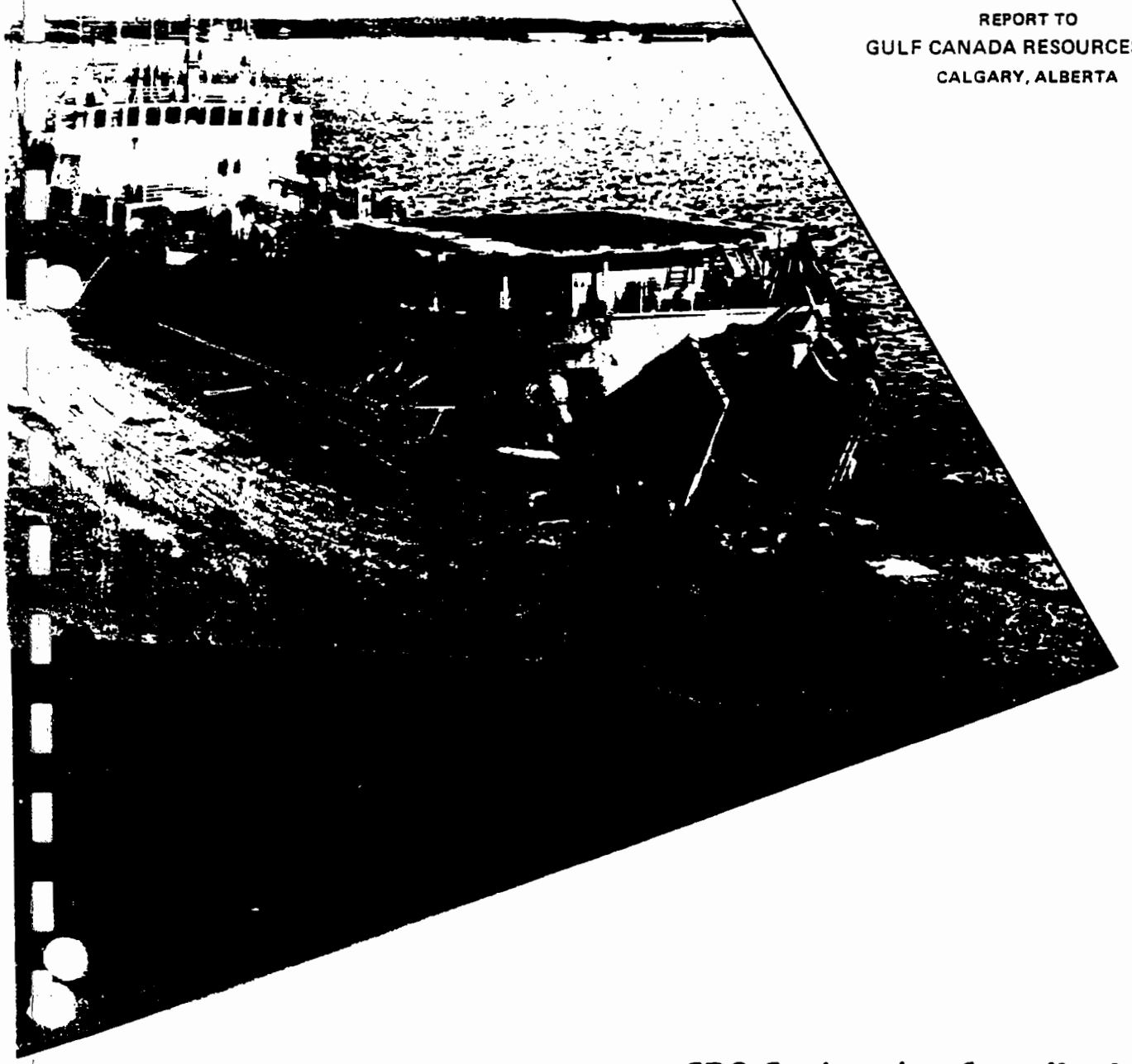
1983 OFFSHORE GEOTECHNICAL SITE INVESTIGATION AKPAK SITE BEAUFORT SEA

REPORT TO
GULF CANADA RESOURCES INC.
CALGARY, ALBERTA



EBA Engineering Consultants Ltd.

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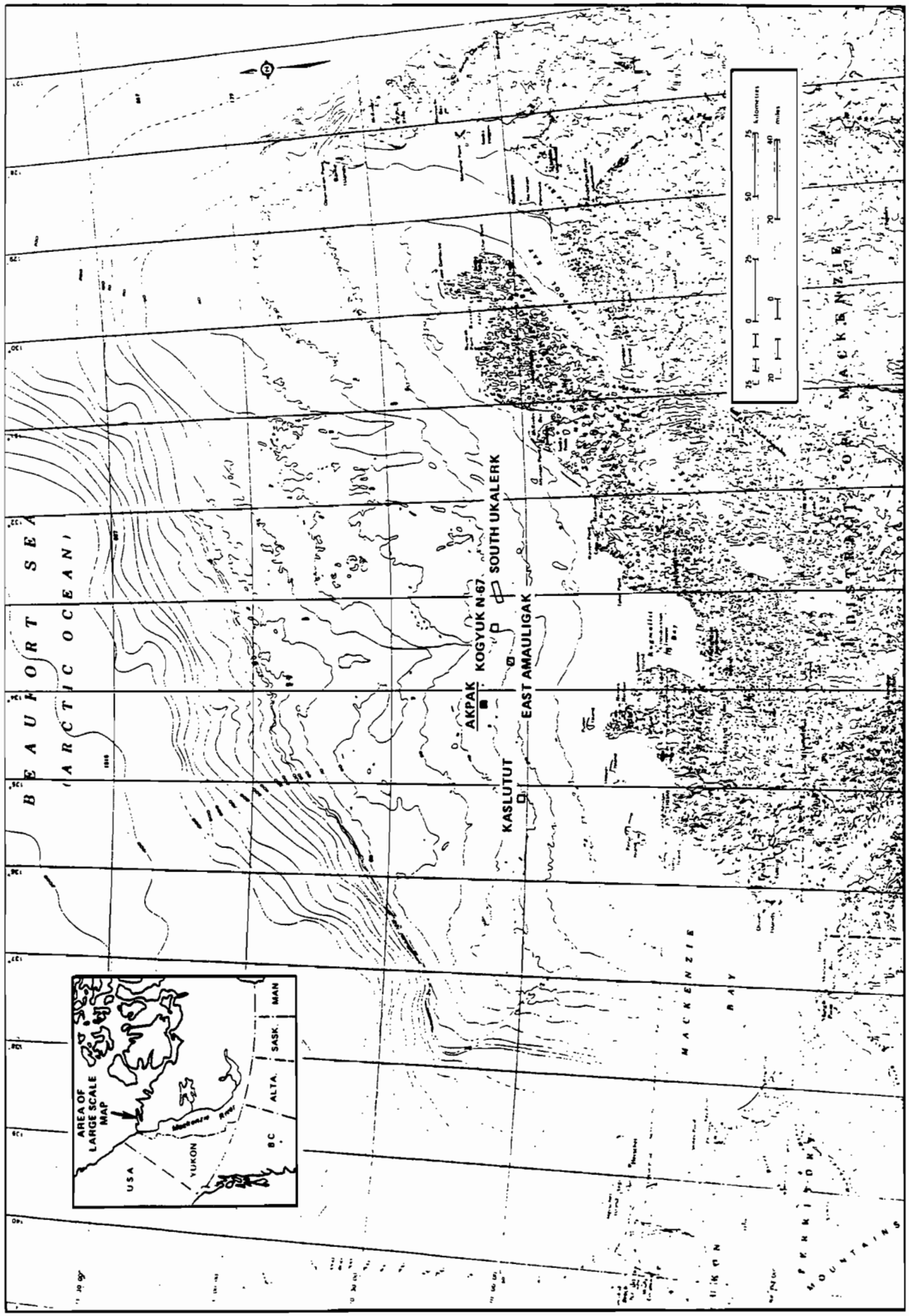
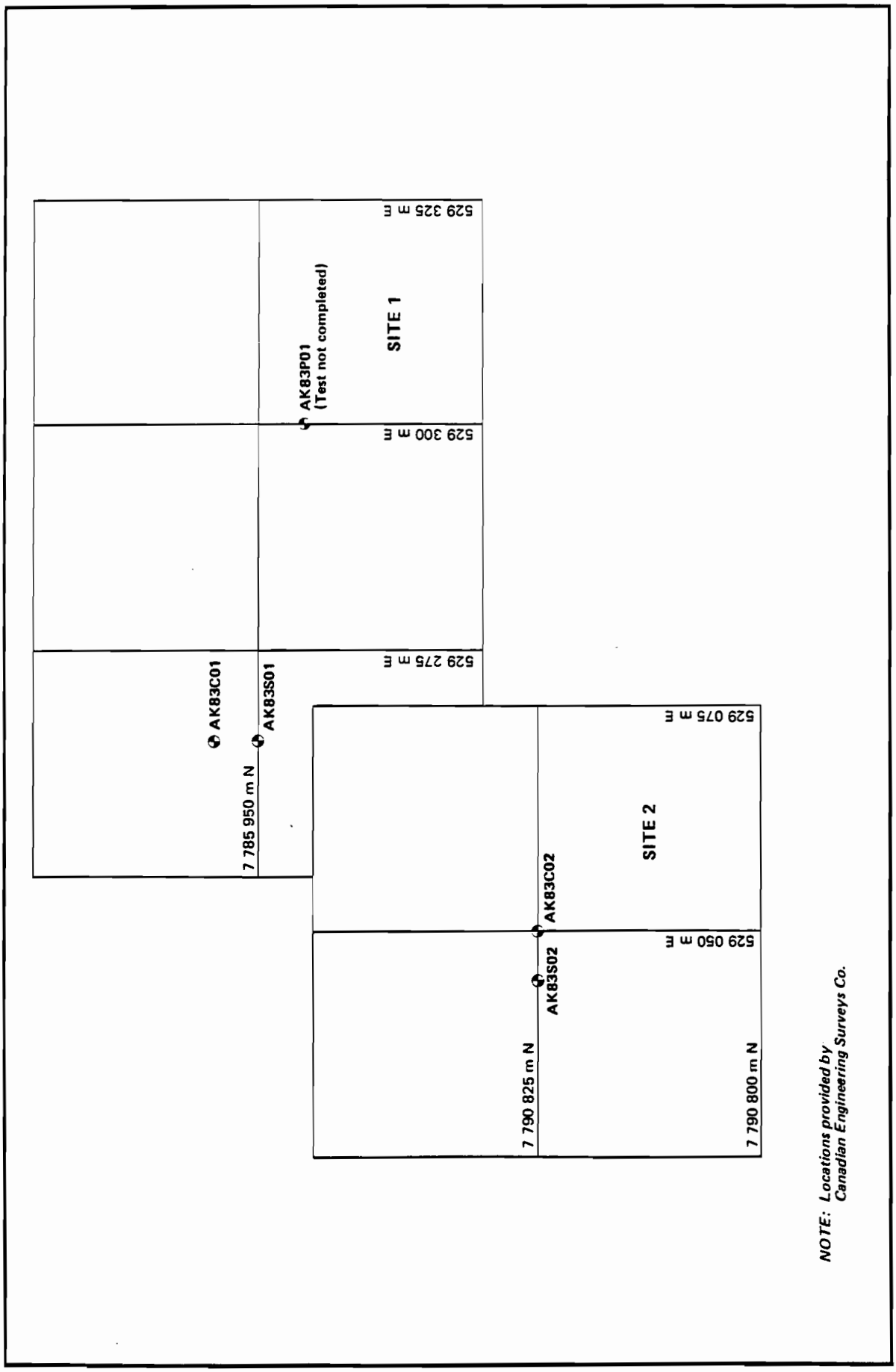


FIGURE 1 GENERAL LOCATION MAP



NOTE: *Locations provided by Canadian Engineering Surveys Co.*

FIGURE 2 . TESTHOLE LOCATION PLAN AKPAK AREA

TABLE 1 BOREHOLE AND PROBEHOLE LOCATIONS

BOREHOLE/PROBEHOLE	UTM COORDINATES (ZONE 8)	GEOGRAPHIC COORDINATES Latitude	Longitude	DATE	SEABED PENETRATION (metres)
AK83C02	N 7 790 825 E 529 050	70° 13' 25.2"	134° 13' 50.5"	83-08-01	14.8
AK83S02	N 7 790 825 E 529 045	70° 13' 25.2"	134° 13' 51.1"	83-08-01, 02	50.2
AK83C01	N 7 785 955 E 529 265	70° 10' 48.0"	134° 13' 36.0"	83-08-02	17.9
AK83S01	N 7 785 950 E 529 265	70° 10' 47.8"	134° 13' 36.1"	83-08-03	32.0

NOTE: 1. All coordinates supplied by CES Ltd.

2. "AK83" denotes a borehole or probehole at the AKPAK site drilled or tested in 1983. "S" refers to "sampled", "C" refers to "static cone". The number following the letter designation is the borehole or probehole number.

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	$m\ kg/s^2$	$m \cdot kg \cdot s^{-2}$
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	$m \cdot s^{-1}$
velocity - angular	(radian per second)		rad/s	$rad \cdot s^{-1}$
acceleration - linear	(metre per second) per second		m/s^2	$m \cdot s^{-2}$
acceleration - 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		$W/(m \cdot K)$	$m \cdot kg \cdot s^{-3} \cdot K^{-1}$

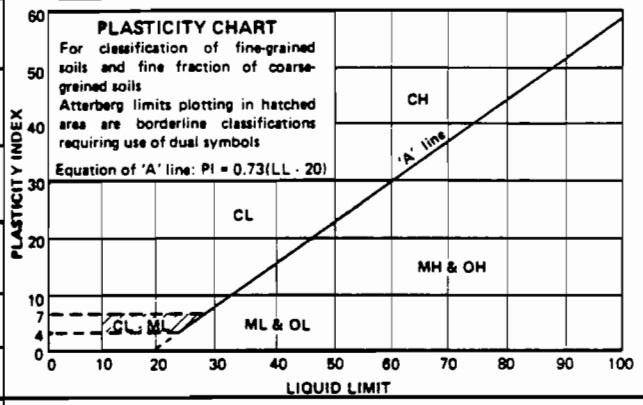
OTHER UNITS PERMITTED FOR USE WITH SI

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° = (π/180) rad
	minute	′	1′ = (π/10,800) rad
	second	″	1″ = (π/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}	tetra	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

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	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 $C_U = D_{60}/D_{10}$ 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 clay of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity	
HIGHLY ORGANIC SOILS			PT	Peat, muck and other highly organic soils	



*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:

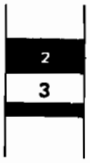
1. *Dual symbols are used to indicate borderline or mixed ice classifications*
2. *Visual estimates of ice contents indicated on borehole logs ± 5%*
3. *This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes*

LEGEND
Soil ■ Ice ■

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



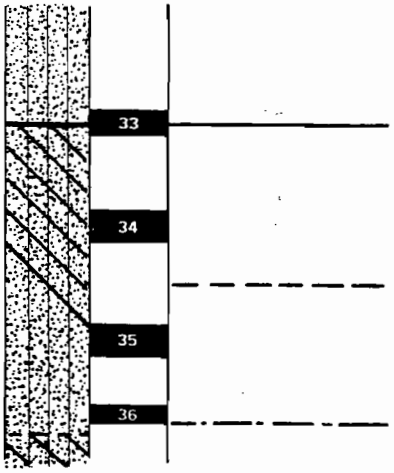
SOIL BOUNDARIES

- 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).

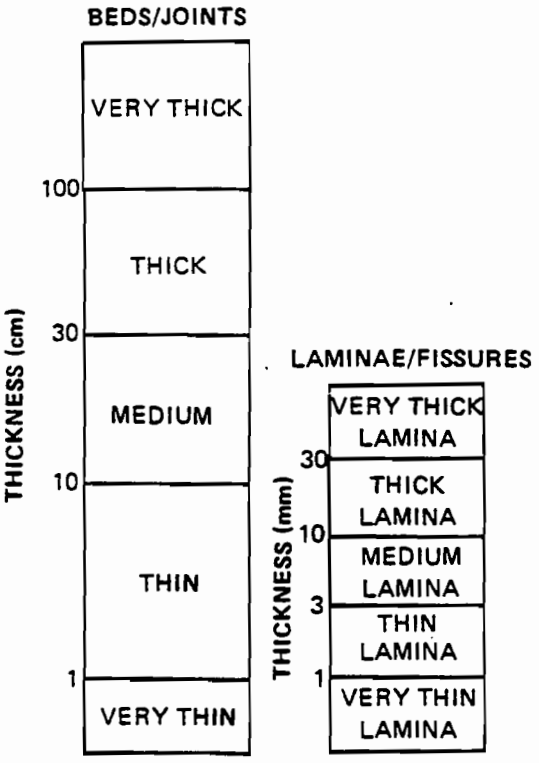
PLASTICITY

Low - Liquid limit less than 50

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

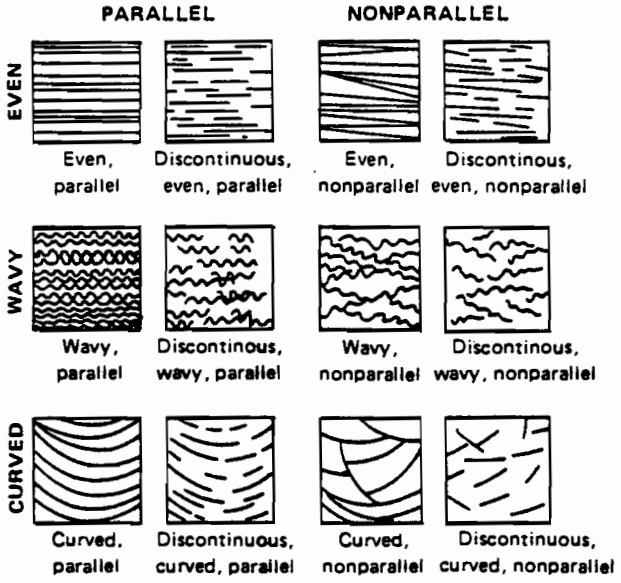
LAMINAE THE SMALLEST MEGASCOPIC LAYERS IN A SEDIMENTARY SEQUENCE, REPRESENTING MINOR FLUCTUATIONS IN PHYSICAL CONDITIONS DURING THE DEPOSITION OF BEDS. LAMINAE ARE RELATIVELY UNIFORM IN TEXTURE AND COMPOSITION AND GENERALLY LACK MEGASCOPIC INTERNAL LAYERING.



e.g. Thick bed
Thickly spaced joint

e.g. Thin lamina
Thinly spaced fissures

(Modified after Ingram, 1954 and Campbell, 1967)



(After Campbell, 1967)

LOCATION: AKPAK SITE1 TIME: 0030 hrs.
UTM COORDINATES: 7 785 950 m N 529 265 m E WATER DEPTH: 36.5 m

SYM	NO.	SOIL DESCRIPTION	GROUND ICE T °C
	1	CLAY (CH) - trace fine sand, high plastic, very soft dark olive grey	
	2	- becoming soft, sand pockets, curved, non-parallel laminations 1.5 m (-38.0 m El.)	
	2A	SAND (SP) - interbedded with clay, some shell fragments	
	3	- becoming clean, fine-grained, compact to dense, uniform	
	4	- medium to fine-grained	
	5	- no recovery	
	6	- trace silt	
	7		
	8	- trace gravel, subangular, polished, maximum size = 10mm	
	9	22.5 m (-58.8 m El.) - mica platelets	
	10		FROZEN Nbn, well bonded fresh water ice
	11		Nbn
		END OF BOREHOLE 32.8 m (-68.5 m El.)	
		NOTE: Hole terminated due to rig breakdown.	

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 (kPa/Pascals)
100 200 300

SPECIALIZED TESTS

DEPTH BELOW SEABED (metres)
0 5 10 15 20 25 30 35 40 45 50

eba

JOB No.: 101 - 3868
DRILLING COMPLETED: 83/08/03
BOREHOLE DEPTH: 32.8 m
DRILLING RIG: Simco 5000/Broderick
LOG COMPILED BY: KWJ/MAV

LEGEND

SOIL SYMBOLS: SAND, SILT, CLAY

SHEAR STRENGTH
+ Torvane
× Mini. Vane
□ Pilcon Vane
◊ Nilcon Vane
○ Unconfined Comp.
△ UU Triaxial
■ CU Triaxial
▽ Fall Cone

TEST IDENTIFICATION
C - Consolidation
DS - Direct Shear
Cs - Carbonate
T - Triaxial Shear
S - P.W. Salinity
TD - TDR
G - Gas Analysis
H - X - Ray Diffr.

BOREHOLE NUMBER AK83501

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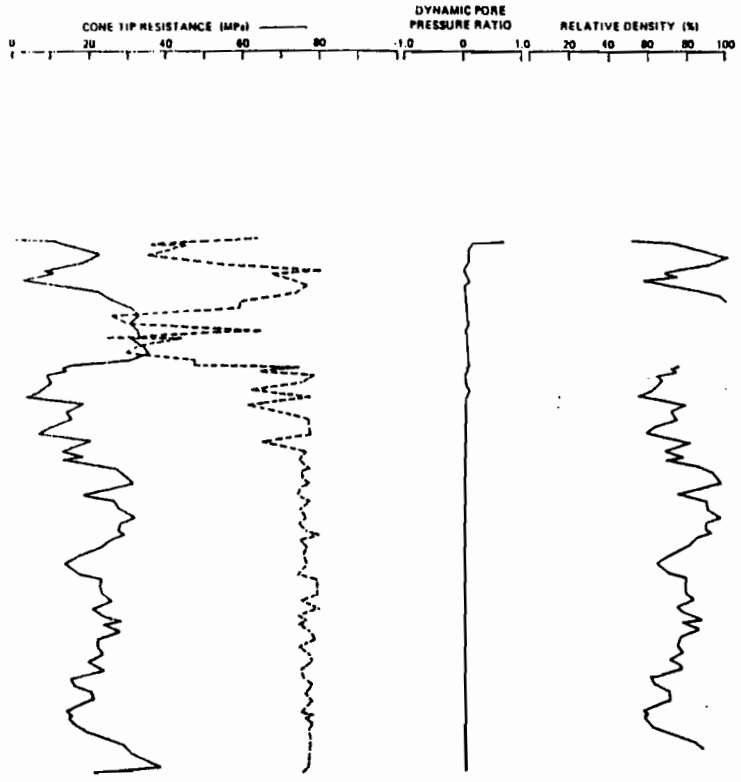
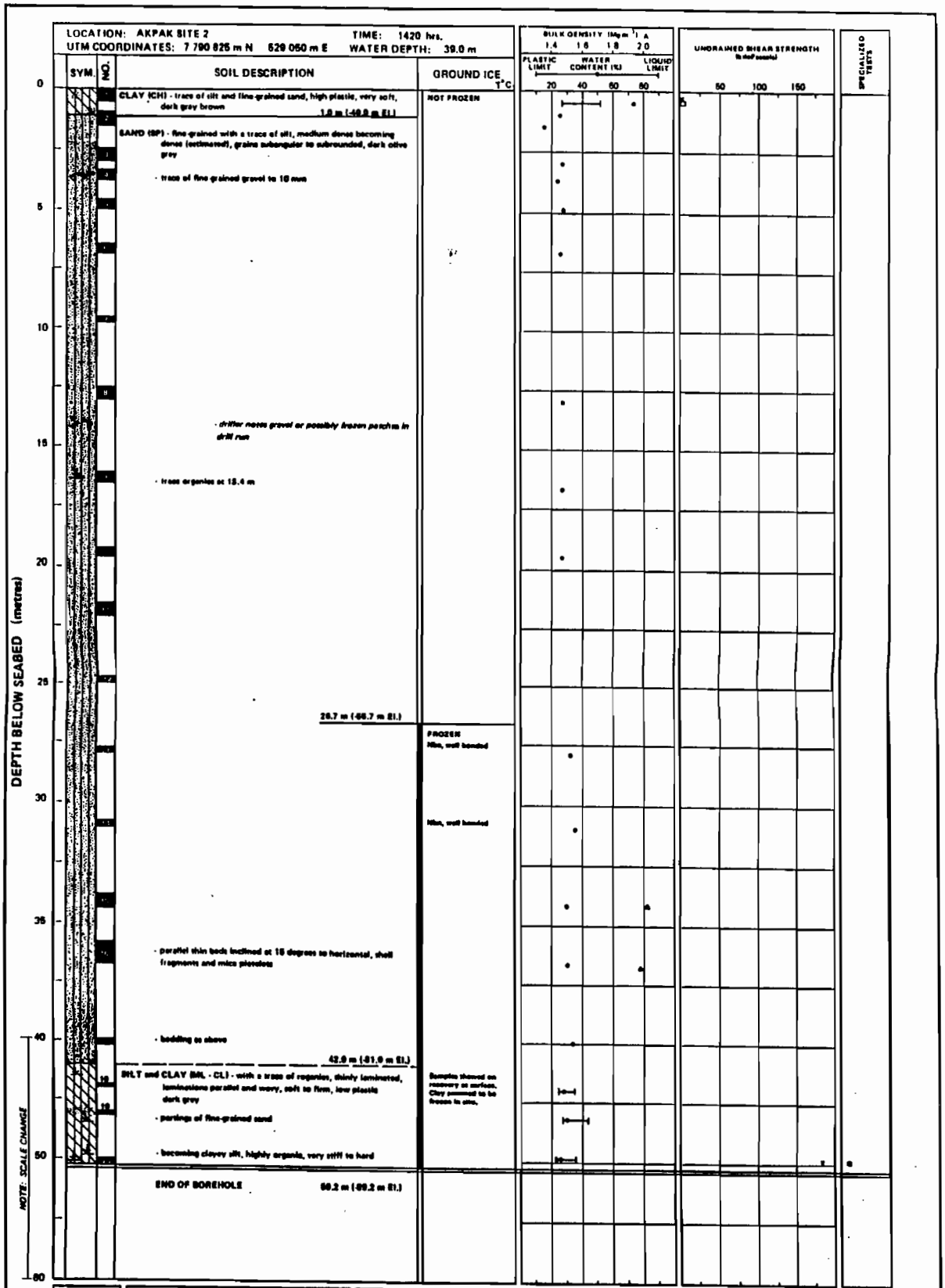
BOREHOLE LOG AND LABORATORY TEST RESULTS



Geosystems

CONE PENETRATION TEST DATA

PENETRATION TEST
AK-03 (01)



JOB No.: 101 - 3886
DRILLING COMPLETED: 93/08/01
BOREHOLE DEPTH: 60.2 m
DRILLING RIG: Simco 6000/Broderick
LOG COMPILED BY: KWJ/JPR

LEGEND

SOIL SYMBOLS: SAND, SILT, CLAY

SHEAR STRENGTH: + Torvane, × Mln. Vane, O Pilcon Vane, ⊕ Nilcon Vane, ◇ Unconfined Comp., △ UU Triaxial, ▣ CUTriaxial, ▽ Fall Cone

TEST IDENTIFICATION: C - Consolidation, DS - Direct Shear, Cc - Carbonate, T - Triaxial Shear, S - P.W. Salinity, TD - TDR, O - Org Analysis, X - X - Ray Diffr.

BOREHOLE HUMBSR AK93862

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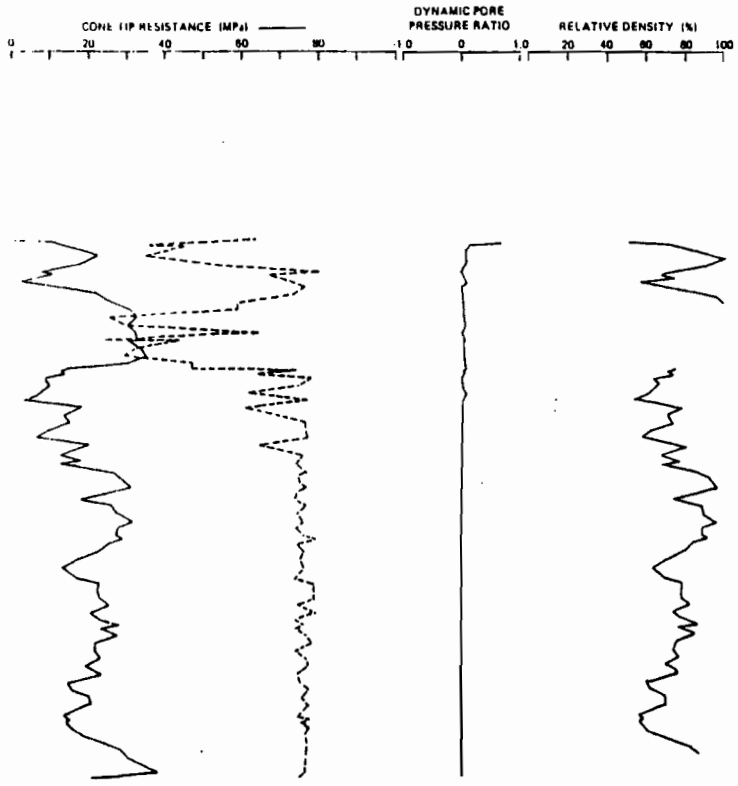
BOREHOLE LOG AND LABORATORY TEST RESULTS



Geosystems

CONE PENETRATION TEST DATA

PENETRATION TEST AK-83-01

LOCATION: AKPAK SITE 2 TIME: 1420 hrs.
UTM COORDINATES: 7 790 825 m N 529 060 m E WATER DEPTH: 39.0 m

SYM.	NO.	SOIL DESCRIPTION	GROUND ICE T°C
	1	CLAY (CH) - trace of silt and fine-grained sand, high plastic, very soft, dark grey brown	NOT FROZEN
		1.0 m (-40.9 m El.)	
	2	SAND (SP) - fine-grained with a trace of silt, medium dense becoming dense (estimated), grains subangular to subrounded, dark olive grey	
	3	- trace of fine-grained gravel to 10 mm	
	4	- driller notes gravel or possibly frozen patches in drill run	
	5	- trace organics at 18.4 m	
	6		
	7		
	8		
	9		
	10		
	11		
	12		
		26.7 m (-66.7 m El.)	
			FROZEN
			Nbn, well bonded
	13		
	14		Nbn, well bonded
	15		
	16	- parallel thin beds inclined at 15 degrees to horizontal, shell fragments and mica platelets	
	17		
	18	- bedding as above	
		42.9 m (-81.0 m El.)	
	19	SILT and CLAY (ML - CL) - with a trace of organics, thinly laminated, laminations parallel and wavy, soft to firm, low plastic dark grey	Samples thawed on recovery at surface. Clay assumed to be frozen in situ.
	20	- partings of fine-grained sand	
	21	- becoming clayey silt, highly organic, very stiff to hard	
		END OF BOREHOLE 50.2 m (-89.2 m El.)	

DEPTH BELOW SEABED (metres)

NOTE: SCALE CHANGE

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 (kPa)
50 100 150

SPECIALIZED TESTS

JOB No.: 101 - 3866
DRILLING COMPLETED: 93/08/01
BOREHOLE DEPTH: 50.2 m
DRILLING RIG: Simco 5000/Broderick
LOG COMPILED BY: KWJ/JPR

LEGEND

SOIL SYMBOLS: SAND, SILT, CLAY

SHEAR STRENGTH
- Torvane
- Mtn. Vane
- Pilcon Vane
- Nilcon Vane
- Unconfined Comp.
- UU Triaxial
- CUTriaxial
- Fall Cone

TEST IDENTIFICATION
- C - Consolidation
- DS - Direct Shear
- Cc - Carbonate
- T - Triaxial Shear
- S - P.W. Salinity
- TD - TDR
- O - Gas Analysis
- X - X - Ray Diffr.

BOREHOLE NUMBER AK83602

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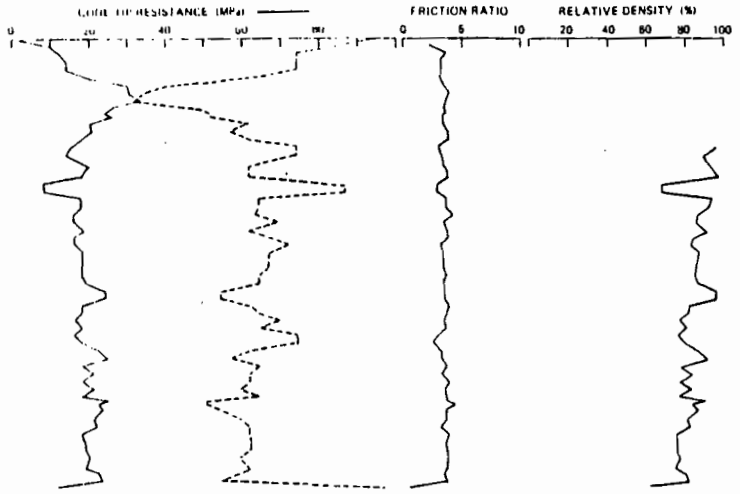
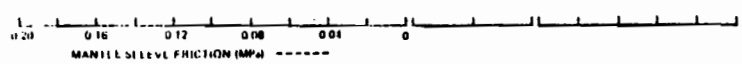
BOREHOLE LOG AND LABORATORY TEST RESULTS





Geosystems

CONE PENETRATION TEST DATA

PENETRATION TEST

APPENDIX B

DIAGNOSTIC PROFILES

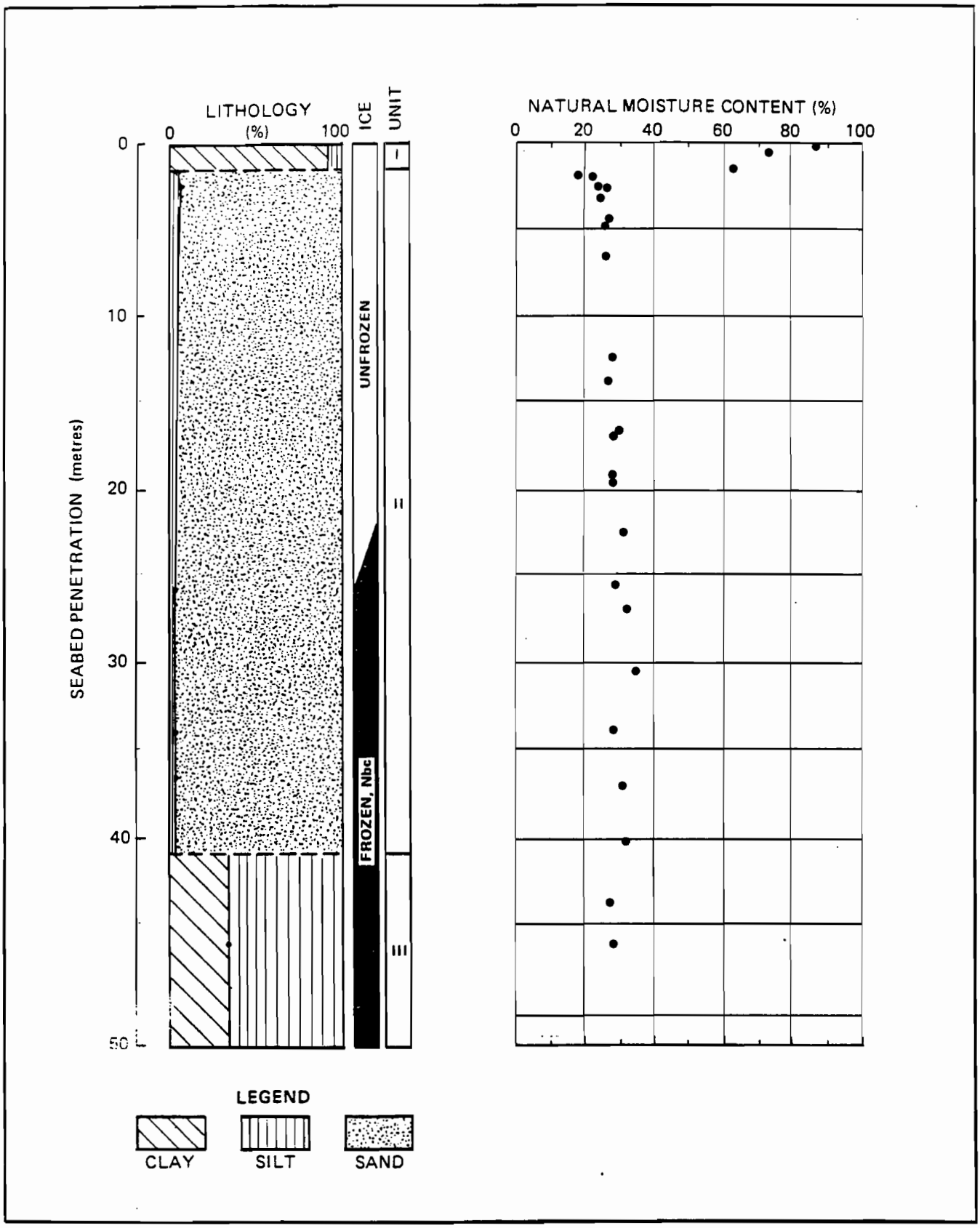


FIGURE B.1 NATURAL MOISTURE CONTENT PROFILE
AKPAK AREA

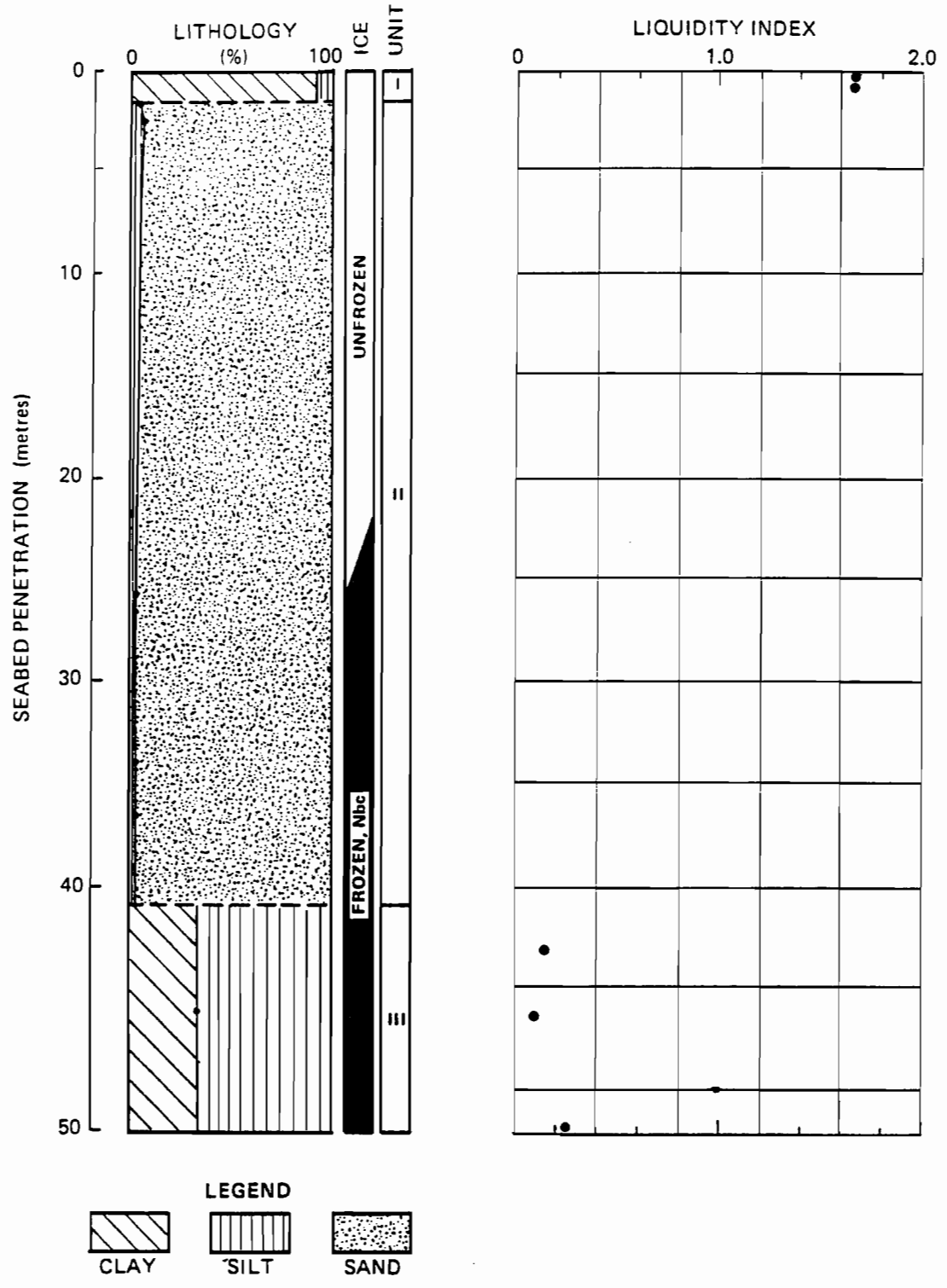


FIGURE B.2 LIQUIDITY INDEX PROFILE
AKPAK AREA

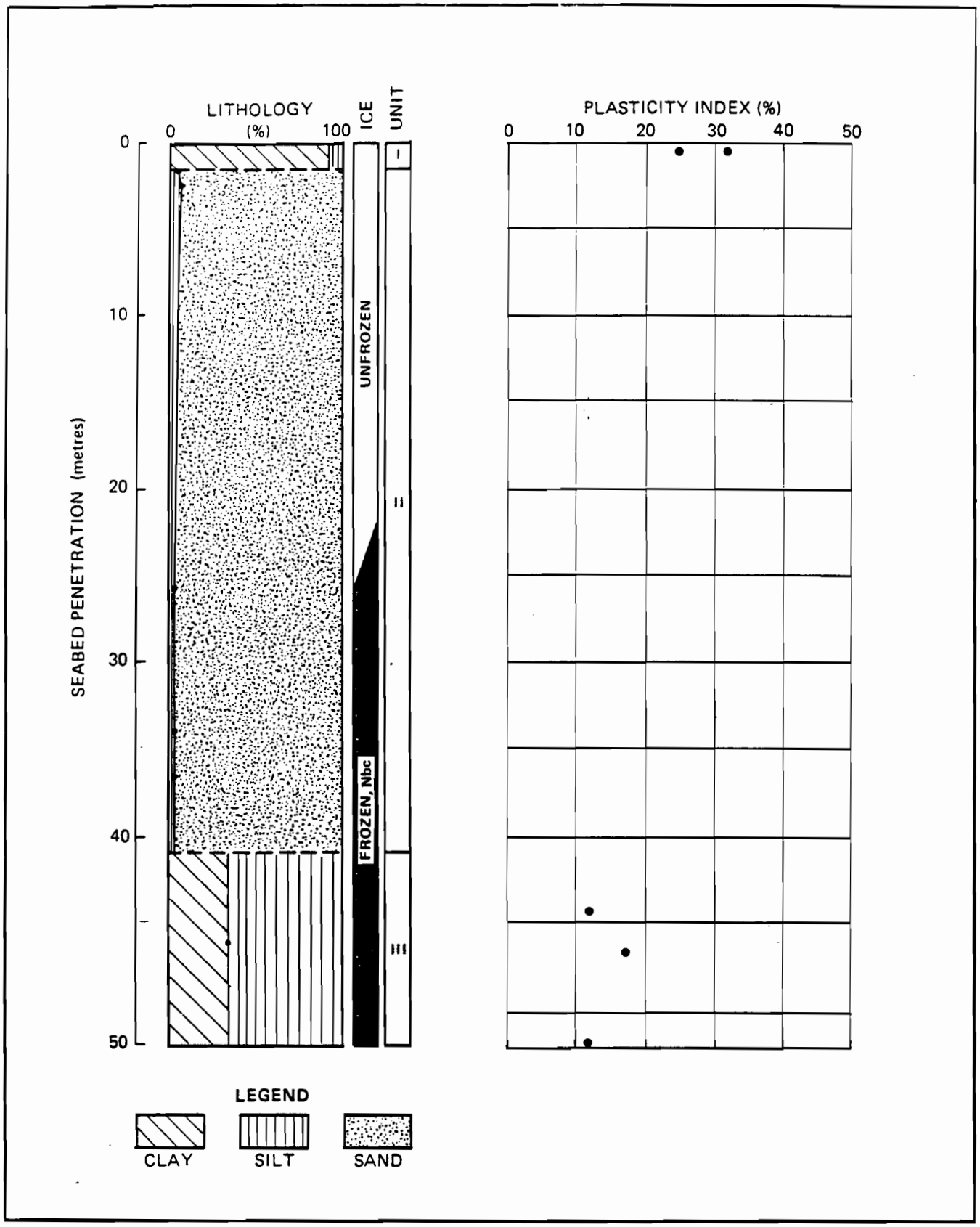


FIGURE B.3 PLASTICITY INDEX PROFILE
AKPAK AREA

-AK83S01

SUMMARY OF TEST RESULTS

Borehole Number / 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
1	B	0.00 - 0.50	CH			87			60	28						FC	1		V soft				
2A	B	1.52 - 1.82				63										FC	8		V soft				
																TV	9		V soft				
2B	B	1.82 - 2.20				22										FC	7		V soft				
3	B	2.44 - 2.75				24						5	95	0	180								
4	B	4.57 - 4.87				27																	
5	NR	7.62																					
6	NS	13.72 - 13.82				27																	
7	B	16.46 - 16.66				30																	
8	B	19.51 - 19.71				28																	
9	NS	22.56 - 22.60		Nbe		31																	

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
SG - Specific Gravity
C - Carbonate

Project Number: 101-3866

Reviewed By: _____ P.Eng.

AK83S01

SUMMARY OF TEST RESULTS

Borehole Number									ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION					SHEAR STRENGTH				CONSOLIDATION CHARACTERISTICS			TEST RESULTS TABULATED SEPARATELY
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})	Liquid Limit (%)	Plastic Limit (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	P_o (kPa)	P_c (kPa)	C_c	
10	B	25.60 - 25.80		Nbn-Nbe		29		1.90				1	99	0	260								
11	B	31.70 - 31.95		Nbn-Nbe				1.79															

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
- SG - Specific Gravity
- C - Carbonate

Project Number: 101-3866

Reviewed By: _____ P.Eng.

2143

EBA Engineering Consultants Ltd.

AK83S02

SUMMARY OF TEST RESULTS

Borehole Number / 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
1A	T	0.00 - 0.30														MV	3		V soft				
1B	B	0.30 - 0.50	CH		-1.1	73			52	27						PV	5		V soft				
																FC	5		V soft				
2A	B	0.91 - 1.00				17																	
2B	B	1.00 - 1.50				26						2	98	0	290								C
3	B	2.40 - 2.90				28																	
4	B	3.35 - 3.70				24																	C
5	B	4.57 - 4.88				26																	
6	B	6.40 - 6.80				26						3	97	0	200								
7	B	9.45 - 9.75				30																	
8	B	12.50 - 13.00				28																	C
9	B	16.15 - 16.55				28																	

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 - Pifcon 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
- SG - Specific Gravity
- C - Carbonate

Project Number: 101-3866

Reviewed By: _____ P.Eng.

AK83S02

SUMMARY OF TEST RESULTS

Borehole 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		GRAIN SIZE DISTRIBUTION					SHEAR STRENGTH				CONSOLIDATION CHARACTERISTICS			TEST RESULTS TABULATED SEPARATELY
Sample Number									Liquid Limit (%)	Plastic Limit (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (µm)	Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	P_o (kPa)	P_c (kPa)	C_c	
10	B	19.20 - 19.55				28																	C
11	B	21.64 - 22.10																					
12	B	24.69 - 25.00																					
13	B	27.74 - 27.90		Nbn		32																	C
14	B	30.78 - 31.00		Nbn		35																	
15	B	33.80 - 34.10		Nbn		29		2.01				1	99	0	270								
16	B	36.88 - 37.48		Nbn		31		1.97				1	99	0	210								
17	B	39.90 - 40.40		Nbn		32																	C
18A	B	43.60 - 44.0	CL-ML			27			37	25													
18B	G	43.60 - 44.00																					G
19	B	46.02 - 46.47	CL-ML			29			44	27	30	69	1										

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
- SG - Specific Gravity

Project Number: 101-3866

Reviewed By: _____ P.Eng.

AK83502

SUMMARY OF TEST RESULTS

Borehole Number / 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 (%)	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
20A	B	49.99 - 50.21	CL			27			36	24						MV	163		V stiff				
20B	G	49.99 - 50.21																					G

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
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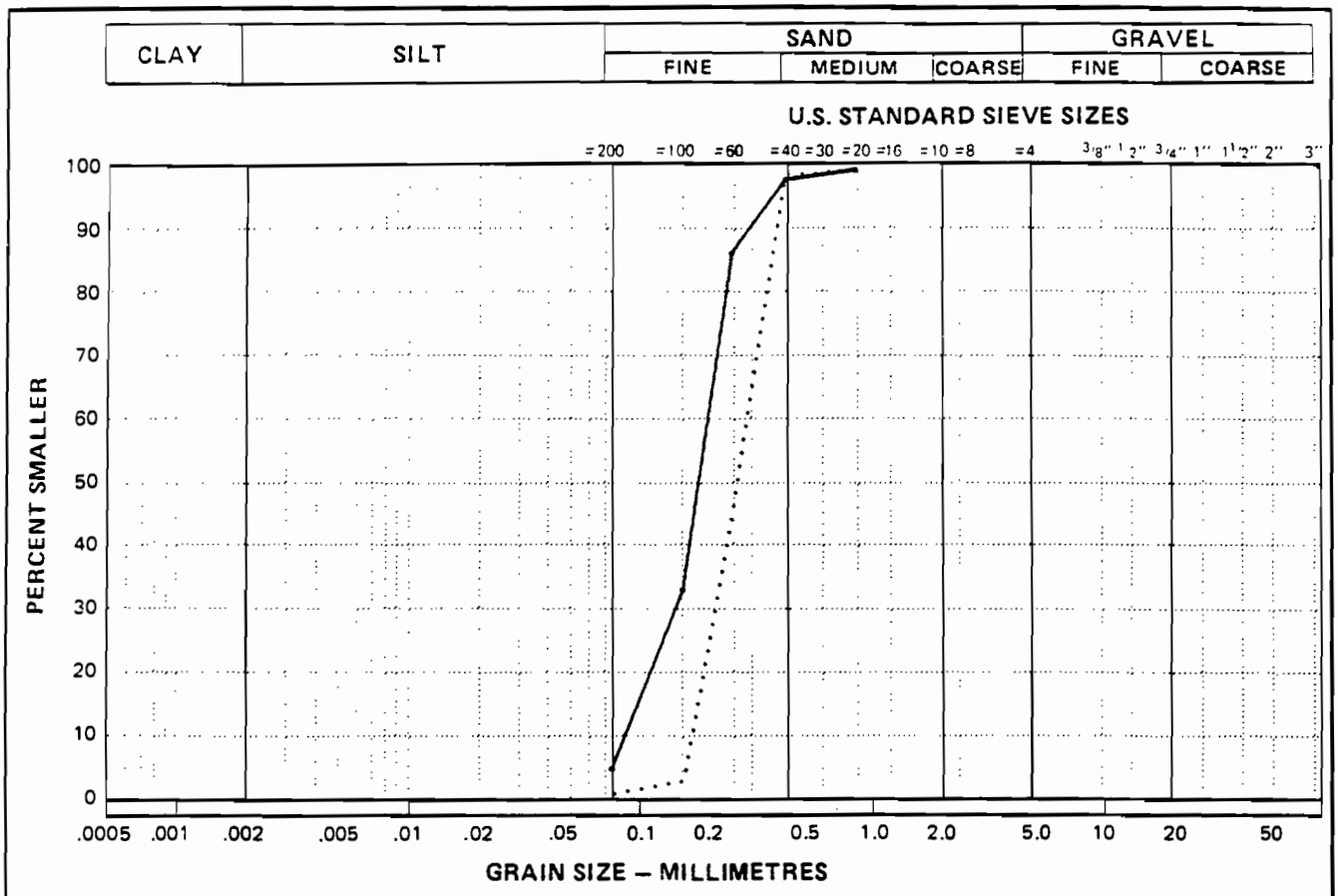
- TV - Torvane
- PV - Pilcon Vane
- RV - Remote Vane
- UU - Unconsolidated Undrained Triaxial
- UUp - UU Triaxial with Pore Pressure Measurements
- CU - Consolidated Undrained Triaxial
- CUp - CU Triaxial with Pore Pressure Measurements
- CD - Consolidated Drained Triaxial
- O - Organic Content
- S - Salinity
- TS - Thaw Strain
- SG - Specific Gravity
- C - Carbonate

Project Number: 101-3866

Reviewed By: _____ P.Eng.

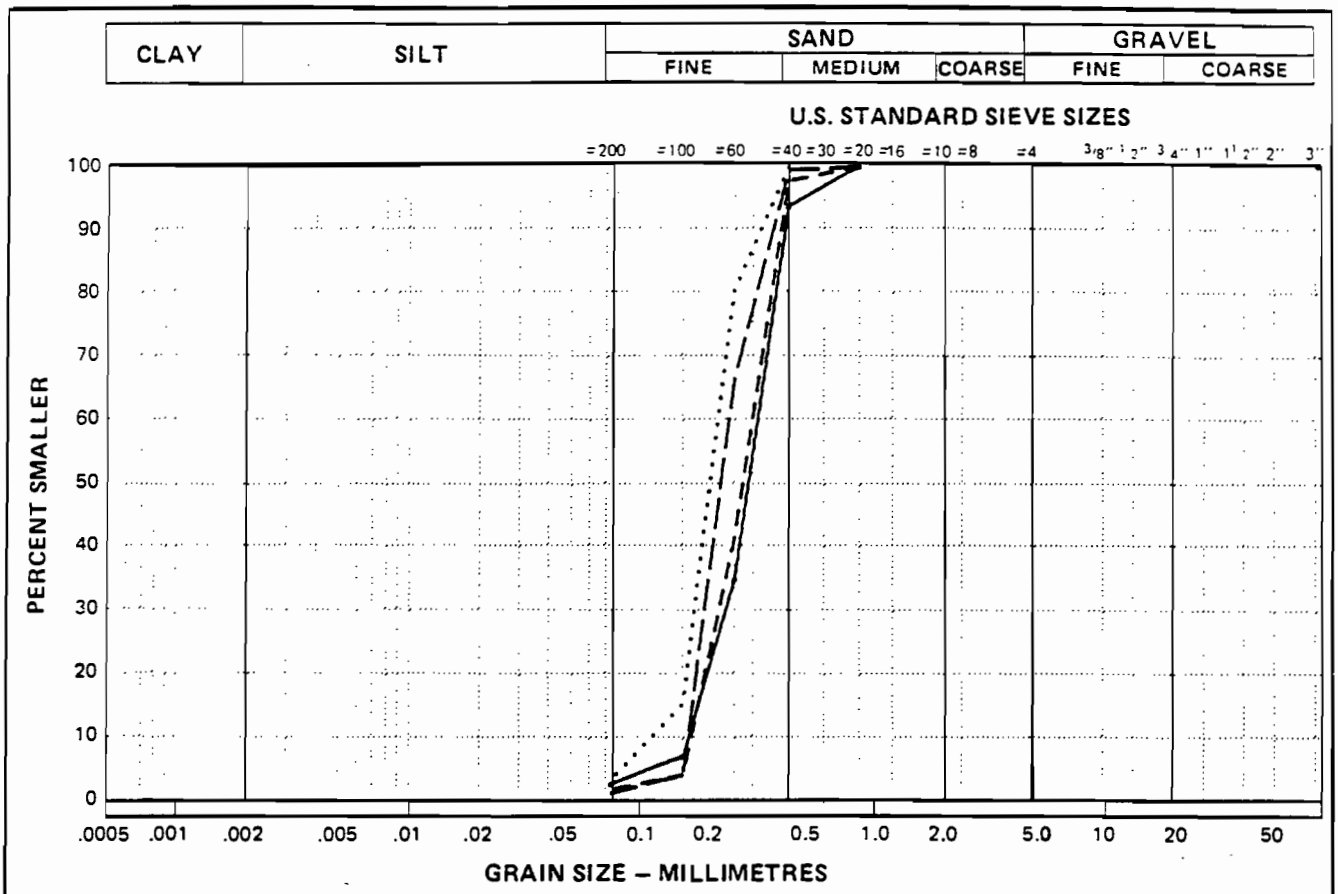
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK83S01	2.40 - 2.75	-	4.9	95.1	0.0	2.3	1.2	SP
. . . . .	AK83S01	25.60 - 25.80	-	.8	99.2	0.0	1.8	.9	SP

JOB NO. 101 -3866 DATE

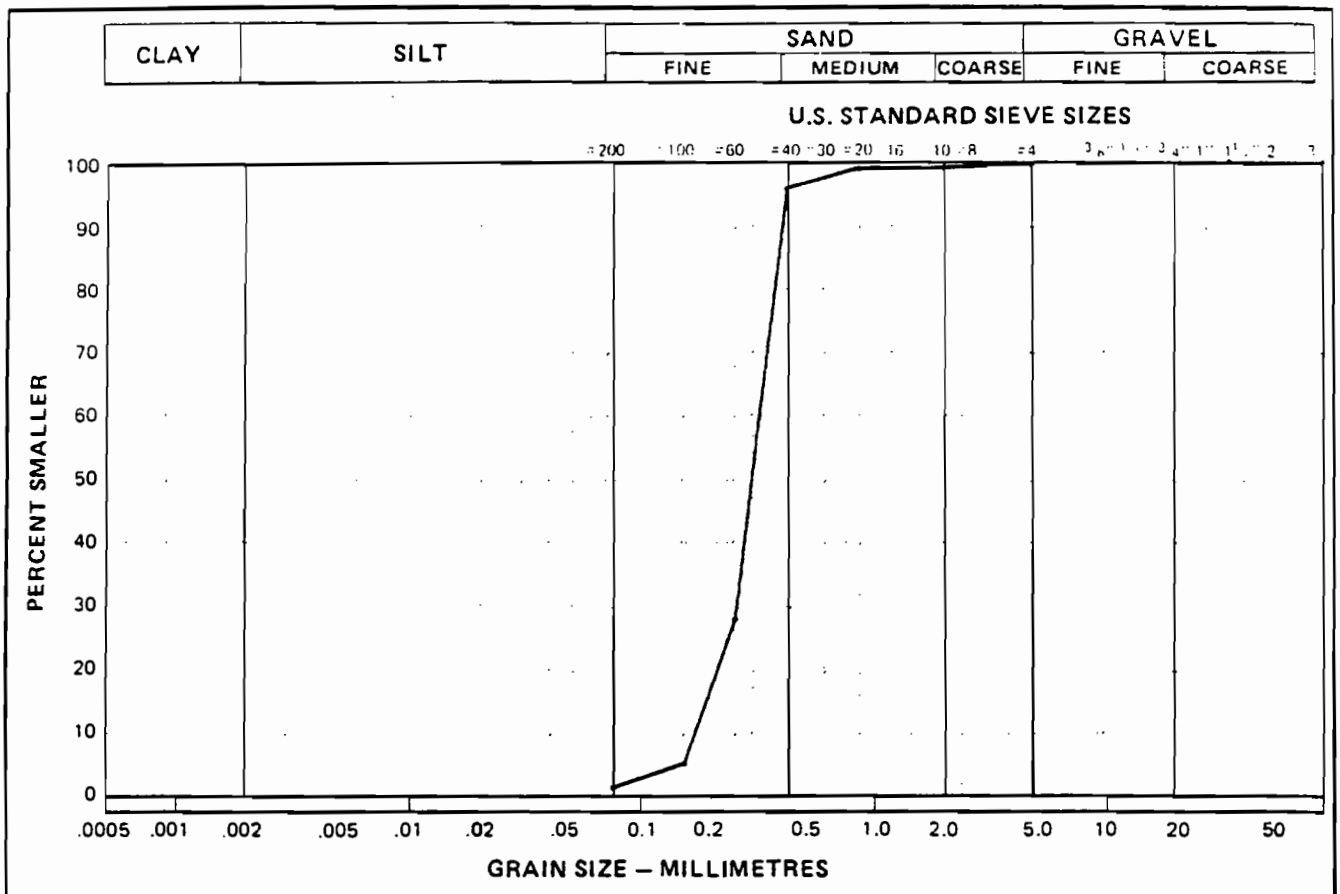
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK83S02	1.00 - 1.50	-	1.9	98.1	0.0	2.0	1.1	SP
. . . . .	AK83S02	6.40 - 6.80	-	2.6	97.4	0.0	1.9	1.2	SP
_ _ _	AK83S02	33.80 - 34.10	-	1.0	99.0	0.0	1.8	.9	SP
___ ___	AK83S02	36.88 - 37.48	-	.4	99.6	0.0	1.5	.9	SP

JOB NO. 101 -3866 DATE

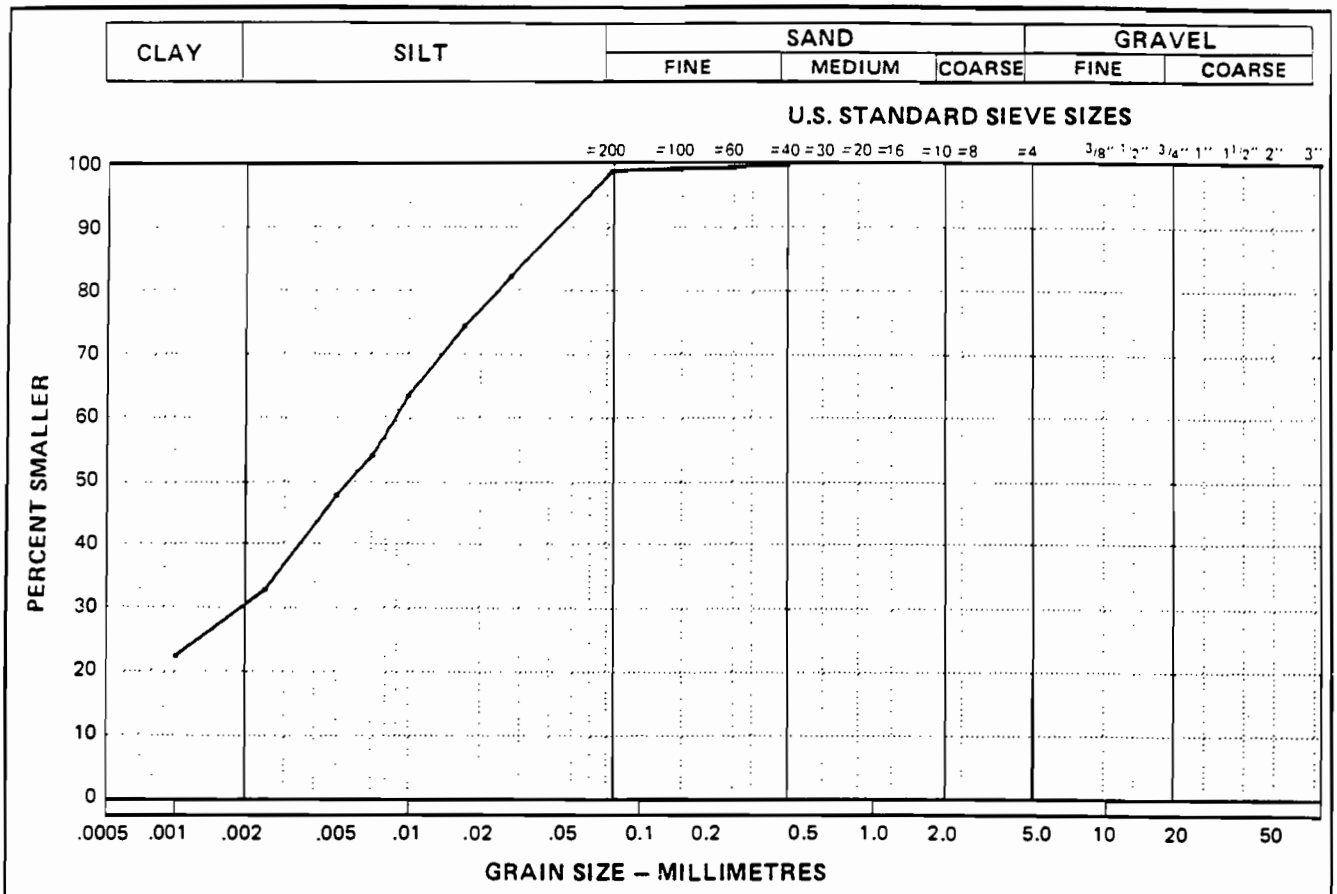
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK-83-S02*	30.78 - 31.00	-	.7	99.3	0.0	1.9	1.2	SP

JOB NO. 101 -3866 DATE 83-11-22

PARTICLE - SIZE ANALYSIS OF SOILS



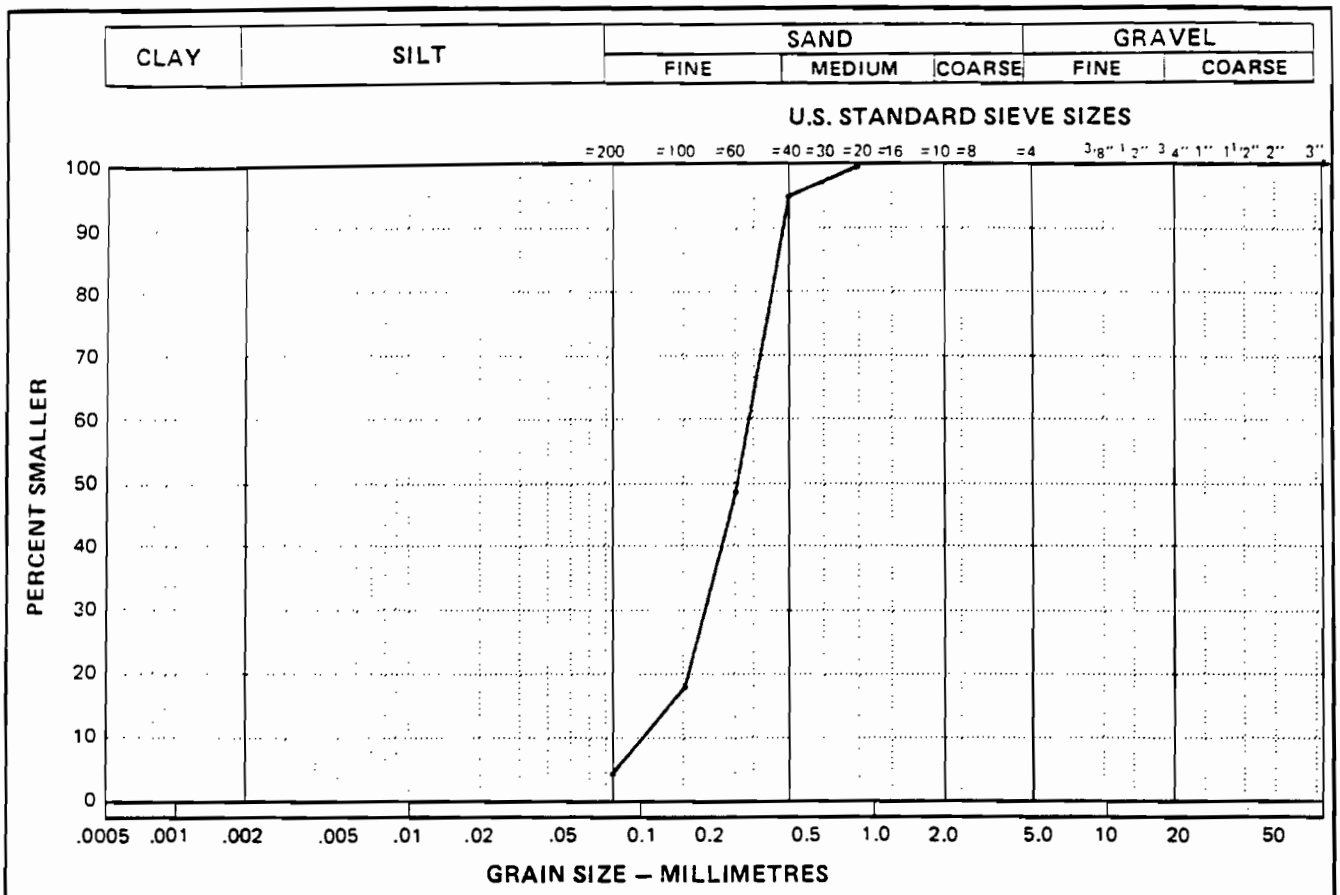
SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK83S02	46.02 - 46.47	30.2	69.0	.8	0.0	-	-	

JOB NO. 101 -3866 **DATE** 83-09-28

TABLE C.1 MAXIMUM-MINIMUM DENSITIES

BOREHOLE NO.	COMBINED SAMPLES	MAXIMUM DENSITY (kg/m^3)	MINIMUM DENSITY (kg/m^3)	SATURATION MOISTURE CONTENT (%)
AK83S01	3, 4, 7, 8	1728	1380	17.4
AK83S02	3, 5, 7, 9, 11, 12	1688	1441	19.2

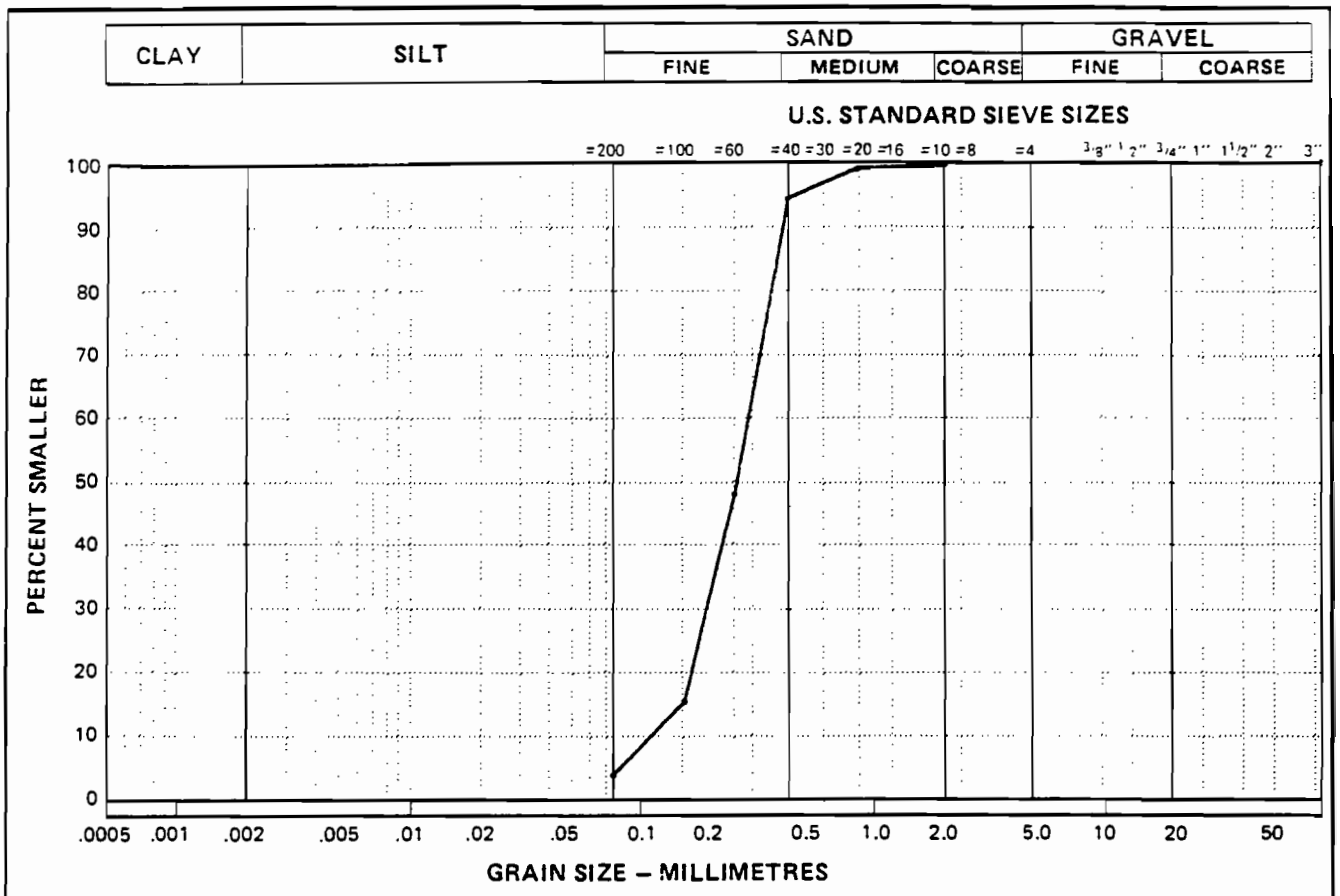
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK-83-501	MAX-MIN	-	3.7	96.3	0.0	2.8	1.2	SP

JOB NO. 101 -3866 DATE 83-11-22

PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	AK-83-S02	MAX-MIN	-	3.2	96.8	0.0	2.6	1.1	SP

JOB NO. 101 -3866 DATE 83-11-22

APPENDIX D

SUBCONSULTANTS

WELL: South Ukalerk and Akpak
LOCATION: Not Given
NO. OF SAMPLES: 6
REQUESTED BY: K. McKenzie

LAB. NO. 1892
DATE: 1983-10-20

RESULTS OF X-RAY DIFFRACTION ANALYSIS
(SEMI-QUANTITATIVE)

Bulk Mineral Content In Per Cent

		Akpak AK83 S02
Sample	(6) 6 4 - 6.8 m	(8) 12.5 - 13.0 m
Mineral:		
Quartz*	66	59
Feldspar	Present	Present
Pyrite	ND	ND
Dolomite	3	2
Siderite	ND	ND
Calcite	6	4
Aragonite	ND	ND
Other**	25	35

ND = Not Detected.

* Quartz and cryptocrystalline species of quartz.

** Difference from 100%. Consists of other minerals for which we do not have conversion factors. May also include clays, organics and amorphous material. In these samples "other" would include 10-15% feldspar.

GULF CANADA RESOURCES INC.

GEOLOGICAL SERVICES LABORATORY

PROJECT NO. 83-0148-4-1005

SEPTEMBER 23, 1983

EBA ENGINEERING CONSULTANTS LTD.
HYDROCARBON GAS AND CARBONATE ANALYSES
ON SOILS FROM AKPAK, EAST AMAULIGAK,
KASLUTUT AND SOUTH UKALERK.

CHEMEX LABS (ALBERTA) LTD.
8764 - 50 AVENUE
EDMONTON, ALBERTA T6E 5K8
(403) 465-9877

ANALYTICAL METHODS

HYDROCARBON GAS ANALYSES

Sediment samples for hydrocarbon gas analysis were sealed in cans in a brine solution at the drill site. Two sizes of cans were used; the larger size contained 100cc of sediment and the smaller 50cc of sediment. In the laboratory, a volume of brine equivalent to the sediment volume was removed and replaced with helium. The cans were then mechanically agitated for one hour to displace the hydrocarbon gases into the head space. The head space gas was analyzed for methane, ethane, propane, ethylene and propylene. Results are reported as gas volume hydrocarbon component per 10^6 volumes of wet sediment (ppm vol/vol). This method of reporting is the same as that used in past reports.

CARBONATE

Moisture content was determined by drying at 105°C; the samples were then digested for 24 hours in hydrochloric acid, - solution was back titrated with sodium hydroxide. Three samples were analyzed in duplicate. Single determinations were performed on the remainder of the samples since check samples were within acceptable limits of reproducibility.

RESULTS

CARBONATE ANALYSES

NAME	SAMPLE #	INTERVAL (m)	MOISTURE (MASS FRAC)	CARBONATE (MASS FRAC) WET BASIS
AKPAK				
(AK83 S02)	2B	1.0 - 1.50	.1500	.0321
	4	3.35- 3.70	.1610	.0301
	6	6.4 - 6.80	.1996	.0428
	8	12.5 -13.0	.2406	.0393
	10	19.2 -19.55	.1797	.0274
	13	27.74-27.90	.1585	.0322
	17	39.9 -40.4	.2011	.0351
SOUTH UKALERK				
(SU83 S01)	2	1.19- 1.49	.1896	.0641
	5B	10.64-10.84	.2013	.0540
	10	25.59-25.88	.2004	.0319
	16	34.62-34.82	.1698	.0290
SOUTH UKALERK				
(SU83 S02)	4	5.4 - 5.7	.1795	.0490
	8	17.6 -17.9	.2103	.0640
	13	32.8 -33.0	.1994	.0261

RESULTS

HYDROCARBON ANALYSES

NAME	SAMPLE #	INTERVAL (m)	CONCENTRATIONS (ppm) METHANE	ETHANE	PROPANE	ETHYLENE	PRO-PYLENE
AKPAK (AK83-S02)	S-18B	43.6 -44.0	387	3.2	N.D.*	0.60	N.D.
	S-20B	49.99-50.21	422,100	6.8	N.D.	0.57	N.D.
EAST AMAULIGAK (EA83-S01)	3	6.10-6.71	2,337	N.D.	N.D.	N.D.	N.D.
KASLUTUT (KT83 S01)	2C	2.41- 3.06	110	N.D.	N.D.	N.D.	N.D.
	14B	35.94-36.31	48,880	2.6	N.D.	N.D.	N.D.
	18B	49.05-49.70	119	N.D.	N.D.	N.D.	N.D.
KASLUTUT (KT83 S02)	7C	9.75-10.55	110	N.D.	N.D.	N.D.	N.D.
	14B	21.95-22.45	375	N.D.	N.D.	N.D.	N.D.
SOUTH UKALERK (SU83 S01)	14B	37.77-38.17	896	3.1	N.D.	0.53	N.D.
	23C	54.43-55.02	890	N.D.	N.D.	N.D.	N.D.
	29C	58.00-58.25	126,970	6.7	N.D.	N.D.	N.D.
SOUTH UKALERK (SU83 S02)	20C	54.13-54.93	397	N.D.	N.D.	N.D.	N.D.
	21C	57.17-57.60	4,650	1.28	N.D.	N.D.	N.D.

APPENDIX E

IN SITU TESTING

APPENDIX E
GLOSSARY OF EQUATIONS USED IN CONE PENETRATION TEST INTERPRETATION

E.1 Undrained Shear Strength

$$q_c = N_c C_u + \sigma$$

where: q_c = instantaneous cone tip resistance (MPa)

C_u = undrained shear strength of the material (MPa)

N_c = a cone bearing capacity factor based on site-specific correlation between the cone and an in situ measurement of undrained shear strength, usually a vane shear apparatus.

and, σ = a representation of total vertical in situ stress (MPa). This factor, for ease of calculation has been calculated by

$$\sigma = \gamma z$$

where: γ = 18 KN/m^3 (estimated "average" density for overlying soil)

and, z = depth of data point below seabed (m)

N.B. the effect of the overlying water column is ignored as the cone tip resistance is zeroed at seabed. This analysis will be ignored if the soil is likely to drain upon shear. The soil is classified in two ways for this purpose; if a mantle sleeve friction value is available, a friction ratio is calculated and compared with the instaneous point resistance by the method suggested by Schmertmann (1977). Values falling outside those suggested for

pure clays are ignored. If pore pressure values are available soils exhibiting marked dilatent behavior are ignored for calculation purposes. As no concensus of opinion exists at present in the literature for a suitable classification system, pore pressure values less than 20% of hydrostatic pressure at the level in question are ignored.

E.2 Dynamic Pore Pressure Ratio

$$DPPR = \frac{U - p_o}{q_c - \sigma_v}$$

where: DPPR = dynamic pore pressure ratio (after Jefferies and Funegard, 1983)

U = pore pressure measured by cone tip (mH_2O)

q_c = instantaneous cone tip resistance (MPa)

p_o = hydrostatic pore pressure calculated at that level (MPa)

$$p_o = \gamma_w (z_w + z)$$

where: γ_w = density of water (9.81 KN/m^3)

z_w = depth of water at the site (metres)

and, z = depth below seabed (metres)

and, σ_v = the total vertical in situ stress (MPa). This factor, for ease of calculation, has been calculated by

$$\sigma_v = \gamma z + z_w \gamma_w$$

where: γ = 18 KN/m^3 = estimated "average" density for overlying soil

and, z, z_w and γ_w are as above.

E.3 Relative Density

The relative density of the soil is calculated from an algorithm based on the data provided by Baldi et al (1979). Two solutions exist for the calculation of relative density. Thus, initially, the calculation uses the formula:

$$\text{Relative Density} = \frac{20q_c + 24\sigma'^{2}_v - 54\sigma'_v + 71}{0.1\sigma'^{2}_v + 1.9\sigma_v + 2.025}$$

where: q_c = instantaneous cone tip resistance (MPa)

and, σ'_v = effective vertical stress at that level, calculated from: $\sigma'_v = \gamma' z$

where: γ' = 10 KN/m^3 ("effective" density of overlying soil)

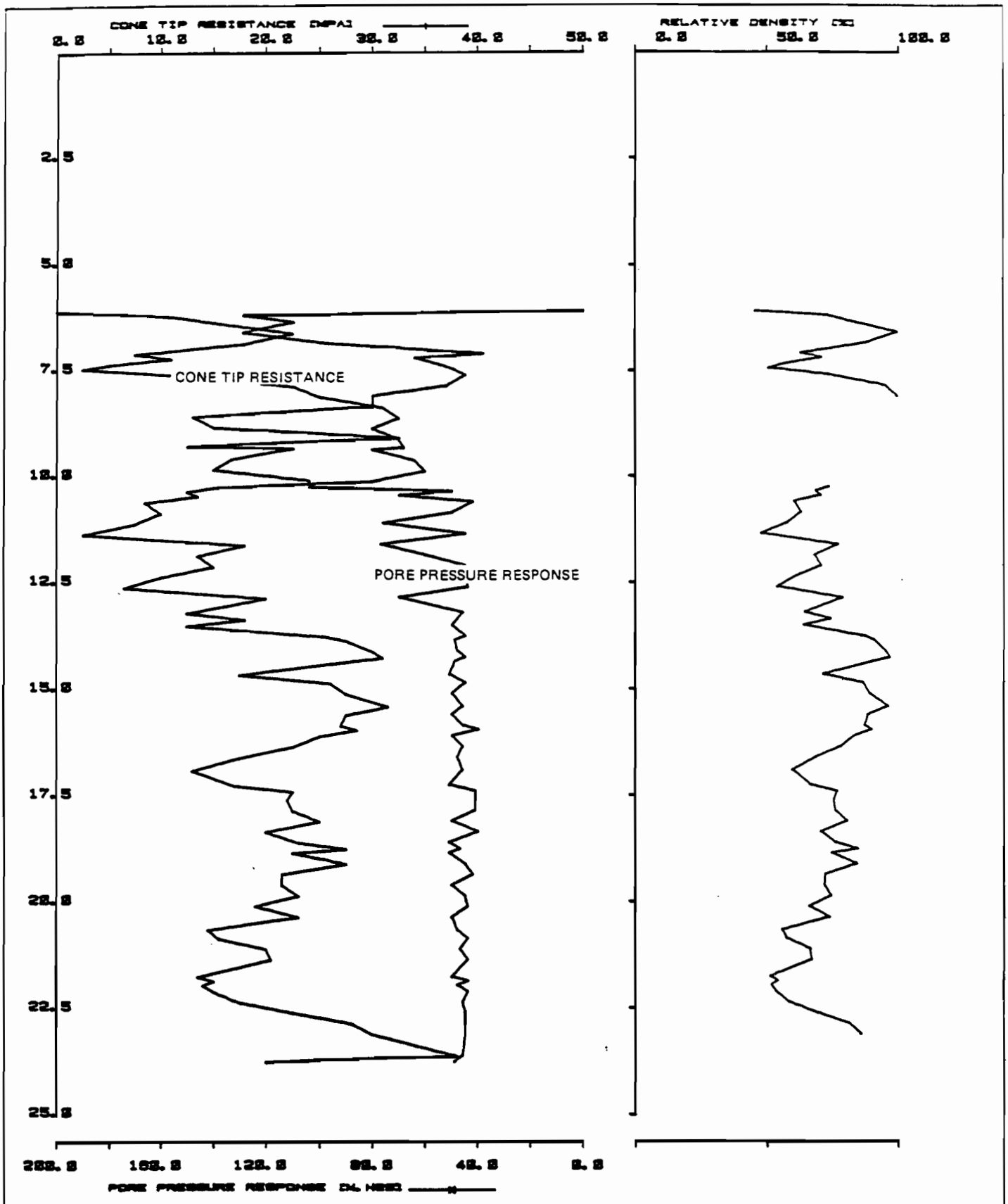
and, z = depth below seabed of that level (metres)

If this value of relative density is greater than 65% the parameter is recalculated using:

$$\text{Relative Density} = \frac{20q_c - 244\,\sigma'^{2}_{v} + 590\,\sigma'_{v} + 94}{11\,\sigma'_{v} - 3.6\,\sigma'^{2}_{v} + 2.6}$$

This analysis will be ignored if the soil is not sand. The soil is classified in two ways for this purpose; if a mantle sleeve friction value is available, a friction ratio is calculated and compared with the instananeous point resistance by the method suggested by Schmertmann (1977). Values falling outside those for SP sands are ignored. If pore pressure values are available, soils exhibiting dilatency are ignored.

In addition to the above, in line with the Baldi analysis, values are ignored when the effective vertical stress exceeds 200 kPa.



WATER DEPTH: 30.5

ALL DEPTHS IN METRES

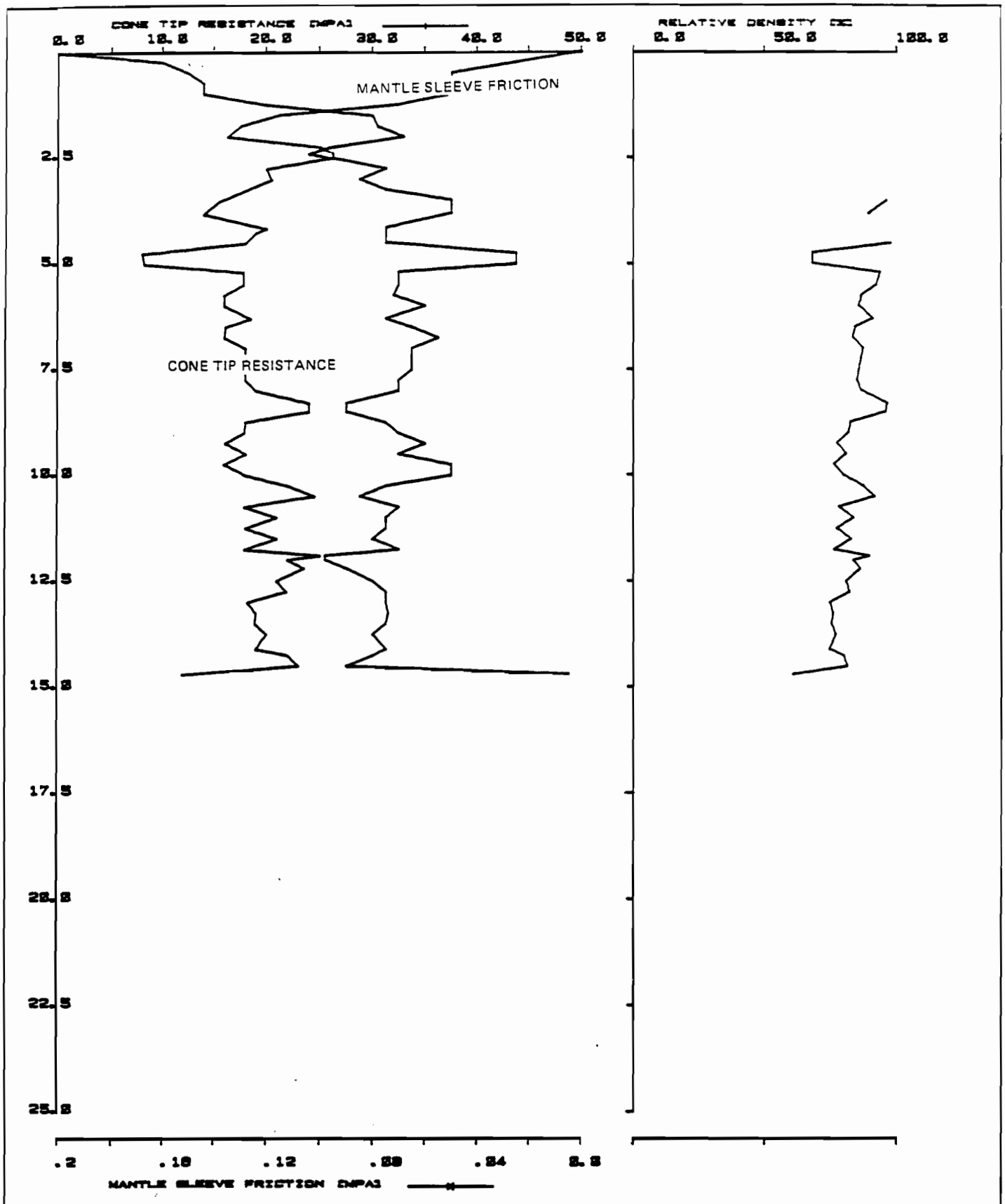
BULK DENSITY (kN/m3): 20.0

NC: 2.0

CONE PENETRATION TEST ANALYSIS

TITLE: GULF CONE AK-83-C01

FIGURE: E-1



WATER DEPTH: 30.0

ALL DEPTHS IN METRES

BULK DENSITY (KN/M3): 20.0

NC: 0.0

CONE PENETRATION TEST ANALYSIS

TITLE: GULF CONE AK-83-C02

FIGURE: E-2

APPENDIX F

LABORATORY TEST PROCEDURES

LABORATORY TEST PROCEDURES

Procedures Specified

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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 (Ko=0.7) is applied without sample drainage. For tests with no pore pressure measurement the sample is loaded to failure at a strain rate of 1%/min. If pore pressure measurements are desired the sample, after cell pressure application, is back pressured with 100 kPa to ensure saturation of the sample. A pore pressure response test is carried out and, if B>0.95 the sample is sheared. Additonal increments of backpressure are applied if B<0.95. The sample is sheared at a controlled rate of strain based on the consolidation characteristics of the material (generally .02%/min. unless C_v less than 3.0×10^{-4} $cm^2/sec.$). Pore pressures are monitored continuously during shear.

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

NOTE: Standard Triaxial Procedure adopted from ASTM D2850

CONSOLIDATED-UNDRAINED TRIAXIAL TESTS

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.

NOTE: 1. Stnadard CU triaxial procedures adopted from Bishop & Henkel (1969)

3. DIRECT SHEAR TESTS

Procedure 1 - Standard direct shear procedure. 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

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 on samples tested in the laboratory whereas only stress-strain curves, peak and post-peak shear strengths are produced in the field.

5. FALL-CONE SHEAR STRENGTH DETERMINATION

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

Sample is set up in oedometer with dry stones. Standard incremental loading is applied done to a specified vertical effective stress that slightly exceeds the in situ effective overburden pressure. Sample may also be rebounded at P'c', at the discretion of the Engineer. 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.

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

Sample is trimmed to remove disturbed material. Porewater is extruded from thawed sample and filtered. The salinity content (NaCl) of the extruded porewater in % is determined using a hand-held refractometer. Several drops of porewater are placed on the reflecting plate and a reading is taken through the eyepiece. Results are reported to the nearest ppt.

8. ORGANIC CONTENT DETERMINATION

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.