

1983/2. Soil salinities at Port Arthur

P.C. Stevenson

Abstract

A twelve-hole drilling programme at Port Arthur has shown that the earth materials close to some buildings comprise soil profiles developed on dolerite, and fill. The measured salinities are not high.

INTRODUCTION

A short drilling programme was carried out at Port Arthur during September 1981 at the request of National Parks and Wildlife Service. This drilling was intended to show what earth materials were close to the foundations of some of the buildings and particularly the saline (NaCl) content of the soils.

Twelve holes were drilled at the locations shown in Figure 1. Drill log diagrams are shown in Appendix 1.

The salinity of the soil samples was tested in some boreholes at 0.2 m intervals. This was done by dispersing 10 g of soil in 100 ml of distilled water and measuring the electrical conductivity of the solution by means of a pHox conductivity meter. The results are expressed as NaCl in mg/l of mass of clay and are plotted in Figures 2 and 3.

Most holes did not show any free water, but Hole 12 struck water which stood at 1.2 m below surface. A sample was taken for analysis (Appendix 2).

DISCUSSION

The materials drilled in the boreholes appear to consist of soil profiles developed on dolerite which have been overlaid, and in some cases truncated, by fill and extraneous soil usually identified by brick or sandstone fragments derived from building.

The salinities measured are not high. The values oscillate between 300 mg/l and about 1000 mg/l in fill, but are usually about 400-500 mg/l in normal soil profiles.

The one water analysis shows a total dissolved solids content of 400 mg/l with HCO₃ being more prominent than Cl.

[25 January 1983]



Figure 1. Location of boreholes, Port Arthur.

5 cm

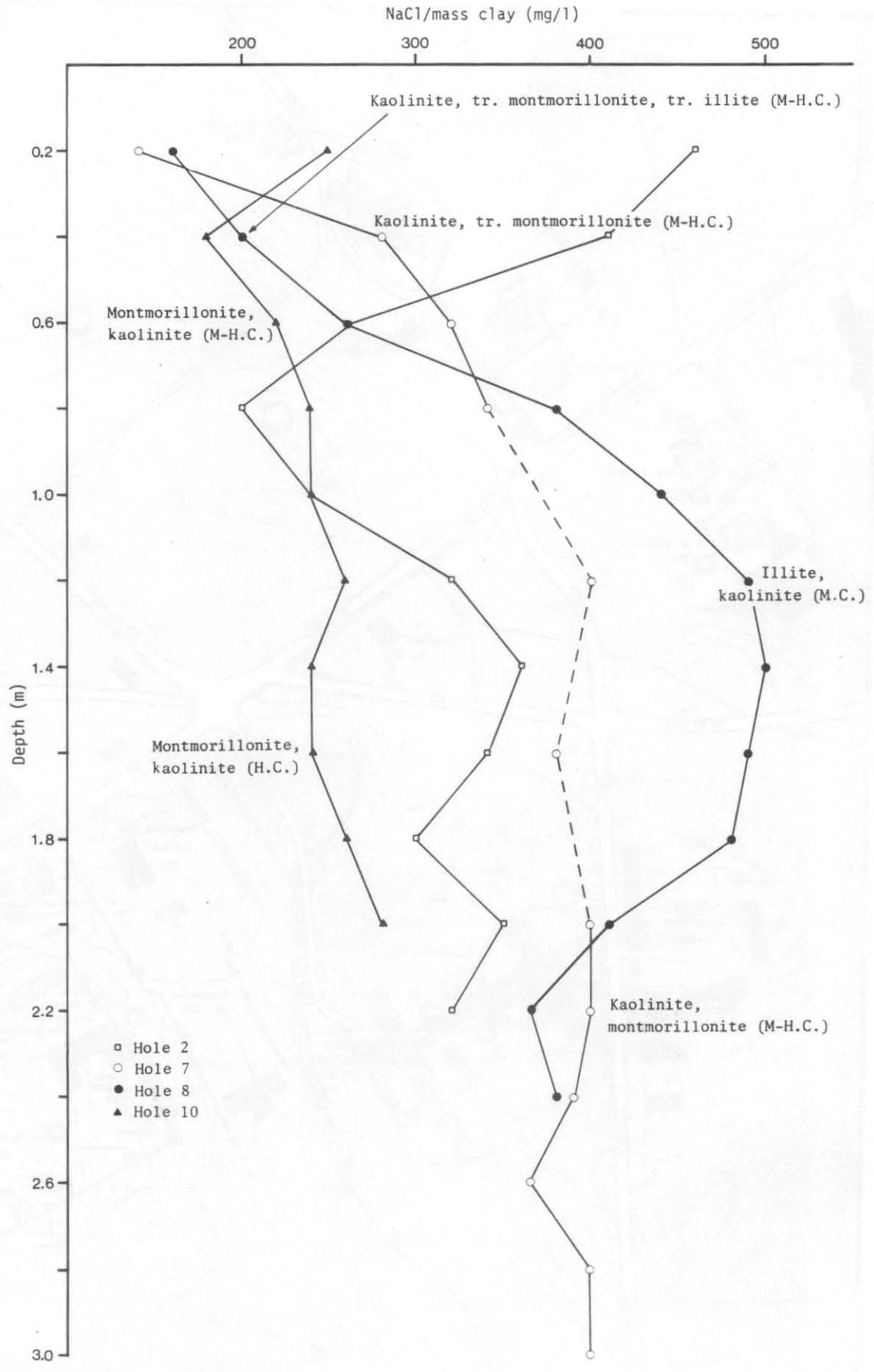


Figure 2. Salinity testing of soil samples, Port Arthur boreholes.

5 cm

2-4

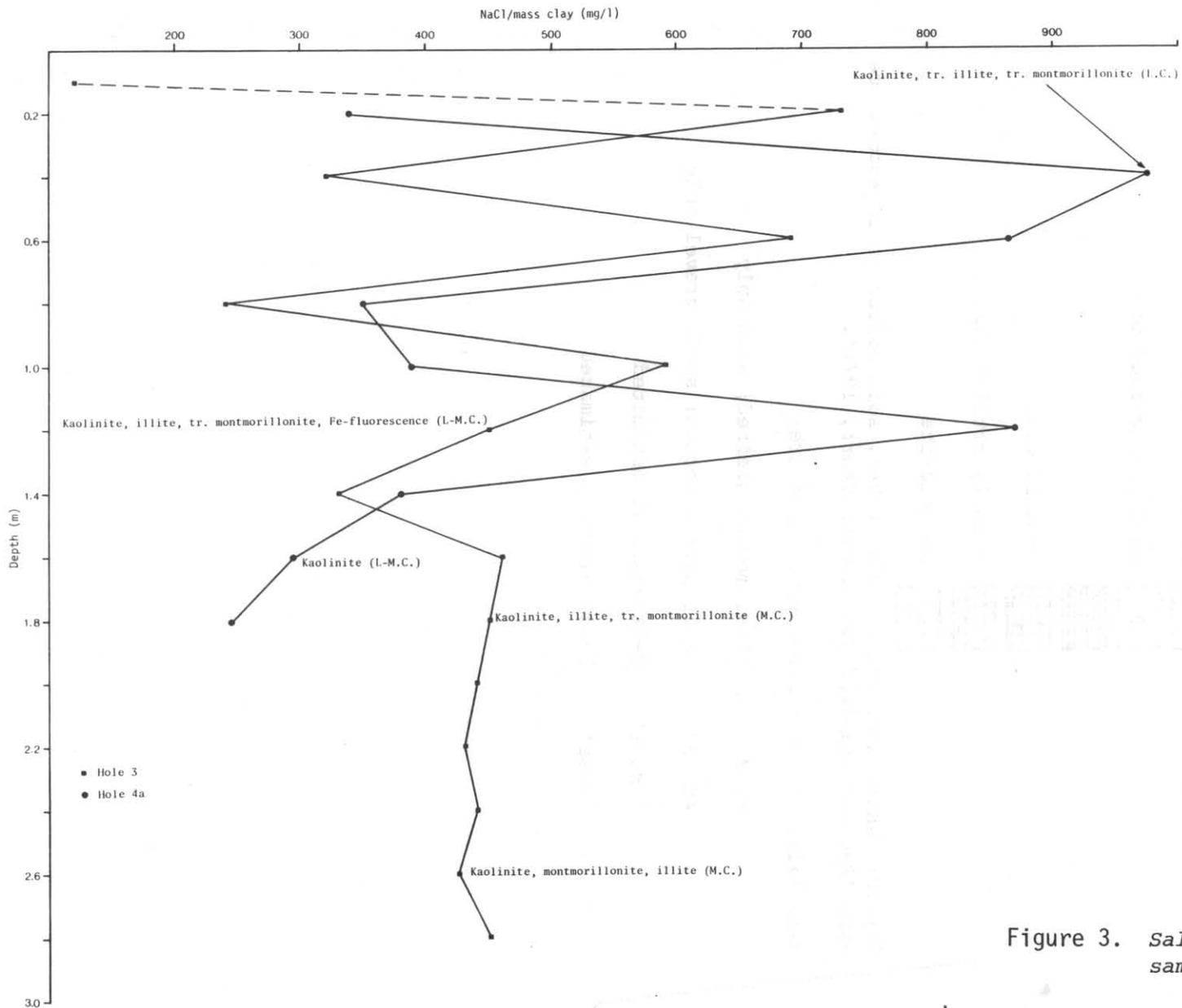
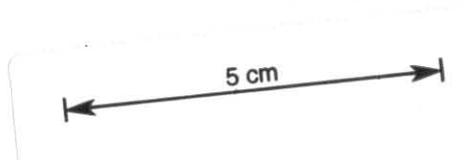


Figure 3. Salinity testing of soil samples, Port Arthur boreholes.



APPENDIX 1

Port Arthur drilling

Logging of boreholes has been carried out in accordance with the 'Explanation sheet for engineering logs', but with the modifications noted below.

Graphic log symbols: Symbols used are as noted on the explanation sheet, with the additional symbols below:

-  Brick fragments
-  EW Triassic sandstone
-  Clay
-  Mottled clay
-  Locally mottled clay
-  EW dolerite

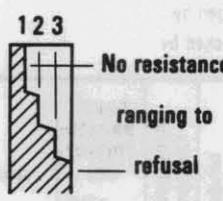
Colour: Where followed by code number, soil colour is in accordance with 'Revised Standard Soil Colour Chart, 1971'.

Materials: Other abbreviations used are:

- F, M fine, medium grained; sand only
- WS, PS well, poorly sorted; sand, gravel only
- 'trace' 0-5% visually estimated
- 'some' 5-12% visually estimated

EXPLANATION SHEET FOR ENGINEERING LOGS

Borehole and excavation log

Penetration	Water	Notes - samples and tests	Material classification
	 <p>22 Jan, 80 Water level on date shown.</p> <p>Water inflow.</p> <p>Water outflow.</p>	<p>U50 Undistributed sample 50mm diameter.</p> <p>D Disturbed sample.</p> <p>N Standard penetrometer blow count for 300mm.</p> <p>N* SPT + sample.</p>	<p>Based on Unified Soil Classification System.</p> <p>In Graphic Log materials are represented by clear contrasting symbols consistent for each project.</p>

Moisture content

D	Dry, looks and feel dry.
M	Moist, no free water on hand when remoulding.
W	Wet, free water on hand when remoulding.
LL	Liquid limit.
PL	Plastic limit.
PI	Plasticity Index.

eg. $M > PL$ - Moist, moisture content greater than the plastic limit.

Consistency

		hand penetrometer (kPa)
VS	Very soft.	< 25
S	Soft.	25 - 50
F	Firm.	50 - 100
St	Stiff.	100 - 200
VSt	Very stiff.	200 - 400
H	Hard.	> 400
Fb	Friable.	

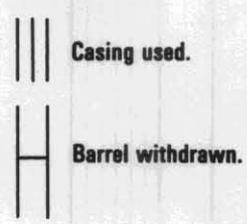
Notes: X on log is test result
 — is range of results.

Density index

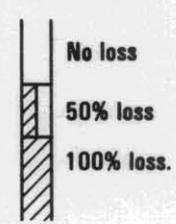
		%
VL	Very loose.	0 - 15
L	Loose.	15 - 35
MD	Medium dense.	35 - 65
D	Dense.	65 - 85
VD	Very Dense	85 - 100

Cored borehole log

Case - lift



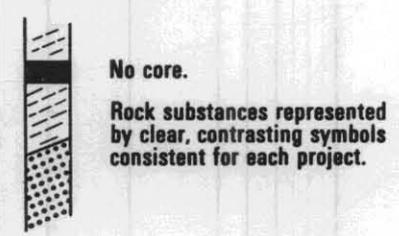
Fluid loss



Lugeons

Lugeon units (μL) are a measure of rock mass permeability. For a 46 to 74mm diameter borehole 1 Lugeon is defined as a rate of loss of 1 litre per metre per minute. 1 Lugeon is roughly equivalent to a permeability of 1×10^{-4} mm/sec.

Graphic log



Weathering

Fr	Fresh.
SW	Slightly weathered.
HW	Highly weathered.
EW	Extremely weathered.

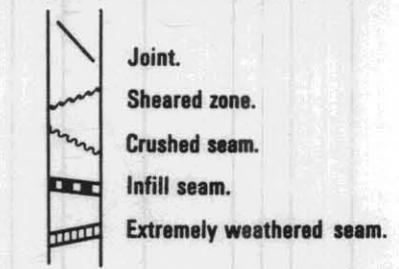
Strength

		point load strength index $I_{5(50)}$ (MPa)
EL	Extremely low.	< 0.03
VL	Very low.	0.03 - 0.1
L	Low.	0.1 - 0.3
M	Medium.	0.3 - 1
H	High	1 - 3
VH	Very high.	3 - 10
EH	Extremely high.	> 10

Note: X on log is test result.

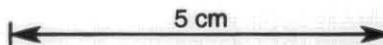
Significant defects

Significant defects shown graphically.



ENGINEERING LOG - BOREHOLE

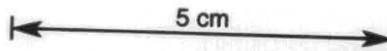
7/19



borehole no. 1
sheet 1 of 1

project		PORT ARTHUR RESTORATION			location		North-west of Hospital			
co-ordinates		See Figure 1.			drill type		hole commenced 8/9/81			
R.L.					drill method		hole completed			
inclination					drill fluid		drilled by			
bearing							logged by			
							checked by			
penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer	structure, geology
									kPa	
						Hole not logged				
						drilling unsuccessful				
						- on hard dolerite				

ENGINEERING LOG - BOREHOLE



9/19
 borehole no. 3
 sheet 1 of 1

project *PORT ARTHUR RESTORATION*

location *Solitary Prison, 8.3m W of SE corner, 1.5m out from wall*

co-ordinates *See map*

drill type *Gemco 210A*
 drill method *50mm x 60mm drive tube ahead of 100mm augering*
 drill fluid *None*

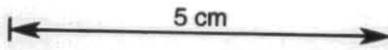
hole commenced *8.9.81*
 hole completed *8.9.81*
 drilled by *G. Hasell*
 logged by *W.C. Cramer*
 checked by

R.L.
 inclination *Vertical*
 bearing -

penetration 1 2 3	support water	notes samples, tests	metres		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
			R.L.	depth							
		50mm x 0.25m		0.5	SPS	organic silty SAND, dark grey to black, sand FWS. many fine roots	M	L to MD			FILL
		0.25m		0.28m	SC	clayey SAND; brown with local faint mottlings of yellowish brown	M-W				
		0.28m		0.18m	SM to GW	sandy SILT, brownish black (104R2/3) with trace pink-orange brick fragments (up to 15mm). some irregular patches of silty gravel (brick fragments and silt matrix). Gravel locally to brick gravel, poorly sorted	M	FB			
		0.18m		0.21m	SP, locally SW		M	St			
		0.21m		1.5		SAND, grey blue - orange brown WS, with trace pink-orange and cream white brick fragments (up to 10mm). Trace silt. Brick apparently absent below 0.6m. Occasional EW sandstone fragments (up to 25mm), friable + micaceous	> PI to 2.2m				Truncated? soil profile developed on dderite; grading from B horizon through CB to C horizon
		0.16m		0.26m	CH	CLAY, dark brown (2.544/3) grading at 1m to yellowish brown (104R5/6), and below 1.2m to patchy and locally mottled dark brown (2.544/4) and bluish grey. High plasticity, high dry strength. Some rotten wood fibres and roots.	?				
		0.26m		0.30m	CL	below 2.2m	M < PI				
		0.30m		2.5		Below 1.6m, mainly grey blue; below 1.8m, greying clays (bluish grey) decrease to mottling. Trace dderite feature developed below 2m; grade to EW dderite					
		0.20m		3.0		Drive tube refusal at 2.9m in EW dderite					

50mm CLAM G PVC tube 0-2.9m NOT ENGAGED

* All samples undisturbed. Figure indicates length of core removed from each run



ENGINEERING LOG - BOREHOLE

project **PART ARTHUR**

location **ASYLUM, 1.5m N of NW corner.**

co-ordinates *See map*
R.L. *Approx 11m AMSL*
inclination *Vertical*
bearing *-*

drill type *Geuco 210A*
drill method *50mm x 60mm drive tube*
ahead of 100mm auger
drill fluid *None*

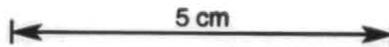
hole commenced *9.9.81*
hole completed *9.9.81*
drilled by *G. Hazell*
logged by *W. Crowar*
checked by *-*

penetration 1 2 3	support water	notes samples, tests*	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
			0.24m		SM to GW	Organic silty SAND, dark brown (10YR 3/4), many fine roots, sand F, with trace pink brick* fragments, these locally abundant (up to 15mm) grading to brick gravel below 0.1m, fragments pink and cream-white. Trace clay. [Possibly brick dust fill from coal mines]	M	L-MD		Organic O soil horizon FILL
			0.20m							FILL, partly derived from wind-blown sand
			0.25m		SP to GP	SAND, dull yellow orange (10YR 7/7), F-M, WS, well-rounded, high sphericity, trace VF dark minerals, with trace and locally abundant pink orange and cream white brick fragments (angular, up to 25mm)	M < PI	St		FILL
			0.1m			Gravelly SAND, mainly reddish brown (5YR 4/6) M quartz sand with VF-F brick fragments, some friable				FILL
			0.1m		CH to CL	CLAY, mainly yellowish brown (10YR 5/8) with local mottles and patches of greyish blue (7.5Y 6/2); high plasticity, probably of detrital origin. Below 0.9m, mainly yellowish brown (10YR 5/8) with mottles and patches of brown (10YR 4/4). Charcoal (up to 20mm) locally abundant; some rotten root stems (10mm in diameter). Trace sand, grading locally to moderate plasticity sandy clay	M < PI	St, locally Fb, L		FILL ?
			0.30m							B, CB and C soil horizons developed in Swainie detrite
			0.20m							
			0.13m							
			0.2m			Interval of no core. Drive tube refusal, probably on broken brick fill. Augered ahead to 1.6m. Some brick below this level may have been pushed by auger down from above				
			3.0		CH to GE	CLAY, brick fragments; clay as above; some sand and friable sandstone fragments up to 20mm. Probably not in situ.				
					CH	CLAY, mottled dark brown (7.5Y 4/3), yellowish brown (10YR 5/8), red and black. Trace charcoal (up to 20mm); high plasticity. Below 1.8m, mainly dark blue brown (2.5Y 3/3) weakly mottled with yellowish brown (10YR 5/8); trace rotten plant stems. Trace broken brick at 1.9m; 2.1m probably contamination				
					CH	CLAY, dark greenish grey (7.5G 4/1) streaked with white, soft weathered yellowish?; high plasticity. Below 2.6m, mainly blue brown (2.5Y 4/4) weakly mottled with yellowish brown (10YR 5/8) and dark greenish grey (7.5G 4/1); high plasticity; grading at 2.7m to EW textured <u>DEBRITE</u>				
						Drive tube refusal in EW detrite at 2.7m.				

* All samples undisturbed; figure indicates sample core recovered in each run

FILL

ENGINEERING LOG - BOREHOLE



12/19

borehole no. 6
sheet 1 of 1

project PORT ARTHUR

location on slope between hospital and Smith o'Brien's cottage; 17.9m W of o'Brien's signpost; 22.3m E of hospital corner.

co-ordinates See map

R.L. 23m AMSL approx
inclination Vertical
bearing -

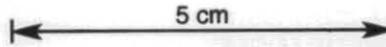
drill type Geico 210 A
drill method 50mm x 600mm drive tube ahead of 100mm auger; 0-1.2m
drill fluid 1.2-1.6m: NMLC diamond drill
None

hole commenced 10.9.81
hole completed 10.9.81
drilled by G. Hazell
logged by W. Corrier
checked by

penetration 1 2 3	support water	notes samples tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
	50mm x 600mm drive tube NMLC core; (dry drilling)	50mm clear PVC tube 0-1.2m NOT ENCASED								
		50mm x 0.23m CORA	0.5		SM	Organic sandy SILT, dark brown (10YR3/3); sand fraction F, WS. Many fine roots. Below 0.4m, occasional EW weakly consolidated - friable light yellow Tertiary sandstone fragments (up to 15mm), and trace clay.	M	L-MD		0 soil horizon on FILL
		0.18m			SM		W	L-MD		FILL
		0.23m	1.0			Silty SAND, mottled and streaked olive brown (2.5Y4/4), yellowish brown (10YR5/6) and light blue grey. Occasional HW-EW yellowish brown friable Tertiary sandstone fragments (up to 20mm), trace clay and hard pink-white brick fragments (eq at 0.20m). Trace root fibres. Sand F-M, well-sorted, iron-stained, probably derived from Tertiary sandstone	M	St		Soil profile developed on Jurassic dolerite, from Bfc.9 horizon through C3 to C horizon
		0.30m					> PI	Vst		
		0.60m	1.5		SM	Silty SAND and sandy SILT, as above, but higher clay content, and mottled brown (10YR4/4), brown (7.5YR4/6) and moist dark reddish brown (2.5YR3/4). Occasional HW-EW dolerite pebbles (up to 10mm), and locally unit grades to gravelly sandy silt. Trace root fibres and fine quartzite gravel	M	St-F6		
			2.0			CLAY, mainly brown (10YR4/6) mottled in places with yellowish brown (2.5Y5/4). Trace fine root fibres. High plasticity. Occasional light yellow mottling. Below 0.9m, trace dolerite texture with fine dolerite grains				
						DOLERITE, mottled as above, EW, medium ground, locally grades to gravelly clay with small dolerite grains; some HW dolerite kernels.				
						<p>Hole stopped at required depth, 1.8m, in EW dolerite.</p>				

* All samples undisturbed; figure indicates length core reported. Horizontal line separates run lengths.

FILL



ENGINEERING LOG - BOREHOLE

project *PORT ARTHUR*

location *CHURCH, SW CORNER, 1.8m W of turret*

co-ordinates *See map*

drill type *GEMCO 210A*

hole commenced *10.9.81*

R.L. *15M AMSL approx.*

drill method *50mm x 600mm drive tube ahead of 100mm augering*

hole completed *10.9.81*

inclination *Vertical*

drill fluid *NONE*

drilled by *G. Hazell*

bearing *-*

logged by *W. Cramer*

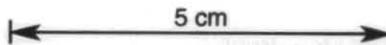
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penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
		<i>50mm x 0.26m CORE</i>			<i>ML</i>	<i>Organic sandy SILT, brownish black (10YR2/3), many root fibres; Below 50mm, organics decrease, trace weak mottling with dark brown (10YR3/3), grey and pale yellow, occasional pale yellow EW friable fragments of micaceous Triassic sandstone (up to 20mm). Locally grades to sand (EW sandstone); trace EW detritic pebbles and angular fragments (up to 10mm)</i>	<i>M</i>	<i>MD</i>		<i>Organic O and Ah soil horizon developed on FILL</i>
		<i>0.27m</i>	<i>0.5</i>				<i>M</i>	<i>St</i>		
		<i>0.13m</i>			<i>CL</i>	<i>Silty CLAY, mottled as above, with trace charcoal, and ironstone fragments (up to 3mm). Clay content increases with depth.</i>	<i>M</i>	<i>1St</i>		<i>Truncated? soil horizon developed on Jurassic detritic;</i>
		<i>0.12m</i>	<i>1.0</i>							<i>[Be, h, g horizon at 0.4m grading through CB horizon at about 2.4m to C horizon near 3.0m]</i>
		<i>0.16m</i>	<i>1.5</i>		<i>CL</i>	<i>CLAY, mottled as above, with trace ironstone fragments (up to 10mm) grading locally to gravelly clay. Trace pale yellow EW sandstone (producing mottling); trace - same charcoal and - crack - low plasticity. lower boundary gradational.</i>				
		<i>0.11m</i>								
		<i>0.20m</i>	<i>2.0</i>							
		<i>0.21m</i>			<i>CH</i>	<i>CLAY, mainly brown (10YR4/6) mottled with brown (10YR4/4), high plasticity, trace very fine root fibres.</i>			<i>St, locally FB</i>	
		<i>0.26m</i>	<i>2.5</i>			<i>Below 0.9m, mottled yellowish brown (10YR5/2), olive brown (2.5Y4/4) and dull yellow (2.5Y6/4), with latter colour more dominant with depth.</i>				
		<i>0.30m</i>	<i>3.0</i>		<i>CL</i>	<i>Below 1.1m, mainly grayish olive (2.5Y6/2) mottled with yellowish brown (10YR5/8). Grades to: DOLOMITE, mainly olive yellow (5Y6/3) mottled with yellowish brown (10YR5/8), EW, moderate plasticity, with irregular sub-horizontal seams infilled with cream, high plasticity (M>PI) clay. Relict detritic texture (fine grained) increasingly apparent with depth.</i>				
						<i>Hole stopped at required depth of 3.0m. in EW detritic. No refusal</i>				

** All samples undisturbed; figure indicates depth core removed in each 0.30m run.*

FILL

ENGINEERING LOG - BOREHOLE



14/19

borehole no. 8

sheet 1 of 1

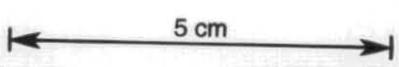
project		location			
PART ARTHUR		CHURCH, NE CORNER, 1.5m N of tunnel			
co-ordinates		drill type		hole commenced	
See map		GENCO 210A		10.9.81	
R.L.		drill method		hole completed	
15m AMSL approx.		50mm x 600mm drive tube		10.9.81	
inclination		drill fluid		drilled by	
Vertical		None		G. Hazell	
bearing				logged by	
-				W. Crowder	
checked by					

penetration	support	water	notes samples, tests	metres		graphic log	classification symbol	material	moisture condition	consistency	density index	hand penetr- ometer kPa	structure, geology
				R.L.	depth								
1 2 3			50mm x 0.20m CORE		0.5		ML	organic, SILT, dark brown (10YR 3/3) with trace fine gr. quartz sand, some angular slightly weathered doleritic pebbles, fragments (up to 50mm), many fine roots; some irregular patches of pale yellow sand (fractile EW Tertiary micaceous sandstone); trace charcoal (up to 3mm)	M	MD			Organic O and Ah soil horizon in FILL
			0.20m						M	St			
			0.13m				CL		M	> PI			Truncated? soil horizon developed on Tertiary dolerite
			0.30m		1.0			Silty CLAY, mainly dull yellowish brown (10YR 4/3) mottled with yellowish brown (10YR 5/8) and brown, trace charcoal (up to 2mm) and F sand, with some small (5mm) patches of light yellow sand; trace root fibres; low plasticity		VSt			[Bh, fc, g horizon grading through CB horizon to C horizon below 1.5m approx.]
			0.22m		1.5		CH	CLAY, mottled drab brown (2.5Y 4/3), yellowish brown (10YR 5/6) and blue-grey; high plasticity, trace root fibres.	M	St,			
			0.21m					Below 0.6m, mainly grey-blue mottled with yellowish brown (10YR 5/8); trace rotten root fibres and some irregular steeply dipping - subhorizontal 2-5mm seams filled with cream-white high plasticity (M > PI) clay		locally Fb			
			0.30m		2.0			Below 1.3m approx, relic doleritic texture (fine grained) apparent					
			0.27m				CL						
					2.5			DOLERITE, mottled grey-blue and yellowish brown, as above; EW, low-medium plasticity, fine-medium grained					
					3.0			Drive tube refusal at 2.4m in EW dolerite					

* All samples undisturbed; figure indicates length core removed in each 0.30m run

FILL

15/19

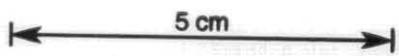


borehole no. 9
sheet 1 of 1

ENGINEERING LOG - BOREHOLE

project	PORT ARTHUR RESTORATION		location	North side of Asst. Surgeon's Cottage	
co-ordinates	See Figure 1		drill type	Gemco 210A	
R.L.			drill method	drive tube and auger	
inclination	vertical		drill fluid		
bearing			hole commenced	14/9/81	
			hole completed	14/9/81	
			drilled by	G. Hasell	
			logged by	P.C. Stevenson	
			checked by		

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
			0.12		Organic sandy clay dark brown	M			
			0.4		Dark brown sandy clay, with brick and sandstone fragments.				Fill
		Tube samples	1.0		Brown mottled soft clay, rootlets with occasional dolerite pebbles.	M	CH		Dolerite derived soil
		inflow	1.30		Grey sandy clay	M			
					Auger refusal on ?dolerite				Bedrock



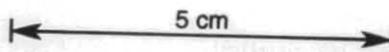
ENGINEERING LOG - BOREHOLE

borahole no. 10
sheet 1 of 1

project PORT ARTHUR RESTORATION location South-east corner of Asst. Surgeon's cottage
co-ordinates Fee Figure 1. drill type Gemco 210A hole commenced 14/9/81
drill method drive tube and auger hole completed 14/9/81
R.L. inclination vertical drilled by G. Hasell
bearing logged by P.C. Stevenson
checked by

penetration 1 2 3	support water	notes samples, tests	metres		classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
			R.L.	depth						
					OH	Organic soil dark brown	M			Fill
					SC	Yellow clay with sandstone fragments	M			
					OH CH	Dark brown mottled sandy organic clay	M F			Old soil horizon
			1.0		CL CH	Yellow-brown gritty clay some contamination from organic soil	M F S			Dolerite soil
			2.0							
			2.3			Refusal				?Bedrock dolerite

OPEN HOLE
no water
tube samples



17/19

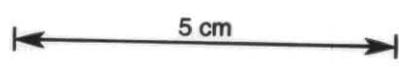
11
borehole no.

1
sheet 1 of 1

ENGINEERING LOG - BOREHOLE

project	PORT ARTHUR RESTORATION		location	South-west of Asst. Surgeon's cottage	
co-ordinates	See Figure 1.		drill type	Gemco 210A	
R.L.			drill method	drive tube and auger	
inclination	vertical		drill fluid		
bearing			hole commenced	14/9/81	
			hole completed	14/9/81	
			drilled by	G. Hasell	
			logged by	P.C. Stevenson	
			checked by		

penetration 1 2 3	support water	notes samples, tests	metres		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
			R.L.	depth							
	OPEN HOLE no water	tube augered				SC	Organic soil dark brown	M			Soil profile on dolerite
						CL CH	Yellow-brown clay	M	F.S		
			1.0			Yellow-brown clay		S			
			1.4			End of hole	M				



borehole no. 12
sheet 1 of 1

ENGINEERING LOG - BOREHOLE

project	PORT ARTHUR RESTORATION		location	South of Chaplain's Cottage	
co-ordinates	see Figure 1		drill type	Gemco 210A	
R.L.			drill method	drive tube, auger and diamond	
inclination	vertical		drill fluid	water	
bearing			hole commenced	14.9.81	
			hole completed	14.9.81	
			drilled by	G. Hasell	
			logged by	P.C. Stevenson	
			checked by		

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
			0.12	x	O	Organic soil, brick fragments				Top soil
					CL	Yellow-brown clay	M	F		Soil profile on
			1.0		CH					
			1.2			Yellow-brown gritty clay	M	F		dolerite
			1.8		GC					
			2.0			Yellow-brown gritty clay	W	S		
			2.4							
						~30 mm dolerite fragments	W	HW		dolerite bedrock very fractured
			3.0							SW
			4.0							HW
			4.5			End of hole				

APPENDIX 2

Chemical analysis of water sample

Registered No.	814173
pH	6.4
Conductivity ($\mu\text{S}/\text{cm}$)	560
<i>Item</i>	<i>mg/l</i>
CO_3	nil
HCO_3	280
Cl	50
SO_4	26
SiO_2	44
Ca	14
Mg	20
Fe	<0.1
Al	<0.2
K	0.8
Na	105
Hardness - permanent	Nil
- temporary	115
Alkalinity as CaCO_3	230
Total dissolved solids	105

Locality : Borehole 12, Port Arthur

Analysis by Department of Mines laboratory, Launceston