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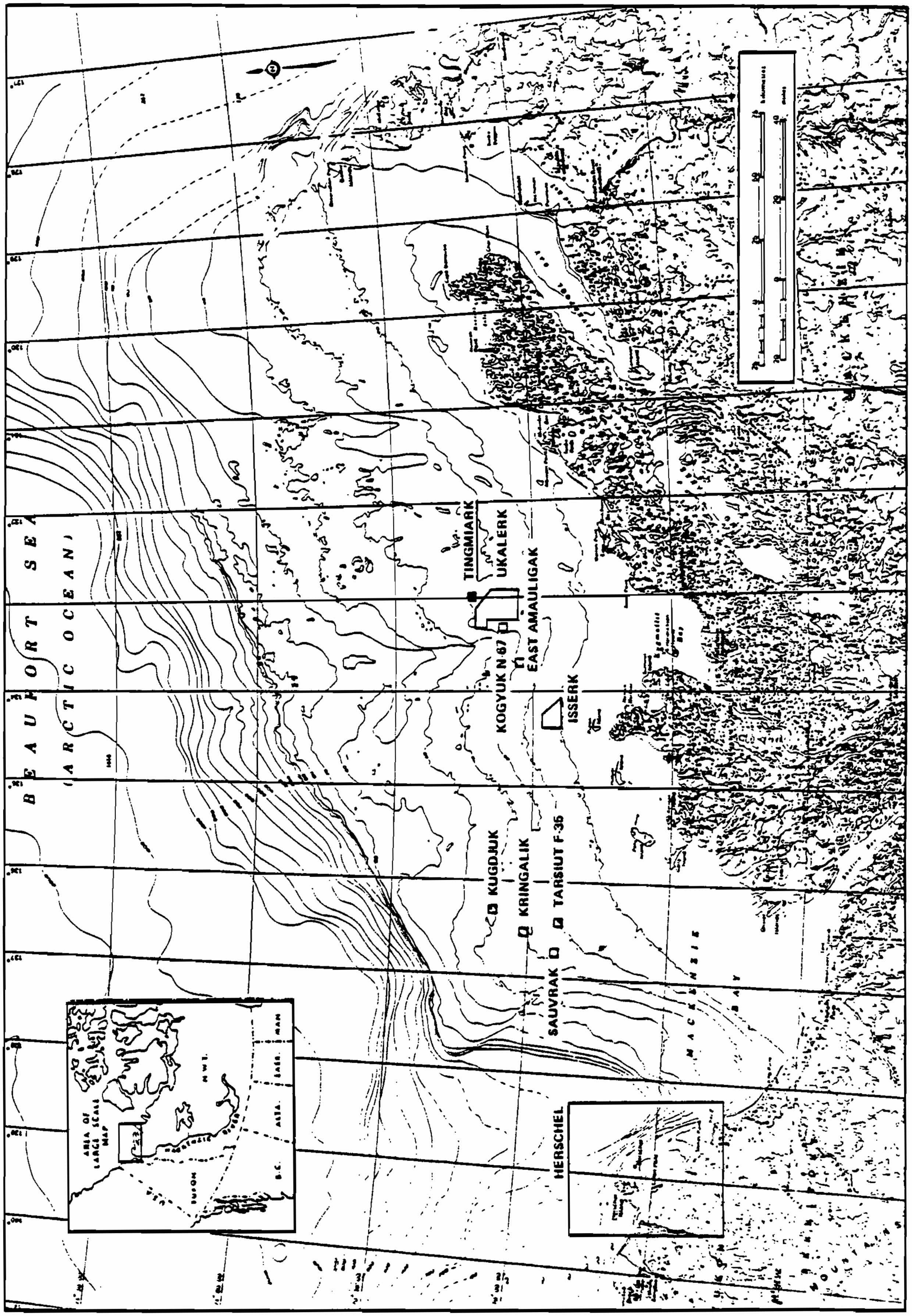
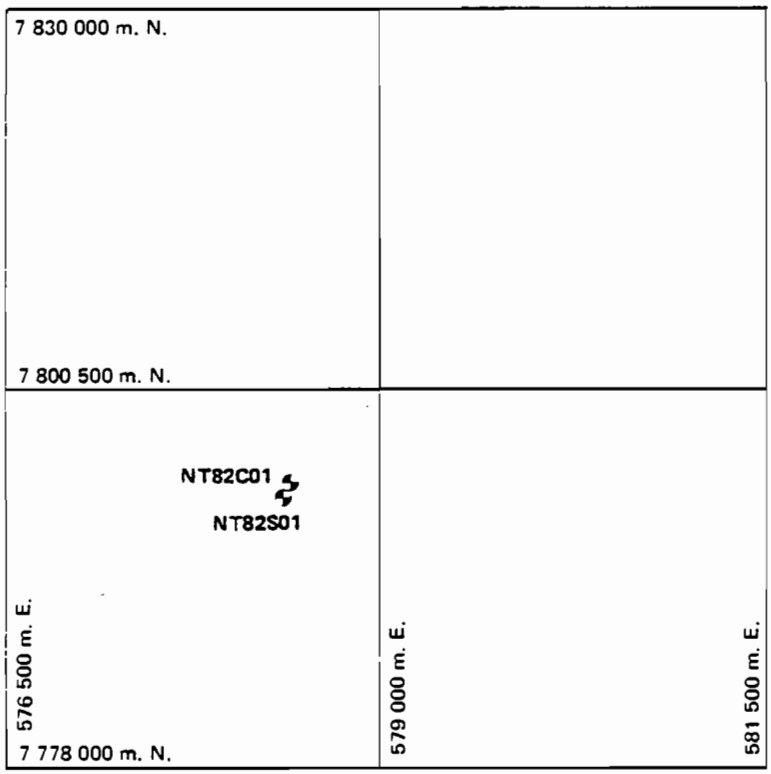


FIGURE 1 GENERAL LOCATION MAP



Note: Locations provided by Canadian Engineering Surveys Co. Ltd.

FIGURE 2 BOREHOLE LOCATION MAP
NORTH TINGMIARK AREA

TABLE 1 SUMMARY OF TEST LOCATIONS
- NORTH TINGMIARK

TEST LOCATION LATITUDE	LONGITUDE	TEST	SEABED PENETRATION (metres)	DATE
70°06'54"	132°56'04"	NT82C01	9.6	82-08-26
70°06'55"	132°56'06"	NT82S01	81.1	82-08-27

Note: 1. All positions supplied by CES Ltd.

2. NT82 denotes a borehole/probehole at the North Tinkmiark site drilled/tested in 1982. "S" refers to "sampled", "R" refers to "Remote Vane", "C" refers to "static cone", and "P" refers to "pressuremeter". The number following the latter designation is the borehole/probehole number.

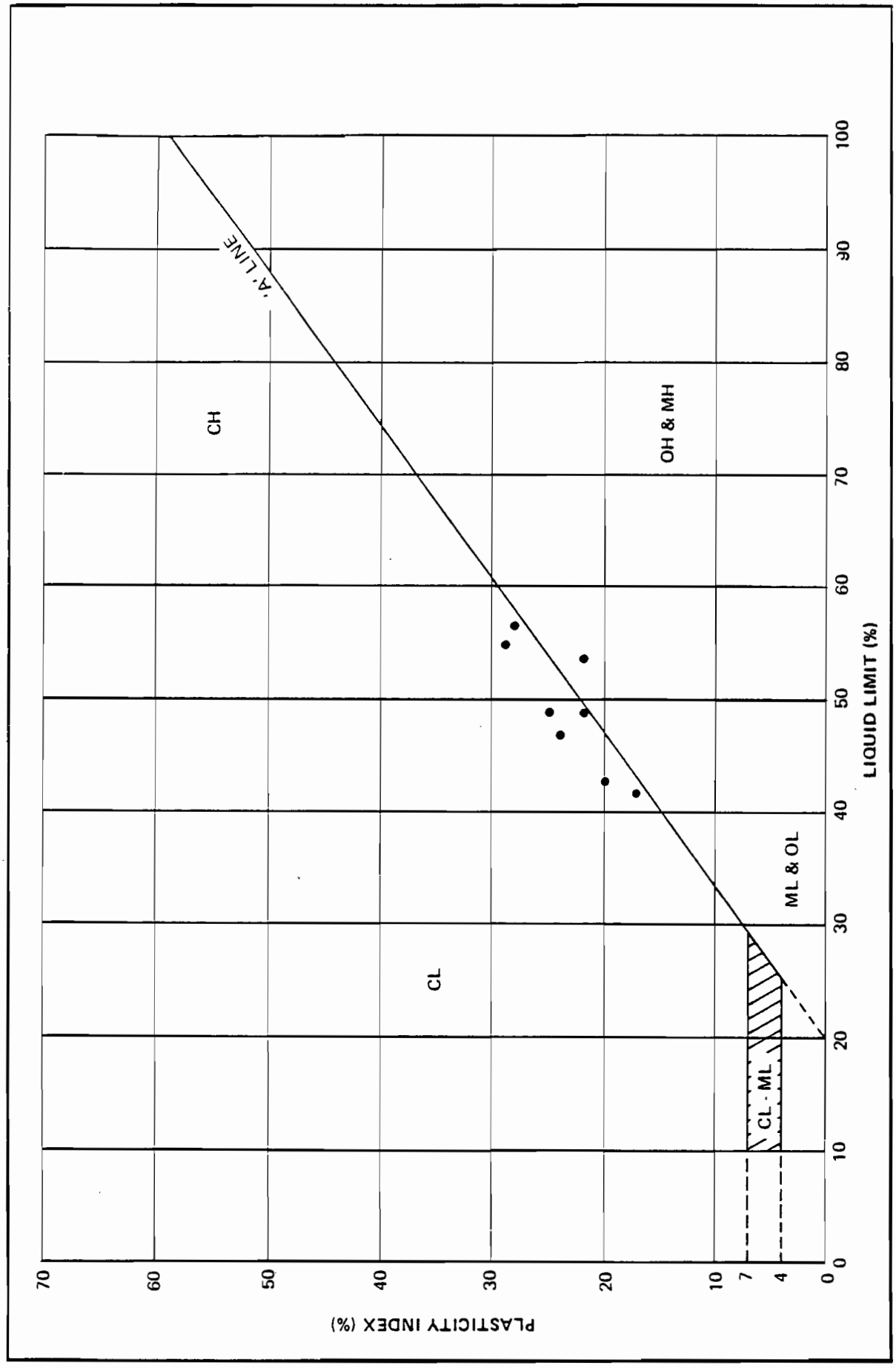


FIGURE 3 PLASTICITY CHART

APPENDIX A

Borehole Logs

SYSTEM INTERNATIONAL UNITS

QUANTITY	NAME	SYMBOL	EXPRESSED IN TERMS OF OTHER SI UNITS	EXPRESSED IN TERMS OF BASE AND SUPPLEMENTARY UNITS
SI UNITS				
length	metre	m		
mass	kilogram	kg		
time	second	s		
electric current	ampere	A		
thermodynamic temperature	kelvin	K		
amount of substance	mole	mol		
luminous intensity	candela	cd		
SI SUPPLEMENTARY UNITS				
plane angle	radian	rad		
solid angle	steradian	sr		
EXAMPLES OF SI DERIVED UNITS WITH SPECIAL NAMES				
frequency	hertz	Hz	1/s	s^{-1}
force	newton	N	$m \cdot kg/s^2$	$m \cdot kg \cdot s^{-2}$
pressure, stress	pascal	Pa	N/m^2	$m^{-1} \cdot kg \cdot s^{-2}$
energy, work, quantity of heat	joule	J	$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
power, radiant flux	watt	W	J/s	$m^2 \cdot kg \cdot s^{-3}$
EXAMPLES OF SI DERIVED UNITS WITHOUT SPECIAL NAMES				
velocity - linear	metre per second		m/s	$m \cdot s^{-1}$
- angular	(radian per second)		rad/s	$rad \cdot s^{-1}$
acceleration - linear	(metre per second) per second		m/s^2	$m \cdot s^{-2}$
- angular	(radian per second) per second		rad/s^2	$rad \cdot s^{-2}$
concentration (of amount of substance)	mole per cubic metre		mol/m^3	$mol \cdot m^{-3}$
dynamic viscosity	pascal second		$Pa \cdot s$	$m^{-1} \cdot kg \cdot s^{-1}$
moment of force	newton metre		$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
surface tension	newton per metre		N/m	$kg \cdot s^{-2}$
heat flux density, irradiance	watt per square metre		W/m^2	$kg \cdot s^{-3}$
heat capacity, entropy	joule per kelvin		J/K	$m^2 \cdot s^{-2} \cdot K^{-1}$
specific heat capacity, specific entropy	joule per kilogram kelvin		$J/(kg \cdot K)$	$m^2 \cdot s^{-2} \cdot K^{-1}$
specific energy	joule per kilogram		J/kg	$m^2 \cdot s^{-2}$
thermal conductivity	watt per metre kelvin		$W/(m \cdot K)$	$m \cdot kg \cdot s^{-3} \cdot K^{-1}$

OTHER UNITS PERMITTED FOR USE WITH SI

QUANTITY	NAME	SYMBOL	DEFINITION
time	minute	min	1 min = 60 s
	hour	h	1 h = 3,600 s
	day	d	1 d = 86,400 s
	year	a	
plane angle	degree	°	$1° = (\pi/180)$ rad
	minute	′	$1′ = (\pi/10,800)$ rad
	second	″	$1″ = (\pi/648,000)$ rad
area	hectare	ha	1 ha = 10,000 m^2
volume	litre	L	1,000 L = 1 m^3
temperature	degree Celsius	°C	0° C = 273.15° K
			temperature interval 1 C° = 1 K°
mass	tonne	t	1 t = 1,000 kg = 1 Mg

MULTIPLYING FACTOR	PREFIX	SYMBOL	MULTIPLYING FACTOR	PREFIX	SYMBOL
$1,000,000,000,000,000,000 = 10^{18}$	exa	E	$0.1 = 10^{-1}$	deci*	d
$1,000,000,000,000,000 = 10^{15}$	peta	P	$0.01 = 10^{-2}$	centi*	c
$1,000,000,000,000 = 10^{12}$	tera	T	$0.001 = 10^{-3}$	milli	m
$1,000,000,000 = 10^{9}$	giga	G	$0.000,001 = 10^{-6}$	micro	μ
$1,000,000 = 10^{6}$	mega	M	$0.000,000,001 = 10^{-9}$	nano	n
$1,000 = 10^{3}$	kilo	k	$0.000,000,000,001 = 10^{-12}$	pico	p
$100 = 10^{2}$	hecto*	h	$0.000,000,000,000,001 = 10^{-15}$	femto	f
$10 = 10^{1}$	deca*	da	$0.000,000,000,000,000,001 = 10^{-18}$	atto	a

* to be avoided where possible

SYMBOLS AND ABBREVIATIONS USED ON BOREHOLE LOGS

SOIL SAMPLE

- represented by sample identification number which increase sequentially from the top of the hole; thickness of block is equivalent to sample recovery

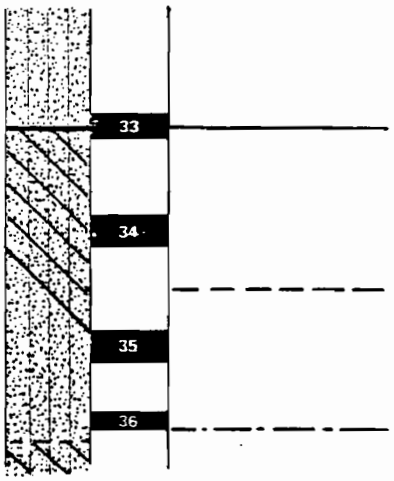
SOIL BOUNDARIES

- have been indicated using the following system

- stratum boundary observed within sample

- stratum boundary assumed to occur within ± 0.5m of the marked level and is probably gradational between the two samples

- stratum boundary assumed to occur within ± 1.0m of the marked level



- stratum boundary notation for both depth below seabed (41.5 metres) and elevation below sealevel (uncorrected for tides) (-64.6 metres El.)

41.5 (-64.6 El.)

SOIL DESCRIPTION

UNIFIED SOIL CLASSIFICATION — USC

- determined in accordance with chart on following page

TEXTURAL DESCRIPTION

- determined in accordance with attached sheet and used to augment Unified Soil Classification

Special terms used include:

e.g. - "becoming trace of/with some CLAY" indicating an overall change in a feature of the stratum not sufficient to change the total description

- "trace of/with some CLAY" indicating small feature displayed in that sample only

MUNSELL COLOUR DESIGNATION

- describing wet grey soil, e.g. (5Y 4/2)

- describing dry grey soil, e.g. (10YR 6/1)

GROUND ICE DESCRIPTION

- determined in accordance with chart on following page; extra effort has been made to better describe the degree and extent of soil bonding and also a value of core temperature (°C) at that level

- see also definition of terms in text

e.g. FROZEN - 2.3
- Nf - Nbn
- poorly to slightly bonded

SAND: Nbn - 2.8
CLAY: not frozen

TEST RESULTS

- see legend at bottom of borehole log

CONSISTENCY

Fine-Grained Soils

Major portion passing No. 200 Sieve. Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silt. Consistency is rated according to shear strength, as indicated by penetrometer readings or vane shear readings.

Descriptive Term	Unconfined Compressive Strength kPa	Equivalent Blows per Foot (N)
Very Soft	less than 25	0 - 2
Soft	25 to 50	2 - 4
Firm	50 to 100	4 - 8
Stiff	100 to 200	8 - 16
Very Stiff	200 to 400	15 - 50
Hard	400 and higher	>50

Coarse-Grained Soils

Major portion retained in No. 200 Sieve. Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

Descriptive Term	Relative Density	Equivalent Blows per foot (N)
Very Loose	0 - 20%	0 - 4
Loose	20 - 40%	4 - 10
Compact or Medium	40 - 75%	10 - 30
Dense	75 - 90%	30 - 50
Very Dense	90 - 100%	50 +

The number of blows (N) on a 2" O.D. split spoon sampler by a 140 lbs. weight falling 30" required to drive the sample a distance of 1' (in accordance with ASTM D1586).

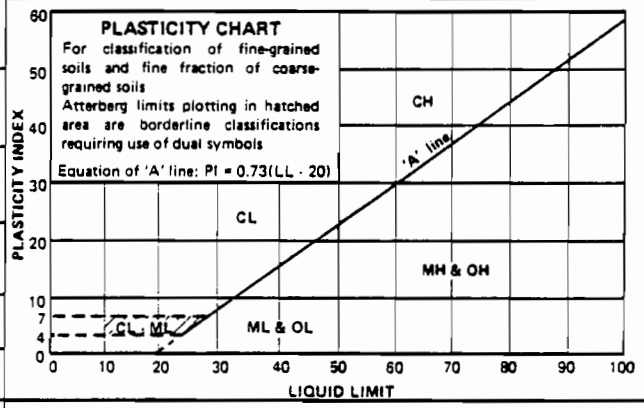
PLASTICITY

Low - Liquid limit less than 50
High - Liquid limit greater than 50

UNIFIED SOIL CLASSIFICATION†

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS — More than 50% retained on No. 200 sieve*	GRAVELS — 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW	
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below 'A' line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand clay mixtures	Atterberg limits plot above 'A' line and plasticity index greater than 7	
	SANDS — More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly-graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW	
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures	Atterberg limits plot below 'A' line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits plot above 'A' line and plasticity index greater than 7	
FINE-GRAINED SOILS — 50% or more passes No. 200 sieve*	SILTS AND CLAYS — Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		
			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		
	SILTS AND CLAYS — Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity		
HIGHLY ORGANIC SOILS			PT	Peat, muck and other highly organic soils		

Classification on basis of percentage of fines
Less than 5% pass No. 200 sieve: GW, GP, SW, SP
More than 12% pass No. 200 sieve: GM, GC, SM, SC
5% to 12% pass No. 200 sieve: Borderline classification requiring use of dual symbols



*Based on the material passing the 3 in. (75 mm) sieve
†ASTM Designation D 2487, for identification procedure see D 2488

GROUND ICE DESCRIPTION

ICE NOT VISIBLE

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
N	Nf	Poorly-bonded or friable	
	Nbn	No excess ice, well-bonded	
	Nbe	Excess ice, well-bonded	

VISIBLE ICE LESS THAN 50% BY VOLUME

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
V	Vx	Individual ice crystals or inclusions	
	Vc	Ice coatings on particles	
	Vr	Random or irregularly oriented ice formations	
	Vs	Stratified or distinctly oriented ice formations	

VISIBLE ICE GREATER THAN 50% BY VOLUME

ICE	ICE + Soil Type	Ice with soil inclusions	
	ICE	Ice without soil inclusions (greater than 25 mm (1 in.) thick)	

NOTE:

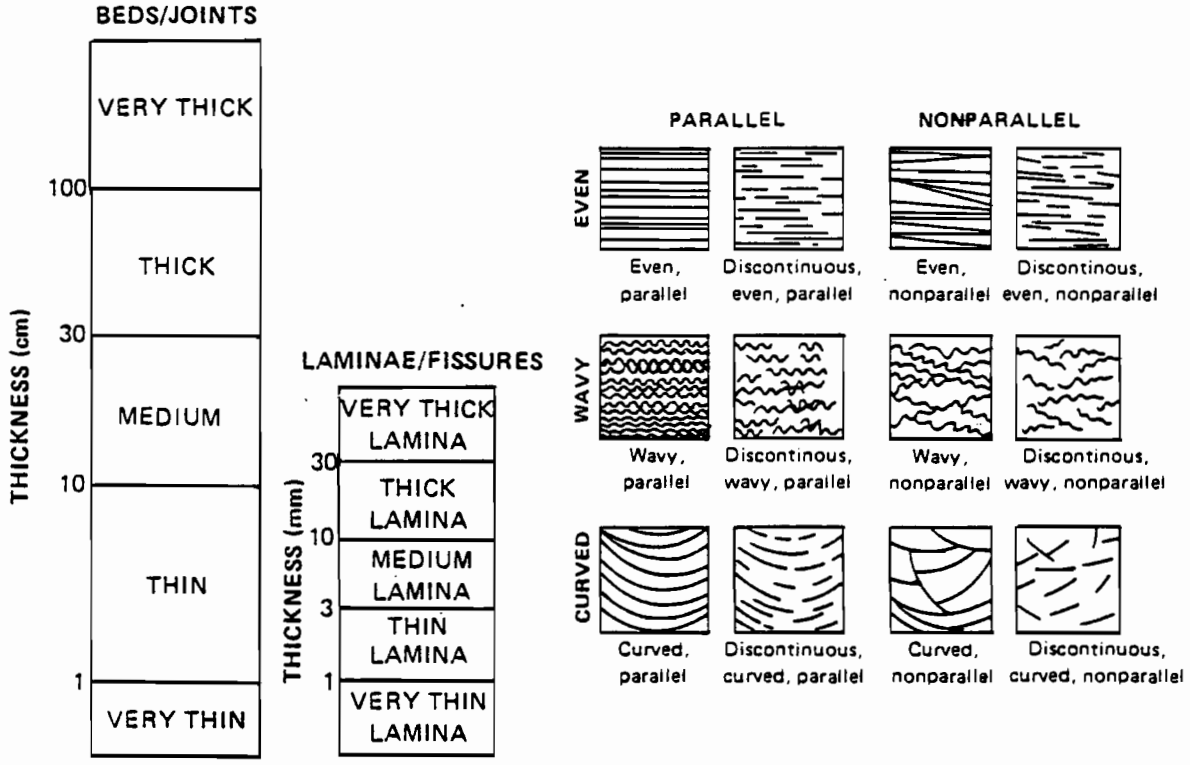
1. *Dual symbols are used to indicate borderline or mixed ice classifications*
2. *Visual estimates of ice contents indicated on borehole logs ± 5%*
3. *This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes*

LEGEND
Soil ☐ Ice ■

DESCRIPTION OF SEDIMENTARY STRUCTURES

BEDS SEDIMENTATION UNITS DEPOSITED UNDER ESSENTIALLY CONSTANT PHYSICAL CONDITIONS, SEPARATED BY BEDDING PLANES WHICH ARE RECOGNIZABLE BY TEXTURAL OR COMPOSITIONAL CHANGES RESULTING FROM PERIODS OF NON-DEPOSITION OR EROSION, OR ABRUPT CHANGES IN DEPOSITIONAL CONDITIONS. BEDS MAY BE INTERNALLY HOMOGENEOUS, OR COMPOSED OF SMALLER UNITS- LAMINAE

LAMINAE THE SMALLEST MEGASCOPIC LAYERS IN A SEDIMENTARY SEQUENCE, REPRESENTING MINOR FLUCTUATIONS IN PHYSICAL CONDITIONS DURING THE DEPOSITION OF BEDS. LAMINAE ARE RELATIVELY UNIFORM IN TEXTURE AND COMPOSITION AND GENERALLY LACK MEGASCOPIC INTERNAL LAYERING.



e.g. Thick bed
Thickly spaced joint

e.g. Thin lamina
Thinly spaced fissures

(After Campbell, 1967)

(Modified after Ingram, 1954 and Campbell, 1967)

LOCATION: NORTH TINGMIARK
UTM COORDINATES: 7 779 880 m. N. 578 370 m. E. WATER DEPTH: 35.4 m

DEPTH BELOW SEABED (metres)

SYM.	NO.	SOIL DESCRIPTION	GROUND ICE T°C
	SB	SILTY CLAY (CL) - sandy, very soft to soft, dark grey, becoming more sandy with depth 0.18 m (-35.5 m El.)	NOT FROZEN Pipe sinks into upper 2 m under own weight
		SAND (SP - SM) - fine-grained with trace of silt	
	1	- bed of dark olive clay at 2.45 m, 5 cm thick	+2.7
	2	- some silt, greyish brown	
	3	- silty, dark grey - black silty sand band at 5.0 m, trace of shell fragments 5.4 m (-40.9 m El.)	
	4	CLAYEY SILT (ML) - thinly laminated at top, becoming interbedded with very thin beds of dark brown to black fibrous peat, soft to very soft, dark grey to black	+0.5
	5	underlain at 6.4 m by: silty sand with peat fibres and strong organic odour, dark brown 6.6 m (-42.0 m El.)	+1.1
		SILTY SAND (SM - SP) - with peat fibres and strong organic odor, dark brown	
	6	becoming: at 7.3 m - fine-grained, with a trace of silt, and trace of medium sized grained sand, subrounded, dark olive grey	+2.8
	7		+3.8
		10.7 m (-46.1 m El.)	
		CLAYEY SILT (ML) - nonplastic soft to firm, dark grey	
	8		+1.6
		14.0 m (-49.4 m El.)	
		SAND (SP) - fine-grained, with trace of silt and trace of medium sized grains medium dense (estimated), light olive grey	

BULK DENSITY ($Mg\,m^{-3}$) ▲
1.4 1.6 1.8 2.0
PLASTIC LIMIT — WATER CONTENT (%) — LIQUID LIMIT
20 40 60 80

UNDRAINED SHEAR STRENGTH (kiloPascals)
100 200 300

SPECIALIZED TESTS
S

JOB No.: 101 - 3661
DRILLING COMPLETED: 82/08/28
BOREHOLE DEPTH: 81.1 m (-116.5 m El.)
DRILLING RIG: S5000/MV BRODERICK
LOG COMPILED BY: JPR

LEGEND

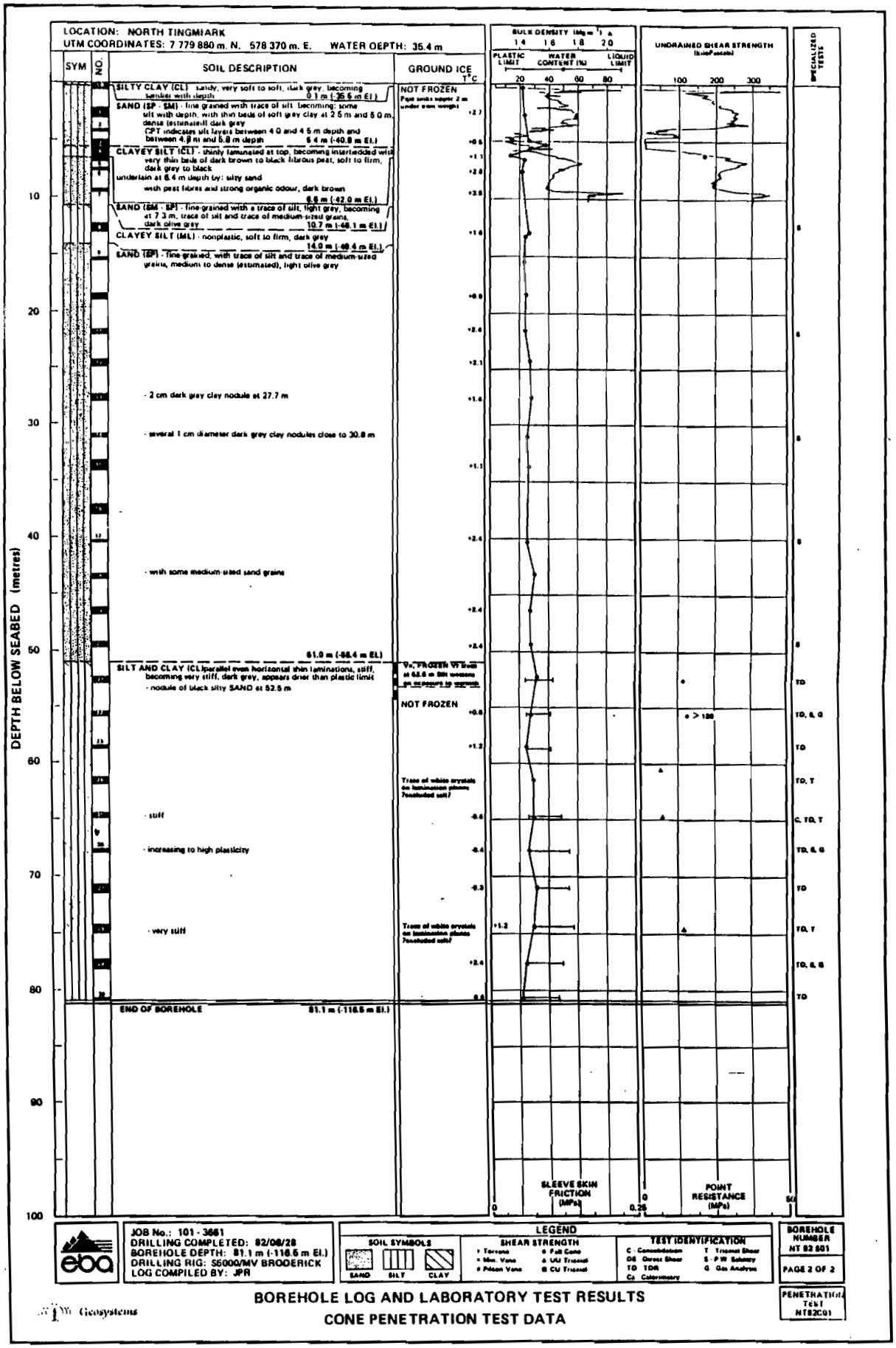
SOIL SYMBOLS: SAND, SILT, CLAY

SHEAR STRENGTH
+ Torvane ● Fall Cone
× Min. Vane ▲ UU Triaxial
• Pilcon Vane ■ CU Triaxial

TEST IDENTIFICATION
C Consolidation T Triaxial Shear
DS Direct Shear S P.W. Salinity
TD TDR G Gas Analysis
Ca Calorimetry

BOREHOLE NUMBER NT 82 S01

BOREHOLE LOG AND LABORATORY TEST RESULTS



BOREHOLE LOG AND LABORATORY TEST RESULTS

CONE PENETRATION TEST DATA

Geosystems

APPENDIX B

Diagnostic Profiles

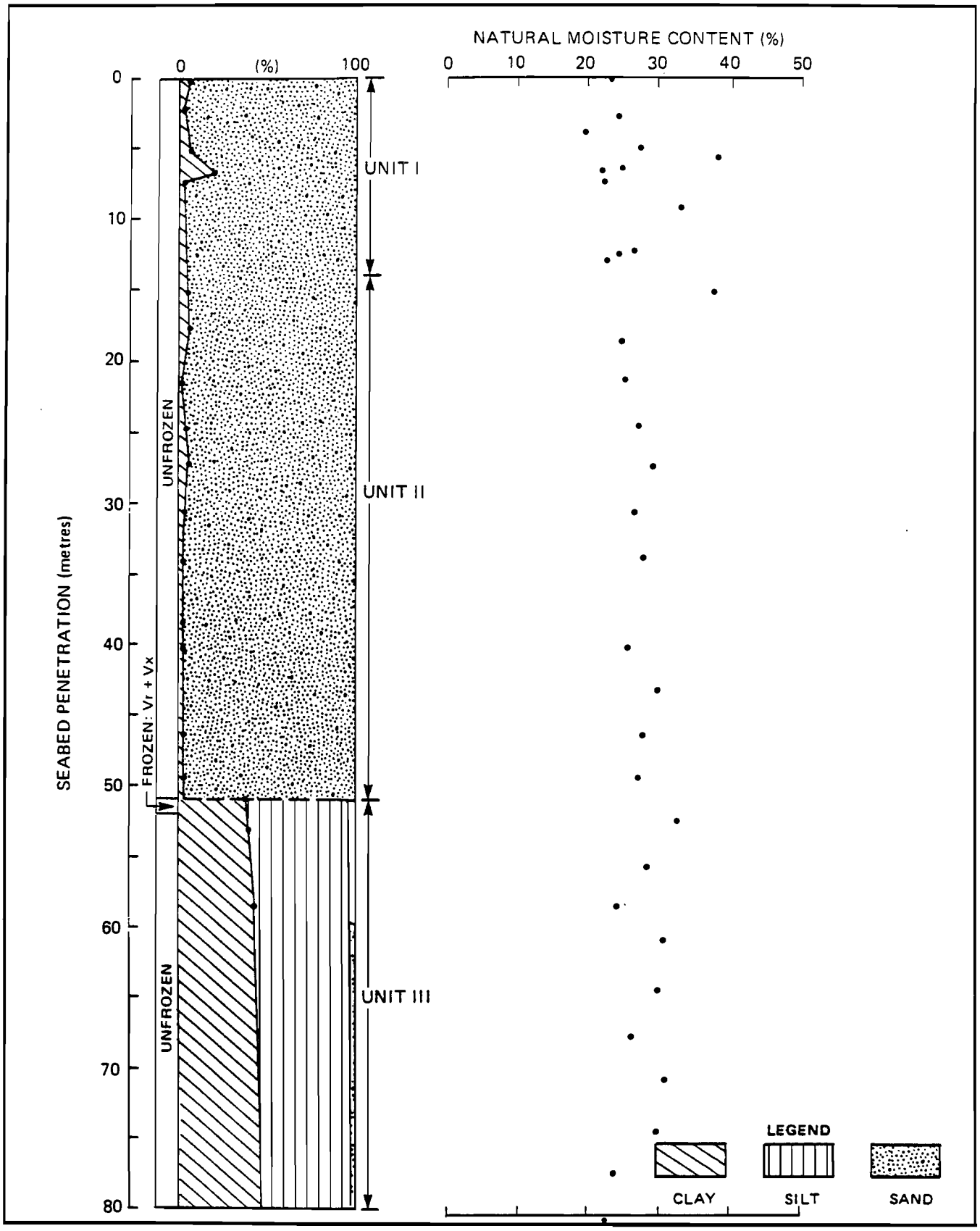


FIGURE B.1 NATURAL MOISTURE CONTENT PROFILE, NORTH TINGMIARK AREA

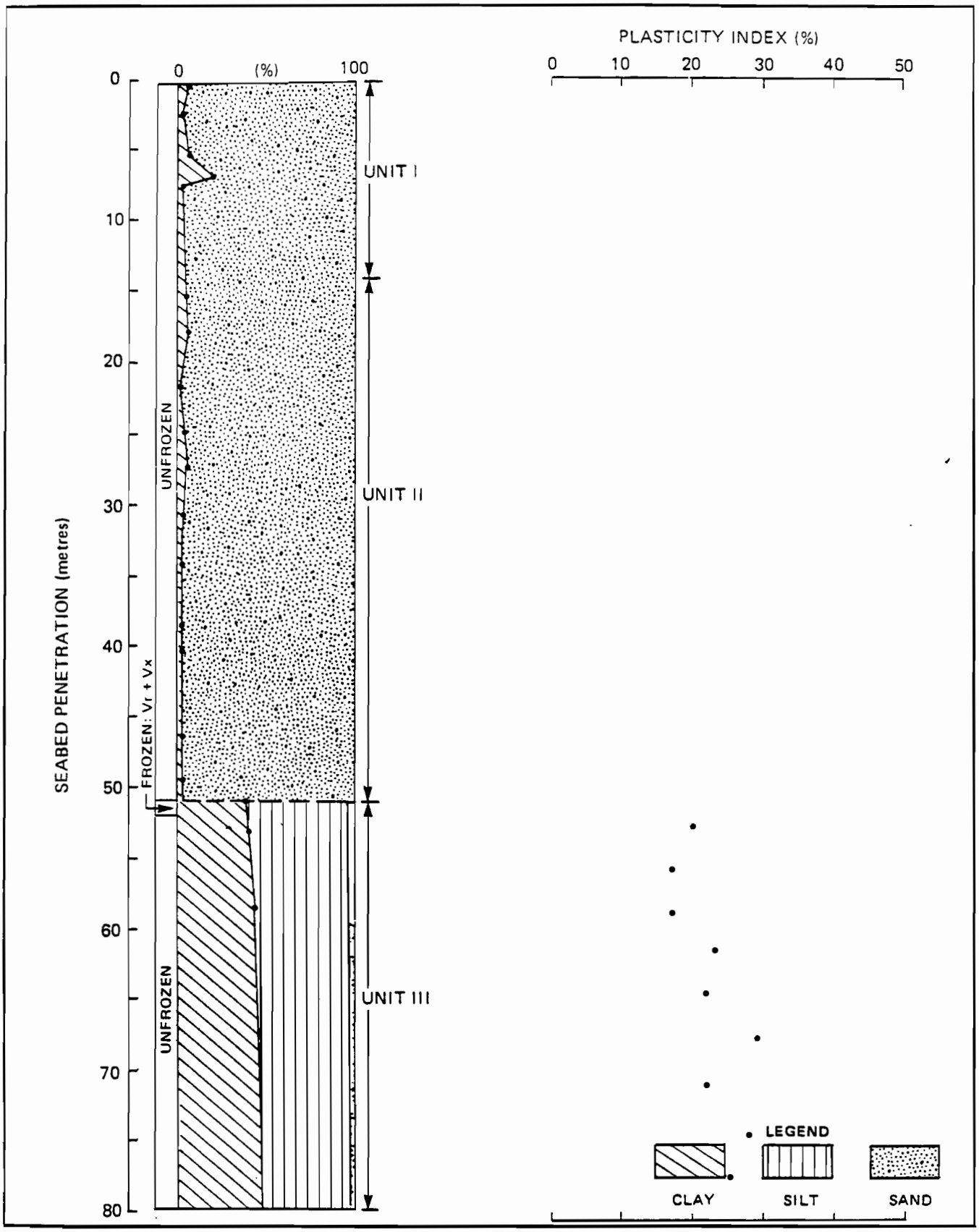


FIGURE B.2 PLASTICITY INDEX PROFILE, NORTH TINGMIARK AREA

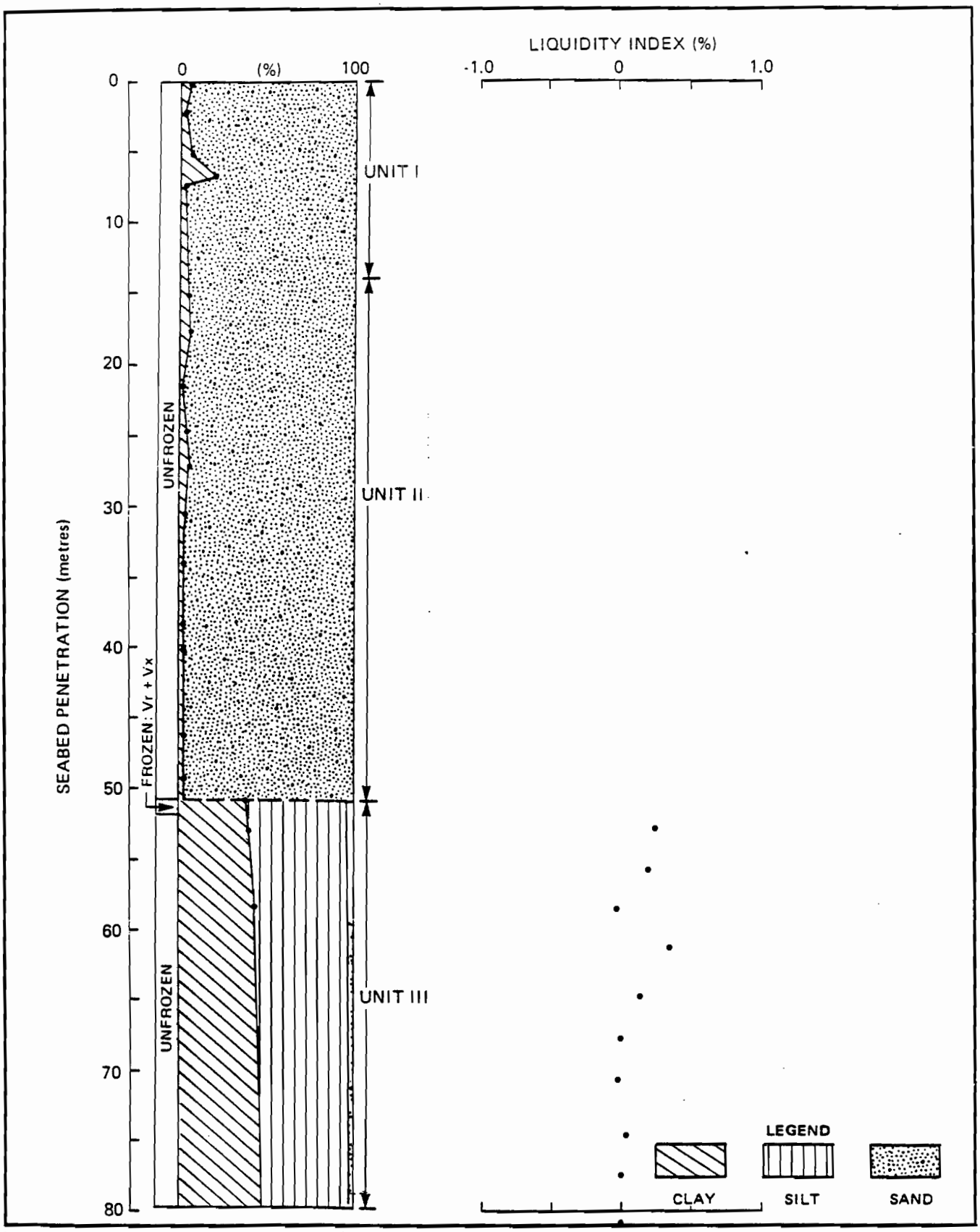


FIGURE B.3 LIQUIDITY INDEX PROFILE, NORTH TINGMIARK AREA

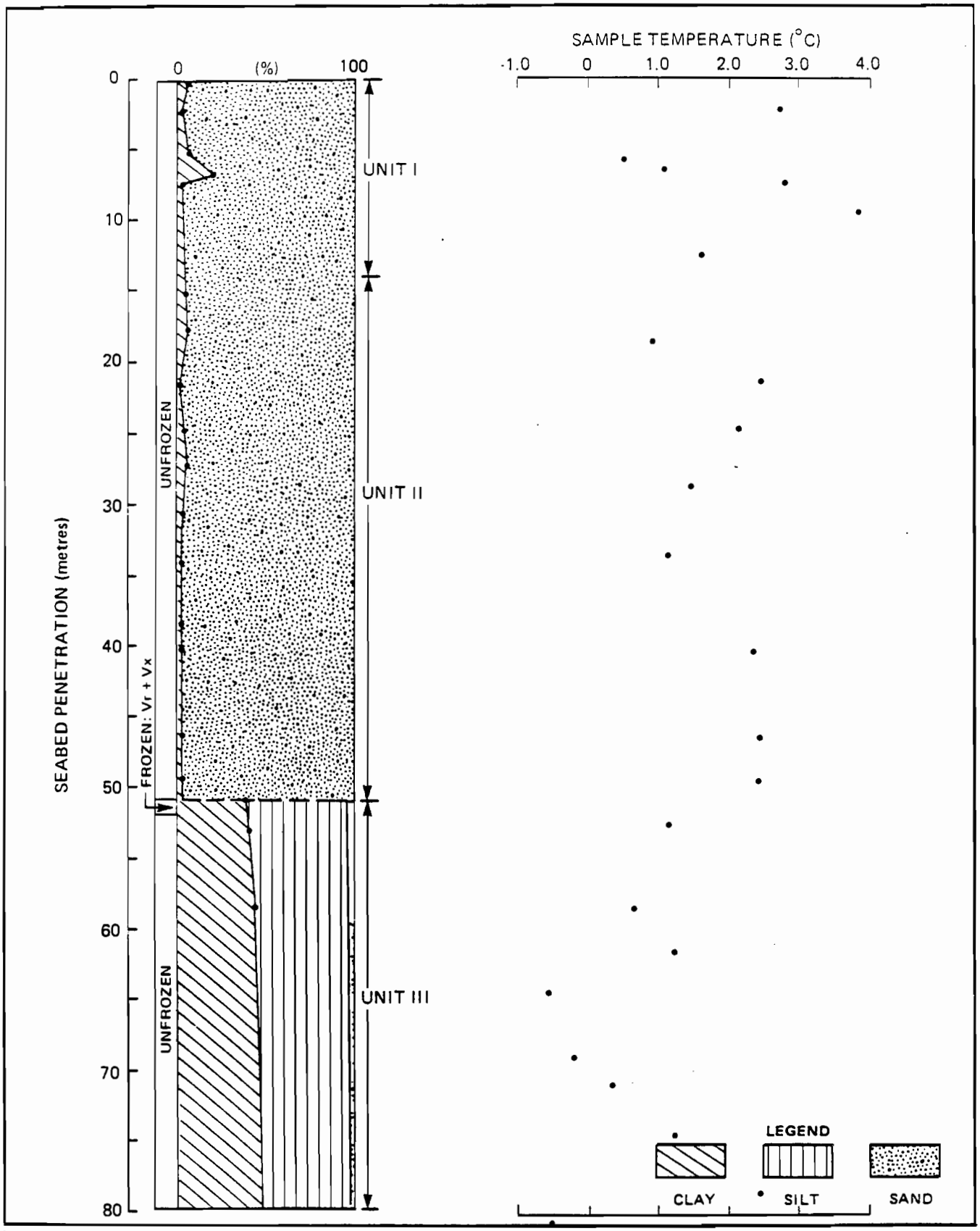


FIGURE B.4 SAMPLE TEMPERATURE PROFILE, NORTH TINGMIARK AREA

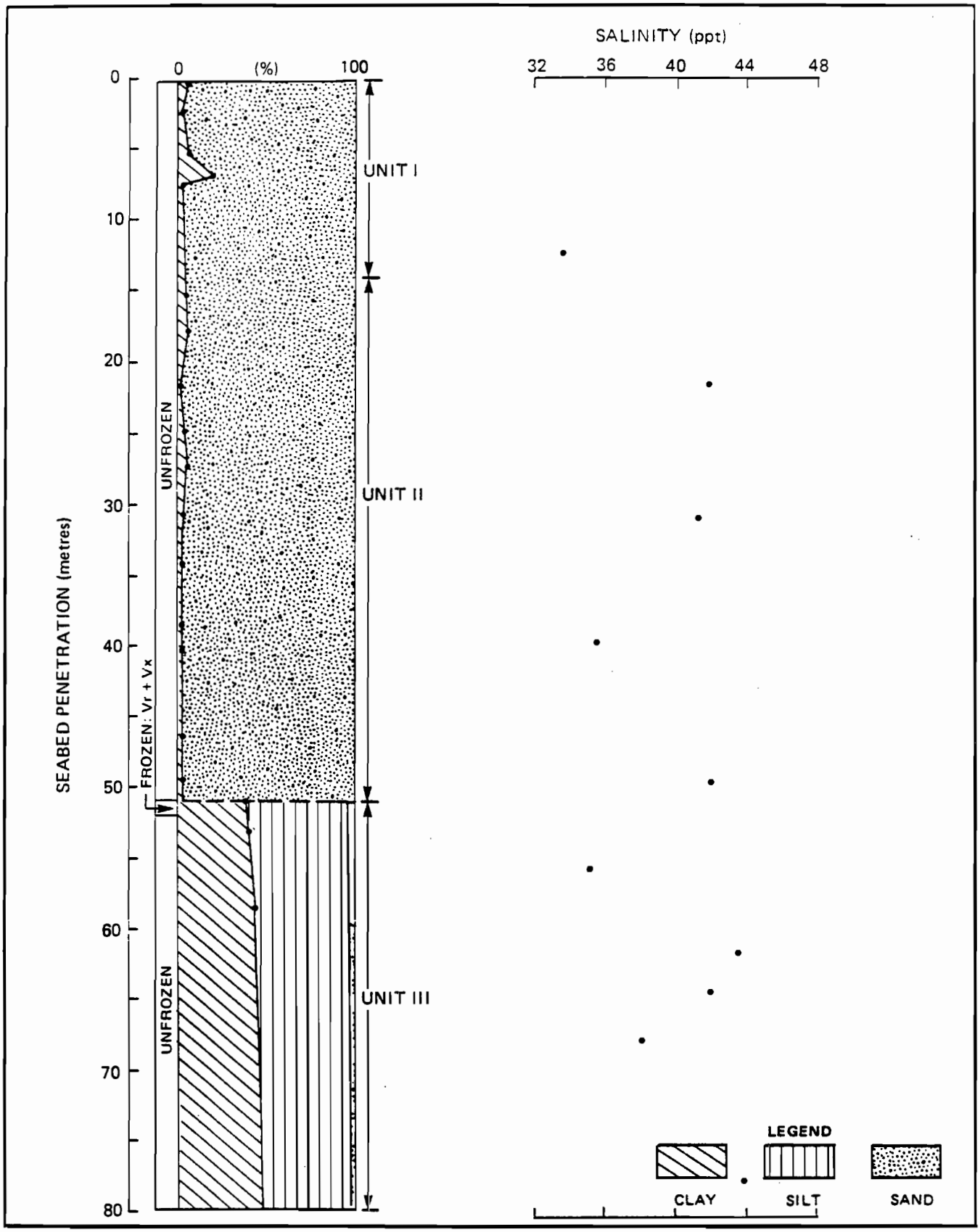


FIGURE B.5 SALINITY PROFILE, NORTH TINGMIARK AREA

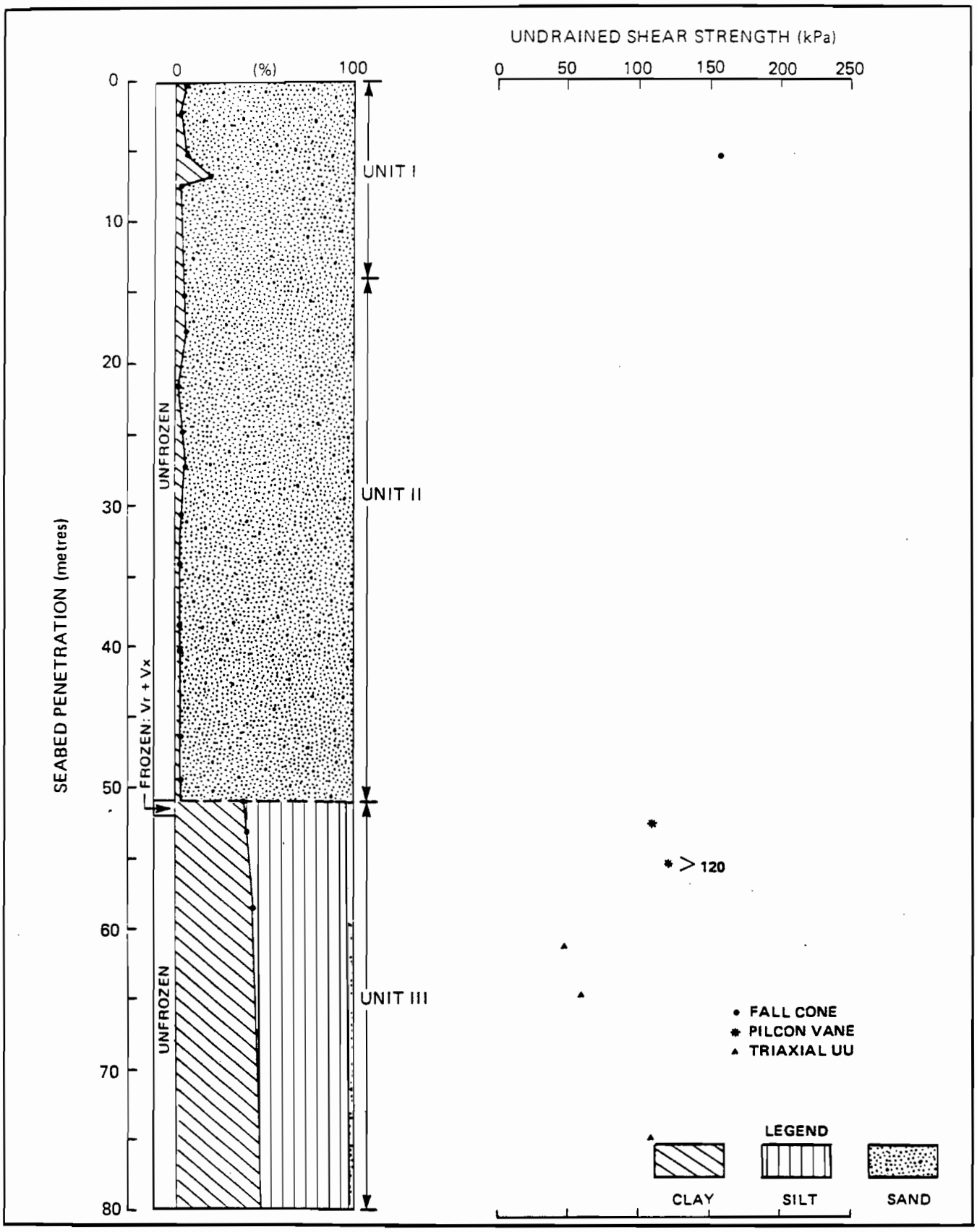


FIGURE B.6 UNDRAINED SHEAR STRENGTH PROFILE, NORTH TINGMIARK AREA

APPENDIX C

Classification and Index Test Results

SUMMARY OF TEST RESULTS

NT82S01

Sample Number	Sample Type	Depth (metres) *Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
SB	B	SB - 0.5	CL			23						3	97		200								
1A	NS	2.70 - 2.80	SP-SM		2.7	24						2	98		220								
1B	B	2.45 - 2.50																					
1C	B	2.20 - 2.70																					
2A	T	3.96 - 4.09				20					1	3	96										
3A	NS	4.88 - 5.00				27						6	94		300								
3B	B	5.00 - 5.03																					
3C	B	5.03 - 5.08																					
3D	B	5.08 - 5.24																					
4A	B	5.49 - 6.02	ML																				
4B	NS	5.50 - 5.60				38										Fc	159		v.stiff				
4C	PF	6.02 - 6.36			0.5																		
5A	NS	6.40 - 6.45	SM			25																	
5B	B	6.45 - 6.60																					
5C	NS	6.60 - 6.65				22						20	80		150								
5D	B	6.65 - 6.75			1.1																		
6A	NS	7.32 - 7.45	SP			23						2	98		200								
6B	B	7.32 - 7.50			2.8																		
7A	T	9.14 - 9.25			3.8	33					3	5	92										
8A	B	12.19 - 12.49	ML			27																	
8B	B	12.99 - 12.79				25																	

LEGEND AND NOTES

- B Bag Sample
- G Gas Sample
- L Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF - Permafrost Sample
- PW - Porewater Sample
- T - Sample Stored in Tube
- W - Waxed Sample
- RC - Radiocarbon Sample
- MV - Minivane
- FC - Fall Cone
- TV - Torvane
- PV - Pilcon Vane
- RV - Remote Vane
- UU - Unconsolidated Undrained Triaxial
- UUp - UU Triaxial with Pore Pressure Measurements
- CU - Consolidated Undrained Triaxial
- CUp - CU Triaxial with Pore Pressure Measurements
- CD - Consolidated Drained Triaxial
- O - Organic Content
- S - Salinity
- TS - Thaw Strain

Project Number: 101-3661

Reviewed By: _____ P.Eng.

2143

SUMMARY OF TEST RESULTS

NT82S01

Sample Number	Sample Type	Depth (metres) *Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
8C	NS	12.79 - 12.85				23																	
8D	B	12.19 - 12.85			1.6																		
8E	S	12.20 - 12.40																					3.4 - S
9A	NS	15.24	SP			38						5	95		240								
10A	NS					25						5	95		210								
10B	B	18.29 - 18.64			0.9																		
11A	NS	21.54 - 21.64	SP			26						2	98		290								
11B	S	24.46 - 21.54																					4.3 - S
11C	B	21.64 - 21.80			2.4																		
12A	NS					27						4	96		230								
12B	B	24.38 - 24.74			2.0																		
13A	NS	27.56 - 27.66				24						5	95		210								
13B	B	27.43 - 27.85			1.4																		
14A	NS	30.78 - 30.90				26						3	97		220								
14B	S	30.78 - 30.94																					4.2 - S
14C	B	30.94 - 31.05																					
15A	NS	34.00				28						2	98		210								
15B	B	33.83 - 34.17			1.1																		
16A	B	37.29																					
17A	NS	40.23 - 40.30				26						3	97		240								
17B	B	40.23 - 40.43			2.4																		3.6 - S

LEGEND AND NOTES

- B Bag Sample
- G Gas Sample
- L Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF - Permafrost Sample
- PW - Porewater Sample
- T - Sample Stored in Tube
- W - Waxed Sample
- RC Radiocarbon Sample
- MV - Minivane
- FC - Fall Cone
- TV - Torvane
- PV - Pilcon Vane
- RV - Remote Vane
- UU - Unconsolidated Undrained Triaxial
- UUp - UU Triaxial with Pore Pressure Measurements
- CU - Consolidated Undrained Triaxial
- CUp - CU Triaxial with Pore Pressure Measurements
- CD - Consolidated Drained Triaxial
- O Organic Content
- S Salinity
- TS - Thaw Strain

Project Number: 101-3661

Reviewed By: _____ P.Eng.

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SUMMARY OF TEST RESULTS

NT82S01

Sample Number	Sample Type	Depth (metres) *Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
18A	NS	43.28 - 43.30				30						3	97		350								
18B	S	43.30 - 43.55																					
19A	NS	46.33 - 46.50				28						4	96		200								
19B	B	46.33 - 46.73			2.4																		
20A	B	49.38 - 49.50				27						3	97		180								
20B	S	49.38 - 49.64			2.4																		4.2 S
21A	NS	52.43 - 52.47	ML	Trace Vr, Vx																			
21B	PF	52.47 - 52.72																					
21C	B	52.72 - 52.83			1.1				43	23	39	60	1			PV	110		stiff				
22A	NS	55.50 - 55.60				28																	
22B	G	55.60 - 55.73																					
22C	S	55.73 - 55.90																					3.5 S
22D	B	55.50 - 55.90	ML						42	25						PV	>120		V. stiff				
23A	NS	58.75 - 58.82	ML		0.6	24																	
23B	B	58.52 - 58.75							42	25	44	55	1										
24A	NS	61.85 - 61.94	ML		1.2	30																	
24B	PF	61.60 - 61.85														UU_p	49	11	firm				4.3 S
24C	B	61.47 - 61.60																					
25A	NS	64.81 - 64.88	ML		-0.6	30																	
25B	PF	64.61 - 64.81							49	27						UU_p	60	14	stiff	580	950	0.23	2.7 SG, 4.2 S
25C	B	64.47 - 64.61																					

LEGEND AND NOTES

- B Bag Sample
- G Gas Sample
- L Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF · Permafrost Sample
- PW · Porewater Sample
- T · Sample Stored in Tube
- W · Waxed Sample
- RC · Radiocarbon Sample
- MV · Minivane
- FC · Fall Cone
- TV · Torvane
- PV · Pilcon Vane
- RV · Remote Vane
- UU · Unconsolidated Undrained Triaxial
- UUp · UU Triaxial with Pore Pressure Measurements
- CU · Consolidated Undrained Triaxial
- CUp · CU Triaxial with Pore Pressure Measurements
- CD · Consolidated Drained Triaxial
- O · Organic Content
- S · Salinity
- TS · Thaw Strain

Project Number: 101-3661

Reviewed By: _____ P.Eng.

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SUMMARY OF TEST RESULTS

NT82S01

Sample Number	Sample Type	Depth (metres) *Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
26A	NS	67.95 - 68.07	ML		-0.2	26																	
26B	S	67.90 - 67.95																					3.8 S
26C	G	67.80 - 67.90																					
26D	B	67.67 - 67.80							55	26													
27A	NS	71.45 - 71.49	ML		0.3	31																	
27B	B	70.71 - 71.45							54	32													
28A	NS	74.90 - 74.92	ML		1.2	30																	
28B	PF	74.75 - 74.90														UUp	110	15	v.stiff	673	600	0.26	2.7SG.
28C	B	74.52 - 74.75							57	29													
29A	NS	78.00 - 78.10			2.4	24																	
29B	S	77.90 - 78.00																					4.4 S
29C	G	77.90 - 77.90																					
29D	B	77.44 - 77.80							49	24	45	53	2										
30A		82.00 - 81.07	ML	-0.6	23																		
30B		80.91 - 81.00																					
30C		80.77 - 80.91							47	23													

LEGEND AND NOTES

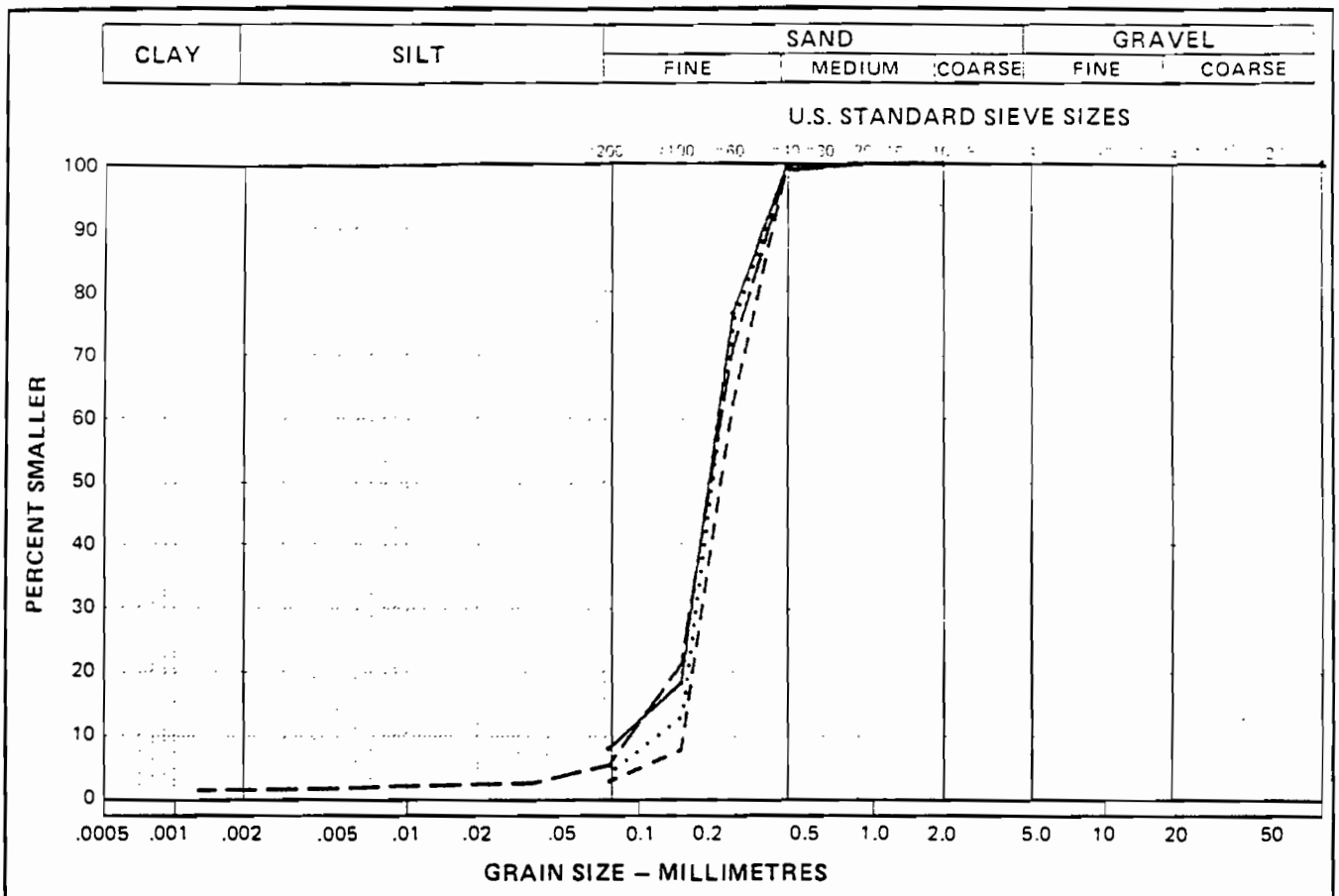
- B Bag Sample
- G Gas Sample
- L Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF Permafrost Sample
- PW Porewater Sample
- T Sample Stored in Tube
- W Waxed Sample
- RC Radiocarbon Sample
- MV Minivane
- FC Fall Cone
- TV Torvane
- PV Pilcon Vane
- RV Remote Vane
- UU Unconsolidated Undrained Triaxial
- UUp UU Triaxial with Pore Pressure Measurements
- CU Consolidated Undrained Triaxial
- CUp CU Triaxial with Pore Pressure Measurements
- CD Consolidated Drained Triaxial
- O Organic Content
- S Salinity
- TS Thaw Strain

Project Number: 101-3661

Reviewed By: _____ P.Eng.

2143

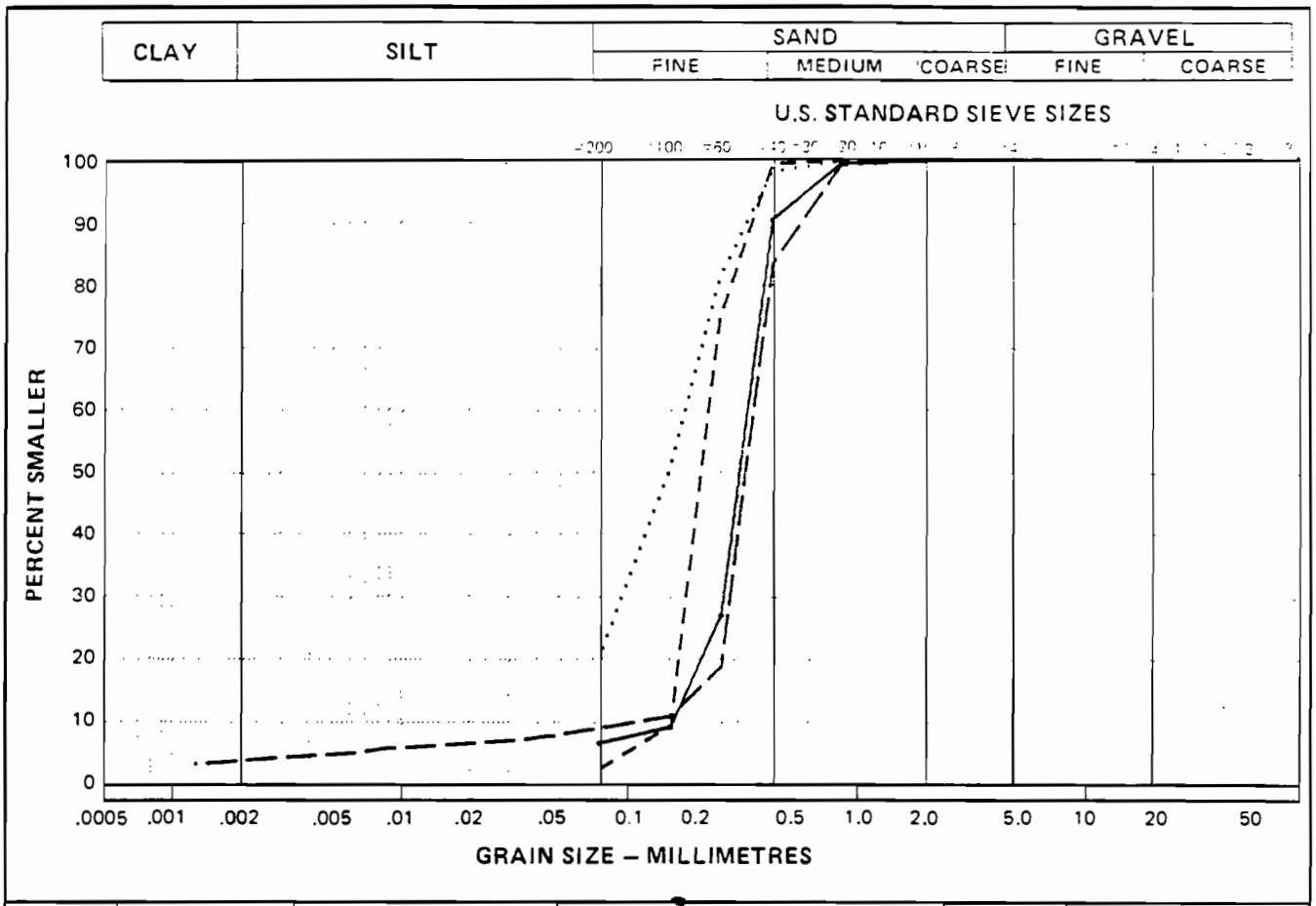
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	Cu	Cc	U.S.C.
_____	NT82S01	0.00 - .05	-	7.0	93.0	0.0	2.4	1.4	SP-SM
. . . . .	NT82S01	0.00 - .50	-	3.4	96.6	0.0	1.8	1.1	SP
_ _ _	NT82S01	2.70 - 2.80	-	1.7	98.3	0.0	1.6	.9	SP
__ __	NT82S01	3.96 - 4.09	.7	3.5	95.8	0.0	2.4	1.3	SP

JOB NO. 101 -3661 DATE 82-08-29

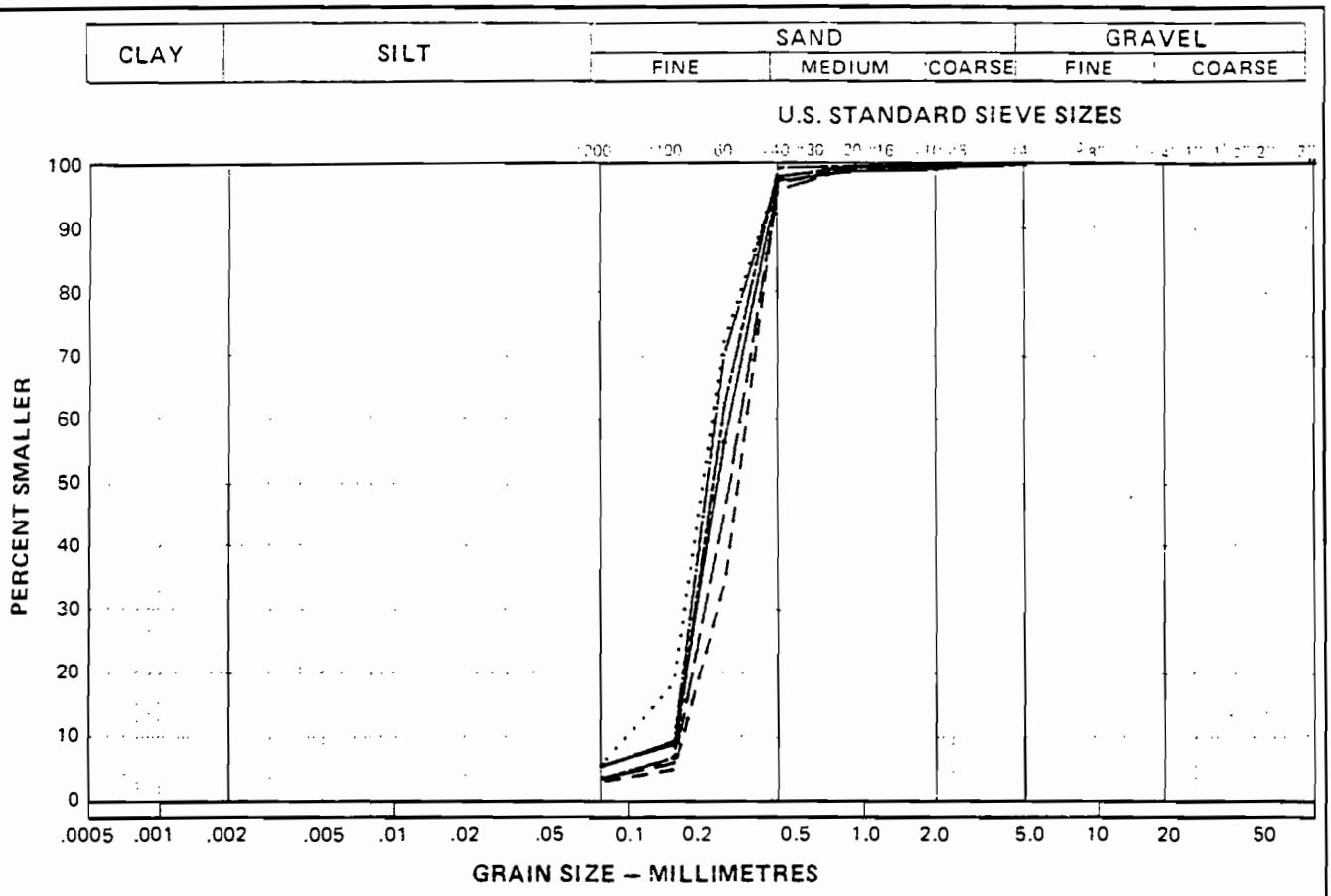
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	NT82S01	4.88 - 5.00	-	5.8	94.2	0.0	2.1	1.3	SP-SM
. . . . .	NT82S01	6.60 - 6.65	-	19.7	80.3	0.0	-	-	
_ _ _	NT82S01	7.32 - 7.45	-	1.6	98.4	0.0	1.5	.9	SP
___ ___	NT82S01	9.14 - 9.25	3.3	4.8	91.9	0.0	2.4	1.5	SP-SM

JOB NO. 101 -3661 DATE 82-08-28

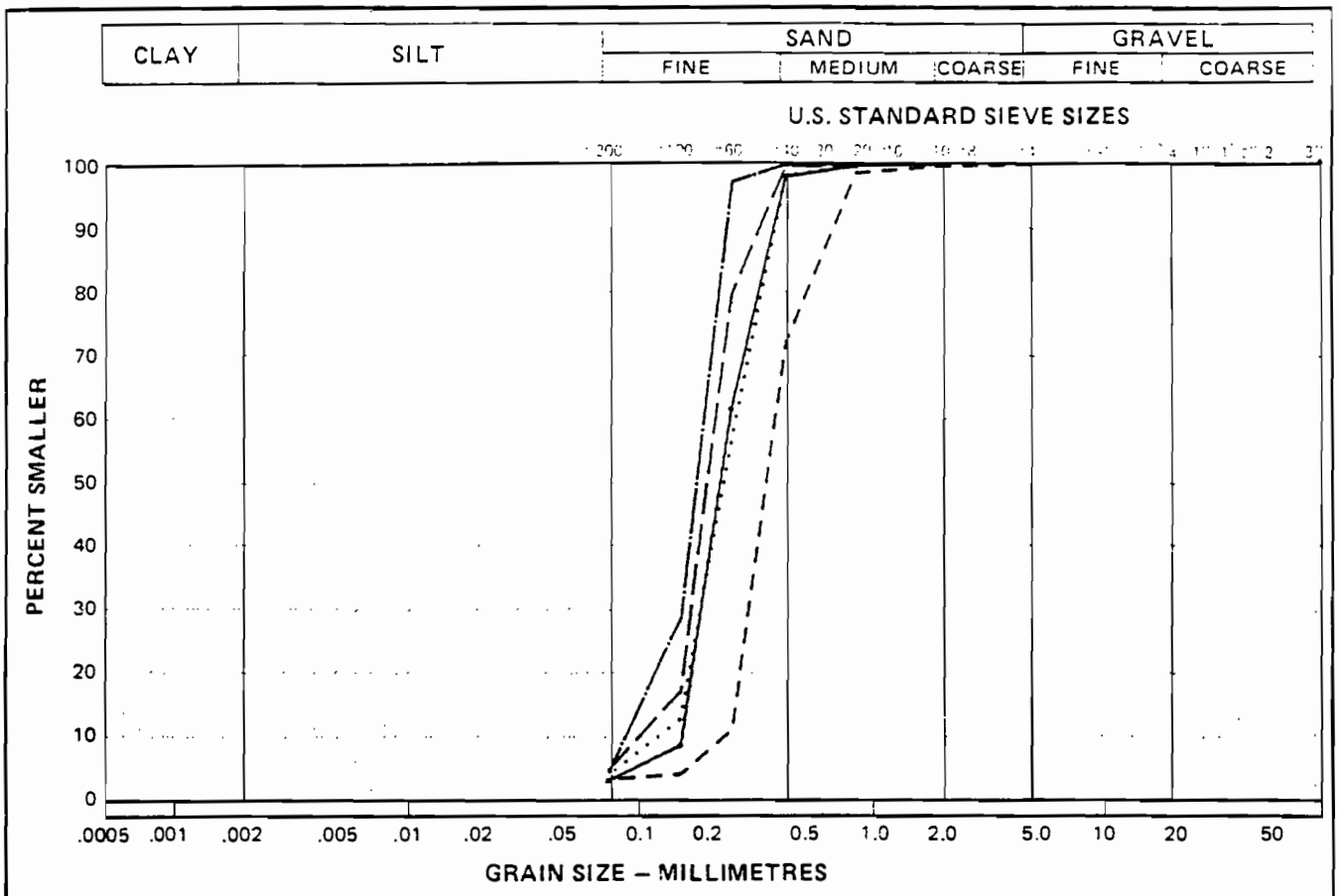
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	NT82S01	15.24 - 15.24	-	4.7	95.3	0.0	1.7	.9	SP
. . . . .	NT82S01	18.29 - 18.50	-	4.9	95.1	0.0	2.3	1.3	SP
_ _ _	NT82S01	21.34 - 21.54	-	2.2	97.8	0.0	1.9	1.1	SP
___ ___	NT82S01	24.50 - 24.74	-	2.7	97.3	0.0	1.8	.9	SP
_____	NT82S01	27.56 - 27.66	-	4.5	95.5	0.0	1.5	.9	SP
_____	NT82S01	30.78 - 30.90	-	2.6	97.4	0.0	1.6	.9	SP

JOB NO. 101 -3661 DATE 82-08-28

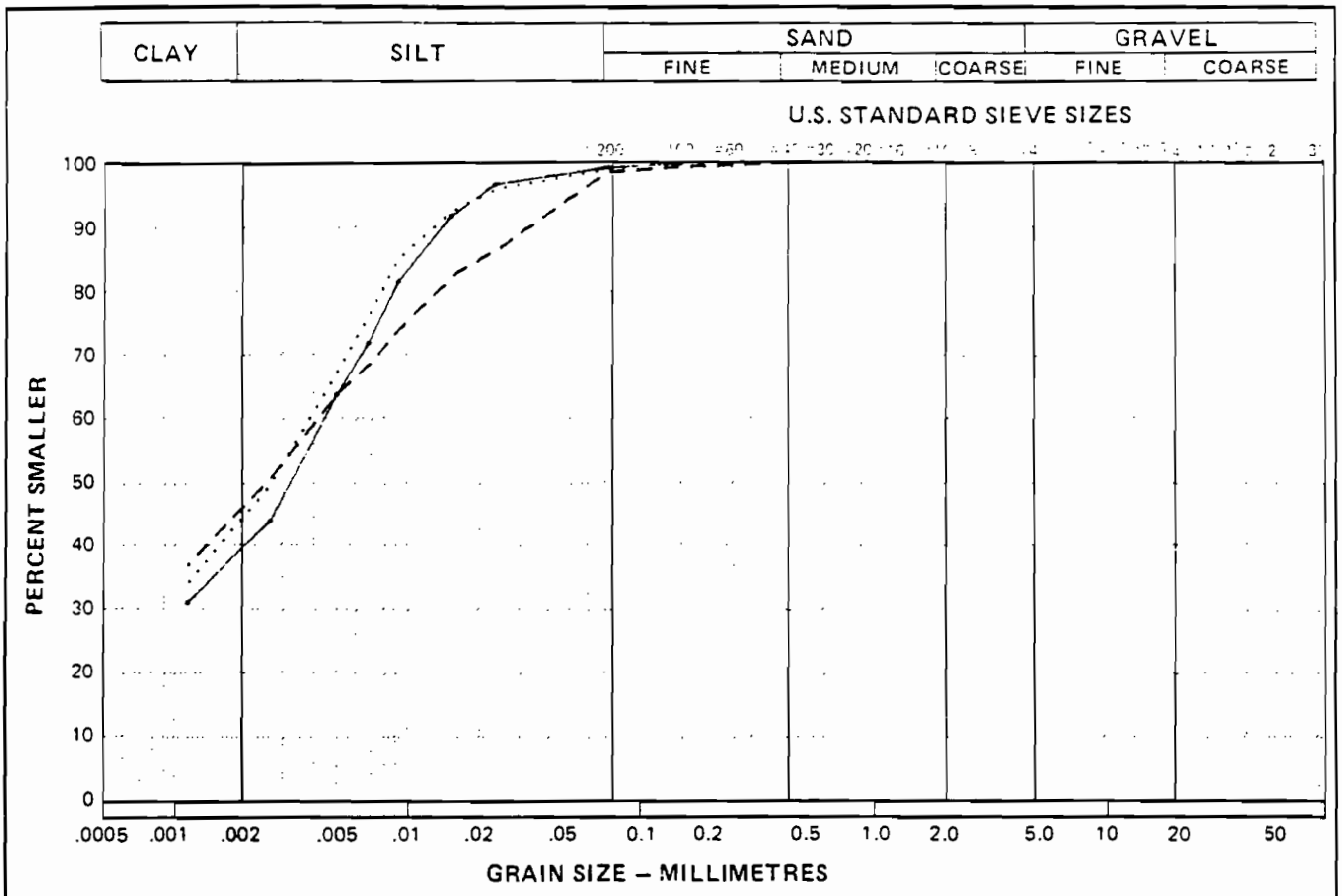
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	NT82S01	33.53 - 34.00	-	1.9	98.1	0.0	1.6	.9	SP
. . . . .	NT82S01	40.25 - 40.30	-	2.9	97.1	0.0	2.0	1.0	SP
_ _ _	NT82S01	43.30 - 43.30	-	2.2	97.8	0.0	1.5	.9	SP
___ ___	NT82S01	46.35 - 46.50	-	3.6	96.4	0.0	2.0	1.2	SP
_____._	NT82S01	49.35 - 49.50	-	3.3	96.7	0.0	2.1	1.4	SP

JOB NO. 101 -3661 DATE 82-08-28

PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	NT82S01	52.70 - 52.80	39.0	60.6	.4	0.0	-	-	
. . . . .	NT82S01	58.50 - 58.75	43.6	55.6	.8	0.0	-	-	
_ _ _	NT82S01	77.44 - 77.80	45.4	53.4	1.2	0.0	-	-	

JOB NO. 101 -3661 DATE 82-11-18

APPENDIX D

Shear Strength Test Results

APPENDIX D

GLOSSARY OF TERMS RELATED TO SHEAR STRENGTH

Axial Stress	:	Vertical stress applied to a sample (Force/X-Sectional Area)
B	:	The ratio of pore pressure response to a change in isotropic pressure. Indicative of the degree of saturation.
Back Pressure	:	An increase in pore pressure applied to a sample for the purpose of increasing saturation.
c'	:	Effective value of cohesion.
Cell Pressure	:	Isotropic confining pressure to which a sample is subjected during triaxial testing.
Consolidation	:	Volumetric change in soil with time resulting from loading under drained condition.
Deviator Stress	:	The net applied axial stress during triaxial testing. Mathematically, the difference between the major and minor principal stresses (sigma $_1$'-sigma $_3$').
Effective Stress	:	The net stress present in a saturated soil after the pore pressure has been subtracted. The stress difference between the total and measured pore pressure.
Epore	:	Computer output heading for excess pore pressure
Excess Pore Pressure	:	The pore pressure generated or developed during shear.
Jacketed	:	A sample is enclosed in a thin, impermeable, latex membrane.
Ko	:	The ratio of the effective horizontal stress to the effective vertical stress. sigma $_3$'/ sigma $_1$'
ParA	:	Computer output heading for Skempton's pore pressure parameter A. A is the ratio of change in excess pore pressure to change in deviator stress.
Peak Strength	:	The maximum deviator stress that can be applied to a sample.

GLOSSARY (continued)

Ø'	:	Internal angle of friction under effective stress conditions.
Pore Pressure Response	:	A change in pore pressure resulting from a change in stress condition.
Reshaped Strength	:	Analogous to remoulded strength. Shear strength measured after soil structure completely removed.
Strain	:	Ratio of deformation over a fixed reference length to the initial reference length. Expressed as a percent.
s1	:	Computer output heading for the effective major principal stress, sigma $_1$'. In triaxial testing this represents the total vertical stress.
s3	:	Computer output heading for the effective minor principal stress, sigma $_3$'. In triaxial testing, this represents the cell pressure.
Tpore	:	Computer output heading for total pore pressure.
VolCh	:	Computer output heading for the volume changes a sample undergoes during loading.
Wet Density	:	Mass of the soil particles and water in a unit volume of soil.
Dry Density	:	Mass of the dry soil particles in a unit volume of soil.

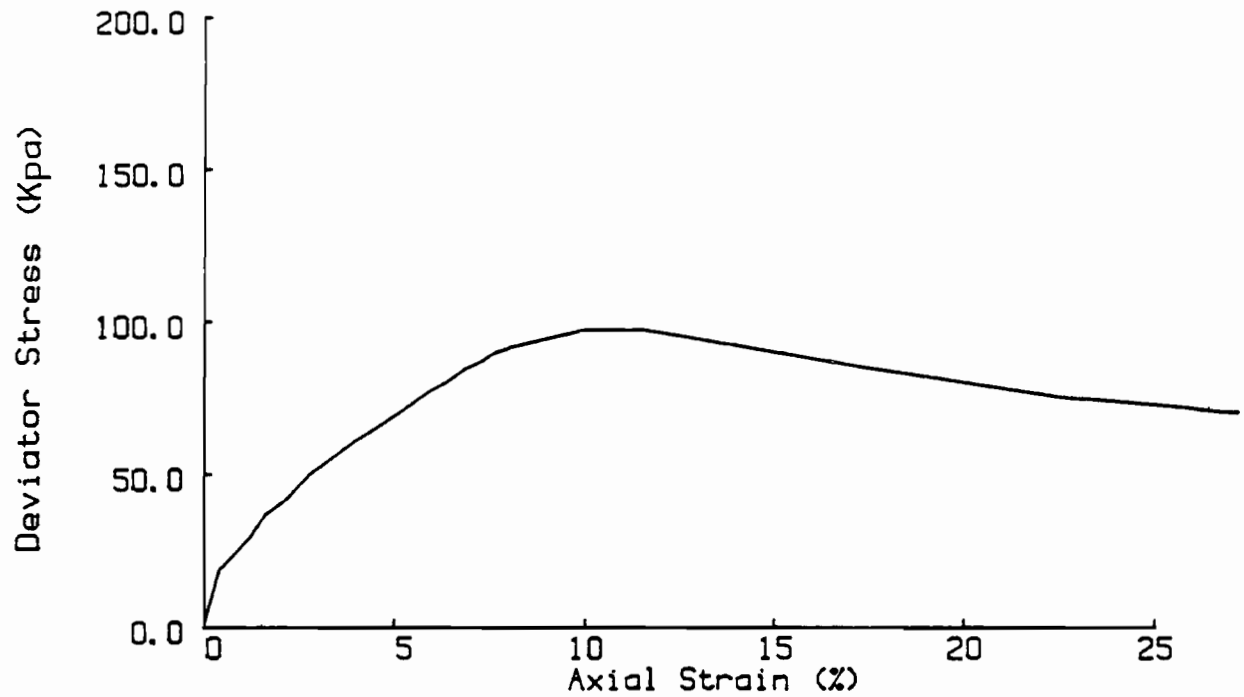
Test Hole..... NT82S01 248
Depth..... 61.60-61.85 m
Test Number..... 1
Cell Pressure..(Kpa).. 1241.1
Back Pressure..(Kpa).. 1239.0
Parameter B..... .99

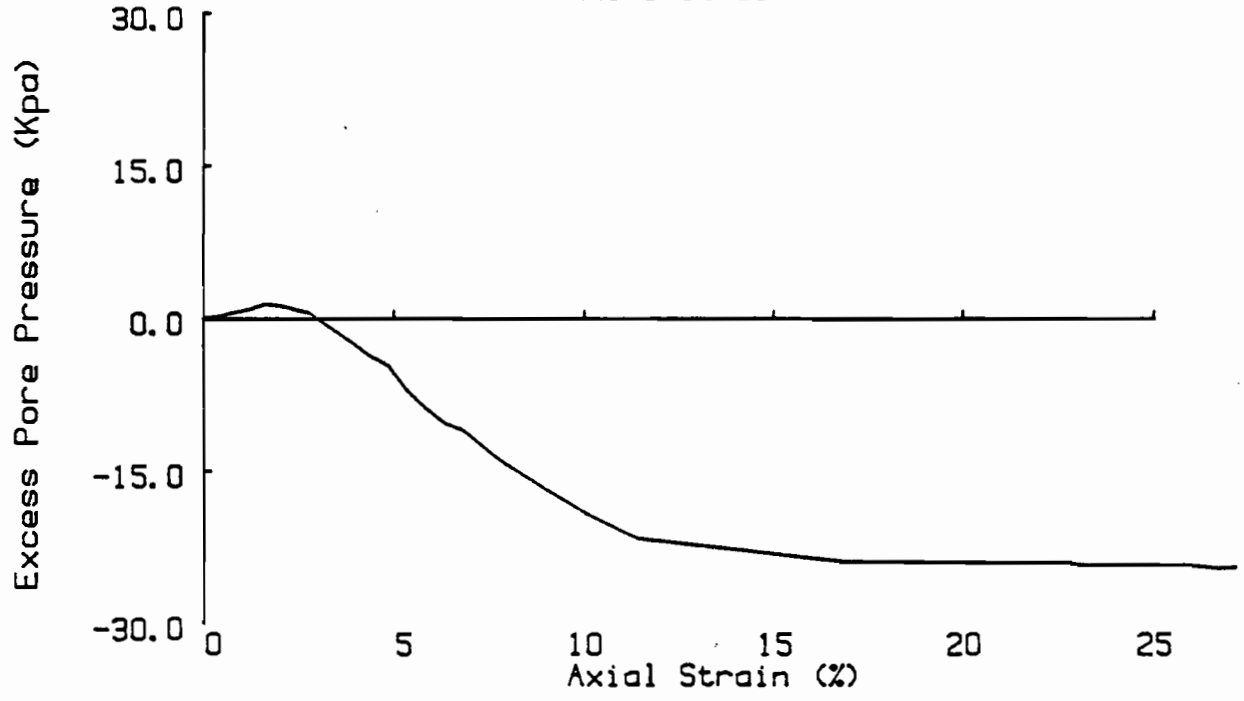
	INITIAL	FINAL
Water Content (%)	30.58	32.80
Wet Density (Mg/cu.m)	1.97	2.00
Dry Density (Mg/cu.m)	1.51	1.51

Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2
0.00	0.0	1237.7	0.00	0.00	0.0	1.00	0.0	3.4
.41	18.8	1238.9	.31	.01	0.0	9.53	9.4	11.6
1.23	29.9	1239.9	.99	.03	0.0	25.69	14.9	16.1
1.62	37.2	1240.5	1.49	.04	0.0	28.90	18.6	19.2
2.18	42.5	1240.1	1.14	.03	0.0	30.29	21.3	22.2
2.76	50.4	1239.6	.59	.01	0.0	29.37	25.2	26.7
3.94	61.0	1236.5	-2.45	-.04	0.0	21.40	30.5	35.1
4.39	64.3	1235.3	-3.70	-.06	0.0	15.09	32.2	38.0
4.90	68.7	1234.3	-4.70	-.07	0.0	11.10	34.3	41.1
5.35	72.6	1232.0	-6.99	-.10	0.0	8.99	36.3	45.4
5.85	77.2	1230.2	-8.79	-.11	0.0	8.09	38.6	49.5
6.34	80.4	1228.8	-10.24	-.13	0.0	7.51	40.2	52.5
6.82	84.9	1228.1	-10.93	-.13	0.0	7.51	42.4	55.5
7.30	87.6	1226.6	-12.38	-.14	0.0	7.05	43.8	58.3
7.44	88.8	1226.2	-12.78	-.14	0.0	6.97	44.4	59.3
7.66	90.4	1225.5	-13.48	-.15	0.0	6.80	45.2	60.8
7.70	90.4	1225.4	-13.58	-.15	0.0	6.76	45.2	60.9
7.90	91.2	1224.9	-14.13	-.15	0.0	6.62	45.6	61.8
7.93	91.2	1224.8	-14.18	-.16	0.0	6.60	45.6	61.9
8.00	91.8	1224.7	-14.33	-.16	0.0	6.59	45.9	62.3
8.06	94.9	1222.1	-16.87	-.18	0.0	6.00	47.4	66.4
9.98	97.8	1220.0	-18.97	-.19	0.0	5.64	48.8	69.9
10.83	97.8	1218.2	-20.78	-.21	0.0	5.27	48.8	71.7
11.40	97.5	1217.4	-21.56	-.22	0.0	5.12	48.7	72.4
18.90	86.0	1216.2	-23.89	-.27	0.0	4.50	43.1	68.0
22.63	75.2	1215.0	-24.01	-.32	0.0	3.88	37.6	63.7
22.84	75.0	1214.9	-24.06	-.32	0.0	3.87	37.5	63.6
23.31	74.8	1214.7	-24.31	-.33	0.0	3.83	37.4	63.8
25.81	72.1	1214.8	-24.21	-.34	0.0	3.74	36.0	62.3
26.19	71.4	1214.6	-24.36	-.34	0.0	3.70	35.7	62.2
26.72	70.6	1214.4	-24.56	-.35	0.0	3.65	35.3	62.0
27.15	70.5	1214.6	-24.41	-.35	0.0	3.66	35.2	61.8
0.00	0.0	0.0	0.00	0.00	0.0	0.00	0.0	0.0
9.99	97.6	1240.5	24.56	.35	0.0	61.90	48.8	72.4
9.99	200.0	1300.0	30.00	.38	0.0	40.00	60.0	100.0
Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2

FIGURE D.1 UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS
-NORTH TINGMIARK AREA.

	Test no.	σ'_{3c} (kPa)	Dry dens. (Mg/cu. m)
———	1	2.1	1.51

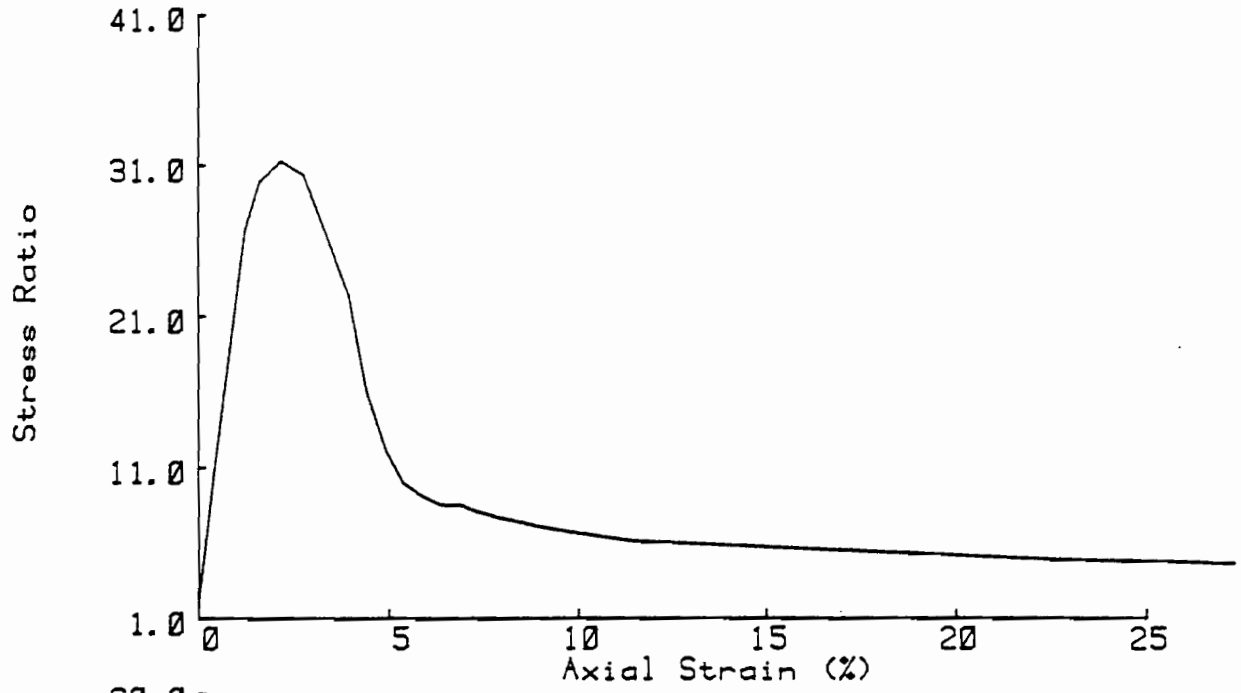


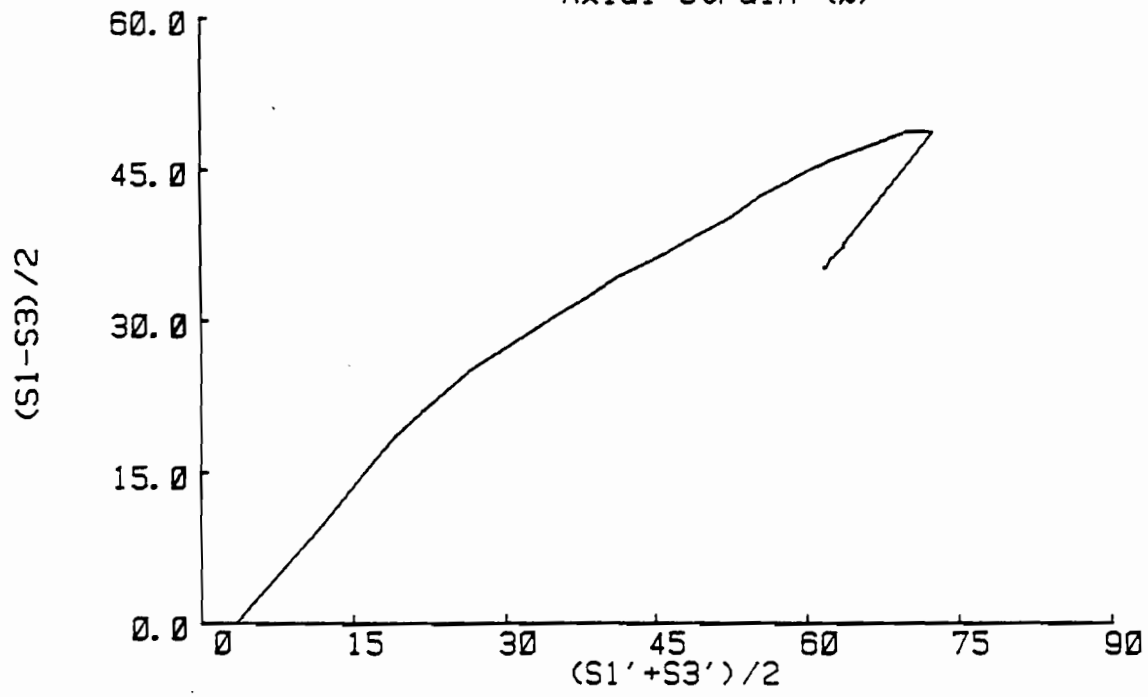


UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE
D.2

	Test no.	σ'_{3c} (kPa)	Dry dens. (Mg/cu. m)
———	1	2.1	1.51





UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE
D. 3

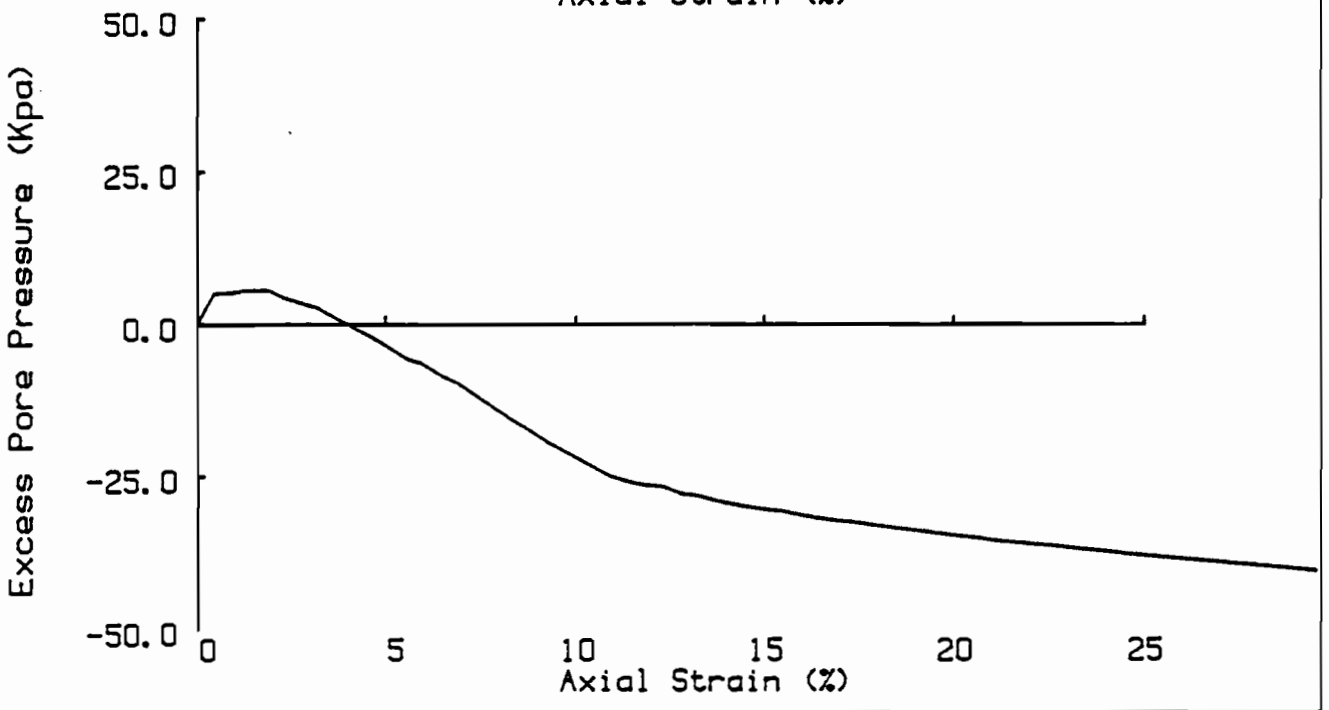
Test Hole..... NI82901 25B
Depth..... 64.61-64.81 m
Test Number..... 2
Cell Pressure..(Kpa).. 1283.9
Back Pressure..(Kpa).. 1267.3
Parameter B..... 1.00

	INITIAL	FINAL
Water Content (%)	30.21	30.09
Wet Density (Mg/cu.m)	1.94	1.94
Dry Density (Mg/cu.m)	1.49	1.49

Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2
0.00	0.0	1265.7	0.00	0.00	0.0	1.00	0.0	18.1
.45	12.8	1272.5	5.22	.41	0.0	2.14	6.4	17.7
.92	30.8	1272.6	5.32	.17	0.0	3.75	15.4	26.6
1.35	37.3	1273.0	5.67	.15	0.0	4.45	18.7	29.5
1.84	43.8	1273.0	5.72	.13	0.0	5.07	21.9	32.7
2.30	49.6	1271.7	4.42	.09	0.0	5.10	24.8	36.9
2.74	55.6	1270.8	3.53	.06	0.0	5.28	27.8	40.8
3.19	82.3	1270.0	2.73	.04	0.0	5.52	31.1	44.9
3.69	67.8	1268.3	.98	.01	0.0	5.37	33.9	49.4
4.17	72.9	1266.6	-.67	-.01	0.0	5.25	36.5	53.6
4.64	77.6	1265.1	-2.16	-.03	0.0	5.16	38.8	57.5
5.11	83.3	1263.4	-3.91	-.05	0.0	5.08	41.7	62.1
5.57	87.6	1261.6	-5.66	-.06	0.0	4.95	43.8	65.8
5.91	91.8	1261.0	-6.30	-.07	0.0	5.03	45.8	68.7
6.46	95.2	1258.9	-8.40	-.09	0.0	4.82	47.6	72.5
6.92	100.4	1257.8	-9.70	-.10	0.0	4.83	50.2	76.4
7.39	104.8	1255.6	-11.69	-.11	0.0	4.72	52.4	80.6
7.86	108.1	1253.6	-13.74	-.13	0.0	4.58	54.1	84.3
8.32	111.0	1251.6	-15.68	-.14	0.0	4.45	55.5	87.7
8.79	113.9	1249.8	-17.48	-.15	0.0	4.35	57.0	90.9
9.24	115.4	1248.0	-19.33	-.17	0.0	4.22	57.7	93.5
10.86	117.4	1242.5	-24.81	-.21	0.0	3.84	58.7	100.0
11.33	116.8	1241.6	-25.71	-.22	0.0	3.77	58.4	100.6
11.78	116.9	1241.0	-26.31	-.23	0.0	3.73	58.4	101.2
12.27	117.9	1240.7	-26.56	-.23	0.0	3.74	58.9	102.0
12.74	117.9	1239.5	-27.76	-.24	0.0	3.66	59.0	103.2
13.22	118.2	1239.2	-28.11	-.24	0.0	3.65	59.1	103.7
13.66	119.0	1238.4	-28.91	-.24	0.0	3.62	59.5	104.9
14.13	119.0	1237.8	-29.50	-.25	0.0	3.59	59.5	105.5
14.59	118.6	1237.3	-30.00	-.25	0.0	3.55	59.3	105.8
15.05	118.6	1236.8	-30.45	-.26	0.0	3.53	59.3	106.3
15.48	117.7	1236.6	-30.70	-.26	0.0	3.49	58.9	106.1
15.96	117.1	1236.0	-31.30	-.27	0.0	3.45	58.5	106.3
16.43	117.0	1235.5	-31.80	-.27	0.0	3.42	58.5	106.8
16.90	117.3	1235.1	-32.20	-.27	0.0	3.41	58.7	107.4
17.37	117.0	1234.8	-32.50	-.28	0.0	3.39	58.5	107.5
17.84	117.5	1234.4	-32.90	-.28	0.0	3.38	58.8	108.2
18.32	117.5	1234.0	-33.35	-.28	0.0	3.36	58.7	108.6
18.79	117.4	1233.7	-33.65	-.29	0.0	3.34	58.7	108.9
19.27	117.6	1233.3	-34.00	-.29	0.0	3.33	58.8	109.3
19.74	117.6	1232.9	-34.44	-.29	0.0	3.31	58.8	109.7
20.21	117.2	1232.5	-34.79	-.30	0.0	3.28	58.6	109.9
20.69	117.4	1232.2	-35.09	-.30	0.0	3.28	58.7	110.3
21.16	117.9	1231.8	-35.49	-.30	0.0	3.27	58.9	110.9
21.63	117.5	1231.6	-35.74	-.30	0.0	3.25	58.7	111.0
22.10	117.3	1231.3	-36.04	-.31	0.0	3.23	58.7	111.2
22.57	117.5	1231.0	-36.29	-.31	0.0	3.23	58.8	111.5
23.05	117.4	1230.7	-36.64	-.31	0.0	3.21	58.7	111.8
23.51	117.2	1230.4	-36.94	-.32	0.0	3.19	58.6	112.1
23.98	117.1	1230.1	-37.24	-.32	0.0	3.18	58.6	112.3
24.43	116.7	1229.8	-37.54	-.32	0.0	3.16	58.3	112.4
24.89	116.8	1229.5	-37.79	-.32	0.0	3.15	58.4	112.7
25.34	115.9	1229.2	-38.09	-.33	0.0	3.12	57.9	112.5
25.79	115.4	1229.0	-38.34	-.33	0.0	3.11	57.7	112.6
26.25	114.7	1228.7	-38.64	-.34	0.0	3.08	57.4	112.5
26.70	114.6	1228.4	-38.89	-.34	0.0	3.07	57.3	112.7
27.18	113.3	1228.2	-39.13	-.35	0.0	3.04	56.7	112.3
27.62	114.0	1227.9	-39.43	-.35	0.0	3.04	57.0	112.9
28.09	114.0	1227.7	-39.63	-.35	0.0	3.03	57.0	113.2
28.55	114.4	1227.4	-39.89	-.35	0.0	3.03	57.2	113.6
29.01	114.2	1227.2	-40.13	-.35	0.0	3.02	57.1	113.7
29.47	114.8	1226.9	-40.43	-.35	0.0	3.02	57.4	114.3
0.00	0.0	0.0	0.00	0.00	0.0	0.00	0.0	0.0
13.66	119.0	1273.0	40.43	.41	0.0	5.52	59.5	114.3
13.66	200.0	1400.0	50.00	.44	0.0	6.00	80.0	125.0
Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2

FIGURE D.4 UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS --NORTH TINGMIARK AREA.

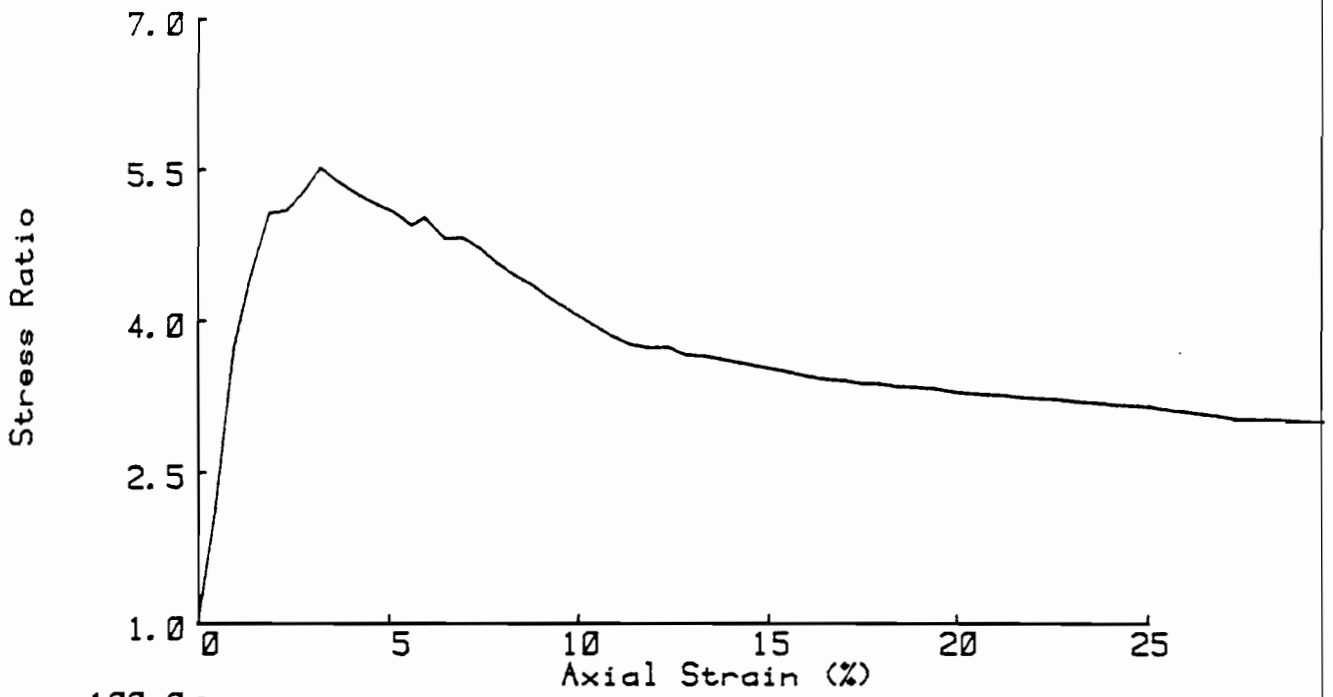
Test no.	σ'_{3c} (kPa)	Dry dens. (Mg/cu. m)
2	16.5	1.49

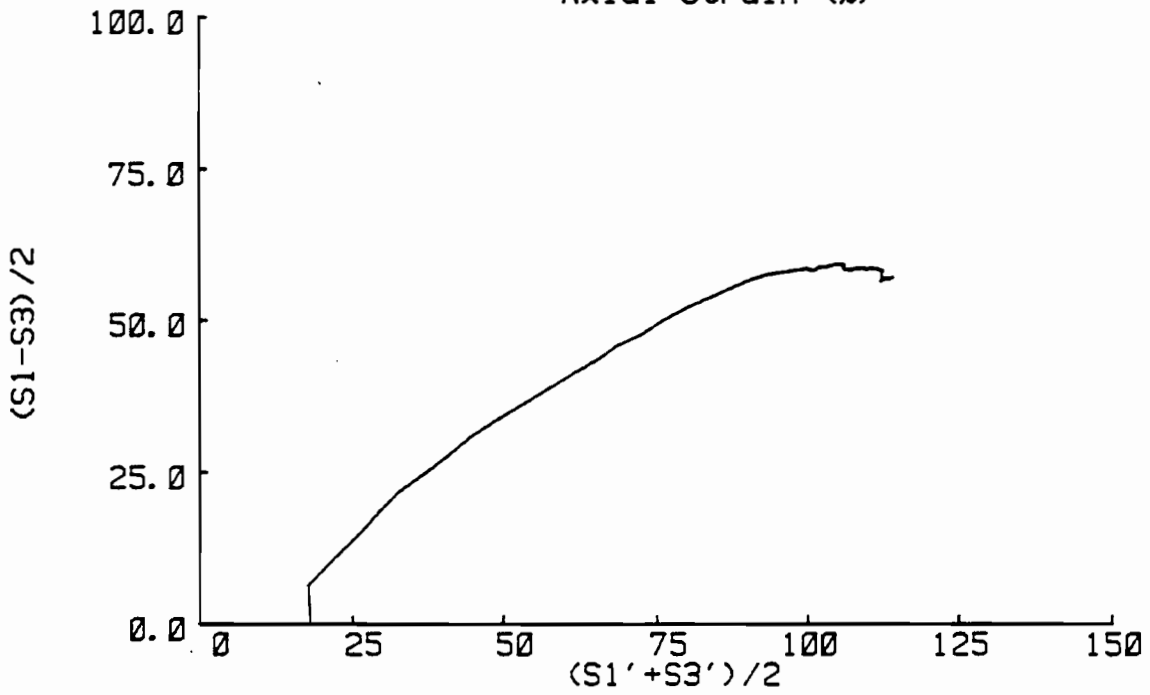


UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE D.5

	Test no.	σ'_{3c} (kPa)	Dry dens. (Mg/cu. m)
———	2	16.5	1.49





UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE D.6

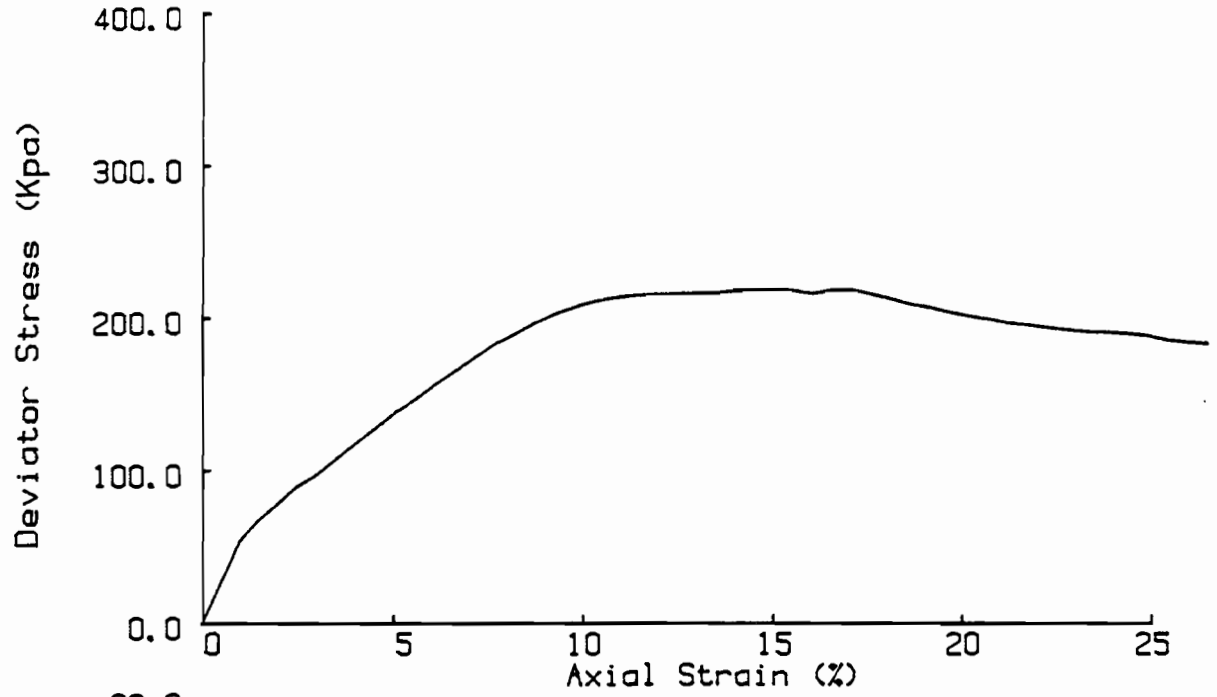
Test Hole..... NT82501 288
Depth..... 74.75-74.90 m
Test Number..... 3
Cell Pressure..(Kpa).. 1430.0
Back Pressure..(Kpa).. 1380.4
Parameter B..... 1.00

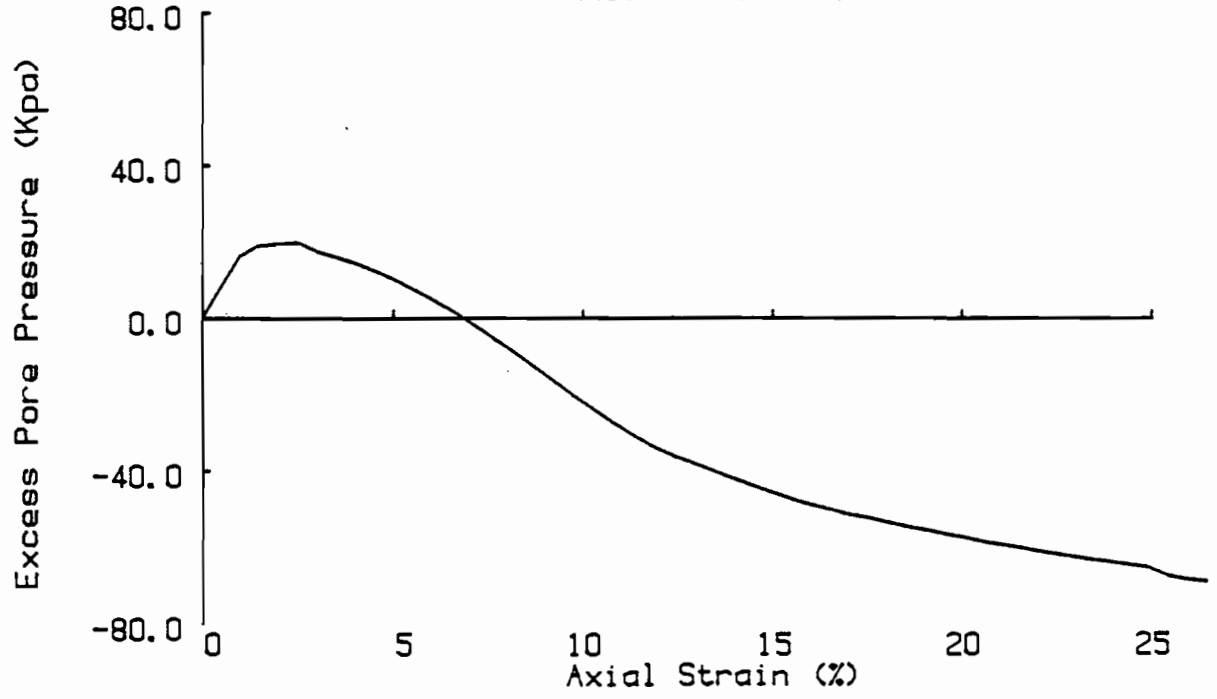
	INITIAL	FINAL
Water Content (%)	30.46	30.58
Wet Density (Mg/cu.m)	1.96	1.96
Dry Density (Mg/cu.m)	1.50	1.50

Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2
0.00	0.0	1378.5	0.00	0.00	0.0	1.00	0.0	51.5
.99	54.6	1386.8	18.51	.30	0.0	2.65	27.3	60.4
1.45	67.7	1389.6	19.20	.28	0.0	3.23	33.9	64.3
1.94	78.4	1400.1	18.65	.25	0.0	3.62	39.2	69.2
2.46	90.1	1400.5	20.05	.22	0.0	4.05	45.0	74.6
3.00	98.3	1398.0	17.56	.18	0.0	4.07	49.2	81.2
3.48	108.0	1396.6	16.18	.15	0.0	4.23	54.0	87.4
4.01	118.2	1394.8	14.36	.12	0.0	4.35	59.1	94.3
4.53	128.3	1392.7	12.32	.10	0.0	4.44	64.2	101.4
5.04	138.7	1390.4	10.02	.07	0.0	4.50	68.3	108.9
5.56	147.5	1387.8	7.43	.05	0.0	4.50	73.8	115.9
6.07	156.9	1385.0	4.59	.03	0.0	4.49	78.5	123.5
6.59	165.9	1382.0	1.64	.01	0.0	4.48	83.0	130.9
7.10	174.4	1378.8	-1.75	-.01	0.0	4.40	87.2	138.6
7.61	182.8	1375.3	-5.08	-.03	0.0	4.34	91.4	146.1
8.13	189.4	1371.7	-8.69	-.05	0.0	4.25	94.7	153.0
8.65	196.2	1368.0	-12.43	-.06	0.0	4.16	98.1	160.1
9.18	202.2	1364.3	-16.12	-.08	0.0	4.08	101.1	166.8
9.71	206.8	1360.4	-20.01	-.10	0.0	3.97	103.4	173.0
10.24	211.0	1356.8	-23.61	-.11	0.0	3.88	105.5	178.7
10.78	213.7	1353.2	-27.25	-.13	0.0	3.78	106.9	183.7
11.31	215.1	1349.8	-30.64	-.14	0.0	3.68	107.8	187.8
11.84	215.8	1346.8	-33.63	-.16	0.0	3.59	107.9	191.1
12.36	216.2	1344.4	-35.98	-.17	0.0	3.53	108.1	193.7
12.90	216.5	1342.3	-38.07	-.18	0.0	3.47	108.3	195.9
13.42	216.8	1340.4	-40.02	-.18	0.0	3.42	108.4	198.0
13.94	217.8	1338.4	-41.97	-.19	0.0	3.38	108.9	200.5
14.46	218.7	1336.5	-43.86	-.20	0.0	3.34	109.4	202.8
14.98	219.0	1334.7	-45.66	-.21	0.0	3.30	109.5	204.8
15.50	218.0	1332.9	-47.50	-.22	0.0	3.24	109.0	206.1
16.01	216.0	1331.5	-48.90	-.23	0.0	3.19	108.0	206.5
16.52	218.5	1330.3	-50.15	-.23	0.0	3.19	109.2	209.0
17.03	218.7	1329.0	-51.45	-.24	0.0	3.16	109.3	210.4
17.55	215.8	1327.9	-52.49	-.24	0.0	3.11	107.9	210.0
18.06	212.6	1326.7	-53.69	-.25	0.0	3.06	106.3	209.6
18.58	209.1	1325.6	-54.84	-.26	0.0	3.00	104.5	209.0
19.11	206.8	1324.6	-55.79	-.27	0.0	2.96	103.4	208.8
19.63	203.7	1323.5	-56.89	-.28	0.0	2.91	101.9	208.3
20.15	201.2	1322.7	-57.73	-.29	0.0	2.87	100.6	207.9
20.67	199.3	1321.6	-58.78	-.29	0.0	2.84	99.6	208.0
21.20	196.8	1320.8	-59.58	-.30	0.0	2.80	98.4	207.6
21.73	195.4	1319.9	-60.48	-.31	0.0	2.78	97.7	207.8
22.26	193.5	1318.9	-61.48	-.32	0.0	2.74	96.8	207.8
22.79	192.2	1318.1	-62.27	-.32	0.0	2.72	96.1	208.0
23.32	190.9	1317.2	-63.17	-.33	0.0	2.69	95.4	208.2
23.84	190.5	1318.6	-63.82	-.34	0.0	2.68	95.2	208.6
24.36	189.7	1315.8	-64.57	-.34	0.0	2.66	94.9	209.0
24.89	188.4	1315.1	-65.32	-.35	0.0	2.64	94.2	209.1
25.42	185.4	1312.7	-67.66	-.36	0.0	2.58	92.7	210.0
25.93	184.1	1311.9	-68.51	-.37	0.0	2.56	92.1	210.2
26.45	183.4	1311.3	-69.11	-.38	0.0	2.54	91.7	210.4
0.00	0.0	0.0	0.00	0.00	0.0	0.00	0.0	0.0
14.98	219.0	1400.5	69.11	.38	0.0	4.50	109.5	210.4
14.98	400.0	1600.0	80.00	.42	0.0	6.00	200.0	250.0
Strn	s1-s3	Tpore	Epore	ParA	VolCh	s1/s3	s-s/2	s+s/2

FIGURE D.7 UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS
NORTH TINGMIARK AREA.

	Test no.	σ'_{3c} (kPa)	Dry dens. (Mg/cu. m)
———	3	49.6	1.50

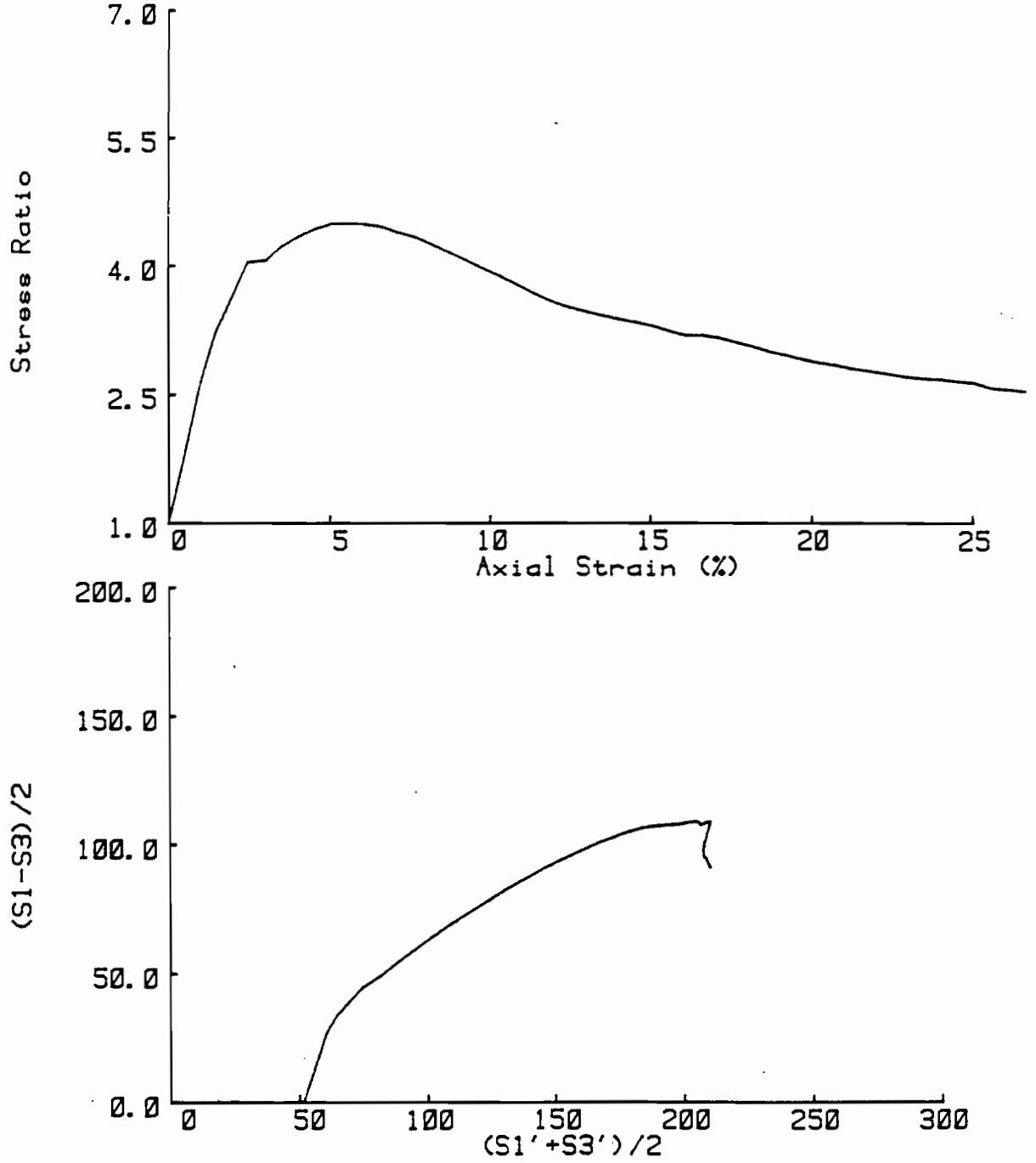




UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE D.8

	Test no.	$\dot{\sigma}_{3c}$ (kPa)	Dry dens. (Mg/cu. m)
———	3	49.6	1.50



UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE WATER PRESSURE MEASUREMENTS

FIGURE D.9

APPENDIX E

Consolidation Test Results

Date Computed..... 9:18 AM THU., 2 DEC., 1982

Date Tested.....82 11 19

Job Number.....101-3661

Test Hole.....NT 82501 25B
Depth.....64.61 - 64.81
Test Number.....1

ROOT Fit

		INITIAL	FINAL	
Height	(mm)	26.38	24.82	
Water Content	(%)	28.97	25.72	
Wet Density	(Mg/cu.m)	2.01	2.09	
Dry Density	(Mg/cu.m)	1.56	1.65	
Void Ratio		.7972	.6946	
Saturation	(%)	98.13	100.00	(Assumed)

Load (KPa)	Void ratio	CV(sq.m/yr)	MV(sq.m/MN)	K(m/s)
0.00	.7972	.000E+00	.000E+00	.000E+00
16.10	.7958	.170E+39	.482E-01	.255E+28
80.60	.7810	.114E+01	.128E+00	.456E-10
161.30	.7583	.235E+01	.180E+00	.117E-09
322.60	.7265	.329E+01	.114E+00	.117E-09
80.60	.7342	.000E+00	.000E+00	.000E+00
121.00	.7333	.240E+02	.124E-01	.927E-10
185.50	.7301	.332E+02	.288E-01	.297E-09
282.30	.7248	.107E+02	.314E-01	.105E-09
427.40	.7109	.593E+01	.560E-01	.103E-09
645.20	.6908	.588E+01	.547E-01	.100E-09
967.70	.6695	.734E+01	.395E-01	.902E-10
1451.60	.6431	.704E+01	.332E-01	.726E-10
2903.00	.5867	.112E+02	.245E-01	.856E-10
5806.50	.5110	.103E+02	.173E-01	.554E-10
645.20	.5417	.000E+00	.000E+00	.000E+00
80.60	.5990	.000E+00	.000E+00	.000E+00
1.25	.6946	.000E+00	.000E+00	.000E+00

FIGURE E.1 CONSOLIDATION TEST RESULTS
NORTH TINGMIARK AREA

Project:

Address::

Project No.: 101-3661

Date Tested: 82 11 19 By: GJB

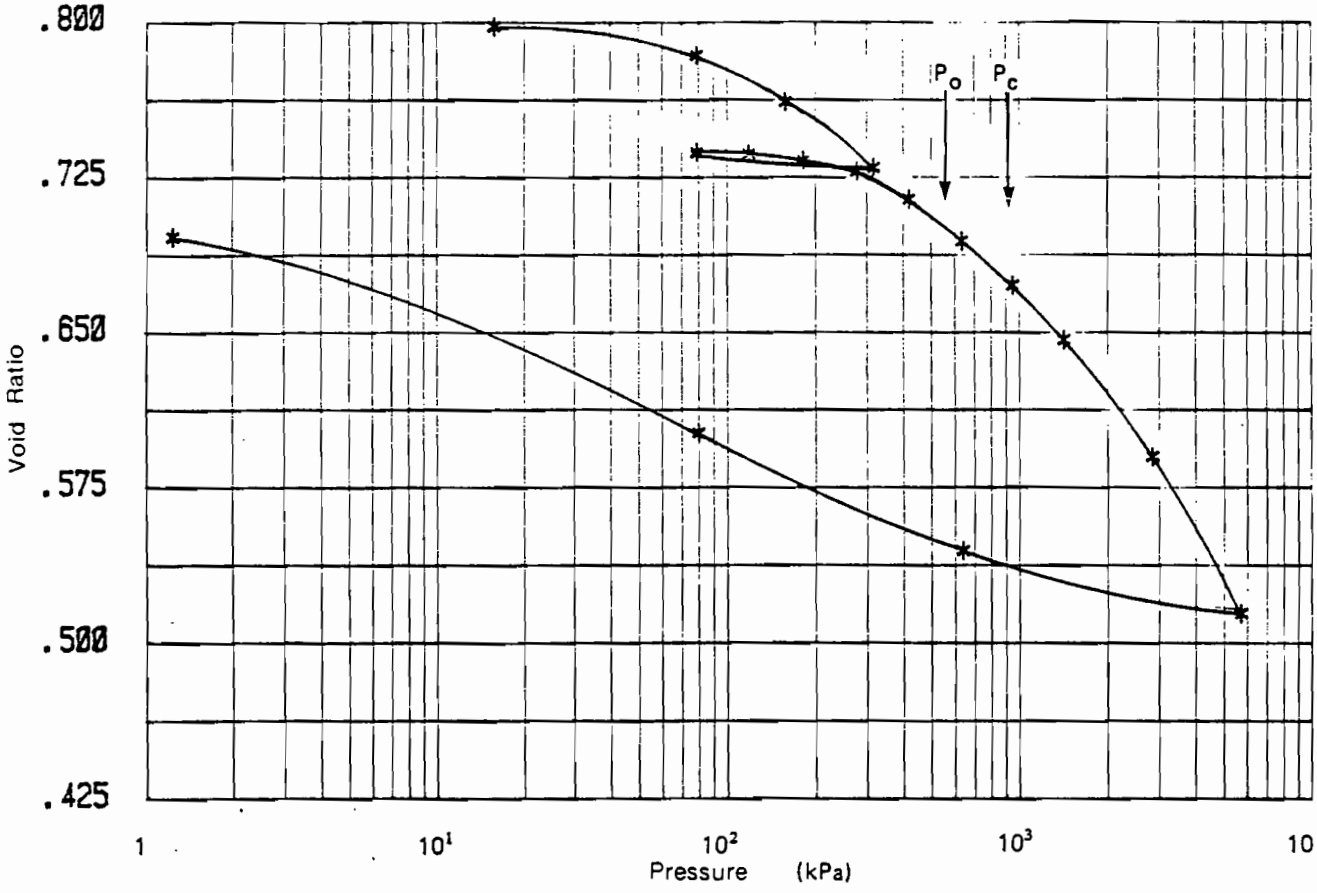
Test No.: 1

Borehole No.: NT 82S01 25B

Depth (m): 64.61 - 64.81

Diameter (mm): 49.82

Specific Gravity: 2.70



	INITIAL	FINAL
Height (mm):	26.38	24.82
Water Content (%):	28.97	25.72
Wet Density (Mg/m^3):	2.01	2.08
Dry Density (Mg/m^3):	1.56	1.65
Void Ratio	.7972	.6946
Saturation (%):	98.13	100.00

Sample Description: CLAY, dk gray, tr silt, blk veining

Overburden Pressure	P_o	580	kPa
Swelling Pressure	P_s		kPa
Pre-Consolidation Pressure	P_c	940	kPa
Compression Index	C_c	0.23	

Note: 1 kPa = 1.044 x 10^{-2} $Tf/ft.^2$

FIGURE E.2 CONSOLIDATION TEST RESULTS
NORTH TINGMIARK AREA

Date Computed.....10:42 AM THU., 9 DEC., 1982

Date Tested.....82 11 29

Job Number.....101-3661

Test Hole.....NT 82S01 28B
Depth.....74.75 - 74.90 m
Test Number.....2

ROOT Fit

		INITIAL	FINAL	
Height	(mm)	26.44	25.88	
Water Content	(%)	30.28	30.61	
Wet Density	(Ms/cu.m)	1.94	1.99	
Dry Density	(Ms/cu.m)	1.49	1.52	
Void Ratio		.8700	.8313	
Saturation	(%)	94.55	100.00	(Assumed)

Load (KPa)	Void ratio	CV(sq.m/yr)	MV(sq.m/MN)	K(m/s)
0.00	.8700	.000E+00	.000E+00	.000E+00
10.00	.8726	.170E+39	-.143E+00	-.756E+28
40.30	.8701	.122E+03	.443E-01	.168E-08
80.60	.8672	.706E+02	.392E-01	.861E-09
161.30	.8576	.394E+02	.639E-01	.782E-09
322.60	.8322	.387E+02	.861E-01	.104E-08
80.60	.8499	.000E+00	.000E+00	.000E+00
121.00	.8485	.352E+02	.188E-01	.206E-09
185.50	.8439	.279E+02	.389E-01	.337E-09
282.30	.8351	.318E+02	.497E-01	.491E-09
427.40	.8188	.206E+02	.617E-01	.395E-09
645.20	.7943	.217E+02	.626E-01	.422E-09
967.70	.7647	.169E+02	.521E-01	.274E-09
1935.50	.6911	.590E+01	.449E-01	.825E-10
3871.00	.6012	.424E+01	.290E-01	.383E-10
645.20	.6401	.000E+00	.000E+00	.000E+00
40.30	.7223	.000E+00	.000E+00	.000E+00
1.25	.8313	.000E+00	.000E+00	.000E+00

FIGURE E.3 CONSOLIDATION TEST RESULTS
NORTH TINGMIARK AREA

Project:

Address::

Project No.: 101-3661

Date Tested: 82 11 29 By: GJB

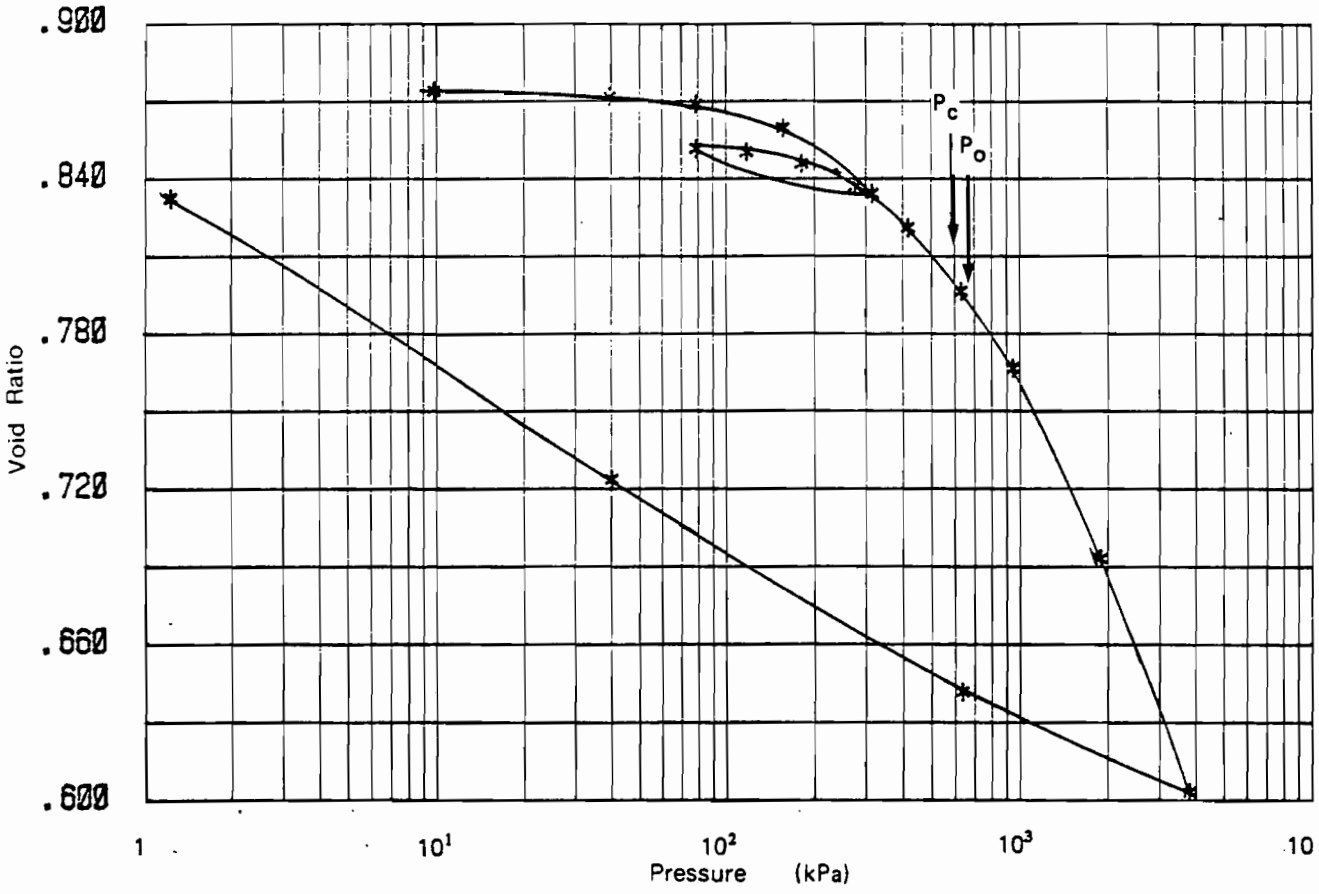
Test No.: 2

Borehole No.: NT 82S01 28B

Depth (m): 74.75 - 74.90 m

Diameter (mm): 50.00

Specific Gravity: 2.72



	INITIAL	FINAL
Height (mm):	26.44	25.88
Water Content (%):	30.28	30.61
Wet Density (Mg/m^3):	1.94	1.99
Dry Density (Mg/m^3):	1.49	1.52
Void Ratio	.8700	.8313
Saturation (%):	94.55	100.00

Sample Description: CLAY, dk gray, tr. silt, blk veining

Overburden Pressure	P_o	673	kPa
Swelling Pressure	P_s		kPa
Pre-Consolidation Pressure	P_c	600	kPa
Compression Index	C_c	0.26	

Note: 1 kPa = 1.044 x 10^{-2} $T_f/ft.^2$

FIGURE E.4 CONSOLIDATION TEST RESULTS
NORTH TINGMIARK AREA

APPENDIX F

Subconsultants Results

Report on

Hydrocarbon Gas Analyses

Borehole NT82501 - North Tingmiark

Job 101 - 3661.3

for

EBA Engineering Consultants Ltd.

J. P. Ruffell

Prepared by:

Dr. J. F. Barker

Dept. of Earth Sciences

University of Waterloo

J F Barker

December 2, 1982

Methods

At the drill site, fresh core material is placed in cans with water so as to eliminate any head space. In the laboratory, 100 cm^3 of helium is added and 100 cm^3 of water withdrawn via gas-tight septa. The sediment/water/helium mixture is vigorously shaken so that hydrocarbon gases will be taken into the helium gas phase. A few microlitres of the gas phase is analyzed by gas chromatography for methane, ethane, ethylene, propane, and propylene. A commercial, analyzed gas mixture is used as standards. The concentration of each component is reported in parts per million (ppm) on a volume basis (v/v). That is, 10^4 ppm, v/v indicates that there is 1 cm^3 of that gas per 100 cm^3 of wet sediment. It is assumed that 100 cm^3 (100 ml) of wet sediment has been canned at the drill site. In addition, the sediment was dried and weighed so that the amount of gas per dry weight of sediment can be reported if the client wishes.

Results

Results of the hydrocarbon gas anlayses for the three core samples are as follows:

Sample	Depth (m)	Gas Content (ppm, v/v) Methane	Ethylene	Ethane
22 B	55.7	7.4×10^3	-	1
26 C	67.9	7.3×10^2	<1	6
29 C	77.9	1.7×10^3	-	1

Dashes indicate the component was not detected. Propane and propylene also were not detected. The lack of significant petrogenic components (ethane and propane) and the trace of ethylene, a biogenic gas, suggest that the hydrocarbon gases are dominantly biogenic. These concentrations of methane do not exceed the solubility of methane in pore water and so this biogenic methane probably exists as a dissolved component and is not contributing to pore pressure build-up.

APPENDIX G

Laboratory Test Procedures

LABORATORY TEST PROCEDURES

Procedures Specified

1. Classification and Index Tests
2. Triaxial Shear Tests
3. Direct Shear Tests
4. Laboratory Miniature Vane
5. Swedish Fall Cone Shear Strength Determination
6. Consolidation Tests
7. Porewater Salinity Tests
8. Organic Content Determination
9. Radiography

LABORATORY TEST PROCEDURES

1. CLASSIFICATION AND INDEX TESTS

These tests are quite routine and the standard ASTM procedures employed are listed below:

TEST	ASTM DESIGNATION
Moisture Content	D 2216
Liquid Limit (1)	D 423
Plastic Limit and Plasticity Index	D 424
Grain Size	D 421 & 422
Specific Gravity	D 854
Relative Density	D 2049
Unified Soil Classification	D 2487

NOTE: 1. All liquid limits reported were obtained from 3 point determinations.

2. SHEAR STRENGTH TESTS

Procedure #1 - Unconfined Compression

Procedure #2 - Unconsolidated Undrained Triaxial
With and without pore pressure measurement

Test specimen is mounted in triaxial cell and jacketed. Cell pressure equivalent to estimated in situ total horizontal stress (K_o = 0.7) is applied without sample drainage. A pore pressure response test is carried out prior to shear. If B < 0.95, sample is loaded to failure at rate of 1%/min with no pore pressure measurement. If B > 0.95 specimen loaded to failure at rate of 0.02%/min with pore pressures monitored continuously. Frozen samples are permitted to thaw (undrained condition) prior to measurement of B value.

For quick UU tests, data is presented in the form of stress-strain curves. Where pore pressure is monitored, the following curves are obtained:

1. Stress-strain
2. Effective stress ratio-strain
3. Excess pore pressure-strain
4. P/Q stress path

CONSOLIDATED-UNDRAINED TRIAXIAL TESTS

Procedure 1 - Sample is mounted in triaxial cell and jacketed. A pore pressure response test is carried out prior to shearing. If further saturation is required, back pressure can be applied to the sample. Frozen samples are placed in a pre-chilled triaxial cell, then permitted to thaw before commencing consolidation. Cell pressure equivalent to estimated total horizontal stress is applied with drainage allowed. Once consolidation is complete, drainage is shut off. Samples are sheared by increasing axial stress at controlled rate of strain based on the consolidation characteristics of the material determined during the consolidation phase of the test. Stress-strain curve and other diagnostic plots are produced.

CONSOLIDATED-DRAINED TRIAXIAL TESTS

Procedure 1 - Sample is mounted in triaxial cell and jacketed, then thawed under a nominal pressure of 35 kPa. A pore pressure response test is carried out prior to shearing. If further saturation is required, back pressure can be applied to the sample. Sample is consolidated to cell pressure equivalent to estimated mean horizontal in situ effective stress. With drainage open, sample is sheared by increasing the axial stress at a controlled rate of strain. The rate of strain is selected on the basis of consolidation properties of the soil determined during the consolidation phase of the test. Stress-strain curve and other diagnostic plots are produced.

Procedure 2 - Lack of undisturbed samples of sand from certain strata necessitate reconstituting disturbed samples for strength testing. Relative density test is conducted on the sand and reconstituted samples are then prepared to approximately 70% relative density. A pore pressure response test is carried out prior to shearing. If saturation is required, back pressure is applied to the sample. Sample is consolidated to cell pressure equivalent to the estimated in situ mean horizontal effective stress. With the drainage open, the sample is sheared by increasing the axial stress at a controlled rate of strain as detailed in Procedure 1. Stress-strain curve and other diagnostic plots are produced.

NOTES: 1. Standard UU triaxial procedure ASTM D2850.

2. Standard CU and CD triaxial procedures taken from Bishop & Henkel (1969).

3. Samples reconstituted according to procedures outlined in Bjerrum, Kringstad, and Kummeneje (1961).

3. DIRECT SHEAR TESTS

Procedure 1 - Standard direct shear procedure. Frozen samples are permitted to thaw and consolidate under applied normal pressure before commencing shear. Resheared strength is measured on plane cut after peak strength has been determined. Generally, a minimum of 3 tests are performed on each material type to define effective stress parameters c' and Ø'. Shear stress - deformation curve and other diagnostic plots produced.

Procedure 2 - If no undisturbed sample is available, an appropriate sample may be reconstituted for testing following the same general procedure indicated above.

NOTES: 1. Standard direct shear procedure ASTM D 3080.

2. Samples reconstituted according to procedures outlined in Bjerrum, Kringstad, and Kummeneje (1961).

4. LABORATORY MINIATURE VANE

Procedure 1 - Sample is either retained in sampling tube or extruded into split ring. Vane is lowered into sample ensuring total submergence of the vane. Vane is rotated at 10 degrees/min. Test is run until steady post-peak value is reached. Stress-strain curves, peak and post-peak shear strengths are produced.

5. FALL-CONE SHEAR STRENGTH DETERMINATION

Procedure 1 - Small portion of sample is extruded into testing cup. Cone is selected with reference to expected shear strength of soil. Cone is lowered to contact the surface of the sample and is then released. Depth of penetration of cone is measured. Shear strength is interpreted from cone strength correlation charts.

6. STANDARD OEDOMETER/CONSOLIDATION TESTS

Procedure 1 - Sample is set up in oedometer with dry stones. Standard incremental loading is applied done to a specified vertical effective stress that exceeds the in situ effective overburden pressure. The oedometer is then flooded with a saline solution similar to that of the soil, unloaded and permitted to rebound. After rebound, the specimen is reloaded in increments of 50% increase until a specified vertical effective stress, is reached. Thereafter, the standard doubling of pressures is resumed to test completion. All load increments are left on for a time interval determined by the root time method. e-log-p' curve, c_v, k, m_v, and Pc' data produced.

Procedure 2 - Sample is set up frozen in oedometer, then moved from cold room to standard apparatus. Stress is applied to seat load cap and sample is then thawed under nominal pressure. Procedure continues as for Procedure 1. e-log-p' curve, c_v, k, m_v, and Pc' data produced.

NOTE: 1. Modifications made to standard procedure (ASTM D 2435) are taken from Andresen et al. (1979) and Broms (1980), as recommended for overconsolidated soils. Procedure is appropriate in view of large reduction in total stress that typically occurs upon sampling.

In addition to the specific procedures described above, all samples programmed for testing may have other basic tests performed as follows:

1. Moisture content
2. Bulk density
3. Core photography (where practical)
4. Detailed description of sedimentological features, and
5. Identification and preservation of discrete organic matter when present.

7. POREWATER SALINITY TESTS

Procedure 1 - Sample is trimmed to remove disturbed material. Porewater is extruded from thawed sample and chloride titration is performed to establish equivalent salinity (NaCl).

NOTES: 1. A silver nitrate titration is performed to determine the chloride ion content (ASTM D 512 Method B).

2. Chloride ion content was converted to an equivalent salinity using the following empirical relationship.

Salinity (o/oo) = 0.03 + (1.805 x Chlorinity (o/oo))

8. ORGANIC CONTENT DETERMINATION

Procedure 1 - Small portion of sample is weighed then oven dried. Dried sample is mixed with hydrogen peroxide solution (HO) and boiled. After reaction ceases sample is oven dried and reweighed. Loss in weight is inferred as organic content.

9. RADIOGRAPHY

Procedure 1 - Samples are transported to be radiographed on subcontractors premises. Samples are returned with processed film negatives.

Procedure 2 - Samples are radiographed at EBA. Samples are removed from storage area and returned immediately. Film is processed on site and results reviewed.

NOTE: 1. For report presentation, radiography subcontractor can prepare high quality B/W prints from film negatives.