DEPARTMENT OF MINES
SOUTH AUSTRALIA

RB 66/72

COMMONWEALTH LAW COURTS BUILDING

GEOLOGICAL INVESTIGATIONS - PROGRESS REPORT NO. 1

DESIGN STAGE

TA 453, Hd. Adelaide

Client: Commonwealth Department of Works

by

J.H. FRYAR
GEOLOGIST
ENGINEERING GEOLOGY SECTION

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12th March, 1968

Rept. Bk. No. 66/72
G.S. 3934
D.M. 1725/67

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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INTRODUCTION

Foundation investigations for the proposed Commonwealth Law Courts Building were requested in a letter dated 3rd November, 1967, from the Acting Director of Works.

The proposed building will be about 130ft. long and 100ft. wide. No other details are available but it is understood that it will be multi-storey.

Footing types under consideration include bored piers and a shallow raft structure.

The investigation consisted of four cable tool drill holes, each about 60ft. deep at the corners of the proposed building (Fig. 1). The holes were tube sampled throughout, with sealed tube samples taken in Hole C.H.3 at intervals of about 5ft. The holes were extended to 92ft., 70.5ft., 70ft. and 64ft. respectively by diamond drilling.

Geological logs of the holes are included as Figs. 3 to 6. Levels shown on the logs are based on contours shown on the City of Adelaide 4 chains to 1 inch plan, and are accurate only to the nearest foot.

Results of holes CH1 and CH4 are summarised on Fig. 2.

This report discusses the results of the drilling and also includes relevant information gained from drill holes and excavations elsewhere in the city area.

SITE GEOLOGY

Soil and Rock Types

The results of the drilling in the four holes indicate a rather uniform near-horizontal succession. This is summarised in Table 1:

TABLE 1

Depth (ft.) From	To	Age	Unit	Description
0	2			FILL material, sand and gravel mixture.
2	6	PLEISTOCENE TO RECENT	HINDMARSH CLAY	CLAY SOIL, medium plasticity, containing slight amounts of lime sand and gravel.
6	30			CLAY SOIL, high plasticity, mainly grey, red brown, and ochre yellow mottled, with considerable amounts of earthy lime in pockets.
30	39			SAND, coarse to medium, with excess clay fines. Consists mainly of quartz grains. Yellow and red brown, mottled.
39	52			CLAY SOIL, high plasticity, grey-green with yellow mottling, limy near its base.
		Erosion Surface		
52	82	UPPER PLIOCENE	HALLETT COVE SAND-STONE	SANDSTONE, fine grained, fossiliferous, white to buff with calcareous cement. The upper 5 to 10ft. occurs as lime gravel with approximately 40% clay in pockets sometimes completely surrounding sandstone fragments. Several solution cavities up to 50mm. size occur parallel to joints or to indistinct horizontal bedding. Limonite staining occurs near its base.
82	92	OLIGO-CENE	PORT WILLUN-GA BEDS	SILT SOIL, low plasticity, grading from ochre yellow to dark grey. Fossiliferous, glauconitic, limy.

From other drill holes in the site area, particularly at the Adelaide Central Market (Ref. 1) and at the P.M.G. Communications Building, Waymouth Street (Ref. 2) it is known that Pt. Willunga beds are underlain by Blanche Point Marls of Oligocene age to depths up to 150ft.

Holes 1, 2 and 3 suggest two distinct layers in the Hallett Cove Sandstone, as follows:-

Layer A

This is the upper 5 to 10ft. and consists of about 50% strong white calcareous sandstone separated by pockets of firm clay up to 10cm. diameter and few clay beds up to 5cm. thick. There are also some vertical joints present.

This layer probably represents a weathered zone at the top of the sandstone.

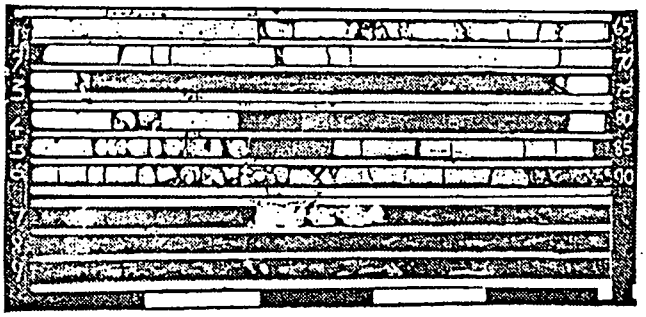
Layer B

This is about 20ft. thick and is dense calcareous sandstone containing irregular solution cavities and numerous near-horizontal fractures. There are also a few near-vertical cemented joints. Solution cavities are concentrated along these joint planes. Weak limestone gravel bands also occur, ranging in thickness from 0.5 to 2ft. Core losses probably represent cavities in the limestone or lenses of sandy material washed away during drilling.

Groundwater

The main groundwater table was cut within the Hallett Cove Sandstone at about 58ft. below ground level. In CH2, at 41ft., water was cut at the base of the sand horizon within the Hindmarsh Clay. Dampness was recorded in the other holes at about

PLATE I



30559.

COMMONWEALTH LAW COURTS BUILDING

DIAMOND DRILL CORE

HOLE C.H. 1

PLATE 2

30560.

COMMONWEALTH LAW COURTS BUILDING

DIAMOND DRIL CORE

HOLE C.H. 4

35ft. (within the sandy horizon) but there was no inflow. Minor quantities of water were noticed in the upper clay horizons between 6 and 18ft. below the ground surface. This water was probably from a "perched" water table associated with "gilgai" structures in the expansive clays as discussed below.

DISCUSSION

Hindmarsh Clay

Drilling results and experience at other sites, suggest that these clays are fairly uniform in lateral extent (Fig. 2). They are highly plastic (CH) soils, mainly very stiff, at moisture contents close to the plastic limit.

The clay is intersected by two sets of near-vertical joints roughly at right angles to each other, spaced about 0.2ft. apart, which tend to divide the mass into a series of vertical columns. Other less regular low dipping (30° to 45°) joints occasionally occur.

The upper 6 to 18ft. of clay is limy and is considerably weaker than the underlying clay. It is probable that the upper surface of the clay is irregular and deformed into a series of mounds and depressions (gilgai structures, Ref. 3). These depressions often contain pools of perched groundwater.

The sand and clayey sand horizon about 30ft. below the ground surface is dense to medium dense.

Hallett Cove Sandstone

Hole 1, the only hole to penetrate to the base of the formation, showed a total thickness of Hallett Cove Sandstone Formation of 29ft.

Observations at other sites in the city and as indicated by the variations between each drill hole at the site, especially Hole 4, show that the sandstone is extremely variable both laterally and vertically. The rock substance ranges from very weak to strong (Table 2), and the rock mass may be weakened by joints, solution cavities, clay seams or pockets, or lenticular beds of sand.

The upper surface of the sandstone is also highly irregular in shape. Buried erosional pinnacles and sink holes are common. One large sinkhole approximately 20ft. in diameter was discovered during pier boring at the Public Library Site, Kintore Avenue, (Ref. 4).

CONCLUSIONS

The following conclusions are based on drilling results, and experience elsewhere in the city area:-

Pier Foundations

.... Auger drilling is feasible through the Hindmarsh Clay Formation. Casing is generally required as any water cut can weaken the clays and cause collapse (Ref. 2).

.... Belling in Layer A by machine has not been possible and hand mining methods have been used.

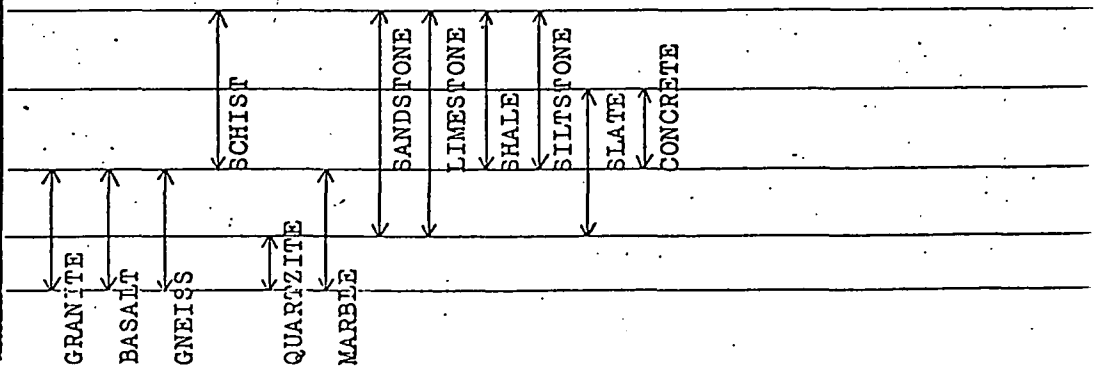
.... Piers could be founded in the Hallett Cove Sandstone Formation, probably at the top of Layer B. The presence and thickness of sandstone suitable for pier foundations should be confirmed at each pier site either by drilling before construction starts or by visual examination and drilling at each pier base during construction (Ref. 5).

TABLE 2

	TERM	ABBREVIATION	UNCONFINED COMPRESSIVE STRENGTH (Kg/sq.cm)*
SOIL PROPERTIES Disintegrates, or can be remolded, in water.	Very soft (clay)	VS	less than 0.25
	Soft "	S	0.25 - 0.5
	Medium "	M	0.5 - 1.0
	Stiff "	St	1.0 - 2.0
	Very Stiff "	V.St	2.0 - 4.0
	Extremely stiff clay	E.St	greater than 4.0
	Boundary Zone Substances		
ROCK PROPERTIES Do not disintegrate, cannot be remolded, in water.	Very weak (rock)	VWR	less than 70
	Weak "	WR	70 - 200
	Medium Strong "	MSR	200 - 700
	Strong "	SR	700 - 1800
	Very strong "	VSR	greater than 1800

*The rock substances are fresh (unaffected by decomposition) samples, tested to A.S.....Ref. H..... For rocks showing planar anistropy, the long axis of the samples is normal to the fabric planes.

Range of strengths of some Common Rock Substances, in the Fresh State



.... Cement grouting has been used in an attempt to strengthen the Hallett Cove Sandstone. Generally it has been of doubtful value due to clay and fine sand in joints and cavities, preventing the penetration of grout. The grout takes can vary considerably depending on the number of solution cavities and fissures intersected.

Raft Foundations

The clays at depths greater than 18ft. below ground surface, are generally very stiff, and it should be possible to utilize them for a raft foundation. At higher levels there is likely to be a greater degree of lateral variation in type of soil, moisture content and strength.

Basement Excavation

This could be readily carried out in the Hindmarsh Clay Formation by mechanical equipment. The joints control the overall strength of the clay, which may be significantly lower than that obtained in the laboratory by testing of small clay samples (Ref. 6). In most cases of failure of excavation walls in the city, failure has occurred along pre-existing joint planes. However in most of these failures water has been allowed to seep into the joints thus weakening the clay mass further. Seepage of perched water from gilgai structures is often a major cause of these failures. If the basement of the proposed building lies below the upper surface of the mottled clays, provision for permanent drainage of perched water is desirable.

FURTHER INVESTIGATION

If a basement is proposed it is considered desirable to explore the site further by means of several backhoe trenches up to 18ft. deep. These give a good sampling of near surface gilgai structures, with associated groundwater problems.

Joanne H. Fryar.

J.H. FRYAR
GEOLOGIST
ENGINEERING GEOLOGY SECTION

JHF:SMA
12.3.1968

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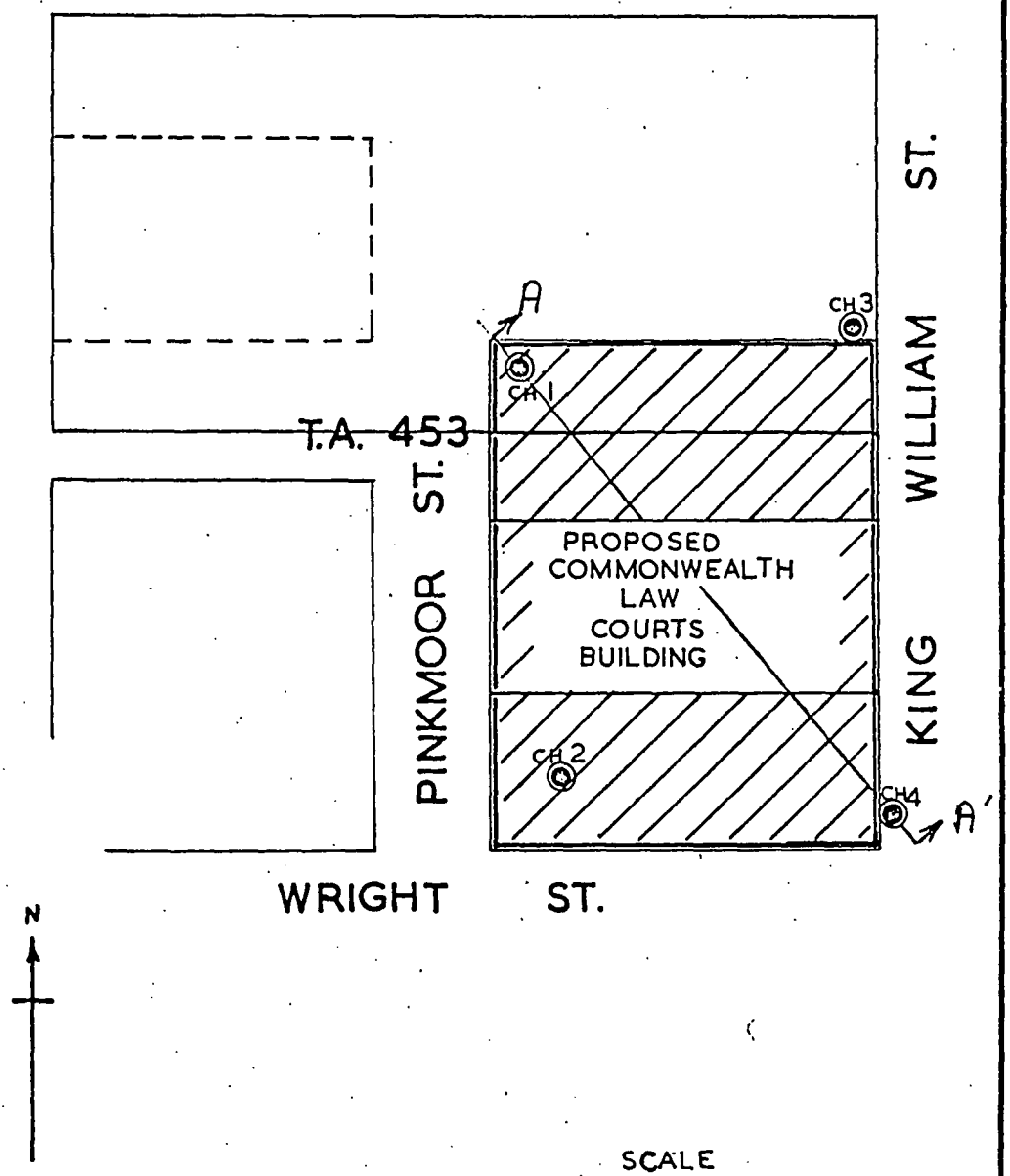

For Section A-A' see Dwg. No. 68-192

FIG 1

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
ENG. GEOL. SECTION	Drn JHF Tcd. K.T Ckd. WGK Exd. DS	COMMONWEALTH LAW COURTS BUILDING LOCALITY PLAN AND LOCATION OF DRILL HOLES	SCALE: AS SHOWN S 6416 Ha 6 DATE: 5 March '68

DEPARTMENT OF MINES – SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO. C.H.8
SERIAL NO 303/75

PROJECT ADELAIDE SUBWAY STUDY
FEATURE RECONNAISSANCE
LOCATION WELLINGTON SQUARE (S.E. Corner)
SEC Res. HD YATALA
CO-ORDS
El Collar m
El. Surface 46 m
Datum A.H.D.

GEOLOGICAL NOTES AND CLASSIFICATION	El. DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL Casing	MOISTURE CONTENT	Consistency Compact Density	FIELD TEST DATA BLOWS PER 30 cm (4 8 16 32 64)	SOIL TEST PENETROMETER U.C.S.
RECENT Recent Soil Profile — Silty Clay Topsoil.	0		CL	Clay soil, low plasticity, silty. With organic matter roots etc. Dark brown grading to lighter brown with lime lumps.		MC KPL	F		
Lime horizon.	1			Brown clay/silt soil with abundant lime, some hard lumps.					
	2								
PLEISTOCENE Hindmarsh Clay — Stiff Red Brown and Grey Clay. Contains some lime.			CH	Clay soil, high plasticity. Red brown colour. Some lime lumps. Slight grey mottling.		MC KPL	V.St		
	3								
	4			Mottled red brown & grey with lime patches.					
	5		CH	Mainly grey with some red brown.					
	6								
	7								
	8								
	9		CH	Mottled red brown, grey and yellow.			V.St		
	10								

WATER LEVELS: Water level (date) 7 Dec '66 — Casing

MOISTURE CONTENT: H – Humid; D – Damp; M – Moist; W – Wet; S – Saturated

CONSISTENCY (Clays): VS – Very Soft; S – Soft; F – Firm; St – Stiff; V St – Very Stiff

COMPACTNESS (Silts): L – Loose; MC – Moderately Compact; C – Compact; VC – Very

RELATIVE DENSITY (Sands): VL – Very Loose; L – Loose; MD – Medium Dense; D – Dense

TYPE OF SAMPLE: OPEN TUBE ..... A Shoe; ..... D Shoe; SEALED TUBE WITH NUMBER 1 2 3 4 5

* These values refer to clay soils only and provide an indication of their consistency

ENGINEERING GEOLOGY SECTION

DRILL NO 23
TYPE DM 500
DRILLER A. Sturak
START 15.7.74

LOGGED R.S.R.
DATE
TRACED D.W.W.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO. C.H. 8
SERIAL NO 303/75

PROJECT ADELAIDE SUBWAY STUDY
FEATURE RECONNAISSANCE
LOCATION WELLINGTON SQUARE (S.E. Corner)
SEC Res. HD YATALA
CO-ORDS
El Collar m
El Surface 46 m
Datum A.H.D.

GEOLOGICAL NOTES AND CLASSIFICATION	El. DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1965	WATER LEVEL	Casing	MOISTURE CONTENT	Consistency Compct Density	FIELD TEST DATA BLOWS PER 30 cm (4 8 16 32 64)	S (Penetrometer)
			CH							
Fine to medium Sand. Quartz sand. Some mica flakes.	11		SC	Sand excess clay fines. Fine to medium sand. Red brown & yellow colour.			D	M.D.		
			SM	Less clay. Silty Brown to off-white colour.						
	12			Mainly fine sand to silt.						
	13									
	14									
	15									
	16									
Sandy Gravel. Gravel mainly subrounded quartz pebbles. Quartz sand.	17		GP/SM	Poorly graded gravel with fine to medium grained silty sand. Gravel fragments 2-5 cm. Colour red brown to light brown colour.						
	18									
	19									
Marl. Calcareous clay/silt. Dark sand size pellets - glauconite	20		SC	Sand excess clay fines. Green colour. Grey clay/silt with some sand.				VC		

Carisbrooke Sand.

Blanche Point Marl.

FIELD TEST DATA:
- 34 (10.12.11)
- 26 (9.10.7)
- 25 (7.10.7)
- 25 (8.8.9)
- 27 (8.10.9)
- 27 (9.9.9)
- 18 (7.6.5)
- 37 (9.16.13)
- 33 (5.12.16)
- 75 (28.32.15)
- 40 (14.14.12)
- 51 (15.20.16)
- 57 (26.13.18)

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE
Water level (date) ▼ Dec. '66 Casing; WC ▶ Water Cut	H Humid; D Damp; M Moist; W Wet; S Saturated; LL Liquid Limit; PL Plastic Limit	VS Very Soft; S Soft; F Firm; St Stiff; V St Very Stiff; H Hard	Ls Loose; MC Moderately Compact; C Compact; VC Very Compact	VL Very Loose; L Loose; MD Medium Dense; D Dense; VD Very Dense	OPEN TUBE A Shoe, D Shoe; SEALED TUBE WITH NUMBER (A 1 2 3 4 5); STANDARD PENETRATION TESTS 9 12,3,4 Total blows for 0·3m (in 0·1m increments)

* These values refer to clay soils only, and provide an indication of their consistency

ENGINEERING GEOLOGY SECTION

DRILL NO 23
TYPE D.M. 500
DRILLER A. Sturak
START
FINISH

LOGGED BY R.S.R.
DATE
TRACED D.W.W.
CHECKED A.F.

SHEET 2 OF 4. DRG NO S11030a Ha5

PF No S6676 b MB

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO. C.H.B
SERIAL NO. 303/75

PROJECT ADELAIDE SUBWAY STUDY
FEATURE RECONNAISSANCE
LOCATION WELLINGTON SQUARE (S.E. Corner)
SEC Res. HD YATALA
CO-ORDS
El Collar m
El Surface 46 m
Datum A.H.D

GEOLOGICAL NOTES AND CLASSIFICATION	El	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL Casing	MOISTURE CONTENT	Consistency Compct Density	FIELD TEST DATA: BLOWS PER 30 cm (4 8 16 32 64)	SOIL TEST PENETROMETER *
Undifferentiated Tortachilla L/s and Blanche Point Banded Marl. / Blanche Point Transitional Marl.										
Marl. Calcareous grey clay/silt with glauconite grains.		21		ML/CL	Material mostly has soil consistency.			MC		T2(26.24.22)
More glauconite specks.		22								
		23								
Less glauconite Yellow Brown Marl.		24			Light yellowish colour. Material mostly soil properties some harder cemented bands.					
		25		ML/CL	Light yellow brown with some glauconite. Some harder bands.					
		26				WL 1.45 p.m. 22.7.74				Drilled
South Maslin Sands Upper Weathered Horizons?										
Sandy Clay Fe and manganese? stained.		27		CL	Sandy clay, low plasticity. Bright maroon colour.					
Clayey Sand.				SC	Sand excess clay fines Fine sand. Mottled orange, maroon & grey colour. Some hard Fe cemented lumps	WC 12 p.m.				
Quartz sand.		28								
		29			Fine sand. Less clay. Grey green colour.			MD		21(6.6.7)
		30								

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE
Water level (date) 7 Dec. '66 Casing; WC Water Cut	H — Humid; D - Damp; M — Moist; W — Wet; S - Saturated; LL — Liquid Limit; PL — Plastic Limit	VS — Very Soft; S — Soft; F — Firm; St — Stiff; V St — Very Stiff; H — Hard	Ls Loose; MC — Moderately Compact; C Compact; VC — Very Compact	VL Very Loose; L Loose; MD Medium Dense; D Dense; VD Very Dense	OPEN TUBE A Shoe, D Shoe; SEALED TUBE WITH NUMBER; STANDARD PENETRATION TESTS (2,3,4) Total blows for 0-3m

* These values refer to clay soils only and provide an indication of their consistency

ENGINEERING GEOLOGY SECTION

DRILL NO 23
TYPE DM 500
DRILLER A. Sturak
START
FINISH

LOGGED BY R.S.R.
DATE
TRACED D.W.W.
CHECKED A.F.

SHEET 3 OF 4. DRG NO 511030b Ha5

DEPARTMENT OF MINES -- SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO. C.H.8

SERIAL NO 303/75

PROJECT ADELAIDE SUBWAY STUDY

FEATURE RECONNAISSANCE

LOCATION WELLINGTON SQUARE (S.E. Corner)

SEC Res. HD YATALA

CO-ORDS

El Collar m

El. Surface 46 m

Datum A.H.D.

GEOLOGICAL NOTES AND CLASSIFICATION	El	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	Casing	MOISTURE CONTENT	Consistency Compact Density	FIELD TEST DATA: BLOWS PER 30 cm (4 8 16 32 64)	FIELD TEST PENETROMETER Unit *
South Maslin Sands				SC							
Grey to Black Fine Sands					Dark grey colour.					21(6.8.7)	
		31								22(7.7.8)	
		32								15(5.4.6)	
					Black colour. Fine sand.					31(8.11.12)	
		33								29(10.8.11)	
		34								27(7.11.9)	
										33(13.9.11)	
		35			END OF HOLE 34·80m.						

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE
7 Dec. '66 Casing; Water level (date); WC Water Cut	H Humid	VS - Very Soft	Ls - Loose	VL Very Loose	OPEN TUBE: A Shoe; D Shoe
	D — Damp	S — Soft	MC - Moderately Compact	L Loose	SEALED TUBE WITH NUMBER (A 1 2 3 4 5)
	M — Moist	F — Firm	C Compact	MD Medium Dense	STANDARD PENETRATION TESTS (0 1 2 3 4) Total blows for 0·3m (in 0·3m increments)
	W - Wet	St - Stiff	VC — Very Compact	D Dense	
	S - Saturated	V St — Very Stiff		VD Very Dense	
	LL — Liquid Limit	H — Hard			
	PL — Plastic Limit				

* These values refer to clay soils only and provide an indication of their consistency

ENGINEERING GEOLOGY SECTION

DRILL NO 23

TYPE D.M.500

DRILLER A.Sturak

START

FINISH 24.7.74

LOGGED BY R.S.R.

DATE

TRACED D.W.W.

CHECKED A.F.

SHEET 4 OF 4

DRG NO S11030c Ha5

LOG OF CABLE TOOL HOLE

PROJECT COMMONWEALTH LAW COURTS BUILDING
FEATURE FOUNDATIONS
LOCATION CRN. KING WILLIAM AND WRIGHT STS.
TOWN ACRE 453.
CITY OF ADELAIDE
CO-ORDS

NO CH.T.
SERIAL No.
R.L. Surface 252 FT.
R.L. Collar FT.
Datum M.S.L.

SOIL TYPE GEOLOGICAL DESCRIPTION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 1st Edition 1963.	WATER LEVEL	CORE %	MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOIL TEST PENETROMETER Tons/sq. ft. 1 2 3 4
PLEISTOCENE TO RECENT HINDMARSH CLAY	250			No Core.						
				Some fine jointing apparent. Rounded lime nodules up to 1m.m. Some lime gravel fragments. Black ironoxide fragments and lime pockets, prominent vertical jointing.						
	240		CH	CLAY SOIL. Medium to high plasticity decreasing with depth, red-brown, est. 5% lime sand up to 1mm. with rounded rare quartz grains.						
	10		CH	CLAY SOIL. High plasticity. Buff, khaki to green grey with increase in depth. Est. 40-50% earthy lime in pockets, and variable fine sand content.					7 Blows	4.5+
				Bioturbated clay and lime pockets. 20-50 mm.					12 Blows	
				15 to 30 ft. occasional lime pockets to 30 mm.					3 Blows	4.5+
	230			Prominent vertical jointing.						
	20			Grey green with distinct yellow mottling.					20 Blows	
				Sand is quartz grains Subrounded to rounded.						
				Isolated root fragments 3 m.m. dia. x 5 cm.						
				Sand is quartz. Subangular to angular. Iron stained.						
	220			Increasing red brown sand in pockets approx 5%.						
	30		Cl. Sc	SAND, excess clay and silt fines. Fines are high plasticity. Light grey with yellow and red mottling.			D		137 Blows	4.5+
			SC	SAND, excess clayey fines, fine to coarse grained. Est. 5% to 2 mm. diam. Red brown.			D			
				Sand is quartz. Rounded to subrounded.			M		19 Blows	
				Limit of Red mottling.			D			
	210			Grey with red brown and ochre yellow mottling increasing green-grey and white clay with depth.					29 Blows	4.5+
	40		CH	CLAY SOIL, high plasticity est. 5% sand slightly silty. Grey green with yellow mottling and some lime pockets near 52 ft.					25 Blows	
				Some lime pockets to 80 m.m.						
	200			Old Erosion Surface.					22 Blows	
PLIOCENE UPPER HALLETT COVE SANDSTONE				Marine, fossiliferous, fine grained, calcareous sandstone, white to buff coloured, hard and dense.						
			GC	GRAVEL; Excess clayey fines (highly plastic) est. 15% fines. Grey green clay pockets up to 10 cm. and occasional bands up to 50 mm.						
	190			Gravel is limestone.						
	60			Joint fragments up to 4 cm.						
				Solution cavities up to 10 m.m. diameter.						
				Core 0.1 to 1.8 ft. sticks, mainly 0.5 ft. Joints welded with cement and solution cavities are concentrated neo-joints.						
	180			Slightly to moderately weathered with limonite staining.						
	70			No Core		0				
				Solution cavities		100				
				No Core		0				
	170			Macro fossils.						
	80			No Core		100				
OLIGOCENE PT WILLUNGA BEDS			ML	SILT SOIL low plasticity, sandy. Ochre yellow to dark grey with gravel shell fragments. Dried core shows desiccation cracks.		100				
	160			Marine and estuarine soft glauconite and lime silt with gravel size shell fragments, and sand size glauconite. Grades to a black fossiliferous marl.						
	90			END OF HOLE 92 FT.						
	100									

Core % Lists

DRILL WATER RETURN — complete loss — FOR KEEPER — NO RETURN

DIAMOND DRILL

Clay is St. — v. St. — St. — V. St. — ≥ PL. — < PL.

WC

xx Jointing
Solution cavities

FIG

TYPE OF SAMPLE	CONSISTENCY	COMPACTNESS	RELATIVE DENSITY	MOISTURE CONTENT
A shoe (SA)	VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
D " (SD)	S — Soft	MC — Moderately Compact	L — Loose	D — Damp
E " (SE)	SF — Soft to Firm	C — Compact	MD-Medium Dense	M — Moist
G " (SG)	F — Firm	VC — Very Compact	D — Dense	W — Wet
Sealed Tube - A Shoe - SAL	F St. — Firm to Stiff		VD — Very Dense	S — Saturated
Standard Penetration Test - SPT	St. — Stiff			LL — Liquid Limit
	V.St. — Very Stiff			PL — Plastic Limit
	H — Hard			

Water level (date) 7 Dec. '68
WC Water cut
Casing

ENGINEERING GEOLOGY SECTION

DRILL No. 8.
TYPE RUSTON
DRILLER DR. PHILIPS
START 22-12-67
FINISH 4-1-68
SHEET 1 OF 1.
DRG No. S 6384 Hag

LOGGED BY J. FRYAR T. MOUNT
DATE 10-1-68
TRACED A McD
CHECKED L.V.W.

PF No. S 5026A

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO CH. 2.

SERIAL No.

PROJECT COMMONWEALTH LAW COURTS BUILDING — TOWNACRE 453

FEATURE FOUNDATIONS — CITY OF ADELAIDE

LOCATION CRN. KING WILLIAM AND WRIGHT STS. — CO-ORDS

R.L. Surface 252·2 FT.

R.L. Collar FT.

Datum M.S.L

SOIL TYPE GEOLOGICAL DESCRIPTION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 1st Edition 1963.	WATER LEVEL	MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P.T.R METER Tons/sq. ft. 1 2 3 4
PLEISTOCENE TO RECENT HINDMARSH CLAY	250		CH	No Core. Rare rounded quartz. Fine jointing apparent. Lime nodules to 5cm.		≥P.L.	st.	16 Blows	
	240		CH	CLAY SOIL, medium to high plasticity. Red brown Est. 5% lime sand, some rare quartz.					
	10		CH	CLAY SOIL, high plasticity Gray green with earthy lime pockets.				10 Blows	
	230			Iron oxides nodules and lime pockets, vertical jointing.		≤P.L.	v. st.	13 Blows	
	20			Several sets of jointing at angles of 60°-80°				16 Blows	
	220			Sand is quartz, sub-rounded to subangular.		DAMP		17 Blows	4·5+
				Sand is quartz, subangular and iron stained					
	30		CH/SC	SAND, excess clay and silt fines. Est. 10% fines have high plasticity. Light grey with yellow and red mottling (transitional)			D	26 Blows	
			SC	SAND, excess clayey fines. Red brown and fine to coarse grained.			MD	35 Blows	
	40			Grey with red brown and ochre yellow mottling. Increasing clay content with depth.			D		
	210			Limit of red mottling.				56 Blows	
			CH	CLAY SOIL, high plasticity slightly sandy Est. 5% Grey green with yellow mottling or occasional lime pockets, and soft claybonds.		≤P.L.	v. st.	26 Blows	4·5+
	50								
	200			Some lime pockets to 10cm				24 Blows	
UPPER PLIOCENE HALLETT COVE SANDSTONE				Old Erosion Surface.			st.		
			GC	GRAVEL. Excess clayey fines (highly plastic) rubbly off white lime with variable grey green silty clay pockets up to 10cm.					
	60			Gravel is limestone (20-30%)					
				Minor clay filled solution cavities.					
	190			Lime gravel with 20% clay matrix.					
	70			← Core pieces approx. 4 ft.					
				← Joints are vertical with horizontal fractures causing pieces from 1 to 1ft.					
				← 66 to 68 ft. Mottled limonite staining and numerous solution cavities up to 8mm. wide					
	180			END OF HOLE 70·5FT.					
	80								
	90								
	00								

Lifts — Core Recovery %

DRILL WATER RETURN — COMPLETE LOSS 2 FULL SECTION

DIAMOND DRILLING AMC Core

Jointing xxx

Solution cavities

FIG 4.

TYPE OF SAMPLE
A Vane (SA)
D " (SD)
E " (SE)
G " (SG)
Scalect Tube - A Shoe - SAT

Water level, (date) ▽ 7 Dec. '66
WCP
Water flit
Casing

CONSISTENCY
VS. — Very Soft
S — Soft
SF — Soft to Firm
F — Firm
F St. — Firm to Stiff
St. — Stiff
V St. — Very Stiff
H — Hard

COMPACTNESS
L — Loose
MC — Moderately Compact
C — Compact
V C — Very Compact

RELATIVE DENSITY
VL — Very Loose
L — Loose
MD - Medium Dense
D — Dense
VD — Very Dense

MOISTURE CONTENT
H — Humid
D — Damp
M — Moist
W — Wet
S — Saturated
LL = Liquid Limit
PL = Plastic Limit

ENGINEERING GEOLOGY SECTION

DRILL No. 8
TYPE Ruston
DRILLER D.R. PHILIPS
START 9-1-68
FINISH 10-1-68
SHEET 1 of 1

LOGGED BY J. FRYAR, T MOUNT.
DATE 15-1-68
TRACED AMCD
CHECKED L.V.W.
DRG. No. S 6385 HG.

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO CH 3

SERIAL No.

PROJECT COMMONWEALTH LAW COURTS

FEATURE FOUNDATIONS

LOCATION CNR. KING WILLIAM AND WRIGHT STS.

TOWN ACRE 453

CITY OF ADELAIDE

CO-ORDS

R.L. Surface 252·2 FT.

R.L. Collar FT.

Datum M.S.L

SOIL TYPE GEOLOGICAL DESCRIPTION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 1st Edition 1963.	WATER LEVEL	CORE RECOVERY	MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P'TR METER Tons/sq. ft. 1 2 3 4
Brick and sand topfill.	250			TOPFILL						
Fine surface jointing. Gravel is lime up to 3 cm. Fe staining along fine joints. Vertical jointing.			CH CL	CLAY SOIL, medium plasticity Red-brown, 8% Lime sand to 1mm. and 2% gravel, rounded rare quartz.			MC≈PL	st		
Fe oxide fragments and lime pockets. Bioturboted clay and lime pockets	240		CH	CLAY SOIL high plasticity Buff, khaki to green grey with increase in depth. Est. 40% earthy lime in pockets.			MC ≈ PL	st	8 blows 15 blows 18 blows	4·5+ 4·5+
Two sets of prominent joint planes, slickensided, openings up to 1mm. one at 45°, 2nd. at 70° to 80°.	20			Variable fine sand content.					16 blows	
Red mottling begins. Sand is iron stained quartz angular to subangular.	230			Grey green with distinct yellow mottling.				MD/V. st.	16 blows	
Sand is rounded quartz to 1mm.				Increasing red brown sand in pockets, approx 5%.						
Sand is quartz, subrounded. to sub-angular.	30 220		SC GC	SAND, excess clay and silt fines, fines are highly plastic. Light grey with yellow and red mottling.			D		65 blows	4·5+
			SC	SAND, excess clayey fines. fine to coarse grained Est. 5% to 2mm. dia. Red brown.			Damp		22 blows	
				Grey with red brown and ochre yellow mottling. increasing clay content with depth.					36 blows	
Limit of Red Mottling.	210 40		CH	CLAY SOIL, high plasticity. est. 5% sand. Grey green with yellow mottling, and some lime pockets nearing 51·5ft.			MC ≈ PL	st.	19 blows	4·5+
Hard lime nodules to 2cm.	50								25 blows	
Old Erosion Surface	200		GC	GRAVEL, excess clayey fines, (highly plastic) est. 15% fines. Grey green clay pockets up to 10cm. and occasional bands up to 5cms.	W.C.			Clay st.	21 blows	
Gravel limestone. Marine, fossiliferous, variable grain size up to 2mm. Strong rock.	60								DIAMOND DRILLED - NMLC core.	
Lime gravel to 2mm sand cemented with lime and clay fines.	190			Core sticks 0·1 to 6ft.						
Limonite mottling.	70			← Occasional cemented steeply dipping joints, 61 ft. to 66 ft.						
				No Core.						
UPPER PLIOCENE HALLETT COVE SANDSTONE. Marine, fossiliferous, very dense, off white, hard, fine grained sandstone, with lime cement and occasional rubbly zones.				END OF HOLE 70 FT.						
Jointing xxx	90									

FIG 5

TYPE OF SAMPLE	CONSISTENCY	COMPACTNESS	RELATIVE DENSITY	MOISTURE CONTENT	ENGINEERING GEOLOGY SECTION
A shoe (SA) D " (SD) E " (SE) G " (SG) Sealed Tube	VS. — Very Soft S — Soft SF — Soft to Firm F — Firm F St — Firm to Stiff St — Stiff	L — Loose MC — Moderately Compact C — Compact VC — Very Compact	VL — Very Loose L — Loose MD — Medium Dense D — Dense VD — Very Dense	H — Humid D — Damp M — Moist W — Wet S — Saturated	DRILL No. 8 TYPE RUSTON DRILLER D.R. PHILLIS START 12TH JAN '68. FINISH 14TH JAN '68.
Water level (date) Dec. '68 Casing Water Bore Water Level					LOGGED BY J FRYAR DATE 18TH JAN '68 DRAWN A.P.H. TRACED L.V.W.

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE NO: CH 4.
SERIAL No.

PROJECT: COMMONWEALTH LAW COURTS.
FEATURE: FOUNDATION
LOCATION: ADELAIDE

TOWN ACRE 453.
CITY OF ADELAIDE.
CO-ORDS

R.L. Surface 252·3 FT.
R.L. Collar FT.
Datum M.S.L.

SOIL TYPE / GEOLOGICAL DESCRIPTION	R.L. (FEET)	DEPTH	GROUP SYMBOL	SOIL DESCRIPTION / GROUP NAME (Unified Soil Classification, U.S.B.R. Earth Manual 1st Edition 1963.)	WATER LEVEL	MOISTURE CONTENT	Consistency / Compact. Density	FIELD TEST DATA: BLOWS PER FOOT (20 40 60 80) / SOILTEST P'TR'METER Tons/sq. ft. (1 2 3 4)
No Core	250							N.A.
Fine surface jointing.						D		
Iron oxide fragments and occasional lime pockets.		10	CH	CLAY SOIL, high plasticity khaki to grey green with yellow and red mottling. Est. 10% earthy lime in pockets variable fine sand content.		≤PL	St	8 Blows
Prominent vertical joints.	240							
Bioturbated clay.								8 Blows
Jointing at 70° with openings up to 1mm.	230	20						9 Blows
				Increasing red brown sand in pockets. Approx. 5%.		D	St / VSt	16 Blows
Highly plastic clay band.	220	30	CL / SC	SAND, excess clay and silt fines. Fines are highly plastic. Light grey with red and some yellow mottling.				32 Blows
Sand is quartz, subrounded to subangular.			SC	SAND, excess clayey fines. Fine to coarse grained. Est. 5% to 2mm dia. Red brown staining and mottling.		<<PL		82 Blows
	210	40	CH	CLAY SOIL, high plasticity est. 5% sand, slightly silty. Grey green with yellow mottling.	No Water Cut.	Damp	St.	32 Blows
						< PL		26 Blows
Old Erosion Surface		50						
Red and yellow mottled clay continues into limestone. Gravel is limestone. Marine fossiliferous. Fine to coarse grained, strong rock.	200		GC	GRAVEL, excess clayey fines (highly plastic) est. 15% fines. Grey green clay pockets up to 15cm and occasional bands to 8 cm.			clay is St.	63 Blows
			100					DIAMOND DRILLED NMLC core
			0	No Core.	Full return	Diamond Drill		
	190	60	100	Core lengths from 0·1 to ·4ft. Mainly ·1 to ·2ft. Numerous solution cavities up to 1cm in width. Rubbly zones with green clay pockets.				
				END OF HOLE 64 FT				
		70	Core recovery %	N.B. (Not proved 5 ft. of strong sandstone).				
		80						
		90						
		100						

Stratigraphic units (left margin):
- PLEISTOCENE TO RECENT "HINDMARSH CLAY"
- UPPER PLIOCENE "HALLETT COVE SANDSTONE" Marine fossiliferous, moderately weathered, off white, fine grained sandstone with lime cement, numerous rubbly zones.

Water level: Drill water return.

Legend (geological description column):
Jointing xxx
Solution cavities •

FIG 6

TYPE OF SAMPLE		CONSISTENCY.	COMPACTNESS	RELATIVE DENSITY	MOISTURE CONTENT
A shoe (SA)	Water level (date) 7 Dec. '66, Casing	VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
D " (SD)		S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F " (SF)		SF — Soft to Firm	C — Compact	MD — Medium Dense	M — Moist
[illegible] " [illegible]		F — Firm	V.C = Very Compact	D — Dense	W — Wet
		F.St — Firm to Stiff		VD — Very Dense	S — Saturated
		[illegible]			[illegible]

ENGINEERING GEOLOGY SECTION

DRILL No. 8.
TYPE RUSTON.
DRILLER PHILLIPS
START 19th JAN '68
FINISH 23rd JAN '68

LOGGED BY J. FRYAR
DATE 22 JAN '68
CHECKED [illegible]