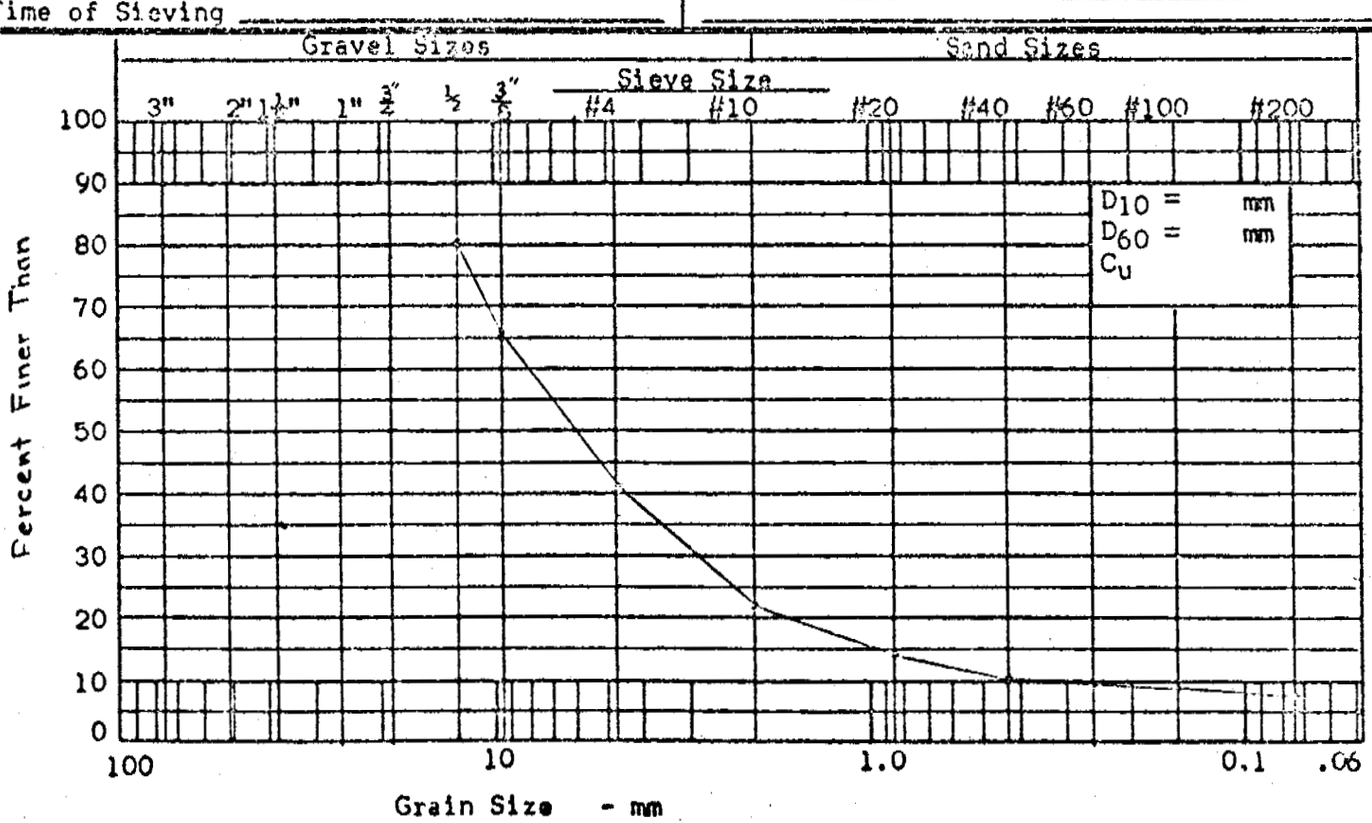
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			80.3	
Wt. Dry		3/8	9.52			65.6	
	4	.185	4.76			41.4	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			21.9	
Tare No.	20	.0331	.840			13.6	
Wt. Dry + Tare	40	.0165	.420			10.6	
Tare	60	.0097	.250			9.7	
Wt. Dry	100	.0059	.149			9.0	
	200	.0029	.074			7.5	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

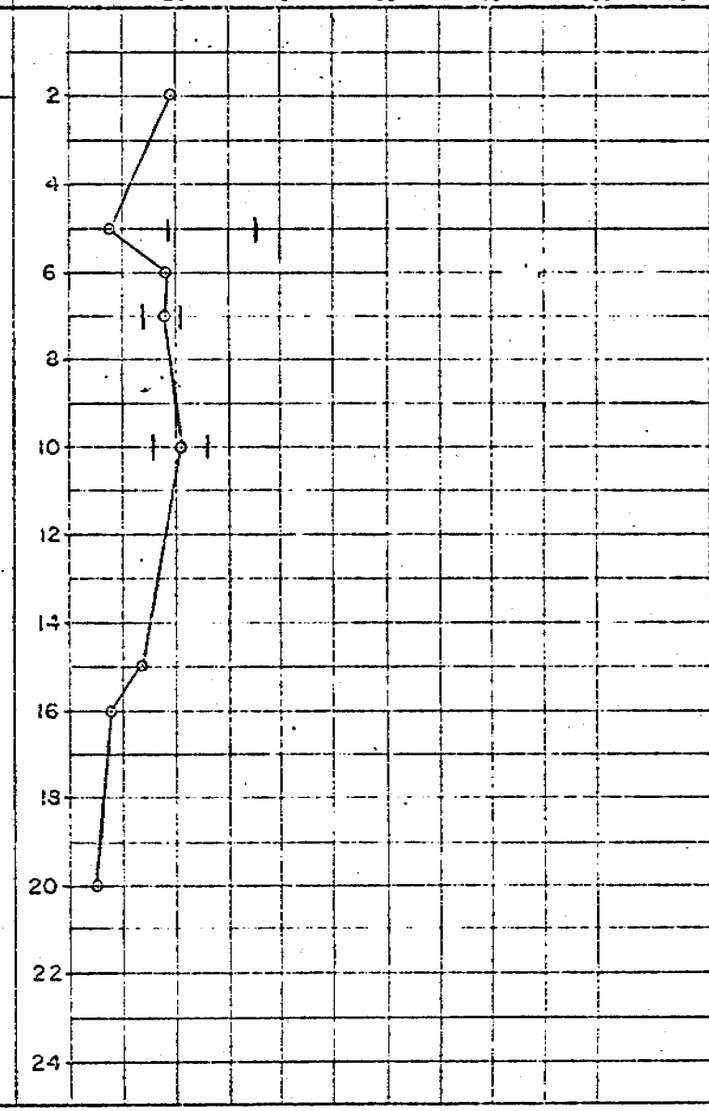
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 6/1/73	AIRPHOTO NO:	CHAINAGE: 992+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
461	S	121A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						CLAY	F								
4						SILTY, SOME SAND	UF								
6		T		27 BLS	CL										
		P													
8		P													
10						CLAYEY, TILL LIKE									
12															
14															
16		T				GRAVEL			19		40	41			
18					GP	SANDY, COARSE SILTY									
20									8		14	68			
22						END OF HOLE									
24															

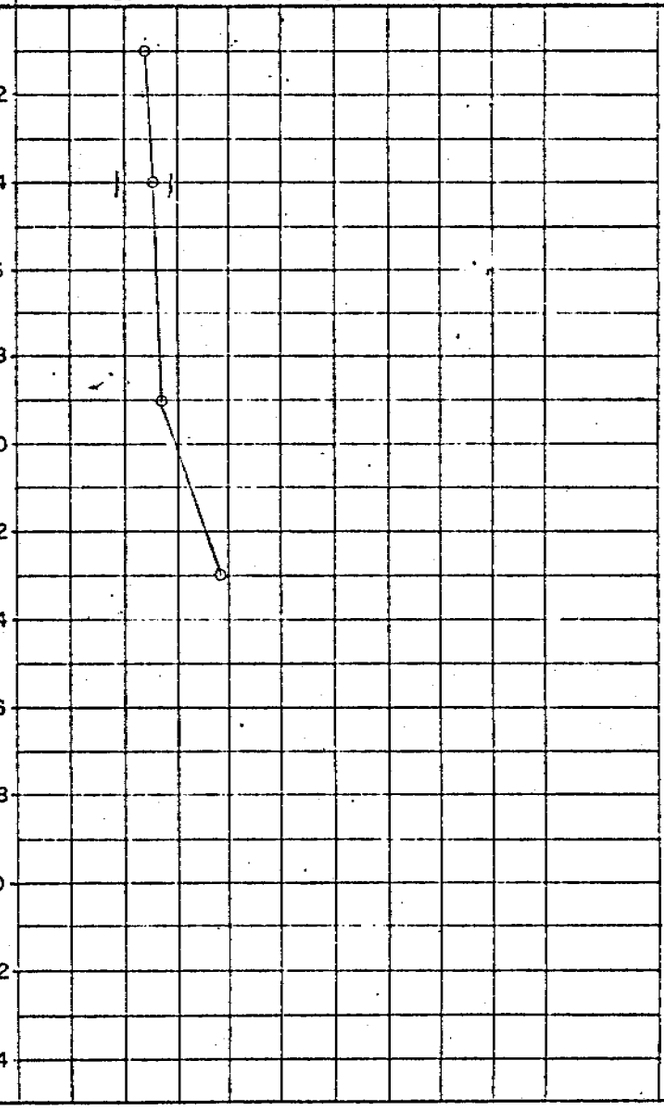


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 6/12/72	AIRPHOTO NO:	CHAINAGE: 1000+00	OFFSET:
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
461	C	565

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						CLAY	F		2							
4		P			CL	ICE CRYSTALS			4							
6								Vr	6							
8								< 2% EXCESS ICE	8							
10		P							10							
12					GP	GRAVEL SANDY		Nf	12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



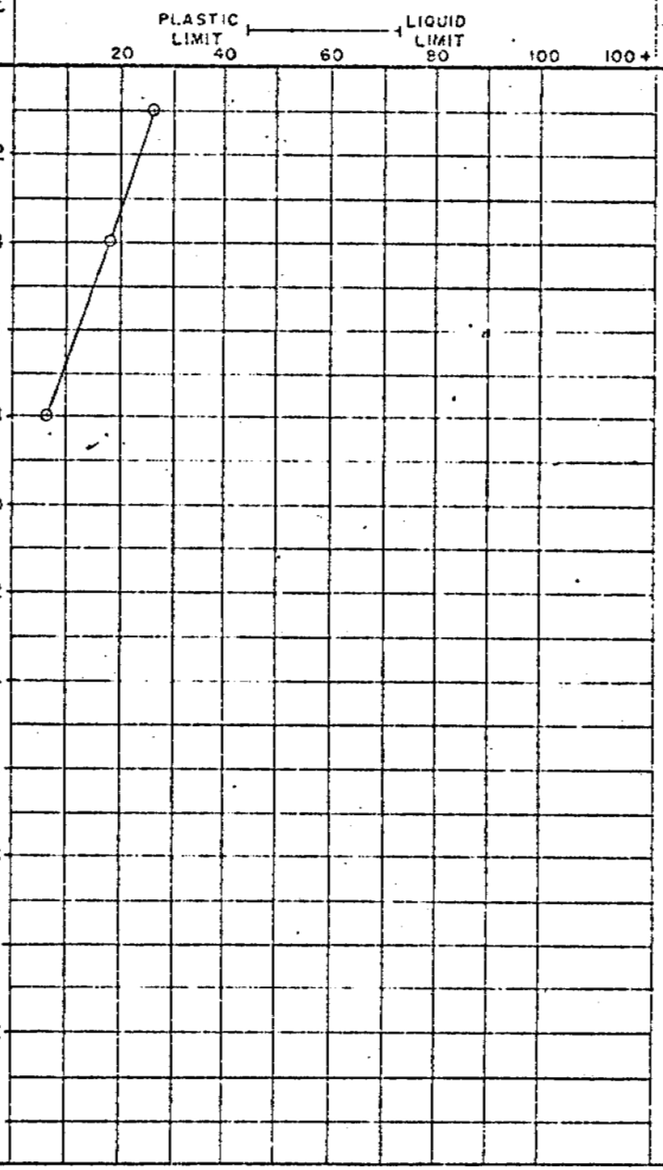
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG B.M.	DATE DRILLED 6/12/72	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET 1
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 35'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
162	C	553

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC	F	
2		P				CLAY		≤5% EXCESS ICE
4					CL	ICE CRYSTALS		Vr
		P						
6								
8						GRAVEL		
					GM	SANDY; FINE CLAY		Nbn
10								
12						END OF HOLE		
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

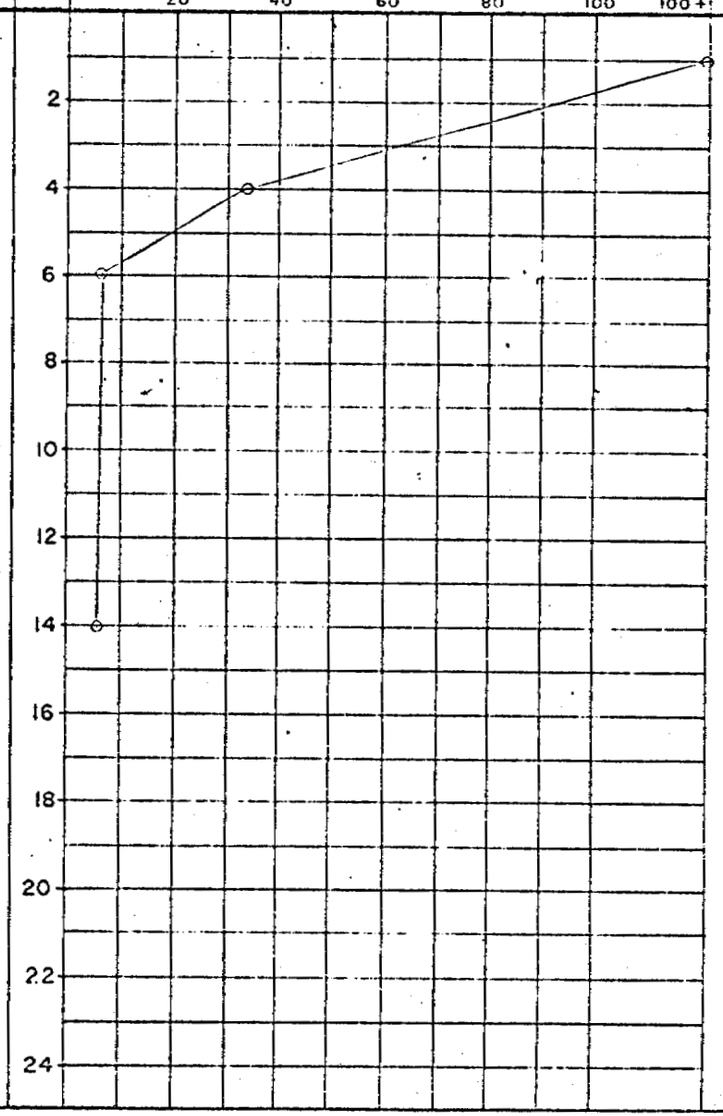
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1020+200	OFFSET: 1
CKD: D G P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
462	C	54 3

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	TT								
2		P			ML	CLAY SILTY, ICE CRYSTALS		Vr							
4		P													
6						GRAVEL									
8						CLAY, SMALL									
10					GC										
12						SAND									
14		P						Nbn							
16						END OF HOLE									
18															
20															
22															
24															



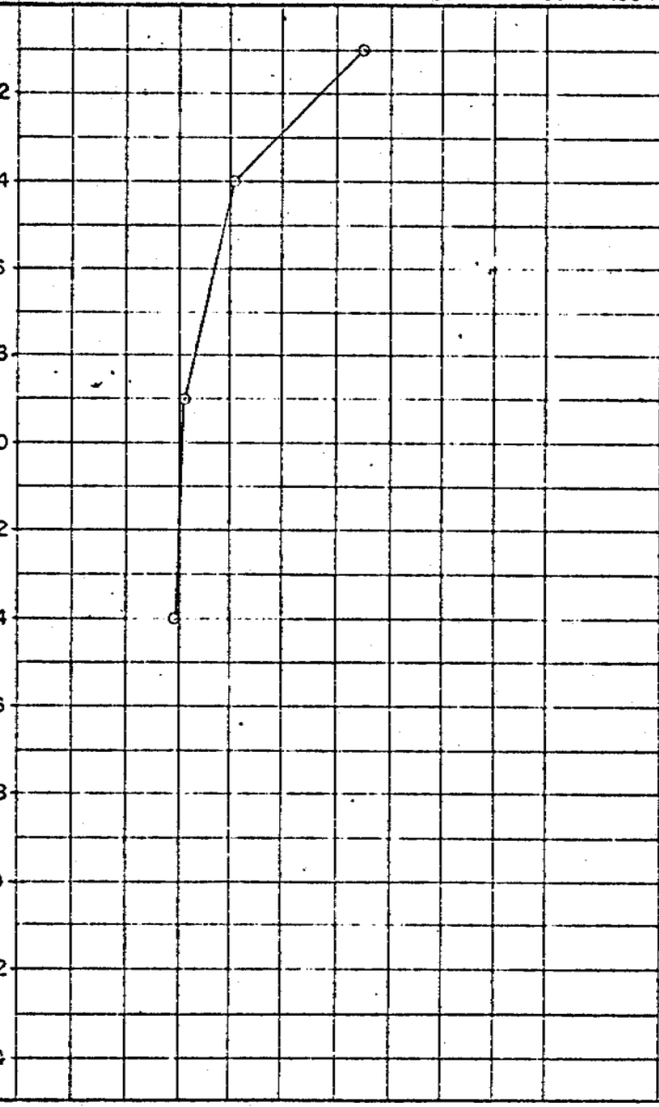
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG. B.M.	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1030+00	OFFSET:
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
462	C	53-5

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - GRANULAR	F									
2		P			CH	CLAY		Vr	2							
4		P							4							
6					To	SANDY ICE CRYSTALS		< 5% EXCESS ICE	6							
8									8							
10		P							10							
12								Nbn	12							
14		P			CL			Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



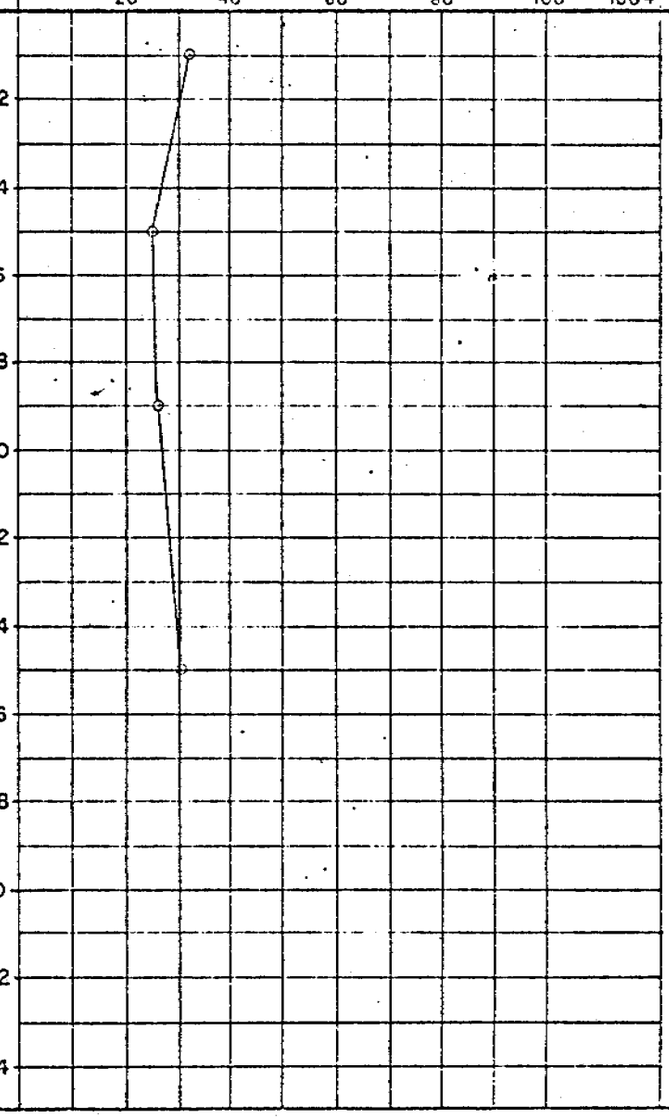
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG. B.M.	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1040+00	OFFSET: ℄
CKD DGP	TECH DM	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
462	C	528

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - GRANULAR MUSKEG	F	Vr							
2					CL	CLAY									
4															
6		P				SILT									
8								Vr							
10					ML	FINE SAND, CLAY									
12															
14															
16		P				ROCKS		Nbn							
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

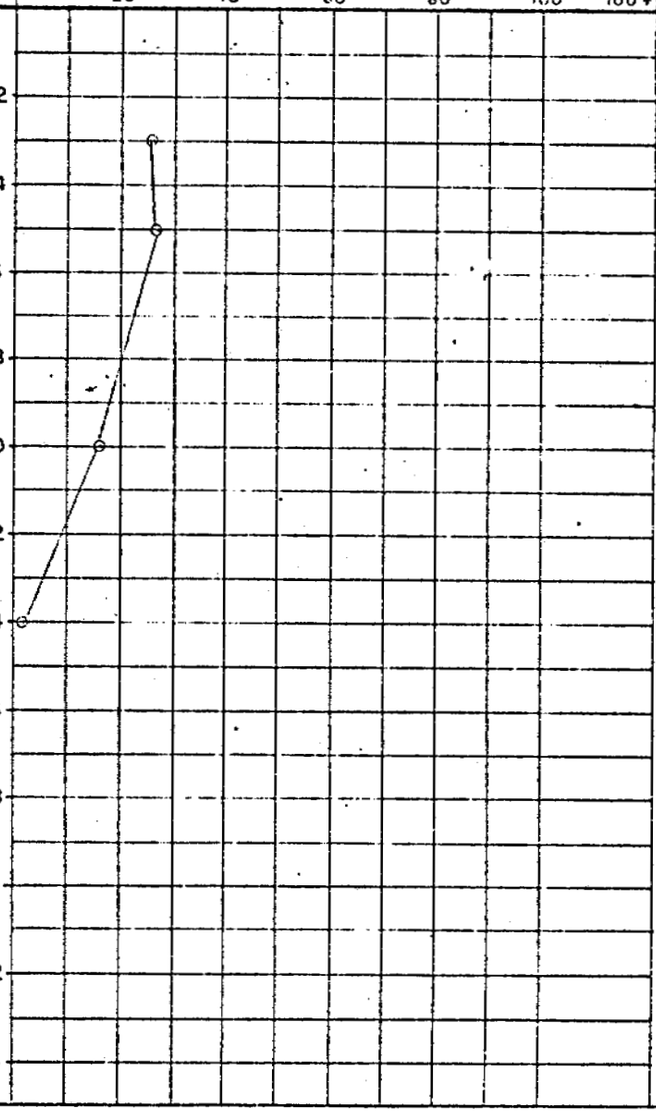
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1150+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
462	C	55

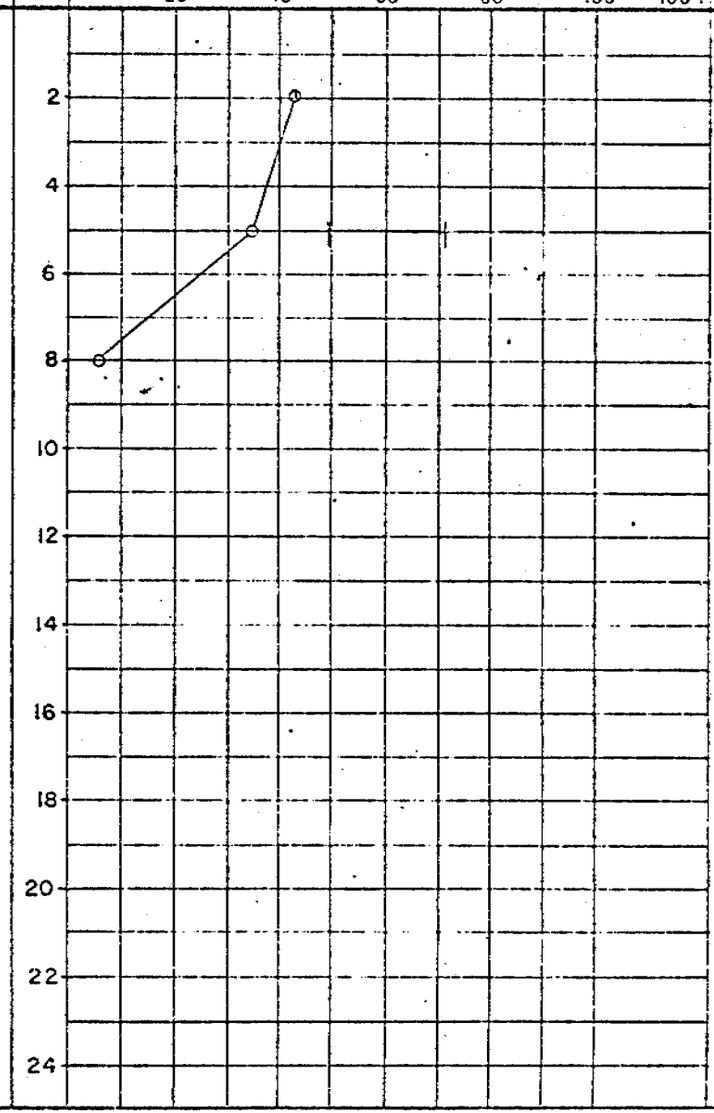
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR, MUSKEG	F									
2						SILT		Vx	2							
4						SANDY SOME EXCESS ICE			4							
6		P			SM				6							
8								<2% EXCESS ICE	8						84.2	
10		P				LOW ICE CONTENT		Vc	10							
12					GP	GRAVEL		Nf	12							
14					SP	SAND		Nf	14							
16									16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1030+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER	ELEV	MILE: 463 B,C,S: C NUMBER: 7:A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F	Nf							
2															
4					CH	CLAY ICE LENSES		Vr							
6		T											101.5	64.1	
8						GRAVEL		Nf							
10					SP	SILTY, SANDY SOME ROCKS									
12															
14								Nf							
16						END OF HOLE									
18															
20															
22															
24															



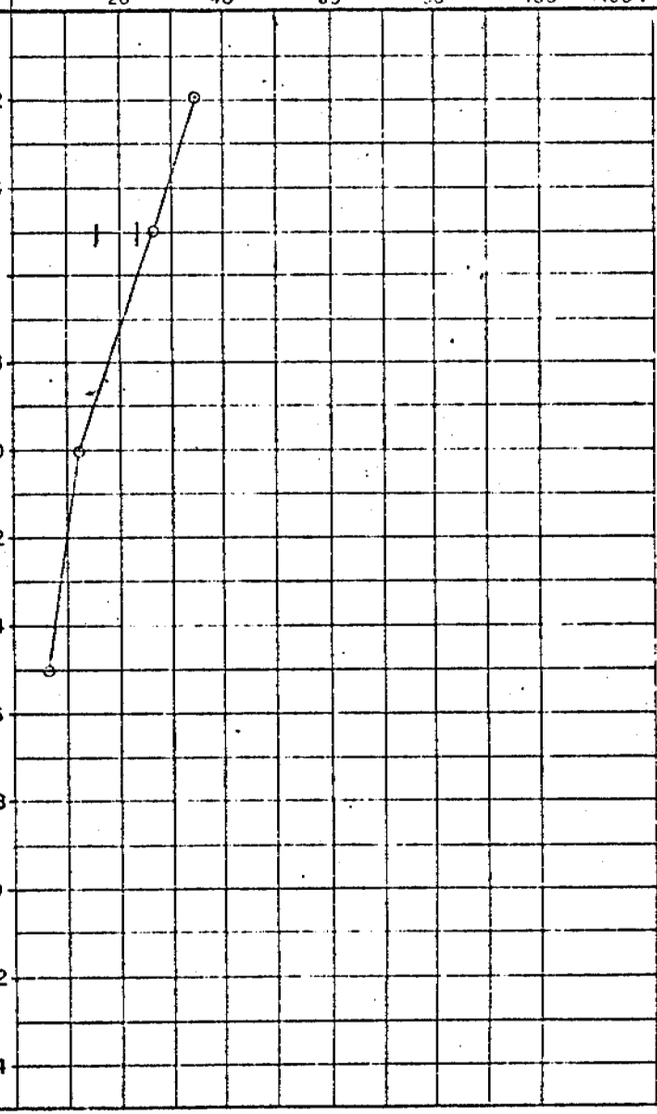
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG: T.S	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET ℄
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER & POPLAR	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
463	C	5-A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F	Vr							
2															
4					CL	SANDY									
5		T						<2% EXCESS ICE					117.0	99.1	
6															
8								Vr							
					SW	GRAVEL									
10															
					GP	SANDY, FINE		Nf							
12															
14					GW	CLAY & SILT ROCKY		Nbr							
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG T.S	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE 1038400	OFFSET –
CKD D.G.P	TECH D.M.	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER & BORDER	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
463	C	63A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GP	GRAVEL SANDY	F	Vh									
2									2								
						SILT											
4					ML	CLAY, TRACE OF SAND			4								
6									6								
8		T				CLAY			8								
10					CL	BROWN, SANDY			10								
12									12								
14								Vh	14								
16		P							16							102.4	
18						END OF HOLE			18								
20									20								
22									22								
24									24								

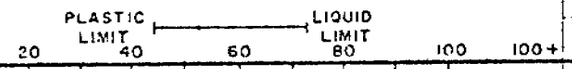
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1090+00	OFFSET:
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & WILLOW	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
463	C	503

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	DENT - GRANULAR MUSKEG	F									
						CLAY										
2						SANDY		Vx	2							
					CL											
4		P							4							
6					To				6							
8						EXCESS ICE			8						34.0	
						ICE LENSES TO 1/2"		< 5% EXCESS ICE								
10		P							10							
12					CH			Vx	12							
14		P							14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

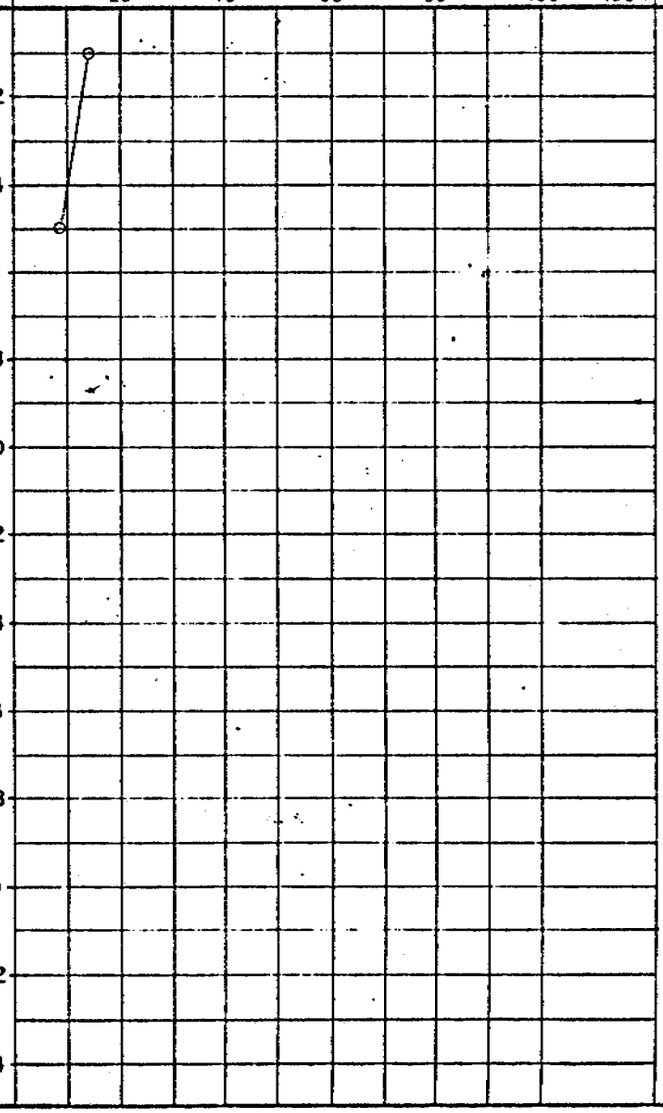


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: B.M	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1105+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
463	C	48.B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - GRANULAR MUSKEG	F	Nbn
2					SP	SAND: SOME GRAVEL		
4						GRAVEL		
6					GP	DARK BROWN SOME SAND		
8								Nbn
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								



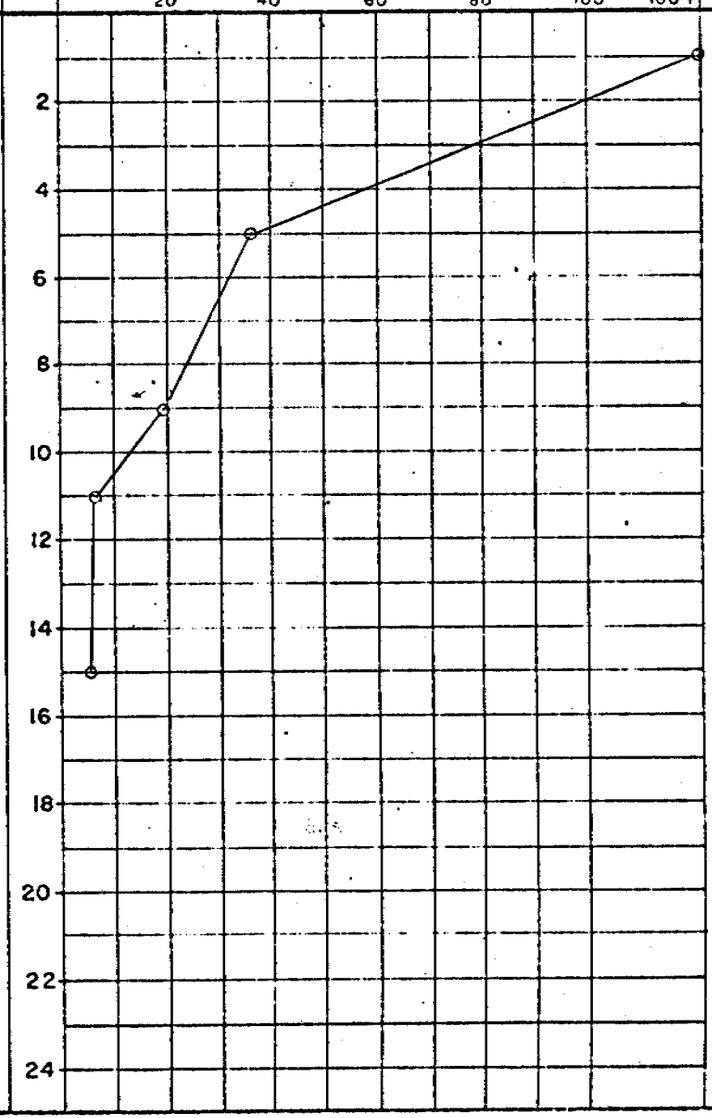
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1435+00	OFFSET 2
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: E TO W	VEGETATION: STUNTED CONIFERS	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
464	C	67A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F									
2					CL	CLAY SILTY										
4																
6																
8					GM	GRAVEL										
10					To	SILTY, SANDY										
12																
14					GP	FINE										
16						END OF HOLE										
18																
20																
22																
24																

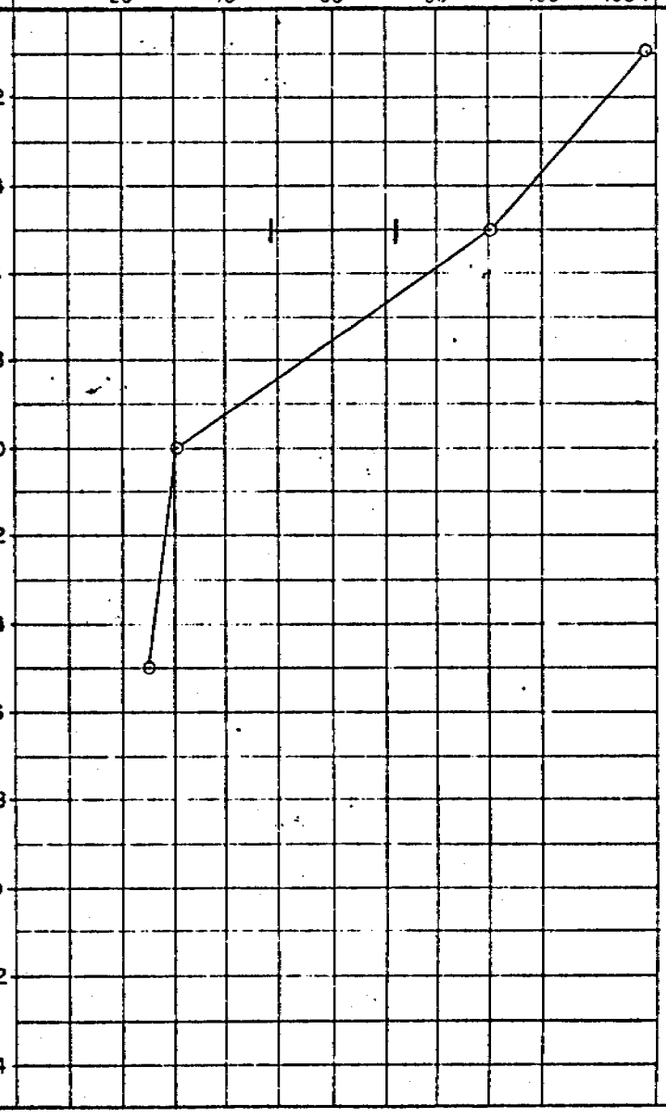


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 15/12/72	AIRPHOTO NO:	CHAINAGE: 1425+00	OFFSET ℄
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: E TO W	VEGETATION: CONIFER TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
464	C	66A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F	Vr								
2						CLAY			2							
4						LIGHT BROWN			4							
6		T				ICE CRYSTALS 1/4"		< 5% EXCESS ICE	6					89.1	52.5	
8					CL			Vr	8							
10						SILTY			10							
12									12							
14						LIGHT BROWN SANDY, SILTY		Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

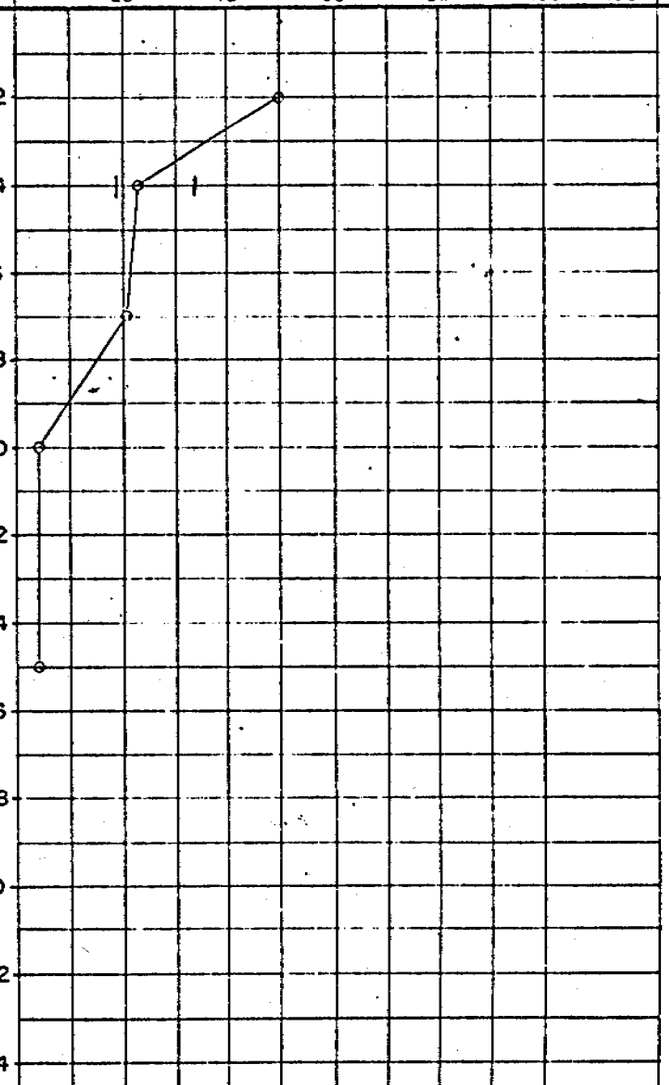


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W.	FIELD ENG T.S.	DATE DRILLED 15/12/72	AIRPHOTO NO:	CHAINAGE: 1415700	OFFSET: ℄
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: E TO W	VEGETATION: STUNTED CONIFER	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
464	C	65A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F	Nf							
2					Pt	SILT									
4		P			To	PEAT & CLAY MIXTURE		< 2% EXCESS ICE						101.8	
6					OL	ICE LENSES TO 1/16"		Vr							
8						GRAVEL									
10					GM	SILTY, FINE SANDY									
12															
14						COARSE		Nf							
16						END OF HOLE									
18															
20															
22															
24															



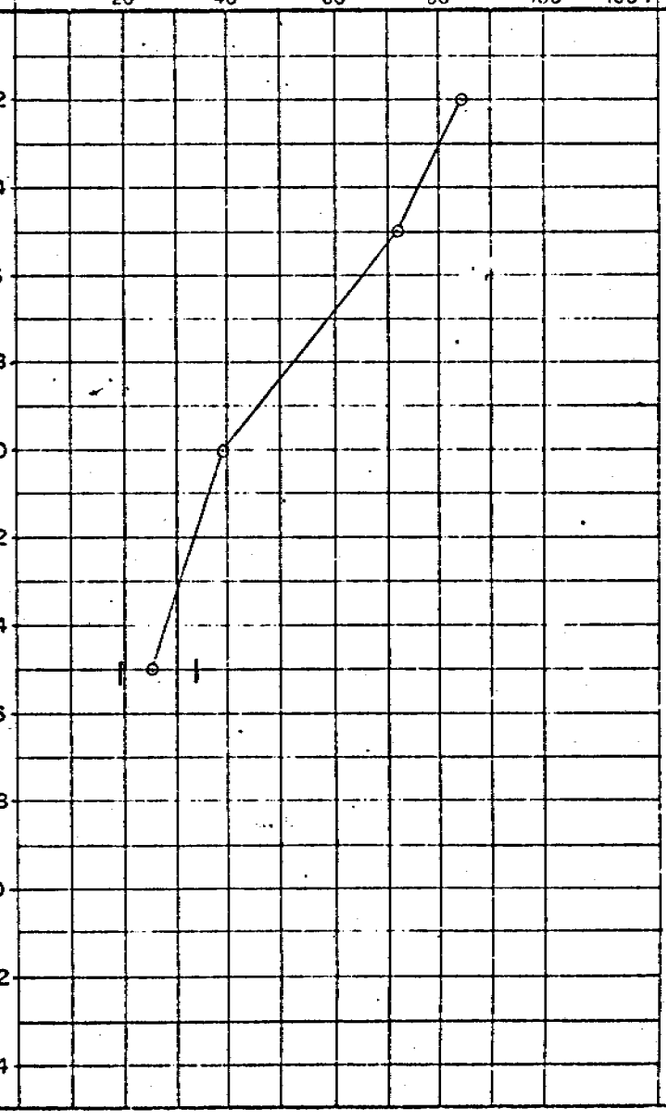
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1405+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: E TO W	VEGETATION: CONIFER TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
464	C	64A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT	F	Vr			
2						CLAY					
4											
6						ICE LENSES 1/16"				57.1	
8					CL	BROWN		Vr			
10											
12											
14		P				ICE LENSES 1/16" - 1/4"		Vr <5% EXCESS ICE		85.2	
16						END OF HOLE					
18											
20											
22											
24											



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %	

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Sand
Location
Hole 464-C-63A Depth 14'-15'
Technician Date Dec.5/72

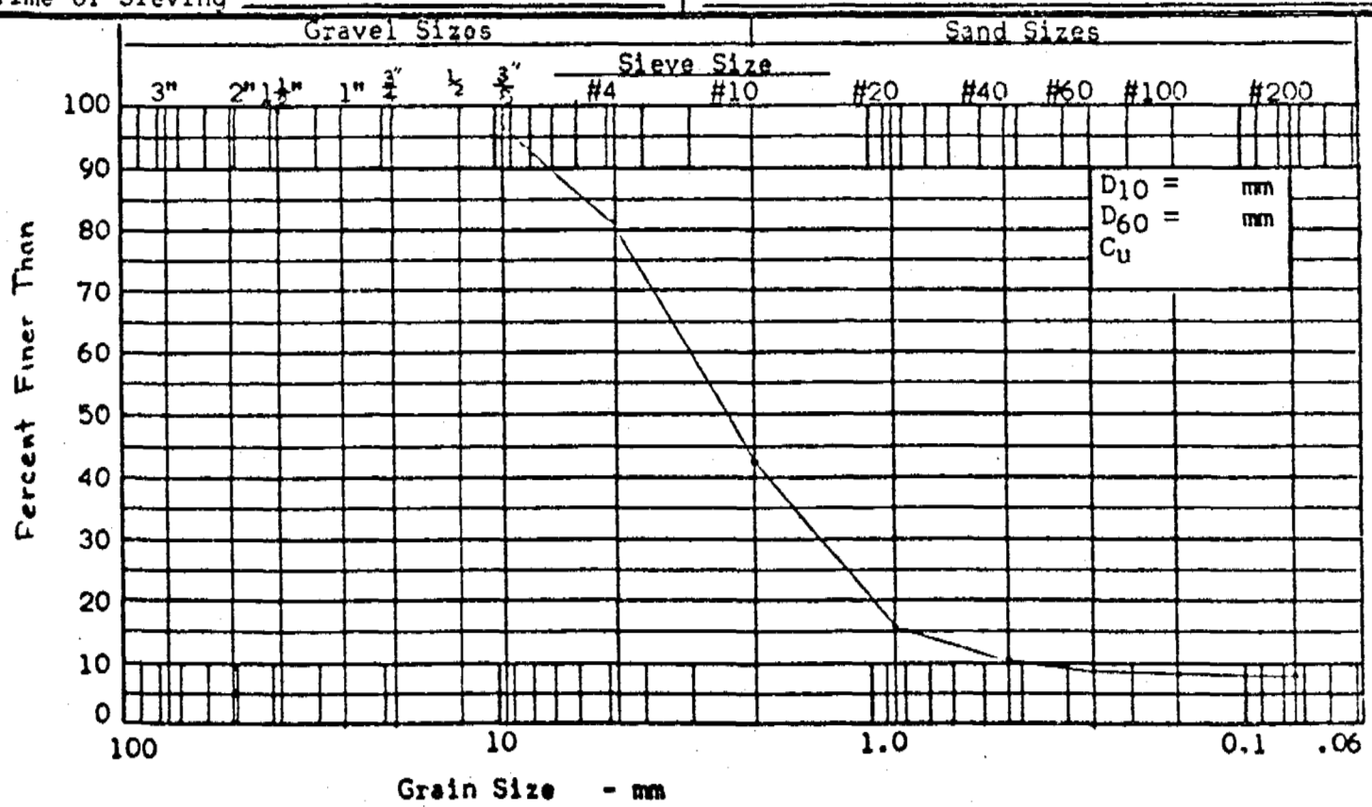
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			96.7%	
	4	.185	4.76			81.6%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			42.7%	
Wt. Dry + Tare	20	.0331	.840			15.8%	
Tare	40	.0165	.420			10.4%	
Wt. Dry	60	.0097	.250			9.3%	
	100	.0059	.149			8.8%	
	200	.0029	.074			8.3%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



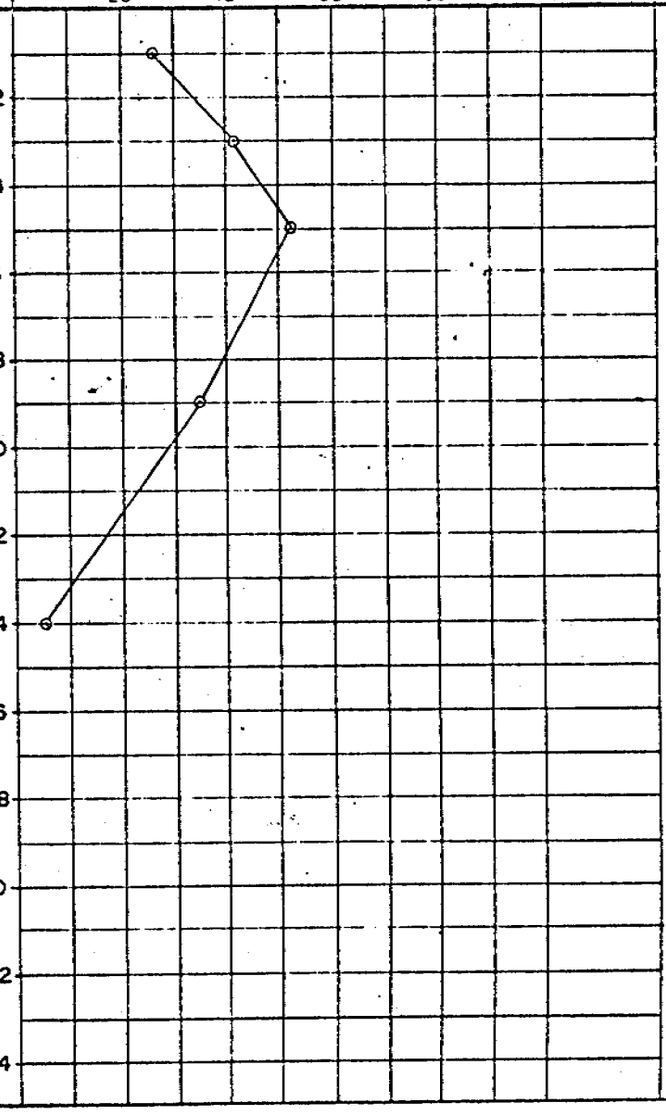
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R S	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1395+00	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION:	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
464	C	63A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - MUSKEG	F									
					CL	CLAY.		Vr								
2		P				LIGHT & DARK LAYERS			2							
4						ICE LENSES		< 2% EXCESS ICE	4							
6		P.			CH				6							
8									8							
10						LIGHT BROWN, SILTY SANDY			10							
					CL											
12						SAND			12							
14					SC	SOME CLAY, SILTY WET		Vr	14		9	35	56			
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

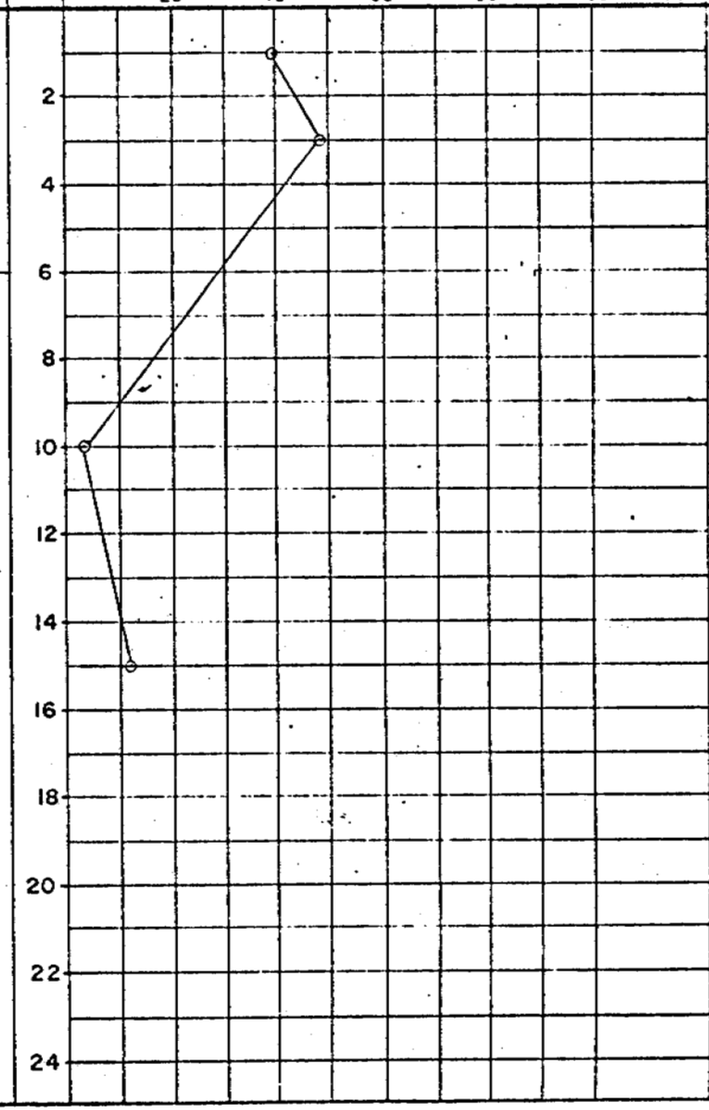


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1385+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
465	C	62A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR	F								
2					OL	SILT BROWN TRACES OF GRANULAR PEAT		Nf							
4		T											120.4	96.6	
6							UF								
8					GP	GRAVEL VERY COARSE SILTY									
10															
12															
14					GM										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 465-C-61A Depth 2'-5'
Technician Date Dec. 5/72

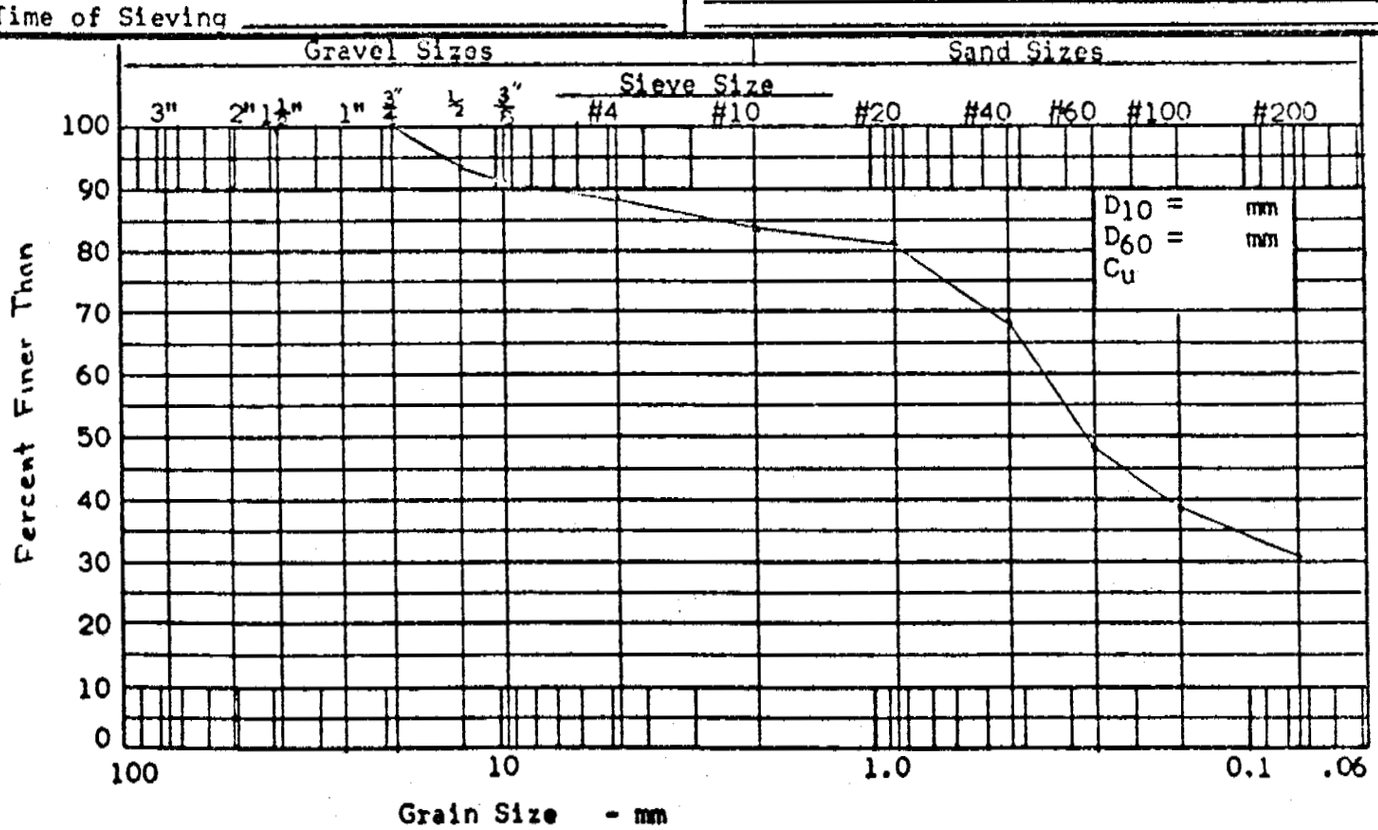
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			93%	
Wt. Dry		3/8	9.52			90.2%	
	4	.185	4.76			88.4%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			84.7%	
Wt. Dry + Tare	20	.0331	.840			81.1%	
Tare	40	.0165	.420			68.9%	
Wt. Dry	60	.0097	.250			48.5%	
	100	.0059	.149			39%	
	200	.0029	.074			30.3%	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



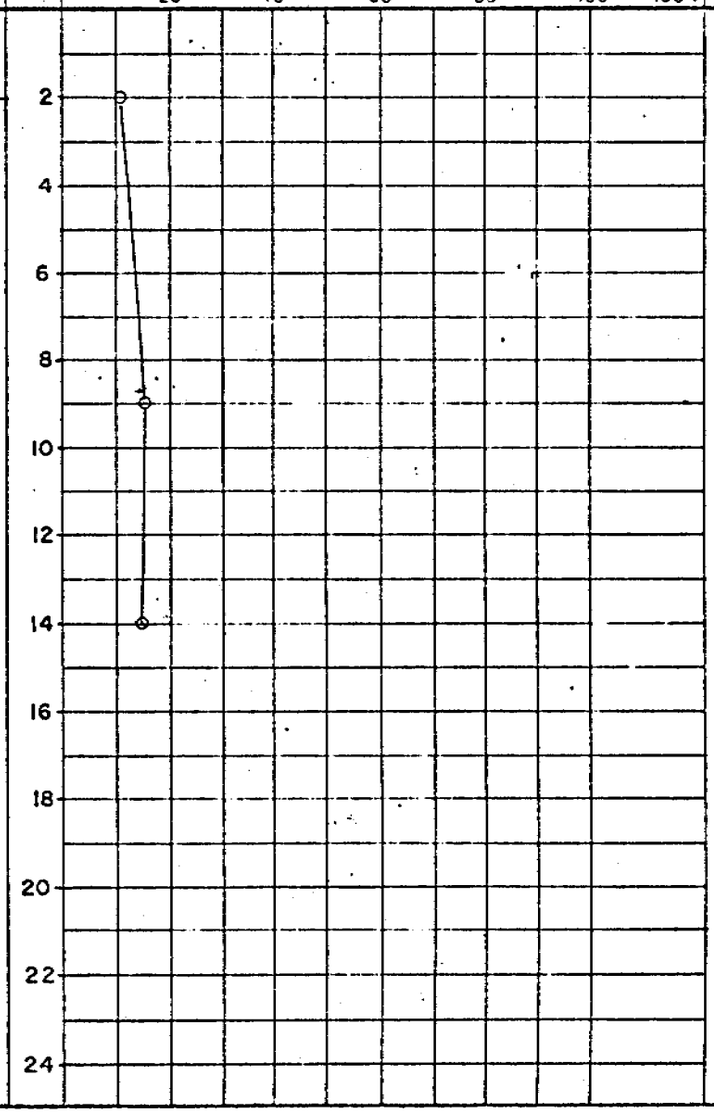
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1376+00	OFFSET: L
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
465	C	61A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR MUSKEG	F	Nf							
						SAND	UF								
2															
4					SM	MED. FINE DRY			30		54	16			
6															
8															
10					GM	GRAVEL VERY FINE. SANDY, SILTY, DRY									
12					SC	CLAY STICKY, FINE SAND									
14					SM	SAND FINE, SILTY, GRAVEL									
16						END OF HOLE									
18															
20															
22															
24															



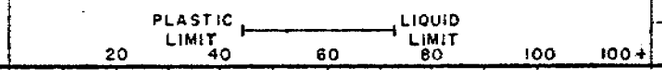
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: RS	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1365+00	OFFSET: L
CKD: DGD	TECH: DM	RIG: AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
465	C	60A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					ML	CLAY HARD, BROWN, SILTY SANDY	F		2							
4		P							4							
6						GRAVEL WET			6							
8									8							
10					GP				10							
12						DRY			12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

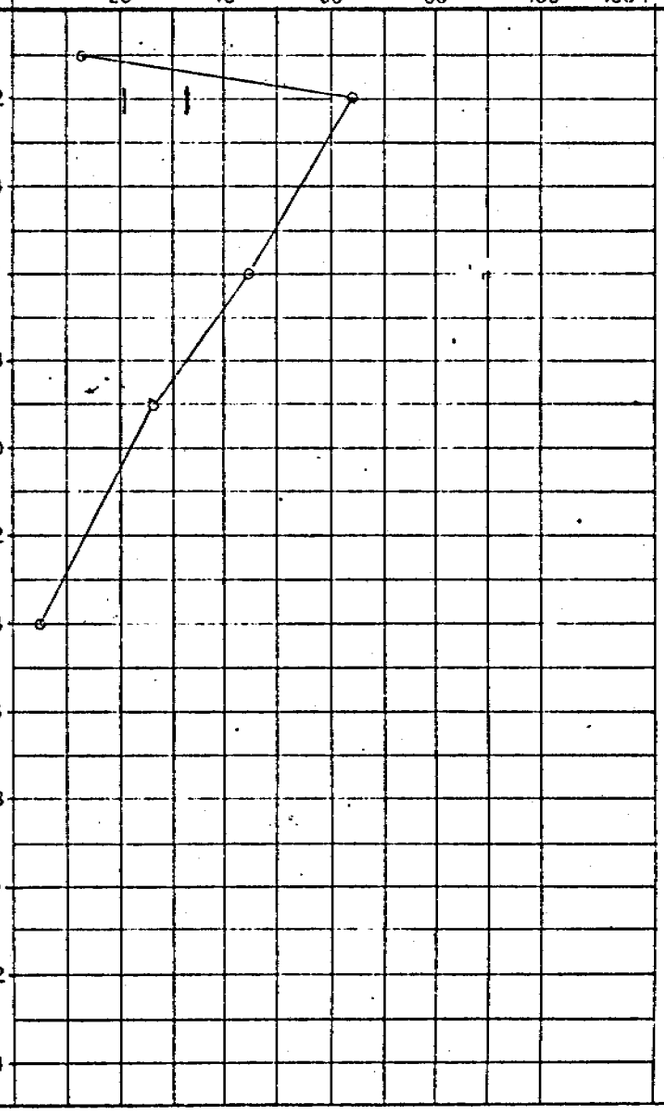


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R S	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1355+00	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
465	C	59 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT GRANULAR MUSKEG	UF								
4		T											1038	71.2	
6					SM	SILT BROWN, DRY, HARD SANDY	F	Nbe							
8															
10															
12					GM	GRAVEL DRY, SANDY LITTLE CLAY	UF								
14															
16						END OF HOLE									
18															
20															
22															
24															

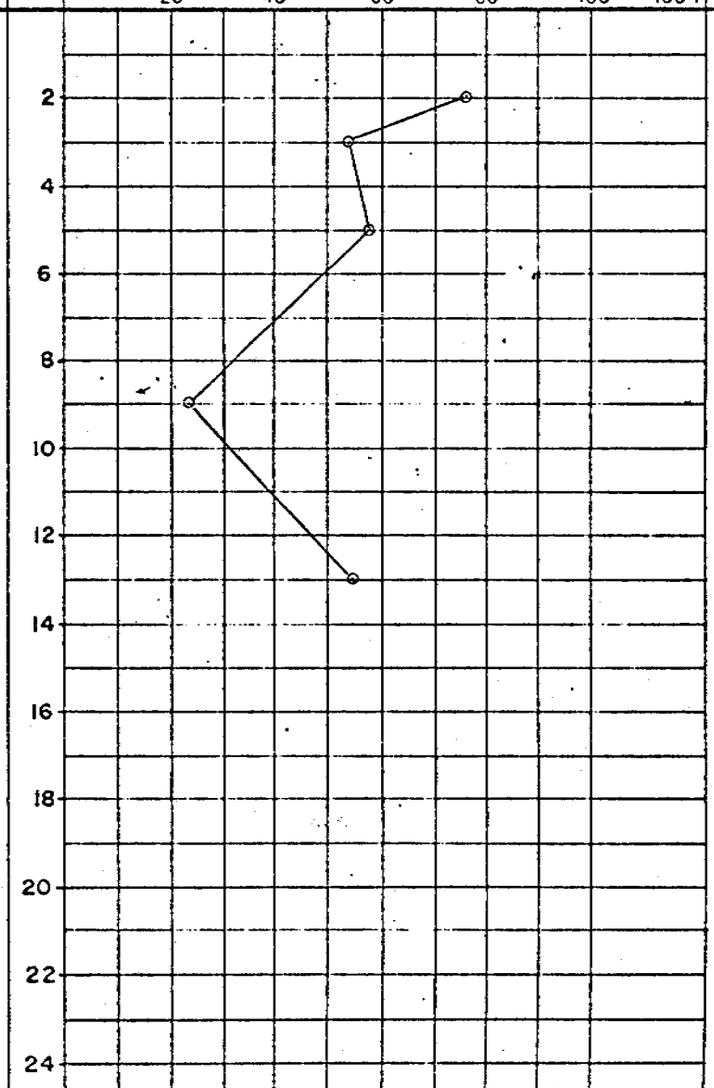


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1345+00	OFFSET: ℄
CKD: D.G.P	TECH: DM	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B.C.S	NUMBER
465	C	58A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT COARSE, FIBROUS, MUSKEG	F	Vx							
4		T			CL	CLAY HARD, LIGHT BROWN TRACES OF SAND AND SILT							66.5	45.9	
6															
8															
10					ML	SILT HARD, SANDY									
12															
14					GC	GRAVEL SANDY, SOME CLAY		Vx							
16						END OF HOLE									
18															
20															
22															
24															

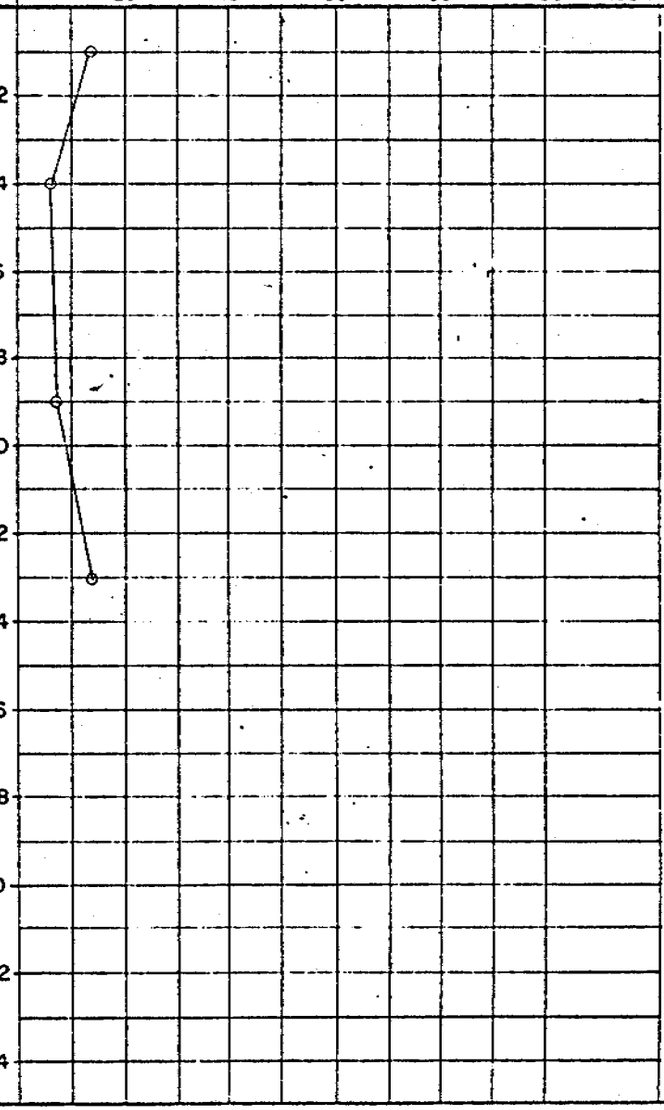


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1335+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
465	C	57A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2		▲			SM	SAND RUST RED, DRY SILTY, FEW PEBBLES	UF		2							
4		▲							4							
6						GRAVEL DRY, SANDY			6							
8					GP	TRACES OF SILT			8							
10		▲							10							
12						SAND			12							
14		▲			SM	DRY, SILTY			14	28		45	27			
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

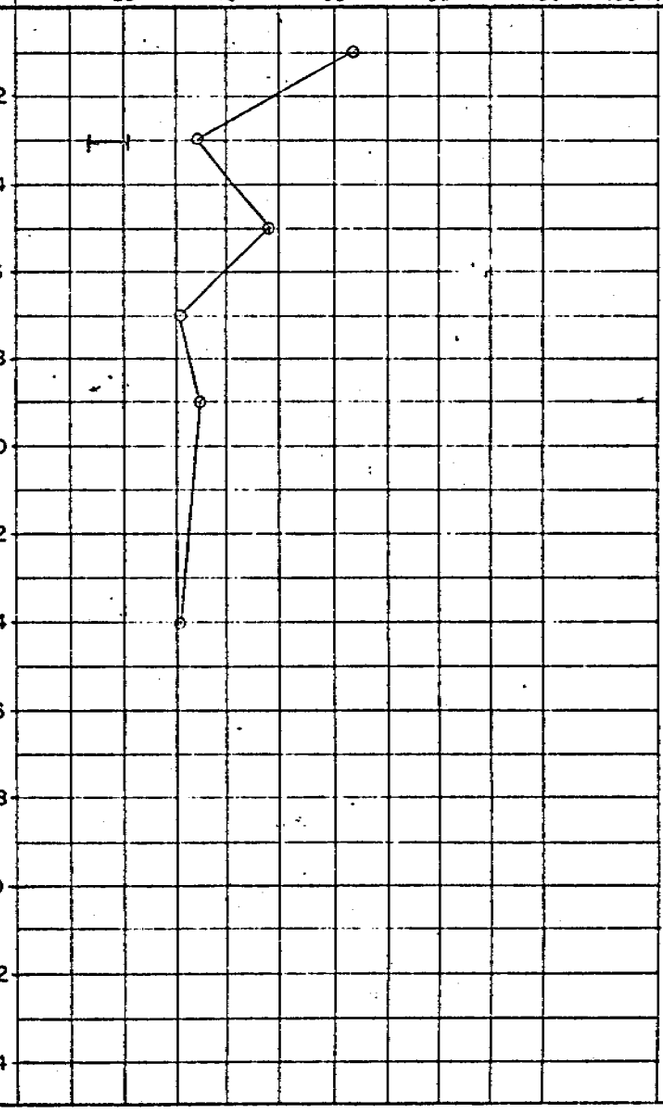


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1325+00	OFFSET: L
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
166	C	56A

DEPTH (FELT)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT GRANULAR, MUSKEG	F	Vx	2							
4		S				CLAY		<.5% EXCESS ICE	4							
6						VERY HARD, LIGHT BROWN, SILTY SANDY			6							
8		P			CL				8							
10									10							
12								Vx	12							
14						WETTER			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

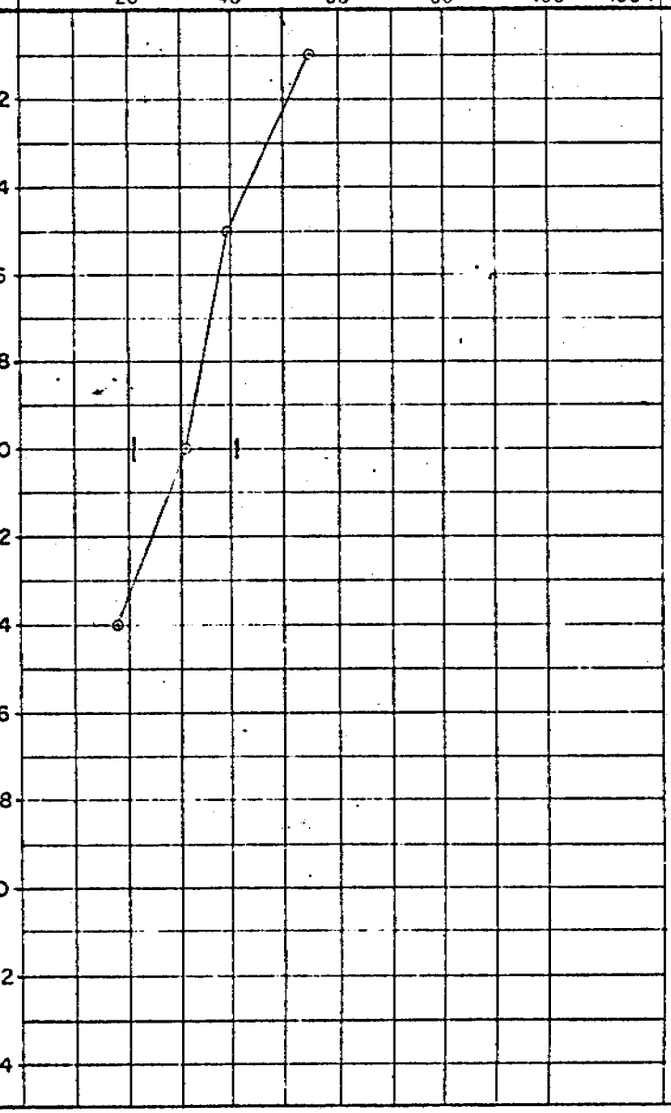


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S.	DATE DRILLED 4/12/72	AIRPHOTO NO:	CHAINAGE 1515+00	OFFSET ℄
CKD D.G.P.	TECH D.M.	RIG AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
466	C	55A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT GRANULAR MUSKEG	UF								
2															
4		P			CH	CLAY FINE, VERY WET, DARK & LIGHT LAYERS SOME SAND									
6															
8															
10		T			SM	SAND FINE, YELLOW, DRY TRACES OF SILT							123.2	95.4	
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 466-C-54A Depth 15'
Technician Date Dec.4/72

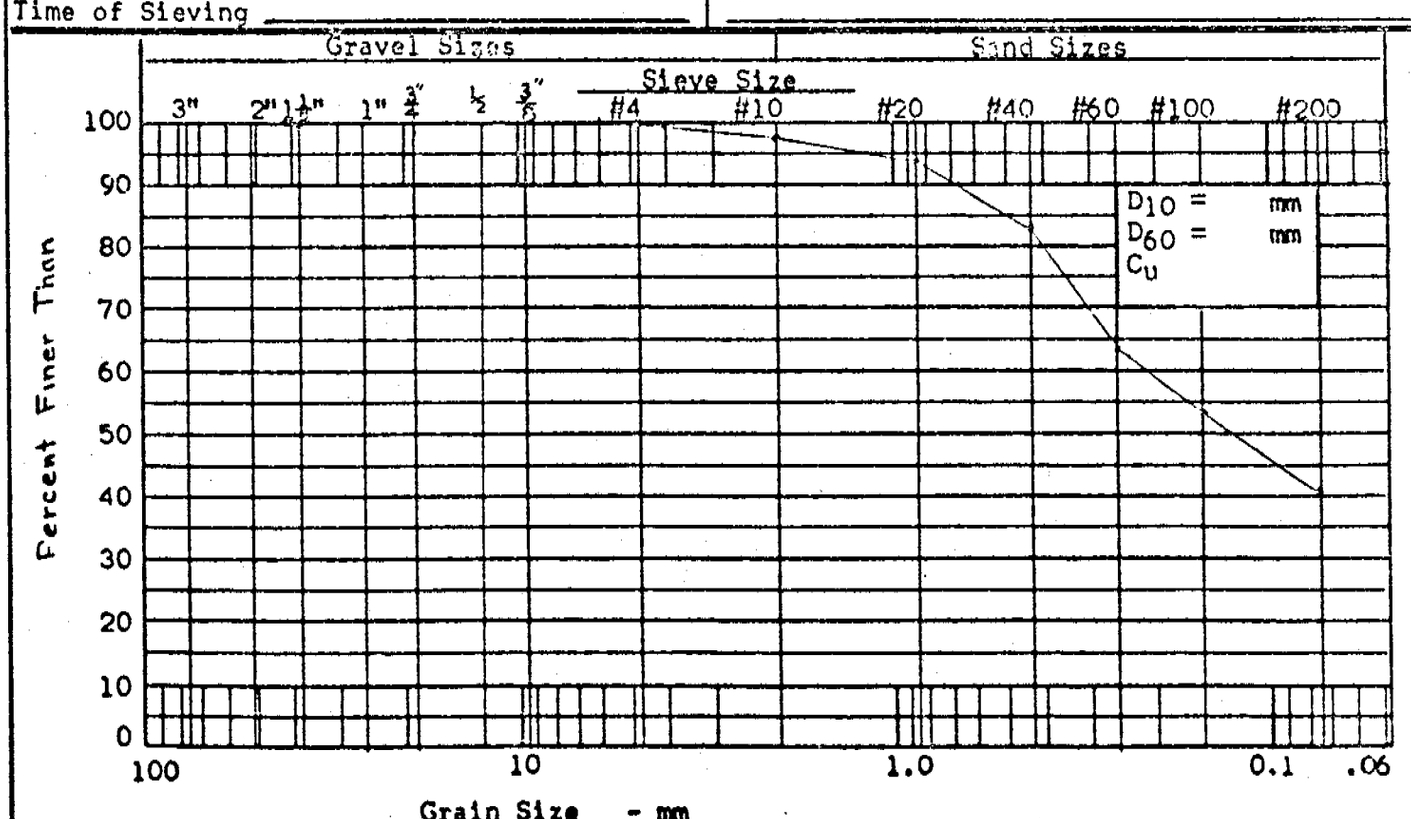
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			97.6%	
Wt. Dry + Tare	20	.0331	.840			94.2%	
Tare	40	.0165	.420			82.9%	
Wt. Dry	60	.0097	.250			63.8%	
	100	.0059	.149			53.5%	
	200	.0029	.074			41.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



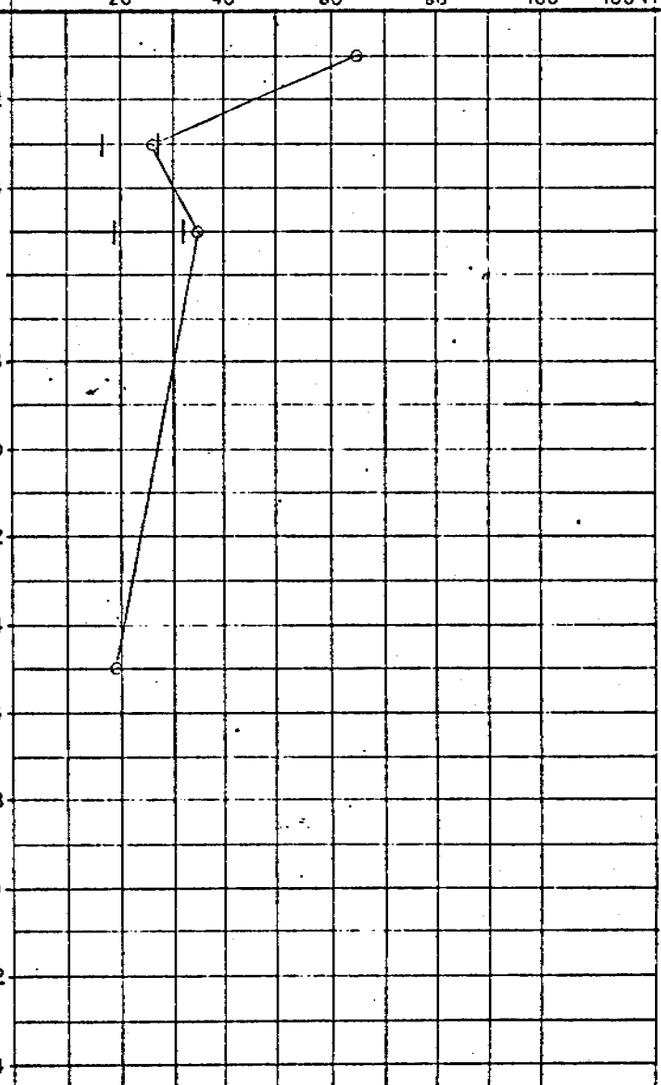
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 4/12/72	AIRPHOTO NO:	CHAINAGE: 1305+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
466	C	54A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT									
					OL	MUSKEG & CLAY MIXTURE	F								
2		T			SP	SAND FINE		Nf					150.5	122.3	
4															
6		P				CLAY HARD, 1/8" ICE CRYSTALS		Vr							
8						SAND									
10						SILTY, ICE CRYSTALS									
12								Vx							
14						FINE, ODD SMALL STONE			41		57	2			
16						END OF HOLE									
18															
20															
22															
24															

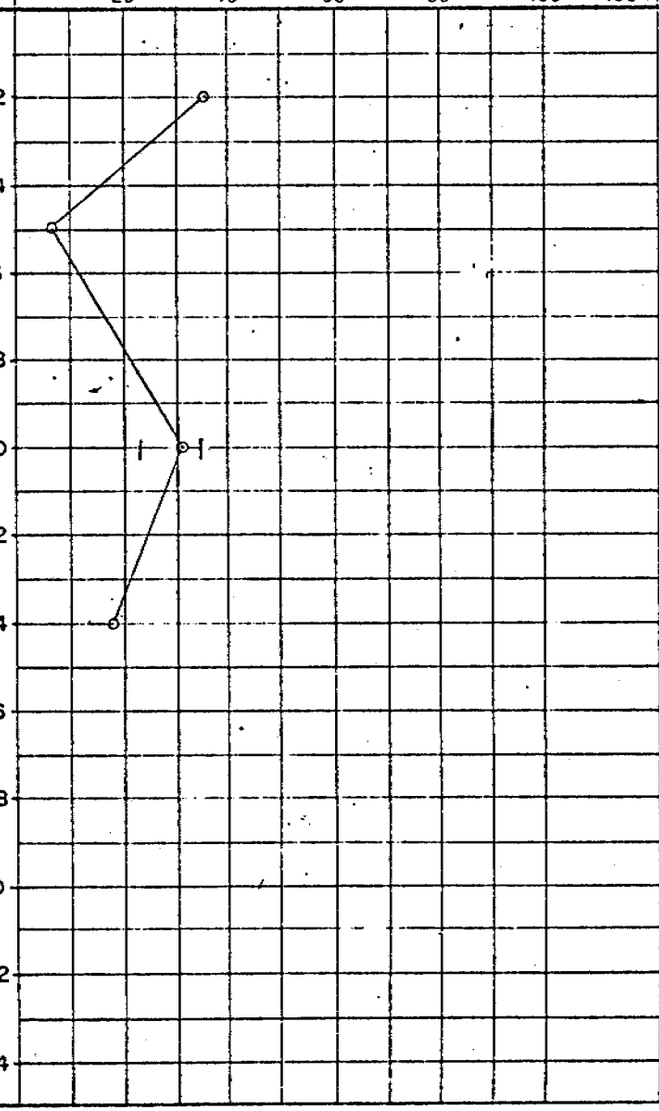


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1295+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TEC.: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV	

MILE	B,C,S	NUMBER
466	C	47B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Vr								
2		P			CL	CLAY BROWN, SANDY FEW ICE CRYSTALS		NO EXCESS ICE	2							
4		P						Nbn	4							
6		P.			SC	SAND		Nf	6							
8									8							
10		P			CL	CLAY GREYISH, SOME SILT SOME EXCESS ICE		Vr < 2% EXCESS ICE	10					112.5	86.4	
12									12							
14		P			SC	SILT SAND & GRAVEL HARD		Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



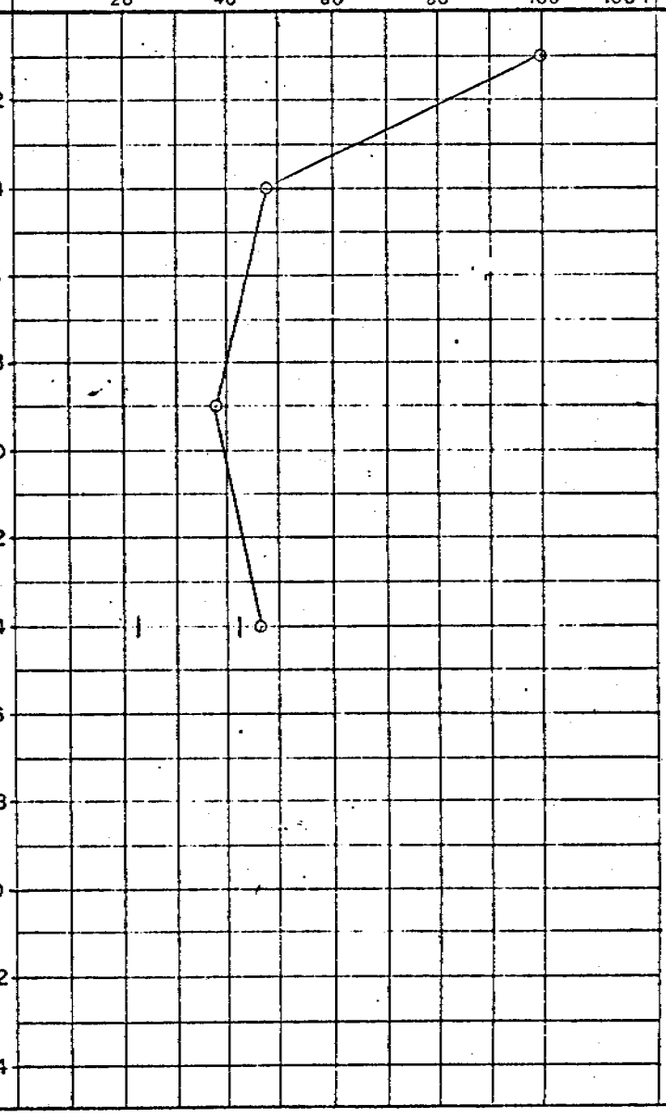
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E N	FIELD ENG B M	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 128 5+00	OFFSET ℄
CKD D G P	TECH D M	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
466	C	453

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT	F	Nbe								
2					Pt	ORGANIC, COARSE FIBROUS			2							
4					OL	CLAY & MUSKEG			4							
6						CLAY			6							
8								Nbe	8							
10					CH	STICKY.			10							
12									12							
14						ICE CRYSTALS		Nbe	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

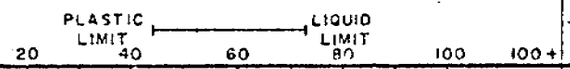


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B M	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1275+00	OFFSET: L	TEST HOLE
CKD D G P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION:	ELEV	MILE: 467 / B,C,S: C / NUMBER: 45 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT	F									
2		▲			Pt	ORGANIC, GRANULAR			2							
4		▲			OH	CLAY & MUSKEG		Nbe	4							
6					GH	CLAY			6							
8						SILTY			8							
10		▲						Nbe	10							
12					GP	GRAVEL			12							
14								Nf	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

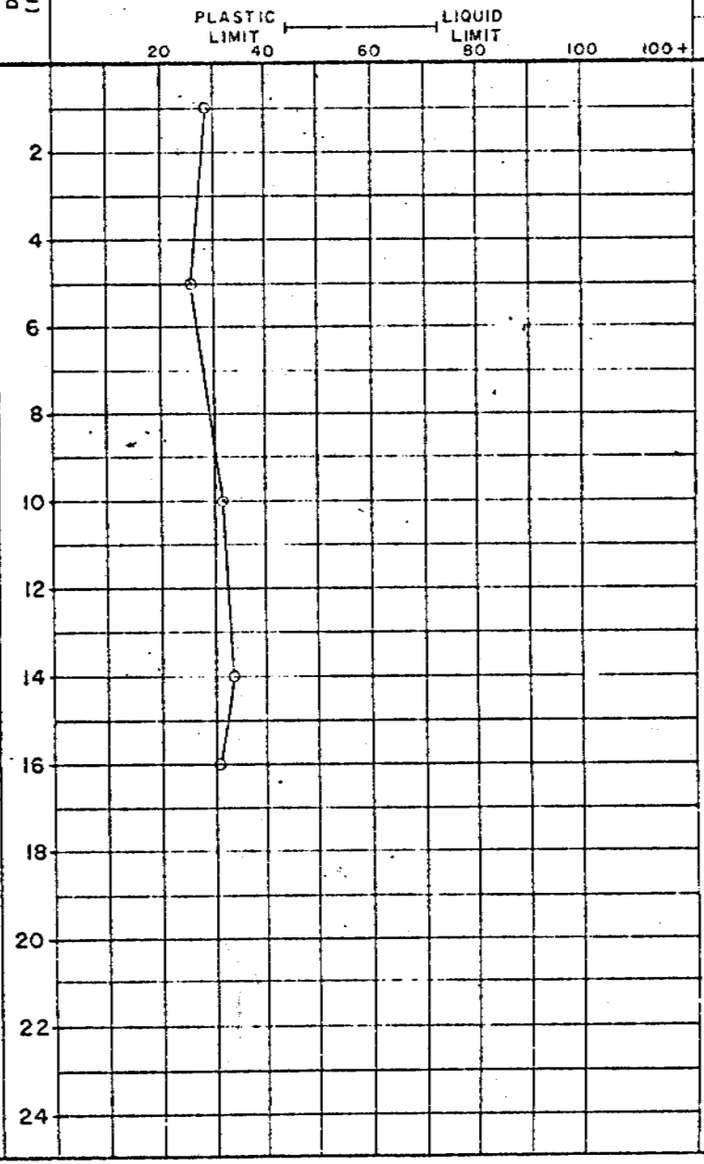


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M.	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1265400	OFFSET 4.	TEST HOLE
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE: FAIR – GOOD	VEGETATION: SPRUCE TO 20'	ELEV	MILE 467 / B,C,S C / NUMBER 443

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
		P		16 BLS	CL	CLAY SILTY	F	Vx								
2						MUSKEG LAYERS			2							
4		P		72 BLS				< 2% EXCESS ICE	4							
6								Vr	6							
8					CL	EXCESS ICE			8							
10		P		55 BLS					10							
12									12							
14		T				SOFT		Vr	14							
16						SILTY			16							
18					CL			Vr	18							
20						GRAVEL			20							
22						END OF HOLE			22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

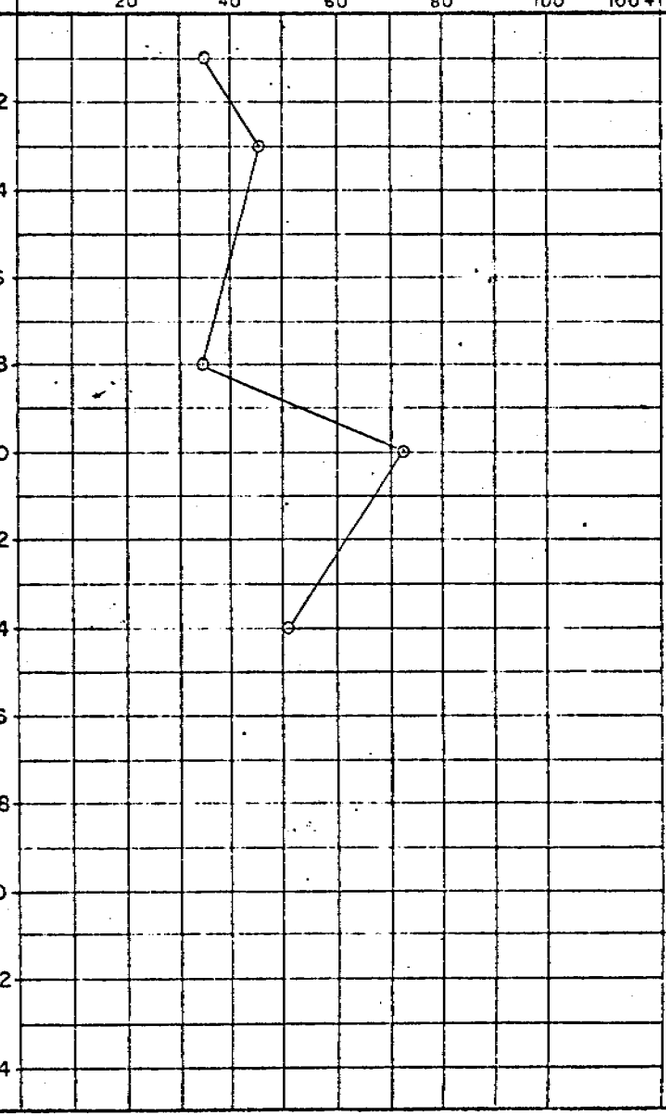


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 5/12/72	AIRPHOTO NO:	CHAINAGE: 1255+00	OFFSET: ℄
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
467	C	43B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	PEAT - ORGANIC, FIBROUS, FINE	F									
		P		20 BLS.	OL	SILT CLAY, FIBROUS MUSKEG										
2					Pt	PEAT ORGANIC			2							
4						CLAY			4							
6						SILTY			6							
8					CL	ICE CRYSTALS AND LENSES 1/2" TO 1"			8							
10		P		55 BLS.				<10% EXCESS ICE	10							
12									12							
14					GM	GRAVEL CLAY, SANDY			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

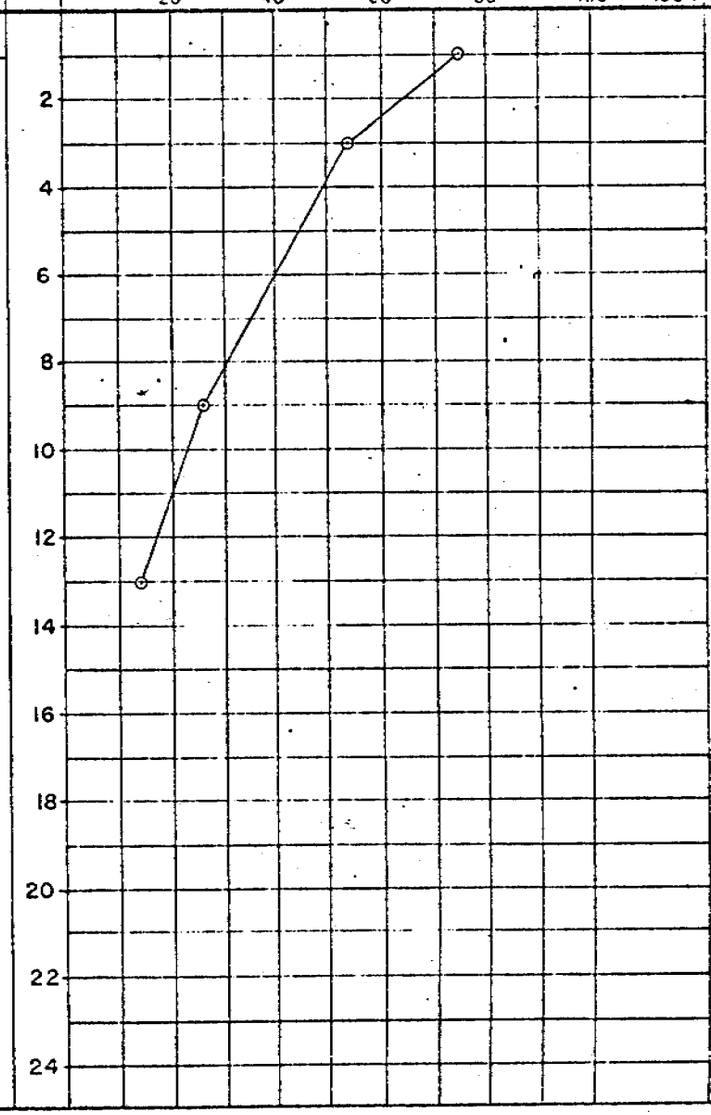


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1243+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FAIR TO GOOD	VEGETATION: SPRUCE & POPLAR	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
467	C	42 3

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - ORGANIC									
					OL	CLAY	UF								
2		P		17 BLS.	Pt	PEAT ORGANIC, FINE FIBROUS	F	<20% EXCESS ICE							
4						CLAY		Vn							
6					CL	VERY SILTY									
8															
10						GRAVEL		Nbe							
12					GC	CLAY									
14								Nbn							
16						END OF HOLE									
18															
20															
22															
24															

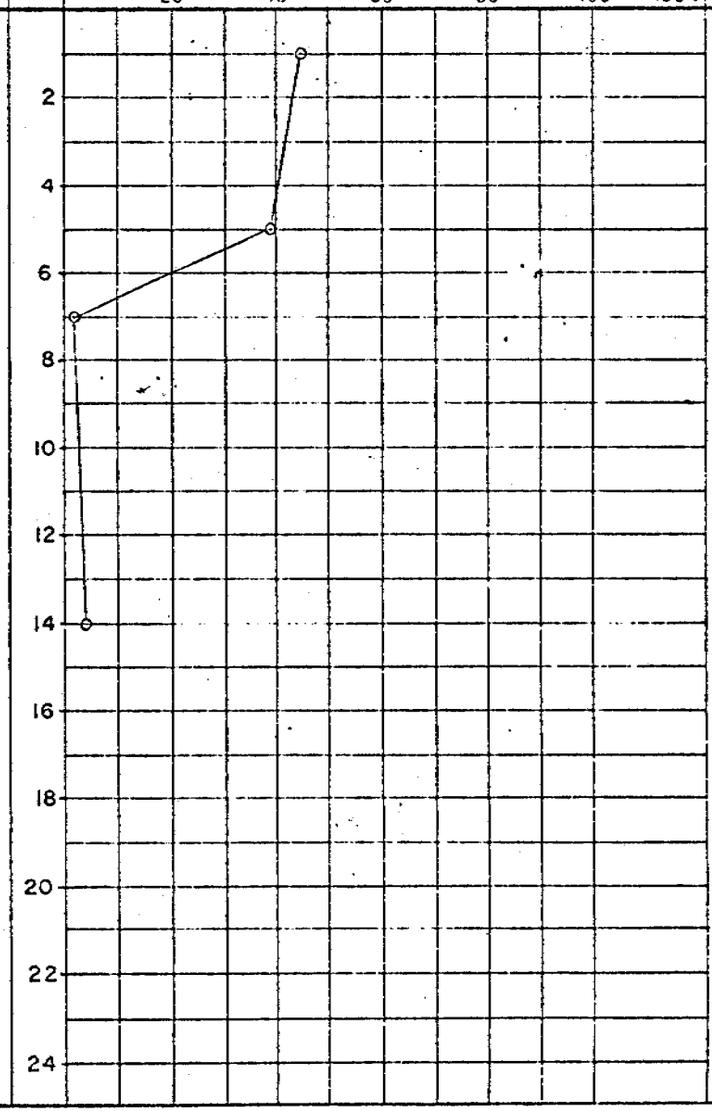


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M.	DATE DRILLED 4/12/72	AIRPHOTO NO:	CHAINAGE: 1235+00	OFFSET: 4,
CKD D.G.P	TECH DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
467	C	413

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	UF								
2					CH	CLAY									
					T.	SOFT, STICKY									
4					CL										
6		P				GRAVEL									
8															
10					GP	SANDY, SILTY SOME CLAY									
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

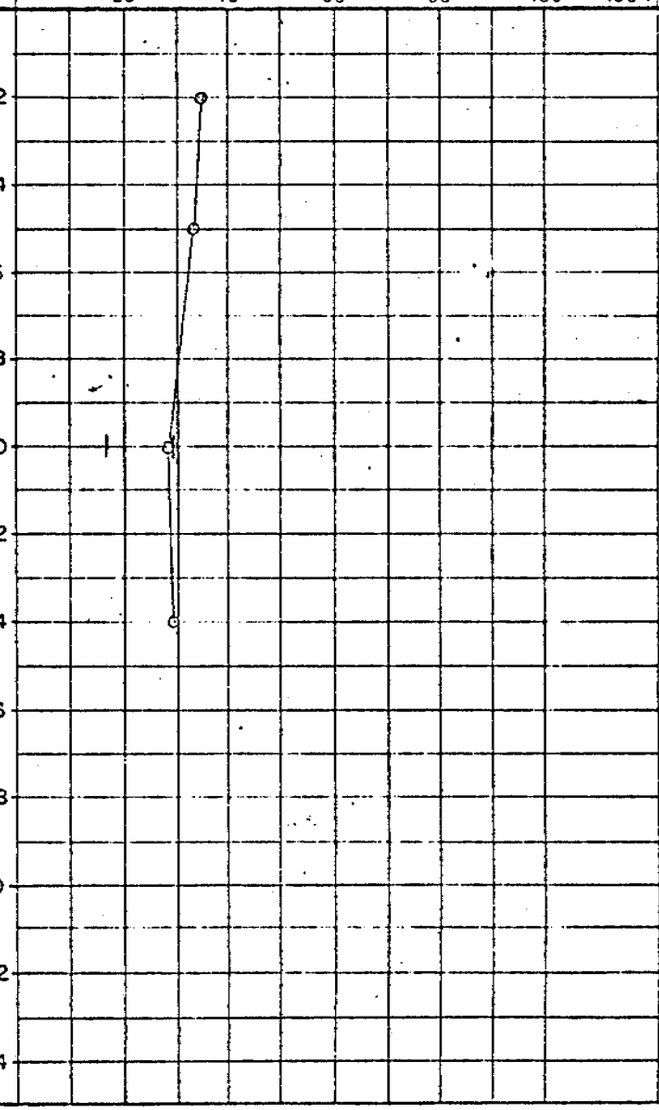


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M.	DATE DRILLED 3/12/72	AIRPHOTO NO:	CHAINAGE: 1225+00	OFFSET: ℄
CKD D.G.P	TECH D.M.	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
468	C	468

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT FINE, FIBROUS	F								
2						CLAY									
4					CL	SILTY, SOME RANDOM ICE CRYSTALS		Vr							
6															
8						TRACES OF SAND									
10						SANDY, SILTY		Nbn							
12					CL										
14		P				SILTY		Nbn							
16						END OF HOLE									
18															
20															
22															
24															

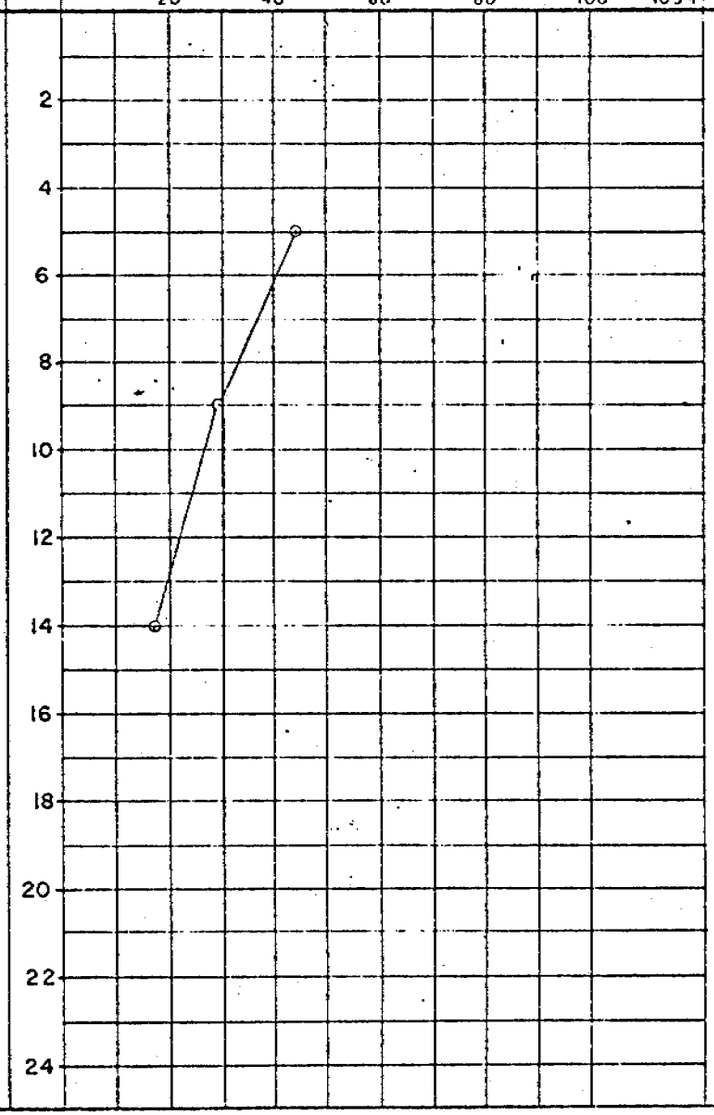


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M	DATE DRILLED 3/12/72	AIRPHOTO NO:	CHAINAGE: 1215+00	OFFSET ℄
CKD D.G.P.	TEC. D.M	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
468	C	398

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT MUSKEG, FINE FIBROUS	F								
2															
4						CLAY BROWN, SOME SILT									
6					CL	NO EXCESS ICE		Nbn							
8															
						SILT SANDY TRACES OF CLAY									
10					ML			Nf							
12						SAND TRACE OF GRAVEL SOME SILT									
14					SM			Nf							
16						END OF HOLE									
18															
20															
22															
24															



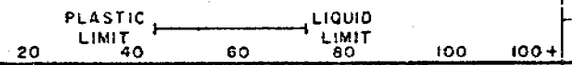
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 3/12/72	AIRPHOTO NO:	CHAINAGE: 1205700	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 18'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
468	C	38 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT FINE, FIBROUS	F	Nf								
2									2							
						CLAY										
4					CL	BROWN, SOME SILT RANDOM ICE CRYSTALS		Vr	4							
					Pt	ORGANIC LAYER		Nf								
6						SILT			6							
8								Nf	8							
10					SM	SANDY TO VERY SANDY			10							
12									12							
14								Nf	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



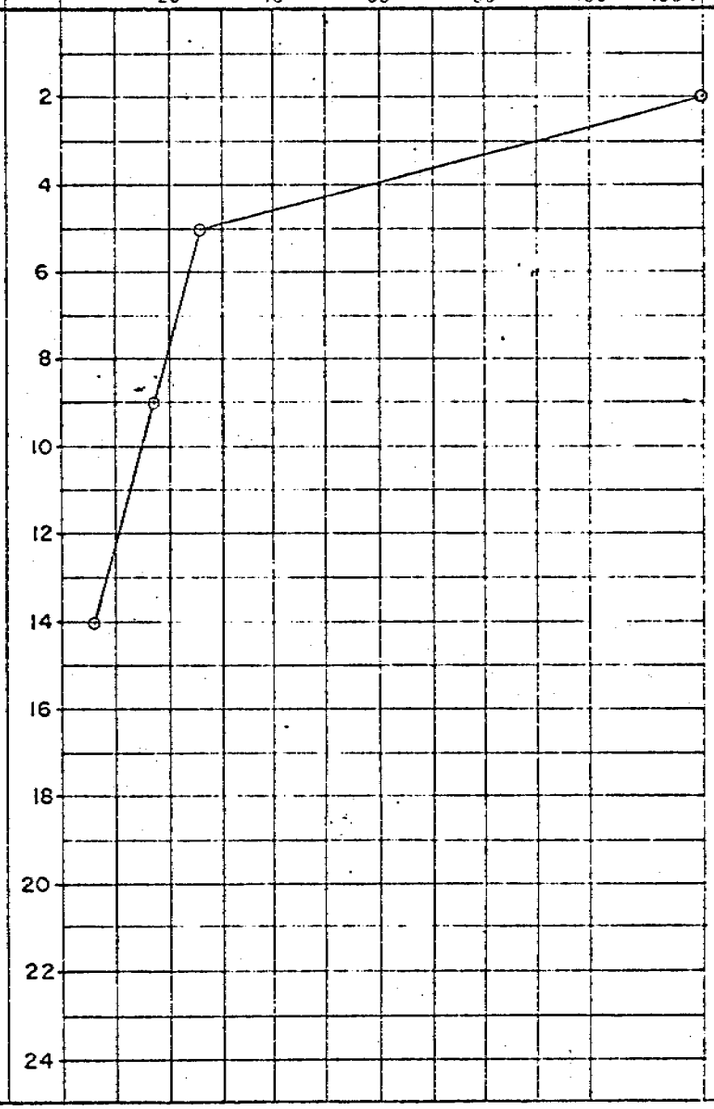
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG. B.M.	DATE DRILLED 3/12/72	AIRPHOTO NO:	CHAINAGE: 1195+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV	

MILE	B,C,S	NUMBER
468	C	37B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT COARSE, FIBROUS	F	Vr
2								
4					CL	CLAY SILTY, BROWN ICE LENSES TO 1/8"		Vr
6						SILT		
8					CL	SOME CLAY TO 12' ROCKS		
10								
12								Nbn
14					GM	GRAVEL SOME SILT		Nf
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

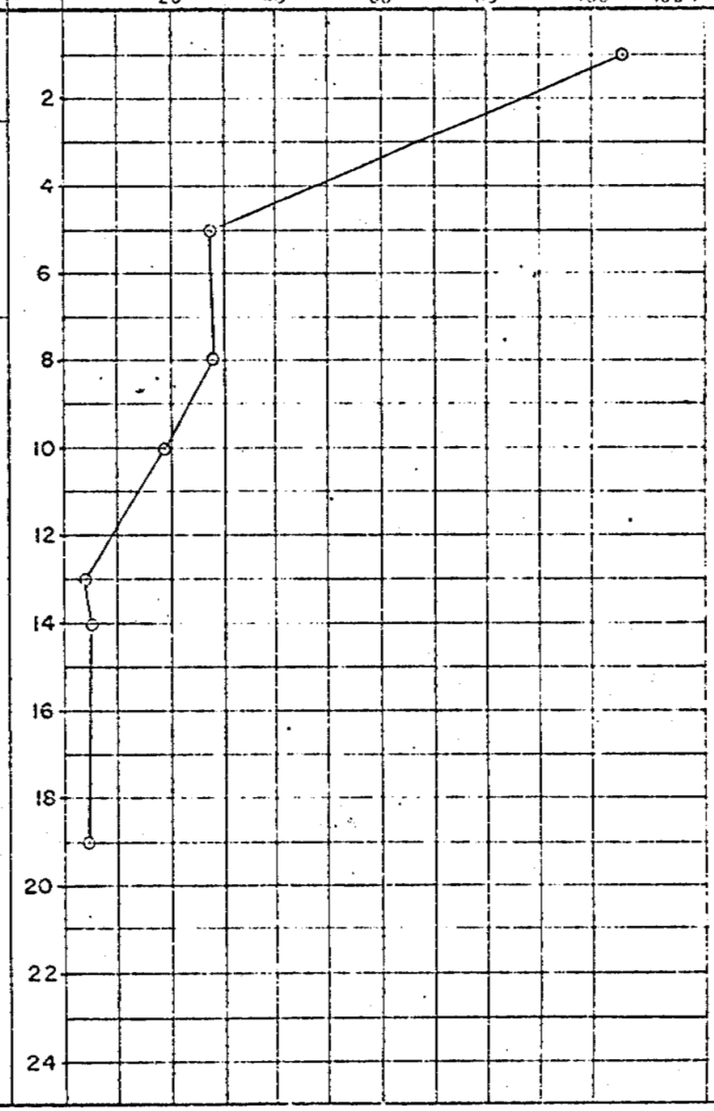


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN. AEW	FIELD ENG B.M.	DATE DRILLED 3/12/72	AIRPHOTO NO:	CHAINAGE: 1166+00	OFFSET ℄	TEST HOLE
CKD DGP.	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV	MILE 468 B.C.S C NUMBER 36B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					PL	PEAT COARSE, FIBROUS GRANULAR	F	Nf							
4						SAND	UF								
6					SM	WET; SOME SILT FREQUENT ROCKS									
8							F	Nf							
10															
12															
14						GRAVEL									
16						SOME SAND, SILTY BOULDERS									
18					GP										
20															
22															
24															
25						BOTTOM OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Sand with some Gravel
Location
Hole 468-S-134A Depth 20'
Technician Date Jan.30/73

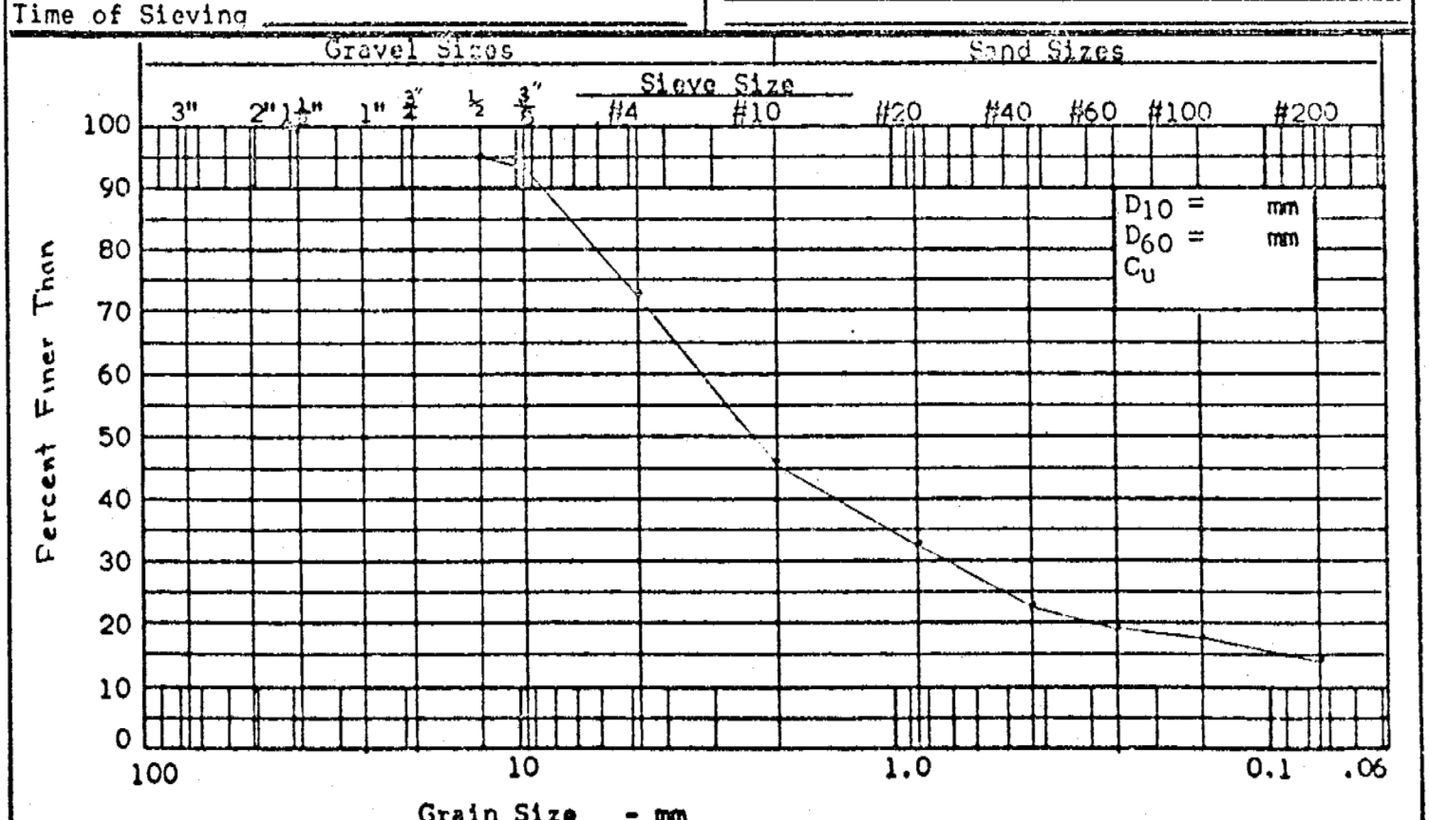
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			95.8%	
Wt. Dry		3/8	9.52			93.9%	
	4	.185	4.76			72.4%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			46.5%	
Tare No.	20	.0331	.840			32.6%	
Wt. Dry + Tare	40	.0165	.420			22.6%	
Tare	60	.0097	.250			19.5%	
Wt. Dry	100	.0059	.149			17.3%	
	200	.0029	.074			14.5%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Sand with some Gravel
Location
Hole 468-S-134A Depth 15'
Technician Date Jan. 26/73

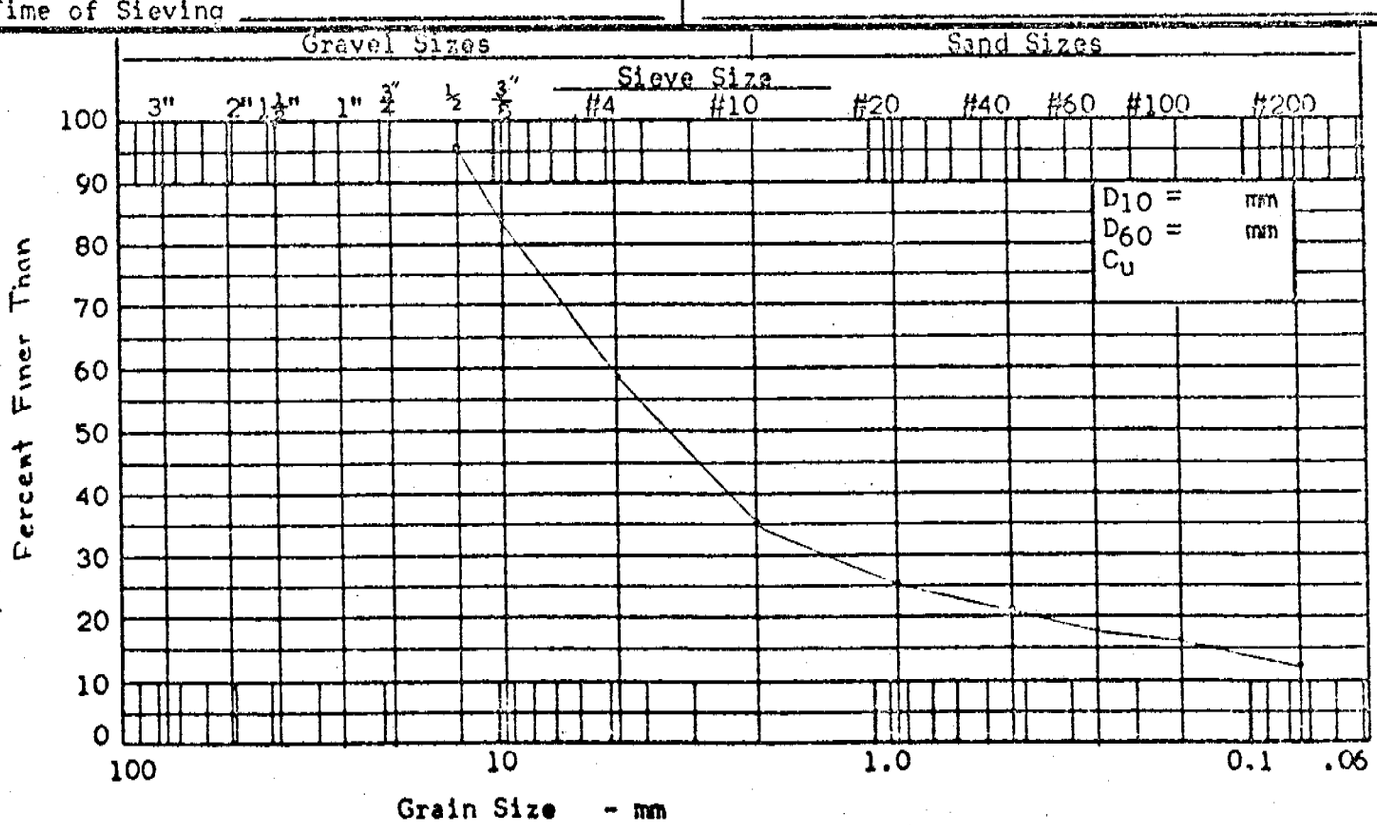
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			96.0%	
		3/8	9.52			84.6%	
	4	.185	4.76			58.8%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			35.2%	
Wt. Dry + Tare	20	.0331	.840			25.8%	
Tare	40	.0165	.420			21.1%	
Wt. Dry	60	.0097	.250			17.9%	
	100	.0059	.149			16.1%	
	200	.0029	.074			12.9%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

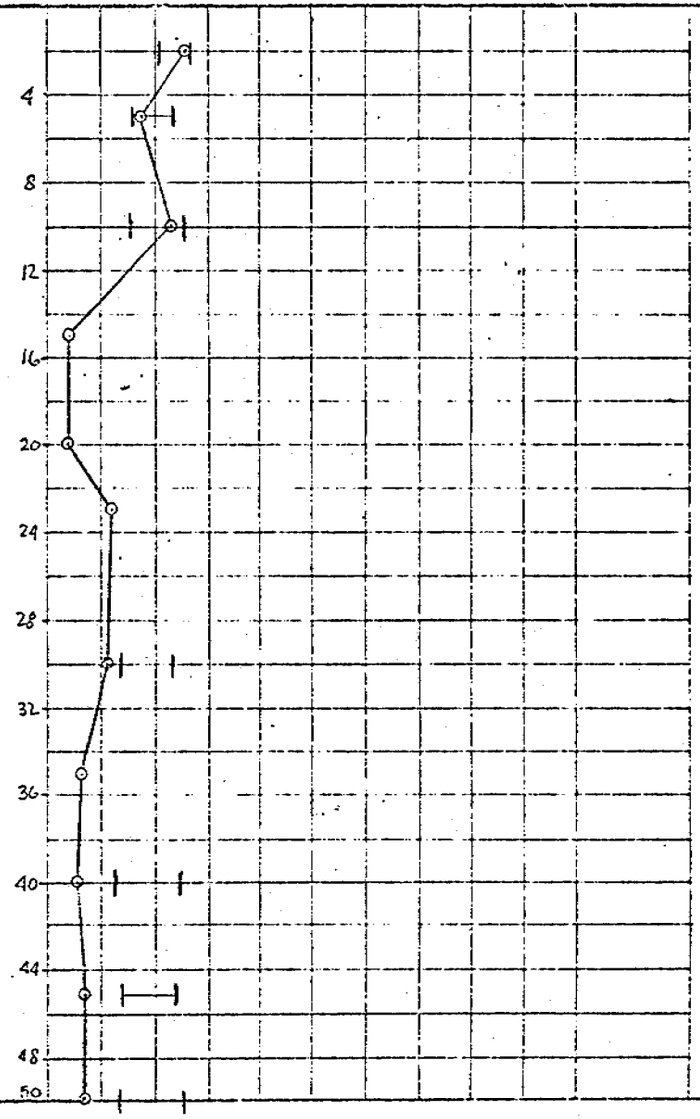
DWN A.E.W	FIELD ENG D.M	DATE DRILLED 13/1/73	AIRPHOTO NO:	CHAINAGE: 1183+00	OFFSET
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR TO 30' ELEV.	

TEST HOLE

MILE	B,C,S	NUMBER
463	S	134 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					CL	CLAY SOME SILT MED-HIGH PLASTIC	F	Nbn							
4		P				SAND - DRY	UF								
8						SILT SANDY, SOME CLAY ODD BOULDER, SOME SAND SEAMS									
12		P				SAND	F								
16					GM	COARSE, SILTY SOME GRAVEL		Nbn	13		22	65			
20									15		32	53			
24						TILL									
28						CLAYEY, FEW BOULDERS	UF								
32					GC										
36															
40						VERY HARD									
44															
48															
50						END OF HOLE @ 50'									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



SO_4 = 0.06%

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 468-S-135A Depth 5'
Technician Date Jan. 30/73

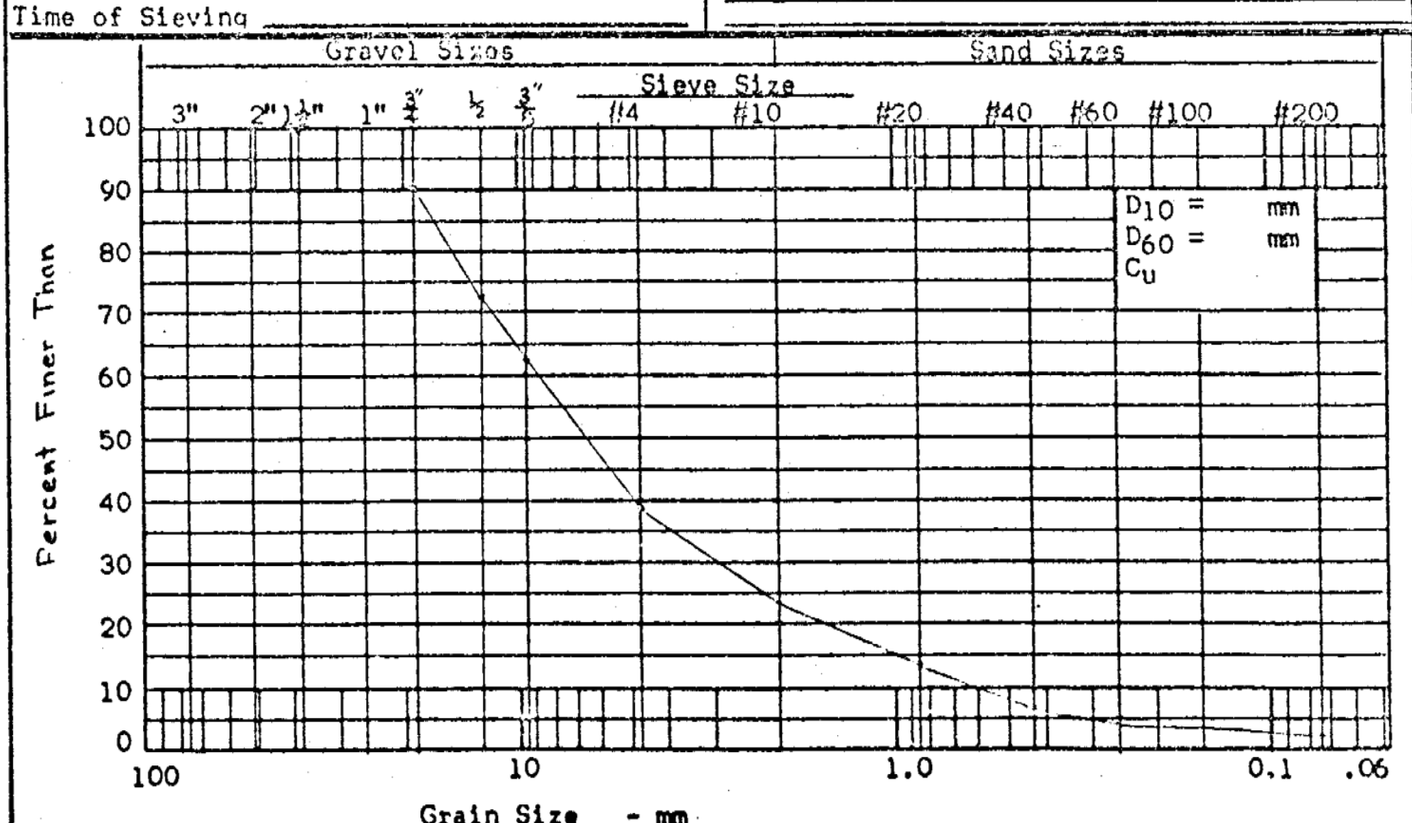
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			90.2%	
Wt. Dry		1/2	12.70			72.9%	
		3/8	9.52			62.6%	
	4	.185	4.76			39.9%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			23.5%	
Wt. Dry + Tare	20	.0331	.840			13.4%	
Tare	40	.0165	.420			6.4%	
Wt. Dry	60	.0097	.250			4.1%	
	100	.0059	.149			3.1%	
	200	.0029	.074			2.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

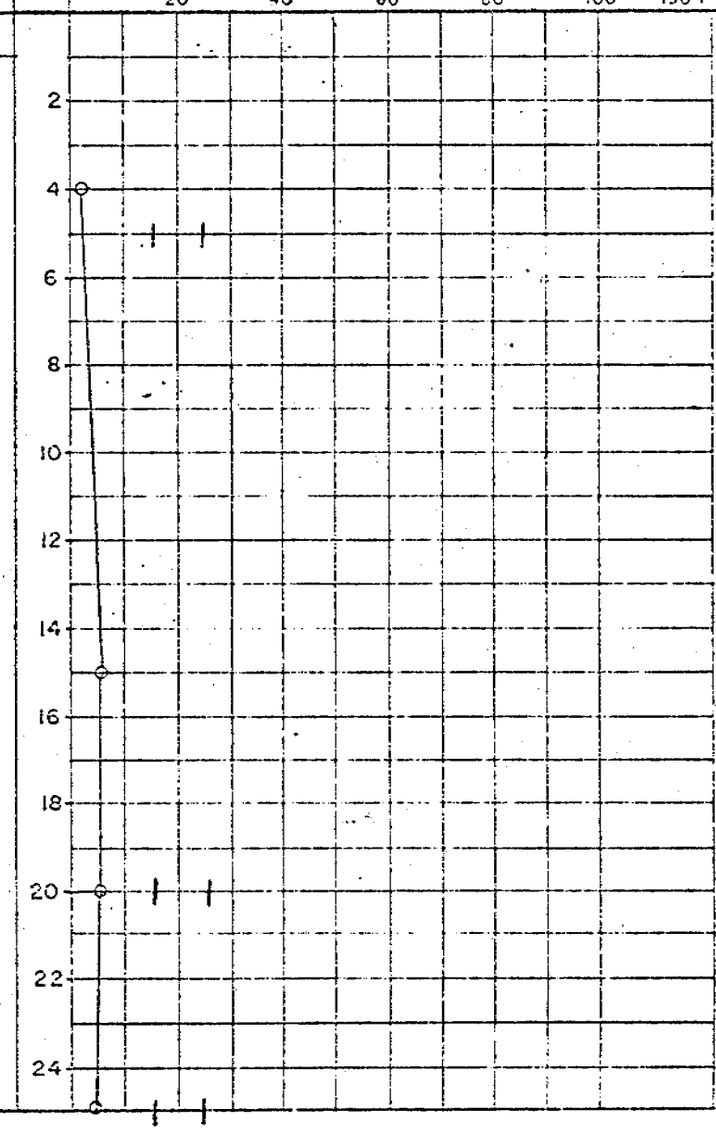
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG D.M.	DATE DRILLED 13/1/73	AIRPHOTO NO:	CHAINAGE 1177+00	OFFSET
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR TO 45'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
463	S	135A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	F								
							UF								
2															
4						COARSE									
									2		22	76			SO_4 = 0.14 %
6															
8															
						SHALE									
10															
12															
14						VERY HARD									
16															
18															
20															
22															
24						END OF HOLE @ 40'									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand with some Silt
Location
Hole 469-C-31B Depth 15'-16'
Technician Date Dec. 1/72

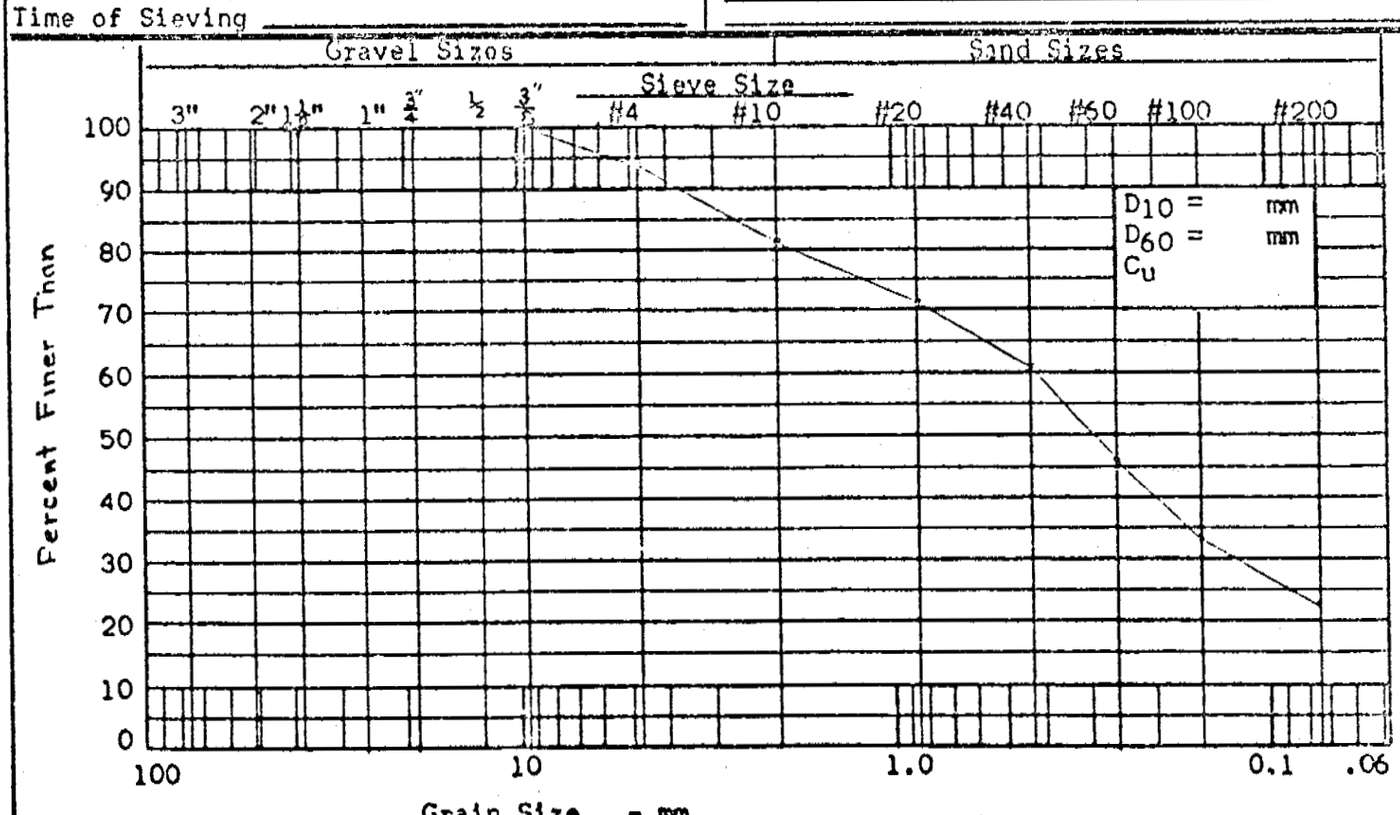
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100%	
	4	.185	4.76			94.3%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			81.5%	
Tare No.	20	.0331	.840			70.5%	
Wt. Dry + Tare	40	.0165	.420			60.8%	
Tare	60	.0097	.250			46.2%	
Wt. Dry	100	.0059	.149			33.5%	
	200	.0029	.074			22.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

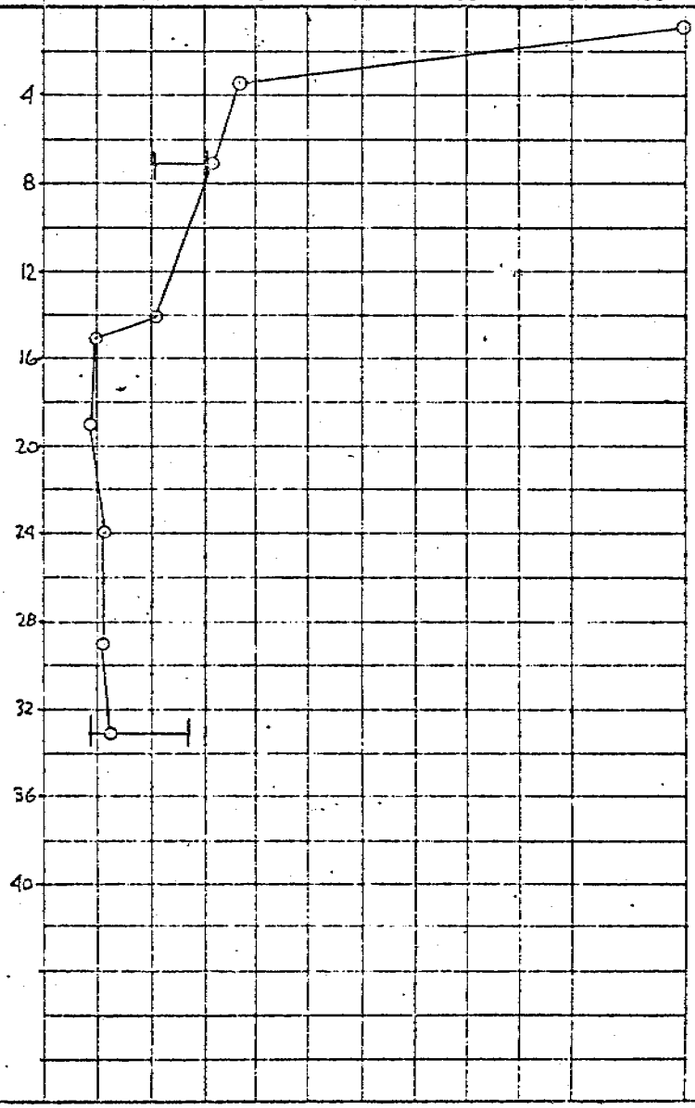


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 29/11/72	AIRPHOTO NO:	CHAINAGE: 1169+00	OFFSET: ℄	TEST HOLE
CKD: D.G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 30'	ELEV	MILE: 469 · B,C,S: C · NUMBER: 31 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG PEATY WITH HIGH SILT CONTENT	F	Nf					103.8	74.9	
4															
8					CL	CLAY SILTY WITH RANDOM ICE VERY HARD DRILLING BOULDERS		Vr							
12								Nf							
16					SM	SAND - SOME SILT		Nf	22		60	18			
20					CL	CLAY GRAVELLY, SANDY LOW TOTAL ICE VOLUME		Vr							
24															
28															
32								Vr							
36						END OF HOLE									
40															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Silty Sand and Gravel

Location

Hole 469-C-30B Depth 13'-15'

Technician Date Dec. 1/72

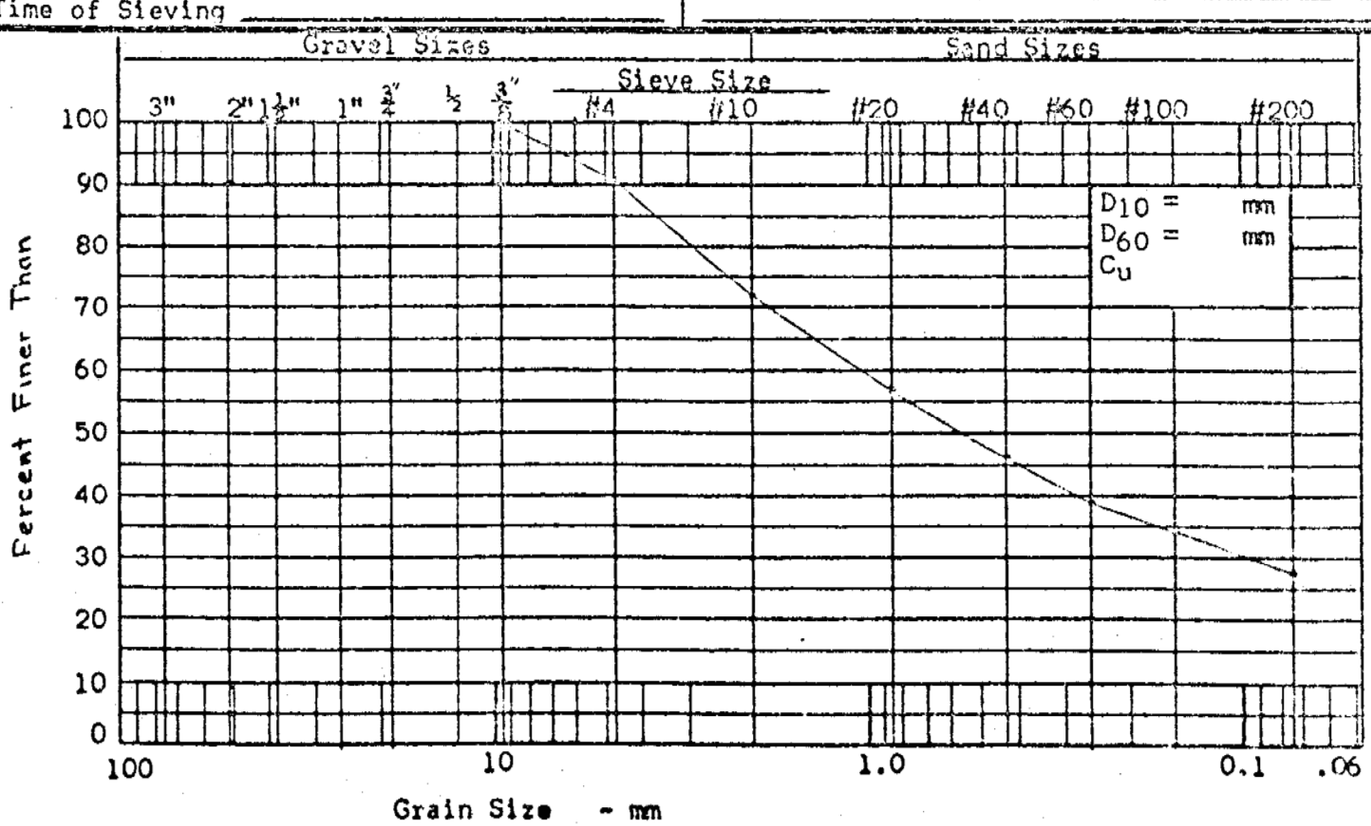
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100%	
	4	.185	4.76			90.6%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			71.4%	
Tare No.	20	.0331	.840			56.6%	
Wt. Dry + Tare	40	.0165	.420			46.9%	
Tare	60	.0097	.250			39.8%	
Wt. Dry	100	.0059	.149			34.6%	
	200	.0029	.074			27.3%	
Passing	200					0	

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

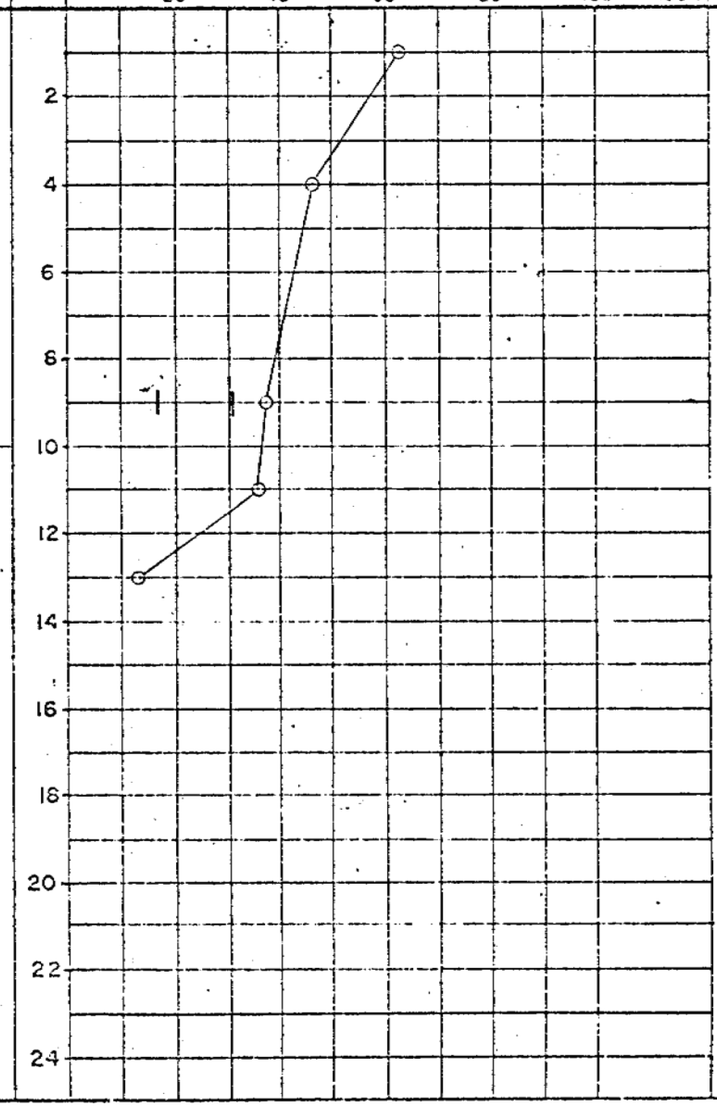
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 29/11/72	AIRPHOTO NO:	CHAINAGE: 1160+00	OFFSET:
CKD: D.G.P.	TECH: D.M.	RIG:	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
469	C	30.B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					Pt	PEAT ORGANIC, GRANULAR	F	Nf							
2–14					CL	CLAY SILTY, BROWN		Nf							
14–16					SM	SAND FINE, SILTY	UF								64% OF COARSE FRACTION CRUSHED BY DRILL
16					GP	GRAVEL SANDY			2	7	44	29			
						END OF HOLE									

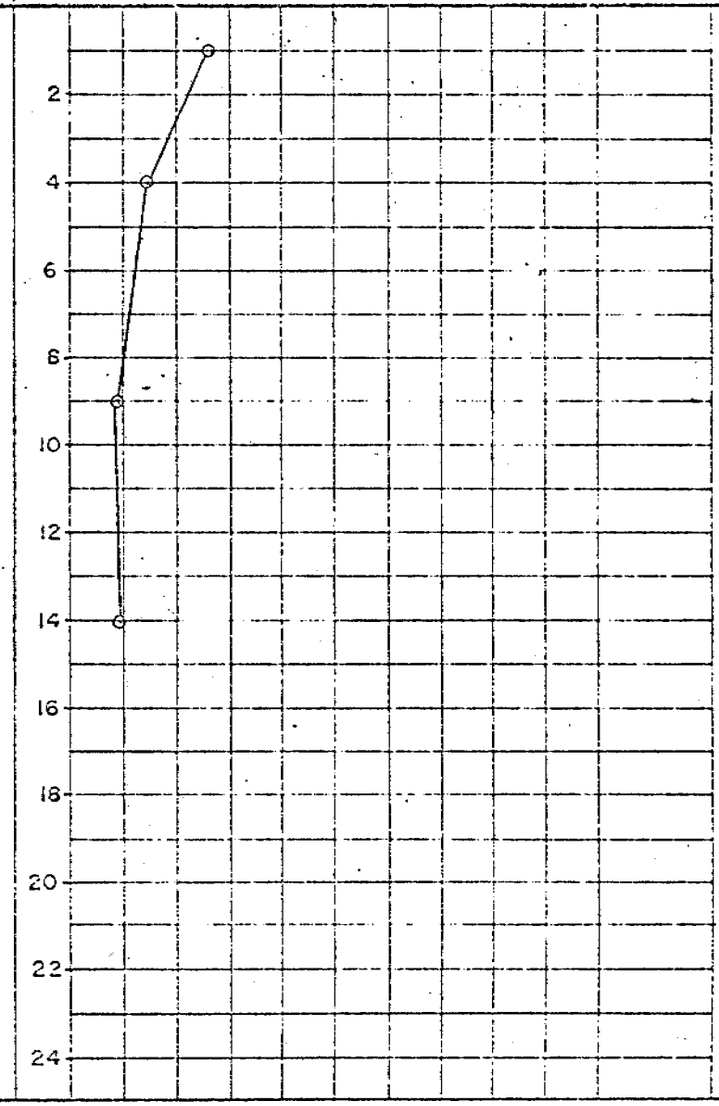


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M.	DATE DRILLED 13/11/73	AIRPHOTO NO.	CHAINAGE: 1149+00	OFFSET: ℄
CKD D.G.P	TECH: DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 35'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
463	C	2213

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					ML	ORGANIC TO 6" SILT BROWN, SOME CLAY SANDY, FEW PEBBLES	F	
2								
4					SC	SOME CLAY		
6						TILL		
8								
10						CLAY, GRAVEL		
12					GC			
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy Silt
Location
Hole 469-C-29B Depth 4'-6'
Technician Date Nov. 28/72

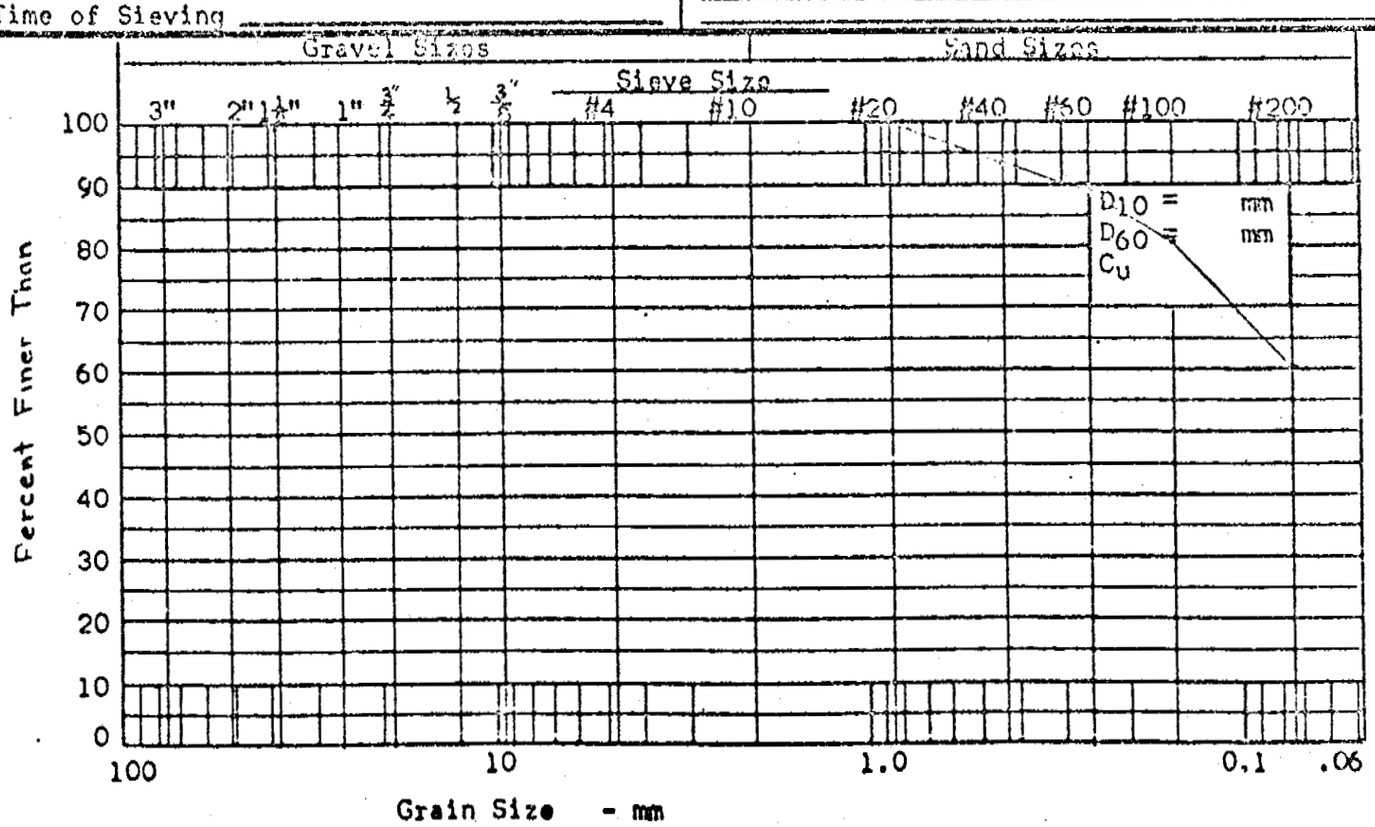
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000				
Tare No.	20	.0331	.840			100%	
Wt. Dry + Tare	40	.0165	.420			93.7%	
Tare	60	.0097	.250			89.8%	
Wt. Dry	100	.0059	.149			81.3%	
	200	.0029	.074			60.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

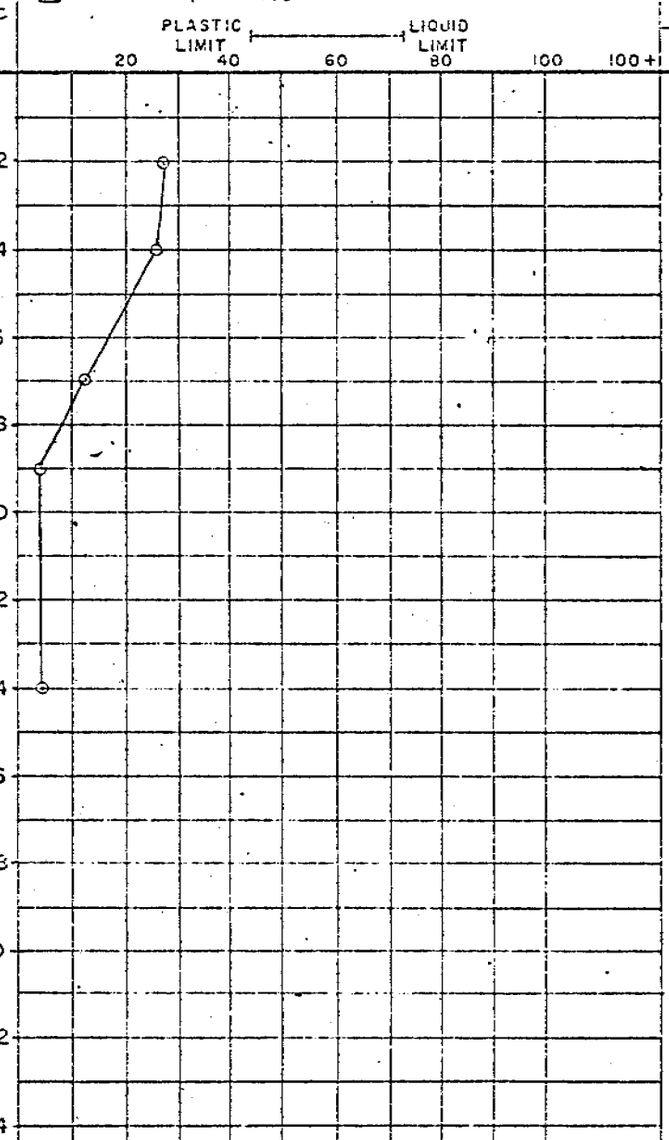
DAN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 29/11/72	AIRPHOTO NO:	CHAINAGE: 1137+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
469	C	29 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC, LOAMY SEASONAL FROST	F	Nbn							
2					ML	SILT MOIST, CLAYEY OCCASIONAL ROCK SANDY VERY DENSE	UF		60		40				
10					GP	GRAVEL ROCKY, WET									
16						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

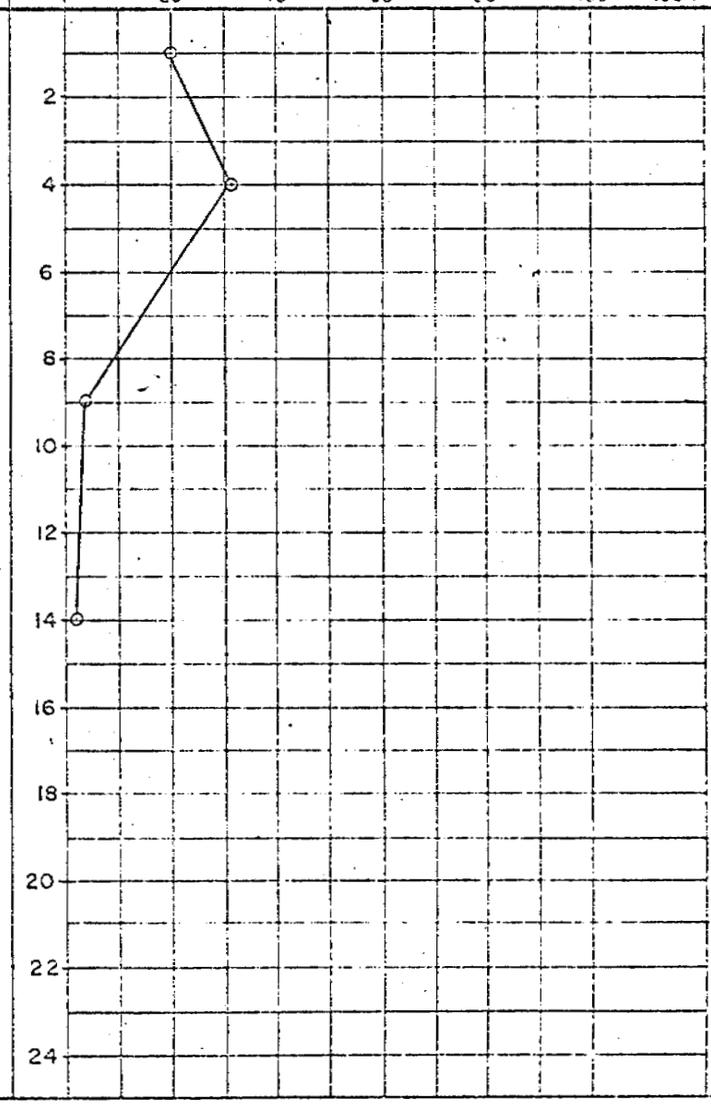
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 13/11/73	AIRPHOTO NO:	CHAINAGE: 1105+00	OFFSET: ℄
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: BRUSH & SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
470	C	225 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						ORGANIC TO 7"	F	
2						SILT		
4					ML	BROWN, FEW PEBBLES SANDY		
6								
8						SAND		
10					SM	SILTY, FINE, FEW PEBBLES		
12					TO			
14					GM			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravelly, Silty Sand
Location
Hole 470-C-28B Depth 14'-15'
Technician Date Nov. 28/72

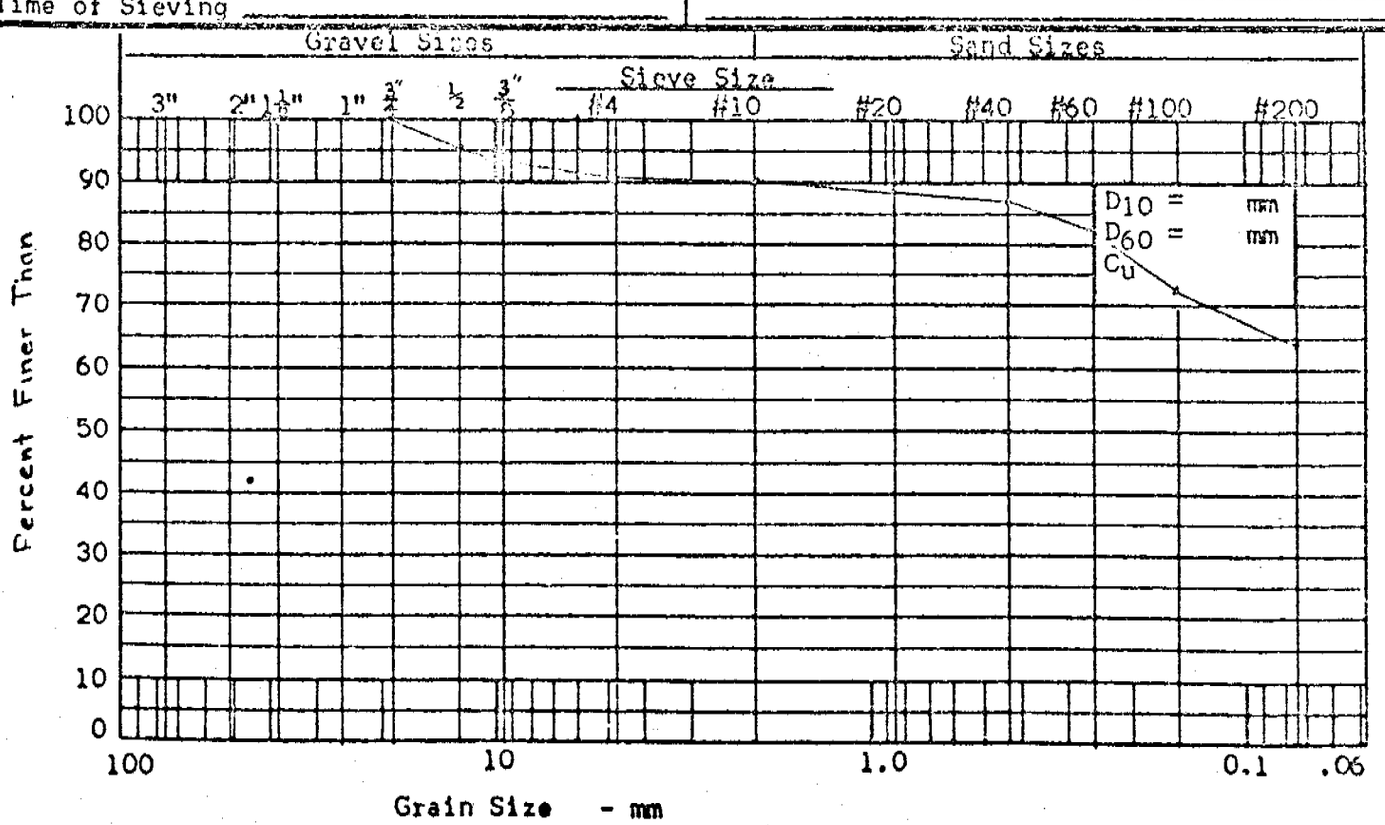
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			95.6%	
Wt. Dry		3/8	9.52			93.4%	
	4	.185	4.76			90.6%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			90.0%	
Tare No.	20	.0331	.840			89.2%	
Wt. Dry + Tare	40	.0165	.420			87.5%	
Tare	60	.0097	.250			82.3%	
Wt. Dry	100	.0059	.149			72%	
	200	.0029	.074			64.7%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

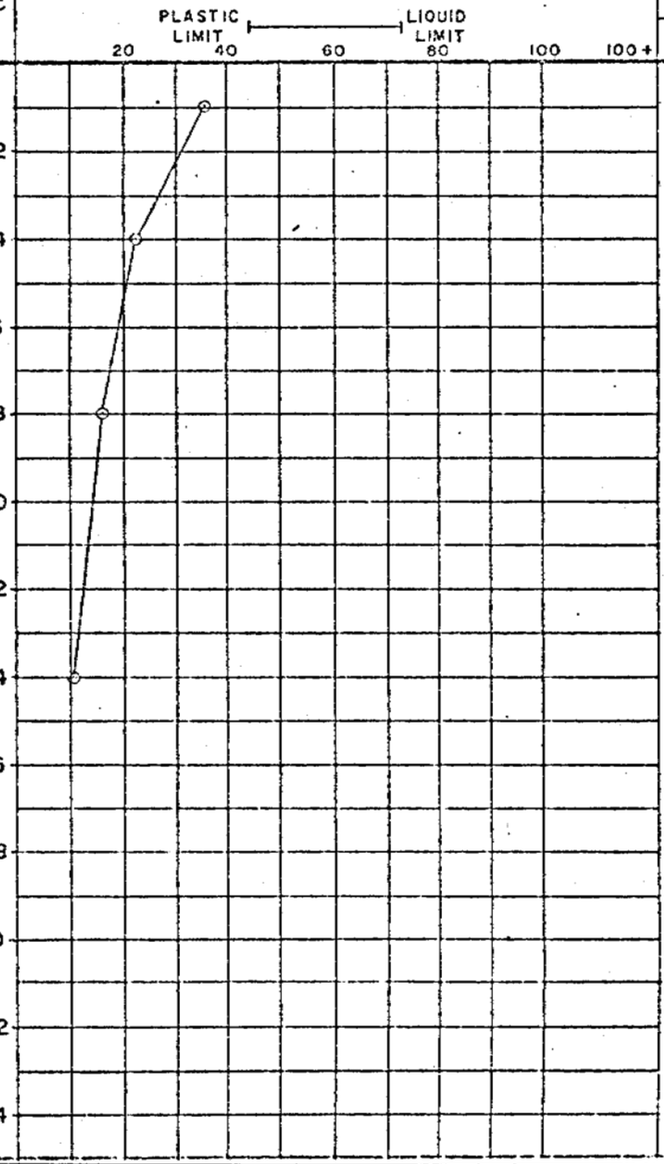
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1097+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & BIRCH 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
470	C	28 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT ORGANIC, GRANULAR									
2					CL	CLAY SILTY, ROCKS & BOULDERS SOME SAND GRAVELLY	F	Nbn							
4							UF								
6															
8															
10															
12					SW	SAND GRAVELLY, SILTY									
14									65		25	10			
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravelly Clay
Location
Hole 470-C-52A Depth 19'-20'
Technician Date Nov. 23/72

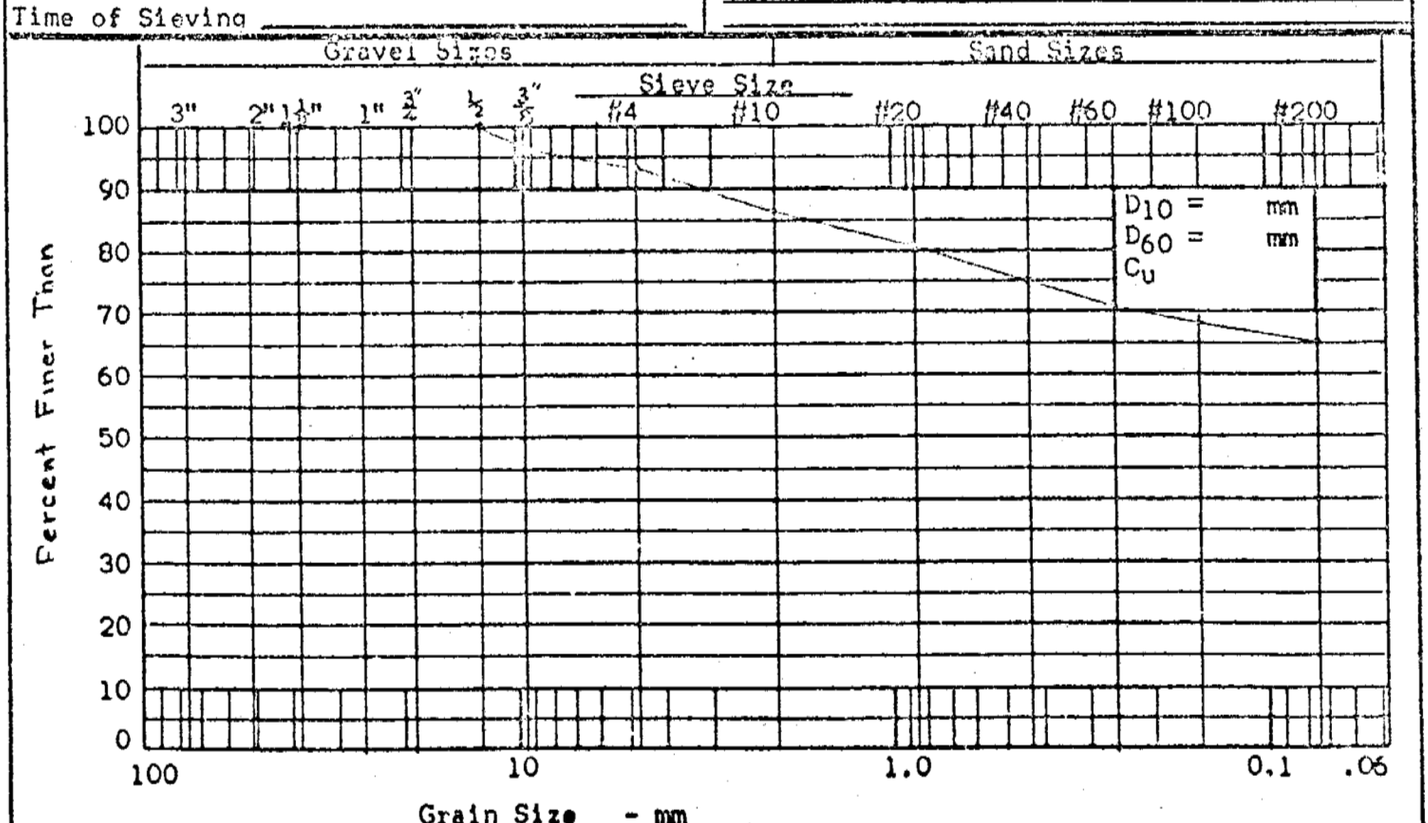
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100%	
Wt. Dry		3/8	9.52			96.9%	
	4	.185	4.76			93.1%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			86.8%	
Tare No.	20	.0331	.840			81.2%	
Wt. Dry + Tare	40	.0165	.420			75.3%	
Tare	60	.0097	.250			71.3%	
Wt. Dry	100	.0059	.149			68.5%	
	200	.0029	.074			65.0%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



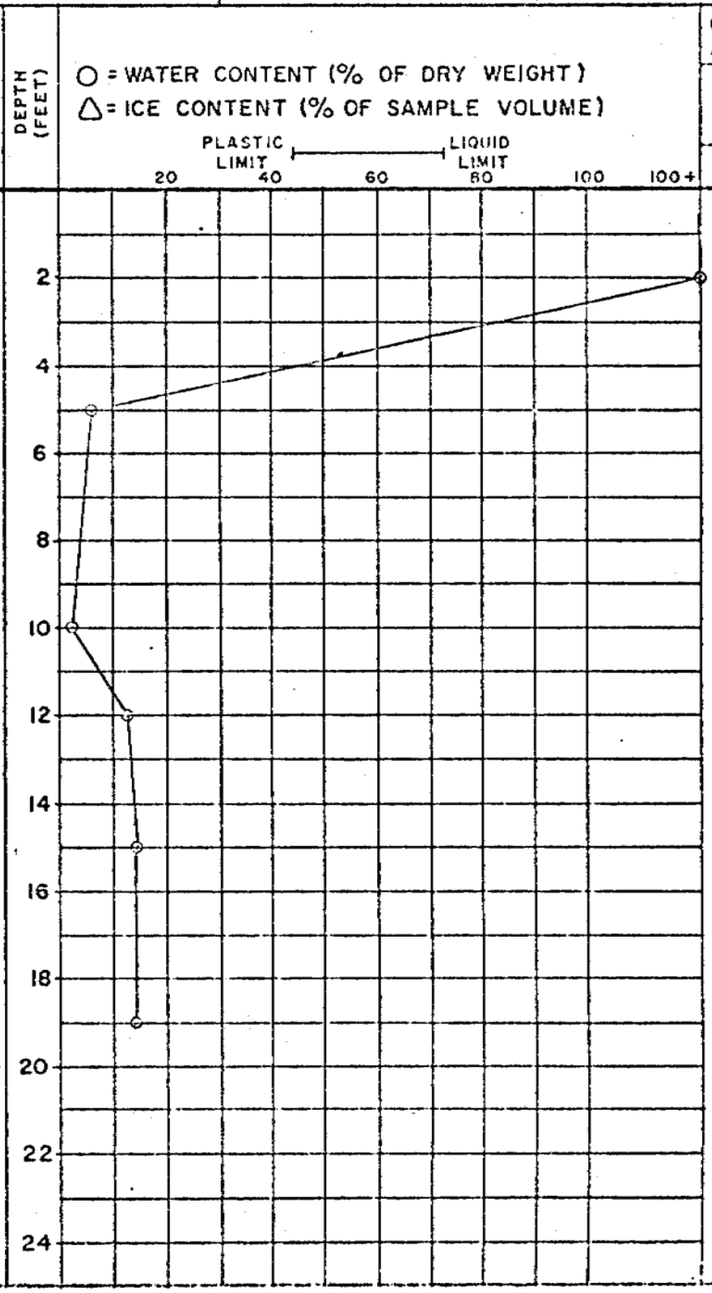
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1090+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: WEST 5%-10%	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
470	C	52A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2															
						GRAVEL									
4															
6						SANDY, ROCKS AND BOULDERS SOME CLAY									
8					GC		F	Nf							
10															
12															
14															
16						CLAY									
18					CL	BROWN, GRAVELLY	F	Nbn							
20									6	5	22	13			
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Gravel
Location
Hole 470-C-27B Depth 14'-15'
Technician Date Nov. 29/72

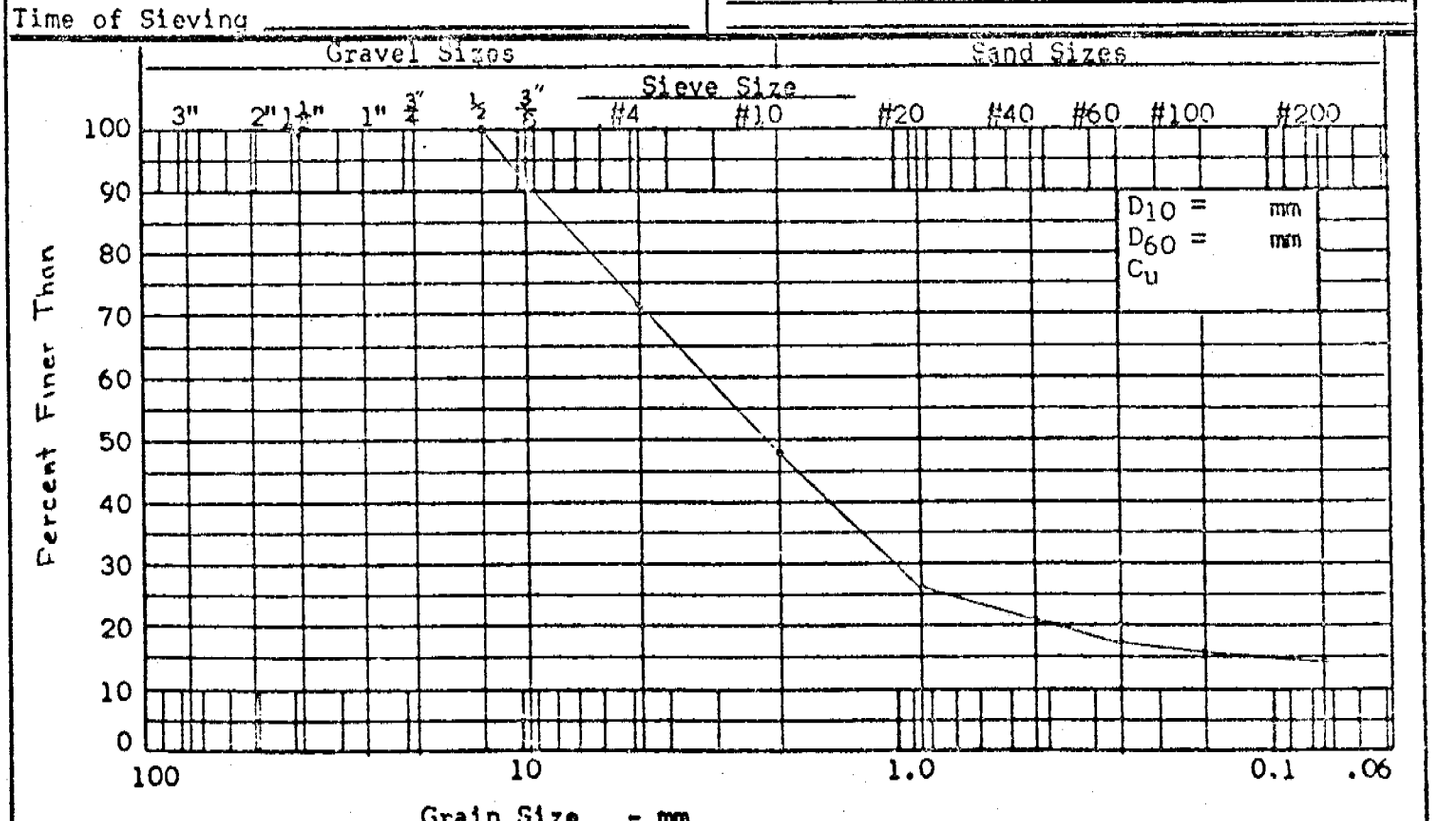
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			100%	
		3/8	9.52			91.3%	
	4	.185	4.76			71%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			48.7%	
Wt. Dry + Tare	20	.0331	.840			26.6%	
Tare	40	.0165	.420			20.1%	
Wt. Dry	60	.0097	.250			17.8%	
	100	.0059	.149			16.1%	
	200	.0029	.074			14%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty Gravel
Location
Hole 470-C-27B Depth 14'-15'
Technician Date Nov. 29/72

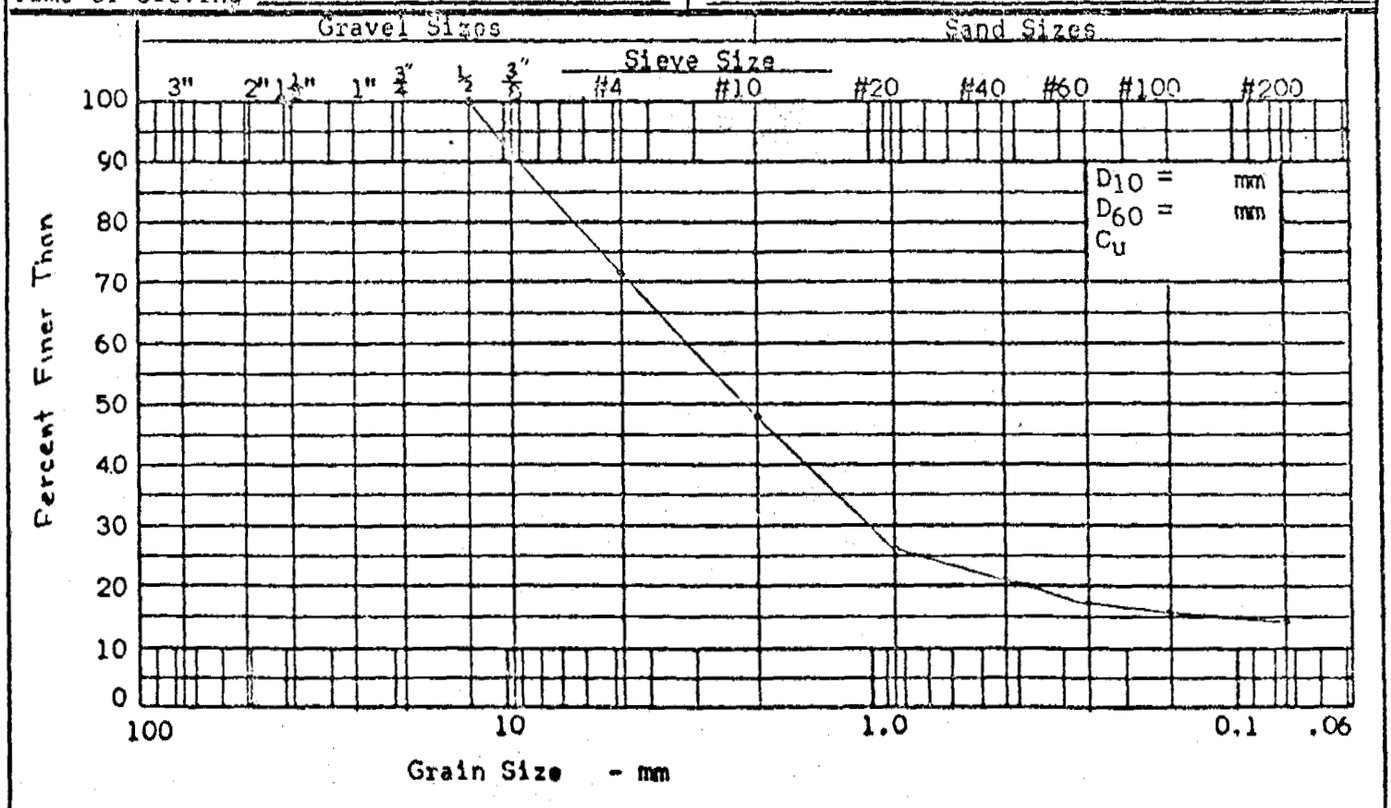
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100%	
Wt. Dry		3/8	9.52			91.3%	
	4	.185	4.76			71%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			48.7%	
Wt. Dry + Tare	20	.0331	.840			26.6%	
Tare	40	.0165	.420			20.1%	
Wt. Dry	60	.0097	.250			17.8%	
	100	.0059	.149			16.1%	
	200	.0029	.074			14%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel with some Sand
Location
Hole 470-C-27B Depth 8'-10'
Technician Date Nov. 29/72

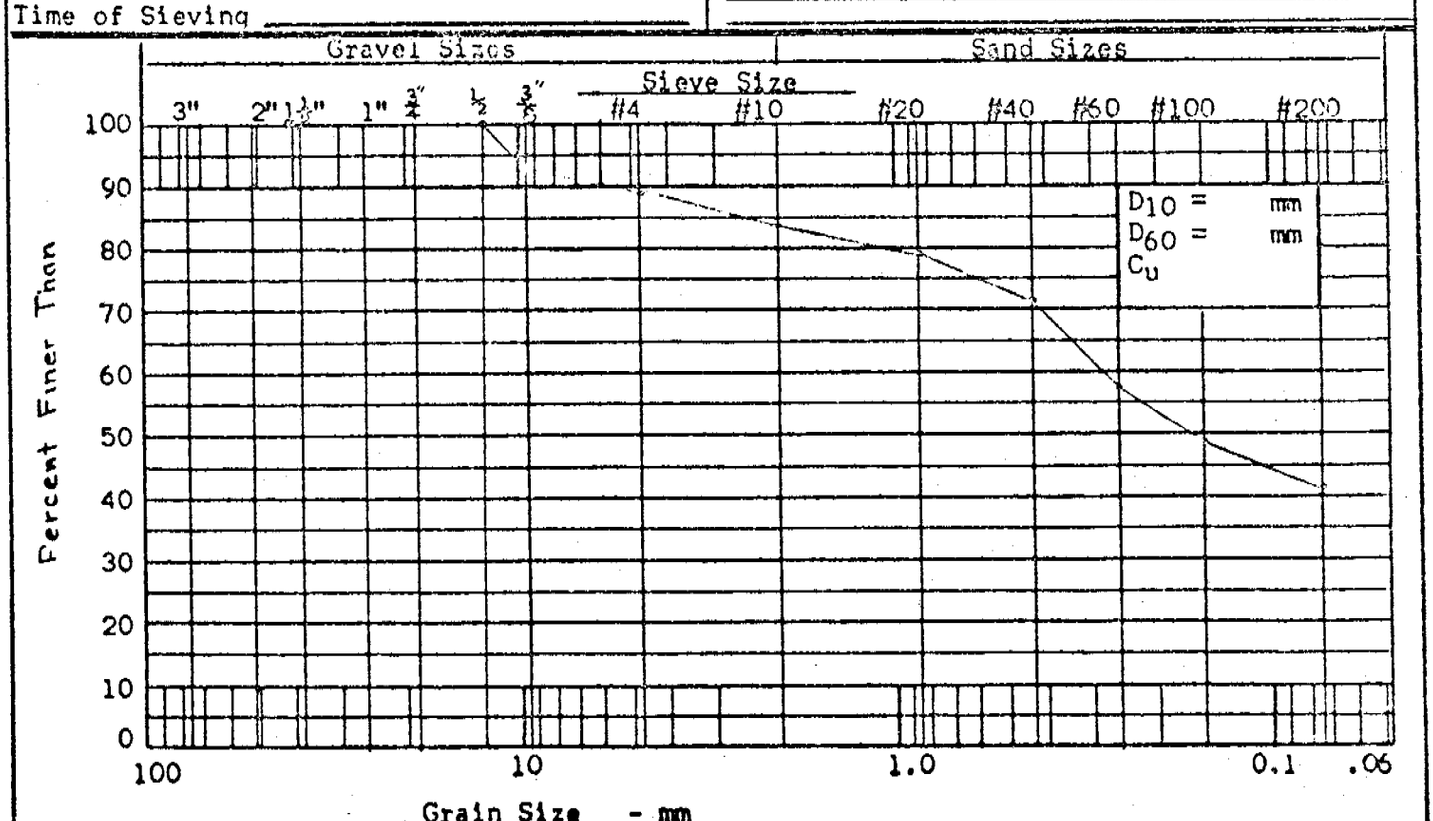
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			100%	
		3/8	9.52			93.3%	
	4	.185	4.76			89.2%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			84.6%	
Wt. Dry + Tare	20	.0331	.840			79.9%	
Tare	40	.0165	.420			71.4%	
Wt. Dry	60	.0097	.250			57.4%	
	100	.0059	.149			48.6%	
	200	.0029	.074			41.6%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



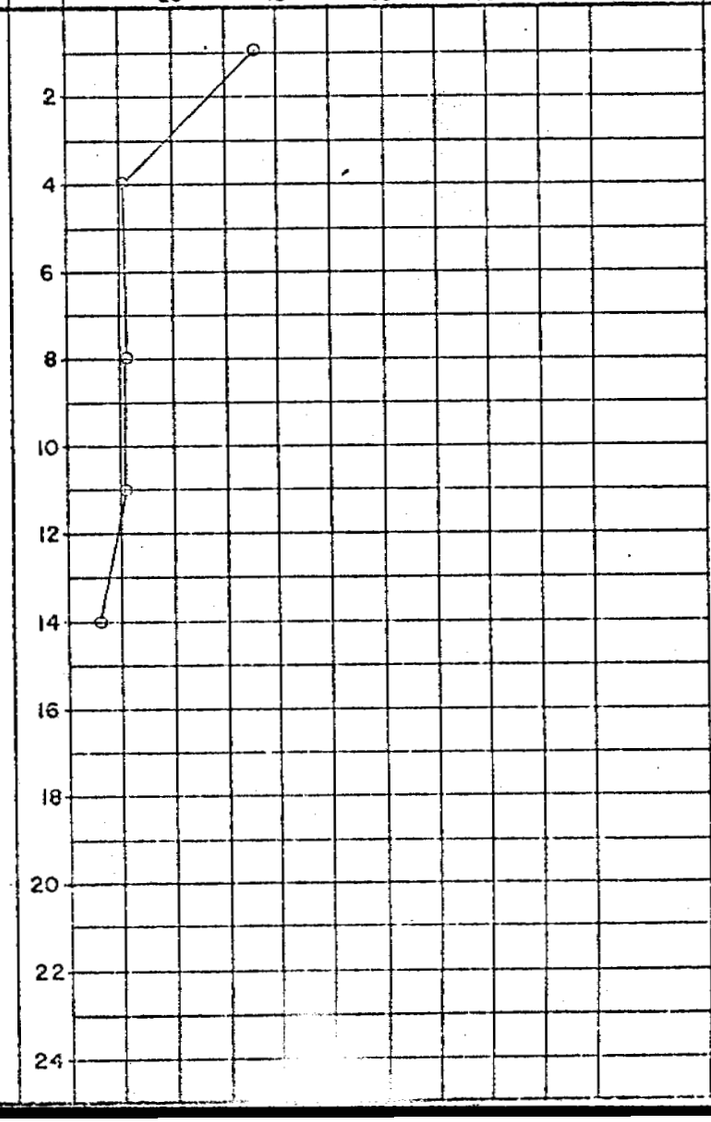
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1081+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & ASPEN TO 25'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
470	C	27B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC, GRANULAR	F	Nbn							
2					CL	CLAY SILTY									
4					GM	GRAVEL SOME SAND FEW FINES	UF								
6															
8									42		43	15			
10															
12						SILTY									
14									14		35	51			
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand with some Gravel
Location
Hole 470-C-26B Depth 9'-10'
Technician Date Nov. 29/72

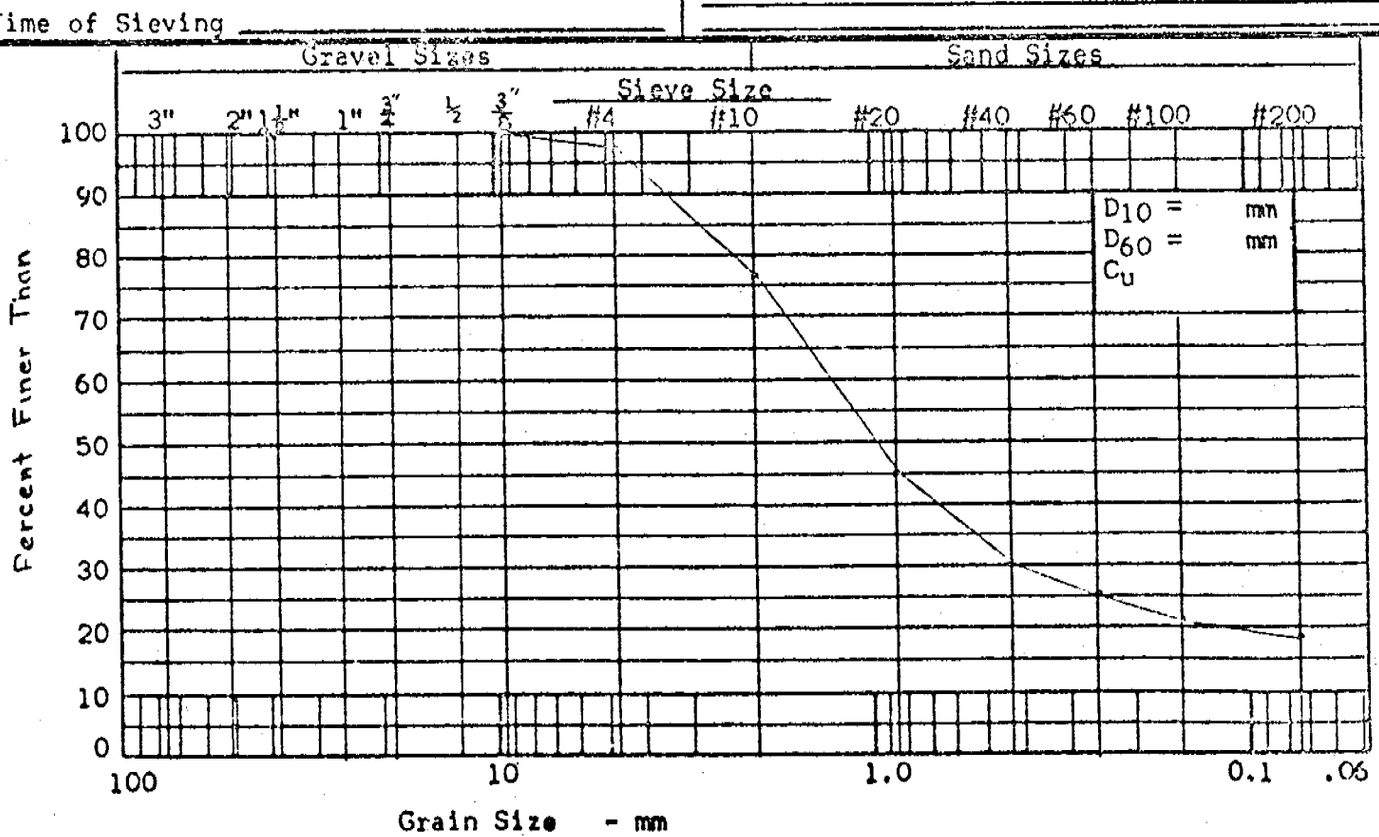
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100%	
	4	.185	4.76			97.4%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			76.6%	
Tare No.	20	.0331	.840			45.7%	
Wt. Dry + Tare	40	.0165	.420			30.2%	
Tare	60	.0097	.250			25.2%	
Wt. Dry	100	.0059	.149			21.4%	
	200	.0029	.074			18.4%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

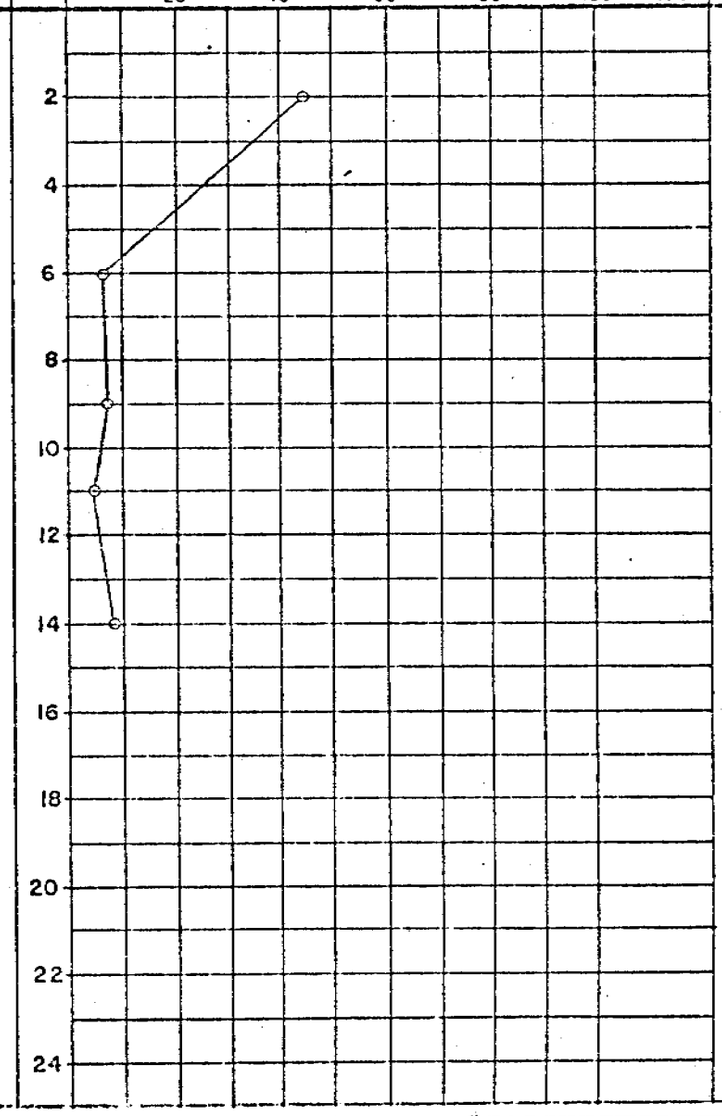


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1074+00	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & ASPEN TO 35'	ELEV:	MILE: 470 / B,C,S: C / NUMBER: 26B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT GRANULAR, MUSKEG	F	Nbn							
2					CL	CLAY BROWN, SOME SILT ROCKS, COBBLES AND BOULDERS									
4															
6					SC	SAND SOME GRAVEL CLAY FINES									
8															
10							F	Nf	18		58	24			
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Fine Gravel
Location	
Hole 471-C-51A	Depth 15'
Technician	Date

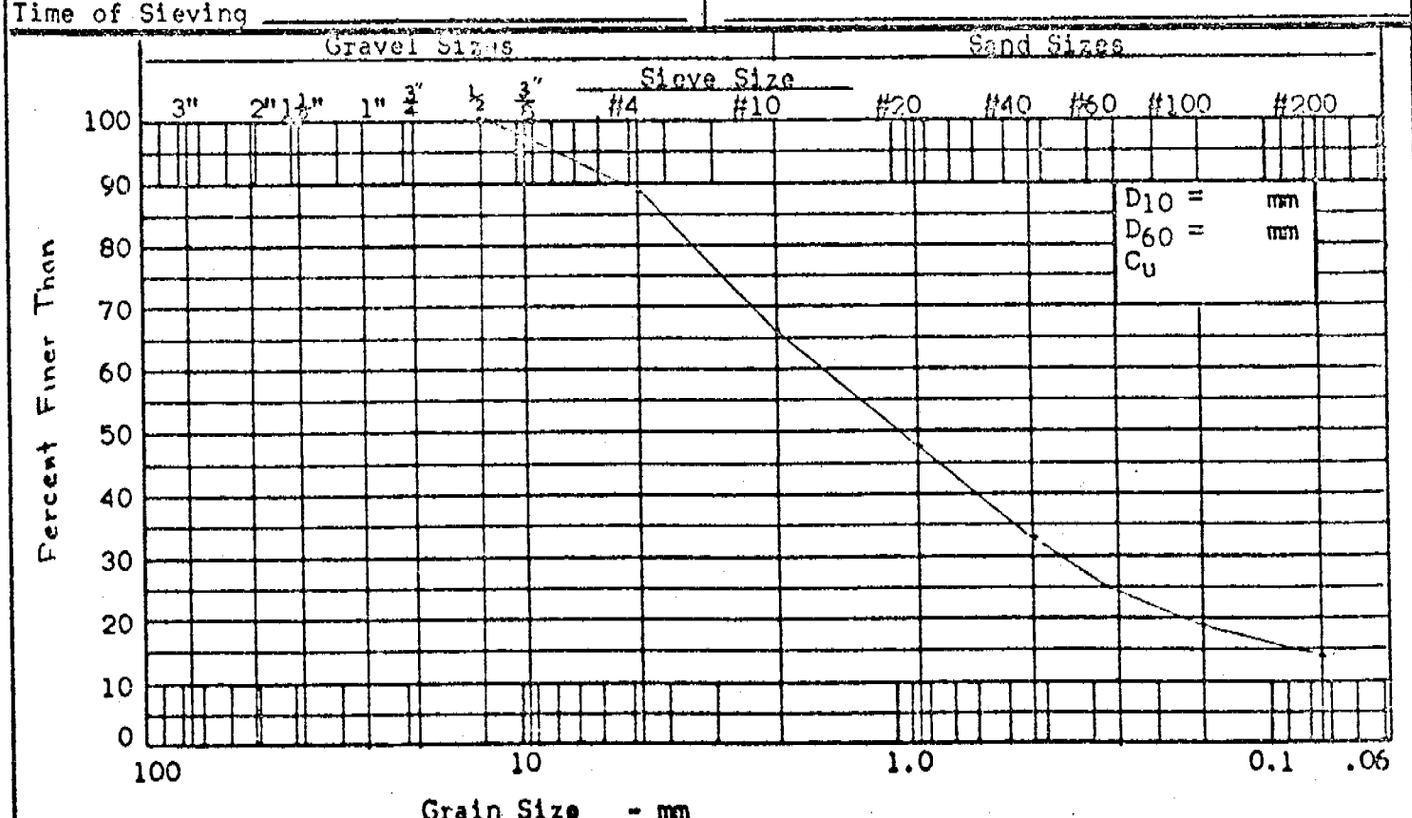
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100%	
Wt. Dry		3/8	9.52			92.5%	
	4	.185	4.76			64.0%	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			32.4%	
Tare No.	20	.0331	.840			21.4%	
Wt. Dry + Tare	40	.0165	.420			16.9%	
Tare	60	.0097	.250			14.4%	
Wt. Dry	100	.0059	.149			12.9%	
	200	.0029	.074			10.4%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

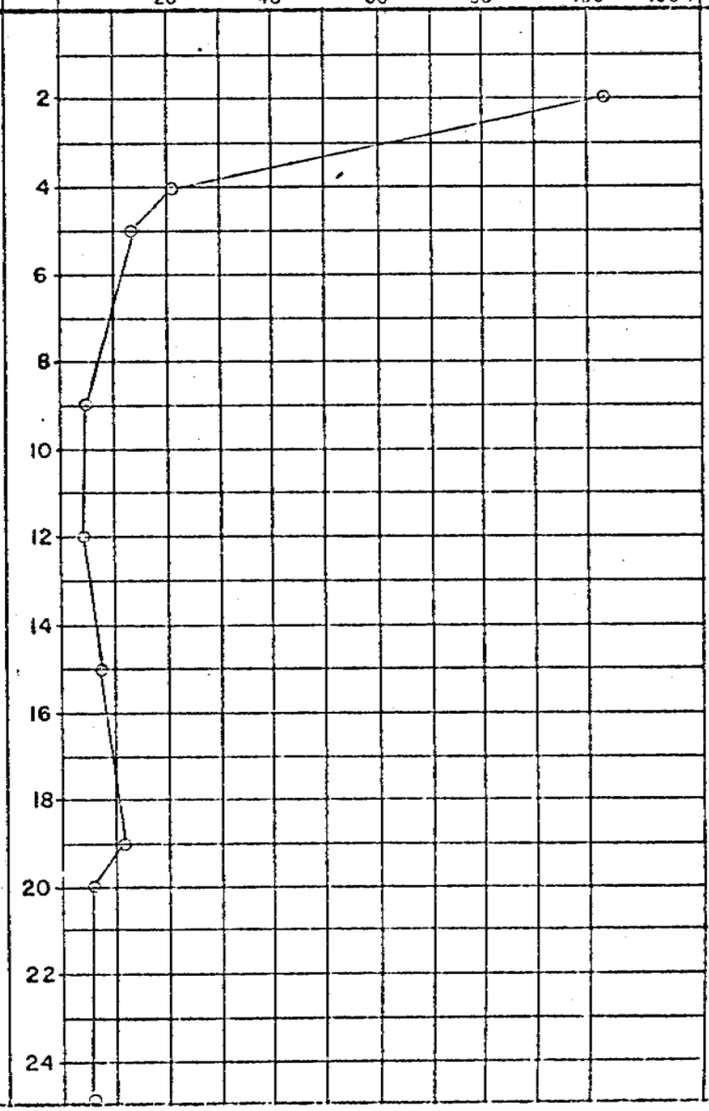
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1058+00	OFFSET: ℄
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: WEST 4%	VEGETATION: CONIFER 20'	ELEV. 407.31

TEST HOLE

MILE	B,C,S	NUMBER
471	C	51A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT ORGANIC, GRANULAR	F	Nbn							
2					CL	CLAY LIGHT BROWN, SILTY SOME ROCKS & COBBLES, HARD									ROCK CRUSHED BY DRILL BIT
8					GC	GRAVEL FINE, SOME ROCKS SOME CLAY			10		22	68			DIFFICULT DRILLING
20						SHALE GREY									
30'						END OF HOLE @ 30'									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy silty gravel
Location	
Hole	471-S-229B Depth 9' - 10'
Technician	Date Jan. 31, 1973

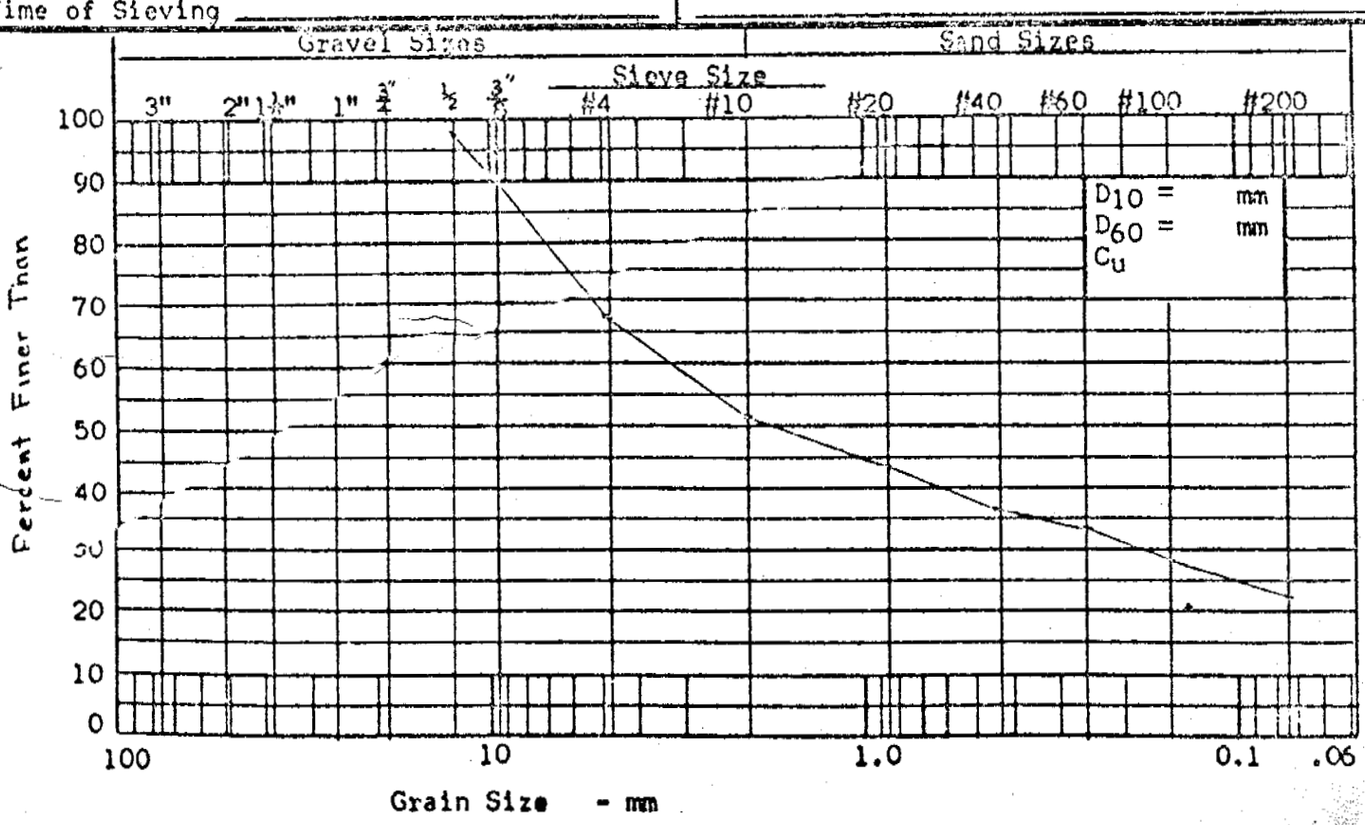
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			97.8	
Wt. Dry		3/8	9.52			90.2	
	4	.185	4.76			67.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			51.4	
Wt. Dry + Tare	20	.0331	.840			43.5	
Tare	40	.0165	.420			36.8	
Wt. Dry	60	.0097	.250			33.0	
	100	.0059	.149			28.9	
	200	.0029	.074			22.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



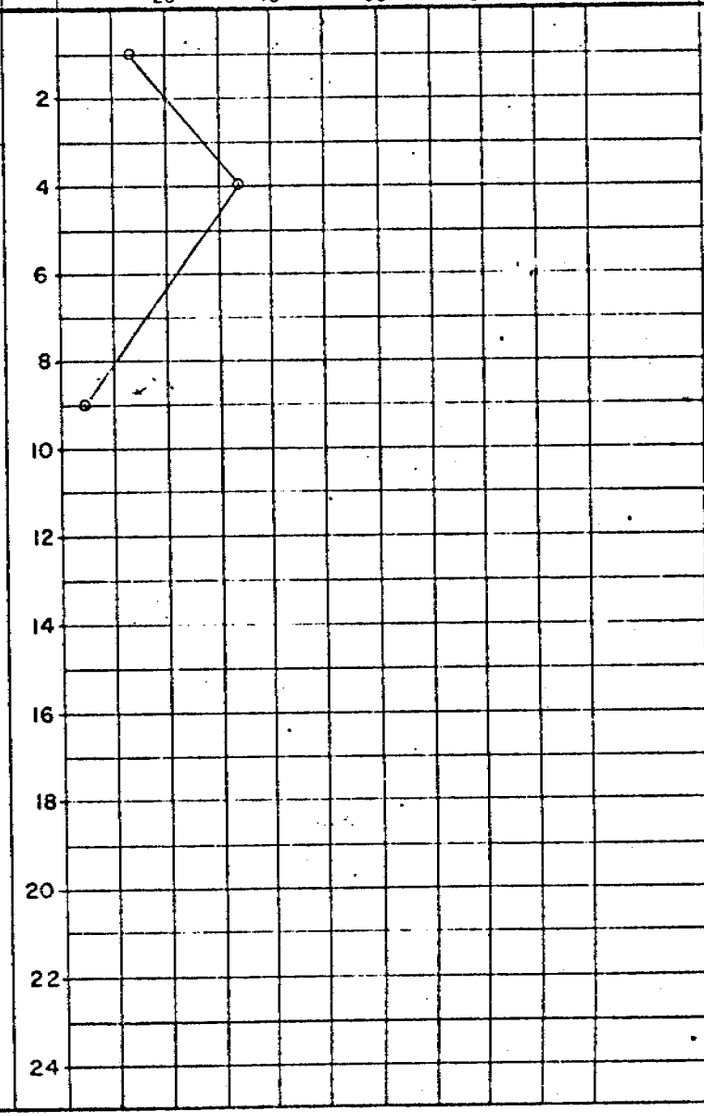
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B.M	DATE DRILLED: 5/12/72	AIRPHOTO NO:	CHAINAGE: 1135+00	OFFSET: ℄
CKD: D.G.P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
463	C	438

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - GRANULAR MUSKEG		
2					SM	SAND LIGHT BROWN, SILT TRACE OF GRAVEL	F	Vx
4							UF	
6						GRAVEL		
8						ROCKS & COBBLES DRY		
10					GP	SOME SAND REDDISH BROWN		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy, silty gravel
Location
Hole 471-S-229B Depth 14' - 15'
Technician Date Jan. 31, 1973

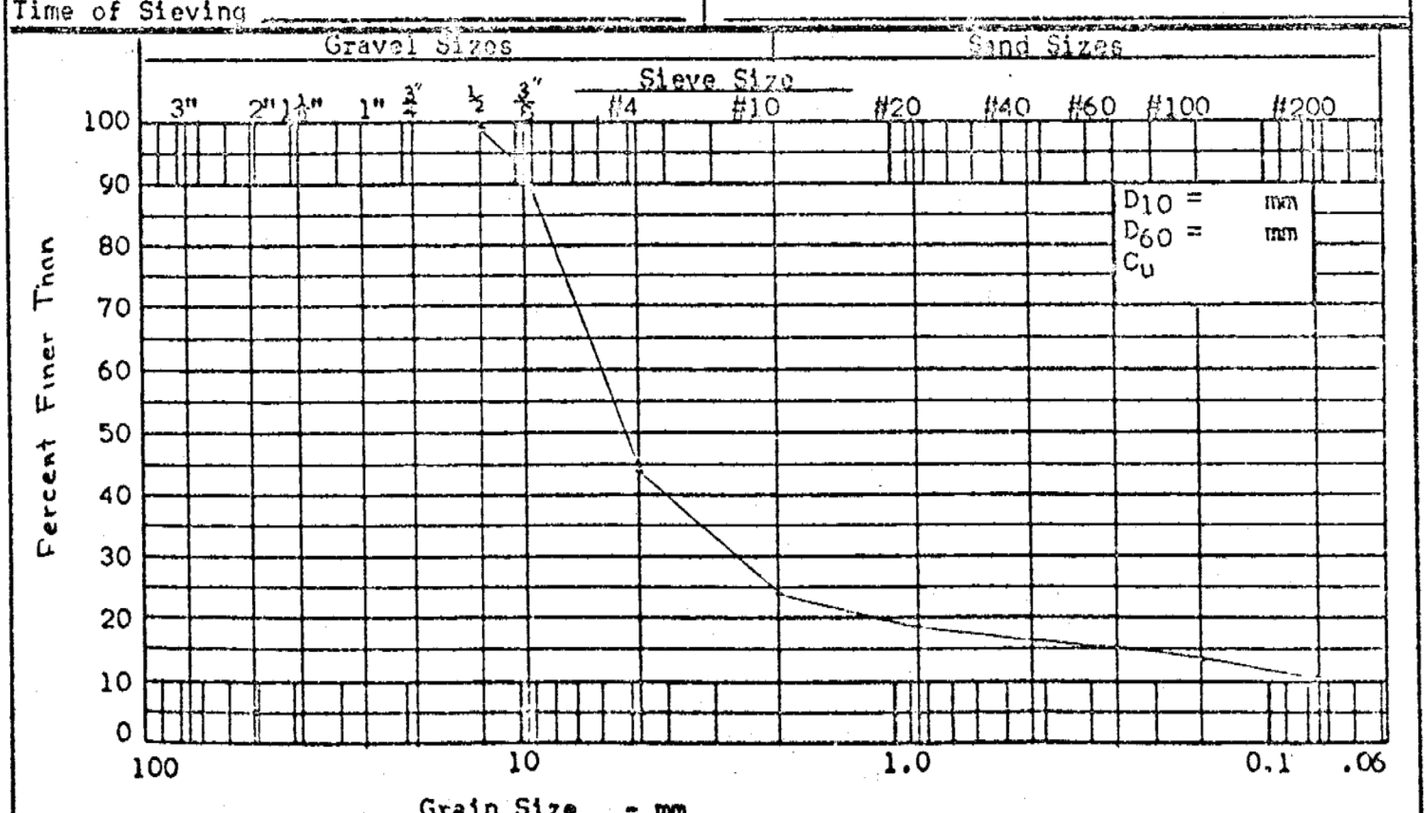
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			99.4	
Wt. Dry		3/8	9.52			93.2	
	4	.185	4.76			44.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			23.6	
Tare No.	20	.0331	.840			18.9	
Wt. Dry + Tare	40	.0165	.420			16.5	
Tare	60	.0097	.250			15.0	
Wt. Dry	100	.0059	.149			13.3	
	200	.0029	.074			10.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy, silty gravel
Location	
Hole 471-S-229B	Depth 15' - 17'
Technician	Date Feb. 1, 1973

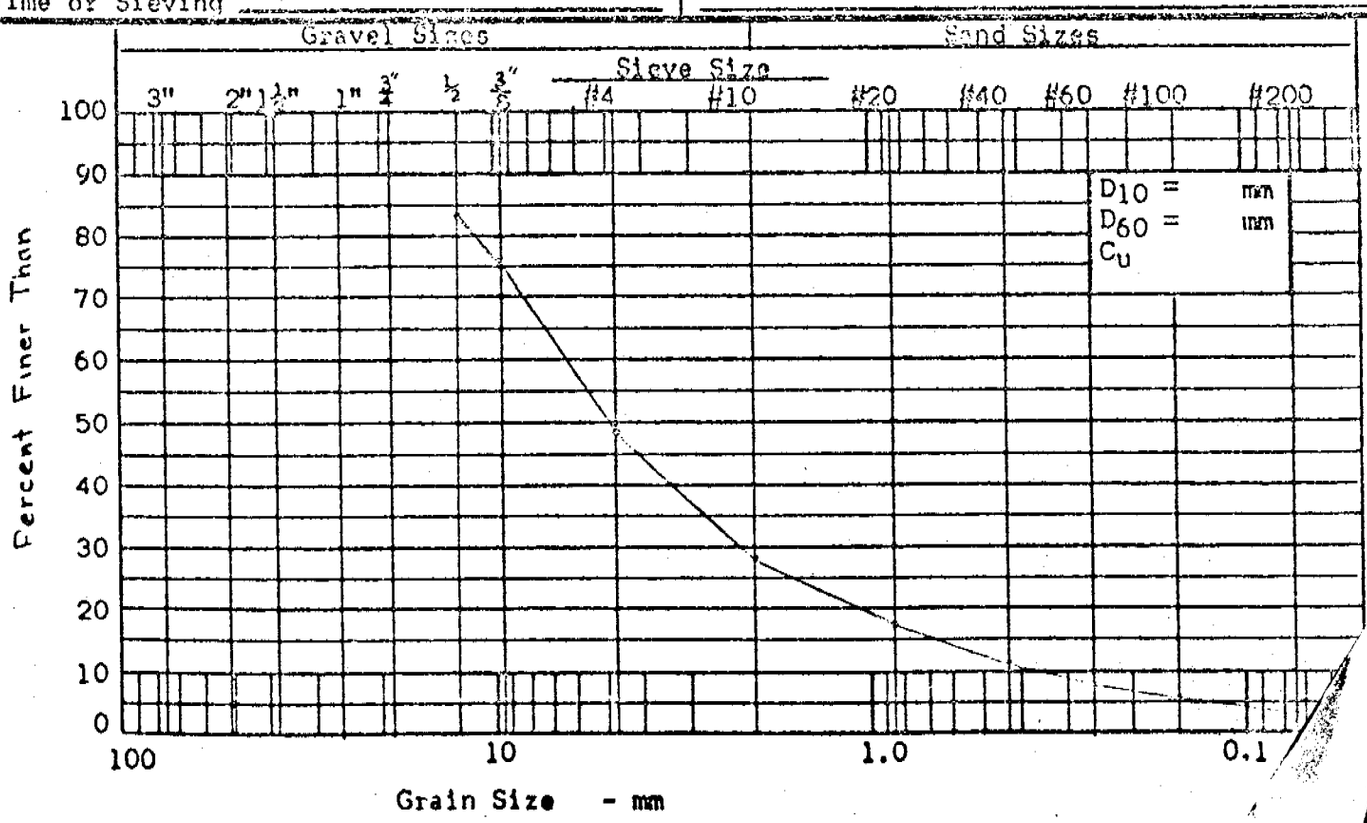
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			83.5	
		3/8	9.52			76.5	
	4	.185	4.76			48.7	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			28.7	
Wt. Dry + Tare	20	.0331	.840			17.4	
Tare	40	.0165	.420			11.3	
Wt. Dry	60	.0097	.250			7.8	
	100	.0059	.149			6.1	
	200	.0029	.074			3.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Sca

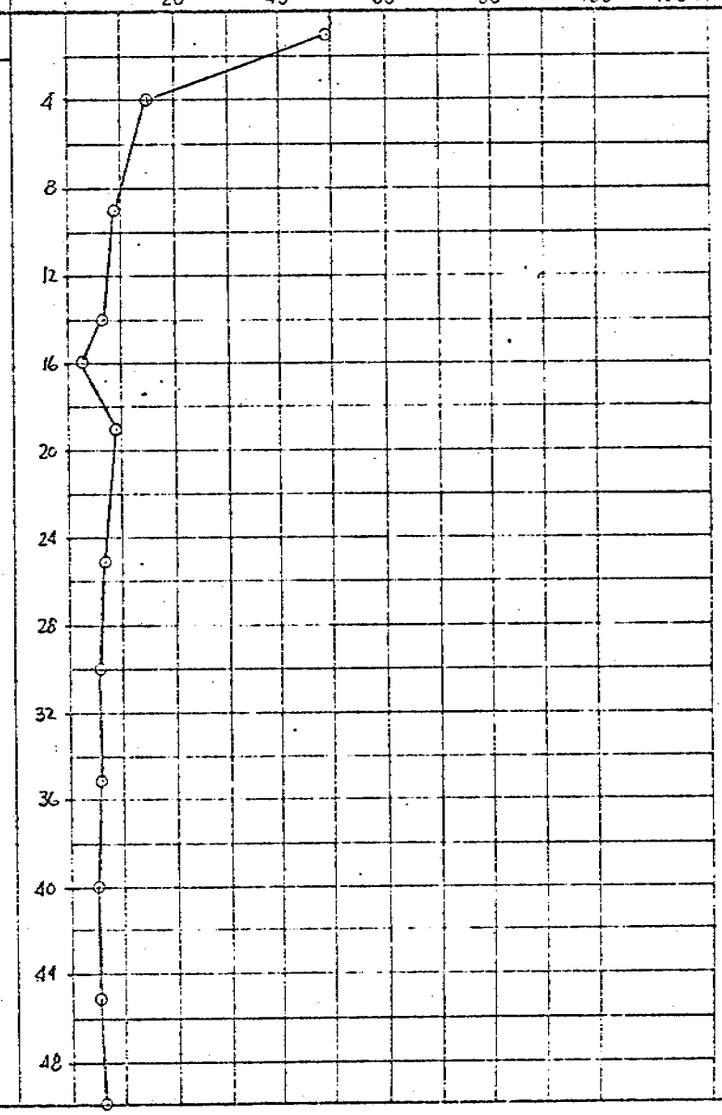
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: B.M	DATE DRILLED: 13/11/73	AIRPHOTO NO:	CHAINAGE: 1056+00	OFFSET: ℄
CKD: DGP	TECH: DM	RIG:	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV: 403.12

TEST HOLE

MILE	B.C.S	NUMBER
471	S	2293

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					ML	SILT 6" ORGANIC	F								
4							UF								SO_4 - 0.10 %
					GM	SAND BROWN, SOME GRAVEL									
8									23		28	49			
						GRAVEL SANDY, SILTY									
12					GW	COARSE			11		13	76			
16						SAND SEAM 18'-19'									
20						SHALE									
24															
28						SOFT, GREY									
32															
36															
40															
44															
48						END OF HOLE @ 50'									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Clay with Gravel
Location
Hole 471-S-32B Depth 4'-5'
Technician Date Dec. 2/72

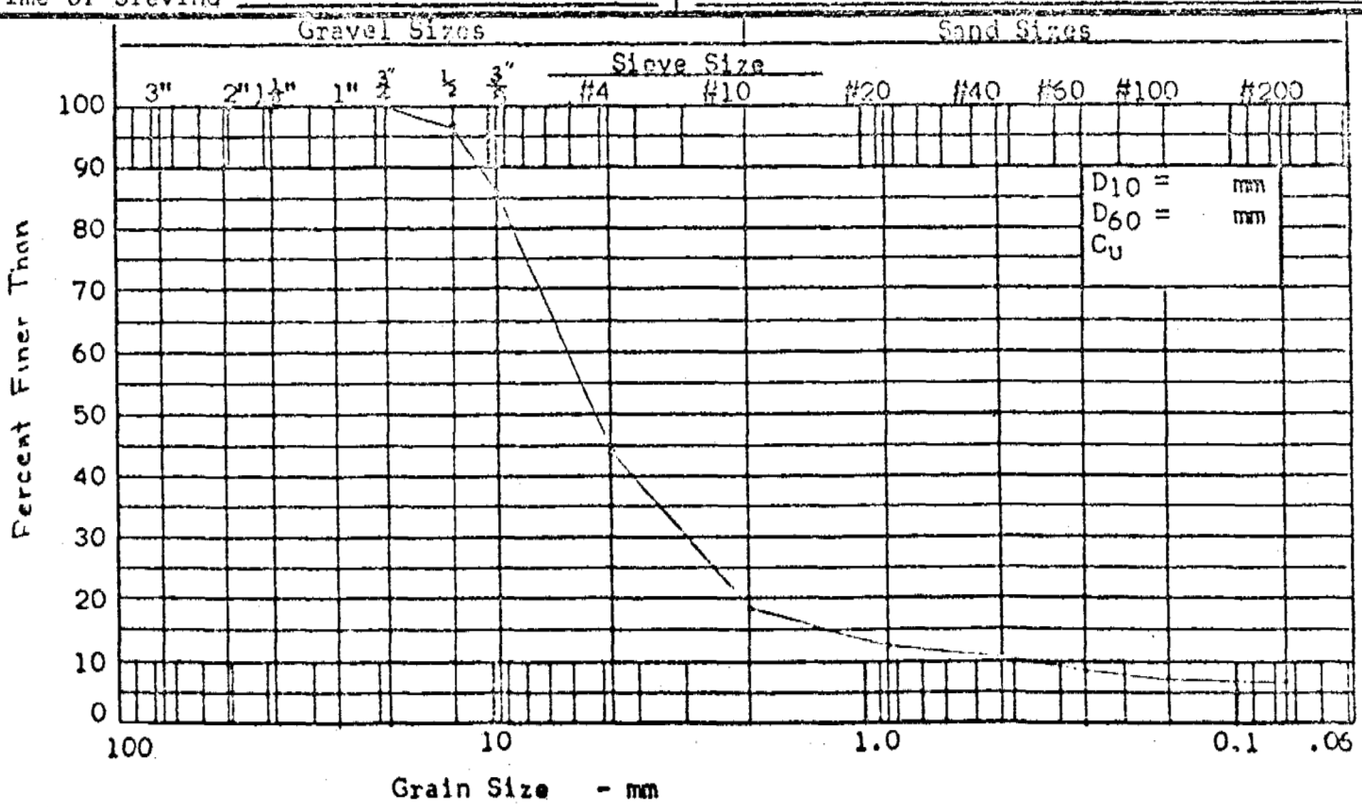
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			97.0%	
Wt. Dry		3/8	9.52			86.8%	
	4	.185	4.76			44.3%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			18.4%	
Tare No.	20	.0331	.840			12.6%	
Wt. Dry + Tare	40	.0165	.420			10.5%	
Tare	60	.0097	.250			8.8%	
Wt. Dry	100	.0059	.149			7.7%	
	200	.0029	.074			6.7%	
Passing	200					0	

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel
Location	
Hole	471-S-32B Depth 9' - 10'
Technician	Date

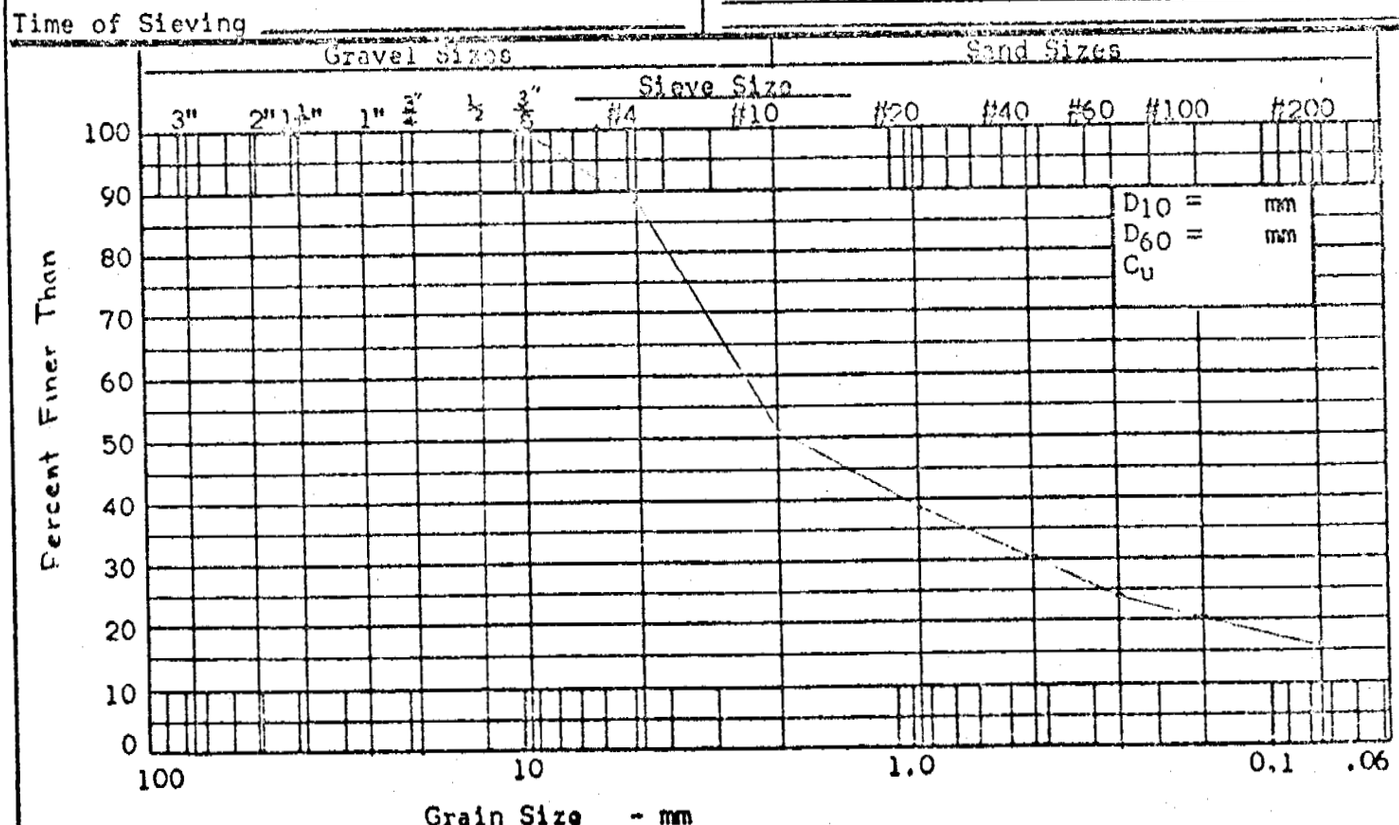
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100.6	
	4	.185	4.76			88.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			51.8	
Wt. Dry + Tare	20	.0331	.840			39.1	
Tare	40	.0165	.420			30.[illegible]	
Wt. Dry	60	.0097	.250			24.4	
	100	.0059	.149			20.8	
	200	.0029	.074			16.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W | FIELD ENG: B.M. | DATE DRILLED: 30/11/72 | AIRPHOTO NO: | CHAINAGE: 1055+00 | OFFSET:

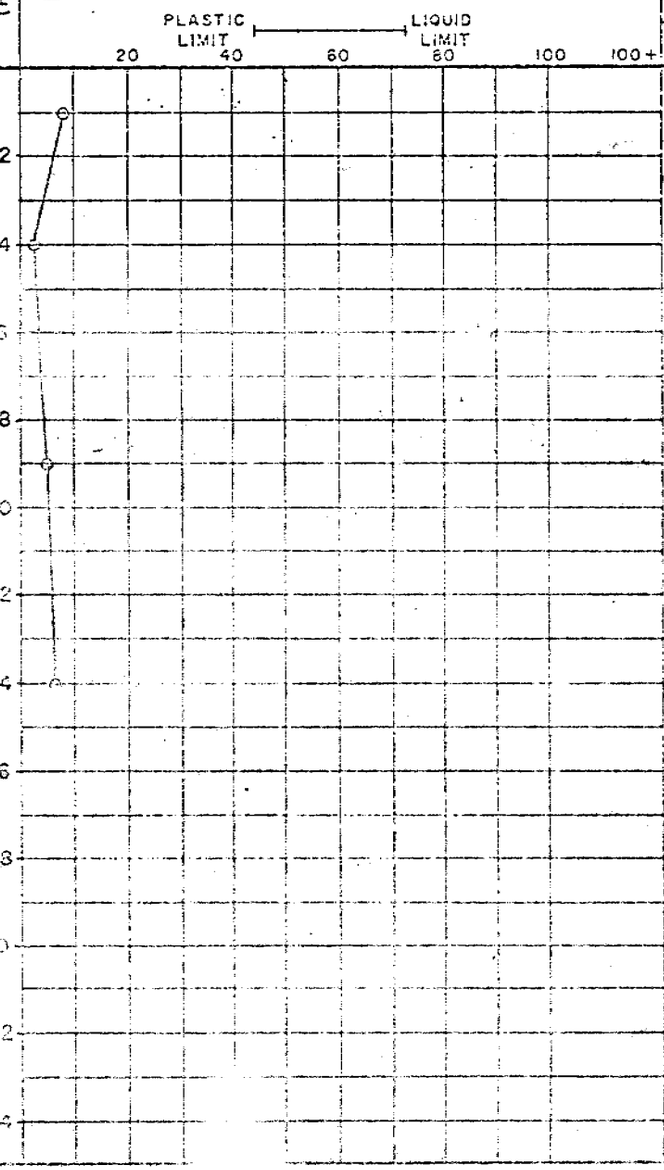
CKD: D.G.P. | TECH: D.M | RIG: AIR | SURFACE DRAINAGE: GOOD | VEGETATION: SPRUCE & BIRCH TO 40' | ELEV: 97.11

TEST HOLE

MILE	B,C,S	NUMBER
471	S	328

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GP	STONES	F	Nf							
2															
					CL	CLAY BROWN, LARGE GRAVEL VERY DRY		Nbn							
4									7		11	82			
6					GP	GRAVEL SOME SAND		Nf							
8															47% COARSE FRACTION CRUSHED DURING DRILLING
					GW	GRAVEL SMALL, SANDY, SOME BROWN CLAY		Nbn	17		35	48			
12						GRAVEL									
14					GC	CLAYEY		Nf							
16															
18															
20															
22						END OF HOLE									
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, sandy gravel
Location
Hole 471-S-138A Depth 5'
Technician Date Feb. 1, 1973

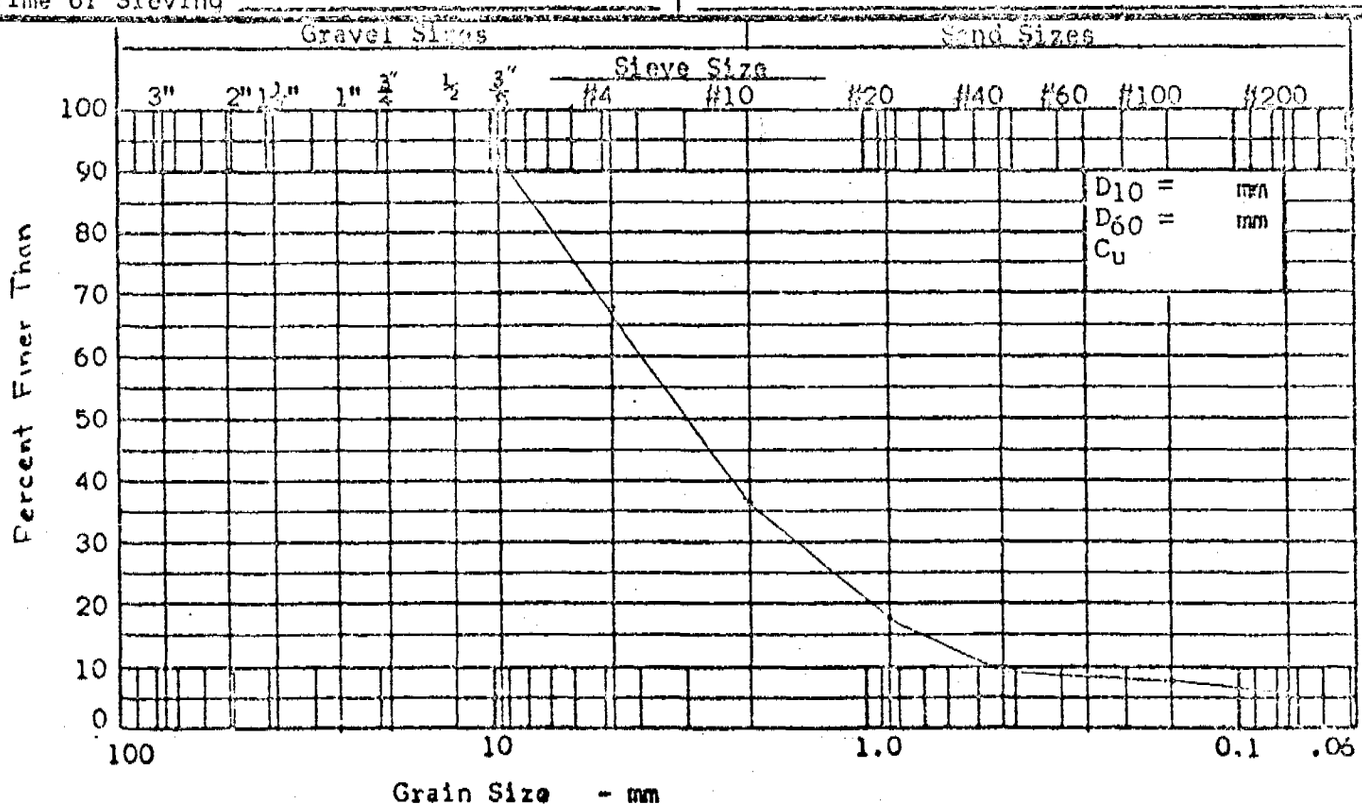
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70				
		3/8	9.52			92.7	
	4	.185	4.76			67.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			36.3	
Wt. Dry + Tare	20	.0331	.840			17.5	
Tare	40	.0165	.420			9.9	
Wt. Dry	60	.0097	.250			8.0	
	100	.0059	.149			7.0	
	200	.0029	.074			6.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, sandy gravel
Location
Hole 471-S-1-138A Depth 10'
Technician Date Feb. 1, 1973

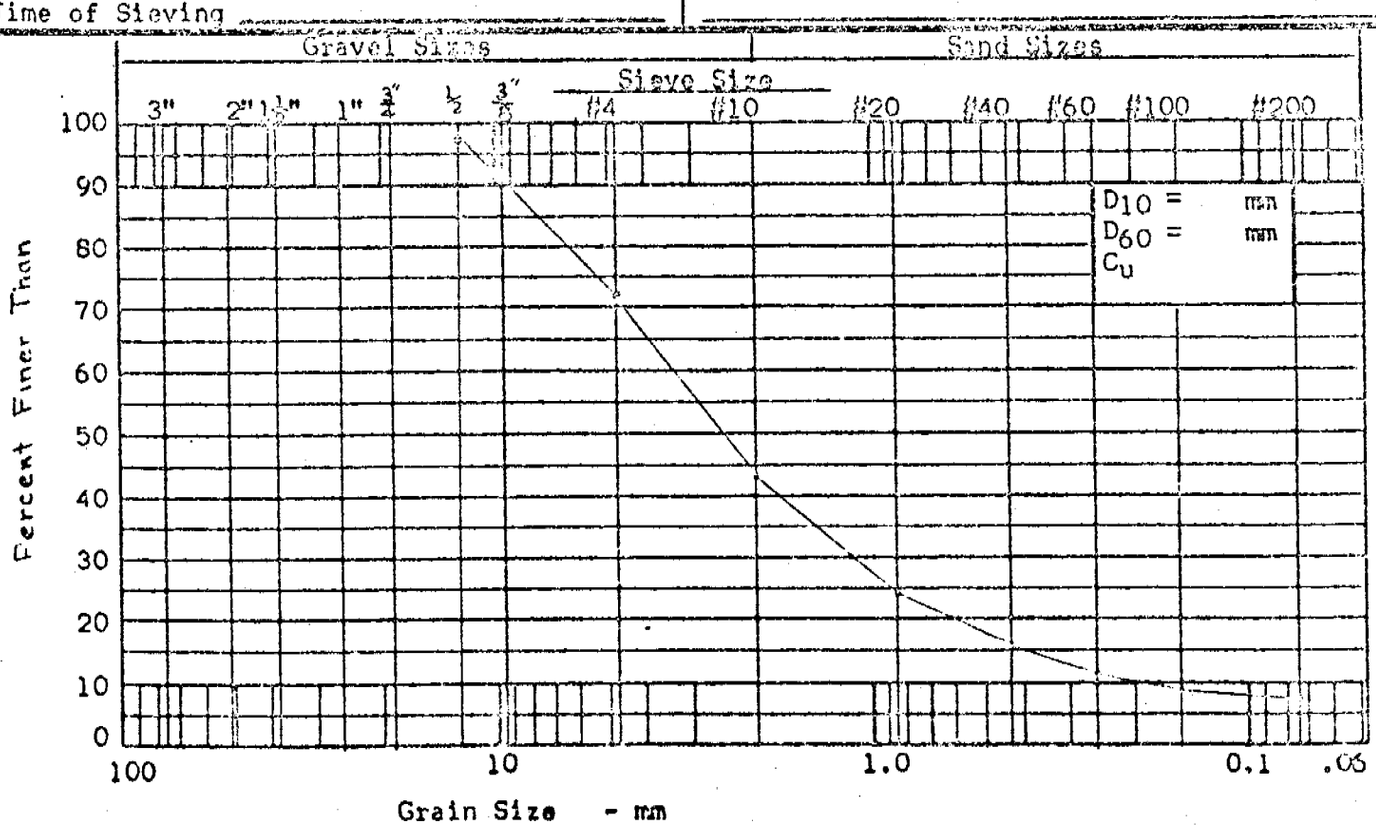
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			97.6	
Wt. Dry		3/8	9.52			91.3	
	4	.185	4.76			72.1	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			43.5	
Wt. Dry + Tare	20	.0331	.840			24.9	
Tare	40	.0165	.420			15.9	
Wt. Dry	60	.0097	.250			12.0	
	100	.0059	.149			9.6	
	200	.0029	.074			7.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty Shale with Gravel
Location	
Hole 471-S-1383	Depth 20
Technician	Date Jan 20/73

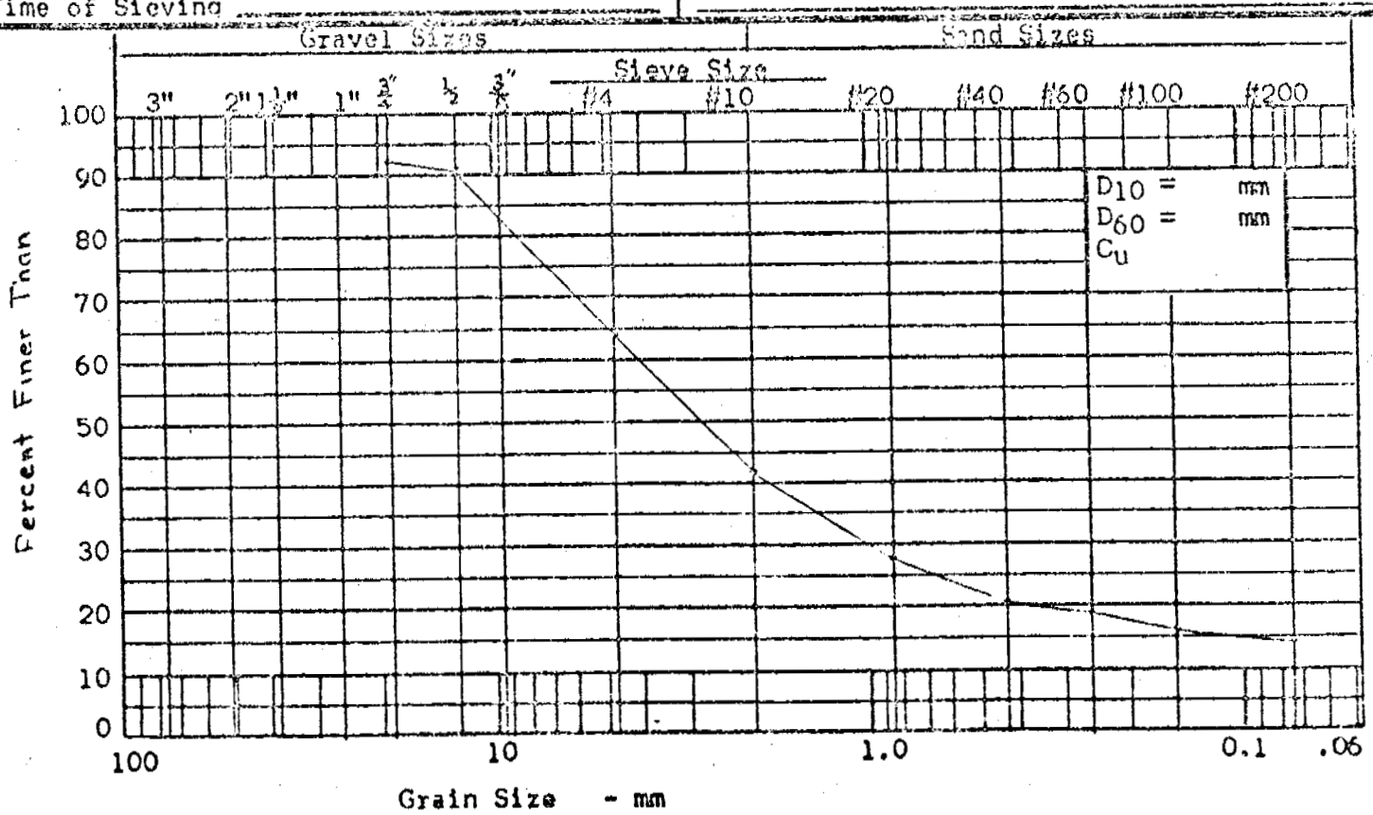
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			92.1	
Tare		1/2	12.70			91.2	
Wt. Dry		3/8	9.52			82.6	
	4	.185	4.76			64.4	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			42.9	
Tare No.	20	.0331	.840			27.4	
Wt. Dry + Tare	40	.0165	.420			20.8	
Tare	60	.0097	.250			18.5	
Wt. Dry	100	.0059	.149			16.8	
	200	.0029	.074			14.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

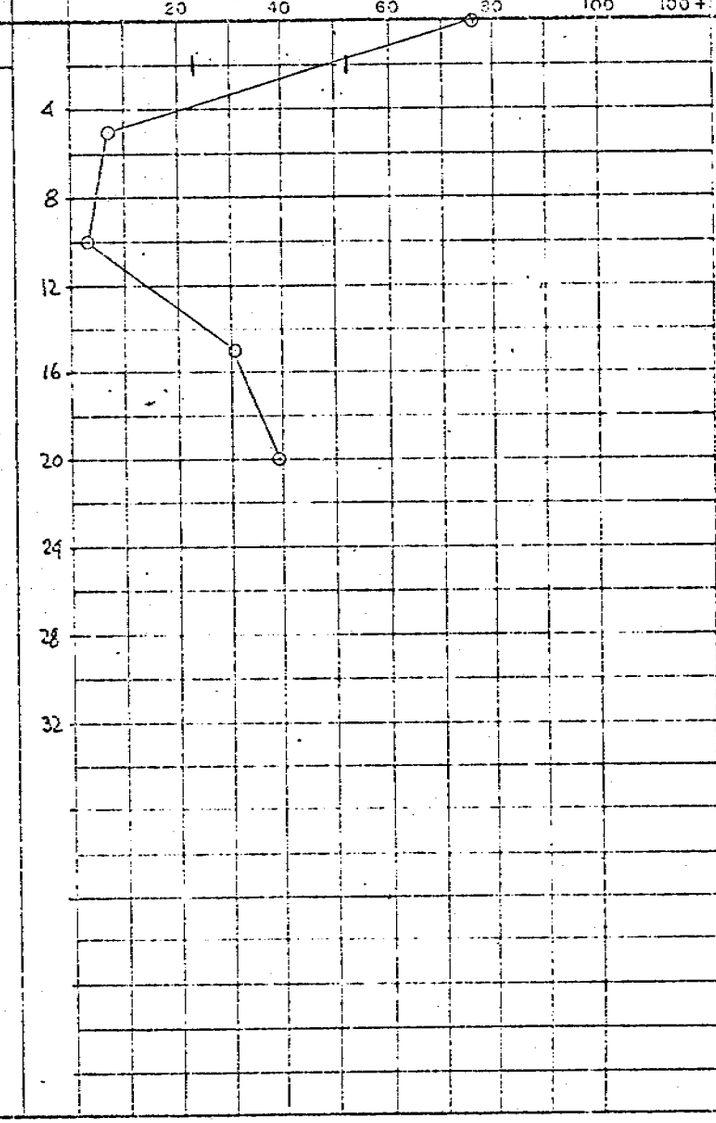
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S.	DATE DRILLED 14/1/73	AIRPHOTO NO:	CHAINAGE: 1054+00	OFFSET:
CKD D.G.P	TECH D.M	RIG AIR	SURFACE DRAINAGE:	VEGETATION: ALDERS	ELEV 740.7

TEST HOLE

MILE	B,C,S	NUMBER
471	S	139A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	PEAT GRANULAR MUSKEG	F		
4					GM	GRAVEL SILTY, SANDY, DRY	UF		
8									
12						WET, SILTY, SOME SHALE			
16									SO_4 - 0.11%
20						SHALE GREY, LITTLE GRAVEL SILTY			
24									
28						END OF HOLE			
32									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		
6		30	64		
8		36	59		
14		29	57		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B.M	DATE DRILLED: 30/11/72	AIRPHOTO NO:	CHAINAGE: 1053+00	OFFSET:
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: GRASS & SHRUBS	ELEV: 1168

TEST HOLE

MILE	B,C,S	NUMBER
471	S	338

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG GRANULAR									
2					CL	CLAY SILTY SEASONAL FROST	F	Nbn							
4					GP	GRAVEL FREE WATER @ 4' ROCKS,	UF								DRILLING WITH ROCK BIT, WATER & DRILLING MUD
6															
8					CL	CLAY SOFT SHALE LAYERS GREY									
10															
12					GP	SHALE SOFT, LAYERED FISSILE									
14															
16					GP	SHALE GREY-BLUE, HARD LAYERED									
18															
30					GP	SHALE SOME GRAVEL GRANITE PEBBLES BOULDERS									
35															
40						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W. | FIELD ENG: B.M. | DATE DRILLED: 1/12/72 | AIRPHOTO NO: | CHAINAGE: 1052+70 | OFFSET: ℄

CKD: D.G.P. | TECH: D.M. | RIG: WATER | SURFACE DRAINAGE: POOR | VEGETATION: GRASS & SHRUBS | ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
471	S	348

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	PEAT ORGANIC	F	Nf	
2					GP	GRAVEL SMALL	UF		
4									
6									DIFFICULT TO DETERMINE FROZEN SOIL WITH WATER & DRILLING MUD
8					CH	CLAY SOME GRAVEL			
10									
12						SHALE GREY			
14									
16									
18									
20									
22									
24						END OF HOLE @ 35'			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ——— LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 2/12/72	AIRPHOTO NO:	CHAINAGE: 1051+30	OFFSET: ℄
CKD: D G P	TECH: D M.	RIG: WATER	SURFACE DRAINAGE: POOR	VEGETATION: SHRUBS & GRASS	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
471	S	35 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT - FINE, FIBROUS		
					CL	CLAY - SOME SAND SEASONAL FREEZING	F	Nbn
2								
					GP	CLAY COBBLES AND BOULDERS	UF	
4								
6					GC	GRAVEL SOFT, CLAYEY		
8						SHALE		
10								
12						GREY		
14								
16								
18								
20								
22								
24						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2							
4							
6							
8							DIFFICULT TO DETERMINE FROZEN SOIL WITH WATER & DRILLING MUD
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

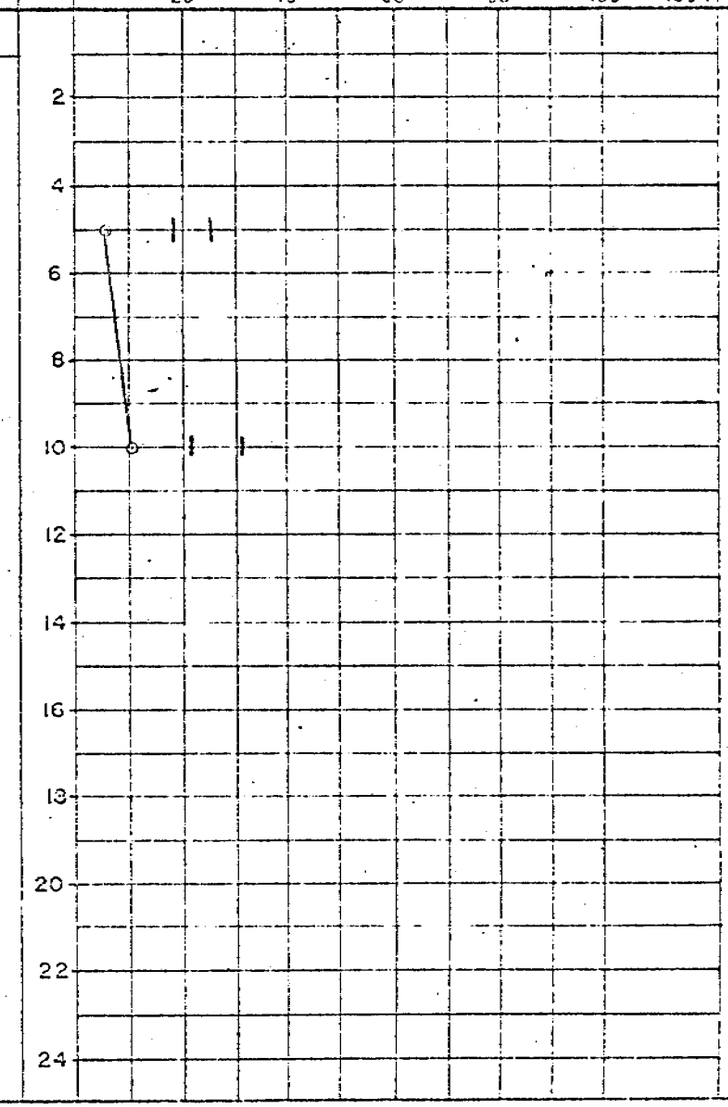
DWN A.E.W	FIELD ENG D.M	DATE DRILLED 14/1/73	AIRPHOTO NO:	CHAINAGE: 1050+90	OFFSET
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JONIFER & POPLAR TO 50' ELEV	

TEST HOLE		
MILE	B,C,S	NUMBER
471	S	140A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL	F	
2					GW	BOULDERS	UF	
4						SHALE		
6								
8								
10								
12								
14						END OF HOLE		
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ——— LIQUID LIMIT



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

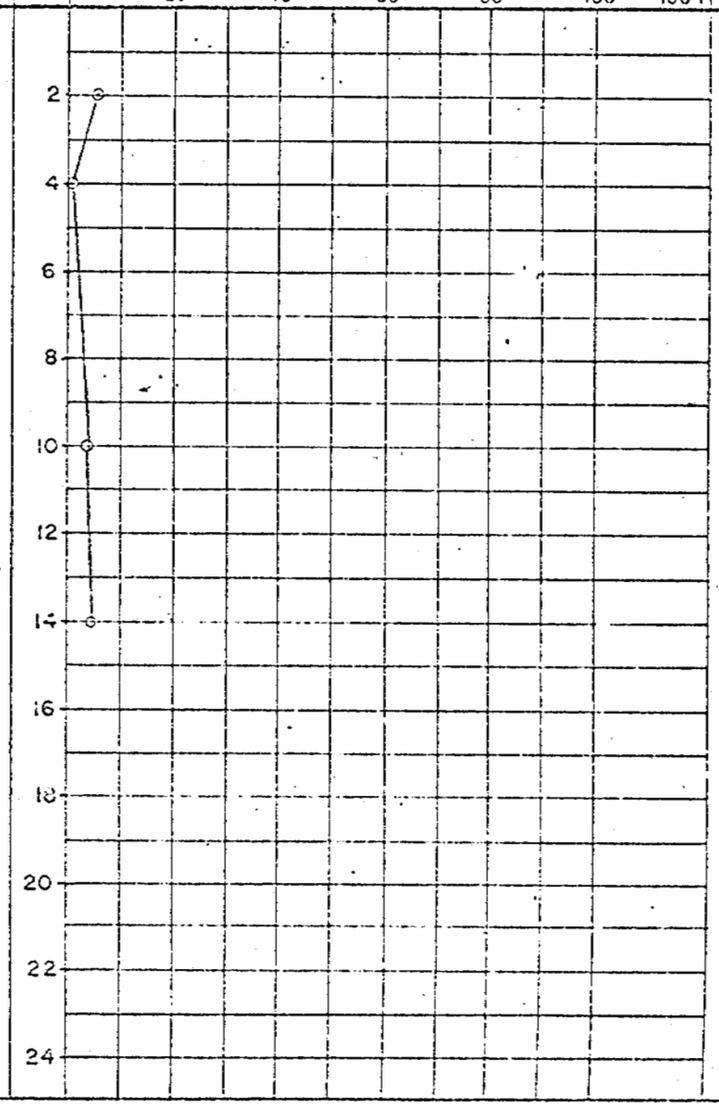
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 29/11/72	AIRPHOTO NO:	CHAINAGE: 1049+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: E-W 2%	VEGETATION: BIRCH, BLACK SPRUCE	ELEV 405.00

TEST HOLE

MILE	B,C,S	NUMBER
471	C	53A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GP	GRAVEL DRY, SANDY NO SEASONAL FROST	UF	
4								
6								
8					GP	, DRY		
10								
12						VERY SANDY		
14								
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							HOLE ABANDONED DUE TO CAVING AFTER TWO ATTEMPTS
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty, sandy gravel
Location
Hole 471-S-137A Depth 5'
Technician Date Feb. 1, 1973

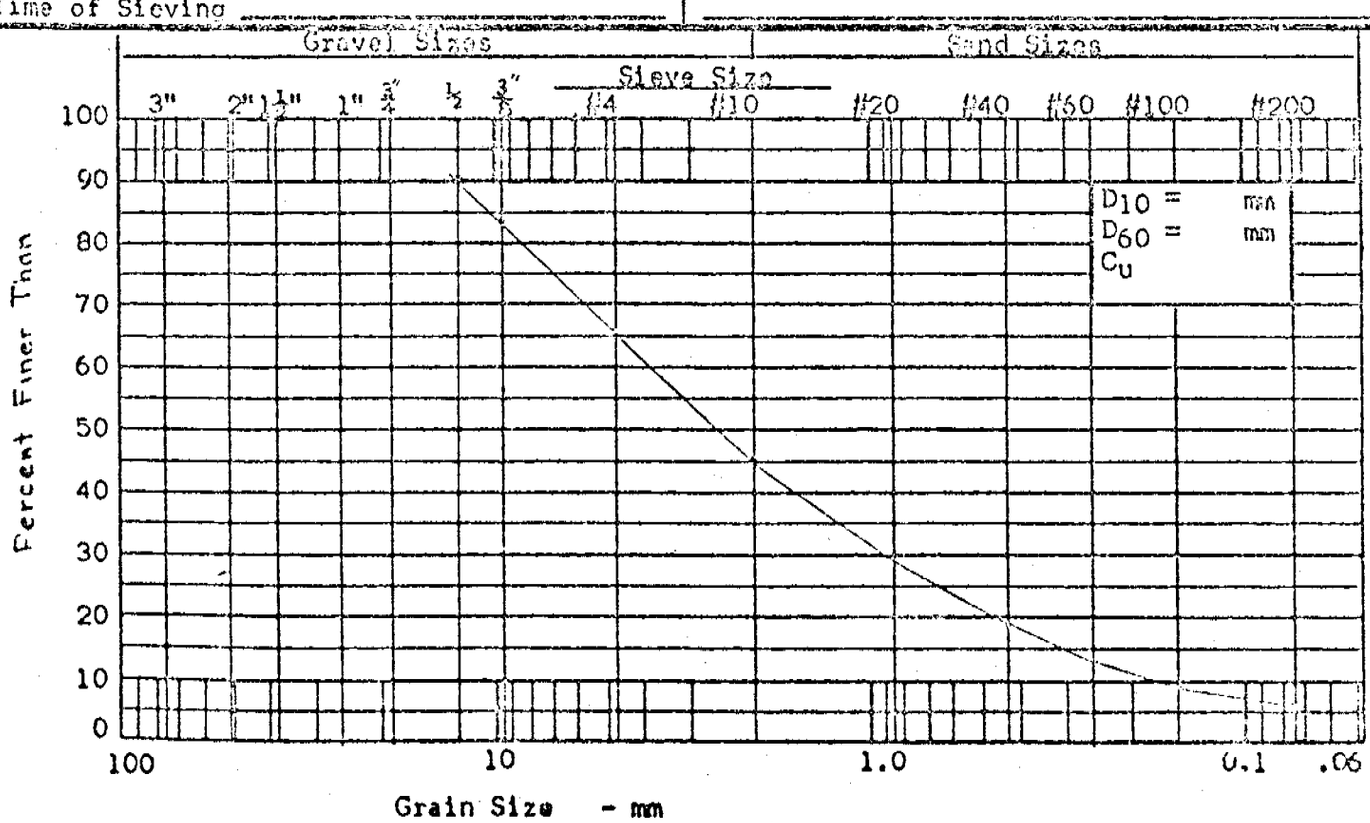
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			90.6	
Wt. Dry		3/8	9.52			84.1	
	4	.185	4.76			66.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			45.6	
Tare No.	20	.0331	.840			29.1	
Wt. Dry + Tare	40	.0165	.420			19.0	
Tare	60	.0097	.250			13.4	
Wt. Dry	100	.0059	.149			9.6	
	200	.0029	.074			6.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty sandy gravel
Location
Hole 471-S-137A Depth 10'
Technician Date Feb. 1, 1973

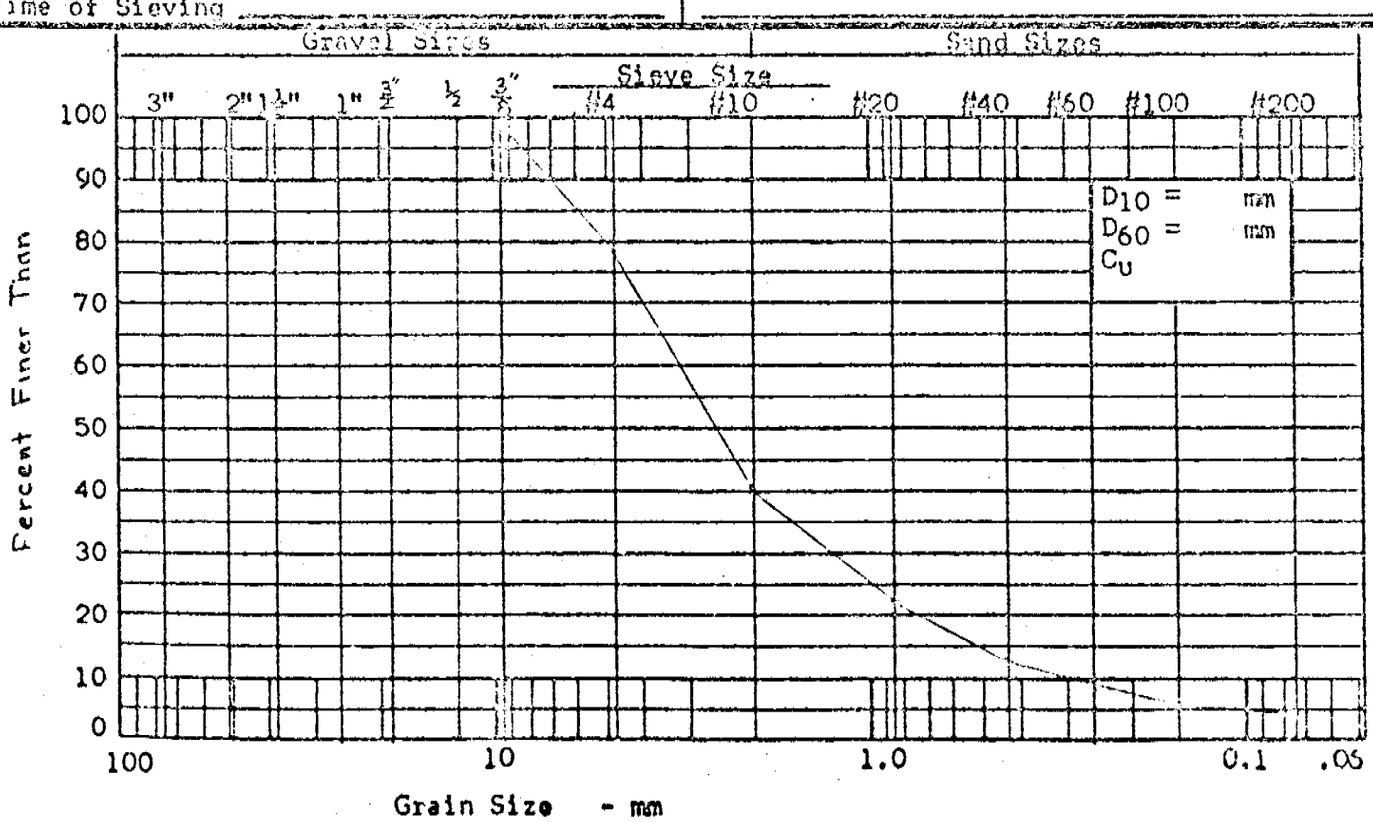
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			99.1	
	4	.185	4.76			78.1	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			40.2	
Tare No.	20	.0331	.840			22.1	
Wt. Dry + Tare	40	.0165	.420			12.6	
Tare	60	.0097	.250			8.6	
Wt. Dry	100	.0059	.149			6.1	
	200	.0029	.074			4.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel with boulders
Location
Hole 471-S-137A Depth 15'
Technician Date Feb. 1, 1973

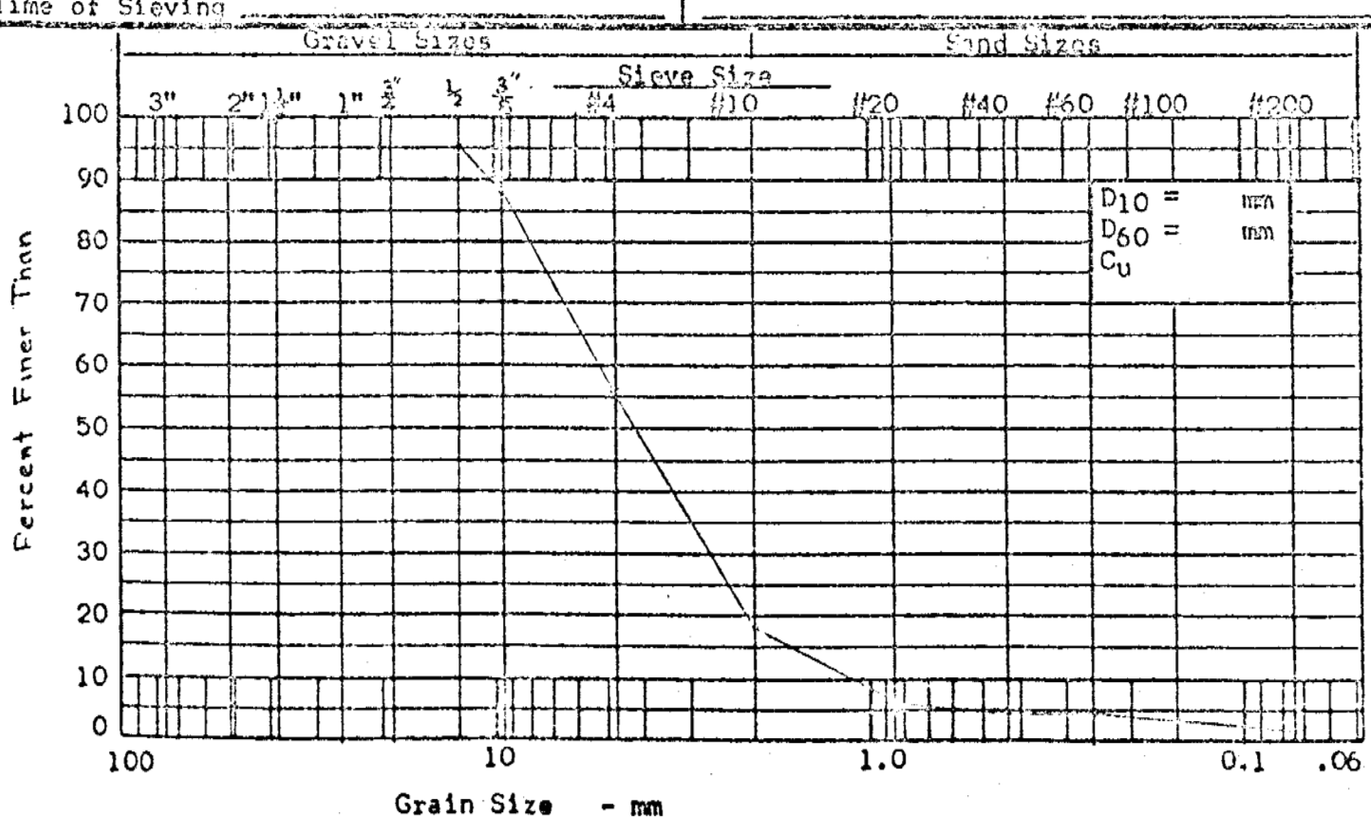
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			95.5	
Wt. Dry		3/8	9.52			88.0	
	4	.185	4.76			56.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			18.1	
Tare No.	20	.0331	.840			6.7	
Wt. Dry + Tare	40	.0165	.420			4.8	
Tare	60	.0097	.250			4.0	
Wt. Dry	100	.0059	.149			3.5	
	200	.0029	.074			2.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty sand
Location
Hole 471-S-137A Depth 19' - 20'
Technician Date Jan. 30, 1973

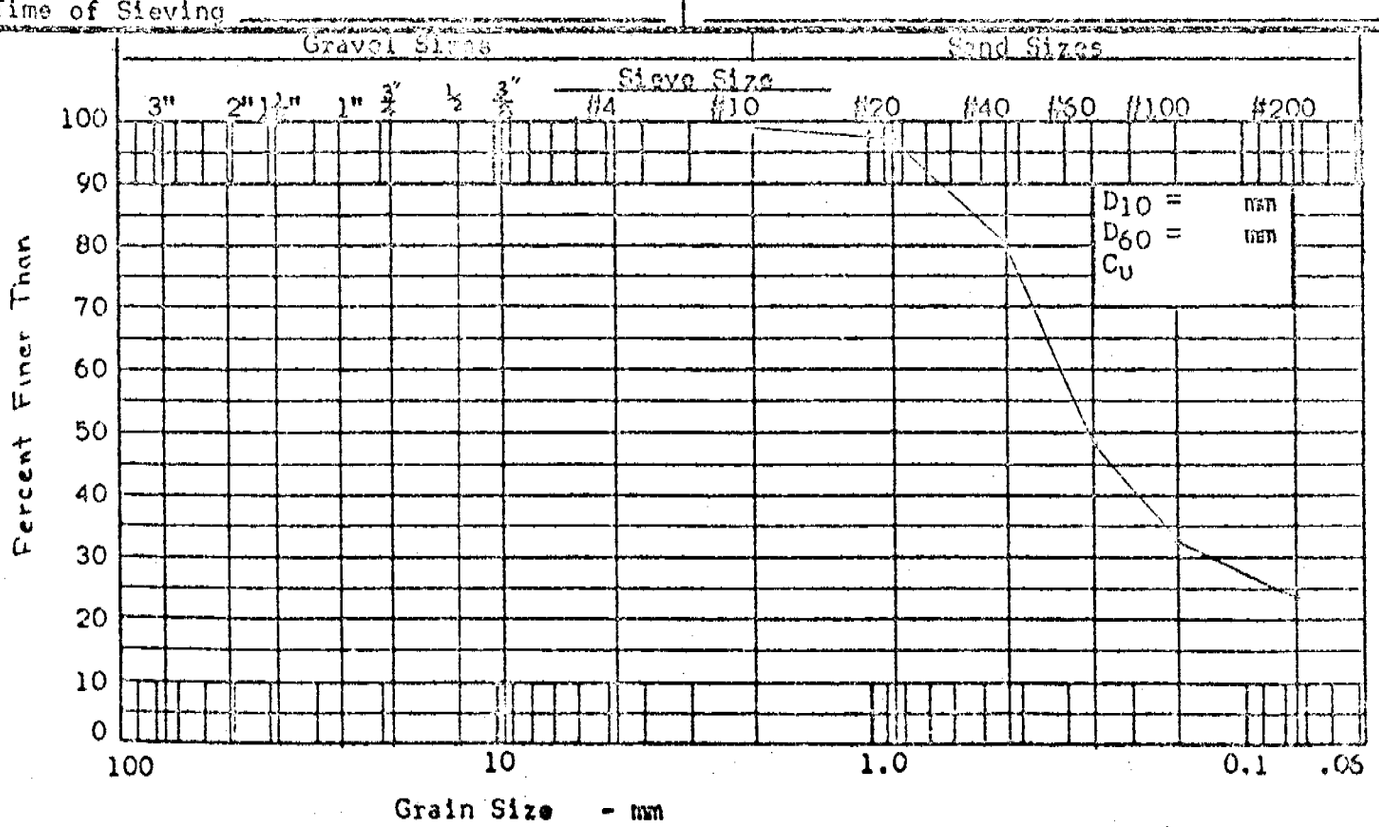
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			99.6	
Tare No.	20	.0331	.840			97.4	
Wt. Dry + Tare	40	.0165	.420			81.0	
Tare	60	.0097	.250			48.7	
Wt. Dry	100	.0059	.149			32.6	
	200	.0029	.074			23.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty sand
Location
Hole 471-S-137A Depth 25'
Technician Date Feb. 1, 1973

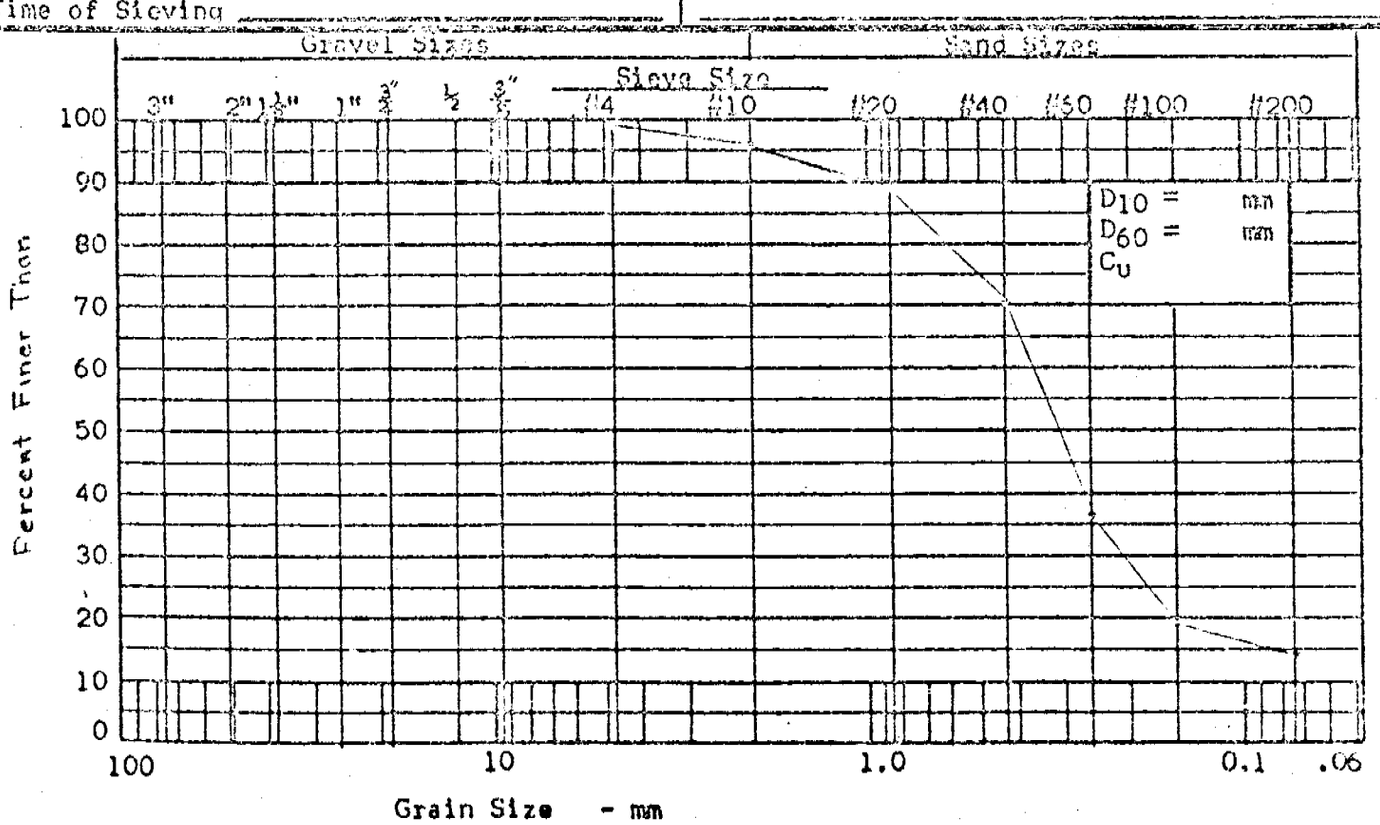
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			99.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			95.4	
Tare No.	20	.0331	.840			89.8	
Wt. Dry + Tare	40	.0165	.420			70.1	
Tare	60	.0097	.250			36.5	
Wt. Dry	100	.0059	.149			19.3	
	200	.0029	.074			14.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty sand
Location
Hole 471-S-137A Depth 29' - 30'
Technician Date Jan. 31, 1973

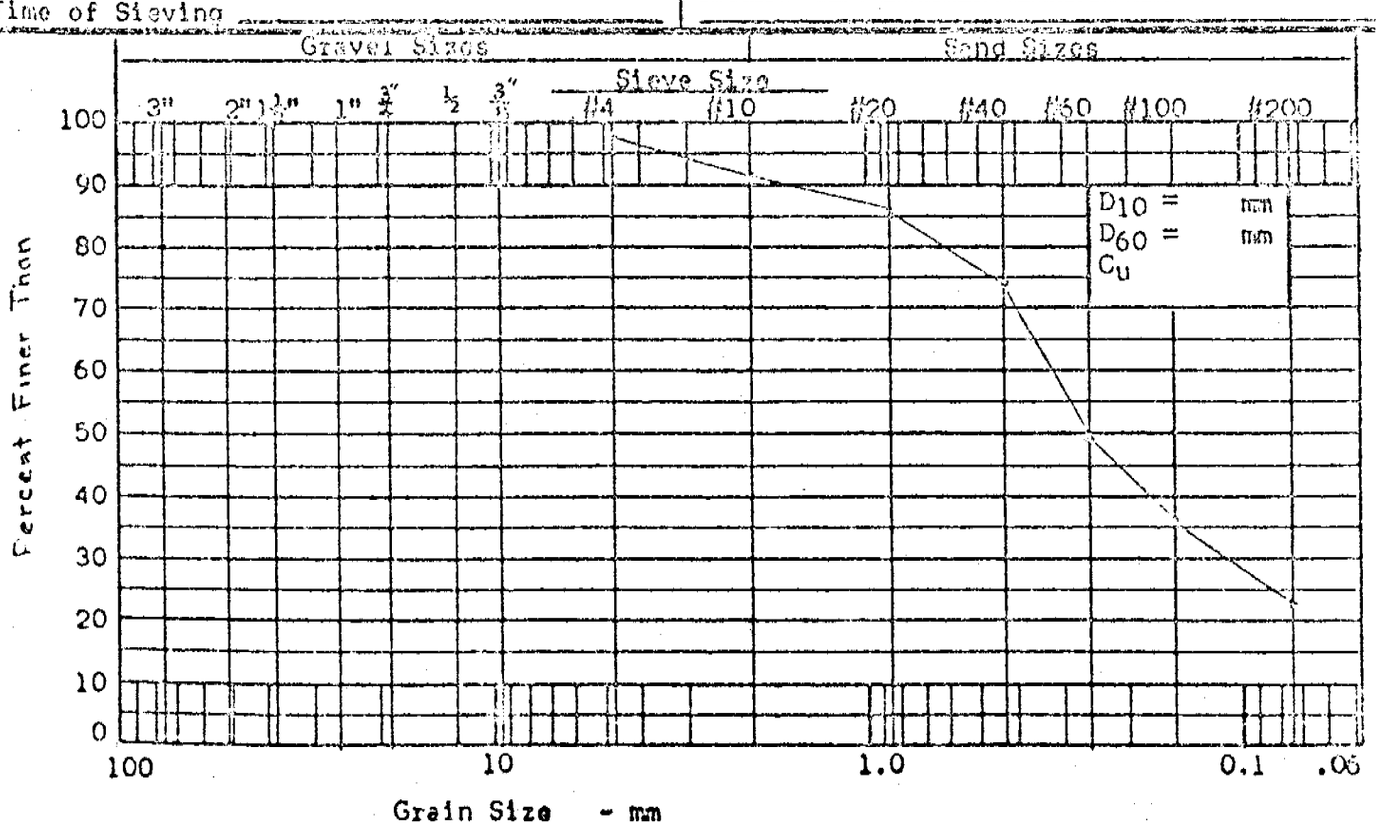
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			98.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			91.6	
Tare No.	20	.0331	.840			86.0	
Wt. Dry + Tare	40	.0165	.420			74.8	
Tare	60	.0097	.250			49.6	
Wt. Dry	100	.0059	.149			35.6	
	200	.0029	.074			22.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

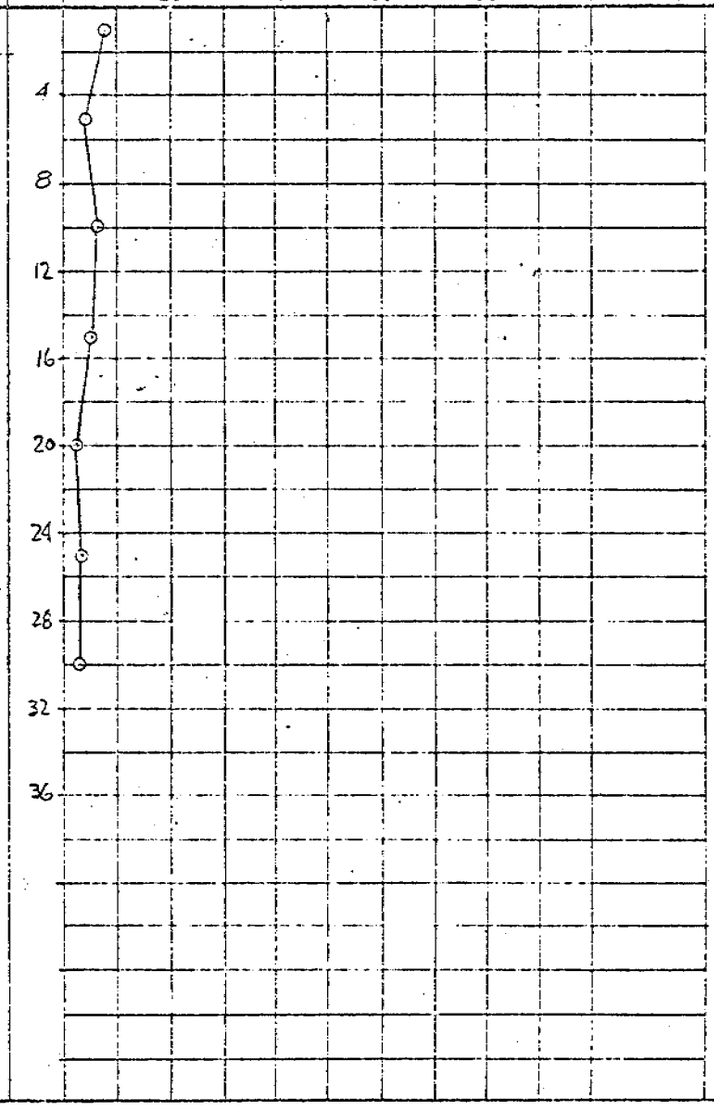
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAY AEN	FIELD ENG: T.S	DATE DRILLED: 14/1/73	AIRPHOTO NO:	CHAINAGE: 1049+00	OFFSET:
CKD 06P	TECH: DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLARS & CONIFER TO 30'	ELEV 406.00

TEST HOLE

MILE	B,C,S	NUMBER
471	S	137A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GP	GRAVEL 1' ORGANIC	F								SO_4 - 0.11%
4						MED. FINE, SILTY SANDY	UF		6		40	54			
8									5		35	60			
12						COARSE SAND, BOULDERS DRY & DUSTY									HARD DRILLING
16									3		15	82			
20						SAND			24		76				
24					SM	BROWN, LOOSE VERY DRY, SILTY			14		82	4			NO RETURN, HOLE SLOUGHING
28									23		69	8			
32						END OF HOLE									
36															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 471-C-50A Depth 2'
Technician Date Nov. 28, 72

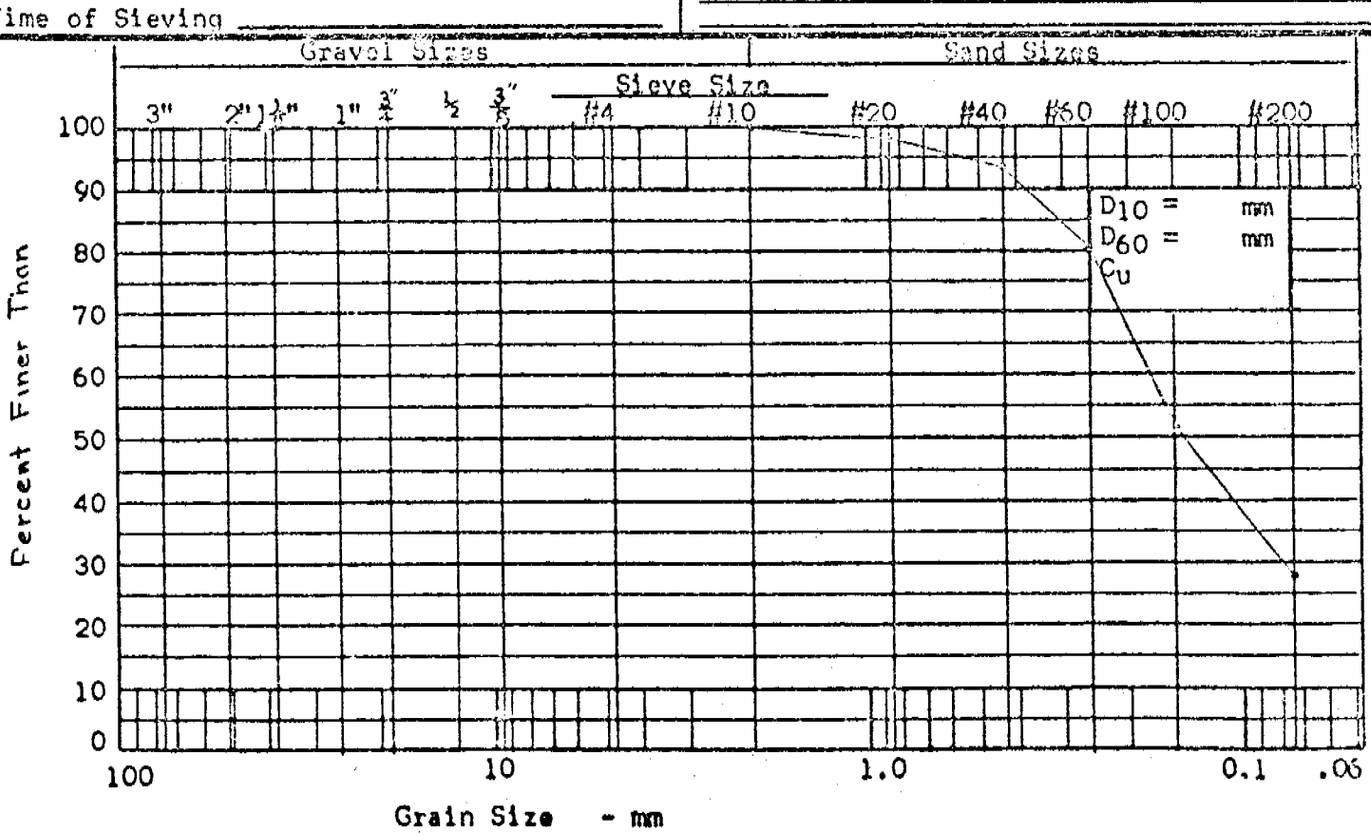
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			100%	
Wt. Dry + Tare	20	.0331	.840			98.5%	
Tare	40	.0165	.420			93.3%	
Wt. Dry	60	.0097	.250			80.7%	
	100	.0059	.149			51.6%	
	200	.0029	.074			27.3%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with some Gravel
Location	
Hole 471-C-50A	Depth 9 - 10'
Technician	Date Nov. 29/72

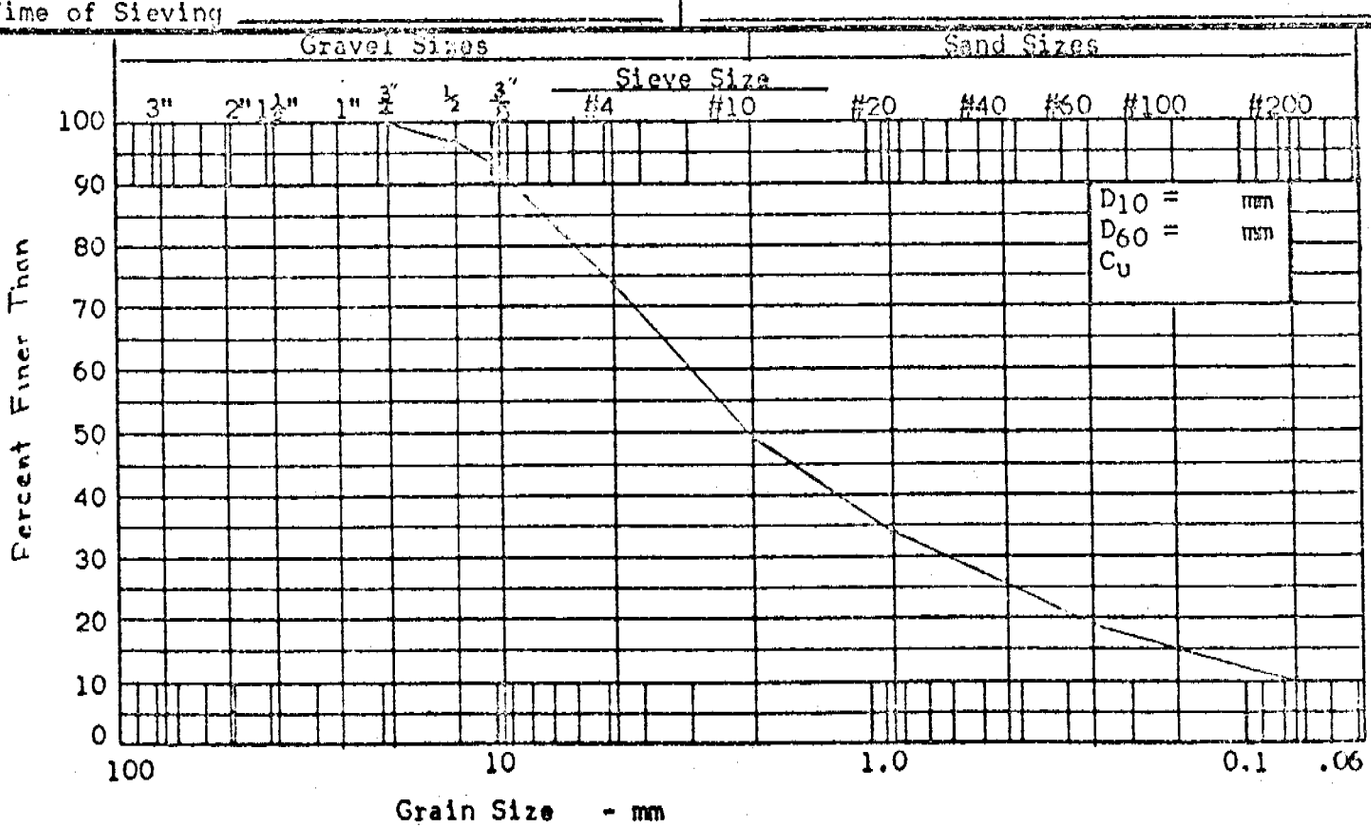
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			100.0	
Wt. Dry		1/2	12.70			97.0	
		3/8	9.52			93.3	
	4	.185	4.76			74.9	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			49.8	
Wt. Dry + Tare	20	.0331	.840			34.7	
Tare	40	.0165	.420			26.5	
Wt. Dry	60	.0097	.250			19.8	
	100	.0059	.149			15.0	
	200	.0029	.074			10.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy Gravel
Location	
Hole 471-C-50A	Depth 19 - 20'
Technician	Date Nov.29/72

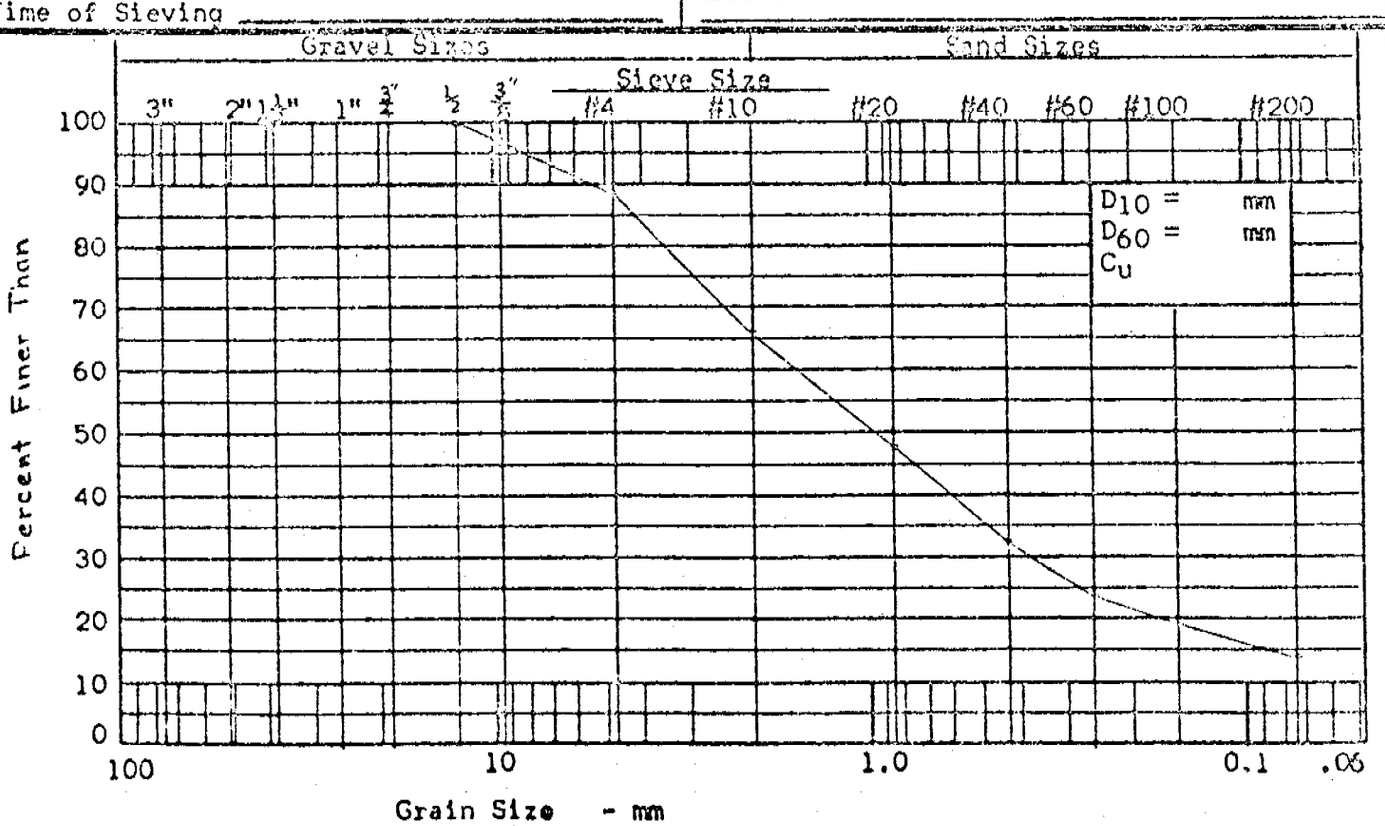
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100	
Wt. Dry		3/8	9.52			97.7	
	4	.185	4.76			89.2	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			66.6	
Tare No.	20	.0331	.840			47.7	
Wt. Dry + Tare	40	.0165	.420			32.4	
Tare	60	.0097	.250			24.7	
Wt. Dry	100	.0059	.149			19.1	
	200	.0029	.074			14.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

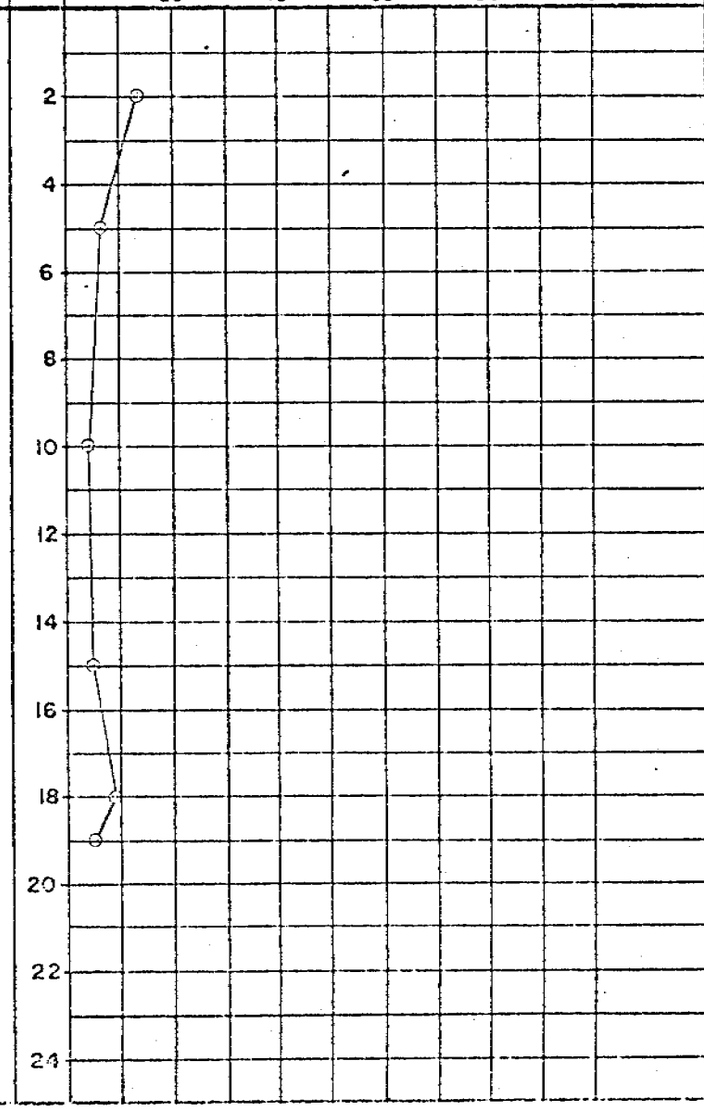
DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1047+00	OFFSET: L
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CON., POPLAR, BIRCH	ELEV 404.38

TEST HOLE

MILE	2,C,3	NUMBER
471	C	504

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SAND	UF	
2						FINE, SOME GRAVEL		
4								
6					SW			
8								
10								
12								
14						GRAVEL		
16					GW	SANDY		
						SOME ROCKS		
18						COARSE SAND		
20						END OF HOLE		
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2	2	7	73			
10	1	1	39	50		
18	1	4	52	34		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

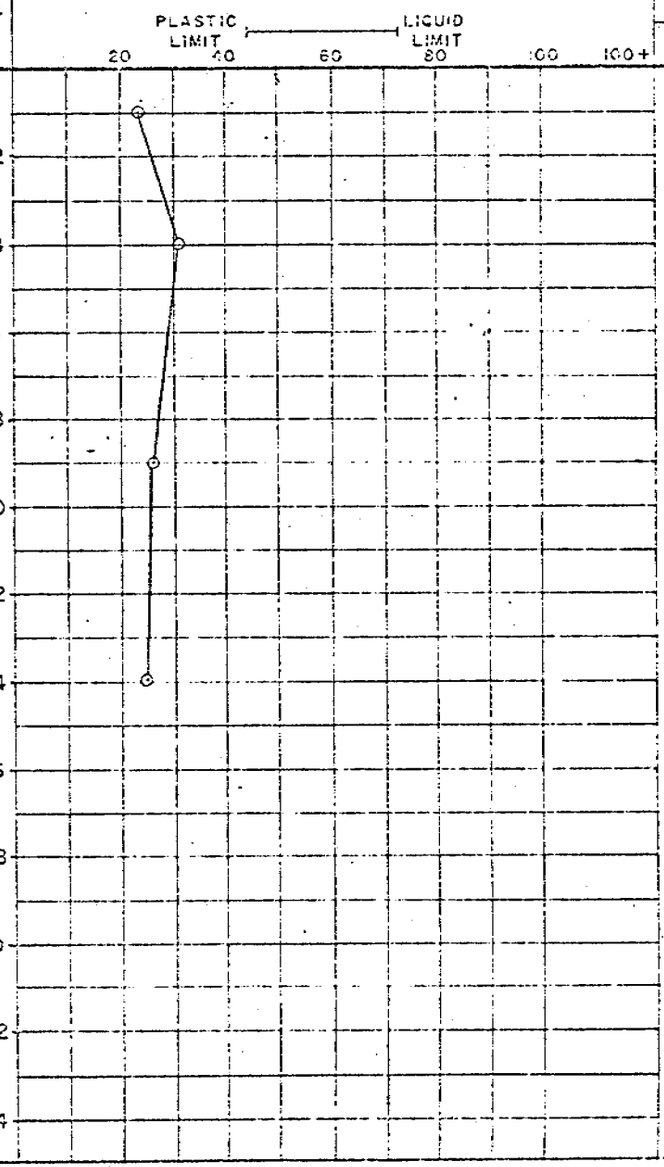
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 14/1/73	AIRPHOTO NO:	CHAINAGE: 1030+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & BIRCH 70 %	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
471	C	236 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						PEAT ORGANIC		
						CLAY	F	
2						DARK, SANDY		Vr
4								
6								
8					CL			
10						LIGHT, SANDY SOME GRAVEL		
12								
14								Vr
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with some clay & gravel
Location	
Hole	472-C-49A Depth 7 - 8'
Technician	Date Nov. 28/72

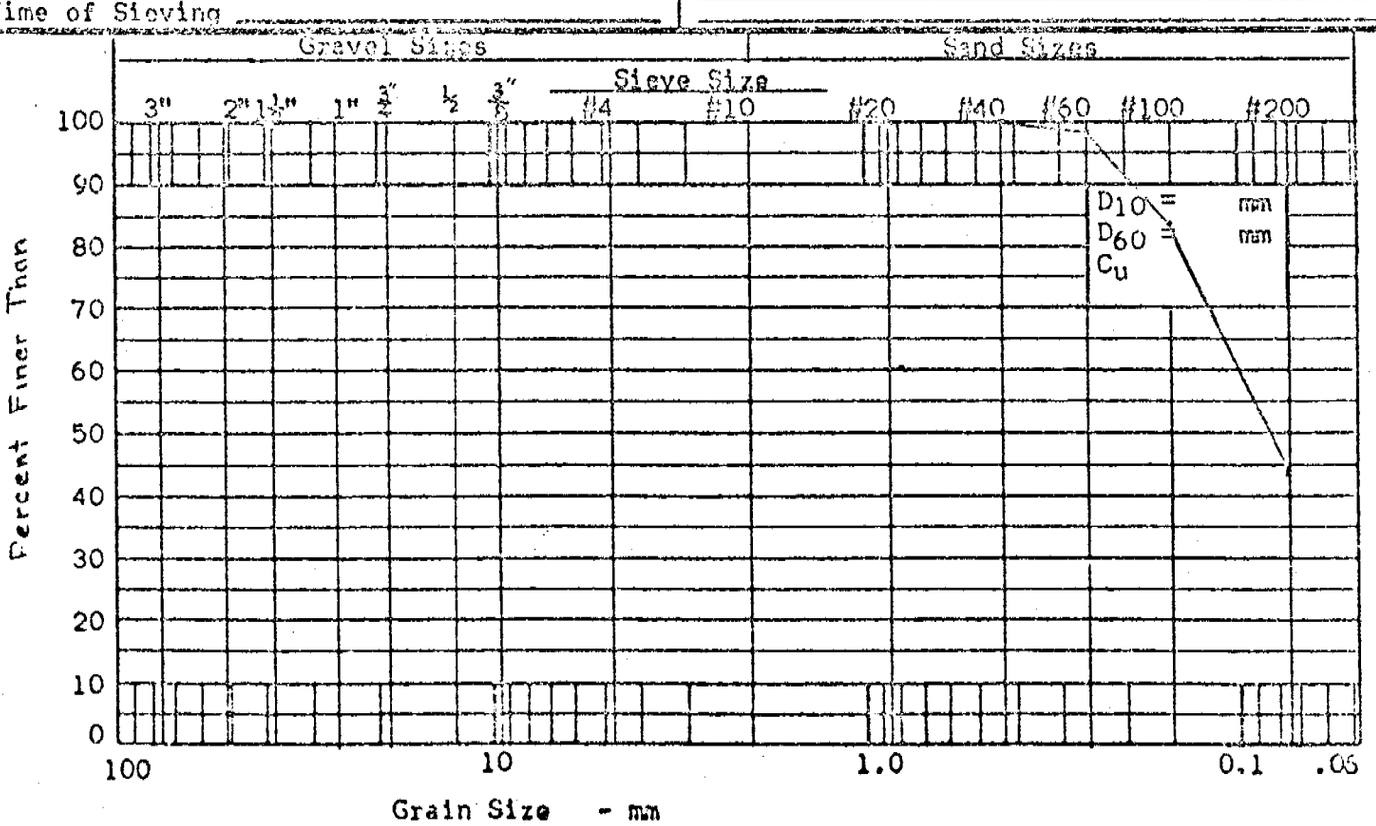
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			100	
Tare No.	20	.0331	.840			100	
Wt. Dry + Tare	40	.0165	.420			98.5	
Tare	60	.0097	.250			83.7	
Wt. Dry	100	.0059	.149			43.2	
	200	.0029	.074				
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Sand with some Clay & Gravel

Location

Hole 472-C-49A Depth 15'

Technician Date Nov.28/72

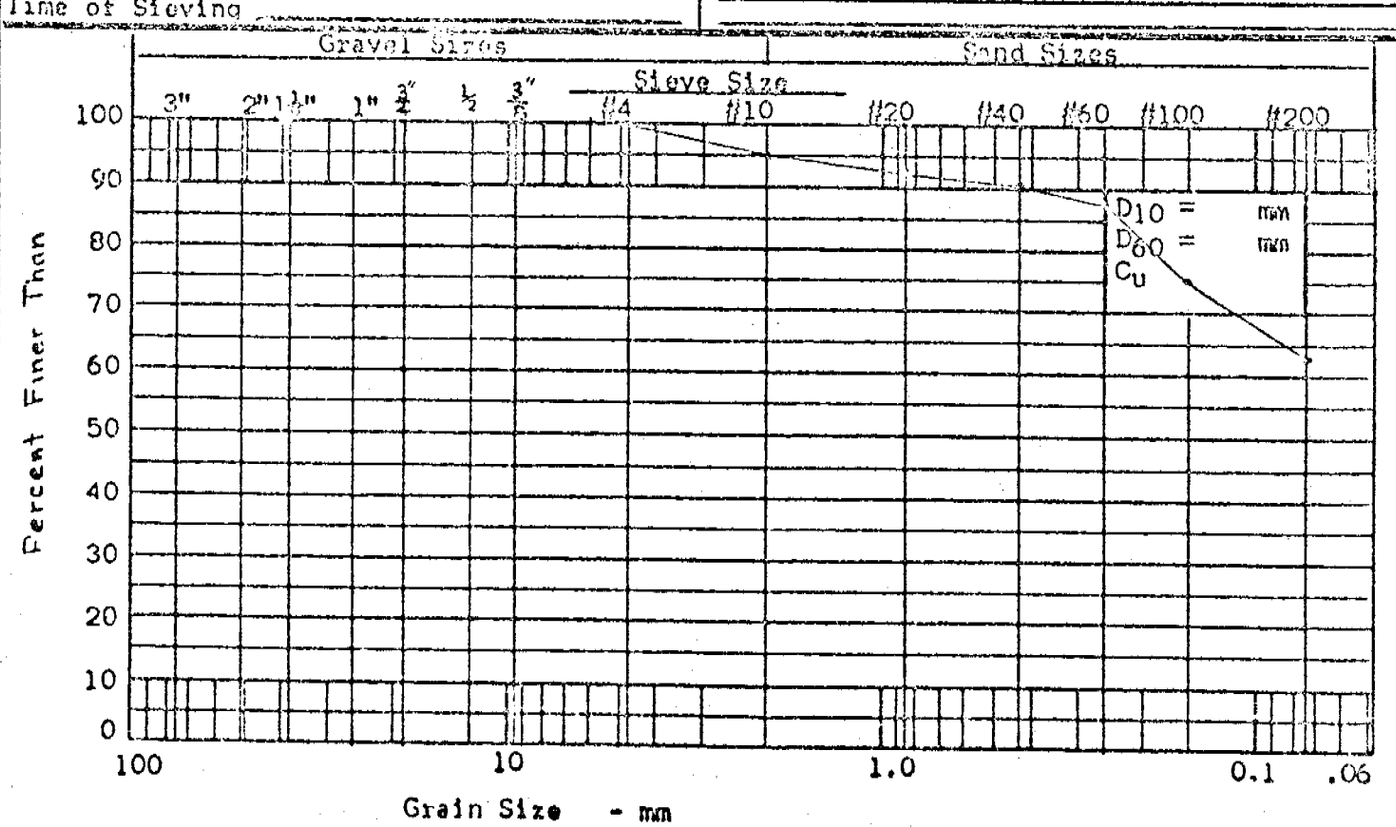
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100	
Passing	4						
Initial Dry Weight passing No. 4	10	.079	2.000			95	
Tare No.	20	.0331	.840			92.4	
Wt. Dry + Tare	40	.0165	.420			90.5	
Tare	60	.0097	.250			87.1	
Wt. Dry	100	.0059	.149			75.1	
	200	.0029	.074			62.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

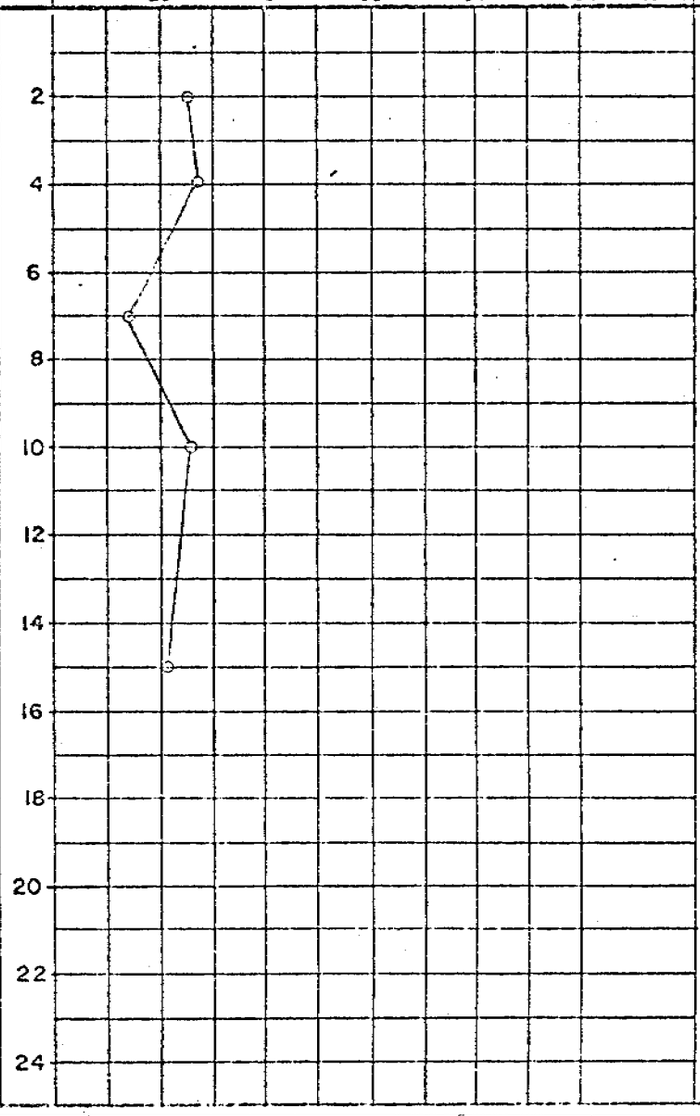
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1015+00	OFFSET: ℄
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
472	C	49 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2					CL	CLAY SANDY	F	Nbe							
4															
6					SW	SAND SOME CLAY FINE GRAVEL	F	Nbe	43		57				
8															
10		T													
12															
14									62		33	5			
16						END OF HOLE									
18															
20															
22															
24															

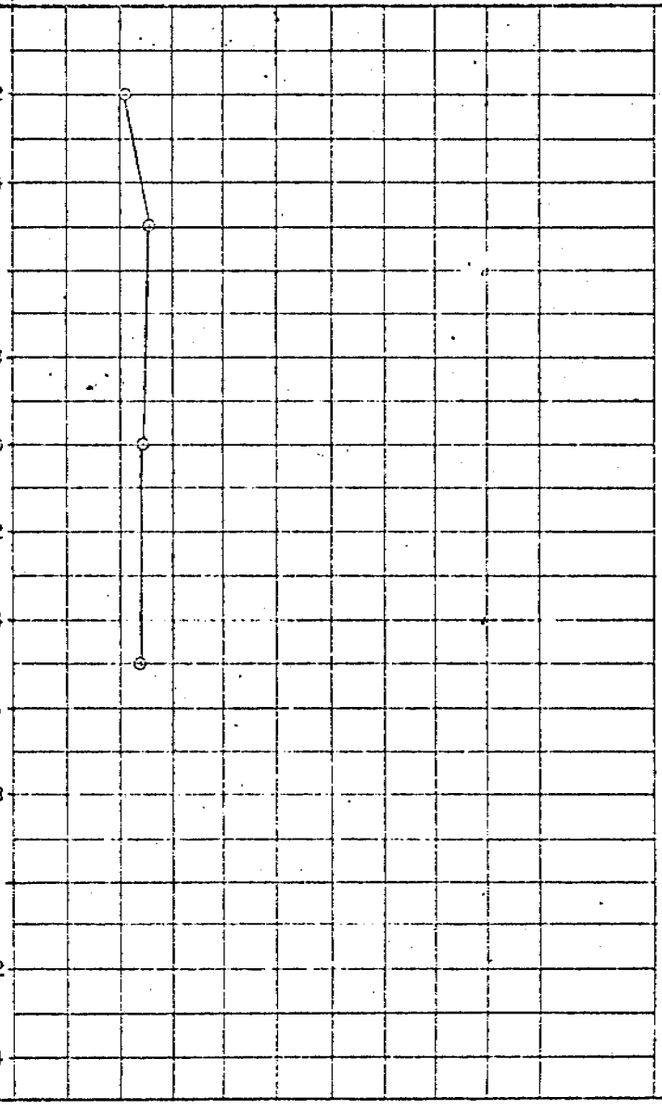


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.EW	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 1005+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	47A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F									
2									2							
4									4							
6					SM	SANDY		Nbn	6							
8									8							
10									10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



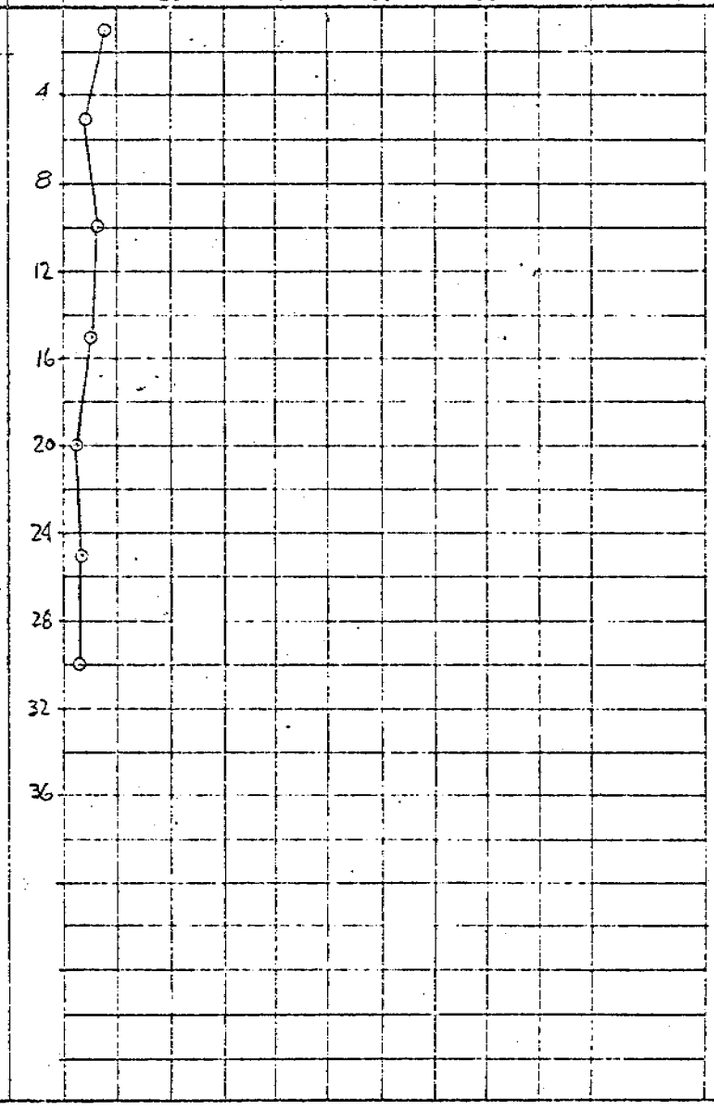
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAY AEN	FIELD ENG: T.S	DATE DRILLED: 14/1/73	AIRPHOTO NO:	CHAINAGE: 1049+00	OFFSET:
CKD 06P	TECH: DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLARS & CONIFER TO 30'	ELEV 406.00

TEST HOLE

MILE	B,C,S	NUMBER
471	S	137A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GP	GRAVEL 1' ORGANIC	F								SO_4 - 0.11%
4						MED. FINE, SILTY SANDY	UF		6		40	54			
8									5		35	60			
12						COARSE SAND, BOULDERS DRY & DUSTY									HARD DRILLING
16									3		15	82			
20						SAND			24		76				
24					SM	BROWN, LOOSE VERY DRY, SILTY			14		82	4			NO RETURN, HOLE SLOUGHING
28									23		69	8			
32						END OF HOLE									
36															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

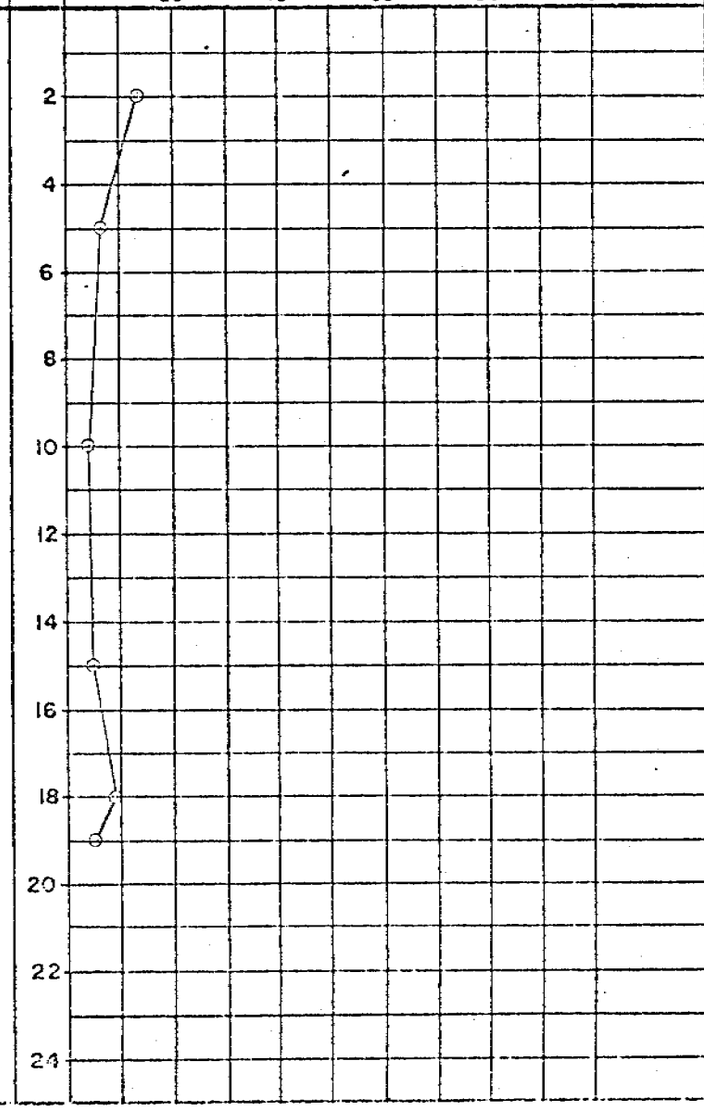
DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1047+00	OFFSET: L
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CON., POPLAR, BIRCH	ELEV 404.38

TEST HOLE

MILE	2,C,3	NUMBER
471	C	504

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SAND	UF	
2						FINE, SOME GRAVEL		
4								
6					SW			
8								
10								
12								
14						GRAVEL		
16					GW	SANDY		
						SOME ROCKS		
18						COARSE SAND		
20						END OF HOLE		
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2	2	7	73			
10	1	1	39	50		
18	1	4	52	34		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

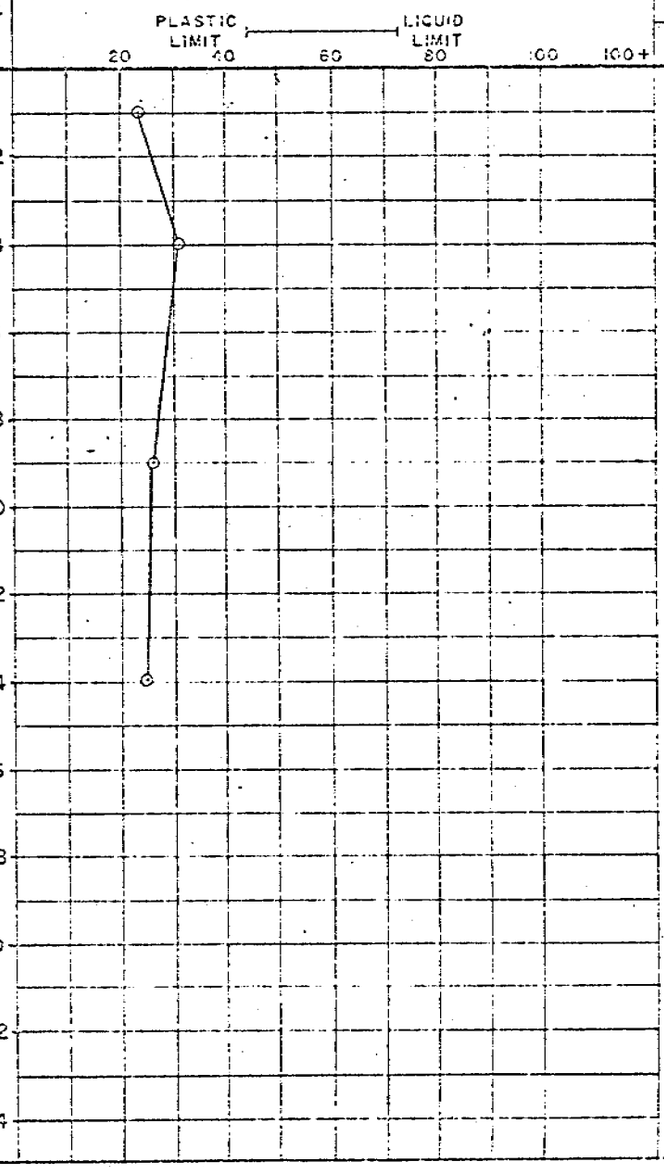
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 14/1/73	AIRPHOTO NO:	CHAINAGE: 1030+00	OFFSET ℄
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & BIRCH 70 %	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
471	C	236 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						PEAT ORGANIC		
						CLAY	F	
2						DARK, SANDY		Vr
4								
6								
8					CL			
10						LIGHT, SANDY SOME GRAVEL		
12								
14								Vr
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

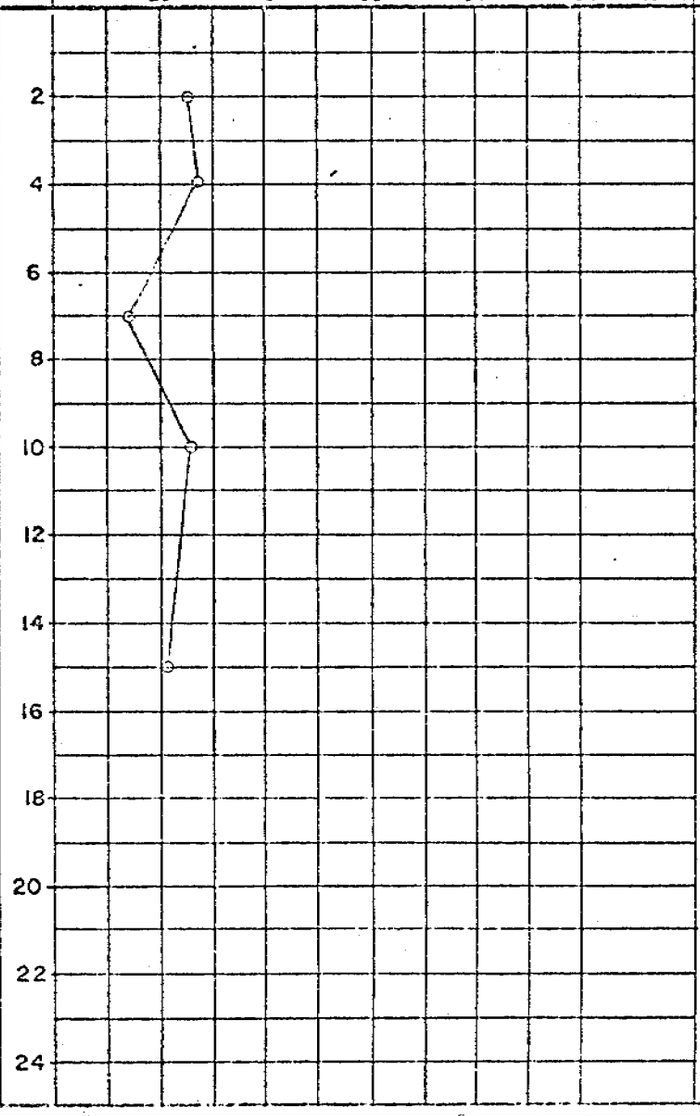
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 1015+00	OFFSET: ℄
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: CONIFER 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
472	C	49 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2					CL	CLAY SANDY	F	Nbe							
4															
6					SW	SAND SOME CLAY FINE GRAVEL	F	Nbe	43		57				
8															
10		T													
12															
14									62		33	5			
16						END OF HOLE									
18															
20															
22															
24															

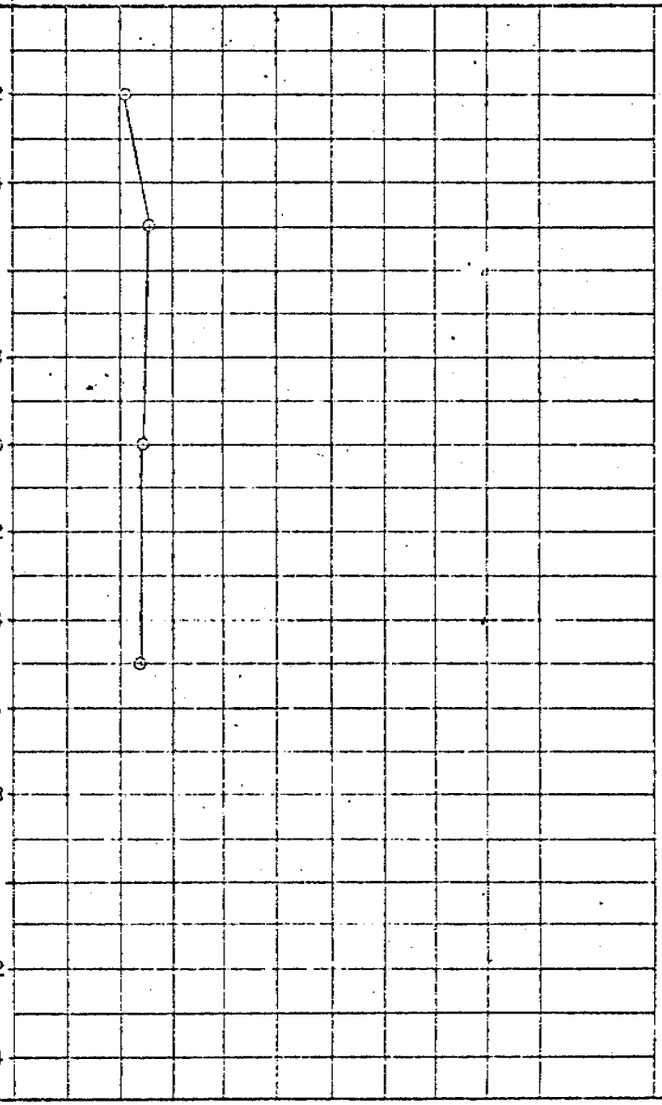


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.EW	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 1005+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	47A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F									
2									2							
4									4							
6					SM	SANDY		Nbn	6							
8									8							
10									10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

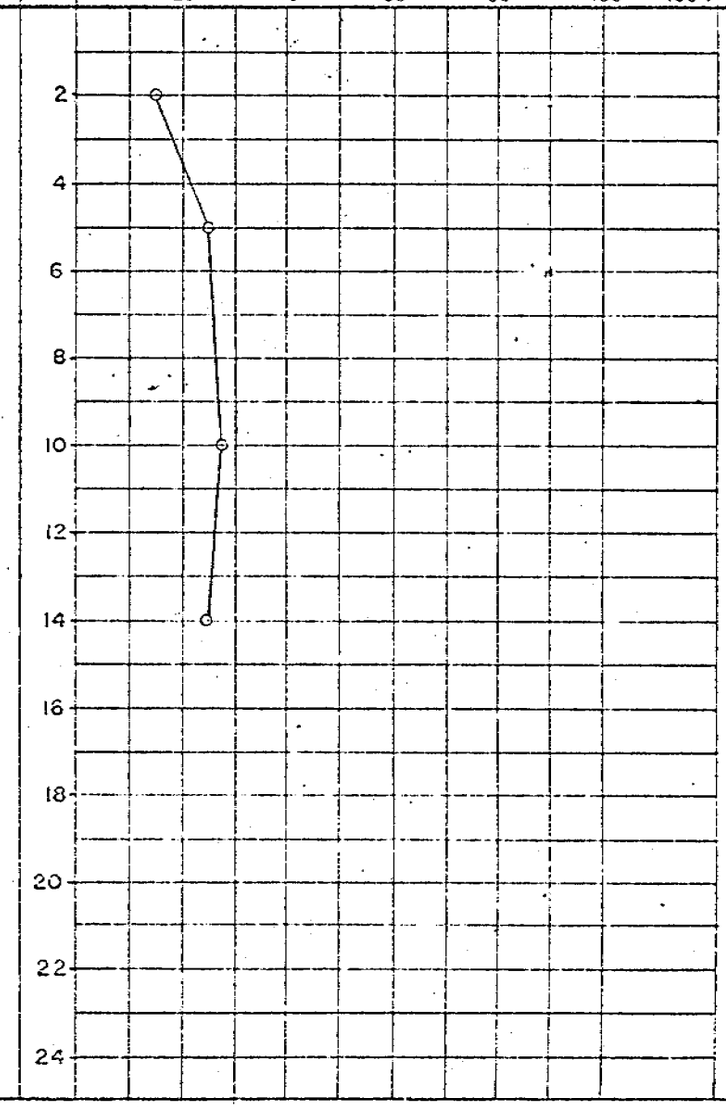


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 995+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	46A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F	Nbn							
2															
4															
6					SM	SANDY									
8															
10															
12								Nbn							
14		T											114.7	88.6	
16						END OF HOLE									
18															
20															
22															
24															

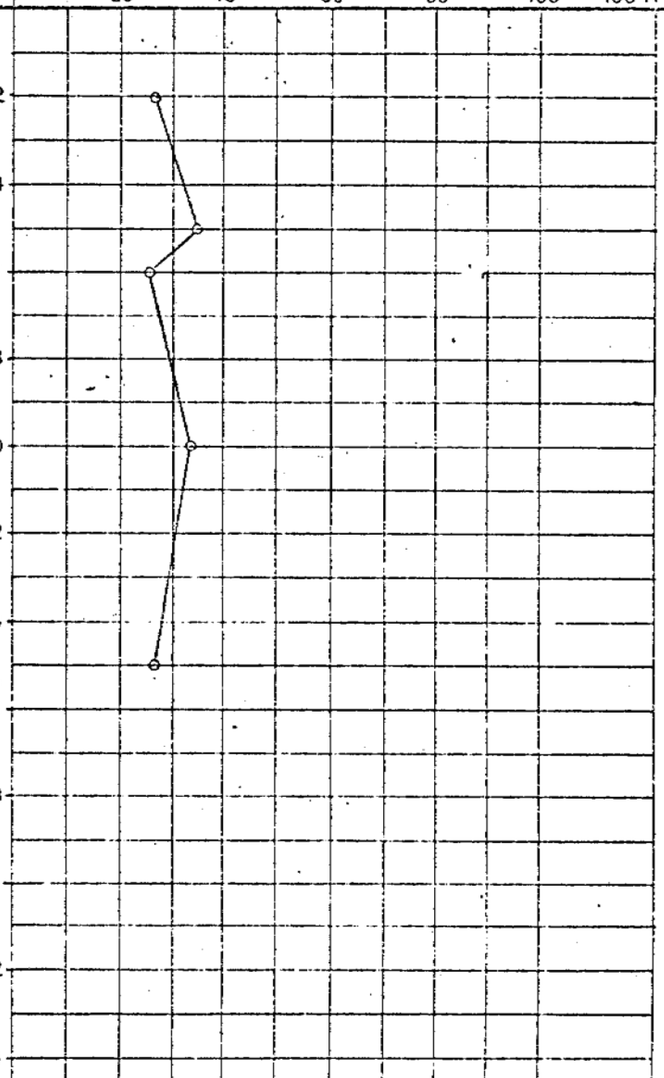


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E M	FIELD ENG: T. S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 965700	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	45 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SAND	F	Nbn								
2									2							
4						FINE, SILTY			4							
6		T			SM	STONES			6					110.1	81.9	
8									8							
10									10							
12									12							
14								Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

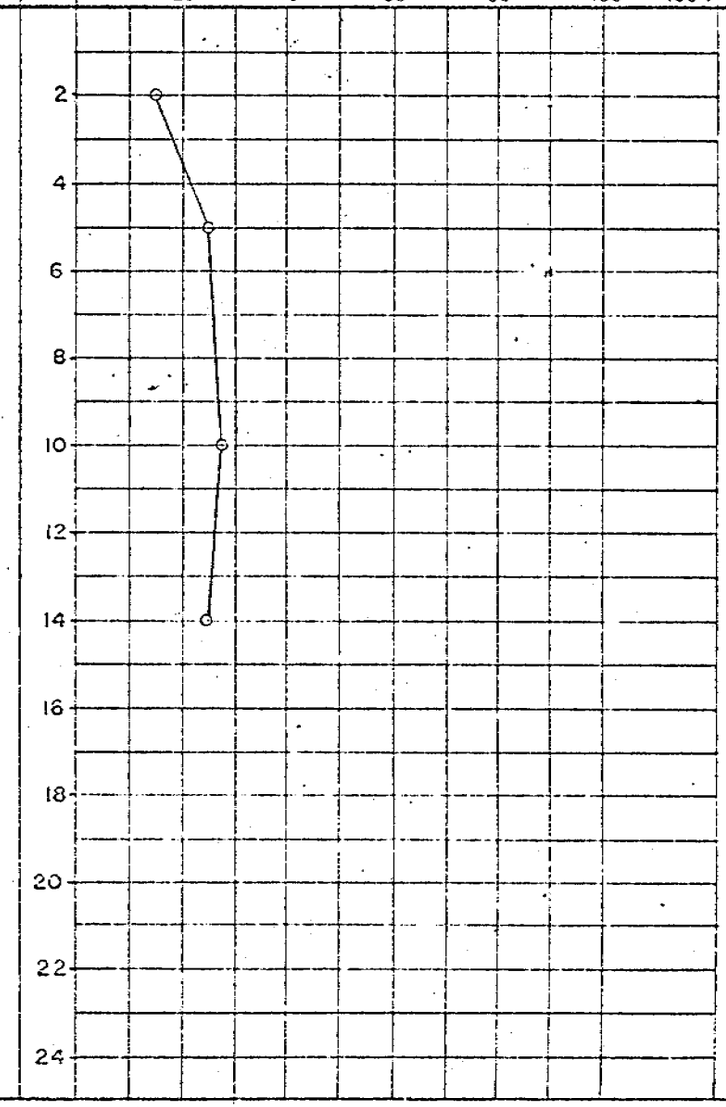


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 995+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	46A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F	Nbn							
2															
4															
6					SM	SANDY									
8															
10															
12								Nbn							
14		T											114.7	88.6	
16						END OF HOLE									
18															
20															
22															
24															

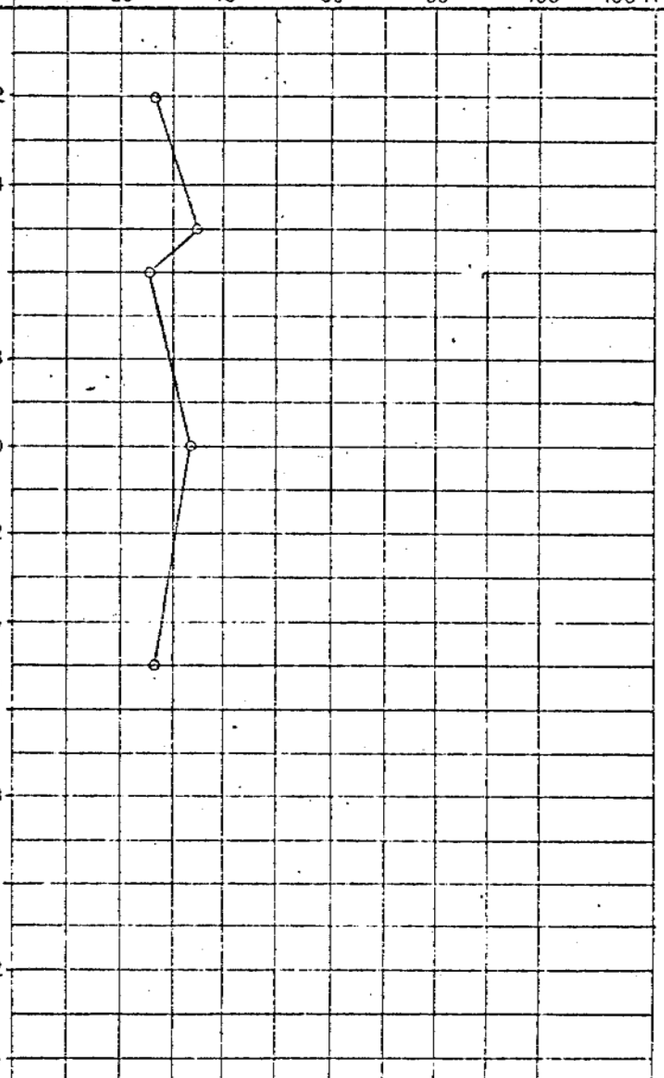


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E M	FIELD ENG: T. S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 965700	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	45 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SAND	F	Nbn								
2									2							
4						FINE, SILTY			4							
6		T			SM	STONES			6					110.1	81.9	
8									8							
10									10							
12									12							
14								Nbn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



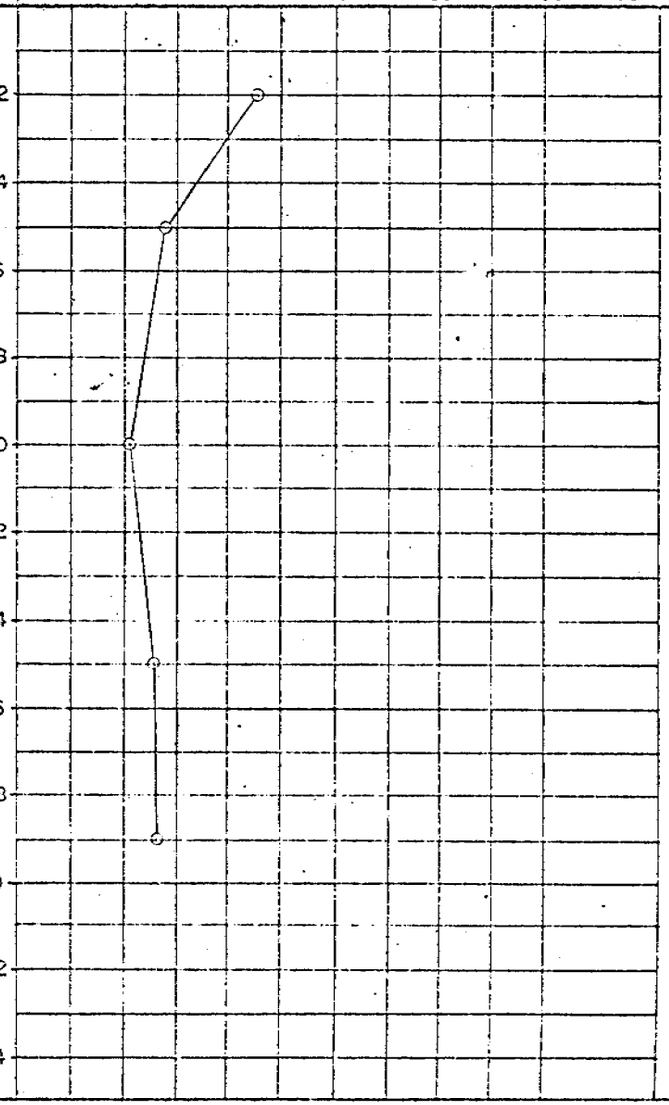
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: T.S	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 575+00	OFFSET: ℄
CKD: D.G.P.	TECH: DM	RIG: AIR	SURFACE DRAINAGE: E TO W	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
472	C	44A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT HIGH SILT CONTENT	F	Nbn							
4						SILT									
6		T.				SANDY							110.1	84.1	
8															
10					SM	CLAYEY									
12															
14															
16						SANDY									
18								Nbn							
20															
22						END OF HOLE									
24															

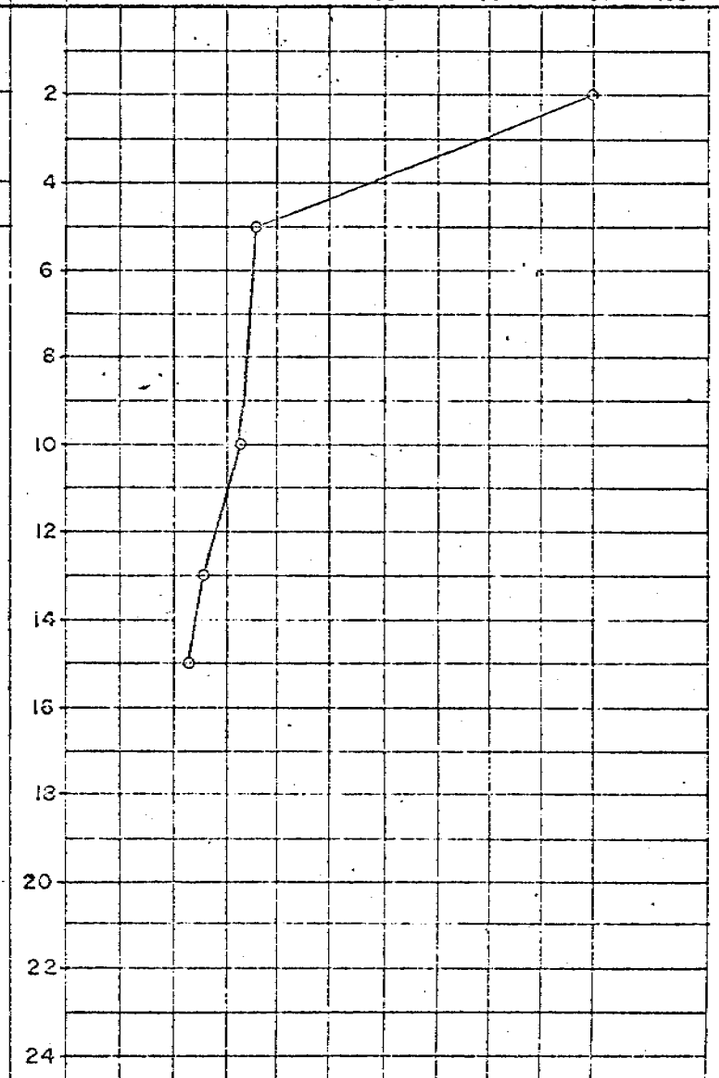


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 966+00	OFFSET: ℄
CKD: D.G.P.	TECH: W.K.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
472	C	534

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT DARK BROWN, GRANULAR SILT LIKE	F	Nbn
							UF	
							F	Nbn
					OH CL	CLAY GREY, SOME ORGANIC FEW COBBLES & BOULDERS SOME FINE SAND SILTY	UF	
						END OF HOLE		

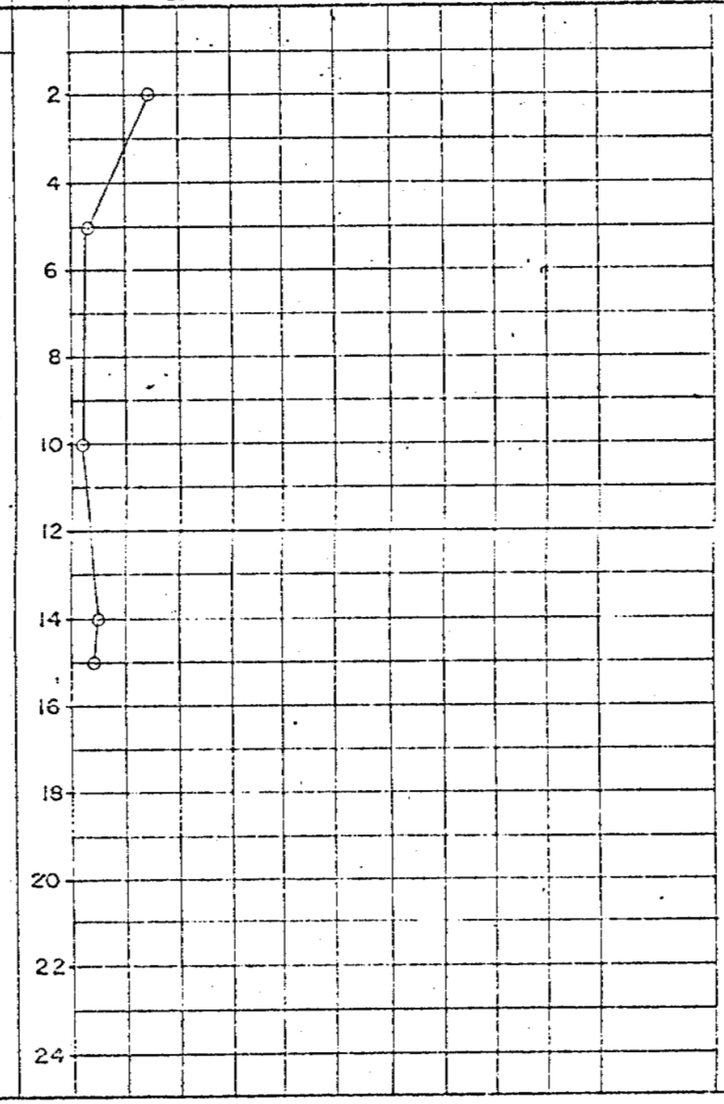


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 958+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: E TO W	VEGETATION: BLACK SPRUCE	ELEV:	MILE: 473 · B,C,S: C · NUMBER: 42 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL	F	Nf
							UF	
2								
4						COARSE, SOME SILT, SANDY, DRY		
6					GP			
8								
10								
12						CLAYEY		
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

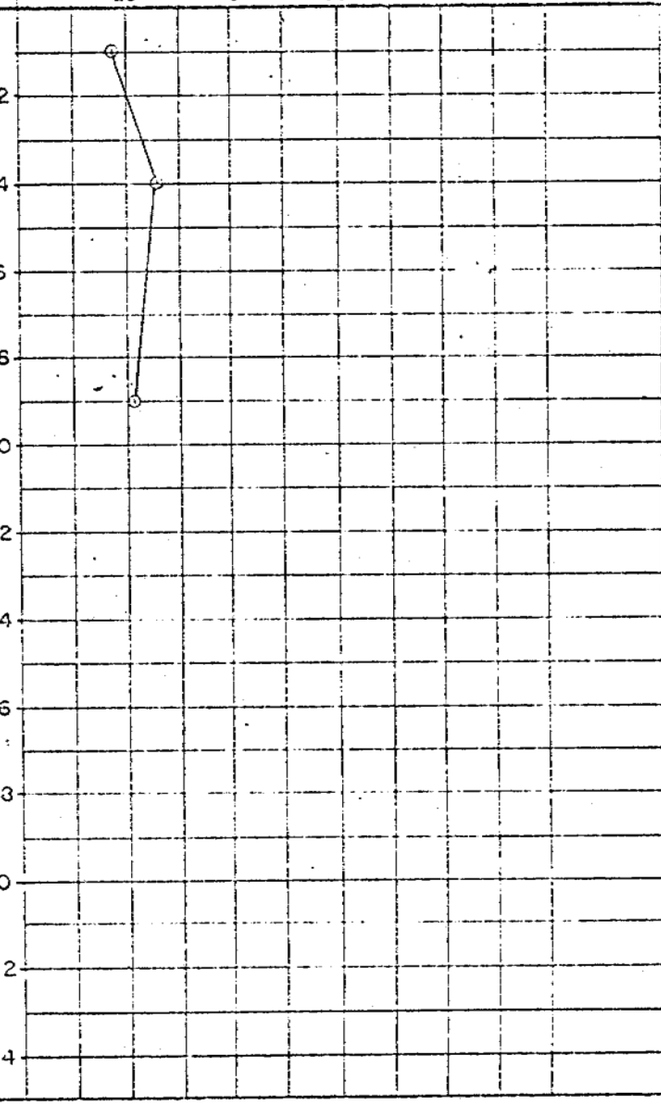
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W	FIELD ENG: B M	DATE DRILLED: 14/1/73	AIRPHOTO NO:	CHAINAGE: 944+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & SPRUCE TO 40' ELEV.		

MILE	B,C,S	NUMBER
473	C	237 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC	F	
2					MH	SILT LIGHT, SANDY		Vr
4						CLAY		
6								
8					CL	DARK		
10								Vr
12								
14						END OF HOLE		
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



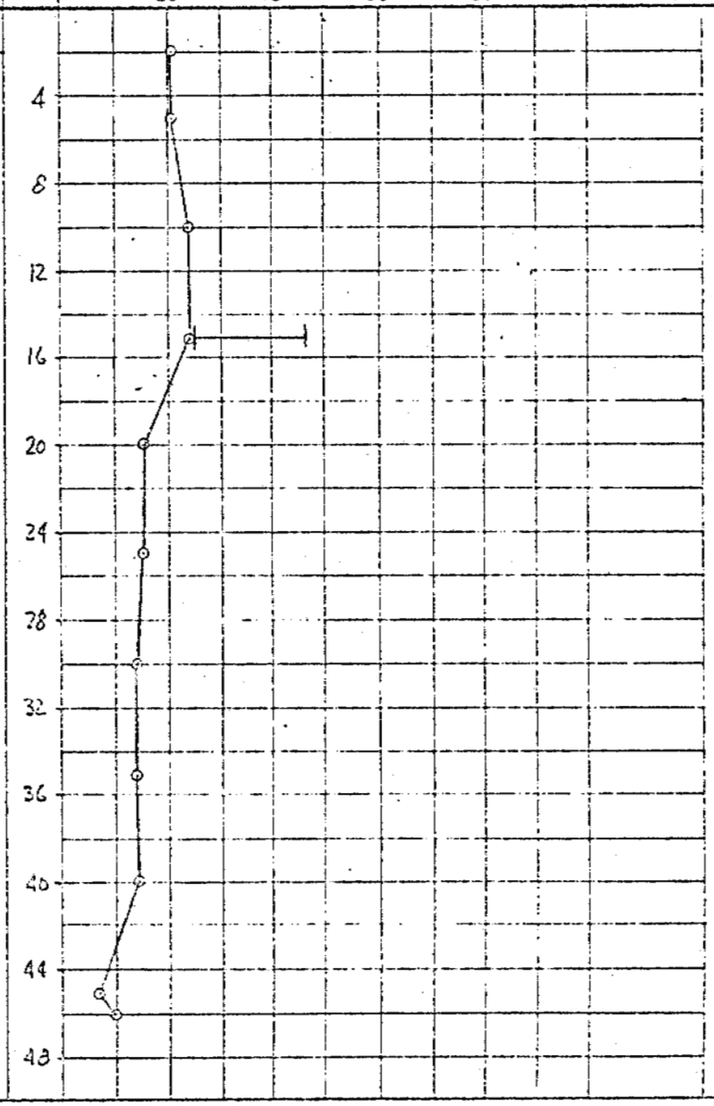
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 15/11/73	AIRPHOTO NO:	CHAINAGE: 944+00	OFFSET	TEST HOLE
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR TO 30'	ELEV	

MILE	B.C.S	NOVEBEF
473	C	133A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						ORGANIC - TRACE OF CLAY	F								
4		P			CL	CLAY BROWN, DRY	UF						1130	987	
8		P											1168	959	
12															
16															
20		P											1157	996	
24						BROWN									
28															
32		P													
36					CL	DARK BROWN, SILTY DENSE, DRY, OCCASIONAL ROCKS AND COBBLES									
40															
44						VERY HARD									
48						END OF HOLE									



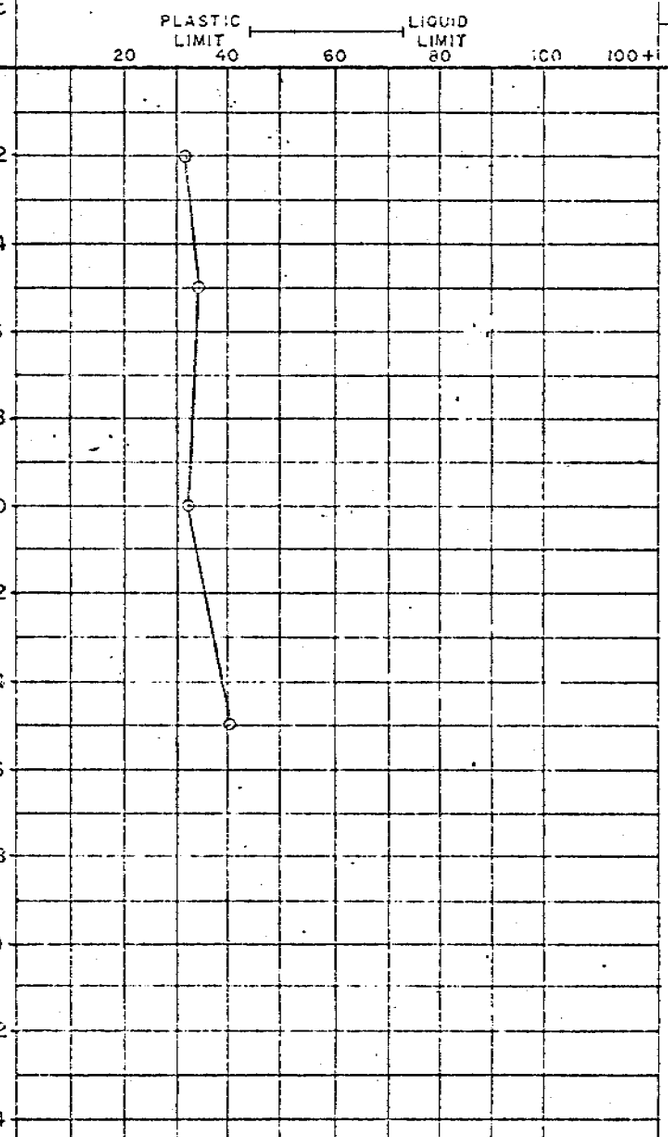
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 928+00	OFFSET: ℄
CKD: D.G.P.	TECH: V.I.K.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE & POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
473	C	41A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT DARK BROWN, SILT LIKE GRANULAR	F	Nbn							
2															
4						CLAY		Vn							
6						GREY, TRACE OF ORGANIC									
8															
10						SANDY									
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

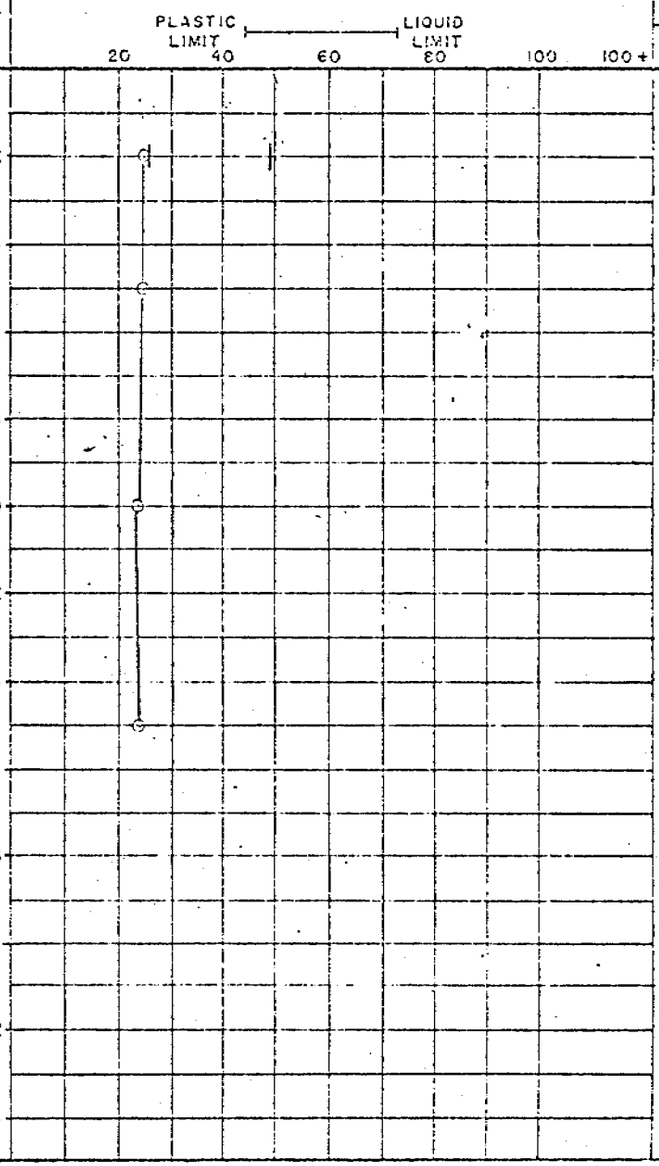
DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 920+00	OFFSET: L
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
473	C	40A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT	F	Nbn								
						ORGANIC										
2				41		CLAY			2					111.3	89.9	
4						GREY, TRACE OF ORGANIC			4							
6						PEBBLES			6							
8								Vr	8							
10						ICE CRYSTALS – 1/16"			10							
12									12							
14						TRACE OF SAND			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W. | FIELD ENG: R.S. | DATE DRILLED: 20/11/72 | AIRPHOTO NO: | CHAINAGE: 910+00 | OFFSET: L

CKD: D.G.P. | TECH: D.M. | RIG: AIR | SURFACE DRAINAGE: FLAT | VEGETATION: BLACK SPRUCE | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
474	C	39A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2		T					UF						117.6	95.0	
						CLAY									
4															
6		T			CL	GREY, MOIST							126.0	101.0	
8															
10															
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 900+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE

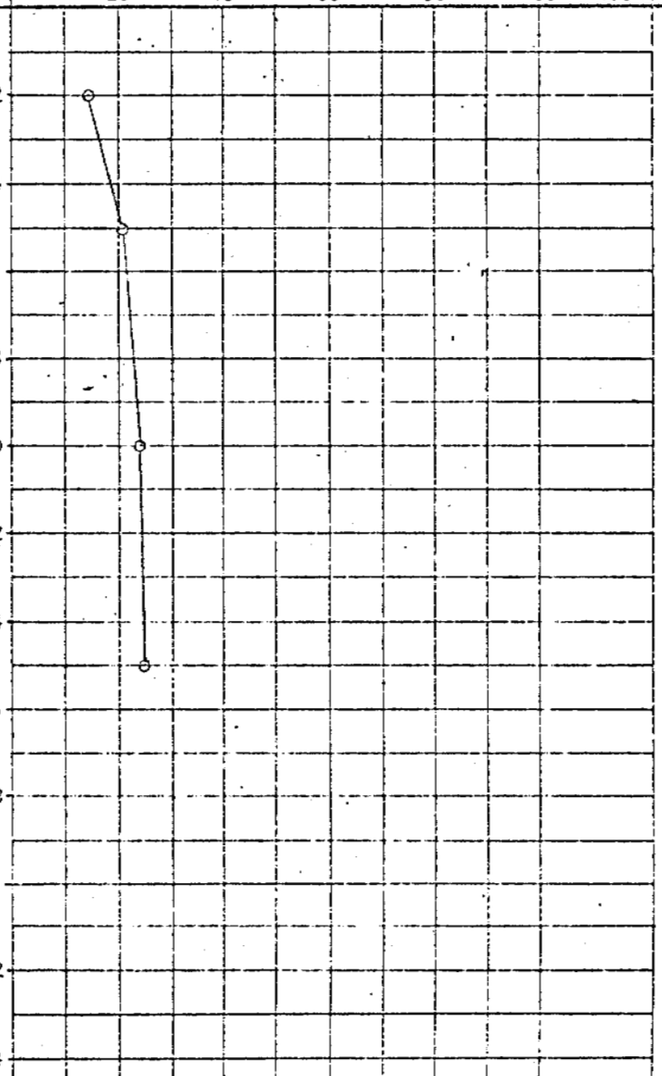
MILE	B,C,S	NUMBER
474	C	38A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn								
2							UF		2							
					GM	GRAVEL CLAY & SAND TRACE OF ORGANIC										
4									4							
6						CLAY			6							
8						GREY, SOME SILT AND PEBBLES			8							
10					CL	TRACE OF SAND			10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+



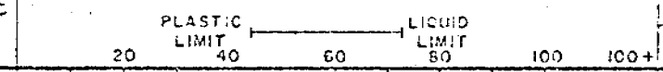
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 8+00 F00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
474	C	37A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn								
2						CLAY	UF		2					121.7	99.6	
4						GREY, COBBLES	F	Vx	4							
6						SAND LENSE			6							
8					CH	ISOLATED ICE CRYSTALS			8							
10						SOME GRAVEL AND SAND, SILTY			10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



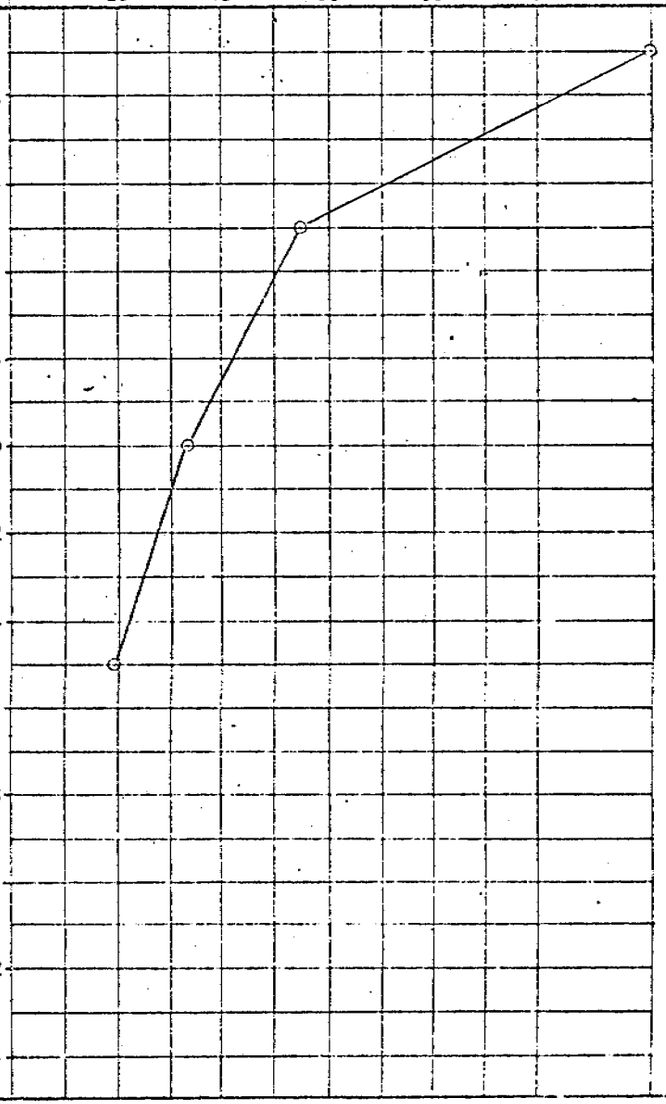
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 29/11/72	AIRPHOTO NO:	CHAINAGE: 880+00	OFFSET: ℄
CKD: D.G.P	TECH: W.K	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
474	C	36A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						PEAT	UF									
2		↘			Pt	DARK BROWN GRANULAR			2							
4									4							
6		↘				CLAY			6							
8						GREY, TRACE OF SILT, SOME SAND MED. SOFT			8							
10		↘			CH				10							
12									12							
14		↘				SOME GRAVEL			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

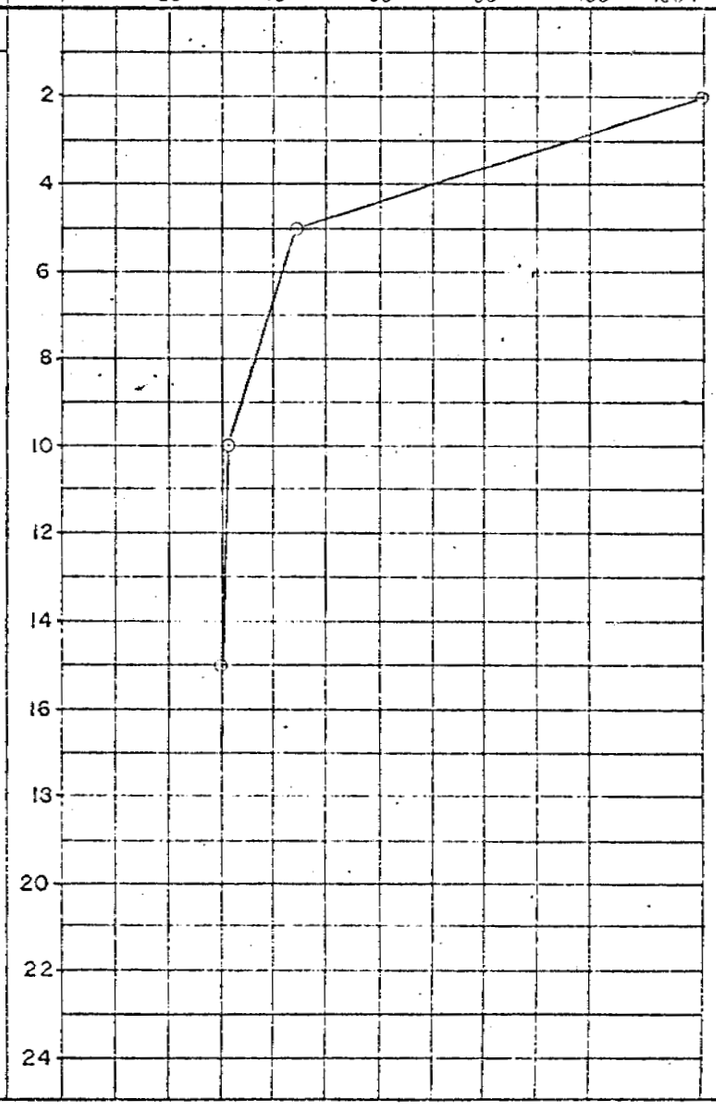


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 670+60	OFFSET: L	TEST HOLE
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: W TO E	VEGETATION: BLACK SPRUCE	ELEV	

MILE	B,C,S	NUMBER
474	C	35A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC, FINE FIBROUS	F UF	Nbn
2								
4						CLAY		
6		P				SILTY, TRACES OF ORGANIC		
8					CH	GREY, SOME PEBBLES		
10								
12								
14						WET		
16						END OF HOLE		
18								
20								
22								
24								



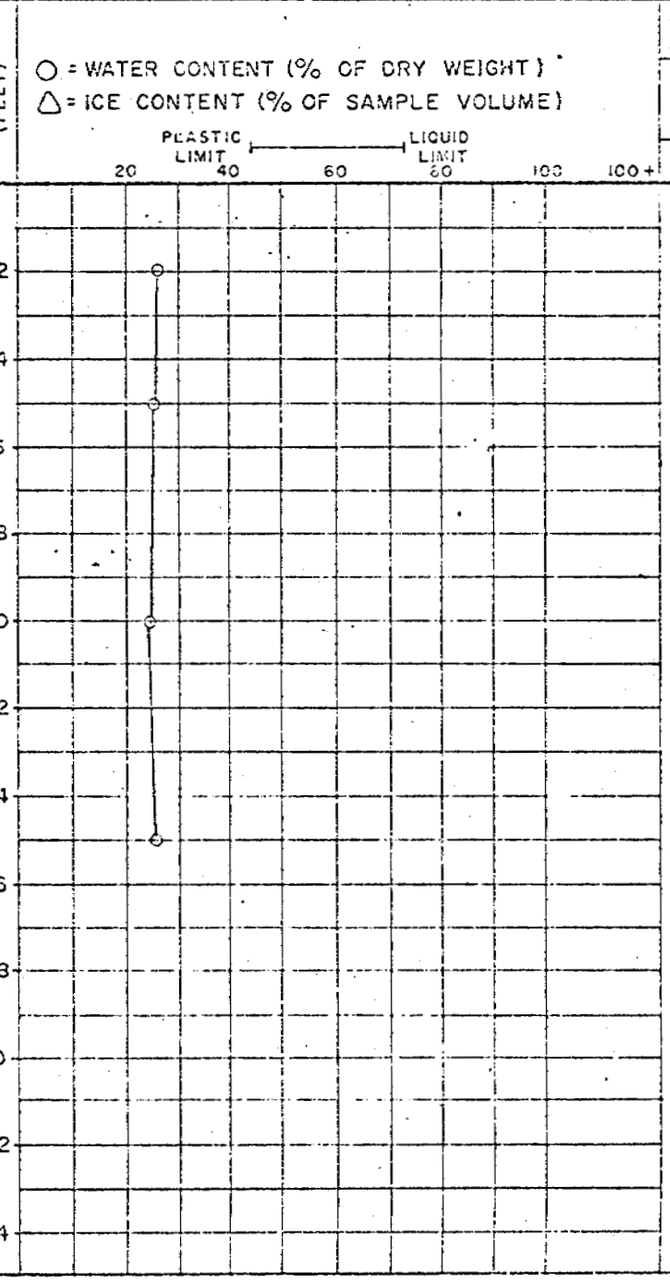
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 860+00	OFFSET: 2
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: BLACK SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
474	C	34A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2						CLAY	UF								
4															
6					CH	GREY									
8															
10															
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



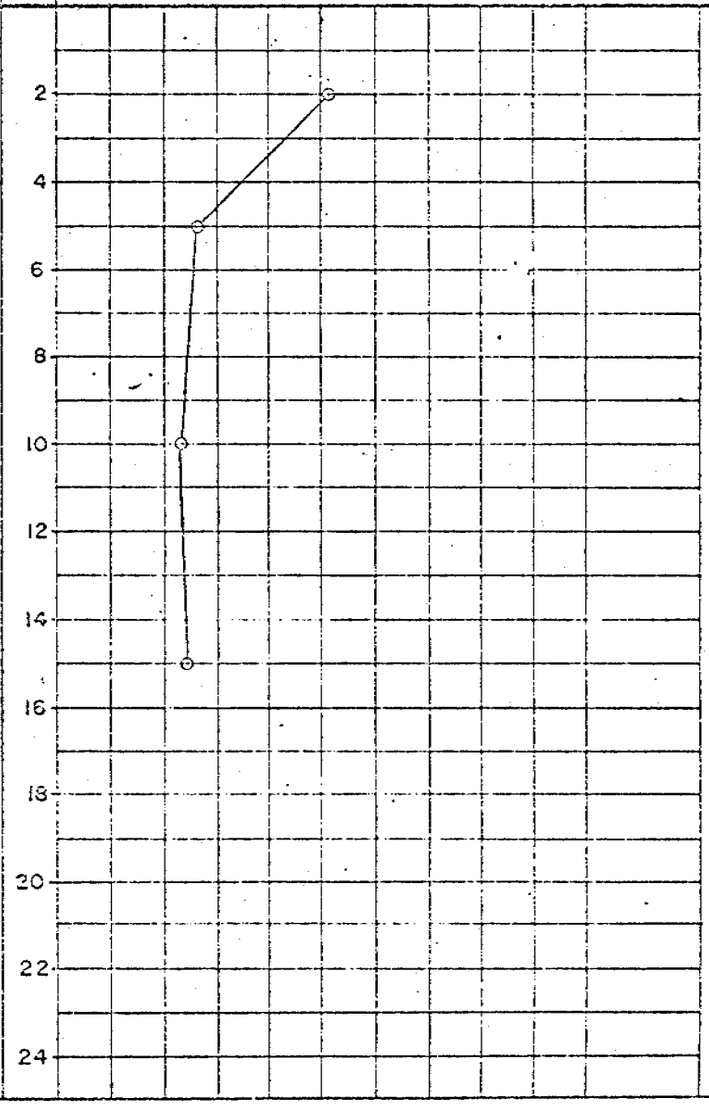
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN. A.F.W	FIELD ENG. R.S.	DATE DRILLED 26/11/72	AIRPHOTO NO:	CHAINAGE: 850+00	OFFSET 2
CRD. D.G.P.	TECH. D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: BLACK SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
475	C	33A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC FINE, FIBROUS	F	Nbn							
2		T				CLAY							126.0	95.3	
4							F								
6		T			CH	GREY ISOLATED ICE CRYSTALS		Vx <2% EXCESS ICE							
8															
10															
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

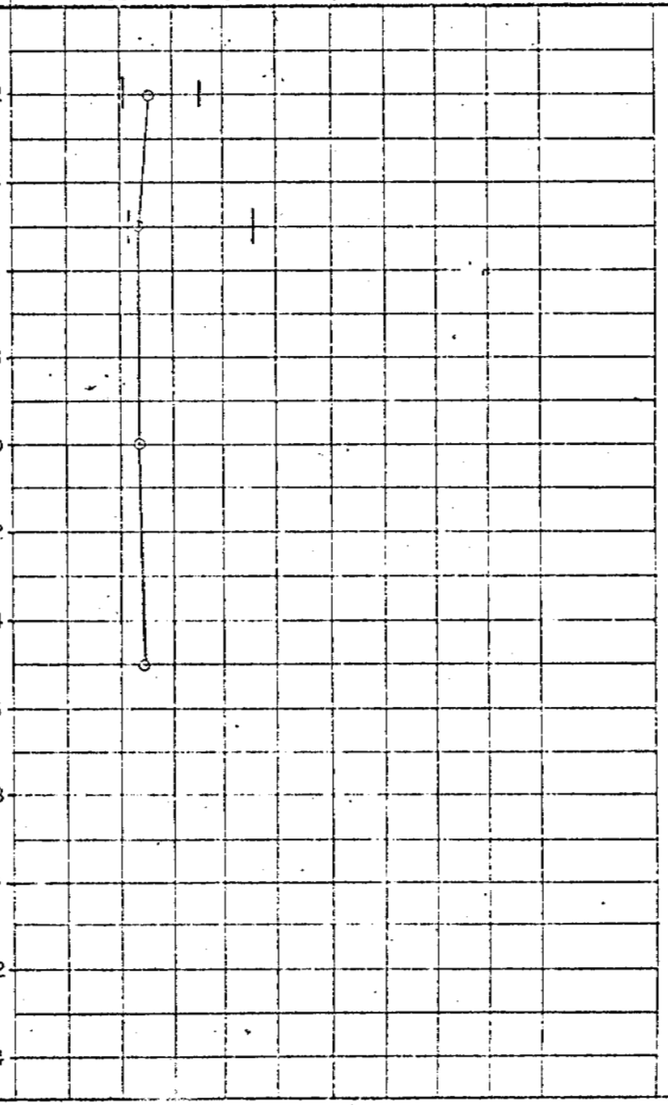


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 840+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
475	C	32A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn					123.1	97.4	
2		P		51 BLS		CLAY	UF	<2% EXCESS ICE							
4					CL	GREY									
6		P				ICE CRYSTALS	F								
8					To										
10					CH			Nbn							
12															
14															
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

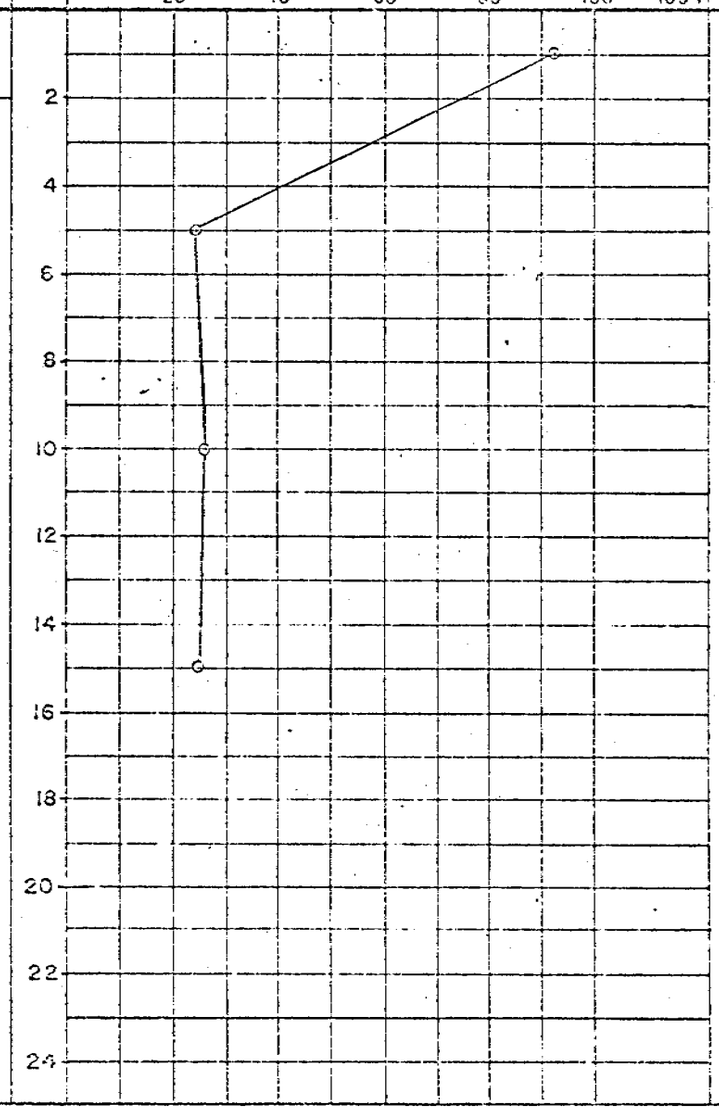
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 830+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: SPRUCE & POPLAR	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
475	C	31A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT DARK BROWN FINE, FIBROUS	F	Nbn							
2															
						CLAY	UF								
4															
						GREY, SILTY, LITTE SAND									
6															
						TRACES OF ORGANIC									
8					CL										
						MED. SOFT									
10															
12															
14															
16															
18						END OF HOLE									
20															
22															
24															



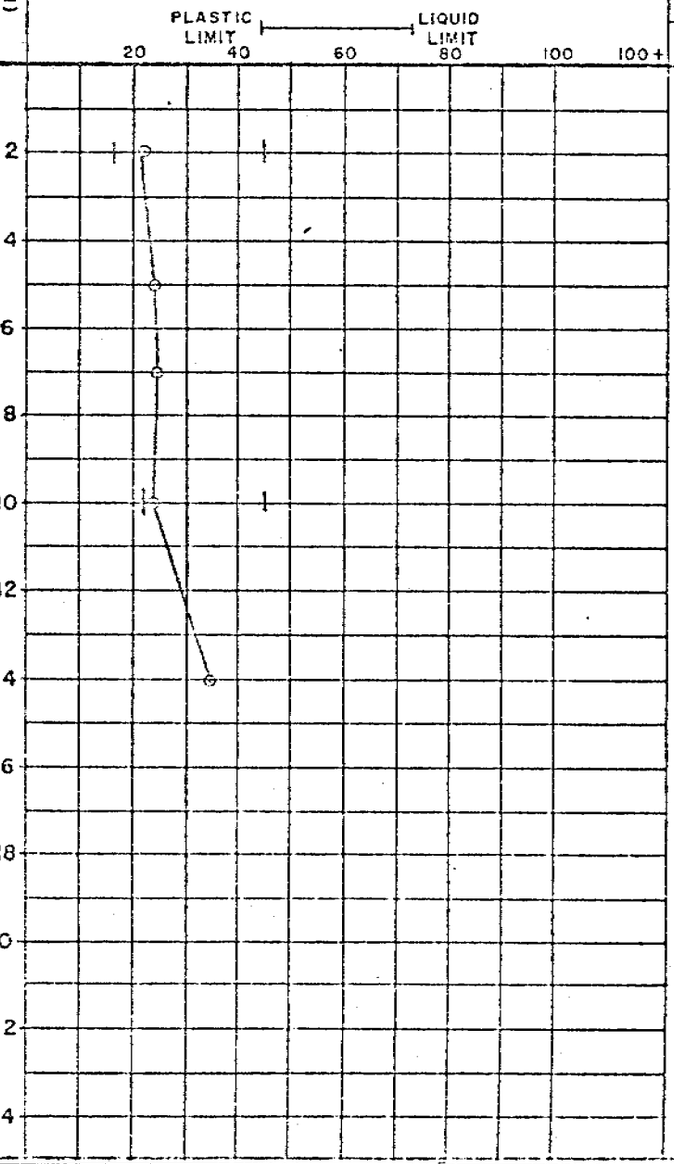
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 820+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 10'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
475	C	356

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT FINE, FIBROUS, ORGANIC										
2		P				CLAY BROWN, SOME SILT PLASTIC TRACE OF SAND SOME GRANULAR MUSKEG	UF	< 5% EXCESS ICE	2							
4									4							
6		P					F	Vr	6							
8									8							
10		P						1/16"-1/8" ICE SEAMS 1/2" CRYSTALS	10							
12									12							
14		P							14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

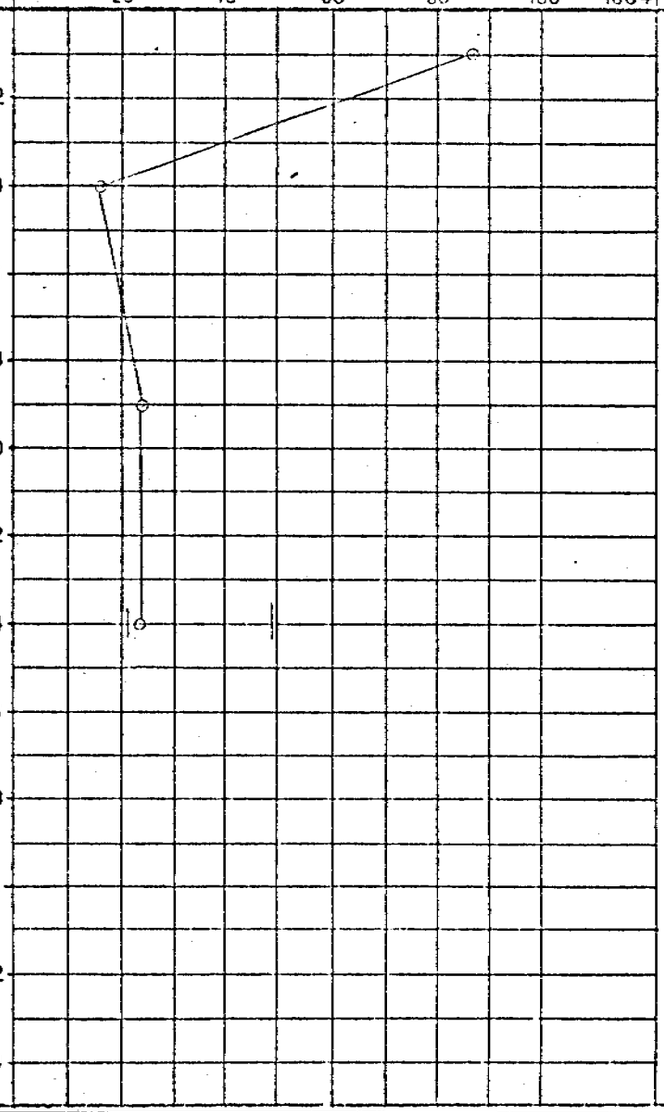


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B.M	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 810+00	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
475	C	243

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT ORGANIC	F	Nbn	2							
4		P		54+ BLS.	CL	CLAY SILTY, SOME GRAVEL ICE CRYSTALS			4							
6									6							ICE LENSES INCREASING IN THICKNESS WITH DEPTH, BUT WIDELY SPACED
8					To				8							
10		P				GREY, SILTY		Vs	10							
12					CH			< 5% EXCESS ICE	12							
14		P		50 BLS.		ICE LENSES TO 1/4"			14							
16									16							
18						END OF HOLE			18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

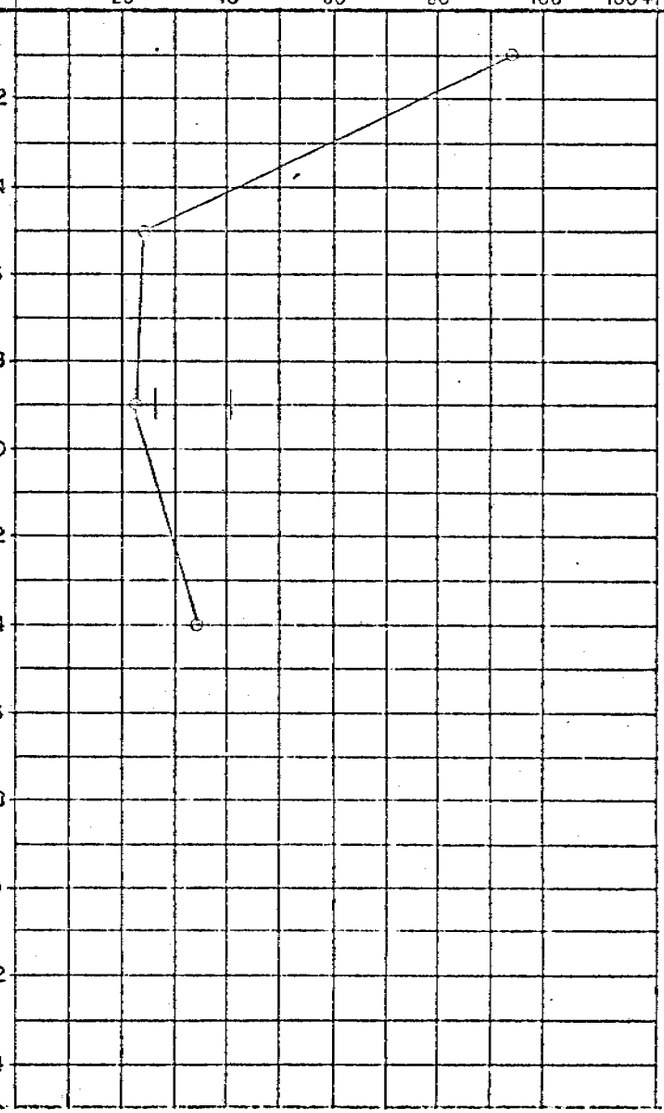
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B.M.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 600+00	OFFSET: ℄
CKD: D.G.P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
476	C	33 5

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
0–2					Pt	PEAT ORGANIC	F	Nbn
2–4					CL	CLAY SILTY, WET	UF	
4–6		P		60+ BLS.	CL TO CH	ICE LENSES TO 1/16" VERY STICKY	F	Vn
6–8								
8–10		P		60+ BLS.				< 2% EXCESS ICE
10–12								
12–14				56+ BLS.	CH			
14–16		P				ICE LENSES TO 1/2"		Vr
16–18						END OF HOLE		
20								
22								
24								



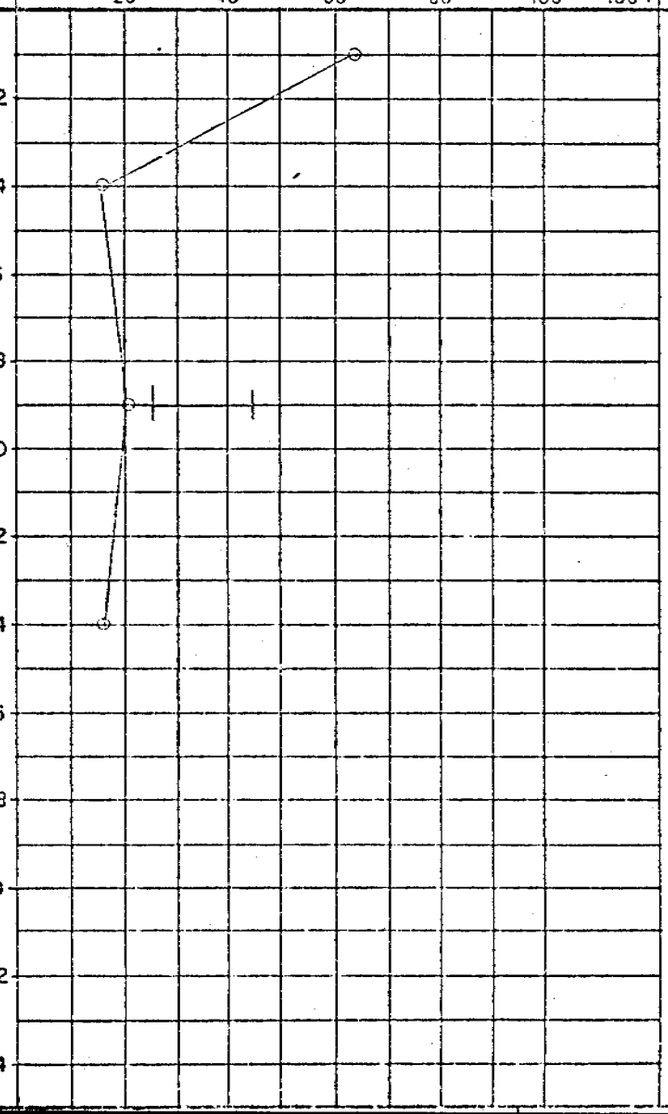
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 790+00	OFFSET: ℄
CKD: O.S.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SURFACE TO 8'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
476	C	22 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT ORGANIC	F	Nbn							
4		P		54 BLS.	CL	CLAY SILTY		Vr							
6					To	ICE LENSES									
8								< 2% EXCESS ICE							
10		P		54 BLS											
12					CH	SILTY									
14		P						Vbn							
16						END OF HOLE									
18															
20															
22															
24															

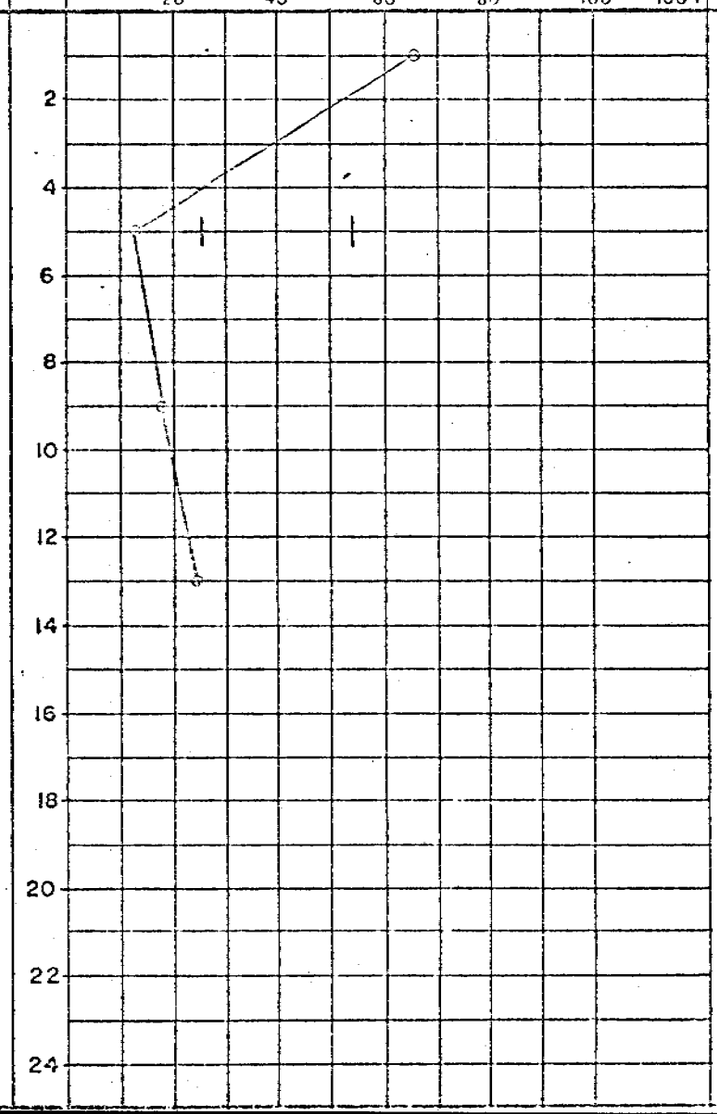


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: G.M.	DATE DRILLED: 20/11/72	AIRPHOTO NO:	CHAINAGE: 760+00	OFFSET: 2
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 10'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
476	C	213

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2						CLAY									
4						SILTY, SOME ICE LENSES		Vh							
6		P		34 BLS.											
8					CH	MED. — HIGH PLASTIC		< 5% EXCESS ICE							
10		P		46 BLS		SILTY, ICE LENSES MORE EXTENSIVE - 1/8"									
12															
14		T						Vh							
16						END OF HOLE									
18															
20															
22															
24															



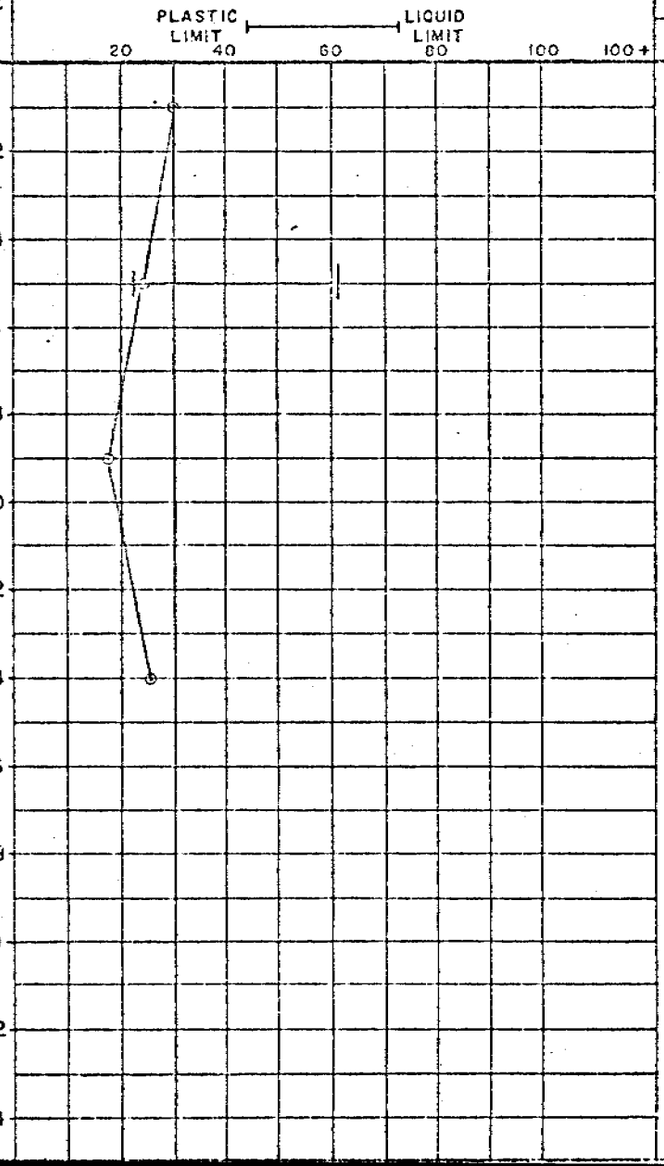
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 770+00	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
476	C	20 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC	F	Nbn
2					CH	CLAY SILTY, SOME ICE CRYSTALS		
4				60 BLS.				Vh
6		P			GC	VISIBLE RANDOM ICE		
8								To
10						SOME GRAVEL		
12								
14		P			CL	SILTY, SOME ICE LENSES		Nbn NO EXCESS ICE
16								
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

LOW TOTAL ICE CONTENT

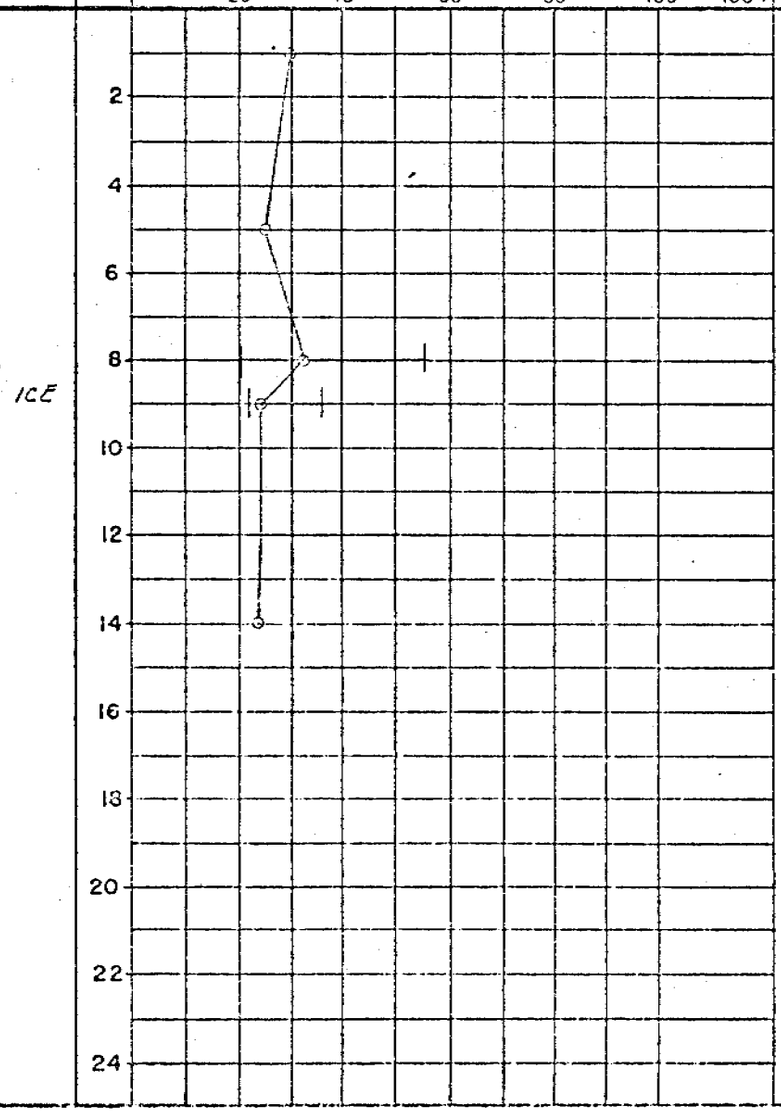
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 760+00	OFFSET: C
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
476	C	193

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					CH	CLAY ICE CRYSTALS	F	Vx
4								
6		P		29 BLS	To	DARK GREY		
8								< 2% EXCESS ICE
10		P						
12					CL	SILTY, RUST		
14		P		80 BLS				Vx
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

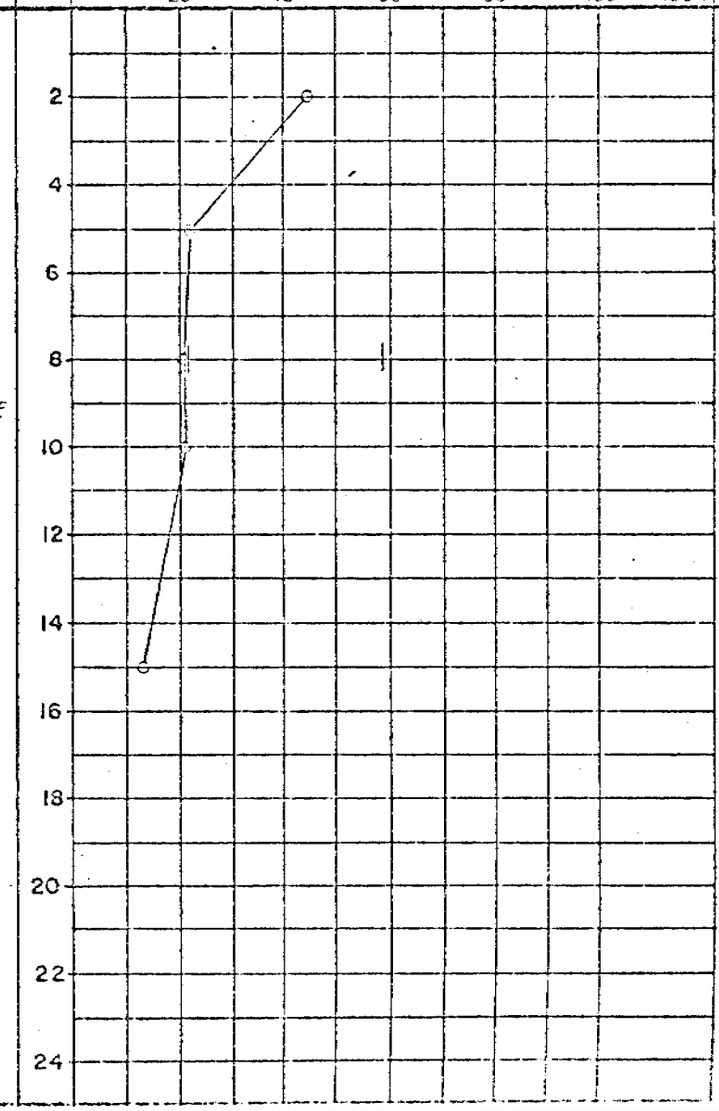
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.M.	FIELD ENG: T.S.	DATE DRILLED: 10/11/12	AIRPHOTO NO:	CHAINAGE: 740+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FLAT	VEGETATION: SPRUCE To 20'	ELEV:

TEST HOLE

MILE	S,C,S	NUMBER
477	C	39 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT CLAY CONTENT	F	Nbn							
2															
4						CLAY		Vx							
6					CH	DARK GREY, LOW ICE CONTENT									
8		P				ICE LENSES 1/8"		< 2% EXCESS ICE					125.0	100.1	
10															
12						GRAVEL									
14					GP	FINE ROCKS		Vx							
16						END OF HOLE									
18															
20															
22															
24															

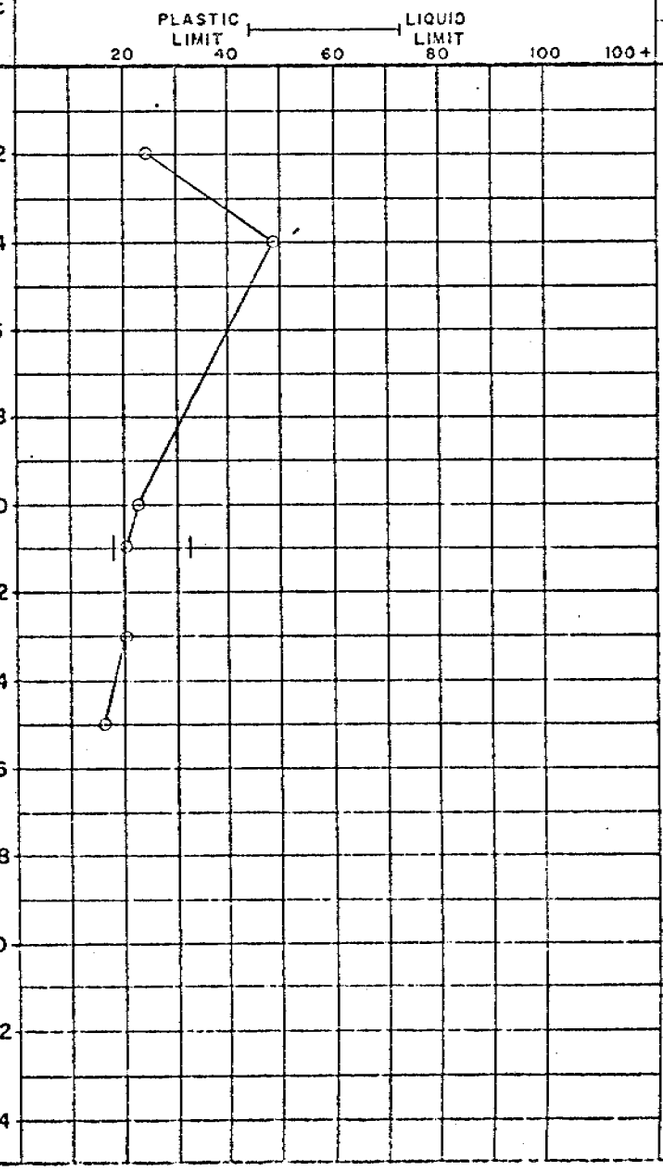


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 26/11/72	AIRPHOTO NO:	CHAINAGE: 708+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: SOUTH 10%	VEGETATION: CONIFER 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
477	C	48A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						CLAY	F	Nbn							
2															
4															
6						BROWN, SOME FINE SAND & SILT									
8															
10		P													
12															
14															
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

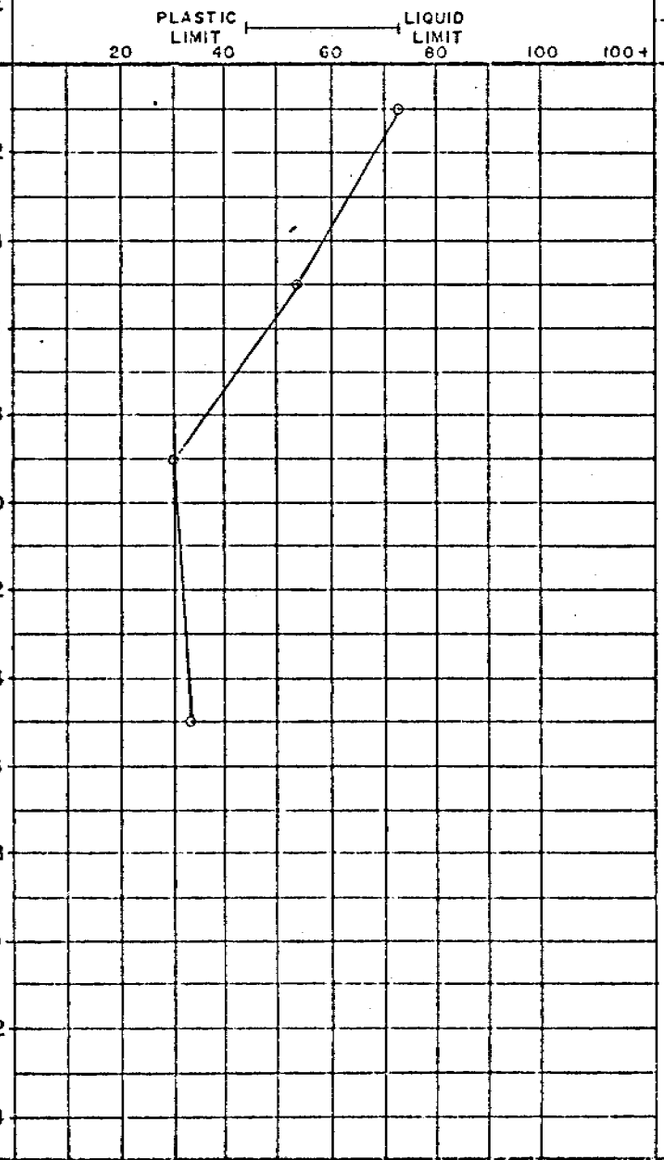
DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 695+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M.	RIG:	SURFACE DRAINAGE: E TO W	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
478	C	23A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT LITTLE SILT	F	Nbn
					CL	CLAY GREY, SOME ORGANIC MED. WET		Nbn
					ML	SILT 1/8" ICE LENSES		Vx
		P				END OF HOLE		

O = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



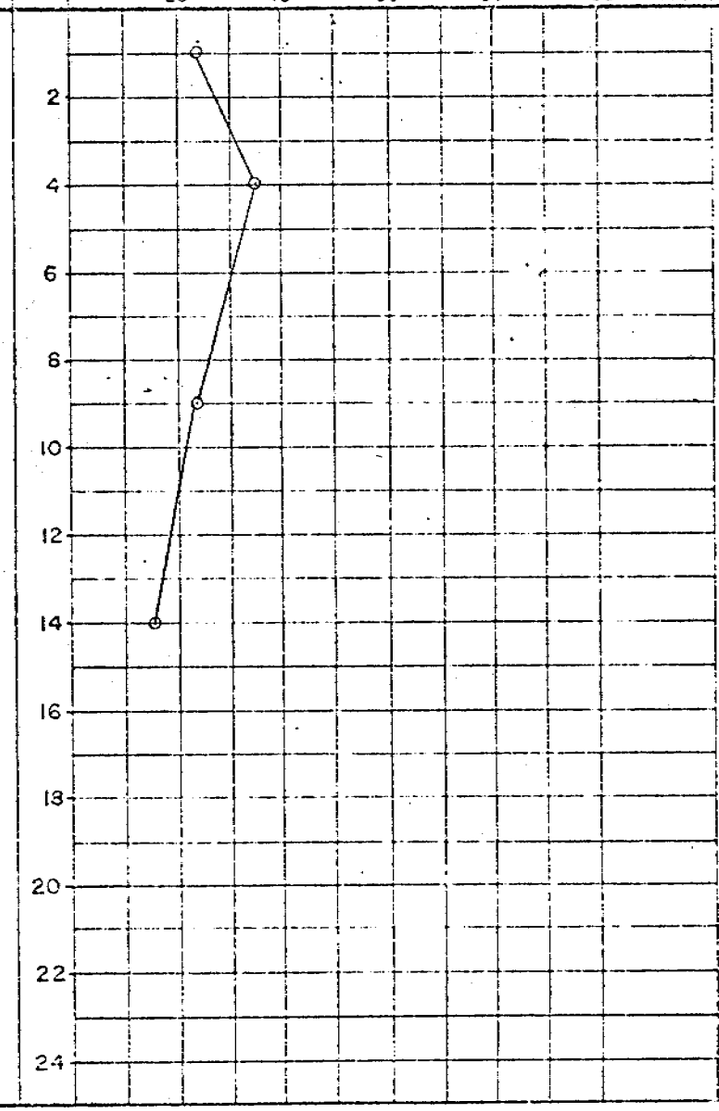
GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W.	FIELD ENG B.M	DATE DRILLED 17/1/73	AIRPHOTO NO:	CHAINAGE 664+35	OFFSET ℄
CKD DGP.	TECH DM	RIG AIR	SURFACE DRAINAGE GOOD	VEGETATION: SPRUCE TO 50'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
478	C	251B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						PEAT ORGANIC	F	
2						SAND SILTY		
4						CLAY SANDY, SILTY SOME PEBBLES		Nbn
6								
8								
10						GRAVEL SANDY		
12								Nbn
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

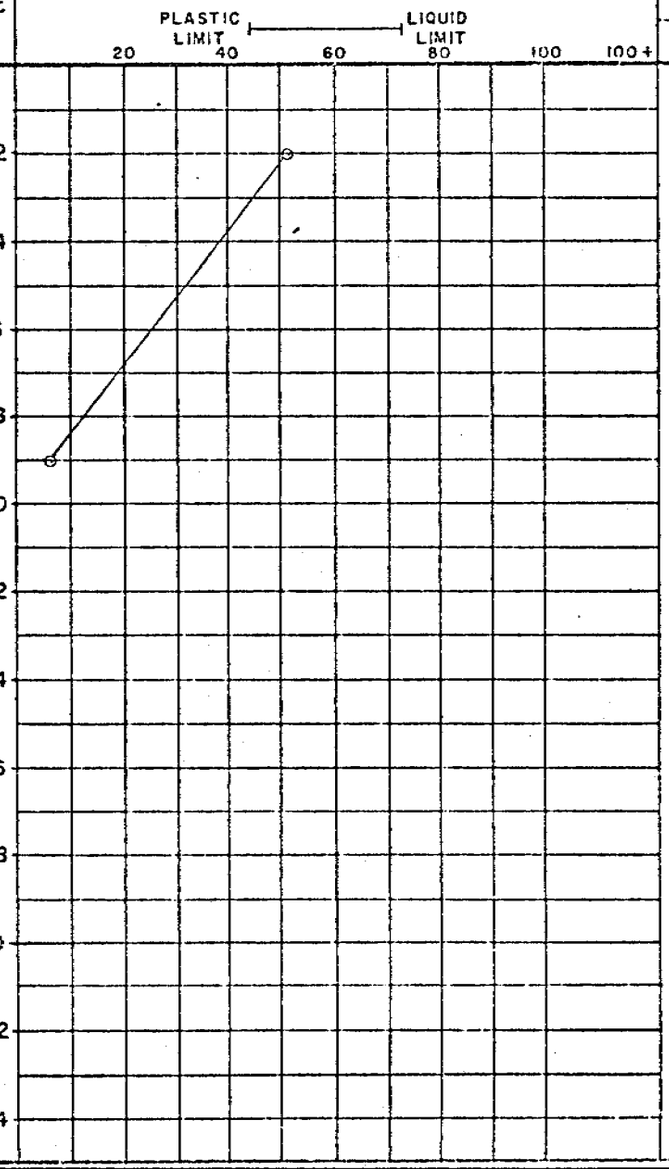
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 670+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
478	C	18 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	PEAT ORGANIC, SOME ROCKS	F	Nbn							
					GW	GRAVEL SANDY, SOME EXCESS ICE, HARD SOME ROCKS		Vx							
								Nbn							
					GP	CLAYEY, SANDY									
								Nbn							
						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

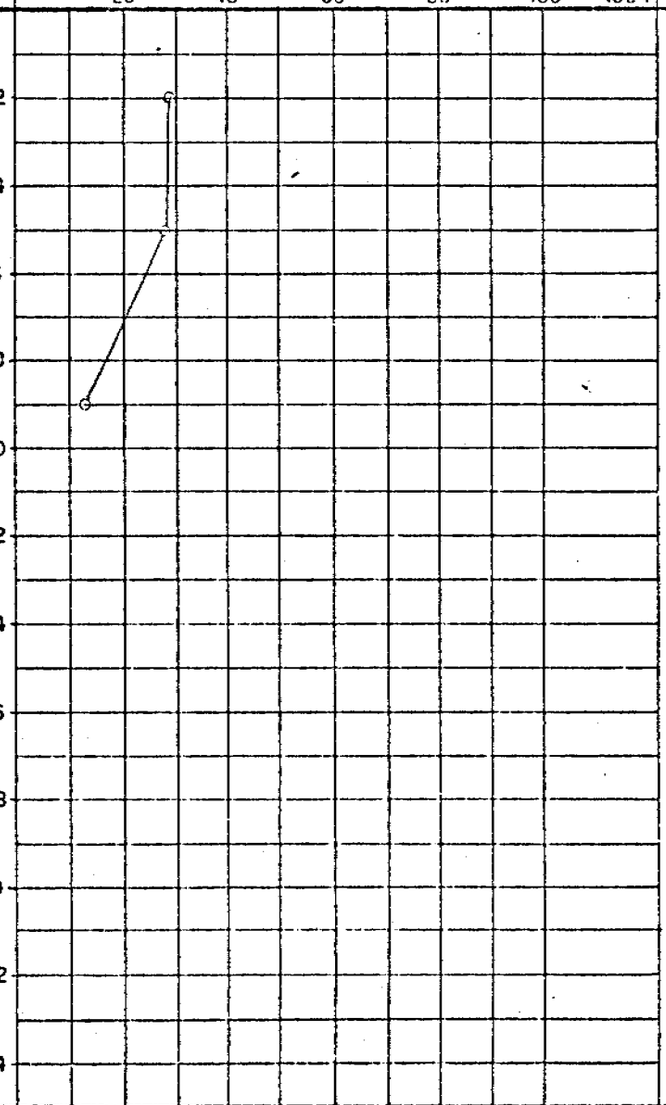


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 653+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
478	C	17 S

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2					GP	GRAVEL									
4					CL	CLAY DARK BROWN, SILTY.		Nbn							
6															
8					GM	GRAVEL SANDY, SOME SILT									
10															GRAVEL CRUSHED BY DRILL BIT
12					GP	EXCESS ICE, SANDY		Vx							
14															
16						END OF HOLE									
18															
20															
22															
24															

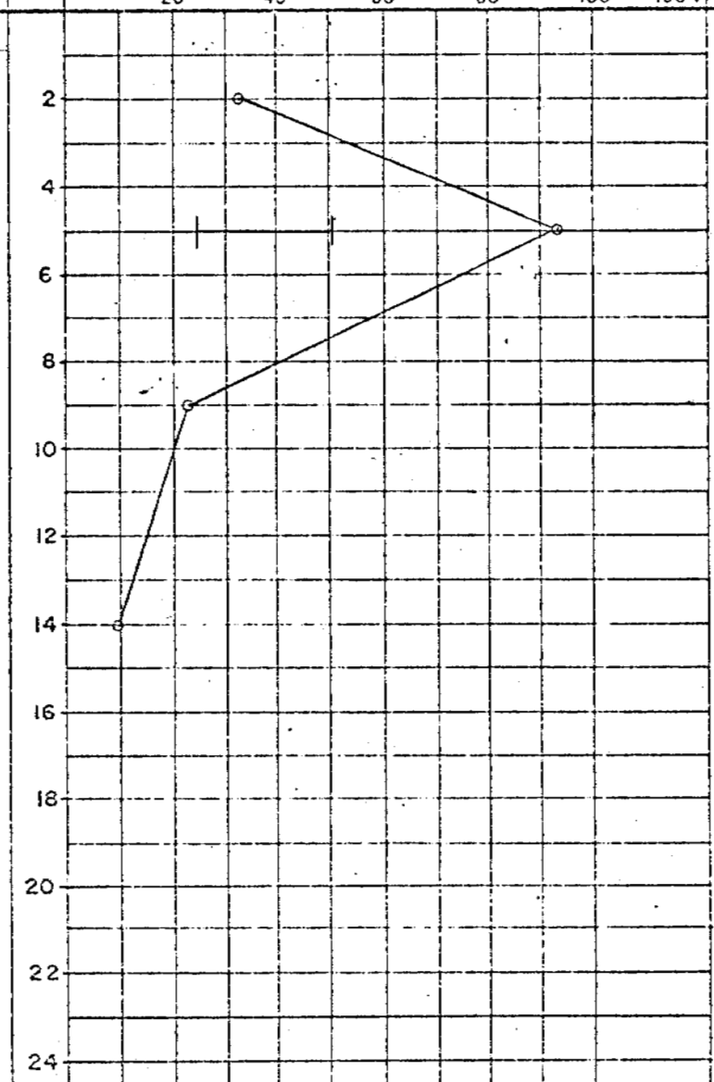


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 19/11/72	AIRPHOTO NO:	CHAINAGE: 6.15+43	OFFSET: 1'
CKD D.G.P	TECH D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV

TEST HOLE		
MILE	S,C,S	NUMBER
479	C	163

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nbn							
2					CL	CLAY BROWN	UF								
4						WET, ORGANIC									
6															
8						ORGANIC LAYER - BLACK TO DARK BROWN, WET									
10						CLAY - WET, PLASTIC									
12					GP	GRAVEL SANDY									
14					SP	SAND SOME GRAVEL									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG: B.M	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 635+00	OFFSET: ℄
CKD D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
479	C	158

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	UF								
					SP	SAND LIGHT BROWN									
2			LOST		Pt	PEAT ORGANIC									
4						GRAVEL									
6															
8					GP	SANDY									GRAVEL CRUSHED BY DRILL BIT
10															
12															
14															
16						END OF HOLE									GRAVEL CAVING MAKES DEEPER PENETRATION IMPOSSIBLE
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W. | FIELD ENG: T.S. | DATE DRILLED: 17/11/73 | AIRPHOTO NO: | CHAINAGE: 632+50 | OFFSET:

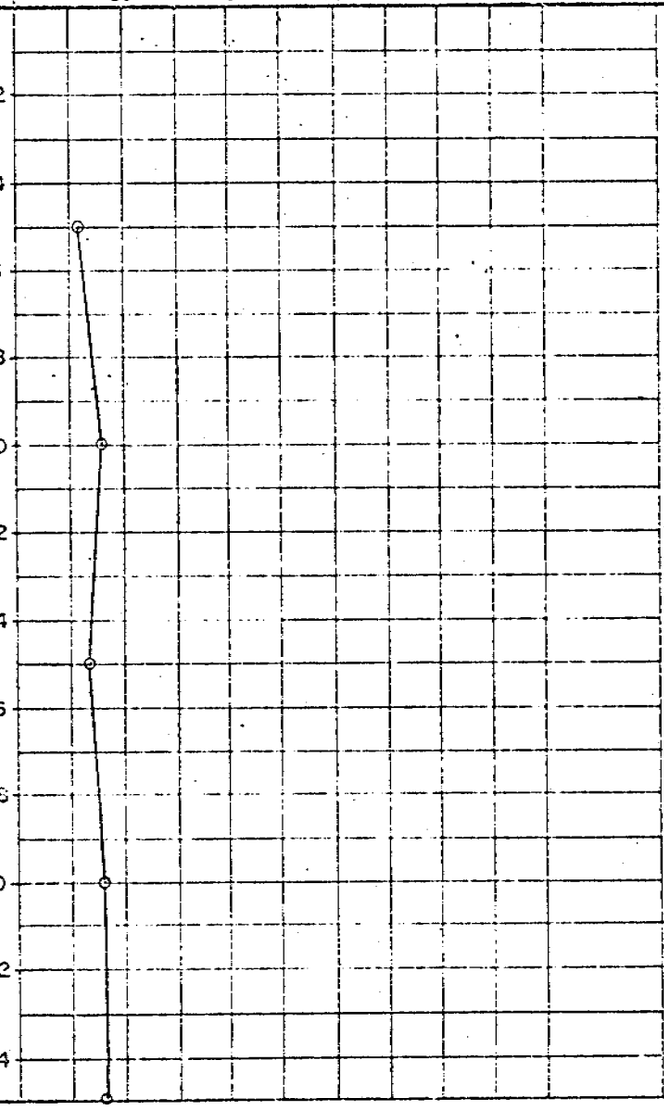
CKD: D.G.P. | TECH: D.M. | RIG: AIR | SURFACE DRAINAGE: GOOD | VEGETATION: 30' CONIFERS | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
479.5	5	155A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	F									
2						SANDY, DRY, LIGHT BROWN TILL TEXTURE			2							
4									4							
6						CLAY			6							
8						SILTY, LIGHT BROWN WET, SEAMED	UF		8							
10		P							10							SO_4 = 0.10 %
12						SAND			12							
14									14							
16						COARSE, WET			16	19		75	6			
18									18							
20									20	3		90	7			
22									22							
24						END OF HOLE @ 26'			24	2		91	7			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Coarse Gravel
Location	
Hole 479-C-14B	Depth 4'-5'
Techoician	Date Nov.21/72

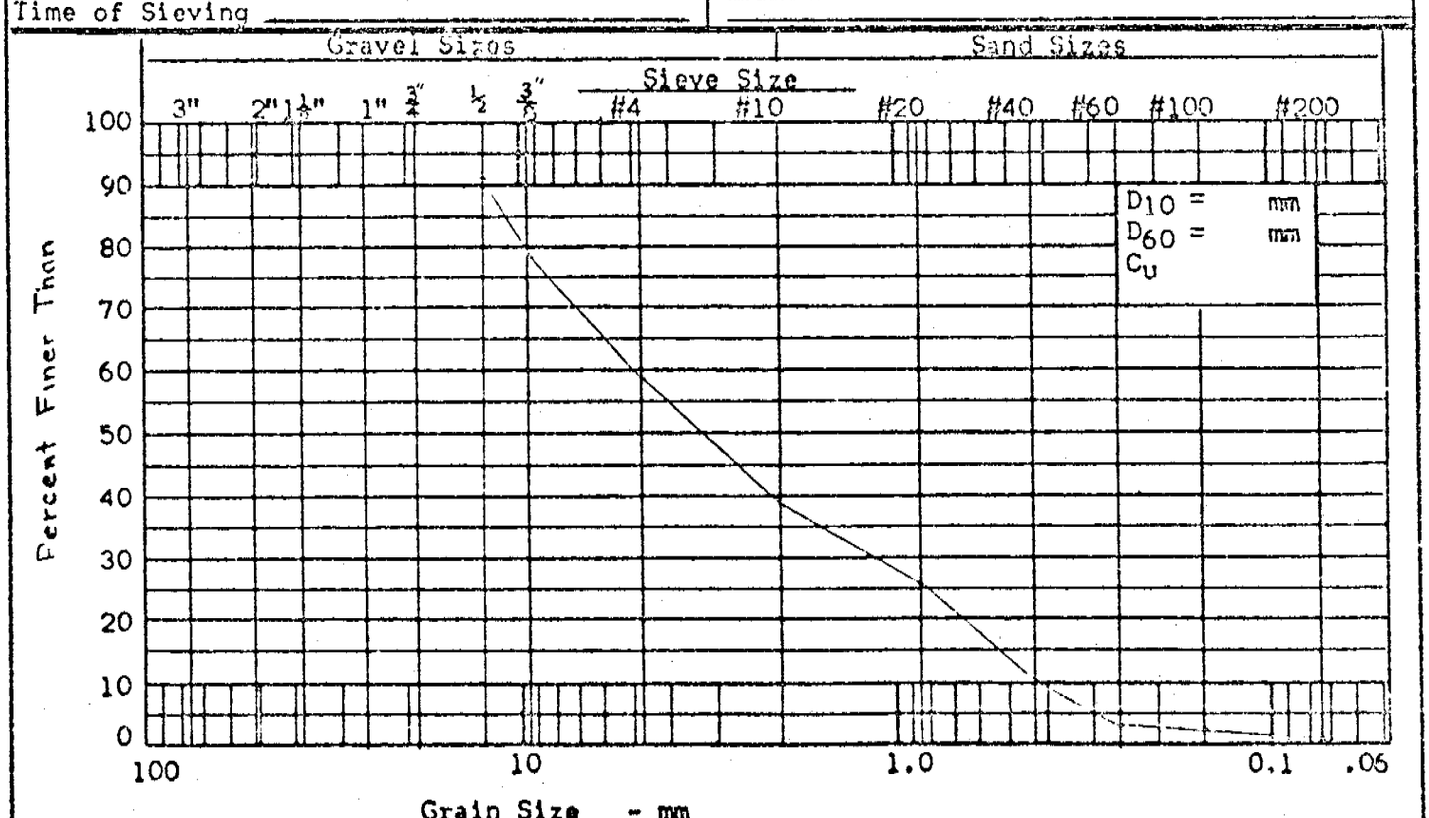
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70			91	
		3/8	9.52			79	
	4	.185	4.76			53	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			39	
Wt. Dry + Tare	20	.0331	.840			26	
Tare	40	.0165	.420			10	
Wt. Dry	60	.0097	.250			3	
	100	.0059	.149			2	
	200	.0029	.074			1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Coarse Sand
Location	
Hole 479-S-150A	Depth 15'
Technician	Date 17/1/72

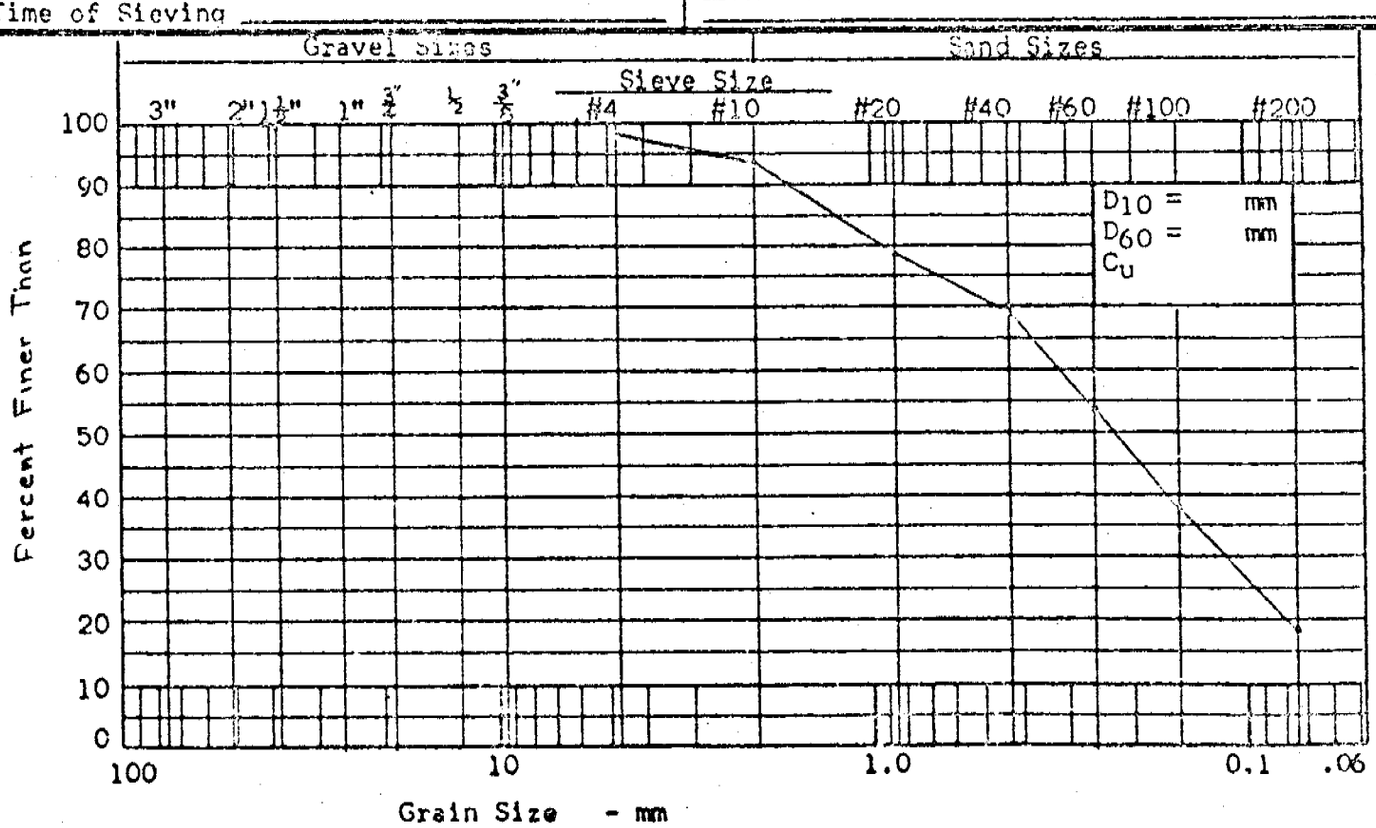
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			98.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			93.7	
Tare No.	20	.0331	.840			79.1	
Wt. Dry + Tare	40	.0165	.420			69.3	
Tare	60	.0097	.250			53.6	
Wt. Dry	100	.0059	.149			37.8	
	200	.0029	.074			18.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Coarse Sand
Location	
Hole	479-S-150A Depth 20'
Technician	Date Jan. 30/73

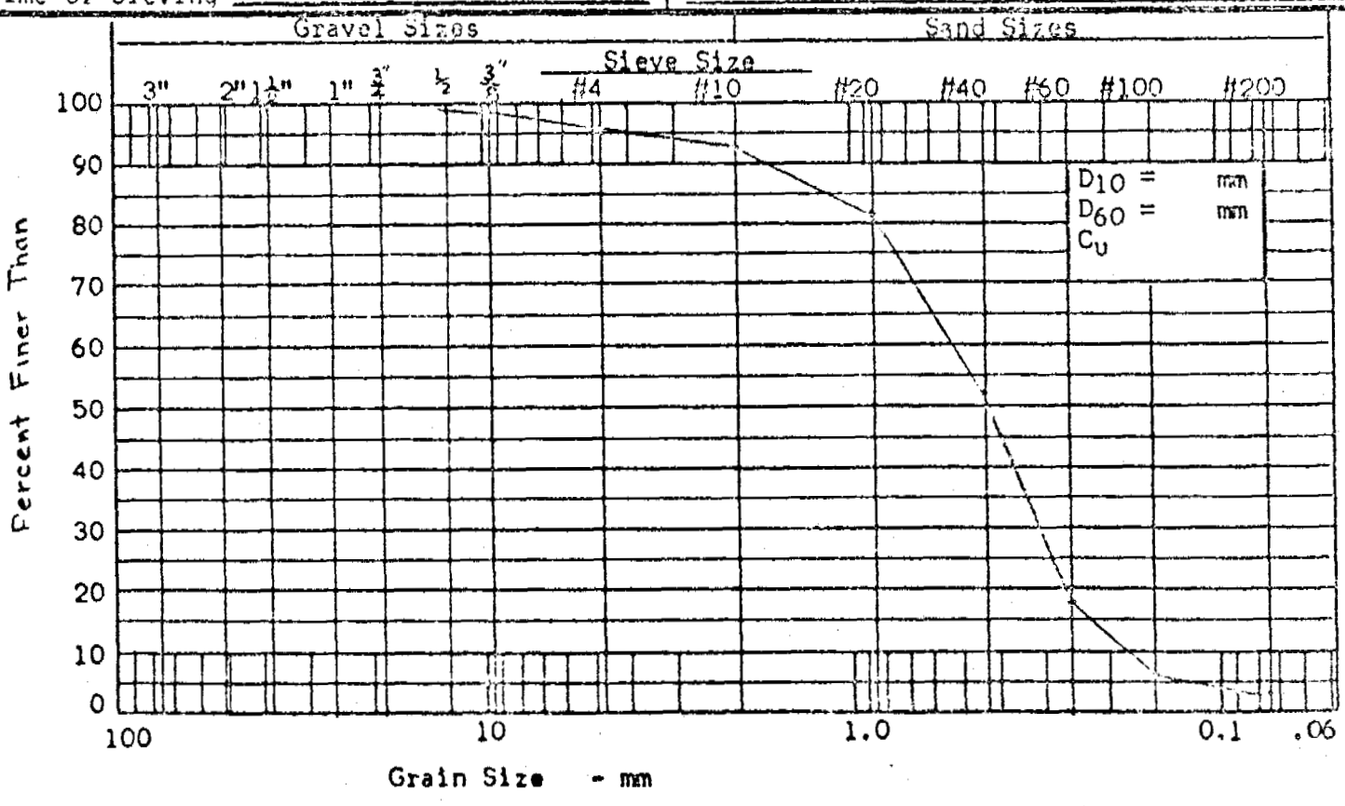
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			99.1	
Wt. Dry		3/8	9.52			98.5	
	4	.185	4.76			96.6	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			92.6	
Wt. Dry + Tare	20	.0331	.840			81.5	
Tare	40	.0165	.420			51.4	
Wt. Dry	60	.0097	.250			17.8	
	100	.0059	.149			6.5	
	200	.0029	.074			2.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Coarse Sand
Location	
Hole	479.5-S-150A Depth 25 - 26'
Technician	Date Feb.1/73

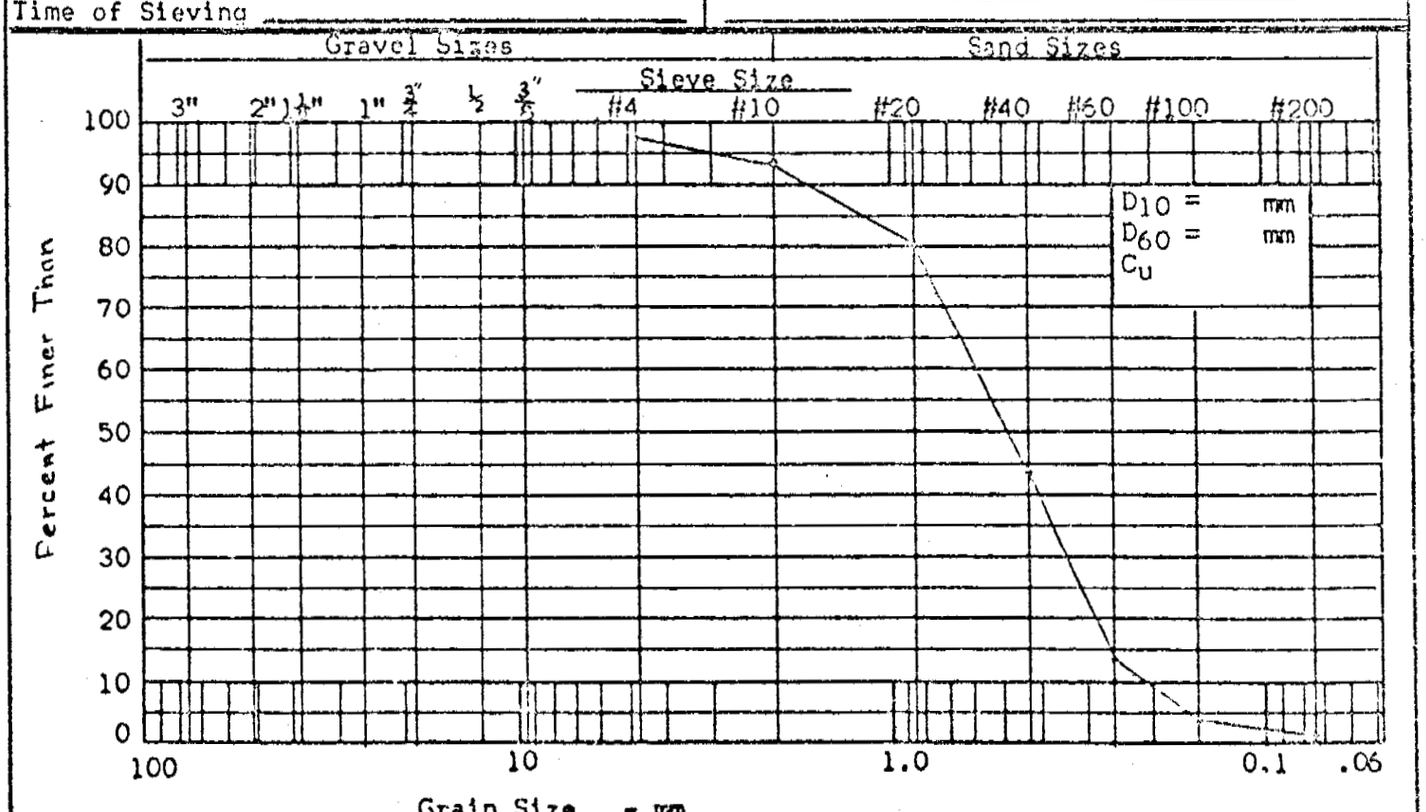
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			97.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			93.0	
Tare No.	20	.0331	.840			80.4	
Wt. Dry + Tare	40	.0165	.420			44.2	
Tare	60	.0097	.250			13.9	
Wt. Dry	100	.0059	.149			4.8	
	200	.0029	.074			1.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



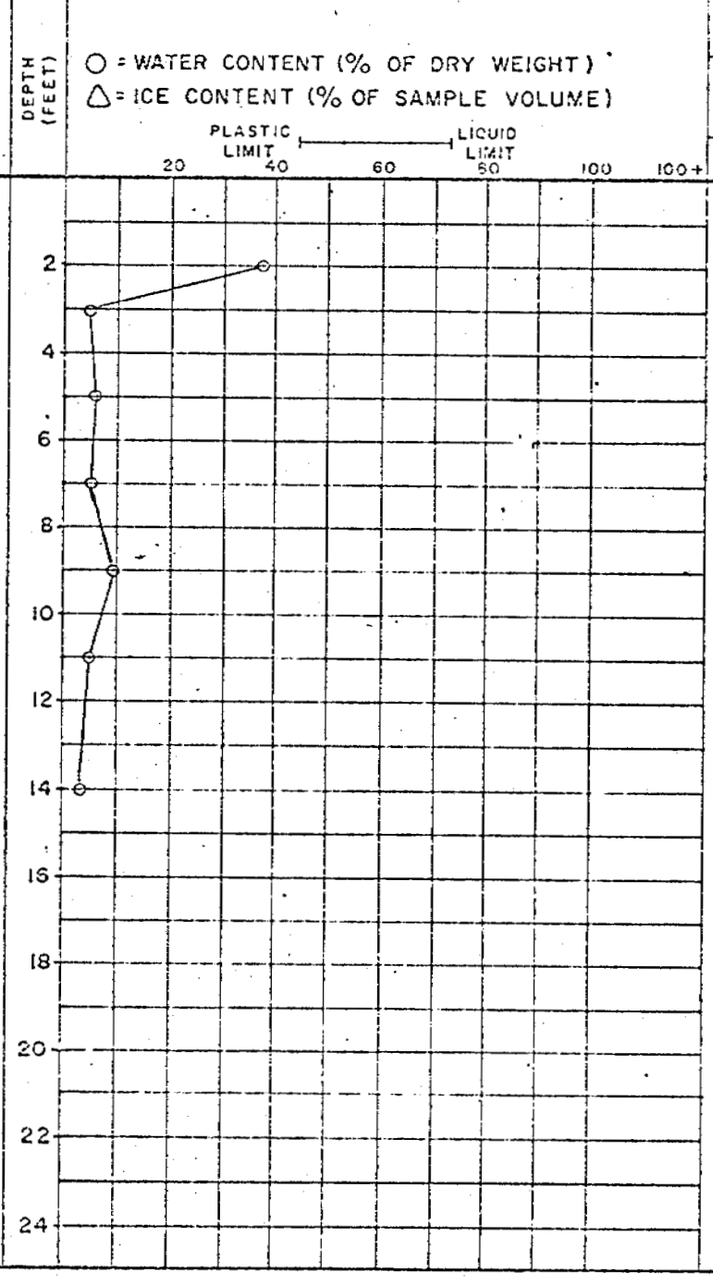
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 630+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & BIRCH TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
479	C	148

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	UF								
2					SM	SAND SILTY, BROWN									
4					GP	GRAVEL COARSE				1	38	61			GRAVEL CRUSHED BY DRILL BIT
6															
8						LARGE BOULDERS									
10					CL	TILL CLAY, LIGHT GREY VERY HARD									
12															
14						VERY DRY									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project: Mackenzie Highway
Site:
Sample: Silty Clay
Location:
Hole: 479-S-152A Depth: 2'
Technician: Date: Jan. 31/73

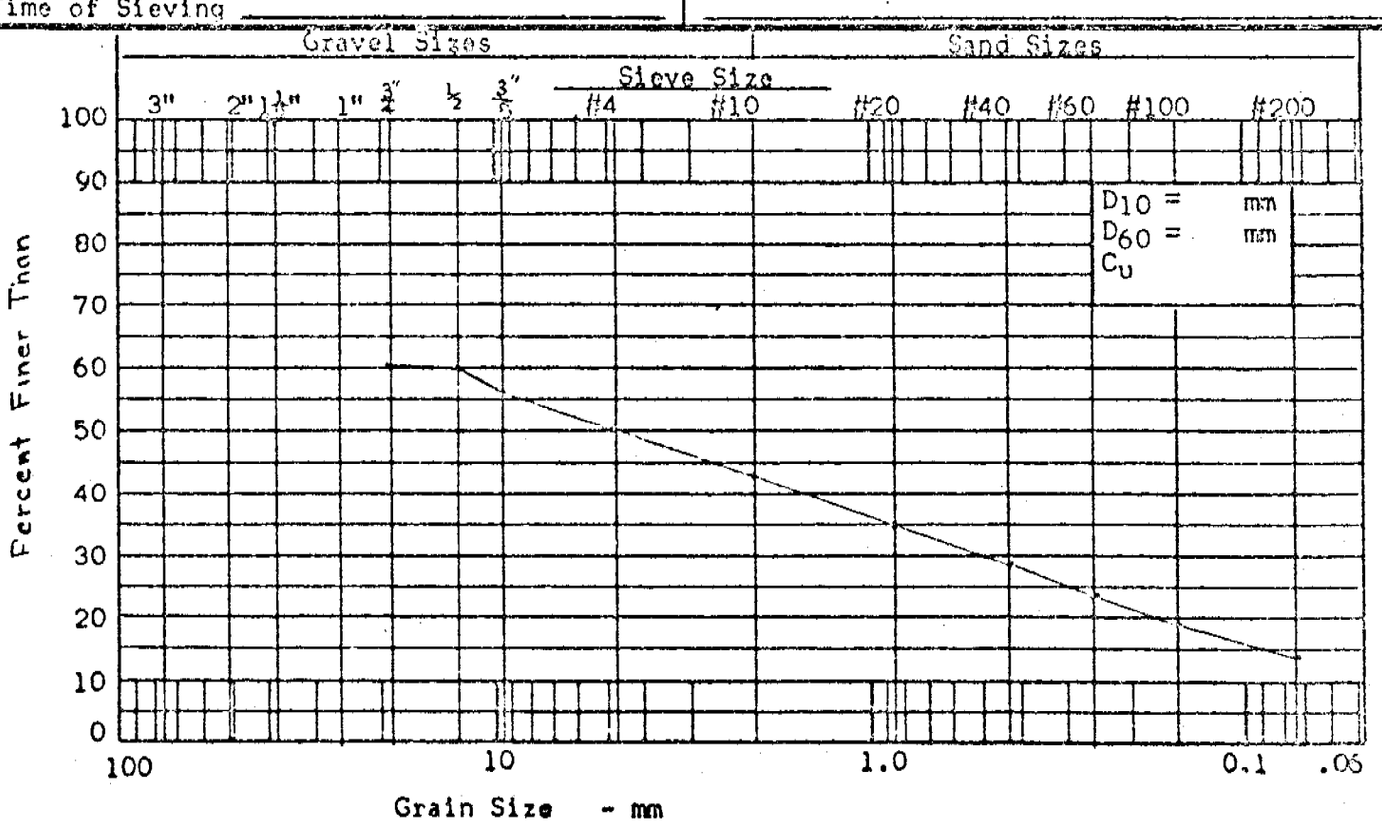
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			65.4	
Tare		1/2	12.70			65.4	
Wt. Dry		3/8	9.52			56.8	
	4	.185	4.76			50.6	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			43.2	
Tare No.	20	.0331	.840			35.8	
Wt. Dry + Tare	40	.0165	.420			28.4	
Tare	60	.0097	.250			23.5	
Wt. Dry	100	.0059	.149			18.5	
	200	.0029	.074			14.8	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Sand with traces of silt & clay

Location

Hole 479-S-152A Depth 10'

Technician Date Jan 31/73

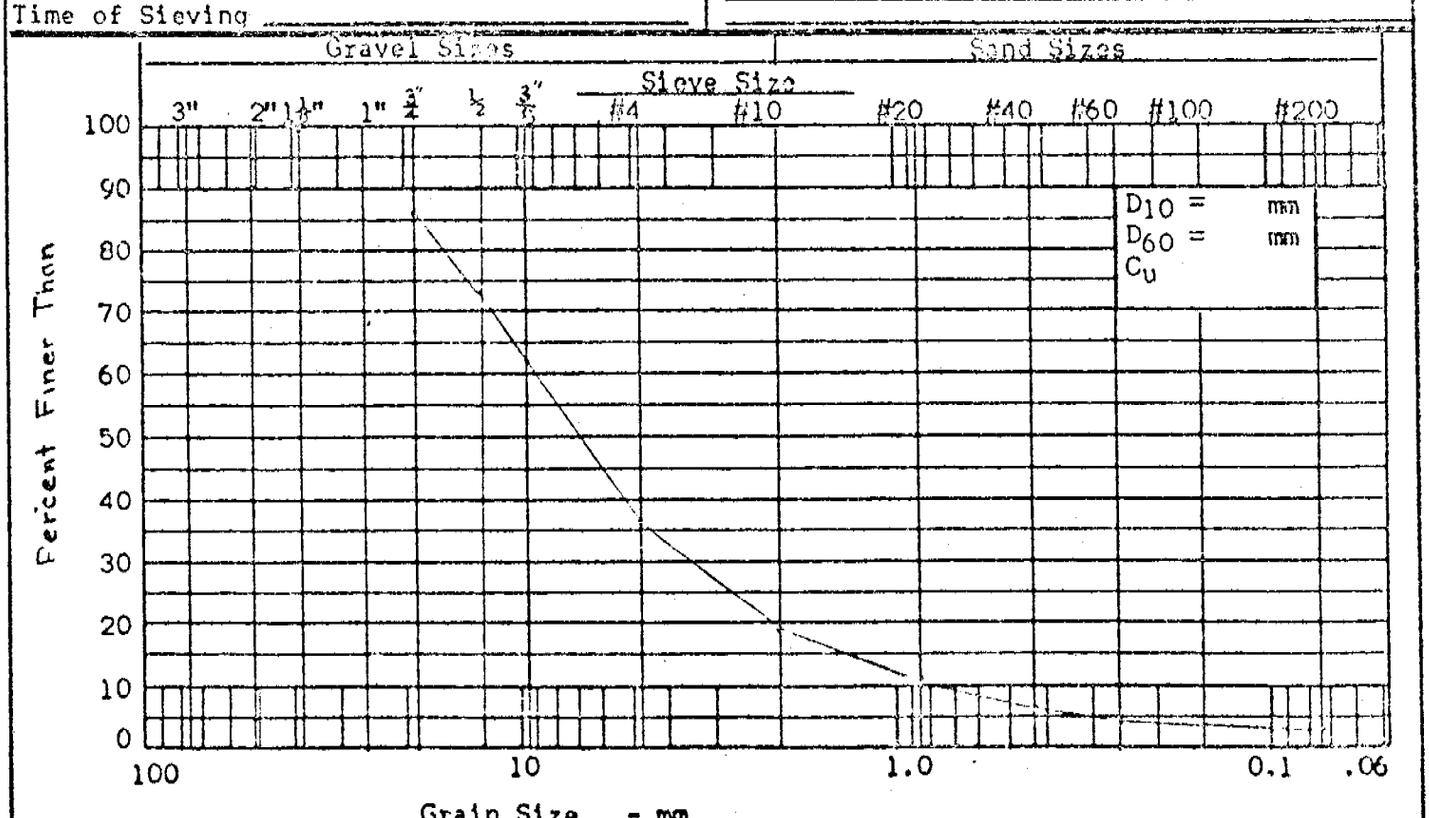
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			86.0	
Tare		1/2	12.70			73.4	
Wt. Dry		3/8	9.52			62.1	
	4	.185	4.76			36.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			19.4	
Tare No.	20	.0331	.840			10.8	
Wt. Dry + Tare	40	.0165	.420			6.7	
Tare	60	.0097	.250			4.8	
Wt. Dry	100	.0059	.149			3.8	
	200	.0029	.074			2.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel with Silt and Clay
Location	
Hole	479-S-152A Depth 15'
Technician	Date Jan. 31/73

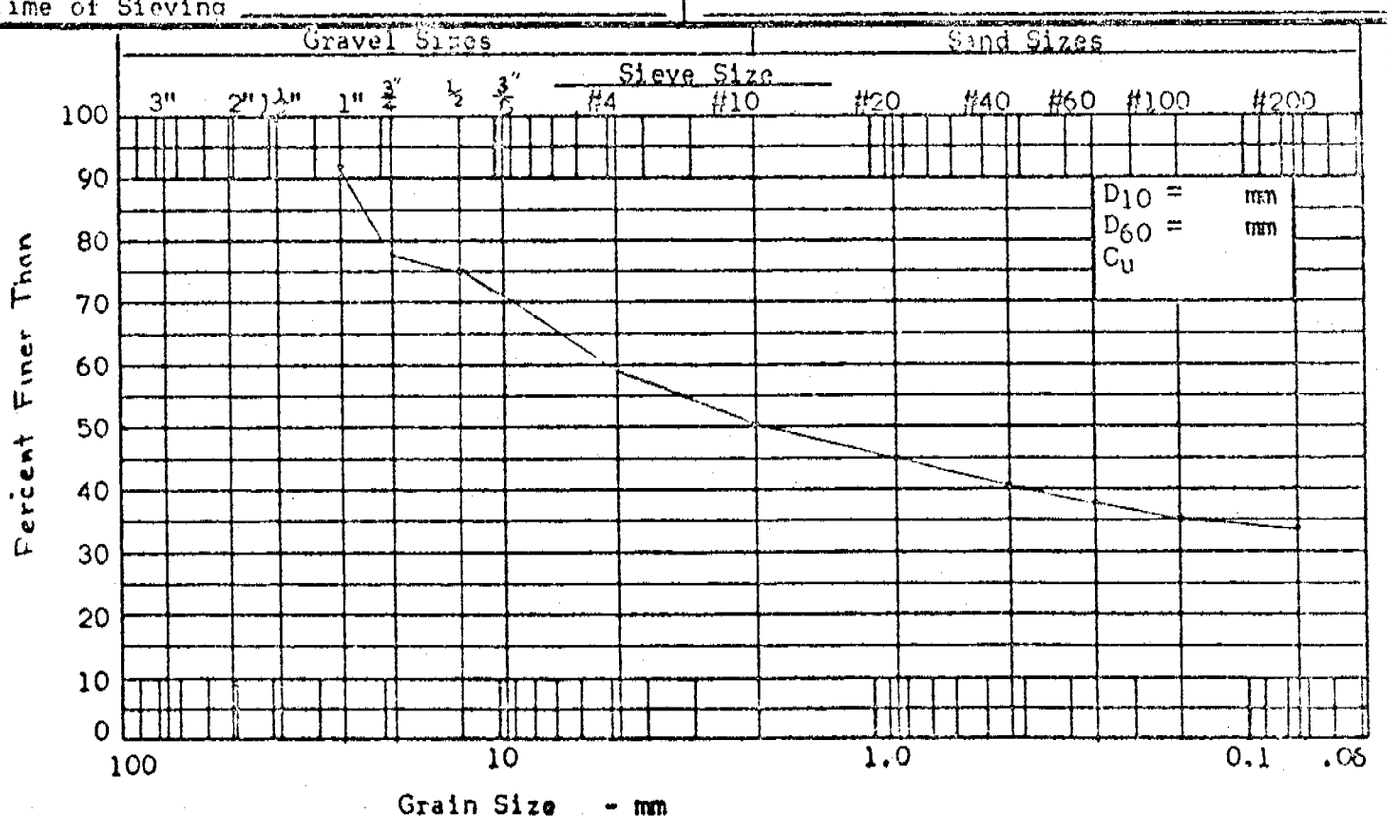
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4		1½"					
Tare No.		1	25.4			92.6	
Wt. Dry + Tare		3/4	19.10			77.3	
Tare		1/2	12.70			75.1	
Wt. Dry		3/8	9.52			71.4	
	4	.185	4.76			59.4	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			50.7	
Tare No.	20	.0331	.840			45.3	
Wt. Dry + Tare	40	.0165	.420			40.6	
Tare	60	.0097	.250			37.4	
Wt. Dry	100	.0059	.149			35.7	
	200	.0029	.074			34.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Gravel with silt and clay

Location

Hole 479-S-152A Depth 20'

Technician Date Jan. 30/73

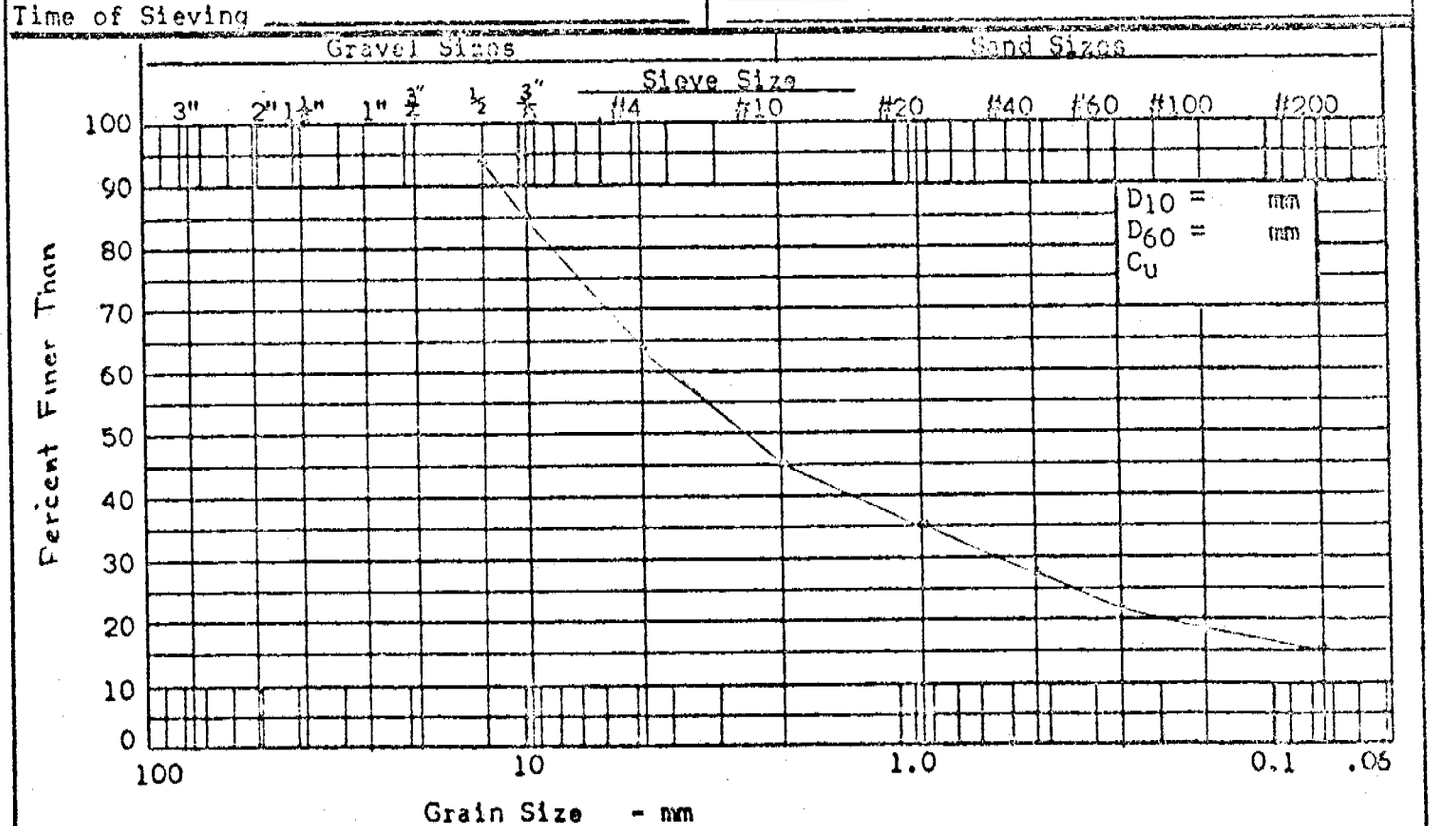
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			94.2	
Wt. Dry		3/8	9.52			85.6	
	4	.185	4.76			64.1	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			45.1	
Wt. Dry + Tare	20	.0331	.840			35.3	
Tare	40	.0165	.420			27.3	
Wt. Dry	60	.0097	.250			22.1	
	100	.0059	.149			19.0	
	200	.0029	.074			15.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel with silt and clay
Location
Hole 479-S-152A Depth 25'
Technician Date Feb 1/1973

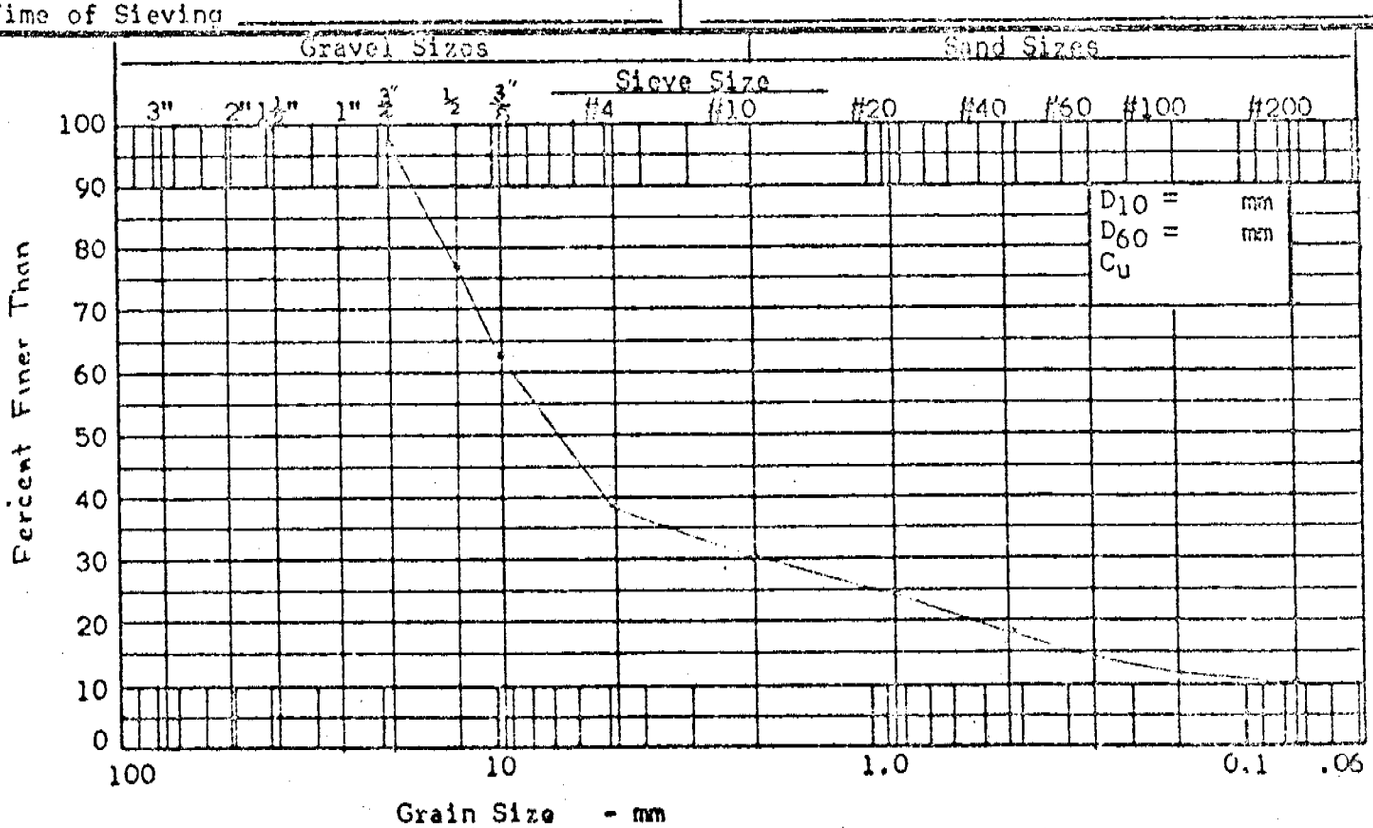
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			96.2	
Tare		1/2	12.70			76.8	
Wt. Dry		3/8	9.52			62.3	
	4	.185	4.76			39.5	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			30.1	
Tare No.	20	.0331	.840			24.6	
Wt. Dry + Tare	40	.0165	.420			18.4	
Tare	60	.0097	.250			14.4	
Wt. Dry	100	.0059	.149			12.2	
	200	.0029	.074			10.4	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel with silt and clay
Location	
Hole	479-S-152A Depth 30'
Technician	Date Jan. 30/73

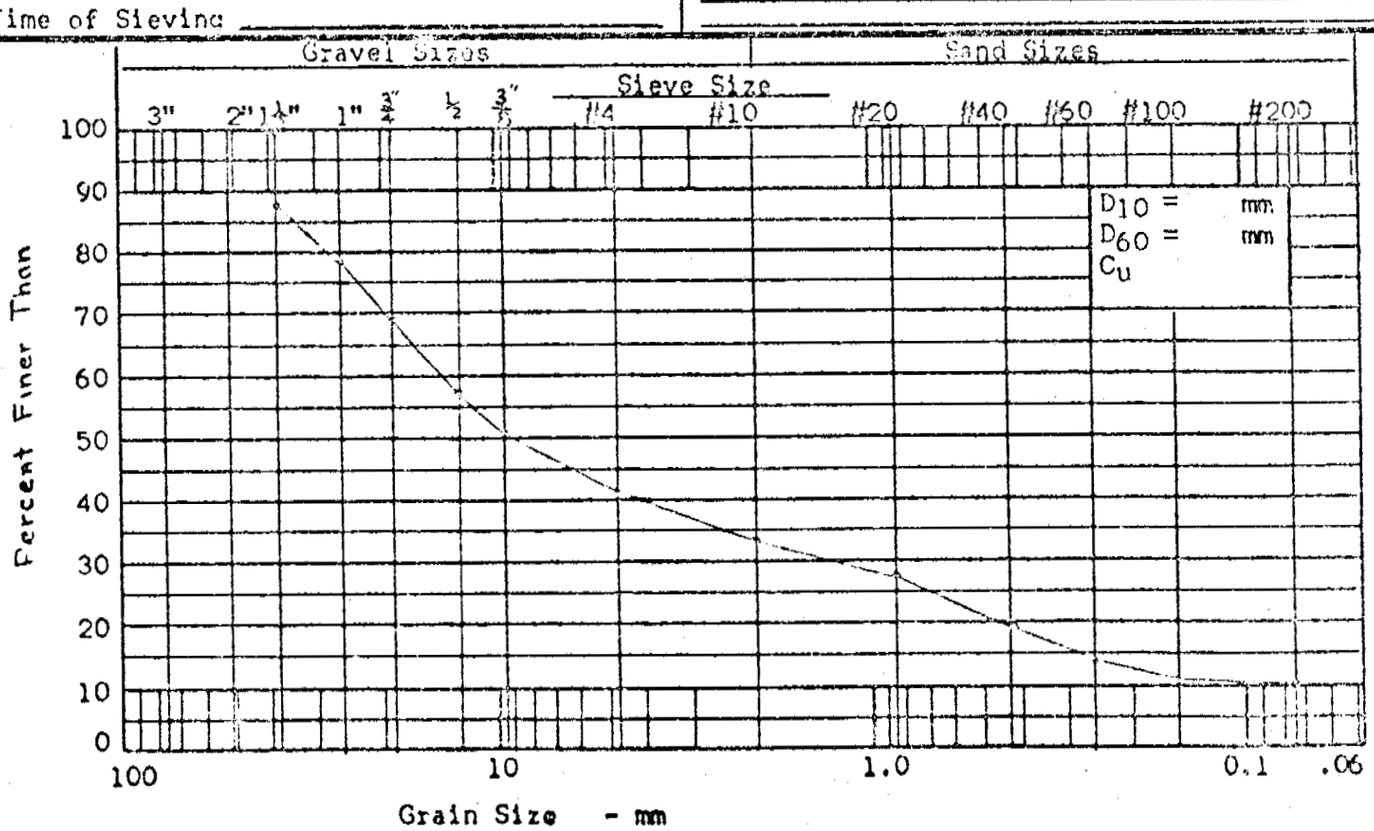
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4		1 1/2				87.5	
Tare No.		1	25.4			78.3	
Wt. Dry + Tare		3/4	19.10			69.6	
Tare		1/2	12.70			57.2	
Wt. Dry		3/8	9.52			51.1	
	4	.185	4.76			41.4	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			33.8	
Tare No.	20	.0331	.840			27.3	
Wt. Dry + Tare	40	.0165	.420			19.5	
Tare	60	.0097	.250			14.6	
Wt. Dry	100	.0059	.149			11.9	
	200	.0029	.074			10.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel with silt and clay
Location	
Hole	479-S-152A Depth 35'
Technician	Date Jan 30/73

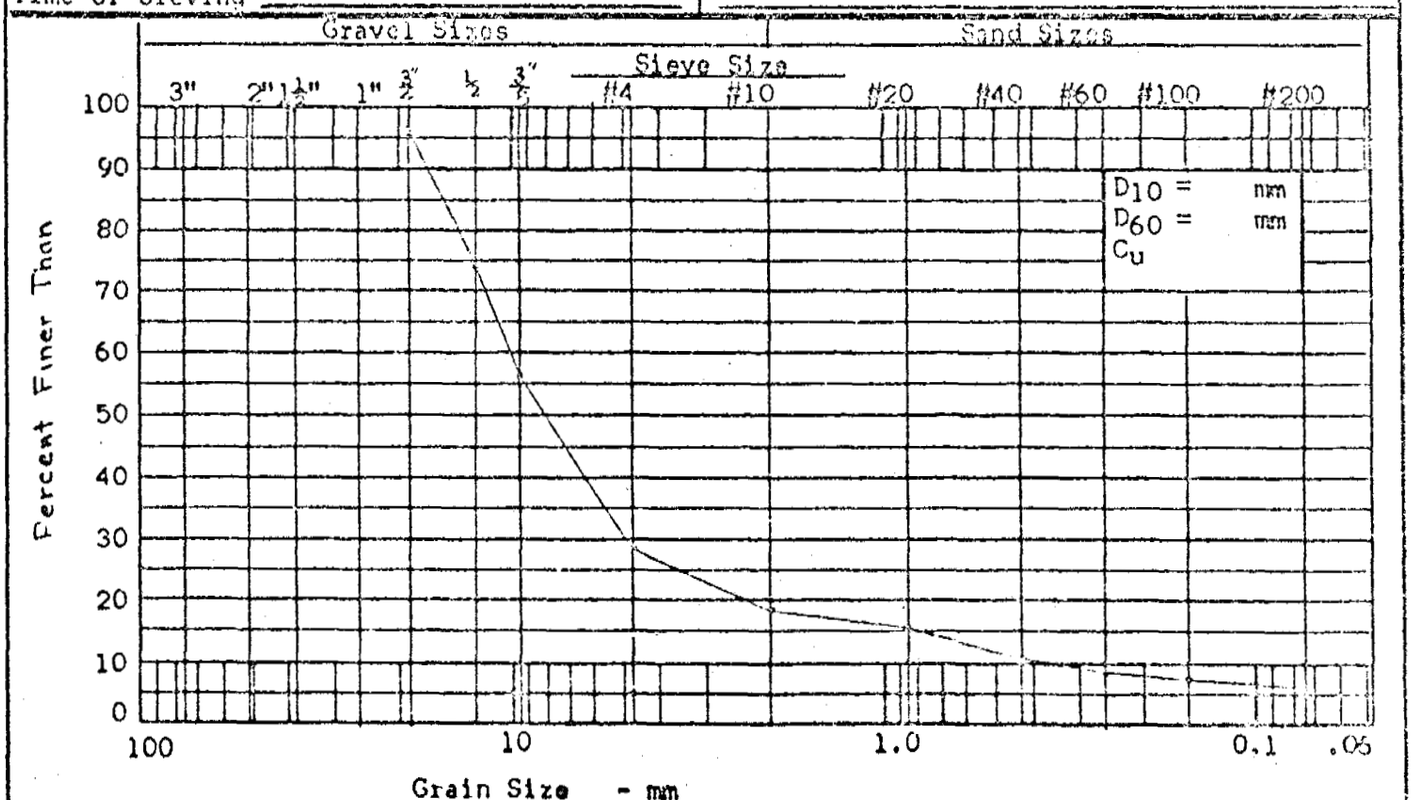
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			96.3	
Tare		1/2	12.70			74.0	
Wt. Dry		3/8	9.52			56.9	
	4	.185	4.76			39.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			18.9	
Wt. Dry + Tare	20	.0331	.840			15.3	
Tare	40	.0165	.420			11.6	
Wt. Dry	60	.0097	.250			8.7	
	100	.0059	.149			7.3	
	200	.0029	.074			6.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

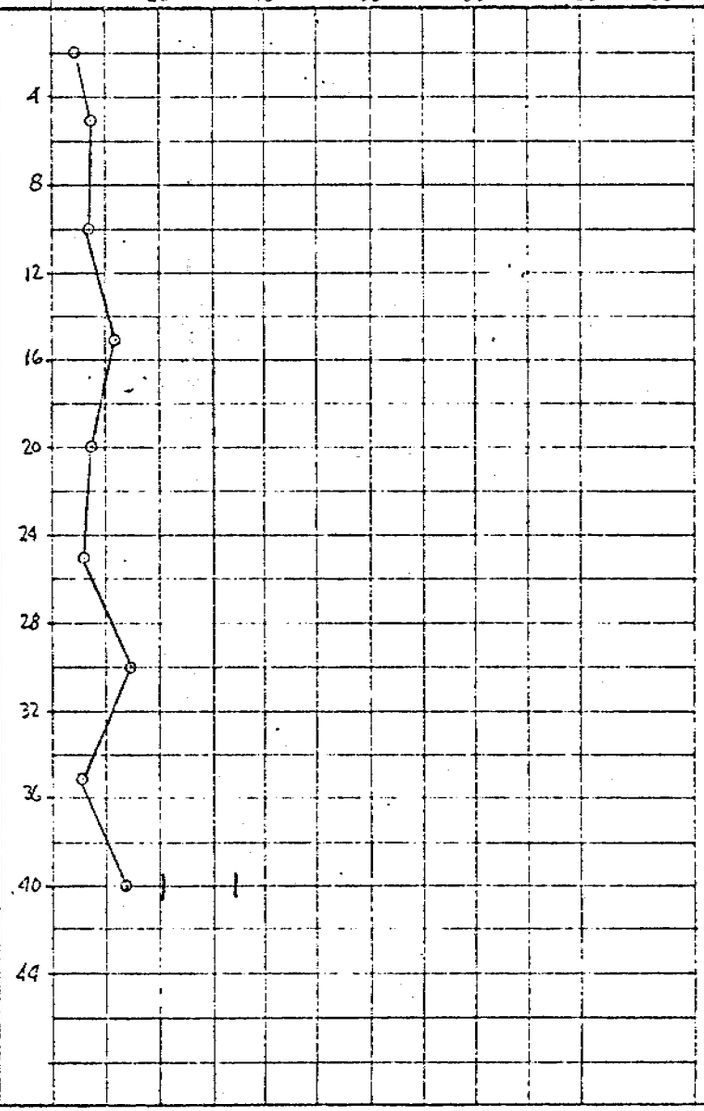
DAN: A.E.W. | FIELD ENG: R.S. | DATE DRILLED: 17/1/73 | AIRPHOTO NO: | CHAINAGE: 628+00 | OFFSET: 35' E of ℄

CKD: D.G.P. | TECH: D.M. | RIG: AIR | SURFACE DRAINAGE: STREAM | VEGETATION: CONIFER TO 90' | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
479	S	150A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4					CL	CLAY SILTY, BOULDERS	F		15		28	57			
8					SM	SAND COARSE, TRACES OF SILT AND CLAY	UF		3		16	81			SO_4 = 0.11 %
12						GRAVEL									
16									34		17	49			
20					GW	WELL GRADED WITH SILT AND CLAY			16		29	55			
24									10		20	70			
28									10		24	66			
32					GC										
36									6		13	81			
40					CL	CLAY SOFT, SILTY, SANDY									
44						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Fine Sandy Gravel
Location	
Hole	479-C-27A Depth 2'
Technician	Date Nov.21/72

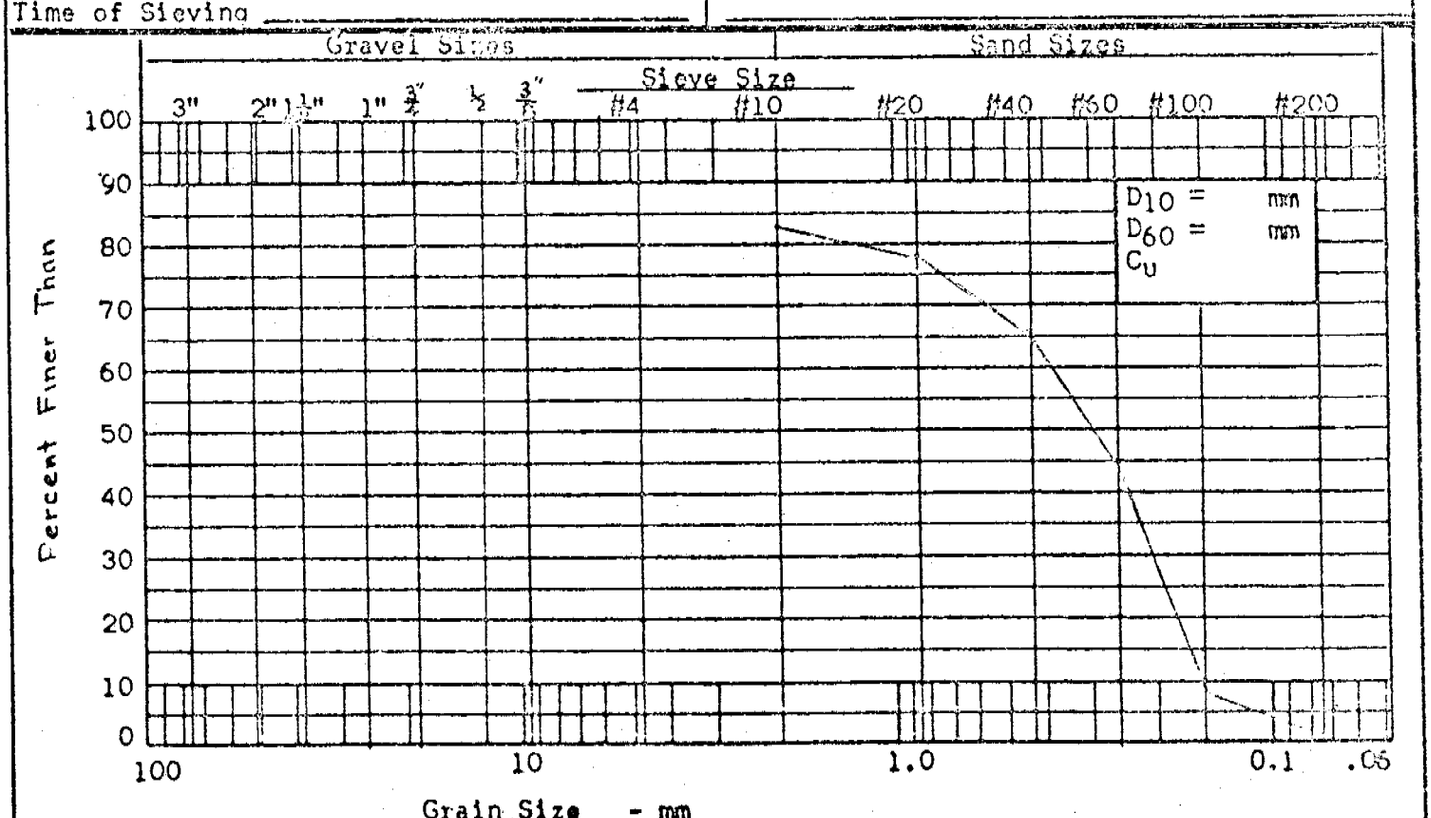
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			83	
Tare No.	20	.0331	.840			77	
Wt. Dry + Tare	40	.0165	.420			66	
Tare	60	.0097	.250			45	
Wt. Dry	100	.0059	.149			8	
	200	.0029	.074			1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy, Silty Gravel
Location	
Hole	479-C-27A Depth 10'
Technician	Date Nov. 21/72

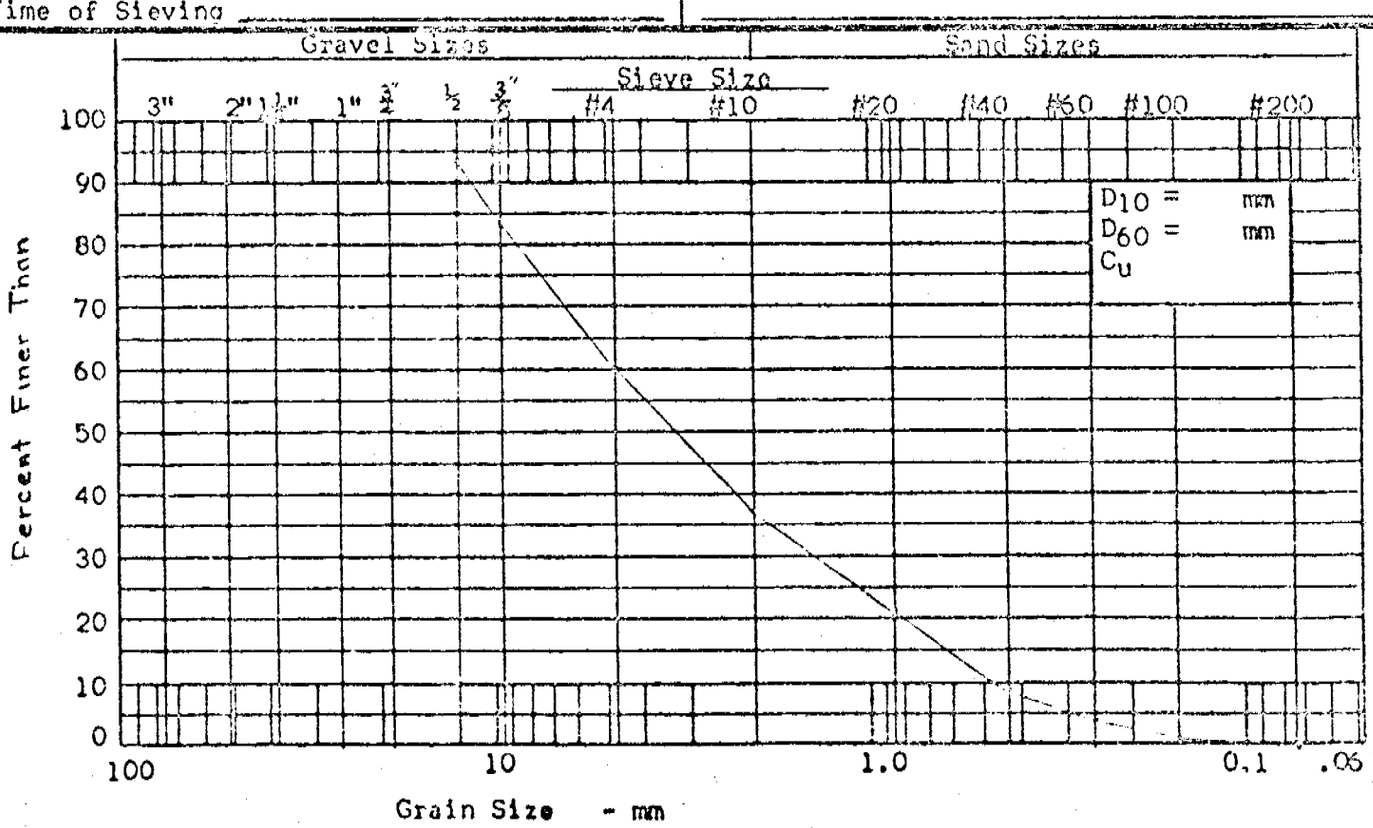
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			93	
Wt. Dry		3/8	9.52			83	
	4	.185	4.76			60	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			37	
Tare No.	20	.0331	.840			21	
Wt. Dry + Tare	40	.0165	.420			9	
Tare	60	.0097	.250			4	
Wt. Dry	100	.0059	.149			1	
	200	.0029	.074			0.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

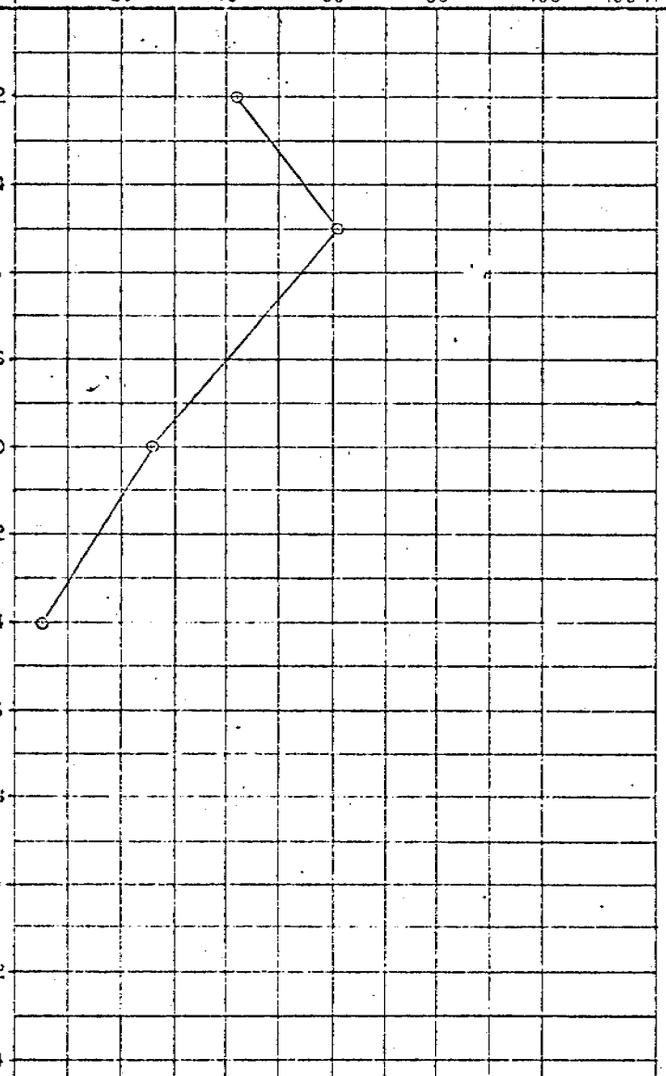
DWN A.E.W. | FIELD ENG T.S. | DATE DRILLED 19/11/72 | AIRPHOTO NO: | CHAINAGE 625+10 | OFFSET X

CKD D.G.P. | TECH D.M. | RIG AIR | SURFACE DRAINAGE: FLAT | VEGETATION: POPLAR | ELEV

TEST HOLE

MILE	B,C,S	NUMBER
479	C	274

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GW	GRAVEL FINE SAND	UF		2		1	82	17			
4									4							
6					SM	SAND FINE, SILTY, WET			6							
8									8							
10					GP	GRAVEL SANDY, WET, SILTY			10			37	63			MATERIALS ARE WET & WON'T COME UP DRILL STEM AFTER 15'
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 17/1/73	AIRPHOTO NO:	CHAINAGE: 624+50	OFFSET:
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 30' CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
479.5	5	151A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	F									
2						COARSE WITH ISOLATED COBBLES			2							
4								Nbn	4							
6									6							
8									8							
10									10							
12									12							
14									14							HARD DRILLING
16						SAND			16							
18									18							
20						DRY, LOOSE		Nbn	20							
22									22							
24						END OF HOLE @ 26'			24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

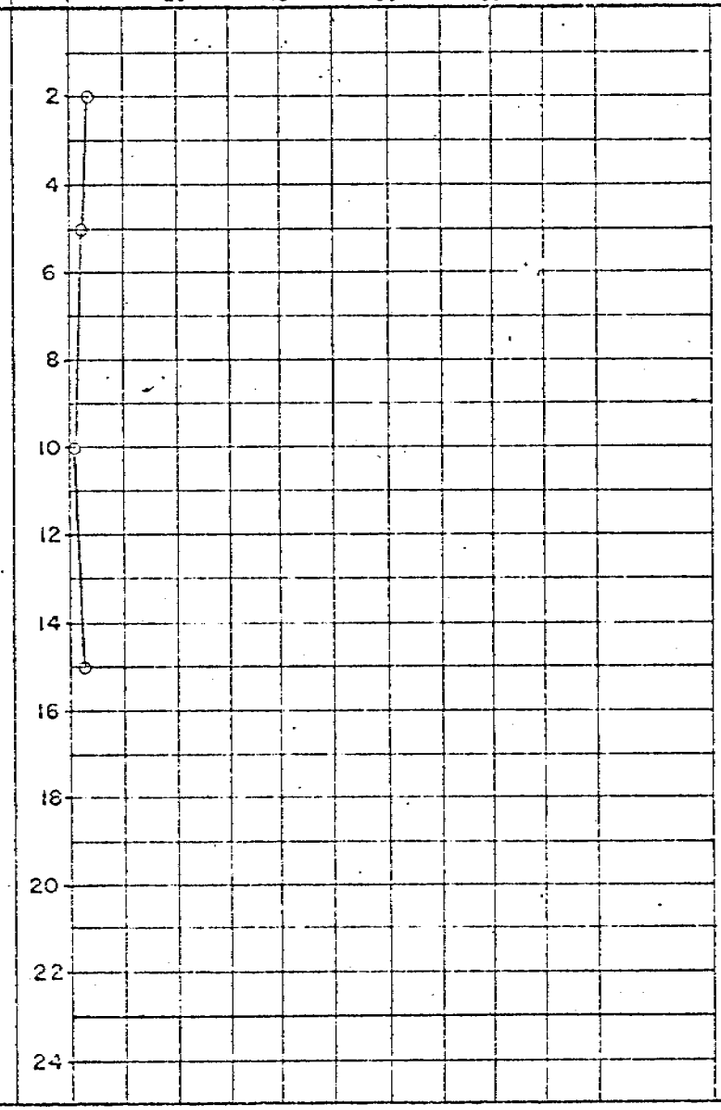
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 324+50	OFFSET: ℄
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
479	C	26A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL	UF	
2								
4								
6					GP	HIGH SAND CONTENT		
8								
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL CRUSHED BY DRILL BIT

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

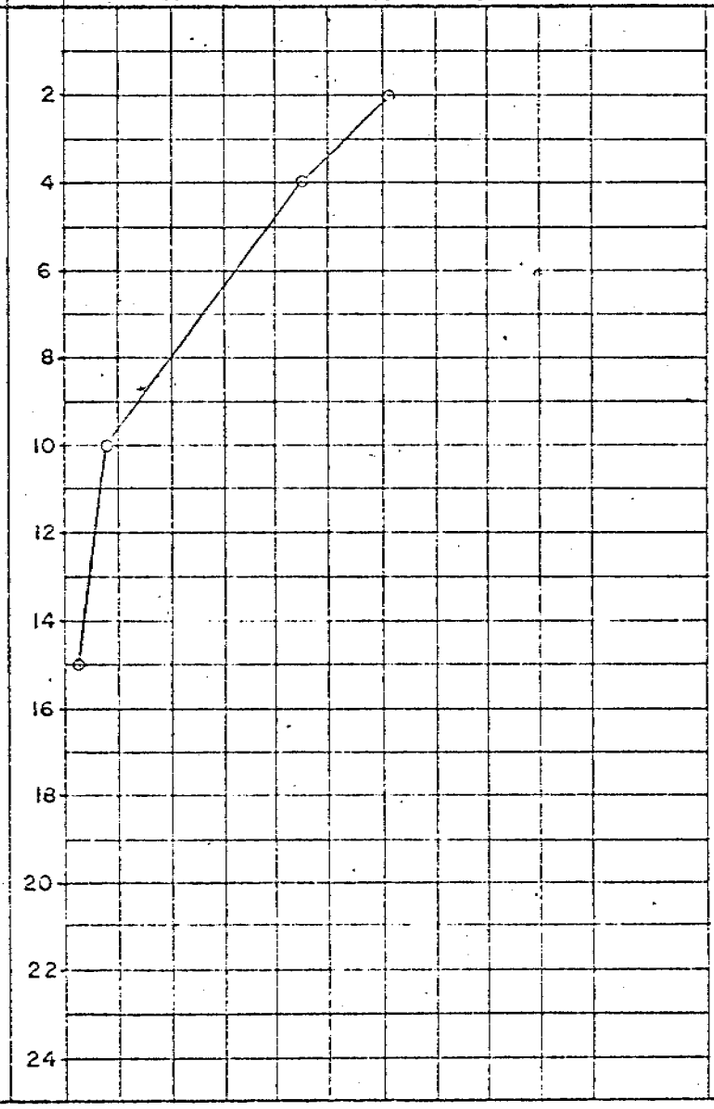
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. R.S	DATE DRILLED 19/11/72	AIRPHOTO NO:	CHAINAGE: C-204+00	OFFSET: ℄
CKD D.G.P	TECH: W.K	RIG: AIR	SURFACE DRAINAGE: EAST TO WEST	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
479	C	25A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT MOSS, DARK BROWN SILT LIKE	UF								
4		T				TRACES OF GREY CLAY							105.1	82.1	
6					OL	CLAY GREY, ORGANIC									
8					GW	GRAVEL SANDY									GRAVEL CRUSHED BY DRILL BIT
10															
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

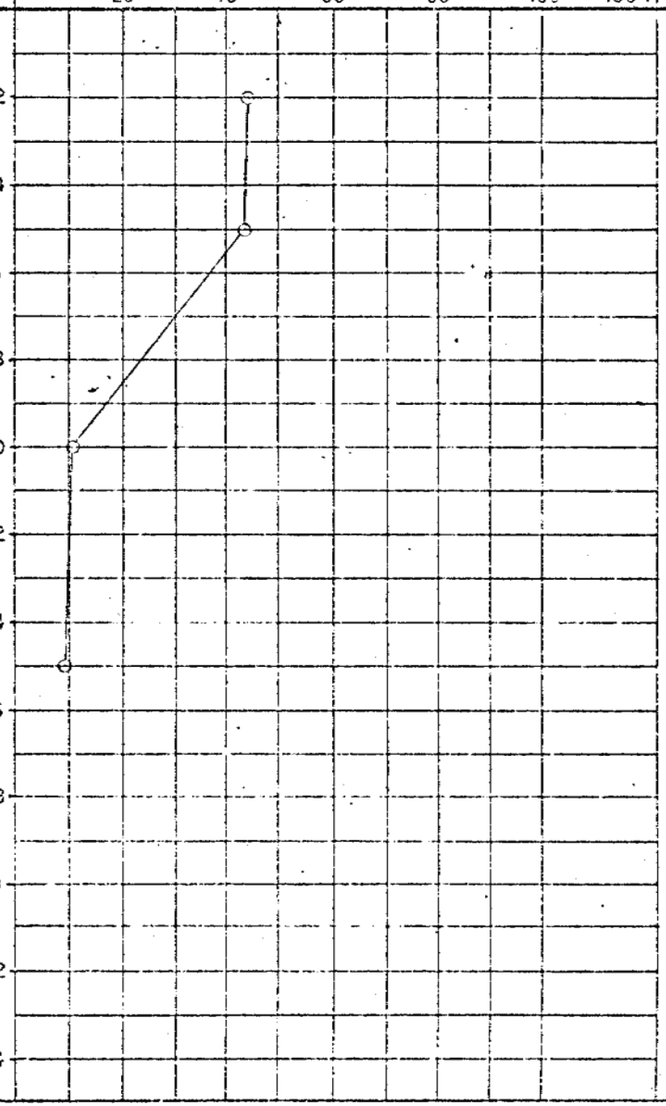
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: R.S.	DATE DRILLED: 13/11/72	AIRPHOTO NO:	CHAINAGE: 610+00	OFFSET: ℄
CKD: D.S.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
479	C	24A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					OH	MUSKEG HIGH CLAY CONTENT	UF								
4															
6															
8															
10					GW	GRAVEL WET, SOME CLAY AND SILT									GRAVEL & ROCKS CRUSHED BY DRILL BIT
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project: Mackenzie Highway
Site:
Sample: Clay with Gravel
Location:
Hole: 479-C-23A Depth: 15'
Technician: Date: Nov 21/72

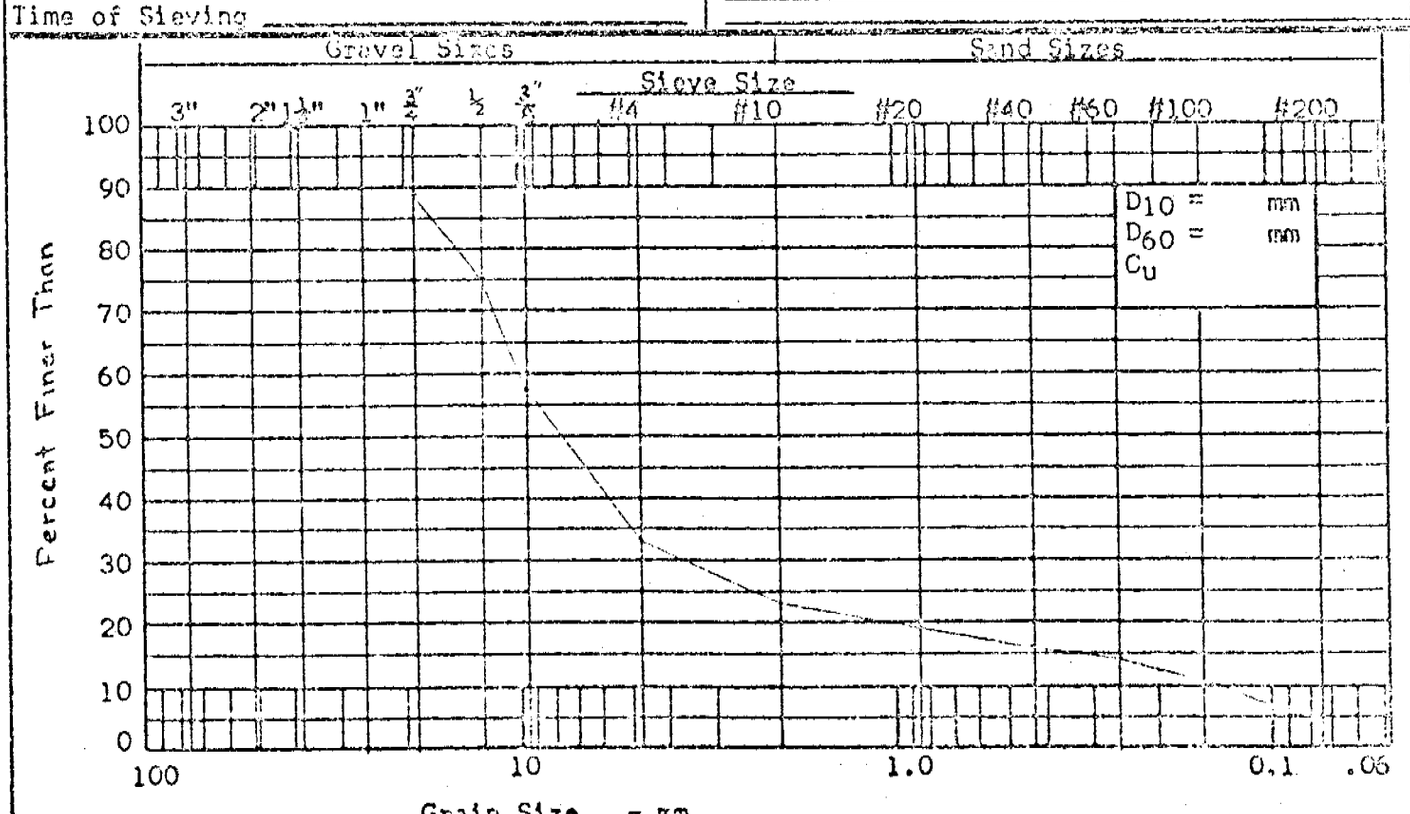
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			89	
Tare		1/2	12.70			75	
Wt. Dry		3/8	9.52			57	
	4	.185	4.76			33	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			23	
Tare No.	20	.0331	.840			19	
Wt. Dry + Tare	40	.0165	.420			16	
Tare	60	.0097	.250			14	
Wt. Dry	100	.0059	.149			11	
	200	.0029	.074			8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

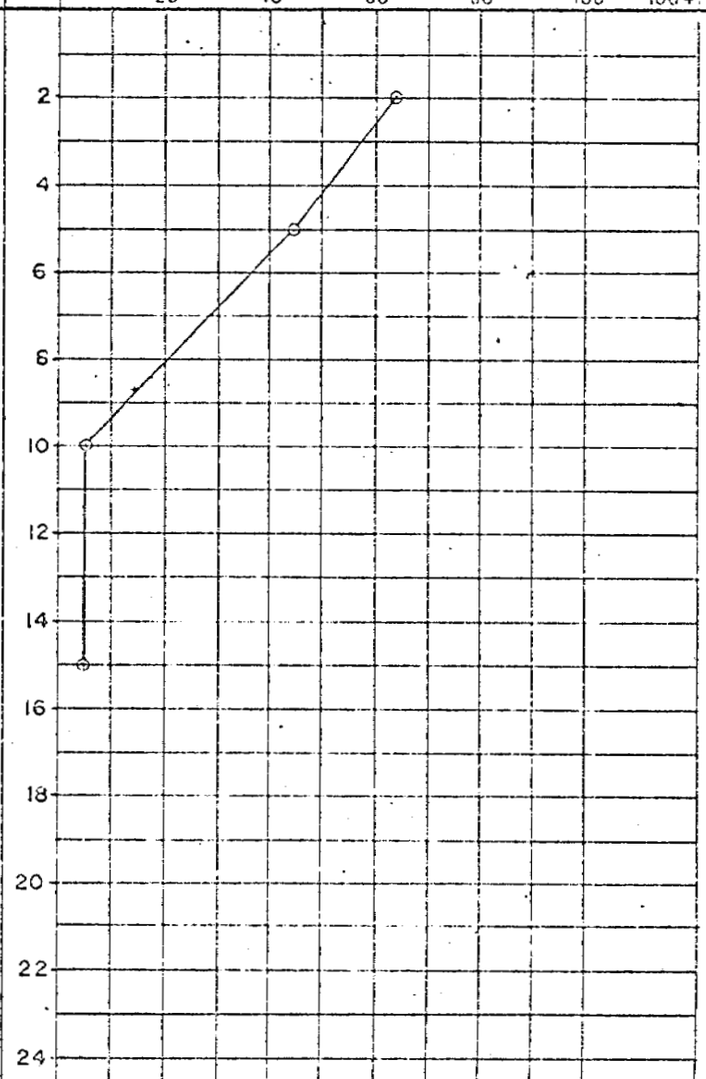
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S.	DATE DRILLED 19/11/72	AIRPHOTO NO:	CHAINAGE: 600+00	OFFSET: ℄
CKD DGP	TECH DM	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFER & POPLAR	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
479	C	32A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT MUSKEG, CLAY	UF								
4															
6		T			OH	CLAY HIGH ORGANIC PEAT CONTENT. GRAVEL, WET							116.3	96.1	
8															
10															GRAVEL CRUSHED BY DRILL BIT
12															
14									8		15	77			
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 480-C-22A Depth 5'
Technician Date Nov. 21/72

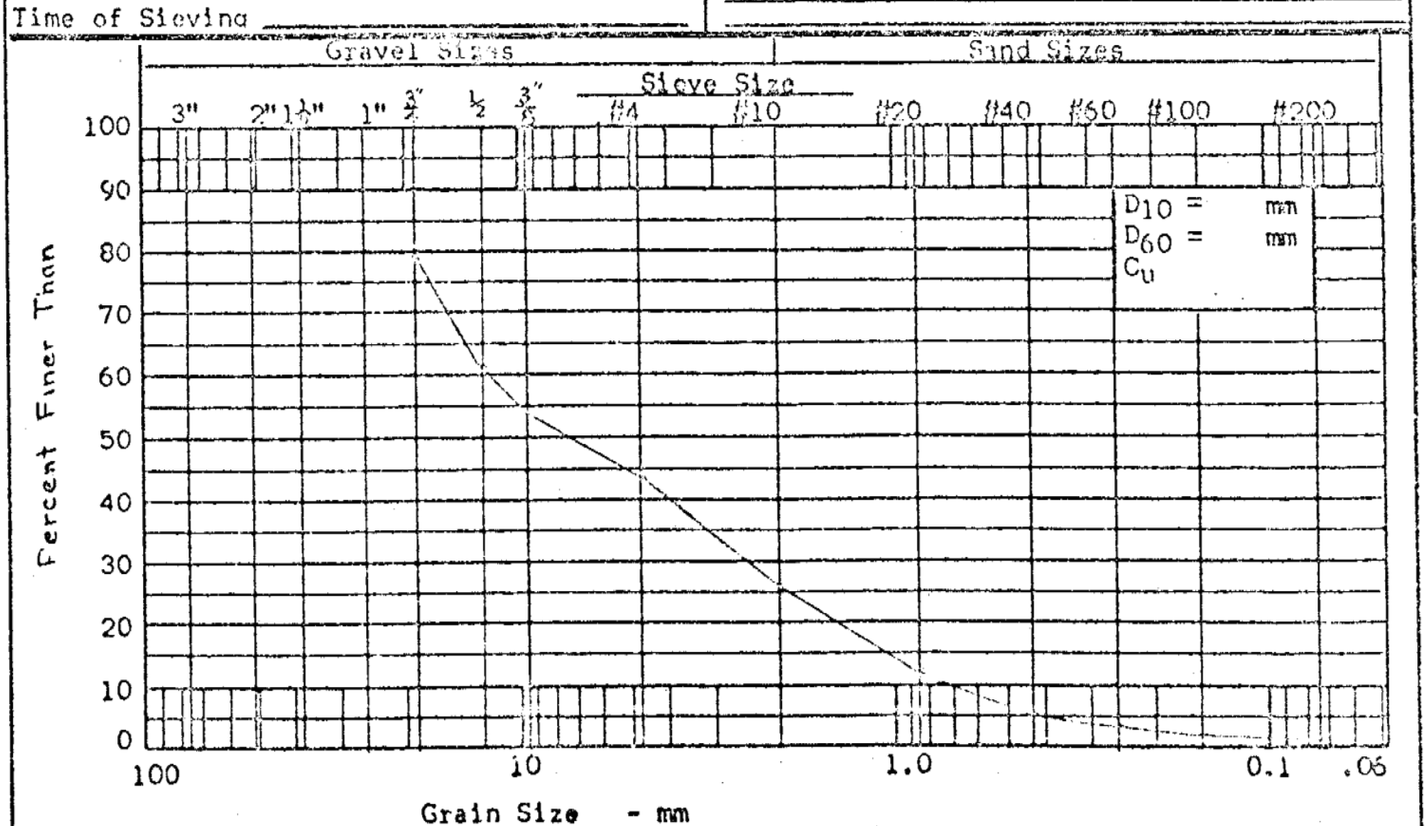
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			79%	
Tare		1/2	12.70			61%	
Wt. Dry		3/8	9.52			54%	
	4	.185	4.76			43%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			26%	
Wt. Dry + Tare	20	.0331	.840			12%	
Tare	40	.0165	.420			5%	
Wt. Dry	60	.0097	.250			3%	
	100	.0059	.149			2%	
	200	.0029	.074			1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

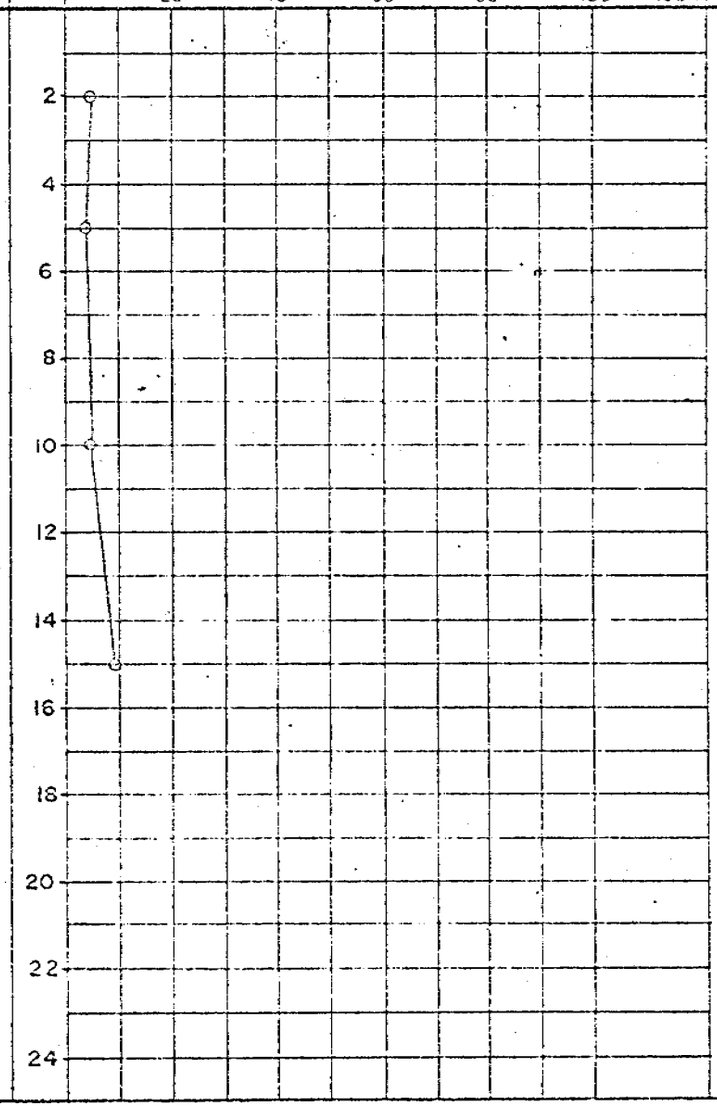


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 590+00	OFFSET: 4	TEST HOLE
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFER & POPLAR	ELEV:	MILE: 490 B.C.S: C NUMBER: 32A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL	UF	
2		◪						
4								
6		◪						
8								
10		◪				COARSE SAND		
12								
14						SILTY SAND		
16		◪				END OF HOLE		
18								
20								
22								
24								

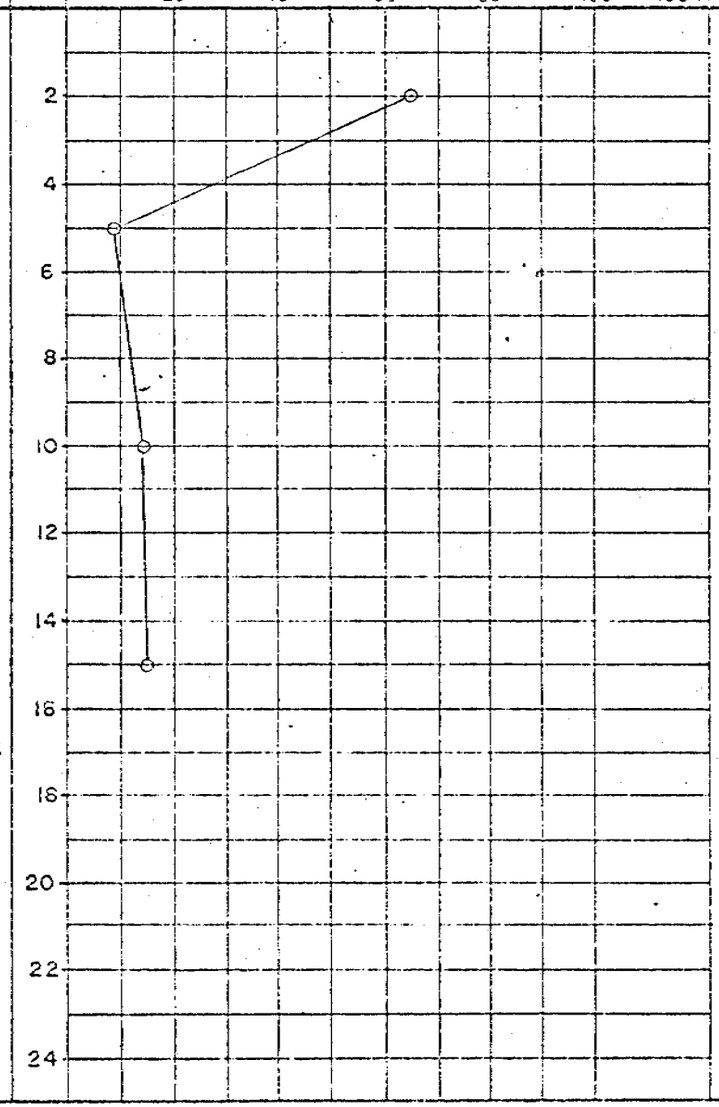


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
	1	25	74			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R.S	DATE DRILLED 18/11/72	AIRPHOTO NO:	CHAINAGE: 520+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFER & POPLAR	ELEV	MILE: 480 · B,C,S: C · NUMBER: 21A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt To OL	PEAT ORGANIC WITH SOME SILT	F	Nf
2					GW	GRAVEL COARSE, SAND	UF	
4								
6								
8					CL	CLAY SILT & SAND LENSES		
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

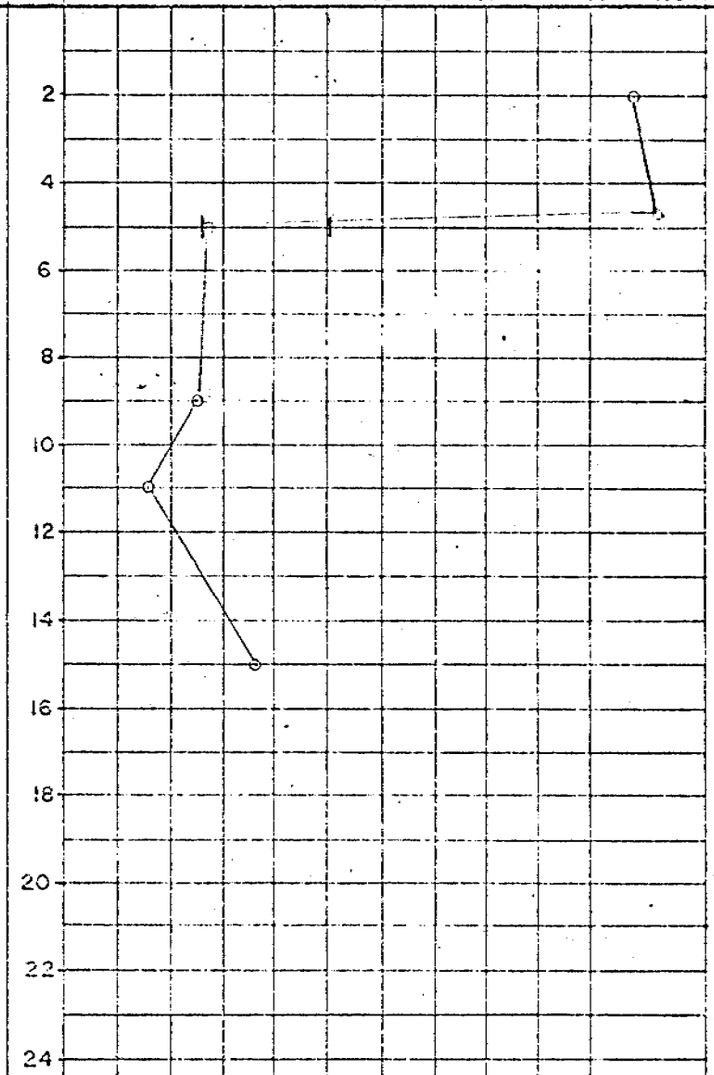
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 570+00	OFFSET: 0
CKD: D.G.P	TECH: W.K	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFERS & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
450	C	20A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2					Pt	PEAT MOSS, DARK BROWN SILT LIKE, WET	UF								
4															
6		T			CL	TILL SOME CLAY							112.1	86.5	
8															
10						GREY, GRAVEL, SAND SILT									
12					GM	GRAVEL CLAY, SAND & SILT FINES.									
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

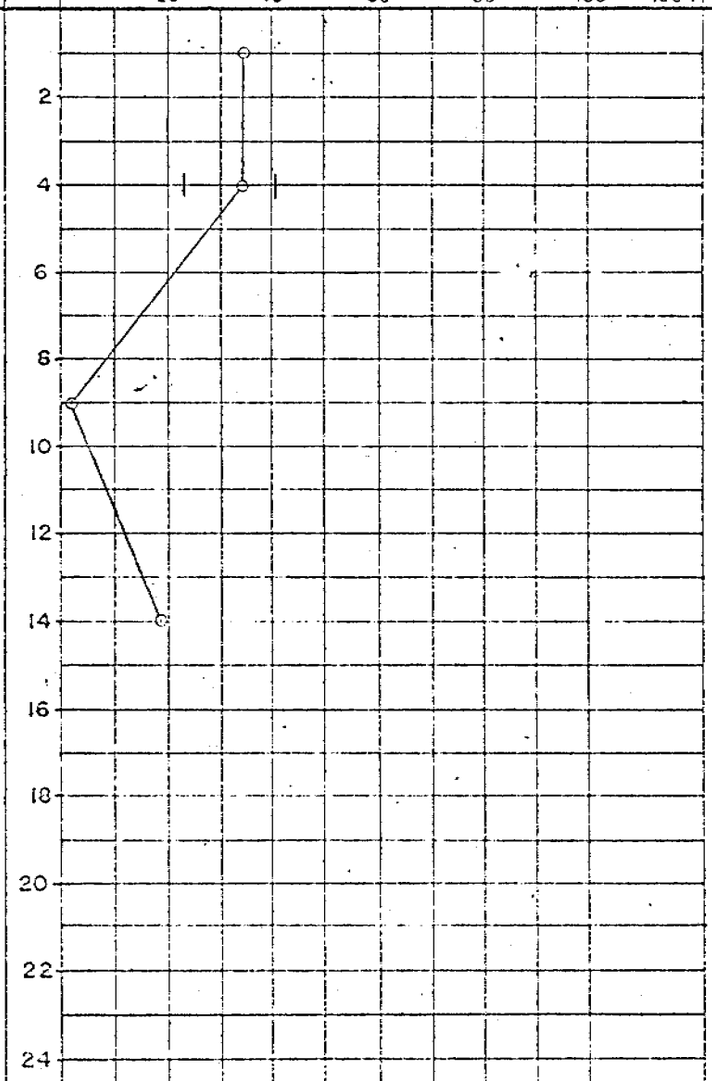
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 560+00	OFFSET: ℄
CKD: DGP	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
450	C	188

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC	F	Nf							
2					CL	CLAY SILTY, LOW-MED. PLASTIC	UF								
4		P		56 BLS											
6						SAND LENSES									
8						SILT, GRAVEL & SAND									
10															
12															
14		P				SILT, GRAVEL & SAND									
16						END OF HOLE									
18															
20															
22															
24															



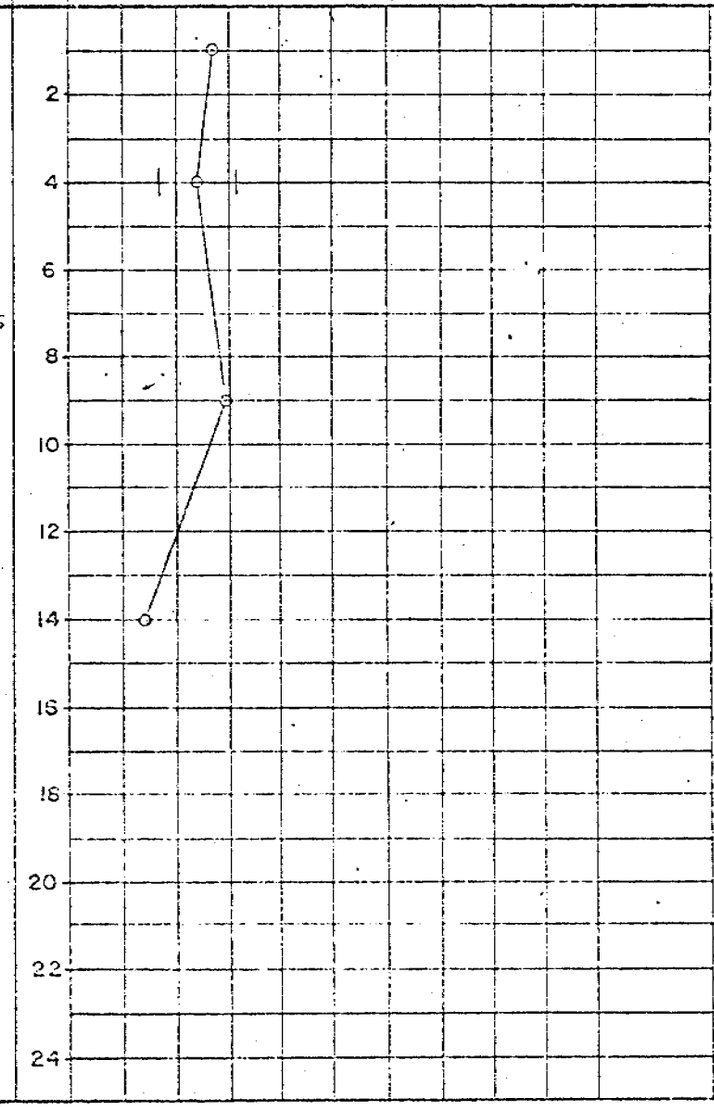
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 555+00	OFFSET: 2
CKD: D.G.D.	TECH: W.K.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR TREES	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
460	C	12

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT MOSS, DARK BROWN	F	Nf
2					CL	CLAY SILTY	UF	
4		P		29 BLS.	CL	TILL GREY, MED. SOFT		NO EXCESS ICE
6								
8								
10		P		32 BLS.		STONES		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

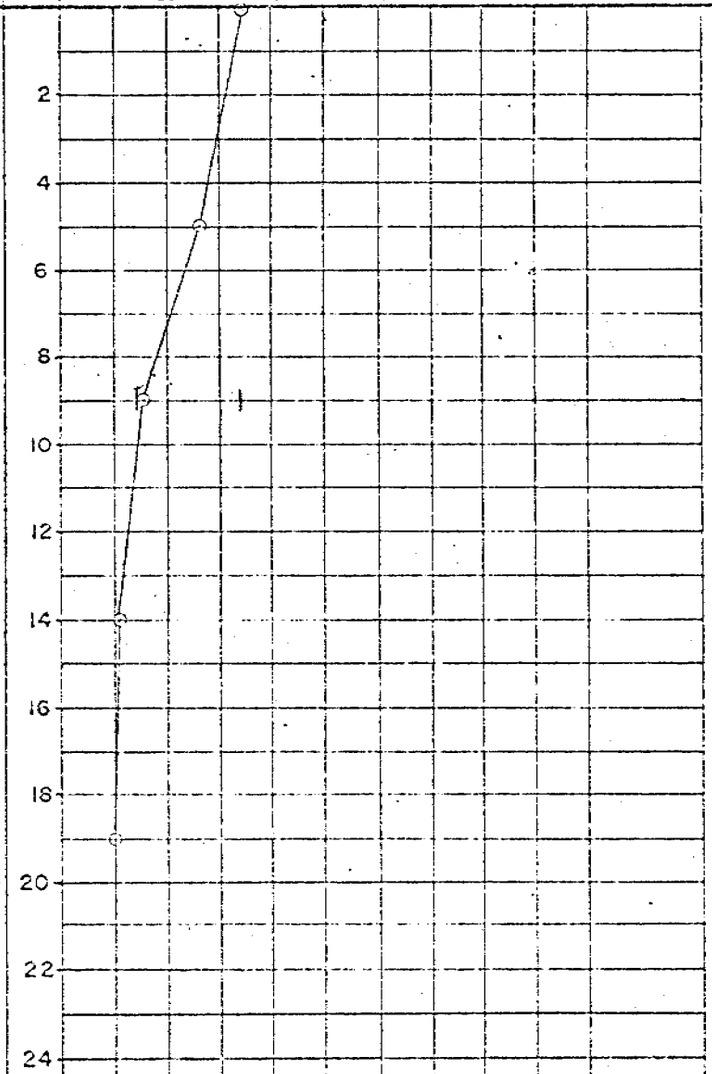
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E W	FIELD ENG: B.M	DATE DRILLED 13/11/72	AIRPHOTO NO:	CHAINAGE: 540+00	OFFSET 2
CKD DGP	TECH: D M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 35'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
451	C	115

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
		P		60 BLS	Pt	PEAT ORGANIC	F	Nf							
2					CL	CLAY SILTY		< 2% EXCESS ICE							
4						TILL									
6		P.		79 BLS.		CLAY, LOW PLASTIC STONES									
8															
10					CL										
12								Nf							
14						GRAVELLY, DRY									
16															
18															
20															
22						END OF HOLE									
24															

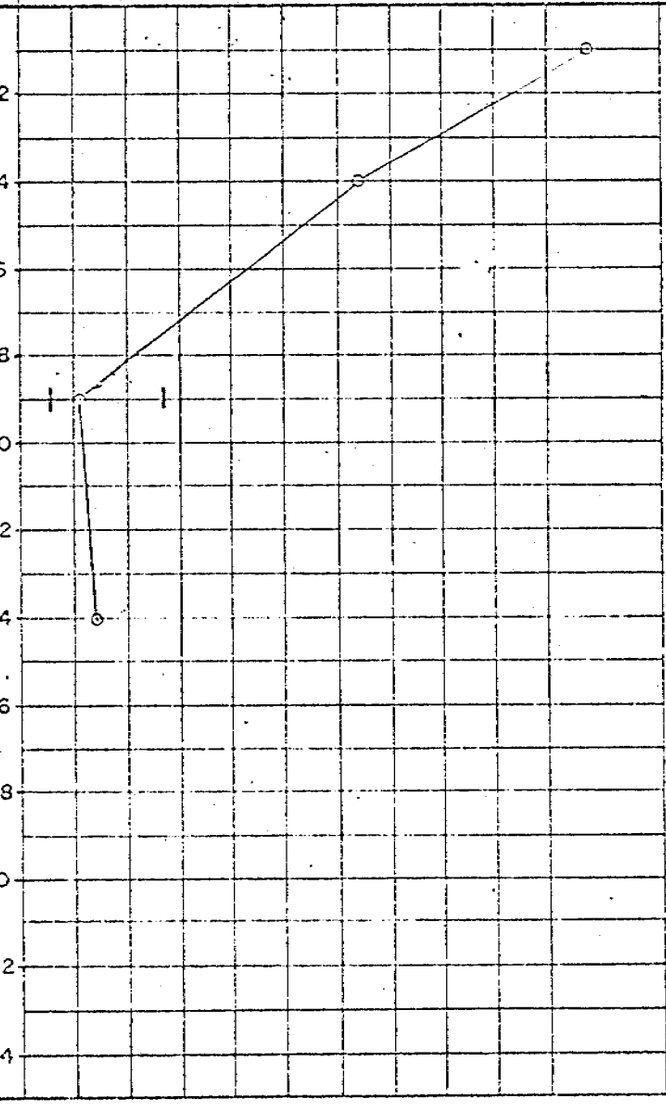


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 19/11/72	AIRPHOTO NO:	CHAINAGE: 530400	OFFSET: ℄
CKD D.G.P.	TECH: W.K.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFERS & POPLAR - 30'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
481	C	108

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT MOSS, DARK BROWN SILTY	F	Vr	2							
4					CL	TILL GREY, STONES			4							
6								1/8" ICE LENSES	6							
8							F	Vr	8							
10									10							
12								Nf	12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

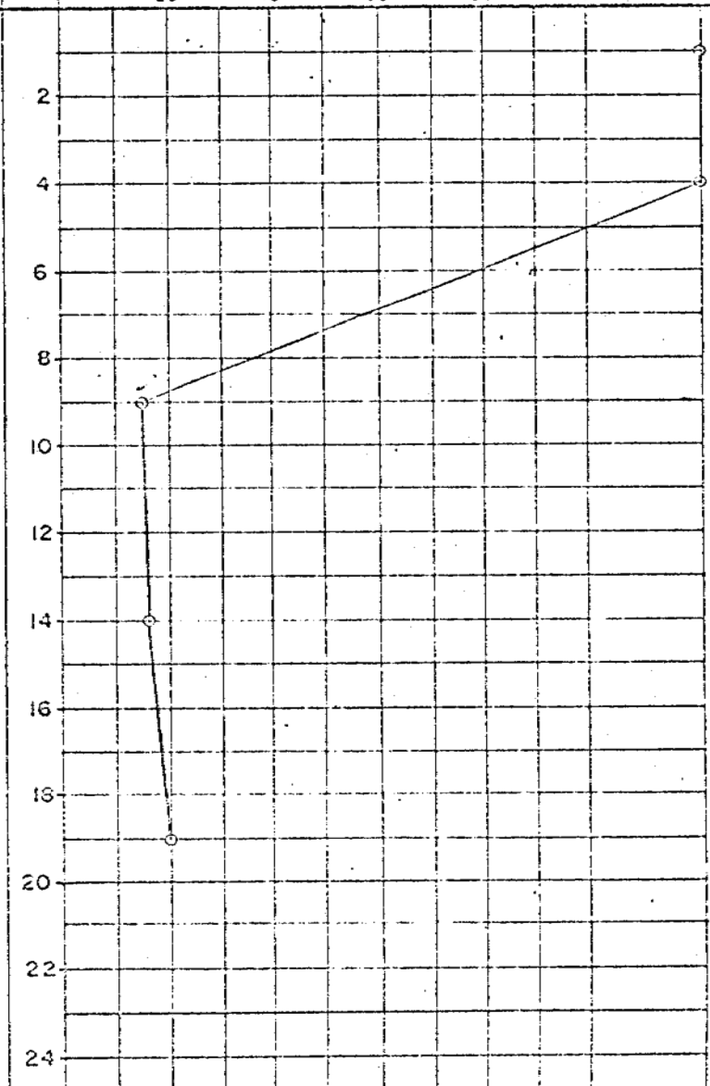
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 520+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE - 20'	ELEV:

TEST HOLE

MILE	E,C,S	NUMBER
121	C	38

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	PEAT ORGANIC	F	Nf							
2															
4					CL	CLAY SILTY HIGHLY ORGANIC SAND - 7'-7½'	F	Vx							
6															
8															
10					CL	TILL CLAY, SAND SOME GRAVEL ROCKS	F	Nf							
12															
14															
16															
18															
20															
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

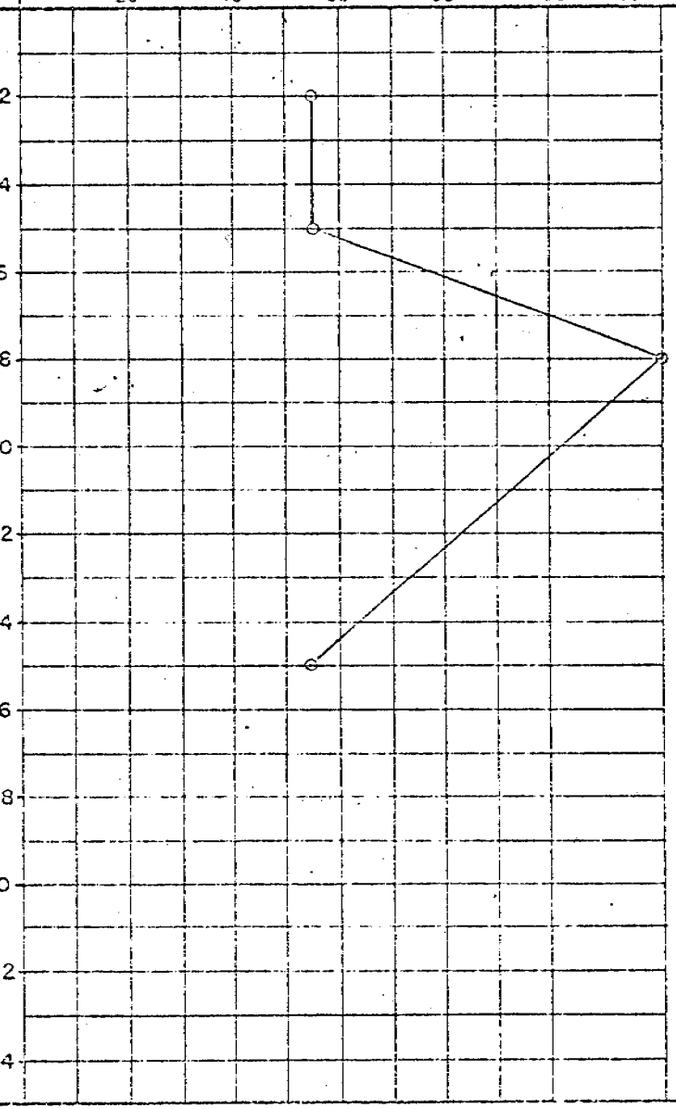
DRN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 510+00	OFFSET: 2
CKD: D.G.A.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE - 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
481	C	23

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC, WET	F / UF	Nf
2		P		25 BLS	CL	CLAY GREY, FREE WATER	F	Vr
4								
6		P		60 BLS		MUSKEG LAYER 5'-5'-9" COARSE, FIBROUS		
						RANDOM ICE		< 5% EXCESS ICE
8		P		55 BLS		SILTY		
10								
12								
14						SOME ICE LENSES		
16		P		87 BLS				
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

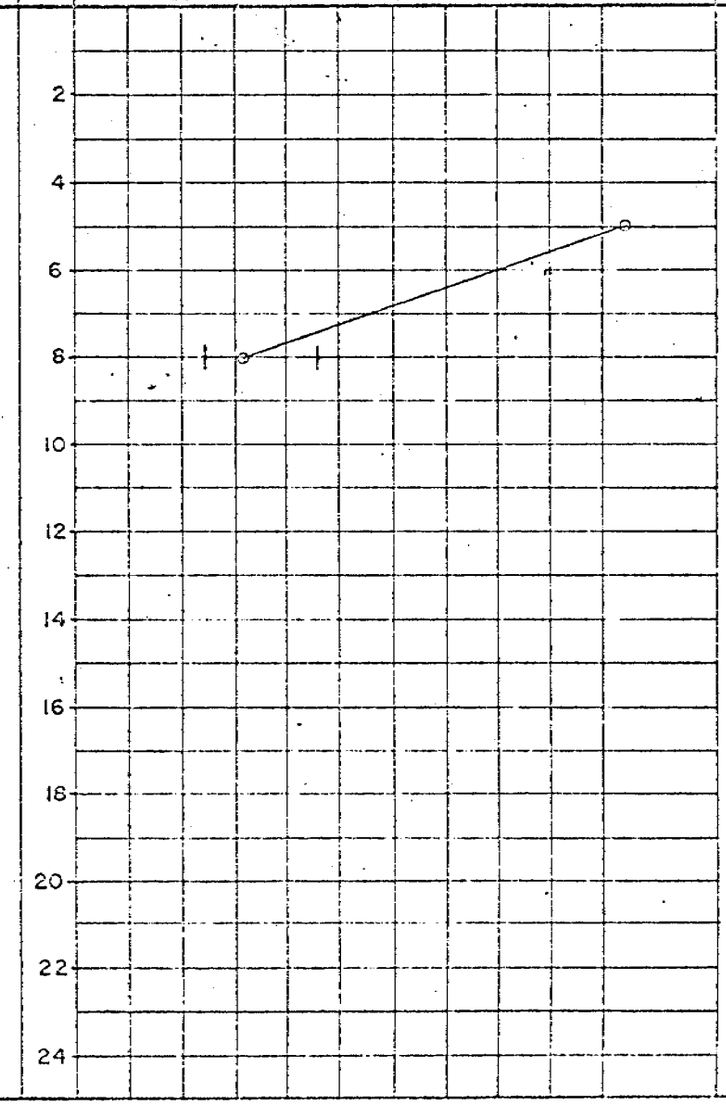
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B.M.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 500+00	OFFSET: ℄
CKD: DG R.	TECH: W.K	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: CONIFERS TO 20' - WILLOW	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
481	C	73

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	PEAT MOSS, FIBROUS	F	Nf							
4															
6		T			GC	GRAVEL CLAY SOME ORGANIC, NO VISIBLE ICE									
8		T			OL	CLAY VERY WET, SOFT GREY	UF	Nbe < 2% EXCESS ICE							
10															
12															
14						END OF HOLE									
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A E W	FIELD ENG: B M	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 49.0 + 49.7	OFFSET: ℄
CKD: DGP	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 2'-10' GRASS	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
452	C	68

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	MUSKEG FREE WATER COARSE, FIBROUS	UF	Nbe
4								
6		P		50 BLOWS	CL	CLAY DARK GREY SOME STONES TO ½" NO VISIBLE ICE EXCESS	F	
8								
10					GP	GRAVEL LARGE BOULDERS		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: AEW | FIELD ENG: T.S | DATE DRILLED: 19/11/73 | AIRPHOTO NO: | CHAINAGE: 1+00+00 | OFFSET: ℄

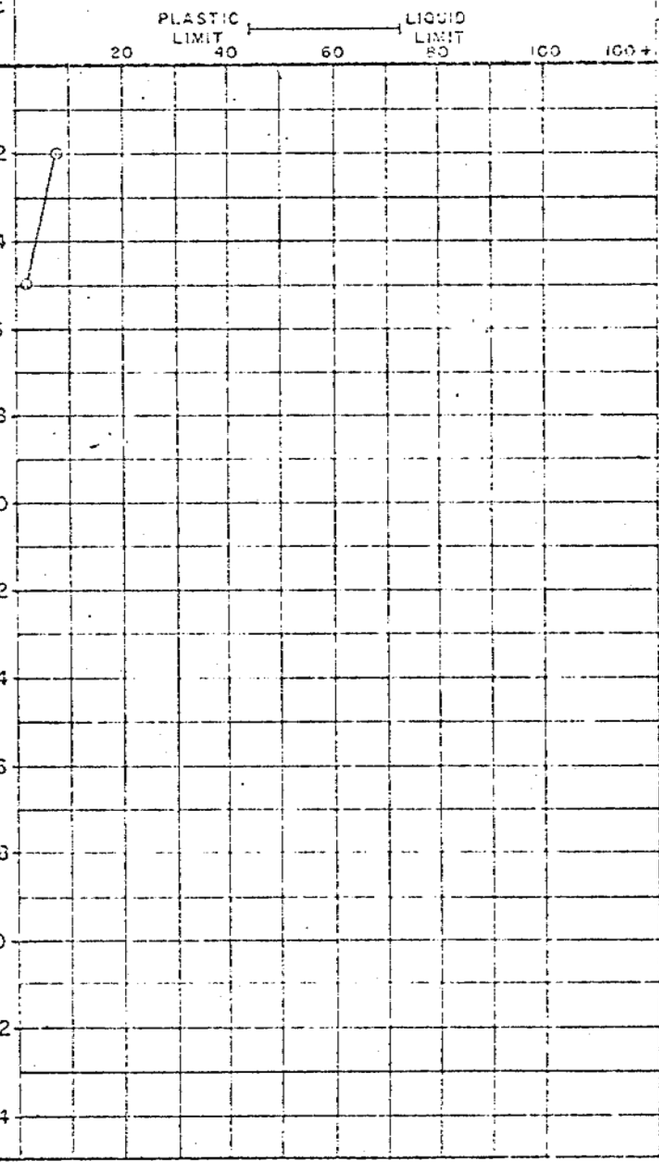
CKD: DGP | TECH: DM | RIG: AIR | SURFACE DRAINAGE: GOOD | VEGETATION: CONIFER & [illegible] TO 30' | ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
462	C	1557

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	PEAT ORGANIC	F		
2						GRAVEL	UF		
4					GW	SANDY, BOULDERS COARSE			HARD DRILLING
6									
8									
10									
12									
14									
16									
18									
20					GW				
22									HOLE SLOUGHING AT 23'
24						END OF HOLE			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

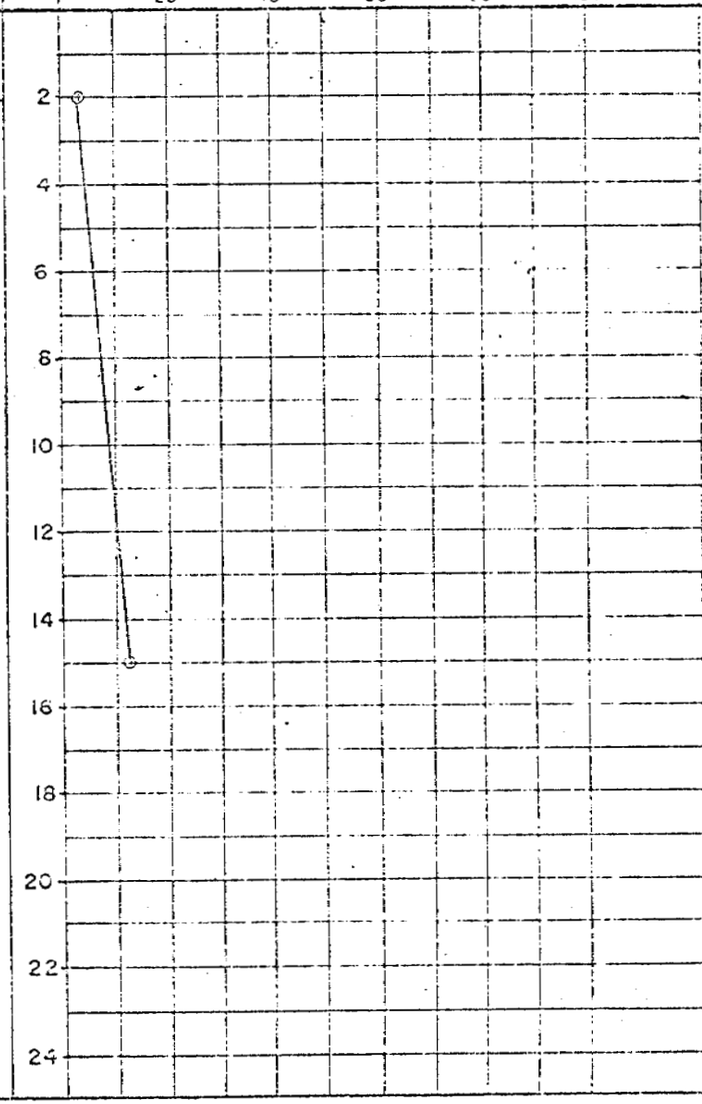
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. T.S.	DATE DRILLED 19/11/73	AIRPHOTO NO:	CHAINAGE: 465+00	OFFSET: ℄	TEST HOLE
CKD D.G.P.	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: S TO N	VEGETATION: CONIFER TO 30'	ELEV	

MILE	D,C,S	NUMBER
462	C	1604

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL	F	
2					GW	COARSE WITH RANDOM BOULDERS	UF	
4								
6								
8								
10								
12						CLAY TILL WITH BOULDERS		
14					GM			
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

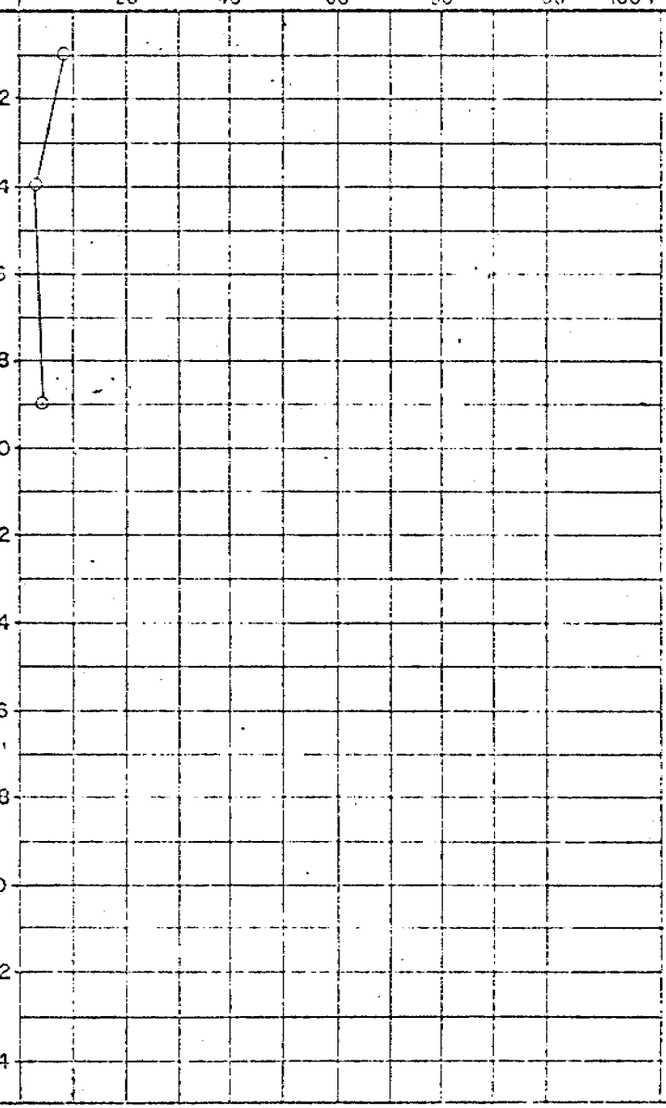
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DR. AEW	FIELD ENG BM	DATE DRILLED 18/1/73	AIRPHOTO NO:	CHAINAGE 435+00	OFFSET L
CKD DGP	TECH DM	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFER TO 50'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
482	C	355 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC	F	
2					SM	SILT SANDY		Nbn
4								
6					GW	GRAVEL SANDY		
8								
10								Nbn
12								
14						END OF HOLE		
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

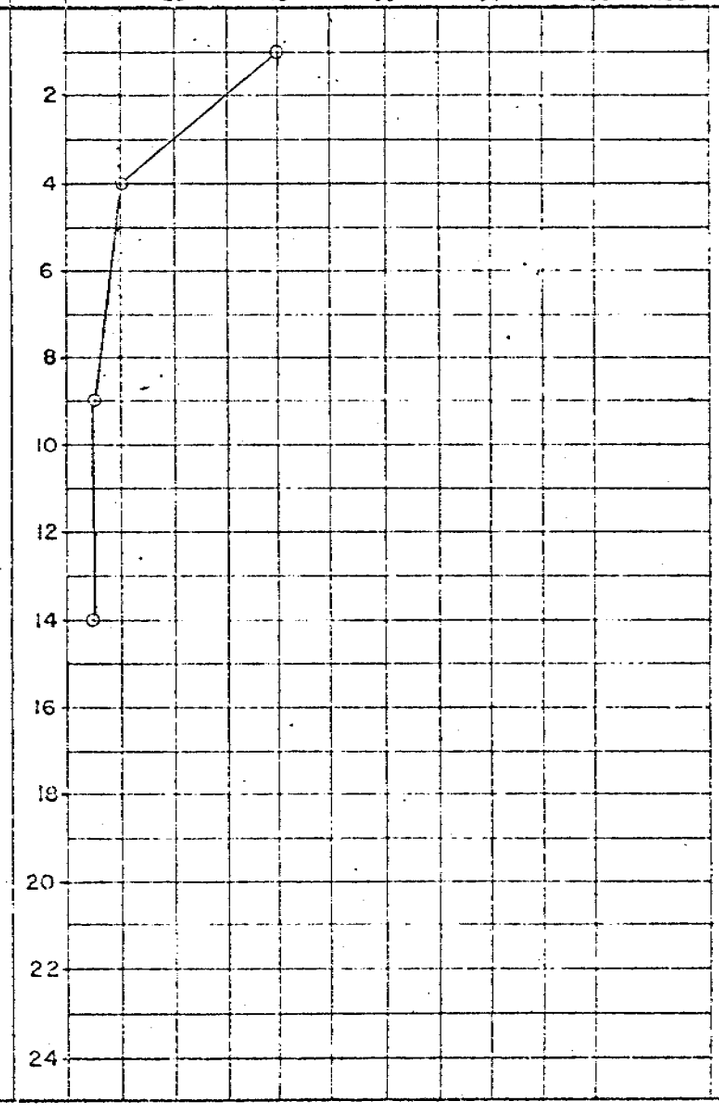
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG B.M.	DATE DRILLED 22/1/73	AIRPHOTO NO:	CHAINAGE 115100	OFFSET 4.
CKD D.G.P.	TECH D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
482	C	3513

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GM	SAND 2" ORGANIC SILTY	F	Nbn
4						GRAVEL		
6								
8					GP	SANDY		
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

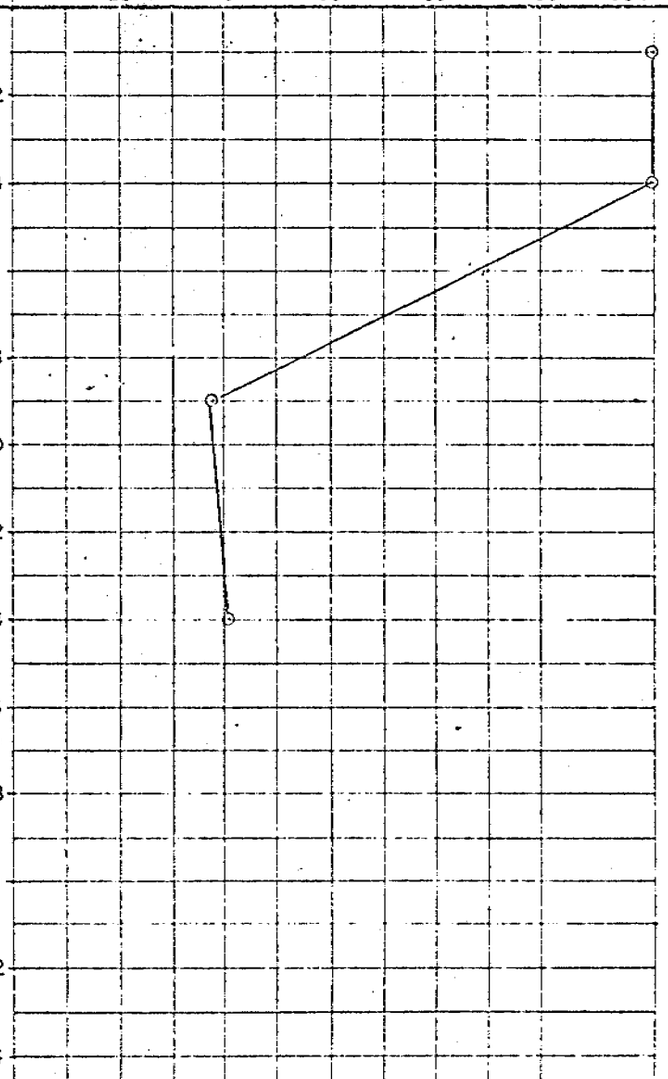
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 22/11/73	AIRPHOTO NO:	CHAINAGE: 435+00	OFFSET ℄
CKD D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
483	C	2223

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT MUSKEG	F									
2									2							
					OH	CLAY		Vr								
4									4							
6									6							
8						SILTY			8							
10									10							
12					CL			Vr	12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



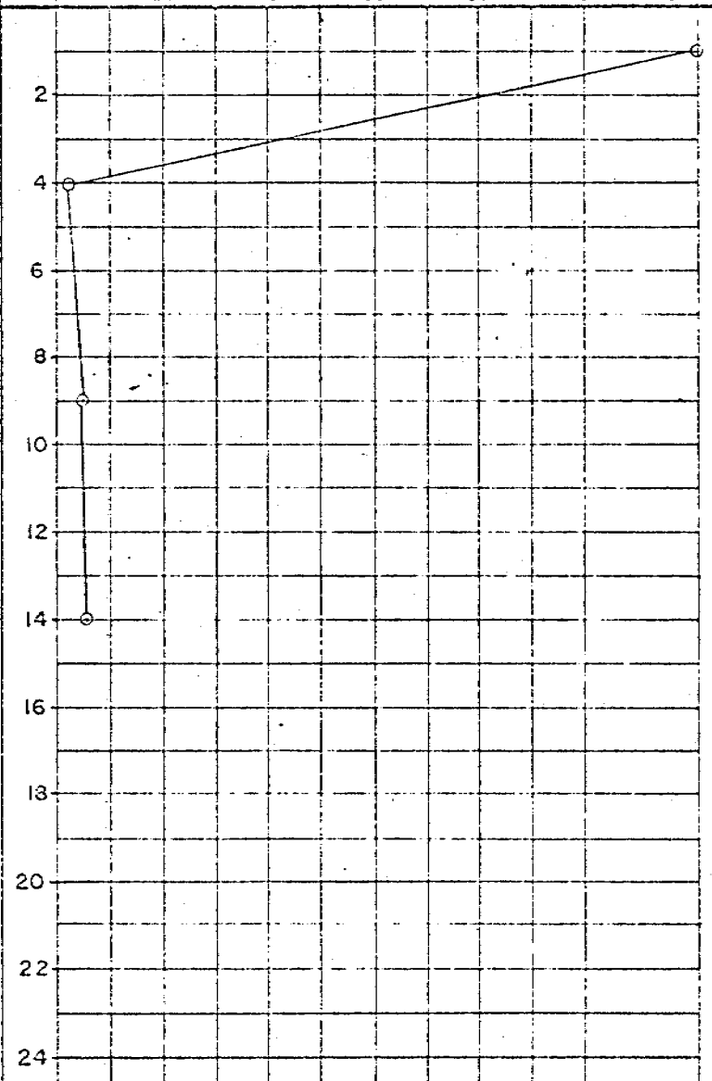
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG B.M	DATE DRILLED 22/11/73	AIRPHOTO NO:	CHAINAGE: 425+00	OFFSET 8.
CKD DGP	TECH D.M	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
433	C	[illegible]

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT GRANULAR MUSKEG ROCKS & GRAVEL	F	
					GP	GRAVEL OCCASIONAL COBBLE	UF	
					GP			
					GC	CLAY SILT, GRAVEL		
						END OF HOLE		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

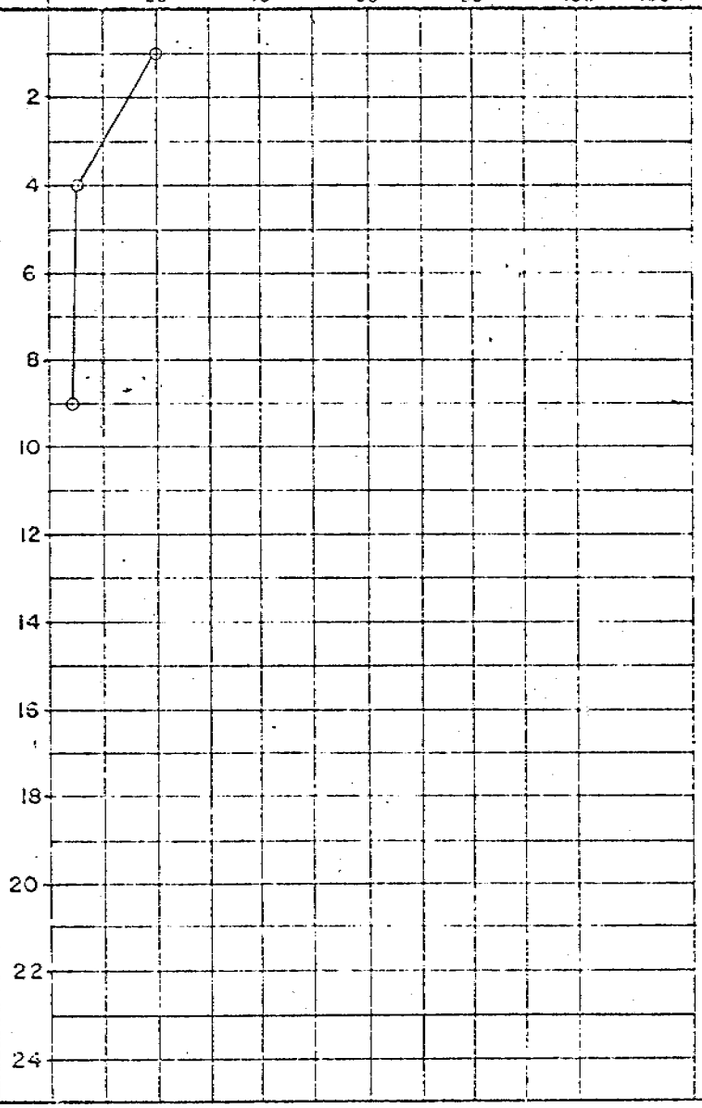
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 22/1/73	AIRPHOTO NO:	CHAINAGE: 415+00	OFFSET: ℄
CKD D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE

MILE	E,C,S	NUMBER
483	C	2345

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT GRANULAR MUSKEG	F	
2					CL	CLAY SILTY WITH GRAVEL		
						GRAVEL		
4						SOME SAND, COBBLES	UF	
6								
8					GW			
10						MED. COARSE SAND		
12								
14						END OF HOLE		
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WT DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel with clay
Location	
Hole	483-C-19A Depth 10'
Technician	Date

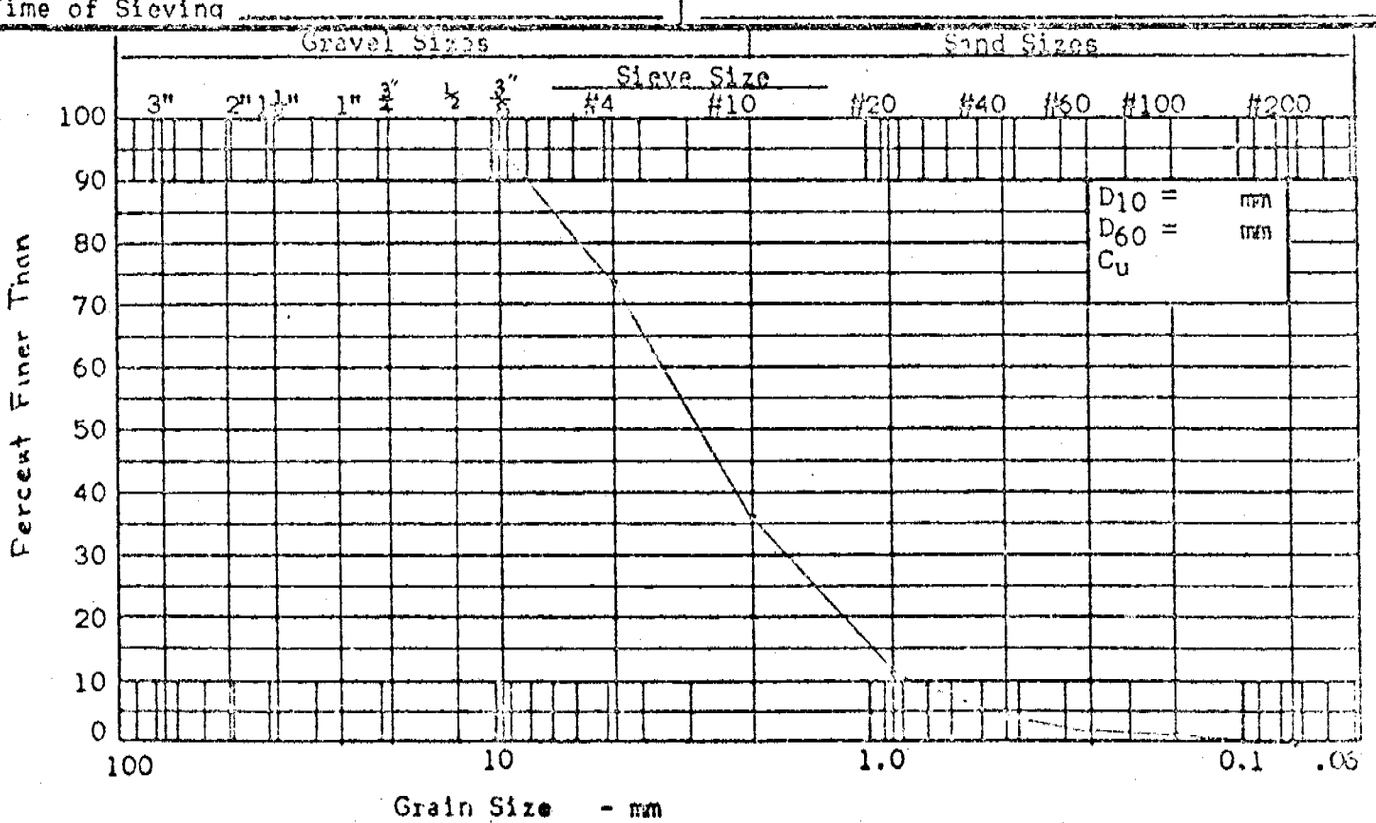
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			96%	
	4	.185	4.76			73%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			36%	
Tare No.	20	.0331	.840			12%	
Wt. Dry + Tare	40	.0165	.420			4%	
Tare	60	.0097	.250			2%	
Wt. Dry	100	.0059	.149			1%	
	200	.0029	.074			.5%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG. R.S.	DATE DRILLED 18/11/72	AIRPHOTO NO:	CHAINAGE: 405+00	OFFSET: ℄
CKD DGP	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFERS & POPLAR	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
433	C	44

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					OL	CLAY ORGANIC	UF								
2															
						GRAVEL									
4															
6		◥				SANDY WITH CLAY									
8					GC	DRY									
10		◥									36	64			
12															
14						SANDY									
16		◥				END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

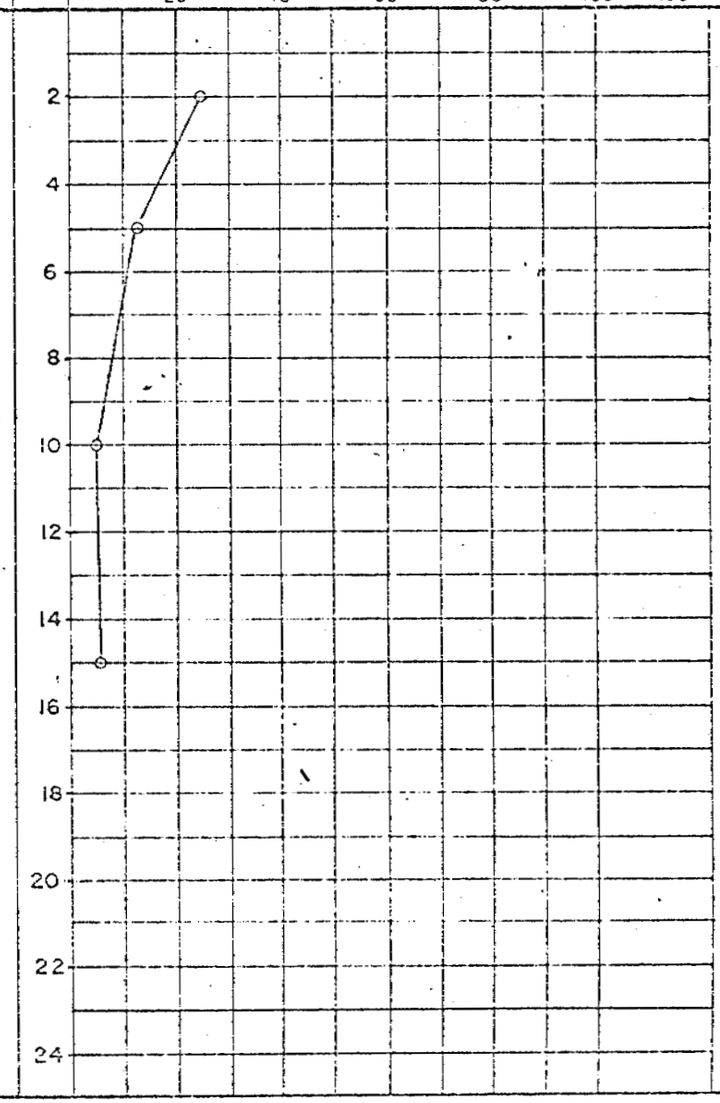
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 13/11/72	AIRPHOTO NO:	CHAINAGE: 395+00	OFFSET: 2
CKD: D.G.P	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
483	C	15 F

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY SILTY	F	Nbn
2								
					SM	SAND SILTY, FEW STONES	UF	
4								
6								
8								
					GP	GRAVEL SOME SAND, DRY		
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy Silt
Location	
Hole 483-C-17A	Depth 5'
Technician	Date Nov.21/72

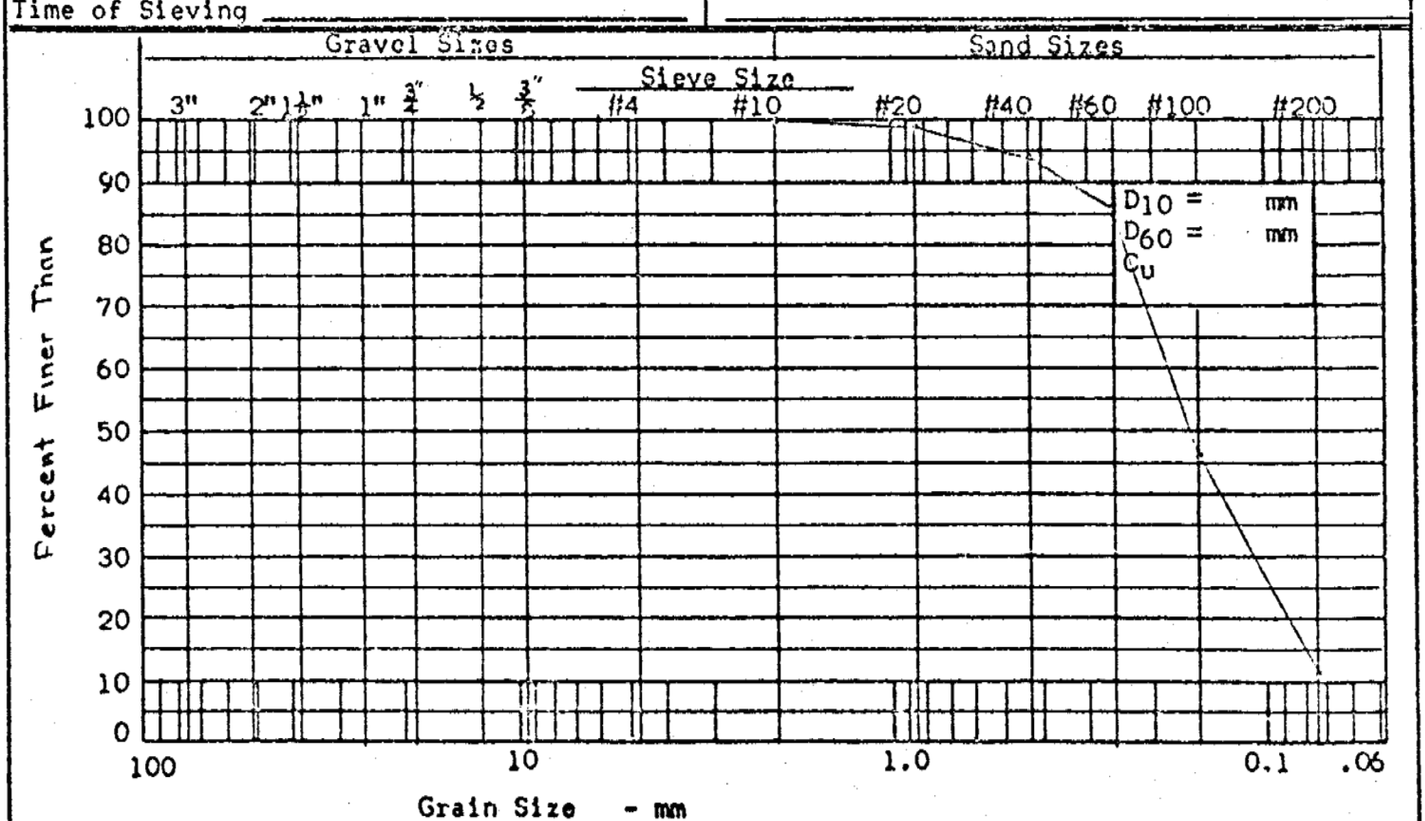
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			100	
Tare No.	20	.0331	.840			99.5	
Wt. Dry + Tare	40	.0165	.420			94.5	
Tare	60	.0097	.250			86.1	
Wt. Dry	100	.0059	.149			46.0	
	200	.0029	.074			11.3	
Passing	200					0	

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel
Location	
Hole	483-C-17A Depth 14 - 15'
Technician	Date NOV. 21/72

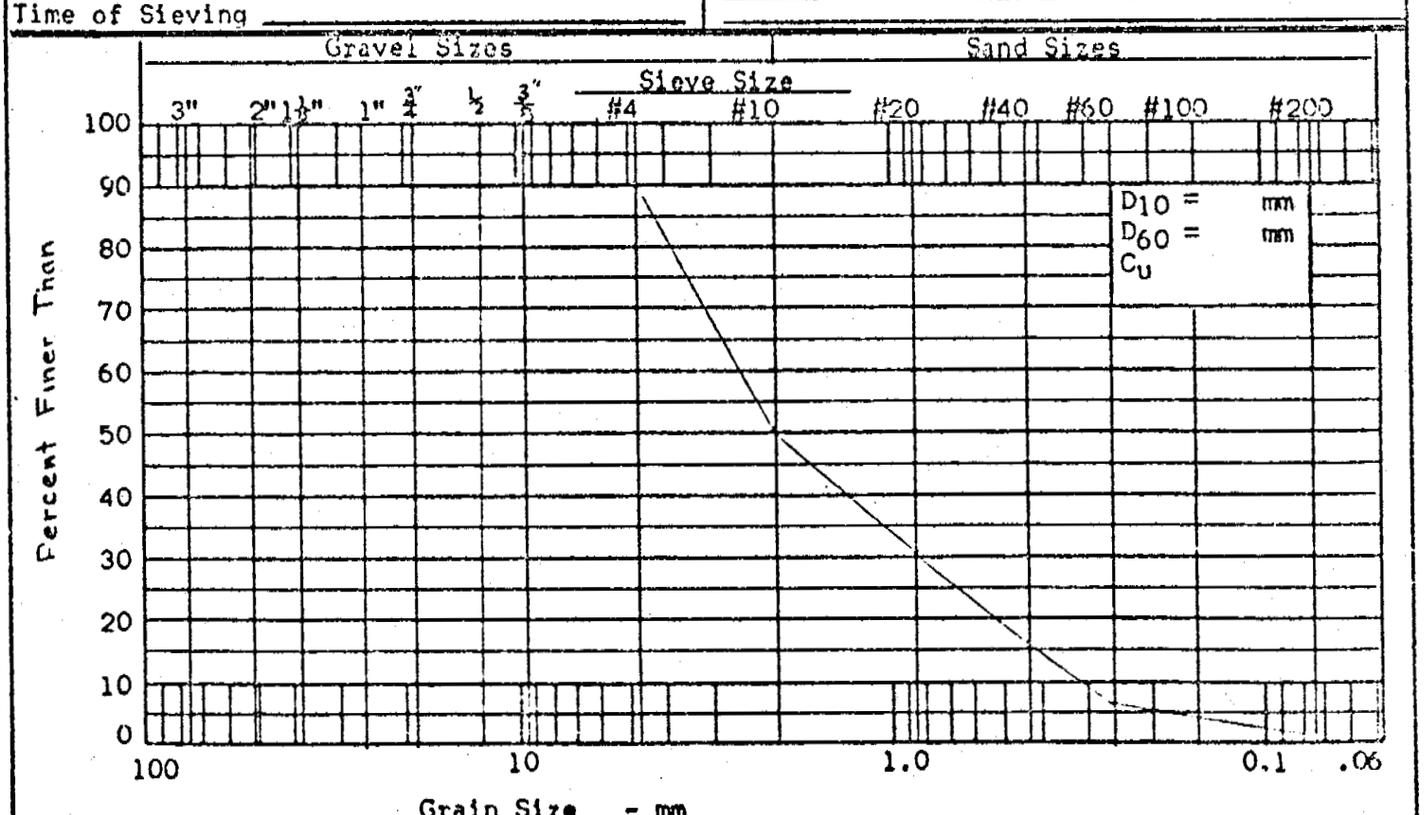
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			90	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			51	
Wt. Dry + Tare	20	.0331	.840			31	
Tare	40	.0165	.420			16	
Wt. Dry	60	.0097	.250			7	
	100	.0059	.149			4	
	200	.0029	.074			1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

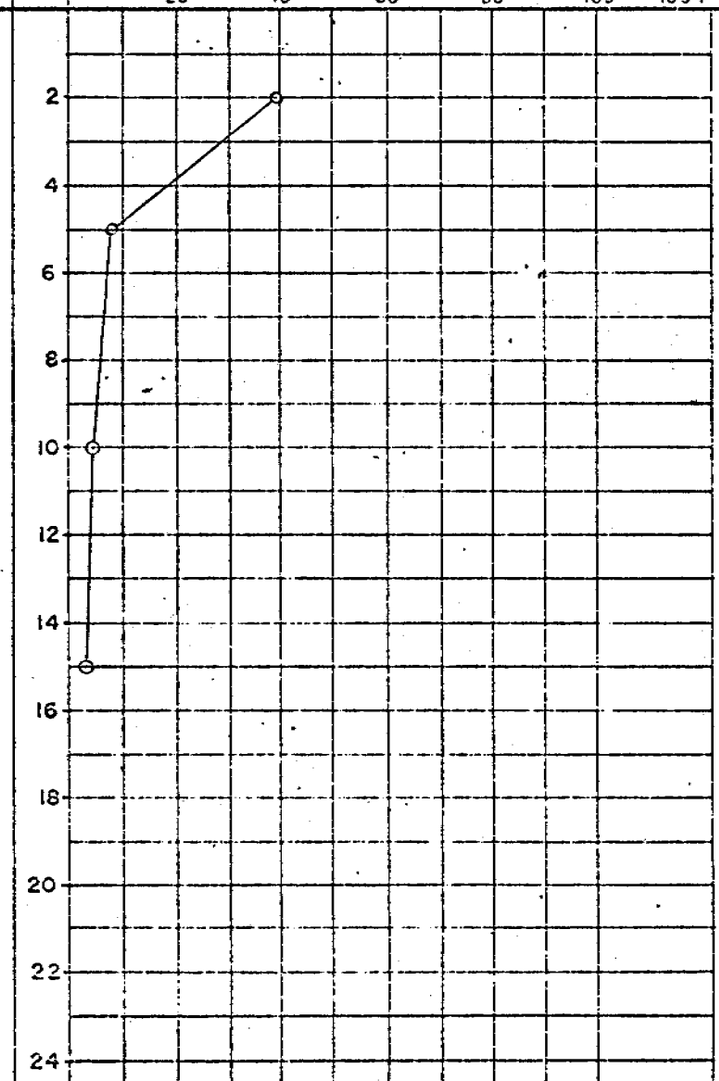
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 385+00	OFFSET: ℄
CKD: D.G.P.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: LEVEL	VEGETATION: CONIFERS & POPLAR	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
483	C	17A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F	Nf							
2					ML	SANDY	UF								
4															
6						SAND FINE, SOME SILT, DRY			11		89				
8															
10					SP	BECOMING GRAVELLY									
12															
14										1	50	49			
16						END OF HOLE									
18															
20															
22															
24															



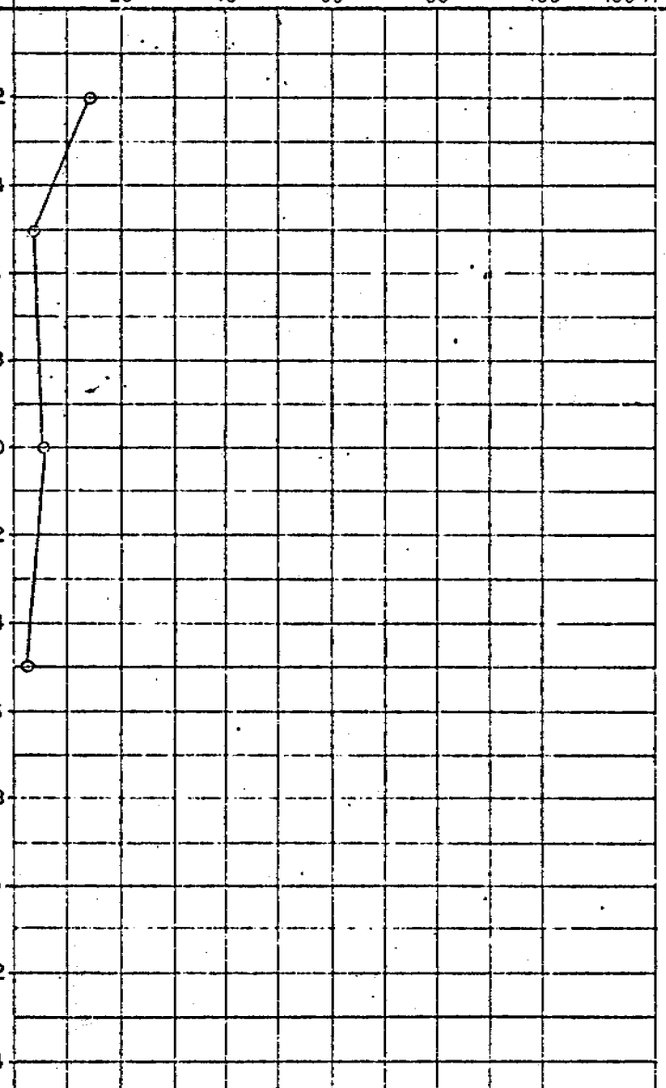
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 375+00	OFFSET: ℄
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: E TO W 2%	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	S,C,S	NUMBER
484	C	16A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					ML	SILT SANDY	UF									
4																
6					GP	GRAVEL COARSE, DRY										
8																
10						CLAY TRACE										
12						SAND LENSE										
14						VERY DRY										
16						END OF HOLE										
18																
20																
22																
24																



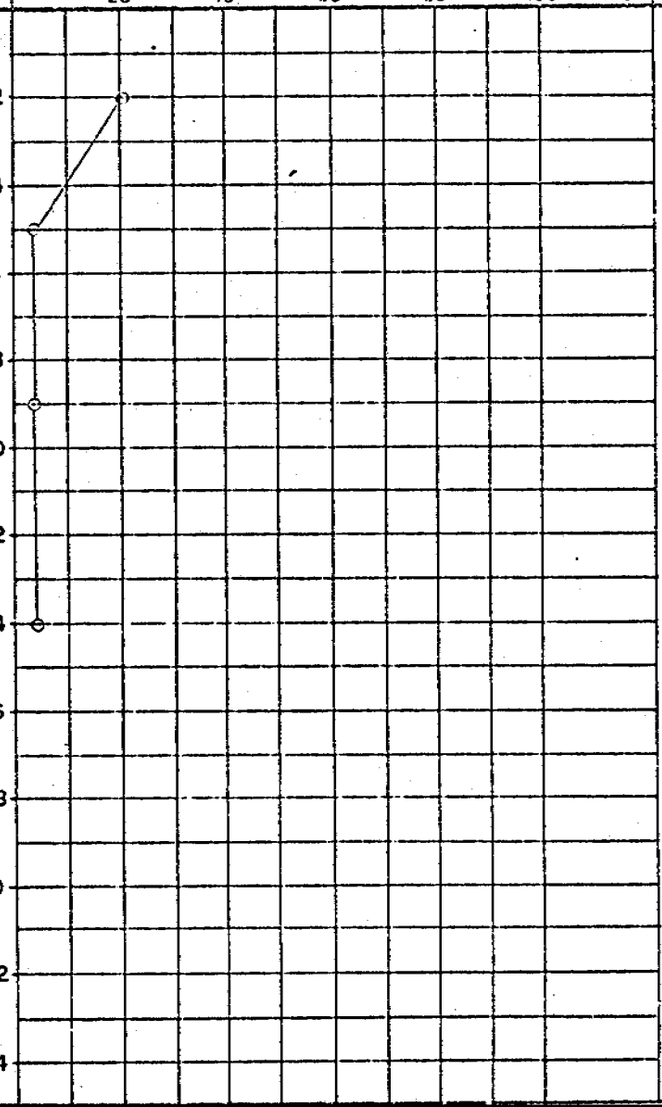
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 365+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: WEST 3%	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
484	C	15 F

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					ML	SILT CLAYEY	F UF	Vf								
2									2							
						GRAVEL COARSE										
4									4							
6					GP				6							
8									8							
10						LARGE ROCKS			10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

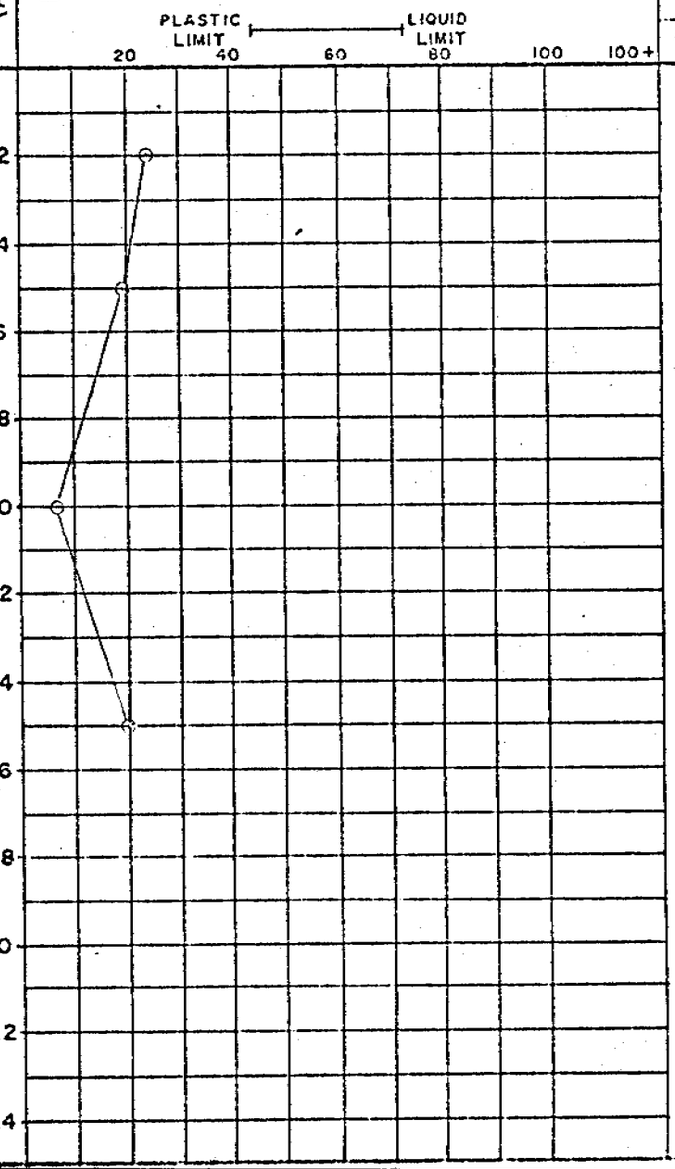
DWN: A.E.W	FIELD ENG: T. S	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 355+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: WEST 2%	VEGETATION: CONIFER	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
464	C	14A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					OL	CLAY SILT MIXTURE, ORGANIC WET	UF	
4					CL	TILL CLAY		
6					SM	SAND SILTY		
8					GP	GRAVEL BOULDERS		
10					GW	SANDY		
12								
14					GC	SANDY & CLAYEY		
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

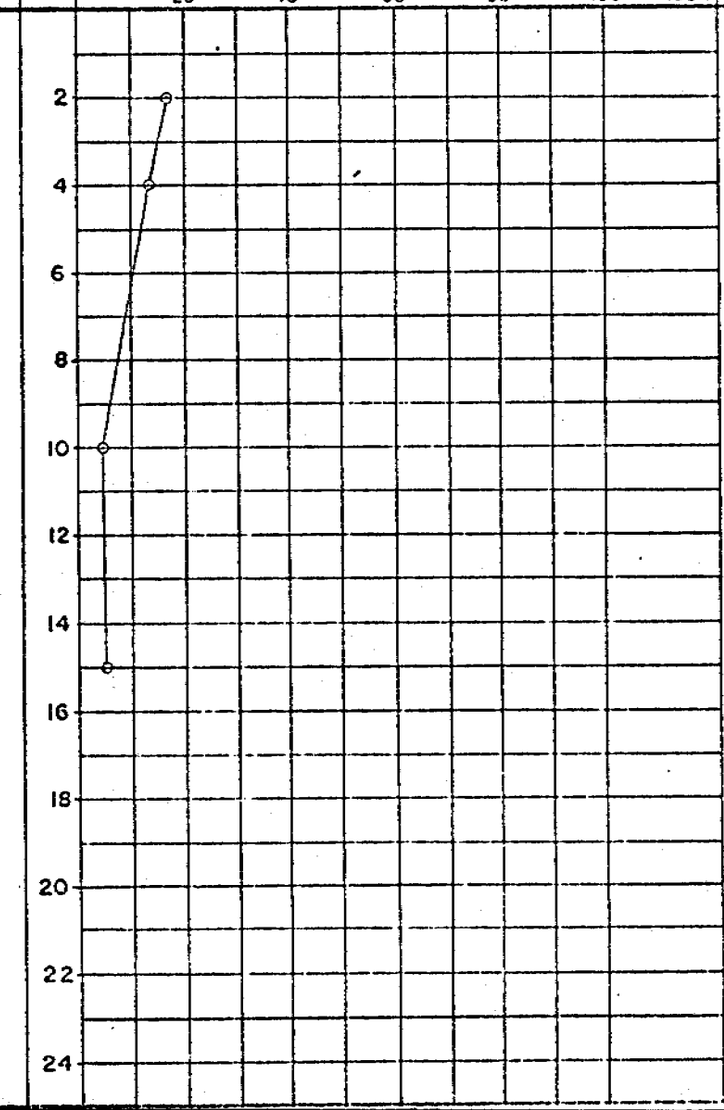
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 345+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: WEST 6 %	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
454	C	13F

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	SILT SANDY	F UF	Nf
4					GW	GRAVEL SANDY		
6								
8						MOISTURE @ 9'-10'		
10						SAND LENSE SANDY		
12								
14						SANDY		
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

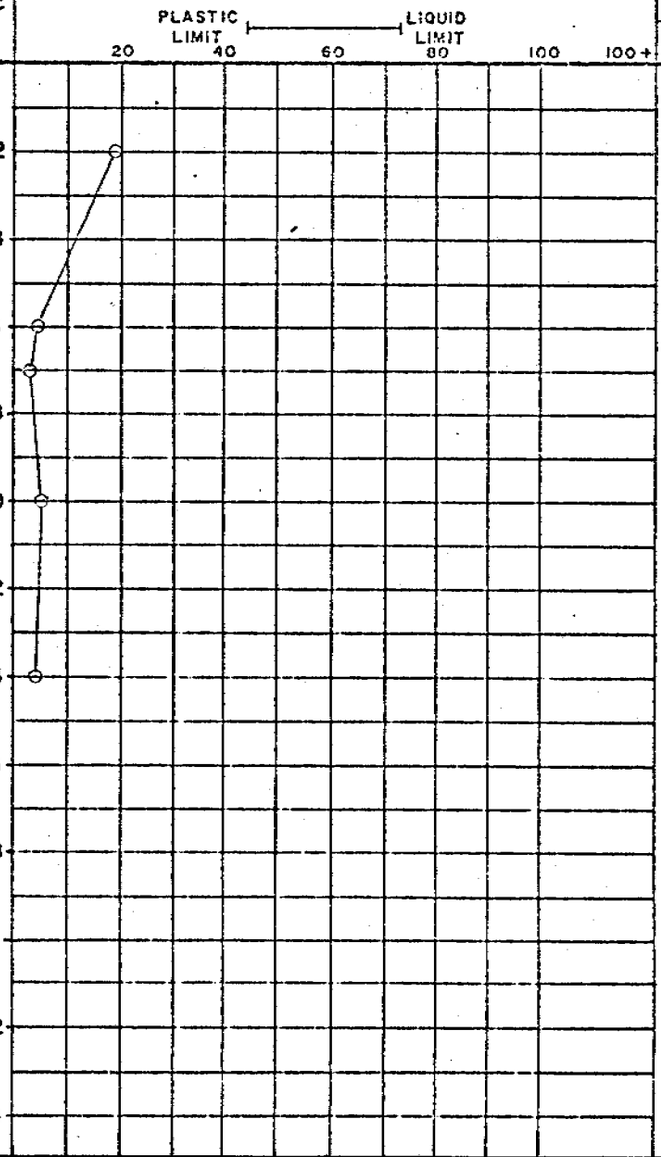
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN. A.E.W.T.	FIELD ENG. T.S	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 335+00	OFFSET: ℄
CKD R.W.T.	TECH. D.M.	RIG: AIR	SURFACE DRAINAGE: EAST 5%	VEGETATION: CONIFER & POPLAR - 40'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
484	C	12A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						GRAVEL	F	Nf								
2		▨				SILTY, HIGH CLAY CONTENT	UF		2							
4									4							
						SILTY										
6		▨							6							
		▨			GM											
8						LARGE BOULDERS			8							
10		▨							10							
12									12							
14		▨				COARSE			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel
Location	
Hole	485-C-11A Depth 5'
Technician	Date

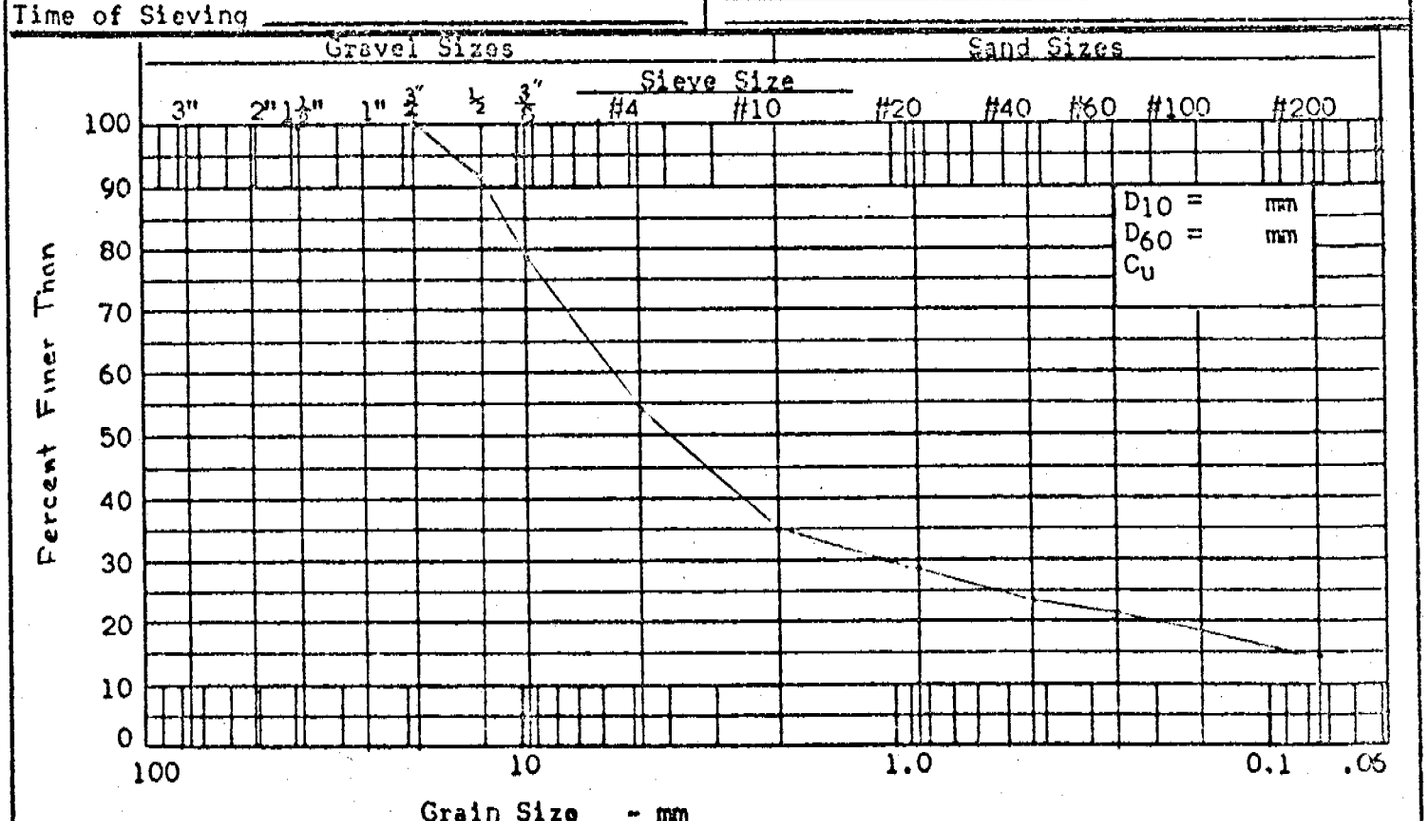
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			92%	
Wt. Dry		3/8	9.52			78%	
	4	.185	4.76			54%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			35%	
Wt. Dry + Tare	20	.0331	.840			28%	
Tare	40	.0165	.420			23%	
Wt. Dry	60	.0097	.250			21%	
	100	.0059	.149			18%	
	200	.0029	.074			14%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project: Mackenzie Highway
Site
Sample: Coarse sandy gravel
Location
Hole: 485-C-11A Depth: 16'
Technician Date

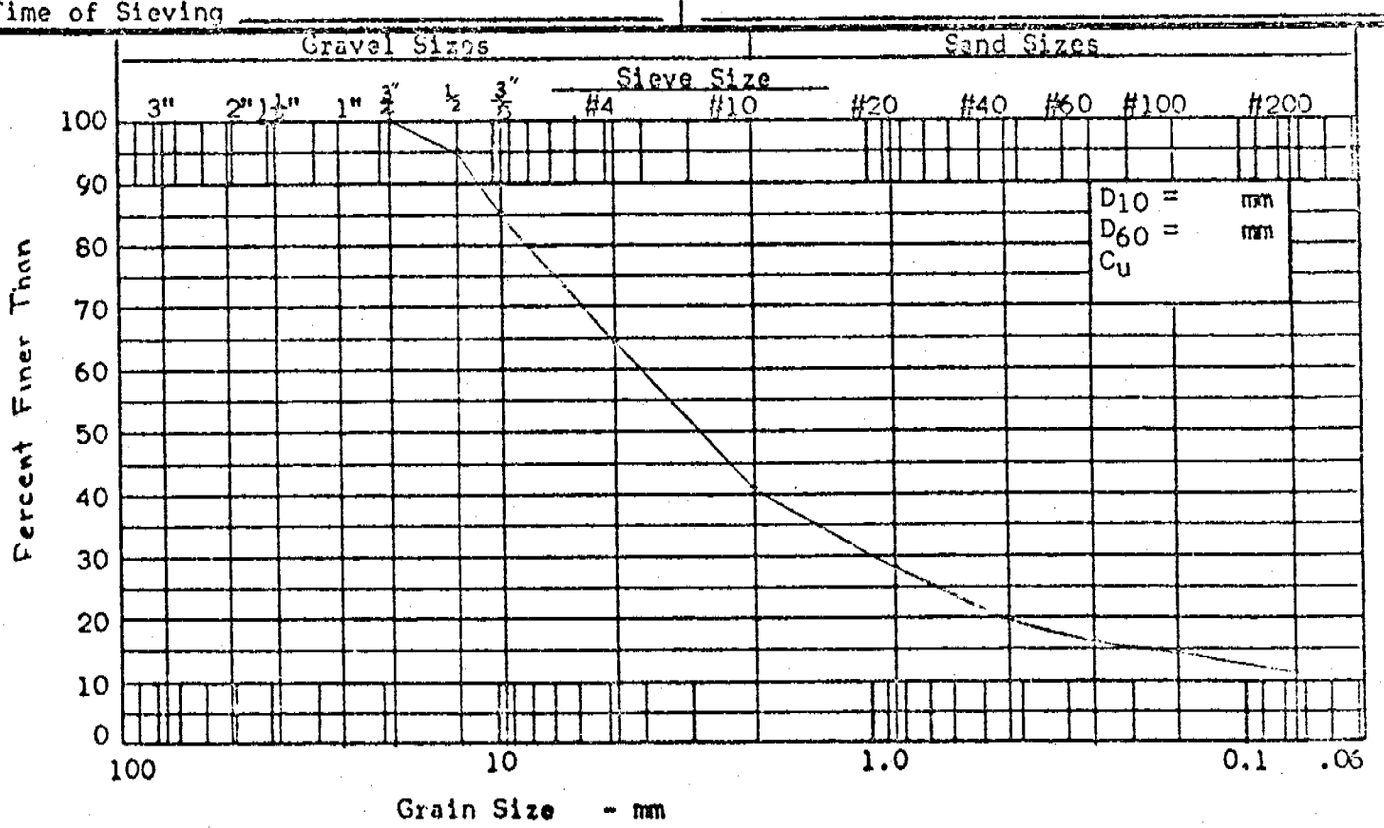
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			95%	
Wt. Dry		3/8	9.52			85%	
	4	.185	4.76			64%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			41%	
Tare No.	20	.0331	.840			28%	
Wt. Dry + Tare	40	.0165	.420			19%	
Tare	60	.0097	.250			16%	
Wt. Dry	100	.0059	.149			14%	
	200	.0029	.074			12%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



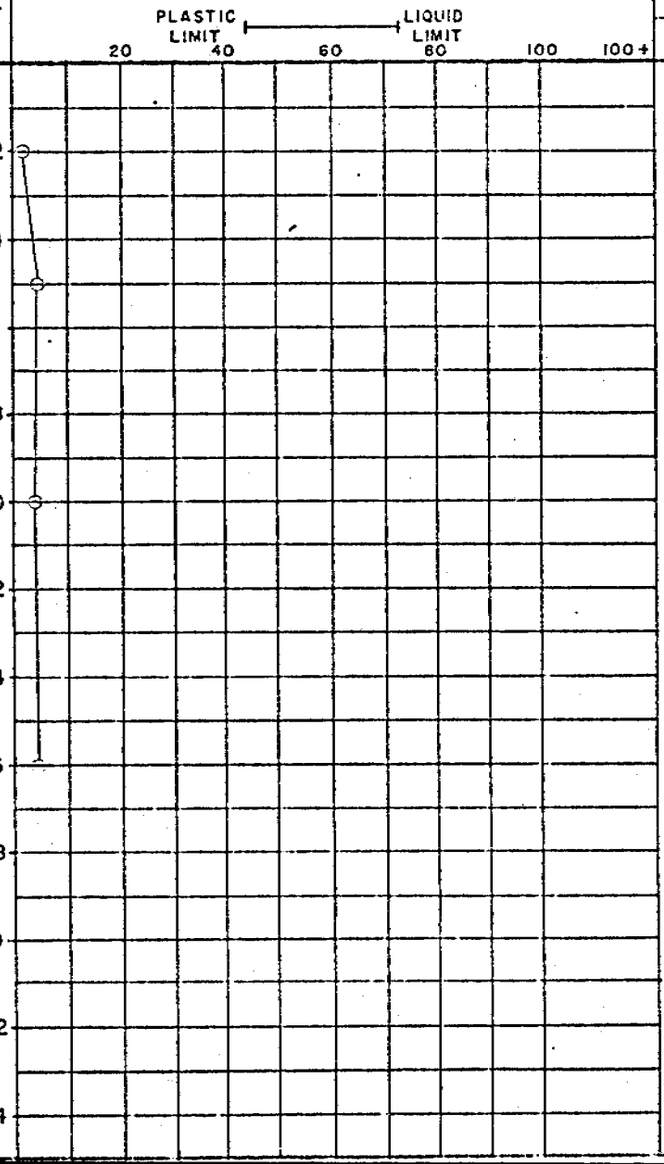
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 326+00	OFFSET: 2	TEST HOLE
CKD: R.W.T	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: WEST 4%	VEGETATION: CONIFER & POPLAR	ELEV:	MILE: 455 / B,C,S: C / NUMBER: 11A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–4					SM	SAND SILTY, DRY	F / UF								
4–16					GP	GRAVEL SANDY, FINE FINE WITH SAND COARSE			14		21	65			BOULDERS AND GRAVEL CRUSHED DURING DRILLING
16						END OF HOLE			12		29	59			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Fine silty sand
Location	
Hole	485-C-10A Depth 2'
Technician	Date Nov. 19/72

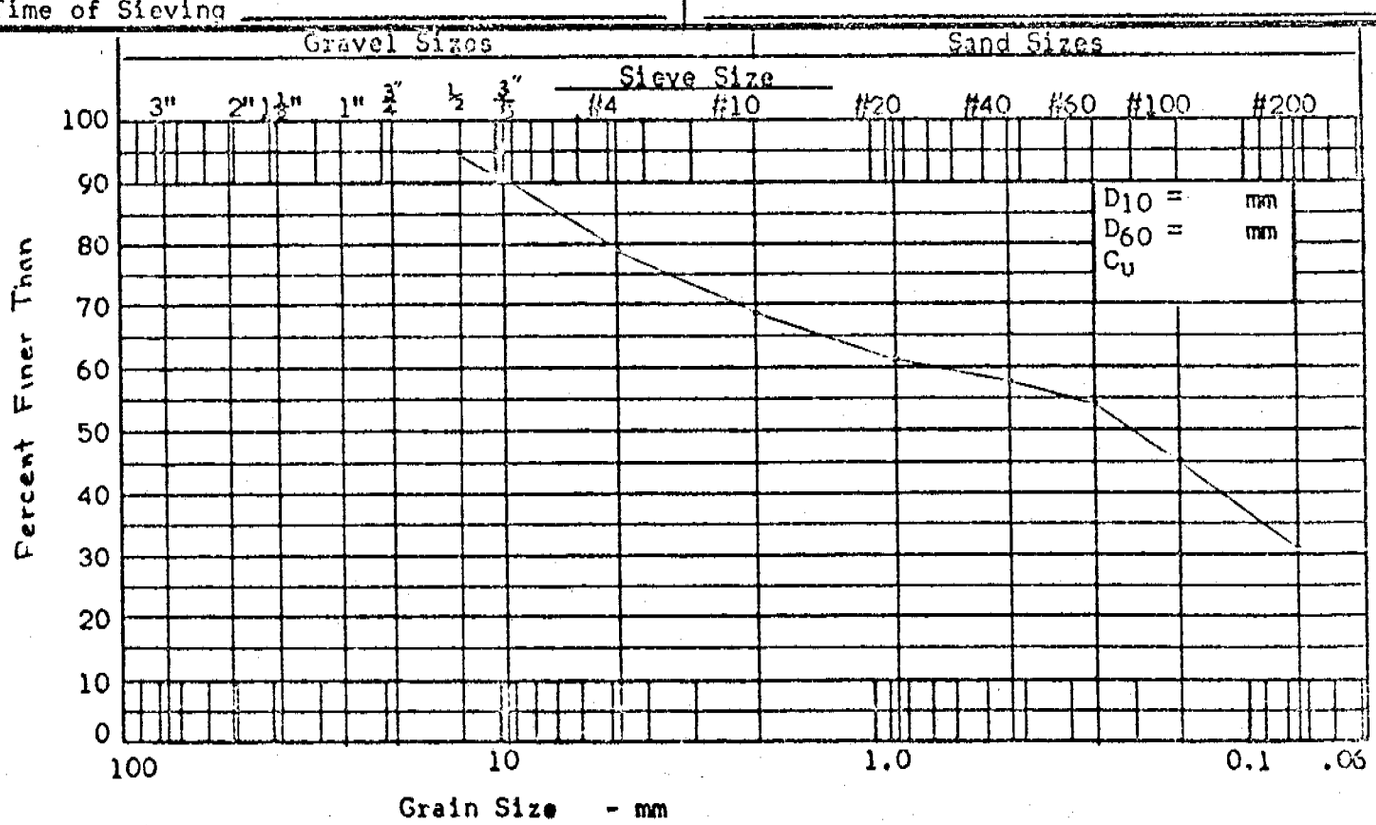
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			94%	
Wt. Dry		3/8	9.52			91%	
	4	.185	4.76			79%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			68%	
Tare No.	20	.0331	.840			61%	
Wt. Dry + Tare	40	.0165	.420			57%	
Tare	60	.0097	.250			54%	
Wt. Dry	100	.0059	.149			45%	
	200	.0029	.074			31%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel with clay traces
Location
Hole 485-C-10A Depth 5'
Technician Date

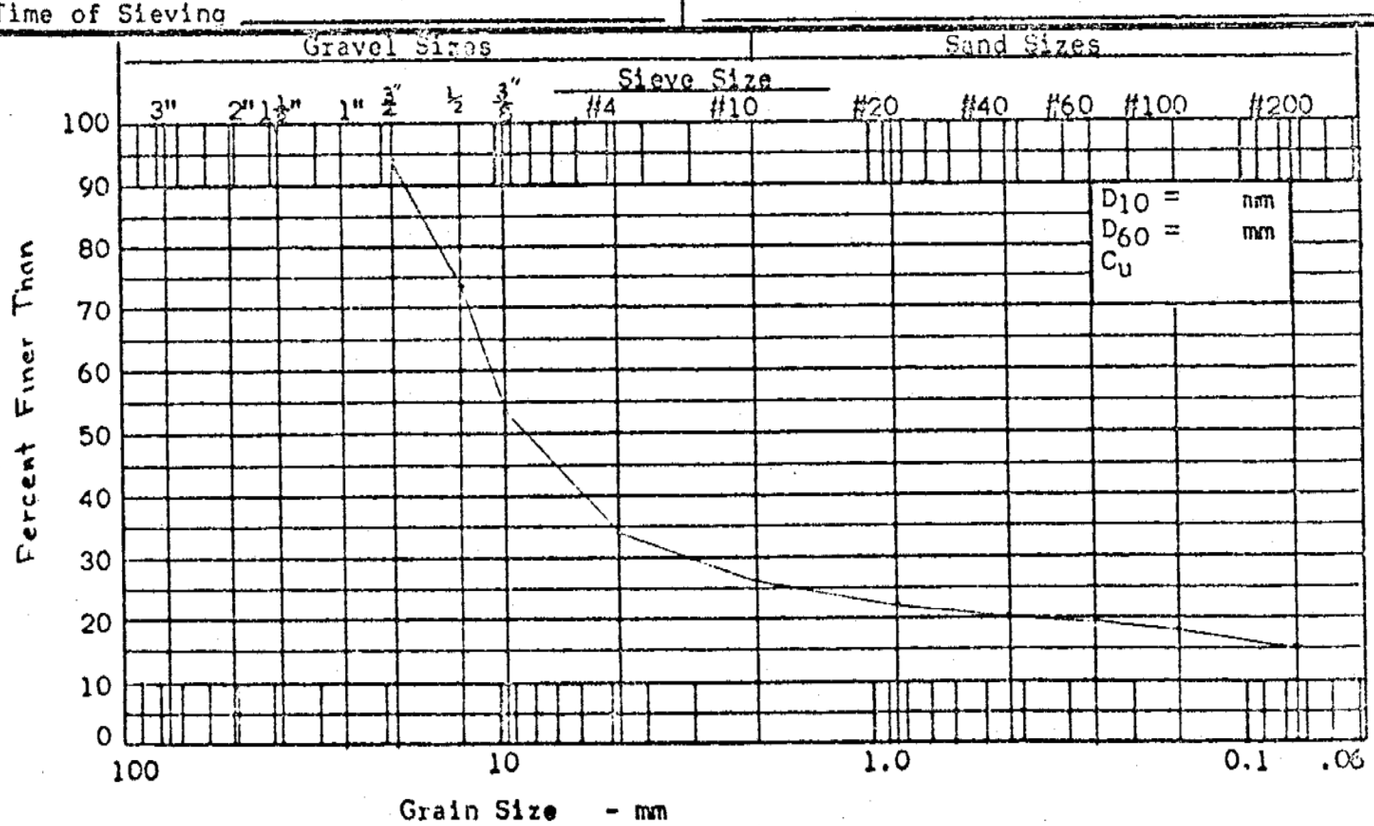
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			94%	
Wt. Dry		1/2	12.70			73%	
		3/8	9.52			53%	
	4	.185	4.76			34%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			26%	
Wt. Dry + Tare	20	.0331	.840			22%	
Tare	40	.0165	.420			20%	
Wt. Dry	60	.0097	.250			19%	
	100	.0059	.149			17%	
	200	.0029	.074			15%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

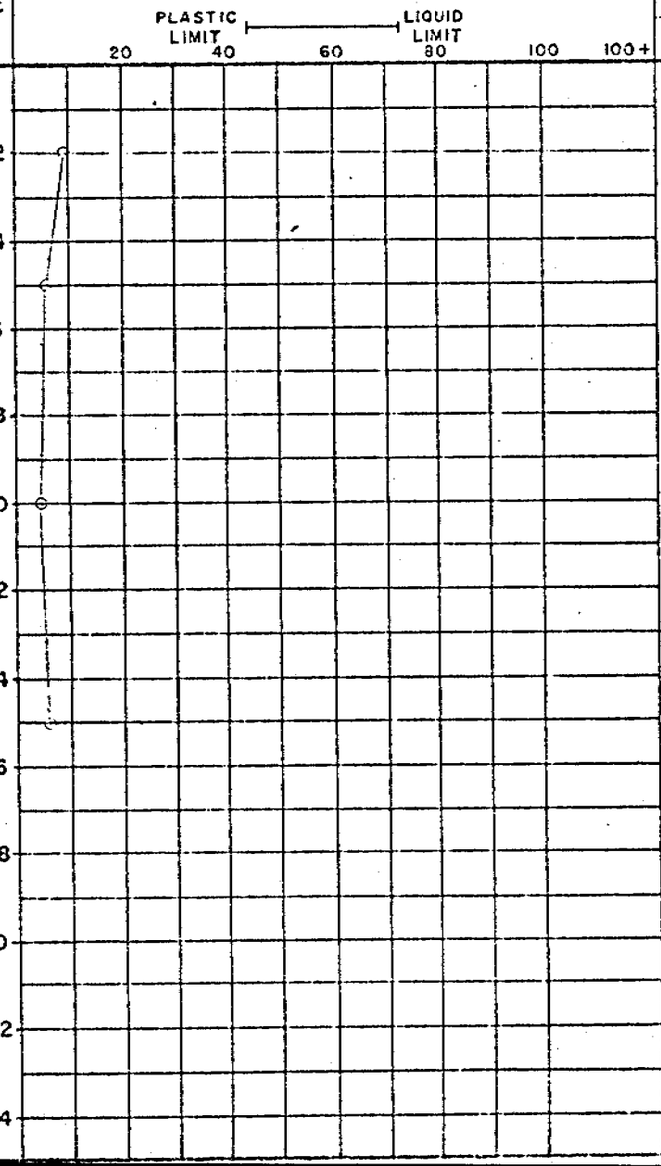
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 18/III/72	AIRPHOTO NO:	CHAINAGE: 316+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M. & W.K	RIG: AIR	SURFACE DRAINAGE: WEST 2%	VEGETATION: CONIFER & DECIDUOUS	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
485	C	10A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					SM	SAND FINE, SILTY	F	
2					GW	GRAVEL SANDY, CLAY TRACES	UF	
4								
6								
8						CLAY & GRAVEL MIXTURE		
10					GP	COARSE, VERY LARGE BOULDERS		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2	31		37	32		
4	15		11	74		

REMARKS

GRAVEL CRUSHED BY DRILL BIT

CRUSHED FACE CONTENT 84.5%

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty gravel
Location
Hole 485-C -9A Depth 2'
Technician Date

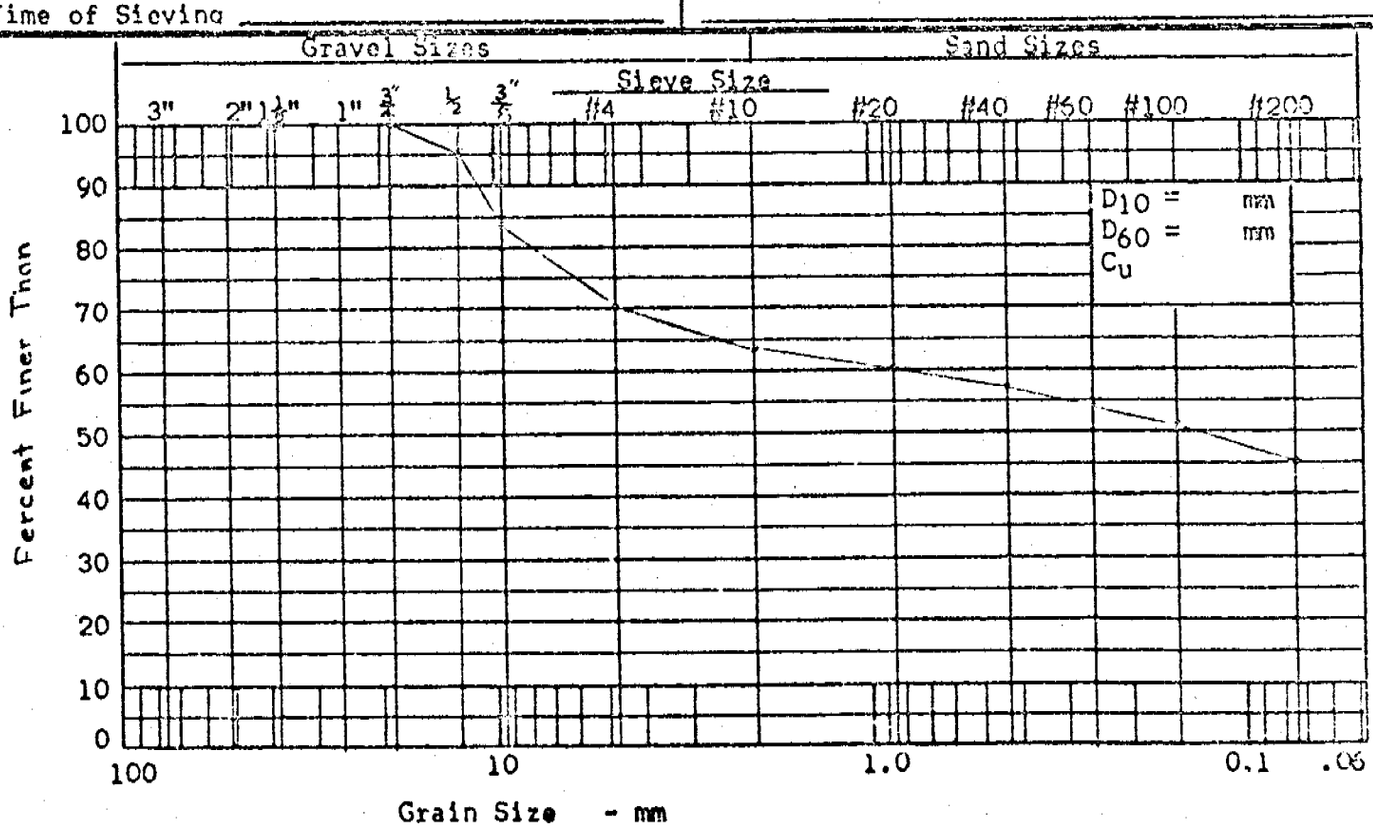
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100%	
Tare		1/2	12.70			95%	
Wt. Dry		3/8	9.52			84%	
	4	.185	4.76			70%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			63%	
Tare No.	20	.0331	.840			60%	
Wt. Dry + Tare	40	.0165	.420			57%	
Tare	60	.0097	.250			54%	
Wt. Dry	100	.0059	.149			51%	
	200	.0029	.074			45%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

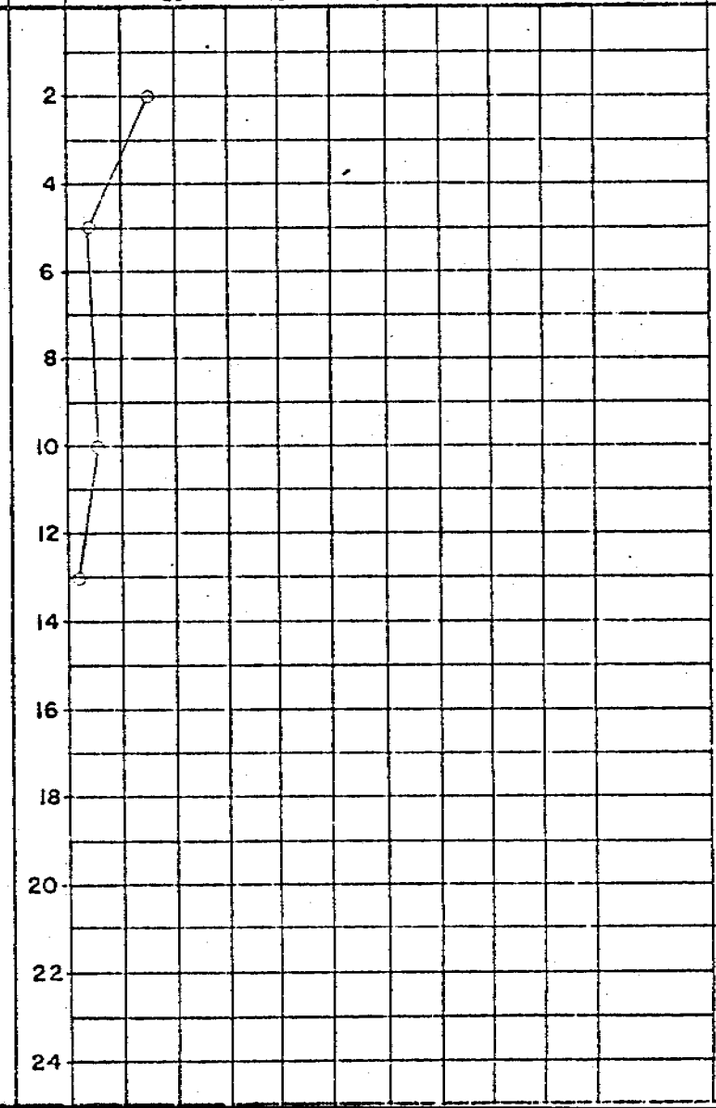
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S.	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 308+00	OFFSET: 2
CKD: R.W.T	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: WEST 1%	VEGETATION: CONIFERS & [illegible]	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
435	C	34

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GM	GRAVEL SILTY	UF	
4					SW	SAND		
6					GP	GRAVEL LARGE ROCKS		
8								
10					GC	SANDY, SOME CLAY & SILT		
12								
14						ROCKS & COBBLES		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
4	5	18	37			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M	DATE DRILLED 23/1/73	AIRPHOTO NO:	CHAINAGE: 10+00	OFFSET: 2
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30'	ELEV

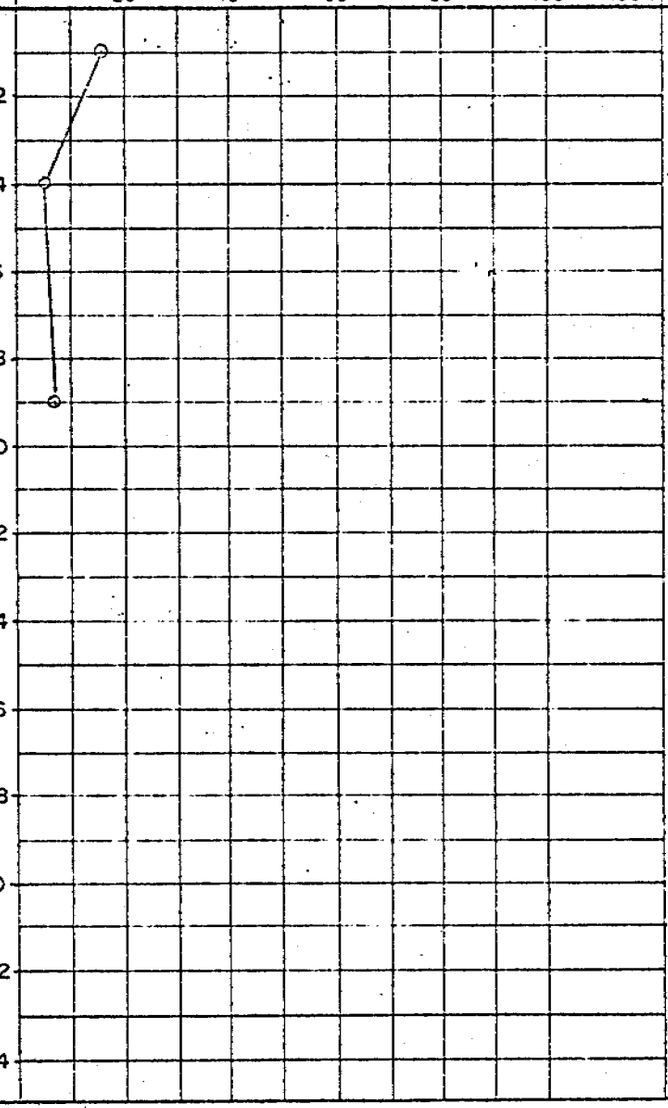
TEST HOLE

MILE	S.C.S	NUMBER
485	C	17.3

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SILT 4" MUSKEG	T	
2					SM	SANDY, BROWN		
						SAND SILTY, SOME GRAVEL		
4								
6					GM	GRAVEL		
							UF	
8						SANDY, SILTY COBBLES, SLOUGHING FROM 8'		
10								
12					GM			
14						END OF HOLE		
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

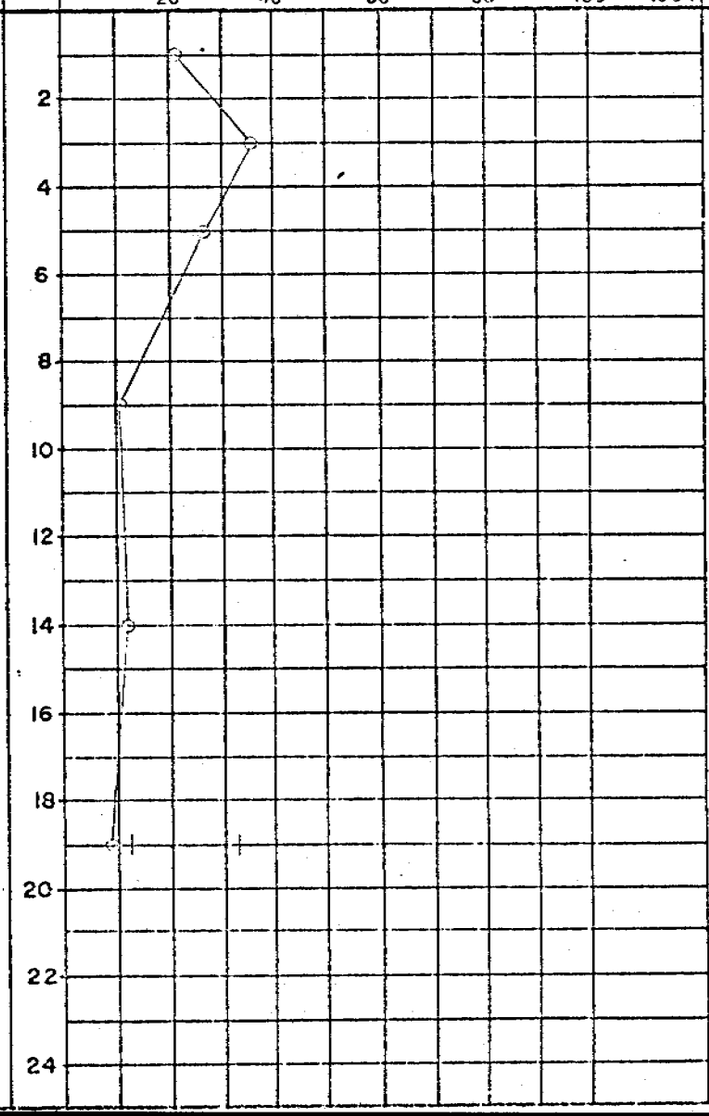
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: F.M	DATE DRILLED: [illegible]	AIRPHOTO NO:	CHAINAGE: 277+00	OFFSET: [illegible]
CKD: R.W.T	TECH: D.M	RIG: AR	SURFACE DRAINAGE:	VEGETATION: CONIFERS	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
[illegible]	[illegible]	[illegible]

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2	1				ML	SILT LIGHT TO DARK BROWN SOME SAND	UF	
4	2							
6	3	P		N=70+				
8					GM	GRAVEL SILTY, SANDY, ROCKS & COBBLES, BOULDERS		
10	4							
12					CL	TILL ROCKY, SOME CLAY, STONES, BROWN, DRY LOW PLASTIC		
14	5							
16								
18								
20	6							
22						END OF HOLE		
24								



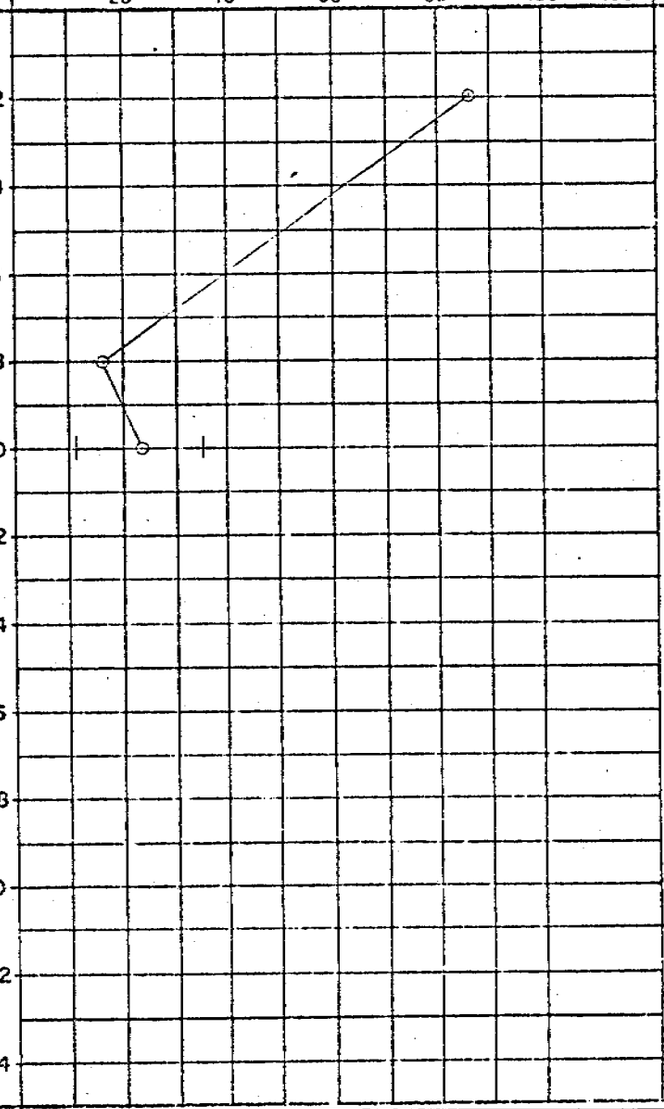
DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A. EW	FIELD ENG: B.M	DATE DRILLED: 18/4/72	AIRPHOTO NO:	CHAINAGE: 264+00	OFFSET: C.
CKD: RW 7	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFERS	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
466	C	45

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
0–6			LOST		Pt	MUSKEG COARSE, FIBROUS SOME ROCKS & BOULDERS	F UF	Nf							DIFFICULT TO GET SAMPLE. DRILLED THROUGH ROCK @ 4' SAMPLE RETURN POOR
6–10		P		6" 36 BLOWS	CL	TILL CLAY, DARK BROWN GREY, ICE LENSES	F	Vr LENSES TO 1/8"							UNABLE TO GET RETURN BELOW 11'
10–13						END OF HOLE									MATERIAL @ 11'-13' REQ'D MUCH DRILLING YET DID NOT BLOCK AS WELL WITH ROCK



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

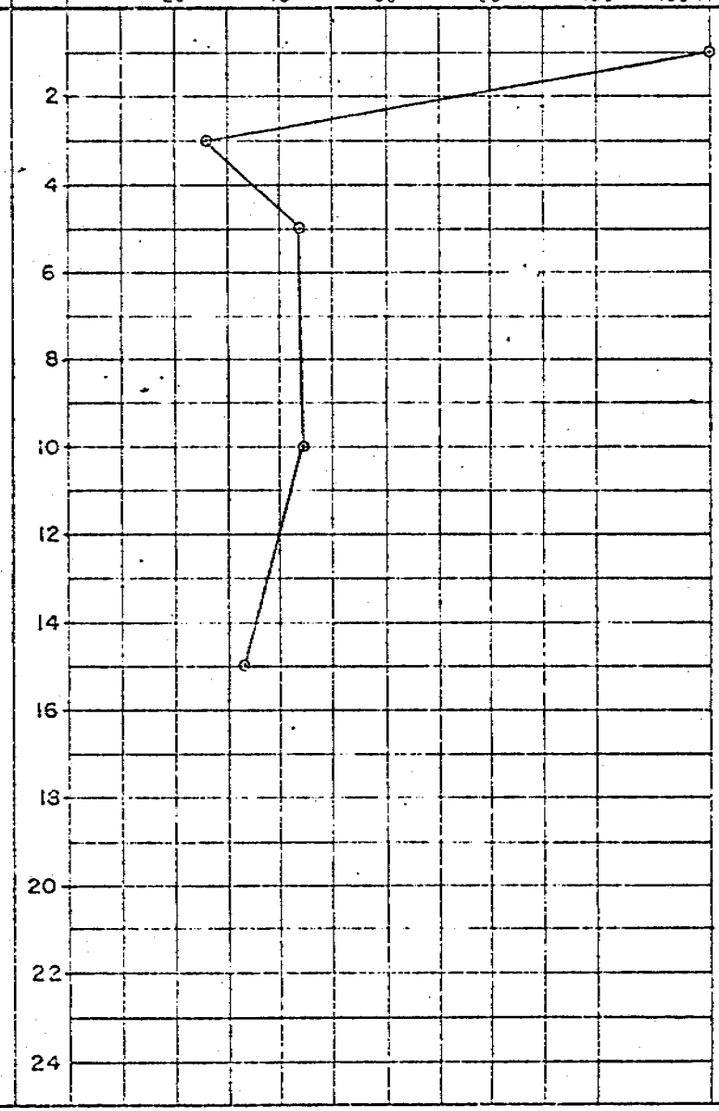
DWN A.E.W | FIELD ENG T.S | DATE DRILLED 23/1/73 | AIRPHOTO NO: | CHAINAGE: 230+00 | OFFSET ℄

CHD D.G.P | TECH D.M | RIG: A.R | SURFACE DRAINAGE: POOR | VEGETATION: CONIFERS TO 20' | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
486	C	171 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT ORGANIC, MUSKEG	F								
2		P			ML	CLAY GREY, SILTY, FINE SAND		Vr					108.3	85.4	
4															
6		P													
8						GREY, SILTY									
10		P						1/4" ICE LENSES					114.4	86.0	
12					CL	VERY STICKY AND SLIPPERY									
14		P						Vr							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

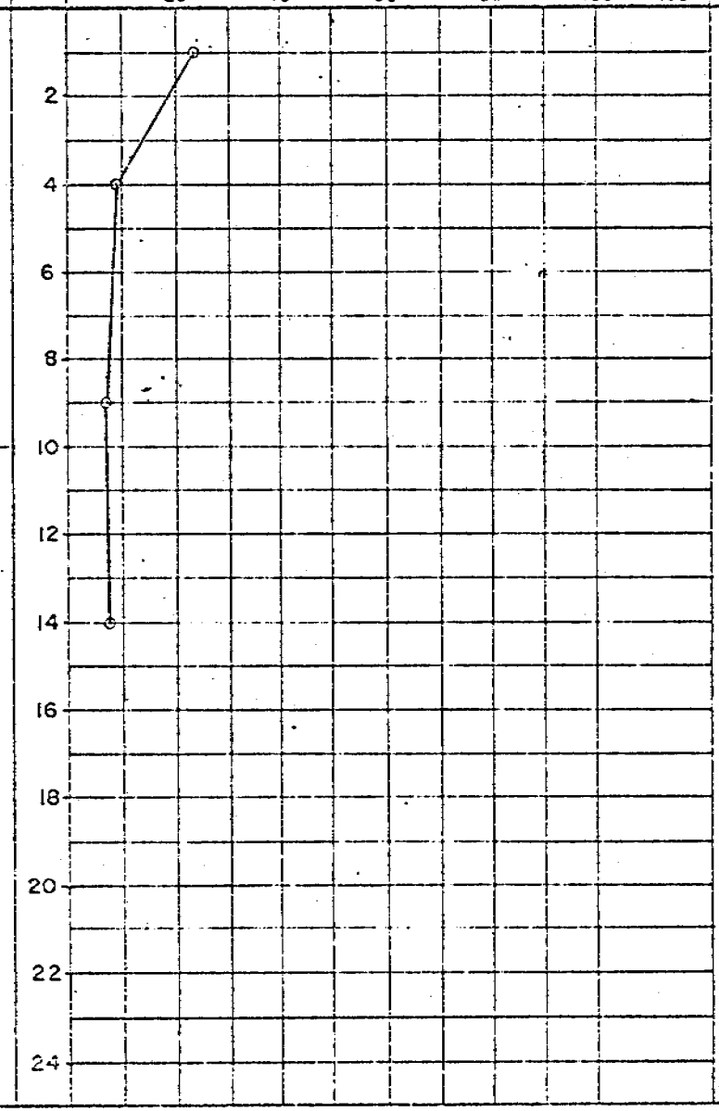
DWN A.E.W. | FIELD ENG W.K. | DATE DRILLED 23/11/73 | AIRPHOTO NO: | CHAINAGE: 237+00. | OFFSET: ℄

CHD D.G.P. | TECH D.M. | RIG: AIR | SURFACE DRAINAGE: FAIR | VEGETATION: JACK PINE, BLACK SPRUCE | ELEV:

TEST HOLE

MILE	S,C,S	NUMBER
486	C	274 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GC	TILL	F								
						BROWN, CLAY, FEW COBBLES									
4								Nbn							
6															
8						6"–8" COBBLES									
10							UF								
12					GC	GREY CLAY									
14															
16						END OF HOLE									
18															
20															
22															
24															

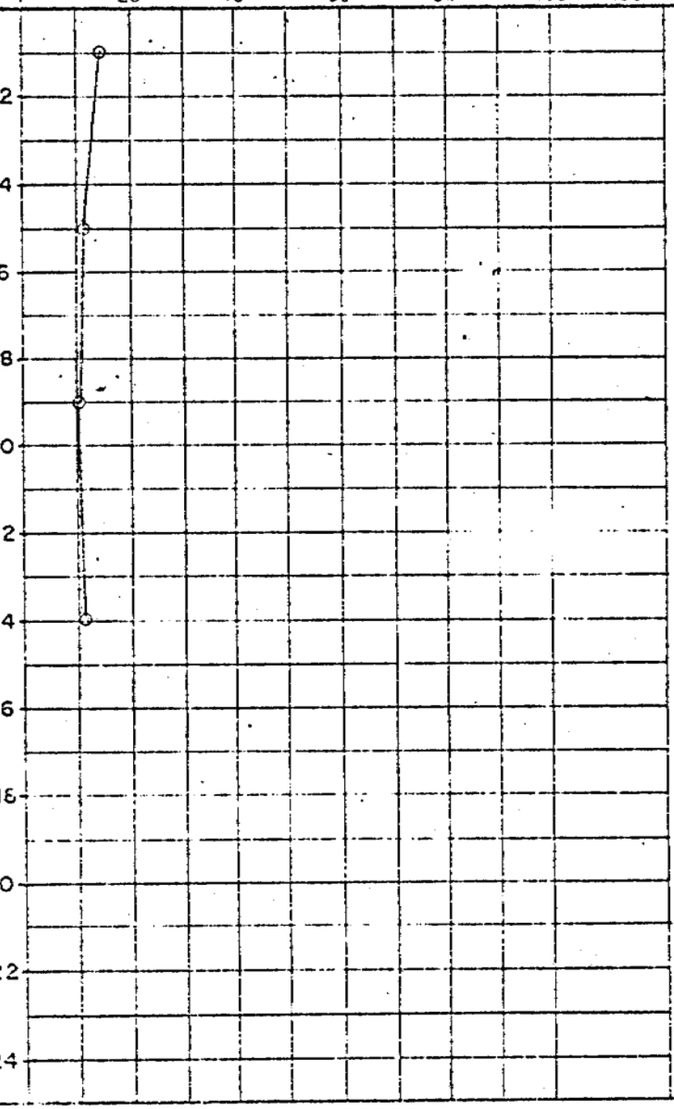


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W.	FIELD ENG. WK	DATE DRILLED 23/1/73	AIRPHOTO NO:	CHAINAGE: 225+00	OFFSET: ℄	TEST HOLE
CKD D.G.P.	TECH. D.M.	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SCRUB SPRUCE	ELEV.	

MILE	B,C,S	NUMBER
487	C	273B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GC	TILL CLAY, BROWN, SANDY GRAVELLY	F	Nbn
4								
6							UF	
8								
10								
12					GC			
14						DARK GREY CLAY		
16						END OF HOLE		
18								
20								
22								
24								



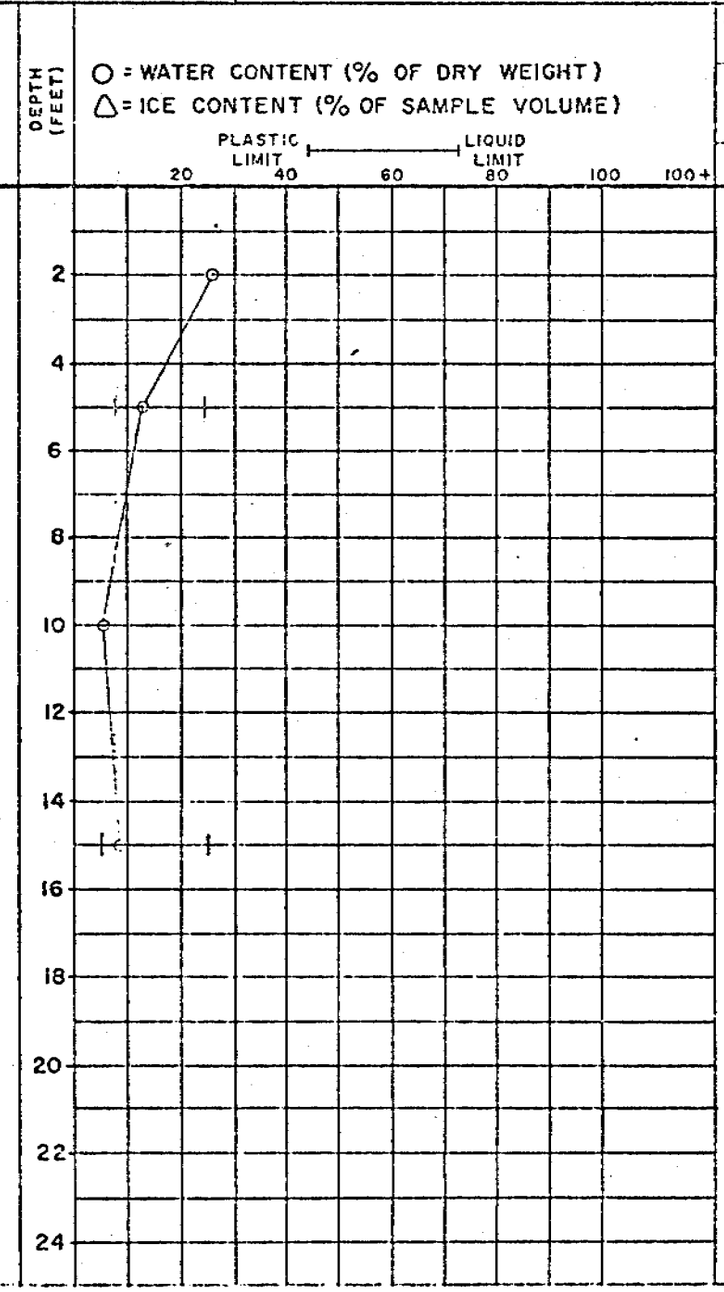
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 13/11/72	AIRPHOTO NO:	CHAINAGE: 212+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
487	C	3B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC SOME ROCKS	F	Nf
2						TILL	UF	
4						SANDY, CLAY, MOIST STONES, DARK BROWN LOW PLASTIC		
6				NH				
8					SC			
10						MORE ROCKS, CLAY COLOR CHANGING TO GREY		
12								
14						LESS ROCK		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty sand
Location	
Hole	487-C-8[illegible] Depth 2'
Technician	Date Nov.19/72

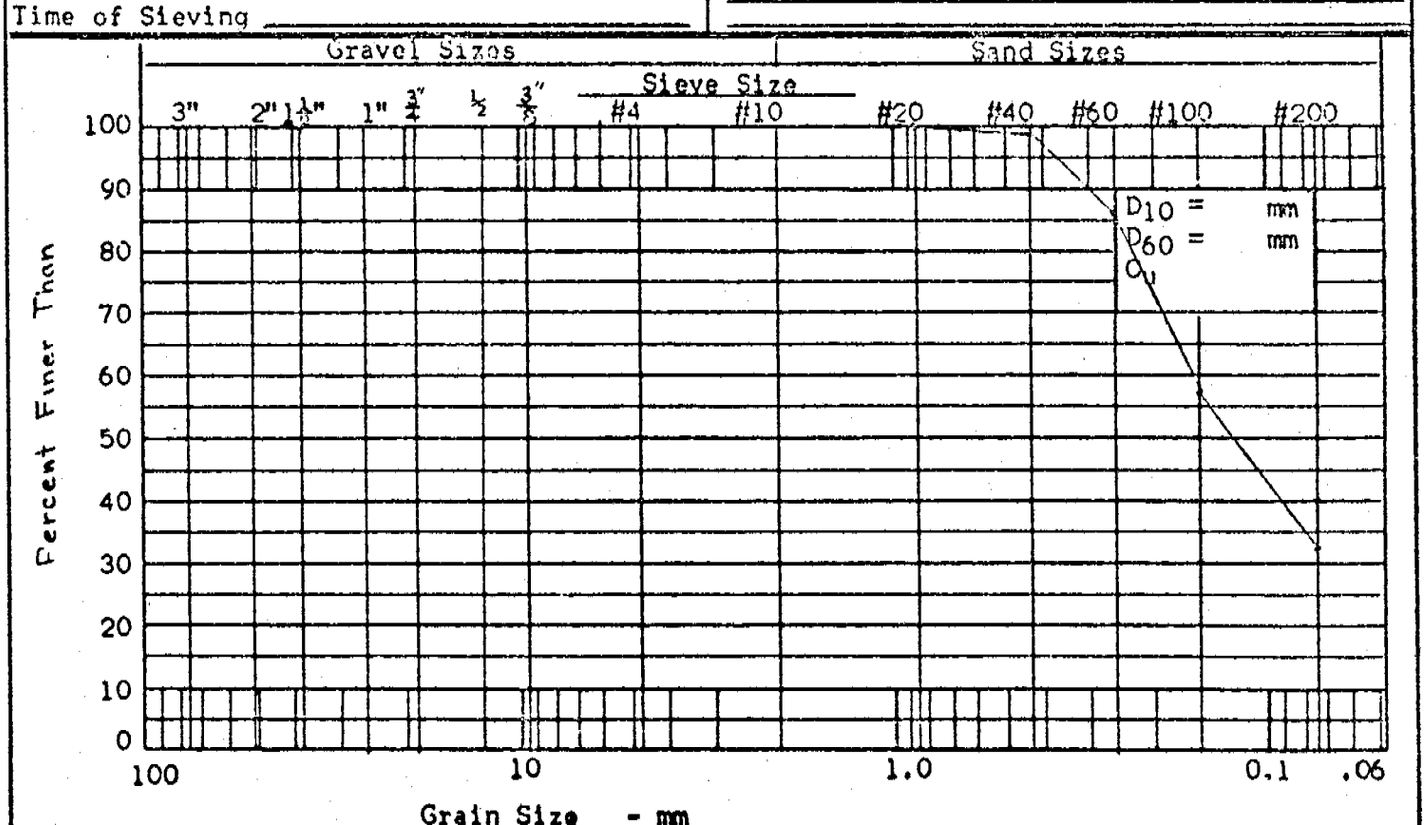
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000				
Tare No.	20	.0331	.840			100%	
Wt. Dry + Tare	40	.0165	.420			99%	
Tare	60	.0097	.250			86%	
Wt. Dry	100	.0059	.149			57%	
	200	.0029	.074			32%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



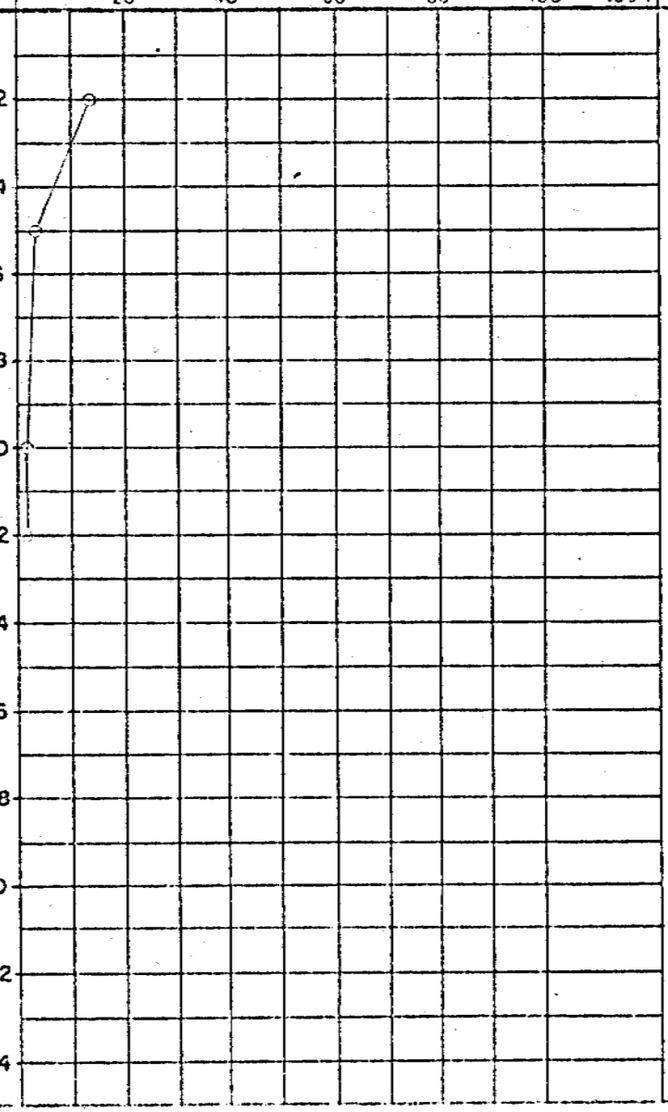
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.M.	FIELD ENG: T.S.	DATE DRILLED: 18/11/72	AIRPHOTO NO:	CHAINAGE: 203+00	OFFSET: ℄
CKD: P.W.T	TECH: A.M.	RIG: AIR	SURFACE DRAINAGE: 6% EAST	VEGETATION: CONIFER	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
487	C	8A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	MUSKEG - PEAT, COARSE FIBROUS	F	Nf							
2					SM	SAND SILTY	UF		32		68				
4															
6					GP	GRAVEL COARSE									DIFFICULT DRILLING
8															
10															ROCKS AND GRAVEL CRUSHED DURING DRILLING
12						SOLID ROCK									
14						END OF HOLE									
16															
18															
20															
22															
24															

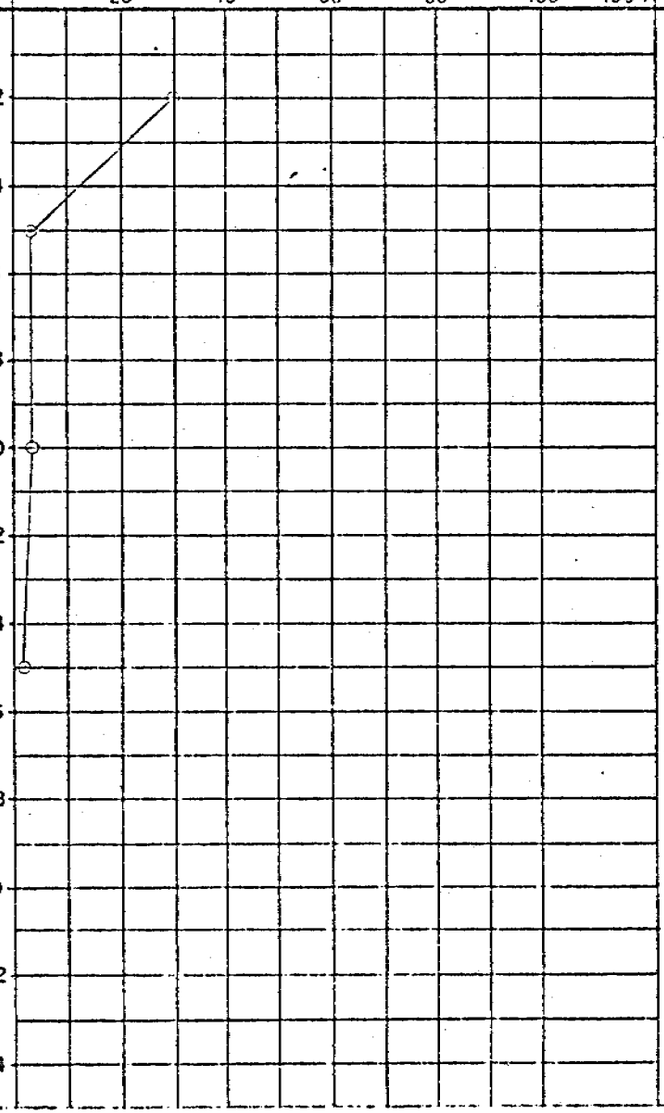


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: T.S.	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 194+00	OFFSET: ℄
CKD: P.W.T.	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: EAST 5%	VEGETATION: CONIFER	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
487	C	7A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					CL	CLAY	F	Nbn							
4					GP	GRAVEL COARSE	UF								DIFFICULT DRILLING
6															
8															BOULDERS, ROCKS AND GRAVEL CRUSHED DURING DRILLING
10															
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel
Location	
Hole	487-C-6A Depth 4' - 5'
Technician	Date

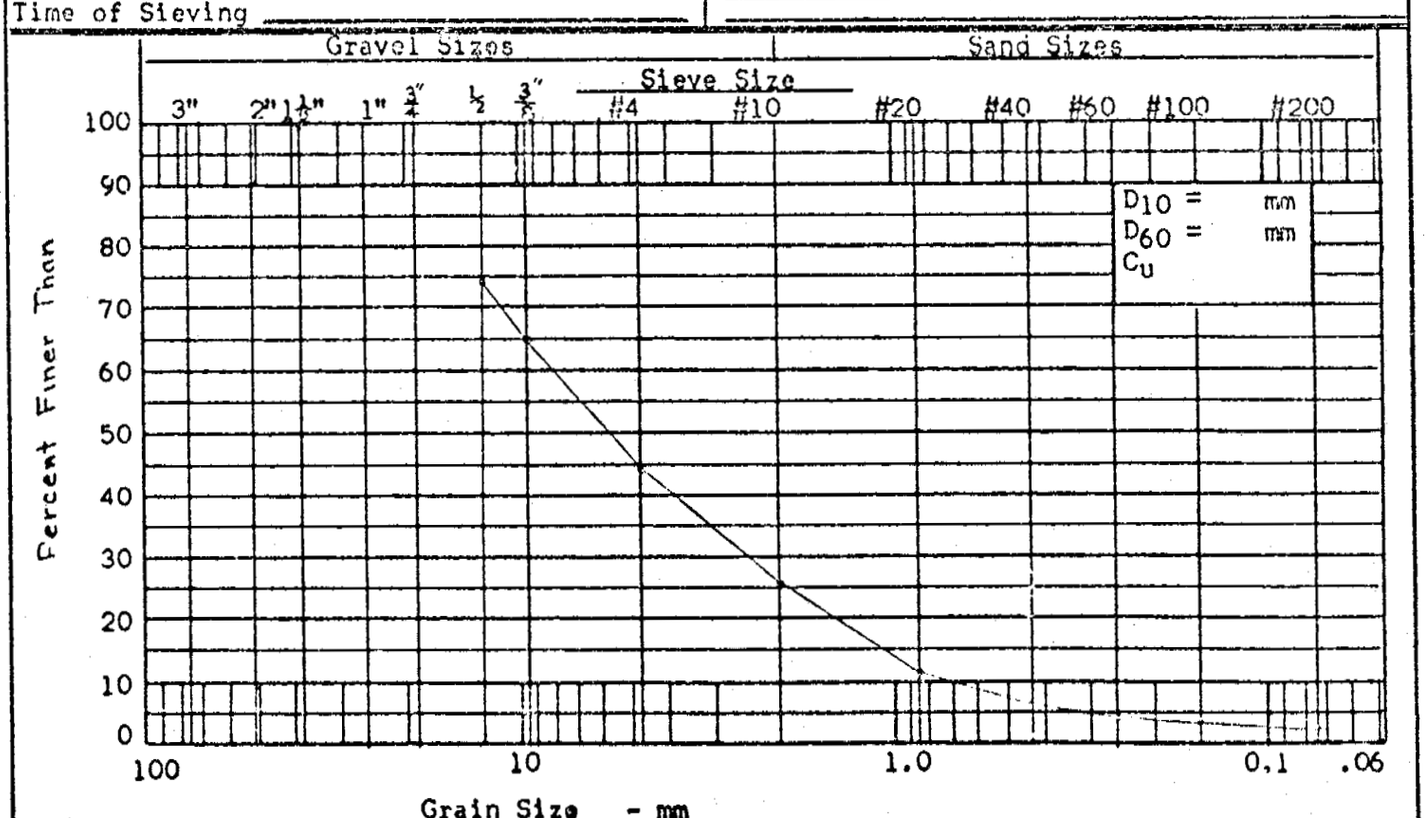
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			74%	
Wt. Dry		3/8	9.52			65%	
	4	.185	4.76			44%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			26%	
Wt. Dry + Tare	20	.0331	.840			12%	
Tare	40	.0165	.420			6%	
Wt. Dry	60	.0097	.250			4%	
	100	.0059	.149			3%	
	200	.0029	.074			2%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



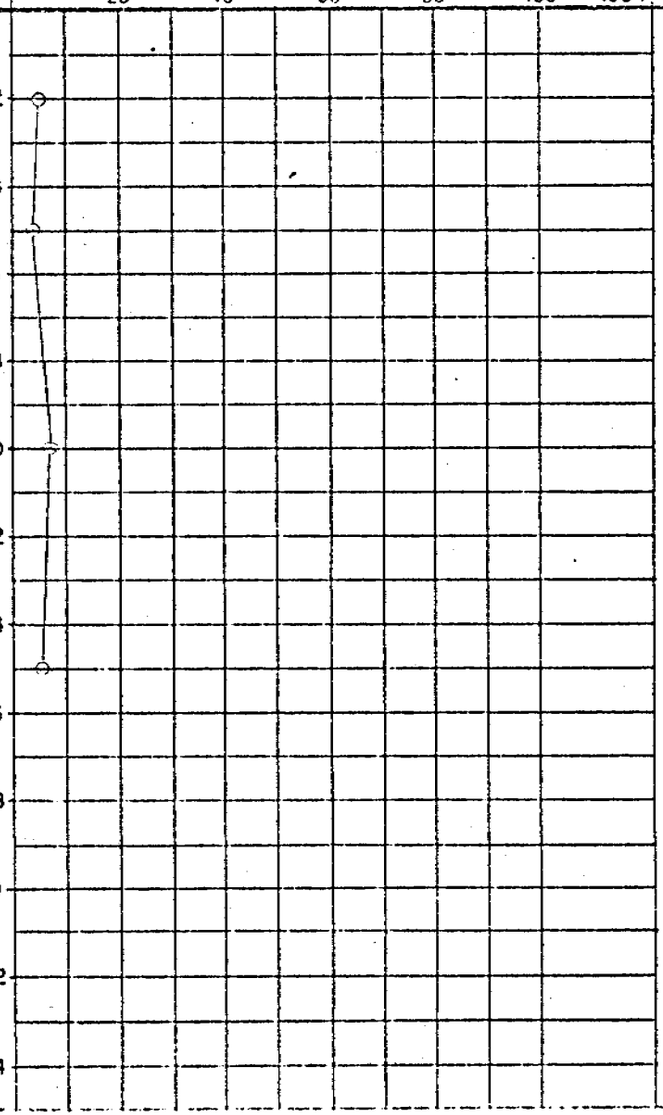
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: [illegible]	DATE DRILLED: 18/4/72	AIRPHOTO NO:	CHAINAGE: 183100	OFFSET: [illegible]
CKD: A.M.T.	TECH: [illegible]	RIG: AIR	SURFACE DRAINAGE: [illegible]	VEGETATION: CONIFER	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
487	C	6A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						GRAVEL	UF								
2					GP										
4						COARSE				2	24	74			
6					To	SAND LAYERS									
8															
10						FINE, CLAYEY									
12					SC										
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 15/4/72	AIRPHOTO NO:	CHAINAGE: 175+00	OFFSET: ℄
CKD: E.J.T	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: EAST 2%	VEGETATION: CON.	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
489	C	5A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						GRAVEL	UF									
2					GP				2							
4									4							
6									6							ROCK & BOULDERS CRUSHED DURING DRILLING
8						COARSE, CLAY			8							
10					GC				10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN AEW	FIELD ENG BM	DATE DRILLED 24/1/73	AIRPHOTO NO:	CHAINAGE: 161+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & HERBS TO 25'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
488	C	278B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20 40 60 80 100 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	MUSKEG, GRANULAR, SOME ROOTS	F										
2					GM	GRAVEL SILTY, SMALL AMOUNT OF SAND, COBBLES AND BOULDERS			2								
4									4								
6							UF		6								
8						COBBLES			8								
10									10								HOLE SLOUGHING 5'-8'
12					GP				12								
14						SAND SOFT			14								SOFT DRILLING NO RETURN PROBABLY SAND
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

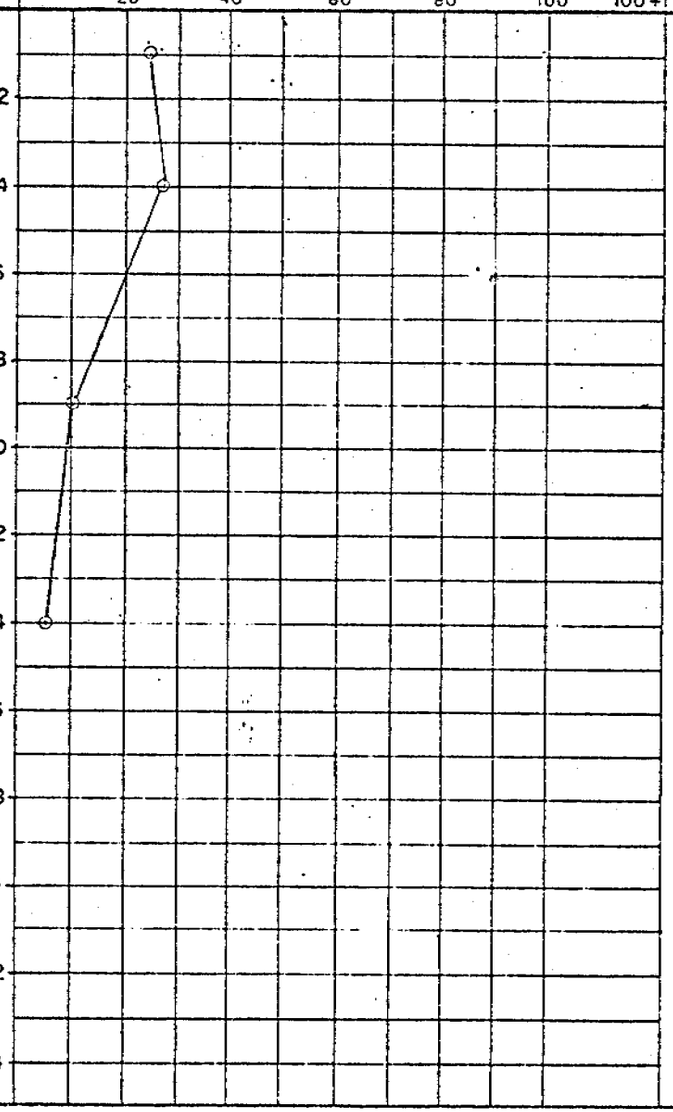
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CKD A.E.W.	FIELD ENG S.M.	DATE DRILLED 24/1/73	AIRPHOTO NO:	CHAINAGE: 150+00	OFFSET: ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
488	C	279B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG GRANULAR		
2					SM	SILT LIGHT BROWN, SANDY	F	
4								
6					GW	GRAVEL SANDY	UF	
8								
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

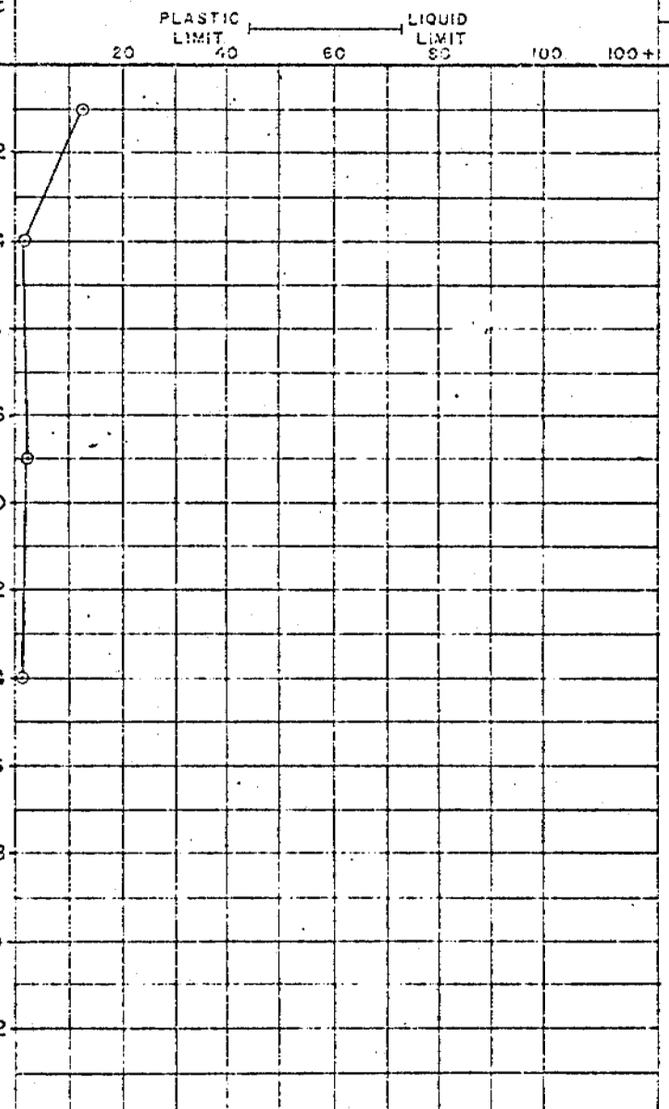
DRN AEW	FIELD ENG WK	DATE DRILLED 24/1/73	AIRPHOTO NO:	CHAINAGE: 139+00	OFFSET: ℄
CKD DCP	TECH DM	RIG AIR	SURFACE DRAINAGE: FAIR — GOOD	VEGETATION: PINE, SPRUCE, BIRCH	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
488	C	282 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	SILT BROWN, SOME FINE SAND	F	
4						GRAVEL	UF	
6								
8					GP	COARSE, SOME SAND COBBLES		
10								
12								
14								
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

SAMPLES ARE MAINLY ROCK CUTTINGS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: AEW | FIELD ENG: WK | DATE DRILLED: 24/11/73 | AIRPHOTO NO: | CHAINAGE: 125+00 | OFFSET: ℄

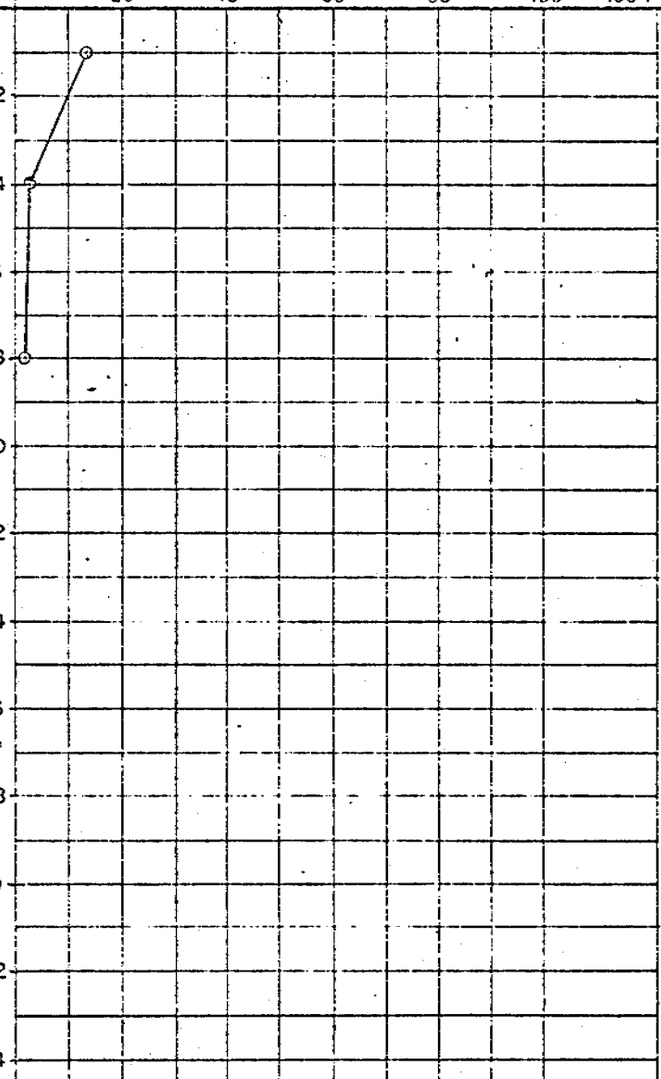
CKD: DGP | TECH: DM | RIG: AIR | SURFACE DRAINAGE: FAIR | VEGETATION: ASPEN, SPRUCE, BIRCH | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
488	C	283 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2						SILT BROWN, SOME FINE SAND	F	
4						GRAVEL COARSE SAND SOME COBBLES POORLY BONDED	UF	
6								
8						END OF HOLE		
10								
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

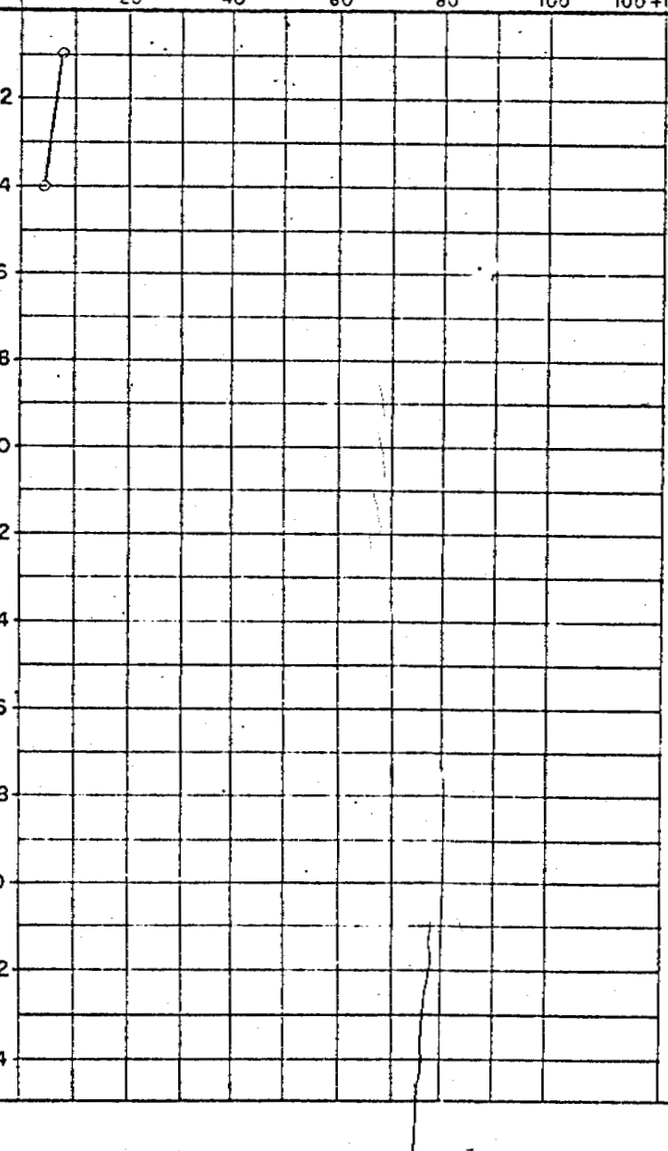
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN AEW	FIELD ENG	DATE DRILLED 2/4/73	AIRPHOTO NO:	CHAINAGE: 105400	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
489	C	288B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					FE	MUSKEG		
2					GW	GRAVEL SANDY, SILTY	F	
4						SOME COBBLES	UF	
6					GP			
8								
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						HOLE SLOUGHING @ 8' - ABANDONED

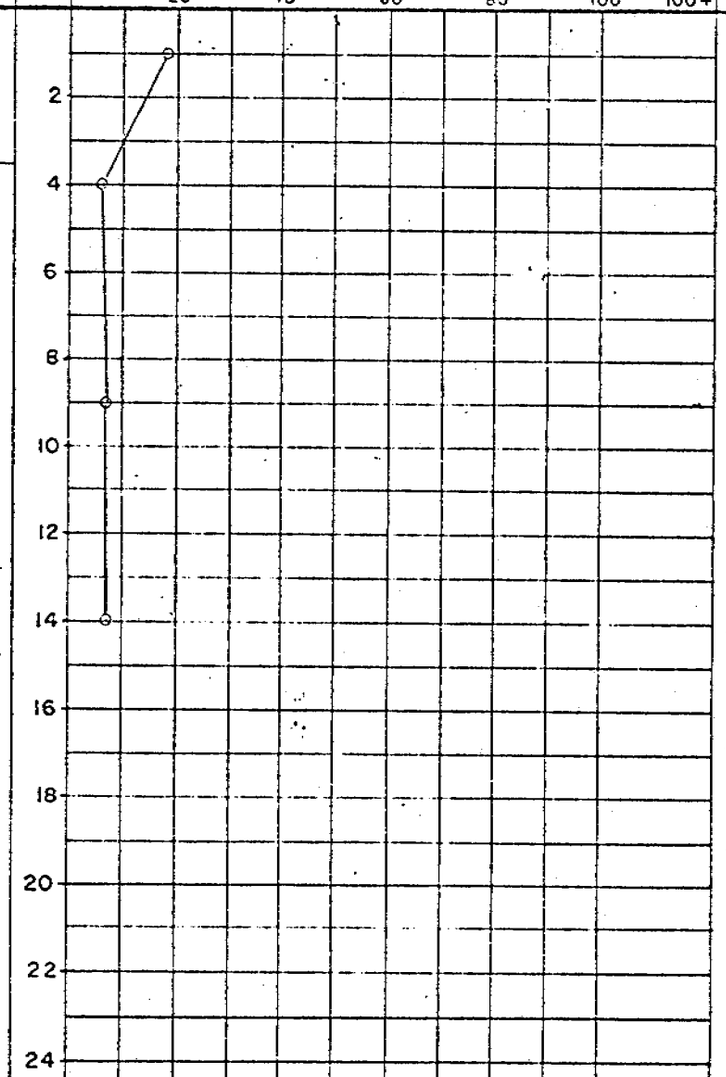
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG BM	DATE DRILLED:	AIRPHOTO NO:	CHAINAGE: 90+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
189	C	289B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PL	MUSKEG GRANULAR		
2					GM	GRAVEL SILTY, SANDY	F	
4						CLAY	UF	
6						GRAVEL & SOME SAND DRY, BROWN, TILL		
8								
10					GC			
12								
14						GREY CLAY TILL		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN AEW	FIELD ENG EM	DATE DRILLED 2/9/73	AIRPHOTO NO:	CHAINAGE: 75+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	S.C.S	NUMBER
489	C	292B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	MOSTLY GRANULAR GRAVEL	F										
2					GM	SILTY, SANDY, SEAMS OF GRAVEL, VERY HARD	UF		2								
4									4								
6					GP				6								
8									8								
10						END OF HOLE			10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

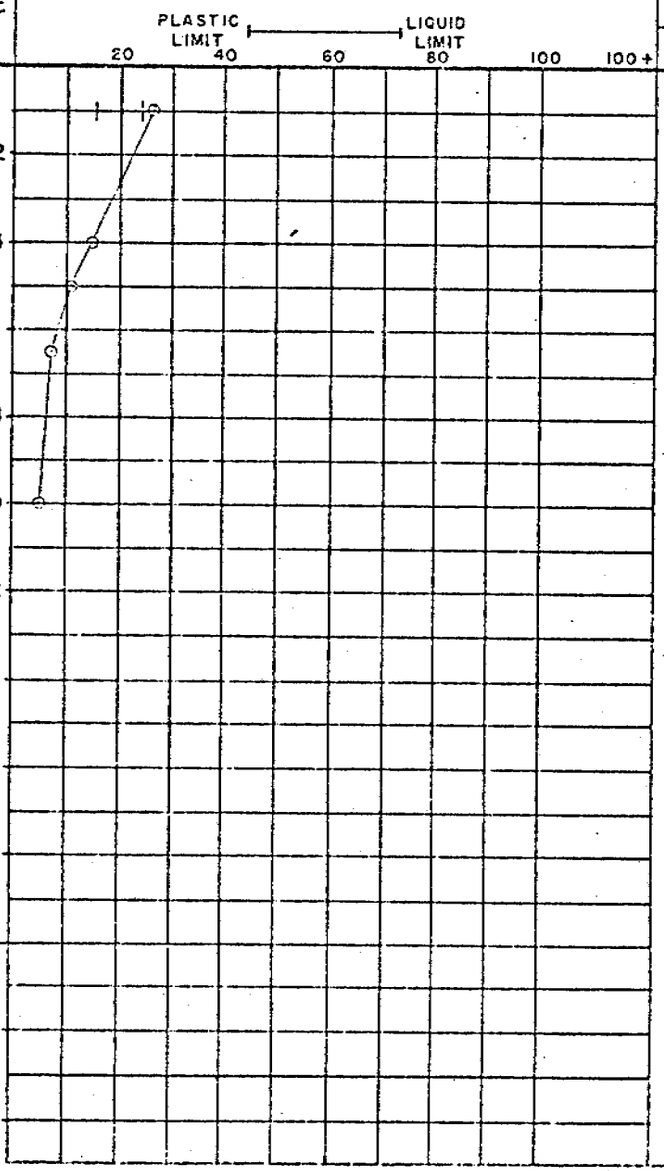
DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 60+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CON. & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
490	C	1B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
2					ML	SILT SANDY, LOW PLASTIC	F UF	Nbn							
4					SC	SAND GRAVELLY, CLAYEY COBBLES, BOULDERS									
6															
8					SP	SAND GRAVEL, SILTY									
10															
12															MATERIAL SLOUGHING
14						END OF HOLE									
16															
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey silty gravel
Location	
Hole	490-C-2B Depth 4' - 5'
Technician	Date

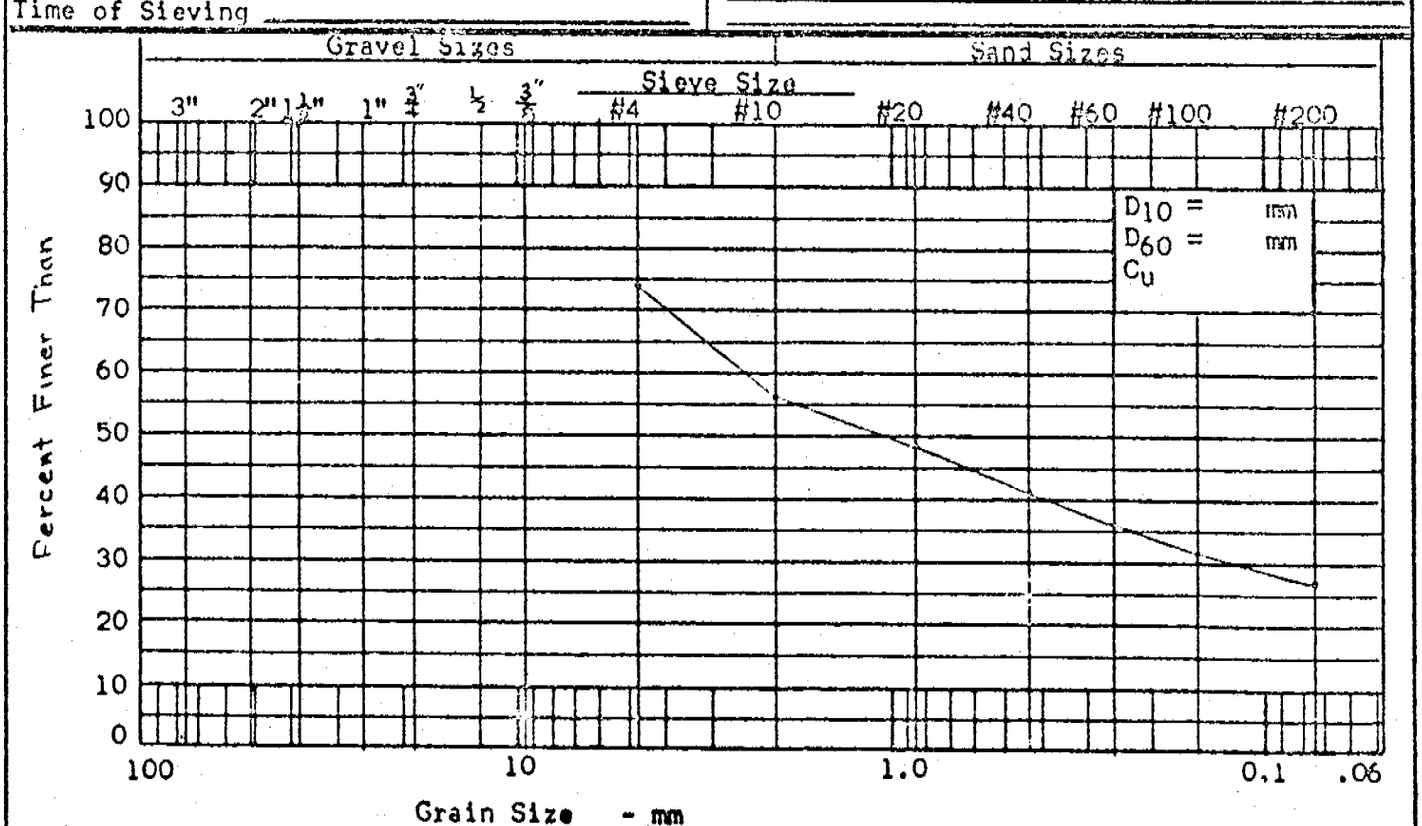
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			74%	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			56%	
Tare No.	20	.0331	.840			48%	
Wt. Dry + Tare	40	.0165	.420			41%	
Tare	60	.0097	.250			36%	
Wt. Dry	100	.0059	.149			32%	
	200	.0029	.074			27%	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: M.M.	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 48+00	OFFSET: ℄	TEST HOLE
CKD: [illegible]	TECH: D.M.	RIG:	SURFACE DRAINAGE:	VEGETATION:	ELEV:	

MILE	B,C,S	NUMBER
490	C	28

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	PEAT - ORGANIC										
					SM	SAND SILTY	F	Nf								
2									2							
					GM	GRAVEL CLAYEY, WET, SILTY	UF									
4									4	27		47	26			
6									6							
					SC	SAND CLAYEY, STONES TO 3/4" FEW BOULDERS OR COBBLES GRAVEL LAYERS										
8									8							
10						END OF HOLE			10							DIFFICULT DRILLING DUE TO BOULDERS
12									12							
14									14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravelly sand
Location
Hole 490-C-4A Depth 5'
Technician Date

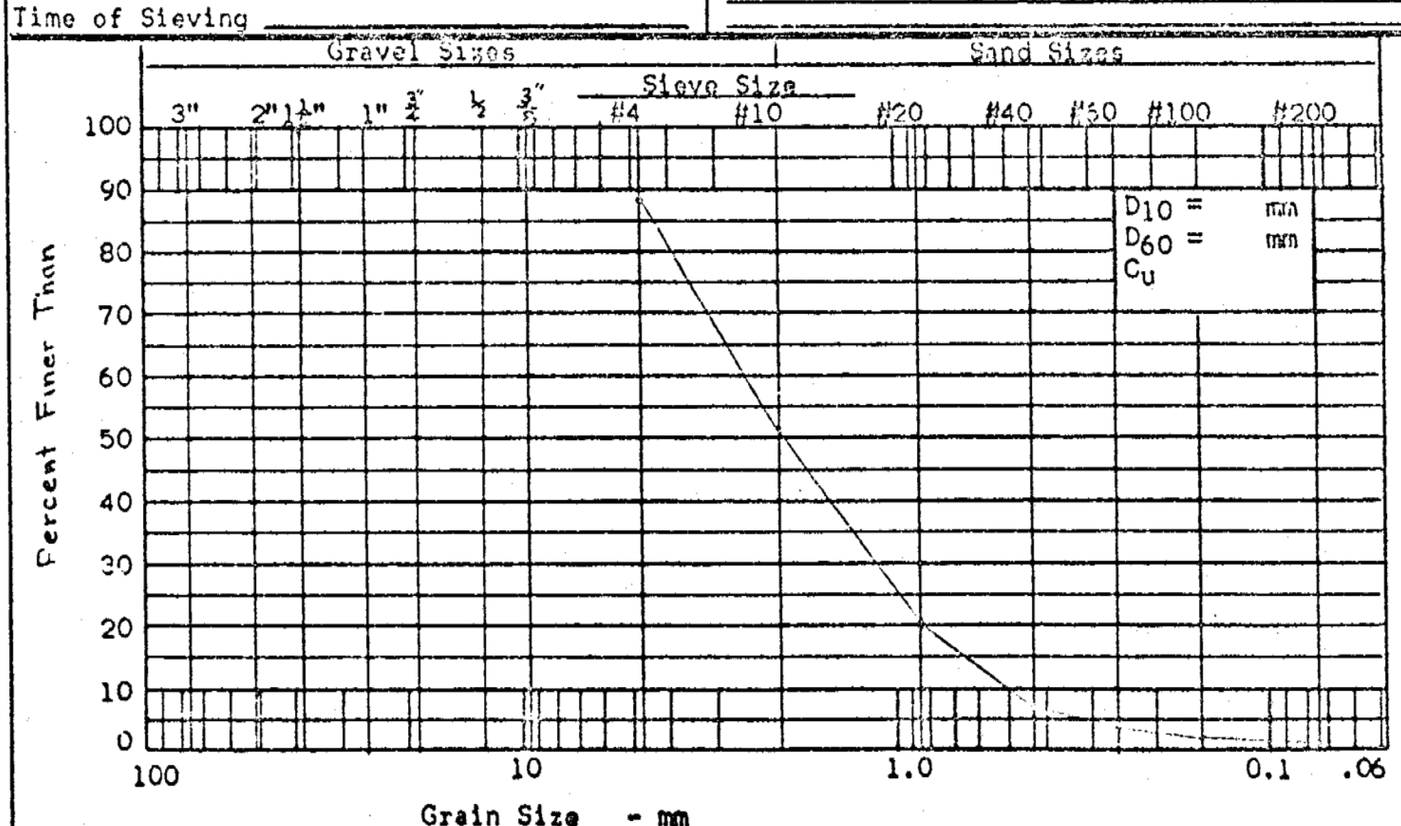
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			88%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			51%	
Wt. Dry + Tare	20	.0331	.840			20%	
Tare	40	.0165	.420			7%	
Wt. Dry	60	.0097	.250			4%	
	100	.0059	.149			2%	
	200	.0029	.074			1%	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand
Location
Hole 490-C-4A Depth 10'
Technician Date Nov. 15/72

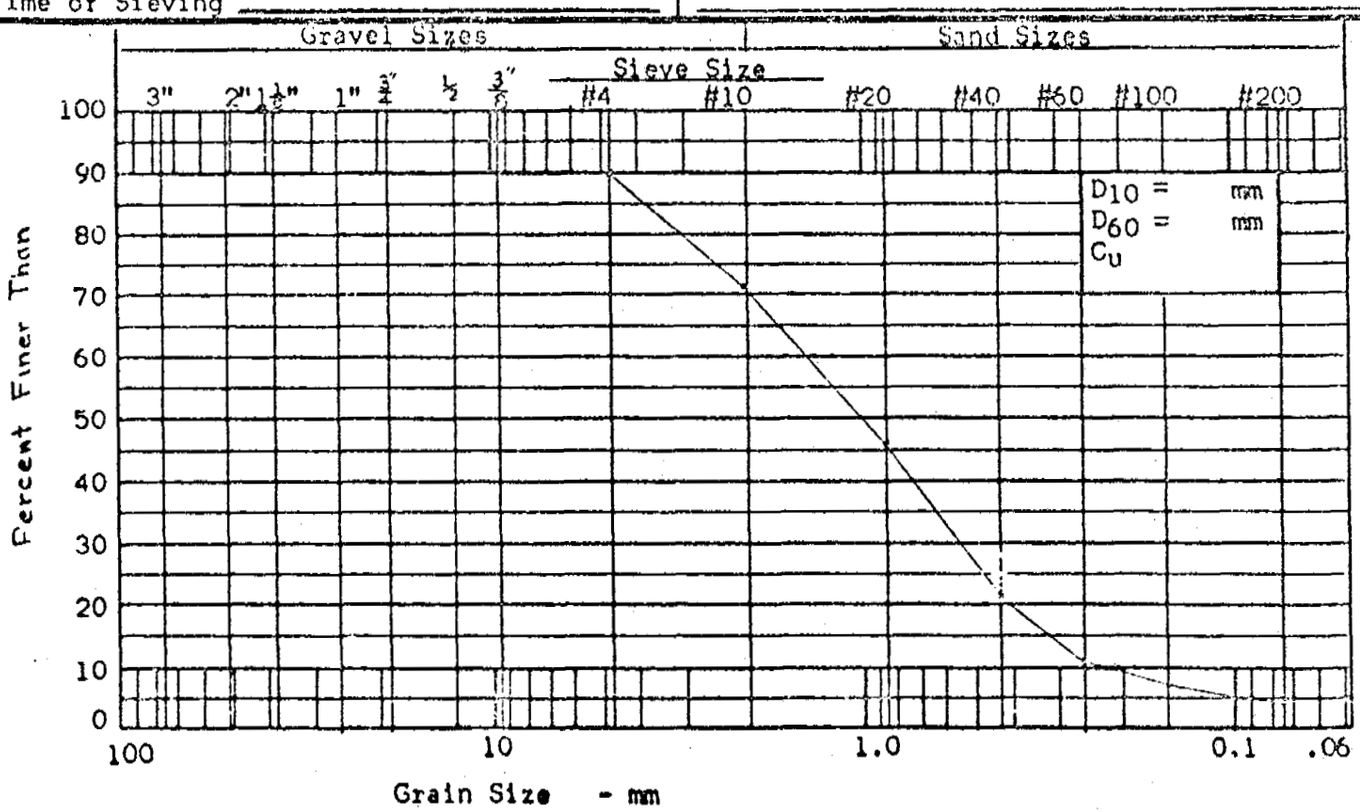
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			90%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			71%	
Tare No.	20	.0331	.840			46%	
Wt. Dry + Tare	40	.0165	.420			21%	
Tare	60	.0097	.250			11%	
Wt. Dry	100	.0059	.149			7%	
	200	.0029	.074			4%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

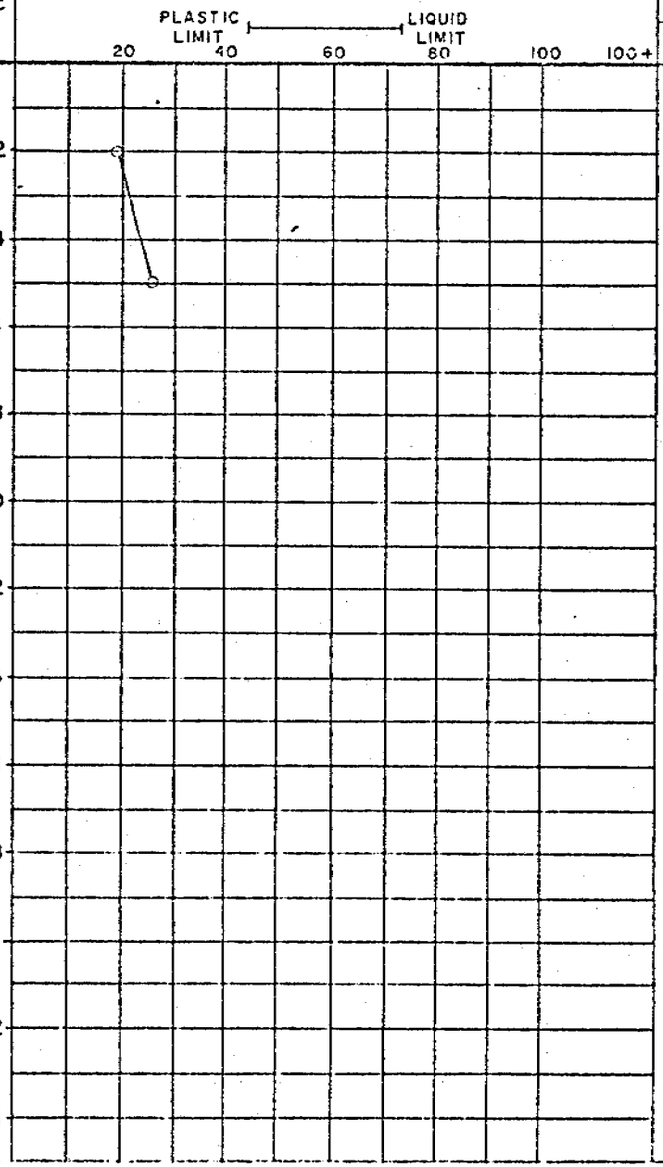
DWN: A.E.W	FIELD ENG:	DATE DRILLED: 16/11/73	AIRPHOTO NO:	CHAINAGE: 36+00	OFFSET: ℄
CKD: R.W.T	TECH: D.M.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CON. & POPLAR	ELEV:

TEST HOLE

MILE	2,C,S	NUMBER
490	C	4A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SP	SAND GRAVELLY	UF	
4								
6					GW	SAND WELL GRADED COARSER		
8								
10								
12						BOTTOM OF HOLE		
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
	1	87	12			BOULDERS AND STONES CRUSHED DURING DRILLING
	4	86	10			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravelly sand
Location	
Hole	490-C-3A Depth 10.5'
Technician	Date

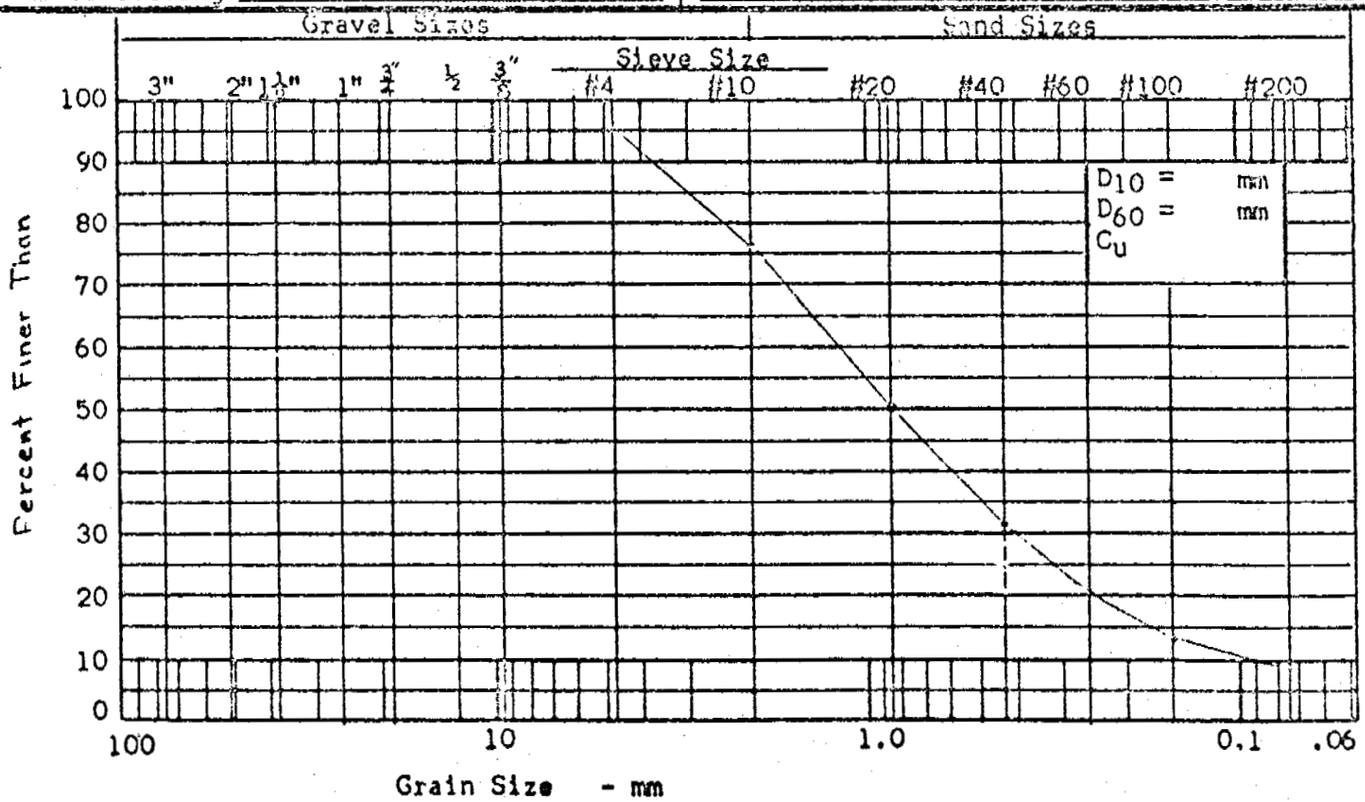
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10				
Wt. Dry		1/2	12.70				
		3/8	9.52				
	4	.185	4.76			95.4%	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			76.2%	
Wt. Dry + Tare	20	.0331	.840			50.2%	
Tare	40	.0165	.420			31.0%	
Wt. Dry	60	.0097	.250			20.7%	
	100	.0059	.149			13.4%	
	200	.0029	.074			9.1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



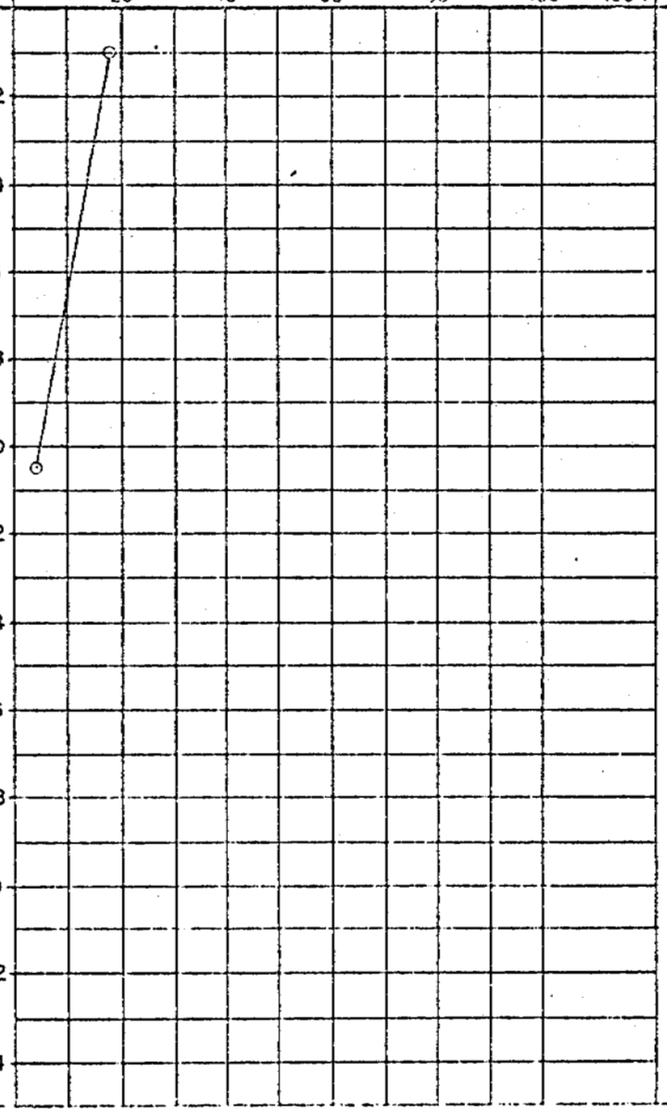
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: S & S	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 24+00	OFFSET: ℄
CKD: R.W.T	TECH: S.M. & W.K.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CON + POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
490	C	3A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F	Nf							
2					ML	SILTY, SAND LENSES	UF								
4															
6						GRAVEL									
8					GP	SANDY									BOULDERS CRUSHED DURING DRILLING
10										9	67	24			
12						SAND GRAVELLY BOTTOM OF HOLE									
14															
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty sand
Location	
Hole	491-C-1A Depth 13'
Technician	Date

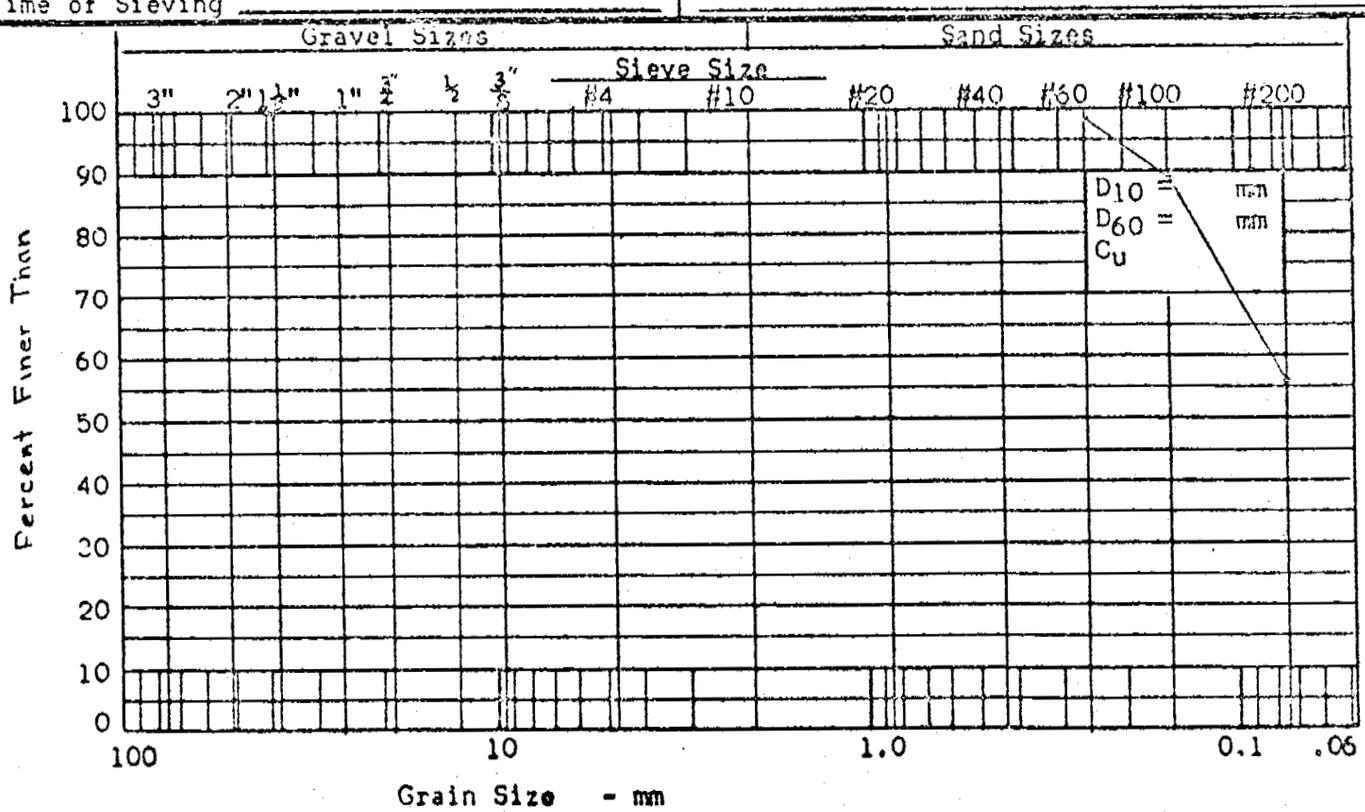
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76				
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000				
Wt. Dry + Tare	20	.0331	.840				
Tare	40	.0165	.420				
Wt. Dry	60	.0097	.250			98.5%	
	100	.0059	.149			89.7%	
	200	.0029	.074			55.9%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

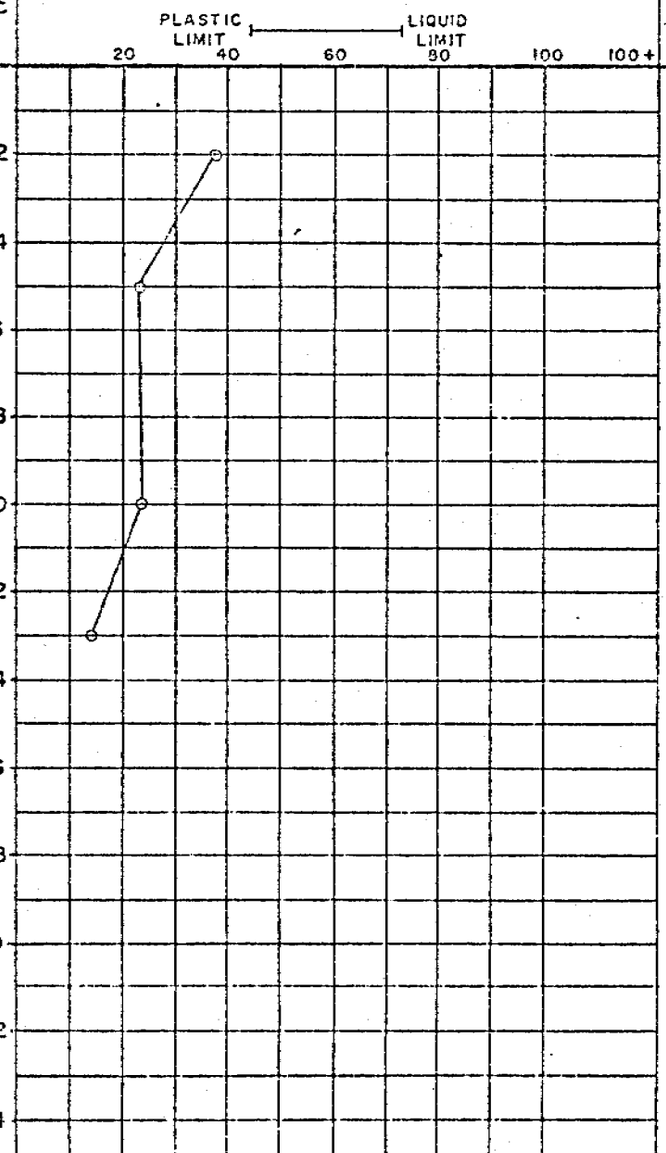
DWN: A.E.W	FIELD ENG:	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 0+00 ALTERNATE A	OFFSET: 55' E ℄
CKD: R.W.T.	TECH: D.M. & W.K.	RIG: AIR	SURFACE DRAINAGE: GOOD TO FAIR	VEGETATION: CON. & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
491	C	1A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY	F	Nbn
2							UF	
4								
6					CL	CLAY SILTY		
8								
10					SM	SAND SILTY, LITTLE CLAY		
12								
14						BOTTOM OF HOLE 1		
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
56		44				

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand , some gravel
Location	
Hole	49I-C-2X Depth 10'
Technician	Date

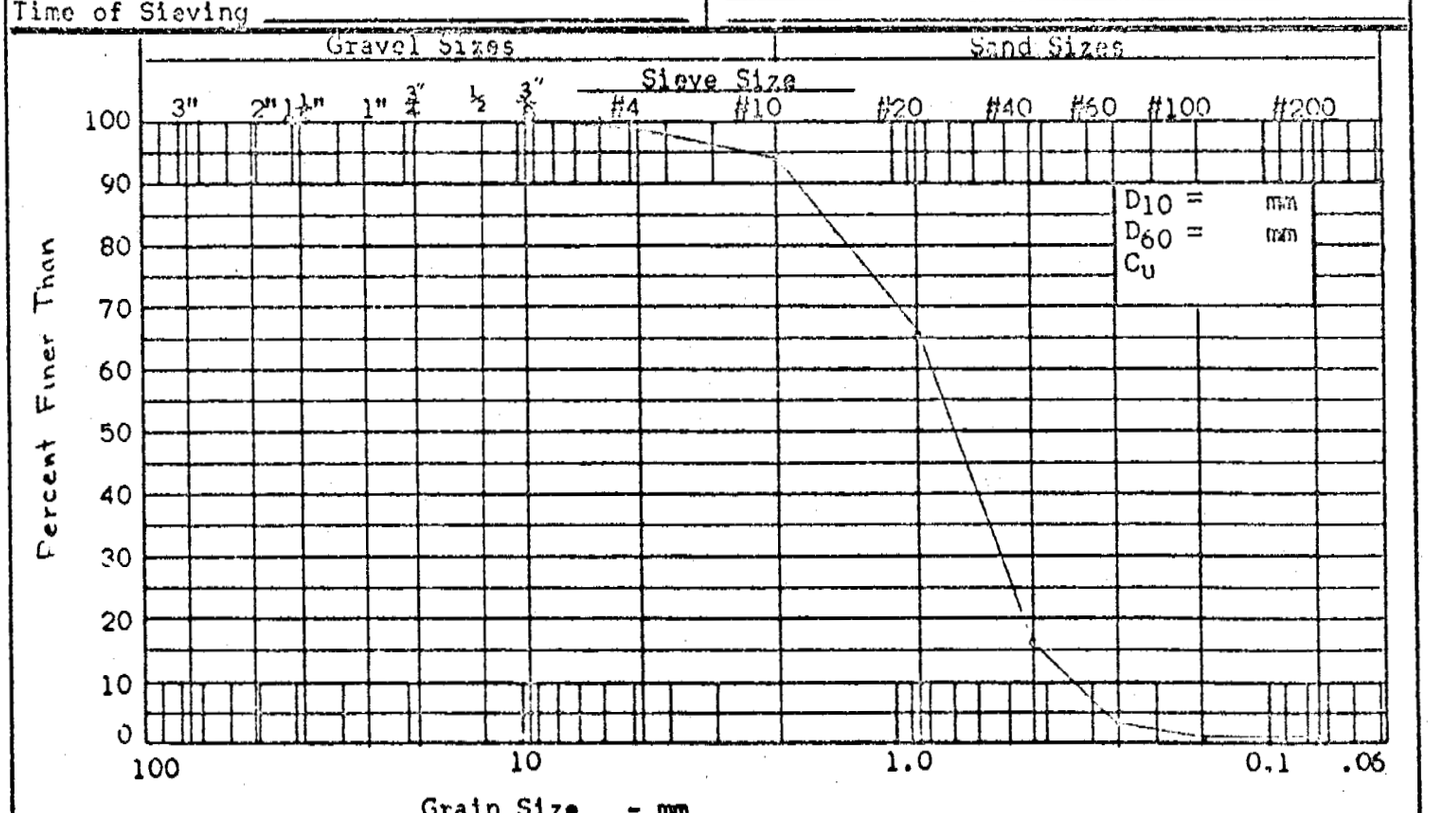
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			88%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			76%	
Tare No.	20	.0331	.840			58%	
Wt. Dry + Tare	40	.0165	.420			29%	
Tare	60	.0097	.250			13%	
Wt. Dry	100	.0059	.149			4%	
	200	.0029	.074			1%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



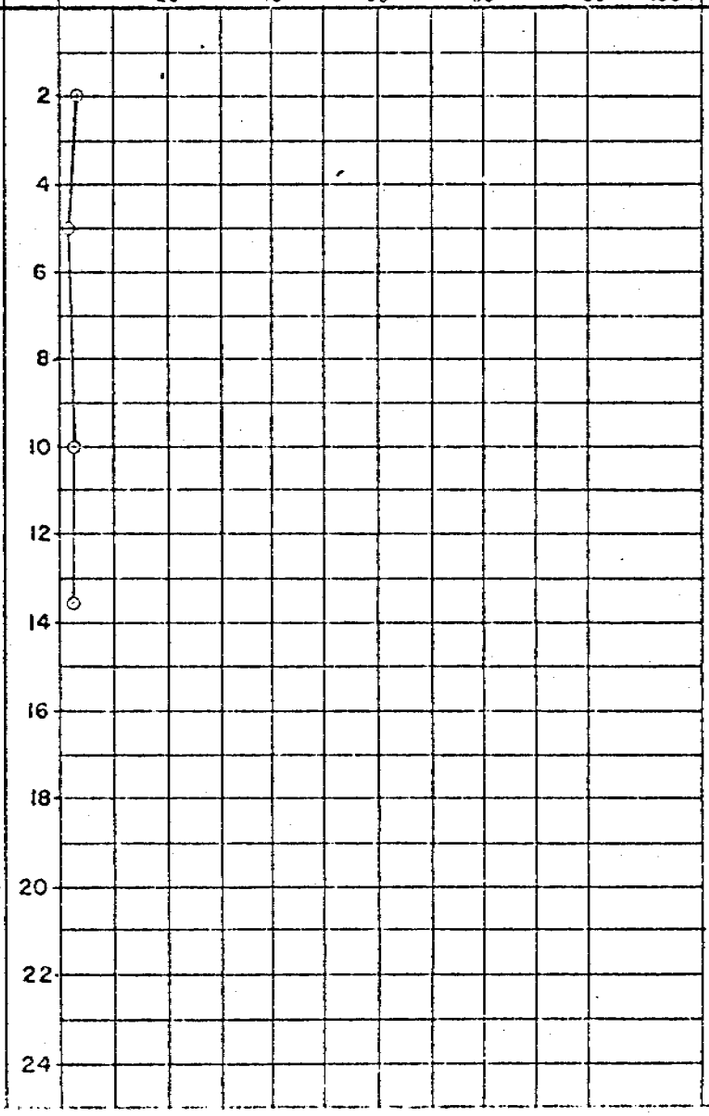
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG:	DATE DRILLED: 16/11/72	AIRPHOTO NO:	CHAINAGE: 12700 ALT. [illegible]	OFFSET: 55' E ℄
CKD: R.W.T	TECH: G.M. & W.K.	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CON + POPLAR	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
491	C	2A

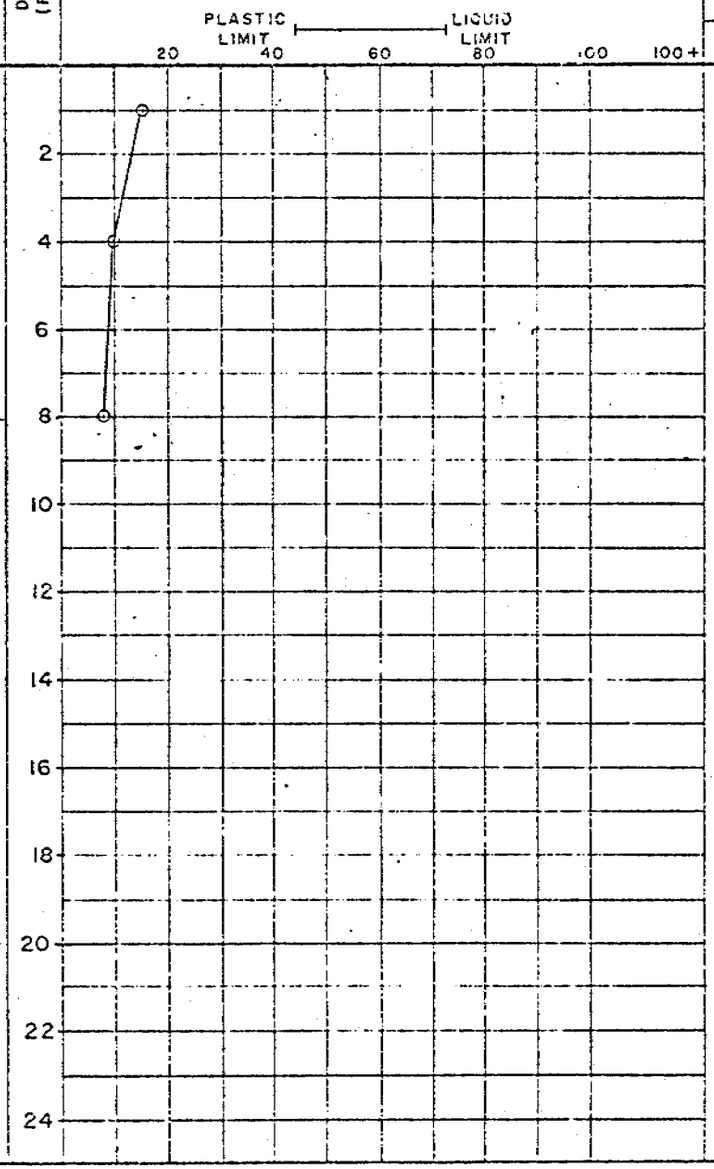
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SW	SAND WELL GRADED ROCKS & STONES	F / UF	Nf							
4															
6					SW	SAND GRAVELLY									
8															
10															
12										1	75	24			
14						BOTTOM OF HOLE									
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN AEW	FIELD ENG NWC	DATE DRILLED 25/1/73	AIRPHOTO NO:	CHAINAGE: 16+75	OFFSET: Q	TEST HOLE
CKD DGP	TECH DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JACK PINE & SPRUCE	ELEV:	MILE 491 / S,C,S C / NUMBER 238B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						DENT MOSS.			
2					GM	GRAVEL SILTY, SAND	F		
4									
6									
8					GP	SAND SOME GRAVEL	UF		
10						END OF HOLE			
12									
14									
16									
18									
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DRAWN E.W.	FIELD ENG	DATE DRILLED 25/1/73	AIRPHOTO NO:	CHAINAGE: 25+75	OFFSET: ℄
CKD D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SCRUB SPRUCE TO 15	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
491	C	299 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG	F								
2															
4						SILT									
6					ML	CLAYEY, NO ROCK									
8															
10							UF								
12					SM	FINE SAND, A FEW PEBBLES									
14															
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

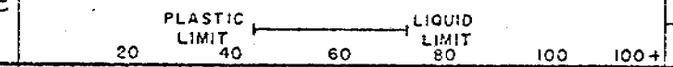
20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG UM	DATE DRILLED 29/11/73	AIRPHOTO NO:	CHAINAGE: 35+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & ASPEN TO 35'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
491	C	300B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG - LABRADOR, MOSS	F									
2						SILT BROWN, SANDY		Vx	2							
4		P						ICE INCLUSIONS	4					112.3	84.5	
6					SM				6							
8									8							
10						FINE, SANDY, SMALL AMOUNT OF GRAVEL SIZE ROCKS			10							
12								Vx	12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DRN AFW	FIELD ENG BM	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 38+40	OFFSET: 1700' E OF ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
491	E	301B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG, GRANULAR	F									
2						GRAVEL			2							
								Nbn								
4						BROWN, CLAYEY TILL			4							
6						BOULDERS & COBBLES			6							
8					GC				8							
10									10							
12									12							
								Nbn								
14						GREY CLAY TILL			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS

EXPLORATORY HOLE SOUTH OF BLACKWATER RIVER

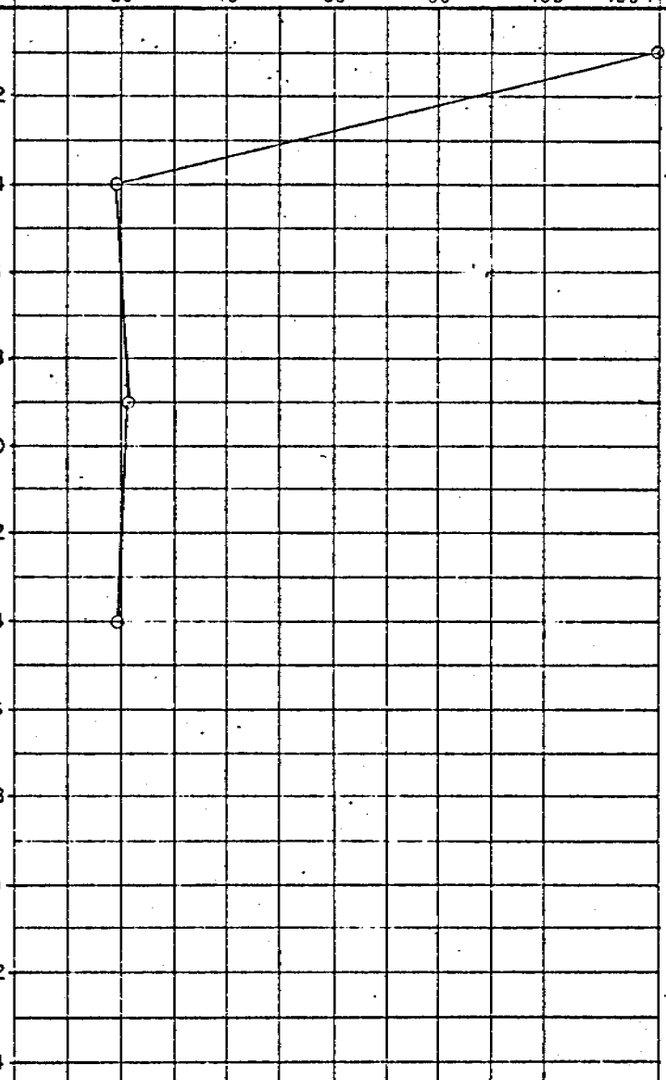
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 25/11/73	AIRPHOTO NO:	CHAINAGE: 38+40	OFFSET: 1200' E OF ℄
CKD: D6P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
491	E	302B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					Pt	MUSKEG COARSE, FIBROUS. SOME ROOTS	F	Vh							EXPLORATORY HOLE SOUTH OF BLACKWATER RIVER
2–4						SILT									
4–6		P			SM	BROWN, FINE SANDY							114.7	96.2	
6–8															
8–10															
10–14					SM	SAND FINE, SOME SILT WITH A SMALL AMOUNT OF GRAVEL SIZE ROCKS		Vh							
14–24						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

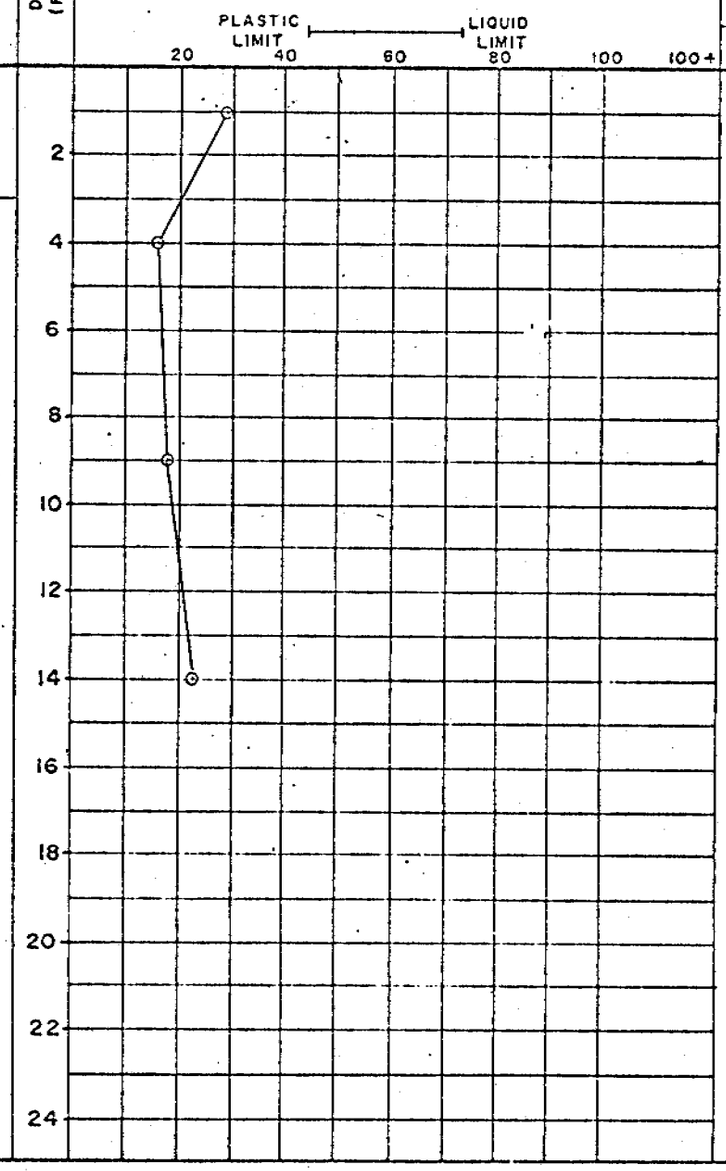
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE: 38+40.	OFFSET: 1300' E OF ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30'	ELEV.

TEST HOLE

MILE	S,C,S	NUMBER
491	E	303B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	NUSKEG GRANULAR		
2						SILT	F	
					SM	BROWN, SANDY, A FEW GRAVEL SIZE ROCKS		
4							UF	
6								
8						VERY SOFT, SANDY BROWN, OCCASIONAL SMALL ROCKS		
10								
12								
14					GM	SANDY, GRAVELLY		
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
							EXPLORATORY HOLE SOUTH OF BLACKWATER RIVER

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

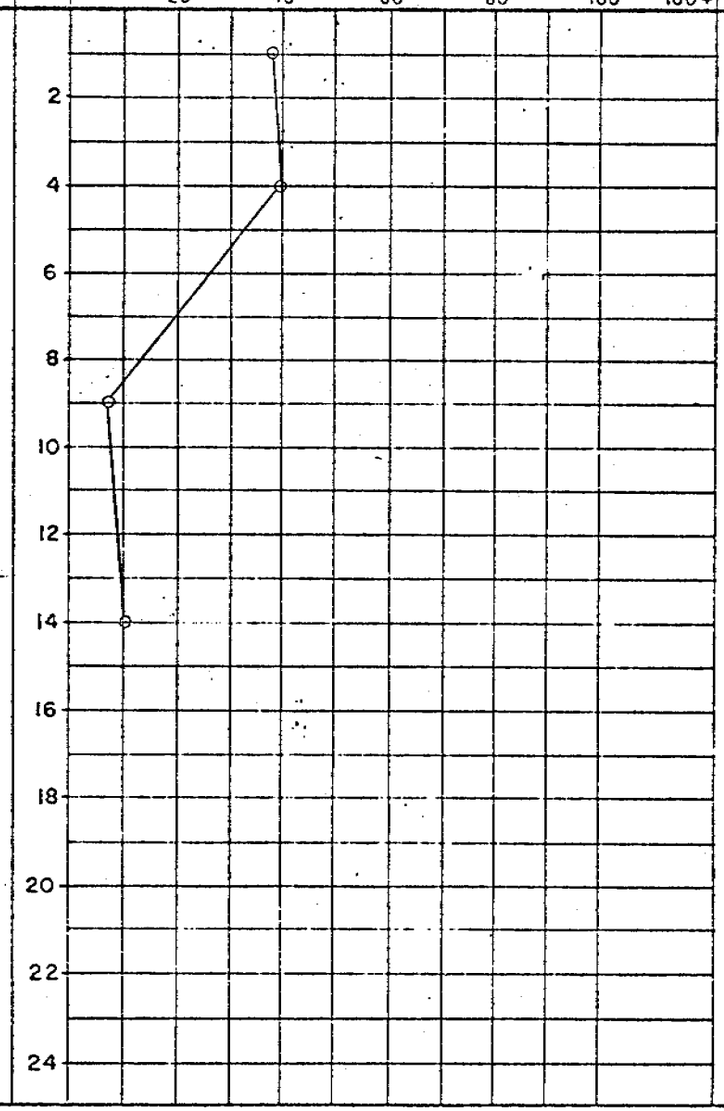
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE: 38+40	OFFSET 800' E OF ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
491	E	304B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG, GRANULAR	F								EXPLORATORY HOLE SOUTH OF BLACKWATER RIVER
2					CL	CLAY SILTY, BROWN		Vr							
4					ML	SILT FINE, TRACE OF SAND									
6					GW	GRAVEL SANDY, COBBLES AND BOULDERS									
8															
10															
12								Nbn							
14					GC	CLAYEY TILL, BROWN	UF								
16						END OF HOLE									
18															
20															
22															
24															

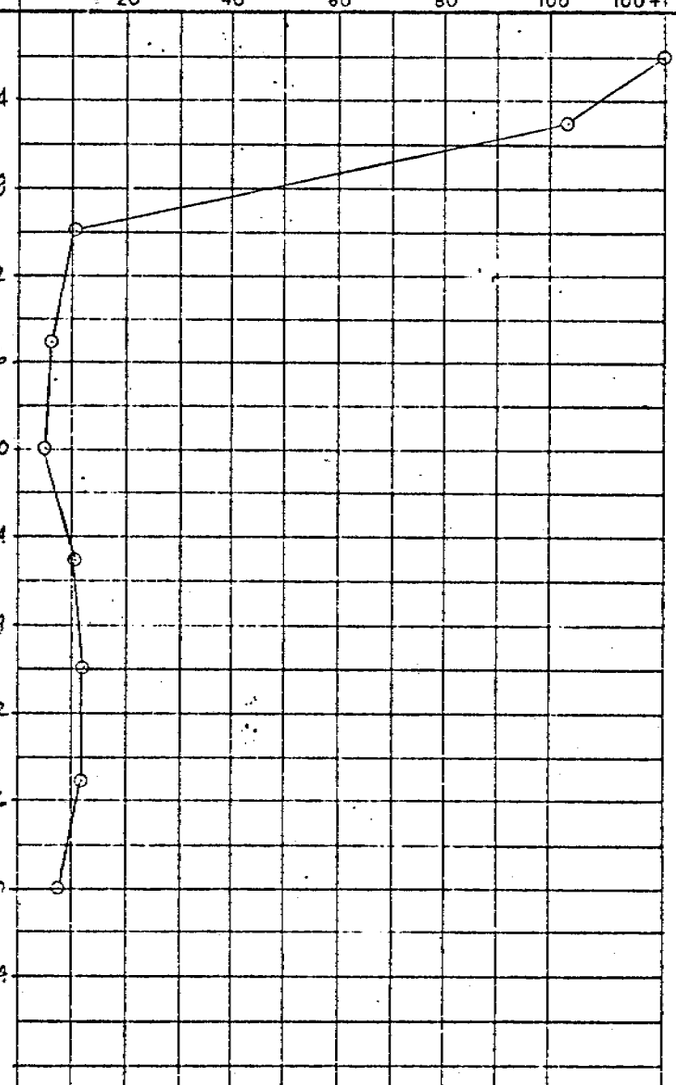


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/1/73	AIRPHOTO NO:	CHAINAGE: 44+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 40' CONIFERS	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
491	S	180A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC SANDY	F	Vr								
4					SM	SAND FINE, SILTY		ICE PARTICLES	4							
8						GRAVEL			8							
12						WELL GRADED, SANDY COBBLES			12							
16					GW			Nbn	16							
20						COARSE, HARD			20							
24						CLAY SEAM			24							
		P		92 BLS		COARSE, WITH CLAY COBBLES, CLAY TILL										
28						CLAY			28							
32					CL	SANDY WITH RANDOM COBBLES AND ISOLATED BOULDERS		Nbn	32							
36		P		73 BLS					36							
40									40							
44						END OF HOLE			44							

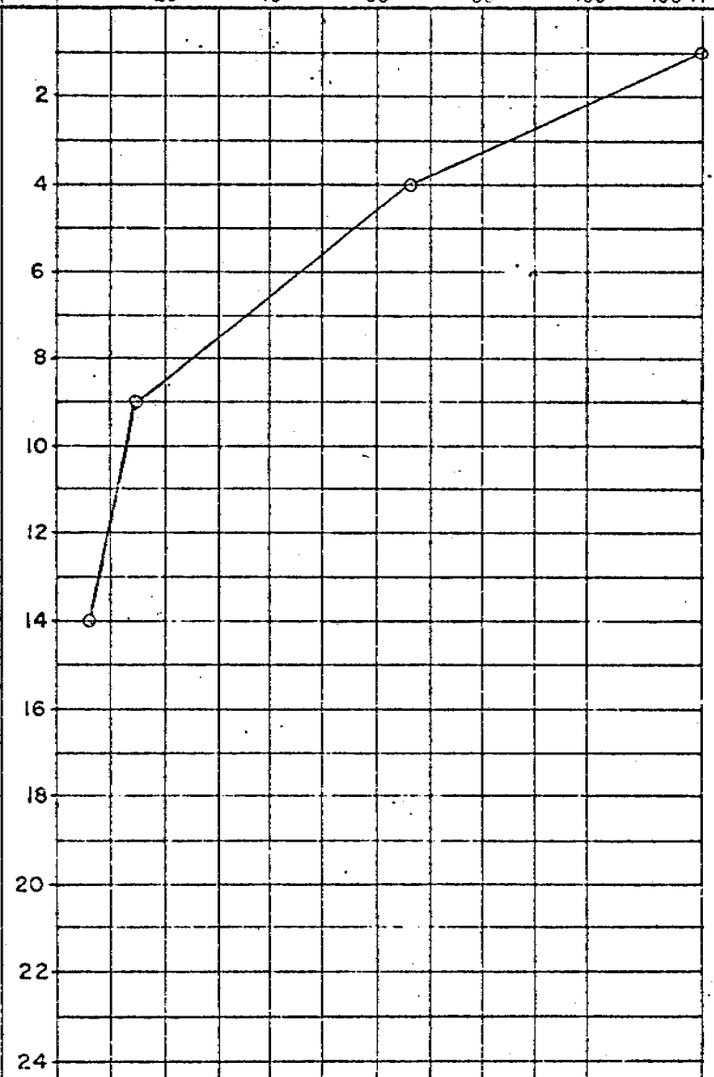


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 26/1/73	AIRPHOTO NO:	CHAINAGE: 44+00	OFFSET: ℄
CKD: D G P	TECH: D M	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
491	C	305 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	MUSKEG, GRANULAR, SOME ROOTS	F								
2						SILT		Vr							
4					ML	BROWN		Visible ICE							
6															
8								Vr							
10					GM	GRAVEL									
12						SANDY, SILTY COBBLES AND BOULDERS WATER SEEPING INTO HOLE @ ≈13'		Nbn							
14					GP		UF								
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: D.M	DATE DRILLED: 23/1/73	AIRPHOTO NO:	CHAINAGE: 49+50	OFFSET:	TEST HOLE
CKD: D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 10' SAPLINGS	ELEV:	MILE: 491 B,C,S: S NUMBER: 175A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SAND FINE	F	
4						GRAVEL	UF	
8					GW	FINE, CHANGING TO COARSE		
12								
16						SAND		
20					SP	FINE		
24						GRAVEL		
28					GP	FINE, SANDY		
32								
36					GC	SOME CLAY		
40								
44						END OF HOLE		

DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) — PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4								
8								
12								
16								
20								
24								
28								
32								
36								
40								
44								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG TS	DATE DRILLED 25/1/73	AIRPHOTO NO:	CHAINAGE: 51+30	OFFSET:
CKD DSP	TECH DM	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NONE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
491	S	178A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						GRAVEL	F		
4						COARSE ROCKS & BOULDERS, SOME COBBLES	UF		
8									FINE CUTTINGS IN ALL SAMPLES 0'-20'
12									
16					GP				
20		P		17 BLS.					DIFFICULT TO DO PENETRATION TESTS DUE TO FREEZING
24						COARSE, CLAY MIXTURE FINE SILTY SEAMS			
28									
32						FINER, SILTY CLAY STRINGERS			CLAY WASHES AWAY
36				80 BLS					
40						END OF HOLE			
44									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
4						
8						
12						
16						
20						
24						
28						
32						
36						
40						
44						

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 26/1/73	AIRPHOTO NO:	CHAINAGE: ALTERNATE #2 (0+00)	OFFSET: 1200' E of ℄
CKD: DGP	TECH: DM	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 30' CONIFER	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
491	S	181A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						PEAT ORGANIC SAND	F	Vr	
4						GRAVEL	UF		
8		P		44 BLS.					
12									
16									
20					GW	WELL GRADED, WITH BOULDERS AND COBBLES OFTEN LOOSE, VERY DRY SLOUGHING			
24									
28									
32									
36									
40									RIG SKIDDED 30' WEST & DRILLING DISCONTINUED
44						END OF HOLE			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D M	DATE DRILLED 25/1/73	AIRPHOTO NO:	CHAINAGE: ALTERNATE #2 (3+00)	OFFSET 1200' E of ℄
CKD D G P	TECH D M	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NONE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
491	S	179 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
4						GRAVEL	F	
8				60+ BLS		MANY COBBLES	UF	
12						COARSE TO FINE		
16				79 BLS	GP			
20								
24								
28								
32						END OF HOLE		
36								
40								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4							
8							
12							
16							
20							
24							
28							
32							
36							
40							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W	FIELD ENG: DM	DATE DRILLED: 26/1/73	AIRPHOTO NO:	CHAINAGE: ALTERNATE #2 (6+30)	OFFSET: 1200' E of ℄
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
491	S	182A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	F	
					SP	SAND		
4						GRAVEL	UF	
		P		78 BLS	GP			
8								
12								
16						SANDY, COARSE		
20								
24								
28					GW			
32								
36						END OF HOLE		
40								

DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT 20 40 60 80 100 100+	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4								
8								
12								
16								
20								
24								
28								
32								
36								
40								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: D.M.	DATE DRILLED: 23/1/73	AIRPHOTO NO:	CHAINAGE: 49+50	OFFSET:
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
492	S	175A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SAND FINE											
4					GW	GRAVEL			4								
8						FINE, CHANGING TO COARSE @ 5'			8								
12						WATER TABLE @ 15'			12								
16						SAND			16								
20					SP	FINE TO MEDIUM			20								
24					GP	GRAVEL			24								
28						FINE			28								
32									32								
36					GC	SANDY WITH A LITTLE CLAY			36								
40									40								
						END OF HOLE											

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG DM	DATE DRILLED 23/1/73	AIRPHOTO NO:	CHAINAGE: 54+25	OFFSET:	TEST HOLE
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NONE	ELEV:	

MILE	S,C,S	NUMBER
492	S	176A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SNOW & ICE	TF										
2									2								
						GRAVEL											
4						COARSE			4								
6				BLS 39		SAND LAYER	UF		6								
8					GC	FINE, WITH CLAY			8								
10									10								
12						COARSE			12								
14						HOLE SLOUGHING @ 15'			14								
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: T.S	DATE DRILLED: 25/11/73	AIRPHOTO NO:	CHAINAGE: 54+45	OFFSET:
CKD: D.G.P	TECH: D.M	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SHRUBS	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
492	S	177A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						TILL ORGANIC	F										
2						GRAVEL	UF		2								
4									4								
6									6								LARGE BOULDERS ENCOUNTERED ON PENETRATION TUBE
8					GP	COARSE, DRY LARGE BOULDERS			8								
10									10								
12									12								
14						COARSE, WET WATER TABLE @ 16'			14								HOLE ABANDONED @16' DUE TO SLOUGHING
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

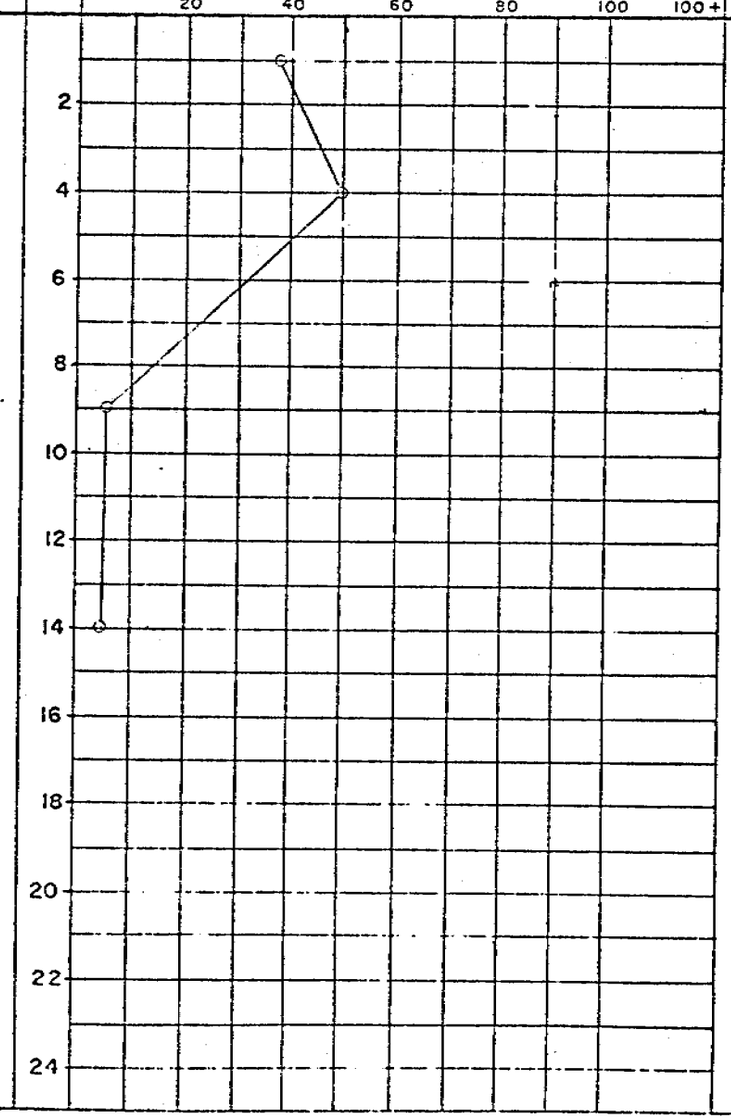
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN AEW	FIELD ENG B.M	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 57+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 30', WILLOW	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
492	C	319B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG GRANULAR, MOSS, ROOTS	F								
2						SILT		Nbn							
4					SM	BROWN, SANDY									
6															
8						GRAVEL									
10					GP	BOULDERS, COBBLES LARGER GRAVEL SIZES									30+ BLOWS < 2" REFUSED
12															
14								Nbn							HOLE SLOUGHING ABANDONED @ 15'
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

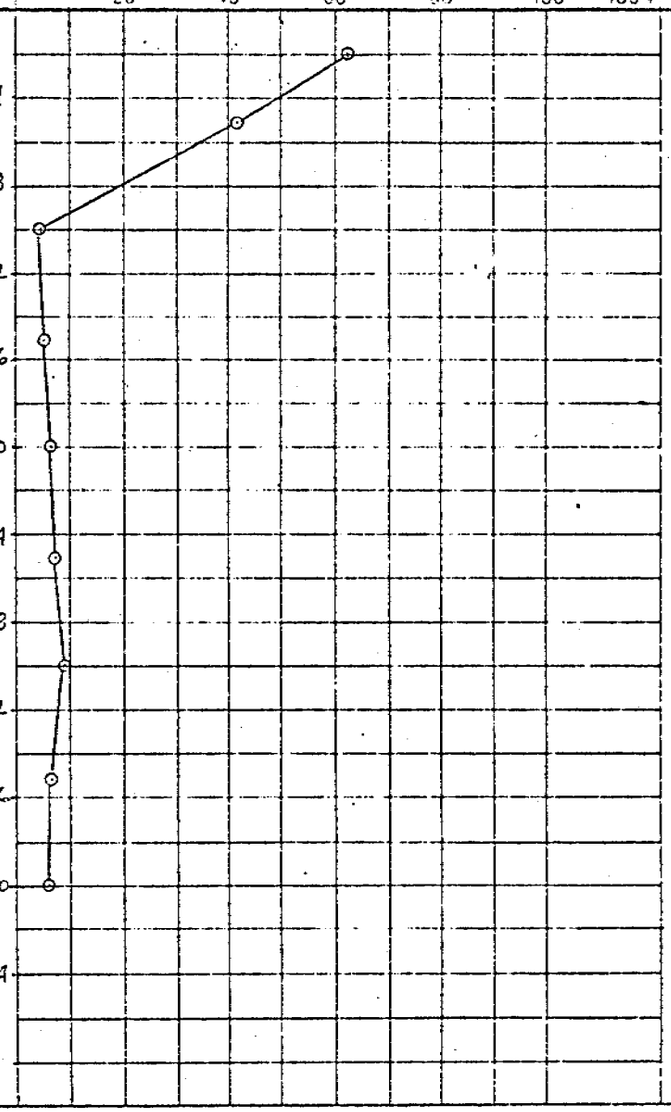
DWN A E W	FIELD ENG T S	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 57+00	OFFSET: ℄
CKD D G P	TECH	RIG AIR	SURFACE DRAINAGE: SOUTH TO NORTH	VEGETATION:	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
492	S	183A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC. SANDY	F	
4					CL	SILT SANDY, BROWN BOULDERS		
		P		52 BLS				Nbn
8						GRAVEL		
12					GM	COARSE, FEW FINES RANDOM COBBLES		
16		P		58 BLS		SILTY, SANDY		
20						CLAY		
24								
		P		110 BLS		GREY, RANDOM COBBLES, TILL		
28					GC			
32								
36		P		88 BLS				Nbn
40								
						END OF HOLE		
44								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

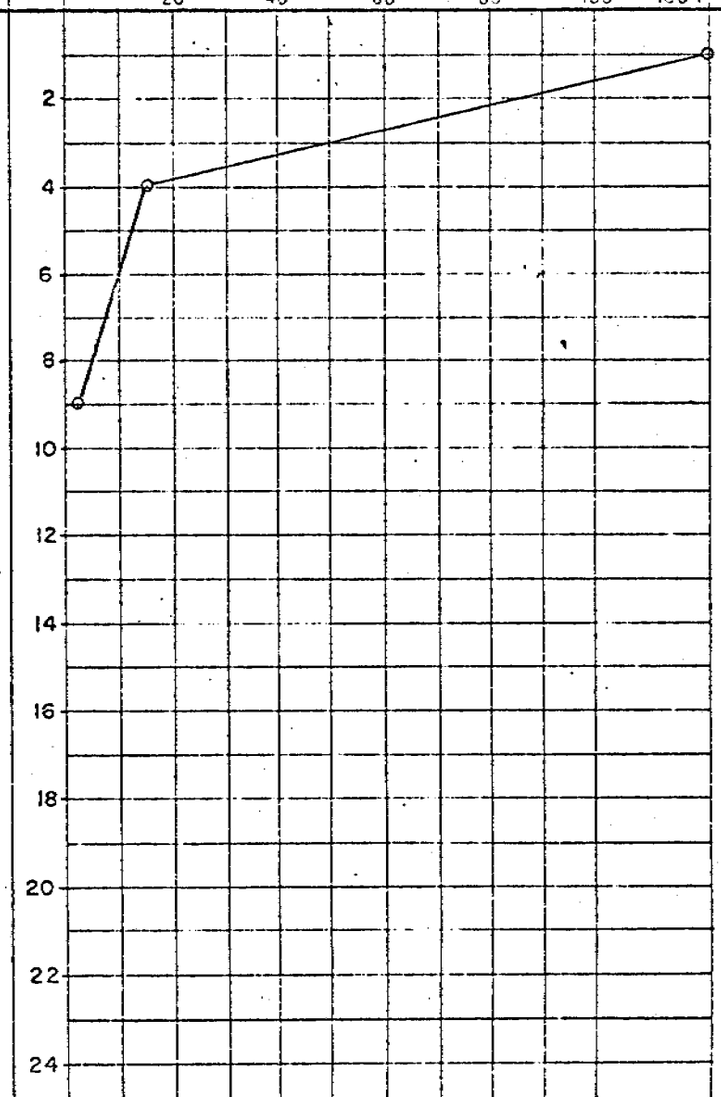
DWN A.E.W	FIELD ENG. B.M	DATE DRILLED 26/11/73	AIRPHOTO NO:	CHAINAGE: 68+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
492	C	318 B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG GRANULAR TREE ROOTS, MOSS	F	
2						SAND		Nb n SOME EXCESS ICE
4					GM	GRAVEL		
6						SANDY, SILTY COBBLES, SOME BOULDERS		
8								
10					GP			Nb n
12								
14						END OF HOLE		
16								
18								
20								
22								
24								

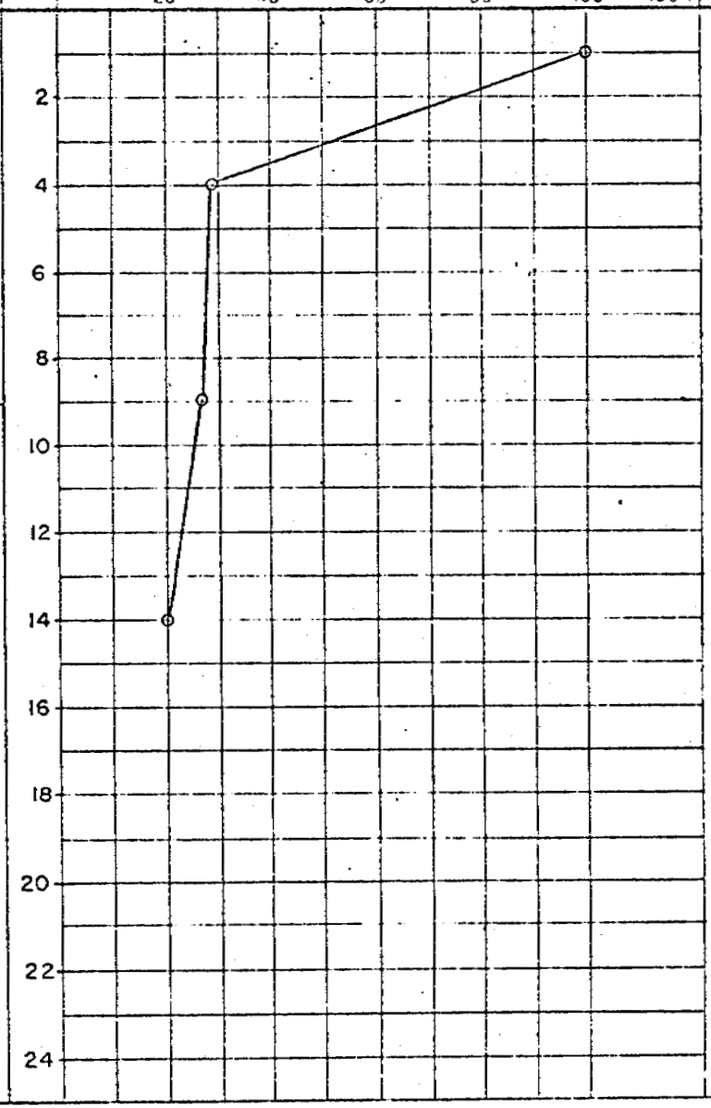


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG. B.M	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE: 80+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV.	MILE 492 / B,C,S C / NUMBER 317B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG - GRANULAR - MOSS	F	
2						SILT		
					ML	SANDY		Nbn
4								
6						SAND		
8					SM	FINE, DRY, SILTY		
10							UF	
12						GRAVEL		
					GM	SANDY, SILTY		
14								
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

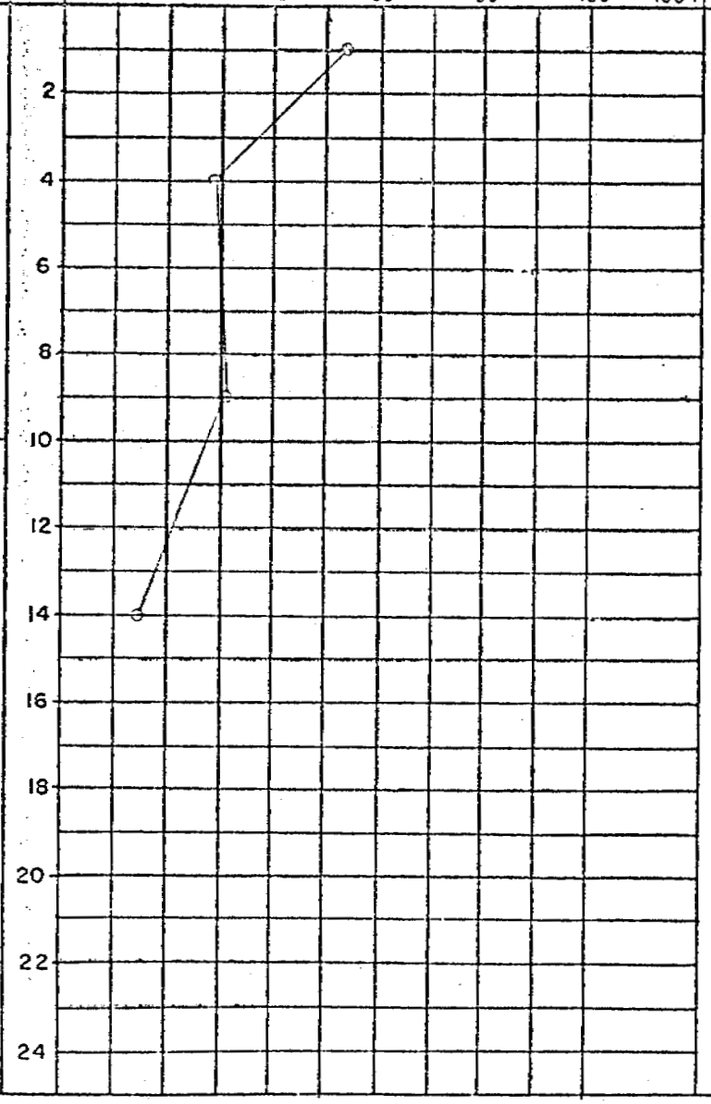
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: B.M	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE: 37+00	OFFSET: ℄
CKD: DAP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
492	C	316B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PT	MUSKEG GRANULAR, MOSS SOME ROOTS	F	Nbn
2						SAND FINE		
					SM	SILT BROWN		
4						SAND FINE. DRY		
6						SILT BROWN		
8					SC	SAND FINE		
						CLAY LITTE SILT AND FINE SAND		
10						SAND DRY SOME GRAVEL	UF	
12					SM	SILT DRY WITH FINE SAND		
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG NWC	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE: 74+50 (CUT LINE)	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER TO 40'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
472	C	315B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	MUSKEG MOSS	F	Vh	2							
4						CLAY			4							
6					CL	SILTY			6							
8									8							SAMPLE STUCK TO SIDE OF DRILL STEM
10									10							
12						SAND			12							
14					CL	CLAY SILTY		Vh	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

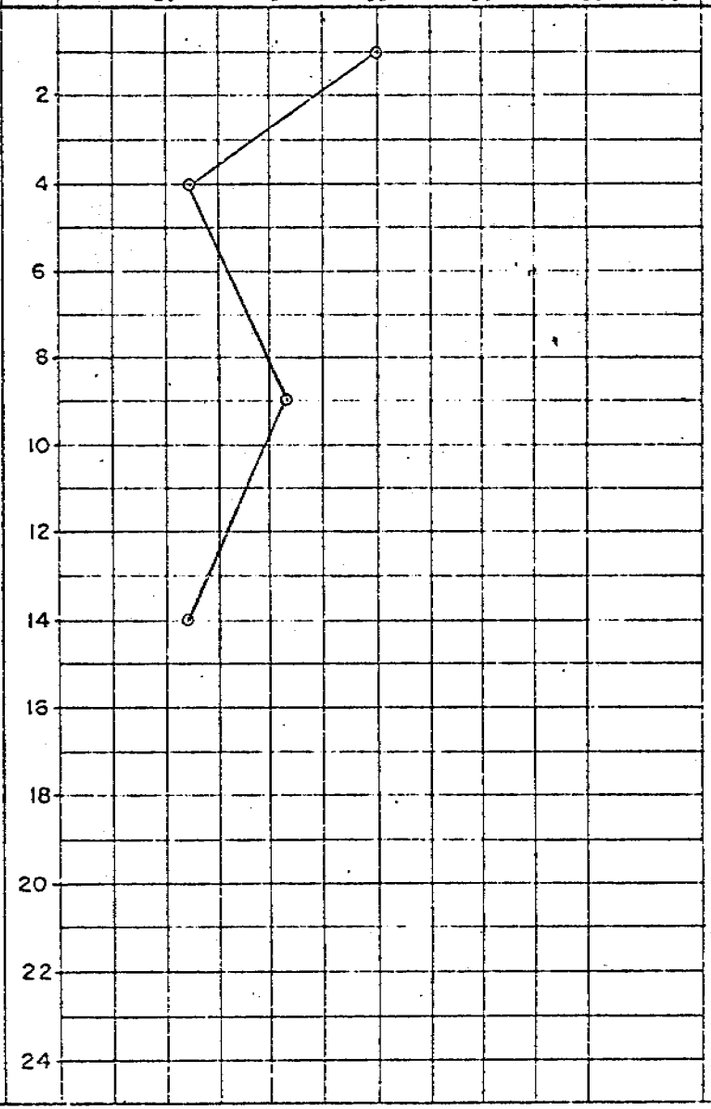
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 27/1/73	AIRPHOTO NO:	CHAINAGE: 824+50	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 35'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
492	C	320B

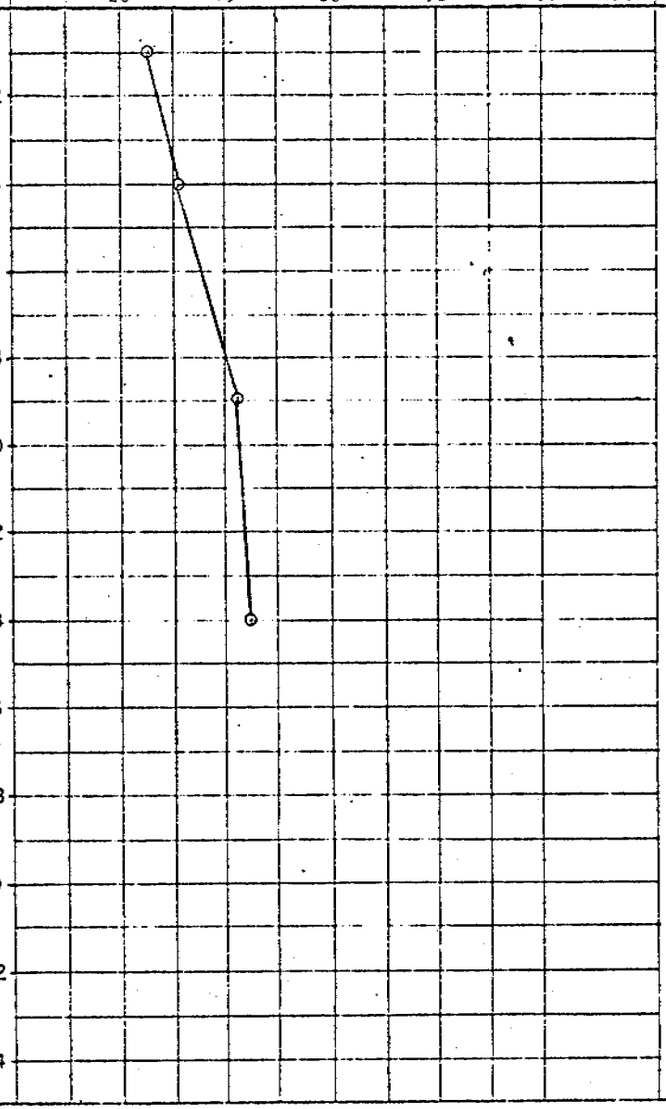
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG - GRANULAR, MOSS	F								
2						CLAY		Vr							
4															
6					CL	SILTY, BROWN									
8															
10															
12															
14					GM	GRAVEL SILTY		Vr							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 93+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:	MILE 493 / B,C,S C / NUMBER 3218

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
2					GC	CLAY	F		ROCK CUTTINGS
4						SILTY, LITTLE GRAVEL		Vr	
6									
8						SOME SMALL PEBBLES			
10									
12					CL			Vr	
14									VERY LITTLE RETURN
16						END OF HOLE			
18									
20									
22									
24									

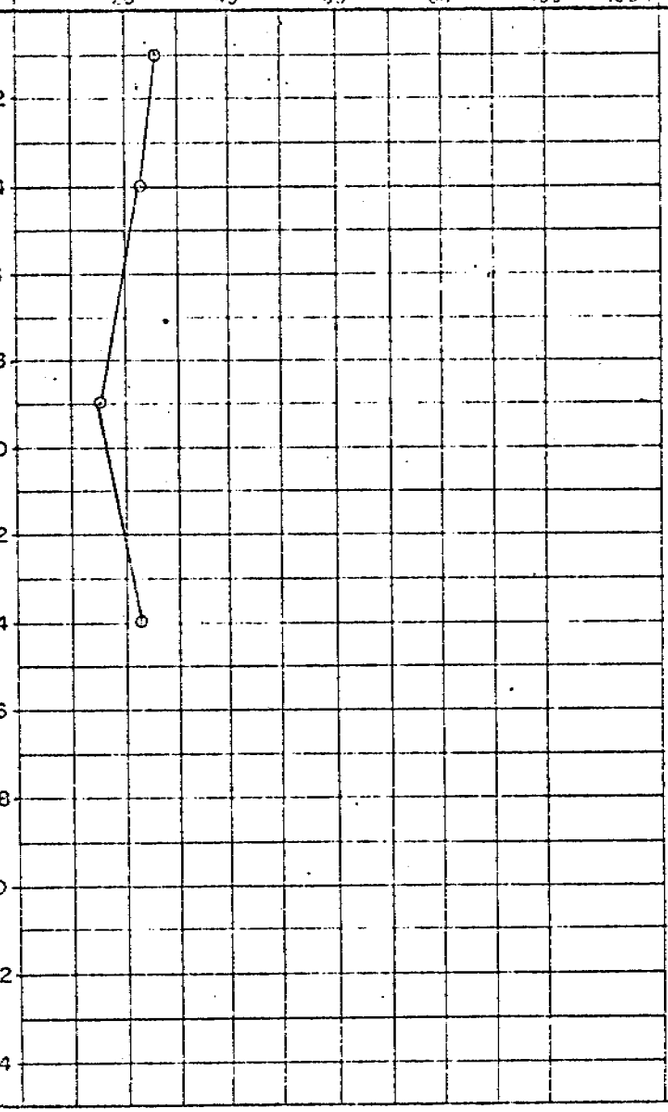


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E W	FIELD ENG	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: TH # 3 (10+00)	OFFSET: 500' E of ℄	TEST HOLE
CKD D G P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & BIRCH	ELEV	MILE: 493 R.C.S: C NUMBER: 3228

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					CL	CLAY	F	Vl
4						MED BROWN, SILTY		
6								
8								
10						CLAY TILL, BROWN		
12								
14					GC			Vl ICE LENSES < 1/4"
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG	DATE DRILLED 27/11/73	AIRPHOTO NO:	CHAINAGE TH #4 117+00	OFFSET 500' S OF ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: VERY GOOD	VEGETATION: SPRUCE & POPLAR	ELEV

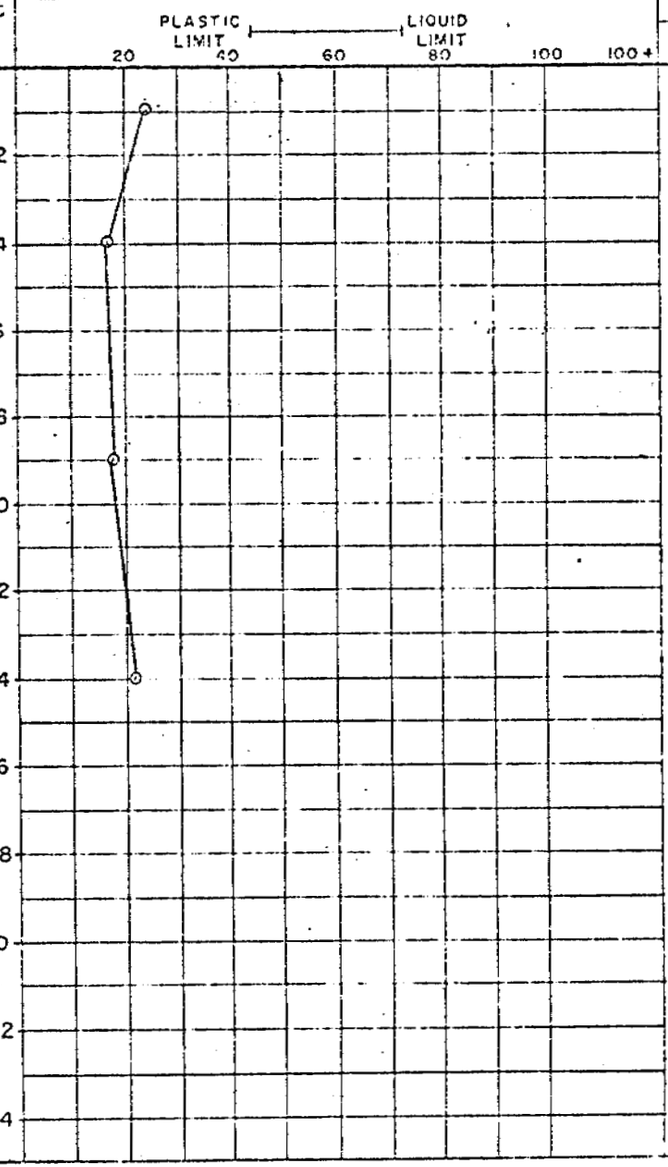
TEST HOLE

MILE	B,C,S	NUMBER
493	C	323B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					CL	CLAY	F	Vh
4						MED BROWN		
6								
8								
10						LITTLE SAND		ICE CRYSTALS VISIBLE " L 1/8"
12								
14					GC			Vh ICE CRYSTALS VISIBLE L 1/8"
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

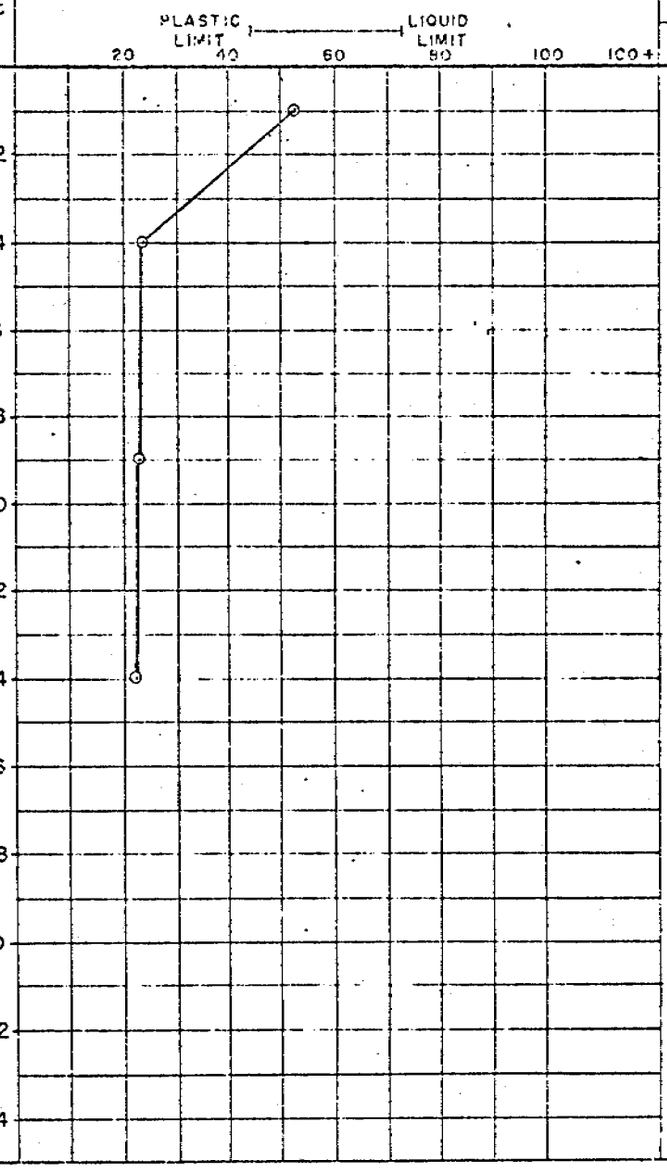
DWN A.E.W	FIELD ENG B.M	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 131+00	OFFSET ℄
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE POOR	VEGETATION: SPRUCE TO 10' (SPARSE)	ELEV

TEST HOLE

MILE	S,C,S	NUMBER
493	C	327B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG FINE, FIBROUS	F	
2						CLAY		V_L ≈ 1/3 ICE
4					CL			
		P					UF	
6						GREY, WITH ODD PEBBLE		
8								
10								
12								
14					CL			
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

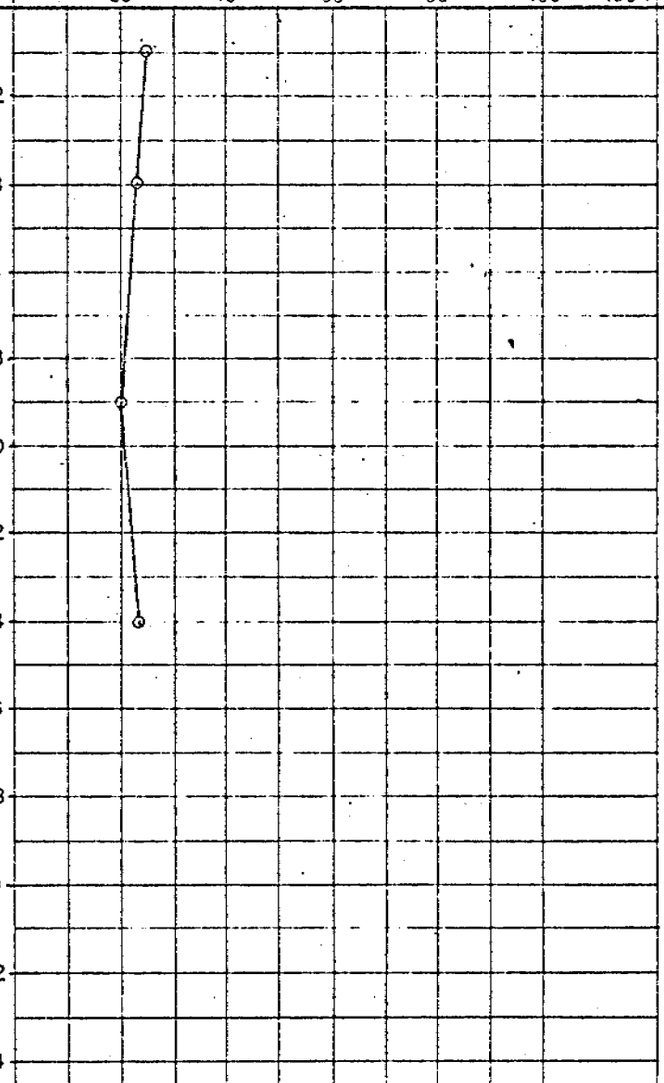
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG T.S.	DATE DRILLED 27/11/73	AIRPHOTO NO:	CHAINAGE: 140+00	OFFSET: ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & POPLAR TO 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
493	C	184A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC - SANDY	F								
2						CLAY									
						LOW PLASTIC, STICKY		Vr							
4		P						ICE CRYSTALS 30 % VISIBLE					119.5	97.8	
6															
8					CL										
10						SANDY									
12						LOW PLASTIC, STICKY		ICE LENSES 1/4" Vr							
14		P											128.1	104.1	
16						END OF HOLE									
18															
20															
22															
24															

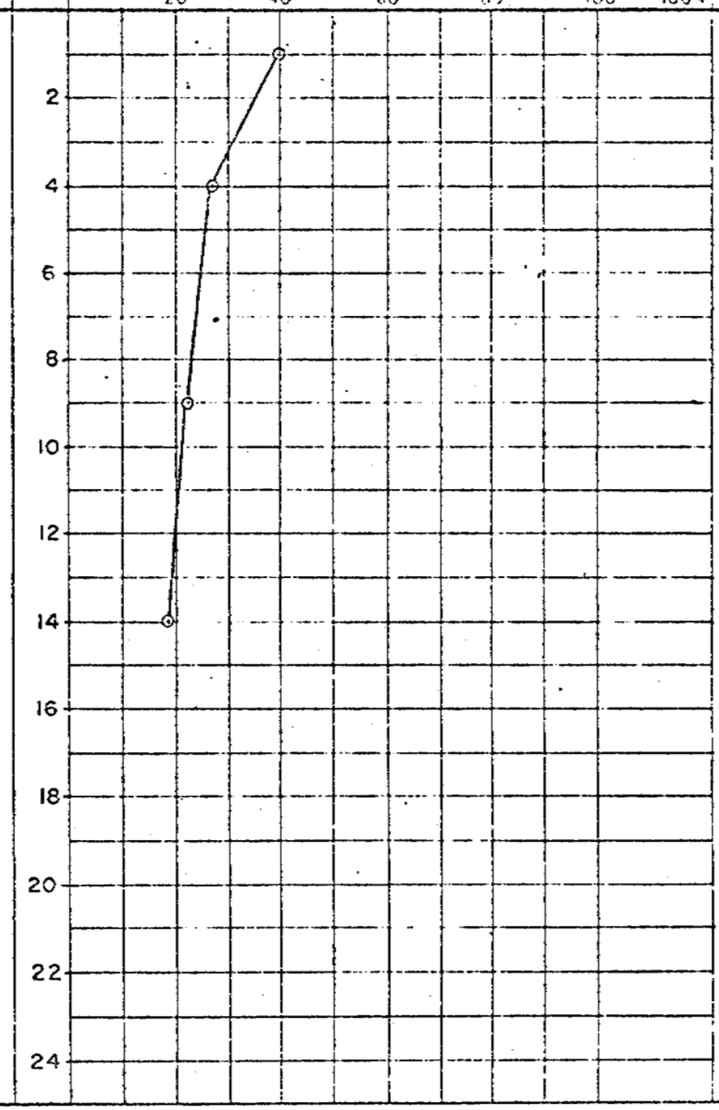


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG. T.S.	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 152+00	OFFSET: ℄	TEST HOLE
CKD D.G.P.	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: POPLAR & BIRCH TO 40'	ELEV	

MILE	B,C,S	NUMBER
494	C	185A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								
2		P				CLAY		Vr							
4						STICKY, DARK BROWN									
6															
8					CL										
10		P											112.7	92.6	
12						SANDY, STICKY DARK BROWN									
14								Vr							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG TS	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 165+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFER & POPLAR TO 50'	ELEV:

TEST HOLE

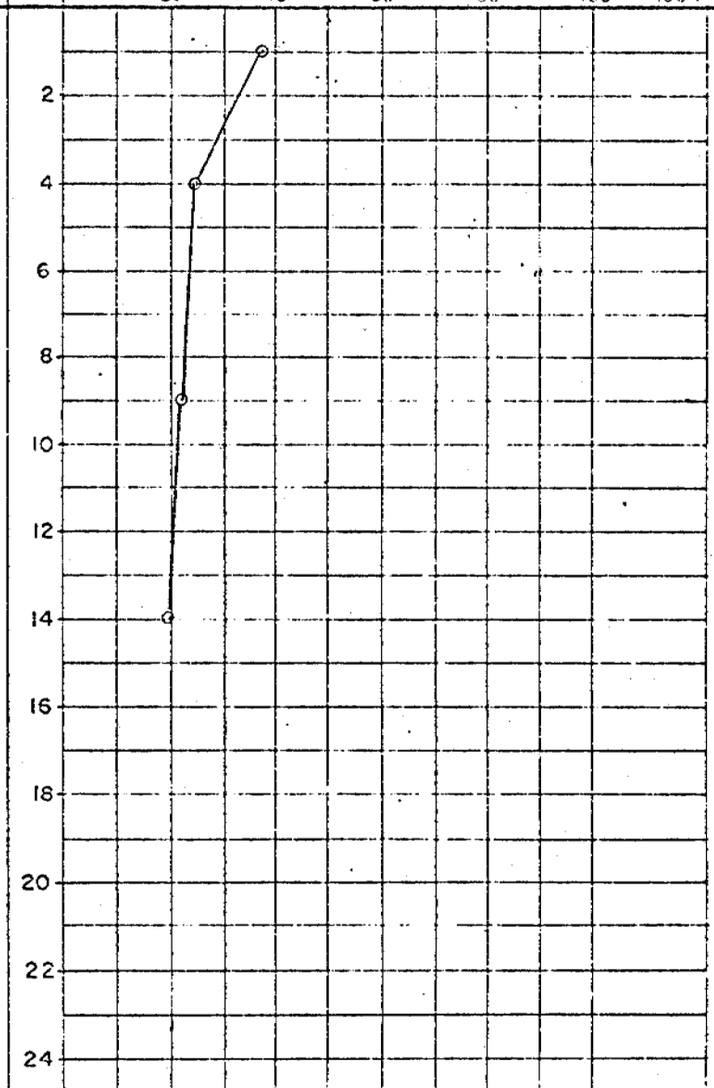
MILE	B,C,S	NUMBER
494	C	186A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC - SANDY, CLAYEY	TT										
2					CL	CLAY		Vh	2								
						STICKY, SANDY		ICE PARTICLES									
4		P							4						118.8	98.1	
6						SANDY			6								
8									8								
10						STICKY, DARK BROWN			10								
12								ICE LENSES ¼" (30%)	12								
14		P			CL			Vh	14						128.8	104.7	
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG TS	DATE DRILLED 27/1/73	AIRPHOTO NO:	CHAINAGE: 177+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFER & POPLAR TO 40'	ELEV	MILE 494 B,C,S C NUMBER 187A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC - SANDY	F	
2		P			ML	SILT BROWN, WITH A LITTLE CLAY		Vr
4								ICE LENSES VISIBLE STATIFIED 1/4"
6								
8								
10		P						
12					CL	CLAY TILL		ICE LENSES Vr
14								
16						END OF HOLE		
18								
20								
22								
24								

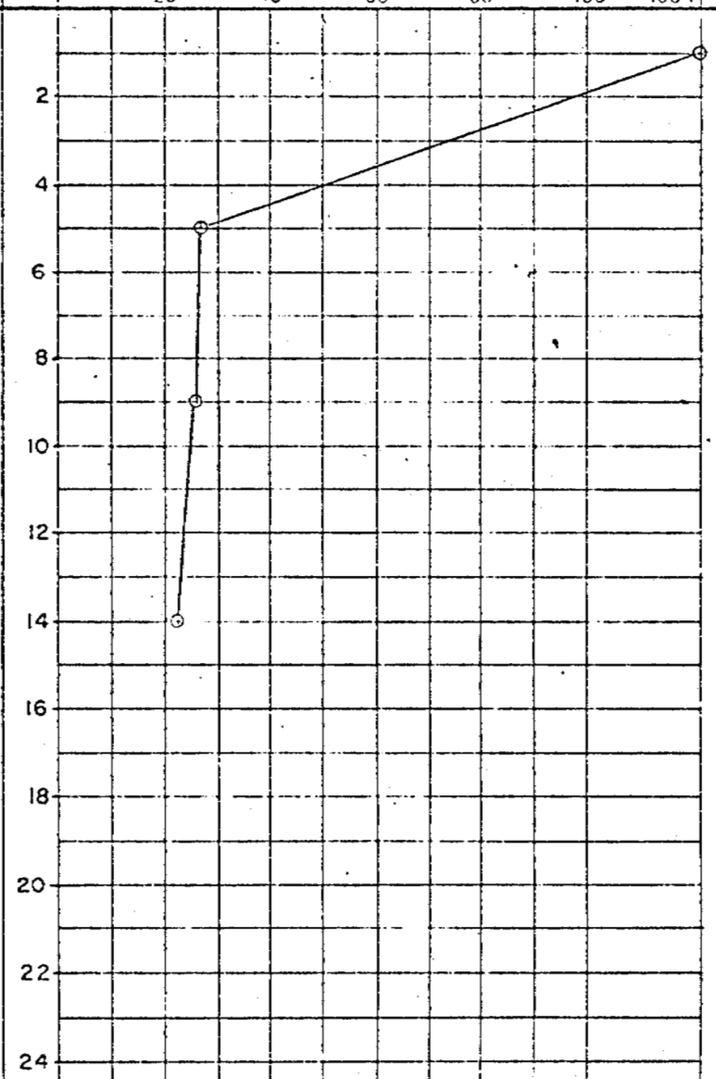


DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
10					121.5	99.8	

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG NWC	DATE DRILLED 27/11/73	AIRPHOTO NO: -	CHAINAGE: 190+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV	MILE 494 / B,C,S C / NUMBER 194A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG	F								
2															
4					CL	CLAY GREY		Vr					114.9	85.4	
6		P						VISIBLE ICE CRYSTALS							
8															
10						GREY BROWN									
12															
14					CL			VISIBLE ICE CRYSTALS. Vr							
16						END OF HOLE									
18															
20															
22															
24															



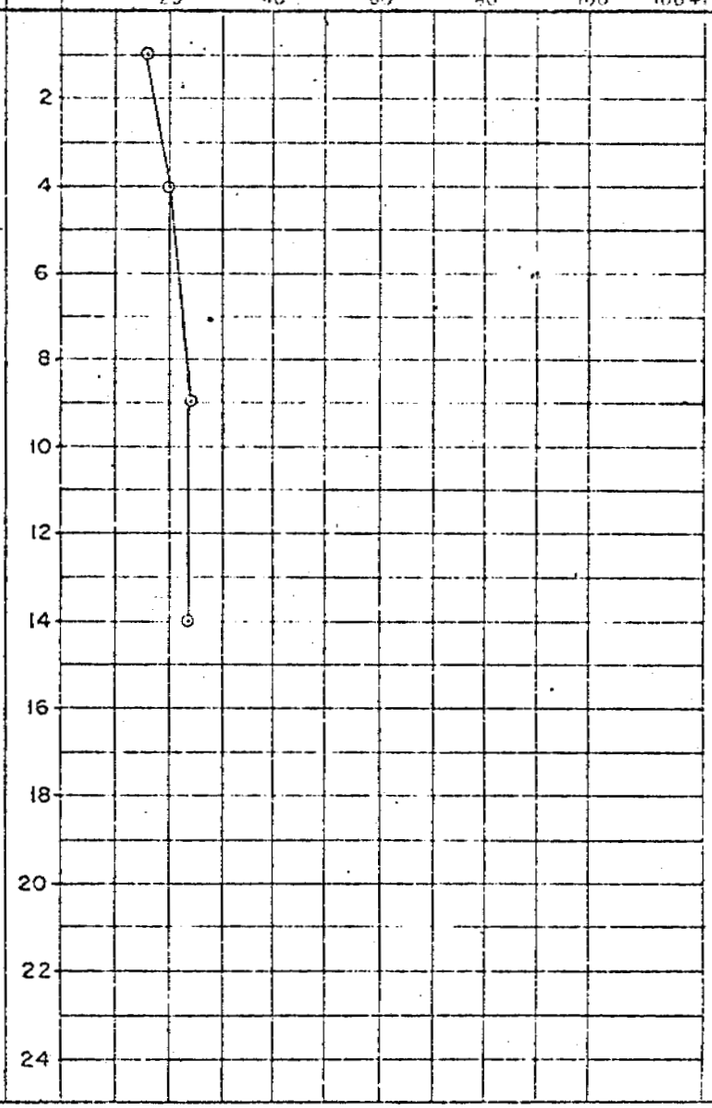
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAM: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 26/1/73	AIRPHOTO NO:	CHAINAGE: 205+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & ASPEN TO 25'	ELEV	

MILE	B,C,S	NUMBER
495	C	331B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	MUSKEG GRANULAR	F		
2		P			CL	CLAY		Vr	DENETRATION HARD
4		P							EASY DENETRATION
6						BROWN, DRY	UF		
8									
10		P							EASY DENETRATION
12					CL				
14		P							EASY DENETRATION
16						END OF HOLE			
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.L.W	FIELD ENG B.M	DATE DRILLED 28/1/73	AIRPHOTO NO:	CHAINAGE: 220+00	OFFSET: 2	TEST HOLE
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15' (SPARSE)	ELEV	MILE 495 B.C.S C NUMBER 332 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	MUSKEG FINE, FIBROUS	F	Vh	2			
						CLAY BROWN						
4		P			ML	SILT CLAYEY, TRACE OF SAND		ICE NOTICEABLE	4			
6									6			HARD PENETRATION
8						CLAY			8			
10		P			CL	BROWN			10	106.4	83.3	
12									12			
14		P						Vh	14	107.7	84.9	FIRM PENETRATION
16						END OF HOLE			16			
18									18			
20									20			
22									22			
24									24			

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

GRAIN-SIZE ANALYSIS	CLAY %	SILT %	SAND %	GRAVEL %

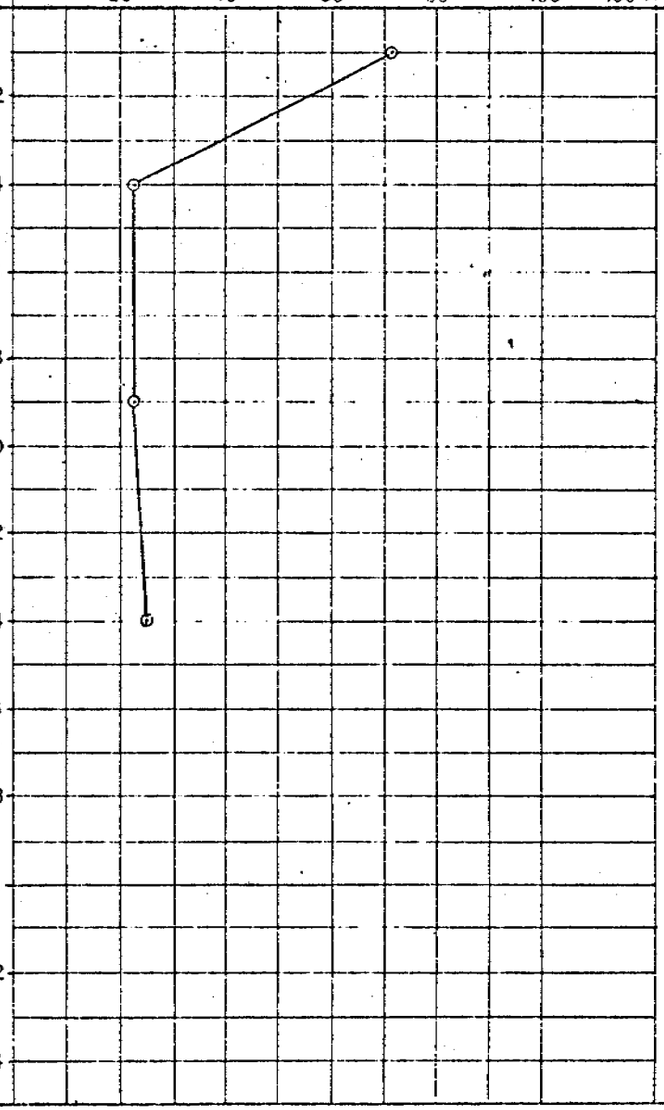
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG B.M	DATE DRILLED 28/1/73	AIRPHOTO NO:	CHAINAGE: 232+00	OFFSET ℄
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
495	C	333 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	MUSKEG FINE, FIBROUS	F	Vr							
4		P			CL	CLAY		ICE NOTICEABLE WELL BONDED					121.4	39.5	FIRM PENETRATION
6															
8						GREY, WITH ODD PEBBLE									
10															
12															
14		P			CL			Vr ICE NOTICEABLE							FIRM PENETRATION
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 28/11/73	AIRPHOTO NO:	CHAINAGE: 245+00	OFFSET: ℄
CKD D6P	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
495	C	334 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	MUSKEG GRANULAR	F										
						CLAY		Vr									
2		P						ICE NOTICEABLE	2								HARD PENETRATION
4									4								
		P															
6					CL	GREY			6								
8									8								
		P															
10								ICE JUST NOTICEABLE	10						125.4	101.9	FIRM PENETRATION
12									12								
14								Vr	14						102.4	81.9	
		P															
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

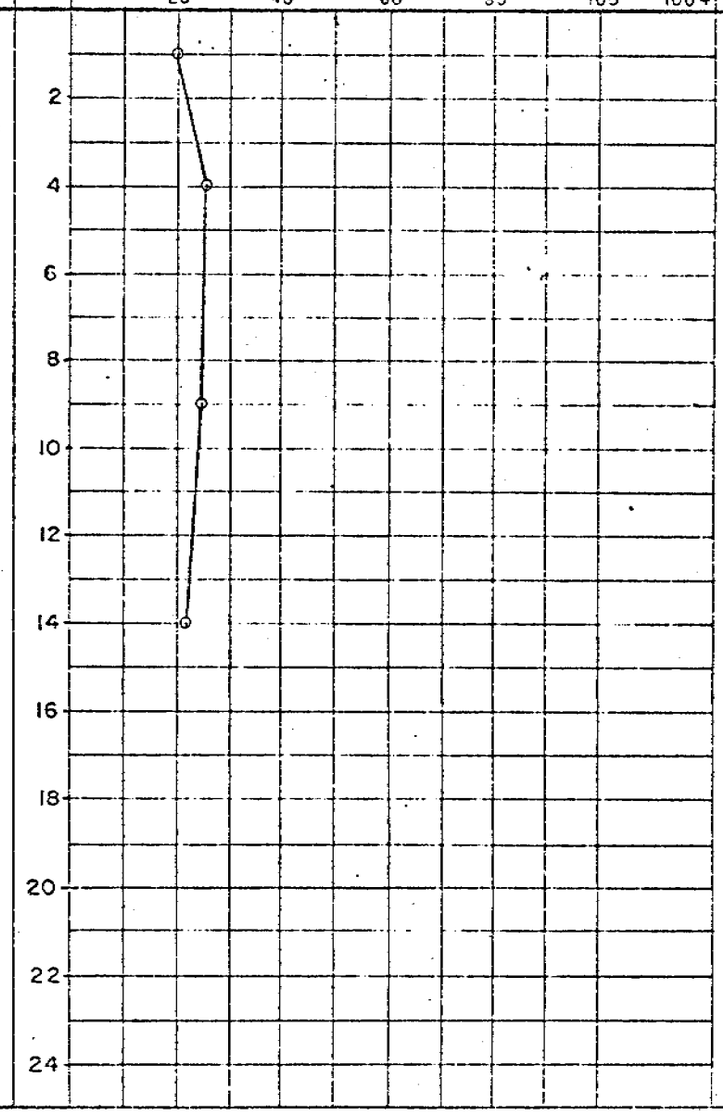
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M.	DATE DRILLED 28/1/73	AIRPHOTO NO:	CHAINAGE: 260+00	OFFSET: ℄
CKD O.G.P.	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
496	C	335B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
					Pt	MUSKEG GRANULAR	F								
2		P			SM	SILT SANDY, BROWN		Vh ICE NOTICEABLE							HARD PENETRATION
4		P													
6						CLAY									
8															
10		P			CL	GREY		ICE JUST NOTICEABLE WELL BONDED					114.7	92.2	PENETRATION FIRM
12															
14		P						Vh					120.7	97.5	
16						END OF HOLE									
18															
20															
22															
24															



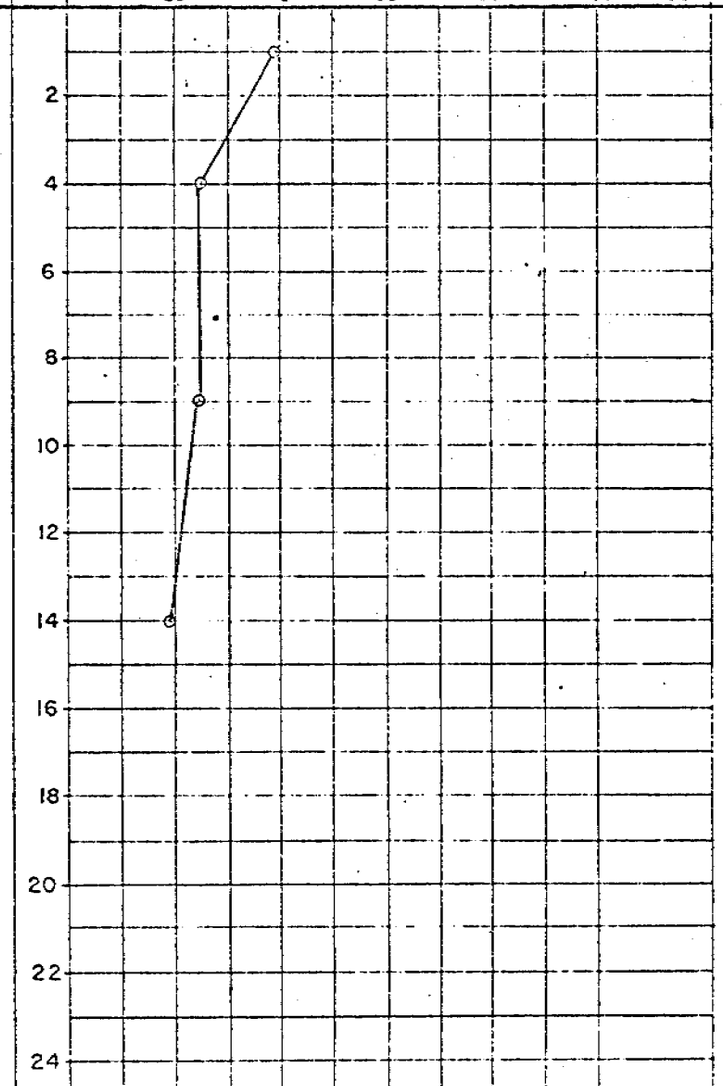
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 28/11/73	AIRPHOTO NO:	CHAINAGE: 276+00	OFFSET: ℄
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFERS TO 40'	ELEV

TEST HOLE

MILE	S,C,S	NUMBER
496	C	195 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								
2					CL	CLAY		Vh							
4		P				STICKY, BROWN, WITH OCCASIONAL ISOLATED PEBBLES							126.8	100.6	
6															
8															
10						STICKY BROWN WITH PEBBLES		ICE LENSES 3/8"							
12															
14		P						Vh					123.1	103.1	
16						END OF HOLE									
18															
20															
22															
24															



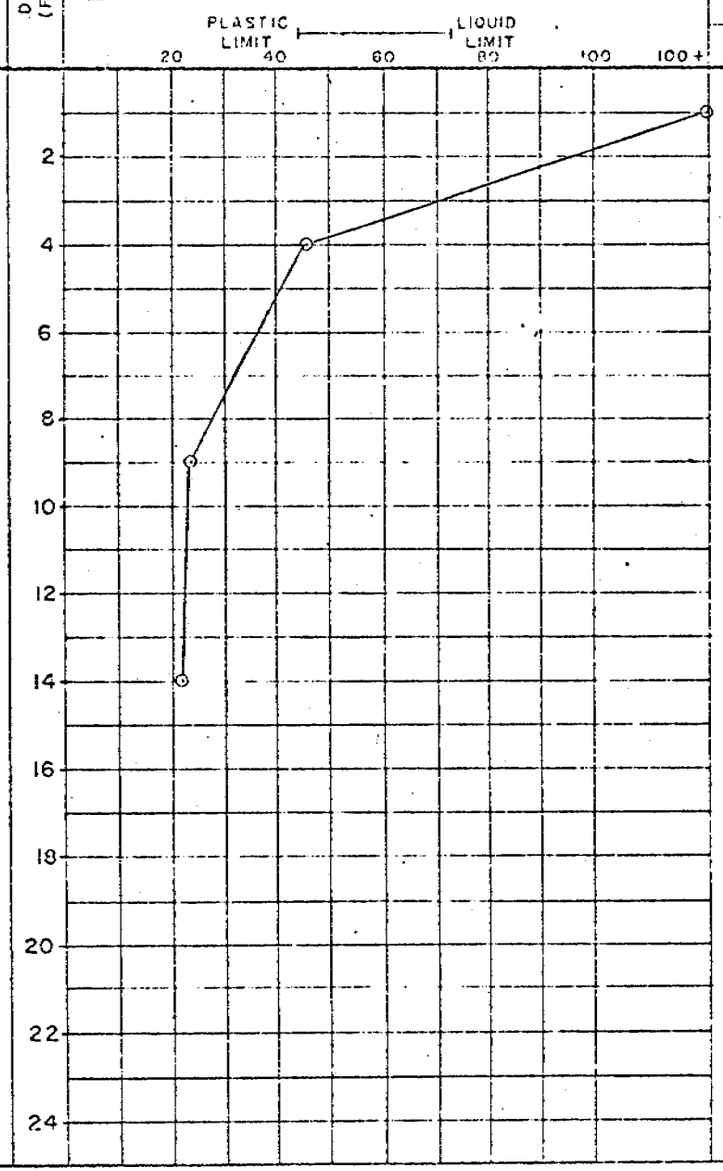
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG T.S.	DATE DRILLED 28/1/73	AIRPHOTO NO:	CHAINAGE: 285+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFERS TO 40', WILLOWS	ELEV	

MILE	B,C,S	NUMBER
496	C	196A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	F	
2						CLAY		Vr
4					CL	HARD, SANDY		
6						FEW PEBBLES		
8						STICKY, BROWN WITH SAND SEAMS		
10		P						ICE LENSES 1"-1½" 10%-20%
12								
14		P			CL			Vr
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

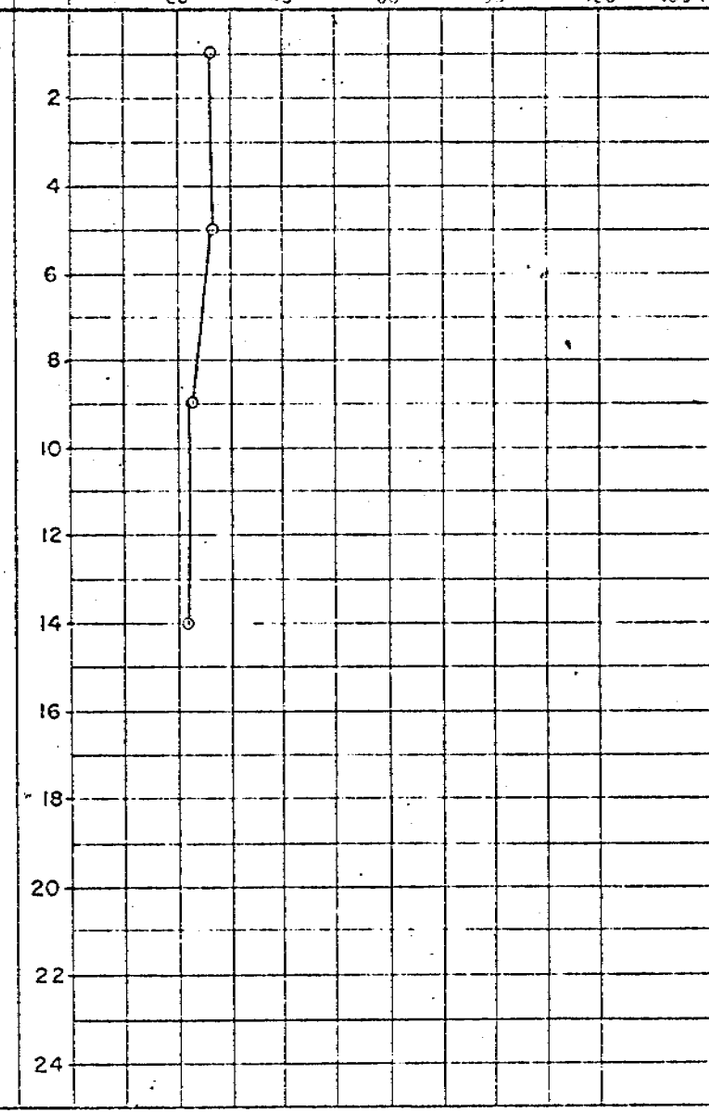
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG T.S.	DATE DRILLED 26/1/73	AIRPHOTO NO:	CHAINAGE 297+00	OFFSET 2
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: CONIFERS TO 30'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
496	C	197A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC - SANDY	F								
2						CLAY		Vr							
						HARD, DENSE, SILTY									
4		P													
6						STICKY, SANDY									
8					CL	SANDY CLAY SEAMS									
10		P											119.0	97.5	
12															
14								Vr							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CKD AEW	FIELD ENG BM	DATE DRILLED 29/11/73	AIRPHOTO NO:	CHAINAGE: 311400	OFFSET ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
497	C	345 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG GRANULAR	F										
2		P				CLAY		Vr	2								
						BROWN, CLUMPY											
4		P							4								FIRM PENETRATION
6								ICE BARELY NOTICEABLE	6								
8					CL				8								
10		P						SMOOTH, WELL BONDED ICE	10								
12									12								
14		P						Vr	14								HARD PENETRATION
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

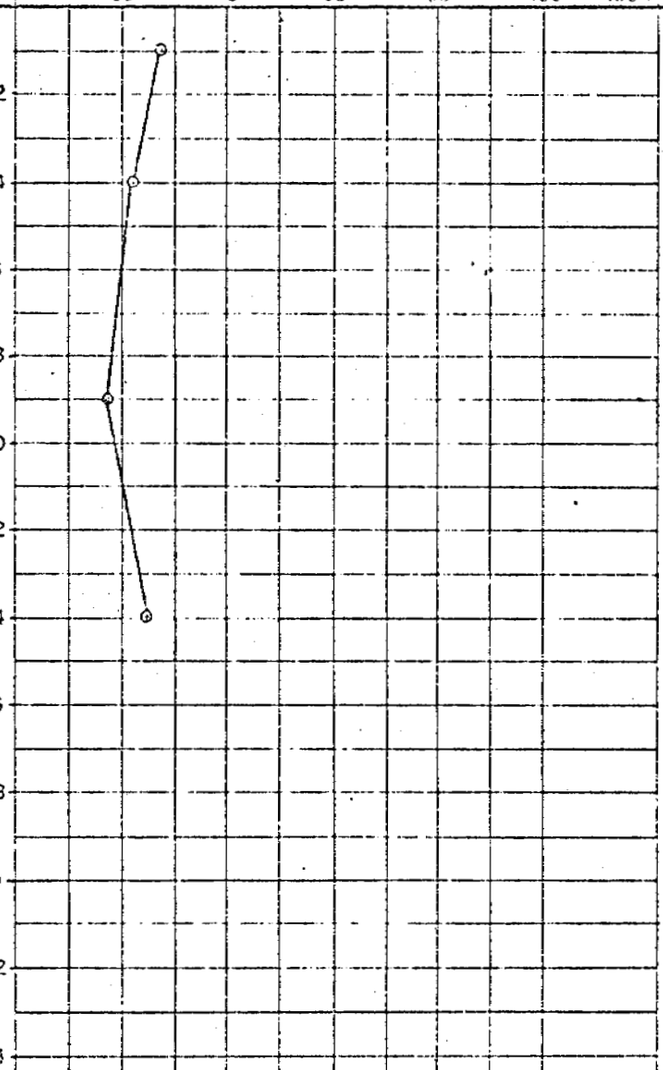
DRN A.E.W	FIELD ENG B.M	DATE DRILLED 23/11/73	AIRPHOTO NO:	CHAINAGE: 326+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 10'	ELEV

TEST HOLE

MILE	B,C,S	NUVSE
497	C	3468

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG - GRANULAR	TT	
2						CLAY		Nbc
					CL			WELL BONDED ICE NOTICEABLE
4		P						Vh
6						BROWN		
8								
10		P						
12								ONE 1¼" ICE LENSE IN A 3' SAMPLE
14		P			CL			Vs
16						END OF HOLE		ICE >10%-<20%
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



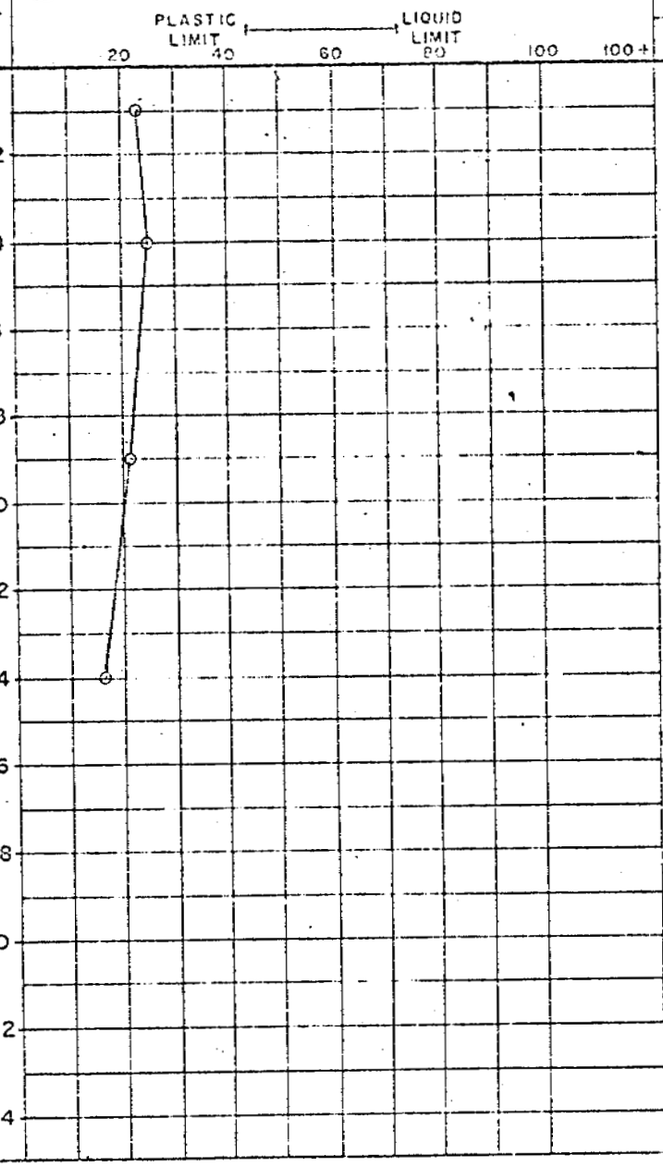
GRAIN SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						HARD PENETRATION

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG. B.M	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 338+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 8'	ELEV	MILE 497 · B,C,S C · NUMBER 347B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	MUSKEG, GRANULAR	T		
2						CLAY		Vh	
4		P			CL			≈ 1/4 ICE BY VOLUME	PENETRATION HARD
6						GREY, SOME PEBBLES AT 1'			
8									
10		P						≈ 1/4 ICE BY VOLUME	PENETRATION HARD
12					CL			ICE NOTICEABLE	
14		P						Vh	PENETRATION HARD
16						END OF HOLE			
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



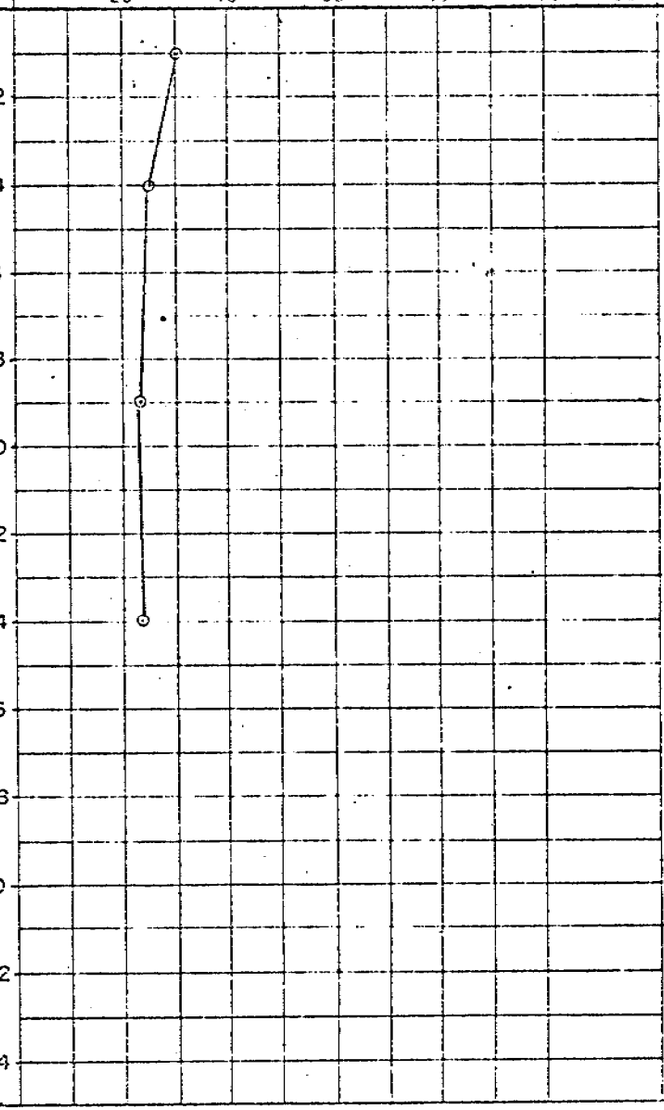
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 29/11/73	AIRPHOTO NO:	CHAINAGE: 350+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH:	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV	MILE 497 B,C,S C NUMBER 348 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					PT	MUSKEG GRANULAR	F		
2						SAND		Vr	
					ML	VERY FINE, BROWN MIXED WITH SILT		ICE BARELY VISIBLE	PENETRATION HARD
4		P							
6									
8						CLAY			
10		P			CL	GREY		WELL BONDED ABOUT 1/8 ICE	PENETRATION FIRM
12									
14		P						Vr ABOUT 1/8 ICE	PENETRATION FIRM
16						END OF HOLE			
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

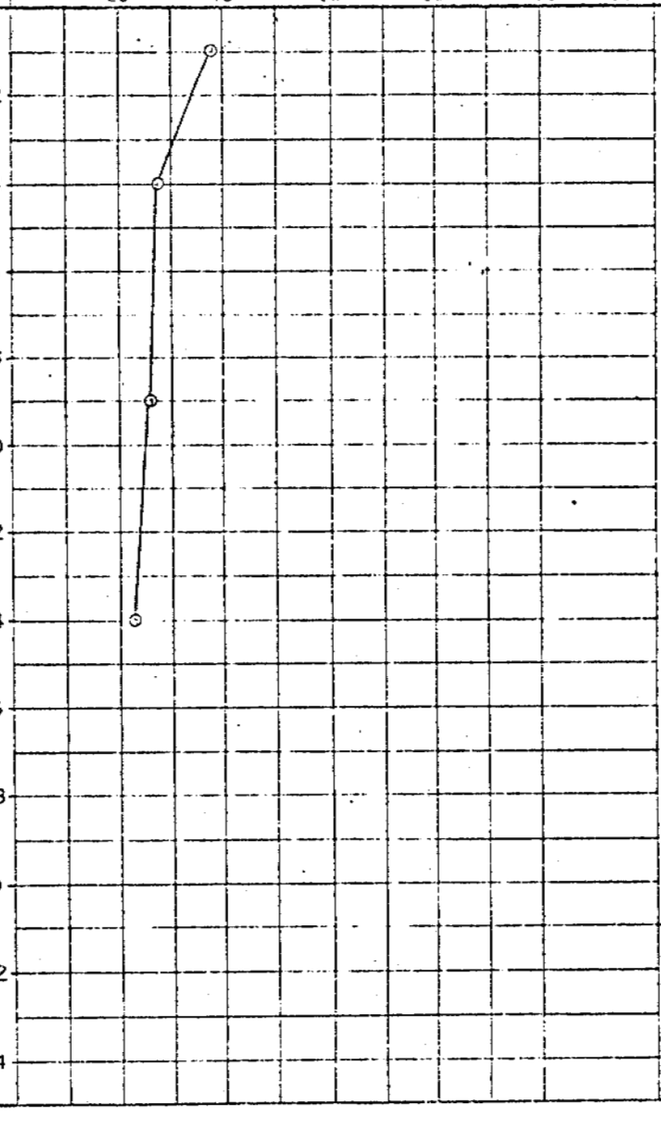
CAN A.E.W	FIELD ENG B.M	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 362+00	OFFSET: ℄
CKD D G P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
498	C	3498

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG GRANULAR	F								
2					CL	CLAY GREY		Vh							
					ML	SAND BROWNISH, VERY SILTY									
4		P			CL	CLAY GREY		ICE BARELY VISIBLE							PENETRATION HARD
						SILT									
6						CLAY									
8						GREY									PENETRATION EASY
10		P			CL										
12								ICE BARELY VISIBLE							
14		P						Vh							PENETRATION EASY
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

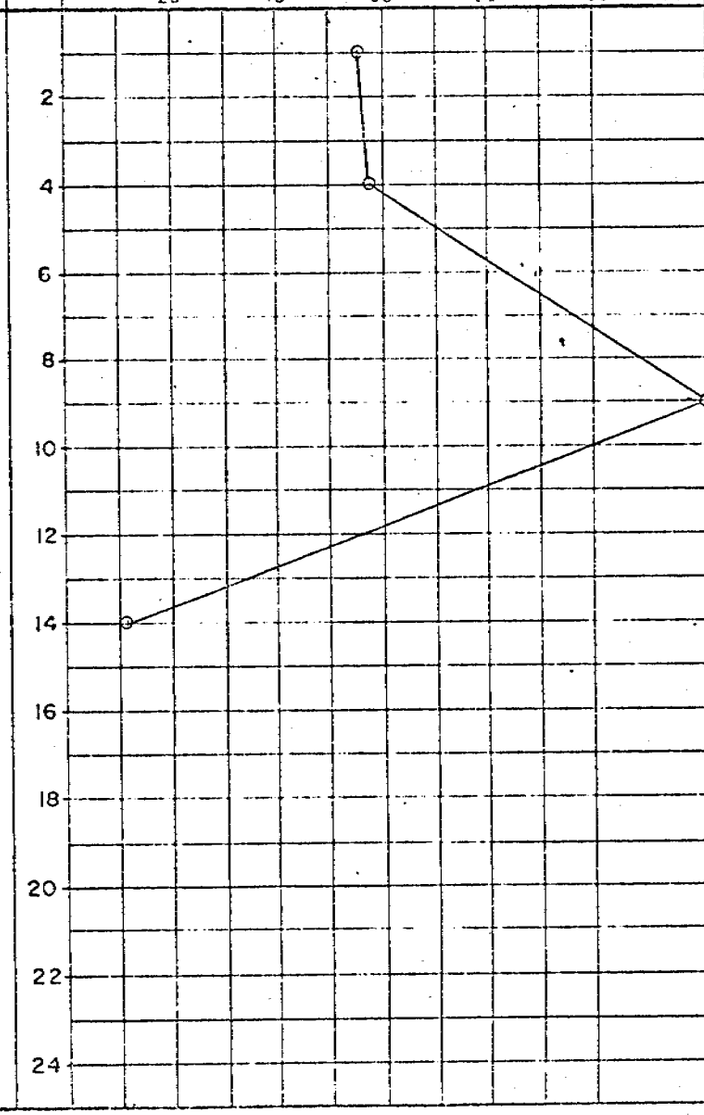


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAT A.E.W	FIELD ENG B.M	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 371 +00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV	

MILE	B.C.S	NUMBER
498	C	350B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	MUSKEG GRANULAR	F		
2						CLAY		Vr	
4		P			CL	BROWN, TRACES OF ORGANIC		ICE NOTICEABLE	PENETRATION FIRM
6									
8									
10		P			Pt	MUSKEG COARSE; FIBROUS			
						SAND GREY			
12						GRAVEL			
14					GP	SOME SAND		Vr	
16						END OF HOLE			
18									
20									
22									
24									

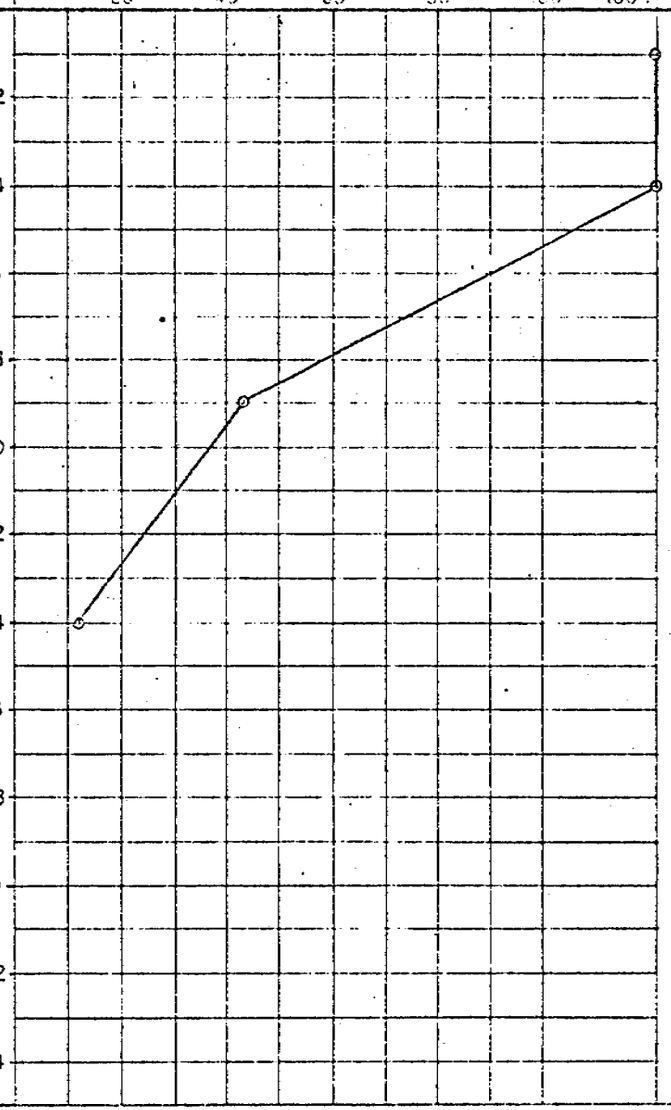


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 379+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 50' WILLOW	ELEV	MILE 498 B,C,S C NUMBER 351B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
2					Pt	MUSKEG FINE, FIBROUS	F		
4					CL	CLAY GREY		Vr ≈ 1/2 ICE	PENETRATION REFUSED
6								≈ 20% ICE	
8									
10						GREY, SAND & GRAVEL TILL, COBBLES			
12									
14					GC			Vr	
16						END OF HOLE			
18									
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W	FIELD ENG N.W.C	DATE DRILLED 3/1/73	AIRPHOTO NO:	CHAINAGE: 381+25	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NIL	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
498	C	265A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ICE	F										
4						ORGANIC	UF		4								
8						LOTS OF EXCESS WATER			8								
12									12								
16									16								
20						CLAY SOFT, GREY			20								MATERIAL SOFT, NO RECOVERY FROM SPLIT TUBE
24						TILL CLAY VERY STIFF			24								BECOMING MORE SOLID AT 22'
28		P		50 B/S					28	○							AT 26' DEPTH, GROUND SHAKES AT 10' IN ALL DIRECTIONS
32						END OF HOLE			32								HOLE ABANDONED @ 28.5' DRILL STEM LOST
36									36								
40									40								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: [illegible]	FIELD ENG: [illegible]	DATE DRILLED: [illegible]	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET: [illegible]
CKD:	TECH:	RIG: [illegible]	SURFACE DRAINAGE: [illegible]	VEGETATION: NONE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
498	C	3501

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT 20 40 60 80 100 100+	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						1' ICE	F										
2						WATER	UF		2								
4						WATER MUSKEG			4								
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: NWC	DATE DRILLED: 31/1/73	AIRPHOTO NO:	CHAINAGE: 382+25	OFFSET: ℄
CKD: DG.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NIL	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
498	C	266A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC	UF										
2									2								
4									4								
6					Pt				6								
8						WET			8								
10									10								
12									12								
14									14								
16					GC	GRAVEL SAND			16								HOLE SLOUGHING
18									18								
20						END OF HOLE			20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: NWC	DATE DRILLED: 31/1/73	AIRPHOTO NO:	CHAINAGE: 382+60	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NIL	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
498	C	267A

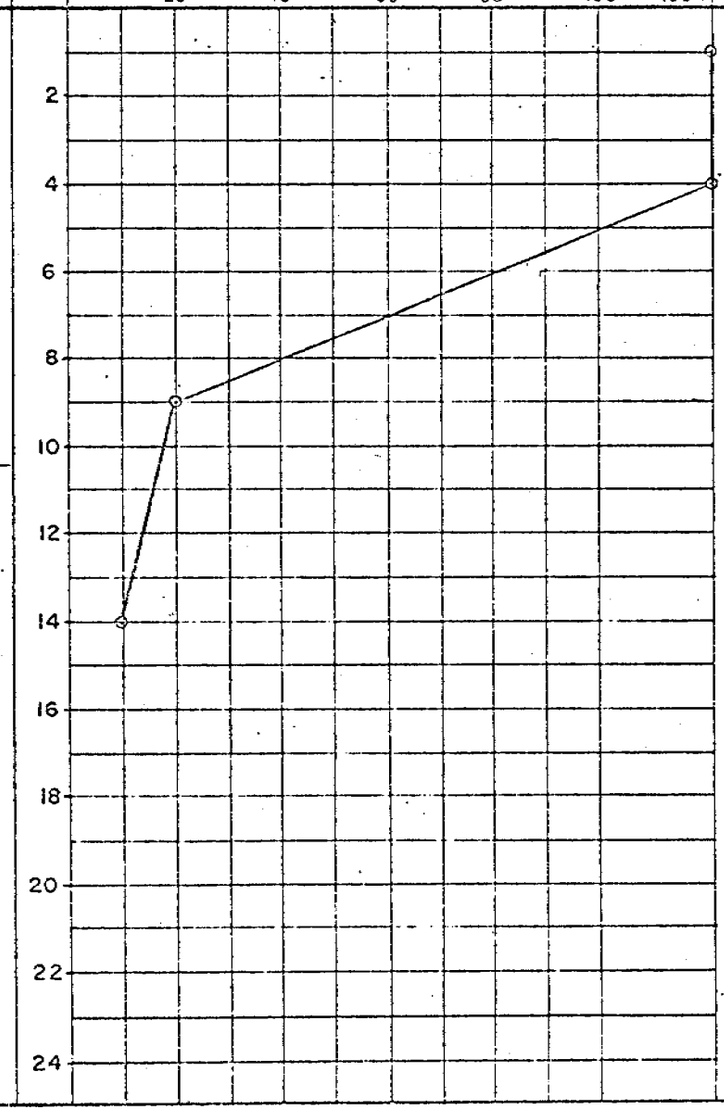
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT 20 40 60 80 100 100+	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC	F										
2					Pt		UF		2								
4									4								
6						WET			6								
8									8								
10									10								
12									12								
14									14								
16						GRAVEL			16								
18					GC	COARSE, SANDY			18								HOLE SLOUGHING
20									20								
22						END OF HOLE			22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.R.	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 384+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: WILLOW, SCRUB BUSH	ELEV:	

MILE	B,C,S	NUMBER
498	C	3538

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					PT	MUSKEG BROWN	F	
4								
6								
8						GRAVEL		
10					GP	SANDY, SOME SHALE FEW COBBLES	UF	
12								
14						MAINLY SHALE		
16						END OF HOLE		
18								
20								
22								
24								



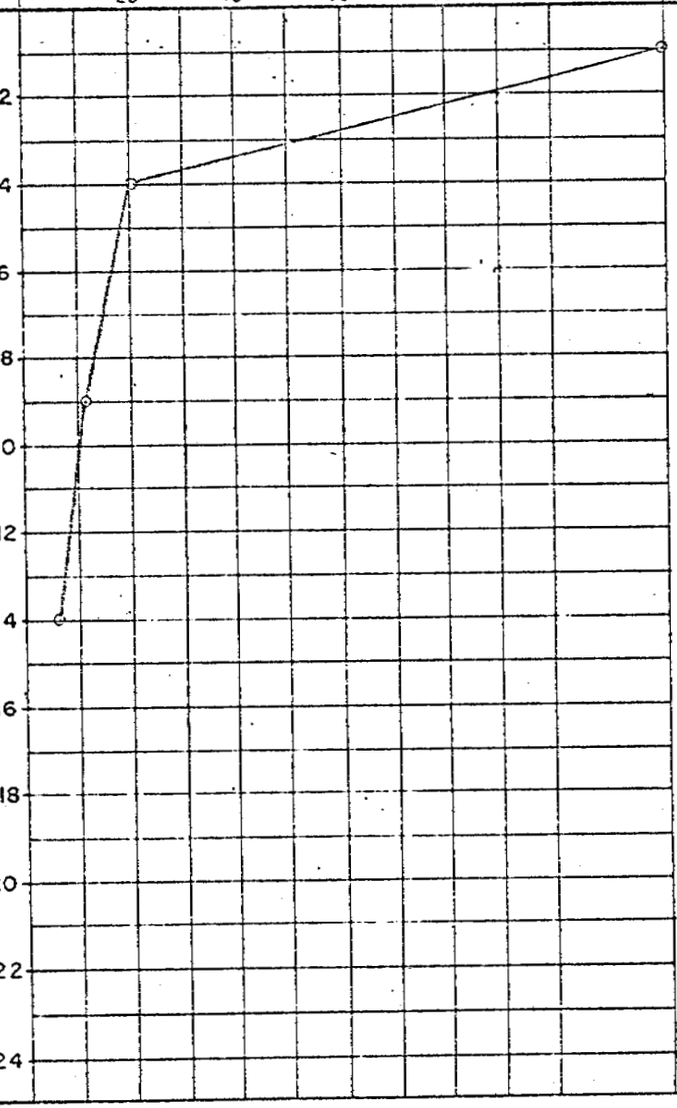
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAT: A.E.W	FIELD ENG: DR	DATE DRILLED: 29/11/73	AIRPHOTO NO:	CHAINAGE: 336 400	OFFSET: ℄
CKD: DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
498	C	3548

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	MUSKEG 3" MOSS BROWN	TI		2							
4					GM	SAND SILTY, MED BROWN GRAVEL) COBBLES			4							
6						GRAVEL			6							
8						CLAY, COBBLES			8							
10					GP		UF		10							
12									12							
14						PEA GRAVEL			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG DR	DATE DRILLED 23/1/73	AIRPHOTO NO:	CHAINAGE: 395400	OFFSET: 2
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
498	C	355B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						GRAVEL 3" MOSS	F		2							HOLE SLOUGHING BADLY
4						SAND			4							
6						END OF HOLE			6							
8									8							
10									10							
12									12							
14									14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

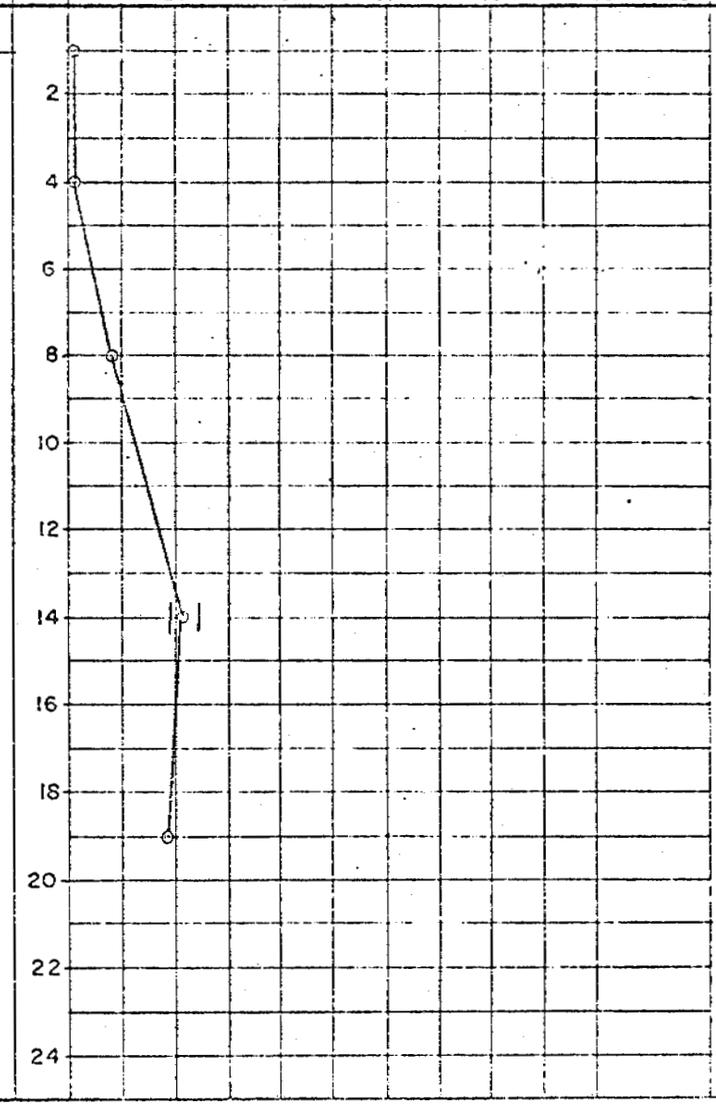
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE: 406+00	OFFSET: ℄
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: CONIFER & BIRCH TO 40'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
499	C	210 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								
2					GP	GRAVEL VERY DRY, WELL GRADED PEA SIZE	UF								
4															
6															
8															
10					GC										
12						CLAY									
14		P			CL	SOFT, STICKY VERY HIGH PLASTIC VERY WET 15'-20'									SAMPLE RETURN SMALL
16															
18															
20		P				CLAY TILL									
22						END OF HOLE									
24															



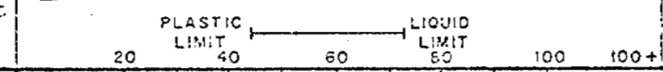
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 29/11/73	AIRPHOTO NO:	CHAINAGE: 420+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: CONIFER 30'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
499	C	214A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC SANDY	F									
2						CLAY		Nbn	2							
4					ML	SANDY, WITH ISOLATED PEBBLES			4							
6									6							
8						DENSE, SANDY VERY HARD		Vn ICE PARTICLES BARELY VISIBLE	8							
10		P						1/32" ICE LENSES	10							
12					CL				12							
14		P						Vn	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

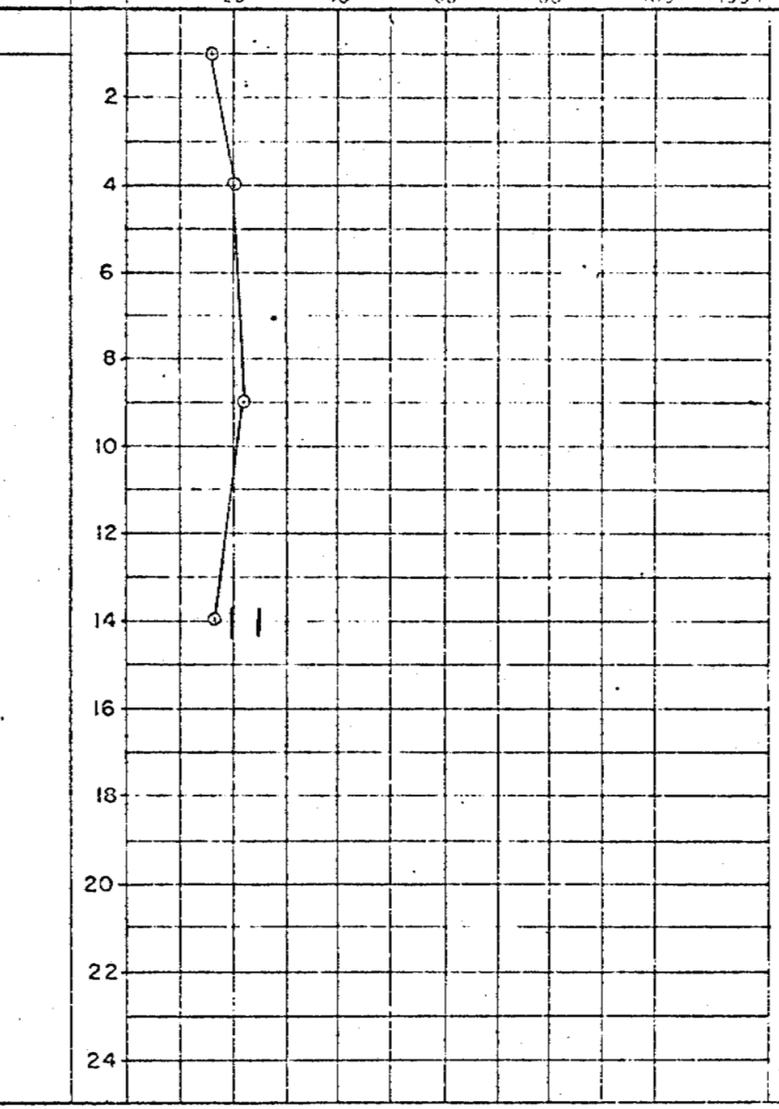


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG T.S	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE 435+00	OFFSET ℄	TEST HOLE
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SWAMP GRASS	ELEV	

MILE	B,C,S	NUMBER
499	C	215 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC SANDY	F	
2						CLAY	UF	
4					CL	FINE, SILTY		
6						VERY LOOSE		
8								
10								
12								
14		P			CL			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

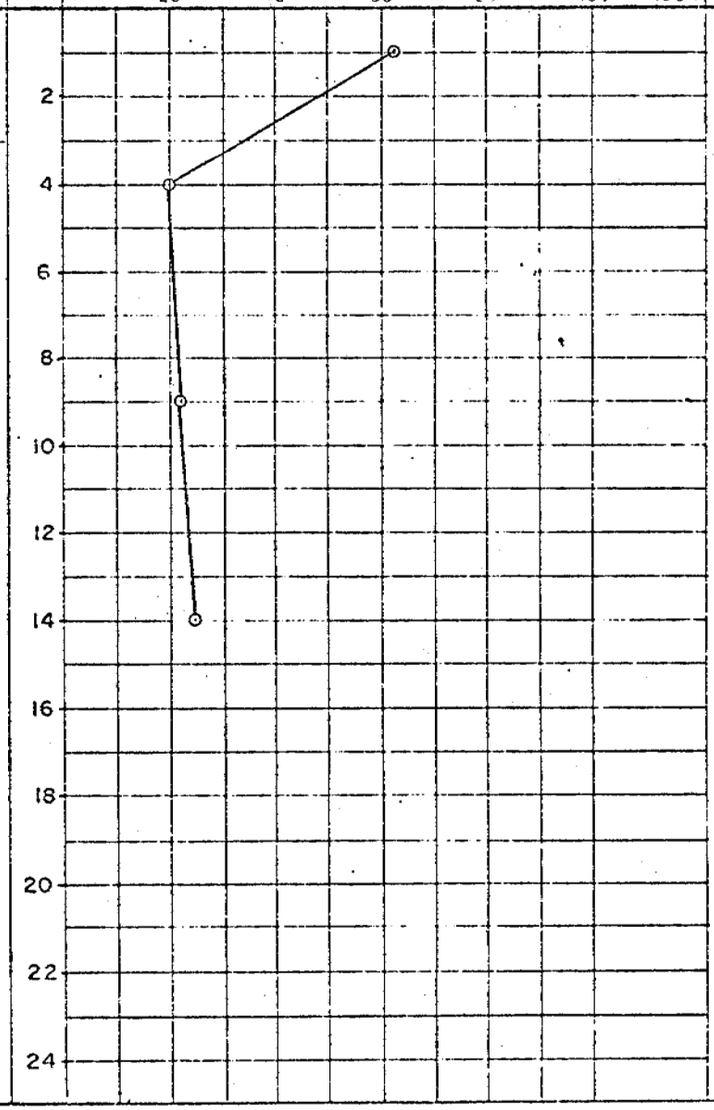
DWN AEW | FIELD ENG DR | DATE DRILLED 29/1/73 | AIRPHOTO NO: | CHAINAGE: 450+00 | OFFSET ℄

CKD DGP | TECH | RIG AIR | SURFACE DRAINAGE: POOR | VEGETATION: SCRUB SPRUCE | ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
499	C	359B

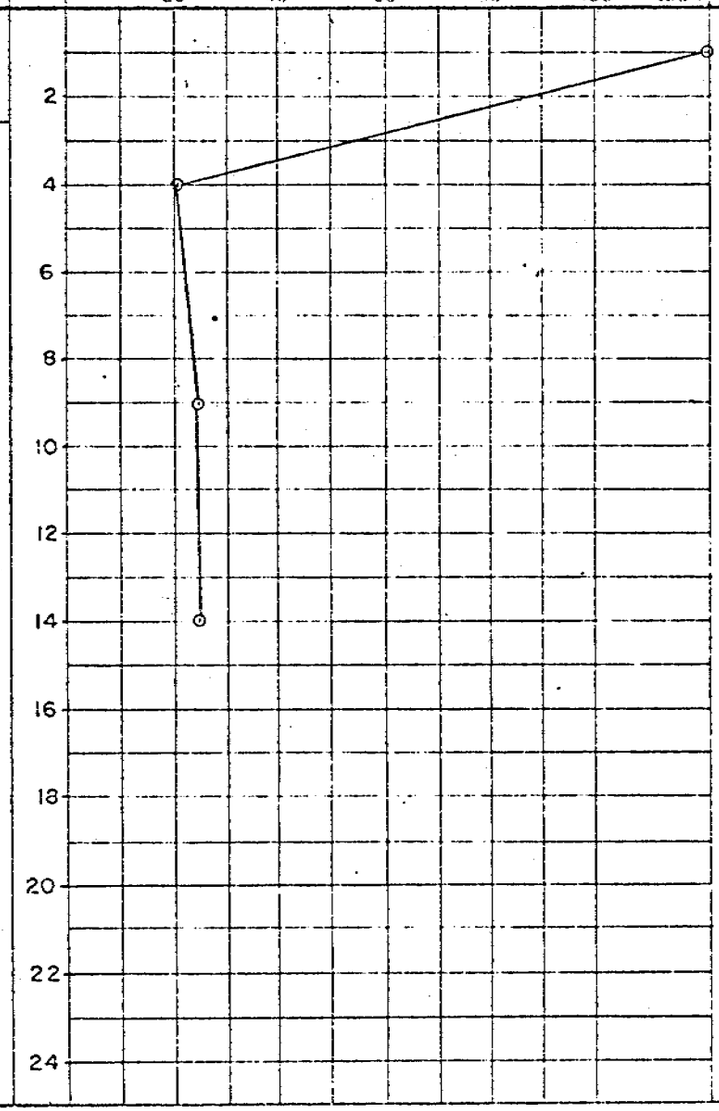
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SM	SAND 3" MOSS SILTY, FEW PEBBLES	F								
4		P				CLAY	UF								
6															
8					CL	MED BROWN									
10															
12															
14		P			ML	SILT MED BROWN									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG S.M	DATE DRILLED 23/11/73	AIRPHOTO NO:	CHAINAGE: 470+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 15', SPARSE	ELEV	MILE 500 / B,C,S C / NUMBER 360B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG GRANULAR		
2						SILT GREY, GRAVEL	F	
4		P				CLAY	UF	
6						GREY SILT, MOIST		
8					CL			
10		P						
12								
14		P						
16						END OF HOLE		
18								
20								
22								
24								



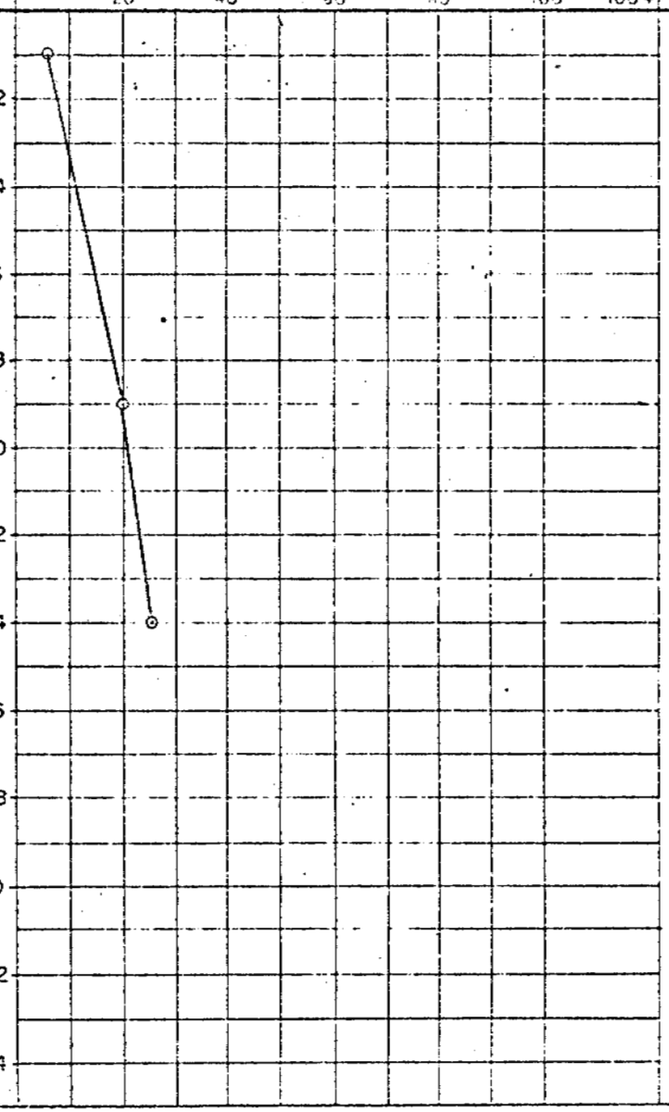
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						PENETRATION EASY

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 29/1/73	AIRPHOTO NO:	CHAINAGE: 480+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 10'	ELEV:	MILE 500 / B,C,S C / NUMBER 361B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GP	GRAVEL 3" MUSKEG SANDY, DRY	F	Vr
4						CLAY		
6						GREY WITH COD PEBBLE		
8					CL		UF	
10								
12						GREY		
14								
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							HOLE SLOUGHING

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 29/1/73	AIRPHOTO NO:	CHAINAGE 490+00	OFFSET ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 10'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
500	C	362B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL · 3" MUSKEG	UF									
2						SAND, VERY DRY			2							
4									4							HOLE SLOUGHING BADLY, ABANDONED
6						END OF HOLE			6							
8									8							
10									10							
12									12							
14									14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 30/1/73	AIRPHOTO NO:	CHAINAGE: 498+00	OFFSET: ℄
CKD: DGP	TECH	RIG: MR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	S.C.S	NUMBER
500	C	363B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL 3" MUSKEG	UF										
2					GP	VERY DRY, SOME COBBLES, SAND			2								HOLE SLOUGHING BADLY. ABANDONED.
4									4								
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG: BM	DATE DRILLED: 30/11/73	AIRPHOTO NO:	CHAINAGE: 510+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV	MILE: 501 B,C,S: C NUMBER: 364B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GM	3" MUSKEG GRAVEL	F										
2						BROWN SILT, SAND VERY DRY	UF		2								HOLE SLOUGHING BADLY, ABANDONED
4					GP				4								
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG B.M.	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 520+00	OFFSET: ℄
CKD D.G.P.	TECH:	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN TO 20', WILLOW	ELEV

TEST HOLE

MILE	B.C.S.	NUMBER
501	C	365B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						3" MUSKEG	F / UF	
2						SAND		
4					GP	SOME GRAVEL VERY DRY		
6								
8								
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							HOLE SLOUGHING BADLY, ABANDONED
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 30/1/73	AIRPHOTO NO:	CHAINAGE: 530+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:	MILE 501 B,C,S C NUMBER 366B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG . GRANULAR	F										
						SAND	UF										
2					SP	COARSE, BROWN, DRY SOME PEBBLES, LOOSE			2								
4									4								HOLE SLOUGHING BADLY, ABANDONED
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 30/11/73	AIRPHOTO NO:	CHAINAGE: 540+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: PINE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
501	C	367B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG GRANULAR	F	
2						SILT BROWN, FEW COBBLES	UF	
4					SP	SAND BROWN, VERY DRY SOME PEBBLES, COARSE		
6						END OF HOLE		
8								
10								
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							HOLE SLOUGHING BADLY, ABANDONED
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG BM	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 550+00	OFFSET ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: PINE TO 30'	ELEV

TEST HOLE

MILE	S.C.S	NUMBER
501	C	368 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						MUSKEG GRANULAR SILT BROWN, COBBLES	UF										
2						SAND			2								
4					SP	BROWN, VERY DRY, SOME PEBBLES, COARSE			4								HOLE SLOUGHING BADLY, ABANDONED
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG DR	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 558+00	OFFSET: ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JACK PINE TO 30'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
501	C	369B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GP	SAND & GRAVEL	F		2								HOLE SLOUGHING
4							UF		4								
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: D.R	DATE DRILLED: 30/11/73	AIRPHOTO NO:	CHAINAGE: 570+00	OFFSET: ℄
CKD: D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JACK PINE TO 25'	ELEV

TEST HOLE

MILE: 502 B.C.S NUMBER: C 370B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					GP	GRAVEL	F	
2						SILTY, SANDY	UF	
4					GM			
6						END OF HOLE		
8								
10								
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							HOLE SLOUGHING BADLY, ABANDONED
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.R	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 580+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JACK PINE TO 25'	ELEV	

MILE	B.C.S NUMBER
502	C 371B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					GP	GRAVEL	F	
2						SANDY, FEW COBBLES	UF	
4					GW			
6						END OF HOLE		
8								
10								
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22						
24						

REMARKS

HOLE SLOUGHING BADLY, ABANDONED

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.R	DATE DRILLED 30/11/73	AIRPHOTO NO:	CHAINAGE: 590+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: JACK PINE TO 25'	ELEV:	MILE 502 B.C.S NUMBER C 372 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
2					GM	GRAVEL SILTY, SANDY	F UF		HOLE SLOUGHING, ABANDONED
4									
6						END OF HOLE			
8									
10									
12									
14									
16									
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22						
24						

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG DR	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 601+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: JACK PINE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
502	C	373 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT 20 40 60 80 100 100+	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	F										
2					GW	SANDY	UF		2								HOLE SLOUGHING
4									4								
6						END OF HOLE			6								
8									8								
10									10								
12									12								
14									14								
16									16								
18									18								
20									20								
22									22								
24									24								

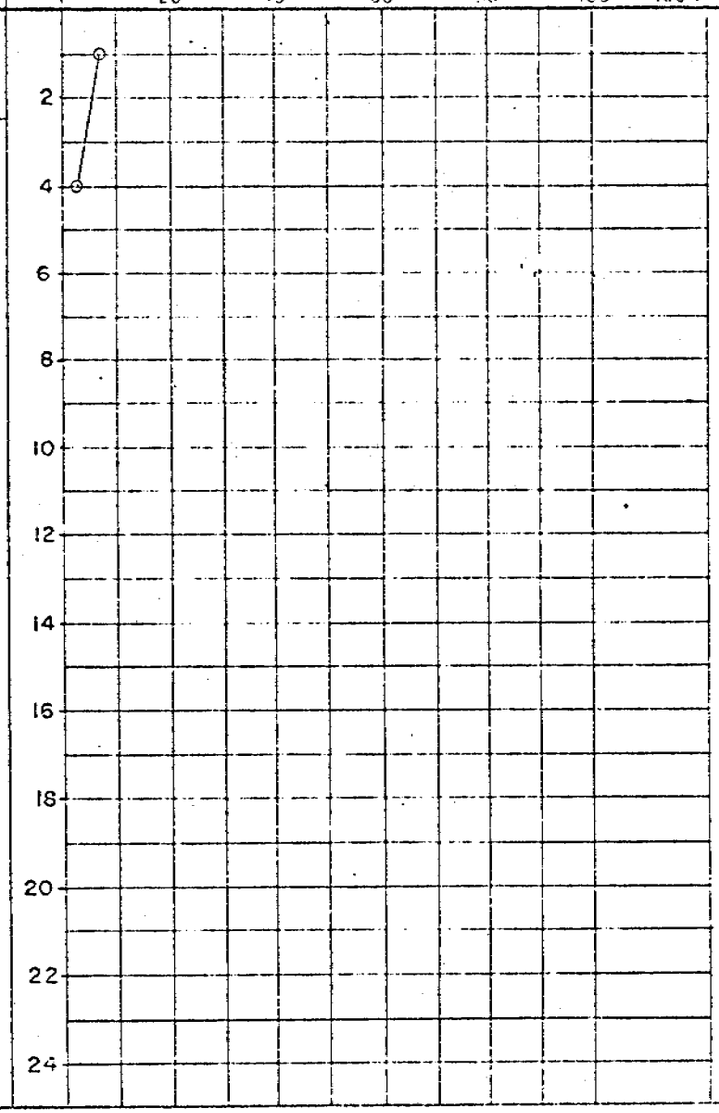
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG. D.R	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 610+00	OFFSET R
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE:	VEGETATION: JACK PINE TO 20'	ELEV

TEST HOLE

MILE	S,C,S	NUMBER
502	C	374B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GP	GRAVEL	F	
4						SAND	VF	
6						END OF HOLE		
8								
10								
12								
14								
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

HOLE SLOUGHING

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG DR	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 620+00	OFFSET: ℄
CKD DAP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: JACK PINE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
503	C	375 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					GP	GRAVEL 3" MOSS SANDY	F	
							UF	
						END OF HOLE		

DEPTH (FEET)

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)

REMARKS

FREE WATER ENCOUNTERED AT 4'-5'

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 630+00	OFFSET: ℄	TEST HOLE
CKD D&P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV	

MILE	B,C,S	NUMBER
503	C	376 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG, GRANULAR, MOSS	F	
2						GRAVEL	UF	
4						SANDY		
6								
8								
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22						
24						

REMARKS

HOLE SLOUGHING BADLY, ABANDONED AT 8'

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG D.R	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE 650+00	OFFSET ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: JACK PINE 40'	ELEV

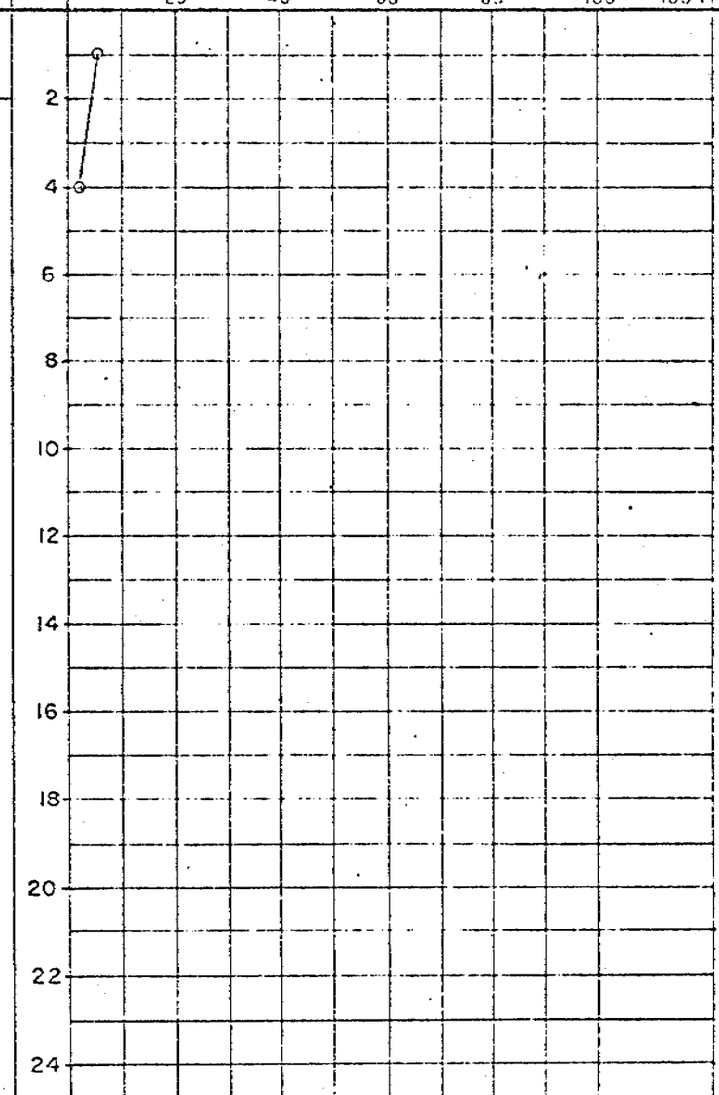
TEST HOLE

MILE	B,C,S	NUMBER
503	C	377B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2						GRAVEL	F	
4						SANDY	UF	
6						END OF HOLE		
8								
10								
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ——— LIQUID LIMIT



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

HOLE SLOUGHING
ABANDONED AT 5'

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CKD A.E.W.	FIELD ENG. DR	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 659+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: JACKPINE 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
503	C	378B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					GP	MOSS STRIPPED GRAVEL	F UF	
						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)

HOLE SLOUGHING
ABANDONED AT 5'

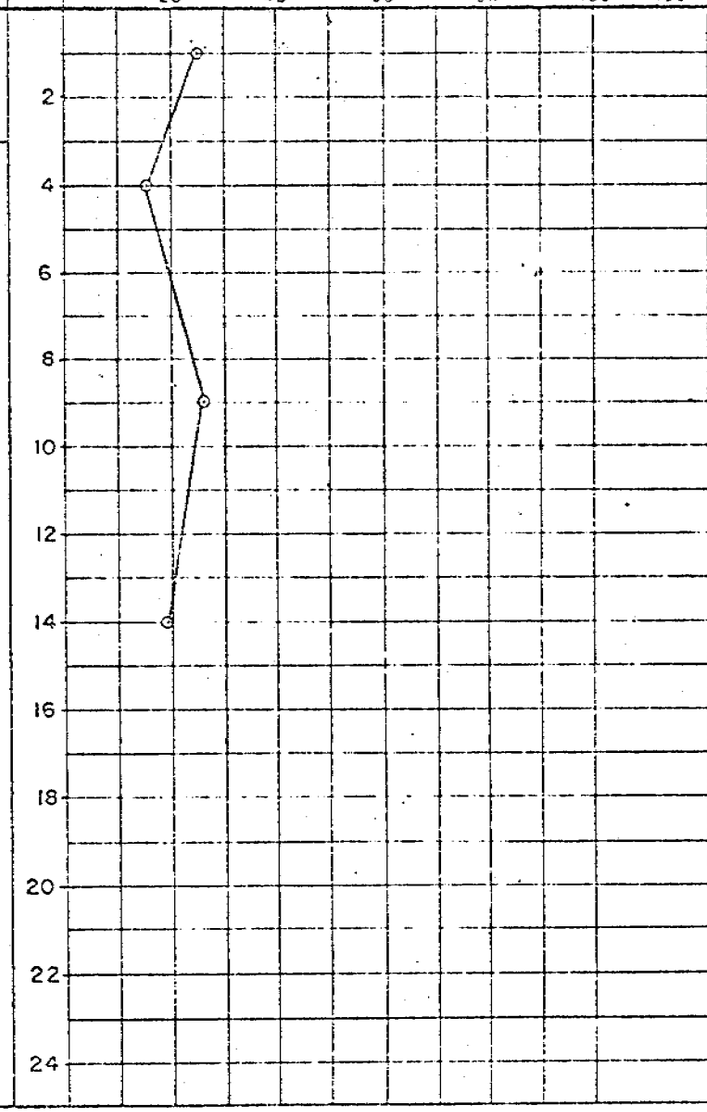
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG DR.	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 670+00	OFFSET: ℄
CKD DGP	TECH:	RIG	SURFACE DRAINAGE: FAIR	VEGETATION: JACKPINE & SPRUCE TO 25'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
504	C	379B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MOSS STRIPPED		
2					SM	SAND SILTY	F	
4					SP	WATER	UF	
6								
8						WATER, SOME GRAVEL		
10					GP			
12								
14					SM	SILTY		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

NO INDICATION OF GRAVEL AT 14'-15'

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

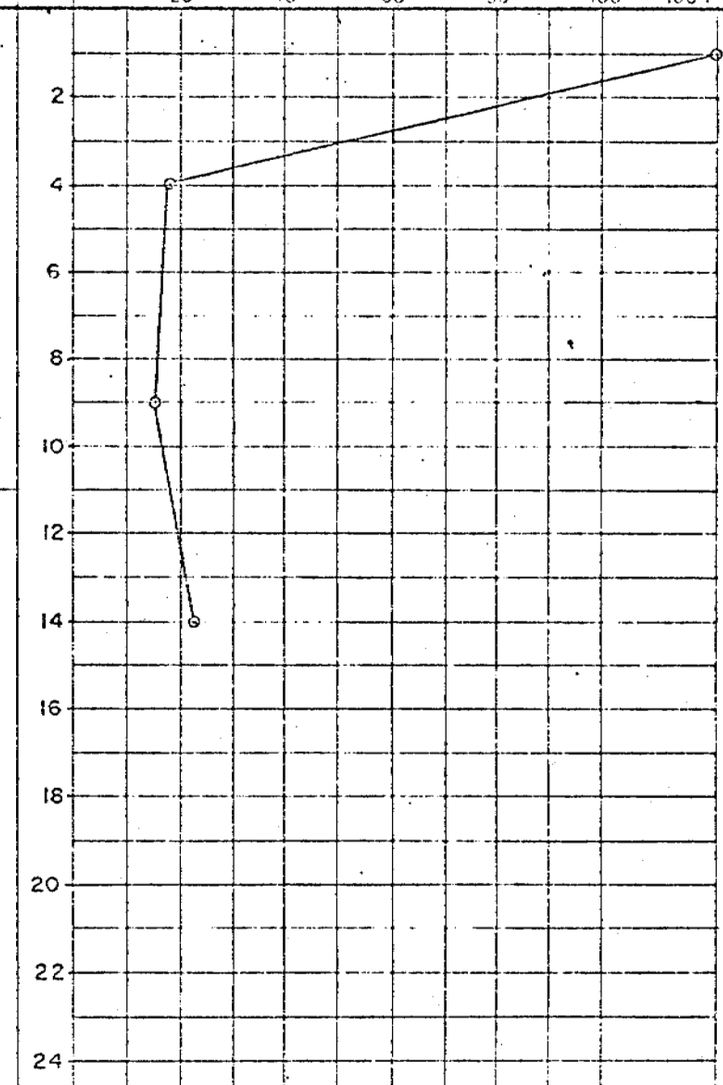
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.R	DATE DRILLED 3/1/73	AIRPHOTO NO:	CHAINAGE: 688+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SCRUB SPRUCE	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
504	C	380B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	MUSKEG	F	
4						GRAVEL		
6								
8					GM	GREY, SAND		
10								
12							UF	
14					CL	CLAY MED BROWN		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W | FIELD ENG: D.R | DATE DRILLED: 31/1/73 | AIRPHOTO NO: | CHAINAGE: 6)4+25 | OFFSET: ℄

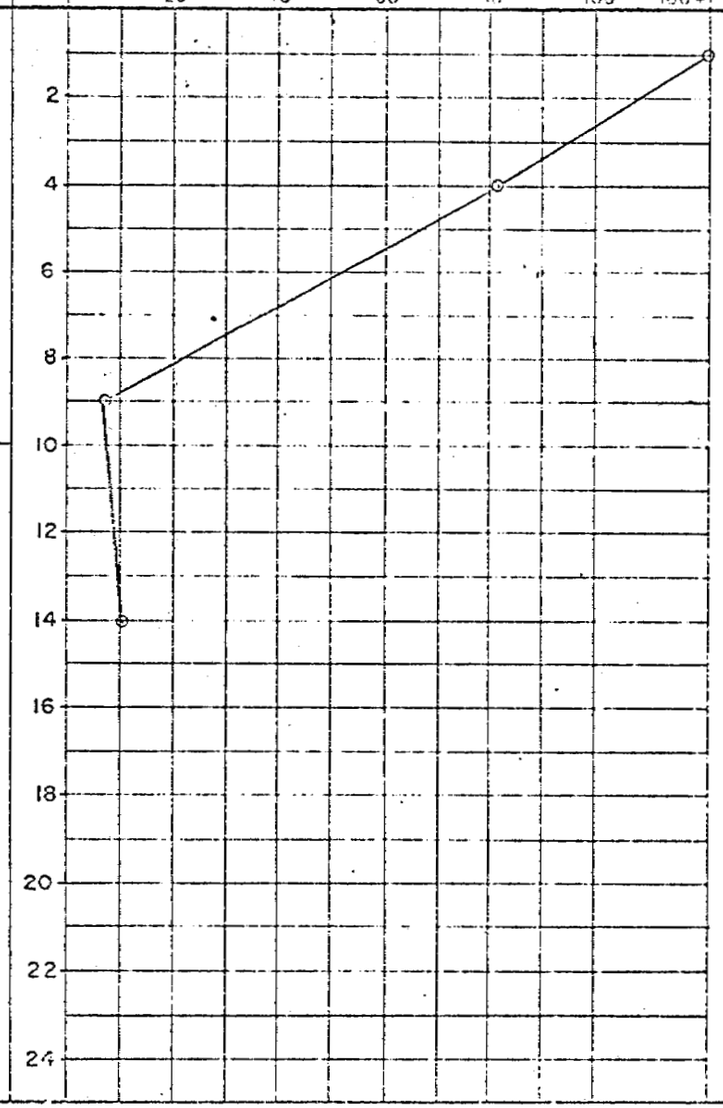
CKD: DGP | TECH: | RIG: AIR | SURFACE DRAINAGE: POOR | VEGETATION: SPRUCE 20' | ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
504	C	381B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	MUSKEG	TF	
4					SM	SILTY SAND		
6								
8					GP	GRAVEL		
10						SAND	UF	
12					GC			
14						CLAY MED BROWN		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

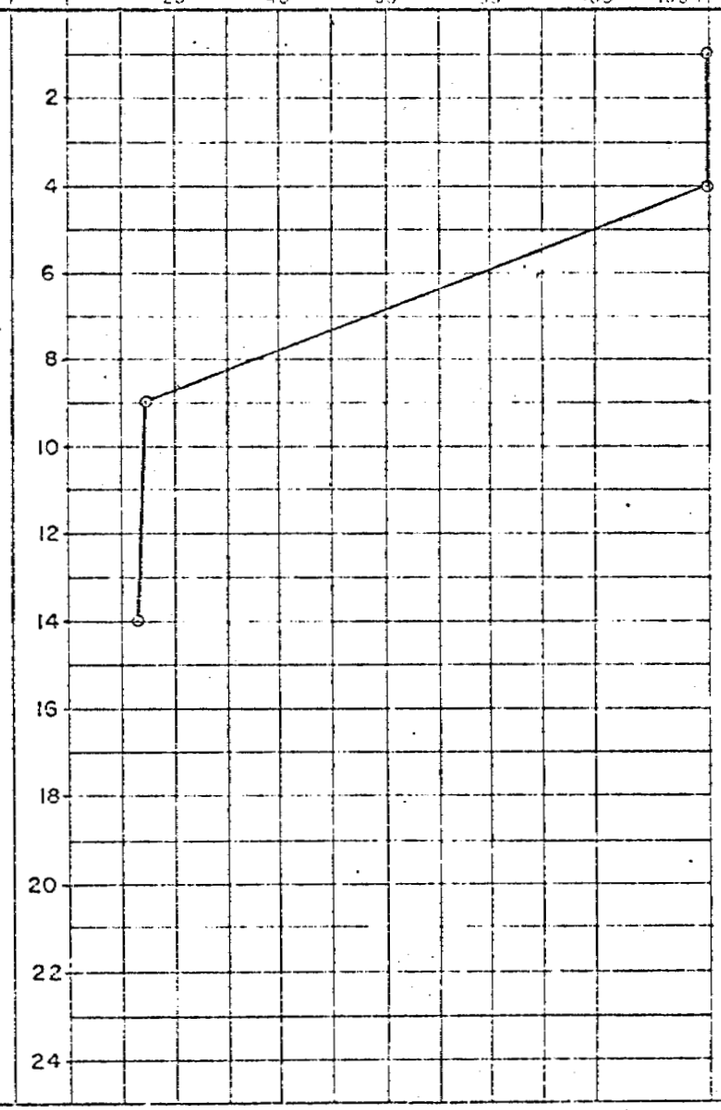
DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE 711+00	OFFSET ℄
CKD DSP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
504	C	249 A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG	F	
2					Pt	GRAVEL		Nbn
4					SM			
6						FINE, COARSE SAND		
8								ICE CRYSTALS < 5%
10								
12								
14					GP			Nbn
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

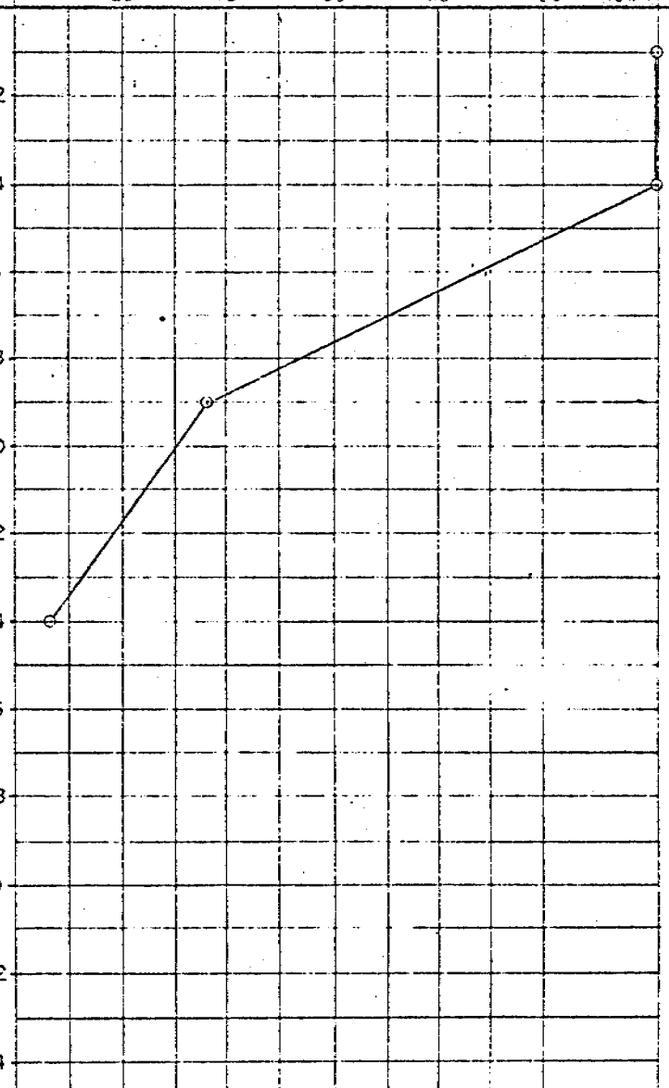
DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 725+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR 15'	ELEV

TEST HOLE

MILE	B.C.S	NUMBER
505	C	248 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG		
2					Pt	PEAT	F	Vh
4						GRANULAR		
6								∠ 5% ICE
8					Pt			
						SILT		
10		P			SM	SANDY GREY		
12								
14					GC	CLAY GRAVEL, SILTY, VERY WET		Nbn
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

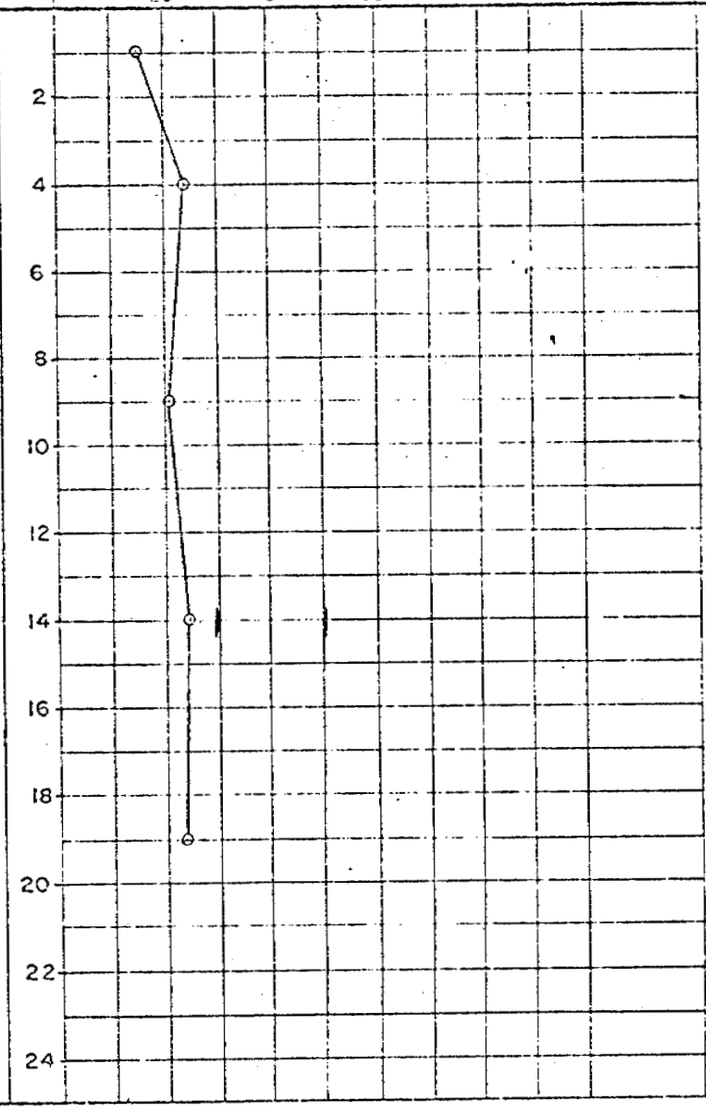


DEPTH (FEET)	GRAIN SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
14							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE 736+00	OFFSET ℄	TEST HOLE
CKD D.S.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR .5' SPRUCE TO 25'	ELEV	MILE B,C,S NUMBER 505 C 247A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG	F	
2						SILT LIGHT BROWN, SANDY		Vr
4						CLAY		
6								
8								
10						GREY		<5% ICE
12								
14		P						
16								
18								Vr
20		P						
22						END OF HOLE		
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
				121.9	97.5	

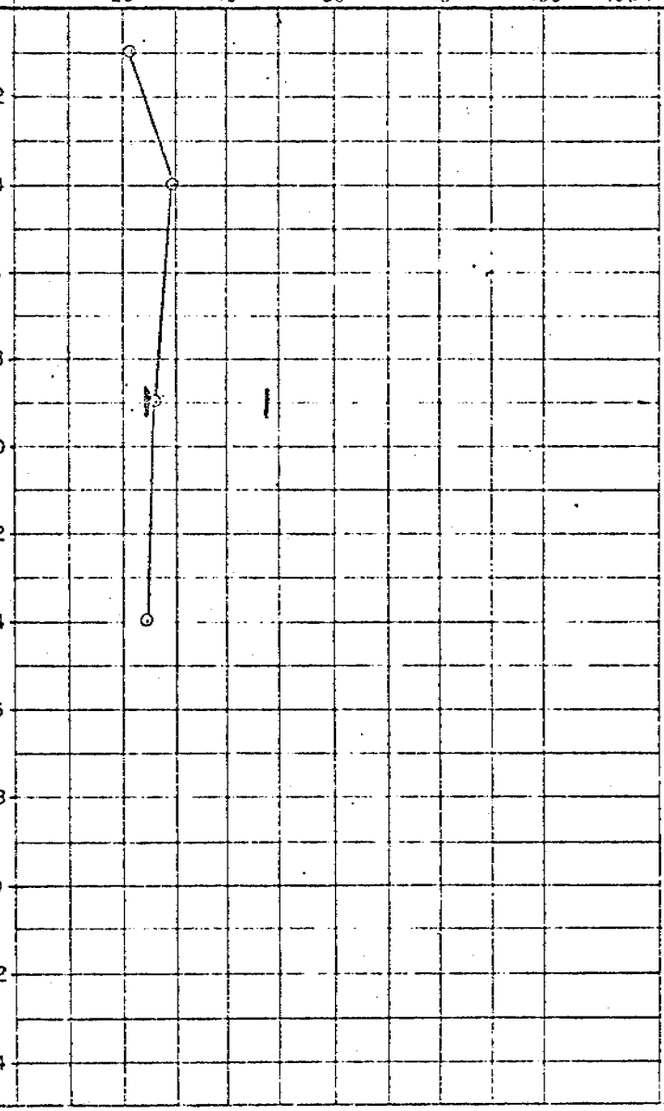
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 750+00	OFFSET: ℄
CKD DSP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 25'	ELEV.

TEST HOLE

MILE	B.C.S	NUMBER
505	C	246 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					CL	MUSKEG COARSE, FIBROUS CLAY	F	Vr	2			
4									4			
6						GREY		< 5% ICE	6			
8									8			
10		P							10	121.6	95.9	
12									12			
14		P			CL			Vr	14	123.2	98.5	
16						END OF HOLE			16			
18									18			
20									20			
22									22			
24									24			



GRAIN SIZE ANALYSIS

CLAY %	SILT %	SAND %	GRAVEL %

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 760+00	OFFSET ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 25'	ELEV

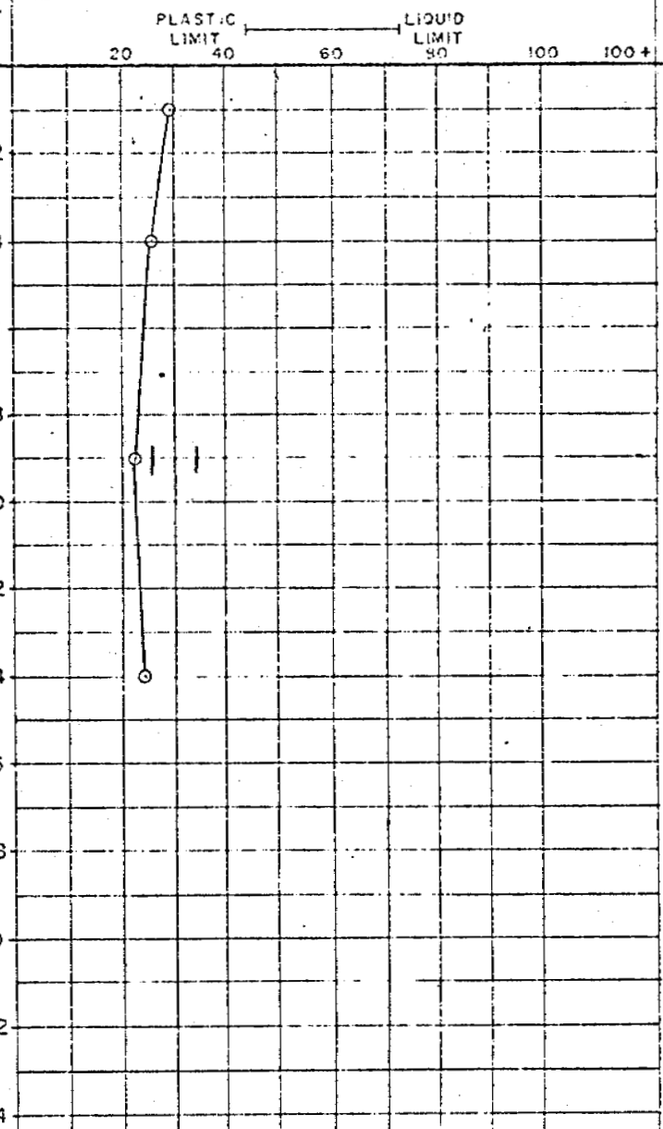
TEST HOLE

MILE	B,C,S	NUMBER
505	C	245 A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG	F	
2					CL	CLAY		Vr
4								
5						GREY, STRATIFIED		
8								< 5% ICE
10		P						
12					CL			
14		P			ML	SILT		Vr
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2					124.1	95.6
10					119.1	97.5

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W | FIELD ENG: D.M | DATE DRILLED 30/1/73 | AIRPHOTO NO: | CHAINAGE: 770+00 | OFFSET: L

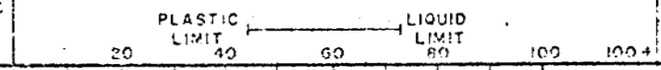
CKD D.G.P | TECH: | RIG: AIR | SURFACE DRAINAGE: GOOD | VEGETATION: SPRUCE & POPLAR TO 20' | ELEV

TEST HOLE

MILE	B,C,S	NUMBER
505	C	244A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG	F									
2						CLAY		Nbn	2							
4					CL	GREY, STRATIFIED			4							
6									6							
8									8							
10		P				SILT			10					123.7	100.7	
12					ML	LIGHT BROWN			12							
14		P			CL	CLAY GREY		Nbn	14					118.5	94.2	
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

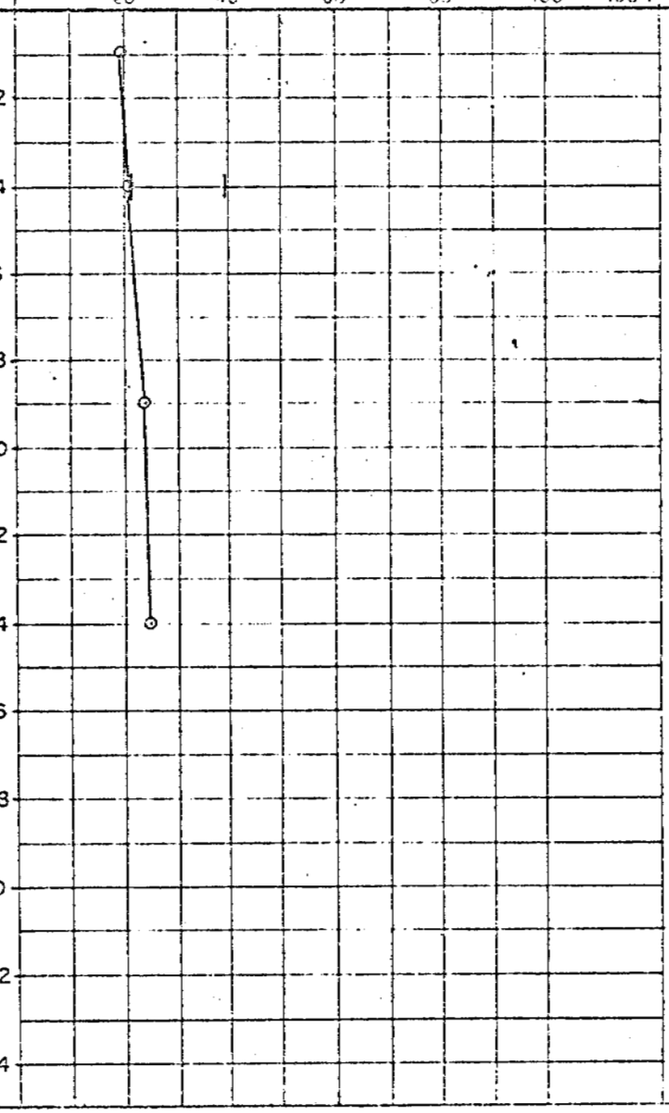
○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 780+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 25'	ELEV	MILE B,C,S NUMBER 506 C 243 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG COARSE FIBROUS	F								
2					CL	CLAY		Vr							
4						GREY									
6								< 5% ICE							
8															
10		P			CL								127.0	112.7	
12						SILT									
14		P				GREYISH BROWN		Vr							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

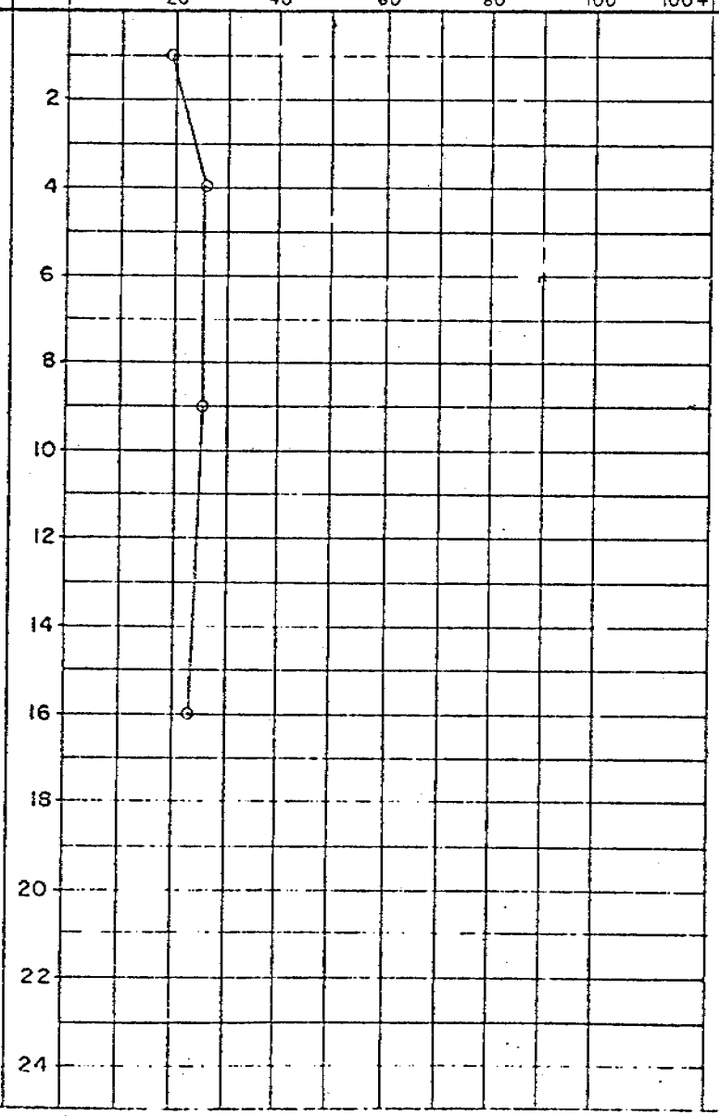
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG DM	DATE DRILLED 30/11/73	AIRPHOTO NO:	CHAINAGE: 791+00	OFFSET: ℄
CKD DGP	TECH	RIG:	SURFACE DRAINAGE GOOD	VEGETATION: SPRUCE & POPLAR TO 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
506	C	242A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG	F								
2					CL	CLAY		Vr							
4															
6						GREY, STRATIFIED									
8								<5% ICE							
10		P											118.7	92.3	
12															
14															
16		P			CL			Vr					123.7	100.6	
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

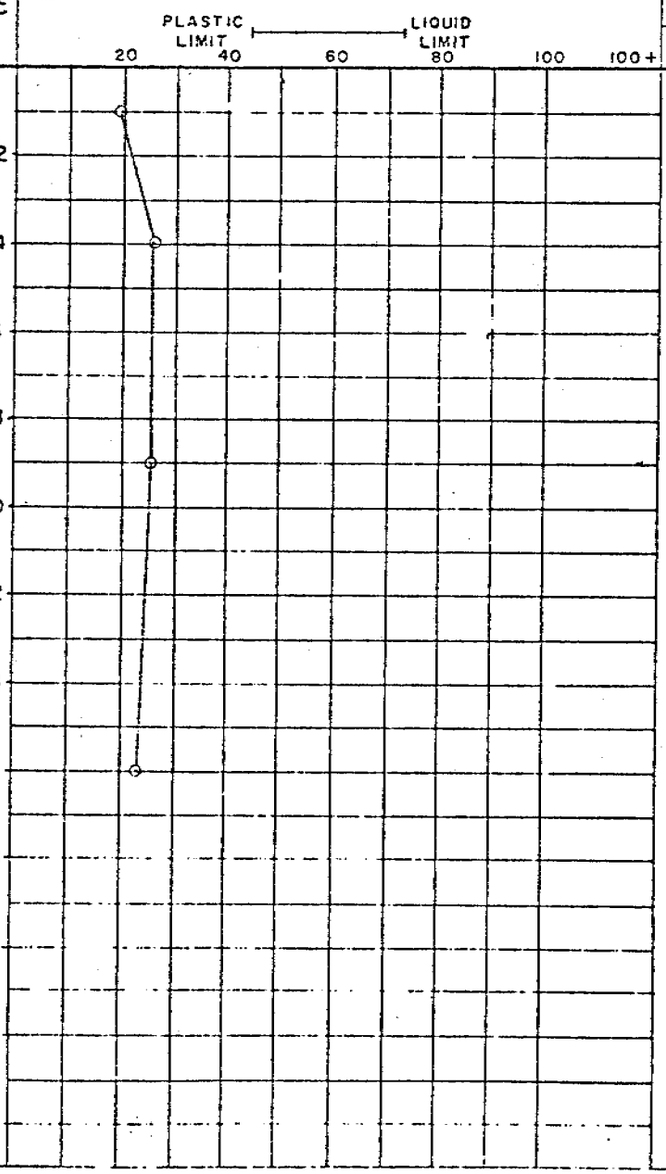
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG DM	DATE DRILLED 30/11/73	AIRPHOTO NO:	CHAINAGE: 791+00	OFFSET: ℄
CKD DGP	TECH	RIG:	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR TO 20'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
506	C	242A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG	F								
2					CL	CLAY		Vr							
4															
6						GREY, STRATIFIED									
8								<5% ICE							
10		P											118.7	92.3	
12															
14															
16		P			CL			Vr					123.7	100.6	
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

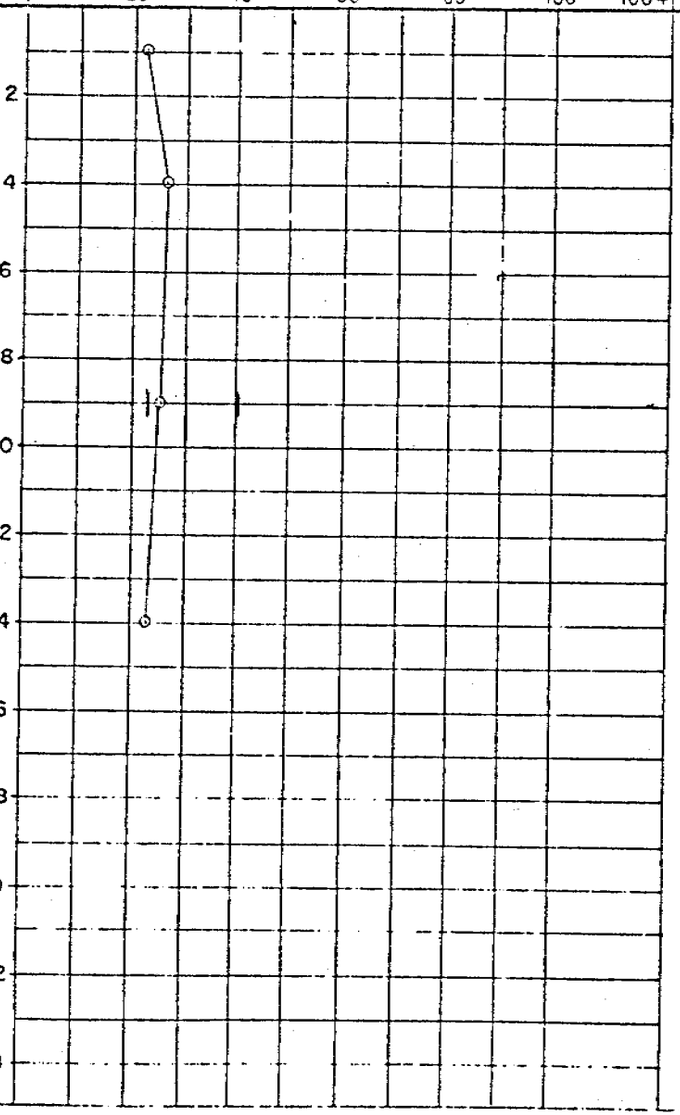
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG D.M	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 800+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE 20'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
506	C	241 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					CL	CLAY 4" MOSS	F	Vr							
4															
6						GREY, STRATIFIED		< 5% ICE							
8															
10		P			CL								117.2	93.5	
12						SILT									
14		P			ML	GREY		Vr					129.3	105.6	
16						END OF HOLE									
18															
20															
22															
24															



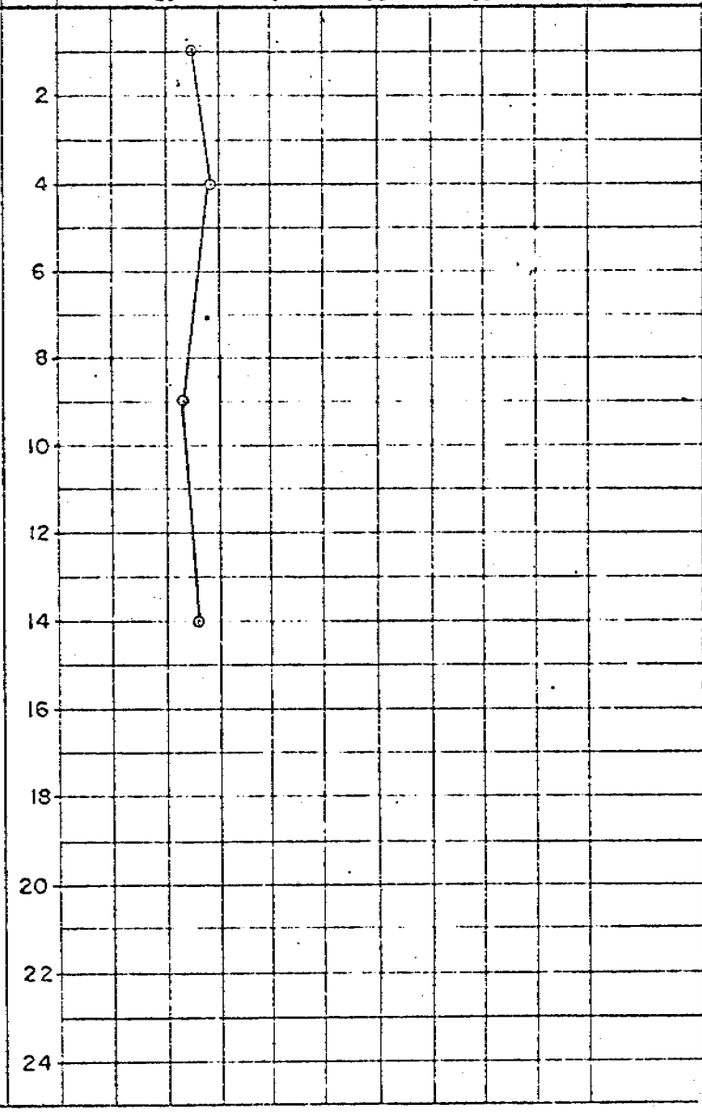
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAT A.E.W	FIELD ENG. DM	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 810 100	OFFSET: L
CKD DEP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 15'	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
506	C	240 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG FINE FIBROUS									
2					CL	CLAY	F	Vr							
4		P											121.6	94.6	
6						GREY		<5% ICE							
8															
10		P											122.1	97.0	
12															
14					CL			Vr							
16						END OF HOLE									
18															
20															
22															
24															

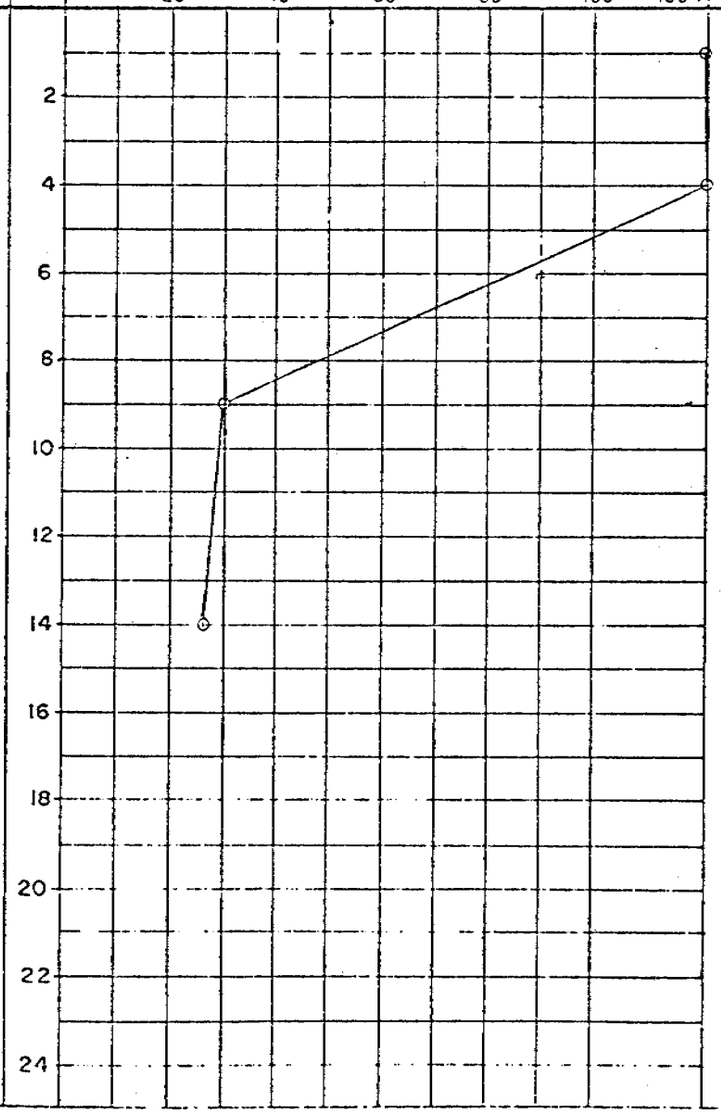


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN AEW	FIELD ENG DM	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 820+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
506	C	239 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG PEAT									
2					CL	CLAY	F	Vr							
4															
6						BROWNISH GREY		ICE CONTENT < 5%							
8															
10		D											120.3	92.9	
12															
14		P			CL			Vr					125.2	99.3	
16						END OF HOLE									
18															
20															
22															
24															

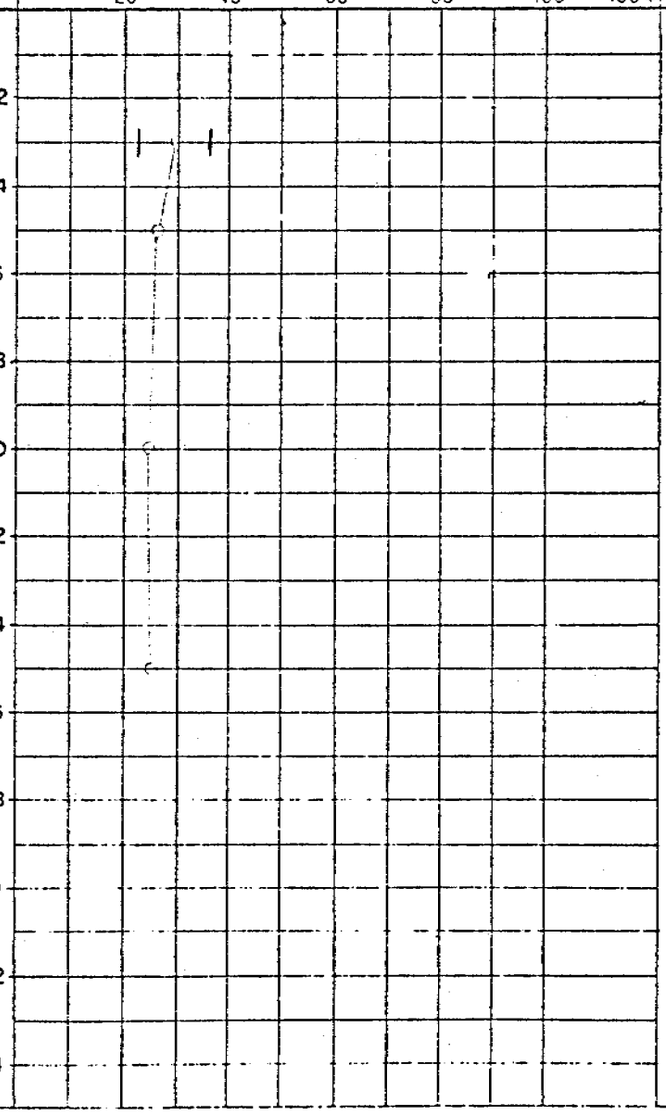


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN R.S.	FIELD ENG N.C.	DATE DRILLED: 7/75	AIRPHOTO NO:	CHAINAGE: 841+00	OFFSET: ?
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: Good	VEGETATION: 20-30 SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
507	C	2524

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" MOSS									
						CLAY									
2		P			CL	SILT, LIGHT, BROWN	F								
4					CL			Vr.					120.2	92.1	
6						CLAY									
8															
10		P			CL	DARK, BROWN							123.0	92.0	
12							F								
14		P			SM	SILT CLAY & SAND		Vx					120.5	96.6	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

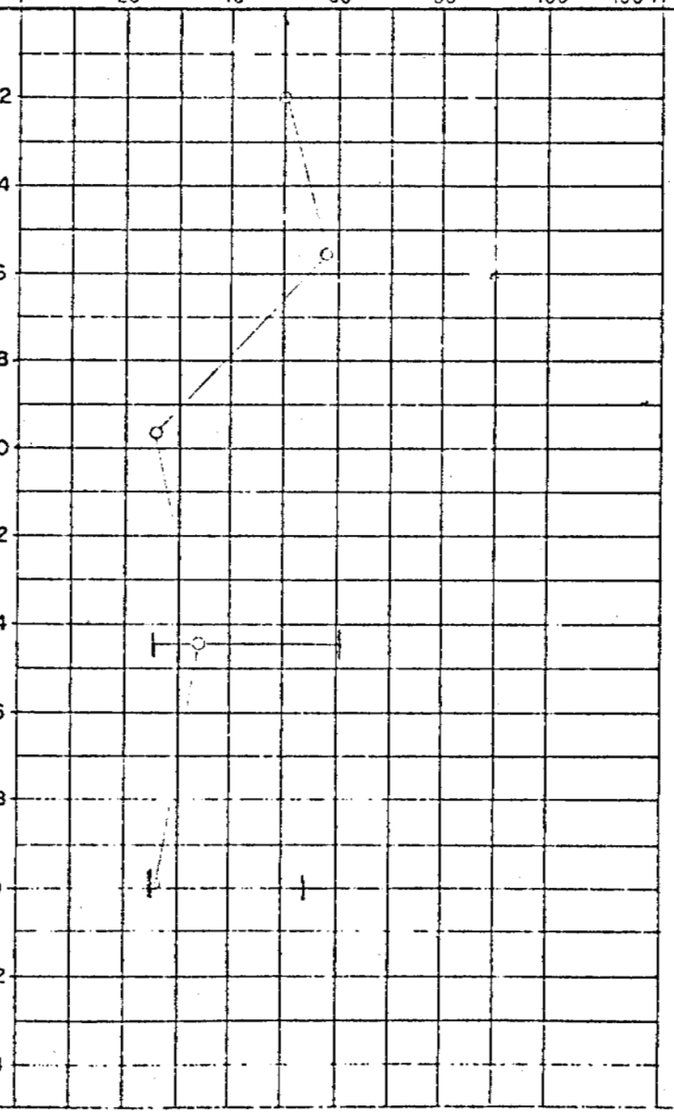
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 30/1/73	AIRPHOTO NO:	CHAINAGE: 846+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20-40 SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
207	C	253A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt-U	CLAY	F								
4															
6		P			Pt-U	SILT, LIGHT, GREY		Vr.					94.4	56.2	
8															
10		P			G.C.	SOME PEBBLES @ 10'							123.8	97.6	
12															
14		P			G.C.		F						117.3	97.1	
16															
18															
20		P			G.C.			Vr LENSE TO ½"					125.3	99.9	
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG D.M.	DATE DRILLED 3/1/72	AIRPHOTO NO:	CHAINAGE: 850+00	OFFSET: 4'
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: Good	VEGETATION: 30' POP. & SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
507	C	254A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						5" ORGANIC CLAY									
4						GREY		Vr							LESS THAN 5% ICE
6															
8							F								
10		P											154.3	119.5	
12															
14		P						Nbn					121.9	99.0	STRATIFIED FROM 13'
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN [illegible]	FIELD ENG [illegible]	DATE DRILLED	AIRPHOTO NO:	CHAINAGE: 560+00	OFFSET: ℄
CKD	TECH	RIG: [illegible]	SURFACE DRAINAGE: [illegible]	VEGETATION: [illegible]	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
[illegible]	C	2552

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" ORGANIC	F										
						CLAY											
2						GREY, SILT SEAMS			2								
4								Vr.	4								
6									6								
8									8								
10		P							10						127.5	104.0	
12								Nbr	12								
14		P							14						124.7	94.1	
16									16								
18						END OF HOLE			18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN B.S.	FIELD ENG [illegible]	DATE DRILLED [illegible]	AIRPHOTO NO:	CHAINAGE: 875+00	OFFSET: [illegible]
CKD	TECH	RIG: [illegible]	SURFACE DRAINAGE: [illegible]	VEGETATION: [illegible]	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
207	C	256A

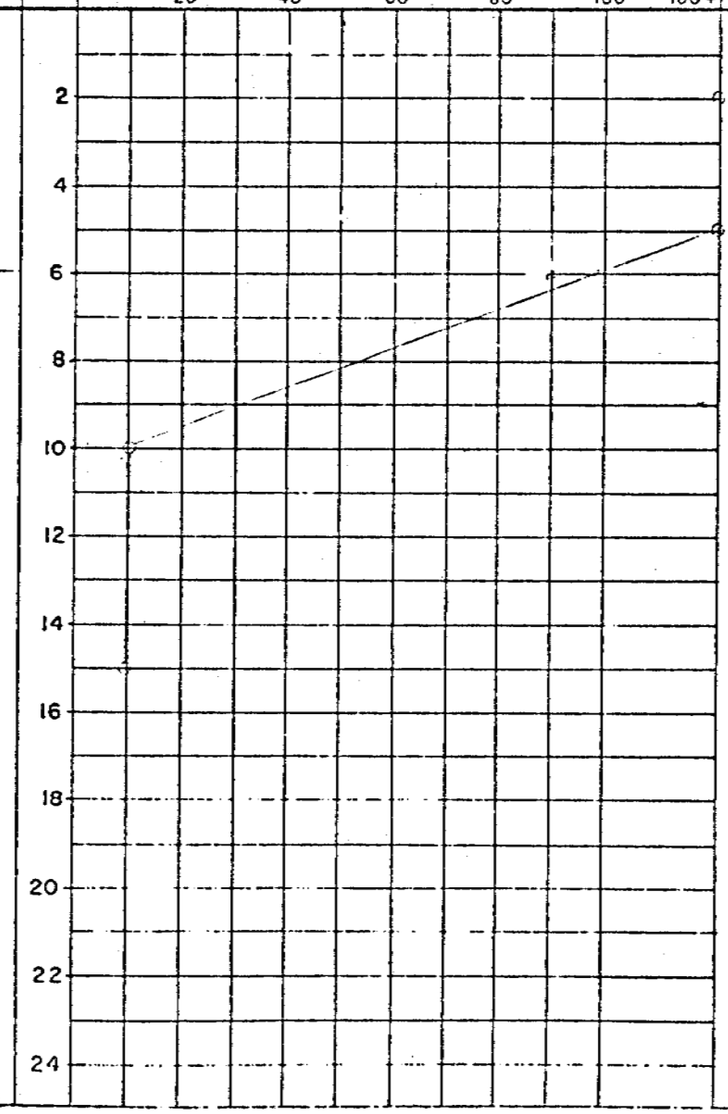
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT 20 40 60 80 100 100+ LIQUID LIMIT)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						STORAGE											
						CLAY											
2						GREY, STRATIFIED	F		2								
4									4								
6								Vr	6								
8									8								
10									10								
12									12								
14						SAND COARSE		Nbn	14								
16									16								
18						END OF HOLE			18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG D.M.	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 890+00	OFFSET:
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 10' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
508	C	257 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	GRAN. MUSKEG	F	Vr
4					Pt			
6						SAND & GRAVEL		
8								
10					GP		F	Nbn
12								
14					GP			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

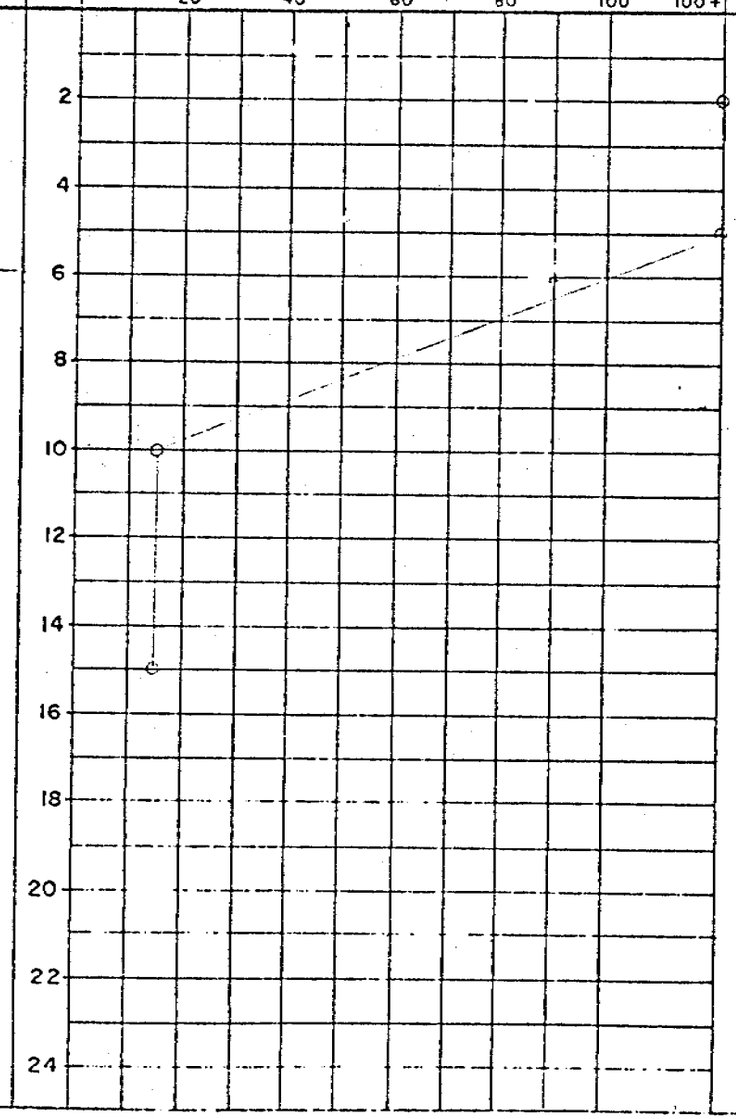
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG D.M.	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 900+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: 5' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
508	C	258A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	MUSKEG	F	
						FINE - FIBEROUS		
4					Pt		UF	
6						MUSKEG		
8						SANDY	F	Nbn
10					S.P.	SAND		
12								
14					S.P.			
16								
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



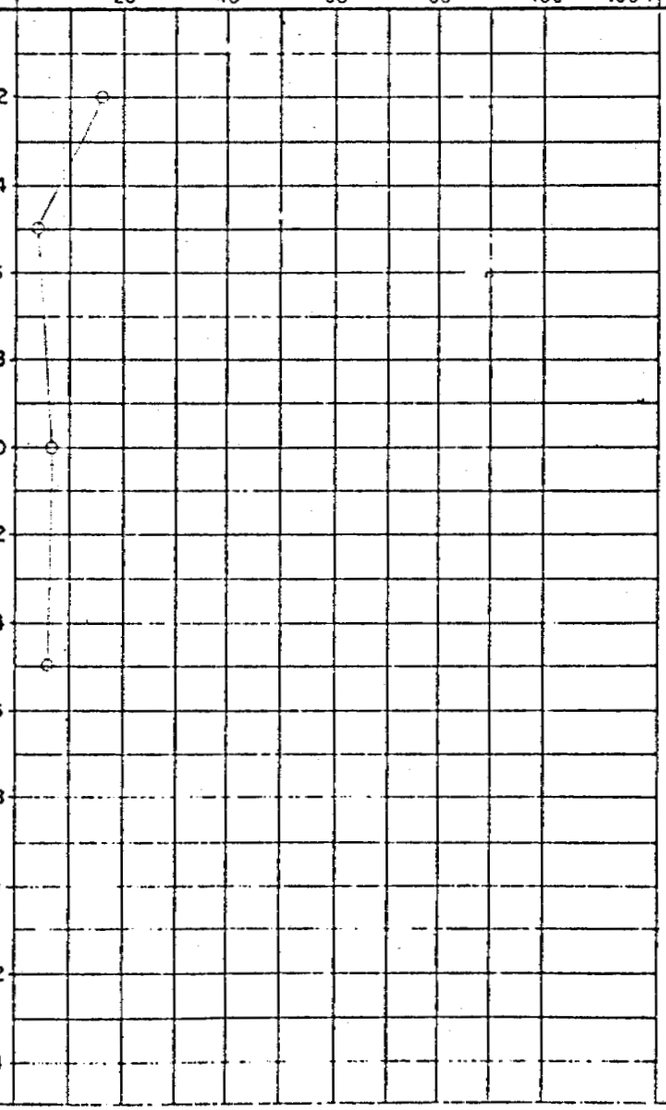
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG D.M.	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 910+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
508	C	959A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GP	GRAVEL	F	Vr							
4					GW										
6															
8															
10					GW										
12							F								
14					GW										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

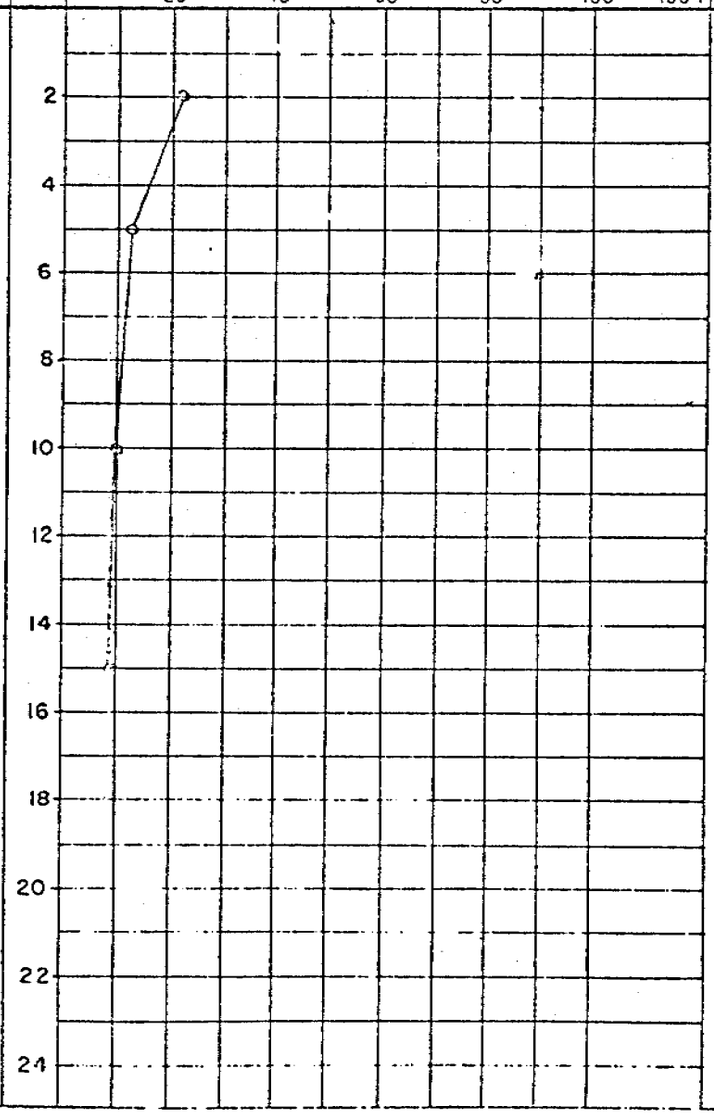
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG [illegible]	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 922+00	OFFSET: [illegible]
CKD	TECH	RIG:	SURFACE DRAINAGE GOOD	VEGETATION: [illegible]	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
[illegible]	C	[illegible]

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					S.P.	SAND	F	Nbn							
4					S.P.										
6						GRAVEL & CLAY									
8															
10					G.C.		F								
12															
14					G.C.										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

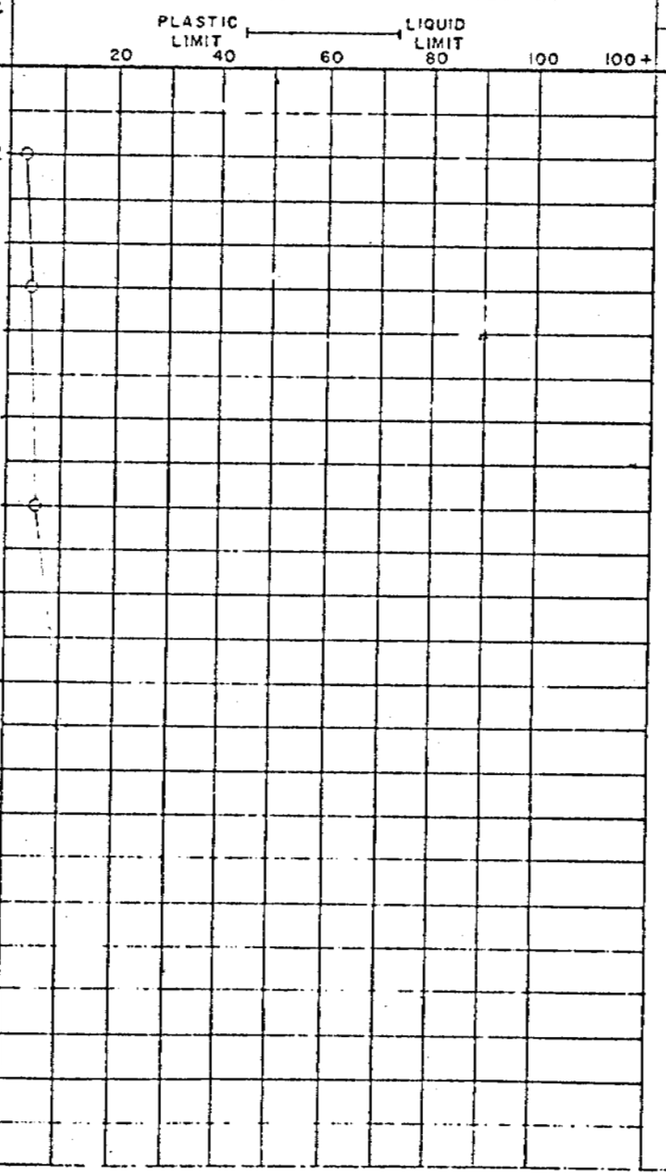
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN [illegible]	FIELD ENG [illegible]	DATE DRILLED [illegible]	AIRPHOTO NO:	CHAINAGE: 930+00	OFFSET: [illegible]
CKD	TECH	RIG: [illegible]	SURFACE DRAINAGE: GOOD	VEGETATION: 15' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
[illegible]	C	[illegible] A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2		/			S.P.	SAND COARSE	F	
4		/			S.P.		UF	
6								
8								
10		/			S.P.			
12								
14		/			G.C.	SAND COARSE, CLAY		
16								
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG [illegible]	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: 845 +00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 15' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
400	C	262A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					S.P.	SAND COARSE	UF		2							
4					S.P.				4							
6									6							
8									8							
10					S.P.				10							
12									12							
14					S.P.				14							
16									16							
18						END OF HOLE			18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN [illegible]	FIELD ENG [illegible]	DATE DRILLED [illegible]	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET:
CKD	TECH	RIG: [illegible]	SURFACE DRAINAGE [illegible]	VEGETATION: [illegible]	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
[illegible]	[illegible]	[illegible]

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						[illegible]											
2					CP		F		2								
4					CP	MED. FINE	UF		4								
6									6								
8									8								
10					CP				10								
12									12								
14							UF		14								
16					CP				16								
18									18								
20						END OF HOLE			20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN P.S.	FIELD ENG [illegible]	DATE DRILLED 31/1/73	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET:
CKD	TECH	RIG: [illegible]	SURFACE DRAINAGE: [illegible]	VEGETATION: [illegible]	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
[illegible]	[illegible]	[illegible]

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					S.P.	SAND	F										
2						FEW PEBBLES			2								
4					S.P.				4								
6									6								
8									8								
10					S.P.				10								
12									12								
14					S.P.				14								
16									16								
18									18								
20					S.P.				20								
22									22								
24						END HOLE @ 25'			24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

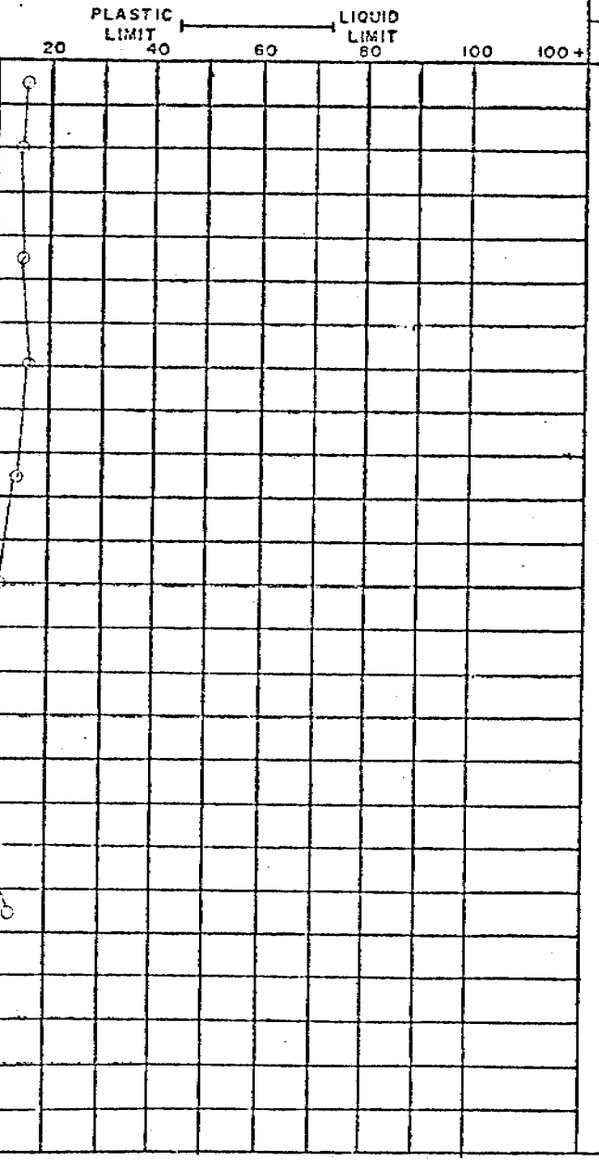
DWN A.E.W	FIELD ENG. B M	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 976+00	OFFSET: 6
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE, POPLAR, PINE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBE
599	S	275A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						GRAVEL 4" ORGANIC	T	
4					GC	SILT		ICE CRYSTALS
8						CLAY		
12					GC	SILTY, GRAVEL		
16		P		26 BLS				
20						GRAVEL TILL		
24		P		51 BLS				
28						COARSE SAND, GRAVEL		
32								
36		P		93 BLS				ICE CRYSTALS
40					GC	GRAVEL		
44						END OF HOLE		
48								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

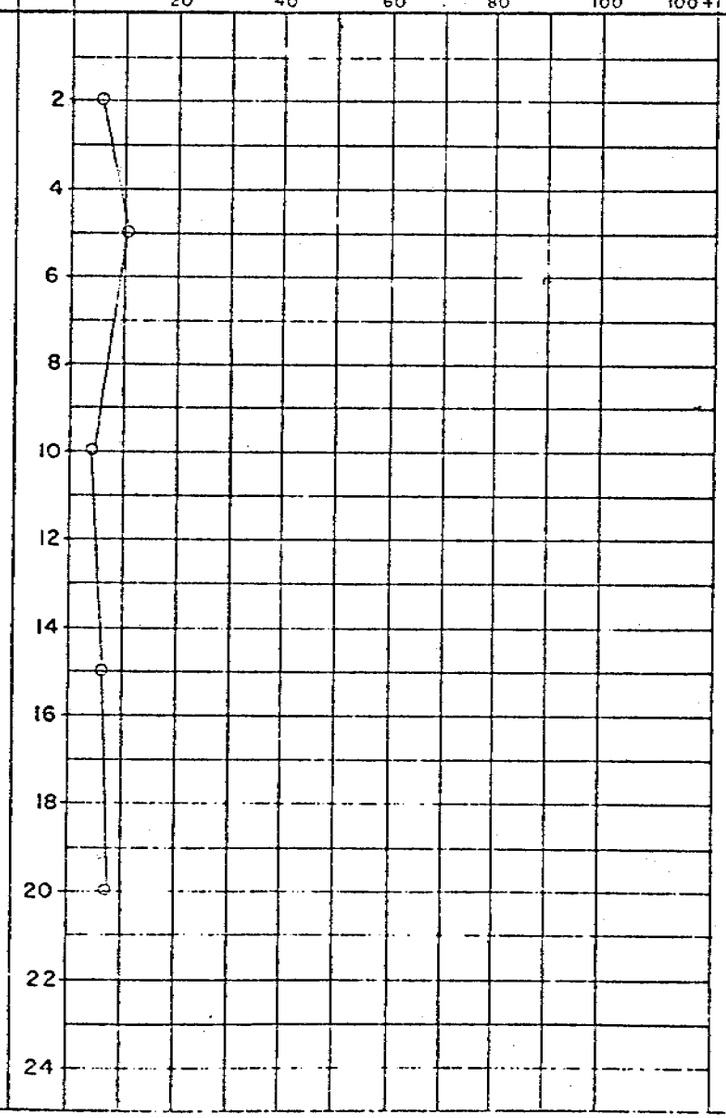
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.N.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 979+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - NORTH & SOUTH	VEGETATION: 30' PINE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
509	C	263A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						3" ORGANIC		
2					SM	SAND SILTY	F	
4					S.P.	SAND		
6						CLAY SEAMS		
8							UF	
10					S.P.			
12								
14					S.P.			
16								
18						SAND, CLAY, PEBBLES		
20				S.P.-C.L.				
22						END OF HOLE		
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

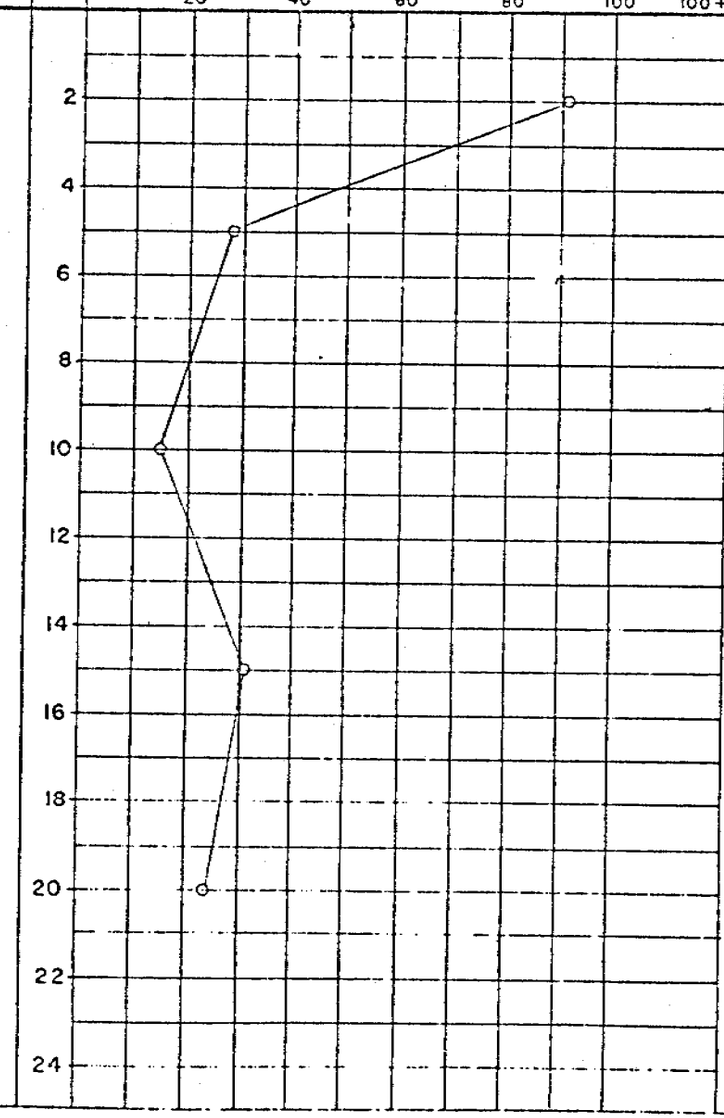
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 981+50	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - WEST	VEGETATION: 30' PINE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
509	C	269A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC		
2					CL	CLAY SANDY	F	
4								
6								
8								
10					CL	CLAY SANDY, PEBBLES		
12								
14					CL	CLAY	F	
16								
18								
20					CL			
22						END OF HOLE		
24								



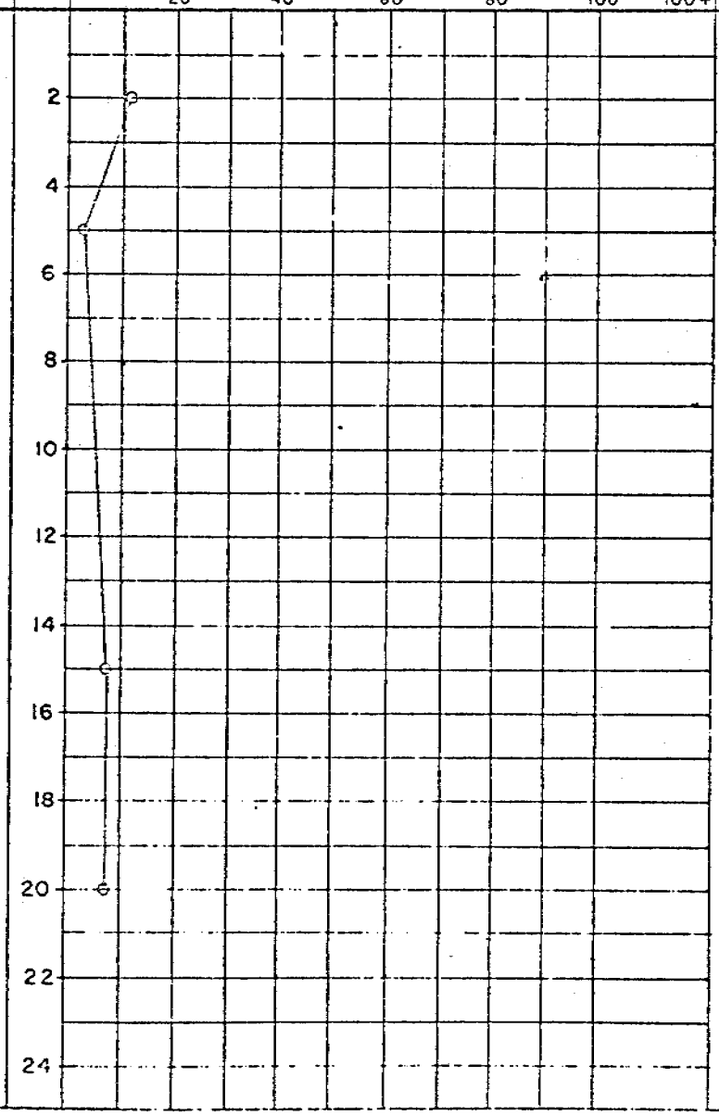
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 985+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - SOUTH	VEGETATION: 20' SPRUCE, POP., PINE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
509	C	270A

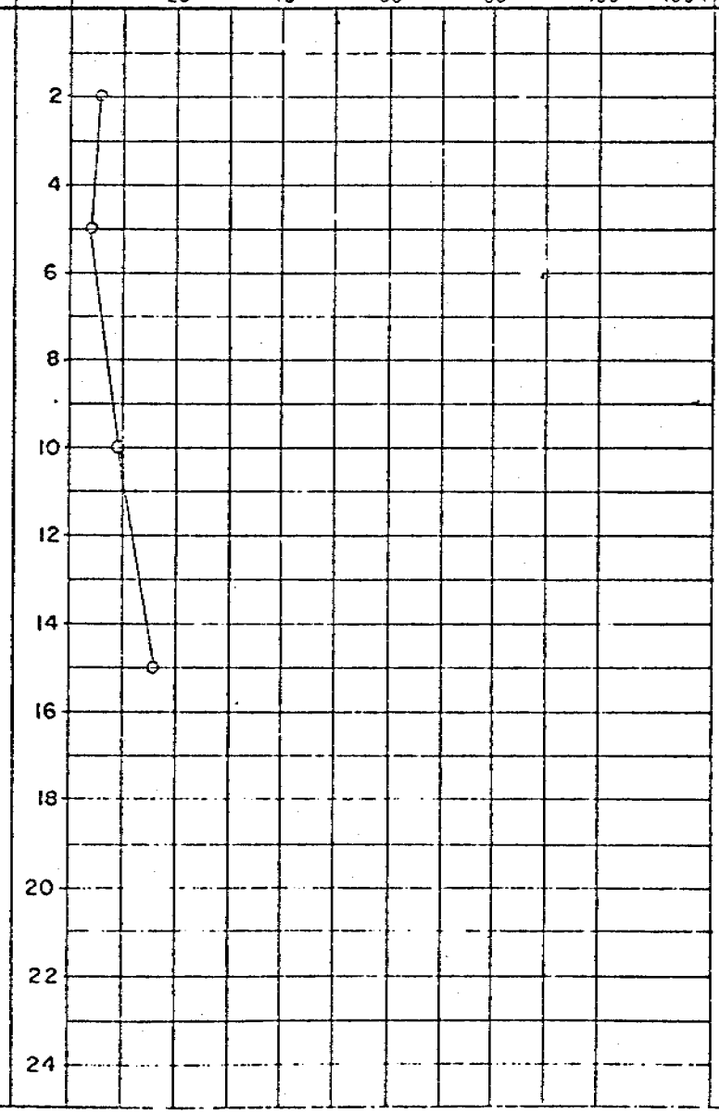
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						2" ORGANIC									
2					SM	SILTY SAND	F								
4					GP	SAND PEBBLES									
6						CLAY TILL									
8							UF								
10					GC										
12															
14					G.C										
16															
18															
20					G.C										
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 991+00	OFFSET: ℄	TEST HOLE
CKD	TECH	RIG: AIR	SURFACE DRAINAGE GOOD	VEGETATION: ASPEN, SPRUCE, PINE	ELEV:	MILE: 510 / B,C,S: C / NUMBER: 276 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						4" MOSS			
2		▨			SM	SAND LIGHT BROWN SILT, CLAY, PEBBLES	UF		
4		▨			GM				
6									
8						SAND			
10		▨			GC	BLACK CLAY, GRAVEL			POSSIBLY LAYERED
12						CLAY	UF		
14		▨			GC	BLACK, SAND, GRAVEL			
16									
18						END OF HOLE			
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

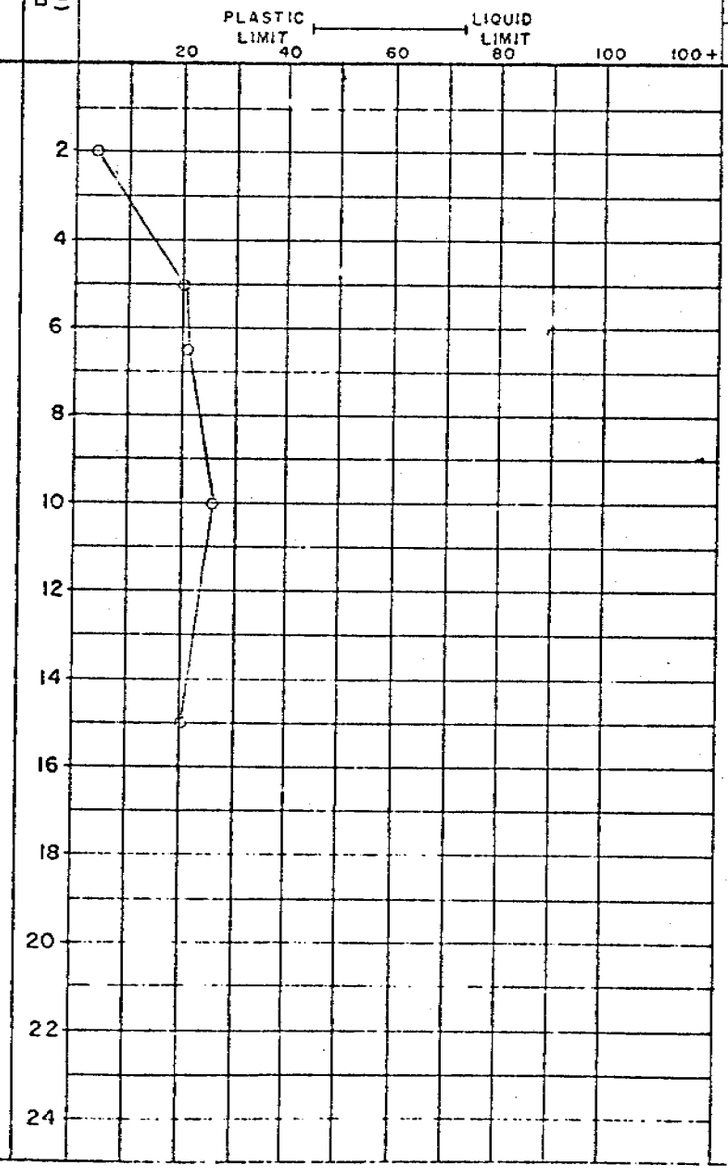
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 1003+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 15'-20' SPRUCE, PINE	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
510	C	277A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					G.P.	6" MOSS SAND LIGHT BROWN, SILT, GRAVEL	UF	
2								
4					C.L	CLAY DARK BROWN, SILT, PEBBLES		
6		P						
8							UF	
10		P			C.L			
12								
14		P			C.L			
16						END OF HOLE		
18								
20								
22								
24								



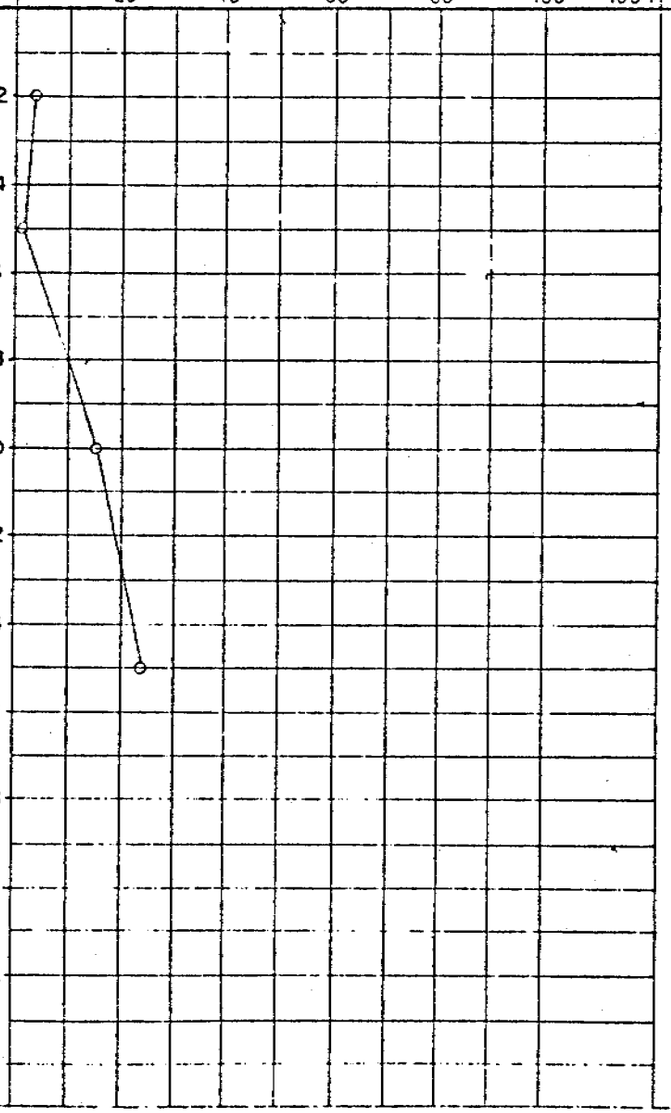
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 1023+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 15'-30' ASPEN, SPRUCE	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
510	C	281A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GP	6" MOSS SAND & GRAVEL	UF		2							
4					GP				4							
6									6							
8									8							
10		P			GC	CLAY DARK BROWN, SAND, PEBBLES	UF		10							
12									12							
14		P			CL				14							
16									16							
18						END OF HOLE			18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

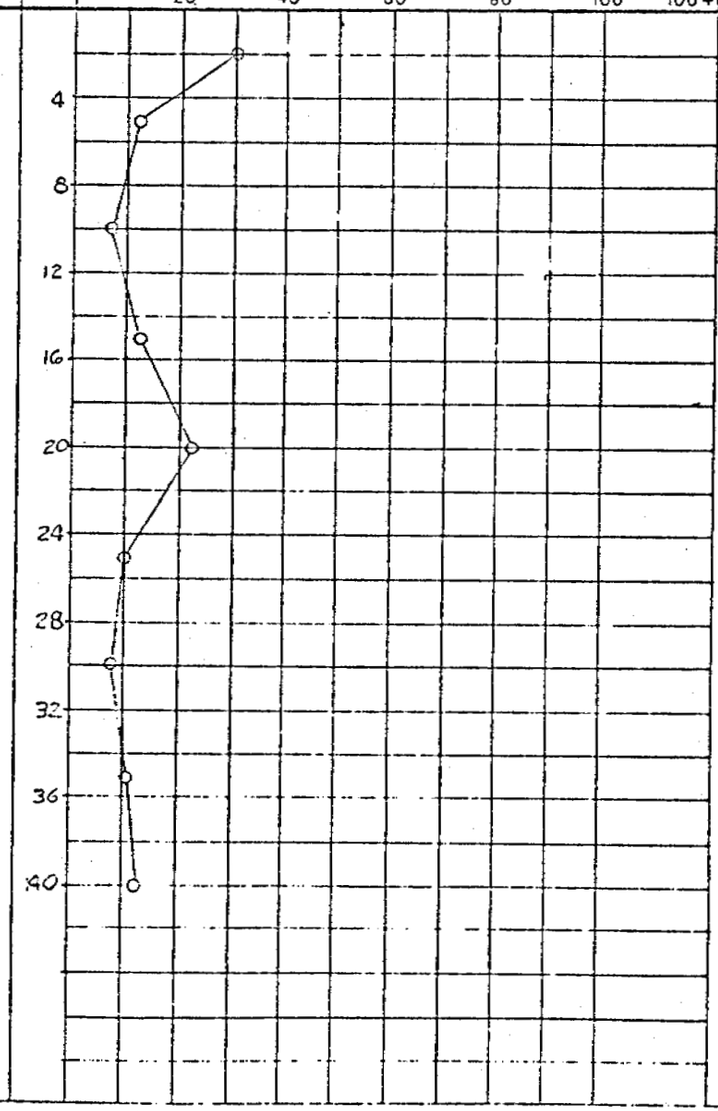
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R S	FIELD ENG B.W.M.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 1029 + 00	OFFSET:
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR - SOUTH	VEGETATION: 30' SPRUCE 20' POP	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
510	C	271A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					M.L.	SILT 3" ORGANIC	F	
4					S.M	SILT, SAND, PEBBLES	UF	
8					G.P.	SAND COARSE, PEBBLES		
12								
16					G.C.	SAND COARSE, CLAY, GRAVEL		
20		P			G.C			
24					G.C.	CLAY TILL	UF	
28					G.C.			
32					G.C			
36								
40					G.C.			
						END HOLE @ 40'		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

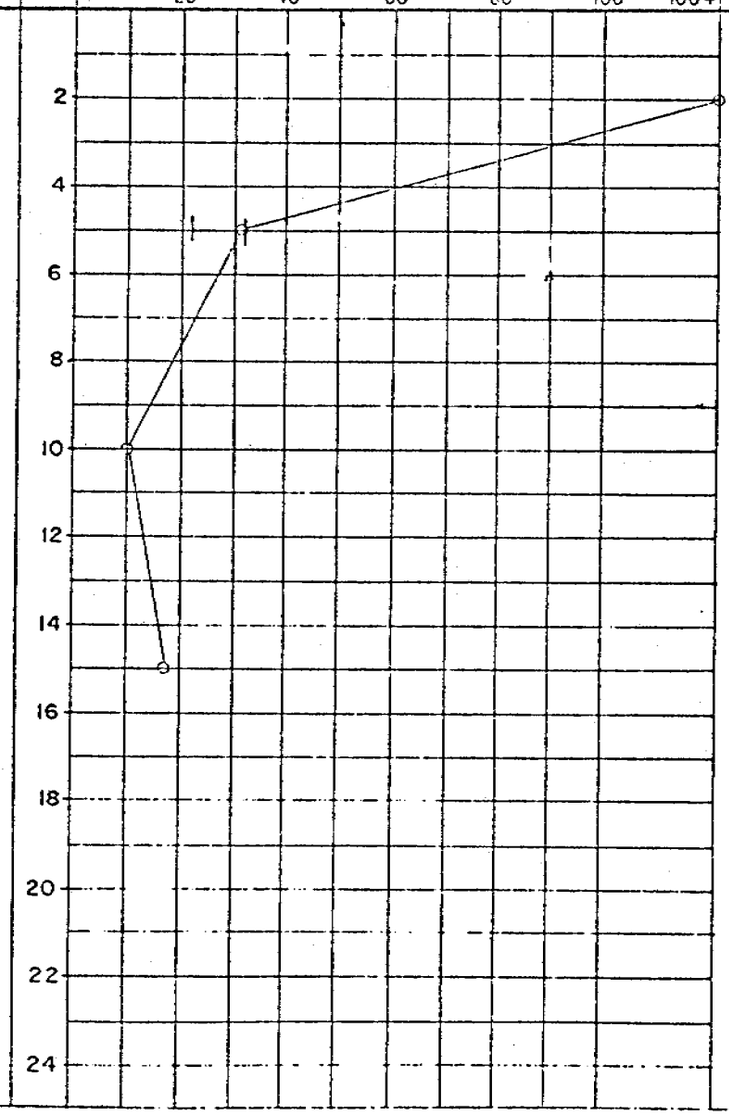
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 1041+50	OFFSET:
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	282A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt-ML	MUSKEG	F								
2					OL	CLAY DARK GREY SAND BOULDERS	UF								
6															
8															
10					CL	CLAY TILL									
12							UF								
14		P			CL	CLAY TILL									
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

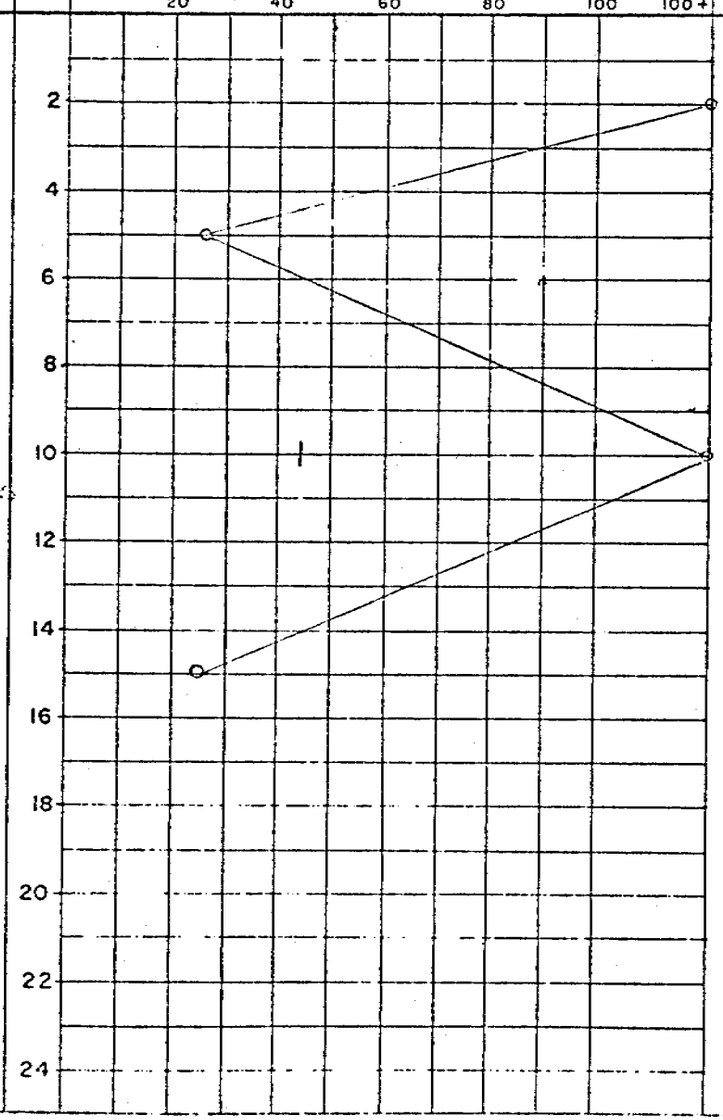
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 20' SPRUCE	ELEV.

CKD: R.S. FIELD ENG: N.C. DATE DRILLED: 1/2/73 AIRPHOTO NO: CHAINAGE: 1050+00 OFFSET: R

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	285A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG									
2					Pt-SM		F								
						SAND									
4		P			SM	SILT									
6															
8															
10		P			SM			Vs ¼" ICE LENSES HORIZONTAL							
12															
14		P			CL			Vs							
16															
18						END OF HOLE									
20															
22															
24															

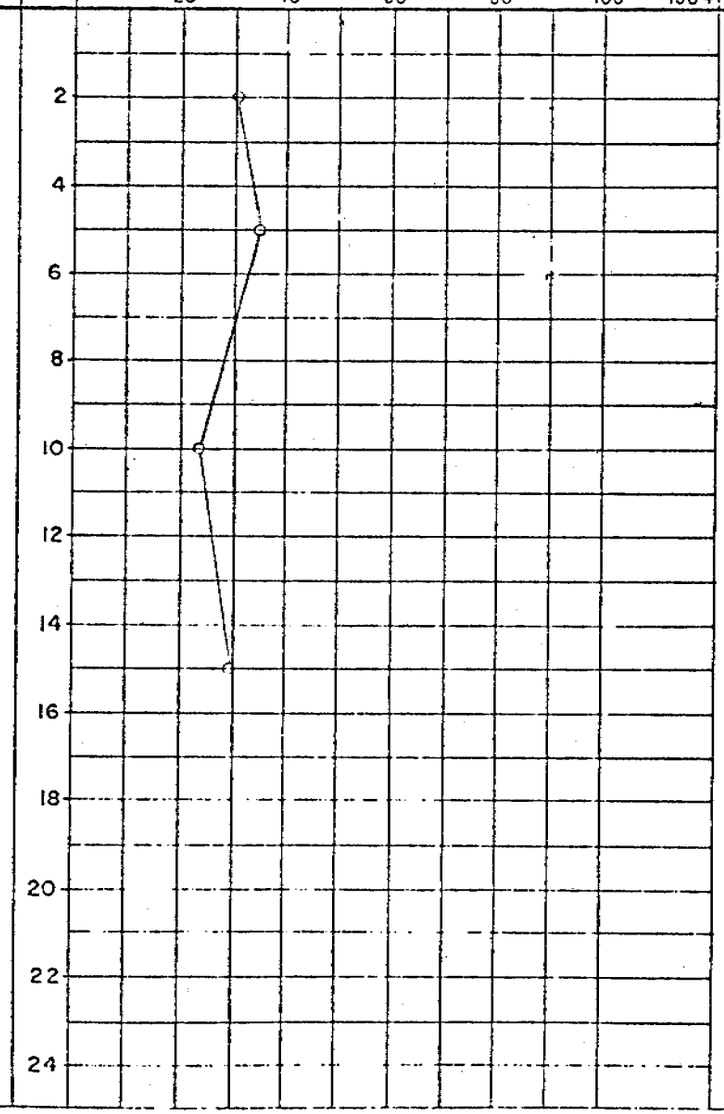


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 1/2/73	AIRPHOTO NO:	CHAINAGE: 1060+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	284A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MOSS									
2		▨			S.M	CLAY DARK BROWN, SILT,	F								
4		▨			S.M	SAND, COBBLES,									
6						BOULDERS		Vr.							
8															
10		▨			GM		F								
12															
14		▨			M.L										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

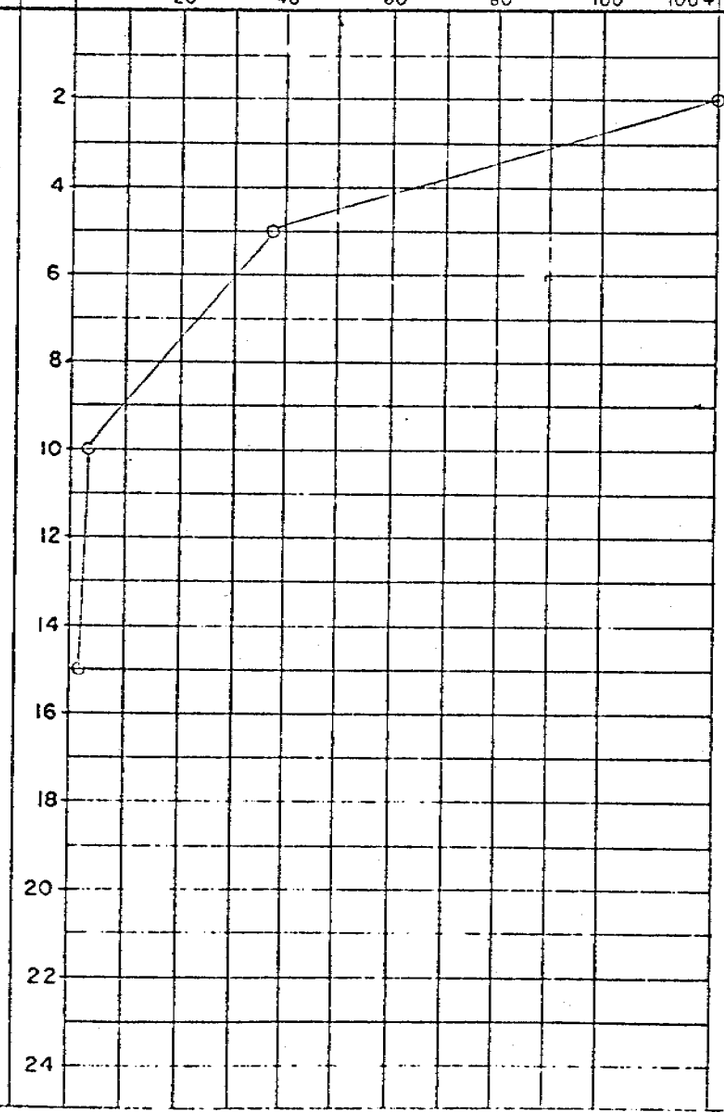
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 2/2/73	AIRPHOTO NO:	CHAINAGE 1070+00	OFFSET ℄
CKD	TECH	RIG AIR	SURFACE DRAINAGE POOR	VEGETATION: 30' SPRUCE 20' BIRCH	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	285A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC									
2					Pt-M.L	SILT	F								
4					G.M.	GRAVEL	UF								
6															
8						GRAVEL & SILTY SAND									
10					G.W.										
12							UF								
14					GW	GRAVEL & SAND									
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

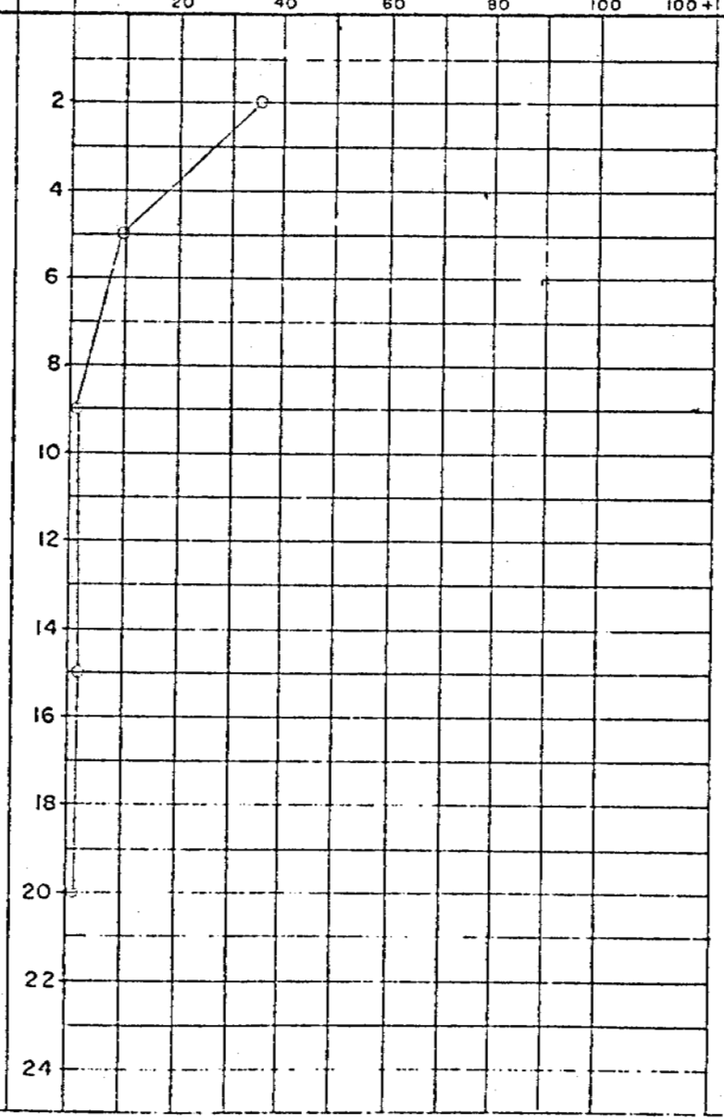
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 2/2/73	AIRPHOTO NO:	CHAINAGE: 1074+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD N.W.	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
511	C	236A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						8" ORGANIC		
2					S.M	SILT SANDY	F	
						SAND		
4					G.M	SILTY, GRAVEL	UF	
6						GRAVEL & SAND		
8								
10					G.W			
12								
14					G.W			
16							UF	
18								
20					G.W			
22						END HOLE @ 20'		
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

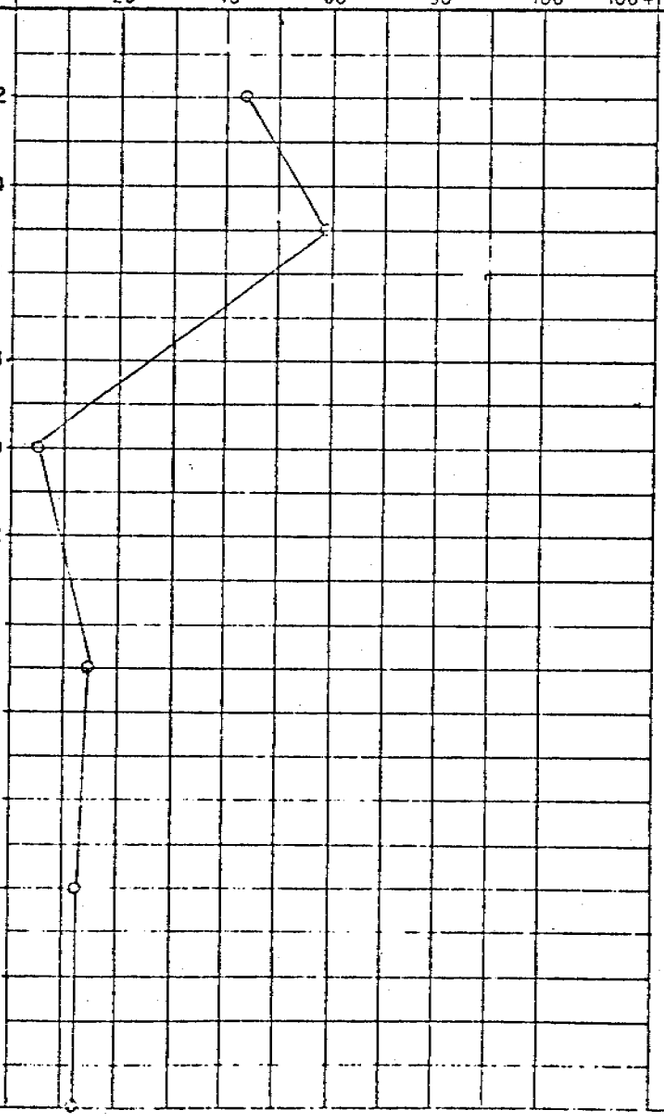
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.J.	FIELD ENG B.W.M.	DATE DRILLED 2/2/73	AIRPHOTO NO:	CHAINAGE: 1078+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 15' BIRCH	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	287A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC	F								
2						SILT & SAND									
4															
6															
8						SAND									
						PEBBLES									
10															
12															
14						SILTY SAND & GRAVEL	UF								
16															
18															
20															FREE WATER FROM 18'
22															
24						END HOLE @ 25'									

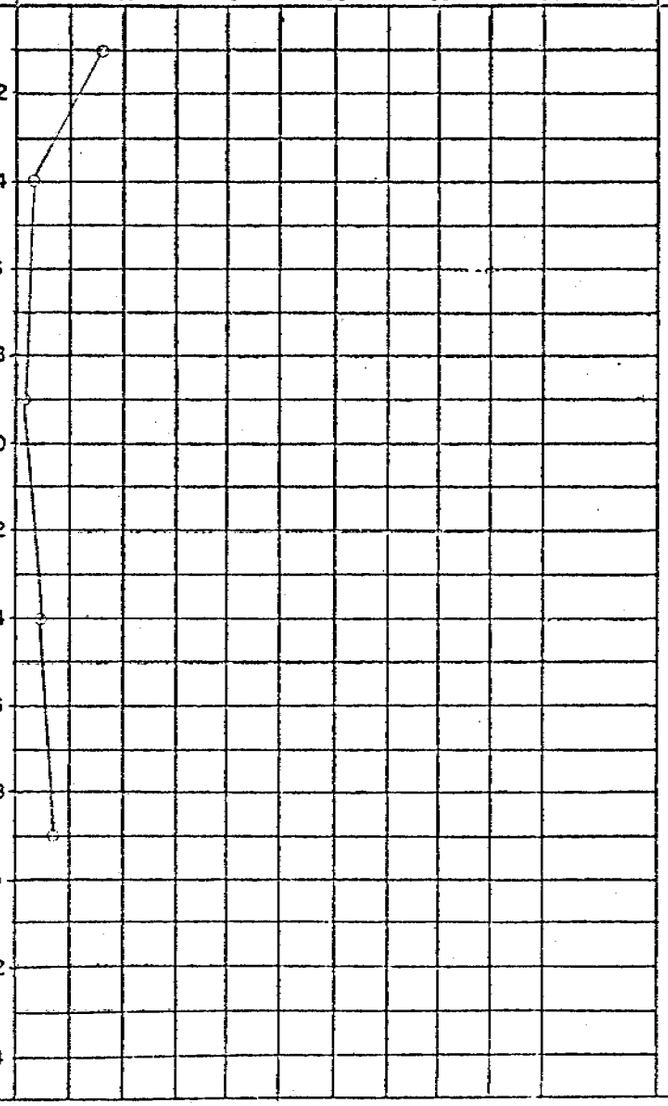


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG B M	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1082+50	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
511	S	291A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GW	GRAVEL 3" ORGANIC	UF								
2															
4															
6															
8															
10															
12															
14															
16															
18					GW	SOME CLAY									
20															
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel with sand & cobbles
Location
Hole 511-S-288A Depth 1' - 2'
Technician Date Feb. 2, 1973

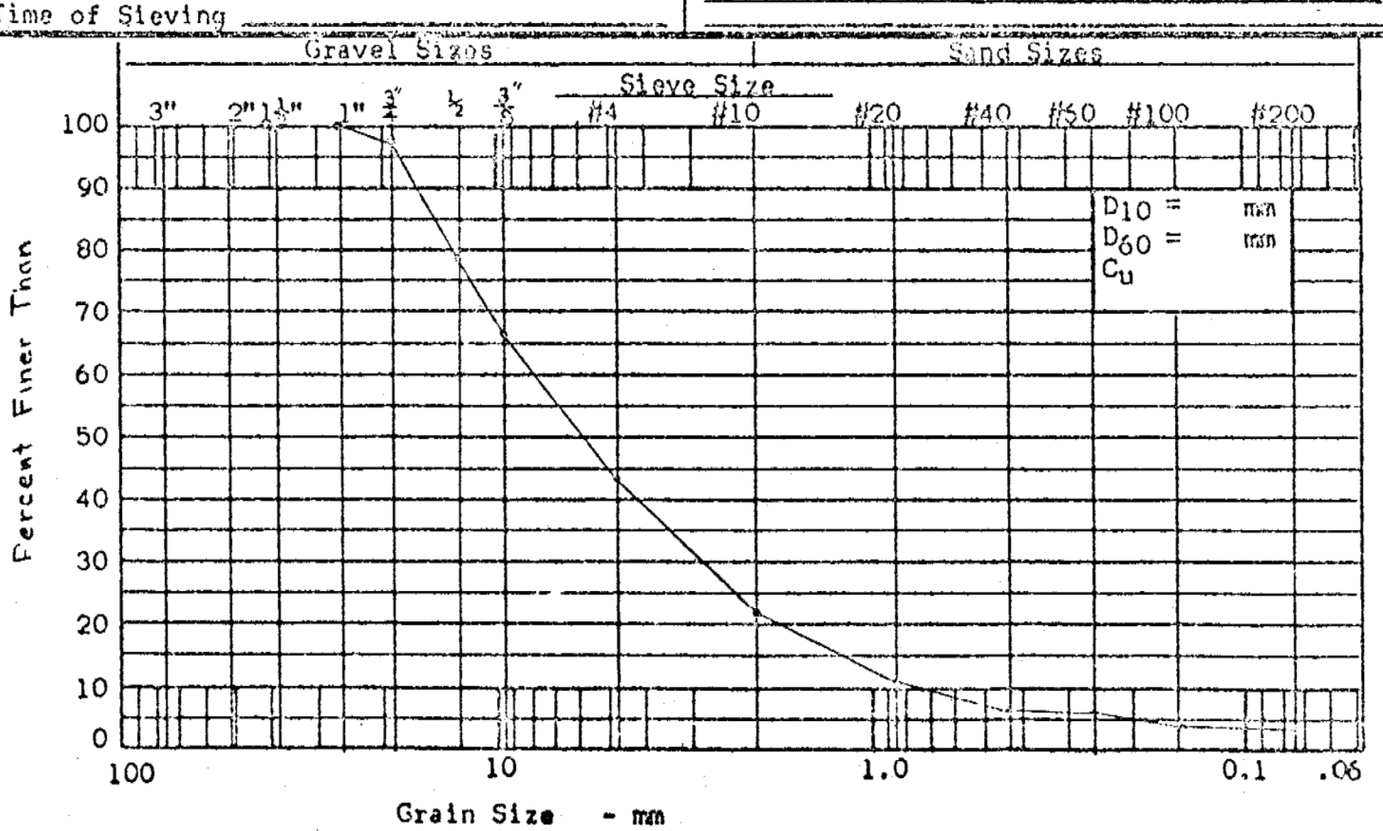
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4			100.0	
Tare		3/4	19.10			97.9	
Wt. Dry		1/2	12.70			78.7	
		3/8	9.52			66.6	
	4	.185	4.76			43.4	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			21.8	
Wt. Dry + Tare	20	.0331	.840			10.3	
Tare	40	.0165	.420			6.6	
Wt. Dry	60	.0097	.250			5.3	
	100	.0059	.149			4.5	
	200	.0029	.074			3.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



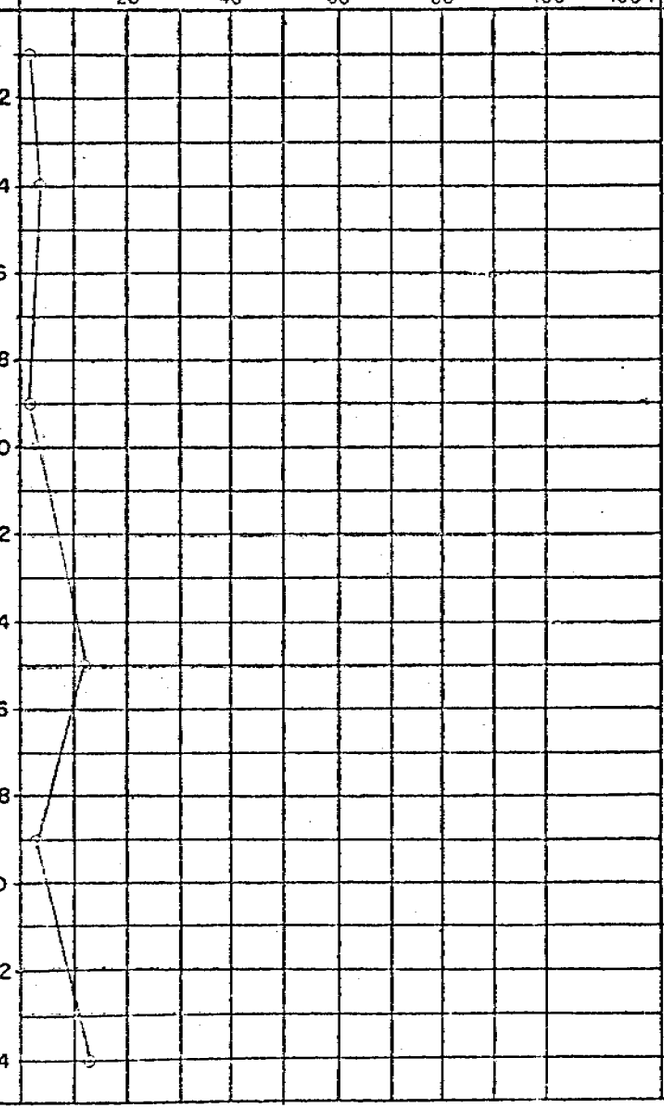
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: HWC	DATE DRILLED: 2/2/73	AIRPHOTO NO:	CHAINAGE: 1082+50	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:	

MILE	B,C,S	NUMBER
511	S	288A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MOSS	UF								
2						GRAVEL			4		18	78			ROCK FRAGMENTS IN SAMPLE
4						SAND, COBBLES AND BOULDERS									
6															
8															
10															
12						SAND WITH SILT AND CLAY VERY WET									
14															WATER COMING OUT OF HOLE AT 14'
16															
18						SAND WITH COBBLES AND BOULDERS VERY WET									
20															
22						CLAY DARK BROWN LITTLE SAND									HOLE SLOUGHING
24						END OF HOLE @ 25'									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

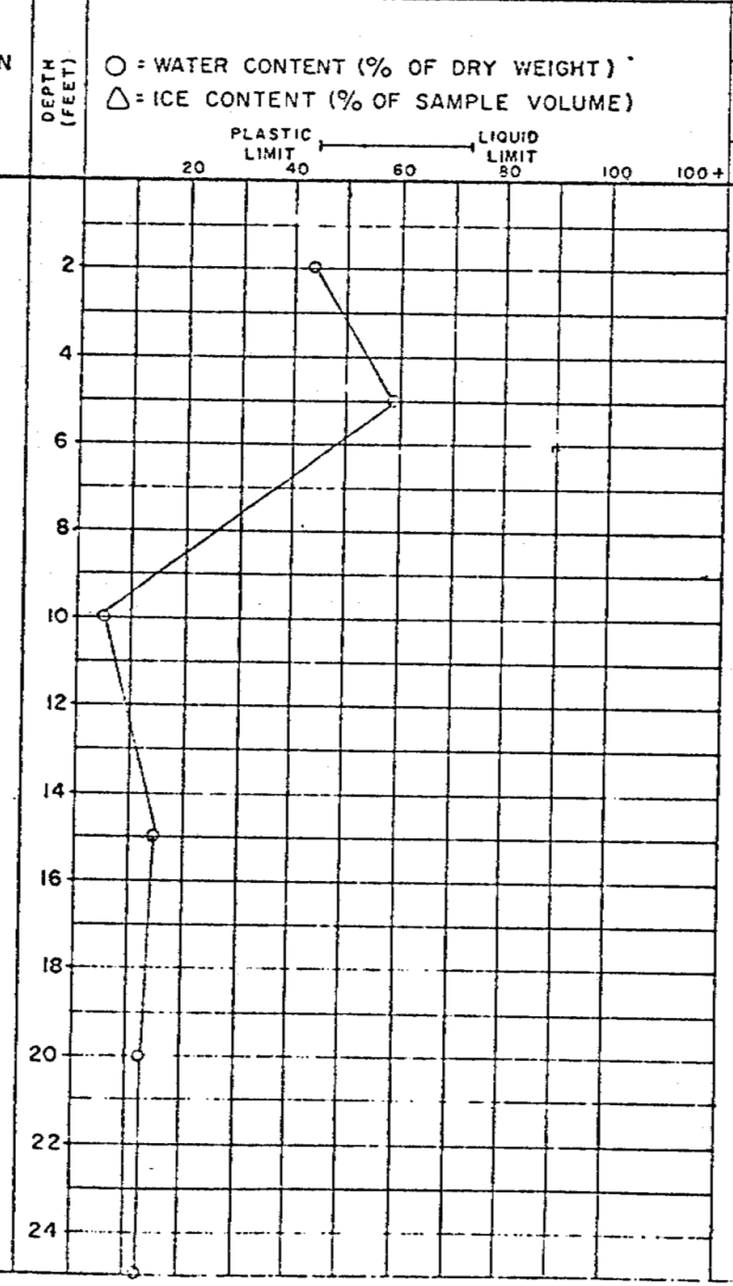
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 2/2/73	AIRPHOTO NO:	CHAINAGE: 1078+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 15' BIRCH	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
511	C	237A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						ORGANIC	F	
2						SILT & SAND		
4								
6								
8						SAND		
						PEBBLES		
10								
12								
14						SILTY SAND & GRAVEL	UF	
16								
18								
20								
22								
24						END HOLE @ 25'		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						FREE WATER FROM 18'

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1084+40	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: CREEK	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
511	S	290A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GW	GRAVEL	UF										
2									2								
4									4								
6									6								
8						▽			8								
10									10								
12									12								
14		P		31 BLS (3")					14								
16					GW				16								
18						SOME CLAY			18								
20									20								
22						END OF HOLE			22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel with sand & cobbles
Location	
Hole 511-S-289A	Depth 9' - 10'
Technician	Date Feb. 3, 1973

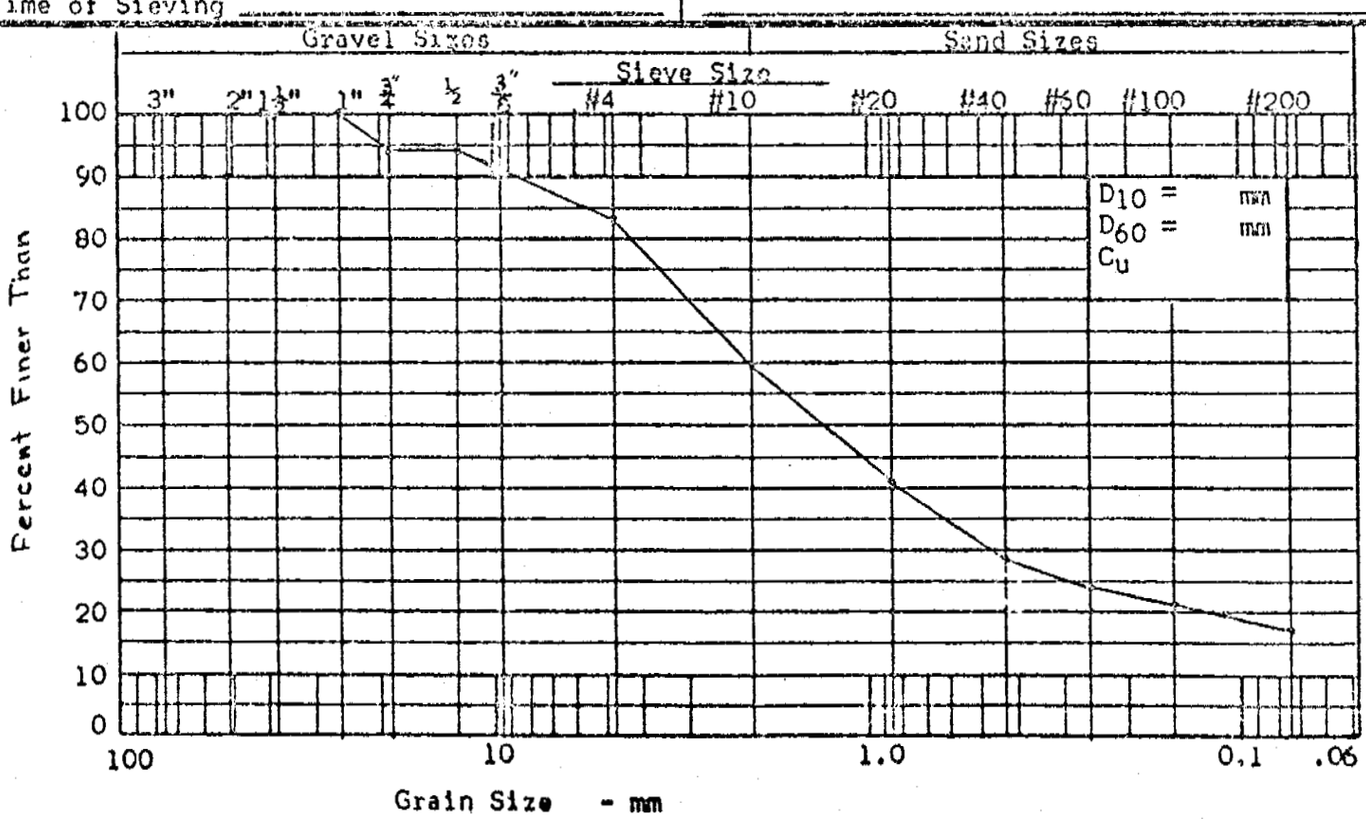
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			94.7	
Tare		1/2	12.70			94.7	
Wt. Dry		3/8	9.52			92.9	
	4	.185	4.76			83.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			59.7	
Tare No.	20	.0331	.840			40.5	
Wt. Dry + Tare	40	.0165	.420			28.9	
Tare	60	.0097	.250			24.1	
Wt. Dry	100	.0059	.149			21.0	
	200	.0029	.074			17.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

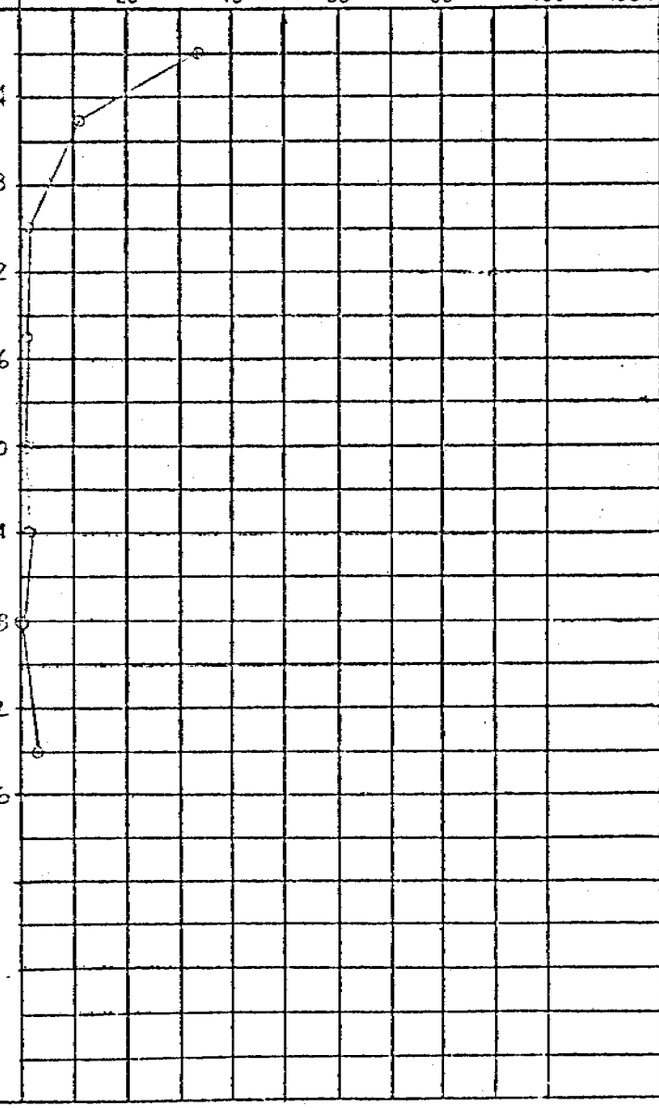
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: NWC	DATE DRILLED: 3/2/73	AIRPHOTO NO:	CHAINAGE: 1087+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & WILLOW	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
511	S	283A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MOSS									
						SAND	F								
4					ML	LIGHT BROWN, SILTY FINE	UF								SO_4 = 0.11 %
8					GP	GRAVEL			17		43	40			
12						SAND COBBLES AND BOULDERS									
16						ROCK FRAGMENTS									HOLE SLOUGHING
20															
24					SP										
28															
32					SW	SILT, SAND BOULDERS									
36						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

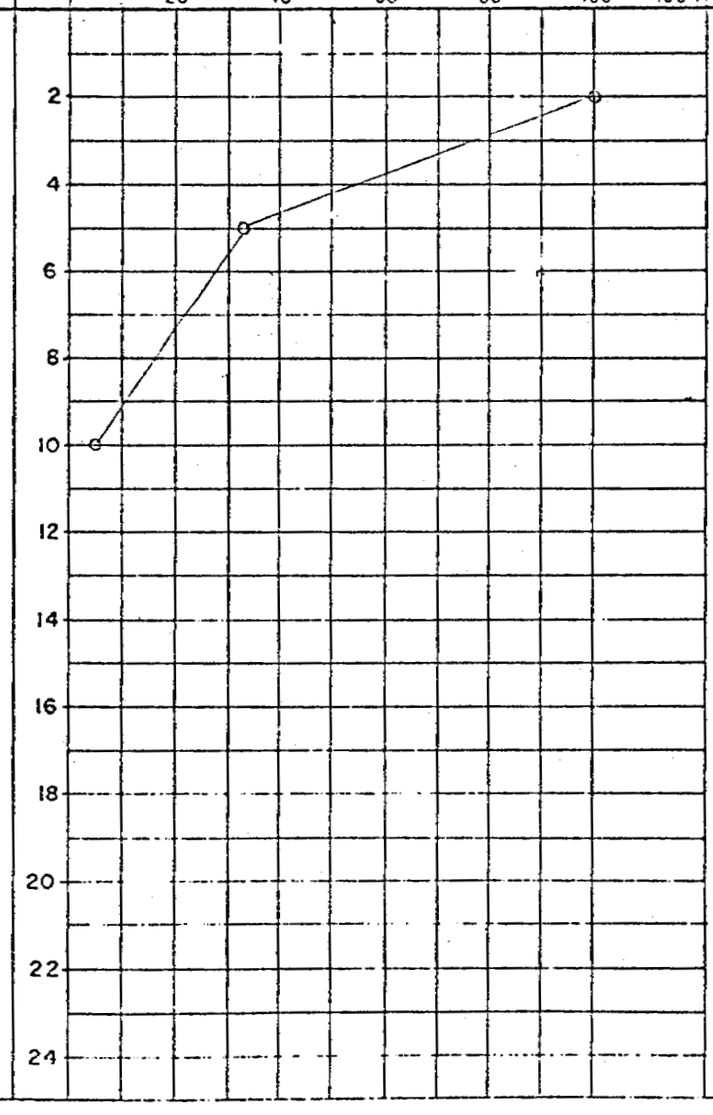
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.D.M.	DATE DRILLED 2/2/73	AIRPHOTO NO:	CHAINAGE: 1092+00	OFFSET: ℄
CKD	TECH	RIG: AIR.	SURFACE DRAINAGE: POOR	VEGETATION: 20' WILLOW, ASPEN, SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	421 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
2					Pt	MUSKEG GRAN., SOME ROOTS	F		
4		P			CL	SAND LIGHT BROWN, MOIST CLAY BROWN, SOFT, MOIST	UF		
6						SAND DARK BROWN, MOIST			
8									
10					SW	GRAVEL COBBLES, SAND			SLUFFING
12							UF		
14						ABANDONED @ 14'			
16									
18									
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand and Cobbles
Location	
Hole	532-C-393A Depth 4-5'
Technician	Date 13/2/73

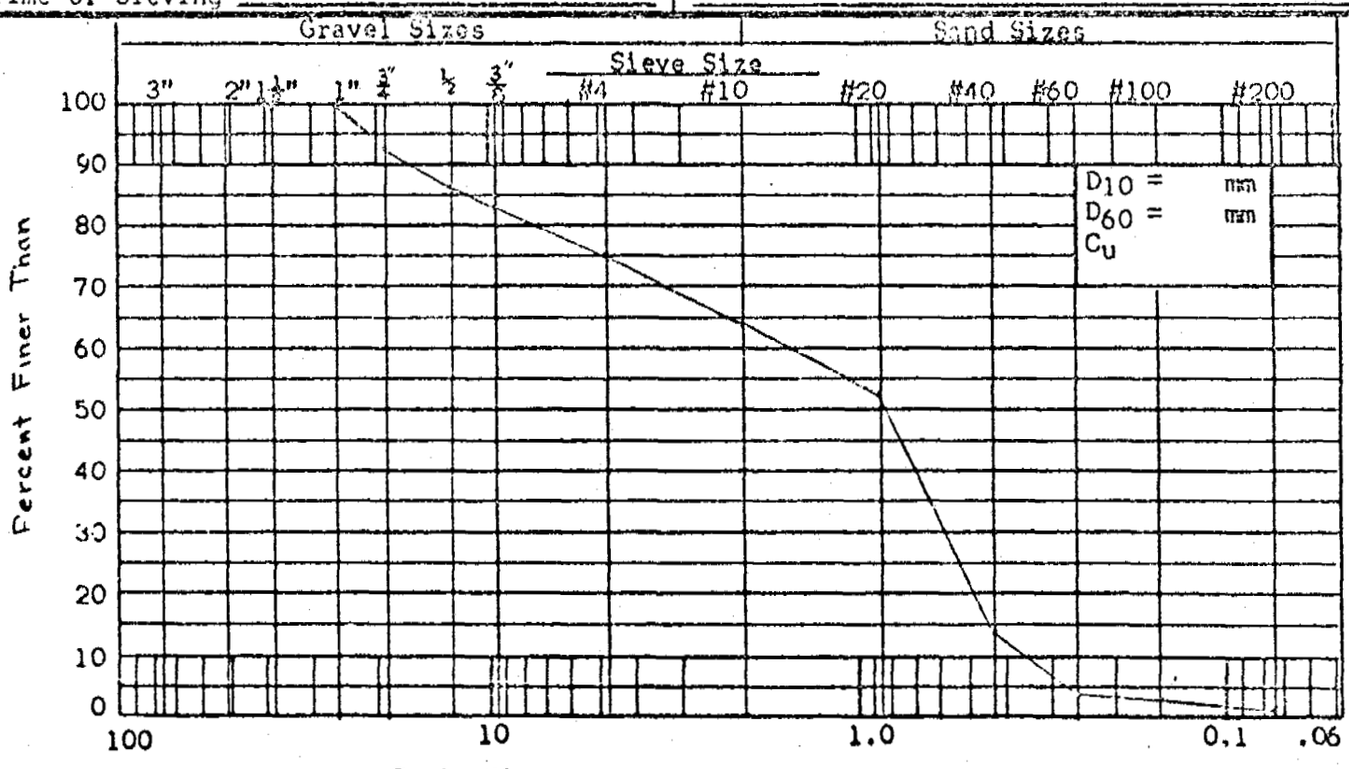
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			92.1	
Tare		1/2	12.70			86.0	
Wt. Dry		3/8	9.52			83.4	
	4	.185	4.76			75.5	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			64.9	
Tare No.	20	.0331	.840			52.5	
Wt. Dry + Tare	40	.0165	.420			13.6	
Tare	60	.0097	.250			3.8	
Wt. Dry	100	.0059	.149			2.6	
	200	.0029	.074			1.9	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

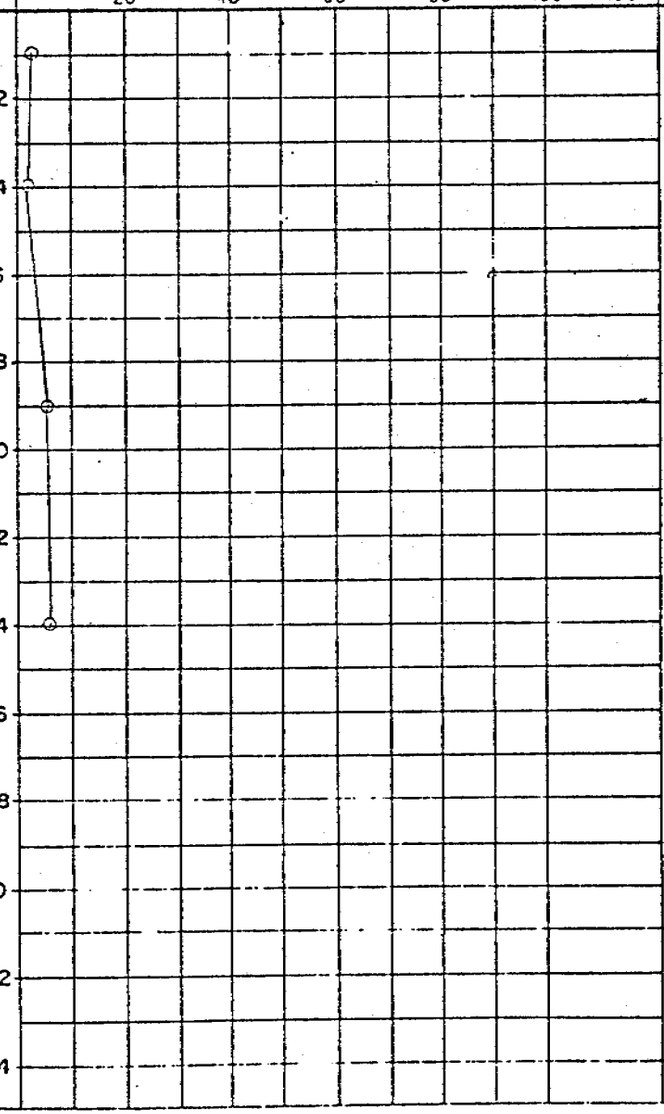
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG N.W.C	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 589+00	OFFSET: ℄
CKD D G P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: PINE 20'-30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
532	C	393A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	TOPSOIL	F									INSULATED HOLE
2					GW	GRAVEL SAND & COBBLES			2							
4									4	2		63	35			
6						SAND			6							
8									8							
10					SP	PEBBLES & COBBLES		VISIBLE ICE CRYSTALS	10							
12									12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Coarse gravel with sand

Location

Hole 532-C-394A Depth 1' - 2'

Technician Date Feb. 9, 1973

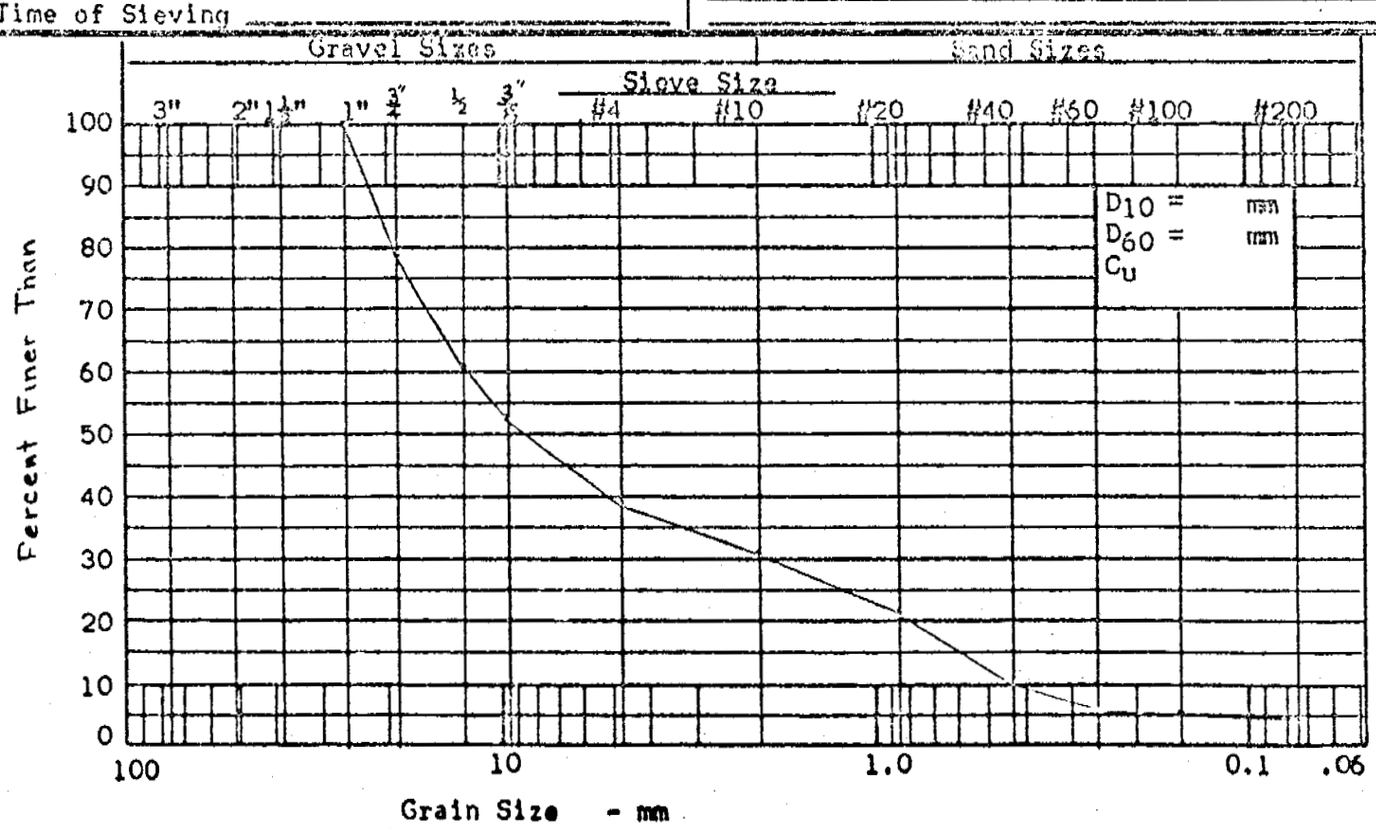
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			79.7	
Tare		1/2	12.70			61.3	
Wt. Dry		3/8	9.52			52.9	
	4	.185	4.76			39.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			30.3	
Wt. Dry + Tare	20	.0331	.840			21.1	
Tare	40	.0165	.420			10.9	
Wt. Dry	60	.0097	.250			6.7	
	100	.0059	.149			5.2	
	200	.0029	.074			4.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

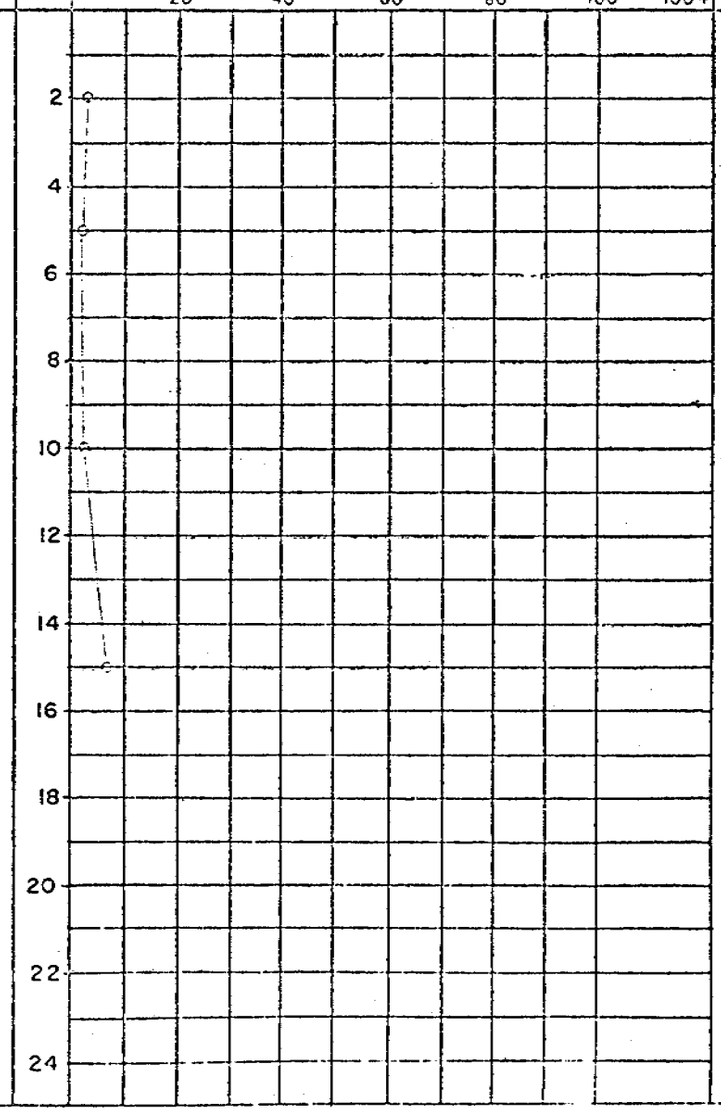
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R S	FIELD ENG N C	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 588+00	OFFSET: R
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20'-40' PINE	ELEV.

TEST HOLE

MILE	S,C,S	NUMBER
532	C	394A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" TOP SOIL									
2		✓			GW	COARSE GRAVEL WITH SAND	F		4		26	70			
4		✓			SP	SAND WITH GRAVEL									
6															
8															
10		✓			SF	SAND WITH PEBBLES									
12															
14		✓			SP		F								
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel
Location	
Hole 532-C-395-A	Depth 1' - 2'
Technician	Date Feb. 10, 1973

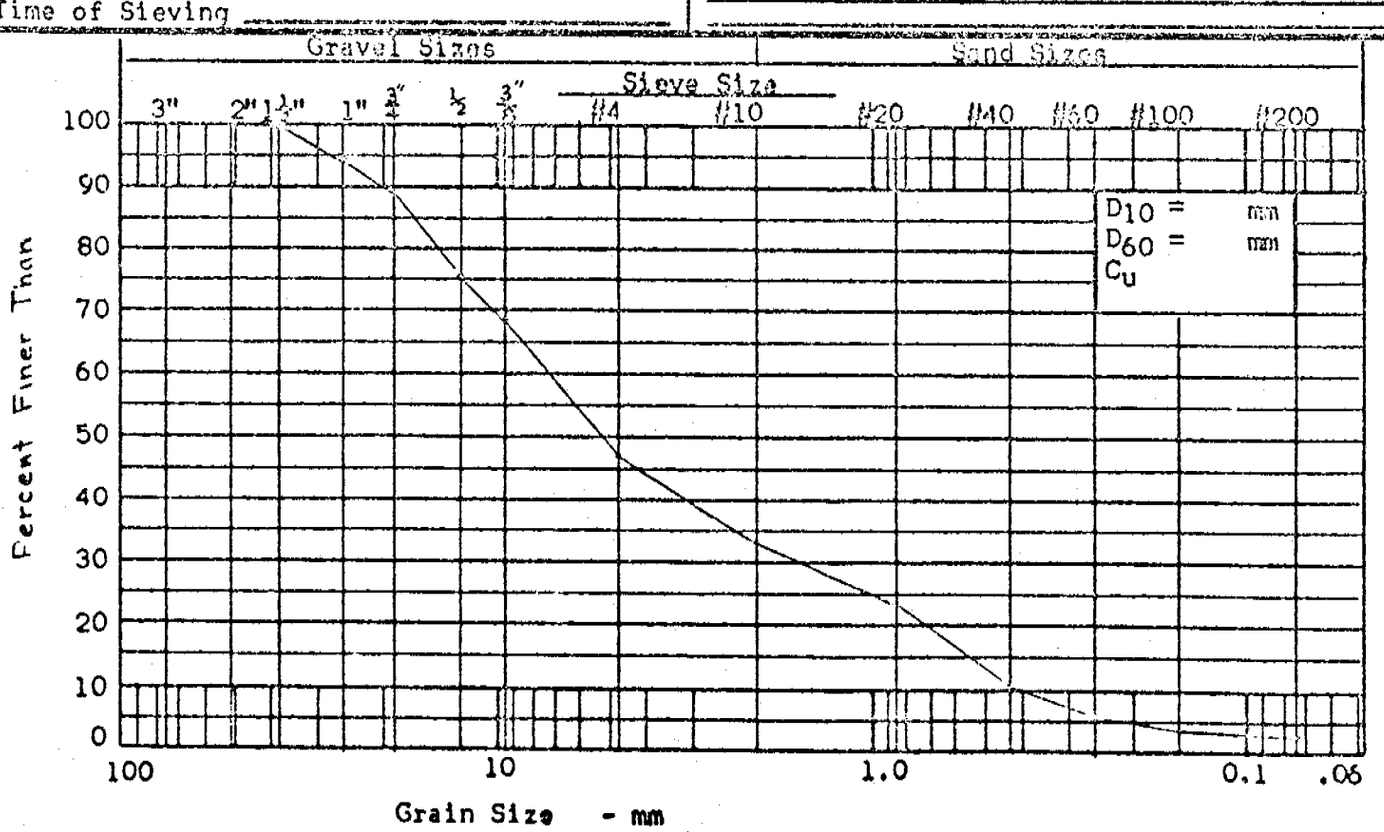
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
		1 1/2				100.0	
Tare No.		1	25.4			94.7	
Wt. Dry + Tare		3/4	19.10			89.3	
Tare		1/2	12.70			75.8	
Wt. Dry		3/8	9.52			68.4	
	4	.185	4.76			47.0	
Passing	4						
Initial Dry Weight passing No. 4							
	10	.079	2.000			33.7	
Tare No.	20	.0331	.840			23.3	
Wt. Dry + Tare	40	.0165	.420			10.5	
Tare	60	.0097	.250			5.1	
Wt. Dry	100	.0059	.149			3.5	
	200	.0029	.074			2.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R S	FIELD ENG R S	DATE DRILLED 10/2/73	AIRPHOTO NO:	CHAINAGE: 571+00	OFFSET: ℄
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 50-60' SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
532	C	395A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GW	GRAVEL	F		3		30	67			
4					SP										
6															
8						SAND & PEBBLES									
10					SP										
12							F								
14					SP										
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

GRAIN-SIZE ANALYSIS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

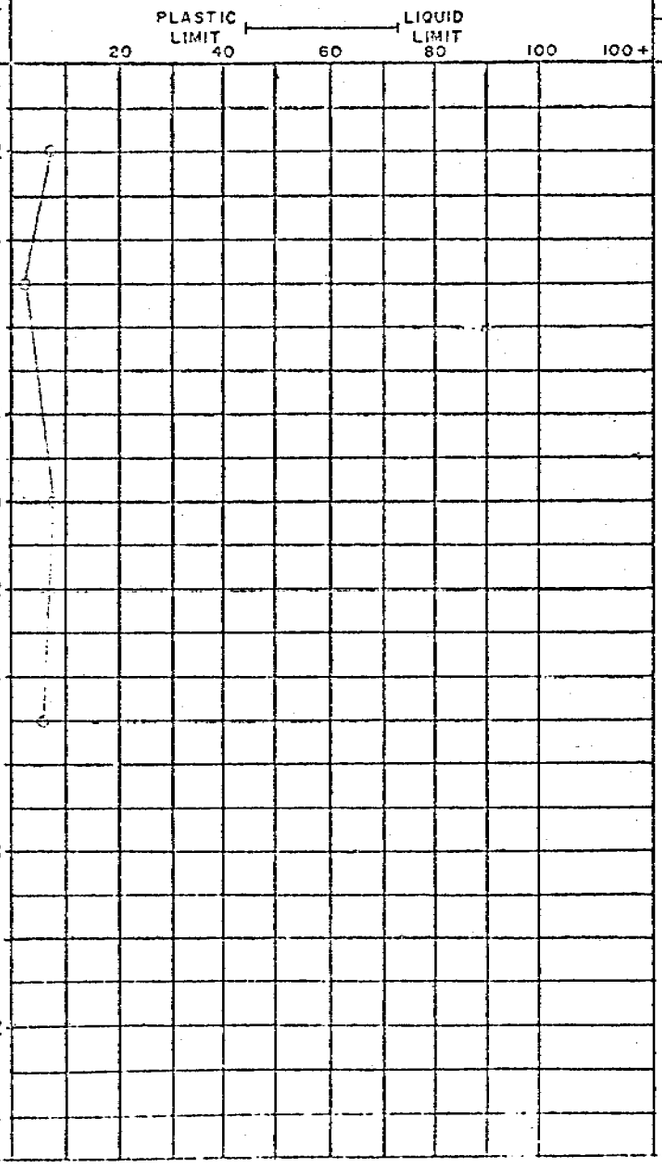
DWN: R.S	FIELD ENG: R.S	DATE DRILLED: [illegible]	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET: [illegible]
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 40'-50' SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
532	C	3931

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL	F									
2		✓			SW				2							
4		✓			SW				4							
6									6							
8									8							
10		✓			SP	SAND & PEBBLES			10							
12									12							
14		✓			SW		F		14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Sand and Gravel - some silt

Location

Hole 533-C-397-A Depth 4' - 5'

Technician Date Feb.10, 1973

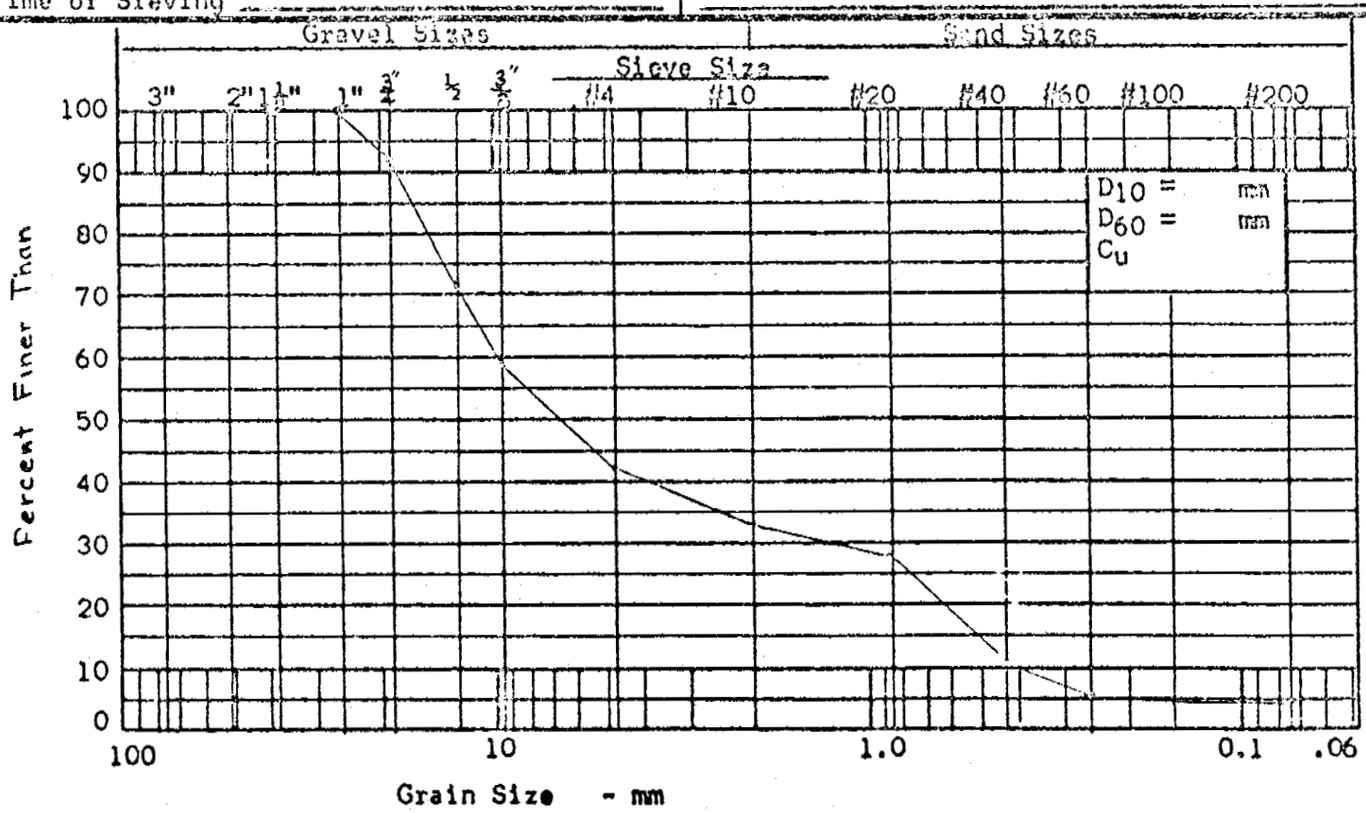
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			92.0	
Tare		1/2	12.70			70.4	
Wt. Dry		3/8	9.52			58.7	
	4	.185	4.76			42.0	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			33.0	
Wt. Dry + Tare	20	.0331	.840			28.2	
Tare	40	.0165	.420			10.9	
Wt. Dry	60	.0097	.250			5.6	
	100	.0059	.149			4.6	
	200	.0029	.074			4.1	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



Note: M.I.T. Grain Size Scale

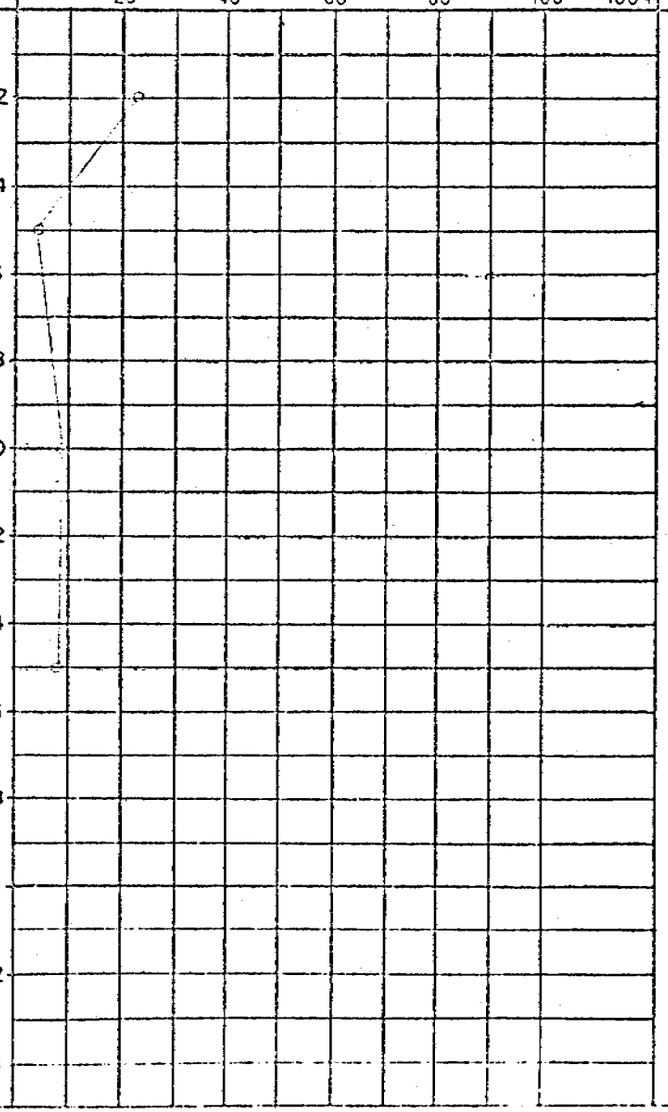
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R S	FIELD ENG: R S	DATE DRILLED: [illegible]	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET: ℄
CKD:	TECH:	RIG: [illegible]	SURFACE DRAINAGE: [illegible]	VEGETATION: [illegible]	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	C	397A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SPI	SAND GRAVEL & SOME SILT	F								
4					SW				4		28	68			
6						SAND & PEBBLES									
8															
10		P			S.P										
12															
14					S.P		F								
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: P. S	FIELD ENG: [illegible]	DATE DRILLED 10/2/73	AIRPHOTO NO:	CHAINAGE: [illegible]	OFFSET: ?
CKD	TECH:	RIG: [illegible]	SURFACE DRAINAGE: SOUTH TO [illegible]	VEGETATION: [illegible]	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	C	3-98A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GW	GRAVEL									
4					CL	SILTY CLAY	F								
6															
8							UF								
10															
12															
14				44 CLS	CL										
16															
18															
20					CL		UF								
22															
24					CL	END OF HOLE	F								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R. S.	FIELD ENG: R. S.	DATE DRILLED: 10/2/73	AIRPHOTO NO:	CHAINAGE: 551+00	OFFSET: 1
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	C	399A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
						SILTY CLAY	F								
2									2						
4					SW	GRAVEL			4						
6									6						
8									8						
10					GW				10						
12							F		12						
14					GW				14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 533-S-400A Depth 4 - 5'
Technician Date 10/2/73

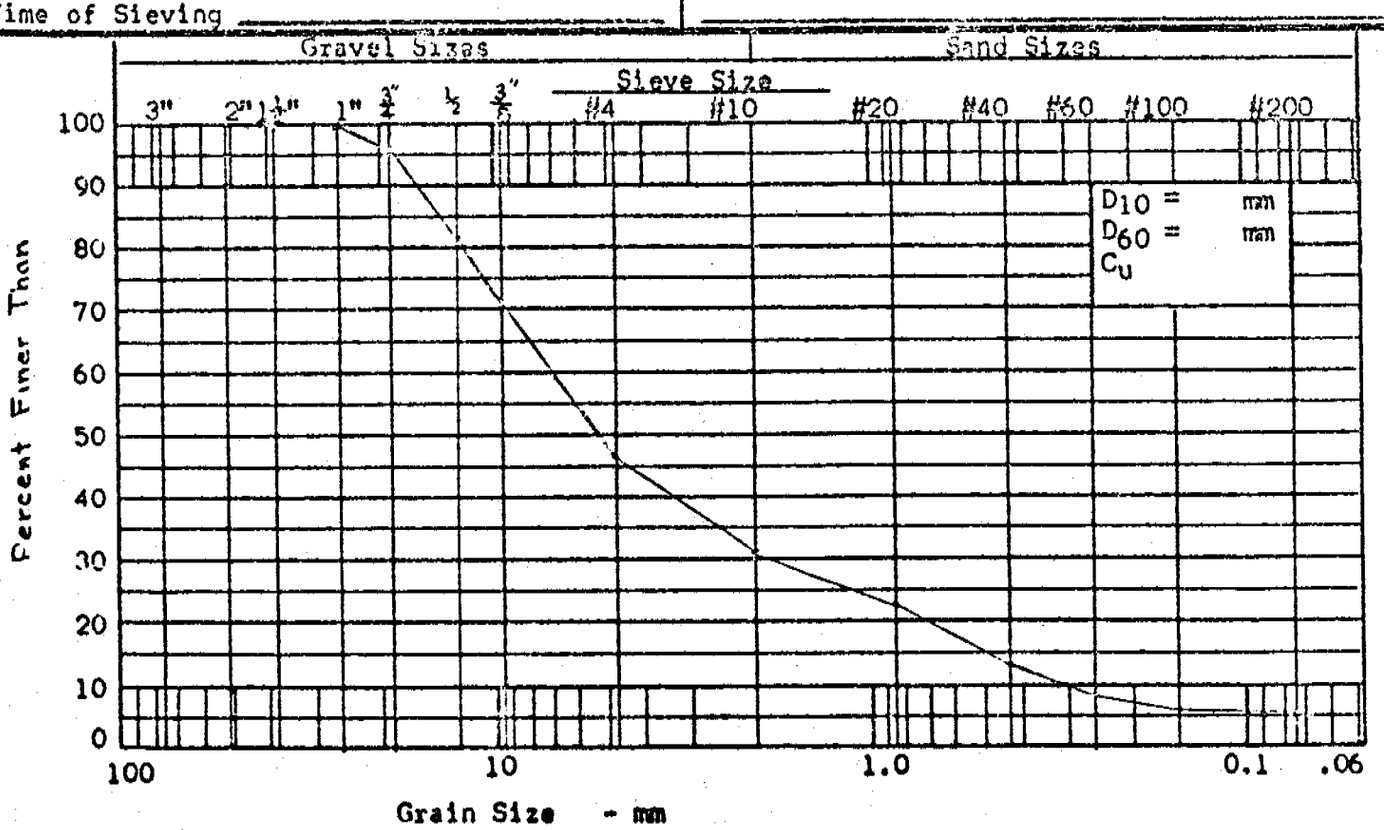
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			96.1	
Tare		1/2	12.70			81.7	
Wt. Dry		3/8	9.52			70.6	
	4	.185	4.76			47.4	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			30.4	
Wt. Dry + Tare	20	.0331	.840			22.5	
Tare	40	.0165	.420			13.1	
Wt. Dry	60	.0097	.250			8.5	
	100	.0059	.149			6.5	
	200	.0029	.074			5.2	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

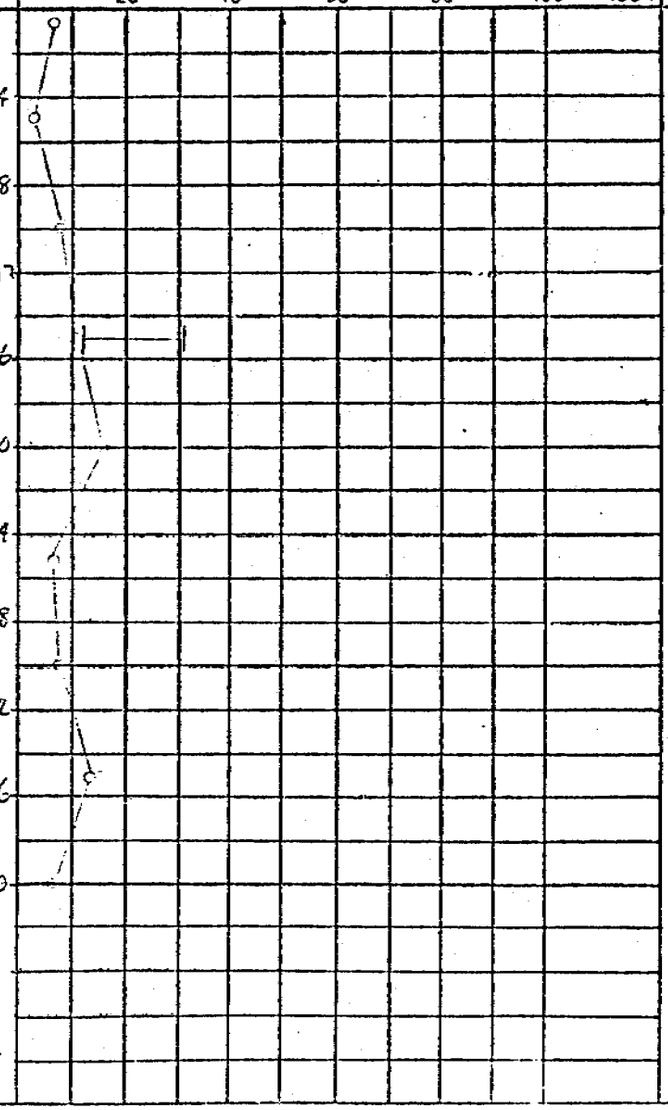
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R S	FIELD ENG: S	DATE DRILLED: 10/2/72	AIRPHOTO NO:	CHAINAGE: 5 285+00	OFFSET:
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: Good To River	VEGETATION: 50-80' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4					GW	GRAVEL	F		5		25	70			
8					CL	CLAY TILL	UF								
12															
16				87 BLS	CL										
20					CL										
24				110 BLS	CL										
28					CL										
32							UF								
36					CL										
40				67 BLS	CL	END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with Gravel and Pebbles
Location	
Hole 534-S-401A	Depth 4 - 5'
Technician	Date 10/2/73

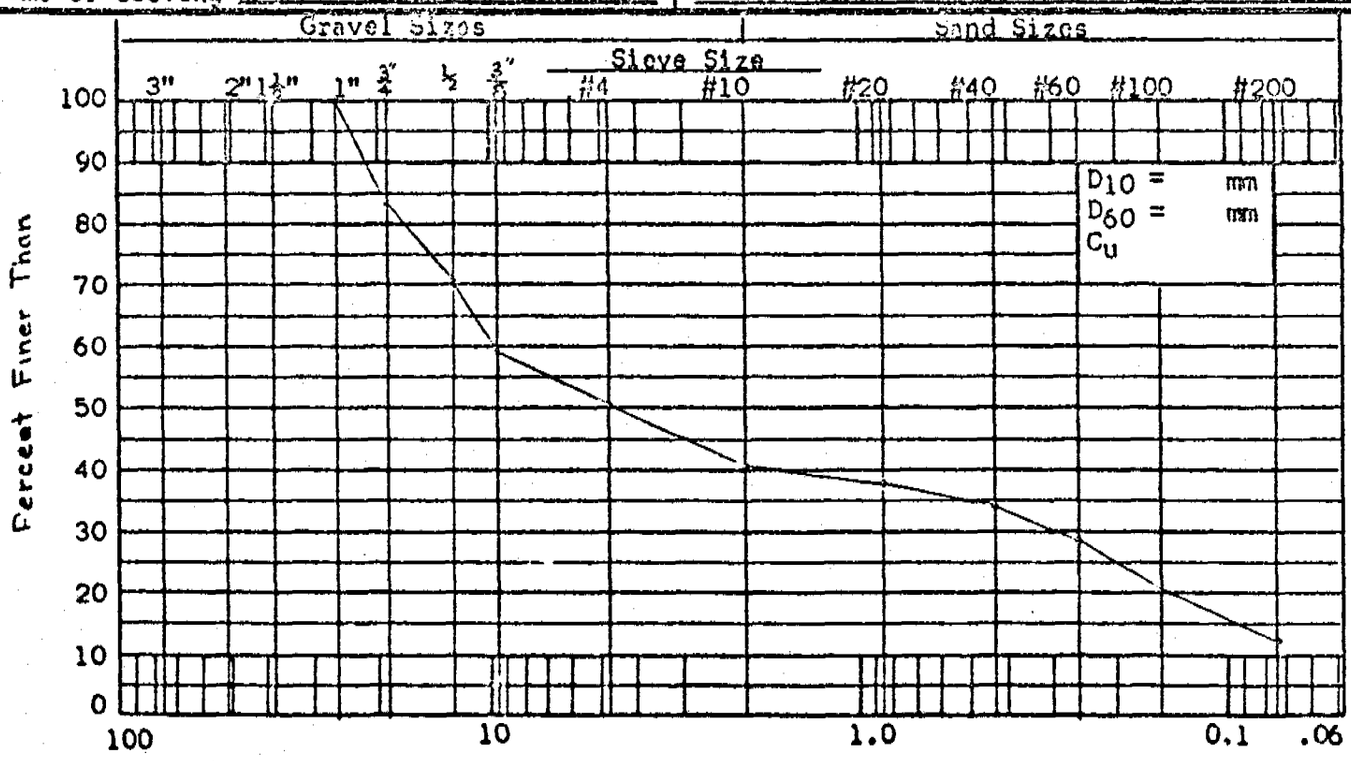
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			83.1	
Tare		1/2	12.70			70.2	
Wt. Dry		3/8	9.52			59.5	
	4	.185	4.76			50.2	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			41.2	
Wt. Dry + Tare	20	.0331	.840			37.6	
Tare	40	.0165	.420			34.3	
Wt. Dry	60	.0097	.250			28.3	
	100	.0059	.149			20.5	
	200	.0029	.074			12.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

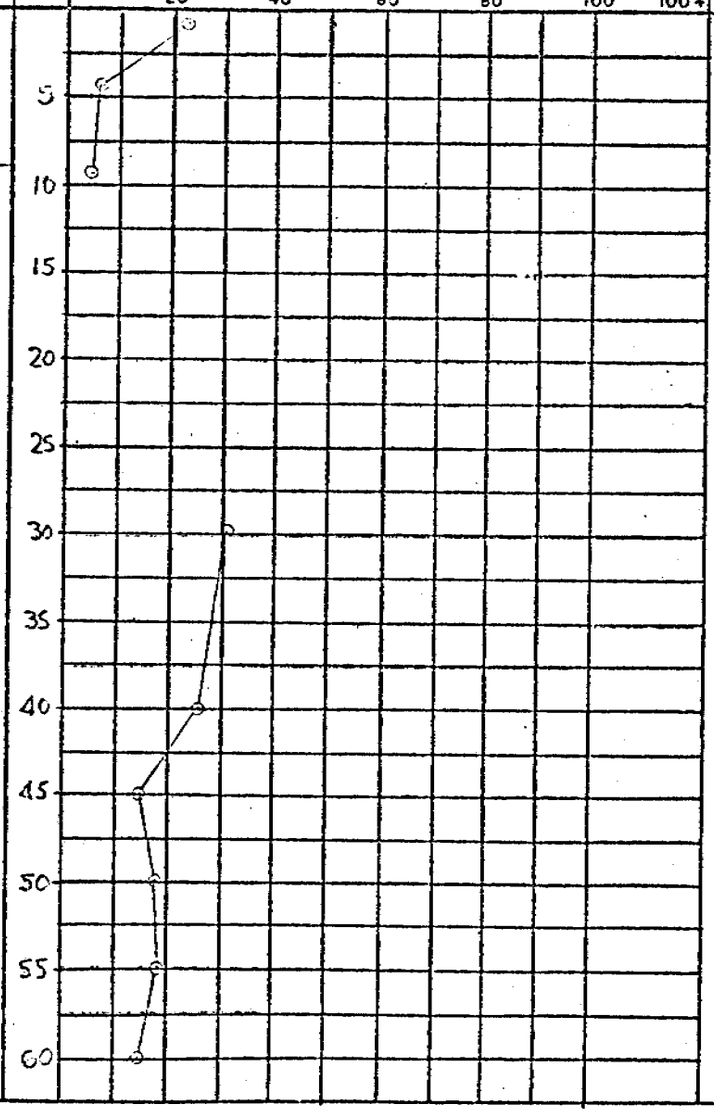
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: PS	DATE DRILLED: 10/2/73	AIRPHOTO NO:	CHAINAGE: 521+00	OFFSET: ℄
CKD: DAD	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	S	401A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						GRAVEL AND COBBLES	F								
						CLAY SAND & PEBBLES									
5					GC	GRAVEL			12		29	59			
10				40 BLS		WATER @ 0' & 12'									
						SAND, CLAY, COBBLES	UF								
15															
20		P		48 BLS		CLAY TILL									
25															
30		P		73 BLS											
35															
40		P		75 BLS											
						CLAY TILL									
45						SOME BOULDERS									
50		P		73 BLS		CLAY									
55															
60		P		47 BLS		END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel with Sand and Pebbles
Location	
Hole	533-S-402A Depth 9 - 10'
Technician	Date 11/2/73

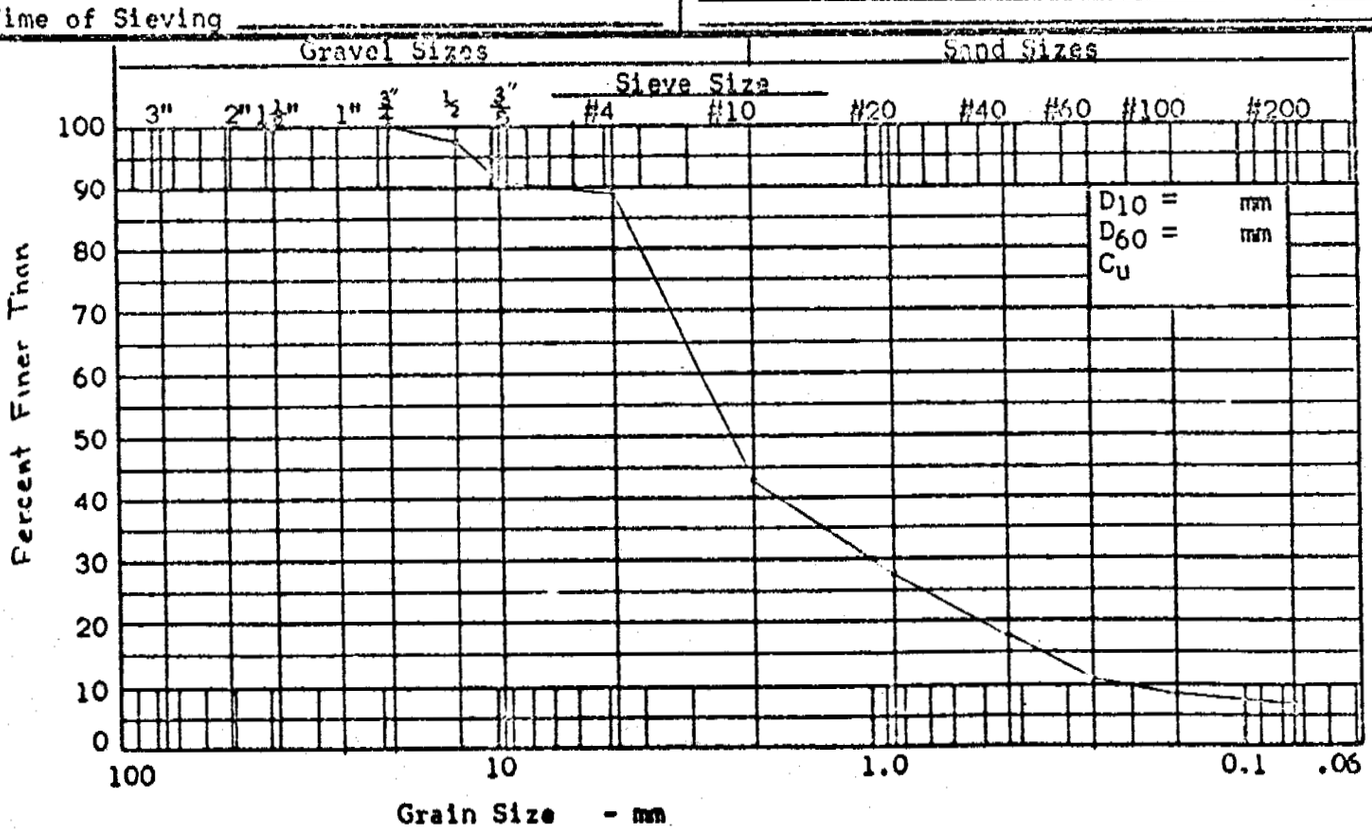
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			97.5	
Wt. Dry		3/8	9.52			90.1	
	4	.185	4.76			69.4	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			42.3	
Wt. Dry + Tare	20	.0331	.840			27.5	
Tare	40	.0165	.420			17.8	
Wt. Dry	60	.0097	.250			11.4	
	100	.0059	.149			8.6	
	200	.0029	.074			7.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

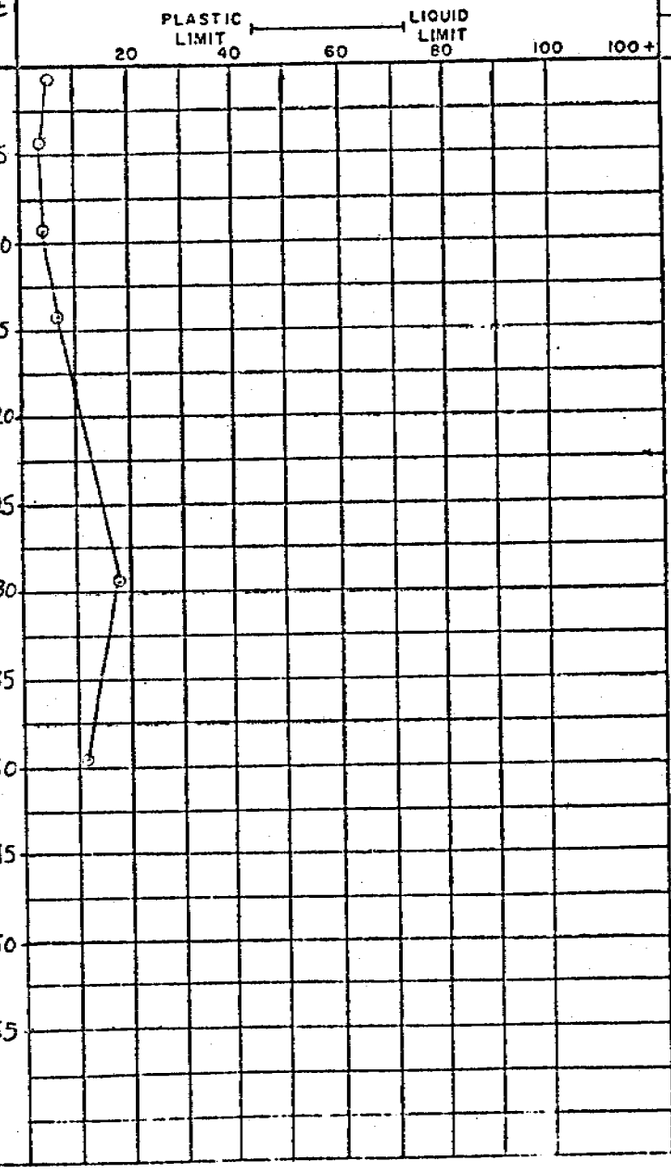
DWN: A E W	FIELD ENG: N.W.C	DATE DRILLED: 11/2/73	AIRPHOTO NO:	CHAINAGE: 519+00	OFFSET: ℄
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	S	402A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL 6" TOPSOIL	UF								SO_4 = 0.07 %
5					GW										
10				23 BLS		SAND, PEBBLES AND BOULDERS			7		34	66			
15															HOLE SLOUGHING
20					GW										
						CLAY TILL									
25					GC										
						GRAVEL									
30															
35															
40		P													
45						DENSER GRAVEL CONTENT									
50		P		91 BLS	GC										
55						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

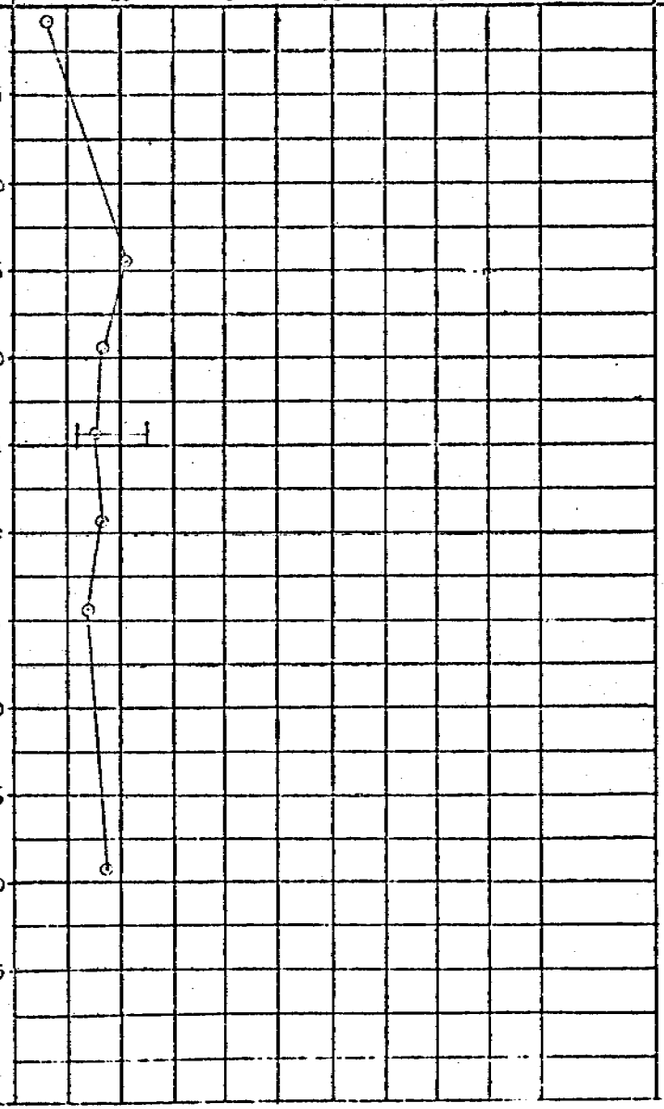


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: N W C	DATE DRILLED: 12/2/73	AIRPHOTO NO:	CHAINAGE: 521+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 50'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
533	S	403A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SAND 6" TOPSOIL	UF								SO_4 = 0.09%
5						GRAVEL									
10				112 BLS		COARSE, DRY									HOLE SLOUGHING
15						TILL									
20															
25				35 BLS											
30						SAND & PEBBLES									
35															
40						CLAY, SAND AND PEBBLES									
45															
50				18 BLS											
55						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy Gravel
Location	
Hole	533-S-404A Depth 4 - 5'
Technician	Date 13/2/73

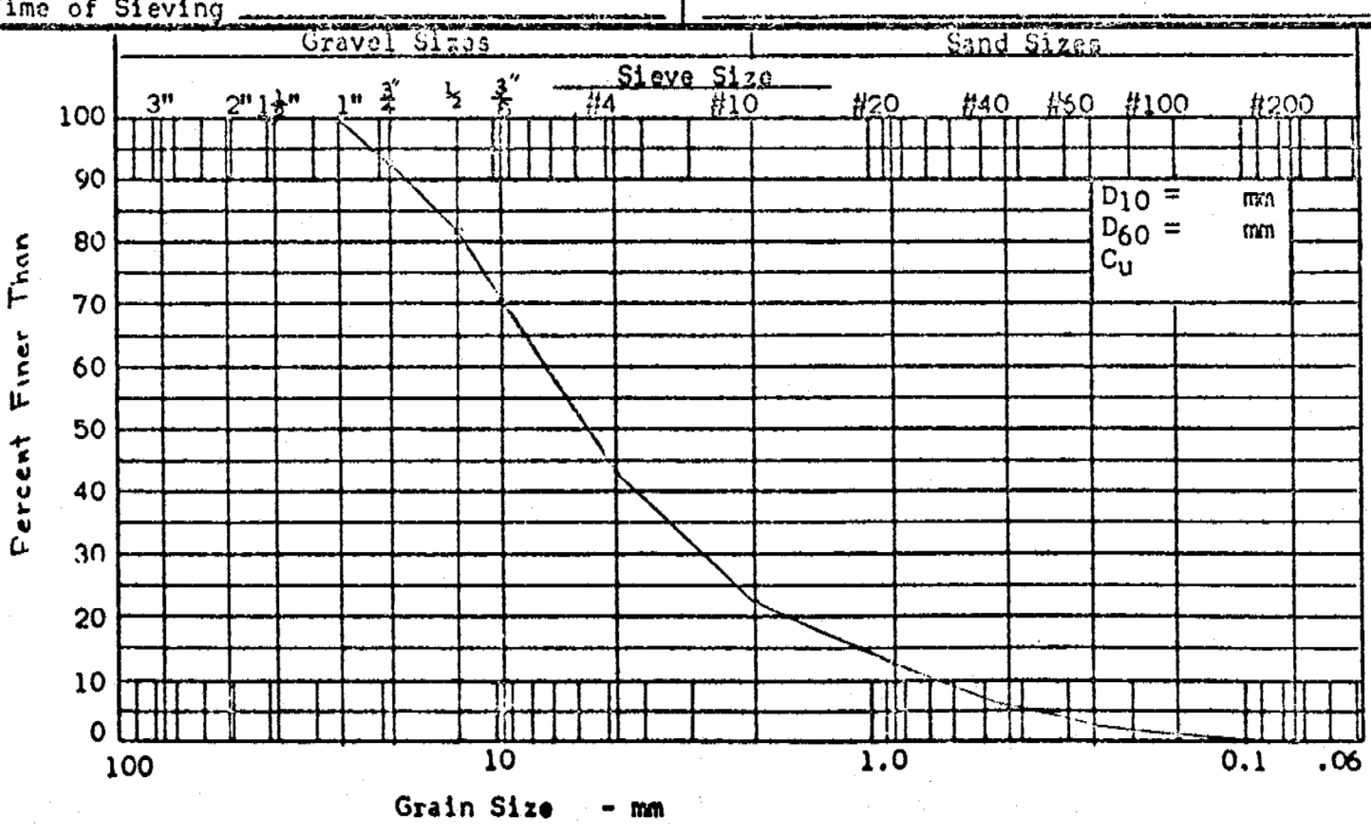
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			92.7	
Tare		1/2	12.70			81.4	
Wt. Dry		3/8	9.52			70.1	
	4	.185	4.76			43.6	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			22.1	
Tare No.	20	.0331	.840			12.5	
Wt. Dry + Tare	40	.0165	.420			5.6	
Tare	60	.0097	.250			2.3	
Wt. Dry	100	.0059	.149			1.2	
	200	.0029	.074			0.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 533-S-404A Depth 9' - 10'
Technician Date Feb. 13, 1973

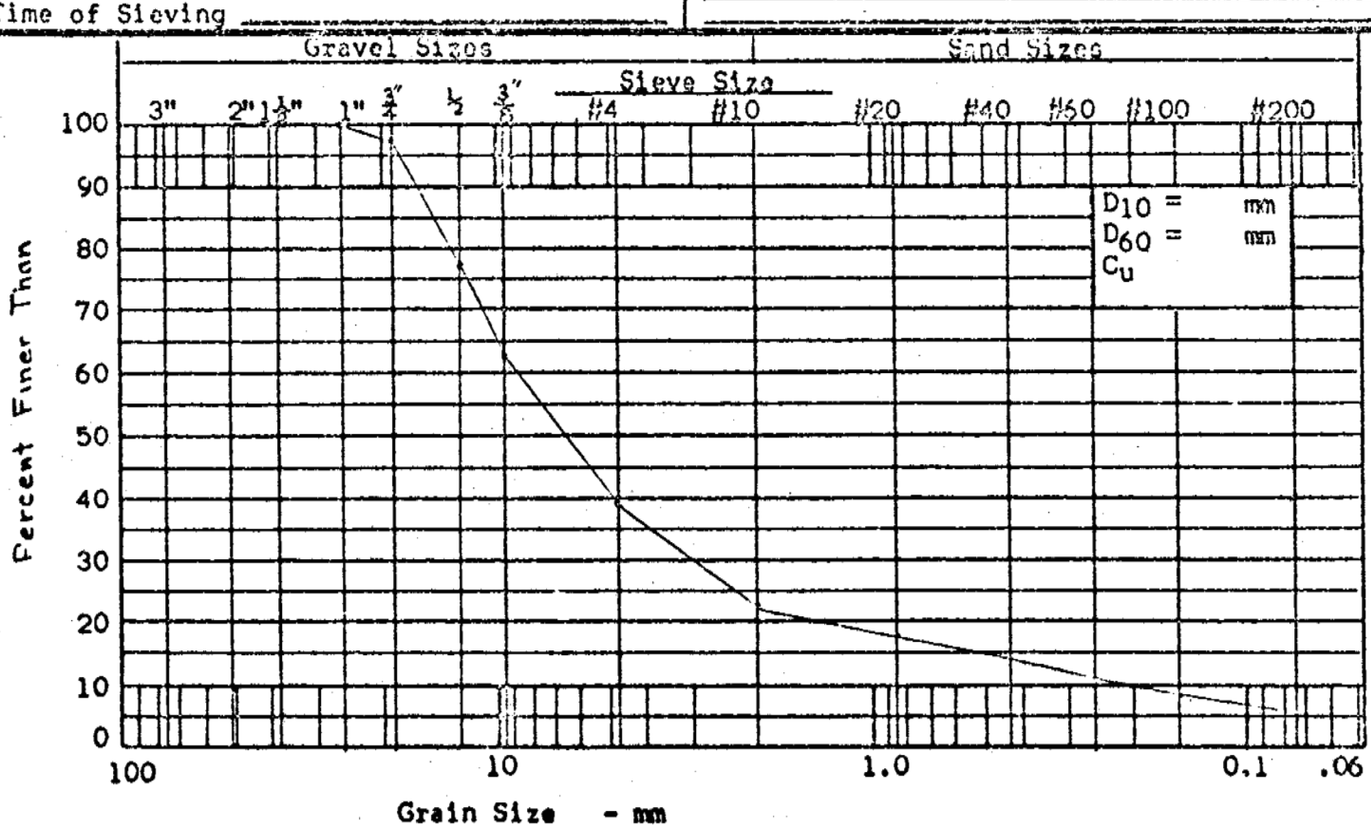
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			97.2	
Tare		1/2	12.70			77.0	
Wt. Dry		3/8	9.52			62.3	
	4	.185	4.76			39.6	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			22.5	
Tare No.	20	.0331	.840			17.1	
Wt. Dry + Tare	40	.0165	.420			14.2	
Tare	60	.0097	.250			10.9	
Wt. Dry	100	.0059	.149			8.3	
	200	.0029	.074			5.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Clay - till
Location
Hole 533-S-404A Depth 14' - 15'
Technician Date Feb. 13, 1973

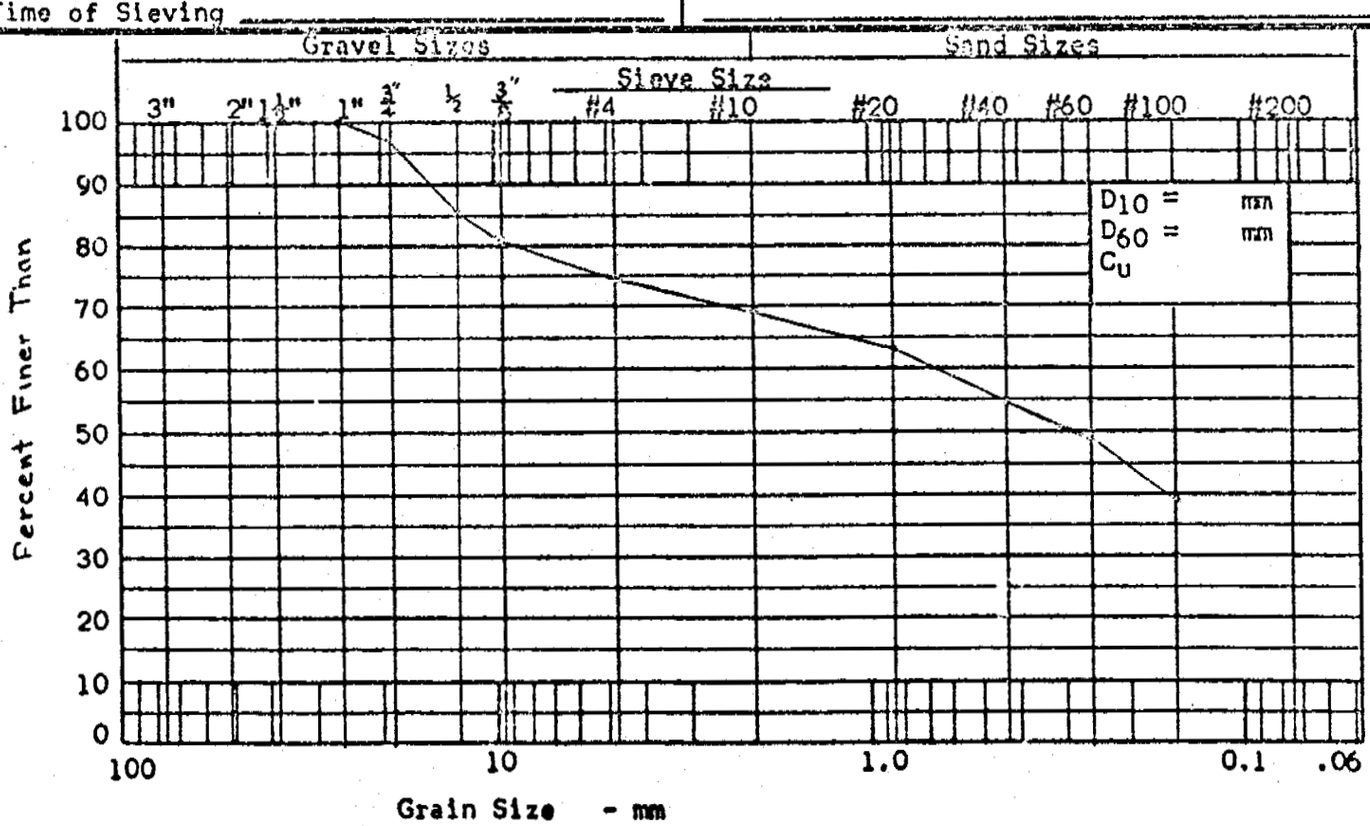
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			97.2	
Tare		1/2	12.70			85.8	
Wt. Dry		3/8	9.52			81.3	
	4	.185	4.76			74.9	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			69.3	
Wt. Dry + Tare	20	.0331	.840			62.9	
Tare	40	.0165	.420			54.5	
Wt. Dry	60	.0097	.250			48.2	
	100	.0059	.149			39.8	
	200	.0029	.074				
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

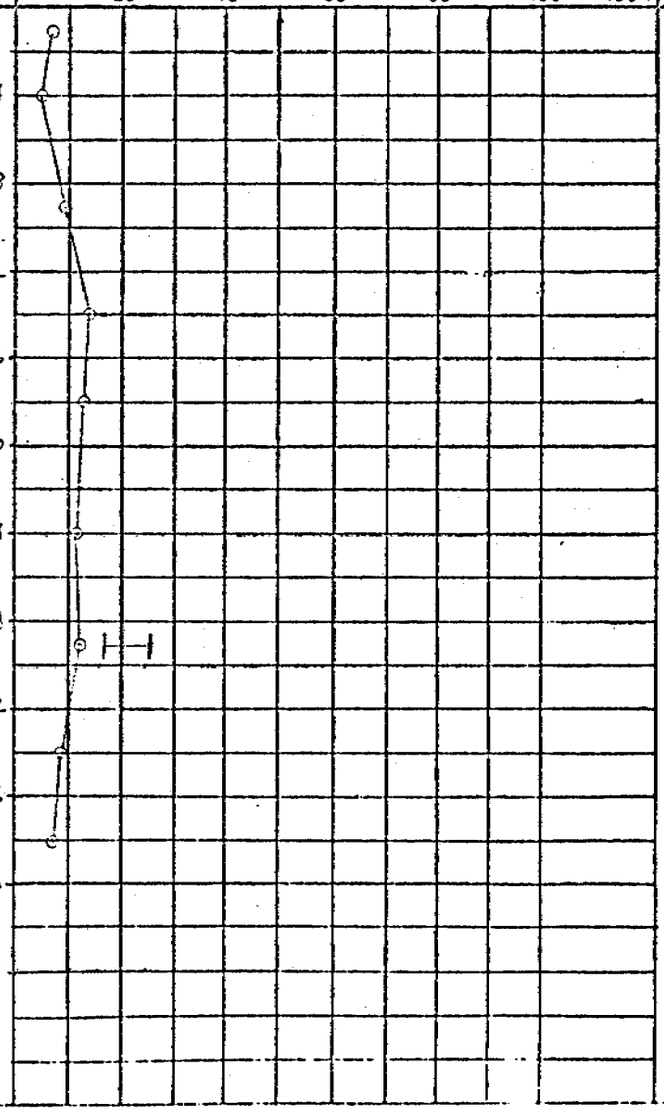
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: R.S.	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 519+00	OFFSET: 2
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR & SPRUCE TO 80'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
533	S	404A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GP	6" TOPSOIL SAND	UF								SO_4 = 0.09%
4						GRAVEL					22	78			
8				41 BLS	GC	SANDY WET			6		17	77			
12															
16						CLAY-TILL			40		29	31			
20				49 BLS											
24					GC	WET, GRAVEL, SAND									
28															
32															
36					GC										
40				103 BLS											
44						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 515+00	OFFSET:
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & ASPEN TO 35'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
533	C	405A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC	F										
2						SAND			2								
						DRY SOME SILT											
4							UF		4								
						GRAVEL											
6									6								HOLE SLOUGHING FROM 3'
8						OCCASIONAL COBBLE			8								
10									10								
						CLAY											
12									12								
14						END OF HOLE			14								
16									16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 534-C-406A Depth 4' - 5'
Technician Date Feb.13, 1973

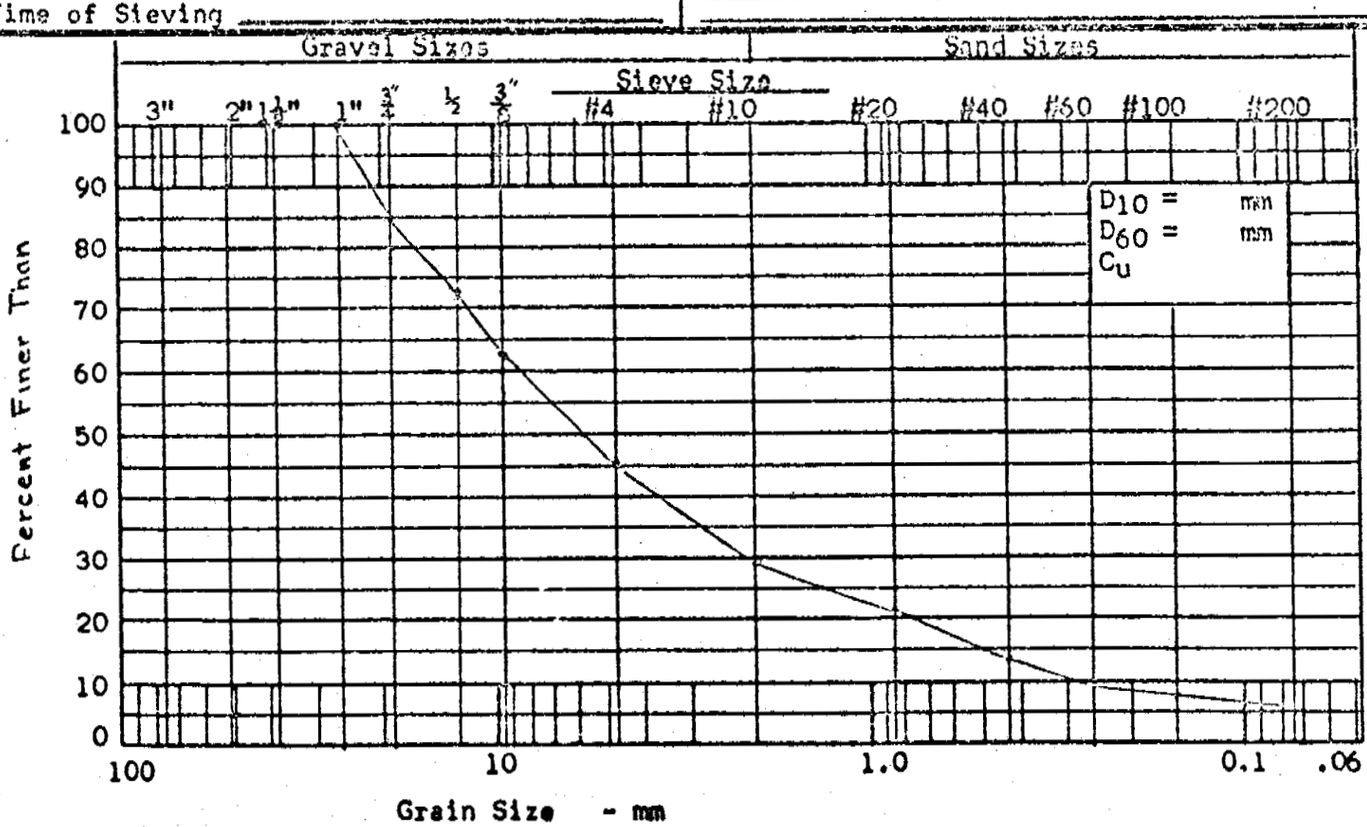
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			84.7	
Tare		1/2	12.70			72.8	
Wt. Dry		3/8	9.52			62.8	
	4	.185	4.76			45.6	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			29.4	
Wt. Dry + Tare	20	.0331	.840			20.3	
Tare	40	.0165	.420			13.4	
Wt. Dry	60	.0097	.250			9.7	
	100	.0059	.149			7.8	
	200	.0029	.074			6.6	
Passing	200						

Description of Sample

Time of Sieving

Method of Preparation

Remarks:



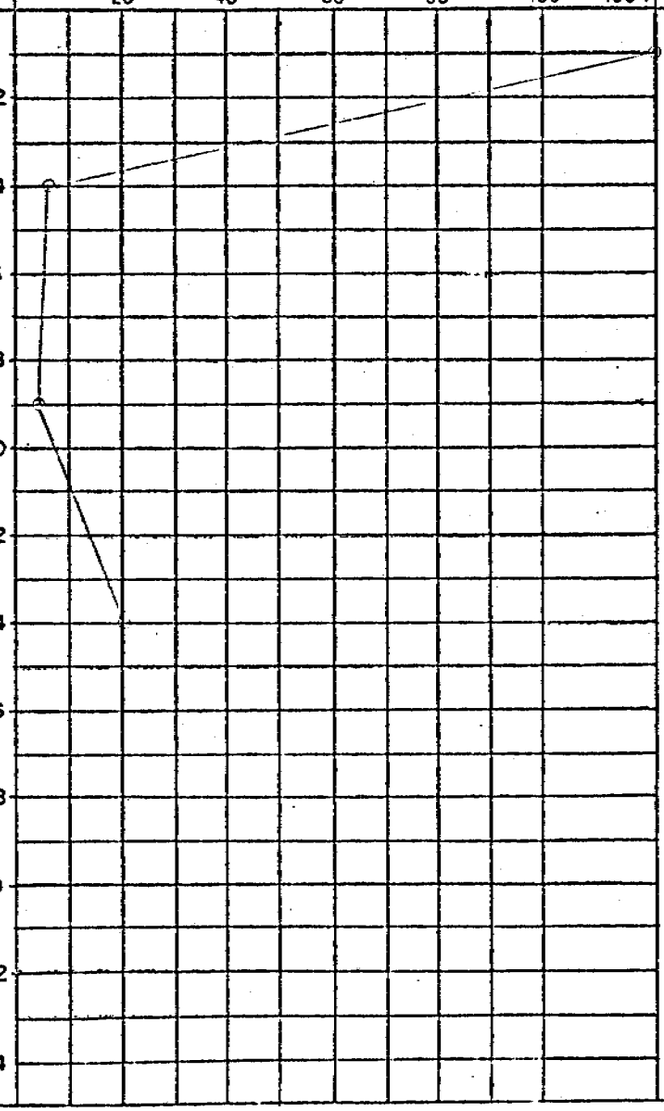
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 505+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
534	C	406A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY 2" ORGANIC	F									
2						SILTY, TILL			2							
						SOME ICE										
4						GRAVEL			4		7	22	71			
6									6							
8									8							
10						COBBLES			10							
12									12							
14						CLAY TILL			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



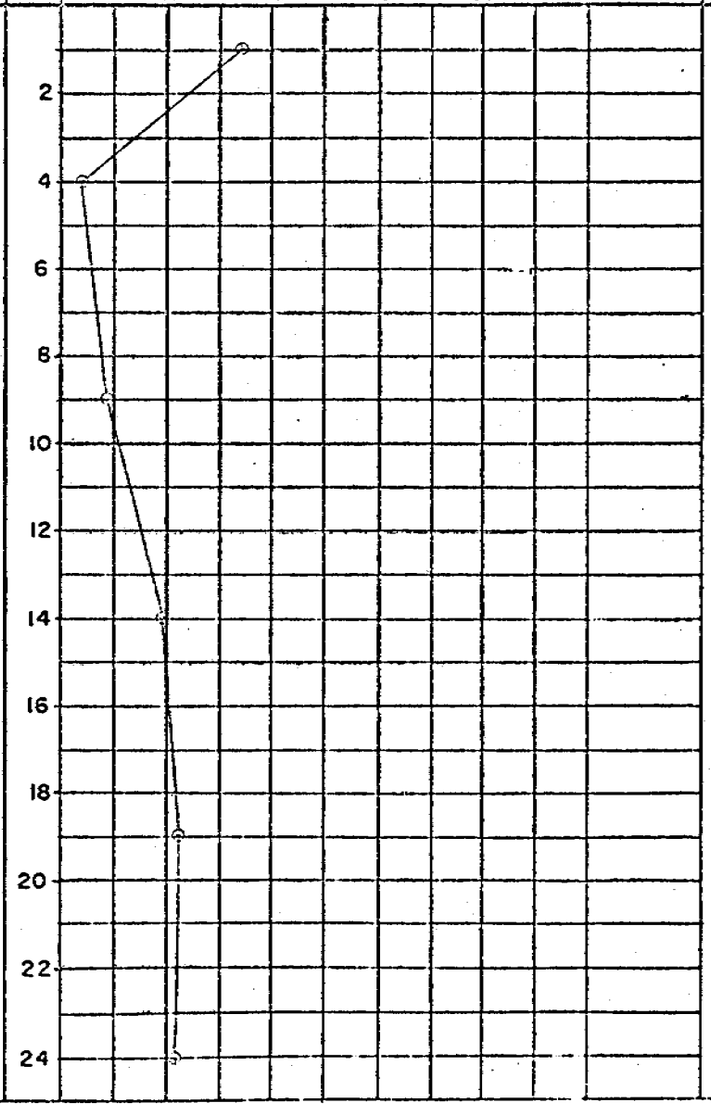
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M	DATE DRILLED 13/2/73	AIRPHOTO NO:	CHAINAGE: 194+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
534	C	407A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						CLAY 3" ORGANIC SILTY	F	
2					GM	GRAVEL		
4								
6						CLAY TILL		
8								
10					GC	SAND		
12					GC	CLAY		
14						DRY, FEW PEBBLES		
16								
18								
20								
22						SILTY		
24					GC	END OF HOLE @ 25'		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

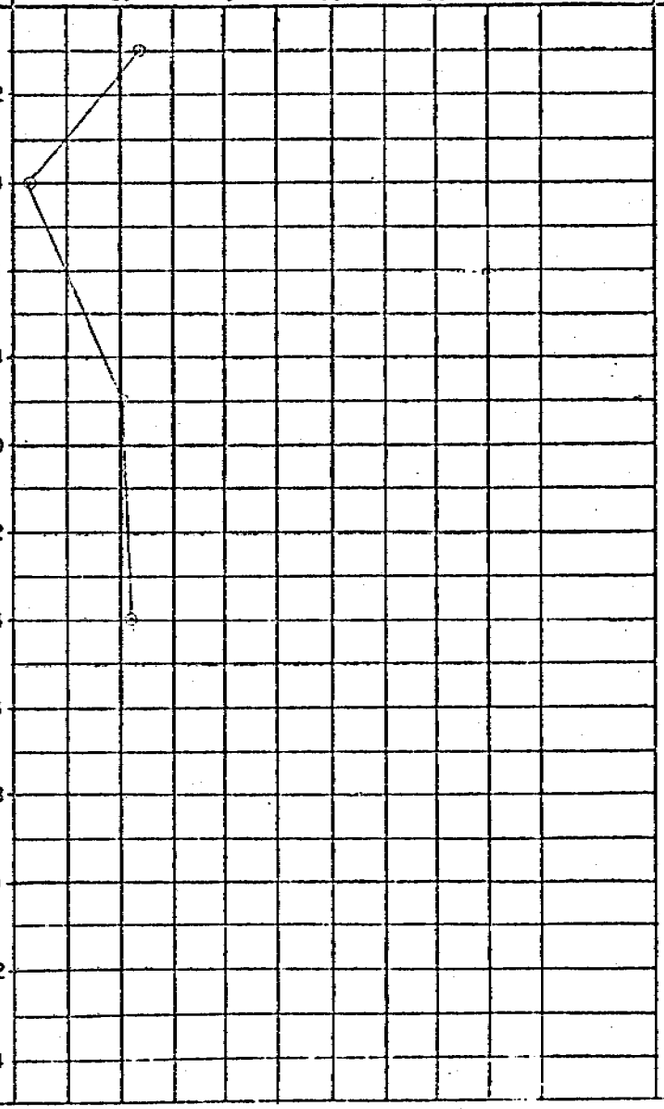
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG B.M	DATE DRILLED 13/2/73	AIRPHOTO NO:	CHAINAGE: 432+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
534	C	408A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SM	2" ORGANIC CLAY TILL SILTY	F									
2									2							
4					GP	GRAVEL AND SAND		Vr	4							
6									6							
8					CL	CLAY GREY		ICE CRYSTALS	8							
10									10							
12								Vr	12							
14					CL				14							
16									16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 534-C-409A Depth 4' - 5'
Technician Date Feb. 13, 1973

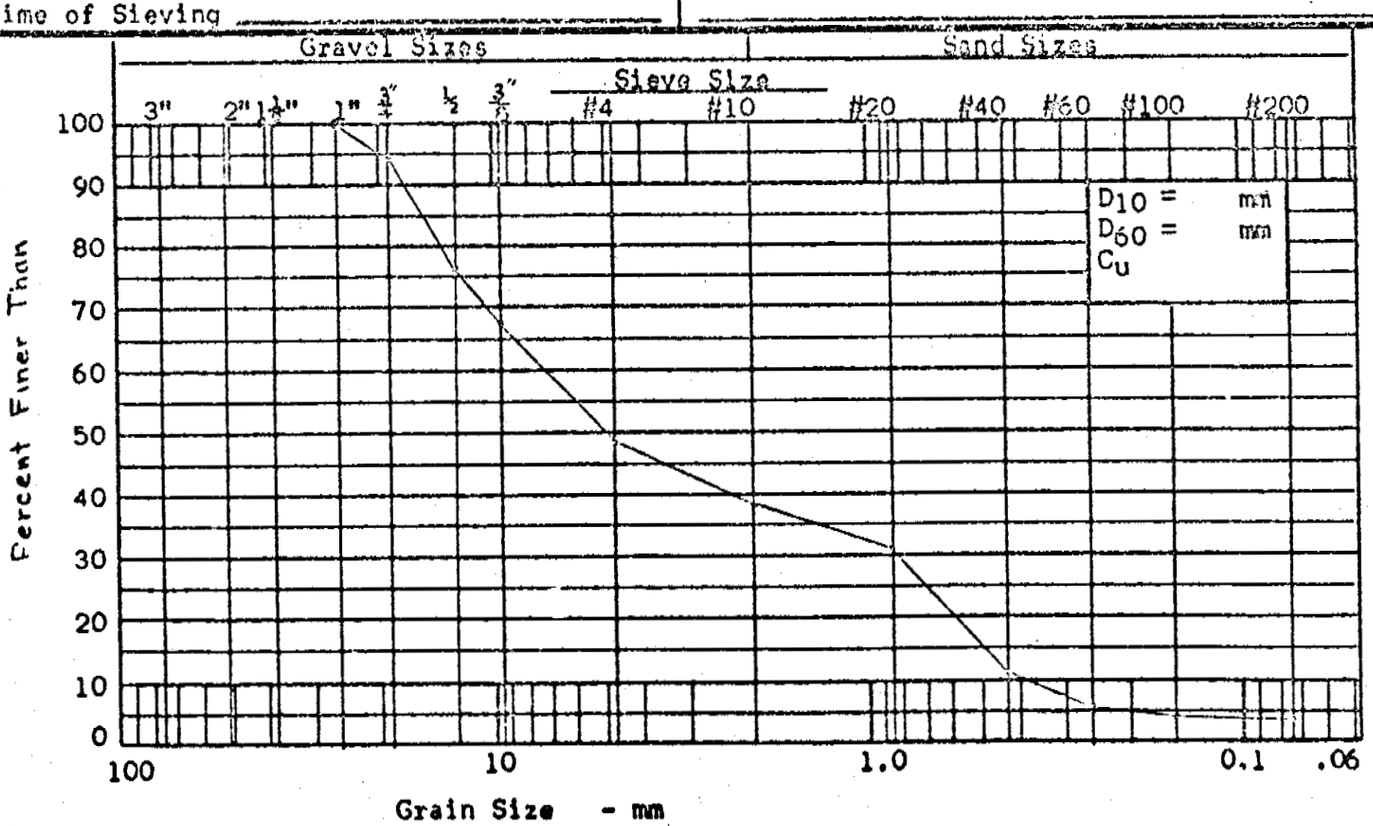
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			94.8	
Tare		1/2	12.70			76.7	
Wt. Dry		3/8	9.52			67.3	
	4	.185	4.76			48.4	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			38.2	
Wt. Dry + Tare	20	.0331	.840			30.9	
Tare	40	.0165	.420			11.5	
Wt. Dry	60	.0097	.250			5.0	
	100	.0059	.149			4.2	
	200	.0029	.074			3.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

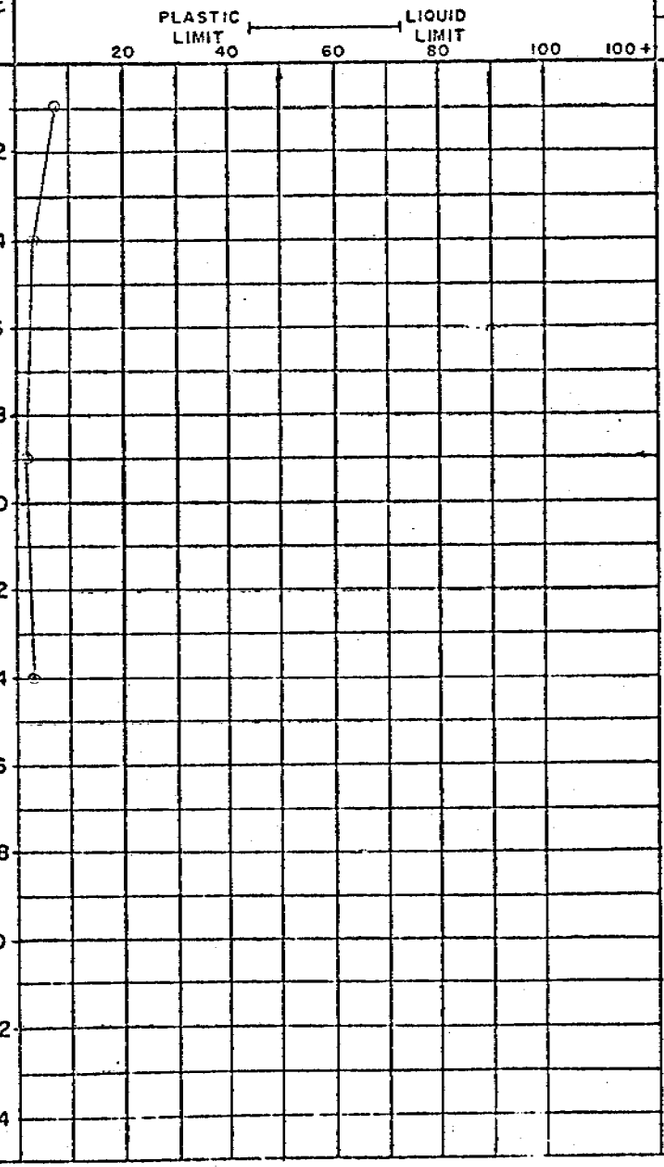
DWN. AEW	FIELD ENG BM	DATE DRILLED 13/2/73	AIRPHOTO NO:	CHAINAGE: 470+00	OFFSET: ℄
CKD DSP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
534	C	409A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL 3" ORGANIC									
2					GP	SILTY SAND									
4										3	35	62			
6						SAND									
8					SP										
10															
12															
14					SW	SAND CLAY									
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



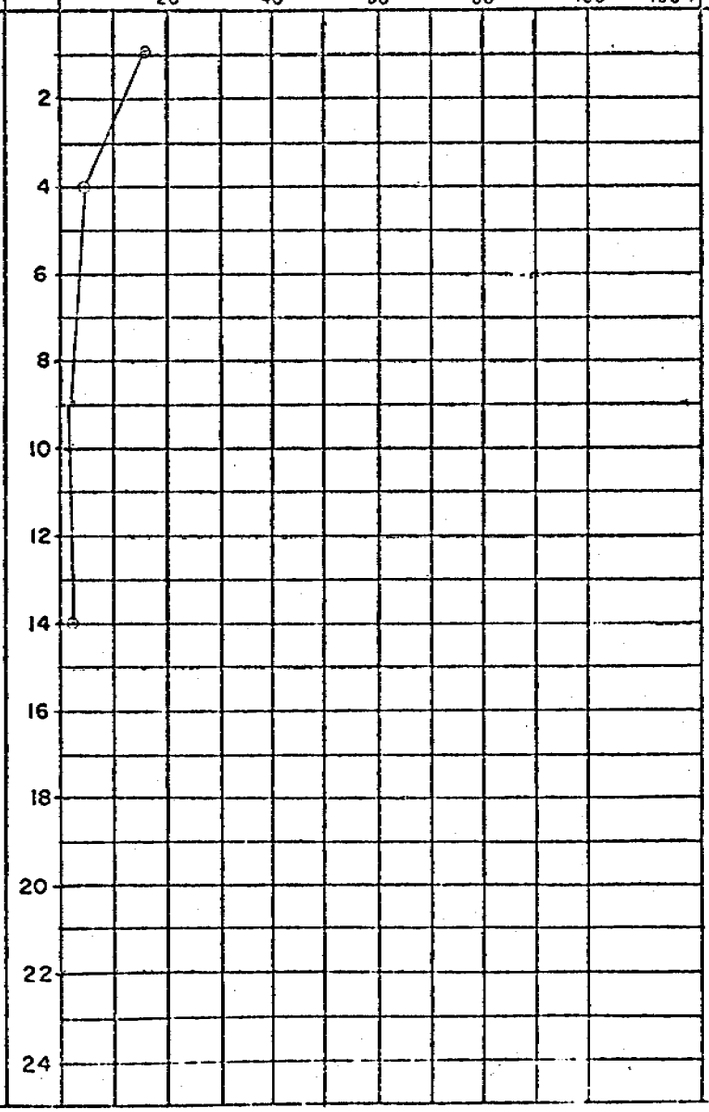
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M.	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 460+00	OFFSET: ℄
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & ASPEN TO 50'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
534	C	410A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SM	5" ORGANIC SAND	F								
2						SILT									
4					SW	GRAVEL									
6															
8															
10															
12															
14					SP	GRAVEL									
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 450+00	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 40'	ELEV:	MILE: 535 · B,C,S: C · NUMBER: 411 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					SM	SAND ORGANIC TO 2" SILT	F	
2								
4					SP	GRAVEL		
6								
8								
10								
12								
14					SP	GRAVEL		
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sand, silt and gravel
Location
Hole 535-C-412A Depth 4' - 5'
Technician Date Feb.13, 1973

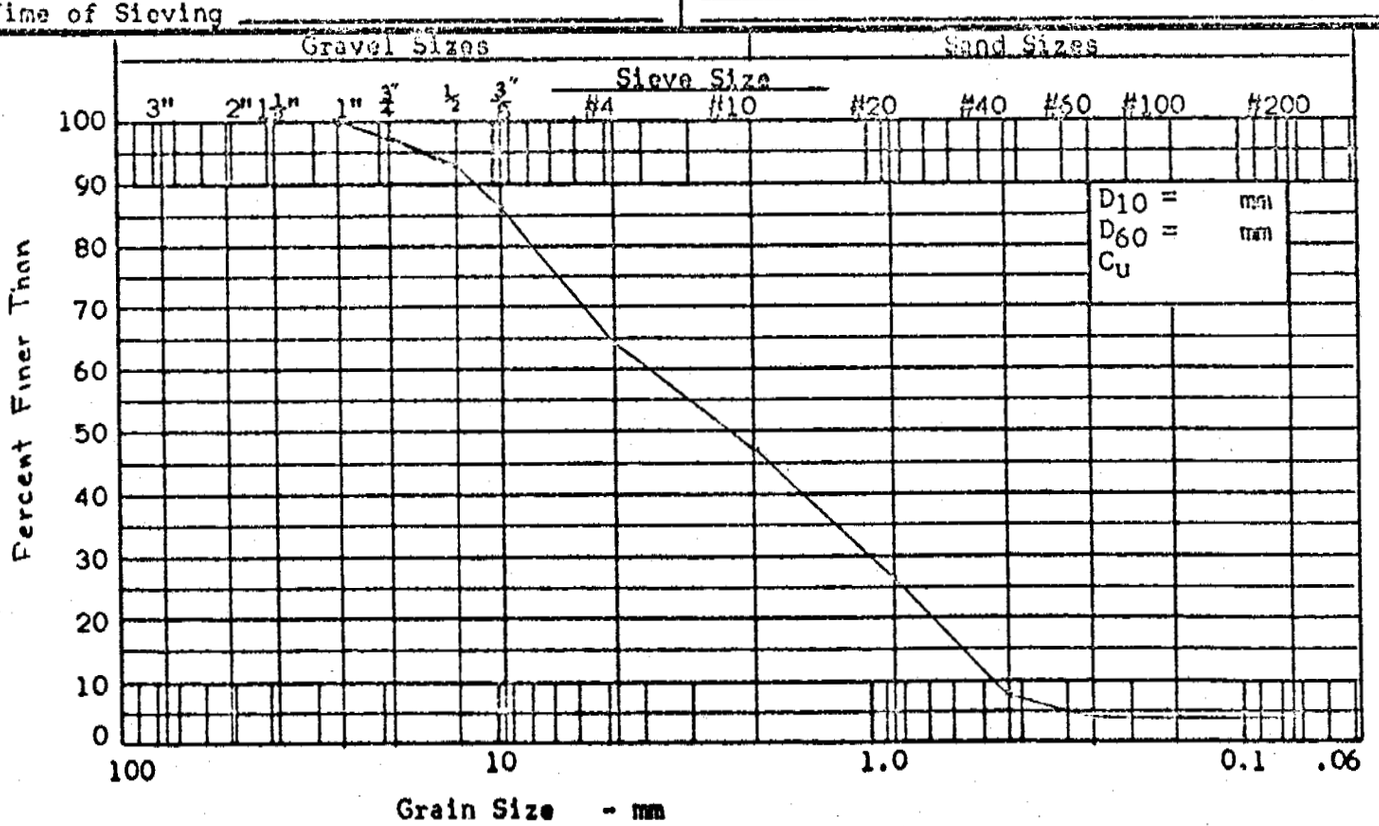
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			97.3	
Tare		1/2	12.70			93.0	
Wt. Dry		3/8	9.52			86.3	
	4	.185	4.76			64.6	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			47.0	
Wt. Dry + Tare	20	.0331	.840			26.5	
Tare	40	.0165	.420			7.3	
Wt. Dry	60	.0097	.250			4.9	
	100	.0059	.149			4.3	
	200	.0029	.074			4.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 440+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 25'	ELEV:

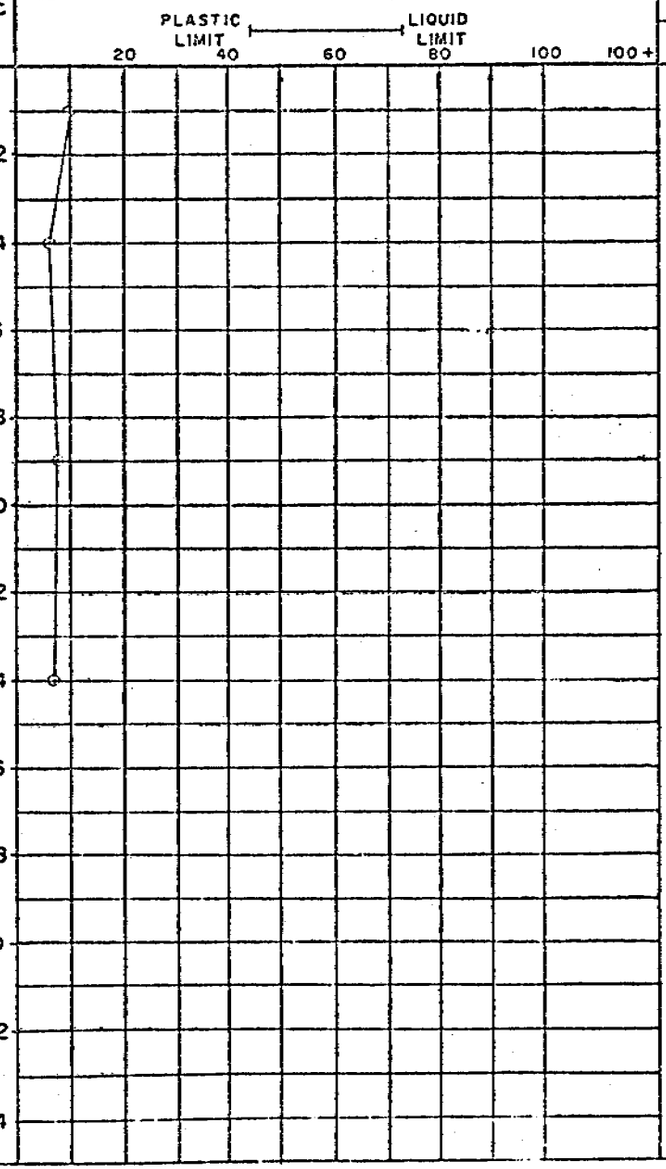
TEST HOLE

MILE	B,C,S	NUMBER
535	C	412 A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
					SM	2" ORGANIC SAND	F								
2						SILT			2						
4					GP				4	4		43	53		
6									6						
8						GRAVEL			8						
10									10						
12									12						
14					SP				14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with silt and gravel
Location	
Hole 535-C-413-A	Depth 4' - 5'
Technician	Date Feb.13, 1973

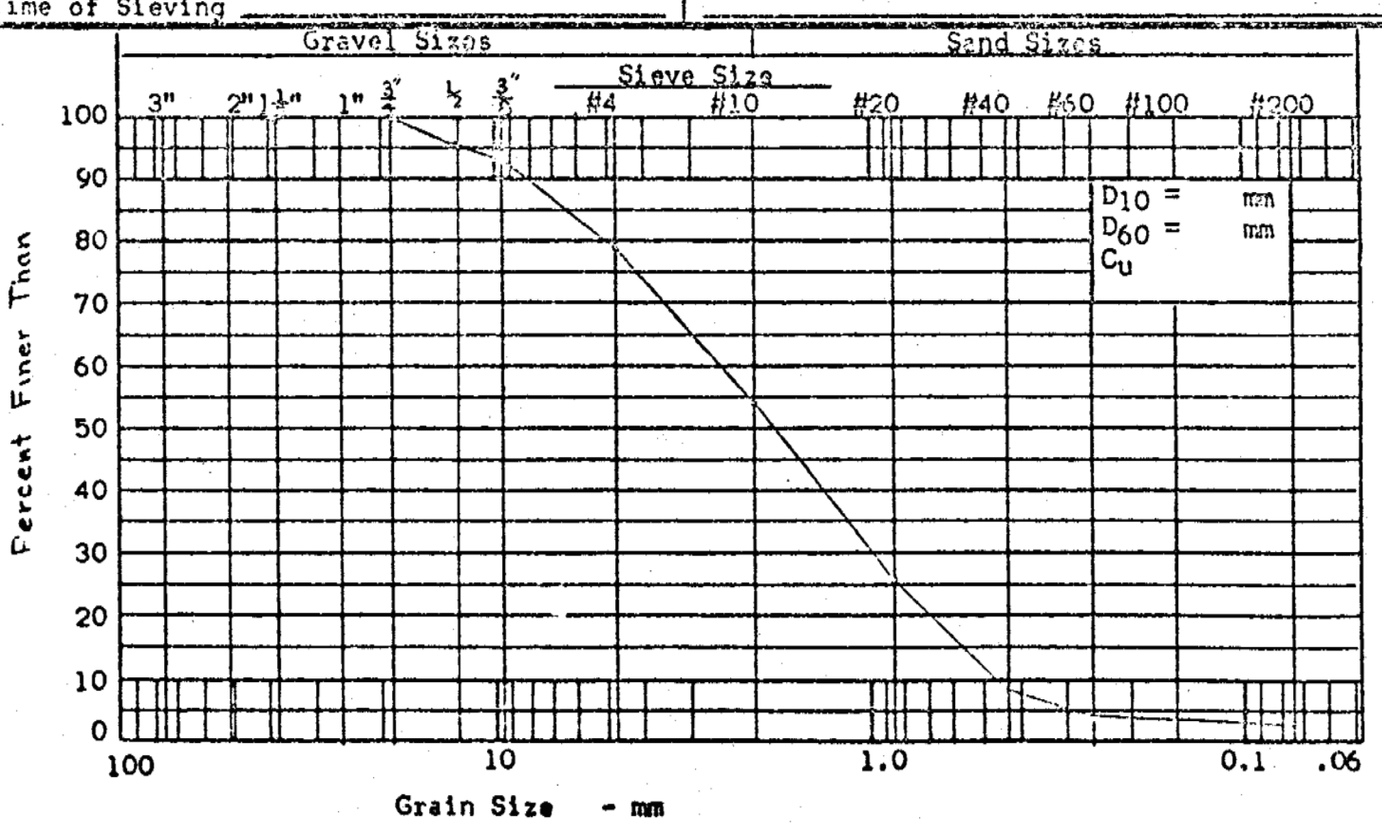
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			95.9	
Wt. Dry		3/8	9.52			93.5	
	4	.185	4.76			78.9	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			54.8	
Wt. Dry + Tare	20	.0331	.840			25.9	
Tare	40	.0165	.420			8.5	
Wt. Dry	60	.0097	.250			4.4	
	100	.0059	.149			3.4	
	200	.0029	.074			2.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

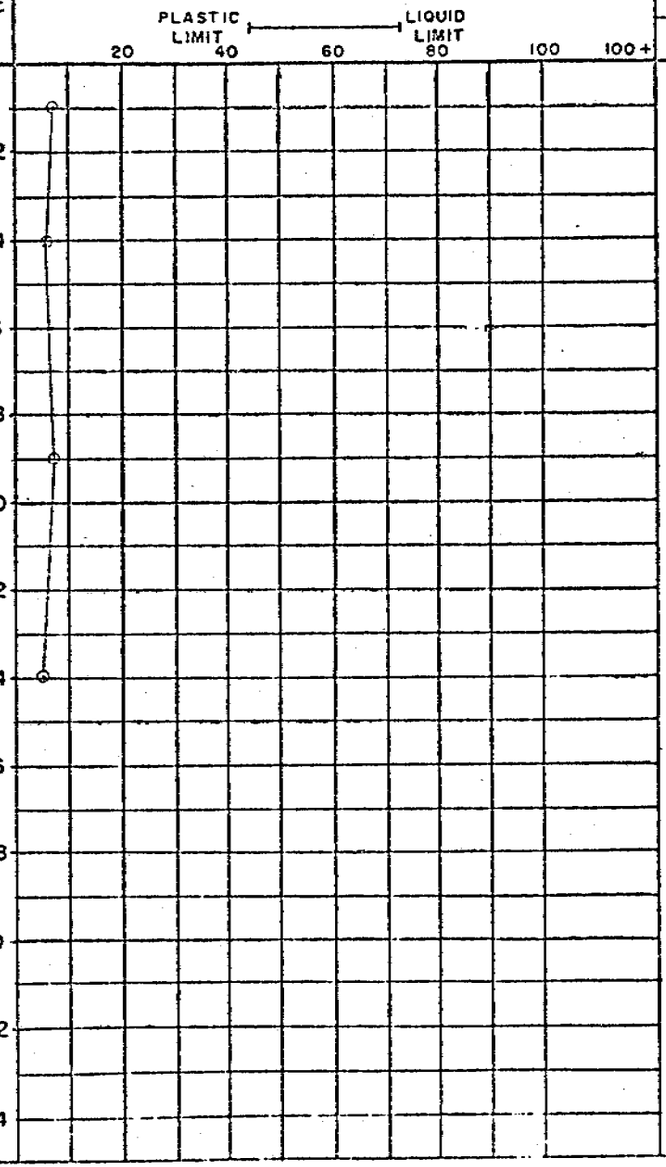
DWN. A.E.W	FIELD ENG B.M.	DATE DRILLED 12/2/73	AIRPHOTO NO:	CHAINAGE: 430+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
535	C	413A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SW	SAND 2" ORGANIC	F								
2						SILT, GRAVEL									
4										2	53	45			
6						GRAVEL									
8															
10						ICE									
12															
14					SP	GRAVEL									
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



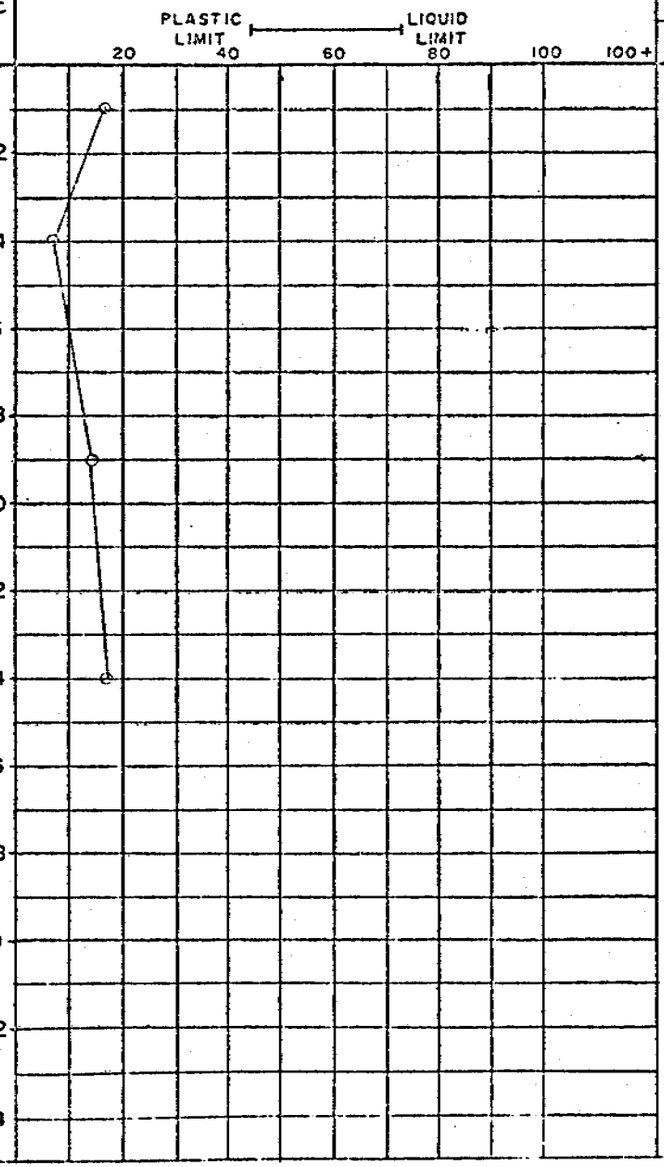
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 416+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
535	C	414 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SP	SAND 2" ORGANIC	F									
2						CLAY & GRAVEL			2							
4							UF		4							
6									6							
8						WET GRAVEL			8							
10									10							
12									12							
14					SP				14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 13/2/73	AIRPHOTO NO:	CHAINAGE: 410+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 50'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
535	C	415A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SP	SAND 3" ORGANIC	F										
2						SILT, SOME PEBBLES			2								
4									4								
6							UF		6								
8						SILT			8								
10									10								
12									12								
14					SP	SILT			14								
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

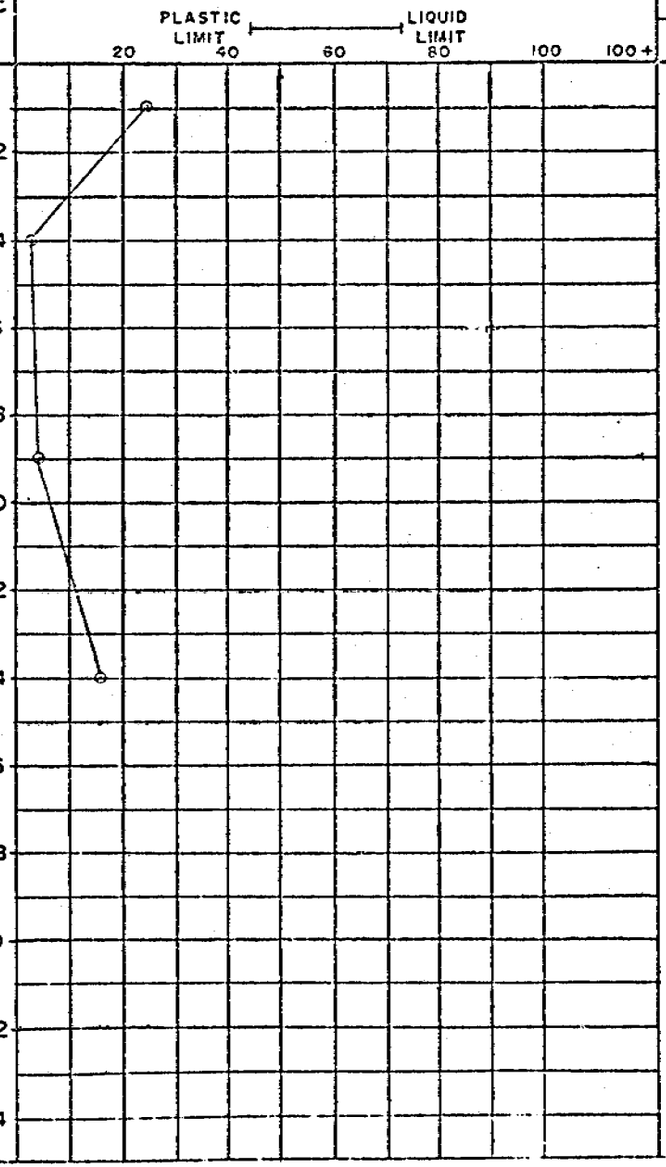
DWN A.E.W	FIELD ENG R.S	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 400+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 60'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
536	C	416 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–6					SM	SILT LIGHT BROWN	F	NO VISIBLE ICE								HOLE INSULATED AND FLAGGED
6–12					GP	GRAVEL										
12–14					GW											
14–24					CL	CLAY SILTY										

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 536-C-417-A Depth 4' - 5'
Technician Date Feb.14, 1973

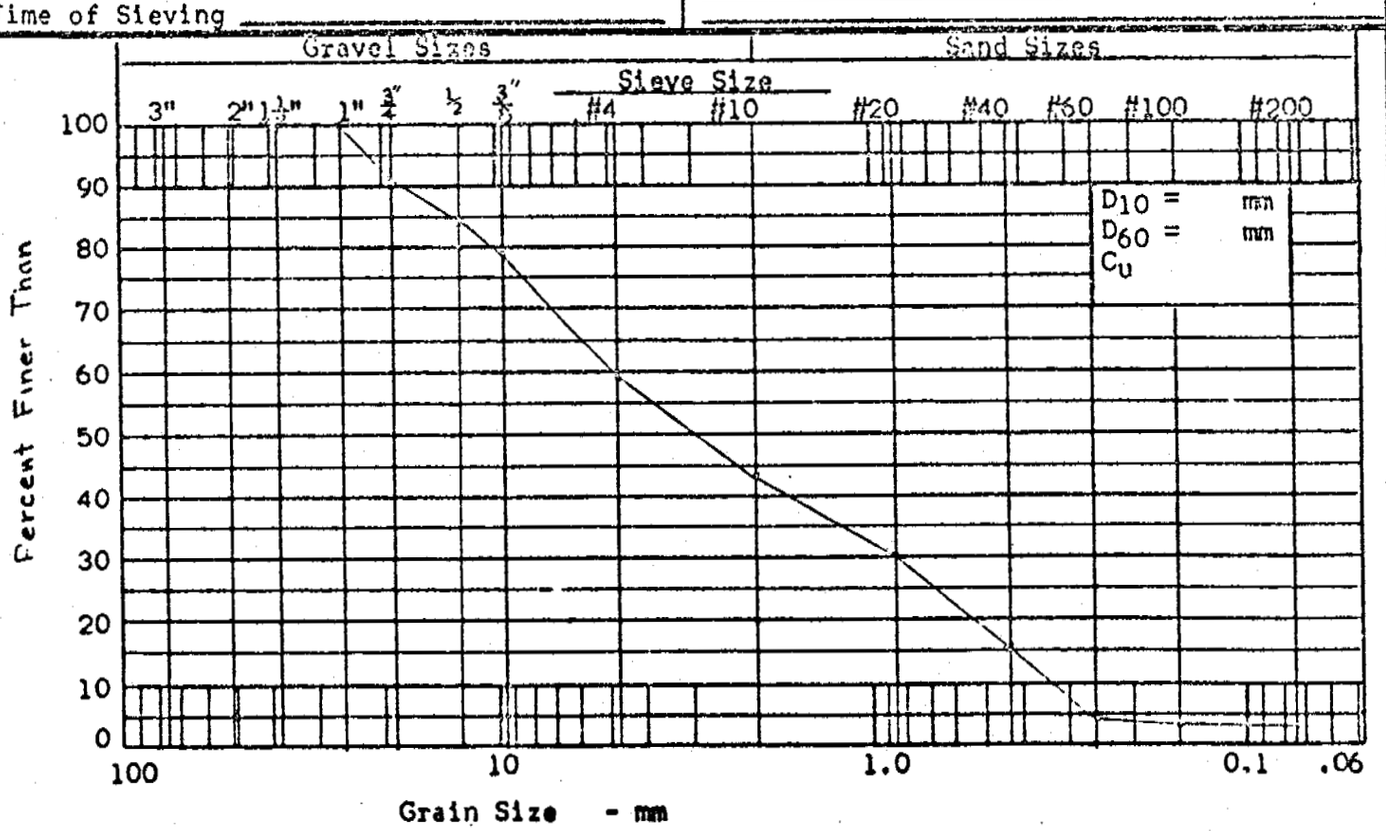
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			91.7	
Tare		1/2	12.70			84.7	
Wt. Dry		3/8	9.52			79.5	
	4	.185	4.76			59.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			43.4	
Wt. Dry + Tare	20	.0331	.840			30.0	
Tare	40	.0165	.420			15.3	
Wt. Dry	60	.0097	.250			4.9	
	100	.0059	.149			3.4	
	200	.0029	.074			2.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

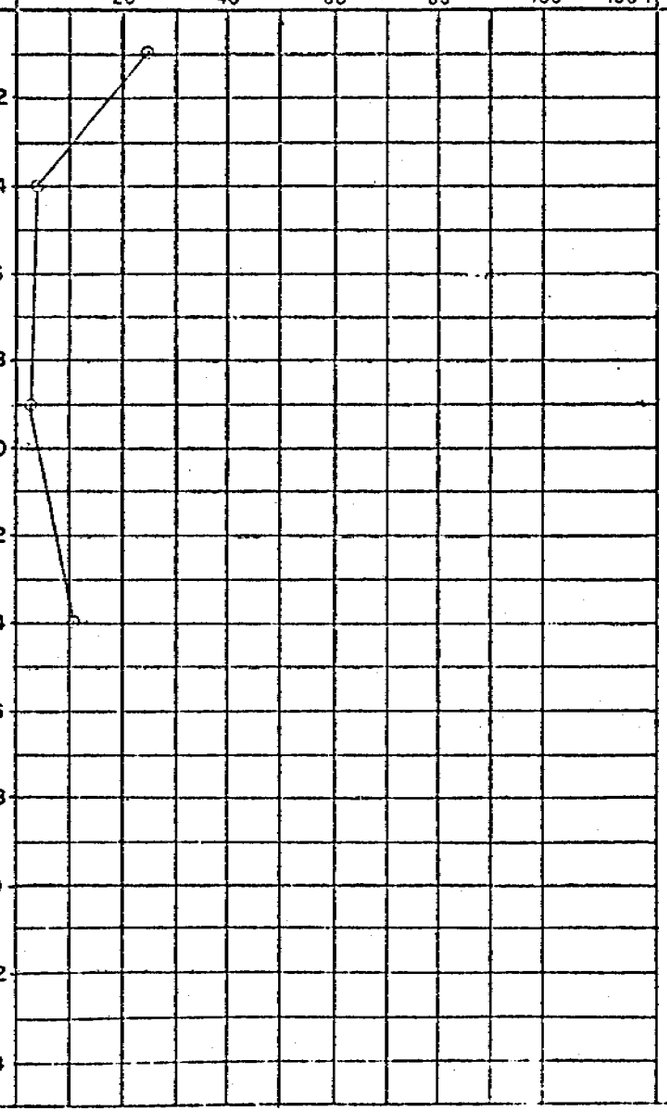
DWN A.E.W	FIELD ENG R.S	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 390+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 50'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
536	C	417A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
						SILT	F								
2		▲			ML	LIGHT BROWN			2						
4		▲			GP	GRAVEL			4		3	40	57		
6									6						
8									8						
10		▲							10						
12					SP				12						
14		▲			SP	SAND FINE			14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway

Site

Sample Sand with pebbles

Location

Hole 536-C-418A Depth 4' - 5'

Technician Date Feb.14, 1973

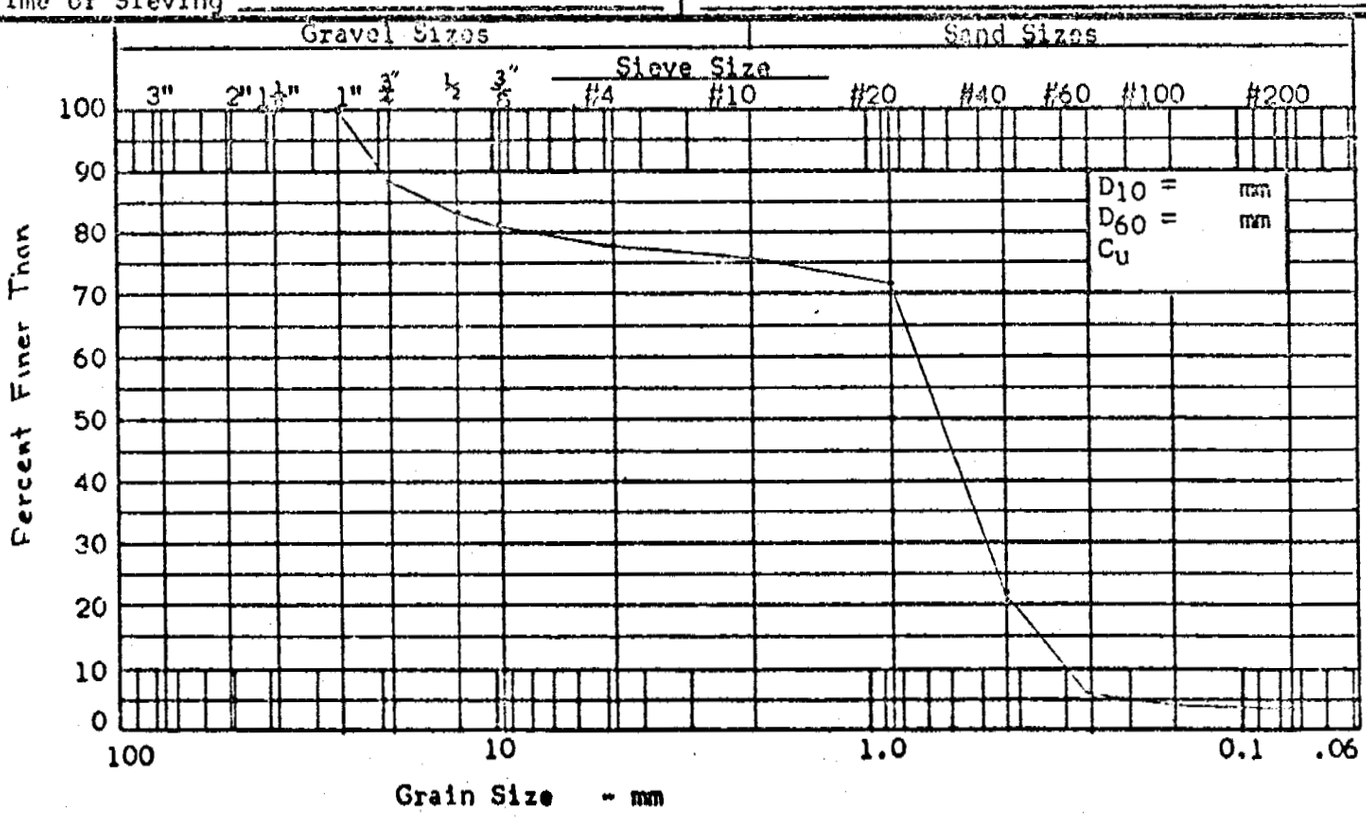
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4			100.0	
Tare		3/4	19.10			88.9	
Wt. Dry		1/2	12.70			83.5	
		3/8	9.52			82.0	
	4	.185	4.76			77.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			76.0	
Wt. Dry + Tare	20	.0331	.840			71.9	
Tare	40	.0165	.420			21.9	
Wt. Dry	60	.0097	.250			6.0	
	100	.0059	.149			4.2	
	200	.0029	.074			3.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: R.S.	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 377+00	OFFSET: L
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 60'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
536	C	418A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SP	SAND	F								HOLE INSULATED AND FLAGGED
2															
4						PEBBLES			4		72	24			
6															
8															
10						PEBBLES									
12															
14					SP										
16						END OF HOLE									
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

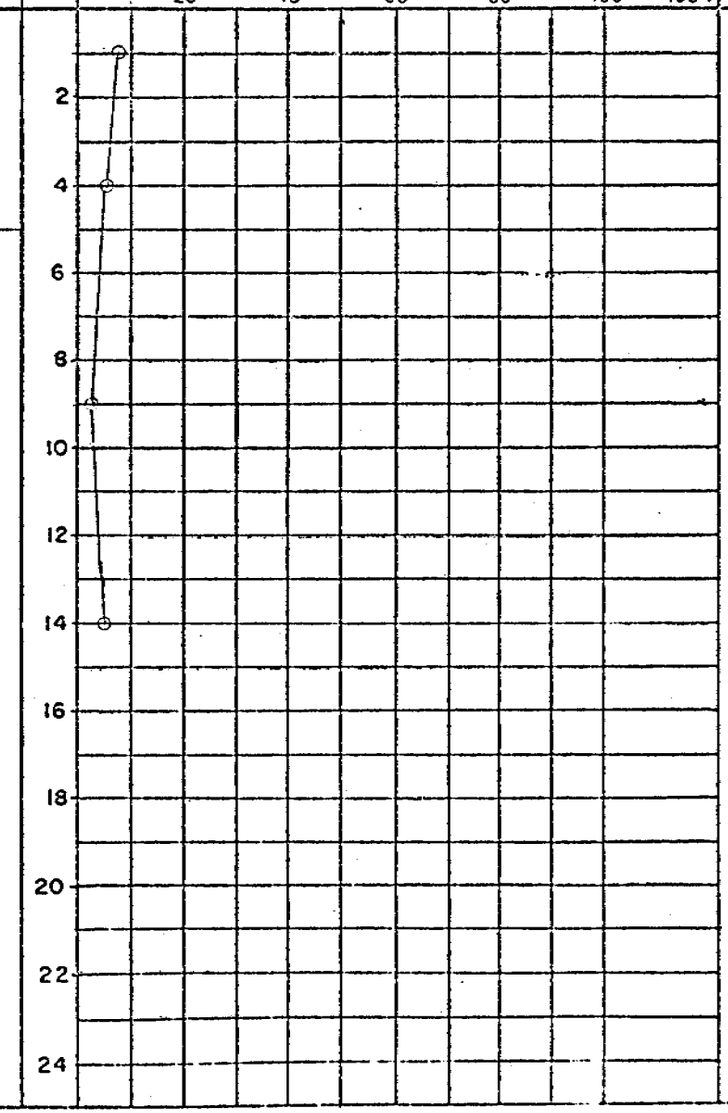
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A EW	FIELD ENG R S	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 370+00	OFFSET: ℄
CKD DGP	TECH:	RIG AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
536	C	419A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SM	SAND SILT AND PEBBLES	F								HOLE INSULATED AND FLAGGED
4					SM	CLAY									
6							UF								
8															
10						PEBBLES									
12															
14					SP	FINE SAND									
16						END OF HOLE									
18															
20															
22															
24															



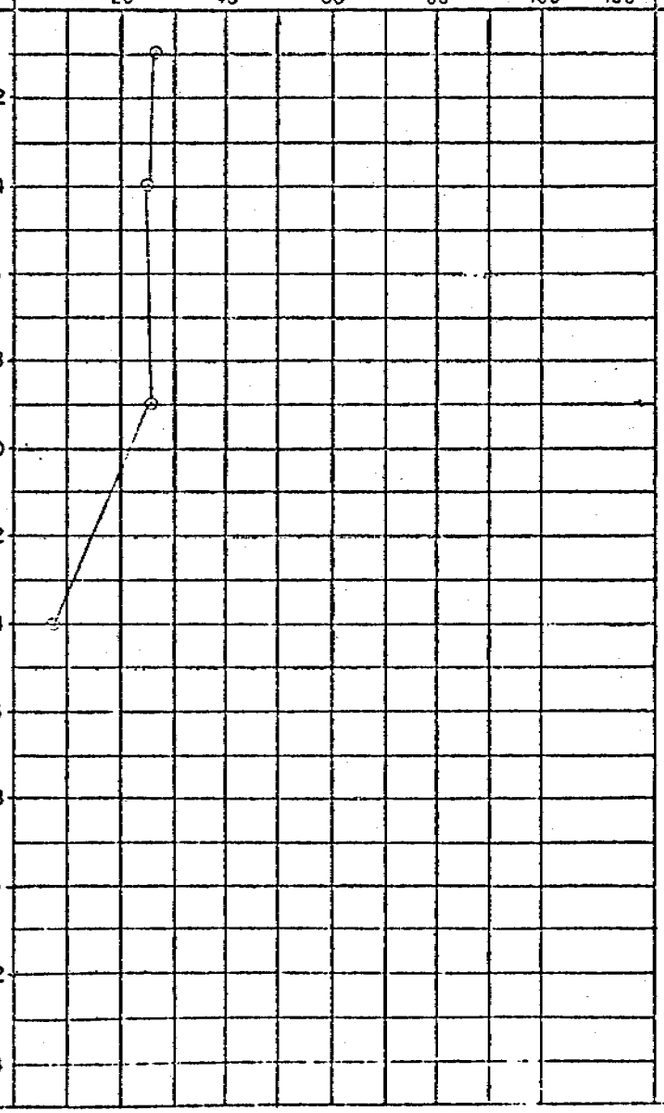
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: B.M	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 363+70	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & ASPEN	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
536	C	5798

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								
2					CL	CLAY BROWN									
4						SAND									
6					SM	FINE, BROWN									
8						SILT GREY									
10						SAND									
12					GW	GREY GRAVEL SOME ICE									
14															
16						END OF HOLE									
18															
20															
22															
24															



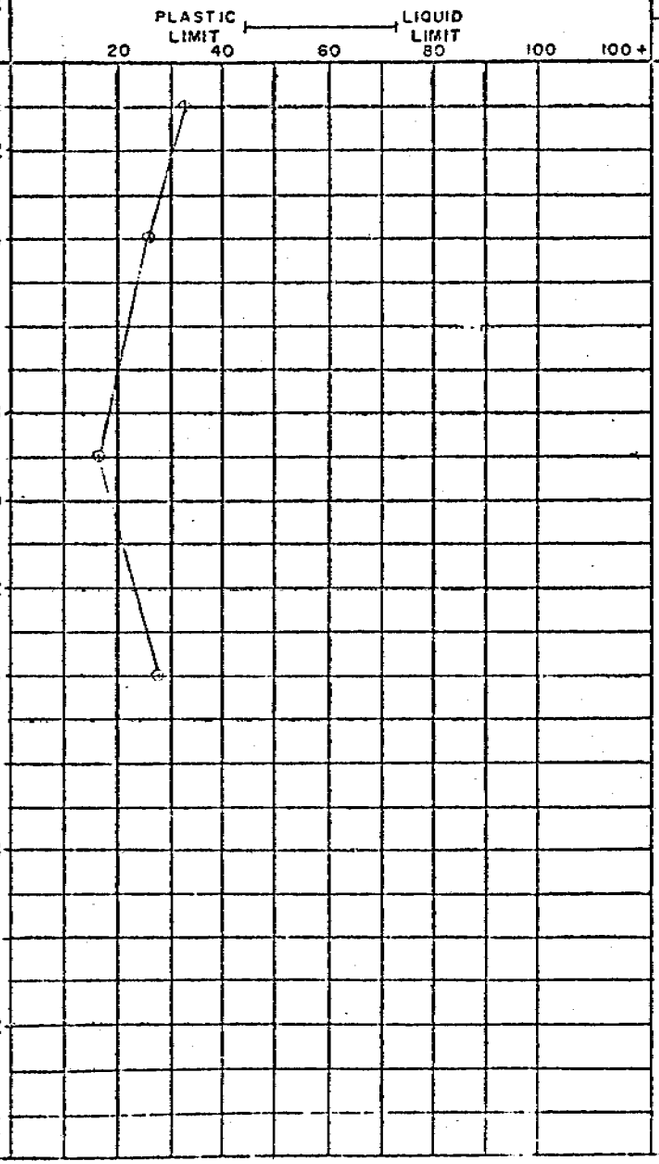
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 356+00	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 20'	ELEV:	

MILE	B,C,S	NUMBER
536	C	580B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	ORGANIC	F		
2					CL	CLAY		Vr	
4		P				BROWN			HARD PENETRATION
6									
8					CL				
10					SC	SAND & GRAVEL			
12						SILT GREY			
						SAND FINE			
14		P			SM	SILT GREY		Vr	HARD PENETRATION
						SAND – FINE, GREY, HARD			
16						END OF HOLE			
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

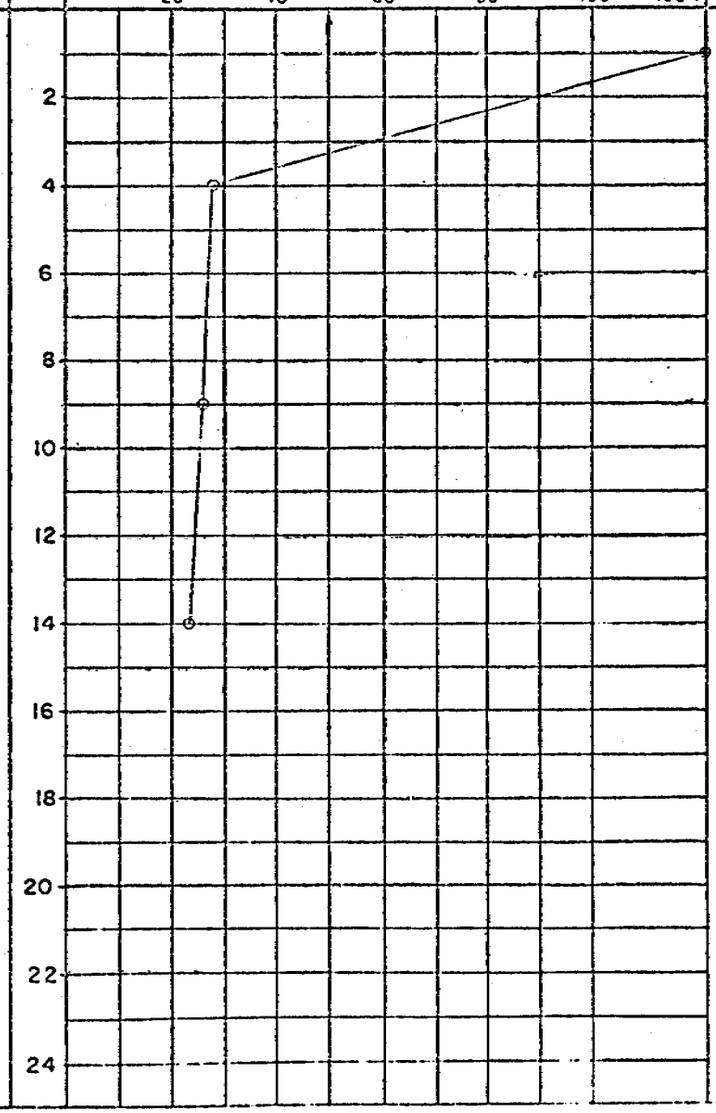
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 350+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
537	C	5818

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC ICE	F								
2															
4					CL	CLAY BROWN, SANDY, HARD									
6															
8						SILT									
10					SM	GREY, SANDY, HARD									
12															
14															
16						END OF HOLE									
18															
20															
22															
24															

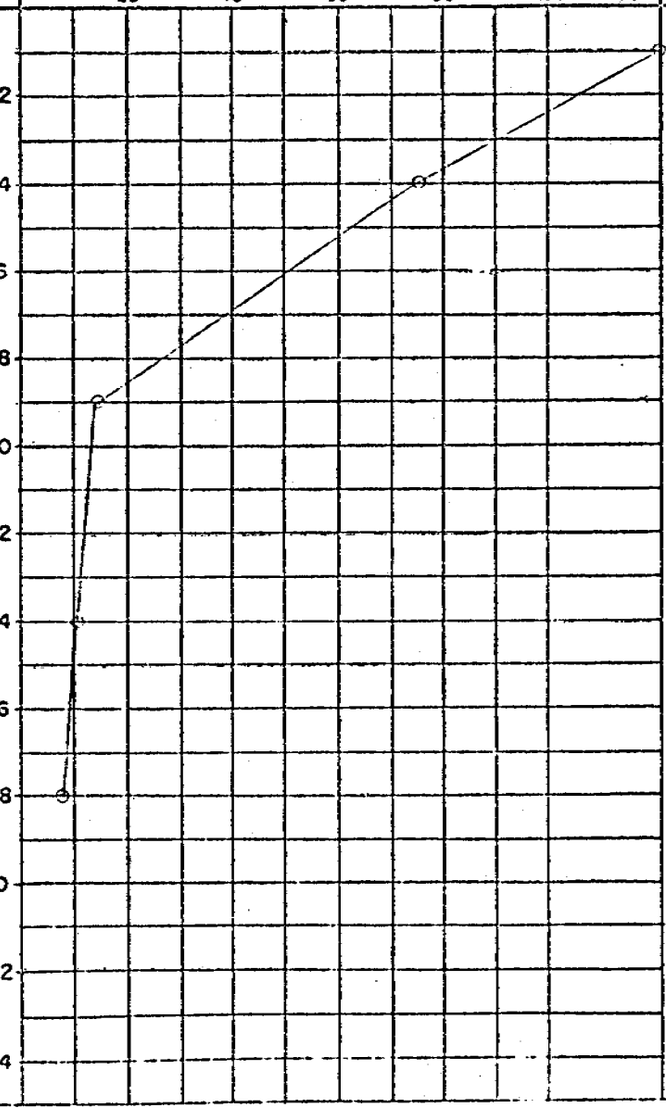


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: RS	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 340+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 40'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
537	C	420A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	ORGANIC	F	
4								
6					CL	CLAY		RANDOM ICE LENCES
8								
10								
12						SILTY, PEBBLES CLAY TILL		
14								
16								
18					CL			
20						END OF HOLE		
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

HOLE INSULATED AND FLAGGED

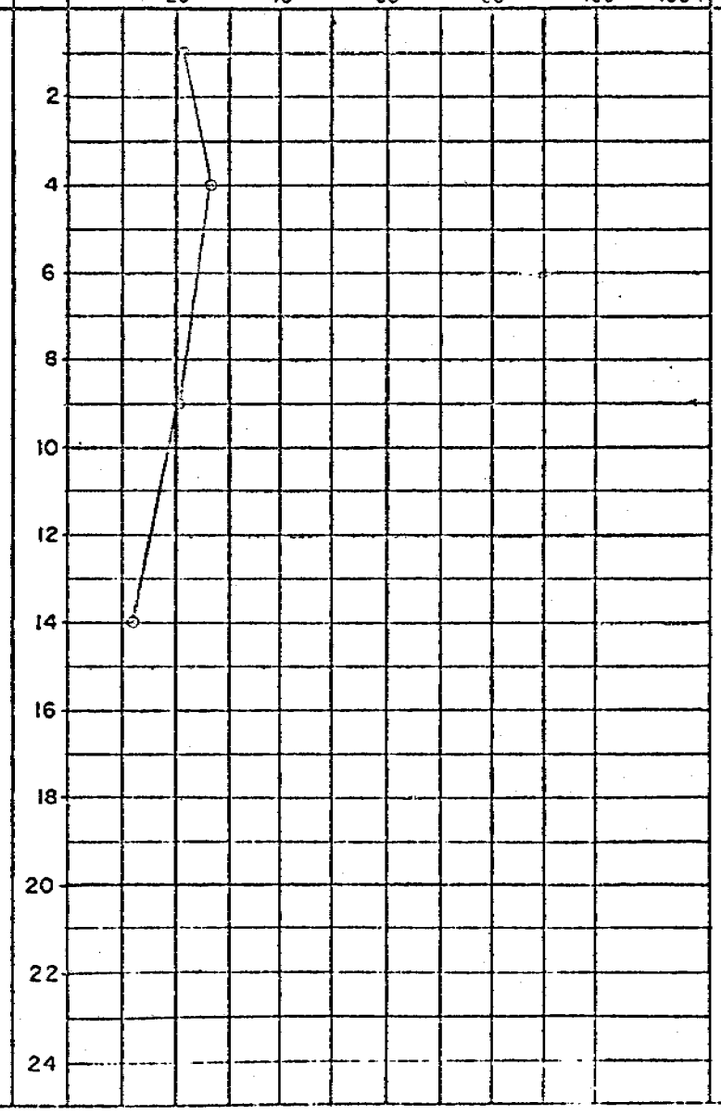
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 330+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
537	C	421A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	SILT LIGHT BROWN	F	
4								
6								
8								
10					SM	LIGHT BROWN BOULDERS & COBBLES		
12					CL	CLAY TILL		
14								
16						END OF HOLE		
18								
20								
22								
24								



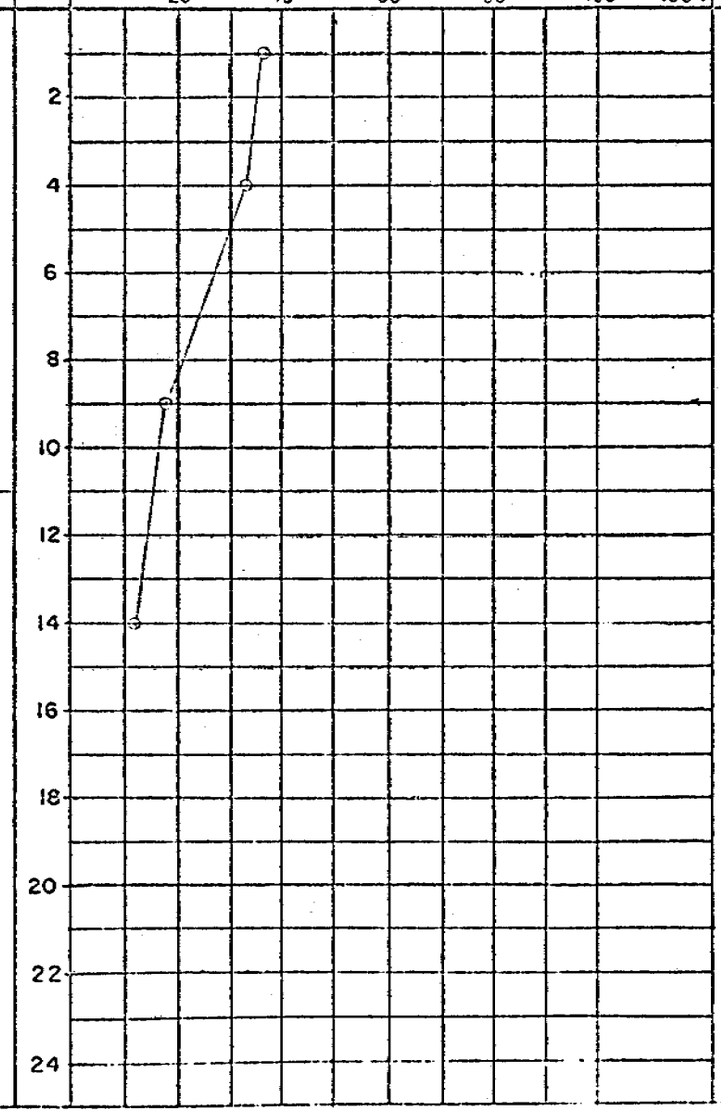
DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
							HOLE FLAGGED AND INSULATED

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: P.S	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 320+00	OFFSET: ℄
CKD: D.S.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 50'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
537	C	422A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					CL	CLAY 4" ORGANIC	F								HOLE INSULATED AND FLAGGED
2		▨				SILT									
4		▨													
6															
8															
10		▨				PEBBLES									
12						TILL	UF								
14		▨			CL										
16															
18															
20															
22															
24															

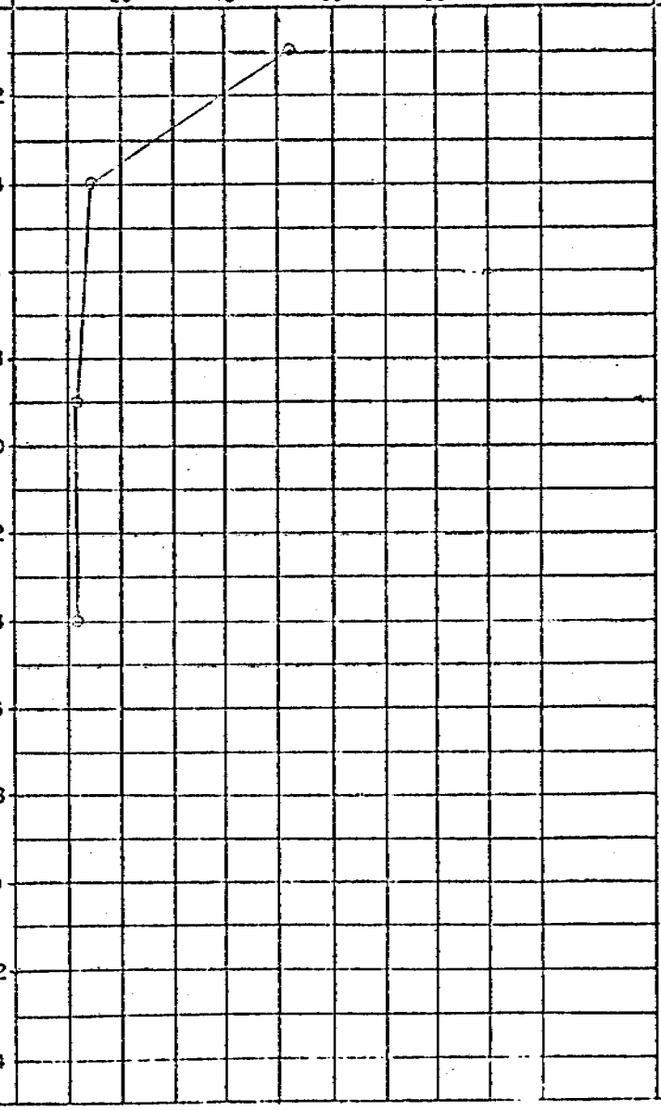


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 310+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 20'	ELEV:	

MILE	B,C,S	NUMBER
537	C	582B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC										
2					CL	CLAY SILTY, BROWN			2							
4									4							
6									6							
8						SANDY SILTY GRAVEL			8							
10									10							
12						TILL			12							
14					CL				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



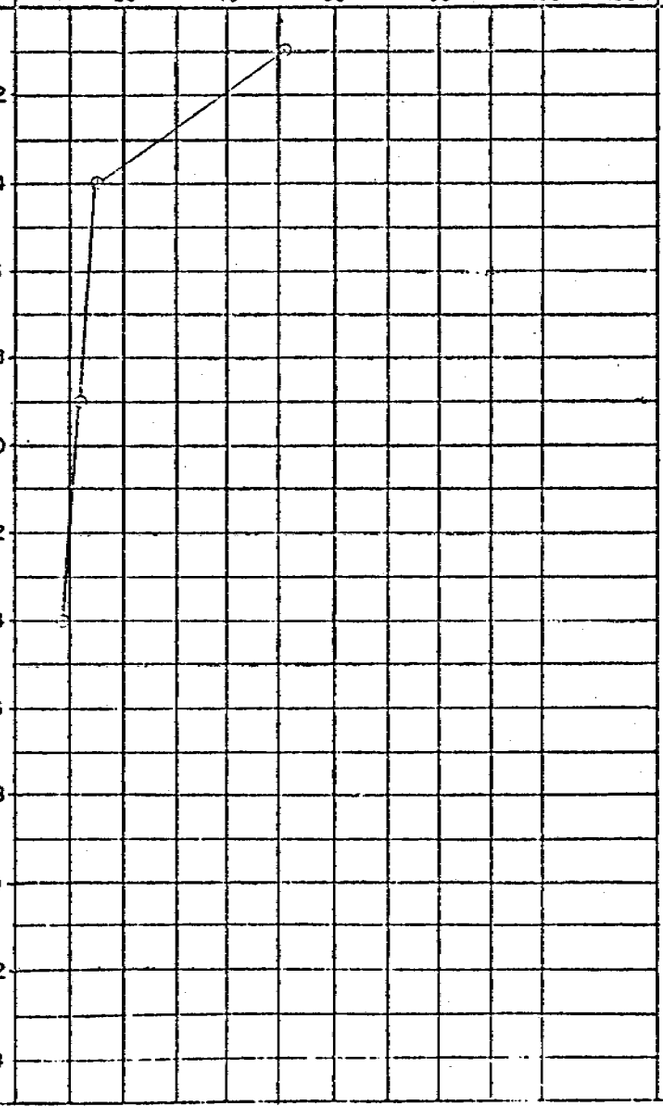
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 200+00	OFFSET: ℄
CKD: D A P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
537	C	583B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC ICE	F									
2					CL	CLAY			2							
4						BROWN			4							
6									6							
8						SANDY SILTY WITH GRAVEL			8							
10									10							
12						TILL			12							
14					CL				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

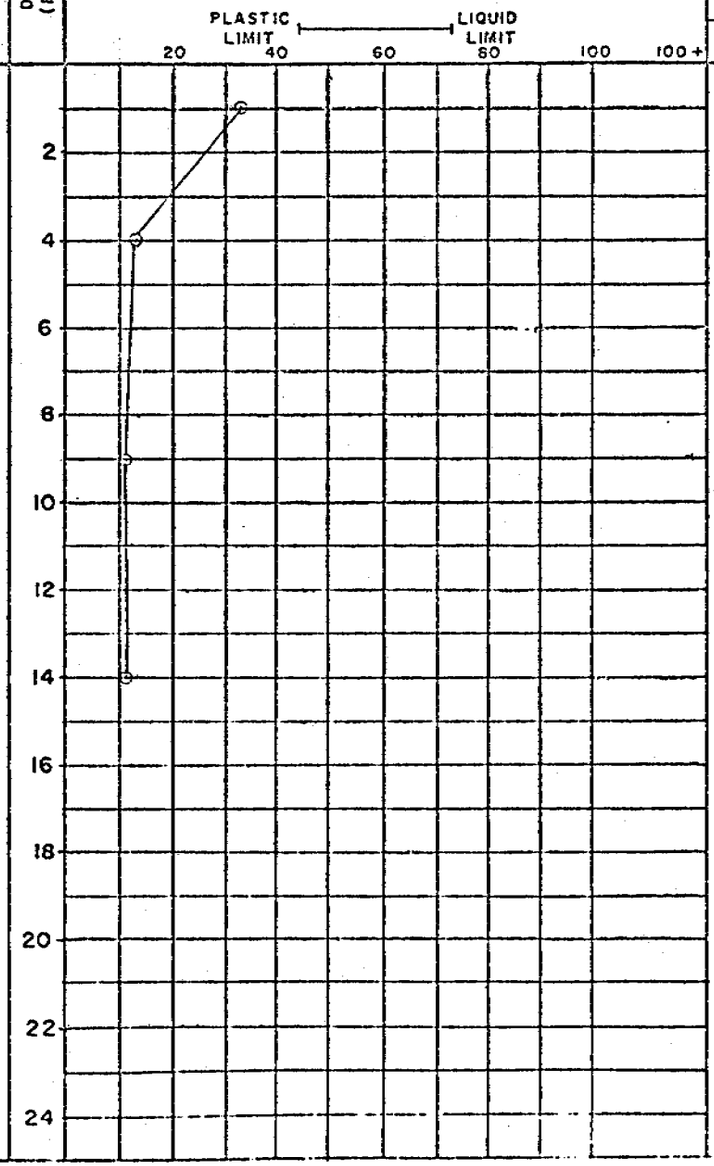
DWN A.E.W	FIELD ENG B M	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 292+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
538	C	584B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	F	
2					CL	CLAY		
4						SANDY, SILTY, BROWN WITH GRAVEL		
6								
8								
10								
12						GREY WITH GRAVEL		
14					CL			
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

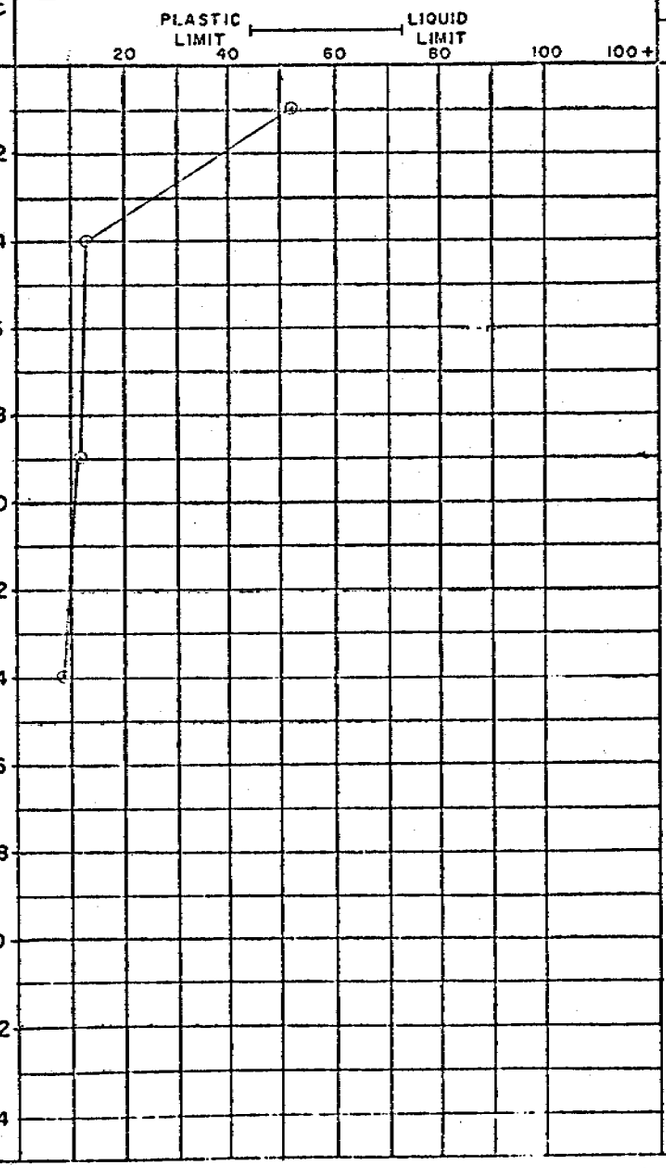
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: R.S	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 284+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
538	C	423 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
						3" ORGANIC	T								
						CLAY									
2					CL	SILT									
4						LIGHT BROWN, SILTY									
6						PEBBLES									
8															
10															
12						LIGHT BROWN SILTY									
14					CL	TILL									
16															
18															
20															
22															
24															



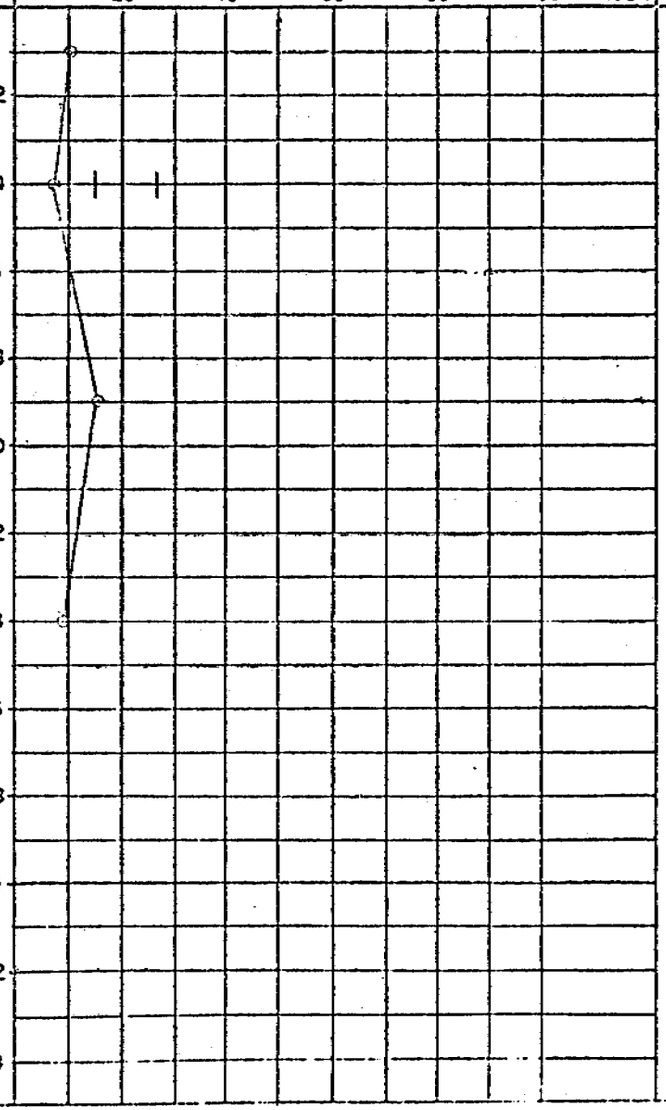
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: RS	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 275+00	OFFSET: 1.
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
538	C	424A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						CLAY	F								HOLE INSULATED AND FLAGGED
2					CL	SILT									
4						CLAY TILL									
6															
8															
10		P													
12															
14					CL										
16						END OF HOLE									
18															
20															
22															
24															



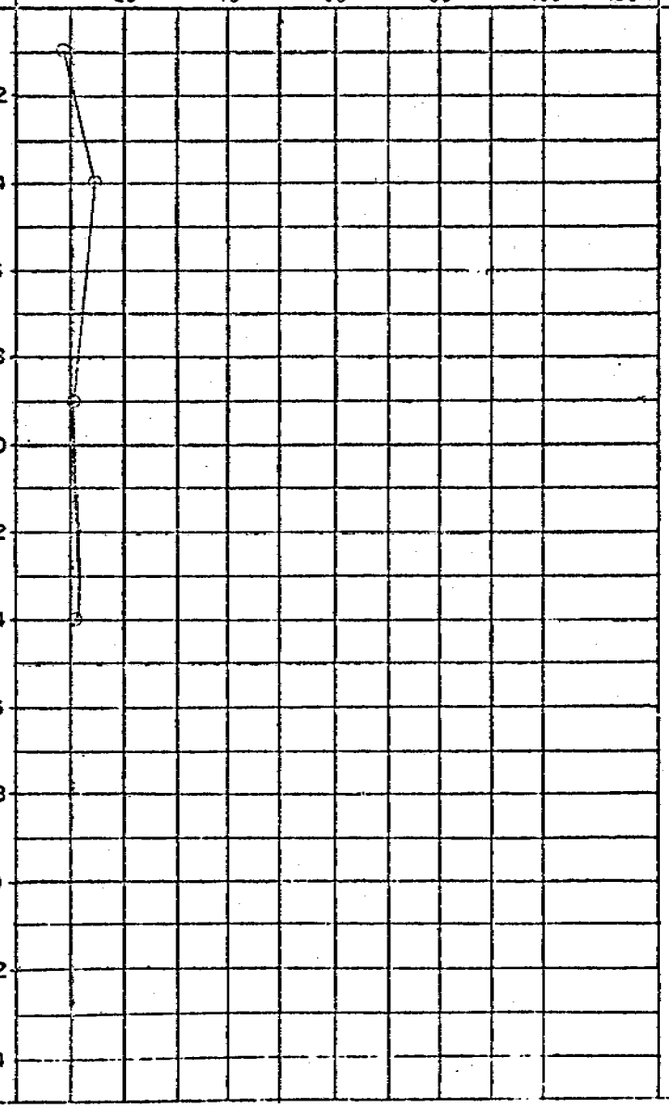
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: R.S.	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 263+00	OFFSET: ℄
CKD: D.G.P.	TECH:	RIG: D/R	SURFACE DRAINAGE: DRY	VEGETATION: SPRUCE & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
538	C	425A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SM	SILT	F									HOLE INSULATED AND FLAGGED
2					CL	CLAY TILL			2							
4									4							
6									6							
8							UF		8							
10									10							
12									12							
14					CL				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

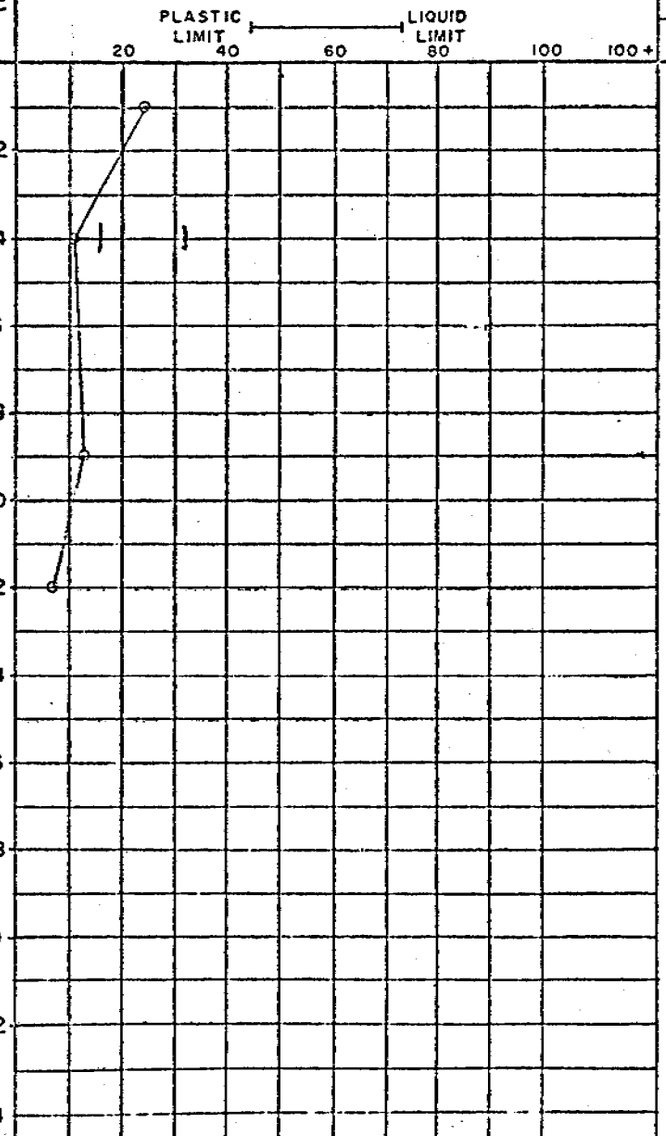
DWN: A E W	FIELD ENG R S	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 250+00	OFFSET: ℄
CKD D G P	TECH:	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 35'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
538	C	426A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY TILL	F	
2								
						SILT, PEBBLES		
4								
6								
8								
10								
12						SILT, PEBBLES		
14					CL			
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
							HOLE INSULATED AND FLAGGED

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

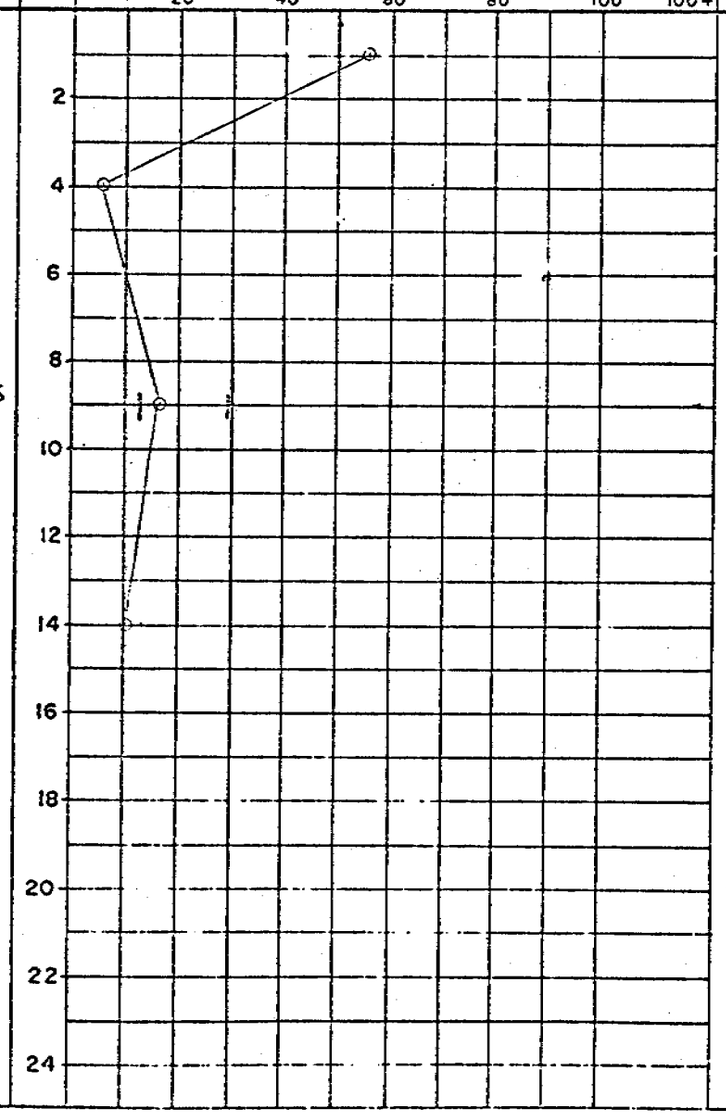
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG B.M	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 240+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
539	C	427A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					CL	CLAY 1" ORGANIC	F	Vr
4					GC	TILL		
6								
8						CLAY & GRAVEL		ICE CRYSTALS
10								
12								
14					GC			Vr
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			INSULATED HOLE

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel and sand
Location
Hole 539-C-428A Depth 4' - 5'
Technician Date Feb.14, 1973

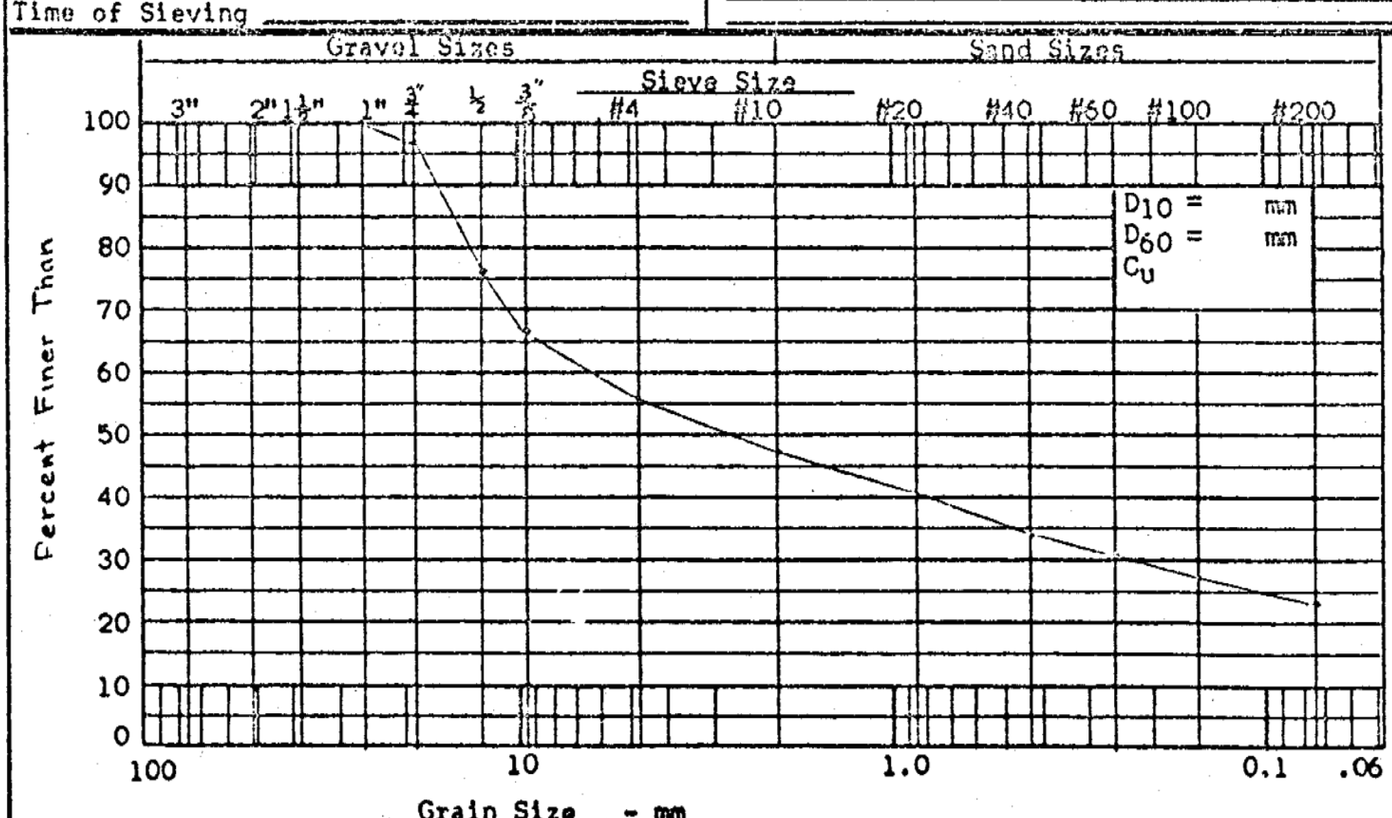
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			97.0	
Tare		1/2	12.70			76.1	
Wt. Dry		3/8	9.52			67.4	
	4	.185	4.76			56.1	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			47.1	
Wt. Dry + Tare	20	.0331	.840			40.9	
Tare	40	.0165	.420			34.2	
Wt. Dry	60	.0097	.250			30.6	
	100	.0059	.149			27.9	
	200	.0029	.074			23.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

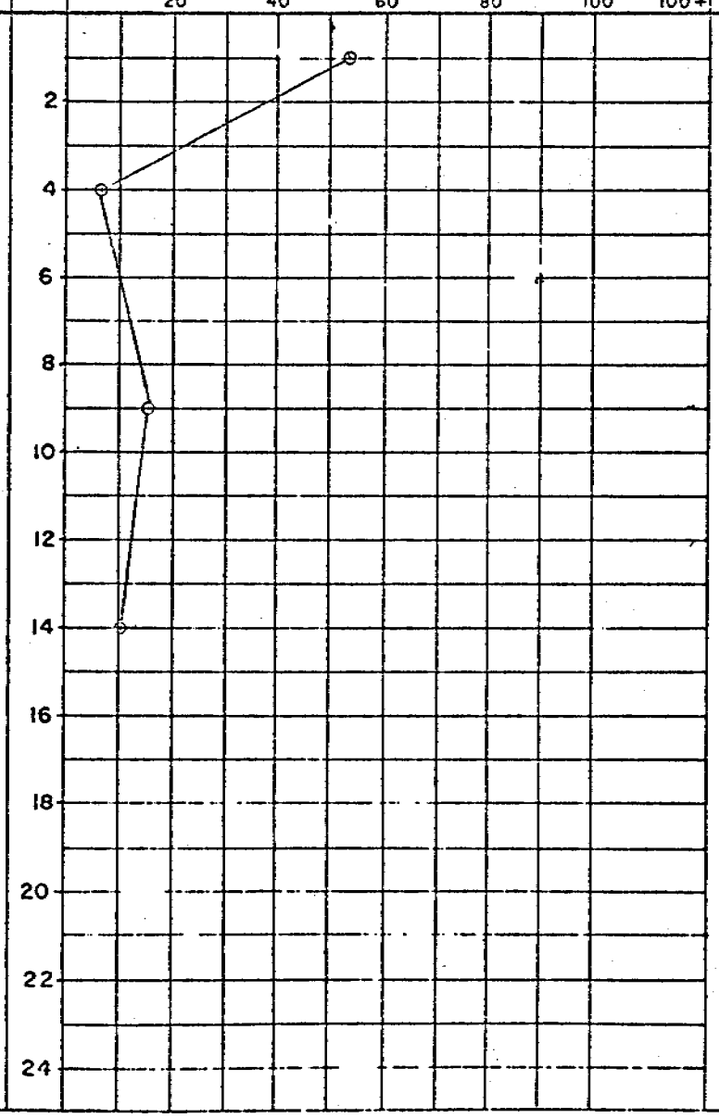
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CKN A.E.W.	FIELD ENG B.M.	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 230+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
539	C	423A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC	F								HOLE INSULATED
2		▨			SM	CLAY									
4		▨			GW	GRAVEL & SAND			24		23	53			
6						TILL									
8															
10		▨				CLAY									
12															
14		▨			GC										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

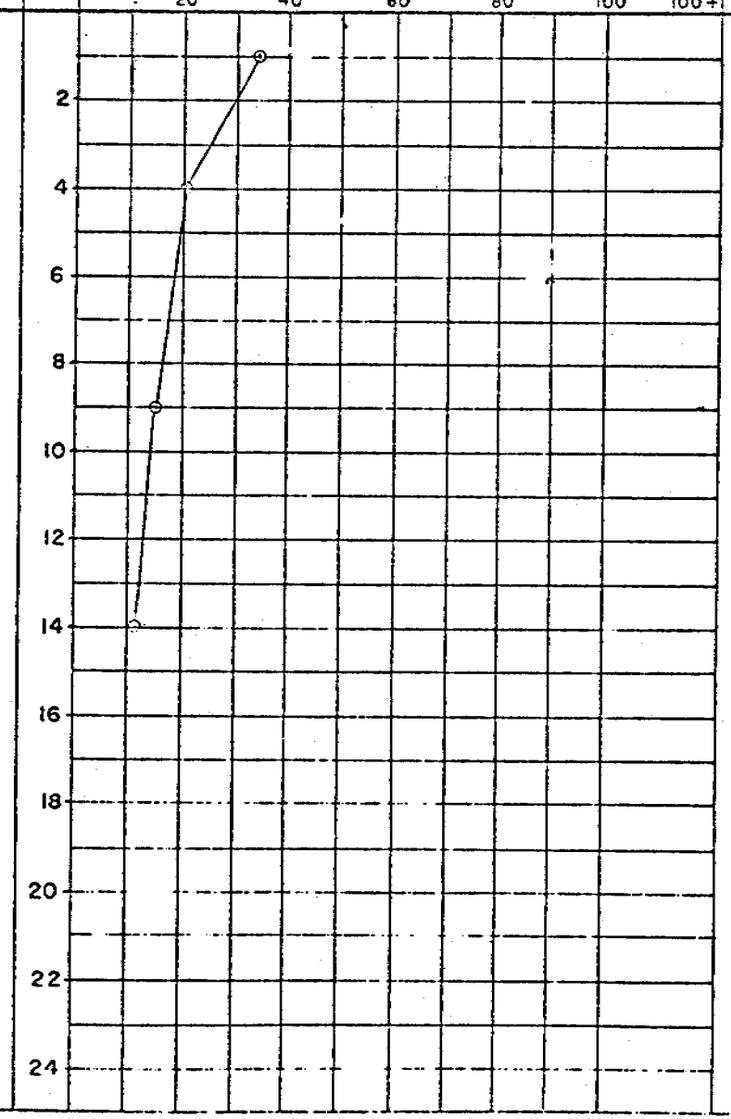
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W.	FIELD ENG B.M.	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 220+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
539	C	429A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	SILT 2" ORGANIC	F	
2					ML	LIGHT		
						CLAY		
4					GC	BROWN		VERY FEW ICE CRYSTALS
6								
8						TILL		
10						CLAY		
12								
14					GC			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						INSULATED HOLE

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

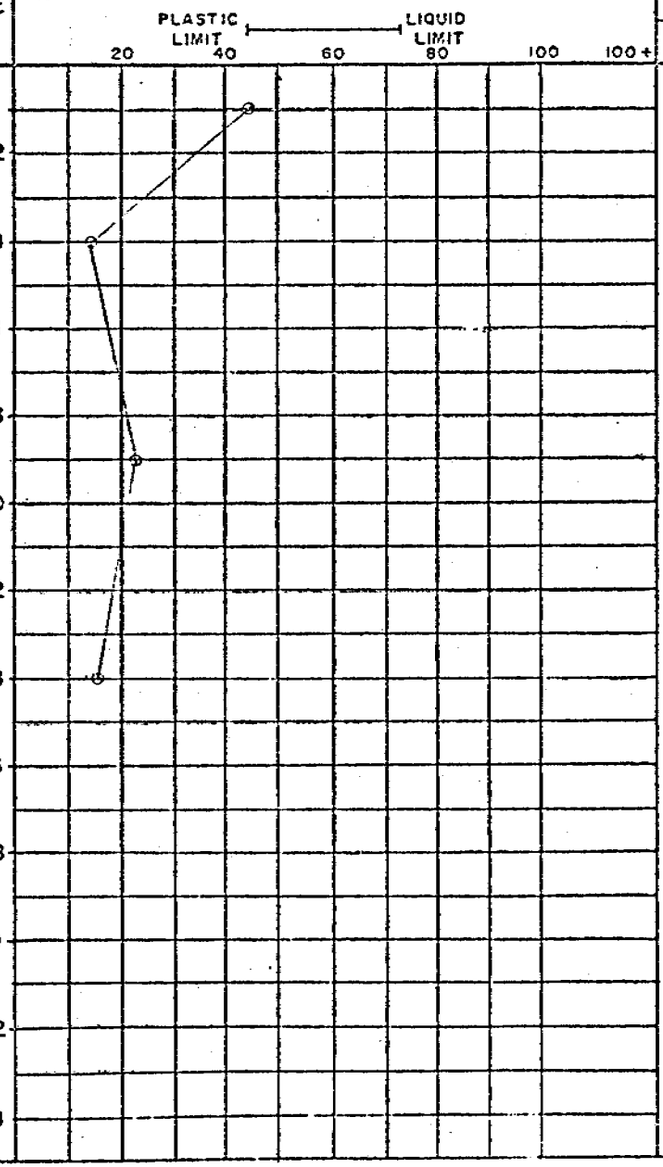
DWN: AEW	FIELD ENG: BM	DATE DRILLED: 14/2/73	AIRPHOTO NO:	CHAINAGE: 210+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
539	C	430A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						2" ORGANIC	F									
						CLAY										
2					CL			ICE CRYSTALS	2							
4									4							
6						LIGHT. SILTY, SANDY			6							
8									8							
10									10							
12									12							
14					CL				14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

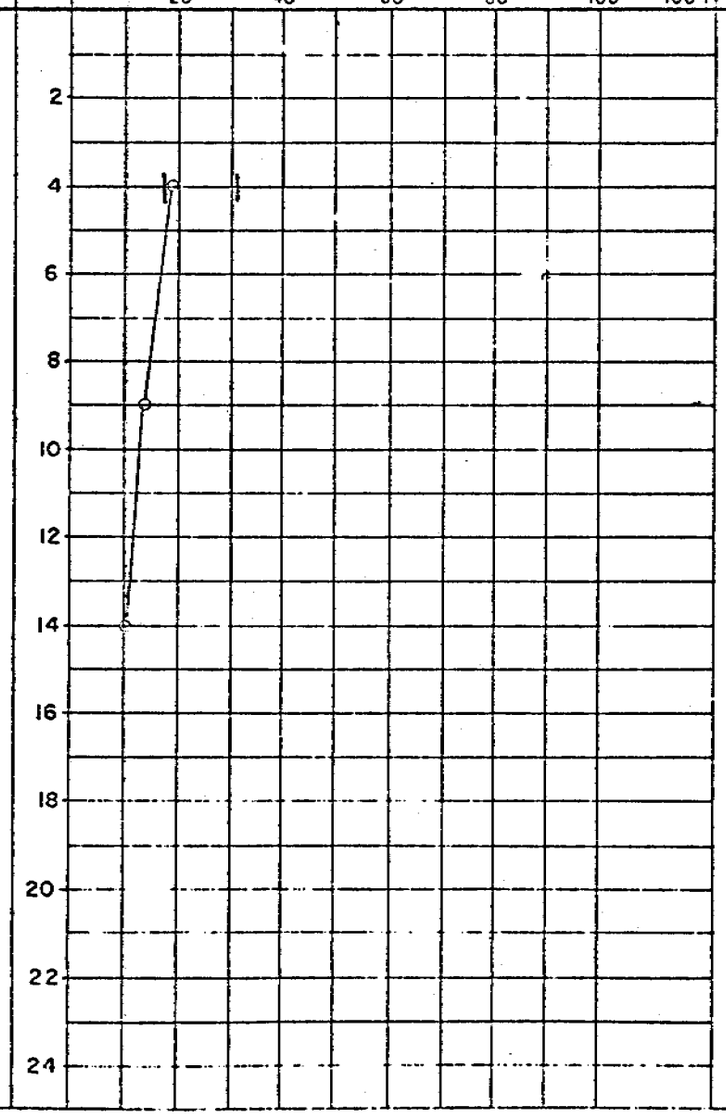
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CKN A.E.W	FIELD ENG B.M	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 200+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
539	C	431 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	CLAY 3" ORGANIC	F	
2					GC	SOME SAND		
4								SOME ICE CRYSTALS
6								
8								
10						SOME PEBBLES		
12								
14					GC	TILL		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

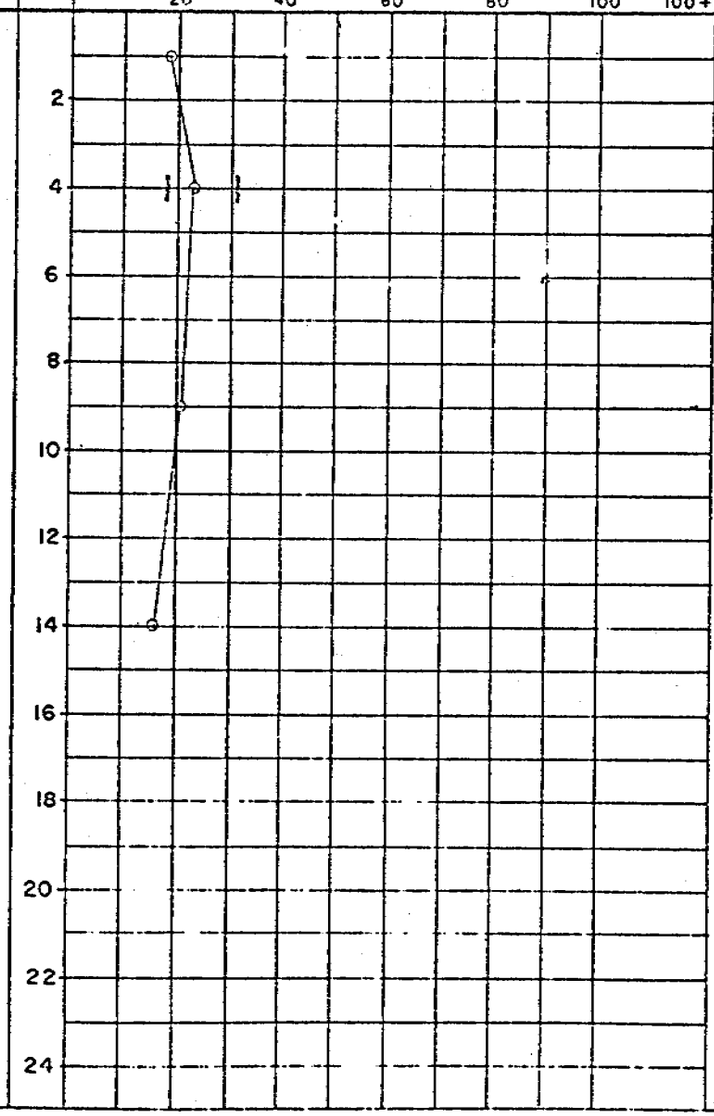
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG B.M.	DATE DRILLED 14/2/73	AIRPHOTO NO:	CHAINAGE: 190+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
540	C	432A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GC	CLAY 3" ORGANIC	F	SOME ICE CRYSTALS
4						TILL		
6								
8								
10								
12								
14					GC	STICKY		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

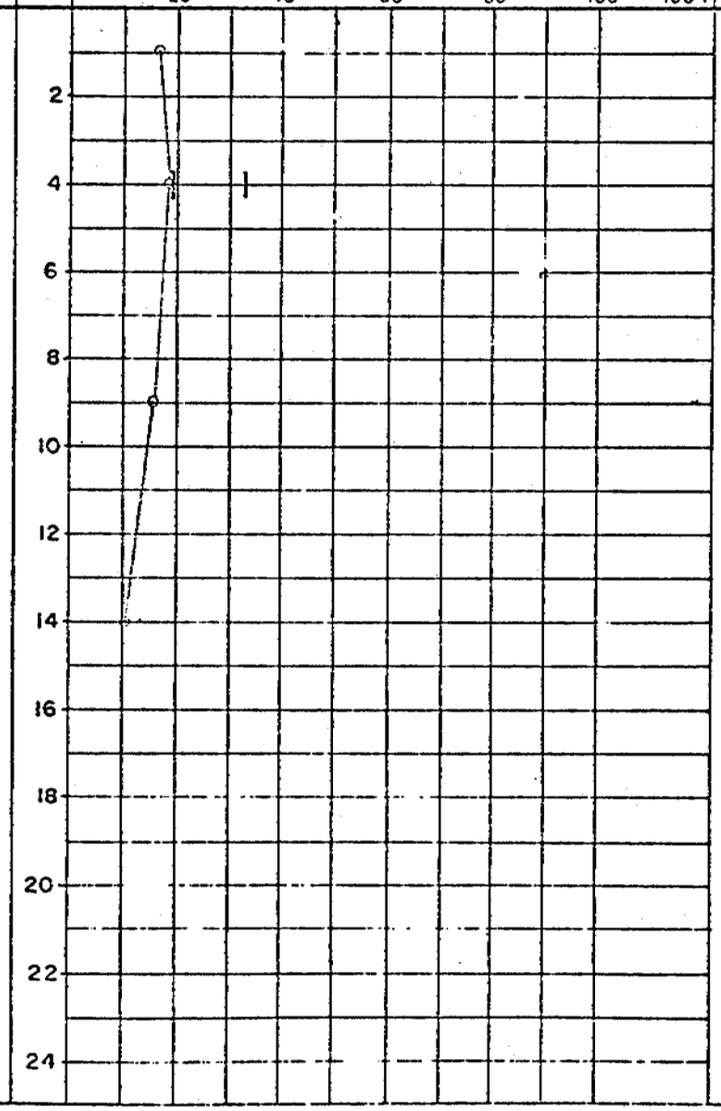
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A E W	FIELD ENG B M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 180+00	OFFSET: 2
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
540	C	433A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						SILT 2" ORGANIC	F	
2					SM			
4						CLAY		
6								
8								
10					GC			
12								
14						TILL		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clay, some Pebbles
Location	
Hole 540-C-434A	Depth 4'-5'
Technician	Date 15/2/73

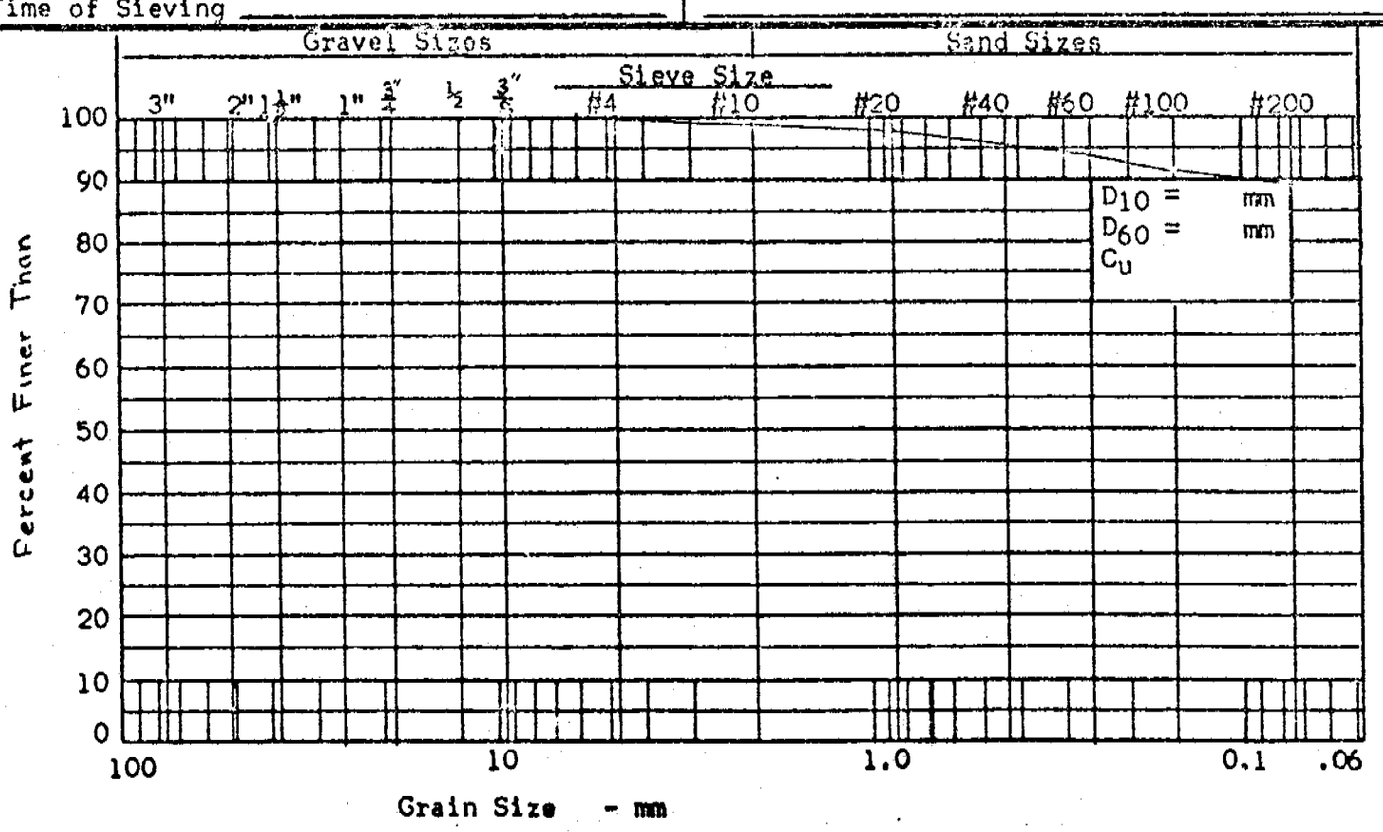
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			99.1	
Tare No.	20	.0331	.840			97.6	
Wt. Dry + Tare	40	.0165	.420			96.2	
Tare	60	.0097	.250			94.3	
Wt. Dry	100	.0059	.149			92.9	
	200	.0029	.074			89.1	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 170+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

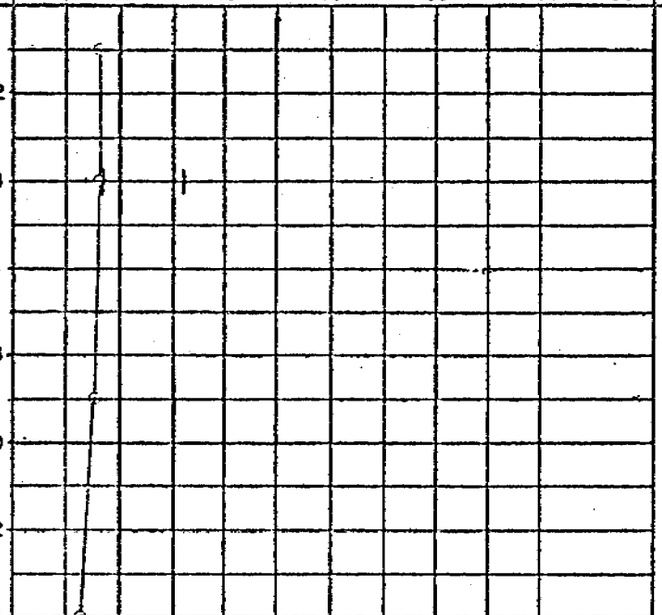
MILE	B,C,S	NUMBER
540	C	434A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						CLAY 2" ORGANIC	F	
2					CL	SOME PEBBLES		
4								Vr
6								
8								
10								
12						SOME PEBBLES		ICE CRYSTALS
14					CL			
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT



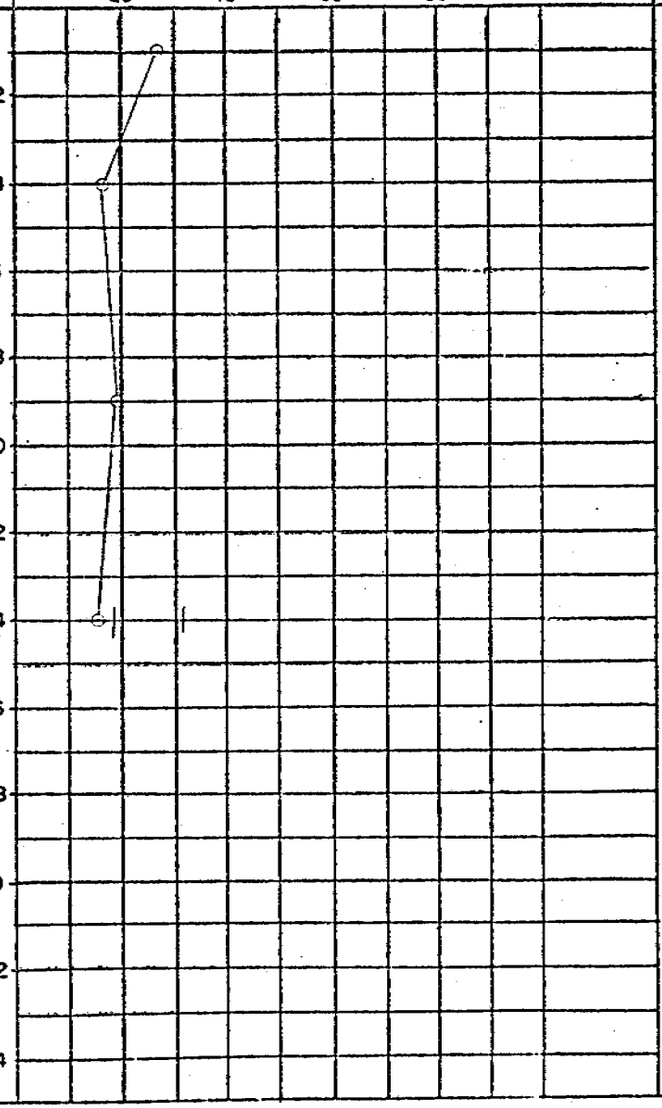
DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
2						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22						
24						

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG B M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 160+00	OFFSET: ℄	TEST HOLE
CKD D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:	

MILE	B,C,S	NUMBER
540	C	435A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	CLAY 3" ORGANIC	F									
2					CL	SILTY			2							
					GC											
4						BROWN			4							
6									6							
8									8							
10									10							
12									12							
14					GC	DARK, STICKY			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



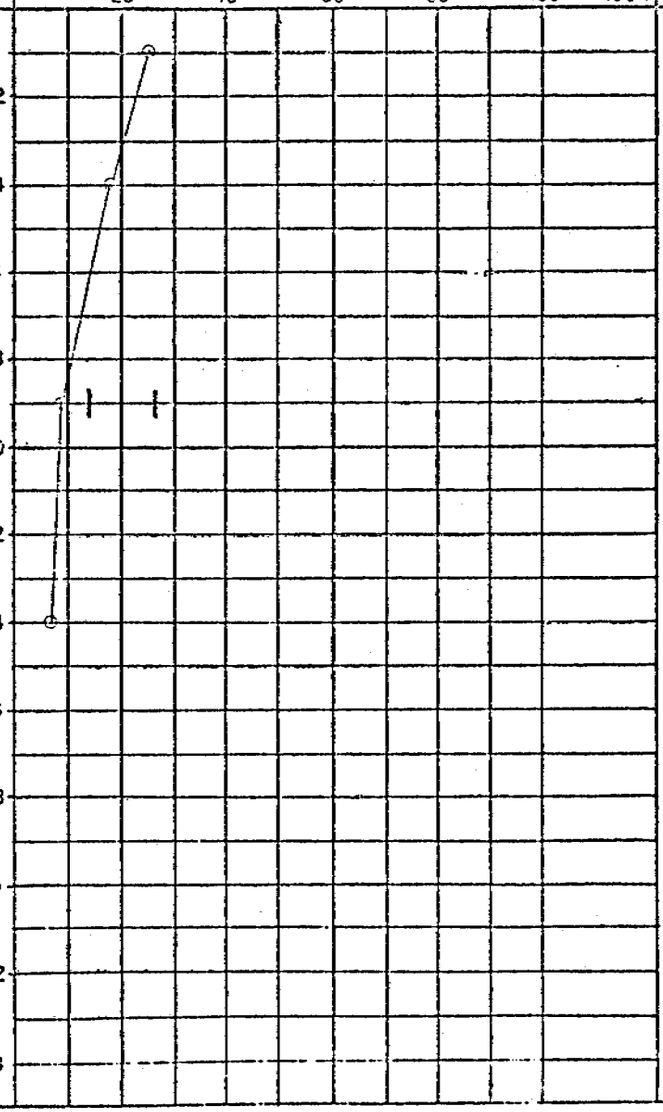
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG B.M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 150+00	OFFSET: ℄
CKD D.G.P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
540	C	436A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
					Pt	3" ORGANIC	F								
2					CL	CLAY			2						
						LIGHT & DARK									
4									4						
6									6						
8									8						
10						SOME PEBBLES			10						
12									12						
14					GC	CLAY TILL, ROCK			14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

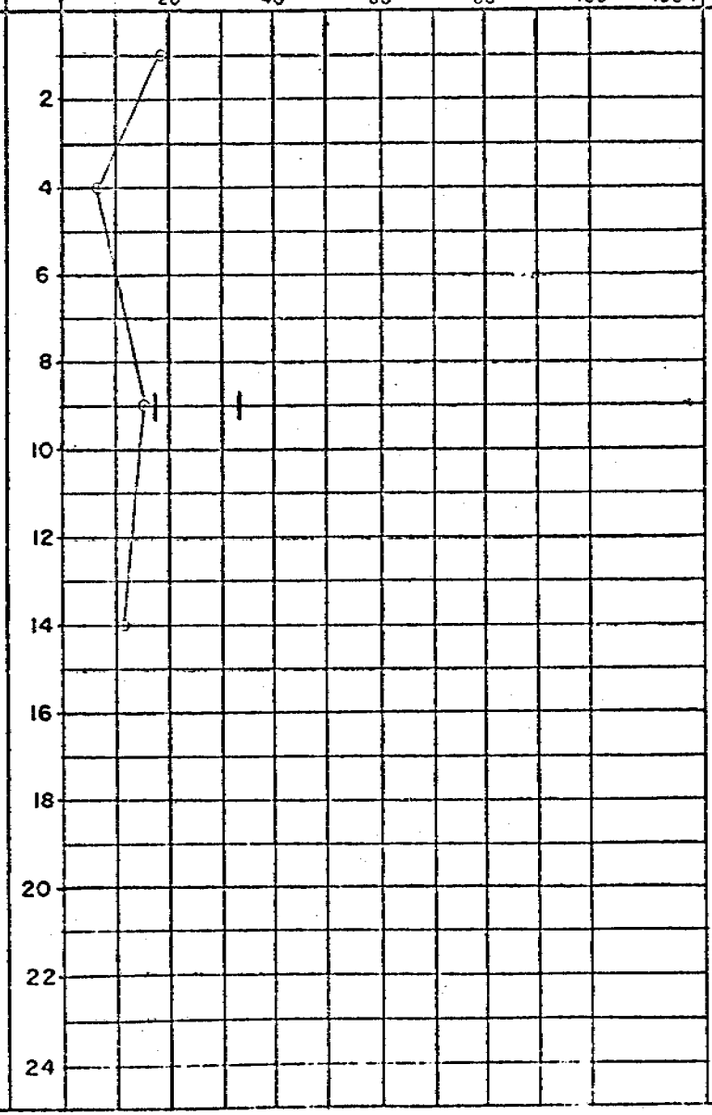
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 140+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
540	C	437A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					SC	CLAY 3" ORGANIC SILTY	F	
2								
4					SW	PEBBLES		
6								
8								
10								
12						PEBBLES		
14					GC	ROCK		
16						END OF HOLE		
18								
20								
22								
24								

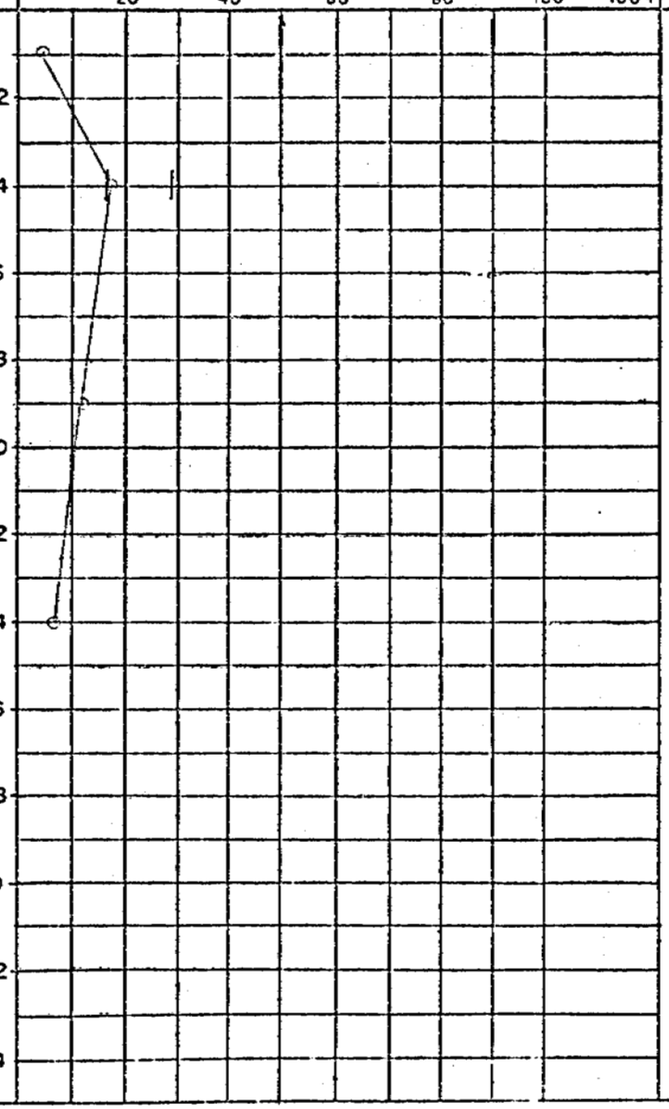


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 130+00	OFFSET: ℄	TEST HOLE
CKD: DCP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:	MILE: 541 / B,C,S: C / NUMBER: 438A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						1" ORGANIC	F								
2					CL	CLAY - TILL									
						SAND & GRAVEL									
4						SOME PEBBLES									
6															
8															
10															
12															
14					CL	FEW PEBBLES									
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

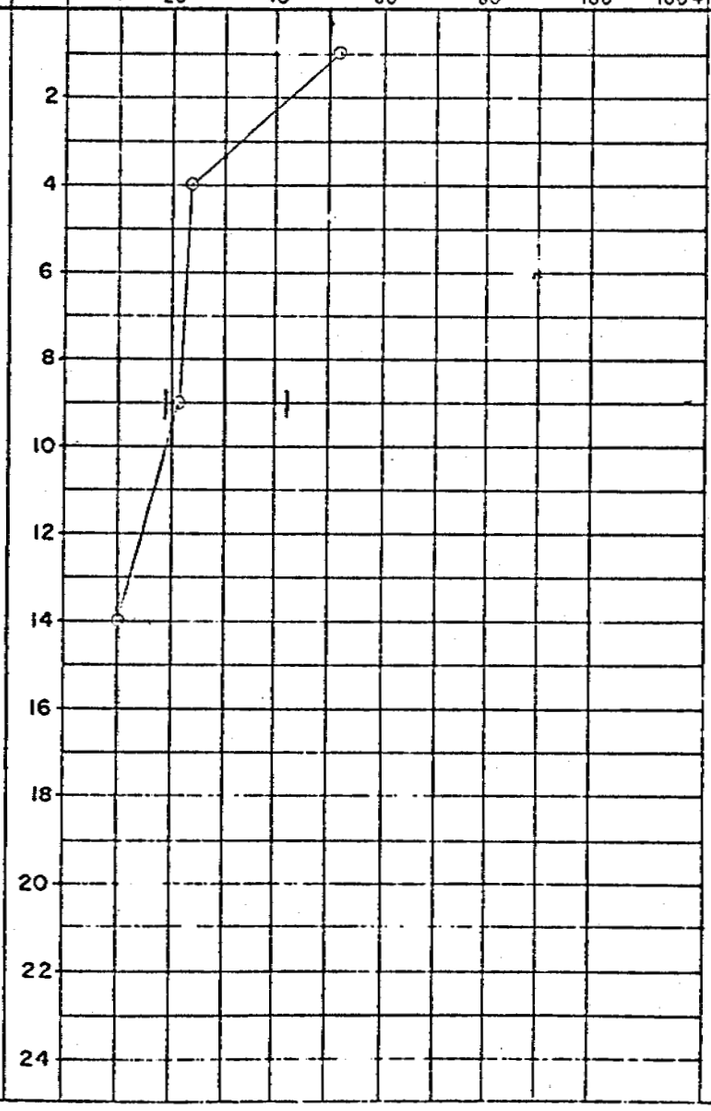
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG B.M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 120+00	OFFSET:
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
541	C	439A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	CLAY	F	
2					CL	ORGANIC, DARK		
4					GC	TILL		
6								
8								
10								
12						DARK, SOME PEBBLES		
14					GC			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

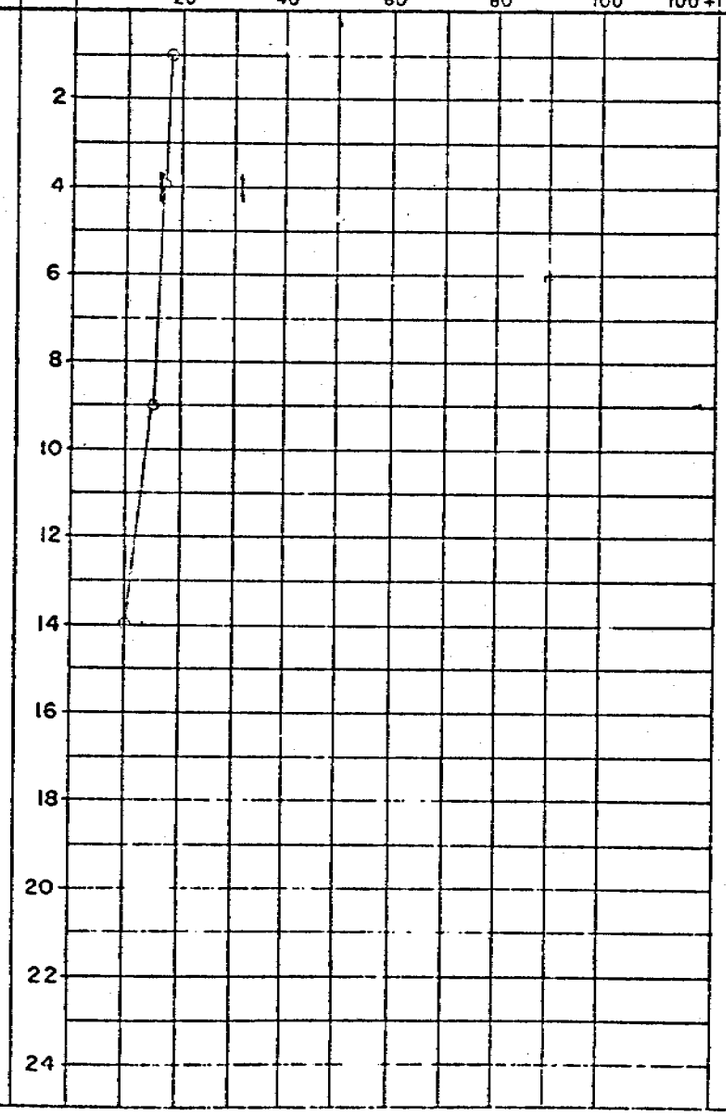
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A E W	FIELD ENG B M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 110+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
541	C	440A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	T	
2					GC	CLAY		
4						BROWN TILL		
6								
8								
10								
12								
14					GC	SOME PEBBLES		SOME ICE CRYSTALS
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

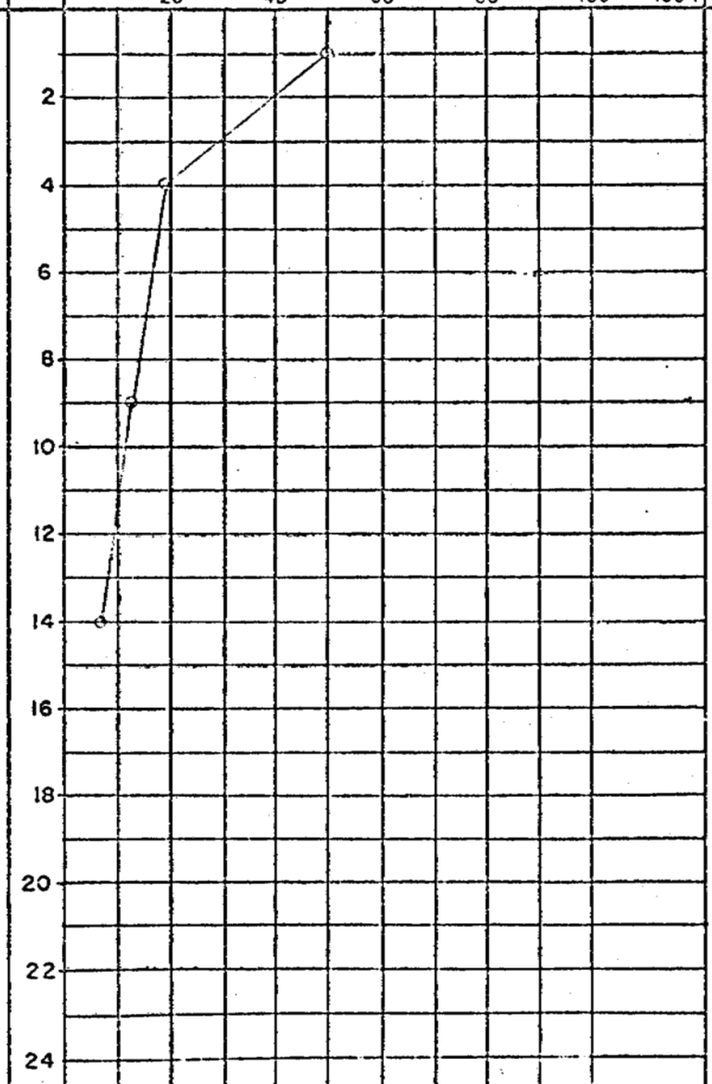
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 100+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
541	C	6663

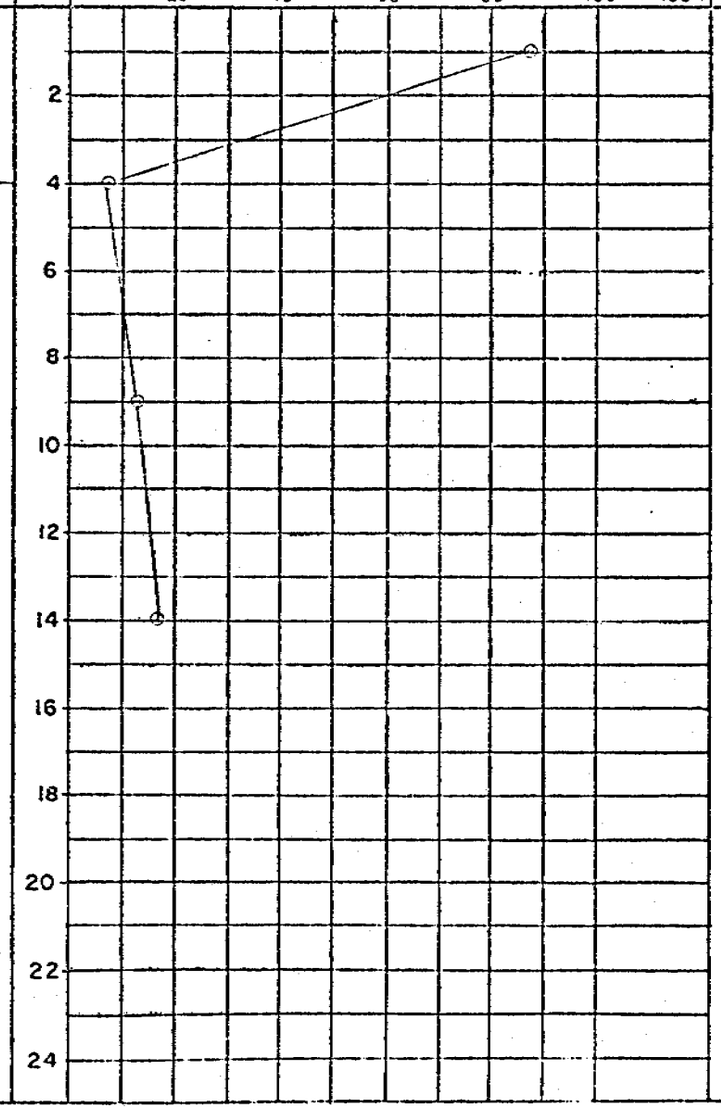
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC PEBBLES	F								
2					CL	CLAY									
4						DRY, SILTY, SANDY QUITE DRY									
6															
8															
10									10	47	30	13			
12															
14					CL										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: B.M	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 90+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 25'	ELEV:	MILE: 541 / B,C,S: C / NUMBER: 610B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	F	
2								
					CL	CLAY LIGHT BROWN DRY SAND		
4		P					UF	
6						OCCASIONAL PEBBLE STICKY		
8								
10		P				CLAY TILL		
12								
14		P			CL			
16						END OF HOLE		
18								
20								
22								
24								

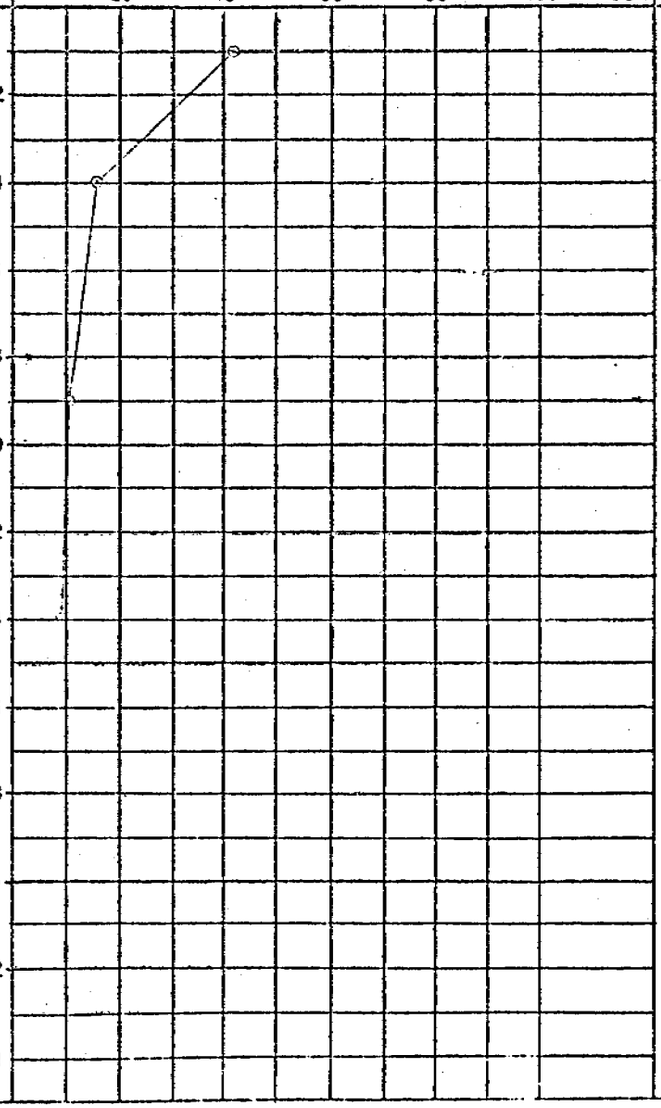


GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG BM	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 80+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:	MILE 542 / B,C,S C / NUMBER 611B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC	F	
2					CL	CLAY		
4						TILL, PEBBLES	UF	
6								
8								
10		P						
12								
14					CL			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

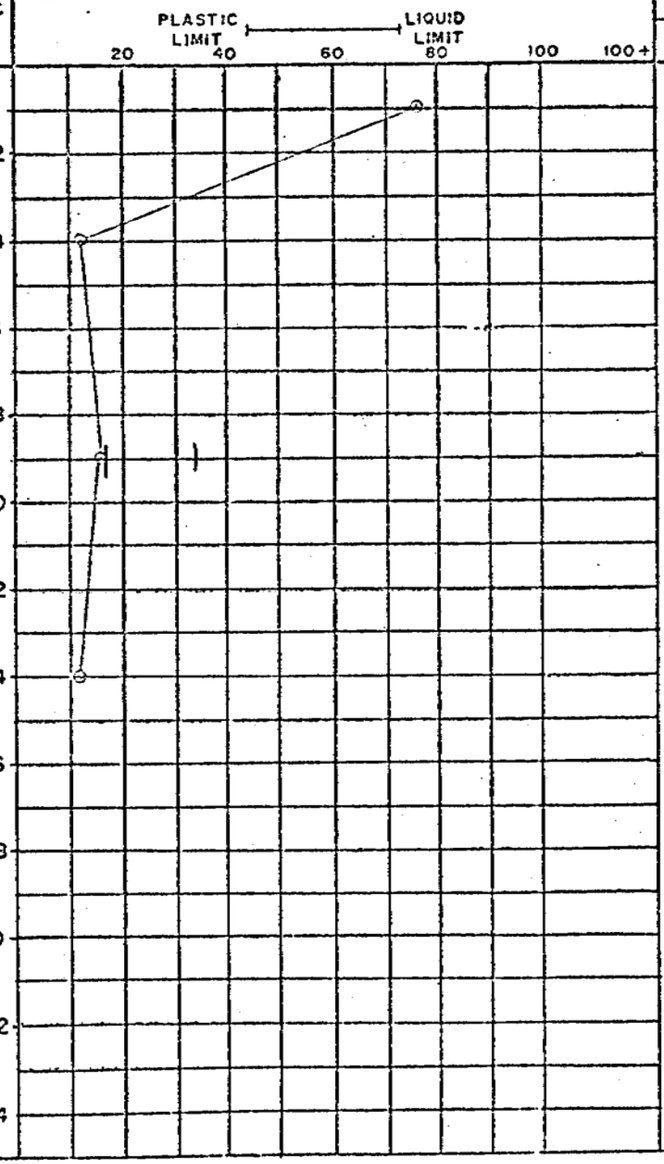
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: HEH	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 70+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
542	C	612B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					ML	CLAY SILTY	F	Vc							
2–14					GC	TILL CLAY									
14–15					GC										
15						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

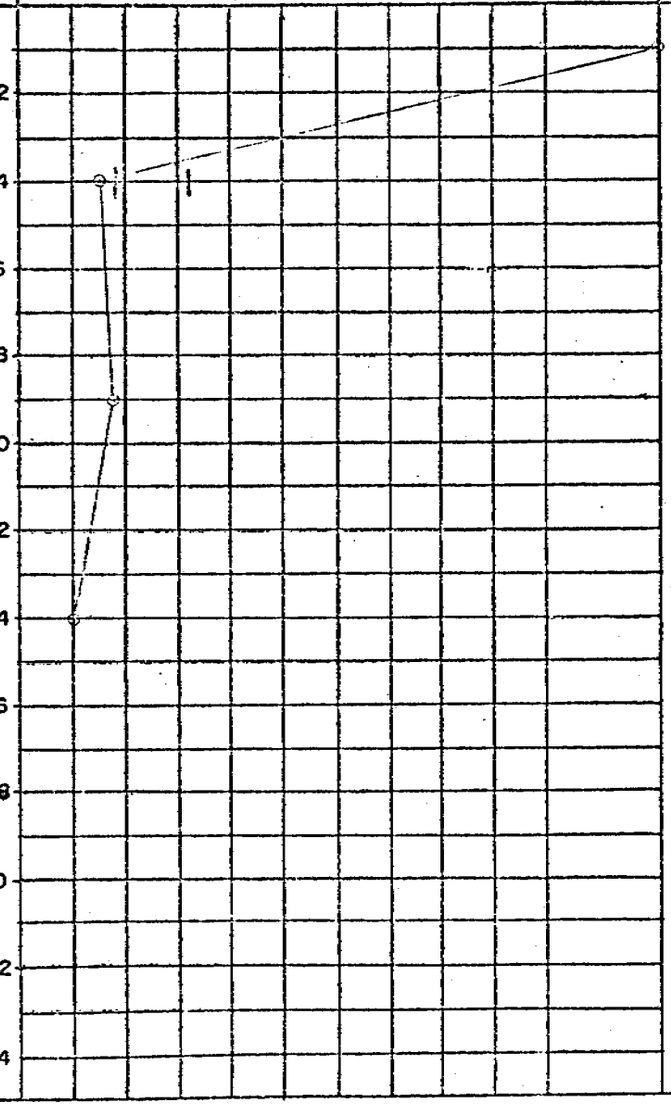


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED:	AIRPHOTO NO:	CHAINAGE: 60+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG:	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:	

MILE	B,C,S	NUMBER
542	C	613B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	SILT	F	Vr								
2					ML				2							
						CLAY										
4					CC	SILTY, FEW PEBBLES			4							
6						TILL			6							
8									8							
10						FEW ROCKS			10							
12						TILL			12							
14					GC	CLAY		Vr	14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

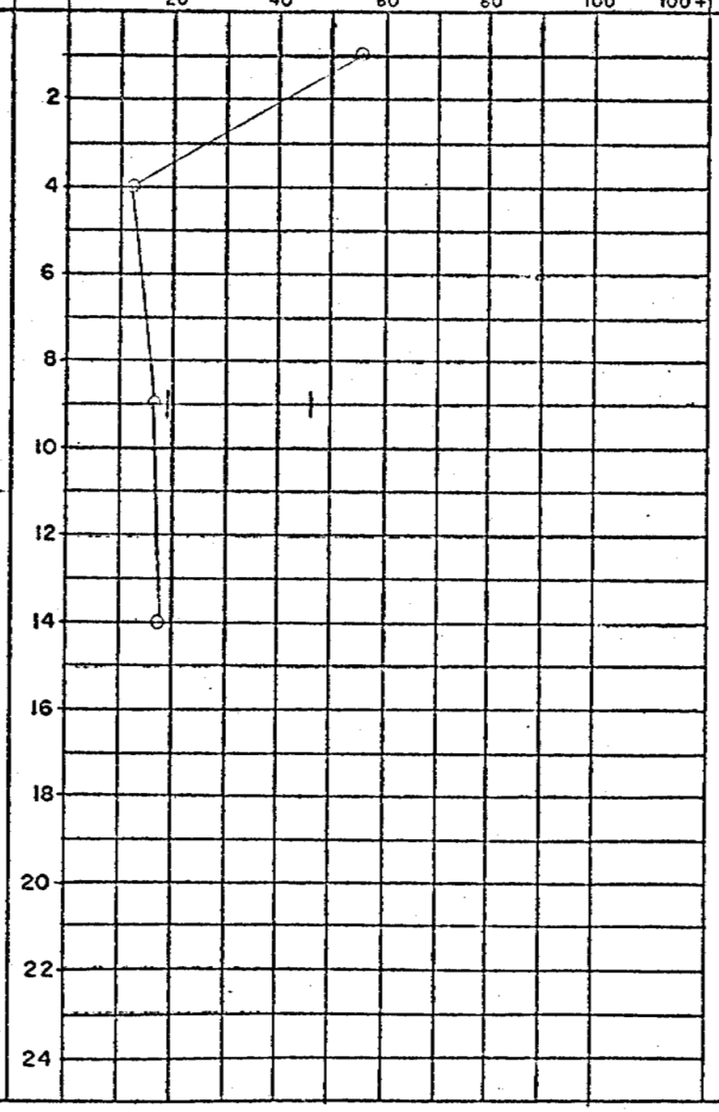


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: HEA	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 50 400	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
542	C	6143

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					CL	CLAY	F	
4						SILTY		
6						TILL		
8					CC	FEW PEBBLES		
10								
12							UF	
14		P			CL			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG HEA	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 40+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
542	C	6.83

REMARKS

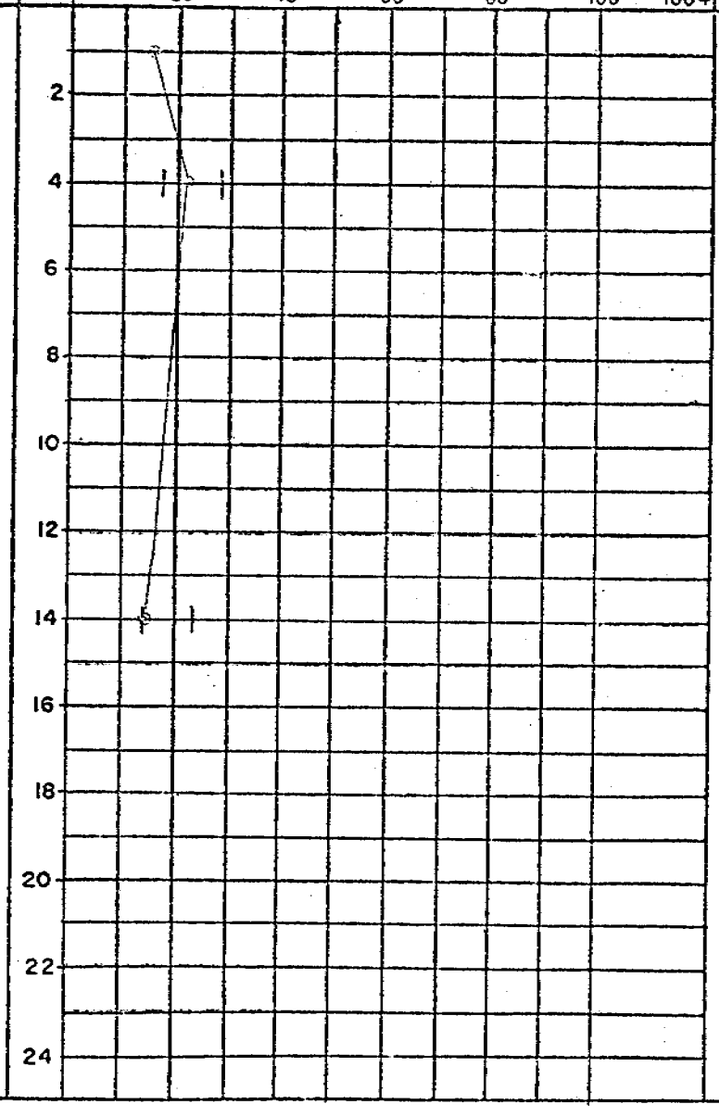
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
					PT	SILT 4" ORGANIC CLAYEY	F									
2					CL	CLAY			2							
4						SILTY			4							
6									6							
8						CLAY TILL			8							
10							UF		10							
12						SILTY, PEBBLES			12							
14		P			CL				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: HEH	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 30+00	OFFSET: ℄
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
543	C	619B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GC	TILL SILTY CLAY	F	Vc
4								
6						SANDY CLAY WITH GRAVEL LENSES		
8								
10						CLAY, FEW PEBBLES		
12								
14					GC			Vc
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (P.C.F.)	DRY DENSITY (P.C.F.)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

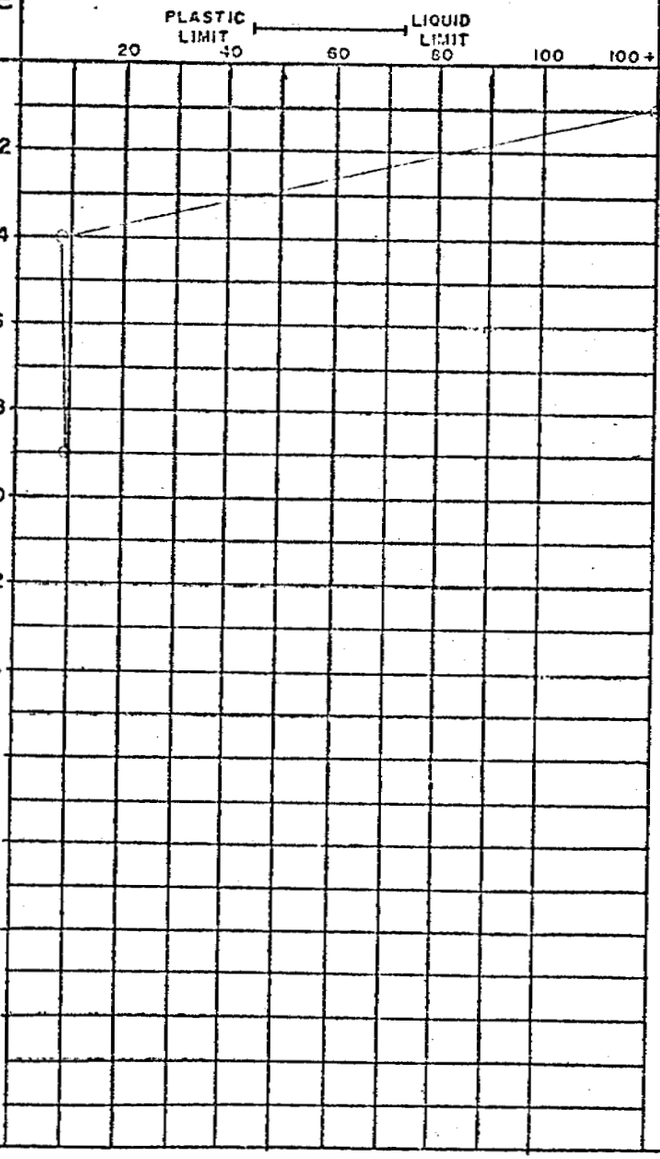
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.F.W.	FIELD ENG: H.E.A.	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 20+00	OFFSET: ℄
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
543	C	623B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					ML	CLAY SILTY	F								
4		P			GC	SOFT, ORGANIC	UF								
10					GC	SANDY, TILL									
16						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

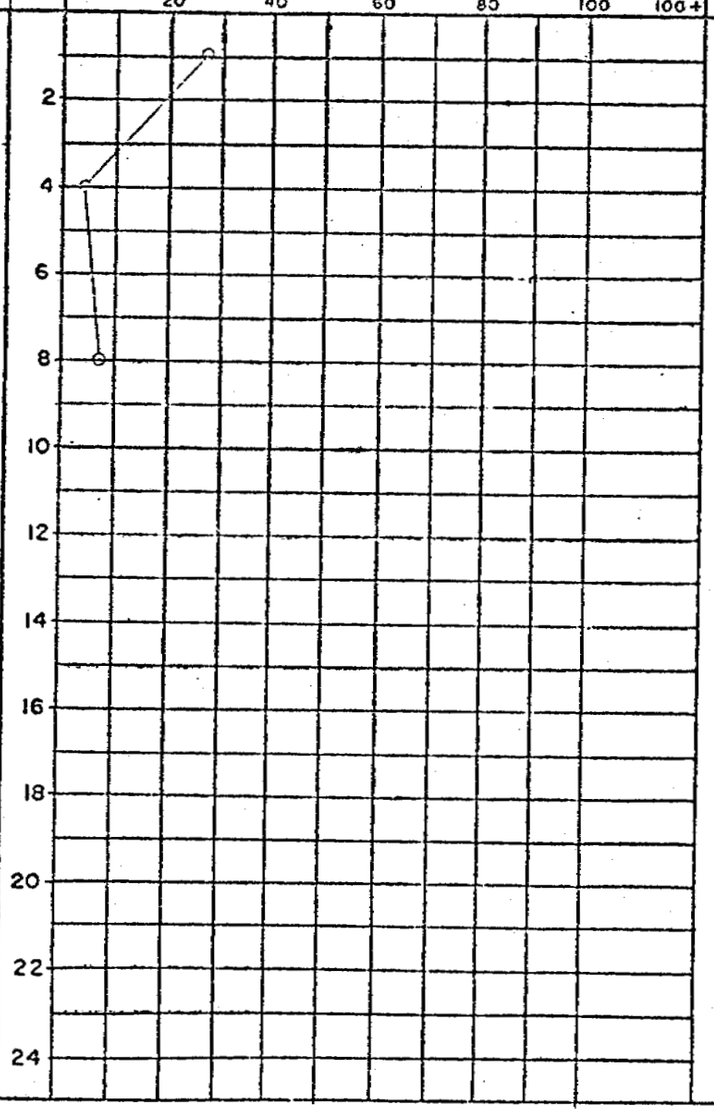
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: [illegible]	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 10+00	OFFSET: ℄
CKD: DSP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
543	C	624B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG		
2					SM	SILT SANDY	F	
4					GW	GRAVEL SANDY WITH A LITTLE CLAY	UF	
6								
8					GC	BEDROCK		
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

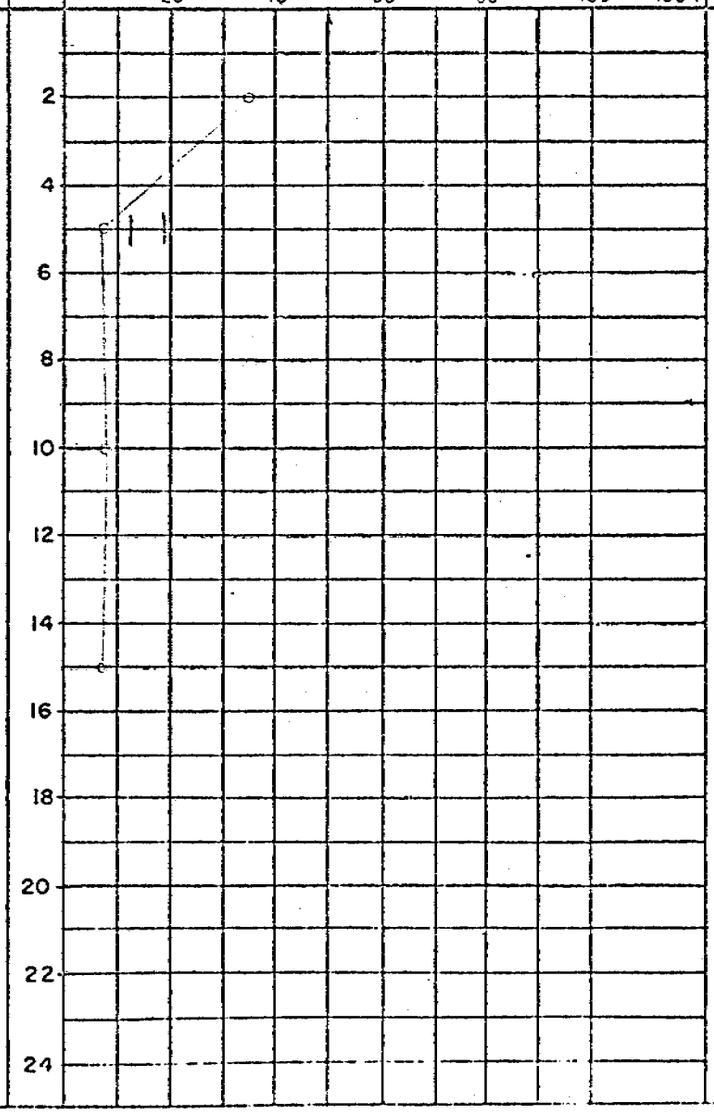
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: R.S	FIELD ENG: B.M.	DATE DRILLED: 16/2/73	AIRPHOTO NO:	CHAINAGE: 0+00	OFFSET: 4
CKD	TECH:	RIG: AR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
543	C	6256

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" ORGANIC									
2					PT-GC	CLAY, SAND & GRAVEL	F								
						GRAVEL									
4					GC	SOME SAND & CLAY									
6															
8															
10					GC										
12															
14					GC		F								
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole	543-C-629-B Depth 4' - 5'
Technician	Date Mar. 8, 1973

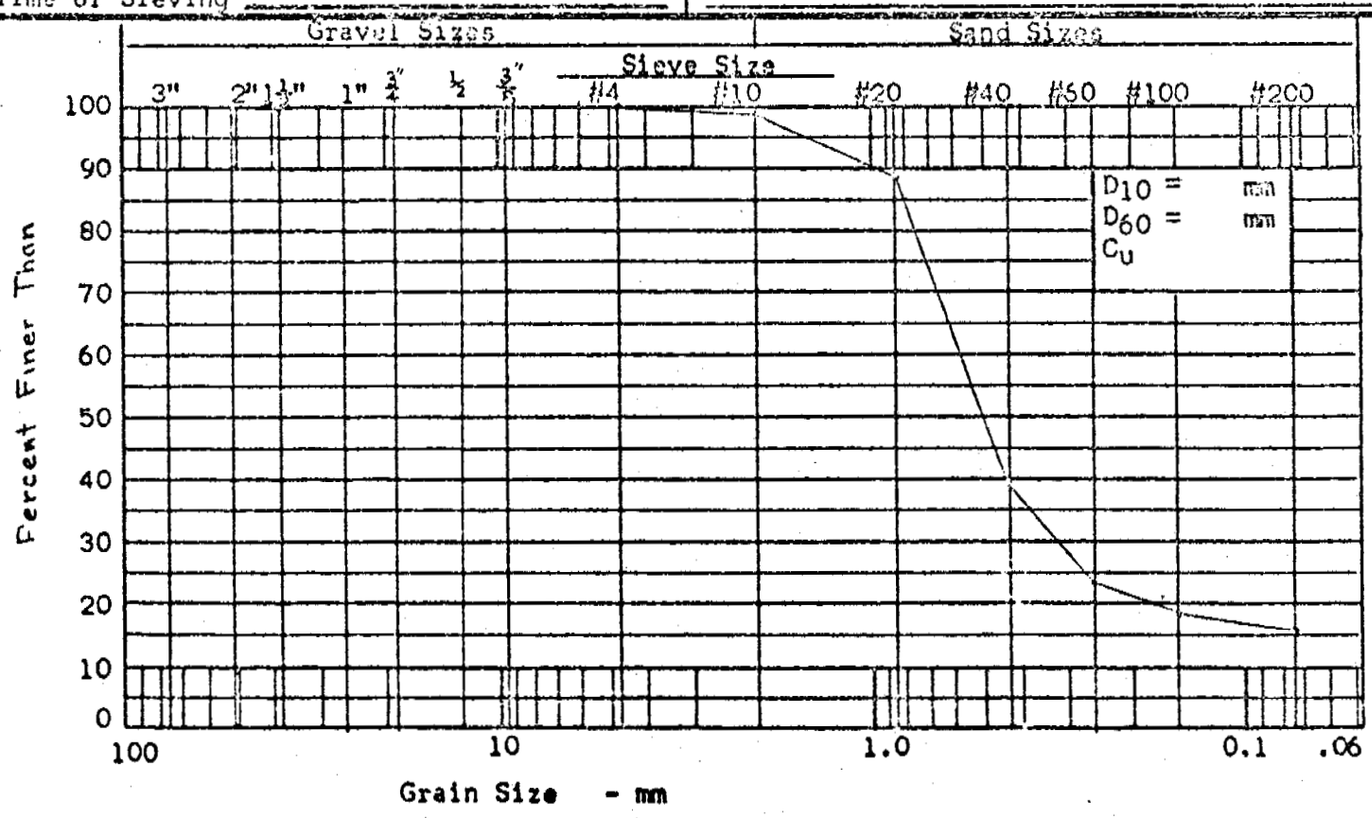
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52				
	4	.185	4.76			100.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			99.4	
Tare No.	20	.0331	.840			89.0	
Wt. Dry + Tare	40	.0165	.420			39.6	
Tare	60	.0097	.250			23.4	
Wt. Dry	100	.0059	.149			18.8	
	200	.0029	.074			15.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W.	FIELD ENG B.M.	DATE DRILLED 16/2/73	AIRPHOTO NO:	CHAINAGE: 10+00
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 15'

OFFSET: ℄
ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
543	C	6238

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					ML	ORGANIC	F									
2						SAND			2							
4					SP				4	16		23	1			
6									6							
8									8							
10					SM	SAND & GRAVEL GREY HARD ROCK			10							
12						END OF HOLE			12							
14									14							
16									16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

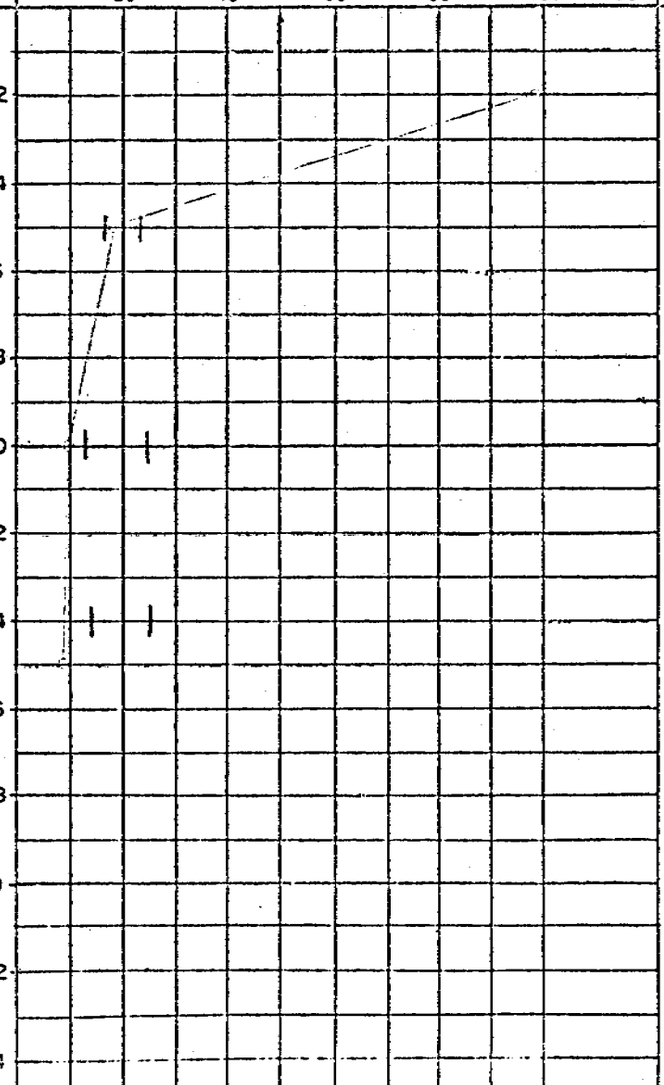
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: P	FIELD ENG:	DATE DRILLED 16/2/73	AIRPHOTO NO:	CHAINAGE: 20+00 N	OFFSET: ℄
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: NONE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
543	C	333B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					ML	SILT	F	
2								
					CL	SILTY CLAY TILL		Vc
4								
6								
8								
10					CL			
12								
14					CL		UF	
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

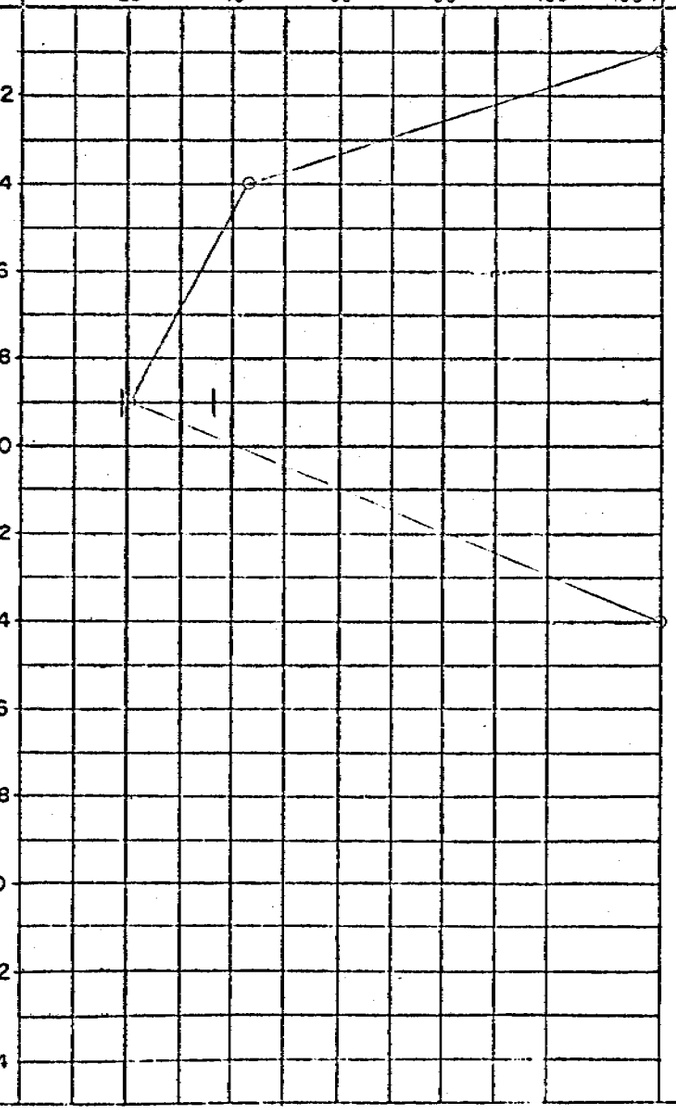
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: HEA	DATE DRILLED: 16/2/73	AIRPHOTO NO:	CHAINAGE: 30+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
549	C	634B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	SILT 3" ICE ORGANIC	F								
2															
					CL	CLAY TILL		Vc							
4															
6															
8								ICE LENSES							
10															
12															
14					CL	CLAY TILL		Vc							
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy Gravel
Location
Hole 544-C-635B Depth 6'
Technician Date March 5/73

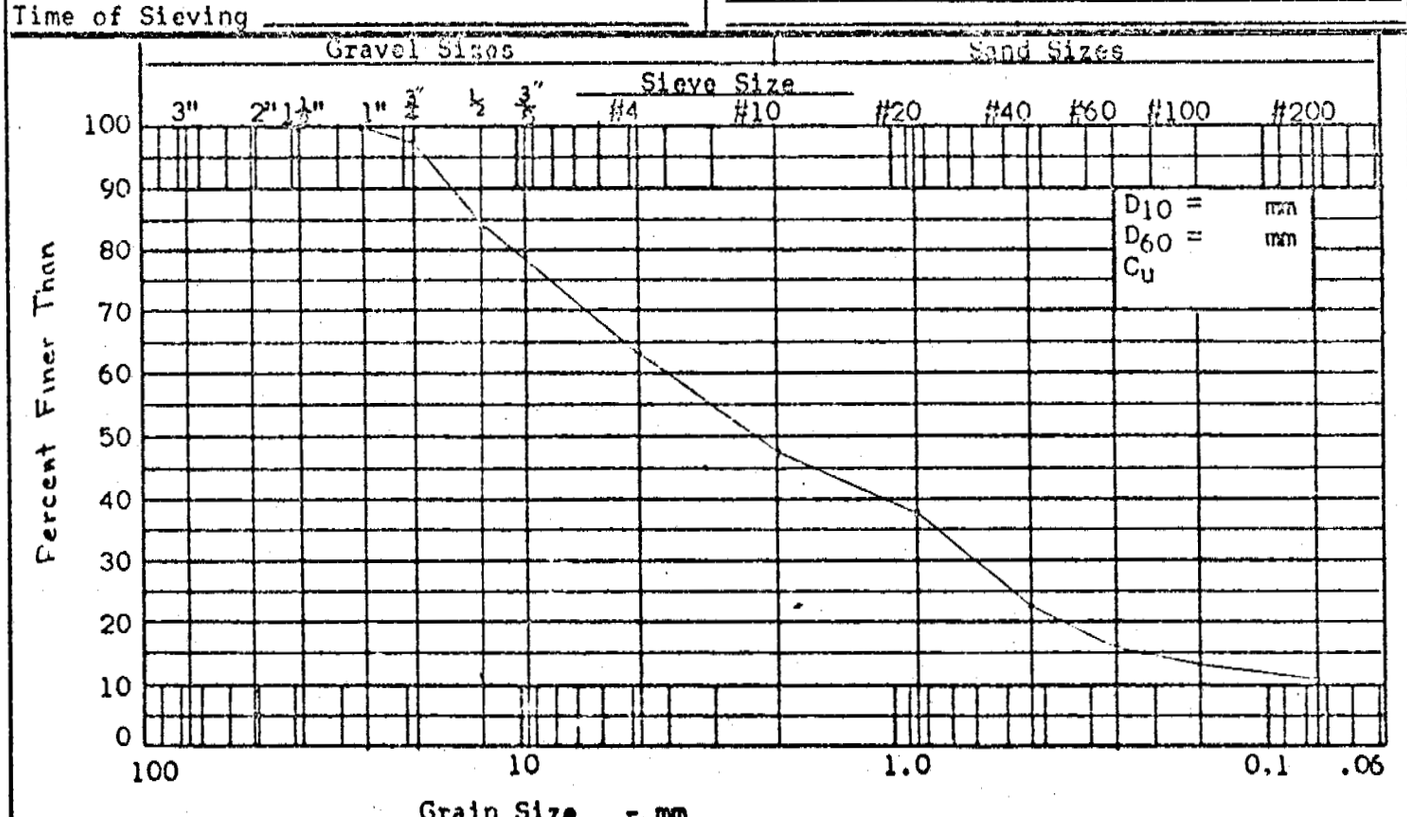
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4			100.0%	
Wt. Dry + Tare		3/4	19.10			97.3%	
Tare		1/2	12.70			84.3%	
Wt. Dry		3/8	9.52			78.5%	
	4	.185	4.76			63.6%	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			47.6%	
Tare No.	20	.0331	.840			37.3%	
Wt. Dry + Tare	40	.0165	.420			22.4%	
Tare	60	.0097	.250			16.0%	
Wt. Dry	100	.0059	.149			13.1%	
	200	.0029	.074			10.7%	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sandy gravel
Location	
Hole 544-C-635B	Depth 4' - 5'
Technician	Date

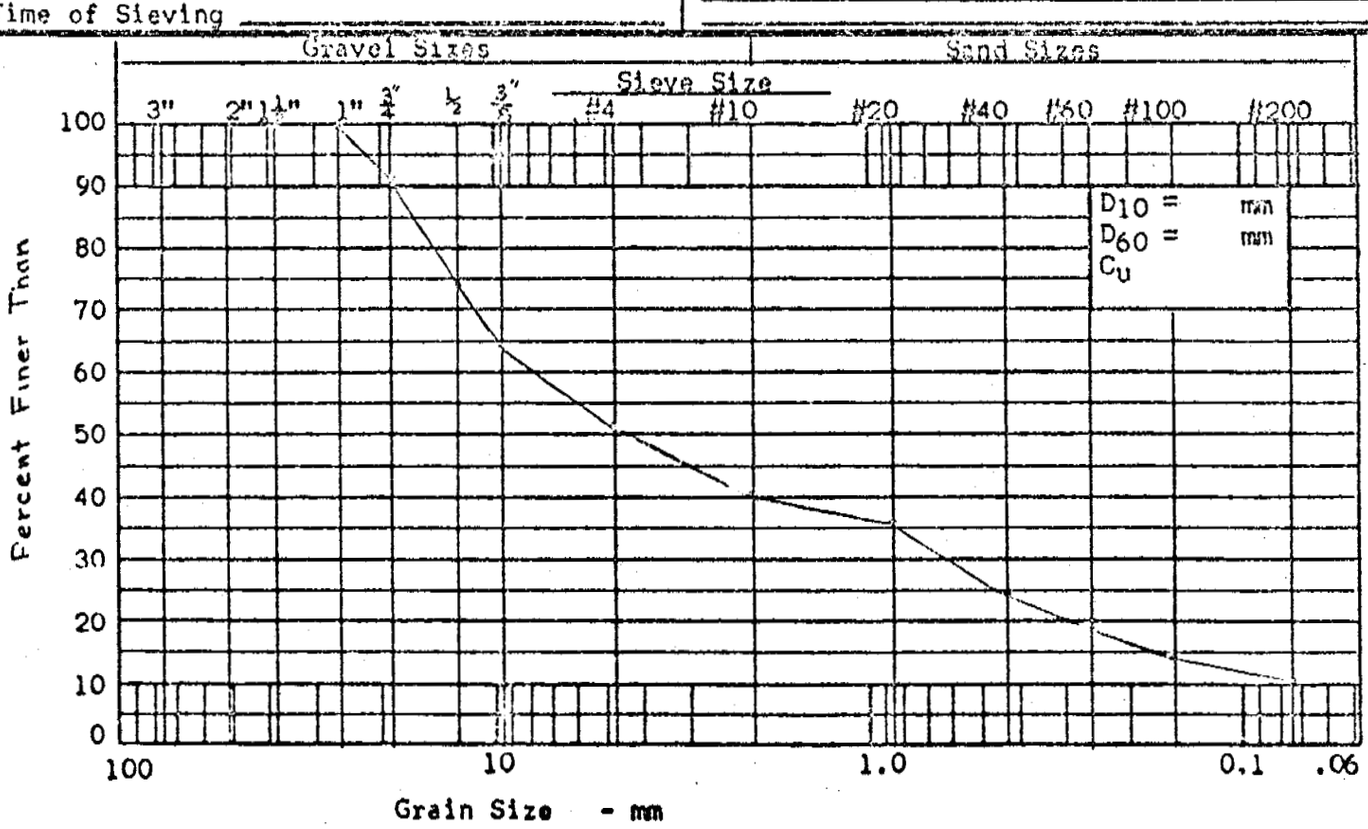
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			91.4	
Tare		1/2	12.70			74.8	
Wt. Dry		3/8	9.52			64.5	
	4	.185	4.76			50.8	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			40.5	
Wt. Dry + Tare	20	.0331	.840			36.5	
Tare	40	.0165	.420			24.4	
Wt. Dry	60	.0097	.250			19.3	
	100	.0059	.149			14.7	
	200	.0029	.074			11.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



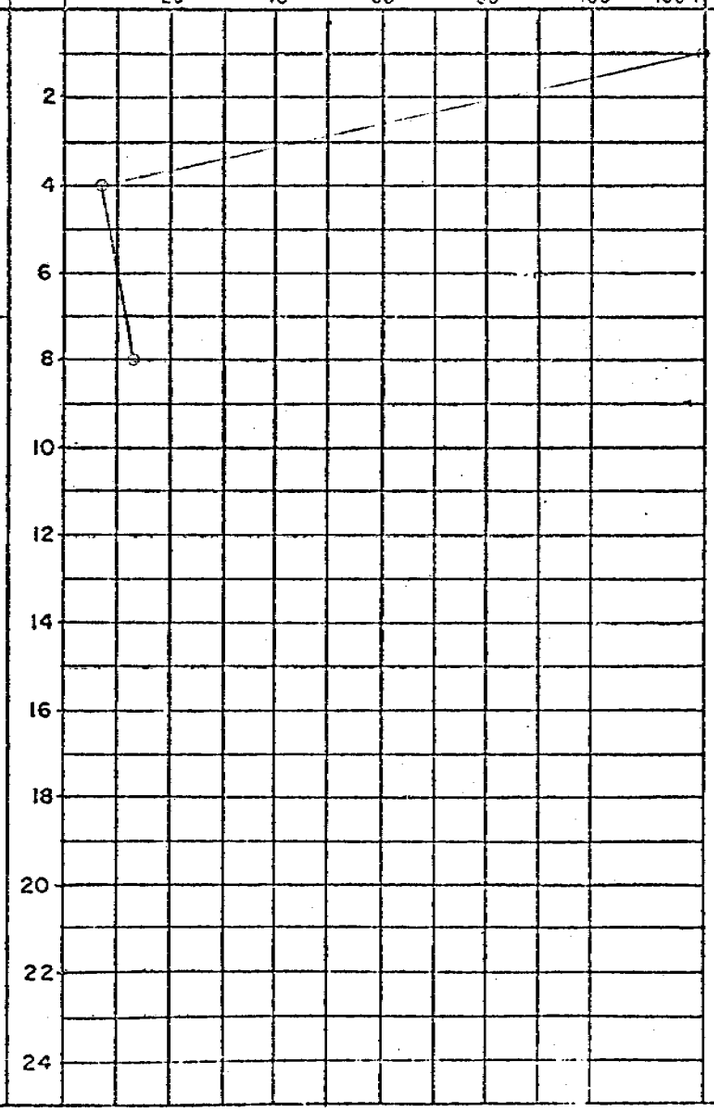
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 16/2/73	AIRPHOTO NO:	CHAINAGE: 40+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE	ELEV:	

MILE	B,C,S	NUMBER
544	C	635B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG	F	
2						SILT ORGANIC		
						GRAVEL		
4						SANDY		
6								
8						ROCK SOFT, WATER	UF	
10						END OF HOLE		
12								
14								
16								
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4	12		29	59			
8	11		37	52			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand with seams of gravel
Location	
Hole 544-C-449A	Depth 4' - 5'
Technician	Date March 8, 1973

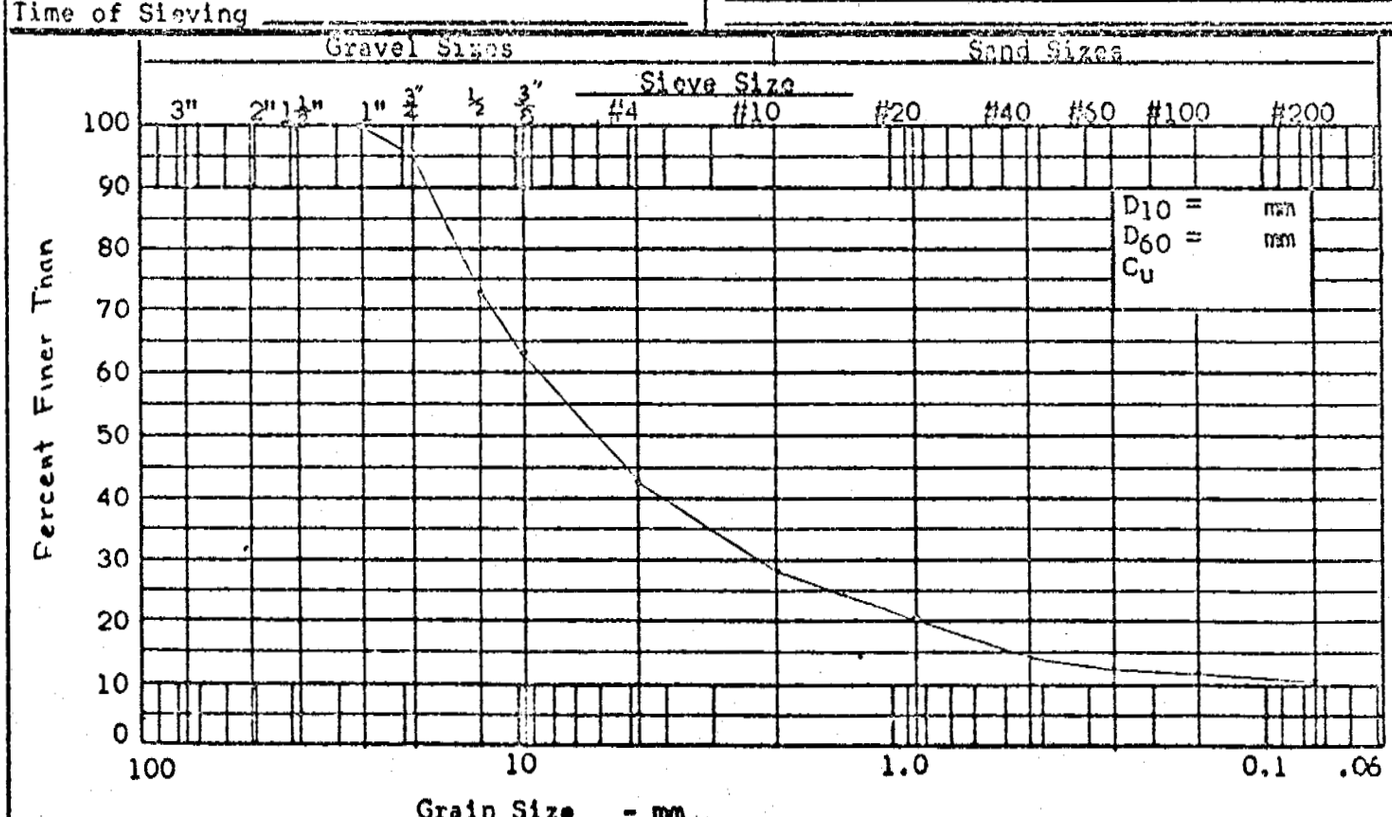
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			95.2	
Tare		1/2	12.70			72.8	
Wt. Dry		3/8	9.52			63.2	
	4	.185	4.76			42.4	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			28.7	
Wt. Dry + Tare	20	.0331	.840			20.8	
Tare	40	.0165	.420			14.3	
Wt. Dry	60	.0097	.250			12.6	
	100	.0059	.149			12.1	
	200	.0029	.074			10.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



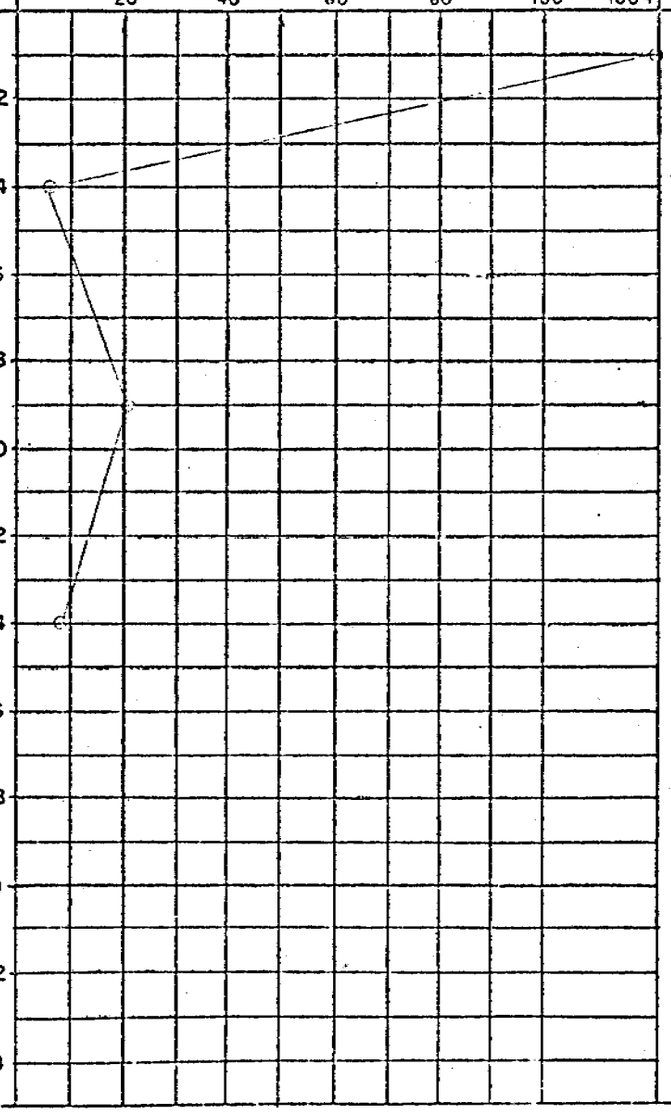
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: BM	DATE DRILLED: 16/2/73	AIRPHOTO NO:	CHAINAGE: 50+00	OFFSET: L
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
544	C	443A

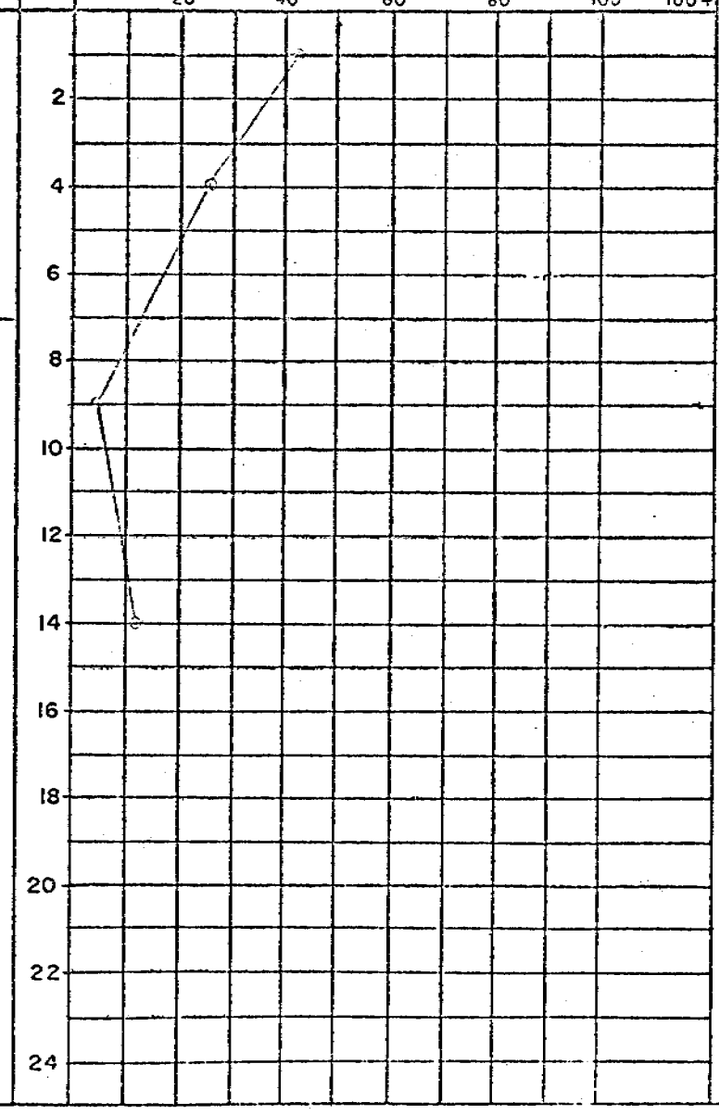
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					CL	CLAY 2" ORGANIC; SILTY	F								
2–14					SP	SAND; SEAMS OF GRAVEL	UF		1		17	72			
14						BEDROCK									ROCK CHIPS IN SAMPLE
16						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: K.S.	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 60+00	OFFSET: L	TEST HOLE
CKD: D.S.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 60'	ELEV:	MILE: 544 / B,C,S: C / NUMBER: 443A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	CLAY	F	
2					ML			
4						SILTY, SANDY		
6								
					SM			
8							UF	
						GRAVEL		
10								
12					GM	CLAY		
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
		-				

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel and sand
Location
Hole 544-C-450A Depth 9' - 10'
Technician Date Mar. 8, 1973

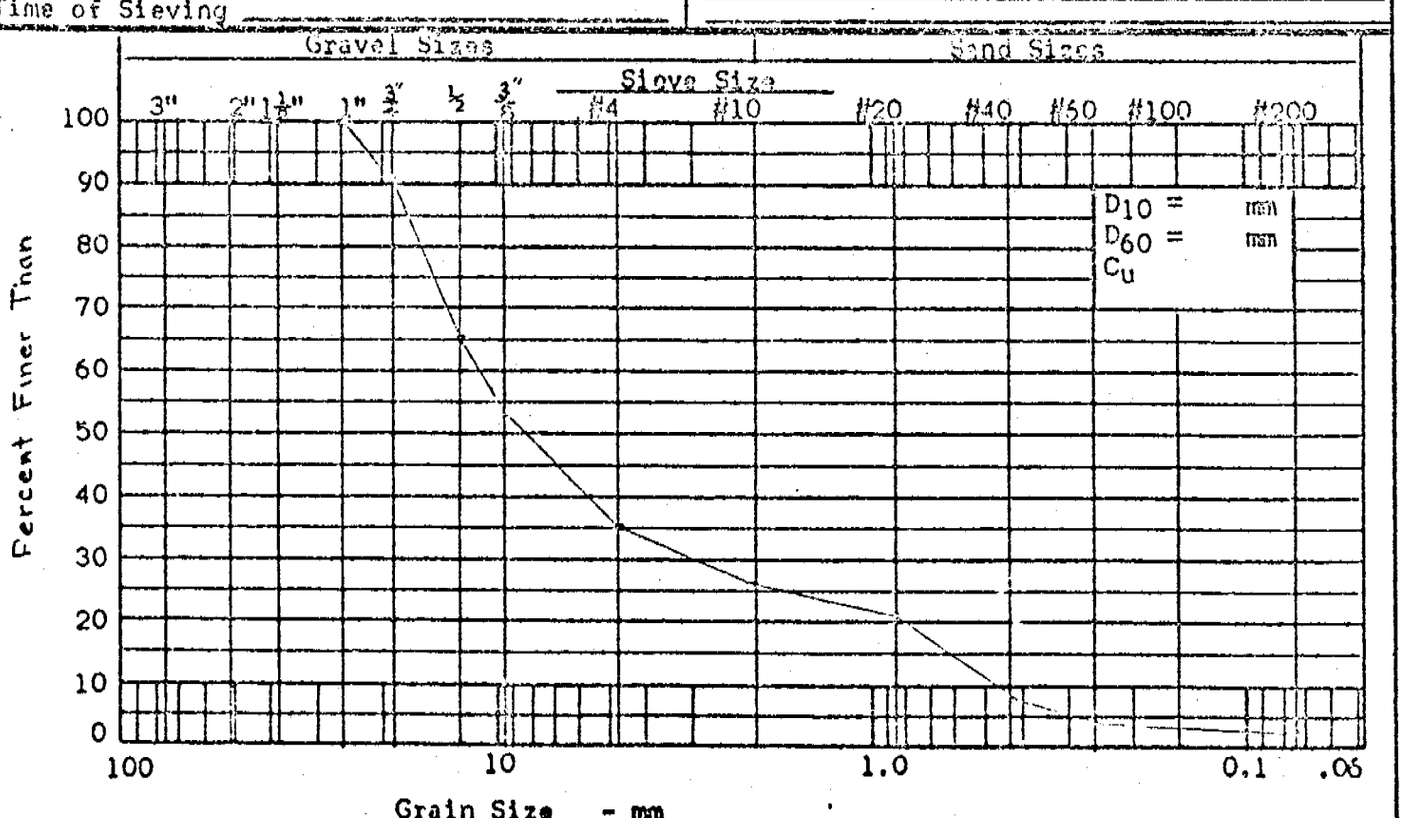
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			91.3	
Tare		1/2	12.70			65.3	
Wt. Dry		3/8	9.52			53.3	
	4	.185	4.76			35.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			26.8	
Wt. Dry + Tare	20	.0331	.840			21.3	
Tare	40	.0165	.420			8.5	
Wt. Dry	60	.0097	.250			4.1	
	100	.0059	.149			3.3	
	200	.0029	.074			2.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

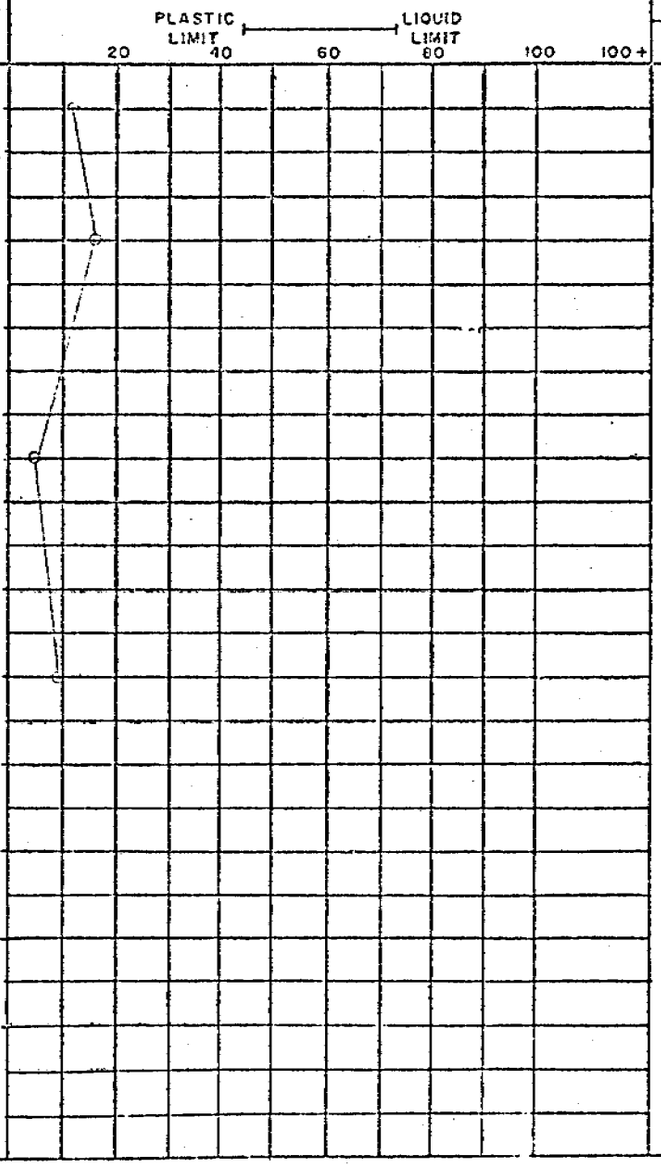
DWN: A E W	FIELD ENG: B M	DATE DRILLED: 16/3/73	AIRPHOTO NO:	CHAINAGE: 70+00	OFFSET: ℓ
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
544	C	450A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					SP	SAND 7" ORGANIC	F								
2–4					GW	GRAVEL	UF								
4–14						SAND			3		24	73			
14–16					GW										
16						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

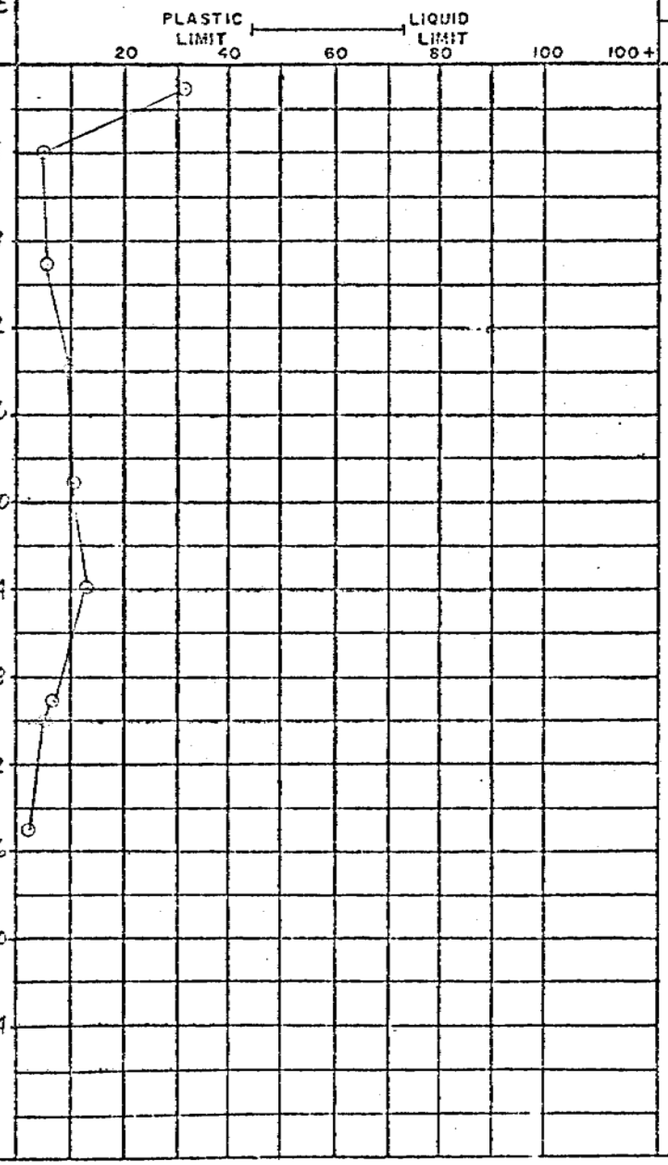


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.K.	FIELD ENG: R.S.	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 77+10	OFFSET: ℄	TEST HOLE
CKD: D.A.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 70'	ELEV: 4520	MILE: 545 / B,C,S: S / NUMBER: 443A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SM	SILT LIGHT BROWN	F								
4						SAND					90	10			
8					SP	PEBBLES	UF								
12						GRAVEL									
16					MC	CLAY									
20															
24						SAND									
28					GC										
32						BEDROCK									
36						SHALE									
40						END OF HOLE									
44															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Sand
Location	
Hole 544-S-444A	Depth 9' - 10'
Technician	Date Mar. 9, 1973

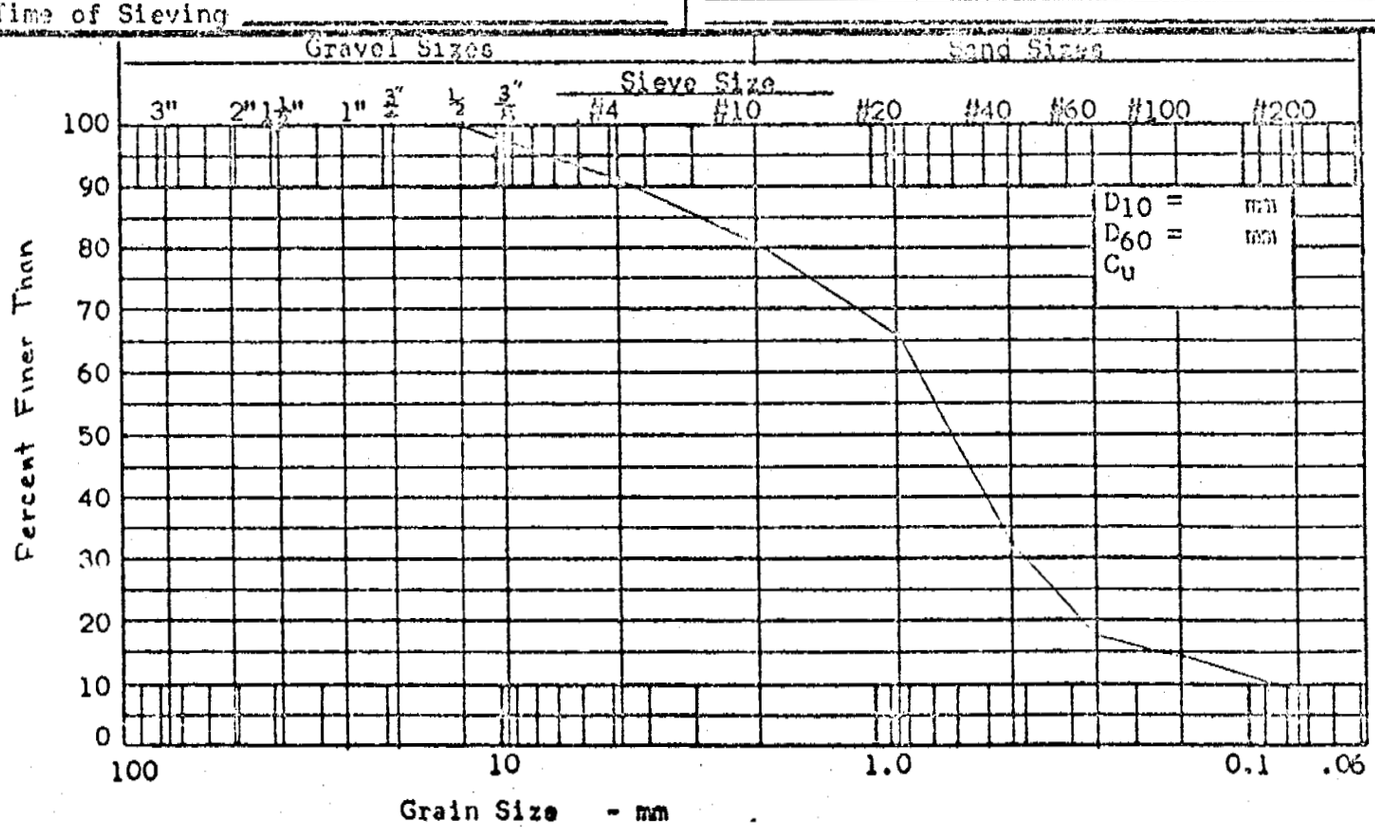
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100.0	
Wt. Dry		3/8	9.52			97.2	
	4	.185	4.76			91.5	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			80.8	
Tare No.	20	.0331	.840			66.8	
Wt. Dry + Tare	40	.0165	.420			32.1	
Tare	60	.0097	.250			17.7	
Wt. Dry	100	.0059	.149			14.4	
	200	.0029	.074			9.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

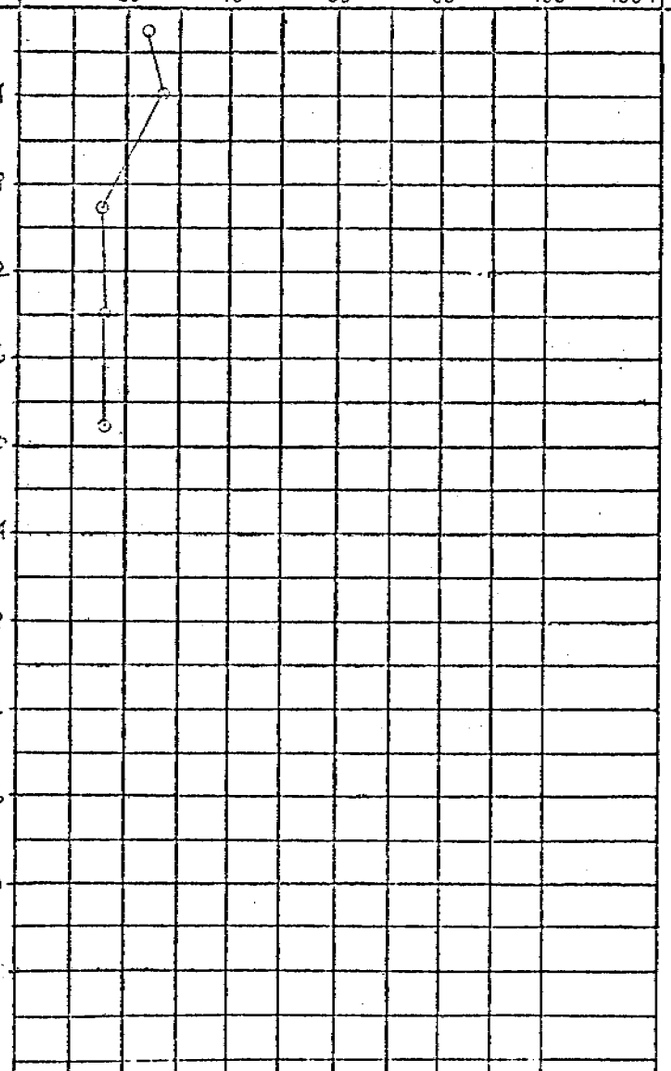
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: B M	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE:	OFFSET: ℄
CKD: D S P	TECH:	RIG: A/S	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & WILLOW	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
544	S	44A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT 2" ORGANIC	F								
4						SAND	UF								
						SANDY CLAY WET									
8									9		71	20			
12															
16						GRAVEL, WET									
20						BEDROCK									
24															HOLE SLOUGHING ROCK CHIPS IN SAMPLE
28															
32						END OF HOLE									
36															
40															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

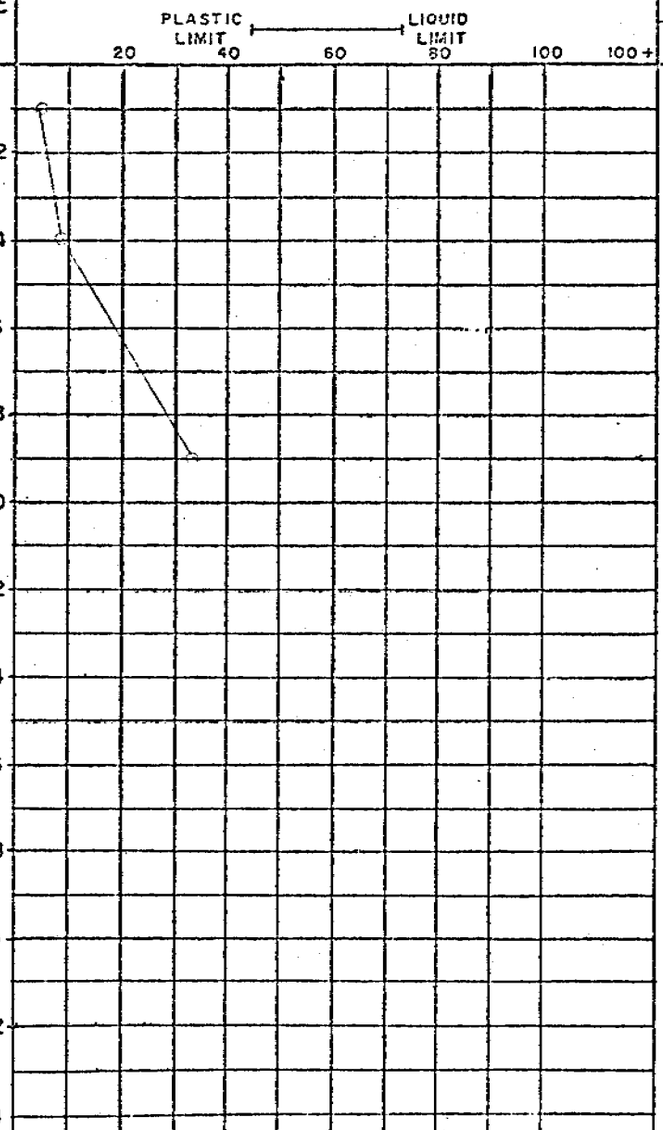
DWN: A.E.W.	FIELD ENG: R.S.	DATE DRILLED: 10/2/73	AIRPHOTO NO:	CHAINAGE:	OFFSET: ℄
CKD: D.G.P.	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
545	S	445A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–5.5					GW	GRAVEL	F								
5.5–16					GC	TILL	UF								
16						BEDROCK									
16–18						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R S	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE:	OFFSET: ℄
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
545	S	443A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) (PLASTIC LIMIT — LIQUID LIMIT; 20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ICE	F										
2						GRAVEL			2								
4						BEDROCK			4								
6									6								
8									8								
10									10								
12									12								
14									14								
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG: RS	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE: 80+39	OFFSET: [illegible]
CKD: DAP	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV: 350.5

TEST HOLE

MILE	B,C,S	NUMBER
545	5	447A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						GRAVEL & BED ROCK									
2															
4															
6															SO_4 = 0.09 %
8															
10															
12															
14						END OF HOLE									
16															
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

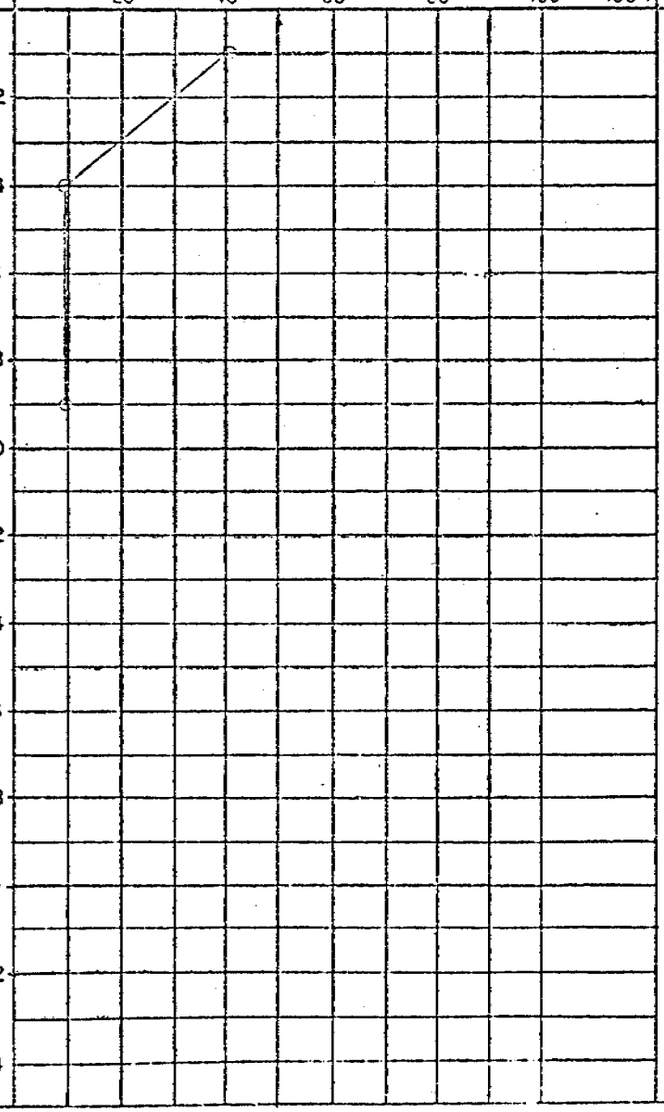
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG R S	DATE DRILLED 15/2/73	AIRPHOTO NO:	CHAINAGE: 79+53	OFFSET: 140' W OF ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV: 348.1

TEST HOLE

MILE	B,C,S	NUMBER
545	S	442A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SAND	F								
2					SM	SILTY CLAY	UF								
4						GRAVEL			8		26	66			
6					GM	CLAY									
8															
10															
12															
14						BEDROCK									
16															
18															
20															
22															
24						END OF HOLE									



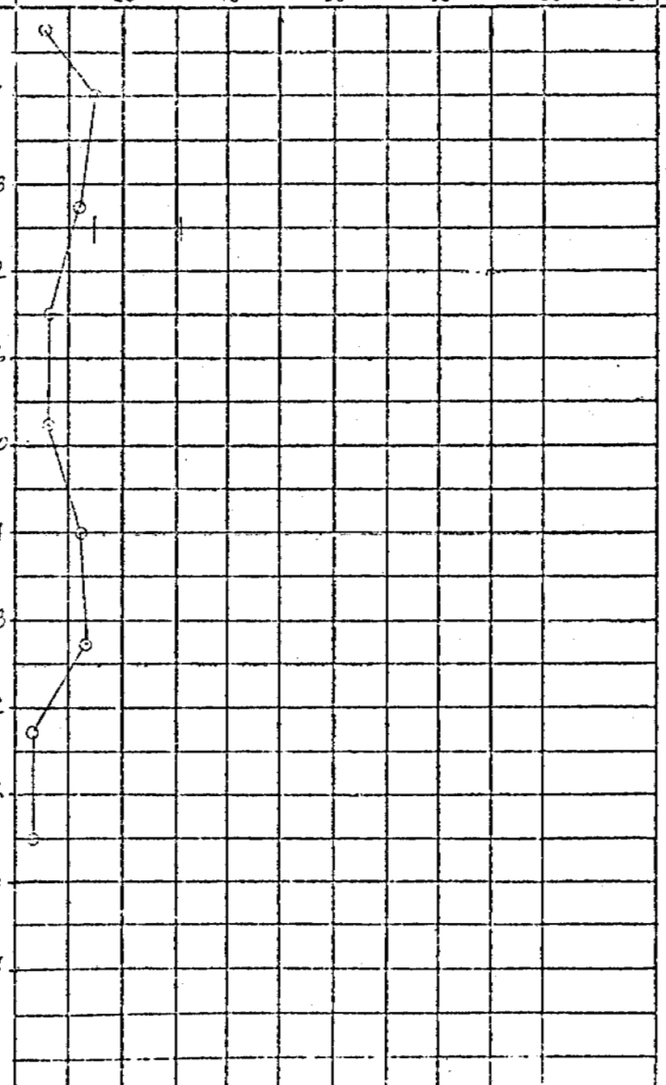
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: R S	DATE DRILLED: 15/2/73	AIRPHOTO NO:	CHAINAGE:	OFFSET: ℄
CKD: D S P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: SPRUCE & LARCH 70 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
545	S	441A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SP	SAND	F		7		85	8			
4															SO_4 - 0.11 %
					GC	TILL	UF								
8		P		21 BLS		SILTY CLAY WITH SMALL PEBBLES									
12															
16						SAND SEAM									
20				103 BLS		▽									
24															
28					GC										
32						BEDROCK									
36						SHALE									
40															
44						END OF HOLE									



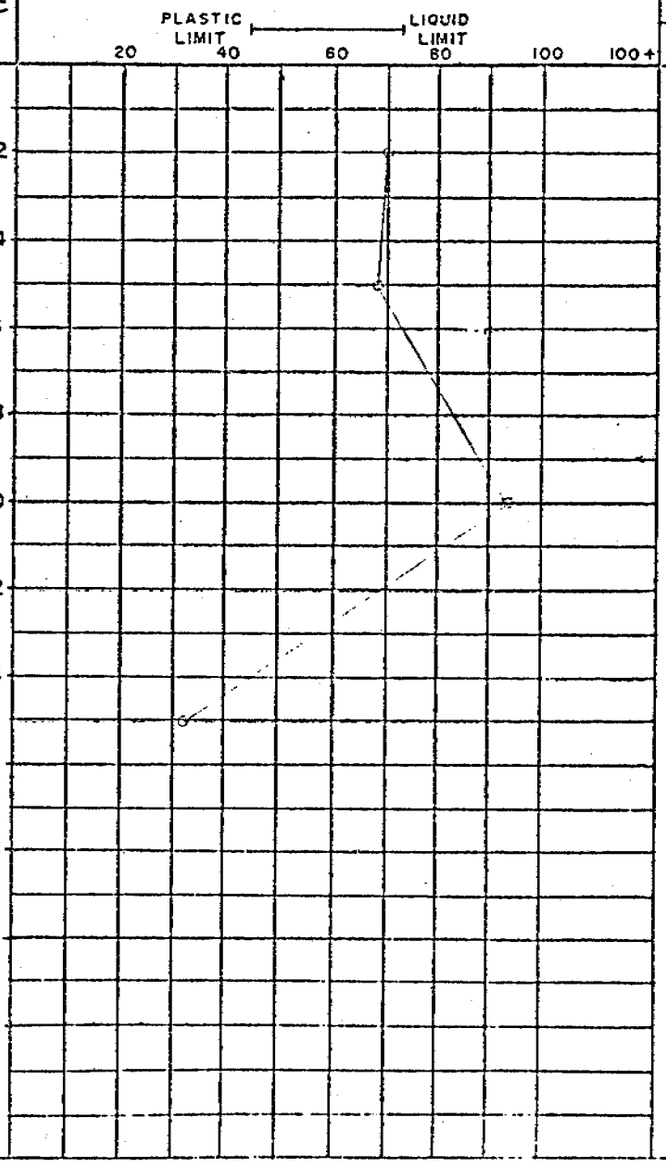
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: [illegible]	FIELD ENG: [illegible]	DATE DRILLED: 2/3/73	AIRPHOTO NO:	CHAINAGE: 1100+00	OFFSET: [illegible]
CKD	TECH:	RIG: AIR	SURFACE DRAINAGE: Poor	VEGETATION: 20' SPRUCE	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	4226

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
2		/			Pt	GRAN. MUSKEG	F	Vr	
4		P			Pt	CLAY.			3" MUSKEG LENSES
6						GRAN. MUSKEG LENSES.	F	Vr	
8									
10		P			Pt	M			1/4" MUSKEG LENSES
12						LIGHT CLAY			
14		P			SM		F	Vr	
16						END OF HOLE			
18									
20									
22									
24									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 512-C-423B Depth 4' - 5'
Technician Date Feb.28, 1973

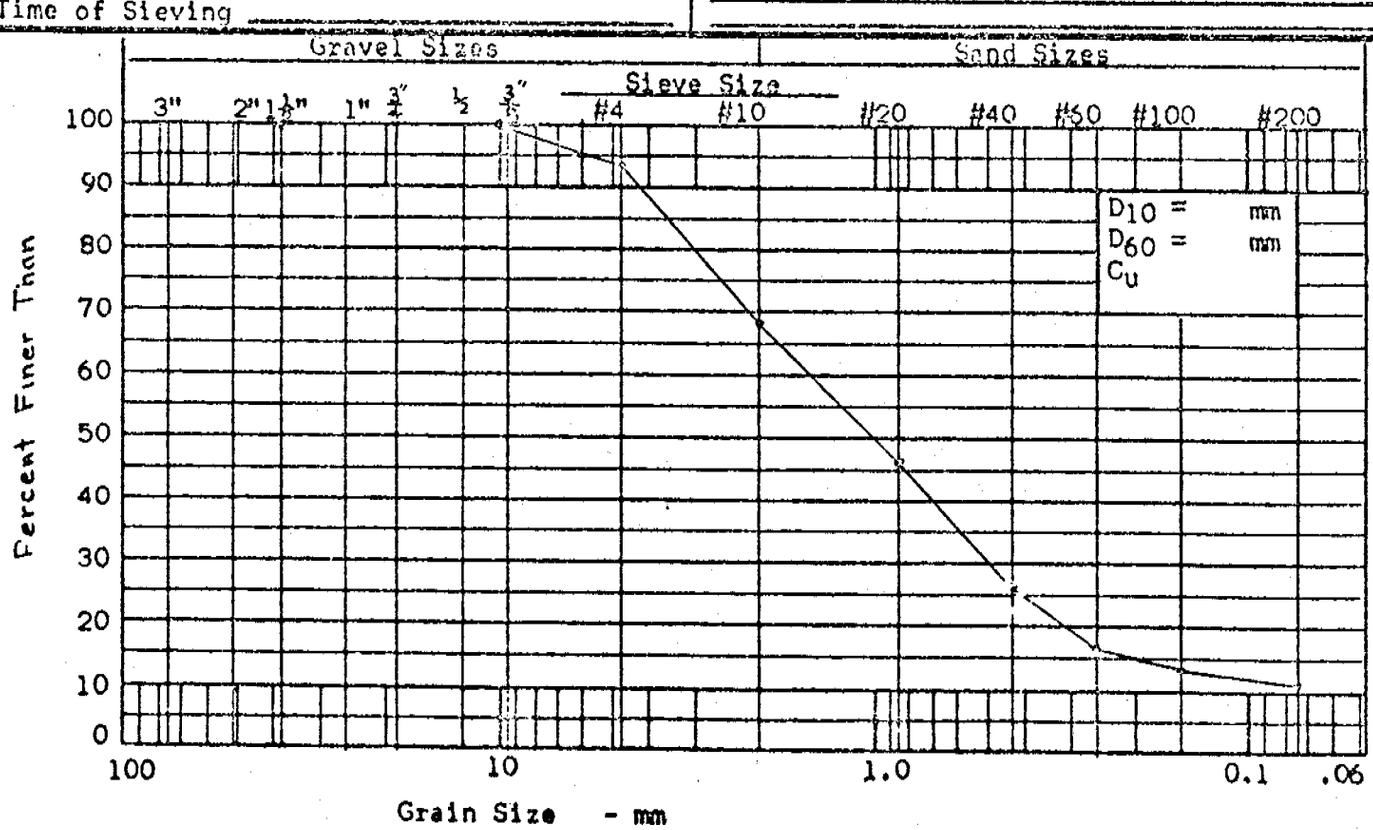
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70				
Wt. Dry		3/8	9.52			100.0	
	4	.185	4.76			93.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			68.2	
Wt. Dry + Tare	20	.0331	.840			46.3	
Tare	40	.0165	.420			25.9	
Wt. Dry	60	.0097	.250			17.0	
	100	.0059	.149			13.6	
	200	.0029	.074			11.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.D.M.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1110+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 15' SPRUCE	ELEV

TEST HOLE

MILE	B,C,S	NUMBER
512	C	4230

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					F-GM	3" GRAN. MUSKEG GRAVEL DRY, SAND	F								
4					G.M.		UF		N		57	32			SLUFFING
6						ABANDONED @ 5'									
8															
10															
12															
14															
16															
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT

20 40 60 80 100 100+

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

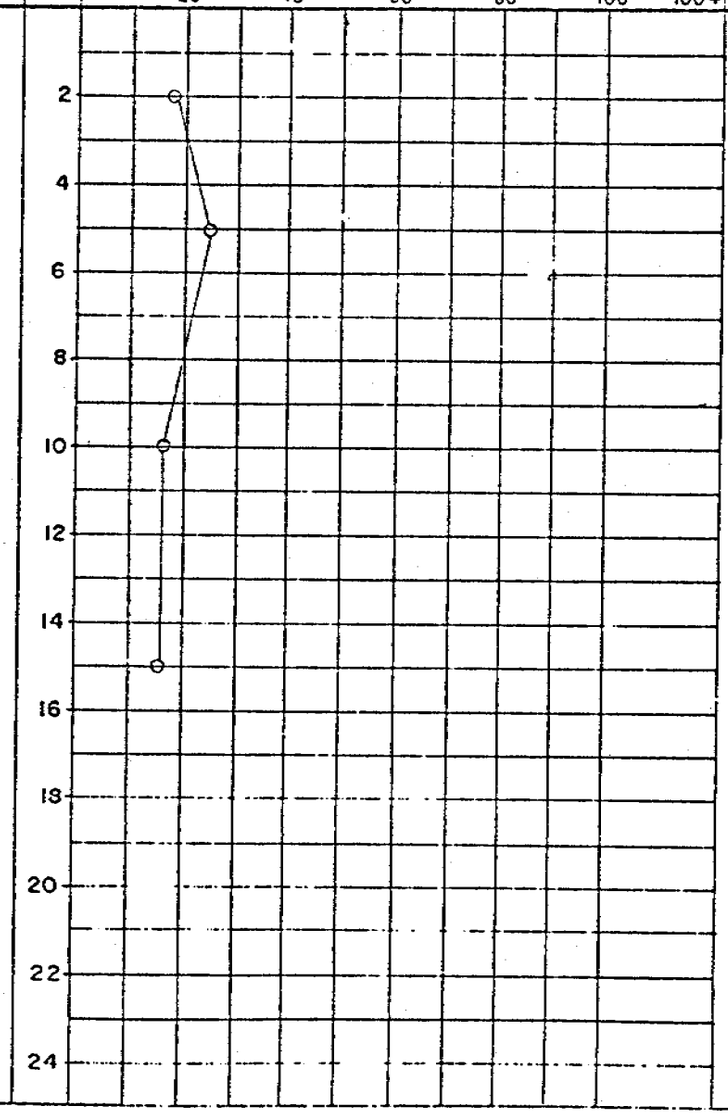
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG D.R	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1112+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - S & W.	VEGETATION: SCRUB SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	4363

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" MOSS									
2					M.L	SILT PEBBLES									
4					G.C	CLAY MED. BROWN, PEBBLES	F								
6															
8					S.P	SAND GRAVEL, CLAY									
10									52		33	15			
12						CLAY TILL									
14					G.C										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Till
Location	
Hole 512-C-424B	Depth 9' - 10'
Technician	Date Feb. 20, 1973

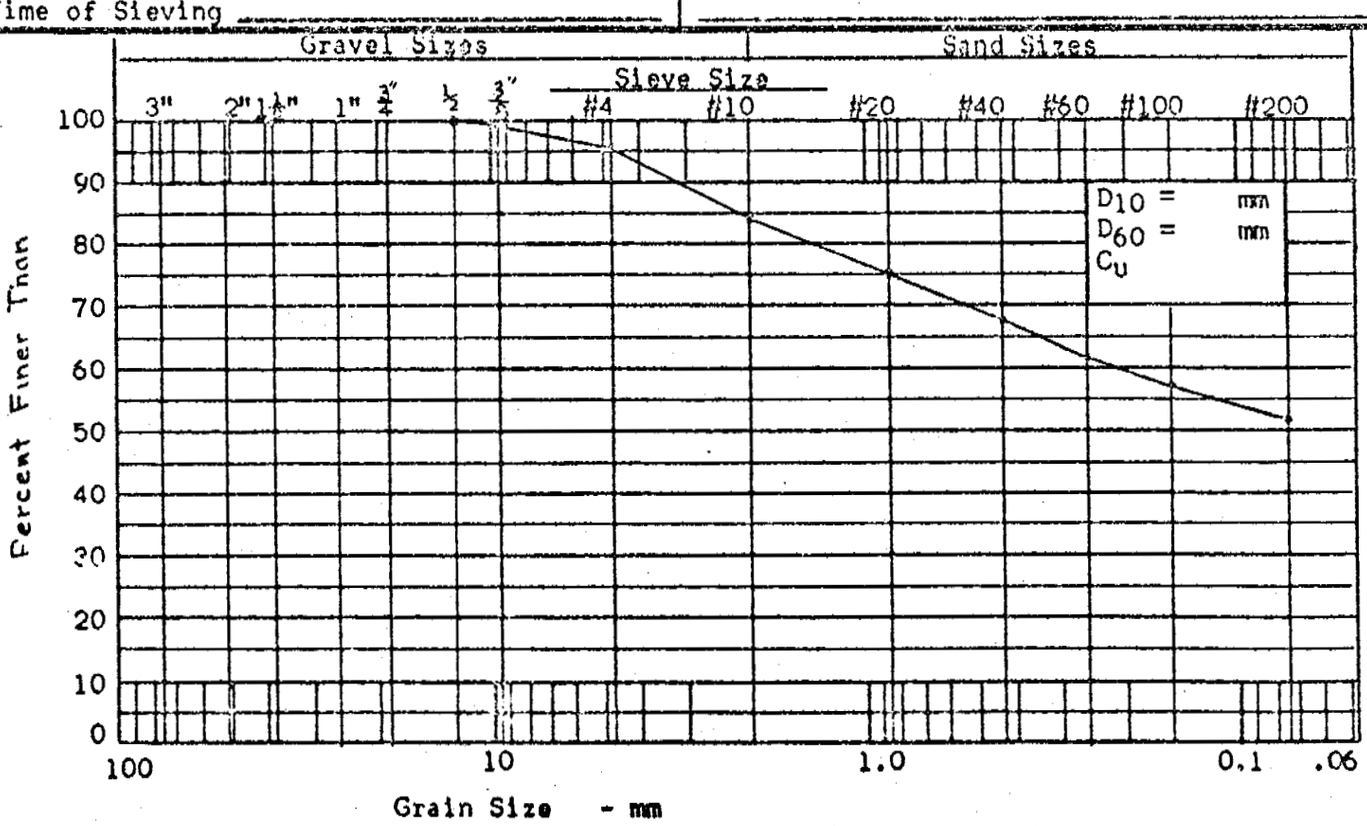
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100.0	
Wt. Dry		3/8	9.52			99.7	
	4	.185	4.76			95.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			84.7	
Wt. Dry + Tare	20	.0331	.840			75.1	
Tare	40	.0165	.420			67.7	
Wt. Dry	60	.0097	.250			61.6	
	100	.0059	.149			57.0	
	200	.0029	.074			51.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

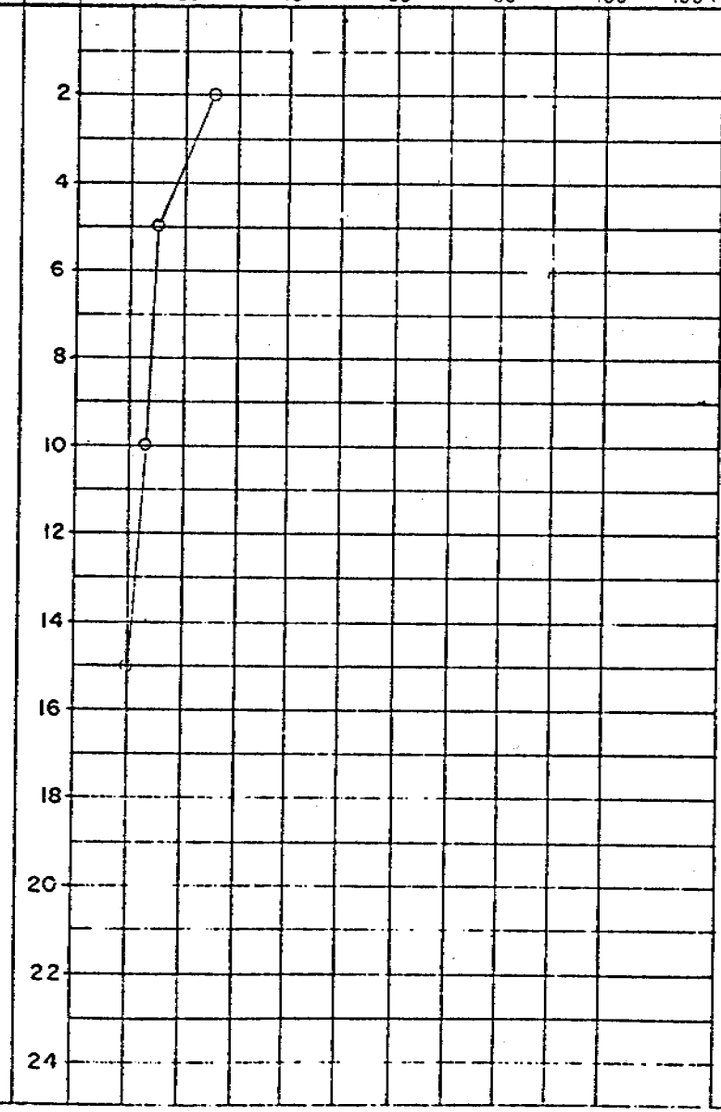
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG B.D.M.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1120+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 15' SPRUCE SPARSE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	424B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						MUSKEG GRAN.		
2		▨			G.C	TILL	F	
4		▨			G.C			Vr.
6								
8								
10		▨			G.C			
12							F	
14		▨			G.C			
16								
18						END OF HOLE		
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

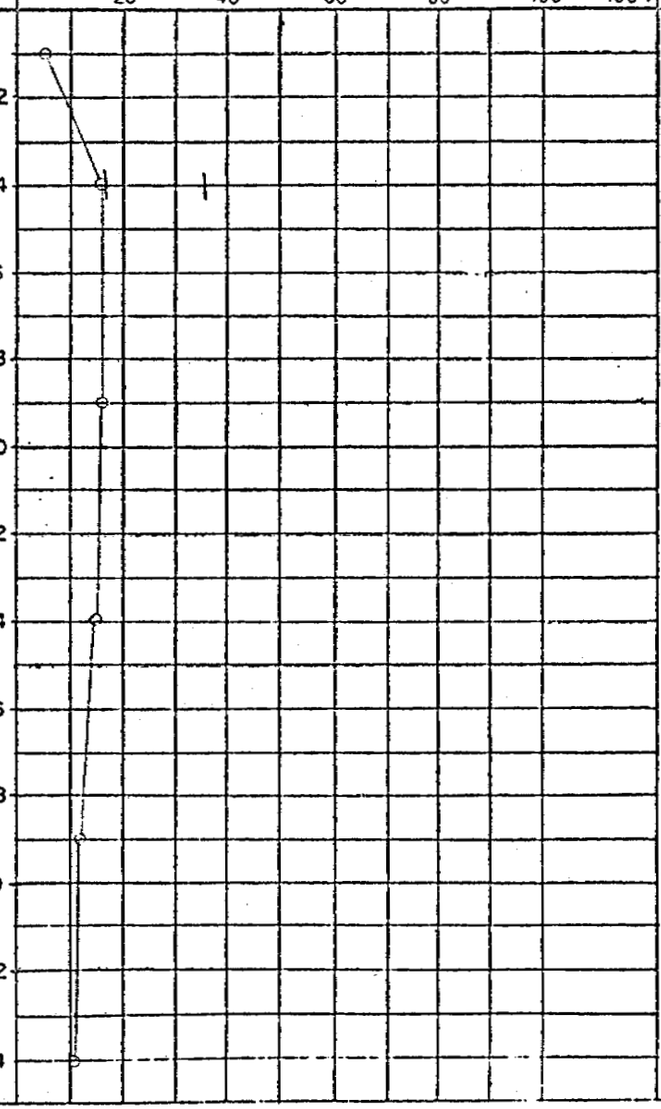
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1125+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
512	C	425B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SP	SAND 3" MUSKEG LIGHT BROWN, DRY SOME SILT	F									
2									2							
						CLAY										
4					CL				4							
6									6							
8									8							
10						SAND & GRAVEL			10							
12									12							
14									14							
16									16							
18									18							
20									20							
22					CL				22							
24						END OF HOLE @ 25'			24							



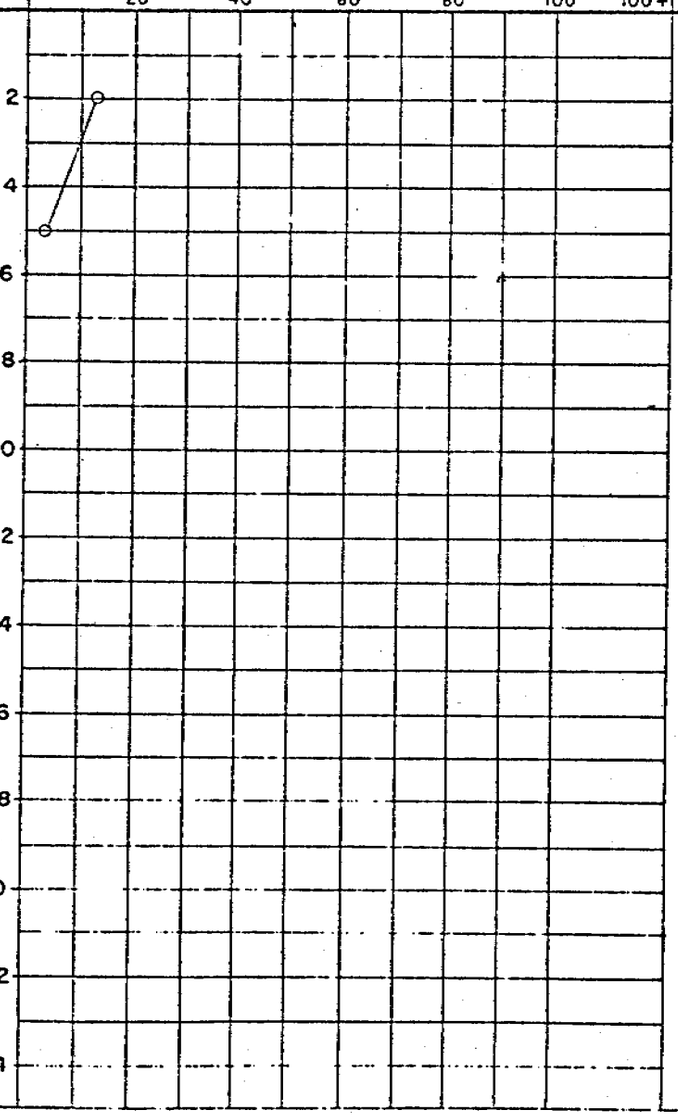
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R S	FIELD ENG B D M.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1135+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 15' BIRCH, WILLOW, SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	426 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					G.M	MUSKEG GRAN. SILT BROWN, CLAYEY	F	
2						GRAVEL		
4					G.P.	DRY, SAND	UF	
6								
8								
10						ABANDONED @ 8'		
12								
14								
16								
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						SLUFFING

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

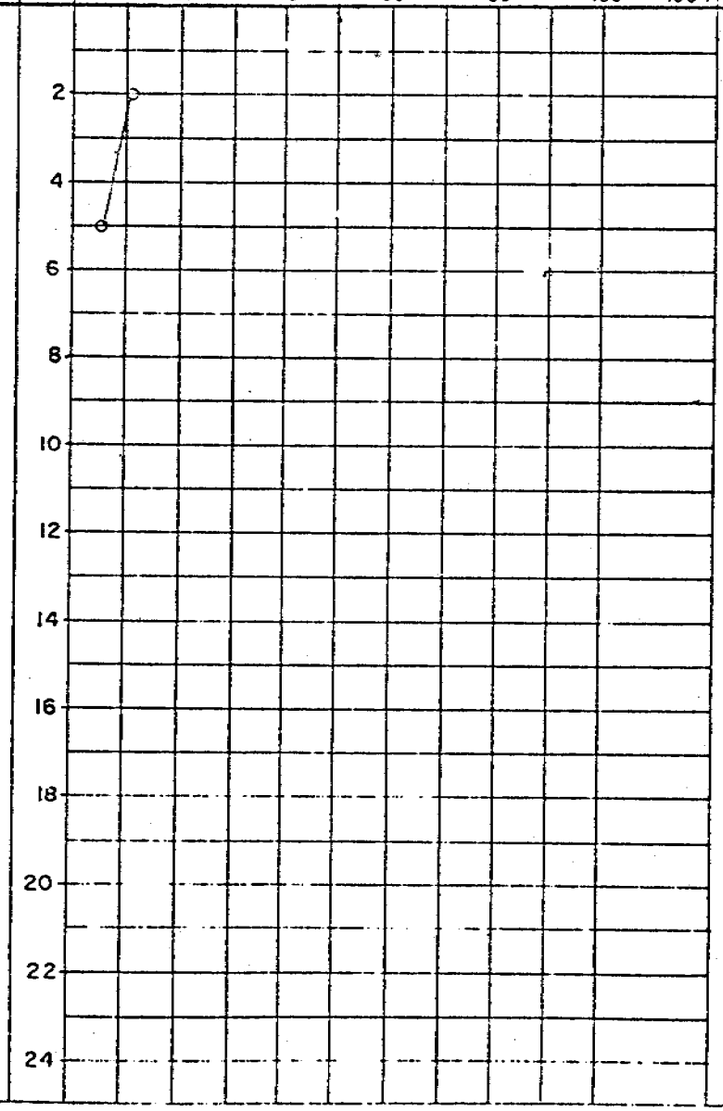
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN R.S	FIELD ENG D.R.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1136+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE POOR	VEGETATION: 15' SPRUCE & BIRCH	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
512	C	435 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						3" MOSS		
2					G.M	SILT FEW PEBBLES		
4					S.P	SAND	F	
6							UF	
8						SAND & GRAVEL		
10						ABANDONED @ 8'		
12								
14								
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

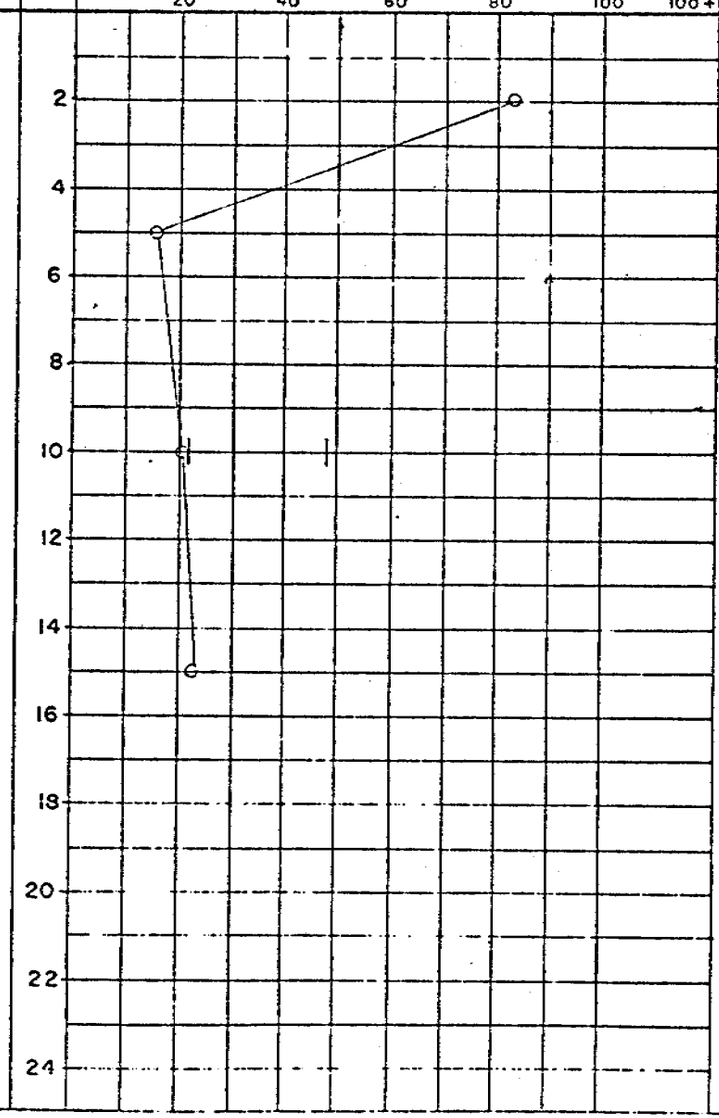
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B DM	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1145+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 3'-10' SPRUCE, SPARSE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
513	C	427E

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					Pt-M	MUSKEG GRAN., SILT									
2–8					G.C	CLAY GRAVEL & SILT	F								
8–16		P, P			C.L, C.L	CLAY PEBBLES	UF								
16						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

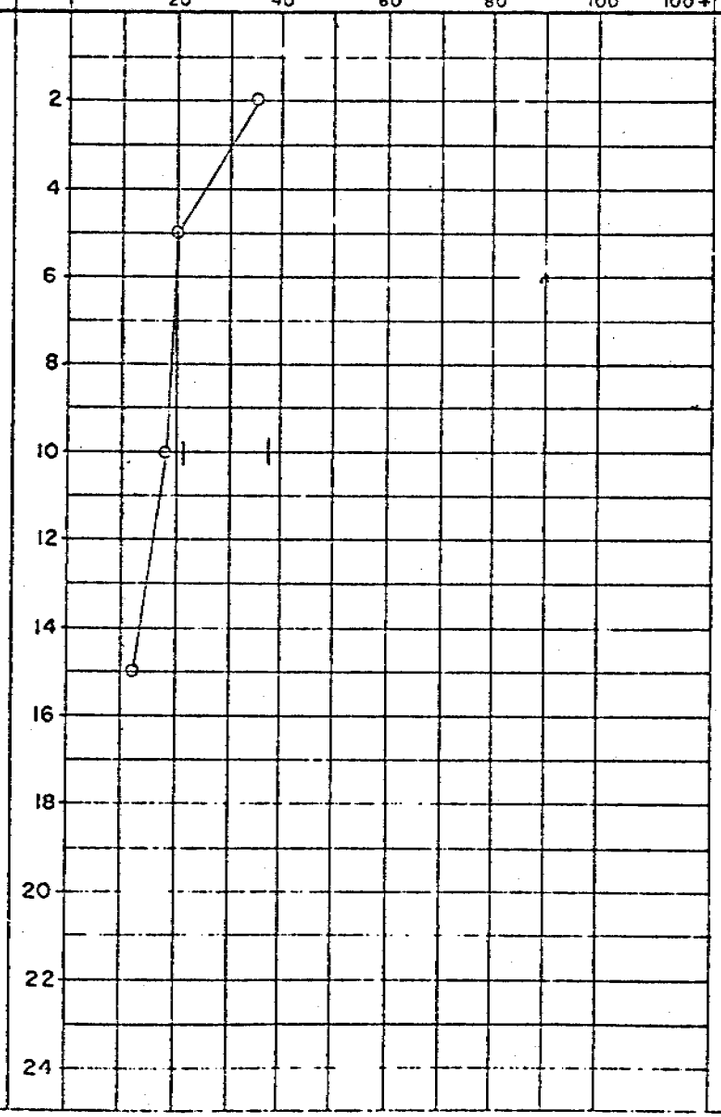
CAN R.S.	FIELD ENG B.D.M.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1160+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 25' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
513	C	428 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt-Mk	MUSKEG GRAN.		
2						CLAY SILTY		
4								
6					S C	TILL	F	
8								
10					G.C			
12								
14					G.C.		UF	
16								
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

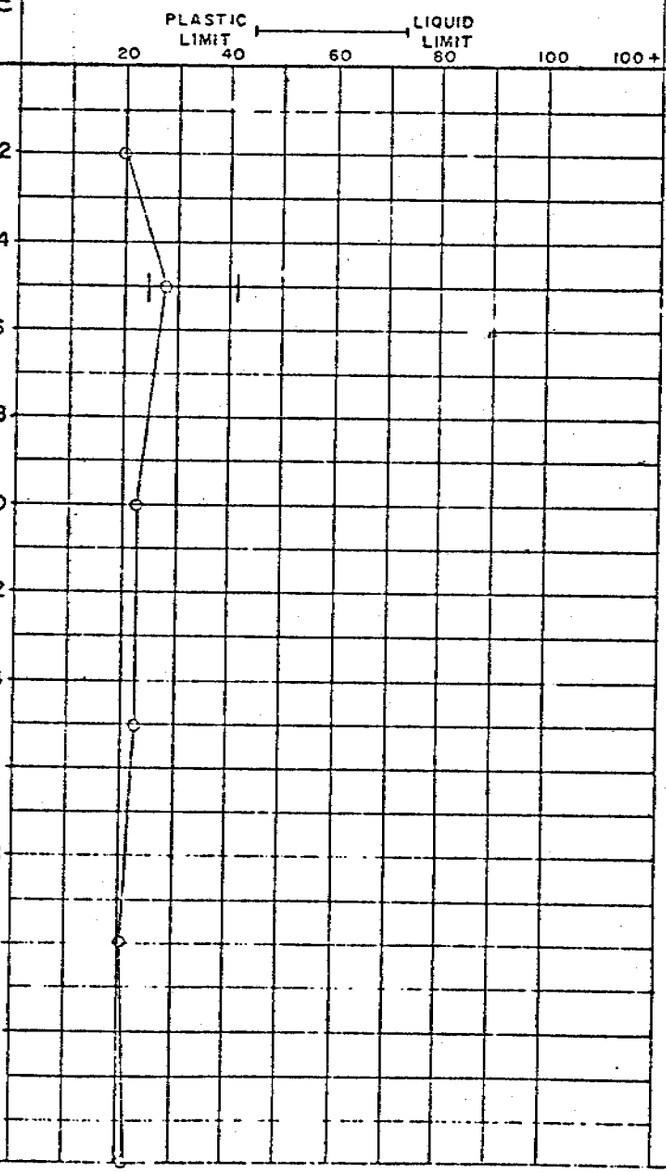
DWN R.S.	FIELD ENG B.D.M.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1175+00	OFFSET: ℄
CKD	TECH	RIG: AIR.	SURFACE DRAINAGE: GOOD	VEGETATION: 35' POP.	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
513	C	429 R

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" GRAN. MUSKEG										
2						CLAY BROWN.	F		2							
4		P							4							WELL BONDED
6						GREY			6							PENS. EASY
8							UF		8							
10		P							10							
12									12							
14		P							14							
16									16							
18									18							
20		P							20							
22						END HOLE @ 25'			22							
24		P				PEBBLES			24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

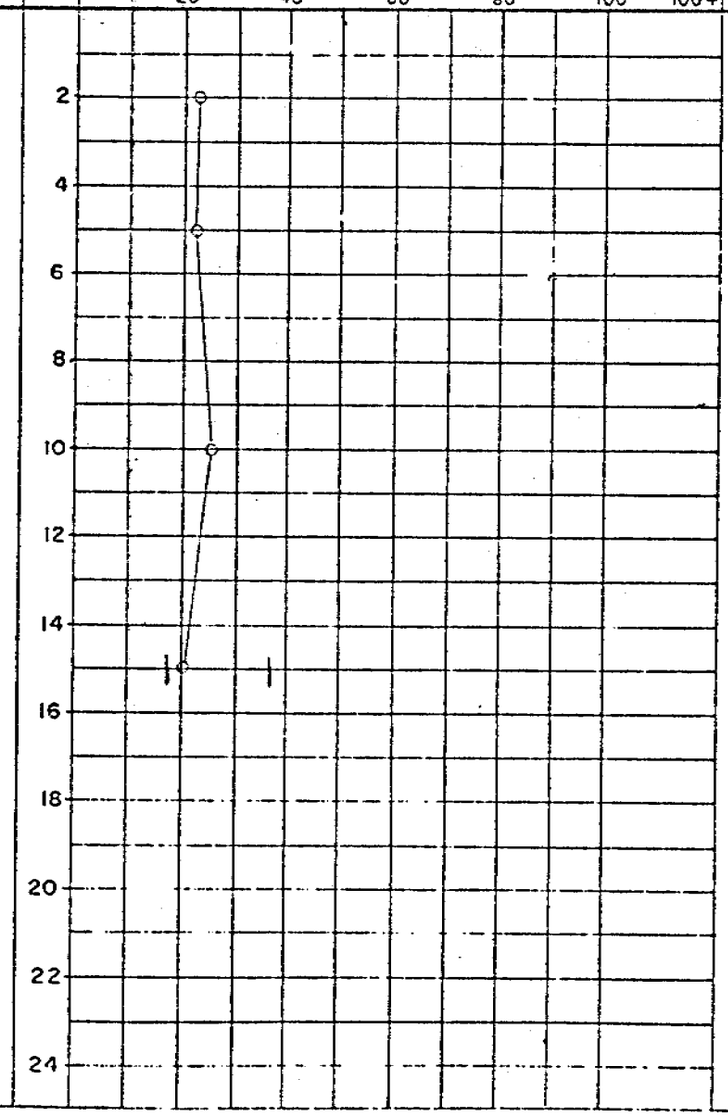
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN E.S.	FIELD ENG D.R.	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1185+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE Good - N E S	VEGETATION: 15' POP - 20' BIRCH	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
513	C	430B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					M.L	SILT LIGHT BROWN									
4					C.L	CLAY MED. BROWN	F	Vr.							
6															
8															
10					C.L			Vr.							
12							UF								
14		P			CL										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

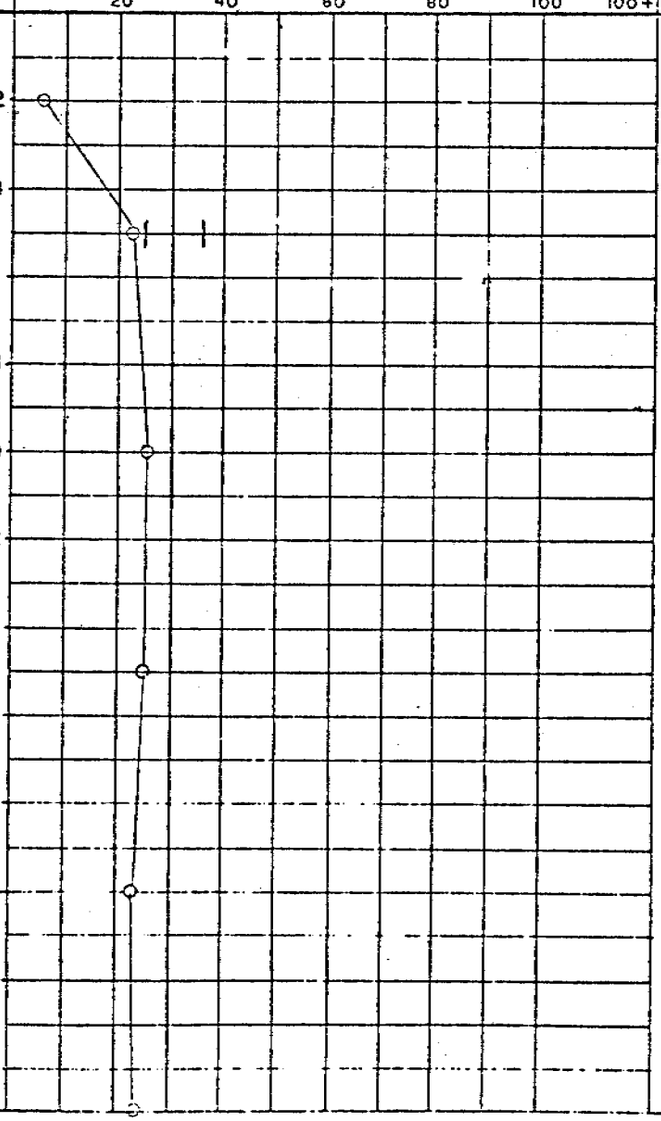
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN, POP	ELEV

CKD: R.S. FIELD ENG: N.C. DATE DRILLED: 4/2/73 AIRPHOTO NO: CHAINAGE: 1185+00 OFFSET: ℄

TEST HOLE		
MILE	B,C,S	NUMBER
513	C	301A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SM	SAND & SILT LIGHT BROWN									
4		P			CL	CLAY DARK BROWN	F	Vr.					119.3	97.6	
6															
8															
10					CL			Vr.							
12							UF								
14		P			CL								125.1	100.2	
16															
18															
20		P			CL	SILTY									
22						END HOLE @ 25'									
24					CL										



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

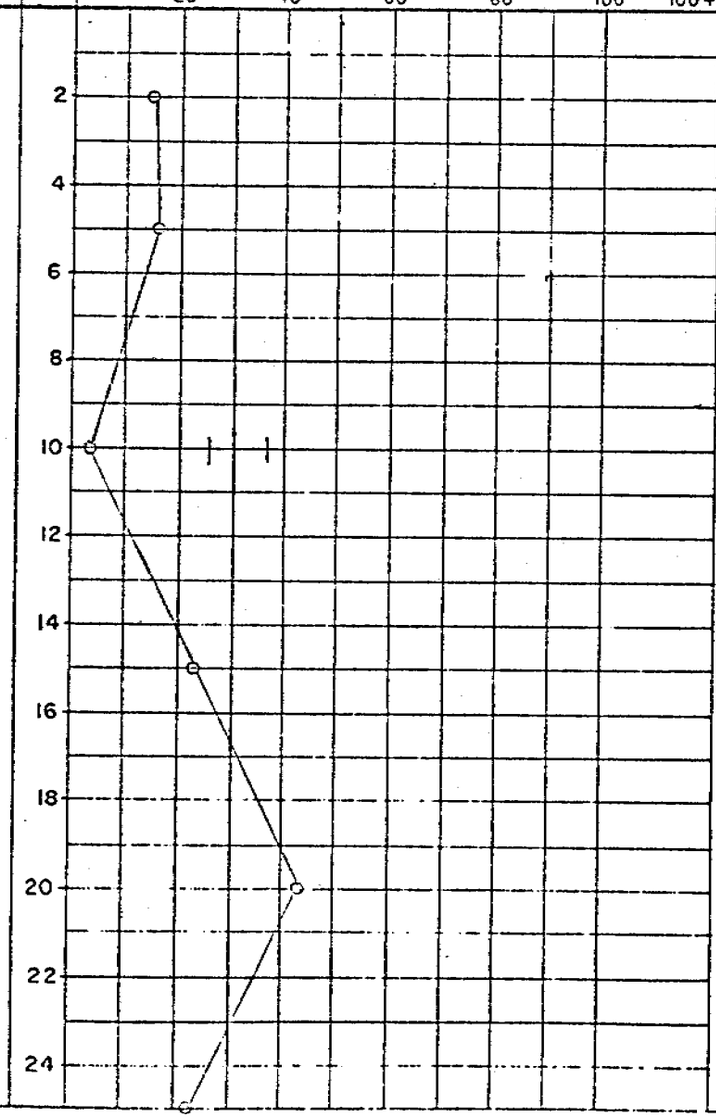
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG R.W.M	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1191+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - NORTH	VEGETATION: 40' ASPEN & POP	ELEV.

TEST HOLE		
MILE	S,C,S	NUMBER
513	C	305 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT 2" ORGANIC									
2					ML	CLAY									
						SILTY	F								
4					CL										
6															
8							UF								
10		P			CL										
						DARK									
12															
14					CL	SANDY									
16															
18															
20		P			CL										
22						END HOLE @ 25'									
24		P			CL										



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

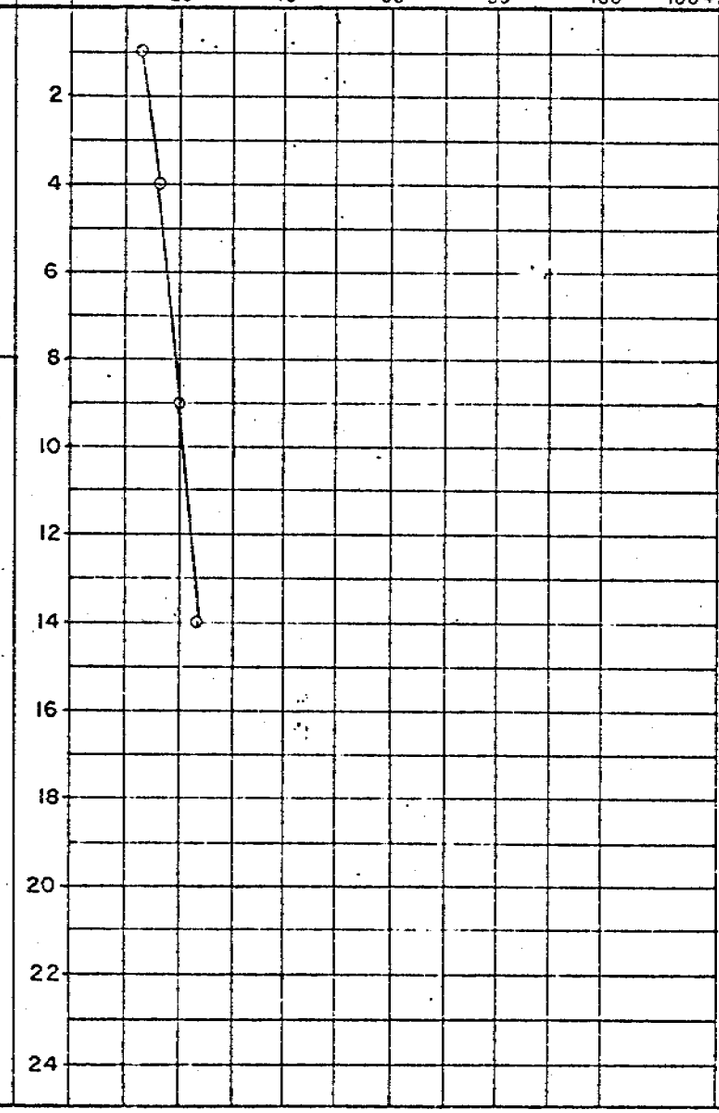
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DRN AEW	FIELD ENG D.R	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1131+00	OFFSET: L
CKD 26P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
513	C	431B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					ML	CLAY	F								
4															
6						SILTY, LIGHT BROWN									
8							UF								
10															
12					CL										
14		P													
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

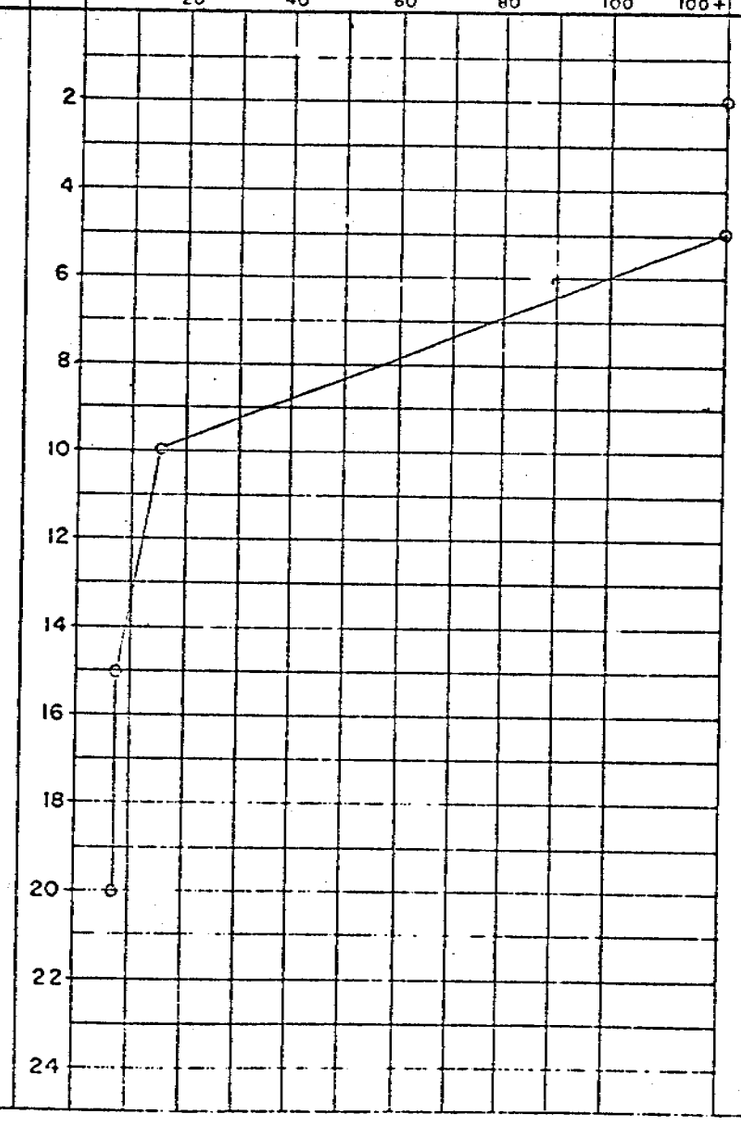
CKD	TECH	RIG: AIR	SURFACE DRAINAGE	VEGETATION: 50' SPRUCE	ELEV

CKD: R.S. FIELD ENG: B.W.M. DATE DRILLED: 4/2/73 AIRPHOTO NO: CHAINAGE: 1193+00 OFFSET: ℄

TEST HOLE

MILE	B,C,S	NUMBER
U14	C	306A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					Pt	ORGANIC		
4					C.L	CLAY	F	Vr.
6								
8								
10					C.L			Vr.
12						CLAY		
14					SL	SANDY		Vr
16							F	
18								
20					C.L			Vr
22						END OF HOLE		
24								



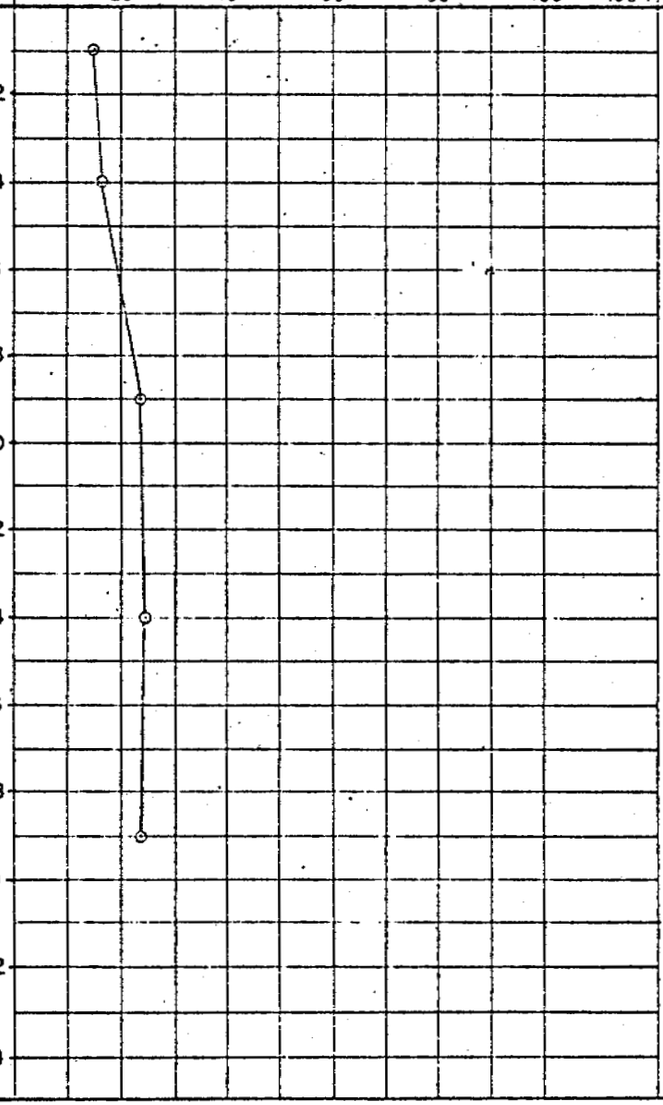
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG. DR	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1203+00	OFFSET: ℄
CKD DGP	TECH	RIG: DIR	SURFACE DRAINAGE: GOOD	VEGETATION: POPLAR 30'	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
514	C	432B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT	F									
2					ML	LIGHT BROWN			2							
						CLAY										
4								Vx	4							
6					CL				6							
8									8							
						SILTY, LIGHT BROWN	UF									
10									10							
12									12							
14		P					F	FEW ICE CRYSTALS IN SAMPLE	14							
16									16							
18						MED. BROWN			18							
20									20							
22					CL				22							
						BROWN										
24		P				END OF HOLE @ 25'			24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

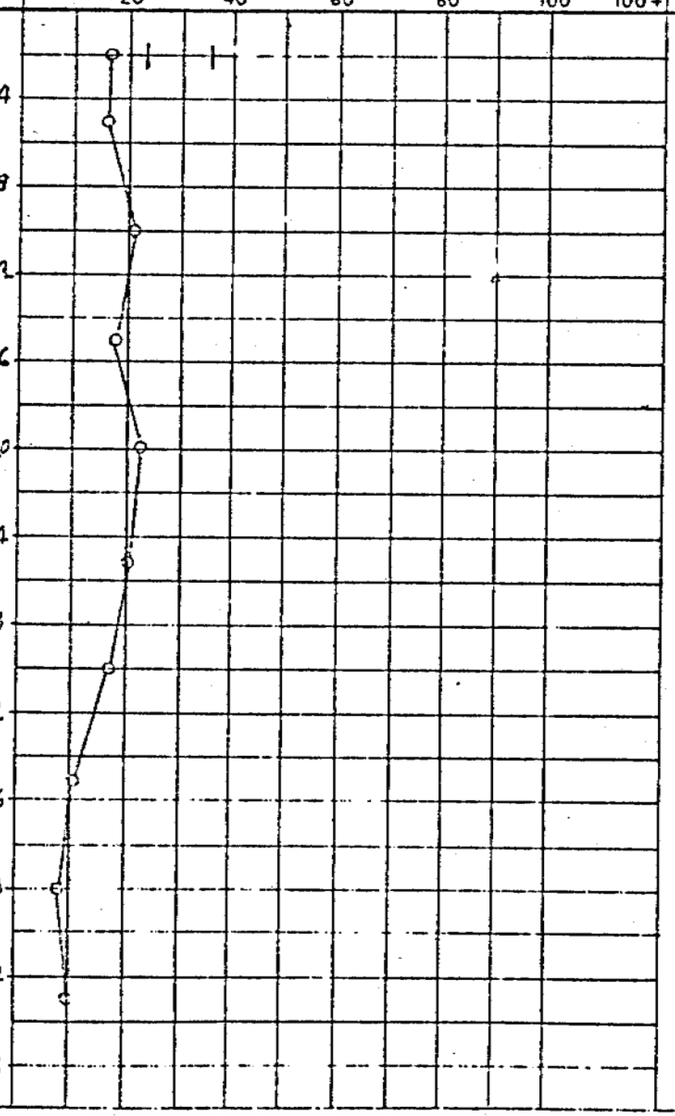
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG C.W.M.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1203+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE GOOD S & N	VEGETATION: ASPEN	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
514	C	307 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" SANDY ORGANIC									
					ML	SILT									
4					CL	CLAY									
						SILTY									
8		P			CL	SILTY							115.9	95.4	
12															
					CL	SILTY									
16							F								
20		P			CL								125.0	102.3	
24					GC	PEBBLES									
28					GC	PEBBLES	F	Vr.							
32					GC	GRAVEL		Vr.							
36					GC	TILL		Vr							
40					GC		F	Vr.							
44						END HOLE @ 45'									
48															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

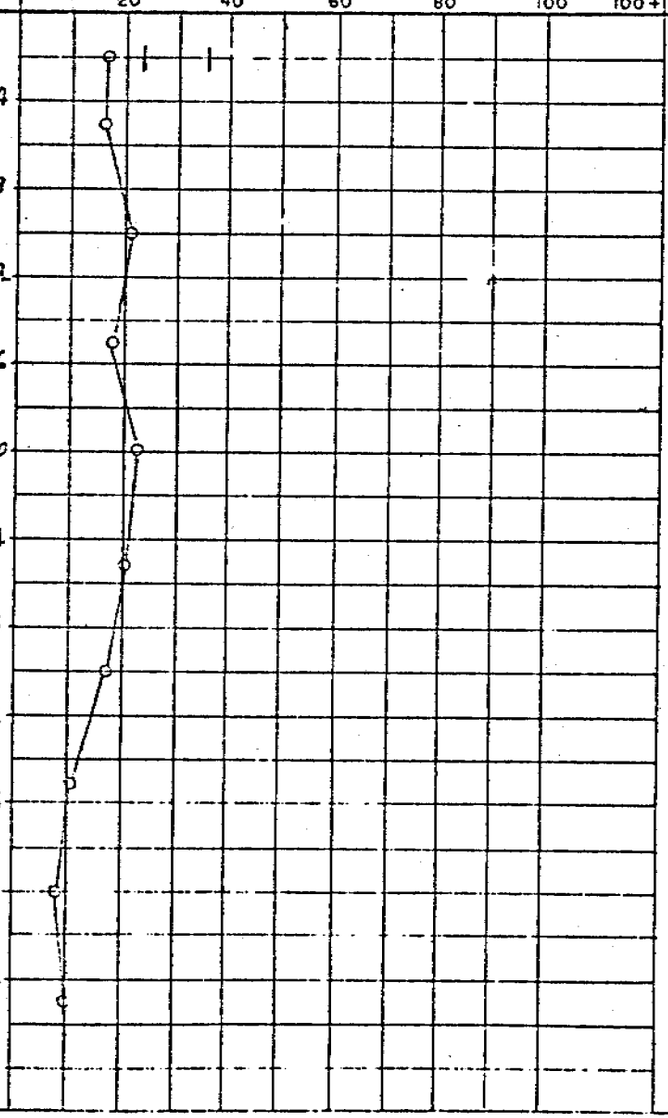
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD S & N	VEGETATION: ASPEN	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
514	C	307 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" SANDY ORGANIC									
					ML	SILT									
4					CL	CLAY									
						SILTY									
8		P			CL	SILTY							115.9	95.4	
12															
					CL	SILTY									
16							F								
20		P			CL								125.0	102.3	
24					GC	PEBBLES									
28					GC	PEBBLES	F	Vr.							
32					GC	GRAVEL		Vr.							
36					GC	TILL		Vr							
40															
44					GC		F	Vr.							
48						END HOLE @ 45'									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

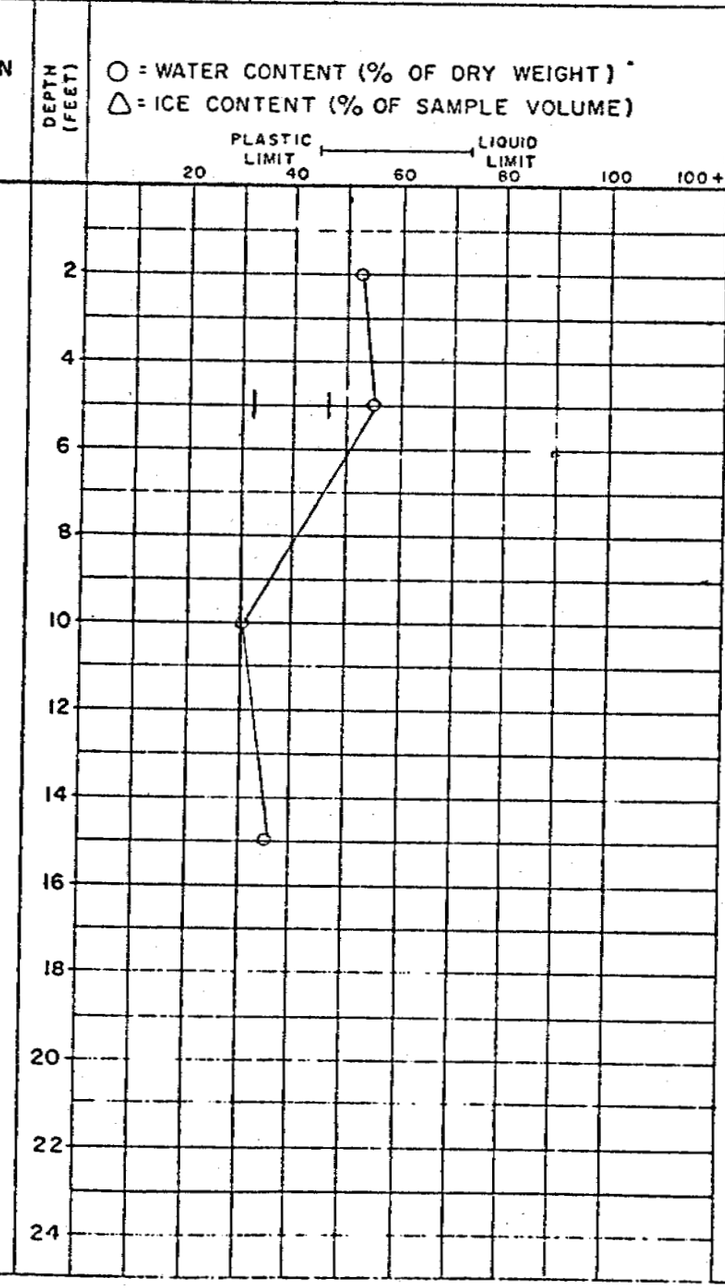
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S	FIELD ENG D R	DATE DRILLED 3/2/73	AIRPHOTO NO:	CHAINAGE: 1213+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR - SOUTH	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
514	C	433 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						4" MOSS		
2					CL	CLAY MED. BROWN		
4					C.L.		F	
6								
8								Vr
10					C.L.			
12								
14		P			C.L		F	Vr
16								
18						END OF HOLE		
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

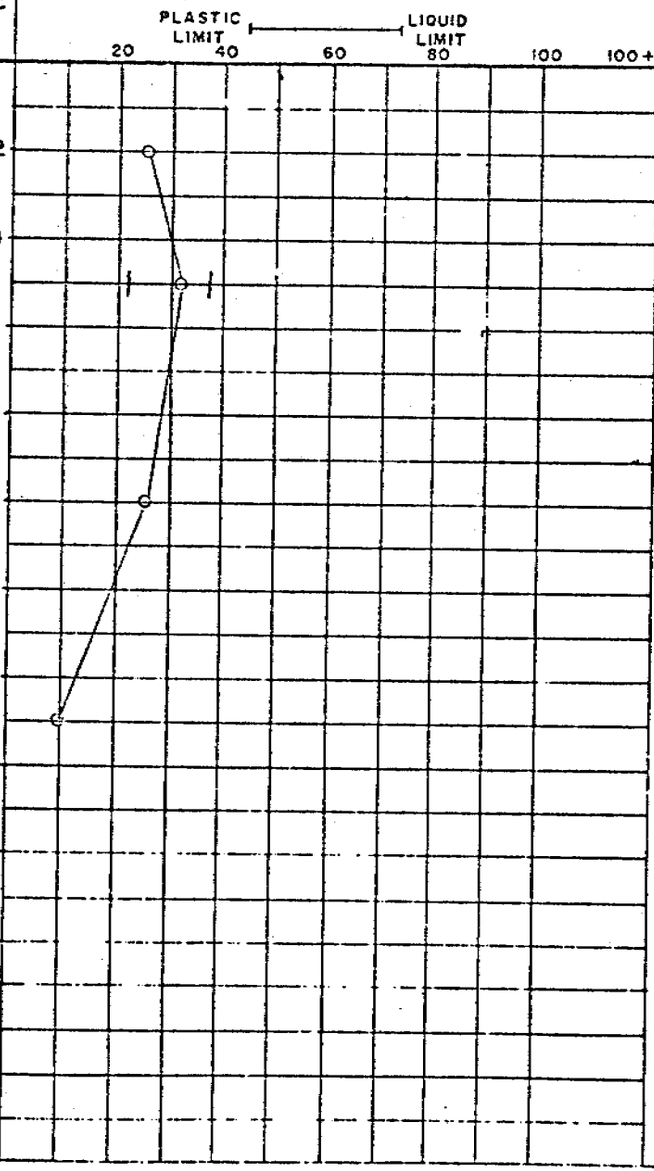
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG D.R.	DATE DRILLED 3/2/72	AIRPHOTO NO:	CHAINAGE: 1225+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE Good South	VEGETATION: 30' SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
514	C	434B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC & SILT										
2		▨			C.L	CLAY MED. BROWN	F	Vr.								
4		▨			C.L											
6																
8																
10		▨			C.L	MED. BROWN & PEBBLES										
12							F	Vr.								
14		▨			G.C	TILL										
16																
18						END OF HOLE										
20																
22																
24																

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

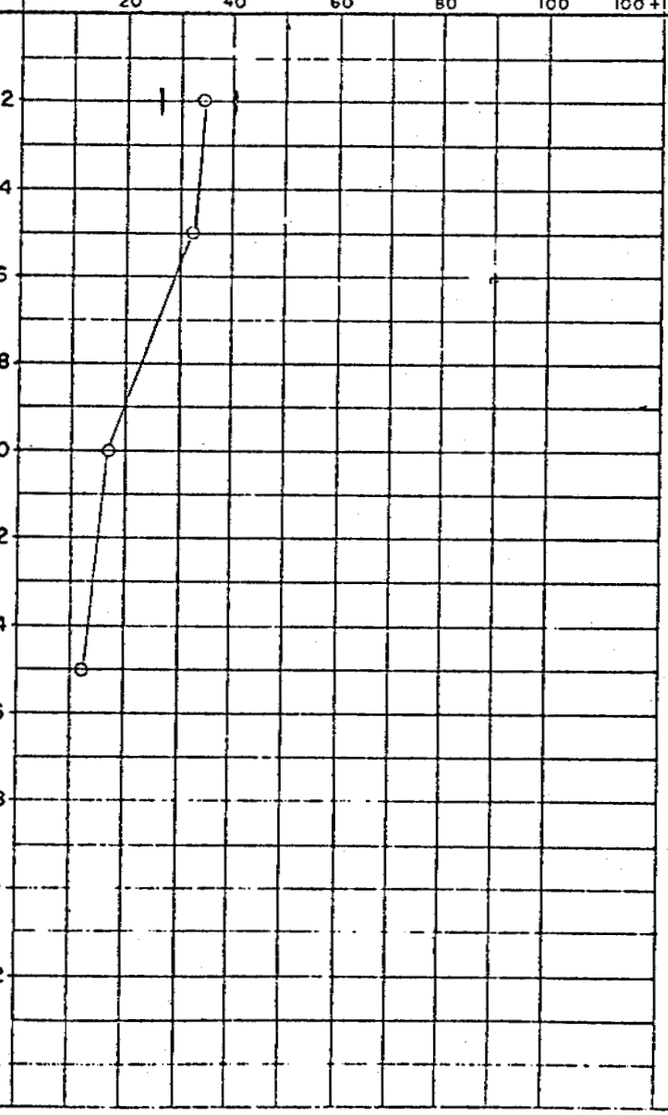
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG. B.W.M.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1231+00	OFFSET: S
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 30' SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
514	C	308A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						4" ORGANIC									
2					CL	CLAY SILT									
4					CL		F	Vr.							
6															
8															
10		P			GC	PEBBLES		Vr.					125.9	107.6	
12															
14					GC	PEBBLES	F	Vr.							
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

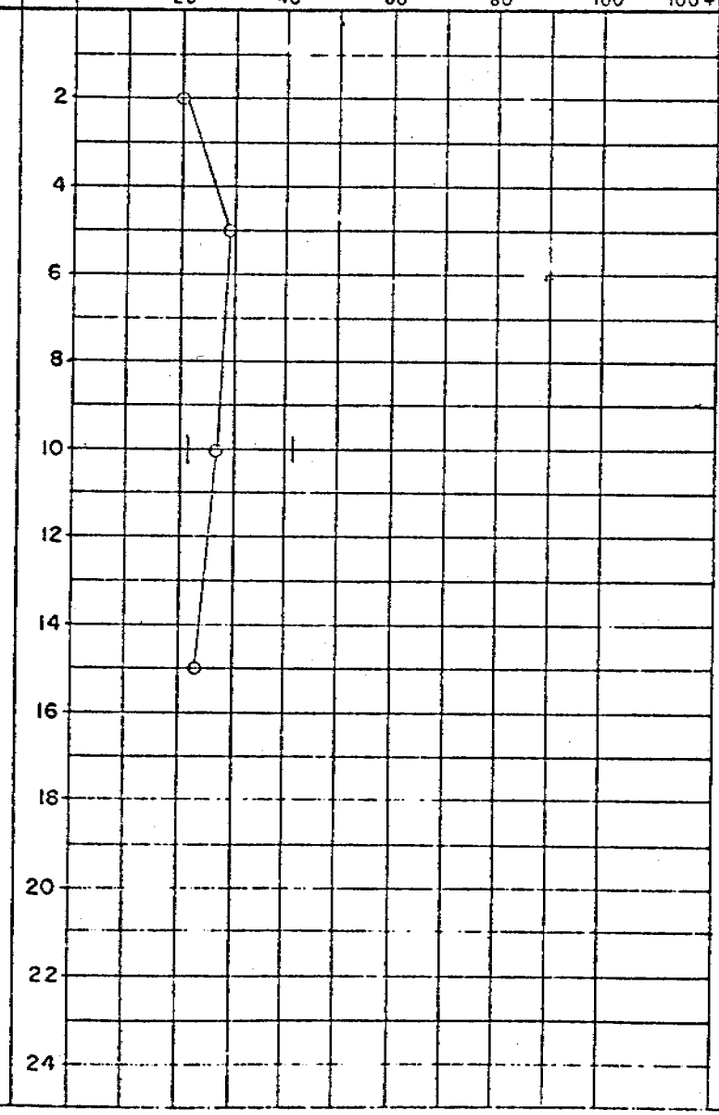
DWN R.S	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1240+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: POP. & SCRUB SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
514	C	309A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" ORGANIC									
2					CL	CLAY LIGHT BROWN, SILT	F	Vr							
4		P			CL								112.2	87.0	
6															
8															
10		P			CL								122.4	97.2	
12															
14		P			CL		F	Vr.					120.1	97.9	
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

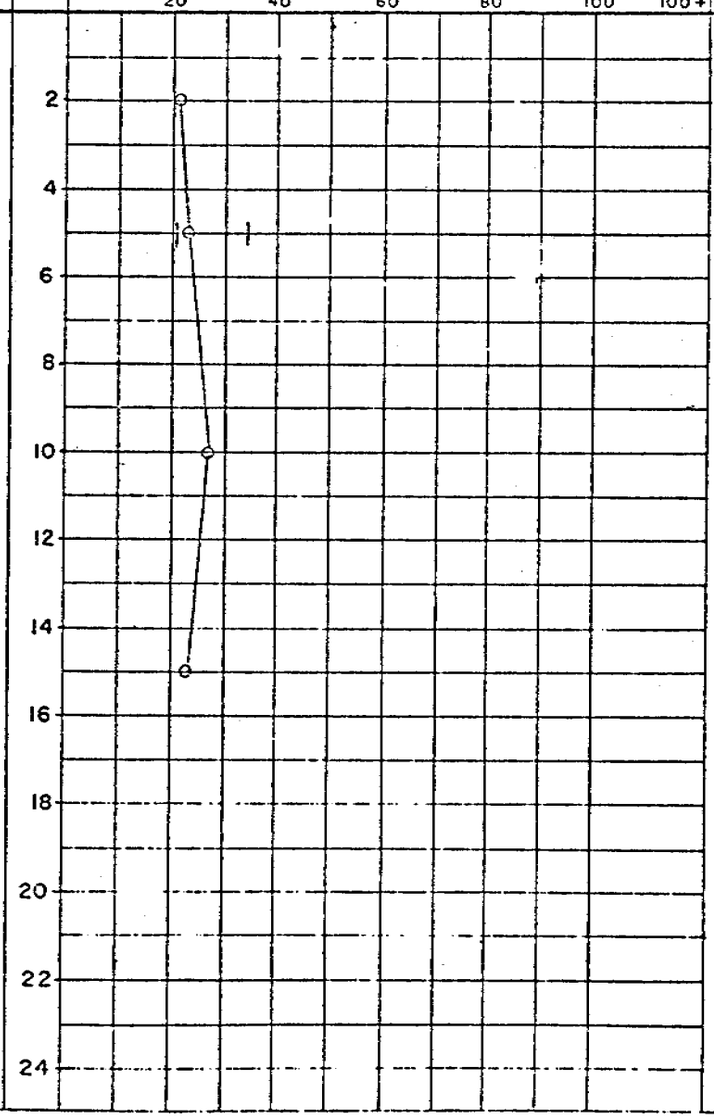


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1253+00	OFFSET: ℄
CKD	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SCRUB SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
515	C	310A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" MOSS									
2					CL	CLAY LIGHT BROWN	F	Vr.							
4		P			CL			Vr.					116.6	94.7	
6															
8															
10		P			C.L			Vr.					118.1	93.0	
12															
14		P			C.L		F	Vr.					117.9	96.3	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

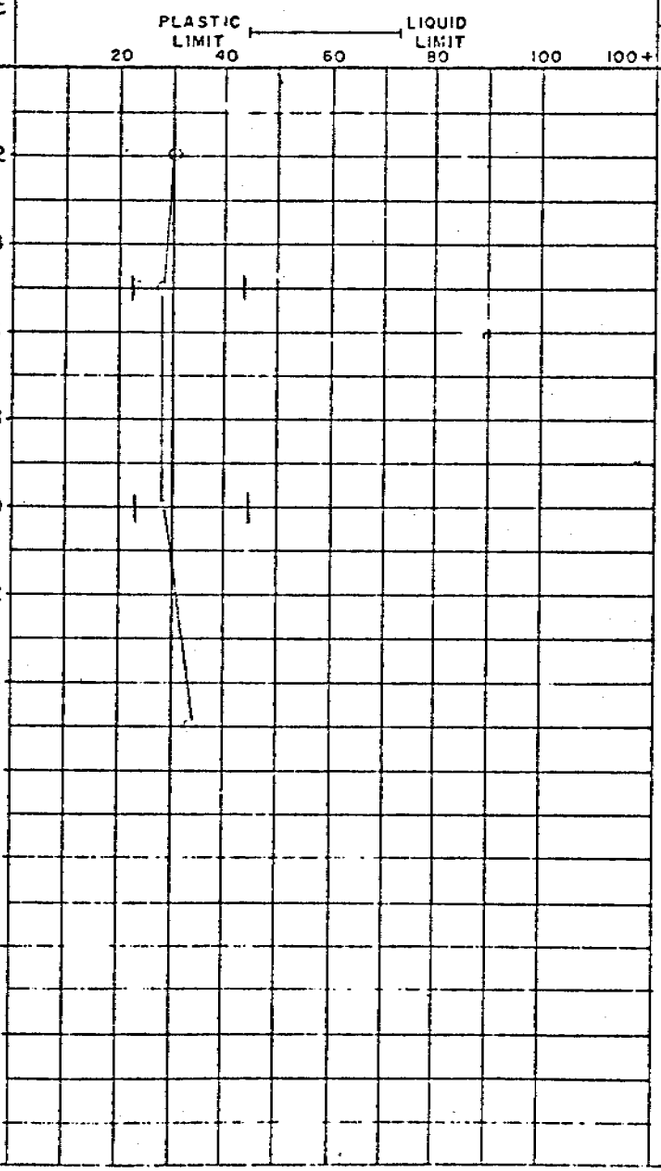
CAN R S	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1262+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SCRUB SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
515	C	311A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG									
2				R	ML	CLAY LIGHT BROWN									
4		P			CL		F	Vr. 1/4"					117.0	90.7	
6															
8															
10		P			CL			Vr.					115.2	89.4	
12															
14		P			CL		F	Vr.					118.2	88.7	
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

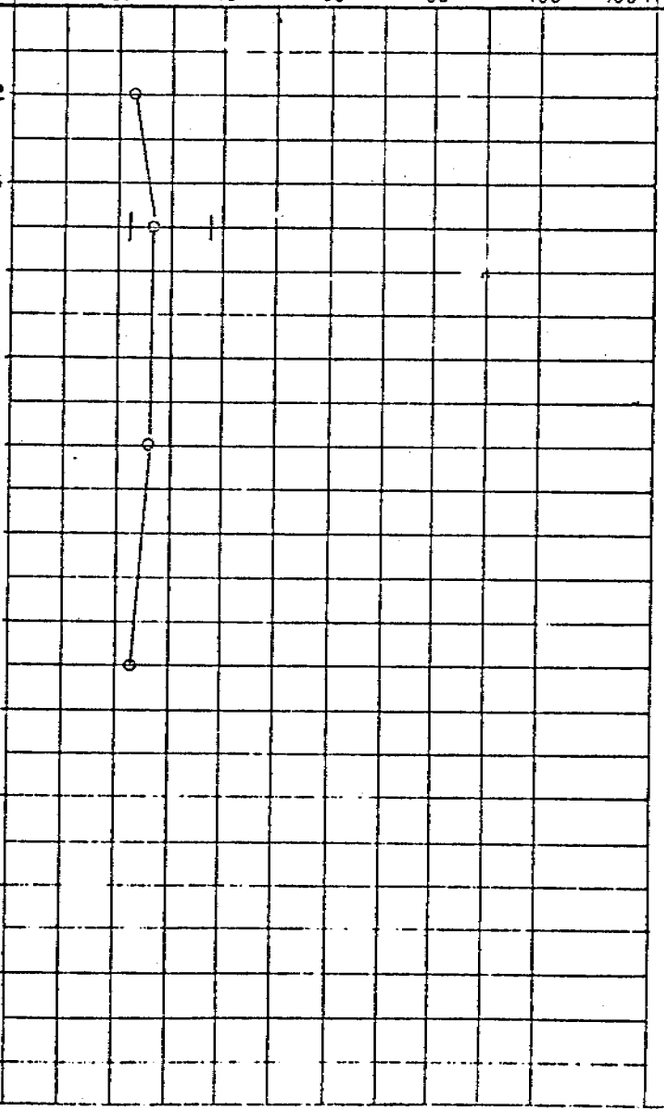
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1281+00	OFFSET: ℄
CKD	TECH	RIG AIR	SURFACE DRAINAGE GOOD	VEGETATION: 70' SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
515	C	314 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						CLAY									
						LIGHT BROWN, SILT									
4		P					F	Vr.					122.9	96.8	
6															
8															
10		P						Vr.					124.2	98.3	
12															
14		P					F	Vr					127.3	103.3	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

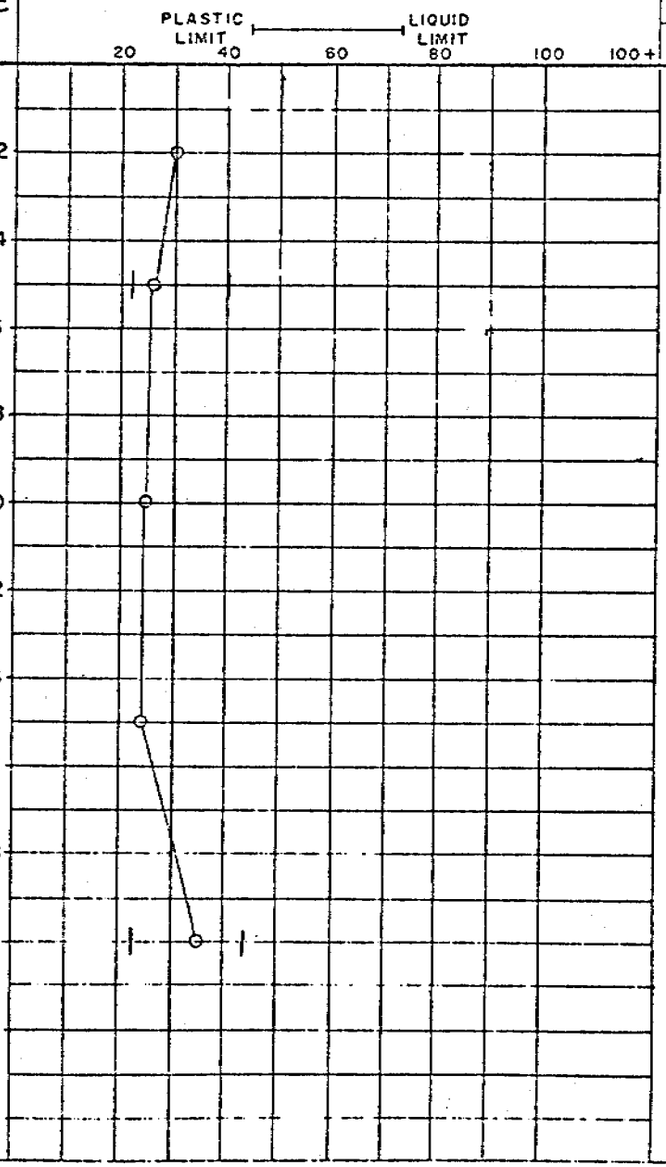
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1284+30	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20'-40' SPRUCE	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
515	C	313A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2		P			CL	CLAY LIGHT BROWN	F	Vr.							
4		P			CL			Vr.					116.5	92.1	
6															
8															
10		P			CL			Vr.					119.5	95.9	
12															
14		P			CL			Vr. 1/4"					119.5	96.4	
16															
18															
20		P			CL			Vr. 1/4" (MANY)					117.7	57.5	
22						END OF HOLE									
24															

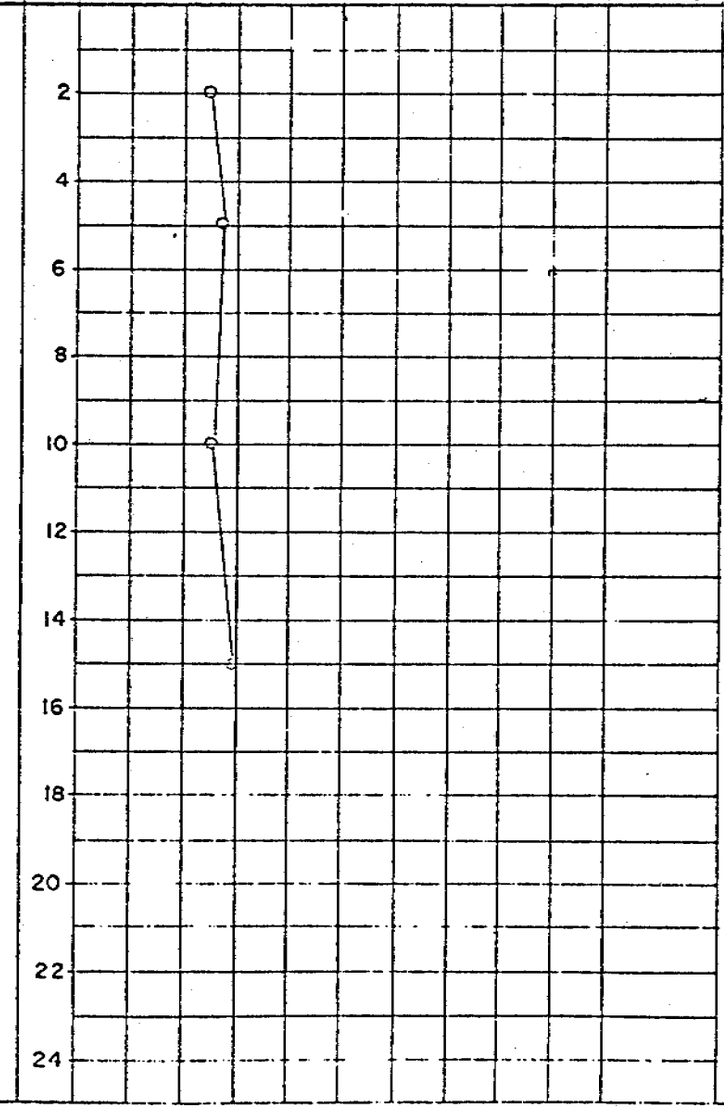
○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1290+00	OFFSET: ℄	TEST HOLE
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SCRUB SPRUCE	ELEV	MILE: 515 / B,C,S: C / NUMBER: 312A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" MOSS									
2						SILT LIGHT, BROWN, CLAY	F								
4		P					UF								
6						SOFT, WET									
8						CLAY DARK BROWN	F	Vr.							
10		P											125.3	99.8	
12															
14		P											121.1	93.4	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

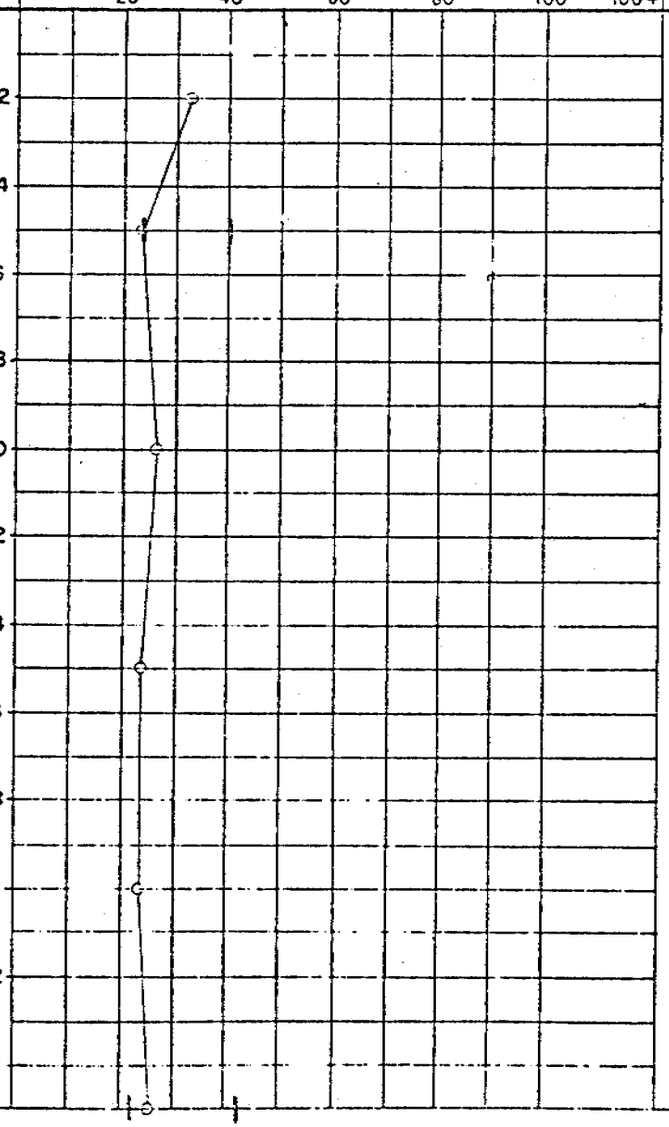
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 4/2/73	AIRPHOTO NO:	CHAINAGE: 1308+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 10'-30' SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
516	C	315A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" MOSS									
2					CL	CLAY									
						LIGHT BROWN, SILT	UF								
4		P			CL								127.3	103.4	
6															
8															
10		P			CL										
12															
14		P			CL		UF						126.5	102.1	
16															
18							F	Vr							
20		P			CL	BROWN							129.0	105.7	
22															
						END HOLE @ 25'									
24		P			CL			Vr					123.6	97.5	



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

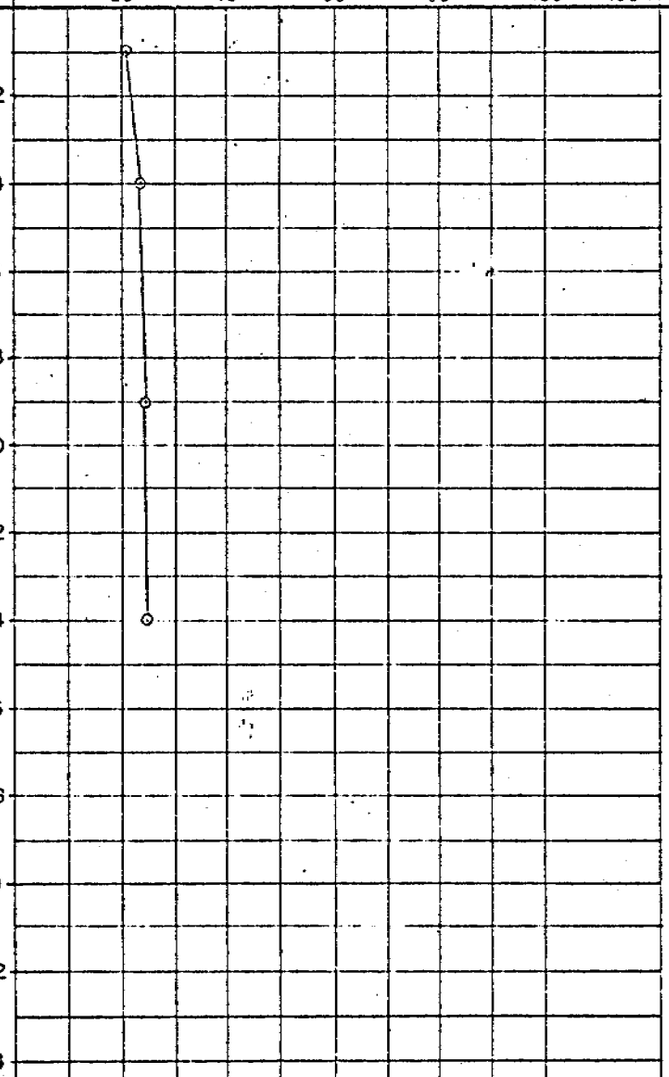
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAT: JEW	FIELD ENG: B.M	DATE DRILLED: 5/2/73	AIRPHOTO NO:	CHAINAGE: 1315+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SCRUB SPRUCE 10'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
516	C	449 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG GRANULAR SAND LIGHT BROWN	F									
2					CL	CLAY		ICE BARELY VISIBLE, WELL BONDED Vr	2							PENETRATION EASY
4		P					UF		4							
6						SANDY, SOFT			6							
8									8							
10		P							10							
12									12							
14		P			CL				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

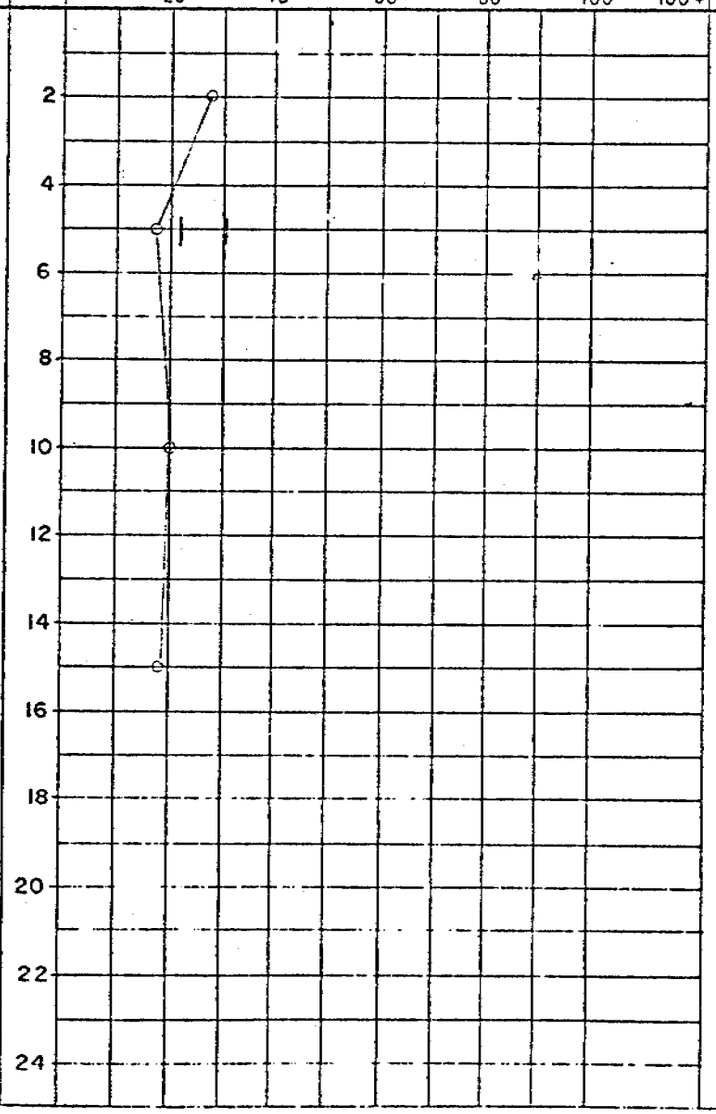
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG R.D.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1330+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
516	C	450B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					SM	GRAN. MUSKEG SAND DRY, PEBBLES, SILT	F								
4		P			CL	CLAY SILTY, MOIST	UF								WELL-BONDED
6															
8															
10		P			CL										
12															
14		P			CL										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

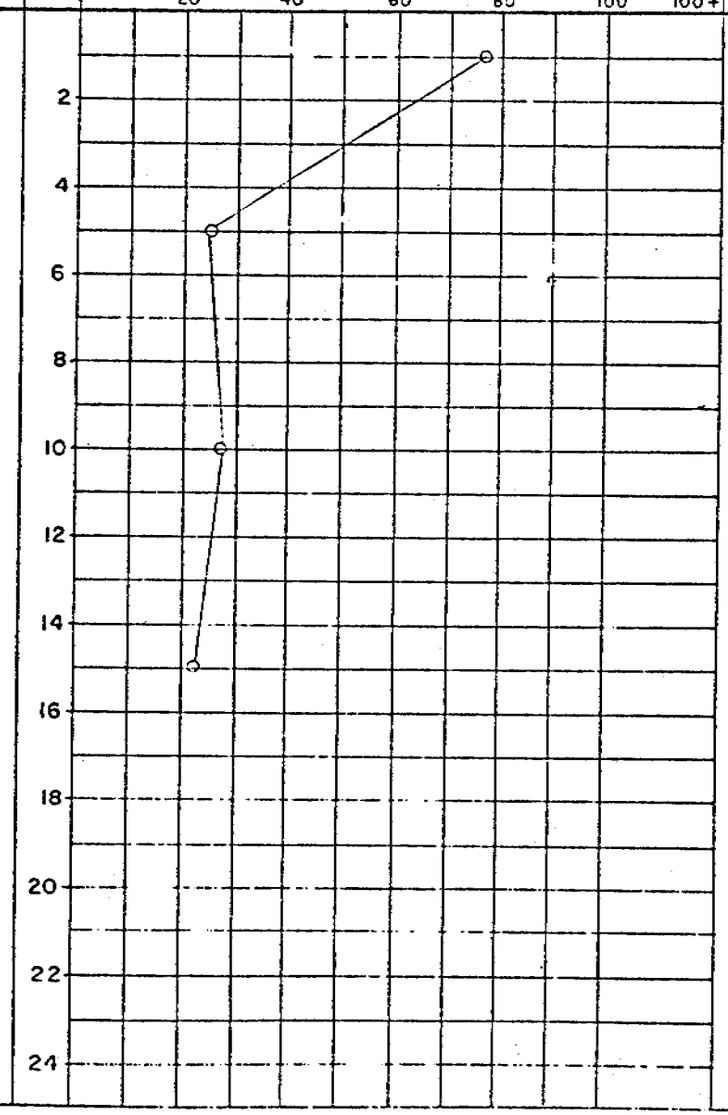
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.D.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1340+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 25' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
516	C	451B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						3" GRAN. MUSKEG			
2				F-ML		SAND SILTY	F		
4		P			C.L	CLAY			WELL-BONDED
6							UF		
8									
10		P			C L		F	Vr.	PEN. FIRM
12									
14		P			C.L			Vr.	PEN. FIRM.
16									
18						END OF HOLE			
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

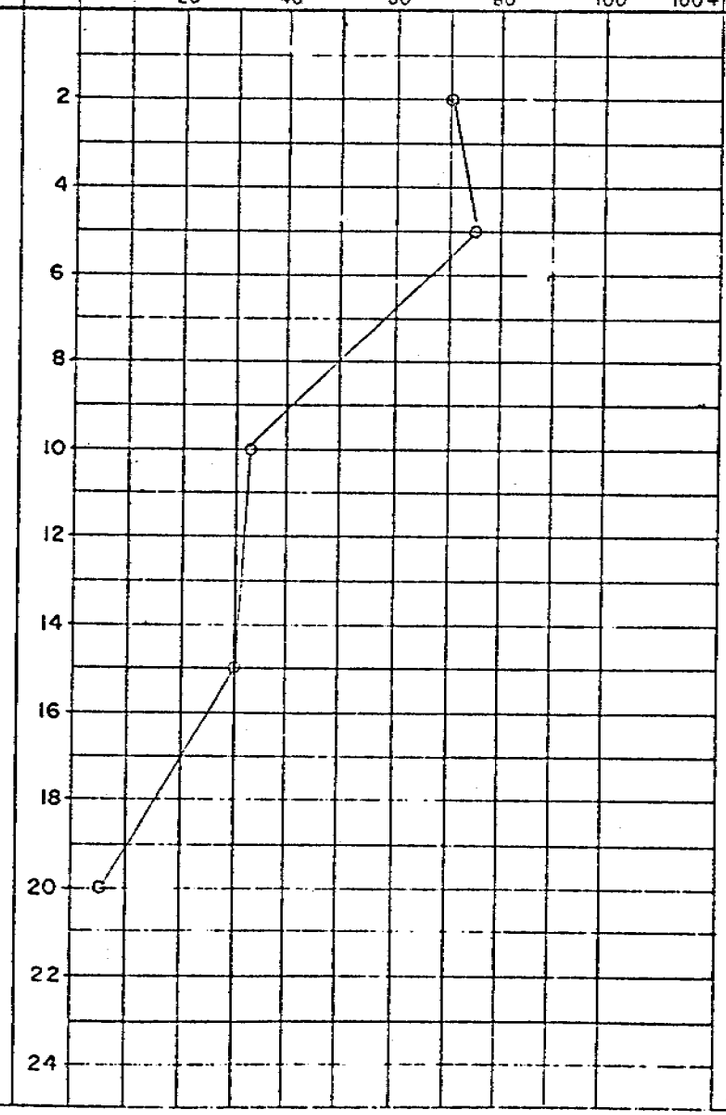
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1343+70	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: CULVERT	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
516	C	316A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC									
2					Pt-ML	SILT									
4					Pt-CL	CLAY & ROOTS	F								
6															
8															
10					CL	CLAY	F	Vr.							
12															
14					CL	CLAY & PEBBLES									
16															
18															
20					GC	CLAY & GRAVEL	F	Vr.							
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

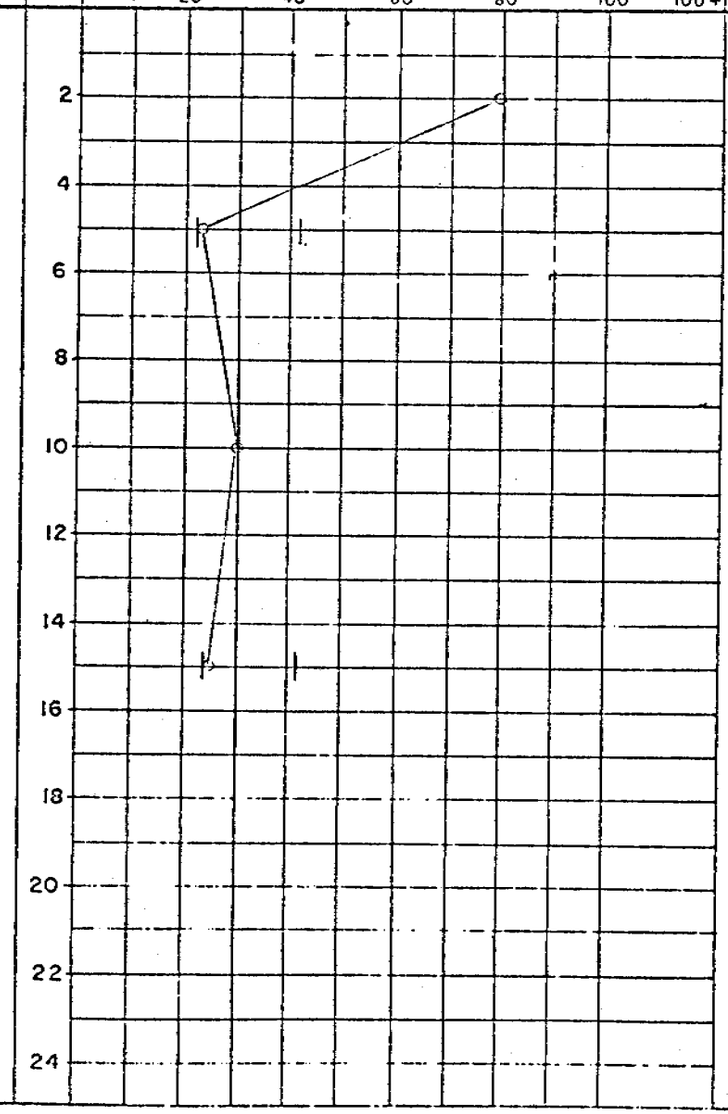
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1350+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR - NORTH	VEGETATION: 15' SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
516	C	317 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC									
2				P	CL	SILT									
						CLAY									
4					CL		F	Vr.							
6															
8															
10		P			CL		F	Vr.					121.1	93.2	
12															
14		P			CL		F	Vr.					125.2	101.1	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

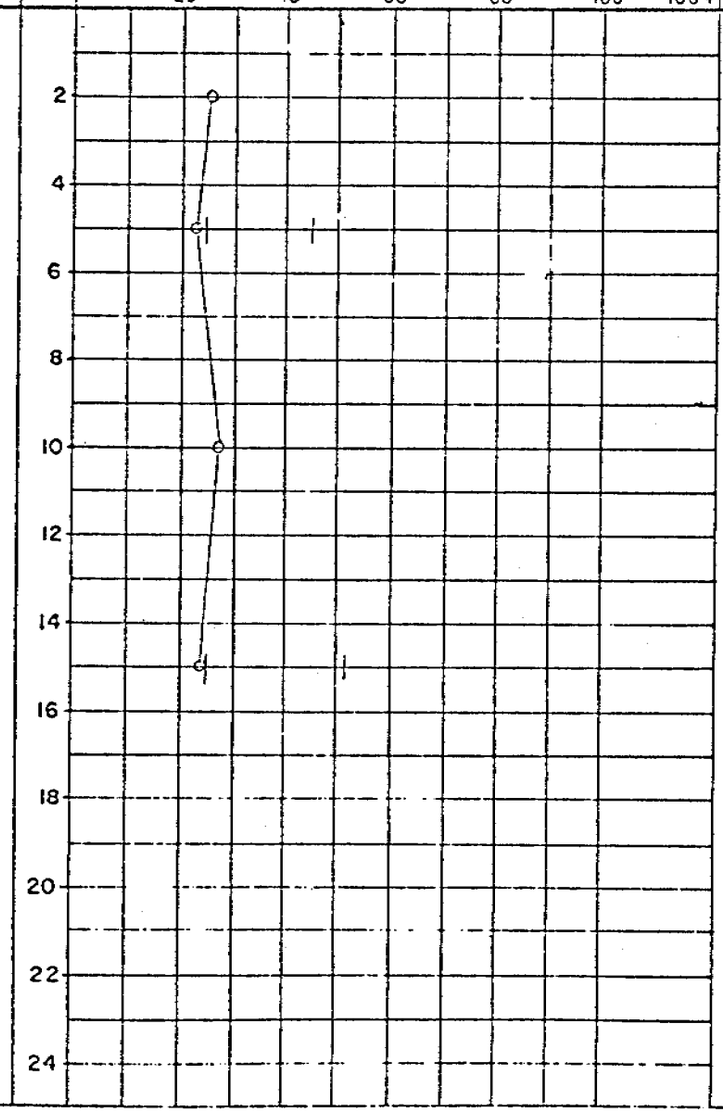
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R. S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1360+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - NORTH	VEGETATION: 25' SPRUCE	ELEV:

TEST HOLE

MILE	B.C.S	NUMBER
517	C	8A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" ORGANIC									
2					CL	CLAY									
							F								
4					CL										
6															
8															
10		P			CL			Vr.					118.9	93.4	
12															
14		P			CL		F	Vr.					120.3	96.7	
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

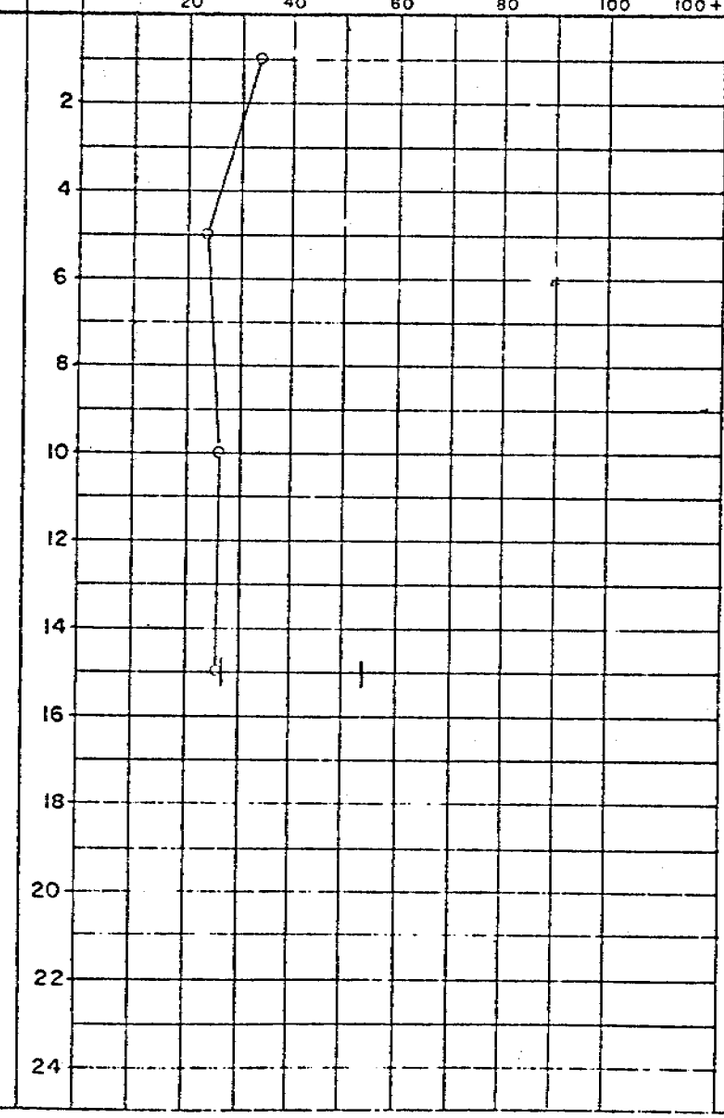
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R S	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1370+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 25' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
517	C	319A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						4" ORGANIC									
2					CL	CLAY SILTY	F								
4					CL										
6															
8															
10		P			CL			Vr.					120.6	95.2	
12															
14		P			CL		F	Vr.					122.5	98.4	
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

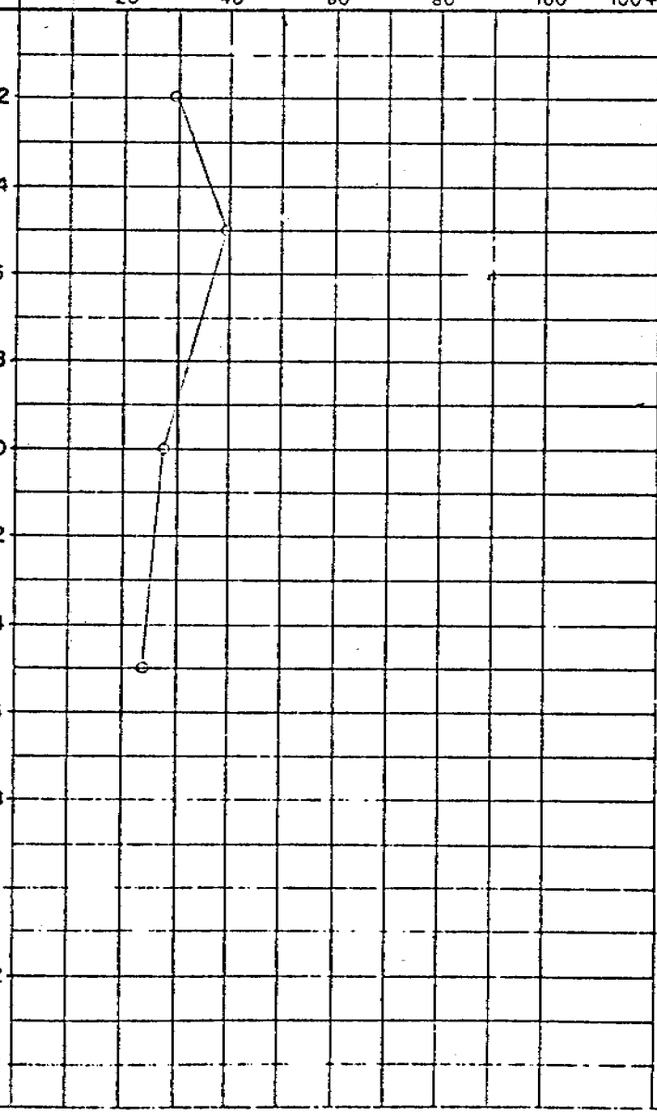
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG D.R.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1390+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR – NORTH	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
517	C	455B

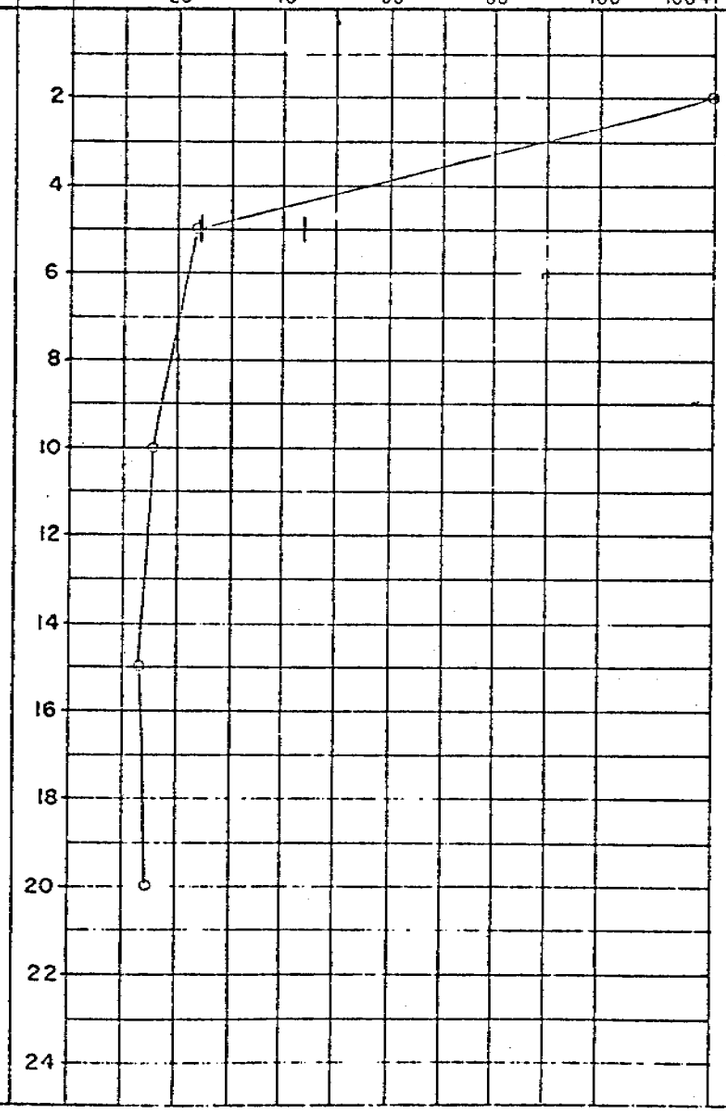
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" MOSS									
2					CL	CLAY MED. BROWN.									
4					CL		F	Vr.							
6															
8															
10					CL			Vr.							
12															
						SILT LIGHT BROWN									
14					CL	CLAY MED. BROWN	F	Vr.							
16															
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R.S	FIELD ENG R.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 138+00	OFFSET: ℄	TEST HOLE
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: CULVERT	VEGETATION: 30' SPRUCE	ELEV:	MILE 517 / B,C,S C / NUMBER 320A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
						6" ORGANIC			
2					PT-ML	SILT	F		
4					CL	CLAY PEBBLES TO 20'	UF		
6									
8									
10					CL				
12									
14					CL				
16									
18									
20					CL		UF		
22						END HOLE @ 20'			
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

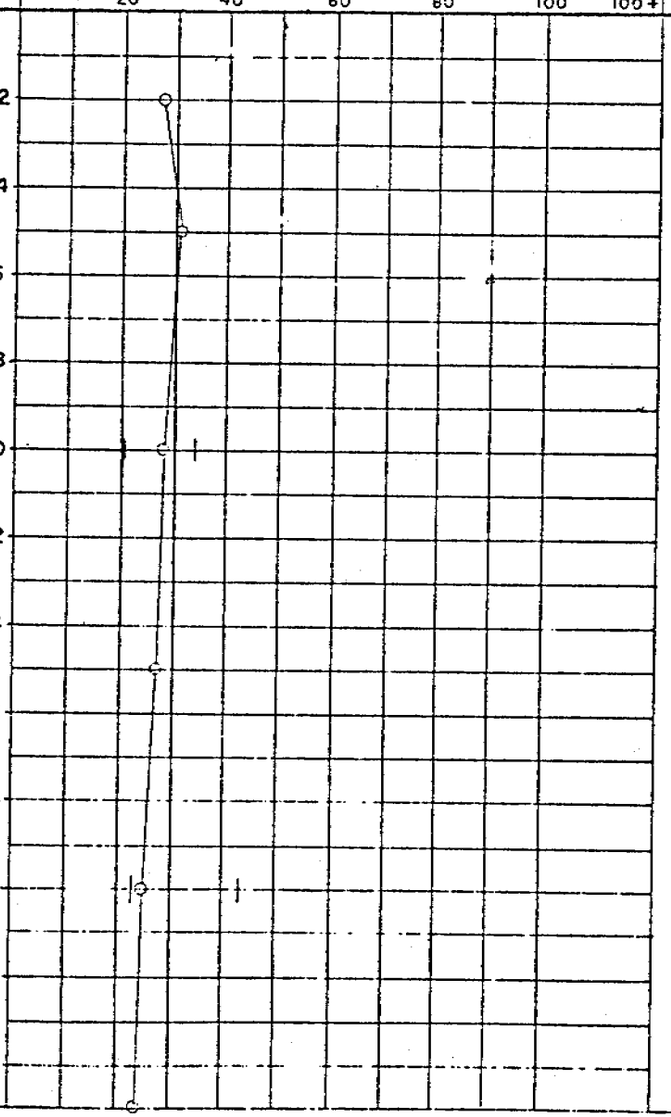
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1394+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - NORTH	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
517	C	321A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" ORGANIC									
2					CL	SILT	F								
4					CL	CLAY									
6															
8															
10					CL										
12															
14		P			CL		F	Vr.					123.2	97.1	
16															
18															
20		P			CL			Vr.					125.9	101.0	
22						END HOLE @ 25'									
24					CL		F	Vr.							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

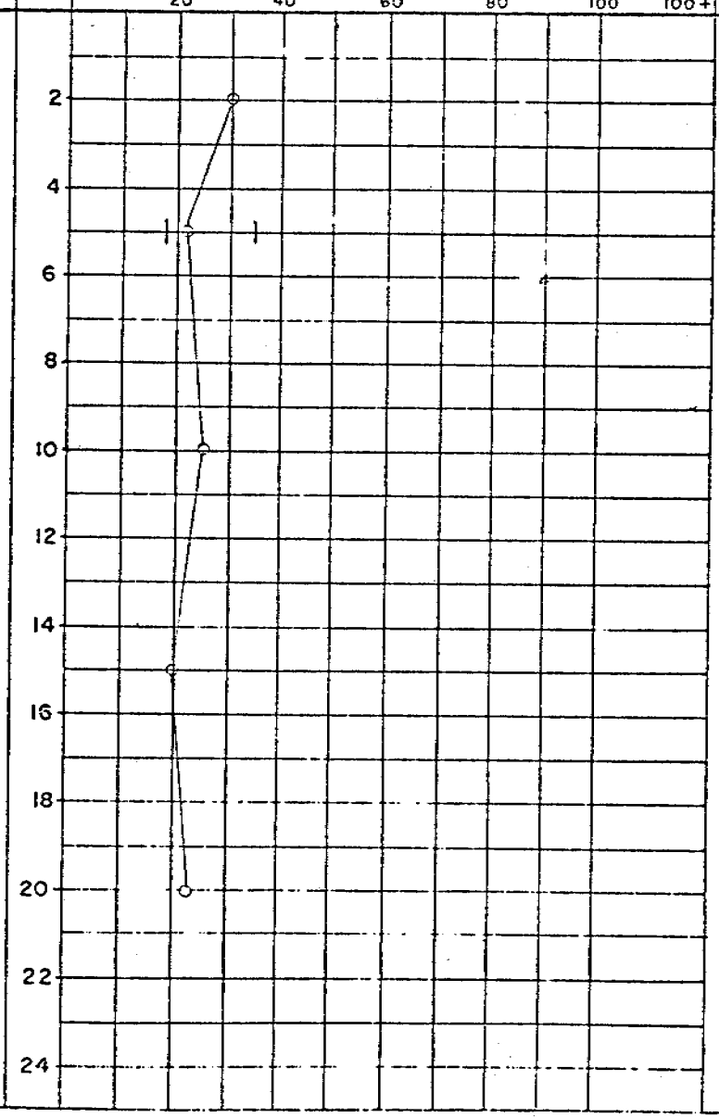
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1400+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: CULVERT	VEGETATION: 30' SPRUCE	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
517	C	322A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					CL	CLAY 2" ORGANIC SILTY									
4					CL	PEBBLES TO 20'	F	Vr.							
6															
8															
10		P			CL			Vr.					125.3	100.3	
12															
14		P			CL			Vr.					131.8	110.3	
16															
18															
20					CL		F	Vr.							
22						END HOLE @ 20'									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

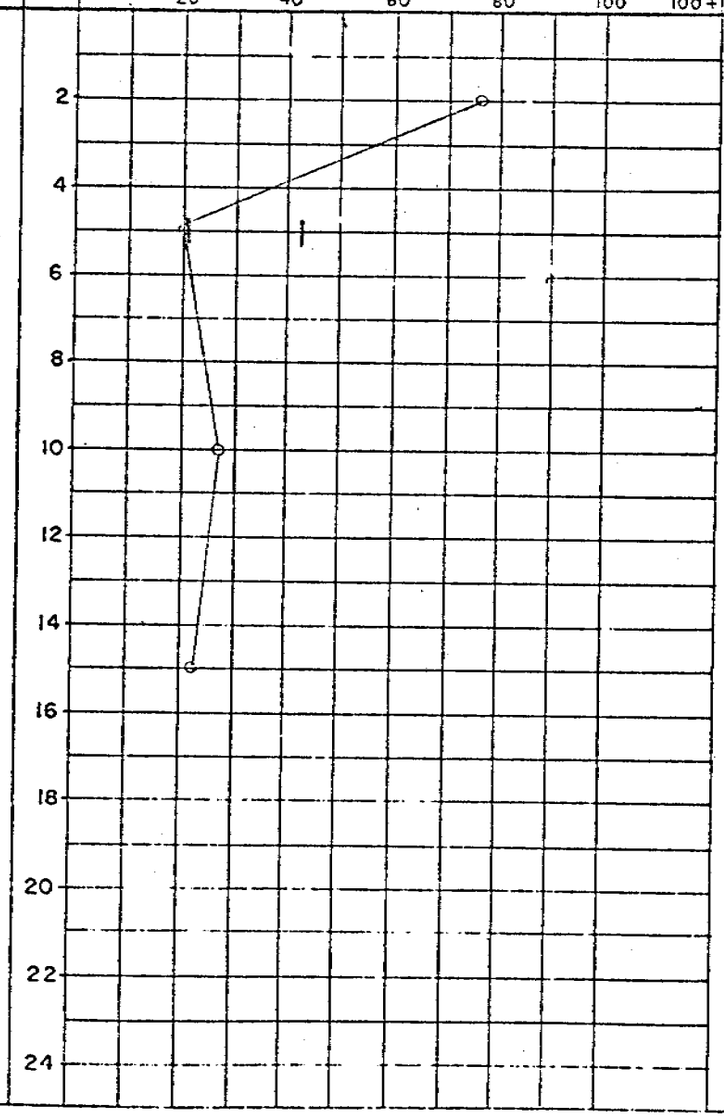
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN DS	FIELD ENG BWM	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1405+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
517	C	323A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						4" ORGANIC									
2					Pt-CL	SILT									
						CLAY	F								
4					CL			Vr.							
6															
8															
10		P			CL			Vr.					123.6	97.0	
12															
14		P			CL		F	Vr					124.9	101.6	
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

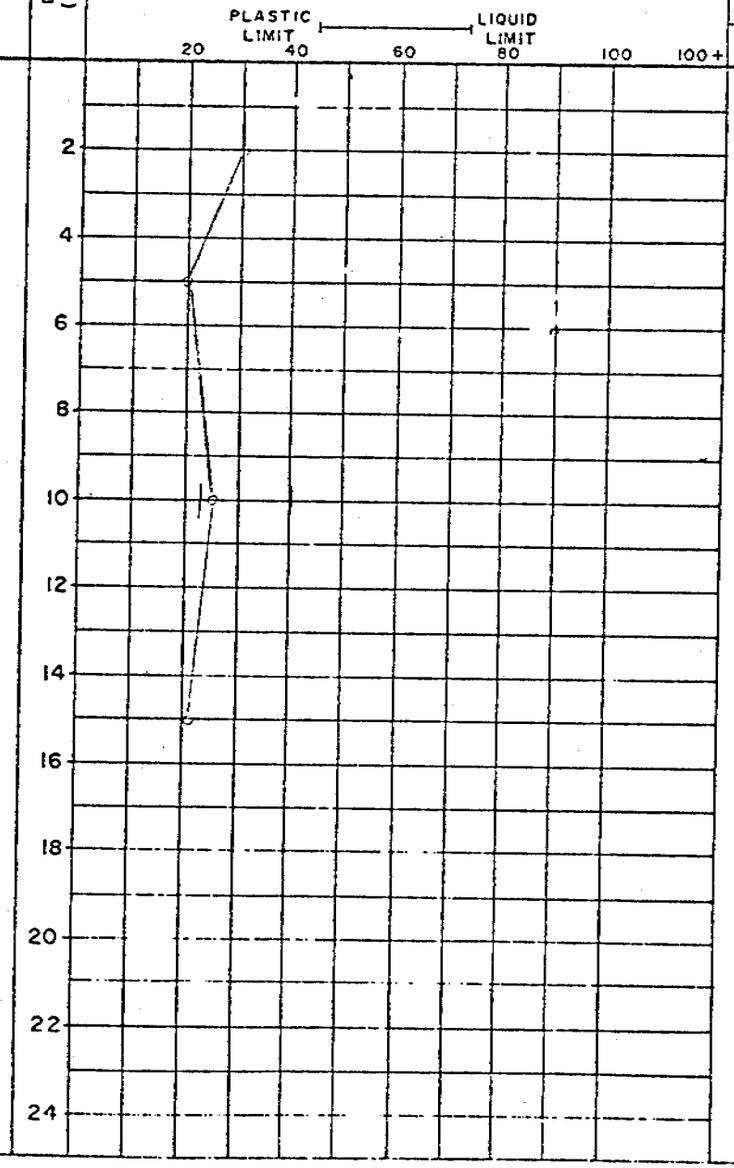
CAN R.S.	FIELD ENG B.W.M	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1423+00	OFFSET:
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 15' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
518	C	324A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						4" ORGANIC									
2					CL	CLAY SILTY	F								
4					CL										
6															
8															
10		P			CL			Vr.					122.3	98.5	
12															
14		P			CL		F	Vr.					126.3	104.5	
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

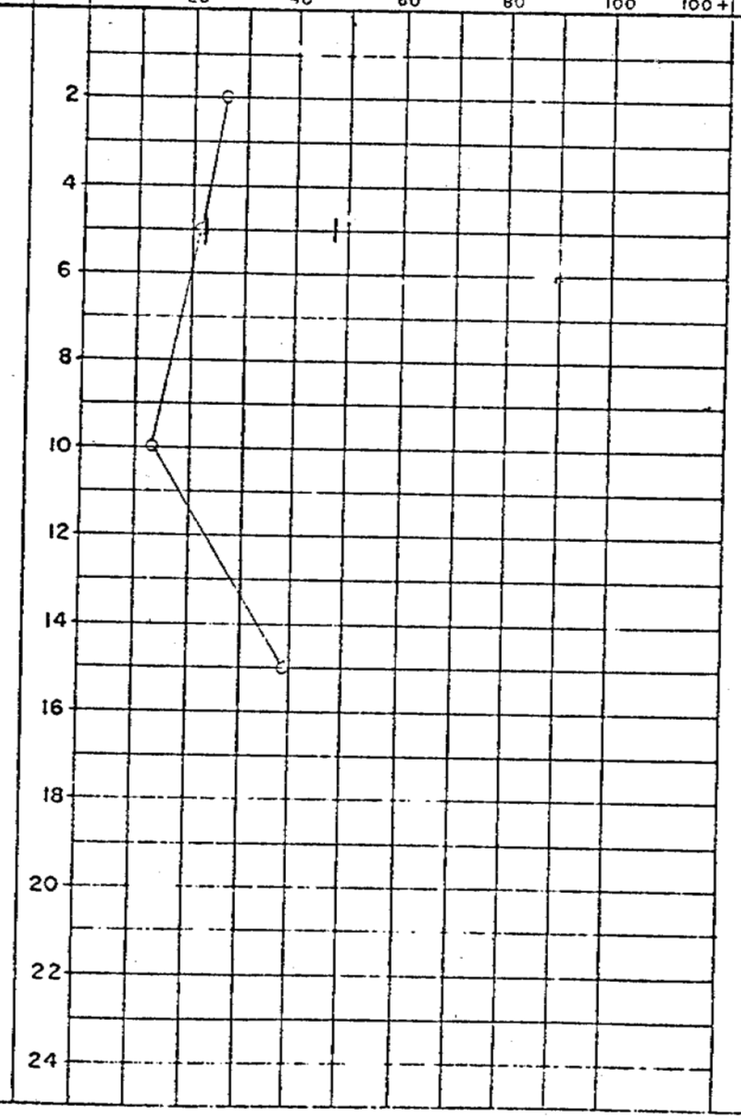
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG R.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1435+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - WEST	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
518	C	325A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						4" ORGANIC		
2					CL	CLAY SILTY	F	
						CLAY		
4					CL			Vr.
6								
8						TILL		
10					GC			Vr.
12								
14					GC		F	
16								
18						END OF HOLE		
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

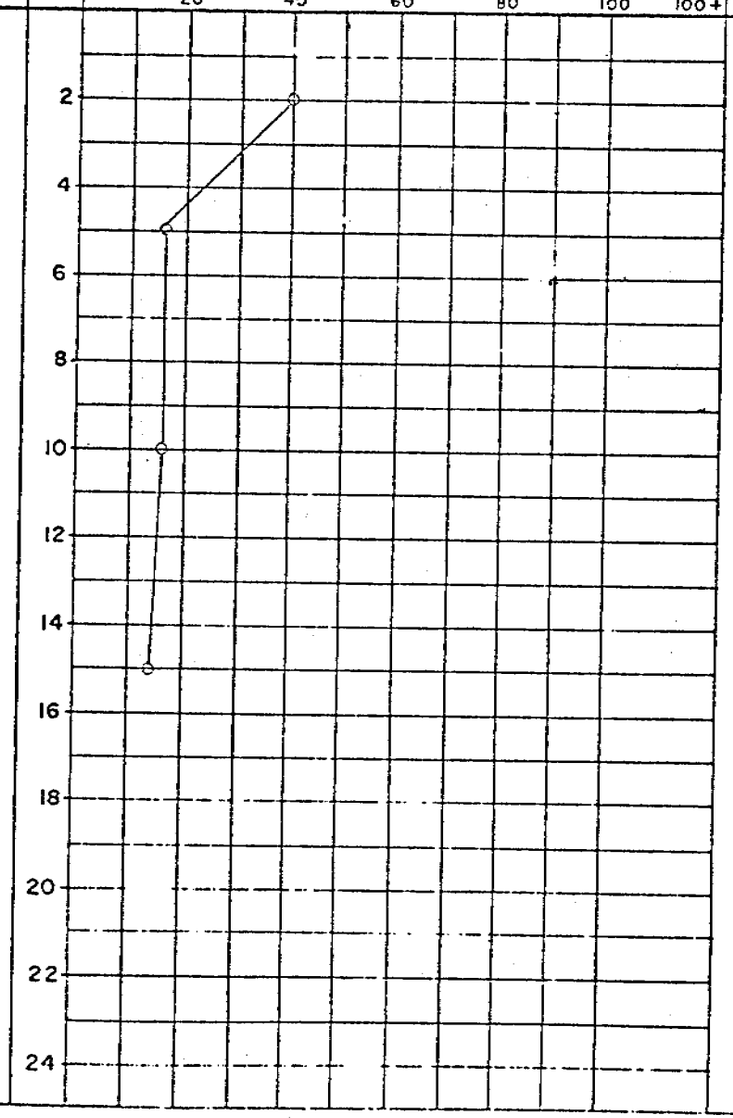
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R S	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1310+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR - WEST	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
518	C	326A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						4" ORGANIC		
2					Pt-ML	SILT	F	
						TILL	UF	
4					G.C.			
6								
8								
10					G.C.			
12								
14					G.C.		UF	
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

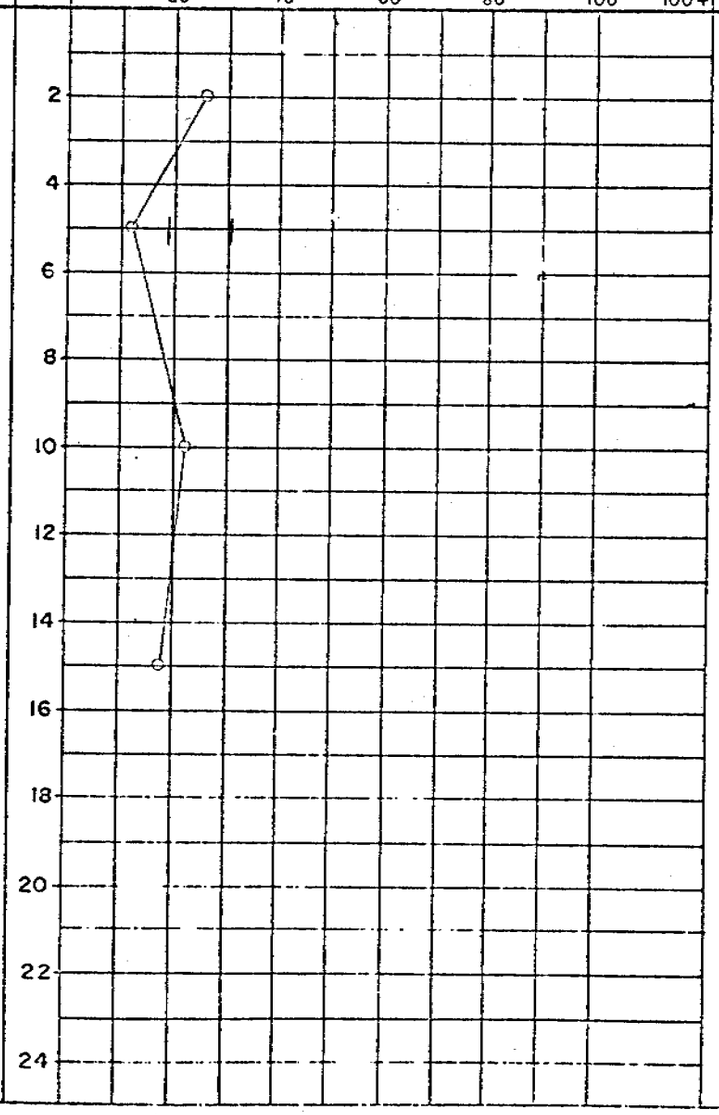
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG S.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1300+00	OFFSET:
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - WEST	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
519	C	327A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						4" ORGANIC		
2					CL	CLAY SANDY, SILTY	F	
4					G.C	TILL		
6								Vr.
8								
10		P			CL	CLAY & GRAVEL TO 15'		
12								
14					G.C		F	
16								
18						END OF HOLE		
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

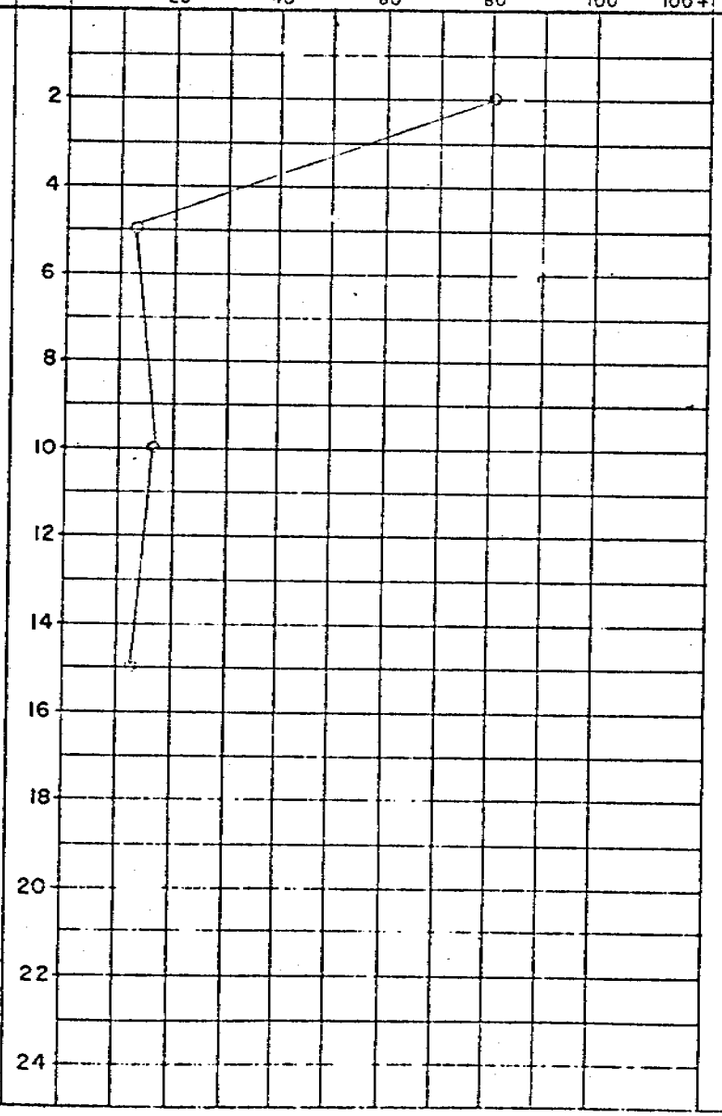
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R.S.	FIELD ENG B.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1290+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - WEST	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
519	C	328A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" ORGANIC									
2					Pt-ML	SILT	F								
						TILL									
4					G.C		UF								
6															
8															
10		P			G.C										
12															
14					G.C		UF								
16															
18						END OF HOLE									
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

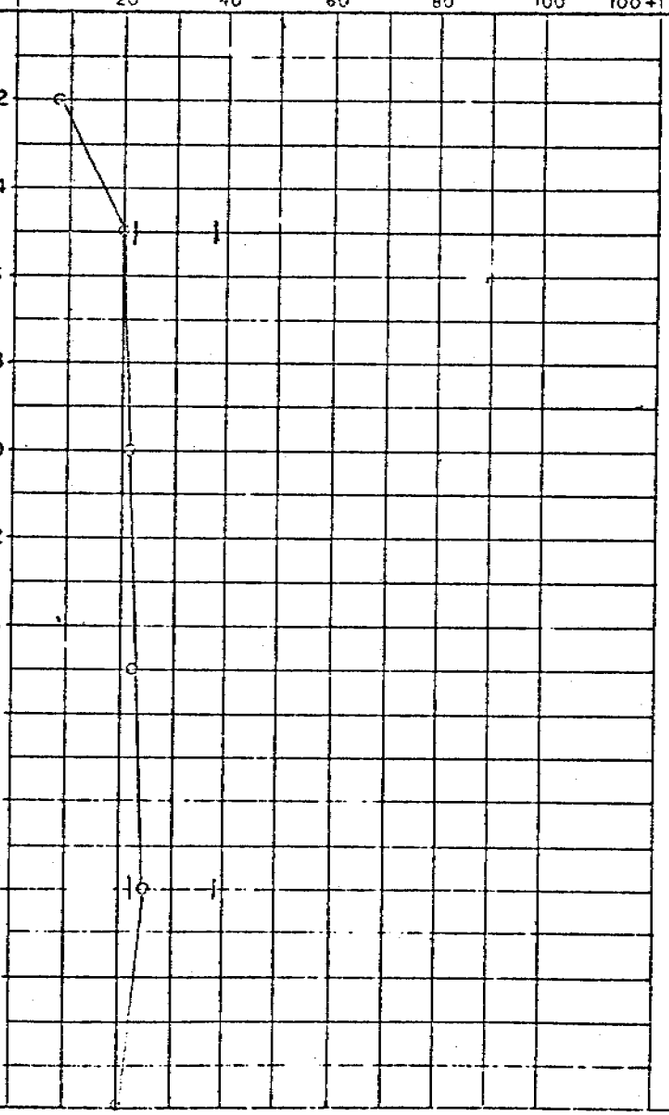
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN R.S	FIELD ENG R.W.M.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1280+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD - WEST	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
519	C	329A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					GM	SILT & GRAVEL	F								
4					G.C.	TILL		Vr.							
6															
8															
10					G.C			Vr.							
12						CLAY									
14		P			CL			Vr.					127.5	104.2	
16															
18															
20		P			CL			Vr.					125.8	101.4	
22						END HOLE @ 25	F								
24					G.C.			Vr.							

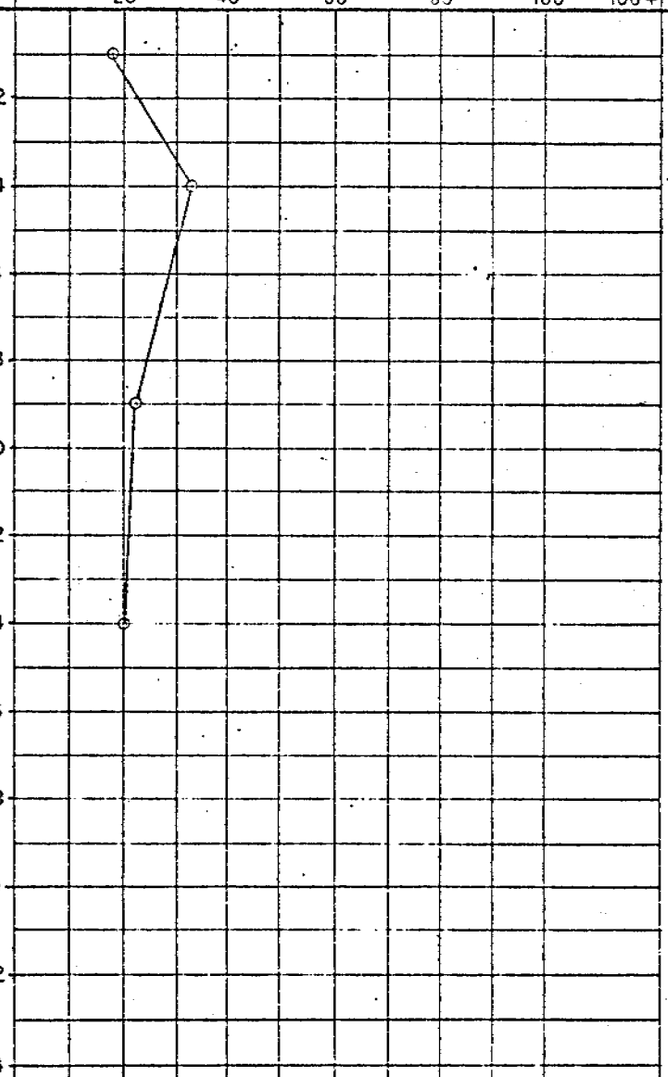


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: B.M.	DATE DRILLED: 5/2/73	AIRPHOTO NO:	CHAINAGE: 1270+00	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV	

MILE	B,C,S	NUMBER
519	C	330A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						ORGANIC									
2					GM	SILT SANDY, PEBBLES	F	Vh							
4					CL	CLAY									
6															
8															
10		P				TILL							128.1	104.7	
12															
14		P			CL	SAND		ICE CRYSTALS Vh					130.7	108.4	
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

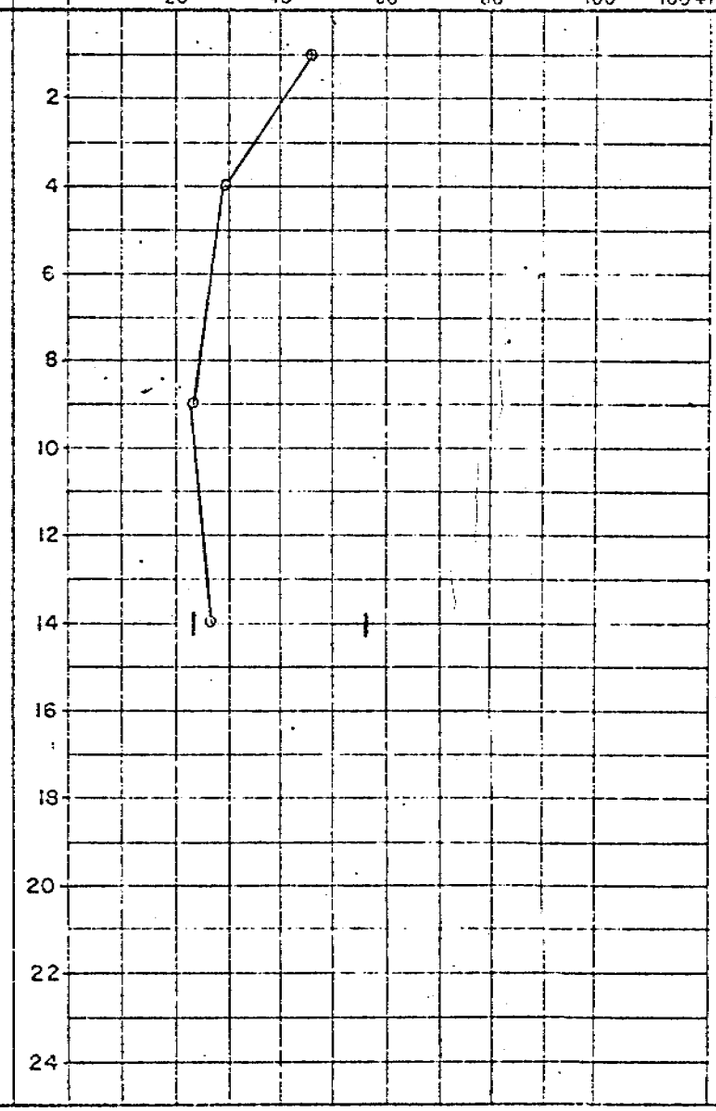
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DRAWN AEW	FIELD ENG BM	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1264+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:

TEST HOLE

MILE	S,C,S	NUMBER
519	C	331 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					SM	SILT 4" ORGANIC SANDY	F								
2–4															
4–6															
6–8					CL	CLAY FEW PEBBLES		Vr.							
8–10															
10–12															
12–14								ICE CRYSTALS							
14–16		P				END OF HOLE							121.9	95.6	
16–18															
18–20															
20–22															
22–24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

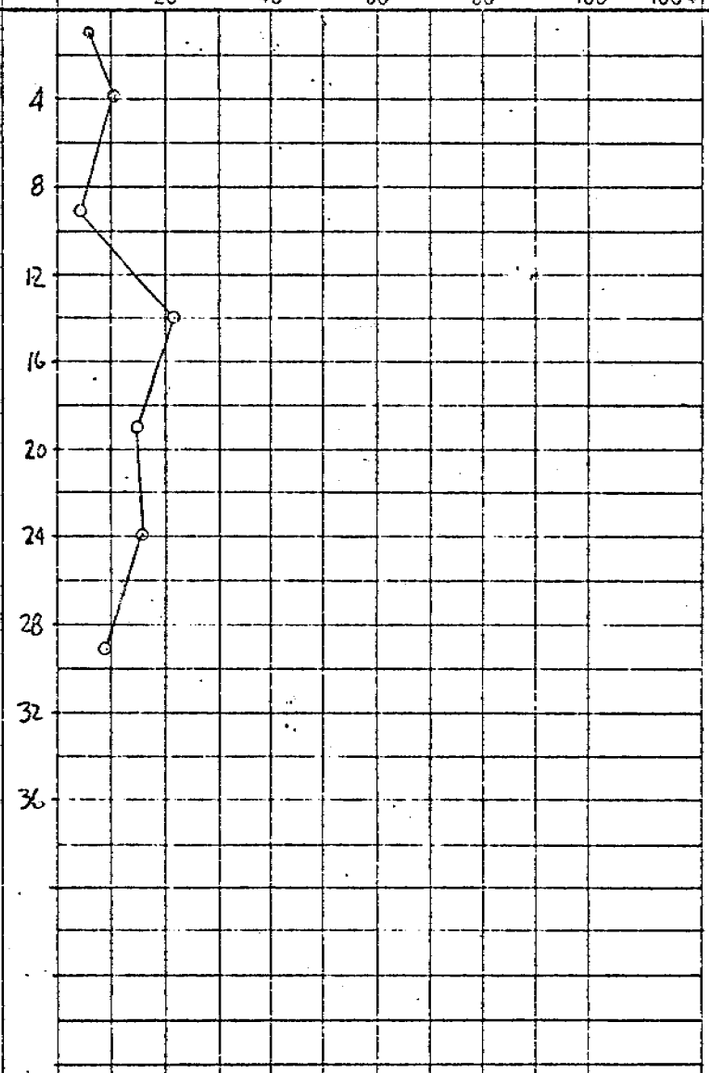
DRN: AEW	FIELD ENG: B.M	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 1261+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
519	C	348 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
4					GW	GRAVEL 3" ORGANIC	T	
8								Nbn
12						SILTY, SANDY CLAYEY		
16					GM			
20						CLAY		
24					GC	TILL, PEBBLES		Vh ICE CRYSTALS
28								
32						END OF HOLE		
36								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



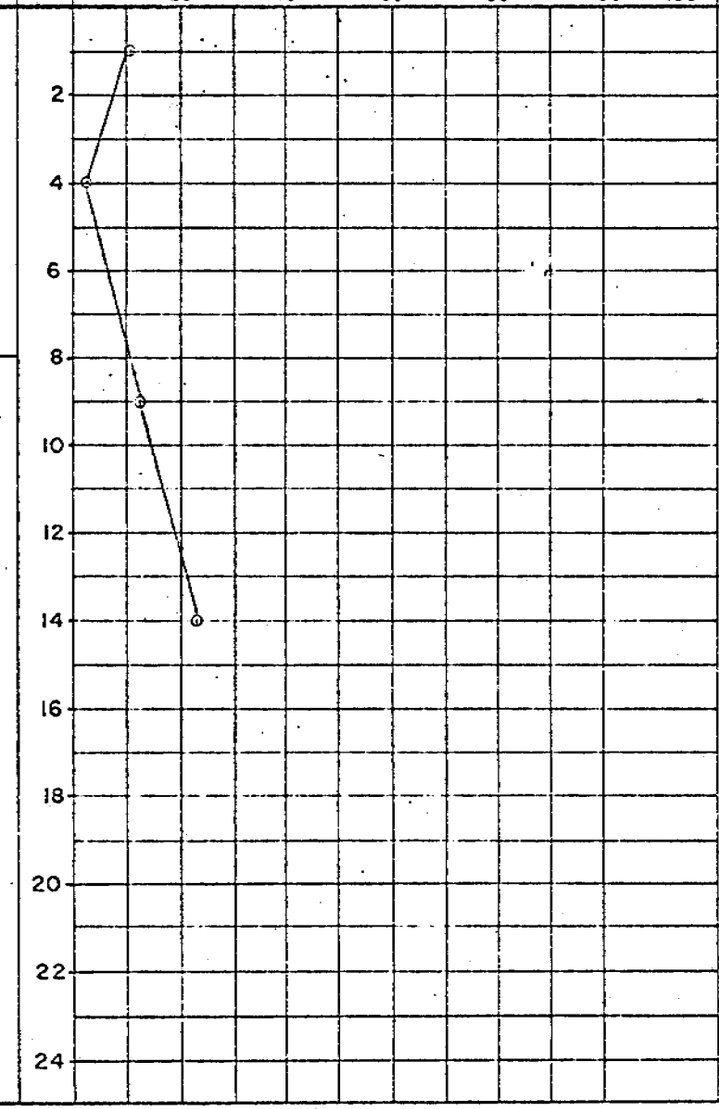
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS:

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1250+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION:	ELEV:	MILE 519 / B,C,S C / NUMBER 349A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2		▨			GC	GRAVEL 4" ORGANIC	F	
4		▨				SANDY, LITTLE CLAY		
6								
8					GW		UF	
10		▨						
12						SANDY, CLAY, TILL		
14		▨			GC			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

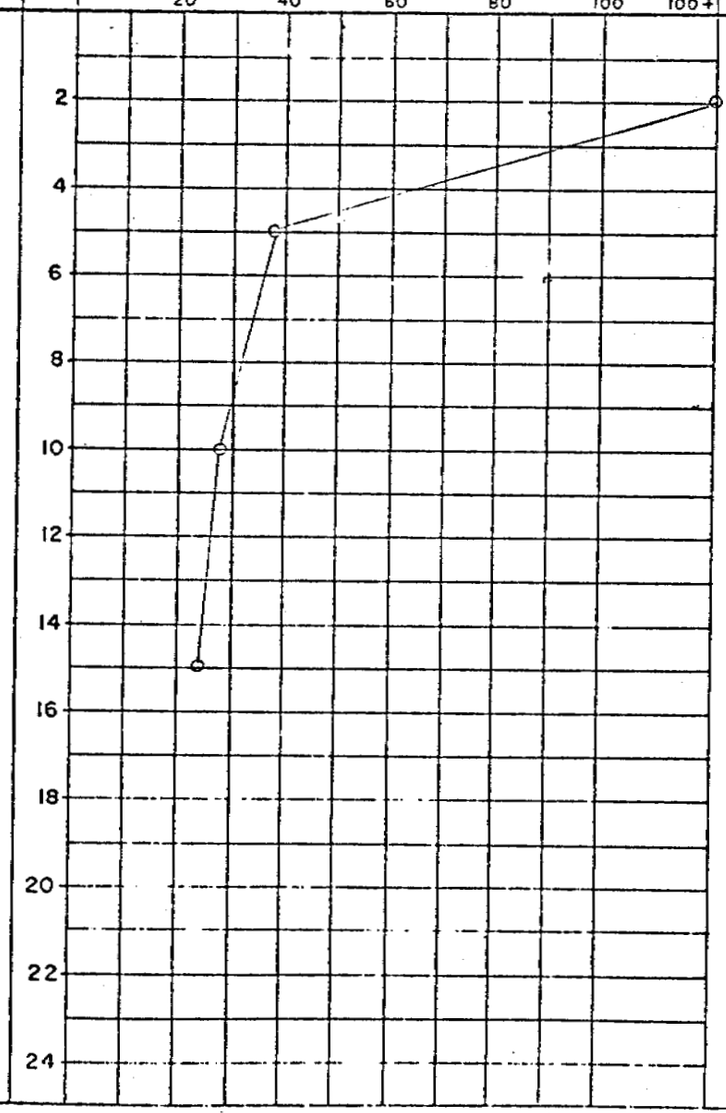
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG N.C.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1238+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SCRUB SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
520	C	338A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT-M	MUSKEG									
2						SILT									
4		P			SM	LIGHT BROWN, CLAYEY, SANDY	F	Vr.							
6															
8															
10		P			SM			Vr							
12						CLAYEY, SANDY, COBBLES, BOULDERS									
14					GC		F	Vr							
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

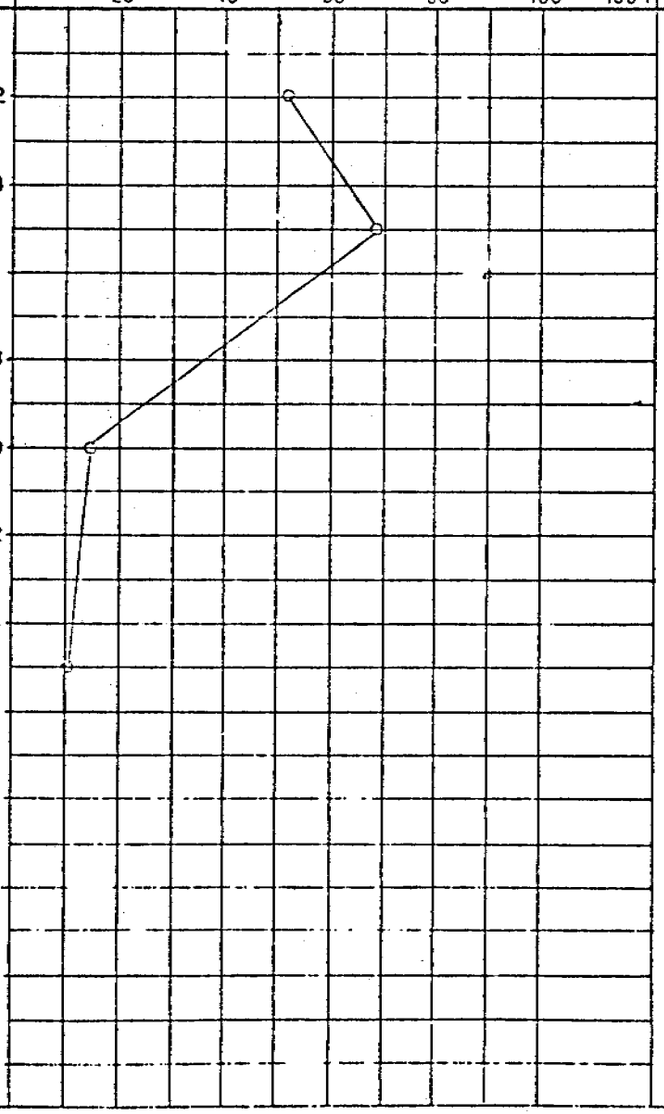
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN R. S.	FIELD ENG N.C.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1228+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SCRUB SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
520	C	339A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG									
2					Pt-SM	SILT	F								
4		P			SM	LIGHT BROWN, SANDY, CLAYEY		Vr							
6															
8															
10					GP	SANDY, CLAYEY, COBBLES, BOULDERS		Vr							
12															
14					GM		F								
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

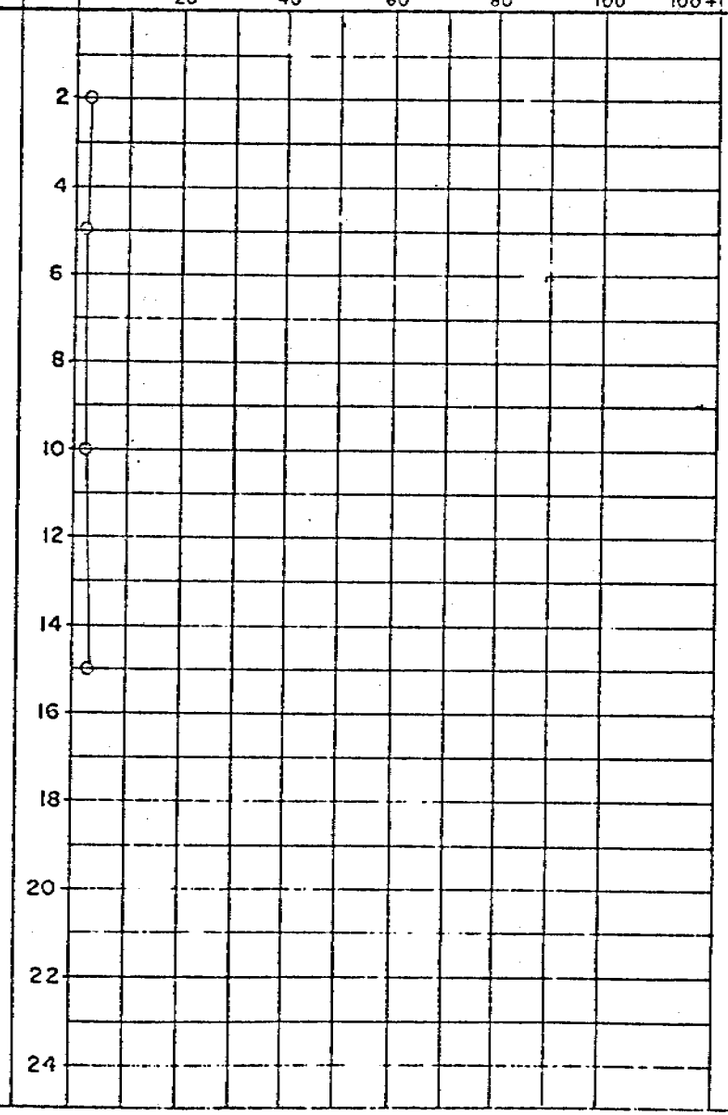
DAN R S	FIELD ENG N.C	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1218+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20'-40' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
520	C	340A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						6" MOSS		
2		▨			GM	GRAVEL SAND COBBLES & BOULDERS	UF	
4		▨			G.P.			
6								
8								
10		▨			GW			
12								
14		▨			GW		UF	
16								
18						END OF HOLE		
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel and clay
Location
Hole 520-C-341A Depth 4' - 5'
Technician Date Feb. 20, 1973

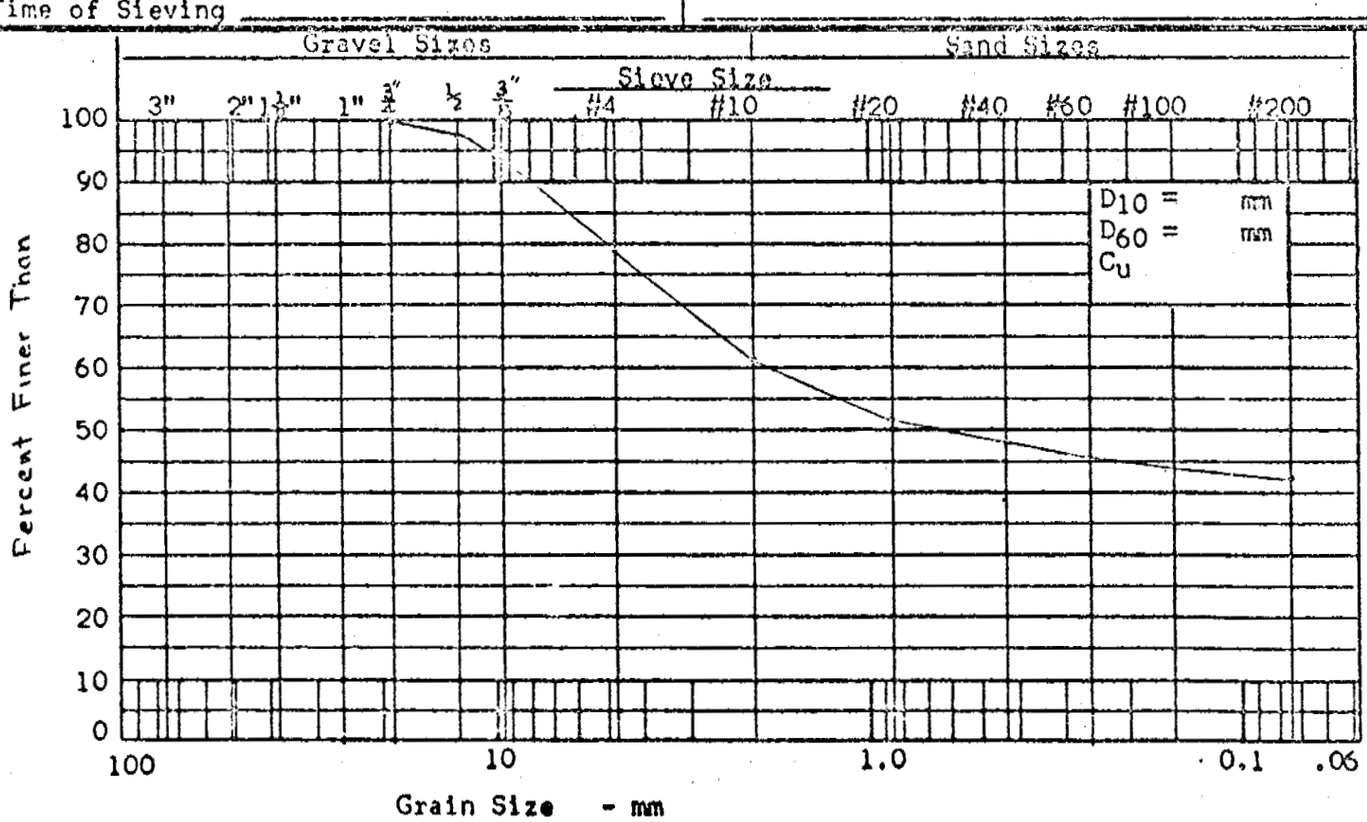
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			98.6	
Wt. Dry		3/8	9.52			94.8	
	4	.185	4.76			79.5	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			61.4	
Wt. Dry + Tare	20	.0331	.840			51.7	
Tare	40	.0165	.420			48.1	
Wt. Dry	60	.0097	.250			46.1	
	100	.0059	.149			44.4	
	200	.0029	.074			42.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

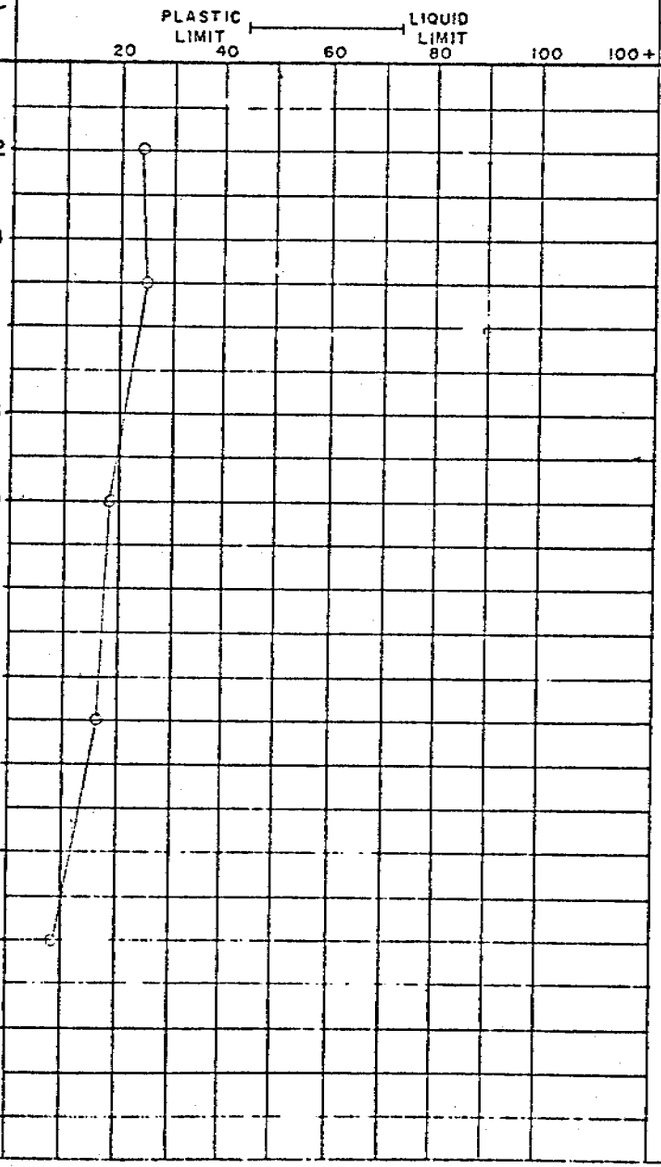
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R S	FIELD ENG N.C.	DATE DRILLED 5/2/73	AIRPHOTO NO:	CHAINAGE: 1207+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 20'-40' SPRUCE	ELEV:

TEST HOLE		
MILE	S,C,S	NUMBER
520	C	341 A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						2" MOSS									
2					GC	GRAVEL & CLAY									
						SAND COBBLES BOULDERS	UF								
4															
					GC	CLAY TILL									
6						DARK BROWN	F	Vr.	43		19	38			
8															
10		P			GC			Vr.					126.0	106.3	
12															
14					GC										
16															
18															
20					GC										
22						END HOLE @ 25'									
24					GC		F	Vr.							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

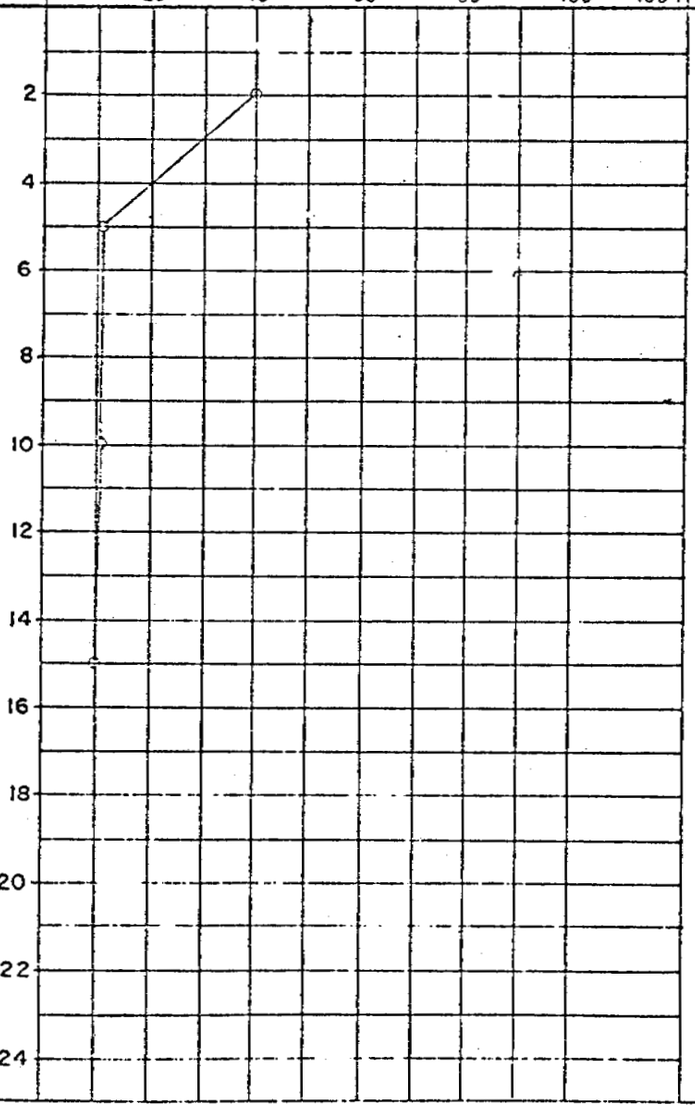
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN R.S.	FIELD ENG B.W.M.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1197+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
52 D	C	350A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						4" ORGANIC									
2		▨			GM	SILT & GRAVEL	F								
4		▨			GM			Vr.							
6															
8						CLAY & GRAVEL MIXTURE									
10		▨			GC	TILL		Vr.							
12															
14		▨			GC		F	Vr							
16															
18						END OF HOLE									
20															
22															
24															

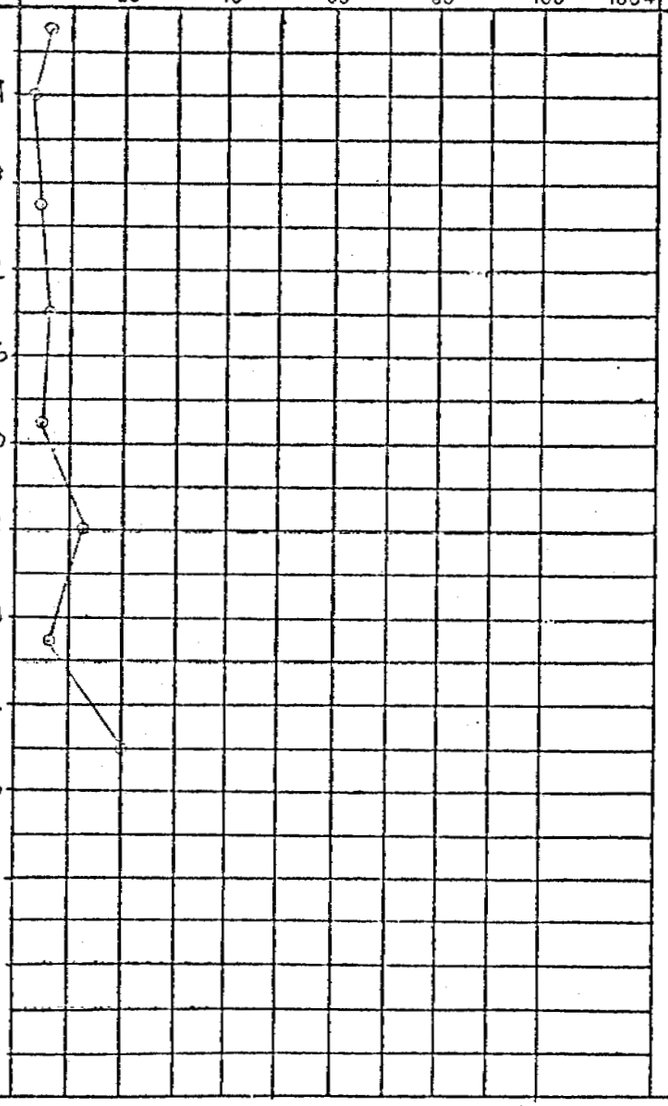


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.F.W	FIELD ENG: N.W.C	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 1193+80	OFFSET: 20' E OF ℄
CKD: L.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION:	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
521	S	351A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
4					GM	GRAVEL SAND WITH COBBLES AND BOULDERS, DRY	UF								
8															
12					GP	WET									WATER COMING OUT OF HOLE
16					GC	CLAY GLACIAL TILL DARK BROWN WITH SAND & GRAVEL									
20															
24						BOULDERS									
28															
32					SC										
36						END OF HOLE									
40															
44															
48															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

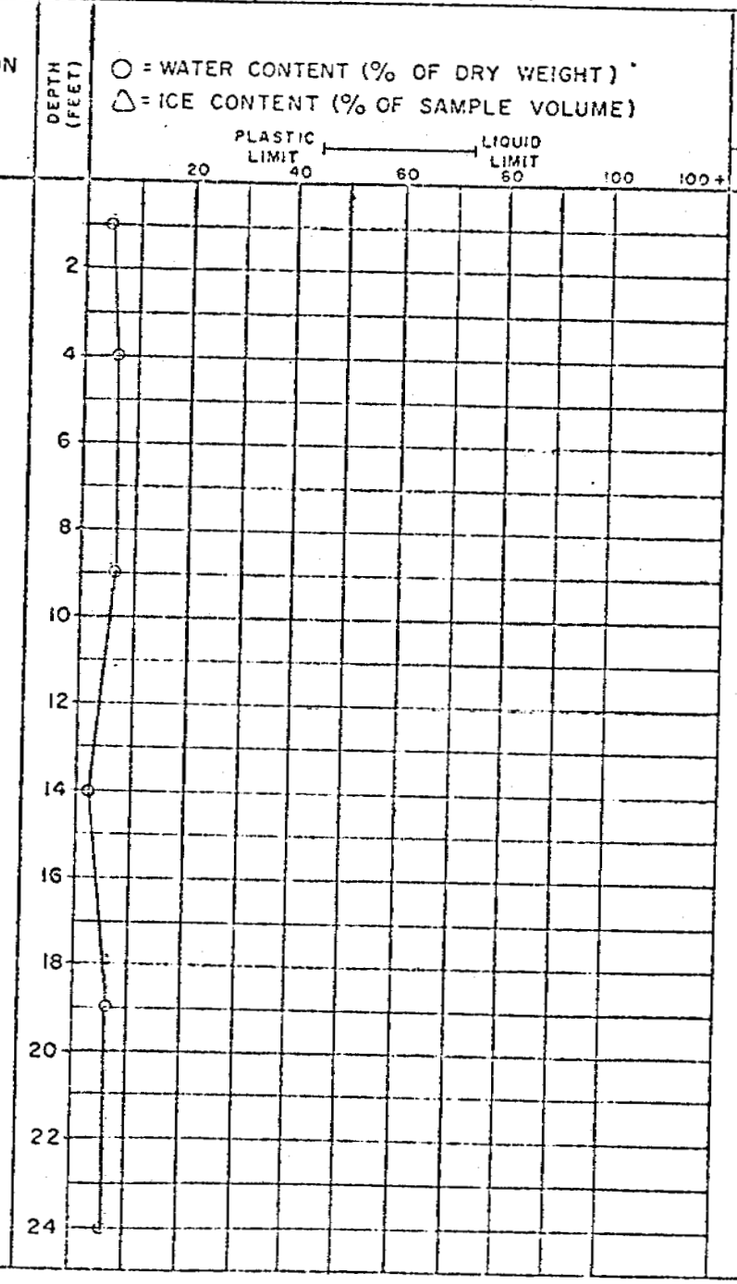
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN AEW	FIELD ENG NWC	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1192+70	OFFSET: 130' E OF ℄
CKD DSP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NIL	ELEV

TEST HOLE		
MILE	B,C,S	NUMBE
521	S	352A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					GP	GRAVEL SAND FAIRLY DRY COBBLES AND BOULDERS	UF	
4								
6								
8								
10				26 BLS	GC	CLAY GLACIAL TILL GRAVEL & SAND SOME MOISTURE COBBLES & BOULDERS		
12								
14								
16								
18								
20				44 BLS				
22					GC	WET		
24						END OF HOLE AT 30'		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

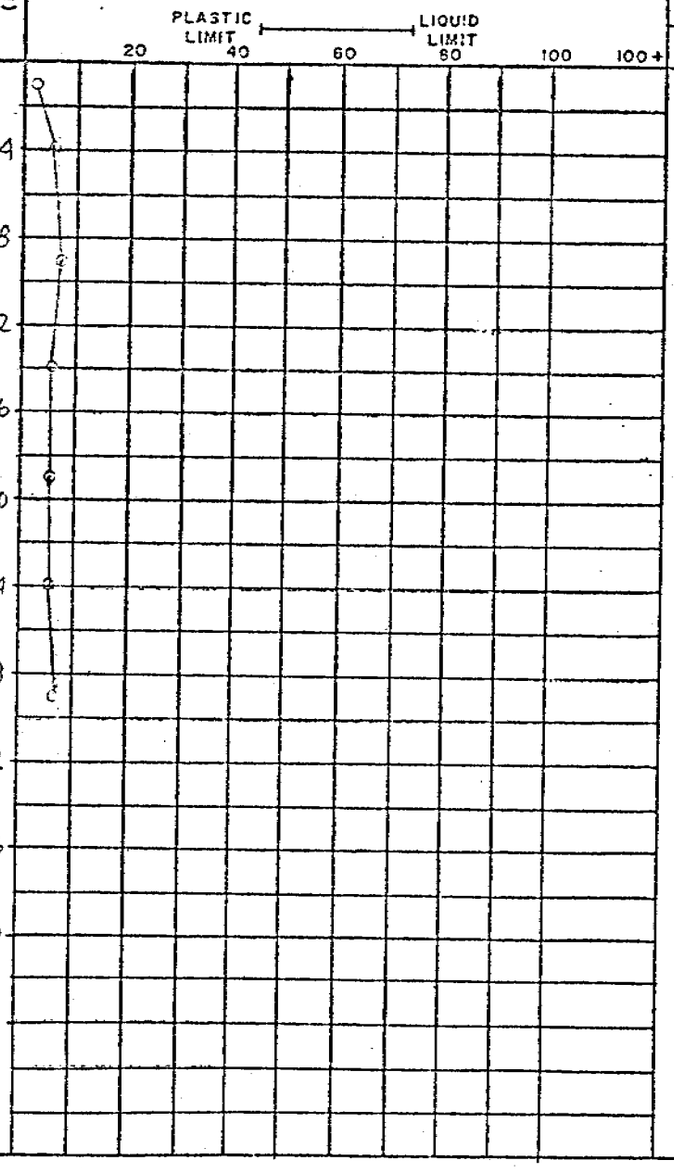
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN AEW	FIELD ENG. NWC	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1190+50	OFFSET: 265' E OF ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: NIL	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
521	S	353A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
4					GP	GRAVEL SAND, BOULDERS. ROCK FRAGMENTS	UF	
8					GC	CLAY TILL		
12				48 BLS		SAND, GRAVEL, AND BOULDERS		
16						FINE, HARD, DRY		
20				83 BLS	GC			
24								
28				80 BLS	SM	SILTY, SAND		
32						END OF HOLE		
36								
40								
44								
48								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silty gravel
Location
Hole 521-S-355A Depth 1' - 2'
Technician Date

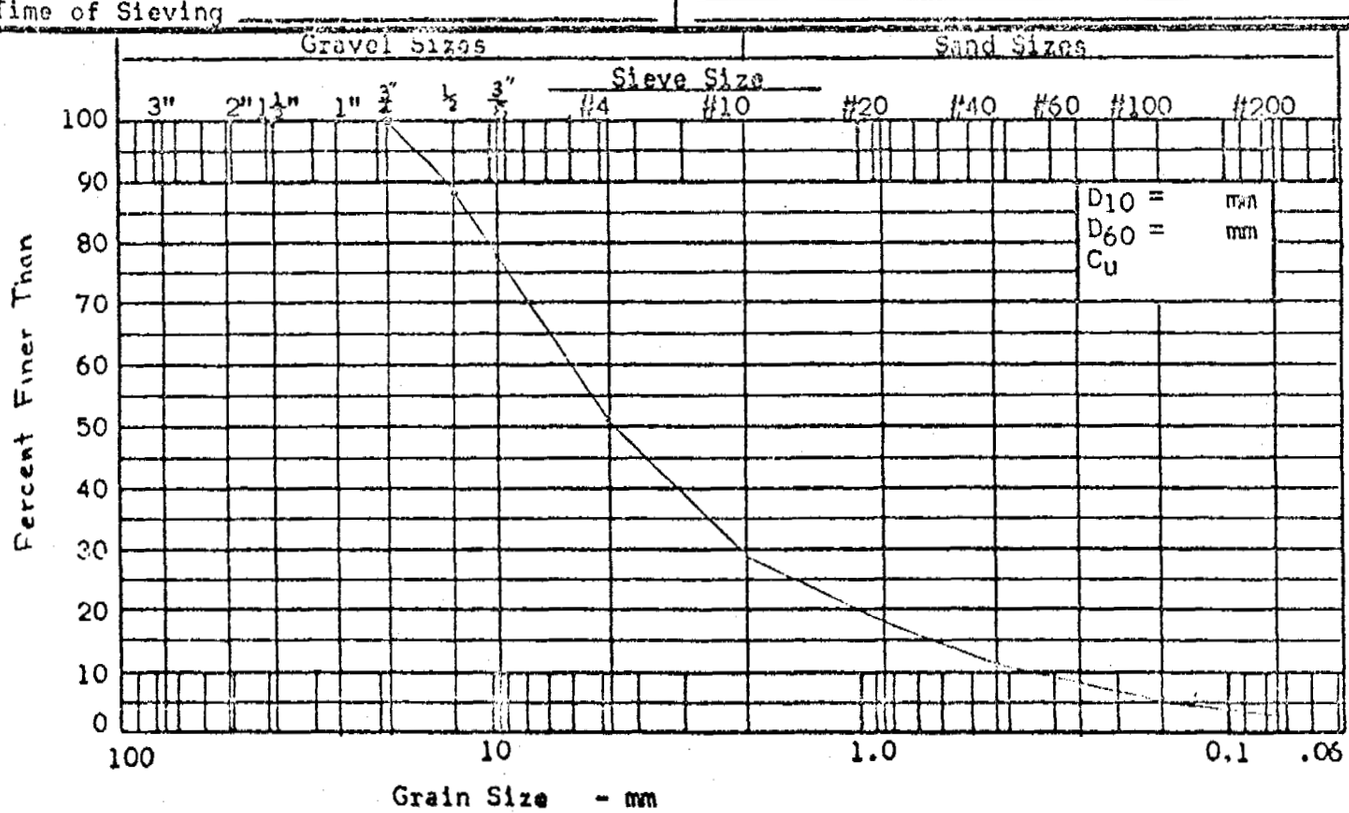
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			88.4	
Wt. Dry		3/8	9.52			78.8	
	4	.185	4.76			51.7	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			29.5	
Tare No.	20	.0331	.840			18.1	
Wt. Dry + Tare	40	.0165	.420			12.4	
Tare	60	.0097	.250			8.3	
Wt. Dry	100	.0059	.149			5.4	
	200	.0029	.074			3.4	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

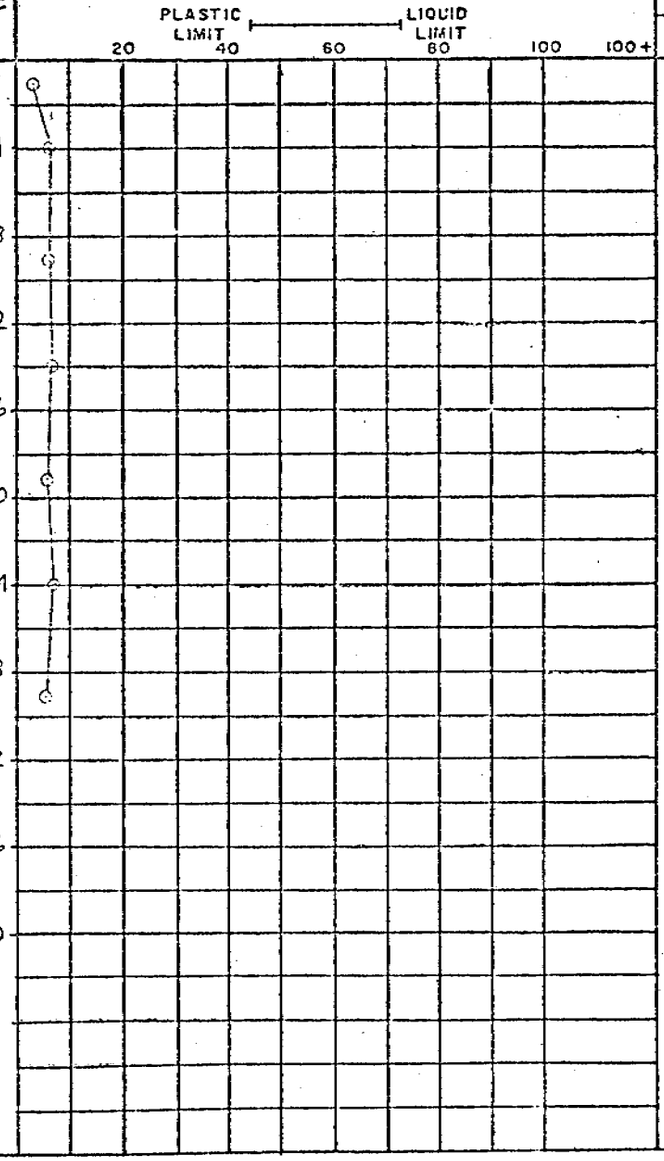
DWN: A E W	FIELD ENG: B M	DATE DRILLED: 7/2/73	AIRPHOTO NO:	CHAINAGE: 1190+63	OFFSET: ℄
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
521	S	355A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GM	GRAVEL 3" ORGANIC	F		3		27	70			
4						SILT, BOULDERS									
8						CLAY	UF								
12		P		42 BLS.	GC										
16															
20		P		46 BLS											
24		P				SANDY CLAY, SOME POWDER PEBBLES									
28		P		53 BLS	GC										
32						END OF HOLE									
36															
40															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



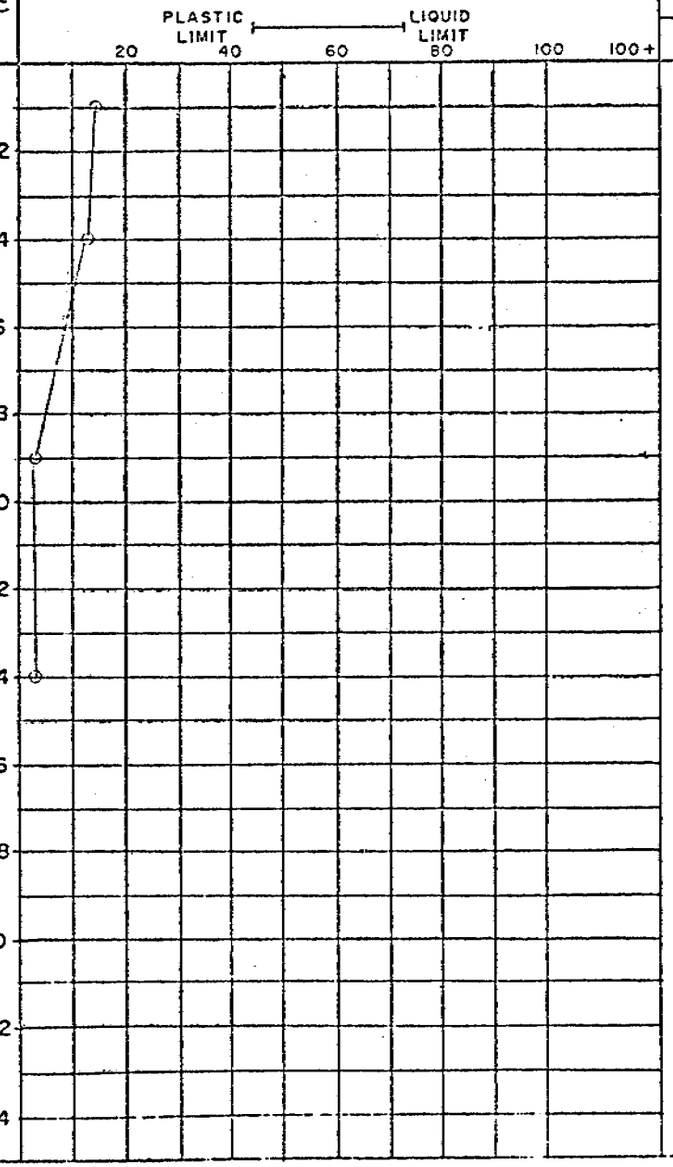
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 7/2/73	AIRPHOTO NO:	CHAINAGE: 1190+00	OFFSET: 300' E OF ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & BIRCH TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
521	S	354A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					GM	GRAVEL 2" ORGANIC	F								
2						SILT									
4					GC	SILTY CLAY	UF								
6															
8							F								
10						SAND									
12					SN										
14						SAND									
16		P				END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG B.M	DATE DRILLED 7/2/73	AIRPHOTO NO:	CHAINAGE: 1188+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & BIRCH TO 35'	ELEV:

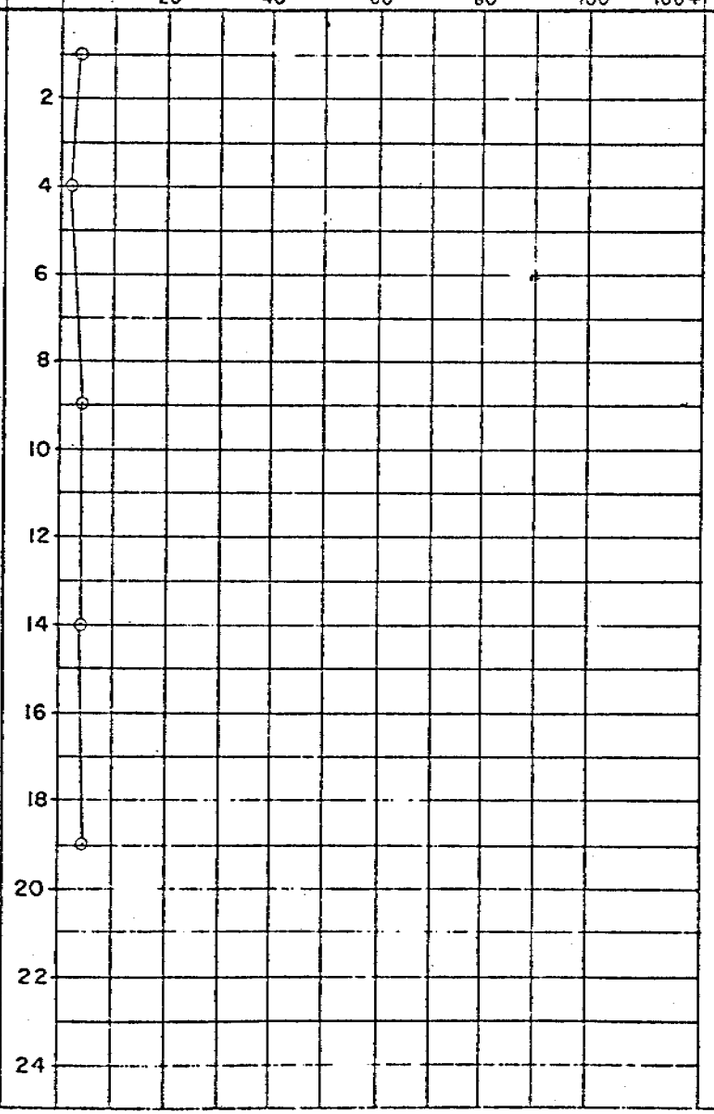
TEST HOLE		
MILE	B,C,S	NUMBER
521	S	356A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT 3" ORGANIC	F								
2					GC	GRAVEL		V							
4															
6					GW	BOULDERS									
8															
10						BOULDERS & SAND									
12					GW										
14						SAND									
16		P		23 BLS											
18					GL	SANDY, POWDERY CLAY		V							
20															
22						END OF HOLE									
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT ⟷ LIQUID LIMIT

20 40 60 80 100 100+



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel and Clay Till
Location
Hole 521-C-357A Depth 5 - 10'
Technician Date 7/2/73

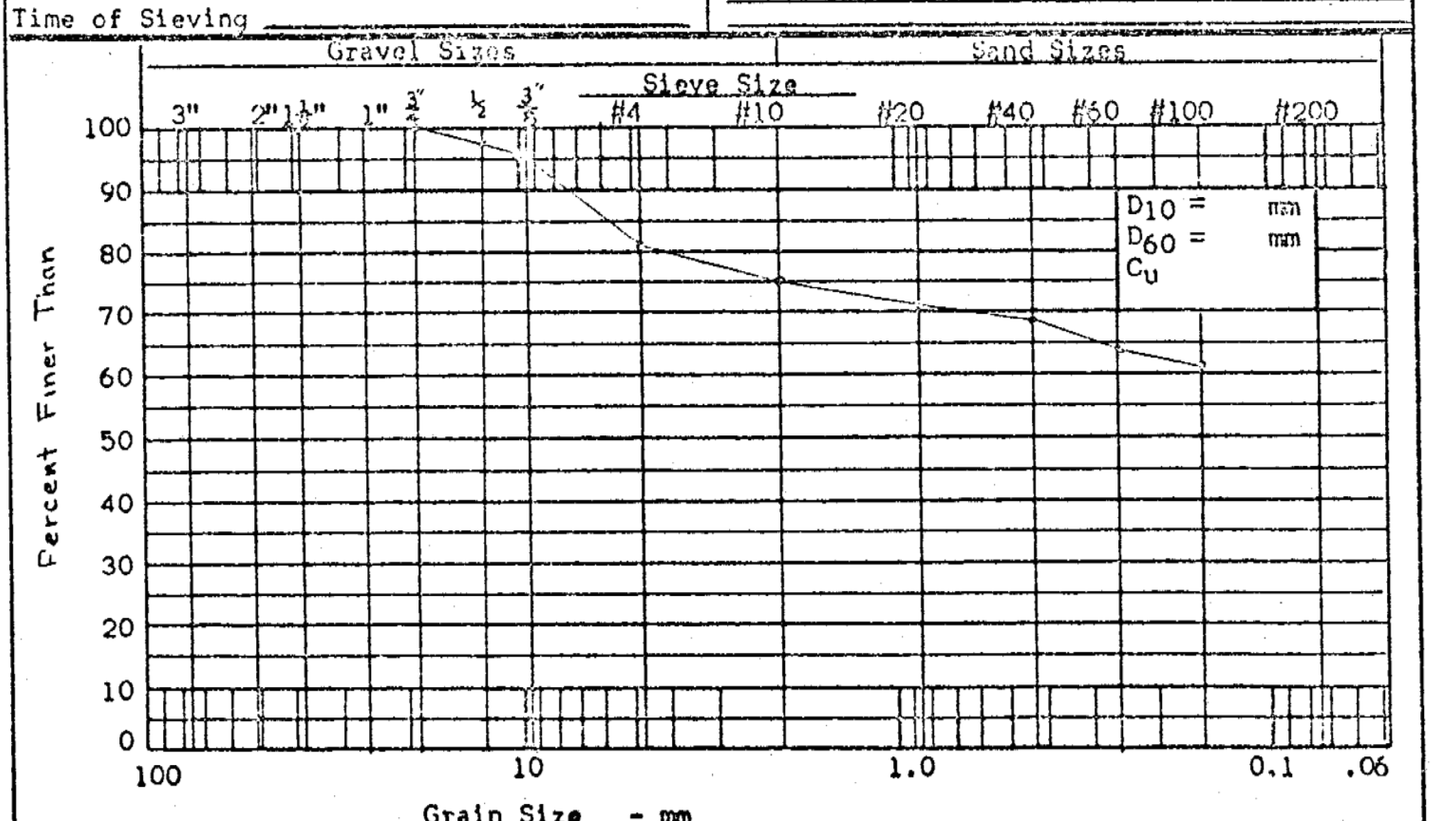
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			97.4	
Wt. Dry		3/8	9.52			96.1	
	4	.185	4.76			80.3	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			75.2	
Wt. Dry + Tare	20	.0331	.840			71.9	
Tare	40	.0165	.420			68.3	
Wt. Dry	60	.0097	.250			64.6	
	100	.0059	.149			61.6	
	200	.0029	.074				
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



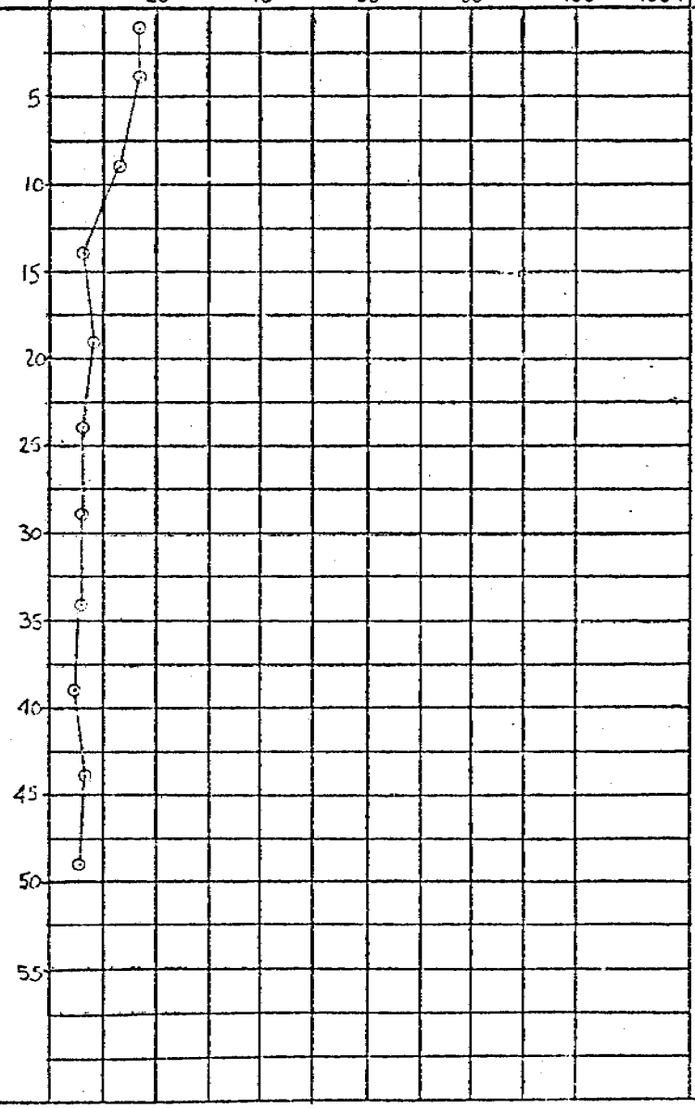
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: S.M.	DATE DRILLED: 7/2/73	AIRPHOTO NO:	CHAINAGE: 1177+00	OFFSET: ℄
CKD: D.A.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: BIRCH TO 35'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
521	C	357A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT 4" ORGANIC	T								
5					SM	SANDY, CLAY, PEBBLES	UF								SO_4 = 0.08 %
10					GC	TILL	F		3		54	43			
15															
20						GRAVEL AND CLAY MIXTURE									
25															
30															
35															
40						LIMESTONE									
						CLAY									
45					GC	SOME GRAVEL									
50															
55						END OF HOLE									



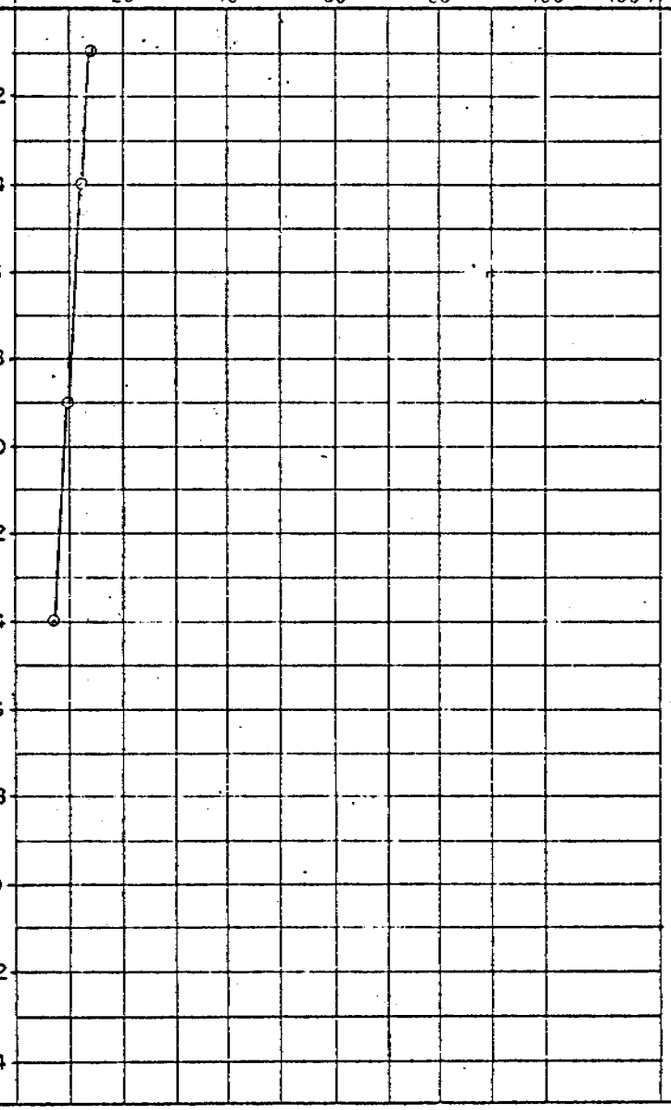
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1169+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: THIN	VEGETATION: SPRUCE TO 25'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
521	C	463B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						3" MOSS	F	
2					GC	CLAY		
4						SILTY, MED BROWN PEBBLES, TILL	UF	
6								
8								
10								
12								
14					GC			
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

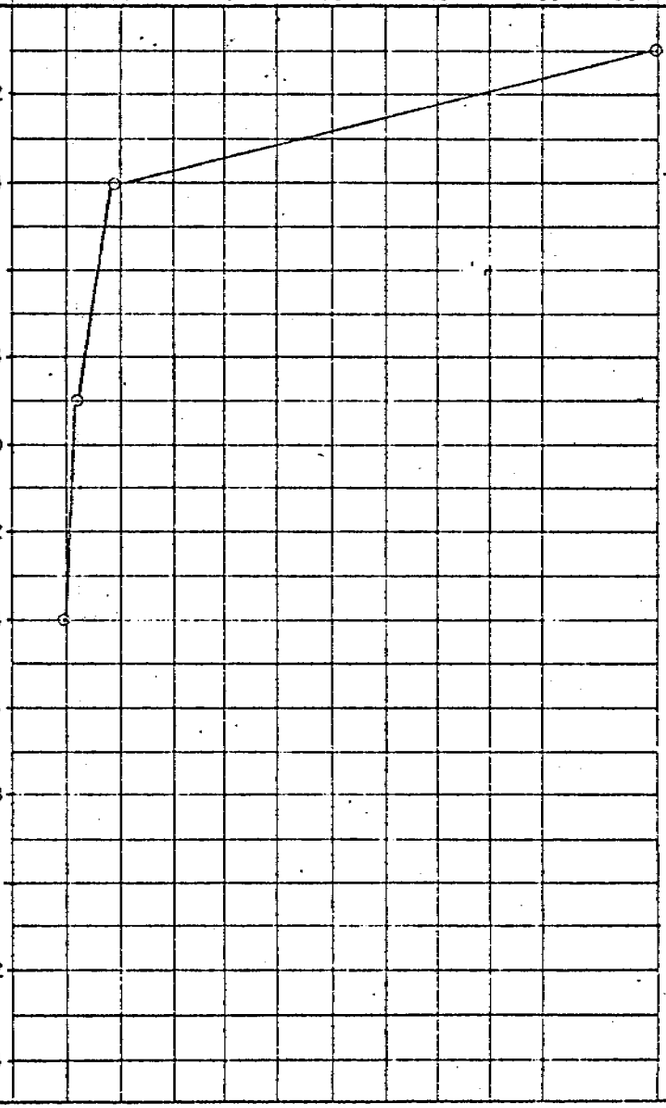
DRN: A.E.W	FIELD ENG: DR	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 1160+00	OFFSET: ℄
CKD: DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE 15'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
521	C	468B

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
					Pt	SILT 3" MOSS	F								
2					ML	DARK BROWN, ORGANIC			2						
					GC	CLAY									
4						LIGHT BROWN, TILL			4						
6						FEW PEBBLES			6						
8							UF		8						
10									10						
12									12						
14					GC	MED. BROWN TILL			14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						

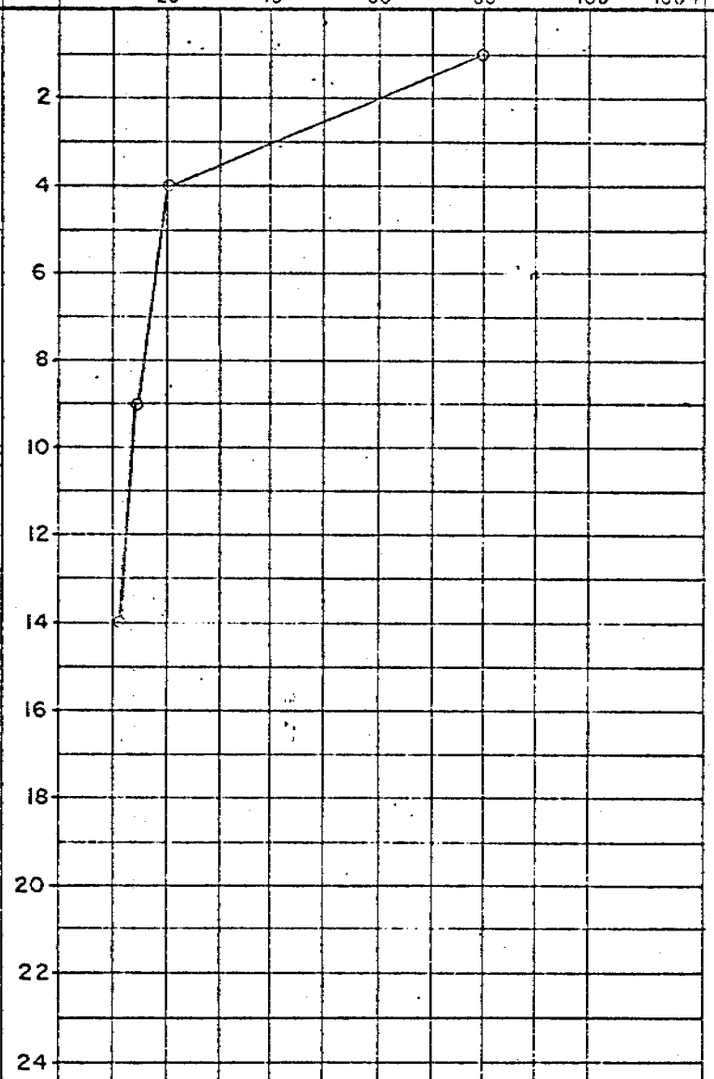


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CM: AEW	FIELD ENG: DR	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 1150+00	OFFSET: ℄	TEST HOLE
CKD: LGP	TECH	RIG: A/P	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV:	

MILE	B,C,S	NUMBER
521	C	467B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	SILT 3" MOSS ORGANIC, DARK BROWN	F								
4					ML										
6					GC	CLAY LIGHT BROWN, FEW PEBBLES	UF								
8						GRAVEL									
10						CLAY									
12						TILL, MED BROWN									
14					GC										
16						END OF HOLE									
18															
20															
22															
24															



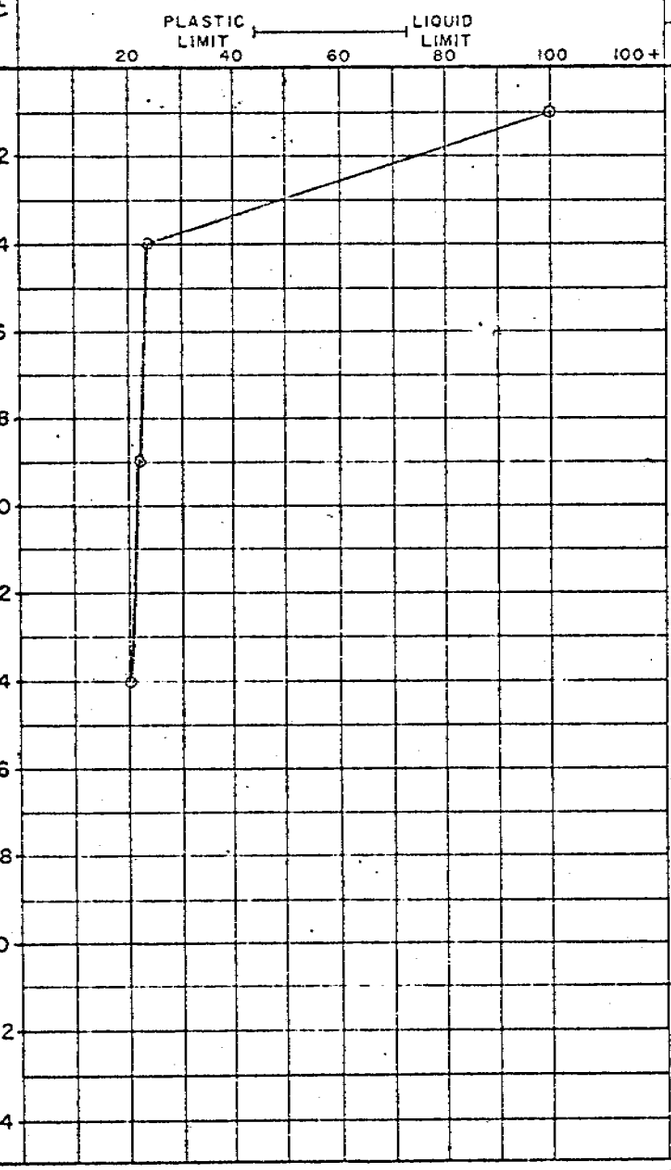
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN J.E.W	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1140+00	OFFSET: ℄
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE TO 25'	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
522	C	466B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	SILT 3" MOSS ORGANIC	T									
					CL	CLAY MED. BROWN, FEW PEBBLES										
					GC	TILL										
						END OF HOLE										

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

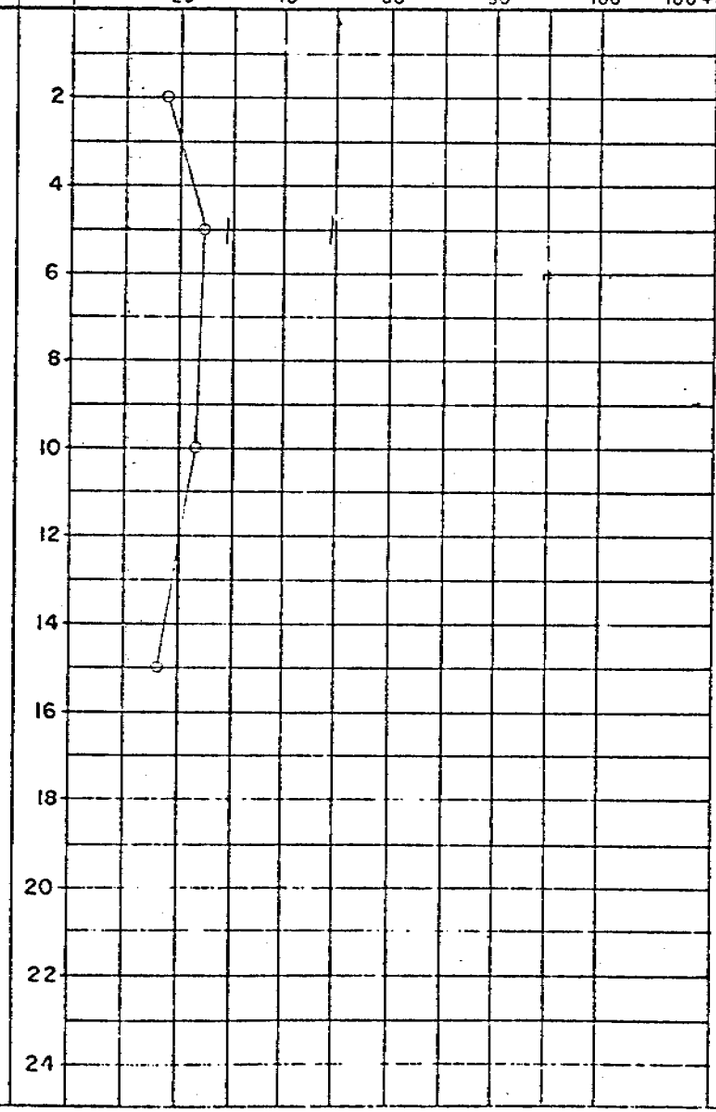
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R.S.	FIELD ENG B D M	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1130+00	OFFSET: ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: 25' SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
522	C	465B

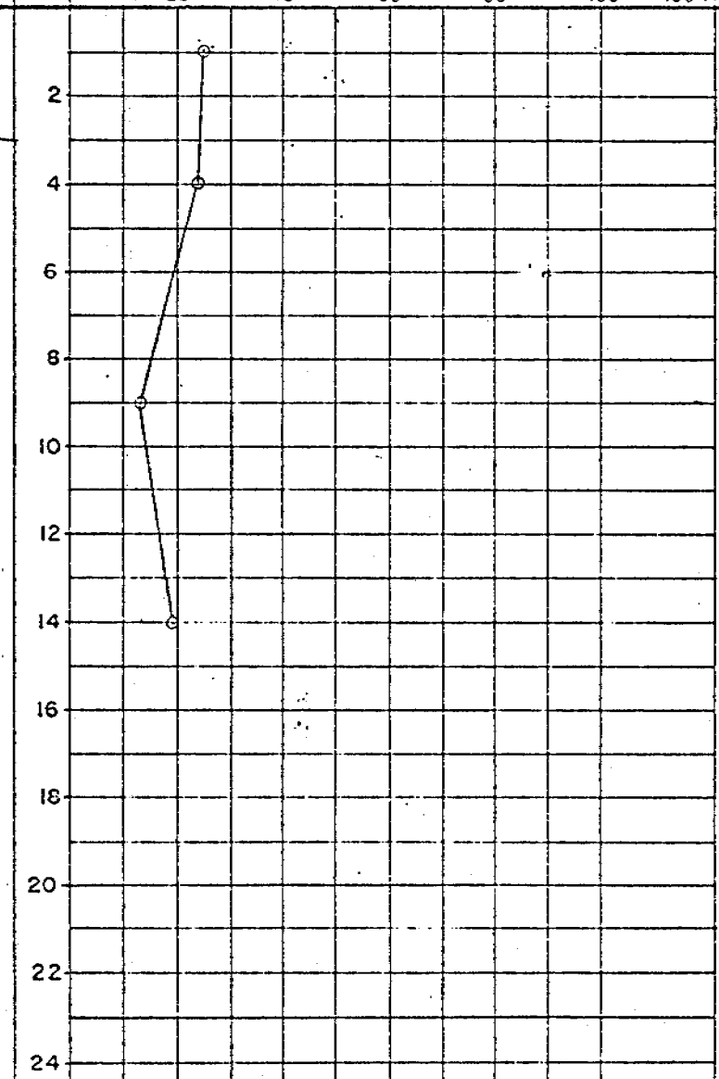
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						6" GRAN. MUSKEG									
2					SC	CLAY SANDY	F								
4		P			CL	CLAY		Vr.							WELL-BONDED PENS. FIRM
6															
8															
10		P			CL			Vr.							
12						PEBBLES									
14					CL		F	Vr.							
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1120+00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 40'	ELEV.	MILE 522 / B,C,S C / NUMBER 470B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	CLAY SILTY, SANDY LIGHT BROWN	F	
4							UF	
6								
8						MED BROWN FEW PEBBLES, TILL		
10								
12					GC			
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

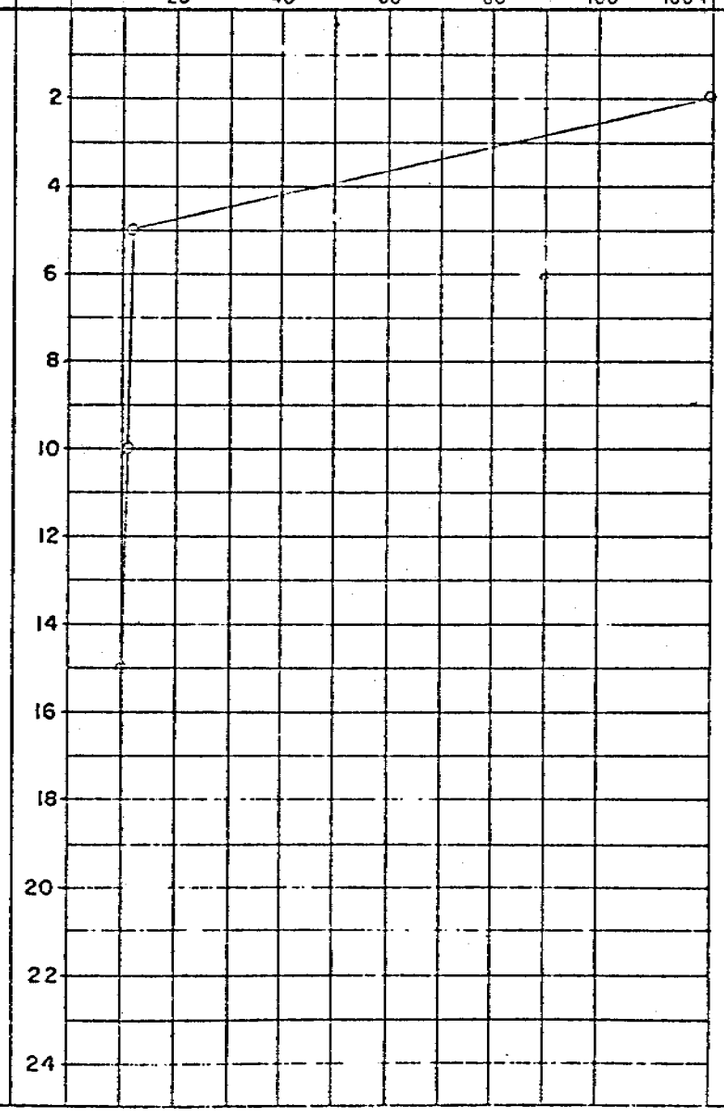
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN R. S.	FIELD ENG D R.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1110+00	OFFSET: 50' E ℄
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD N & S	VEGETATION: 30' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
522	C	471 B

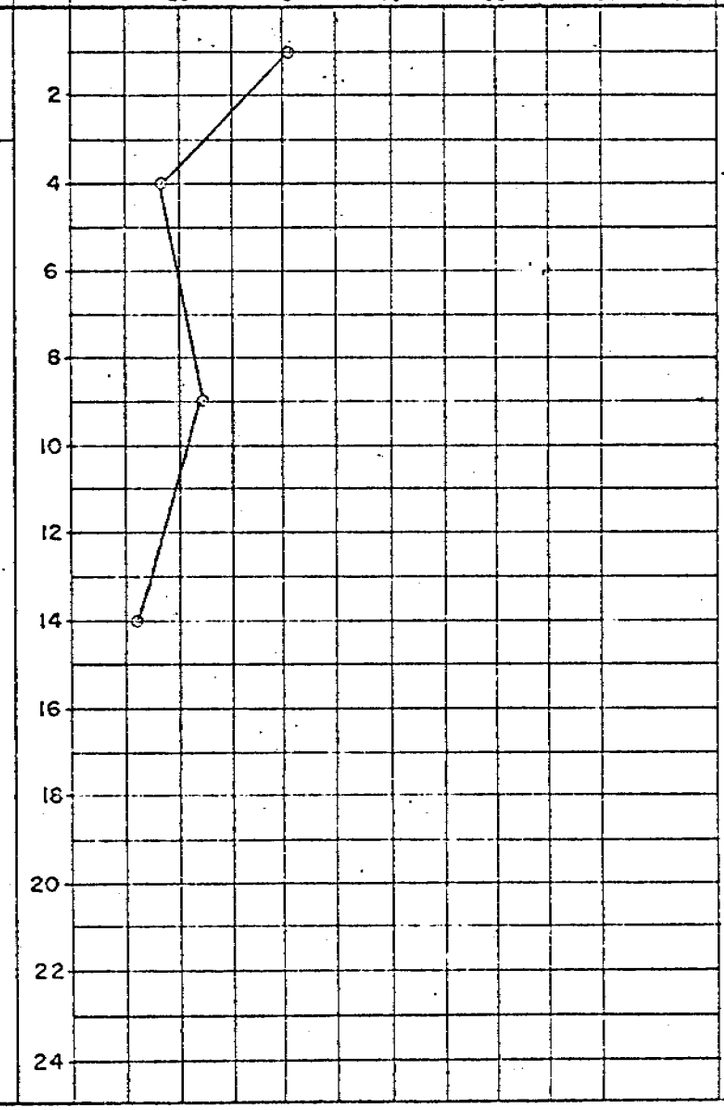
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2					Pt	SILTY ORGANIC	T								
4					GC	CLAY TILL MED. BROWN	UF								
6															
8															
10					GC										
12															
14					GC										
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG D.R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1100 +00	OFFSET: ℄	TEST HOLE
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE 35'	ELEV:	MILE: 522 · B,C,S: C · NUMBER: 472 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	SAND SILTY, LIGHT BROWN SOME CLAY	F	
4							UF	
6						SAND STONE COBBLES		
8						CLAY		
10					GC	MED. BROWN, TILL		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

HOLE DRILLED ON ℄ APPROX. 100' EAST OF ACTUAL ℄

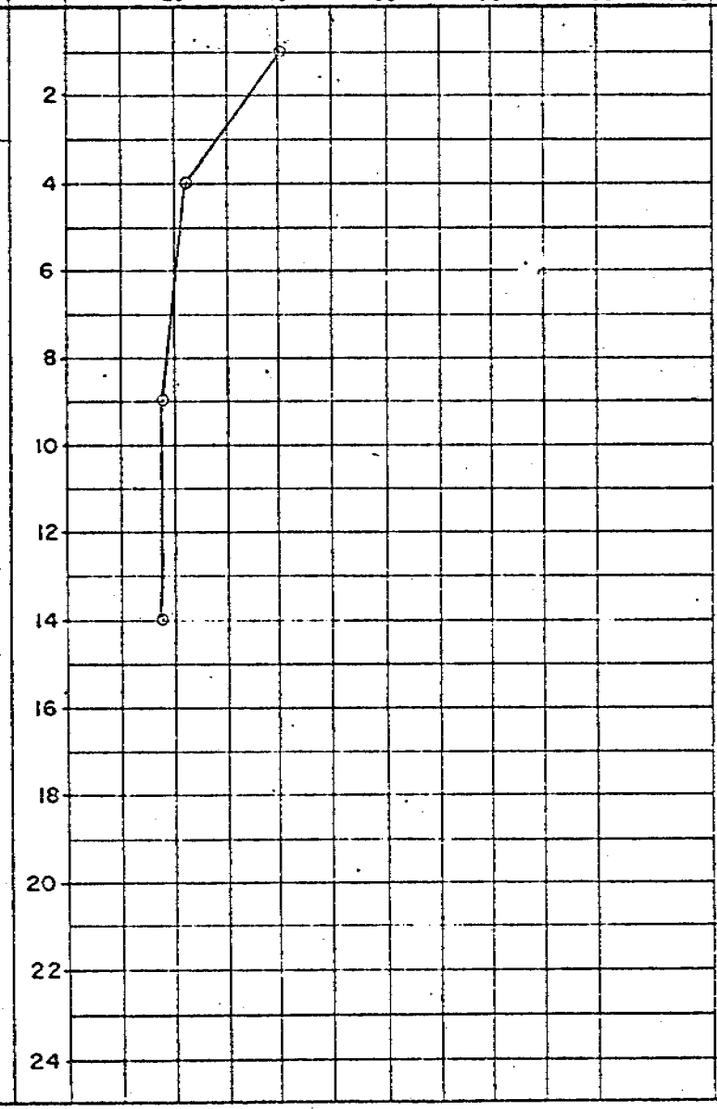
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: D.R	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 1090700	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 25'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
522	C	473 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	SAND ORGANIC	F	
2					SM	SILTY, DARK - LIGHT		
						CLAY	UF	
4					GC			
6						MED. BROWN FEW PEBBLES, TILL		
8								
10								
12								
14		P			GC	TILL		
16						END OF HOLE		
18								
20								
22								
24								



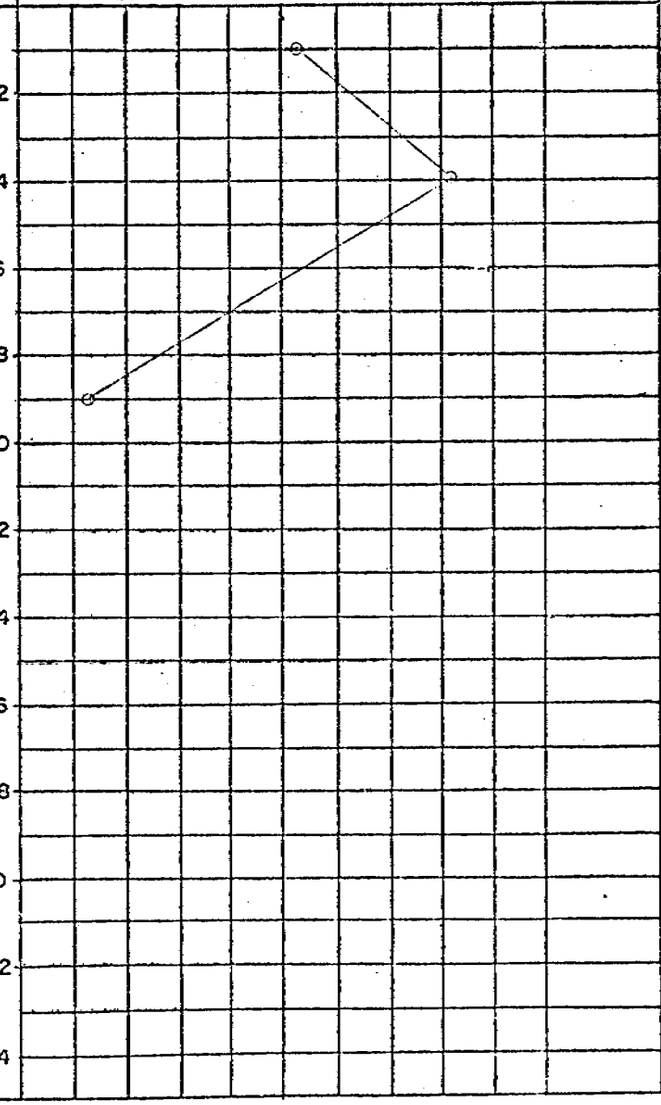
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A EW	FIELD ENG: H.E.A	DATE DRILLED: 7/2/73	AIRPHOTO NO:	CHAINAGE: 1086+90	OFFSET: ℄
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 40'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
523	C	505B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY	F	
2						SILTY, PEBBLES		
						TOPSOIL, ORGANIC		
4								
6								
8						ROCKS, BOULDERS		
						SMALL ROCK CHIPS		
10								
12					CL			
14						END OF HOLE		
16								
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN. AEW	FIELD ENG N.W.C	DATE DRILLED 7/2/73	AIRPHOTO NO:	CHAINAGE: 1086+90	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 30'	ELEV:

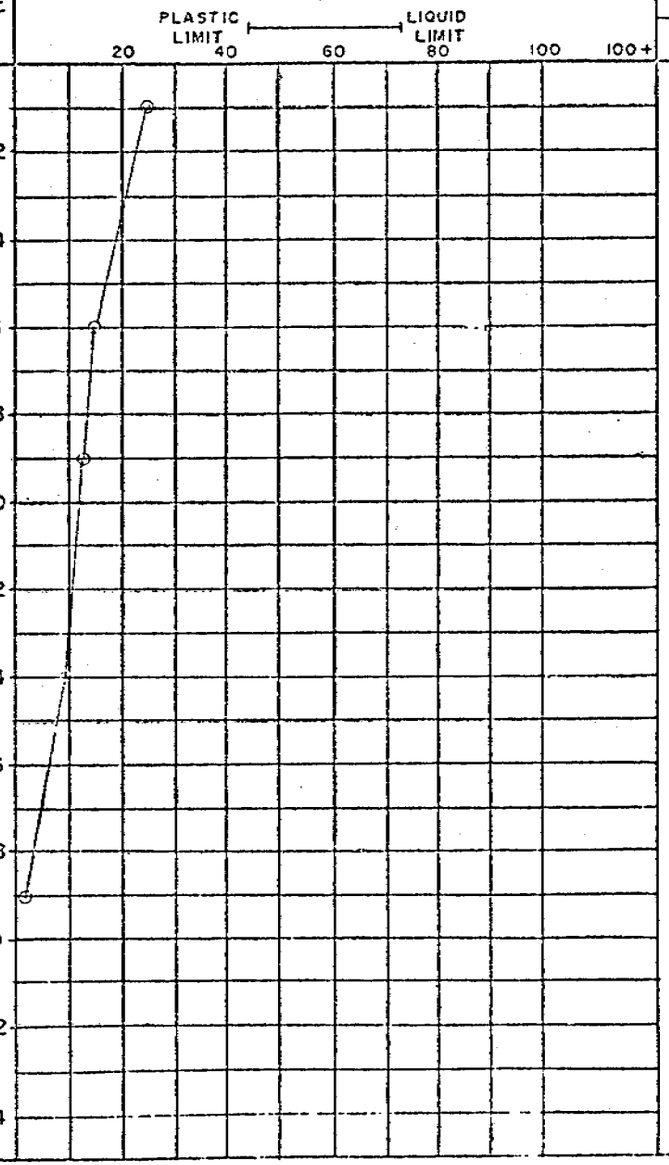
TEST HOLE

MILE	B,C,S	NUMBER
523	C	370A

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	TOPSOIL	F	
2					CL	CLAY		
						SILT & SAND		
4								
6		P				SOME COBBLES & PEBBLES		TRACE OF ICE CRYSTALS
8								
10								
12								
14								
16								
18						SAND, BOULDERS ROCK CUTTINGS		
20					CL			
22						END OF HOLE		
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



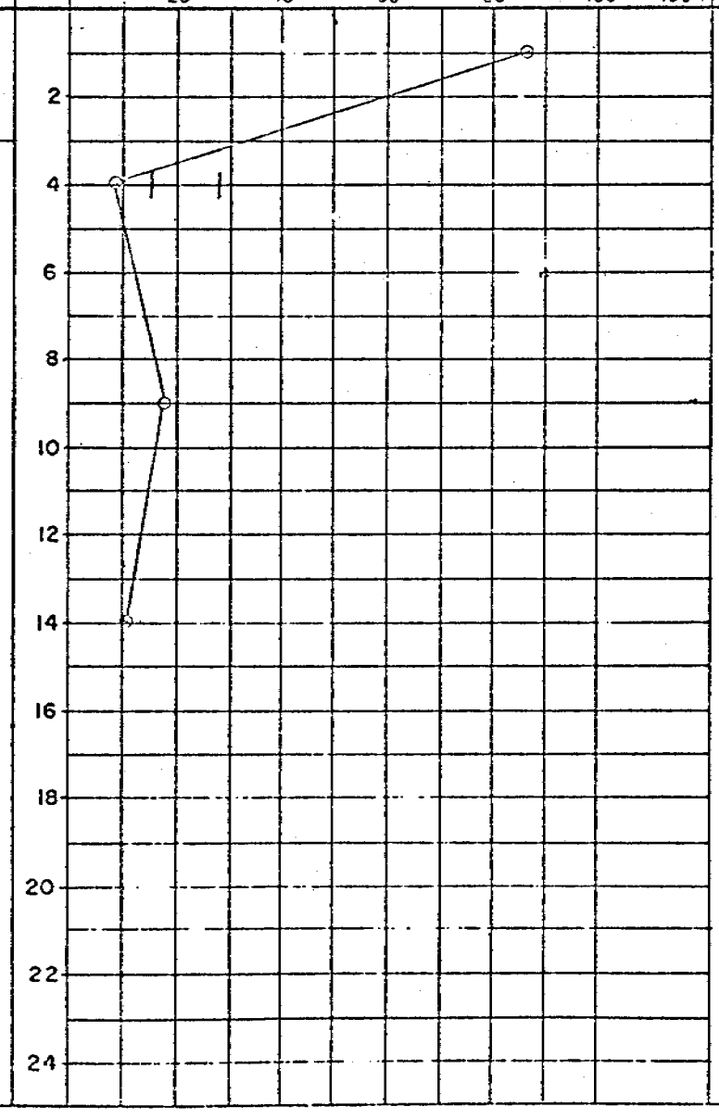
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1080+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
523	C	474B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC SILTY, BLACK	F								
2						SILT LIGHT BROWN									
4						SAND & GRAVEL	UF								
6					GC	TILL									
8						MED BROWN									
10															
12															
14					GC										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 523-C-506B Depth 5'
Technician Date Feb.20, 1973

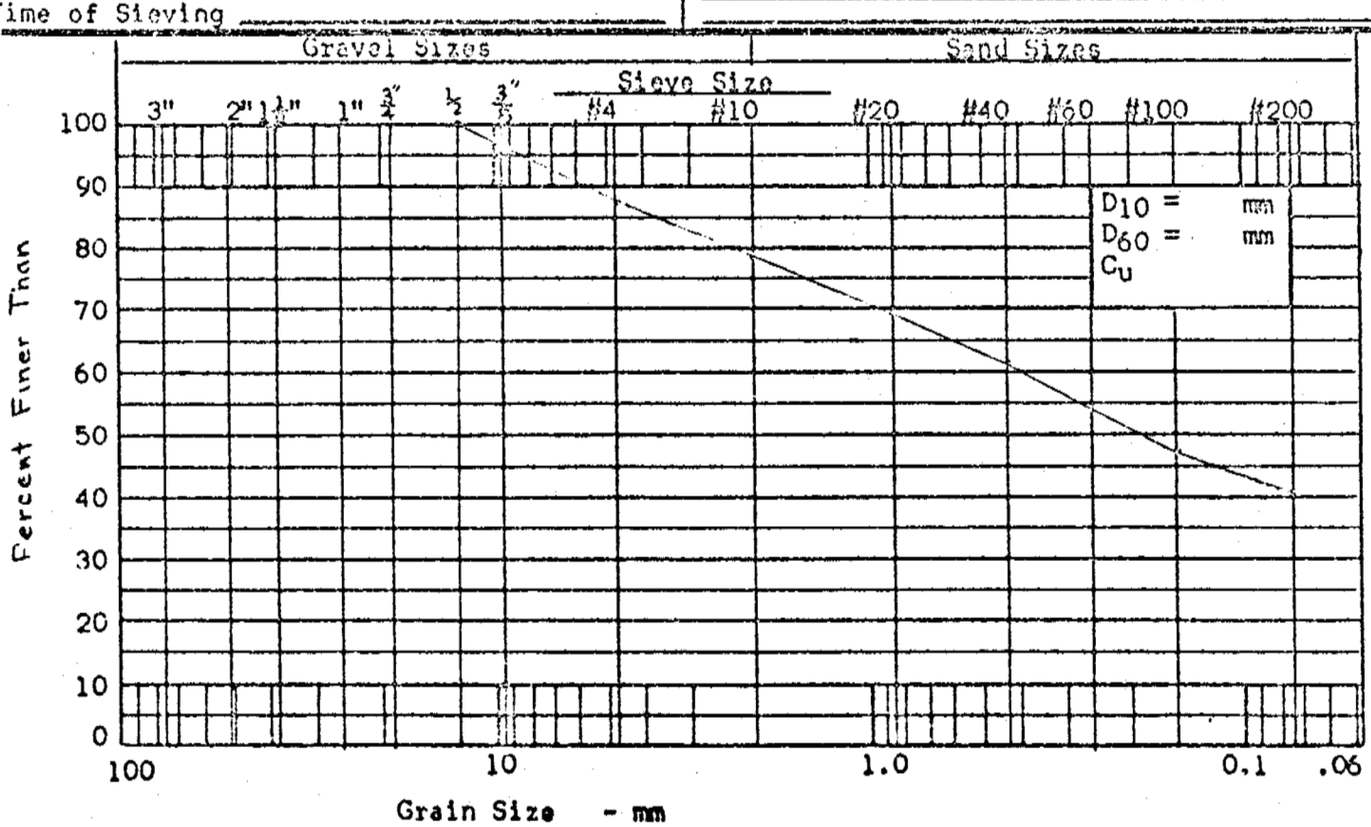
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100.0	
Wt. Dry		3/8	9.52			97.4	
	4	.185	4.76			87.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			78.1	
Tare No.	20	.0331	.840			69.4	
Wt. Dry + Tare	40	.0165	.420			61.2	
Tare	60	.0097	.250			54.1	
Wt. Dry	100	.0059	.149			47.4	
	200	.0029	.074			40.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

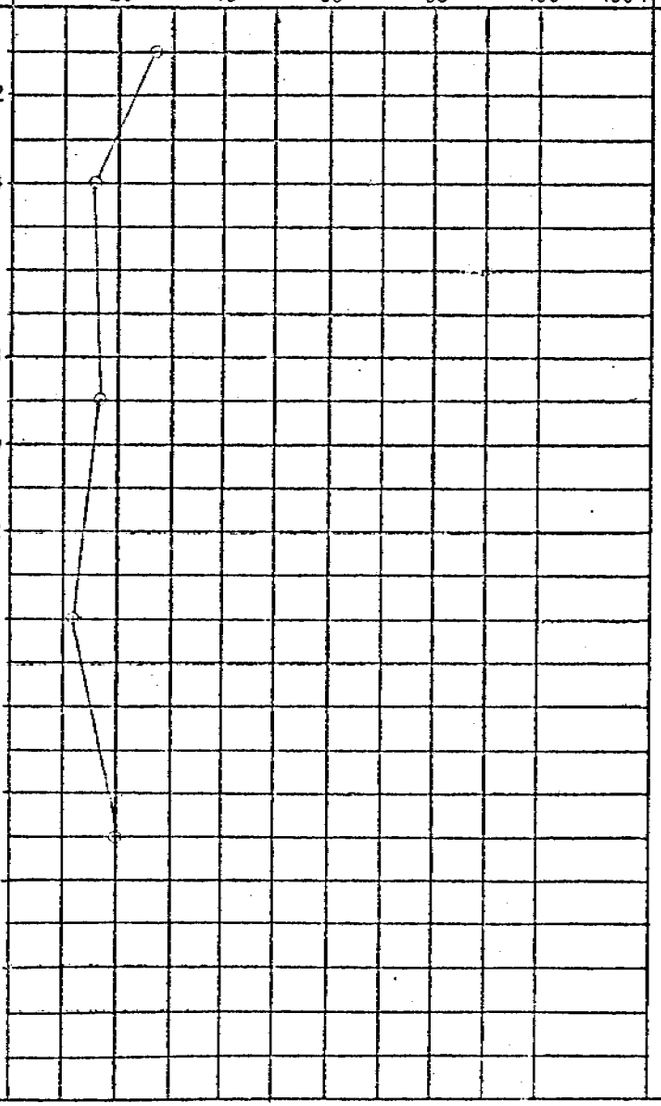
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: M.E.A	DATE DRILLED: 7/8/73	AIRPHOTO NO:	CHAINAGE: 1072+75	OFFSET: ℄
CKD: [illegible]	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
523	C	506B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						TILL	F								
2					GC	MIXED TOPSOIL AND SANDY GRAVEL									
4									41		47	12			
6						GRAVEL, SOME SILTY CLAY									
8															
10															
12															
14						GRAVEL & CLAY									
16															
18					GC										
20															
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

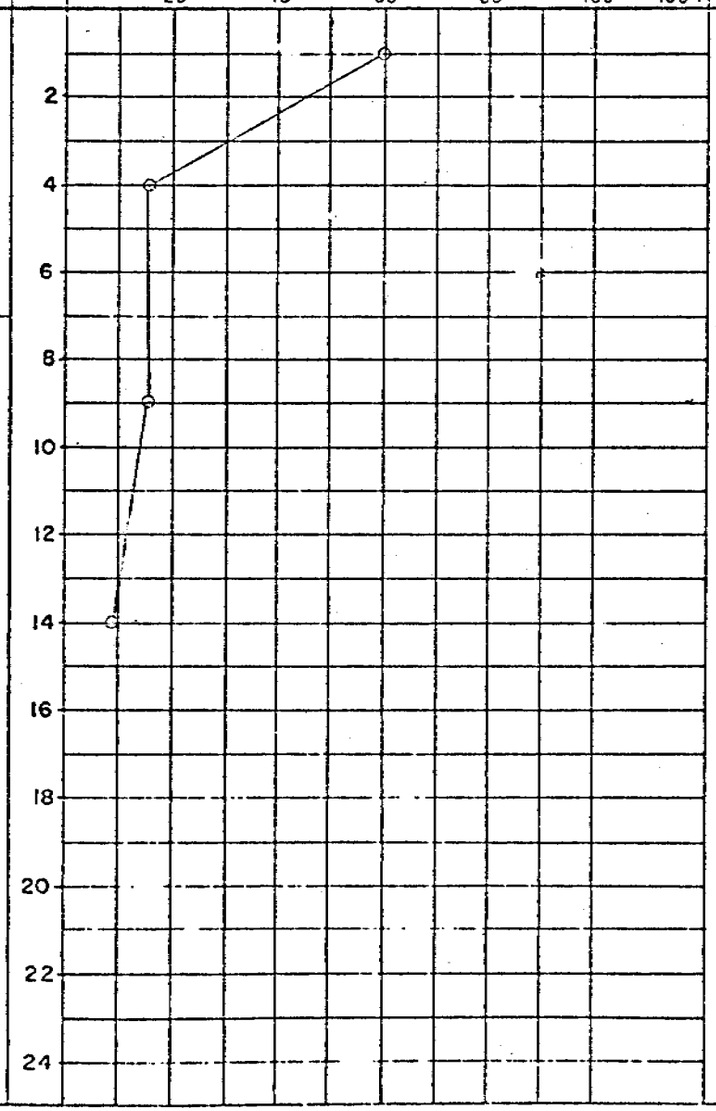
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN AEW	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1070+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
523	C	4753

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC SILTY LIGHT - DARK BROWN	F	
2								
						SILT		
4					SM	SANDY, LIGHT BROWN		
6								
8						TILL	UF	
10					GC	CLAY, MED BROWN		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



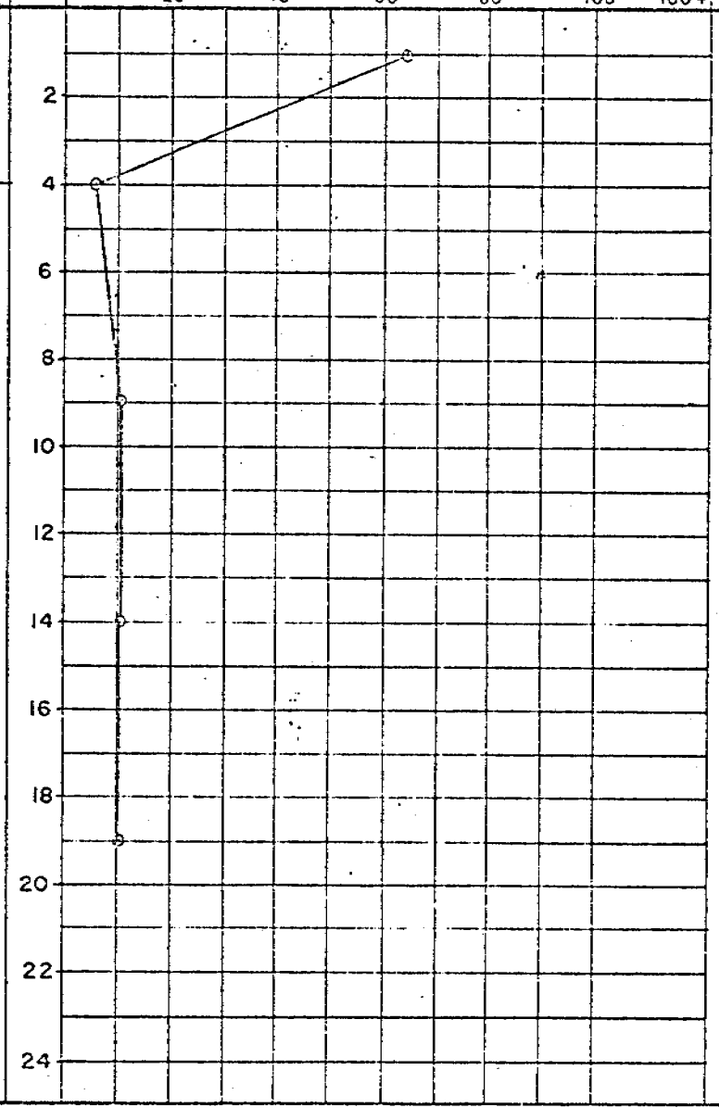
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W	FIELD ENG D.R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1060+00	OFFSET ℄
CKD D.A.P	TECH	RIG AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 20'	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
523	C	476B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2						SAND ORGANIC, SILTY	FT								
						GRAVEL SAND									
4															
6						CLAY	UF								
8															
10															
12						MED. BROWN, TILL									
14															
16															
18															
20															
22						END OF HOLE									
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

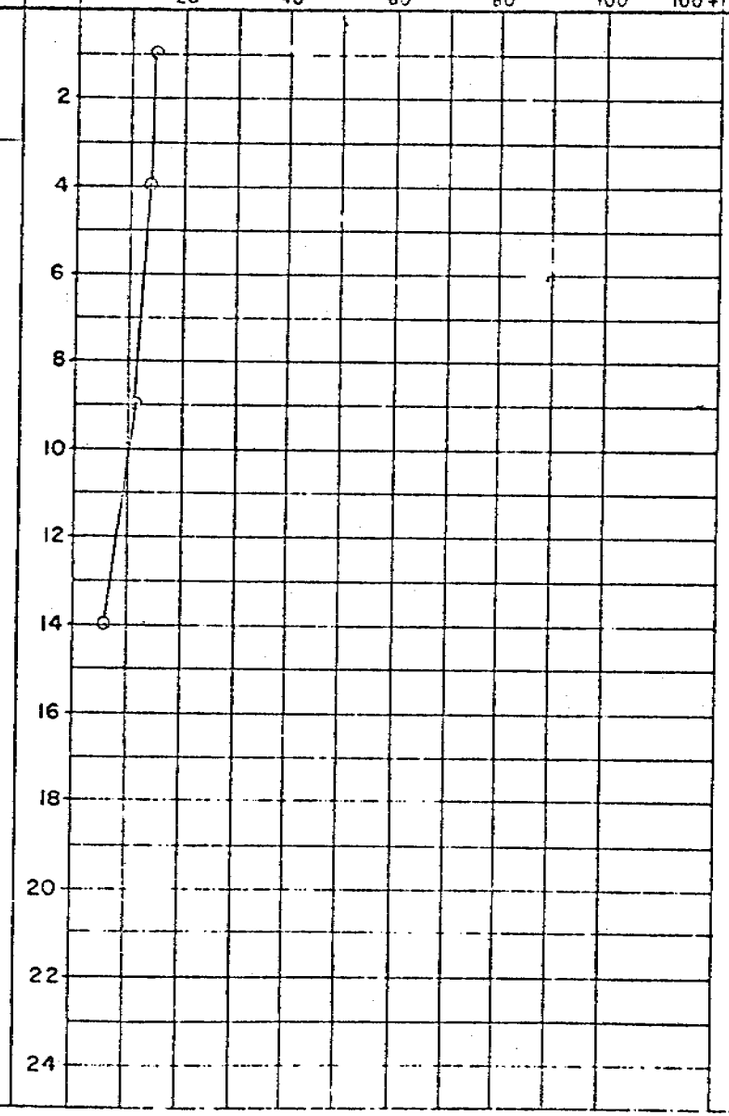
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN AEW	FIELD ENG DR	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1050+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 10'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
523	C	477B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC SANDY, GRAVEL	F								
					GM	SILT SAND & GRAVEL LIGHT BROWN	UF								
					GC	TILL MED BROWN									
					GC										
						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

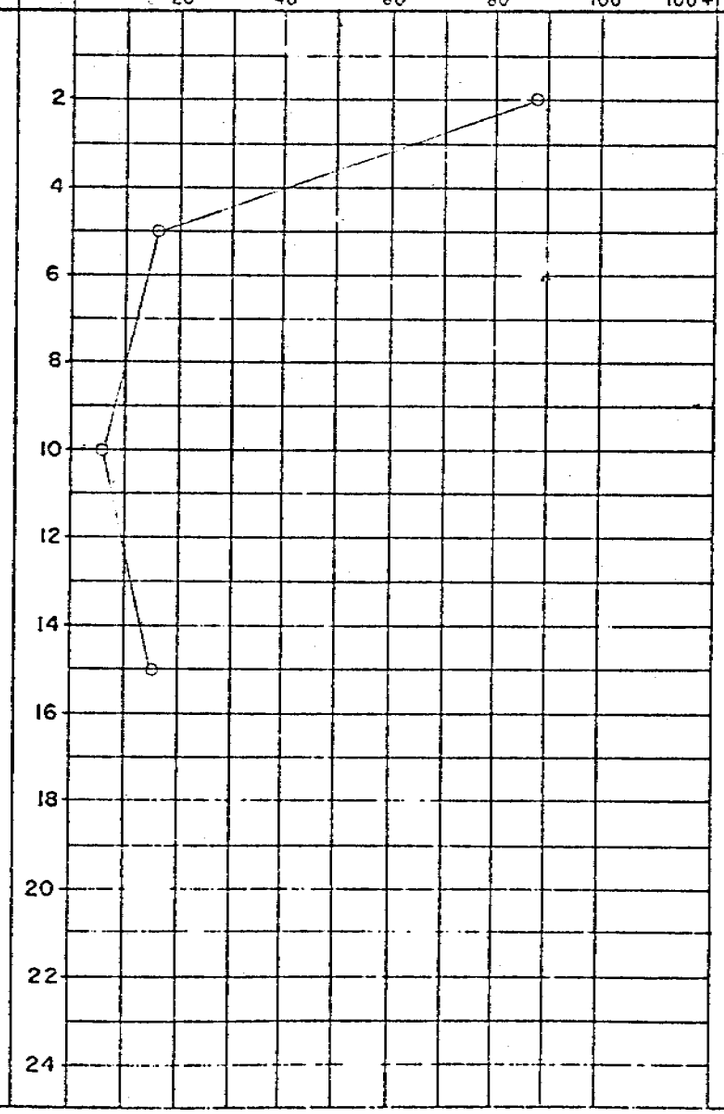
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN R S	FIELD ENG D.R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1040+00	OFFSET: 1L
CKD	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: 20' SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
523	C	473B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" MOSS									
2					ML	SILT BLACK	F								
4					SM	SAND SILTY COBBLES									
6															
8															
10					GM	SAND & GRAVEL									
12															
14					SM		F								
16															
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

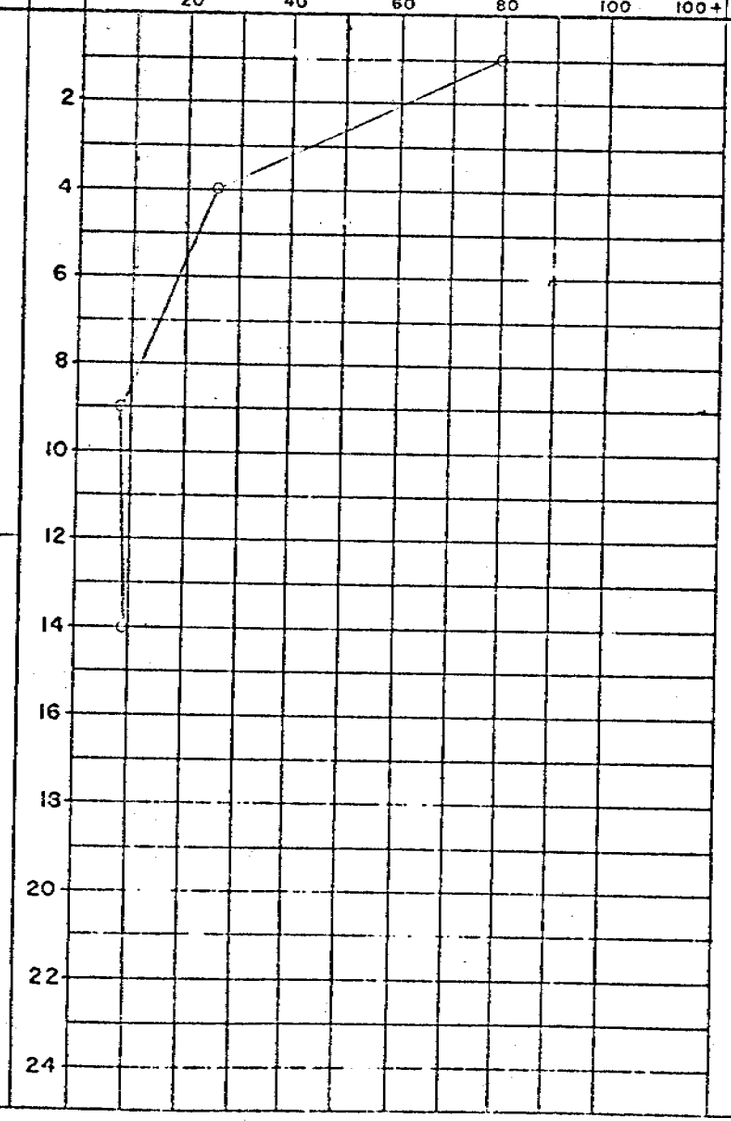
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN AEW	FIELD ENG D.R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1030+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
524	C	479B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
2					SM	SILT 3" MOSS ICE	F	
4						SAND & SILT		
6					GP	GRAVEL		
8								
10						SAND		
12							UF	
14					GC			
16						END OF HOLE		
18								
20								
22								
24								



DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

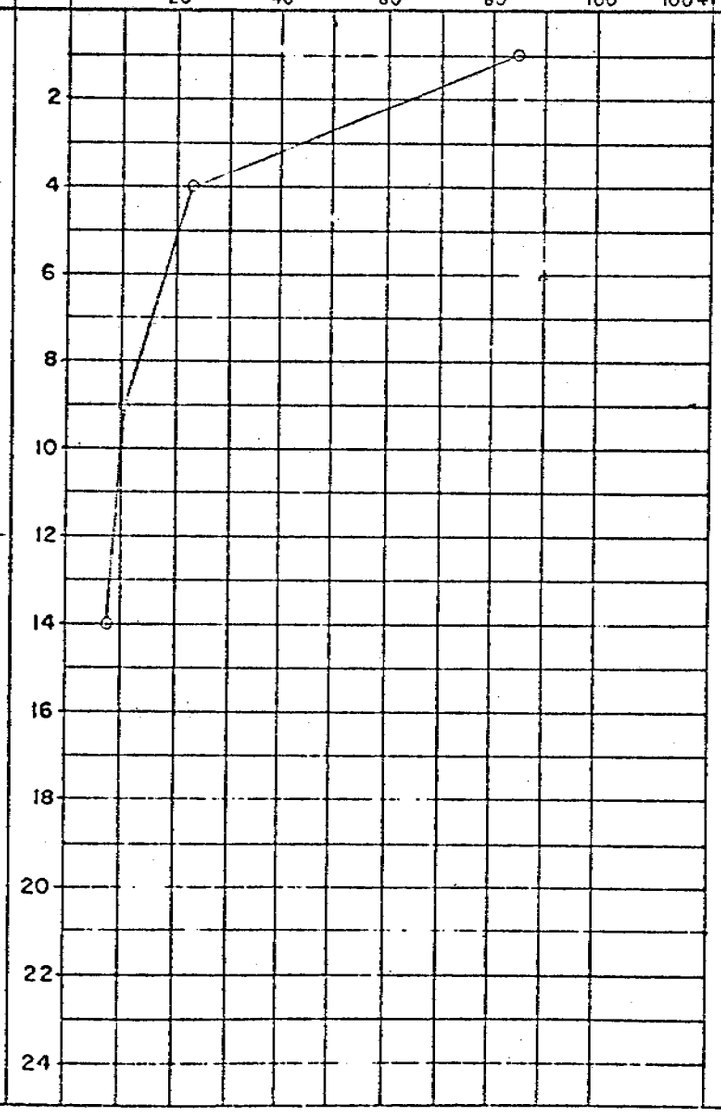
DRN A.E.W	FIELD ENG D.R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1020+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 30'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
524	C	480B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					ML	SILT 3" MOSS ICE	F	
					GM	GRAVEL		
					SP	SAND		
					GC	TILL CLAY, MED BROWN	UF	
						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



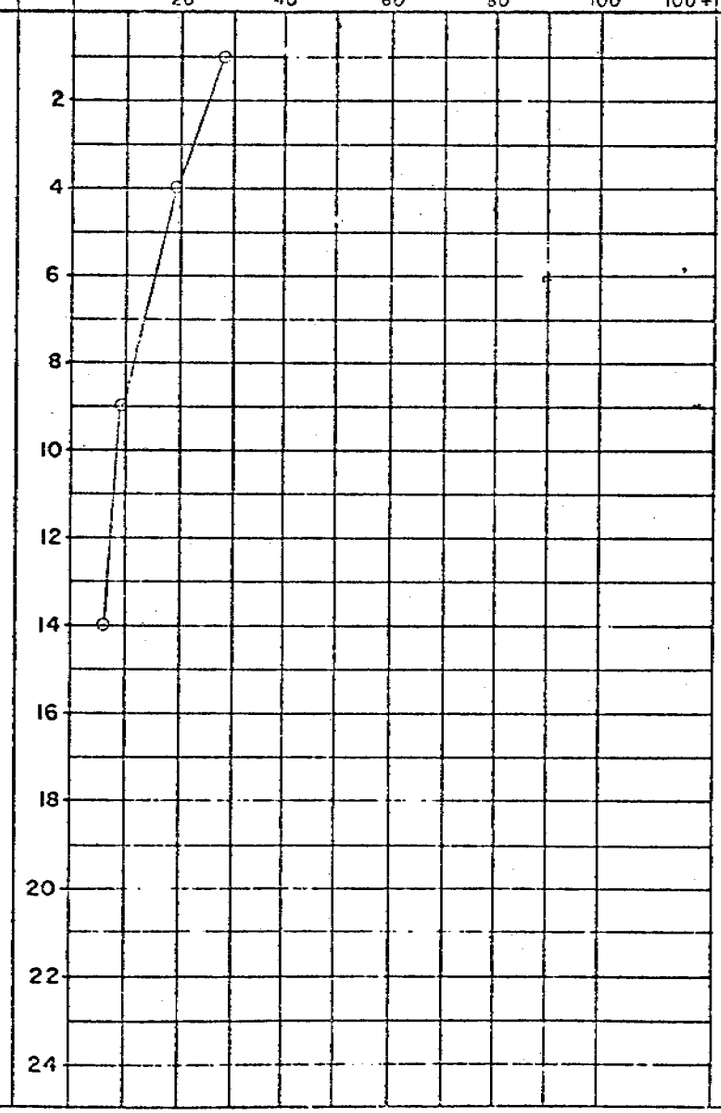
GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.M	FIELD ENG D R	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1010+00	OFFSET: ℄
CKD D G P	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
524	C	481 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					SM	SILT 3" MOSS	F								
2–4						SANDY, GRAVELLY		Vr							
4–6															
6–8					GC										
8–10						TILL									
10–12						CLAY, MED BROWN									
12–14					GC			Vr							
14–16						END OF HOLE									
16–18															
18–20															
20–22															
22–24															

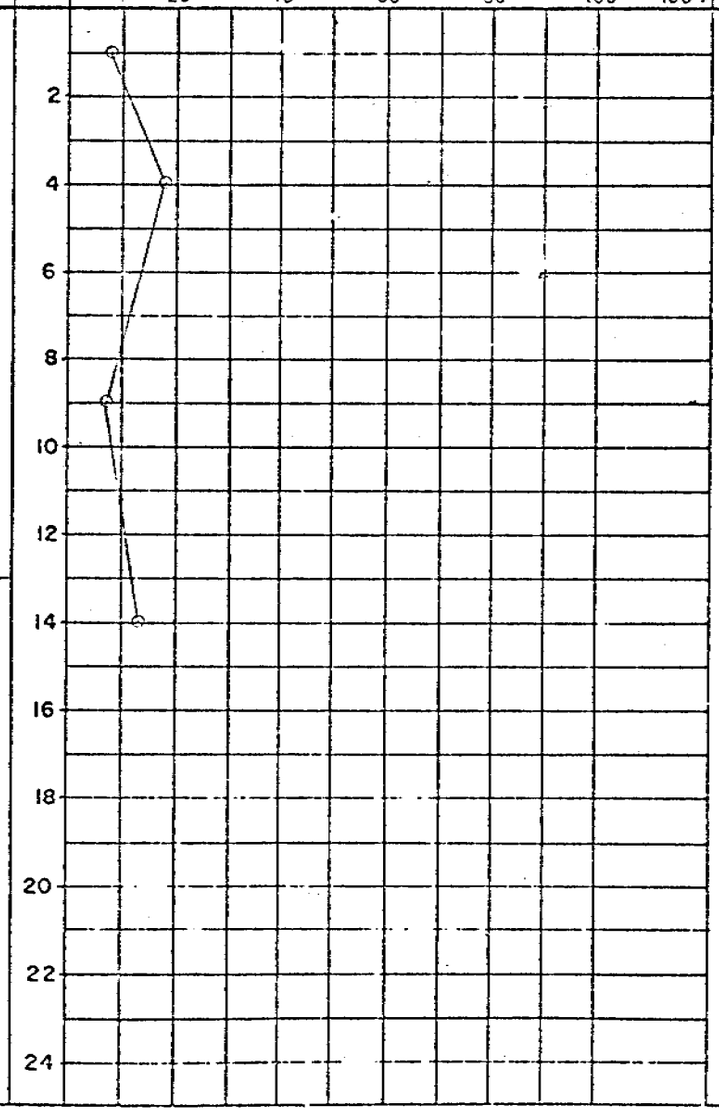


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN A.E.W.	FIELD ENG D.R.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 1000+00	OFFSET: ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
524	C	482B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						3" MOSS	F	
2					GC	GRAVEL SILTY SAND		
						COBBLES		
4					GM			
6						SANDY SILT LIGHT BROWN		
8								
10						SILTY SAND, PEBBLES LIGHT BROWN		
12								
14					GC	TILL	UF	
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Silty, sandy gravel
Location	
Hole 524-C-483B	Depth 4' - 5'
Technician	Date Feb. 20, 1973

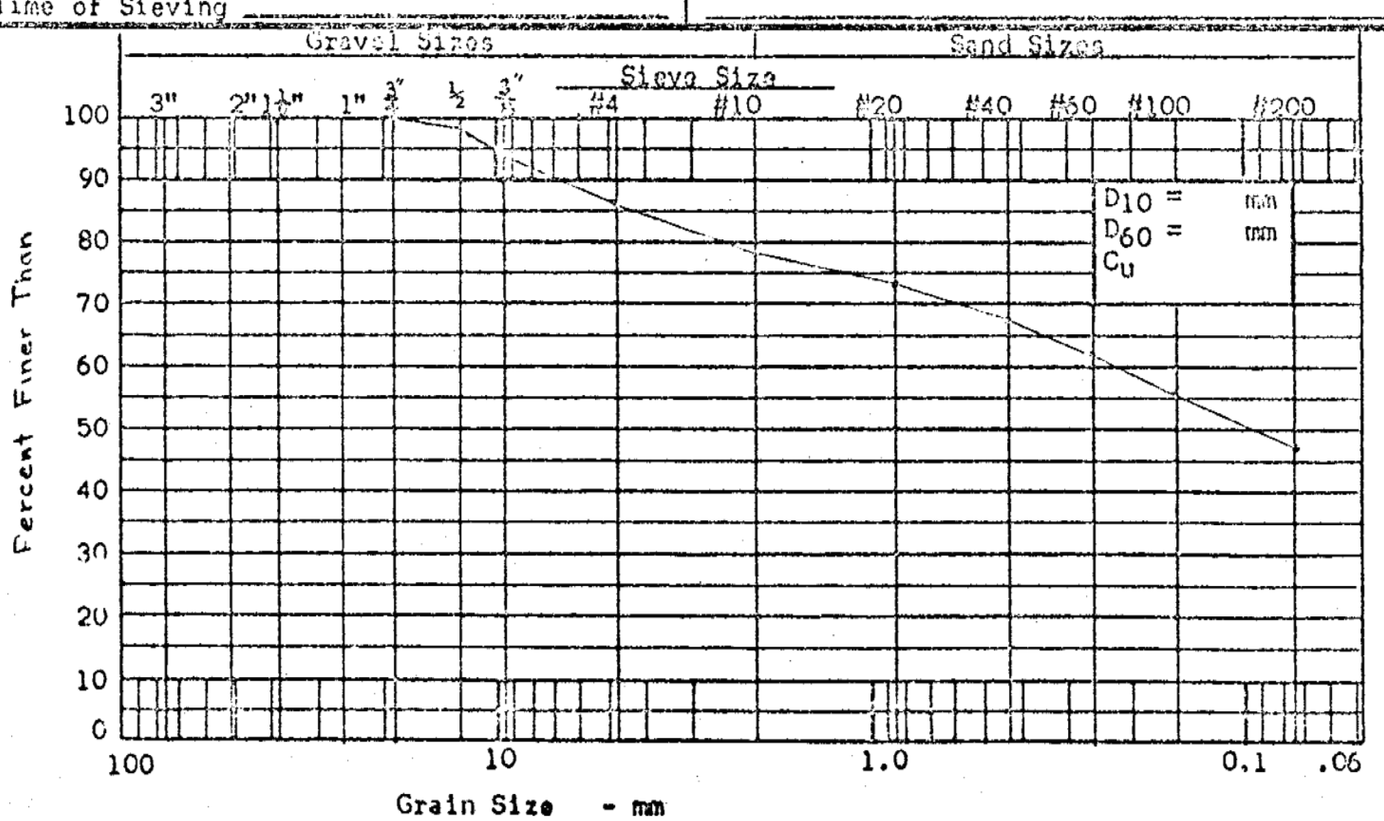
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			99.2	
Wt. Dry		3/8	9.52			94.8	
	4	.185	4.76			86.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			78.8	
Tare No.	20	.0331	.840			73.2	
Wt. Dry + Tare	40	.0165	.420			67.3	
Tare	60	.0097	.250			62.1	
Wt. Dry	100	.0059	.149			56.8	
	200	.0029	.074			47.0	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

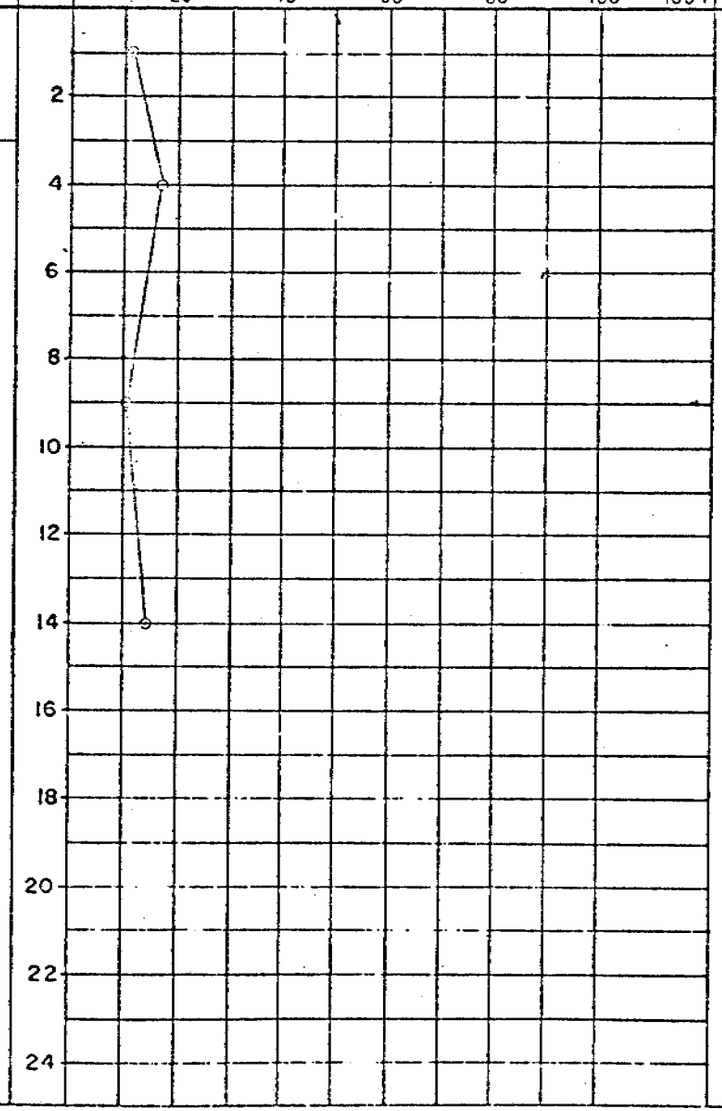
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DAN A.E.W.	FIELD ENG D.R.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 990+00	OFFSET: ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: FIRM	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
524	C	483 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" MOSS									
2					GW	GRAVEL SAND	F								
4							UF		47		32	21			
6					GC	SILTY, SANDY									
8															
10						TILL									
12					GC	CLAY, MED. BROWN									
14															
16						END OF HOLE									
18															
20															
22															
24															

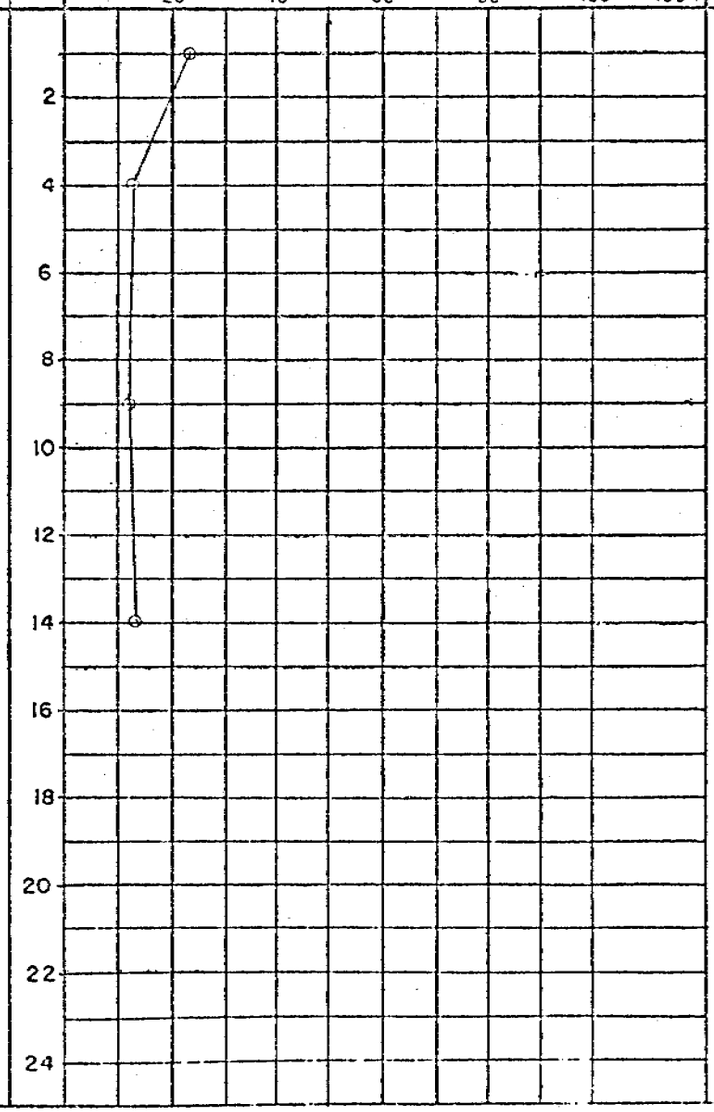


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 980+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: SPRUCE	ELEV:	

MILE	B,C,S	NUMBER
525	C	484B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					PT	MUSKEG	F		
2					SM	SILT CLAYEY			
4					GM	SAND SILTY WITH PEBBLES			
6					CL	CLAY			
8									
10						SANDY WITH ROCKS AND PEBBLES			
12									
14					CL				
16						END OF HOLE			
18									
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

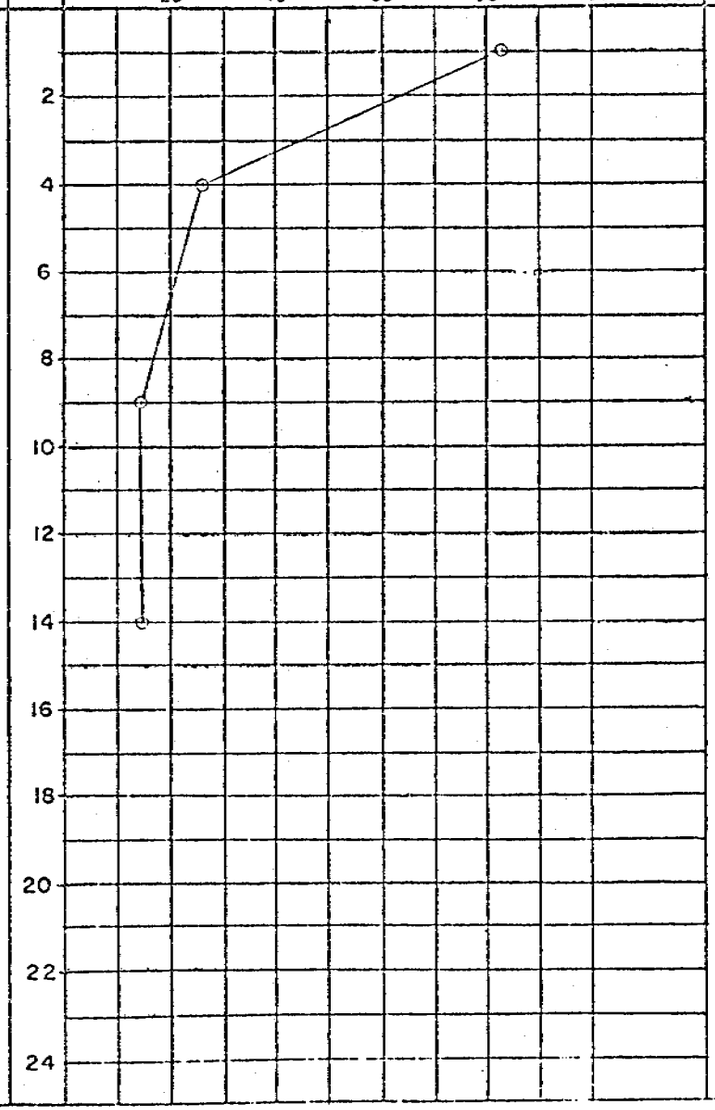
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 970+00	OFFSET: L
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 40'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
525	C	4355

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					M	MUSKEG	F								
2					CL	CLAY SILTY, SANDY									
4															
6						SAND									
8															
10					SC	COARSE									
12															
14															
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

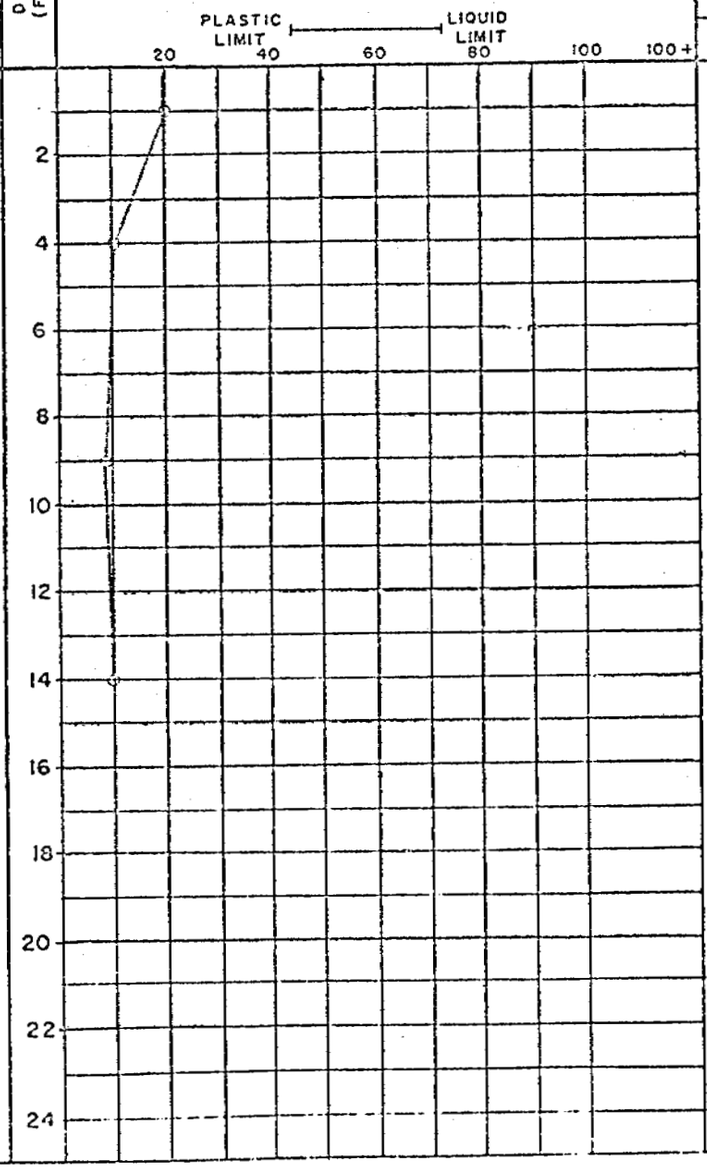
DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 966+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
525	C	486B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PT	MUSKEG	TT								
					SP	SAND FINE									
2															
					GP	GRAVEL									
4									19		35	46			
6															
8															
10															
12															
14					GP	CLAY LENSES									
16						END OF HOLE									
18															
20															
22															
24															

○ - WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



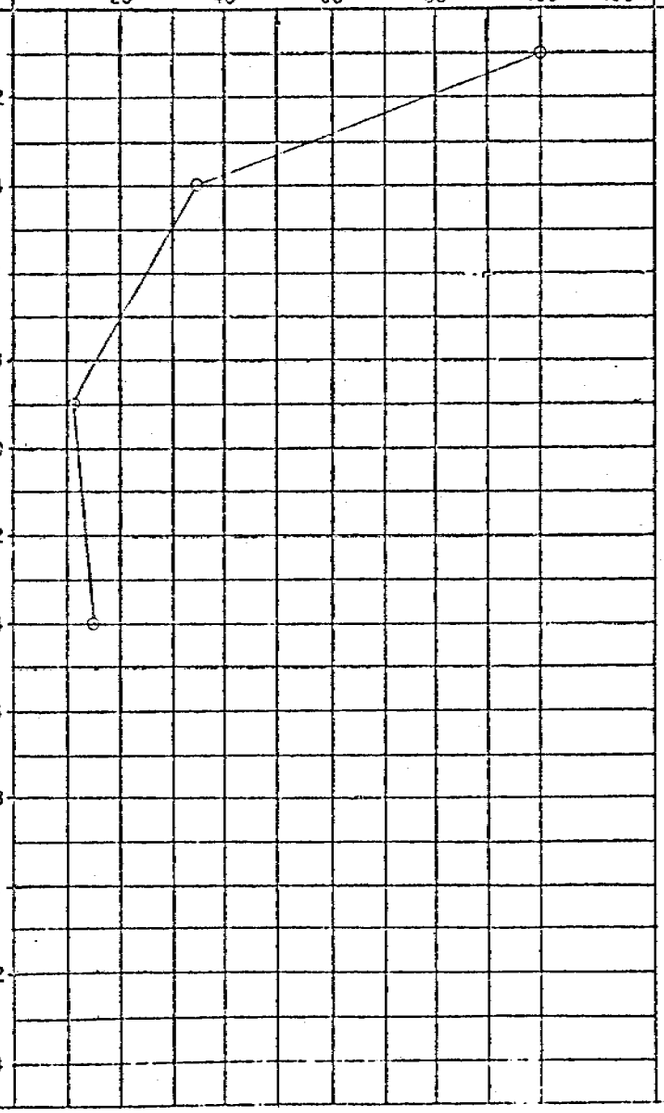
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN. A.E.W	FIELD ENG H.E.A	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 955+00	OFFSET: ℄
CKD D.A.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
525	C	437B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG	F									
2					Pt	ORGANIC		ICE	2							
4					CL	CLAY			4							
6					GM	TILL			6							
8									8							
10									10							
12									12							
14					SM	SAND			14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

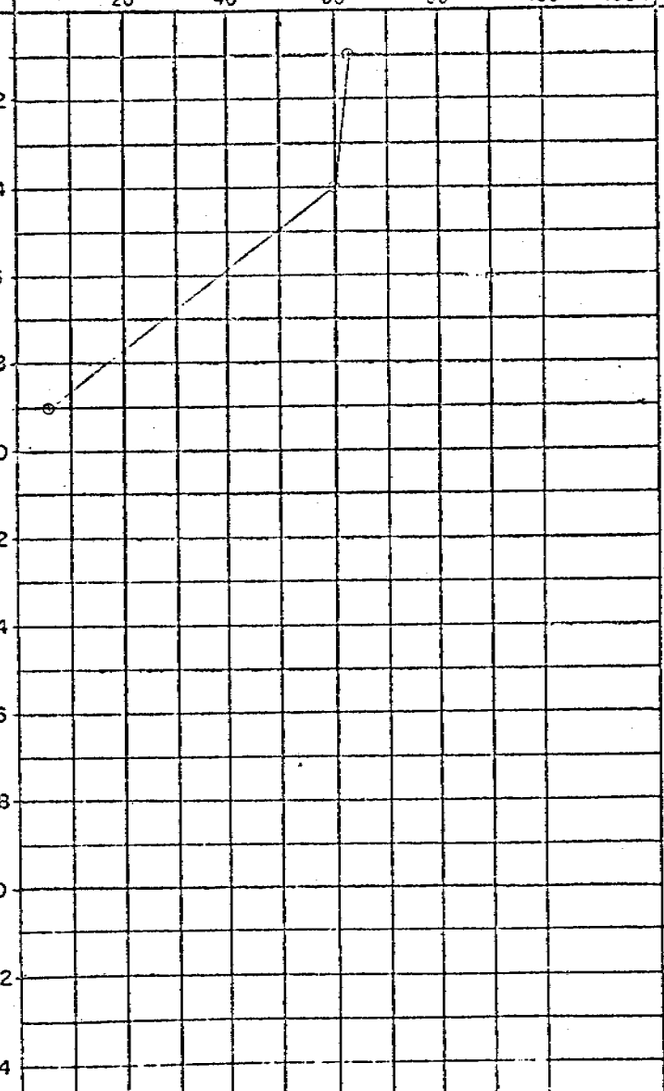
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A.E.W.	FIELD ENG: H.E.A.	DATE DRILLED: 6/2/73	AIRPHOTO NO:	CHAINAGE: 945+00	OFFSET: ℄
CKD: G.S.P.	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE TO 40'	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
525	C	488B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG	F	
2					CL	CLAY		
4		P						
6								
8						GRAVEL TILL		
10								
12								
14					CL			
16						END OF HOLE		
18								
20								
22								
24								



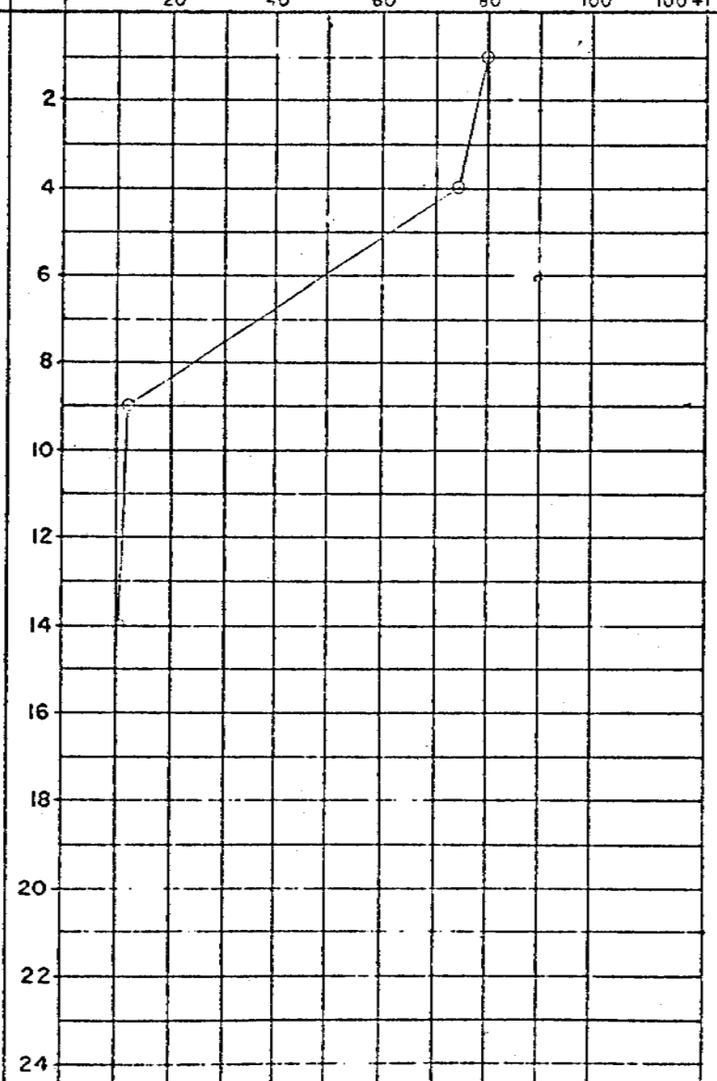
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG HEA	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 933+00	OFFSET: L
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE 30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
525	C	469B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG									
						CLAY	F								
2					SM	SILTY									
4															
6															
8						GRAVEL									
10															
12															
14					GC	SANDY									
16						END OF HOLE									
18															
20															
22															
24															

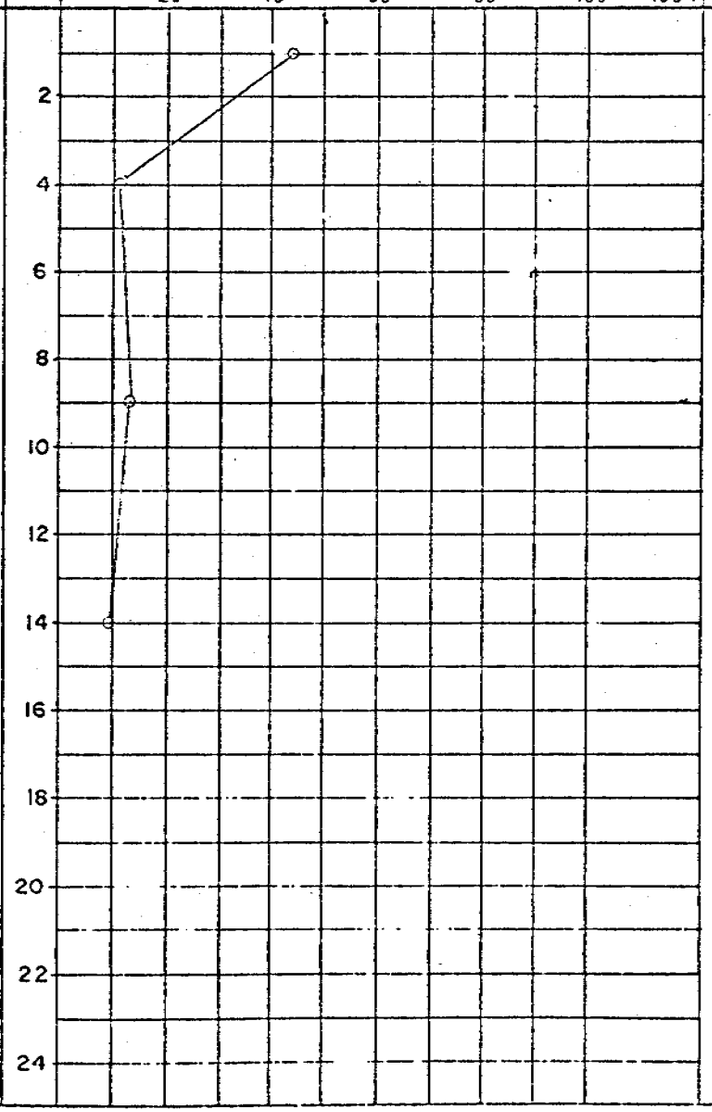


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN A.E.W.	FIELD ENG H.E.A.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 926+00	OFFSET: ℄
CKD D.G.P.	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
526	C	4905

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	MUSKEG									
						CLAY	F								
2					ML	SILTY									
4					GP	TILL									
6						GRAVEL									
8															
10															
12						CLAY, WITH PEBBLES									
14					GC										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

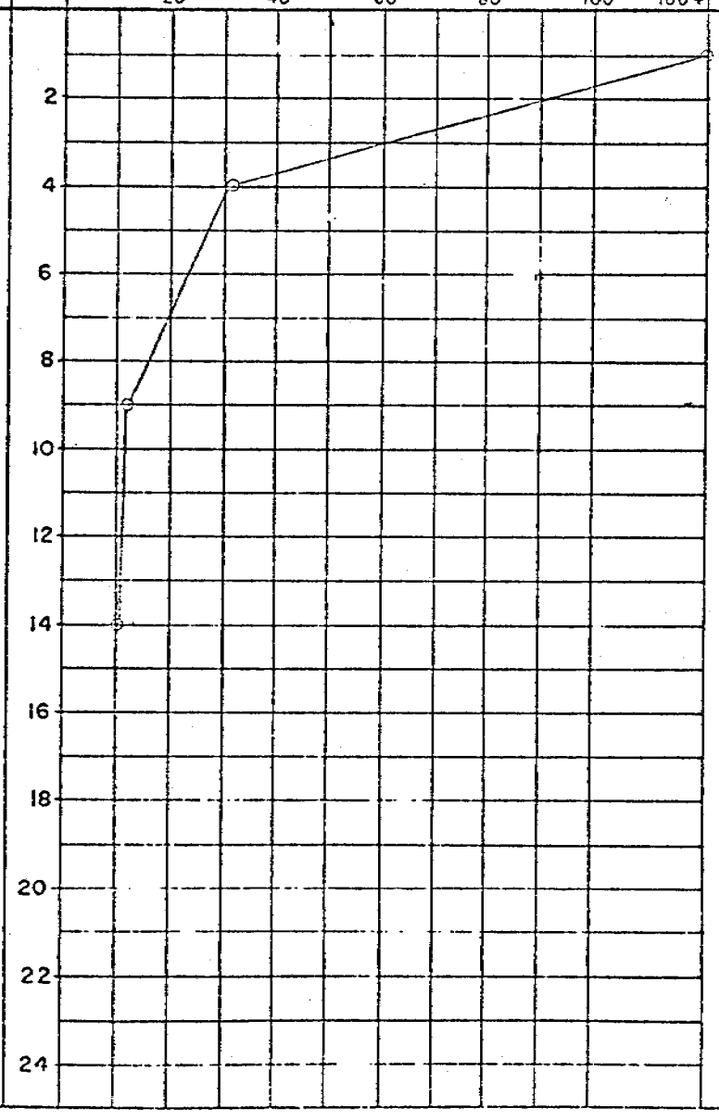
DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

CAN A.E.W	FIELD ENG HEA	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 922+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
526	C	491 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PT	MUSKEG	F	
2					ML	CLAY SILTY		
4					GM	SAND SILTY WITH PEBBLES		
6						TILL		
8								
10					CL	CLAY, GRAVEL		
12								
14								
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

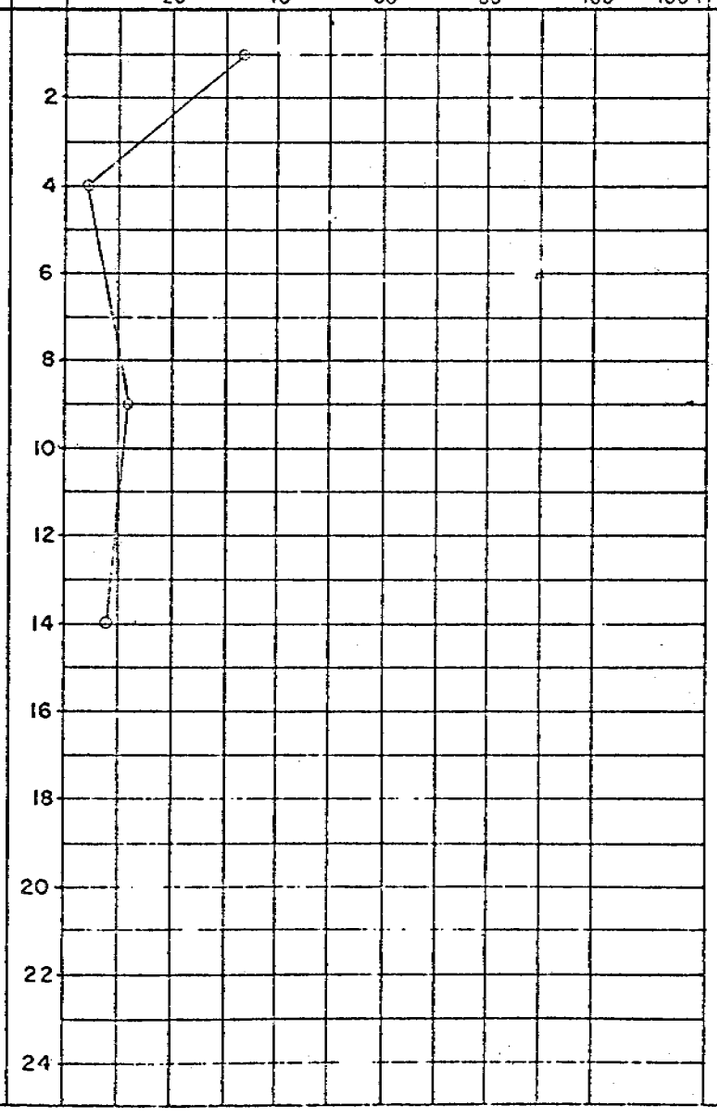
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG F.E.A	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 910+00	OFFSET: ℄
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
526	C	4928

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	4" MUSKEG	F								
2					GM	GRAVEL									
4															
6															
8					GP										
10					GC	TILL CLAY DEBBLES, ROCKS									
12															
14					GC										
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

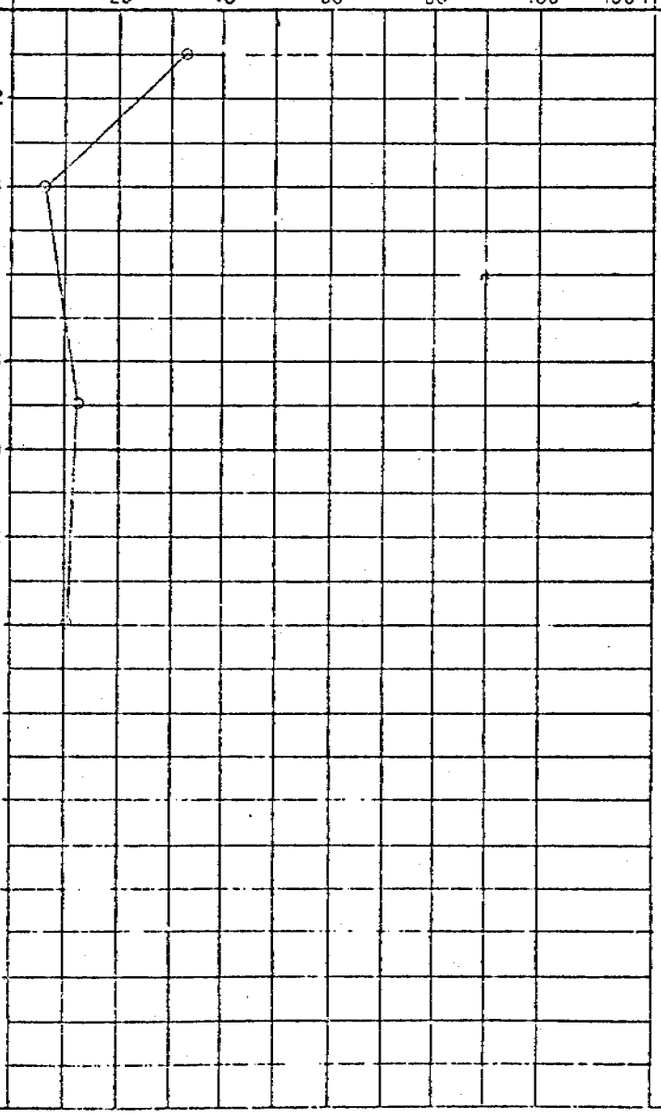
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG HEH	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 897+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
526	C	493B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						MUSKEG										
					ML	CLAY SILTY	F									
2									2							
						GRAVEL										
4					GW				4							
6						TILL			6							
8									8							
10					GC	CLAY, PEBBLES			10							
12							UF		12							
14									14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							



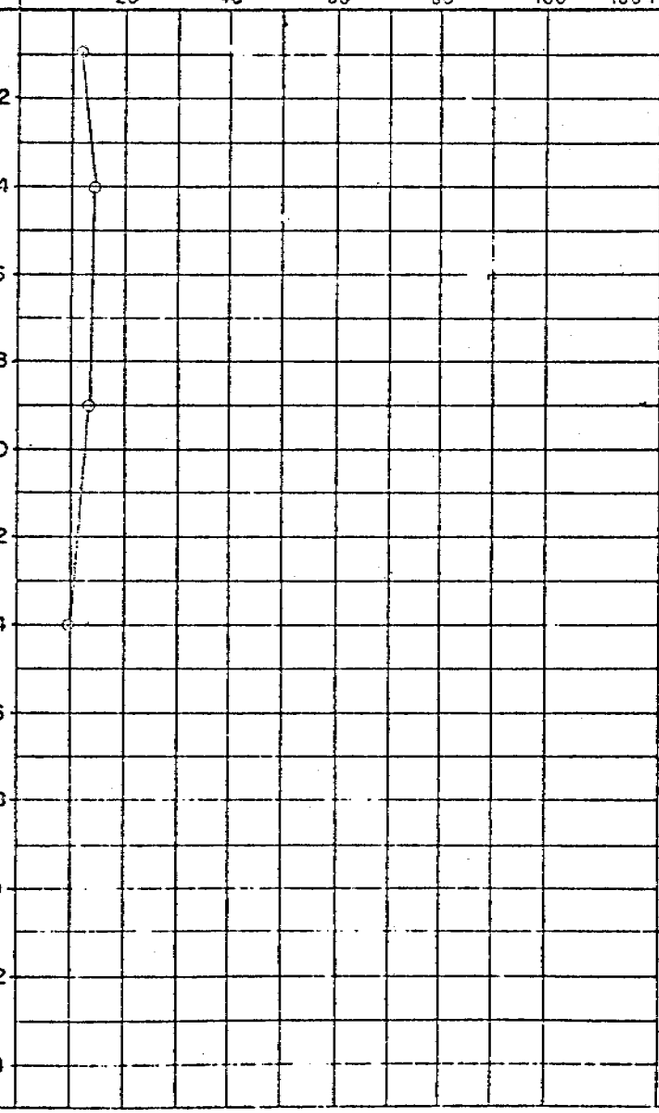
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W.	FIELD ENG H.E.A.	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 885+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE & POPLAR	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
526	C	494 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					SM	SAND 4" MUSKEG SILTY	T								
2															
					GC	CLAY SANDY WITH ROCKS									
4															
6															
8															
10						ROCKS 1/2" AND LARGER									
12															
14					GC										
16						END OF HOLE									
18															
20															
22															
24															

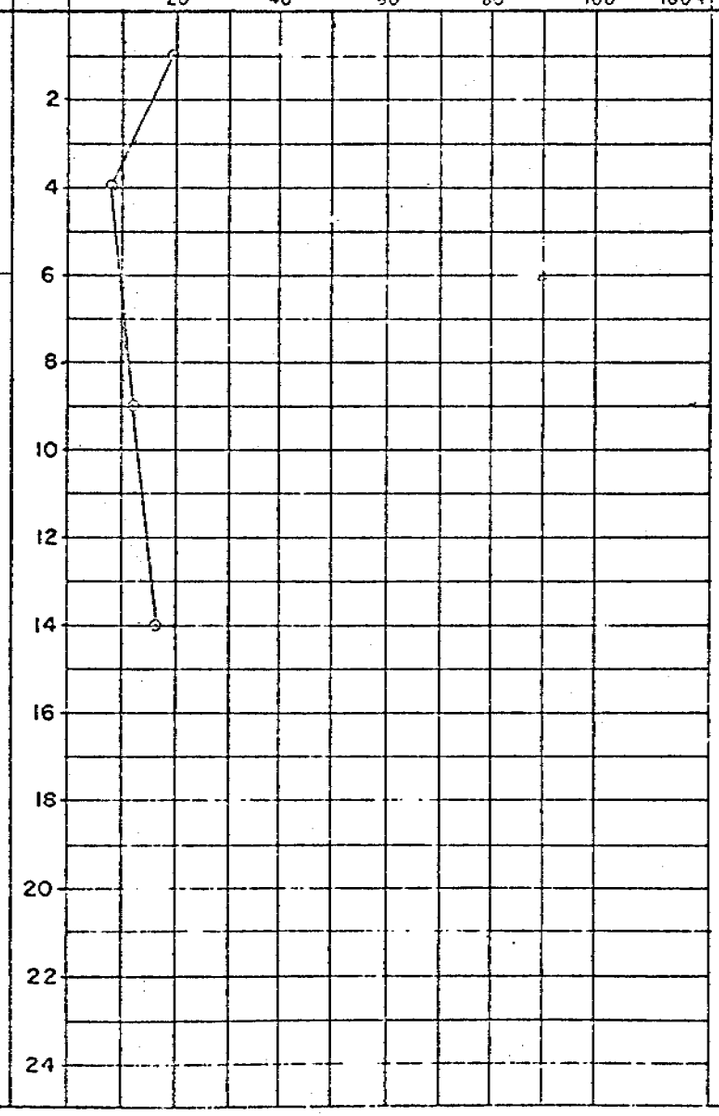


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DRN AEW	FIELD ENG HEM	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 873+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
527	C	495B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					PL	MUSKEG ORGANIC, SILTY CLAY	F								
2															
4					GC	GRAVEL									
6						CLAY	UF								
8															
10															
12					GC	CLAY PEBBLES, VERY WET									
14															
16						END OF HOLE									
18															
20															
22															
24															

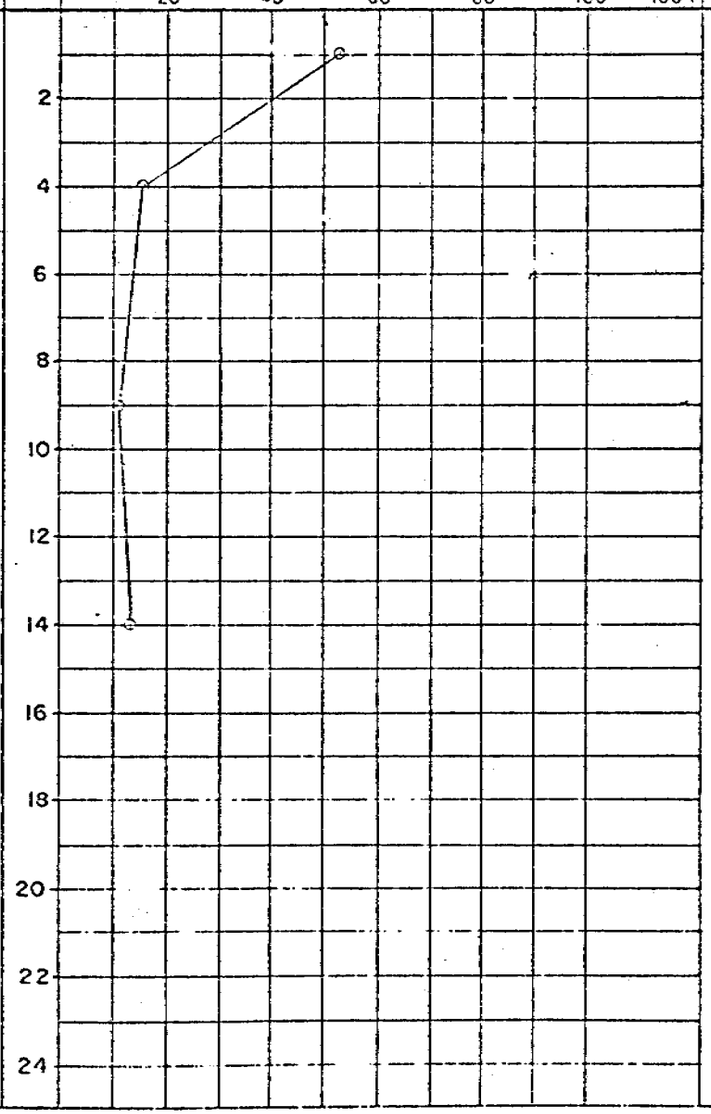


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CAN AEW	FIELD ENG HEA	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 860+00	OFFSET: ℄
CKD DSP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 20'-30'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
527	C	496B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	NUSKEG SILTY, ORGANIC	F								
2															
					GC	GRAVEL									
4						SILT									
6							UF								
8						SOME CLAY									
10															
12						SILTY CLAY									HOLE FILLED UP WITH WATER
14					GC										
16						END OF HOLE									
18															
20															
22															
24															



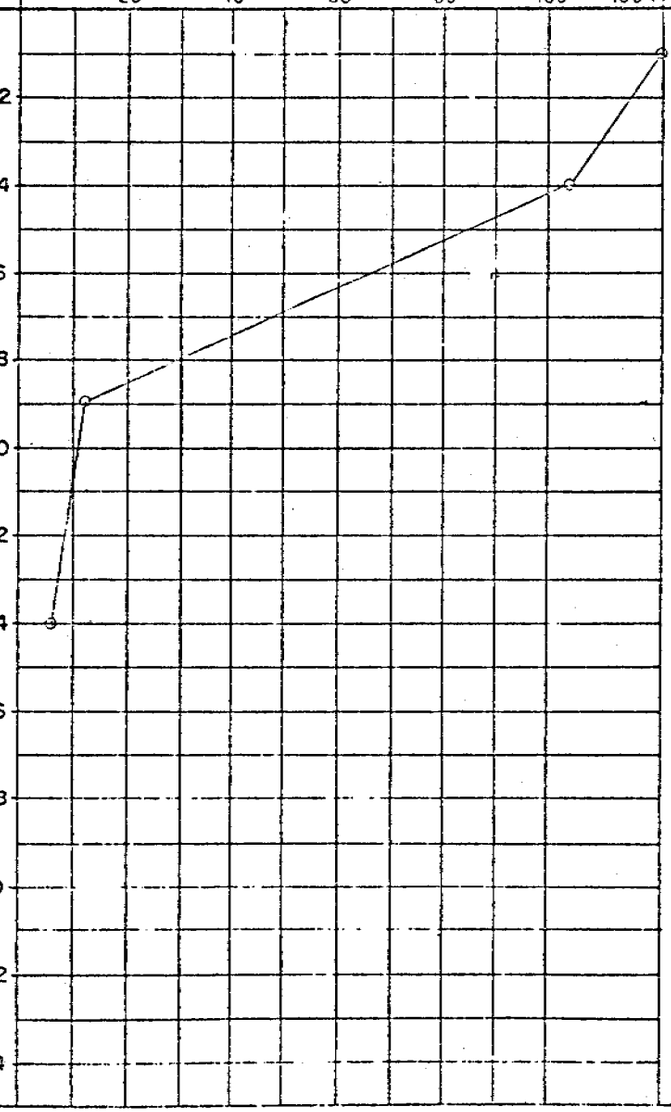
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG HEA	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 847+00	OFFSET: ℄
CKD DGP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & TAMARACK	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
527	C	497B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG	F									
2					ML											
						GRAVEL		ICE CRYSTALS VISIBLE								
4					GC											
6																
8						CLAY										
10																
12																
14					GC											
16						END OF HOLE										
18																
20																
22																
24																

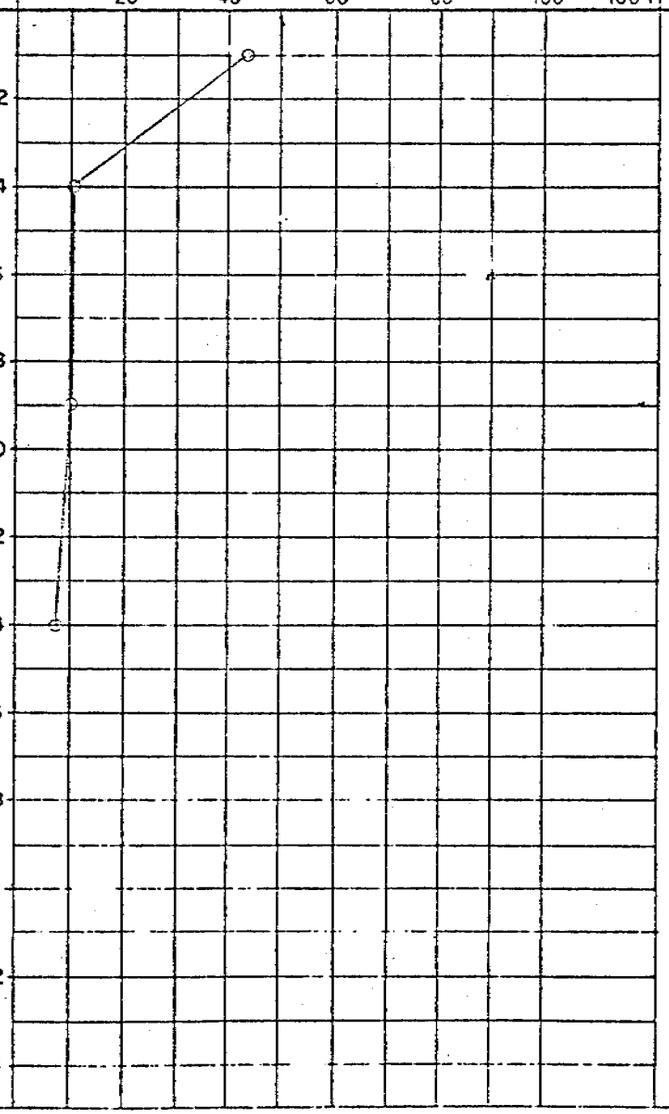


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN AEW	FIELD ENG HEA	DATE DRILLED 6/2/73	AIRPHOTO NO:	CHAINAGE: 836+00	OFFSET: ℄
CKD DSP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV

TEST HOLE		
MILE	B,C,S	NUMBER
527	C	4383

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					Pt	ORGANIC	F								
2–4					GM	GRAVEL									
4–6						SILT									
6–8															
8–10						CLAY									
10–12							UF								
12–14					GC	SILTY, SMALLER GRAVEL									
14–16		P													
16–18						END OF HOLE									
18–20															
20–22															
22–24															



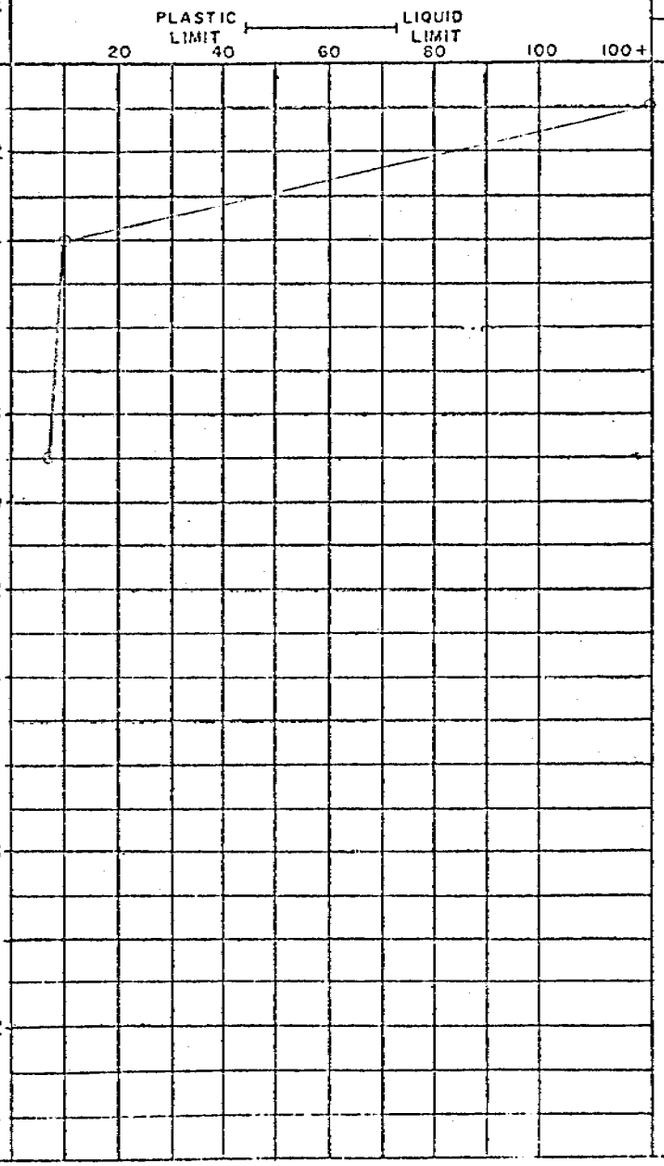
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: H.E.W	FIELD ENG: H.E.A	DATE DRILLED: 8/2/73	AIRPHOTO NO:	CHAINAGE: 826+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
527	C	513B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	SILT ORGANIC SANDY	F	
2								
					SM	SAND SILTY ROCKS TO ½"		
4								
6					CL	CLAY		
8						SILTY GRAVEL TILL		
10								
12							UF	
14					CL	SMALL PEBBLES		
16						END OF HOLE		
18								
20								
22								
24								

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



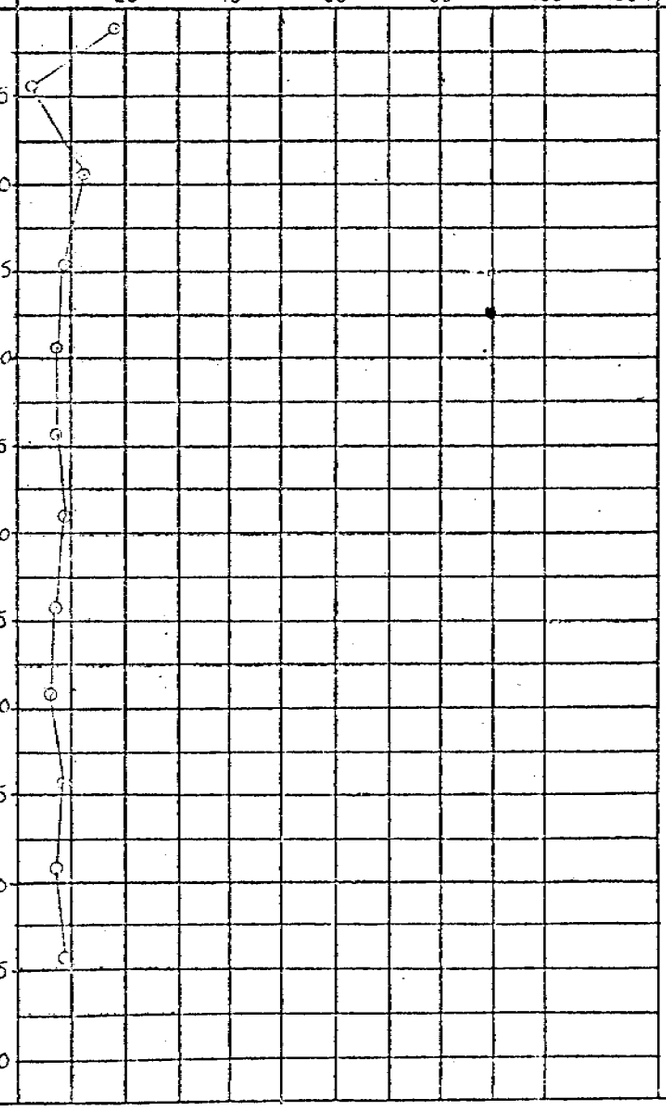
DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.F.W	FIELD ENG: NWC	DATE DRILLED: 8/2/73	AIRPHOTO NO:	CHAINAGE: 812+00	OFFSET: ℄	TEST HOLE
CKD: DEP	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: ASPEN & POPLAR	ELEV:	

MILE	B,C,S	NUMBER
528	S	382A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					PT	TOPSOIL	F	
					GC	GRAVEL		
5						COARSE, SANDY		V
10						CLAY		
15					GC	TILL WITH PEBBLES AND COBBLES		VISIBLE ICE CRYSTALS
20						FEW BOULDERS		
25								
30								
35						TILL WITH SAND AND PEBBLES.		
40						COBBLES AND A FEW BOULDERS		VISIBLE ICE CRYSTALS
45					GC			
50						SAND		V
55						CLAY PEBBLES AND COBBLES, QUITE WET		
60						END OF HOLE		



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						HOLE INSULATED AND FLAGGED

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Till with trace of sand
Location
Hole 528-S-384A Depth 30'
Technician Date Feb. 9, 1973

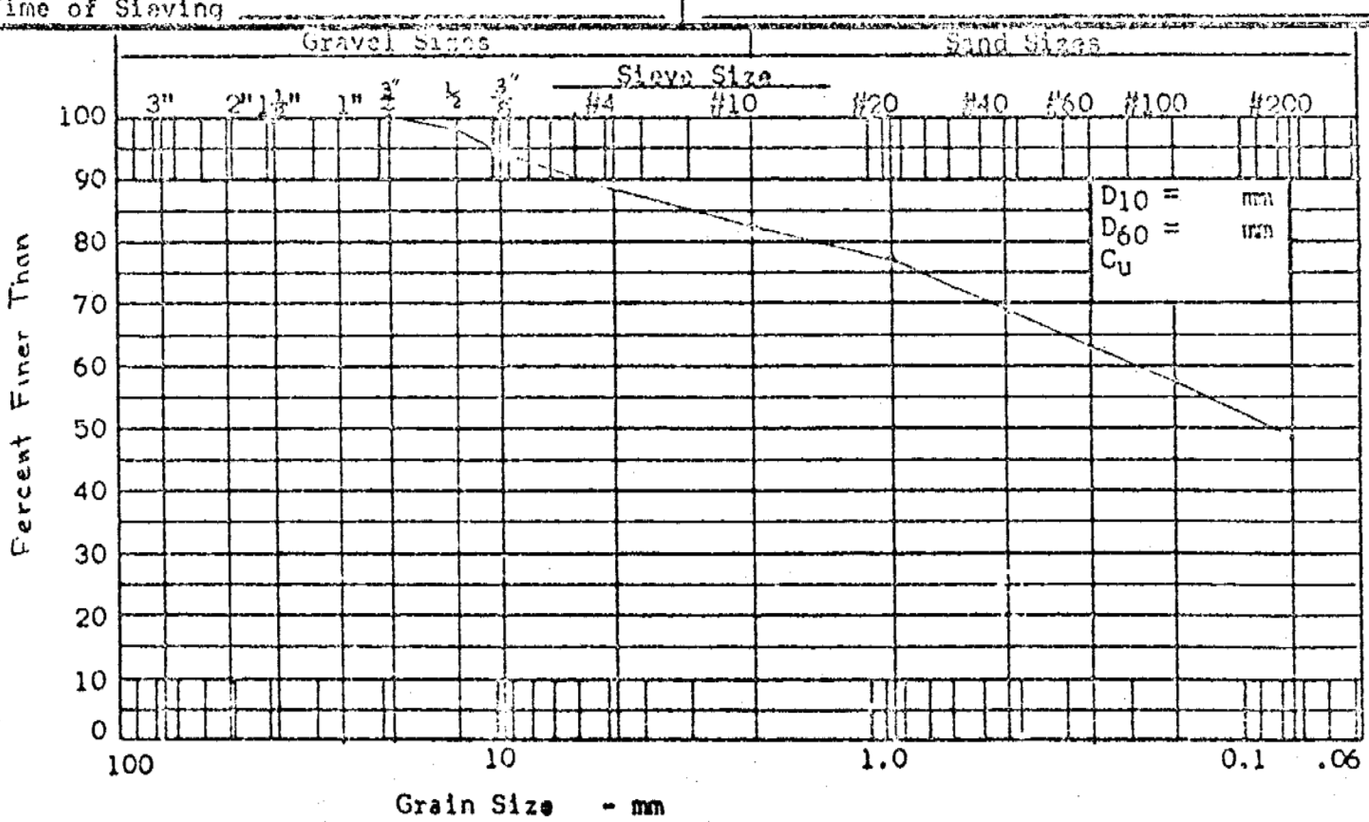
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			98.6	
Wt. Dry		3/8	9.52			94.7	
	4	.185	4.76			88.6	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			82.7	
Wt. Dry + Tare	20	.0331	.840			77.2	
Tare	40	.0165	.420			69.6	
Wt. Dry	60	.0097	.250			63.0	
	100	.0059	.149			57.4	
	200	.0029	.074			49.6	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

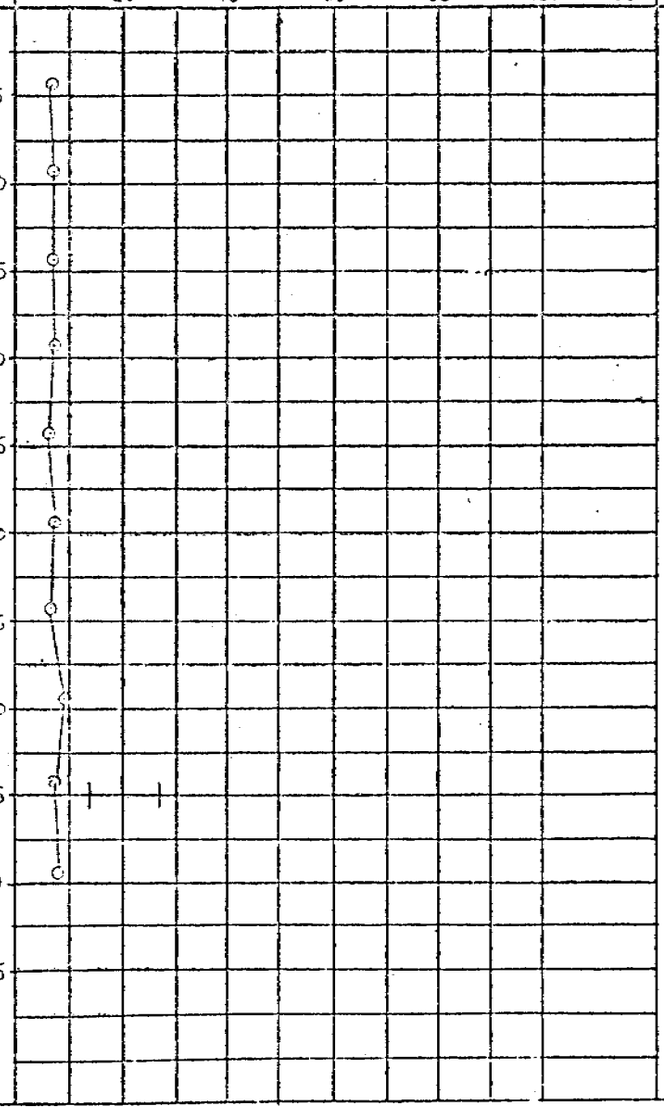
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: L E W	FIELD ENG: R S	DATE DRILLED: 9/2/73	AIRPHOTO NO:	CHAINAGE: 804+00	OFFSET:
CKD: D E P	TECH:	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: SPRUCE TO 100'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
528	S	334A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								TOP 5' STRIPPED
5					GW	GRAVEL									
10				50 BLS	GC	TILL	UF								SO_4 - 0.14 %
15						SILTY CLAY WITH A FEW PEBBLES									
20				29 BLS											
25					GC										
30				50 BLS		TRACE OF SAND				50	32	18			
35						FEW PEBBLES									
40				50 BLS											
45					GC										
50				104 BLS											
55						END OF HOLE									



UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A.E.W.	FIELD ENG R.S.	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 799+00	OFFSET: ℄
CKD DSP	TECH	RIG AIR	SURFACE DRAINAGE: S TO CREEK	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
528	S	383A

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					CL	CLAY	F	
5						SILTY, TRACE OF SAND		
10						SAND & PEBBLES, SILTY	UF	
15								
20						SILTY, PEBBLES		
						TRACES OF COARSE SAND		
25								
30						TRACES OF FINE-MEDIUM SAND		
35						PEBBLES		
40						FINE SAND SOME PEBBLES		
45								
50					CL	SILTY SOME SAND FEW PEBBLES		
55								
60						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT

20 40 60 80 100 100+

DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
5						
10						
15						
20						
25						
30						
35						
40						
45						
50						
55						
60						

REMARKS

SO_4 - 0.13 %

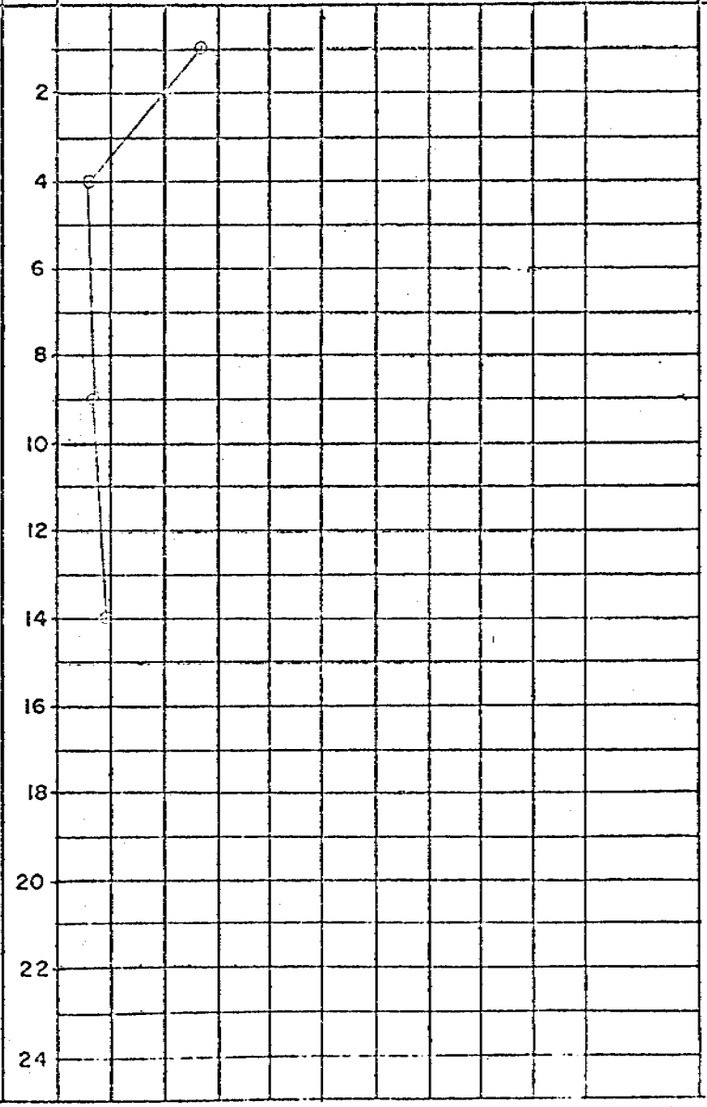
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG H.E.A	DATE DRILLED 8/2/73	AIRPHOTO NO:	CHAINAGE: 790+00	OFFSET: ℄
CKD D.S.P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & TAMARACK	ELEV.

TEST HOLE		
MILE	B,C,S	NUMBER
528	C	5258

REMARKS

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC MUSKEG	F	
2								
					GW	GRAVEL		
4								
6						SILTY CLAY	UF	
8								
10						SILT, WET, VERY FEW FINES		
12					GC			
14		P			CL	CLAY		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Gravel
Location
Hole 528-C-526B Depth 4' - 5'
Technician Date Feb. 8, 1973

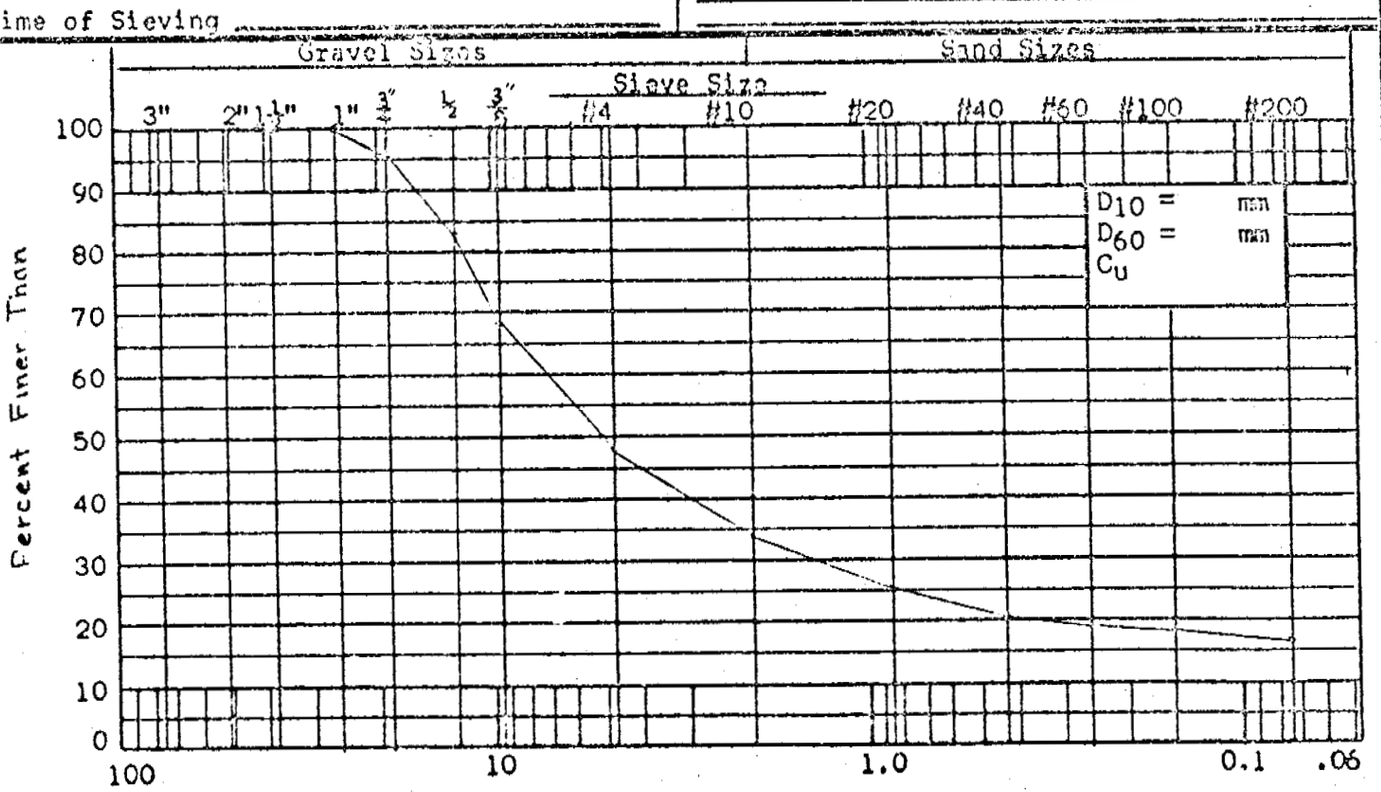
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4			100.0	
Tare		3/4	19.10			95.7	
Wt. Dry		1/2	12.70			83.4	
		3/8	9.52			68.7	
	4	.185	4.76			48.6	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			34.0	
Wt. Dry + Tare	20	.0331	.840			25.8	
Tare	40	.0165	.420			21.5	
Wt. Dry	60	.0097	.250			19.3	
	100	.0059	.149			18.2	
	200	.0029	.074			16.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



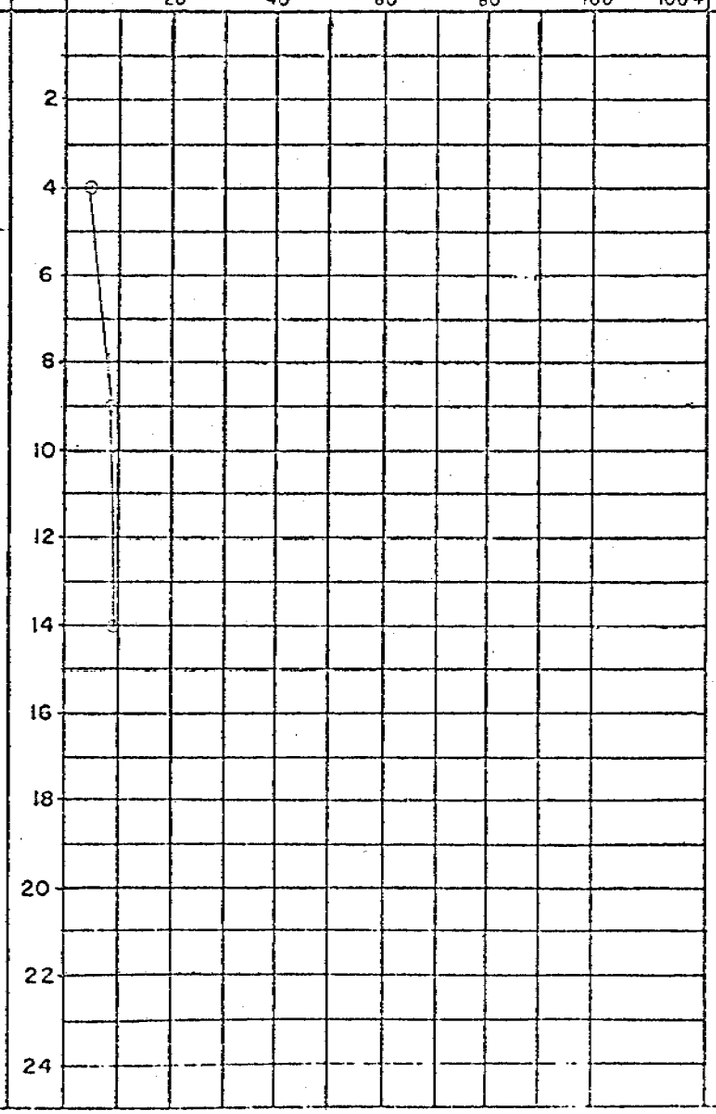
Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: H E A	DATE DRILLED: 8/2/73	AIRPHOTO NO:	CHAINAGE: 780+00	OFFSET: ℄
CKD: D S P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: TAMARACK, SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
528	C	5265

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	SILT 3" TOPSOIL	F								
2					ML	GRAVEL, ORGANIC									
					GC	GRAVEL									
4									16		18	66			
6						CLAY, SMALL STONES	UF								
8															
10					GC										
12					CL	CLAY									
14		P													
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Clayey Gravel
Location	
Hole 529-C-527B	Depth 9' - 10'
Technician	Date Feb. 8, 1973

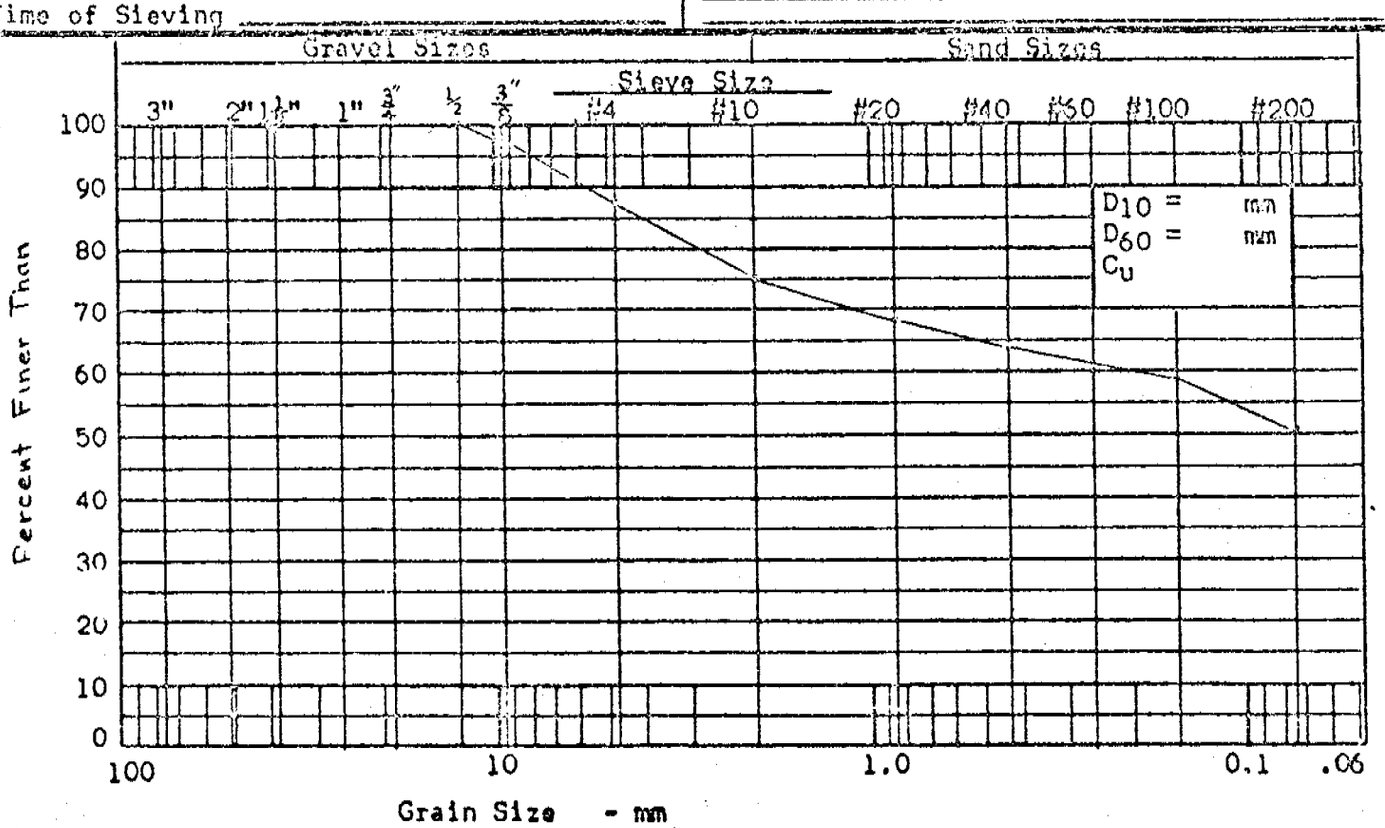
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100.0	
Wt. Dry		3/8	9.52			98.6	
	4	.185	4.76			87.8	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			75.5	
Tare No.	20	.0331	.840			68.3	
Wt. Dry + Tare	40	.0165	.420			64.0	
Tare	60	.0097	.250			61.5	
Wt. Dry	100	.0059	.149			59.4	
	200	.0029	.074			50.7	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

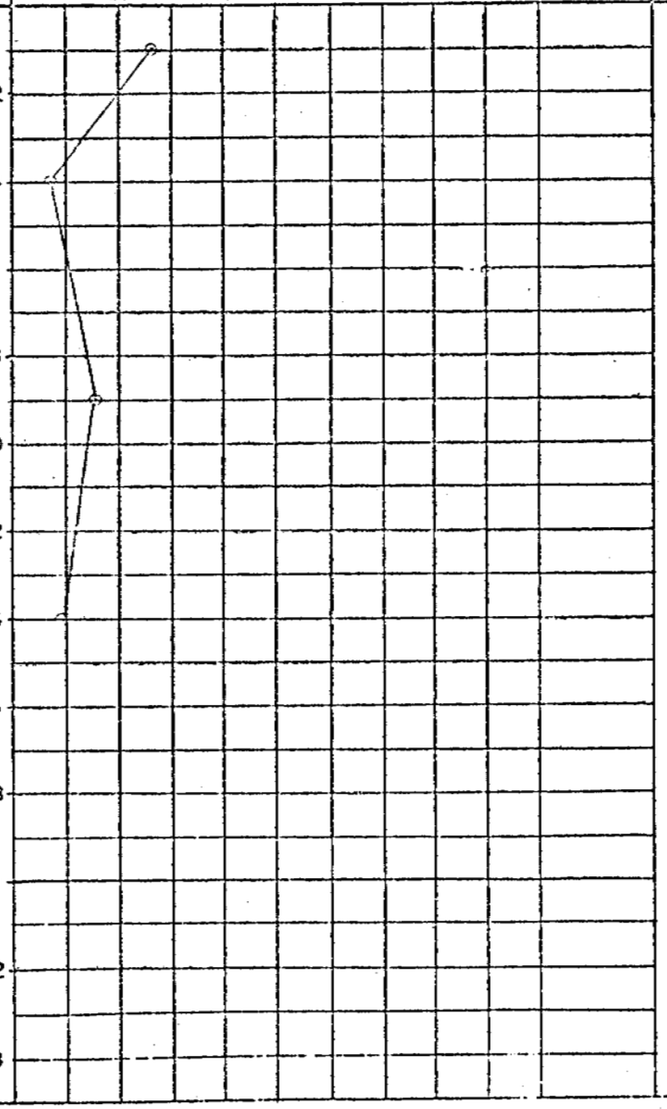
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN A E W	FIELD ENG H E A	DATE DRILLED 8/2/73	AIRPHOTO NO:	CHAINAGE: 770+00	OFFSET: 6
CKD D G P	TECH	RIG AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV.

TEST HOLE

MILE	B,C,S	NUMBER
529	C	527B

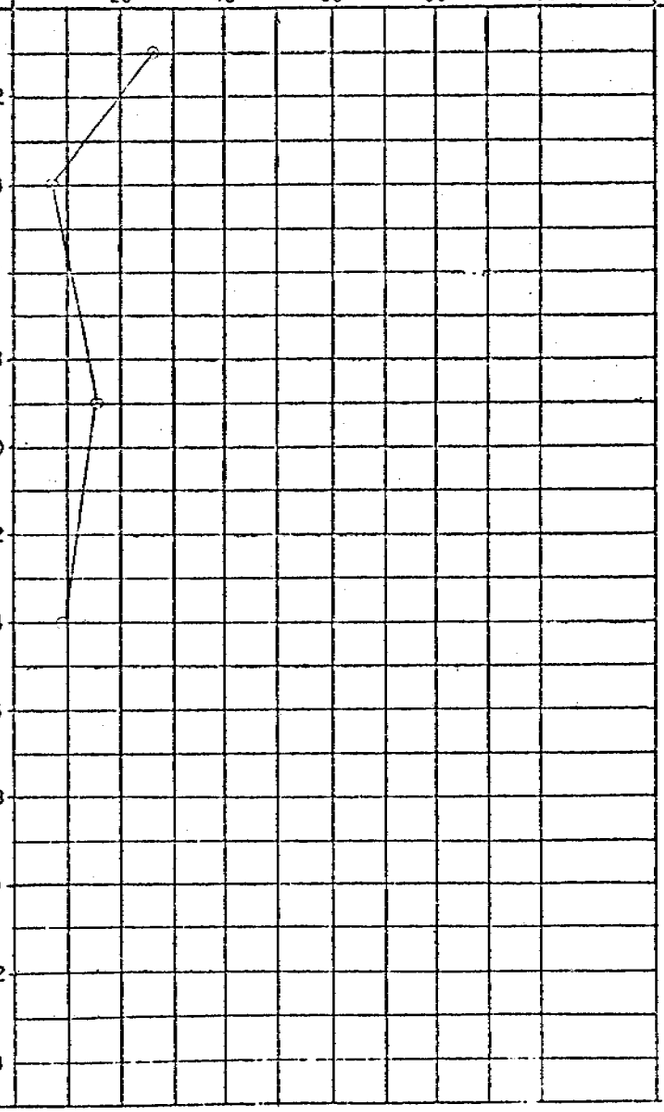
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	ORGANIC	F								
2					GW	GRAVEL									
4															
6						CLAY									
8															
10									51	24	25				
12						CLAY									
14					CL	PEBBLES	UF								
16						END OF HOLE									
18															
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: H E A	DATE DRILLED: 8/2/73	AIRPHOTO NO:	CHAINAGE: 770+00	OFFSET: ℄	TEST HOLE
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:	MILE: 529 / B,C,S: C / NUMBER: 527B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	REMARKS
					Pt	ORGANIC	F		
2					GW	GRAVEL			
4						CLAY			
6									
8									
10						CLAY			
12					CL	PEBBLES			
14							UF		
16						END OF HOLE			
18									
20									
22									
24									



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		
51	24	25			

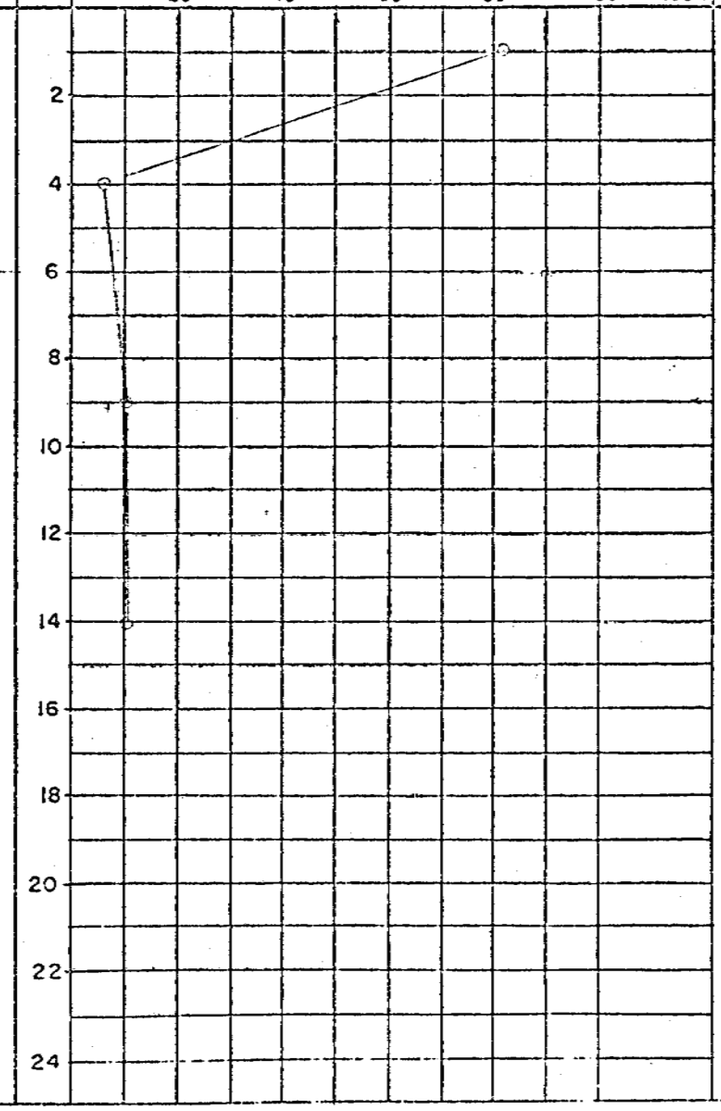
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN AEW	FIELD ENG DR	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 760+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
529	C	5318

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC SILTY, BLACK, ICE	F	
					SM	SILT DRY, FEW PEBBLES LIGHT BROWN		
					GC	CLAY TILL MED BROWN	UF	
					GC			
						END OF HOLE		

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

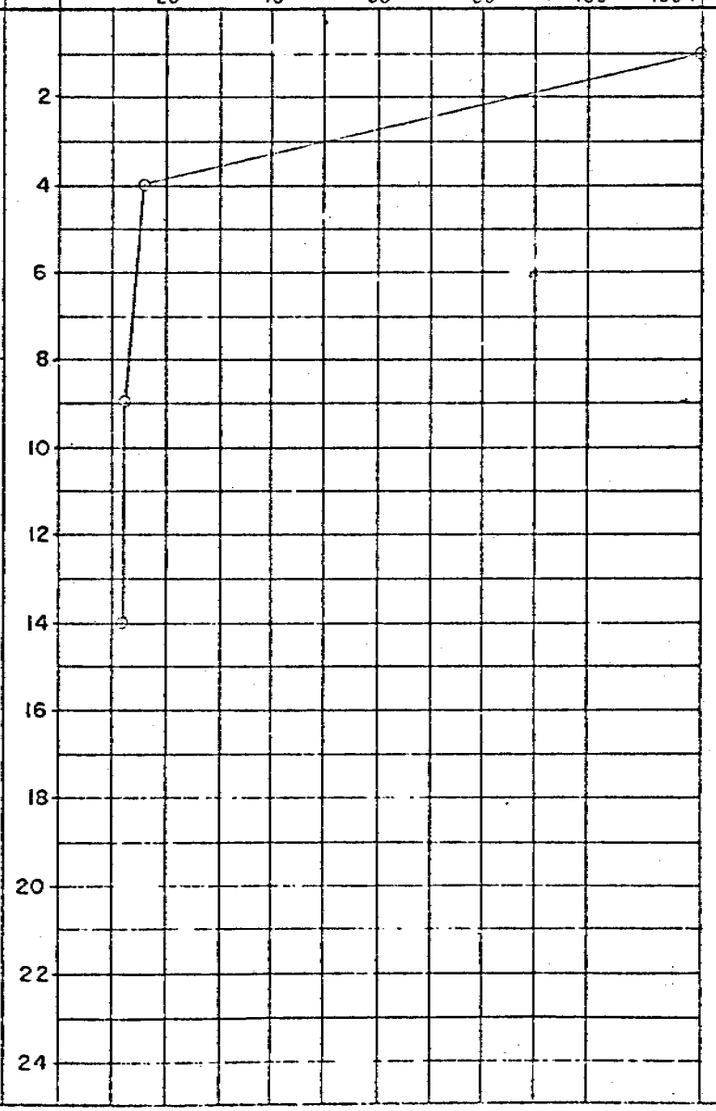
HOLE INSULATED

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

CMN A.E.W	FIELD ENG DR	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 750+00	OFFSET: ℄
CKD DSP	TECH	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 20'	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
529	C	5323

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC BLACK, SILT	F	
2								
						TILL		
4					GM	SILTY CLAY		
6								
8							UF	
10								
12								
14					GC			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)
CLAY %	SILT %	SAND %	GRAVEL %		

REMARKS

INSULATED HOLE

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

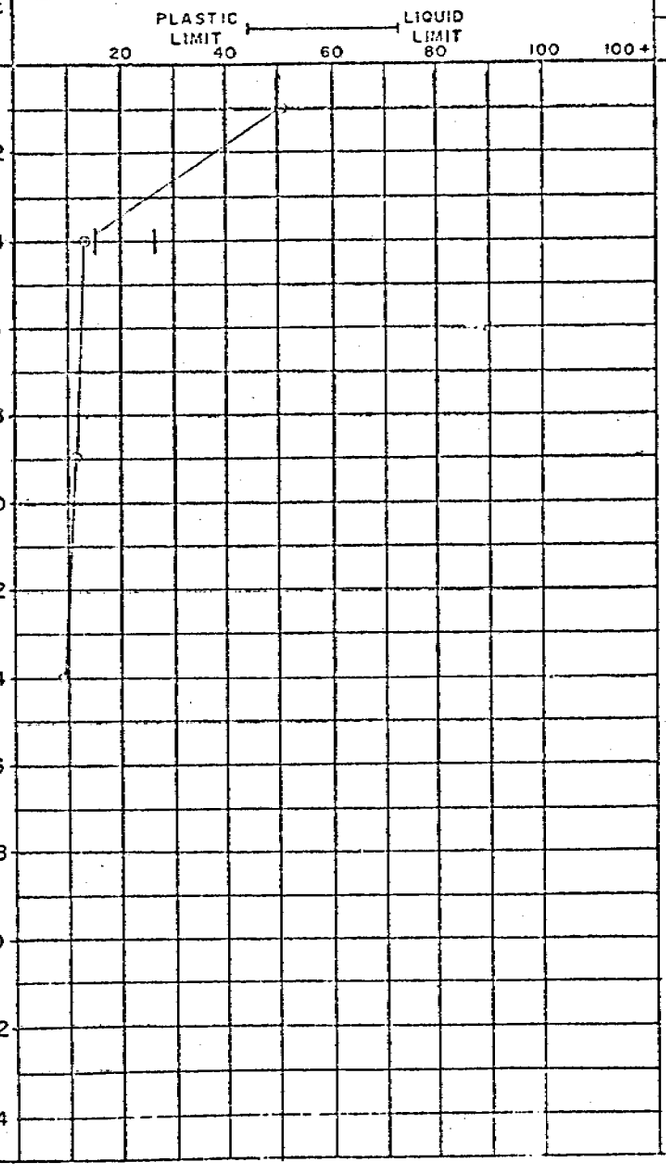
DWN: A.E.W	FIELD ENG: D.R	DATE DRILLED: 9/2/73	AIRPHOTO NO:	CHAINAGE: 740+00	OFFSET: ℄
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 20'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
529	C	533B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT BLACK ORGANIC LIGHT BROWN	T									HOLE INSULATED
2					Pt				2							
4						CLAY TILL			4							
6					GC	MED. BROWN			6							
8							UF		8							
10									10							
12									12							
14					GC				14							
16						END OF HOLE			16							
18									18							
20									20							
22									22							
24									24							

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A E W	FIELD ENG D. R	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 730+00	OFFSET: ℄	TEST HOLE
CKD D.S.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE 20'	ELEV.	

MILE	B,C,S	NUMBER
529	C	5343

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	○ = WATER CONTENT (% OF DRY WEIGHT) △ = ICE CONTENT (% OF SAMPLE VOLUME) PLASTIC LIMIT — LIQUID LIMIT (20, 40, 60, 80, 100, 100+)	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	SILT BLACK, ORGANIC LIGHT BROWN	F										HOLE INSULATED
2									2								
					GC	CLAY TILL MED. BROWN											
4									4								
6									6								
8							UF		8								
10									10								
12						COBBLES			12								
14					GC	MED BROWN			14								
16						END OF HOLE			16								
18									18								
20									20								
22									22								
24									24								

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Silt
Location
Hole 529-C-535B Depth 4' - 5'
Technician Date Feb. 9, 1973

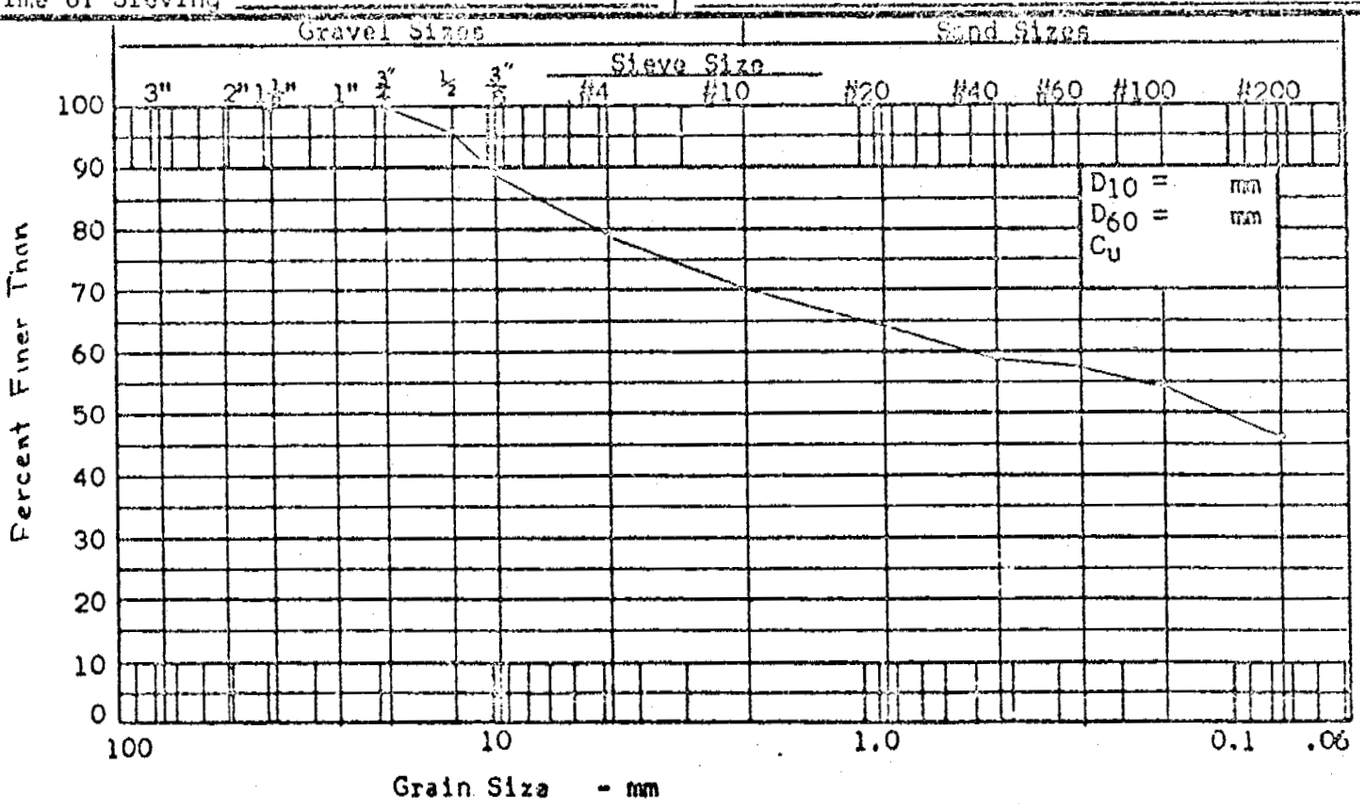
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.							
Wt. Dry + Tare		1	25.4				
Tare		3/4	19.10			100.0	
Wt. Dry		1/2	12.70			96.1	
		3/8	9.52			89.6	
	4	.185	4.76			79.9	
Passing	4						
Initial Dry Weight passing No. 4							
Tare No.	10	.079	2.000			70.1	
Wt. Dry + Tare	20	.0331	.840			64.3	
Tare	40	.0165	.420			59.7	
Wt. Dry	60	.0097	.250			57.1	
	100	.0059	.149			54.5	
	200	.0029	.074			46.8	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

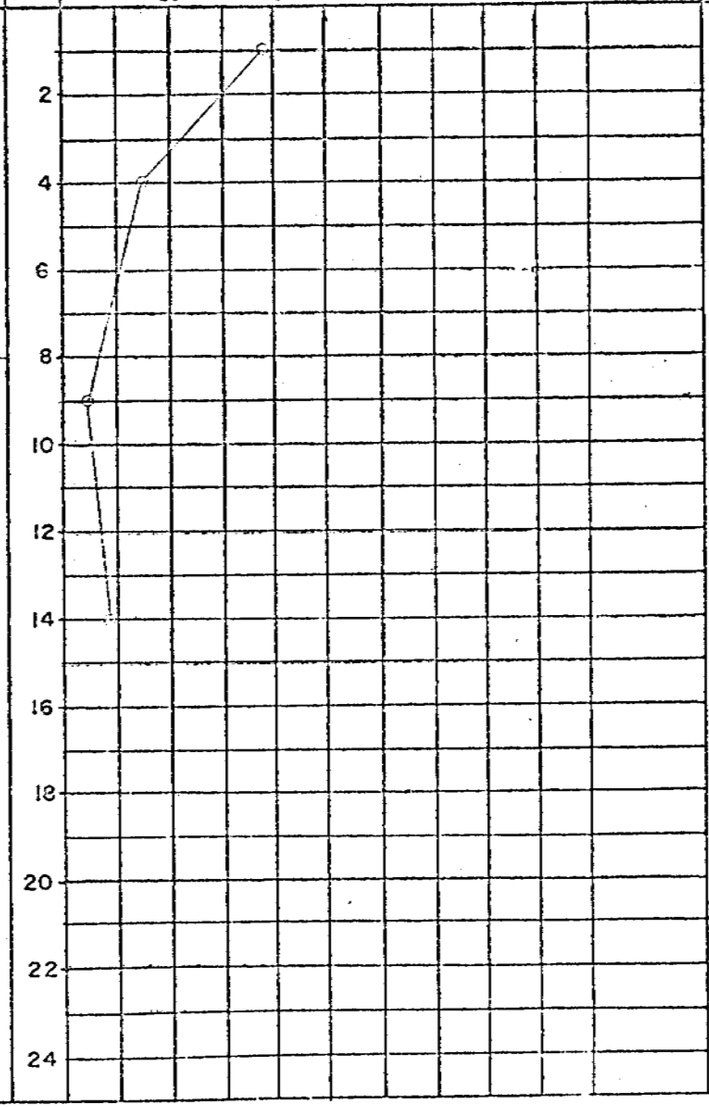
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.F.W.	FIELD ENG: D.R.	DATE DRILLED: 9/2/73	AIRPHOTO NO:	CHAINAGE: 720+00	OFFSET: ℄
CKD: D.G.P.	TECH:	RIG: A.R.	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 25'	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
529	C	5558

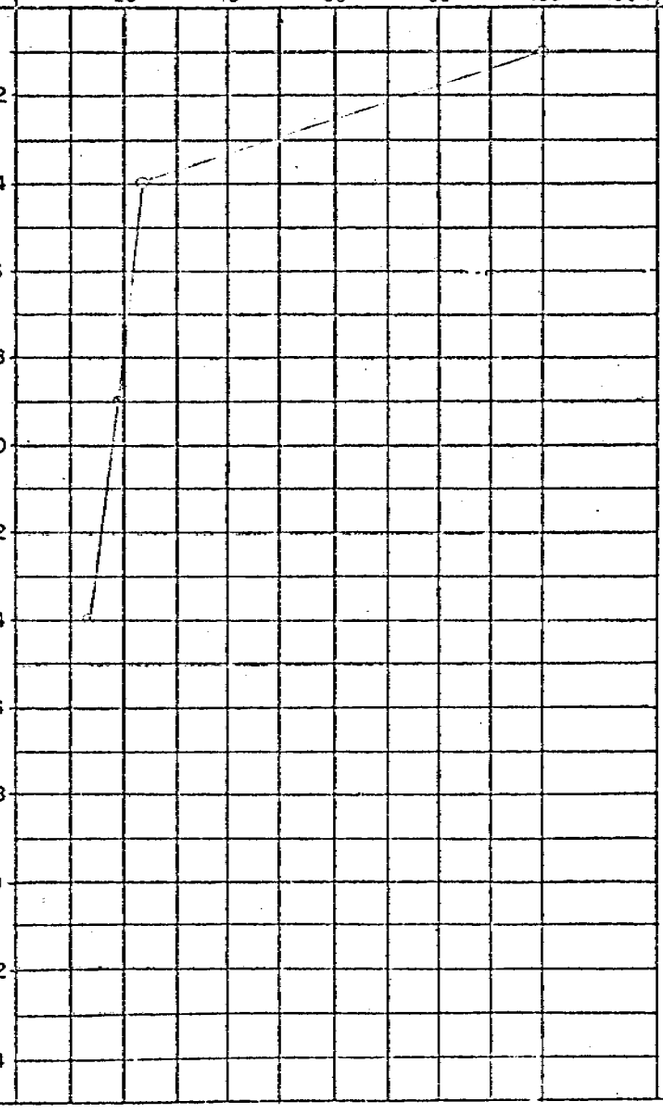
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					Pt	ORGANIC SILT LIGHT BROWN — BLACK	F								INSULATED HOLE
2–4															
4–6						SILT			3	37	30	30			
6–8					CL	LIGHT BROWN PEBBLES									
8–10							UF								
10–12															
12–14					GC	CLAY TILL MED BROWN									
14–16															
16–18						END OF HOLE									
18–20															
20–22															
22–24															



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: D R	DATE DRILLED: 9/2/73	AIRPHOTO NO:	CHAINAGE: 710+00	OFFSET: ℄	TEST HOLE
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TO 40'	ELEV:	MILE: 536 / B,C,S: C / NUMBER: 536B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	ORGANIC SILT LIGHT BROWN — BLACK	F	
2								
						SILT		
4					ML	GREY		ICE CRYSTALS
6								
8						CLAY TILL		
10								
12					GC	MED BROWN		ICE CRYSTALS
14								
16						END OF HOLE		
18								
20								
22								
24								



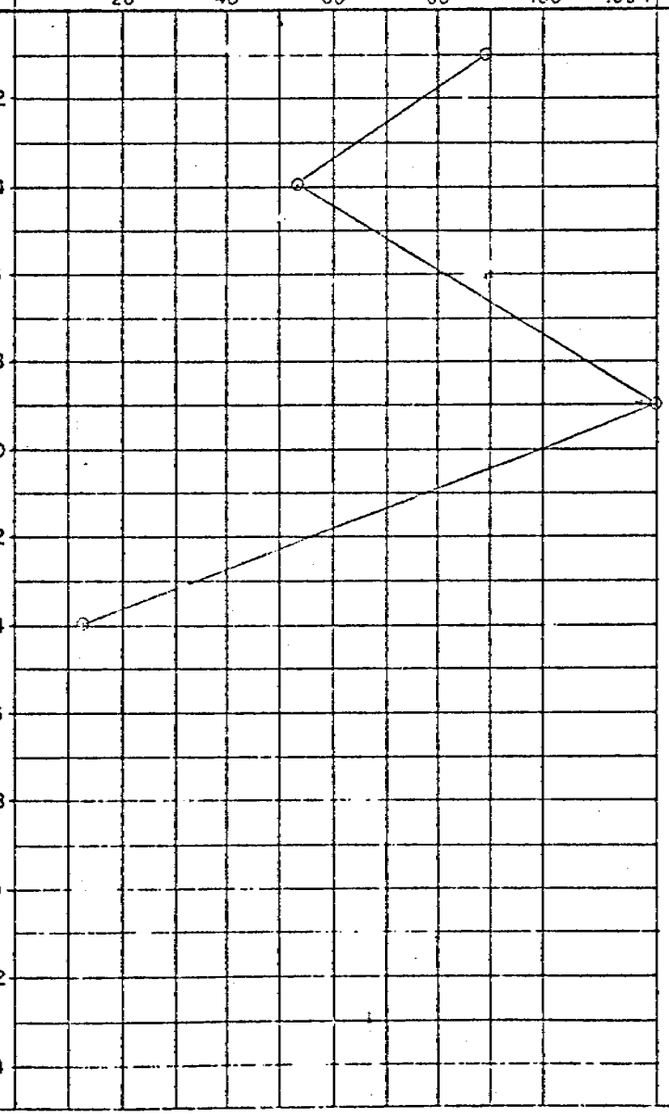
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						INSULATED HOLE

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DAN A.E.W	FIELD ENG D.R	DATE DRILLED 9/2/73	AIRPHOTO NO:	CHAINAGE: 700+00	OFFSET: ℄	TEST HOLE
CKD D.G.P	TECH	RIG: AIR	SURFACE DRAINAGE:	VEGETATION: SPRUCE 40'	ELEV:	

MILE	B,C,S	NUMBER
530	C	537B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	SILT 3" MOSS SANDY, LIGHT BROWN	F	
2								
4						SILT		
6						LIGHT BROWN		
8					CL			
9					Pt	ORGANIC		
10						GRAVEL	UF	
12						TILL		
14					GC	CLAY, MED BROWN		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
						INSULATED HOLE

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

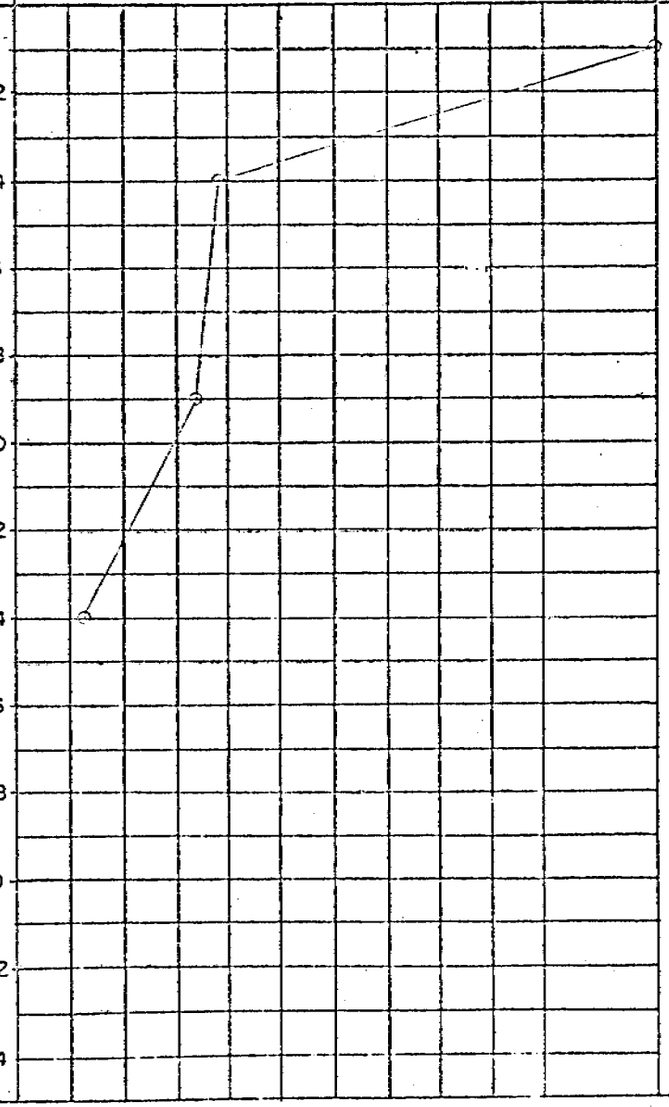
DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: M.E.A	DATE DRILLED: 11/2/73	AIRPHOTO NO:	CHAINAGE: 690+00	OFFSET: ℄
CKD: DSP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
530	C	5388

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	MUSKEG	F	
2					ML	SILT		
4								
6					CL	CLAY		
8						SILTY, TILL		
10								
12								
					CL			
14					GC	GRAVEL		
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED

DRILL HOLE REPORT

DEPARTMENT OF PUBLIC WORKS, CANADA
MACKENZIE HIGHWAY

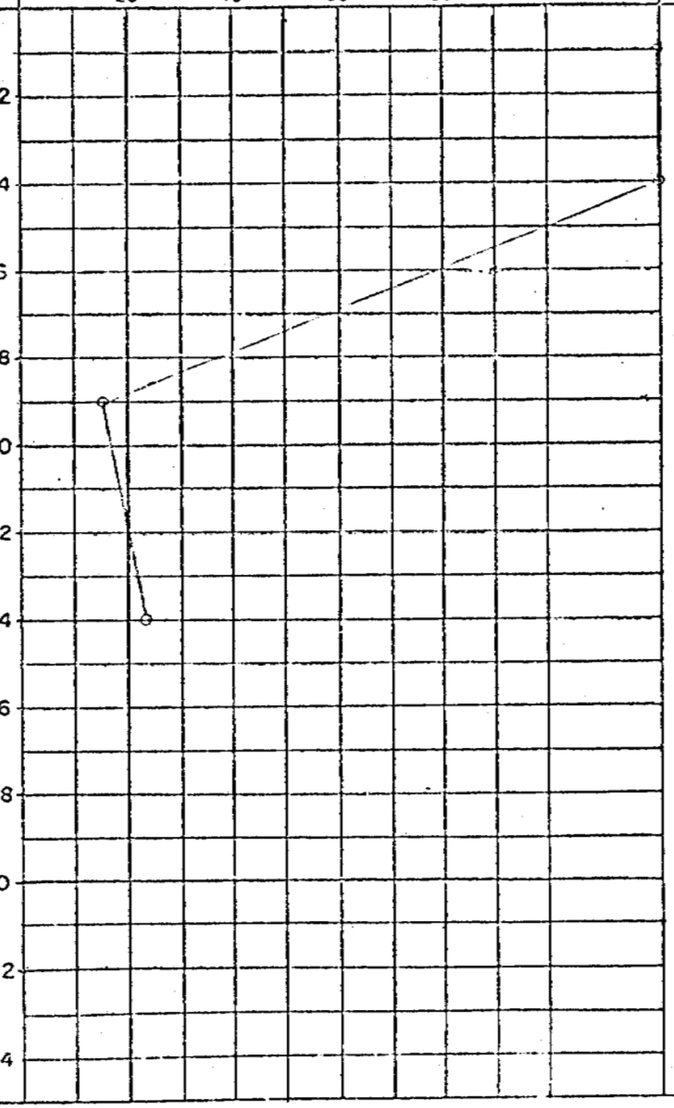
DWN AEW	FIELD ENG HEA	DATE DRILLED 11/2/73	AIRPHOTO NO:	CHAINAGE: 680+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TAMARACK	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
530	C	539B

REMARKS

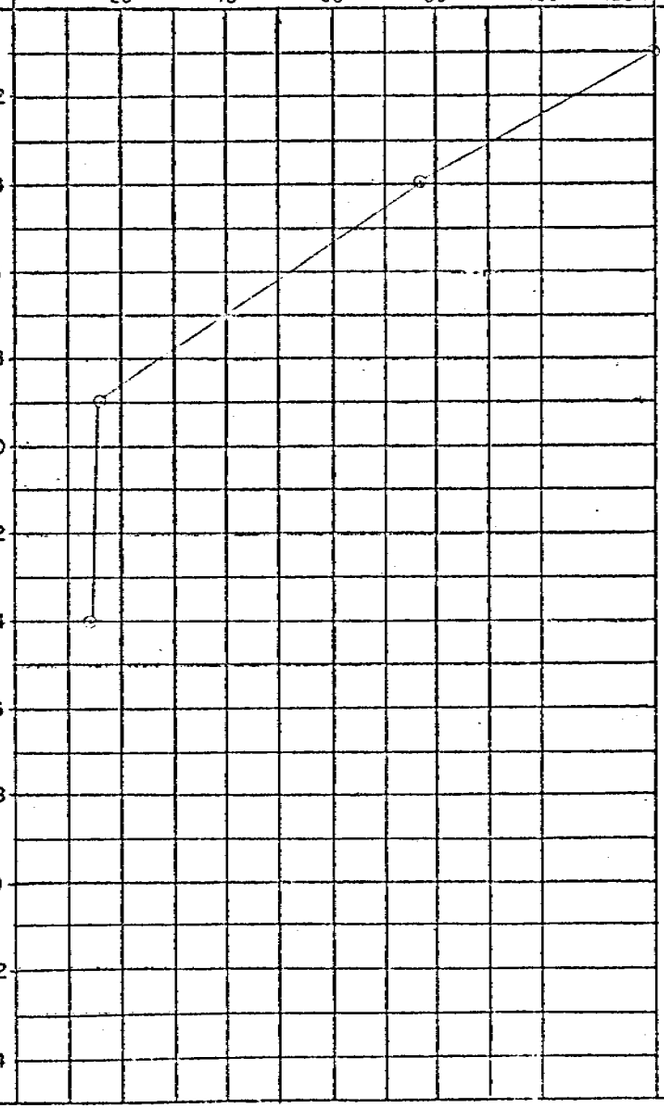
DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	DEPTH (FEET)	CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)
						MUSKEG	F								
2					Pt	ORGANIC		ICE LENSES	2						
4									4						
6					CL	CLAY			6						
8						FEW PEBBLES		LARGE ICE LENSES	8						
10									10						
12						CLAY TILL			12						
14					GC				14						
16						END OF HOLE			16						
18									18						
20									20						
22									22						
24									24						



UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A E W	FIELD ENG: H E A	DATE DRILLED: 11/2/73	AIRPHOTO NO:	CHAINAGE: 670+00	OFFSET: ℄	TEST HOLE
CKD: D G P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE & TAMARACK	ELEV:	MILE: 530 · B,C,S: C · NUMBER: 543 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
						PEAT	F	
2					Pt	ORGANIC, SILTY		Vc ICE LENSES
4						TILL		
6					GC			
8						CLAY		
10								
12								Vc
14					GC			
16						END OF HOLE		
18								
20								
22								
24								



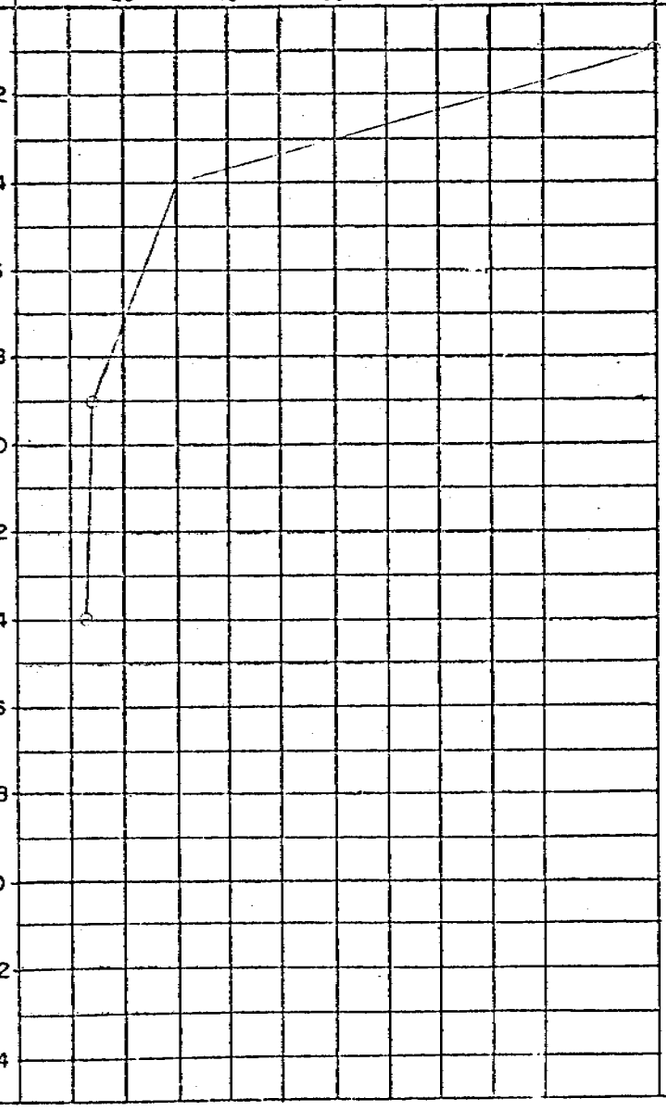
GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG H.E.A	DATE DRILLED 11/2/73	AIRPHOTO NO:	CHAINAGE: 660+00	OFFSET: ℄
CKD D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
531	C	544B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG ORGANIC	F								
					ML	SILT									
					GC	TILL SILTY CLAY, GRAVEL									
						END OF HOLE									

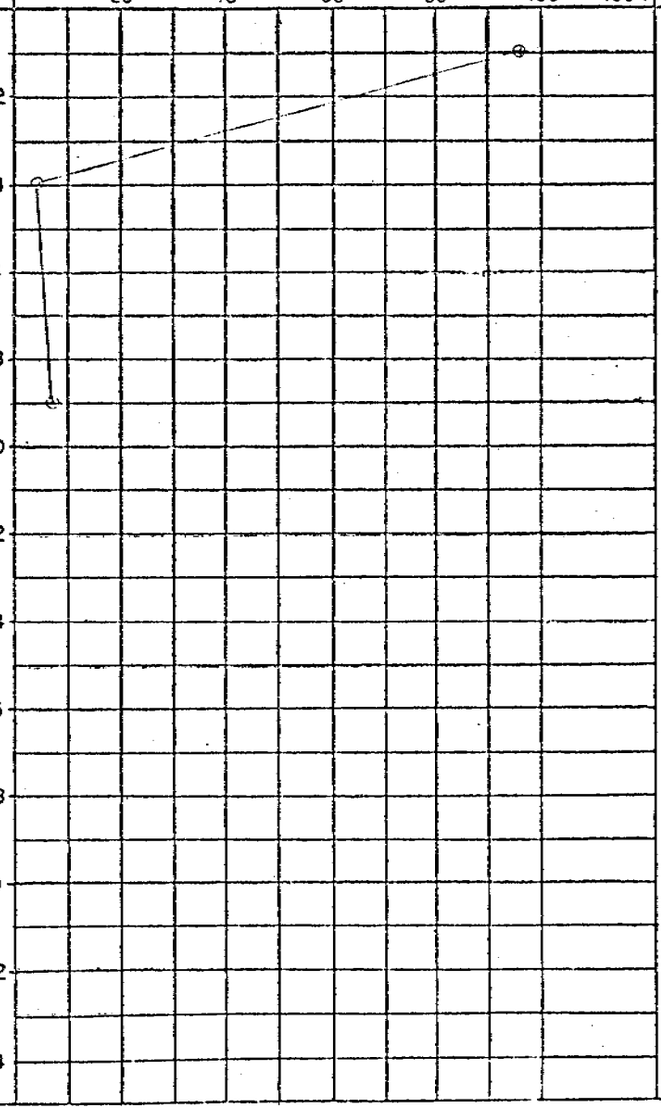


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: AEW	FIELD ENG HEA	DATE DRILLED 11/2/73	AIRPHOTO NO:	CHAINAGE: 650+00	OFFSET: ℄
CKD DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE	ELEV:

TEST HOLE		
MILE	B,C,S	NUMBER
531	C	5458

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG	F								
2						SILT ORGANIC									
					GP	GRAVEL									
4															
6						SOME CLAY LARGE ROCKS	UF								
8															
10		P			GC										HOLE CAVING IN
12						END OF HOLE									
14															
16															
18															
20															
22															
24															



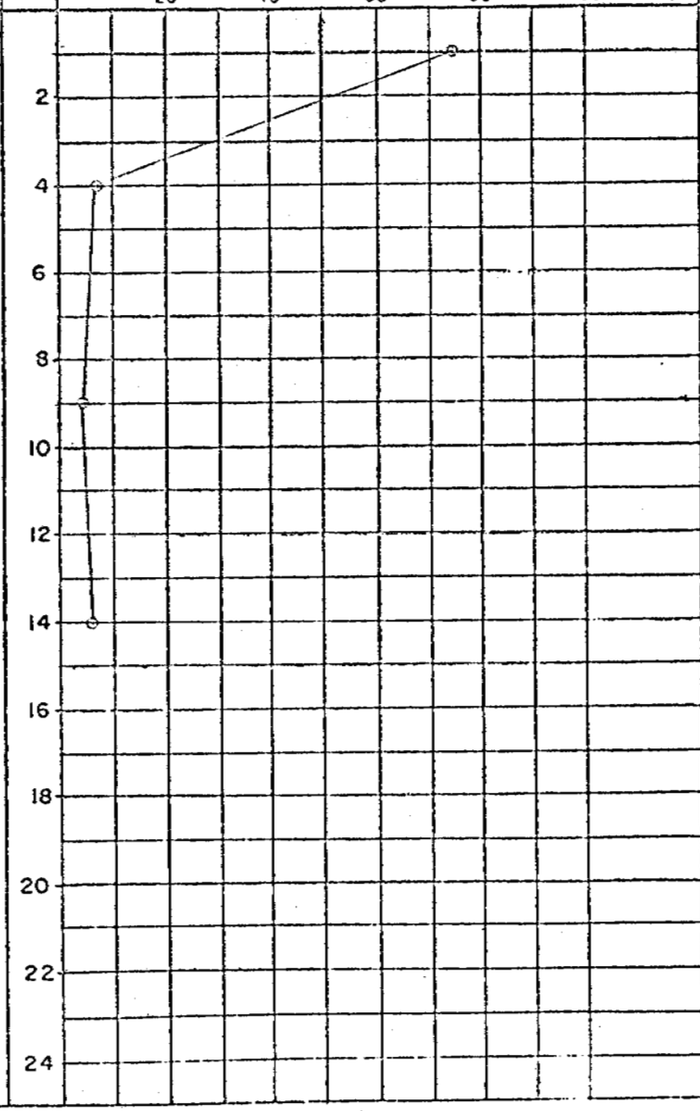
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 12/2/73	AIRPHOTO NO:	CHAINAGE: 640+00	OFFSET: ℄
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: POOR	VEGETATION: SPRUCE TAMARACK	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
531	C	5463

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
					Pt	MUSKEG ORGANIC PEAT SILT	F								
2					GM	GRAVEL	UF								
4															
6															
8						LARGE ROCKS AND BOULDERS									
10															
12															
14															
16					GW										
18						END OF HOLE									
20															
22															
24															



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project	Mackenzie Highway
Site	
Sample	Gravel
Location	
Hole	531-C-547-B Depth 4' - 5'
Technician	Date Feb. 12, 1973

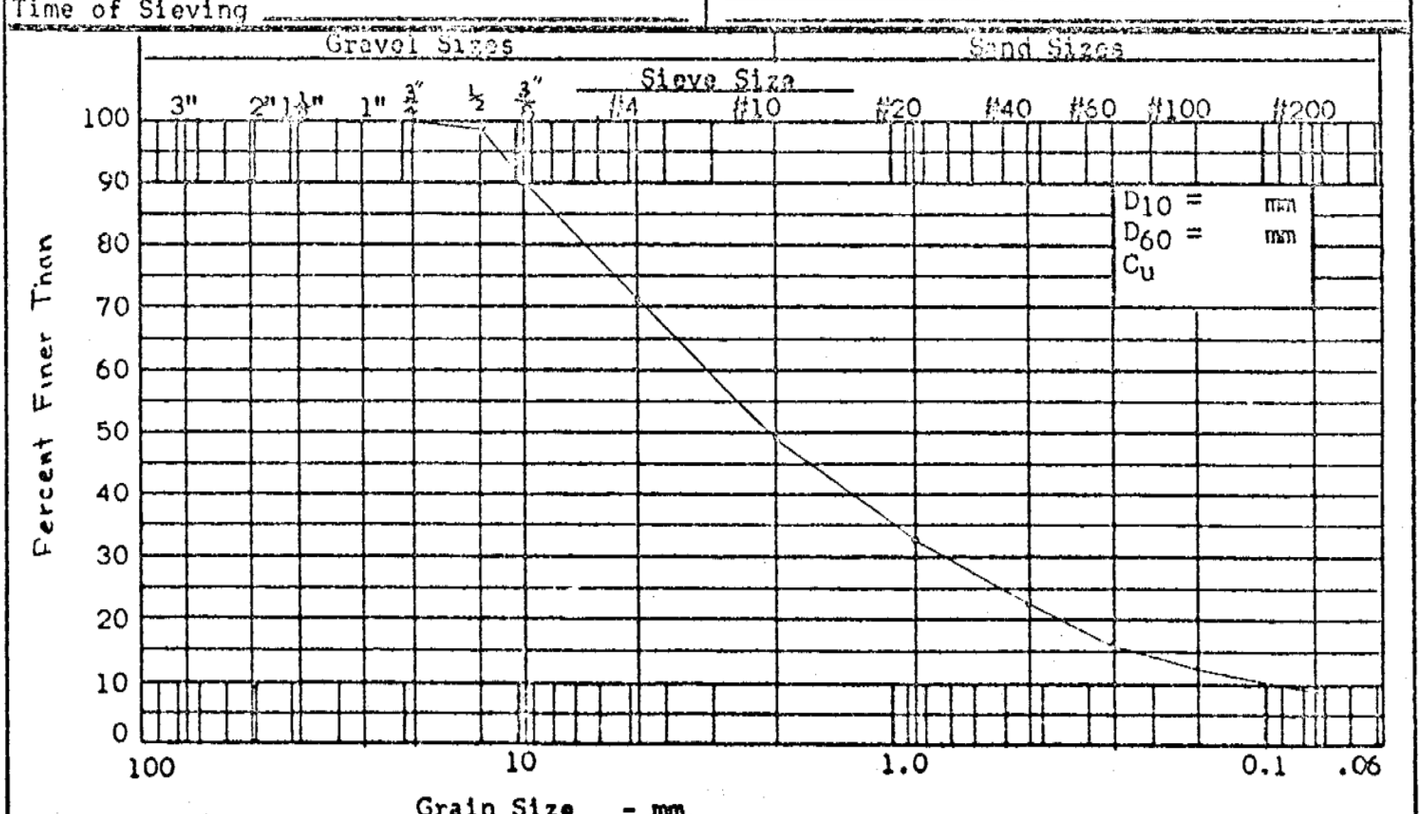
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10			100.0	
Tare		1/2	12.70			98.4	
Wt. Dry		3/8	9.52			90.5	
	4	.185	4.76			71.0	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			49.1	
Tare No.	20	.0331	.840			32.5	
Wt. Dry + Tare	40	.0165	.420			22.8	
Tare	60	.0097	.250			16.0	
Wt. Dry	100	.0059	.149			12.5	
	200	.0029	.074			9.5	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

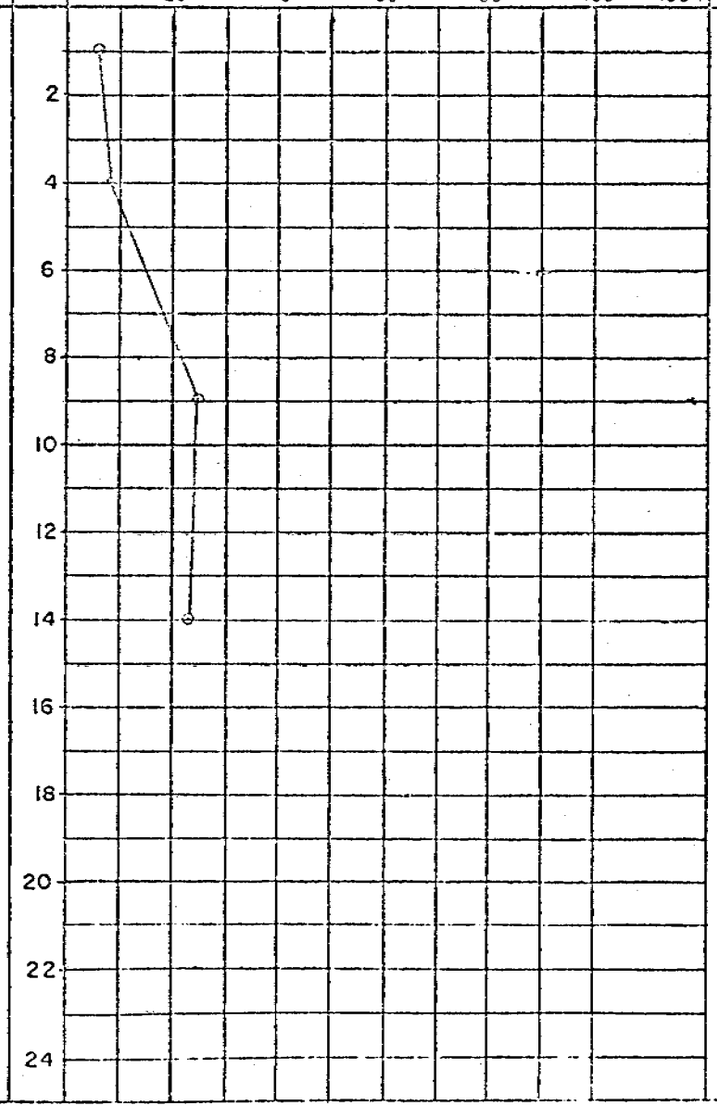
UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN A.E.W	FIELD ENG H.E.A	DATE DRILLED 12/2/73	AIRPHOTO NO:	CHAINAGE: 630+00	OFFSET: ℄
CKD DAP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE & BIRCH	ELEV.

TEST HOLE

MILE	B.N.S	NO.
531	C	76

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION
					Pt	PEAT ORGANIC SILT	F	
2					GW	GRAVEL		
4								
6								
8						SILT WITH LITTLE CLAY VERY FEW PEBBLES		
10								
12								
14					GW			
16						END OF HOLE		
18								
20								
22								
24								



GRAIN-SIZE ANALYSIS				WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
CLAY %	SILT %	SAND %	GRAVEL %			
10		40	50			

UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 531-C-551-B Depth 4' - 5'
Technician Date Feb. 12, 1973

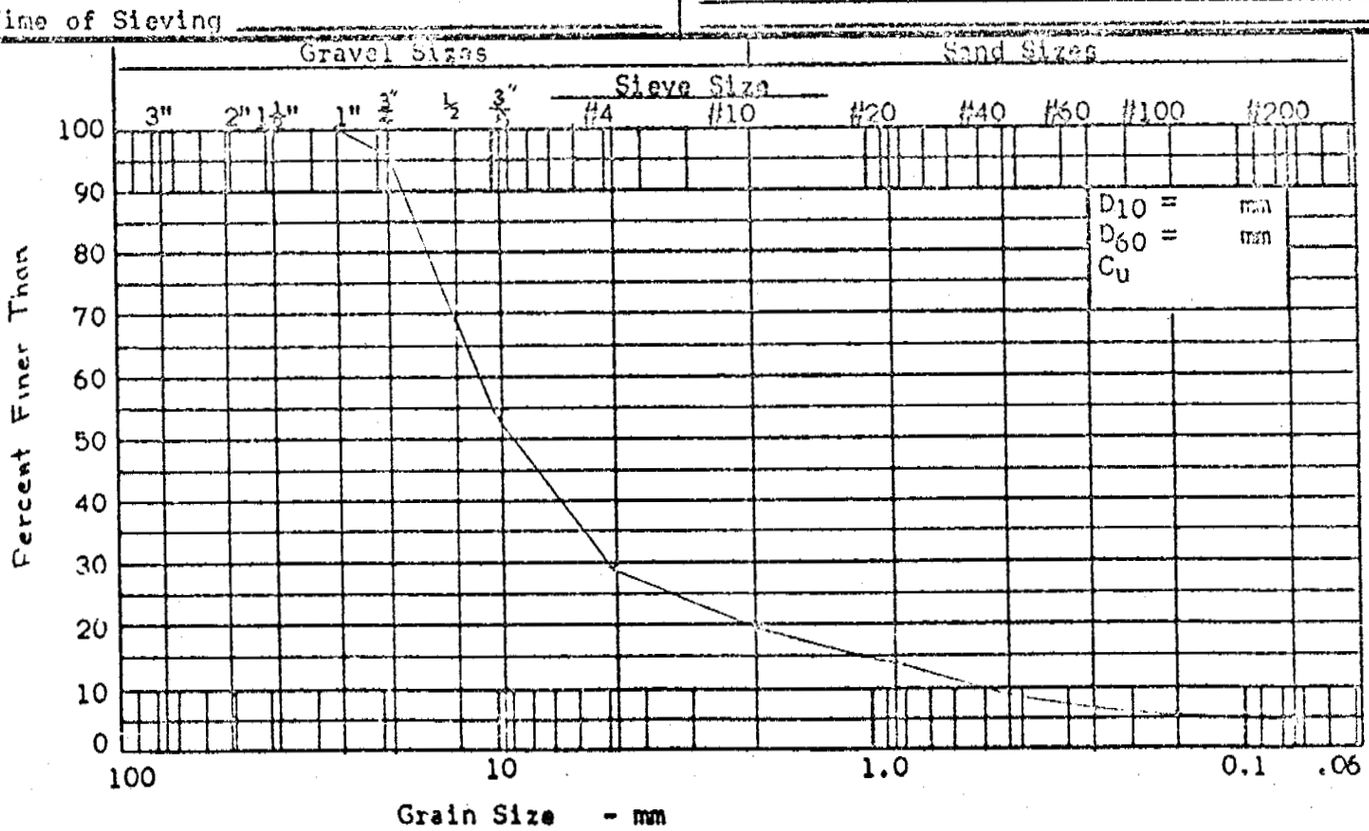
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight Retained on No. 4							
Tare No.		1	25.4			100.0	
Wt. Dry + Tare		3/4	19.10			96.2	
Tare		1/2	12.70			68.9	
Wt. Dry		3/8	9.52			53.1	
	4	.185	4.76			28.3	
Passing	4						
Initial Dry Weight passing No. 4	10	.079	2.000			19.5	
Tare No.	20	.0331	.840			13.8	
Wt. Dry + Tare	40	.0165	.420			9.3	
Tare	60	.0097	.250			6.3	
Wt. Dry	100	.0059	.149			5.3	
	200	.0029	.074			4.3	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving

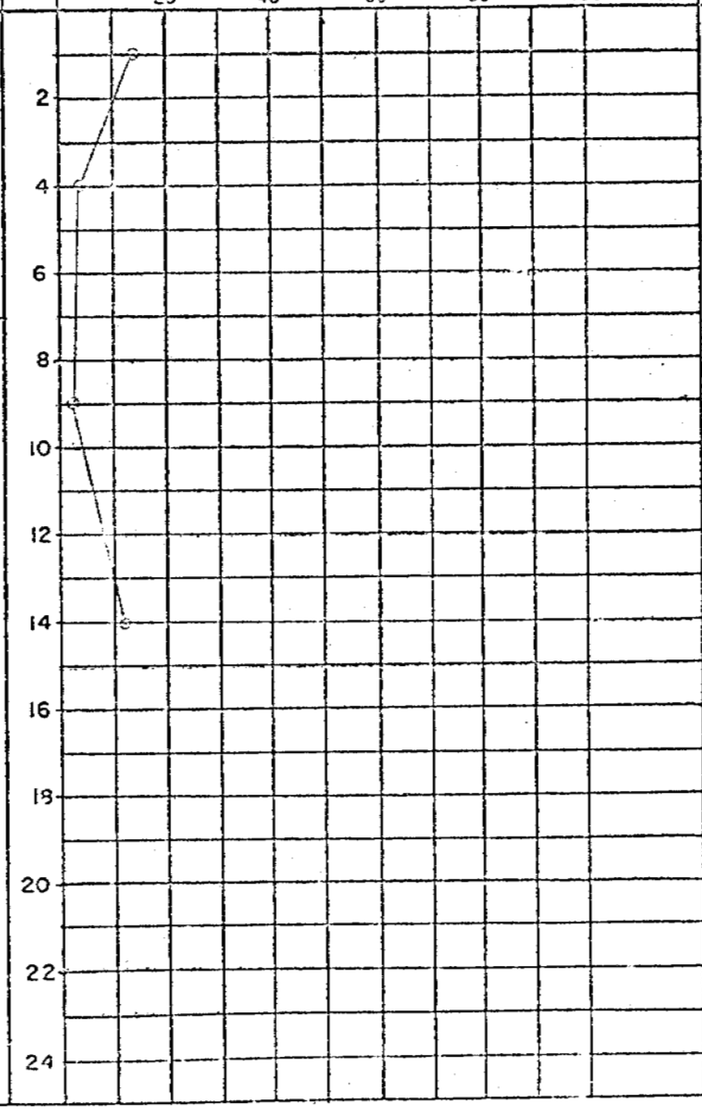


Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H E A	DATE DRILLED: 12/2/73	AIRPHOTO NO:	CHAINAGE: 525+00	OFFSET: ℄	TEST HOLE
CKD: DGP	TECH:	RIG: AIR	SURFACE DRAINAGE: FAIR	VEGETATION: SPRUCE	ELEV:	MILE: 531 / B,C,S: C / NUMBER: 551B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						SILT 3" PEAT	F								
2					GM	GRAVEL									
4									4		16	80			
6															
						SANDY	UF								
8															
10															
12															
14					GW	SANDY CLAY TILL									
16						END OF HOLE									
18															
20															
22															
24															

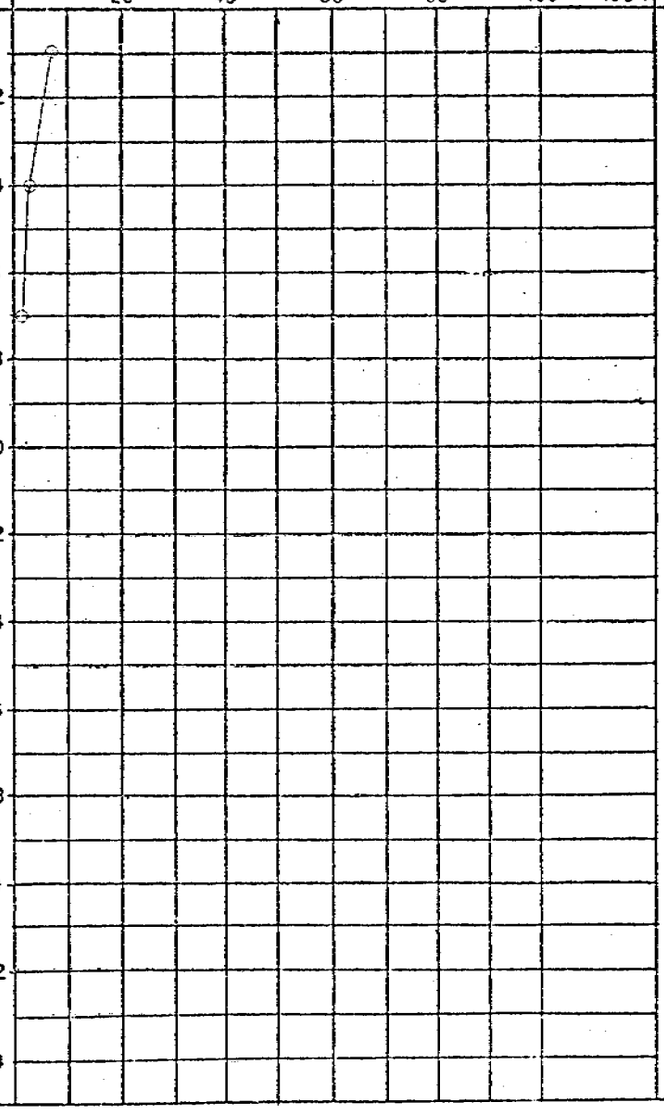


UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 12/2/73	AIRPHOTO NO:	CHAINAGE: 617+00	OFFSET: ℄	TEST HOLE
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:	MILE: 531 / B,C,S: C / NUMBER: 553B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
0–2					GM	3" ORGANIC GRAVEL	F								
2–4						SILTY									
4–6									31		49	20			
6–8		P			GW	FINE DRY SAND	UF								HOLE SLOUGHING
8–10						END OF HOLE									

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)



UNDERWOOD McLELLAN & ASSOCIATES LTD.

Consulting Engineers

WINNIPEG SASKATOON CALGARY

SIEVE ANALYSIS

Project Mackenzie Highway
Site
Sample Sandy gravel
Location
Hole 532-C-554B Depth 4' - 5'
Technician Date Feb. 12, 1973

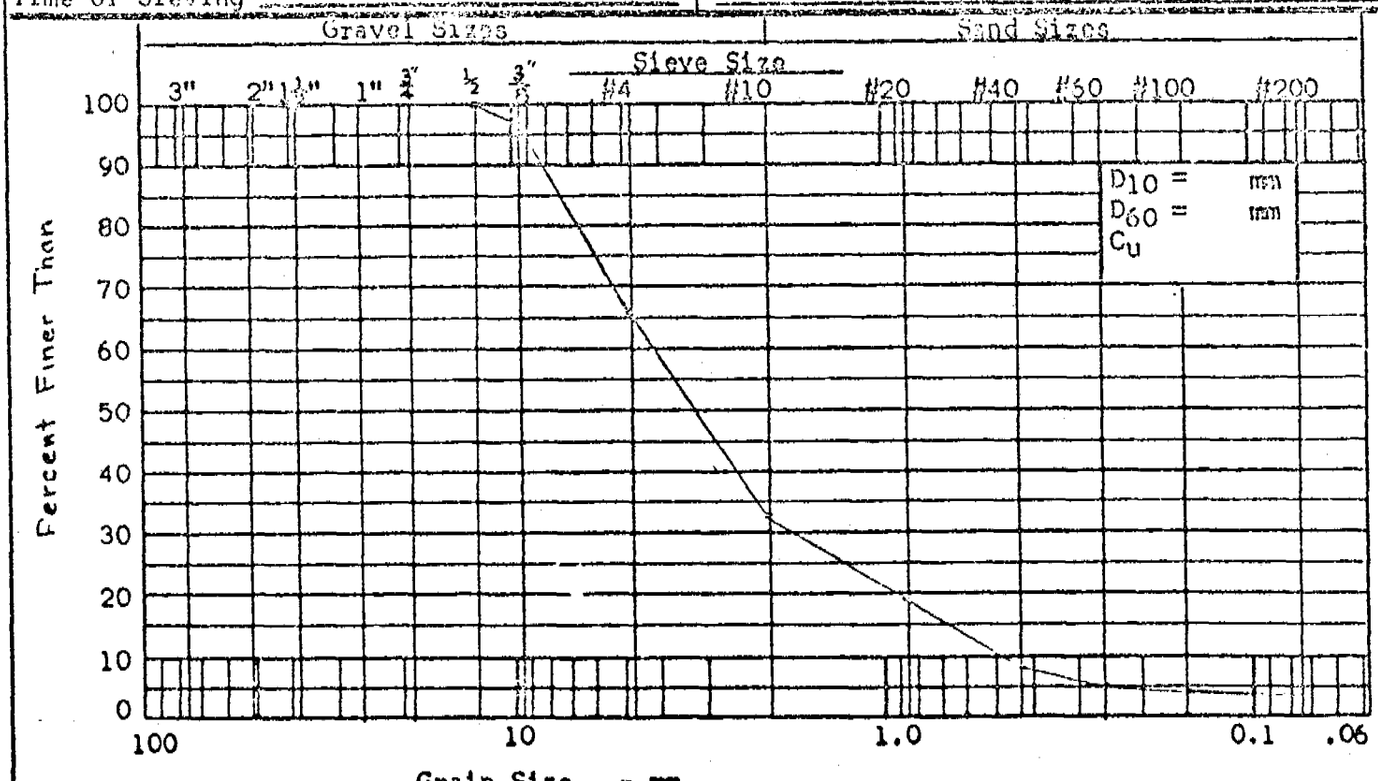
Total Dry Weight of Sample	Sieve No.	Size of Opening Inches	Size of Opening MM	Weight Retained gms	Total Wt. Finer than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
Initial Dry Weight							
Retained on No. 4							
Tare No.		1	25.4				
Wt. Dry + Tare		3/4	19.10				
Tare		1/2	12.70			100.0	
Wt. Dry		3/8	9.52			97.6	
	4	.185	4.76			66.3	
Passing	4						
Initial Dry Weight							
passing No. 4	10	.079	2.000			32.4	
Tare No.	20	.0331	.840			19.7	
Wt. Dry + Tare	40	.0165	.420			8.2	
Tare	60	.0097	.250			5.0	
Wt. Dry	100	.0059	.149			4.2	
	200	.0029	.074			3.9	
Passing	200						

Description of Sample

Method of Preparation

Remarks:

Time of Sieving



Note: M.I.T. Grain Size Scale

UNDERWOOD McLELLAN & ASSOCIATES LIMITED	DRILL HOLE REPORT	DEPARTMENT OF PUBLIC WORKS, CANADA MACKENZIE HIGHWAY

DWN: A.E.W	FIELD ENG: H.E.A	DATE DRILLED: 12/2/73	AIRPHOTO NO:	CHAINAGE: 608+00	OFFSET: R
CKD: D.G.P	TECH:	RIG: AIR	SURFACE DRAINAGE: GOOD	VEGETATION: SPRUCE	ELEV:

TEST HOLE

MILE	B,C,S	NUMBER
532	C	554 B

DEPTH (FEET)	SAMPLE NUMBER	SAMPLE TYPE	% RECOVERY	PENETRATION RESISTANCE	UNIFIED SOIL SYMBOL	SOIL DESCRIPTION	LIMITS OF FROZEN GROUND	ICE DESCRIPTION	GRAIN-SIZE ANALYSIS CLAY %	SILT %	SAND %	GRAVEL %	WET DENSITY (PCF)	DRY DENSITY (PCF)	REMARKS
						3" ORGANIC	F								
						GRAVEL	UF								
2															
4					GW	SANDY, DRY			4		29	67			
6															HOLE CAVED IN
8						END OF HOLE									
10															
12															
14															
16															
18															
20															
22															
24															

○ = WATER CONTENT (% OF DRY WEIGHT)
△ = ICE CONTENT (% OF SAMPLE VOLUME)

PLASTIC LIMIT — LIQUID LIMIT
20 40 60 80 100 100+