Rep.Bk. No. 65/106
G.S. No. 3844

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

ENGINEERING DIVISION

250,000 GALLON ELEVATED TANK - BARMERA

GEOLOGICAL INVESTIGATIONS - PROGRESS REPORT NO. 1

FEASIBILITY STAGE

Crown Land, Barmera Township, Co. Hamley

Client: Engineering and Water Supply Department

by

W.R.P. BOUCAUT
SENIOR GEOLOGIST
ENGINEERING GEOLOGY SECTION

1st December, 1967

D.M. 1515/67

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INTRODUCTION

Construction of a 50ft. deep test hole at the site of a proposed 250,000 gallon capacity elevated tank at Barmera was requested in a letter dated 3rd November, 1967 from the Engineer-in-Chief following on discussions held with Mr. D. Flemings, Designing Engineer, Soils Section, E. & W.S. Dept.

The purpose of this hole was to determine the geological sequence beneath the proposed tank, and also obtain undisturbed samples of the various materials encountered, particularly the surface sand dune material which was known to be a "collapsing-soil".

The test hole was tube-sampled with a Mayhew Air-Rig with Power-Flow hydraulic thrust. The drilling technique is described in Appendix A. Sealed tube samples were forwarded to the E. & W.S. Laboratory for testing.

The position of the drill-hole is shown in Fig.1 and a log of the samples on Fig. 2.

REGIONAL GEOLOGY

The site lies within the Murray Basin. The succession in the area is:-

AGE	FORMATION	MATERIAL
Recent	Woorinen (Surface Sands Windblown in part)	Red-brown, limy-silty sand.
Pleistocene	Calcrete in Bakara Soil	Red-brown silty sand with rounded calcrete gravel fragments
	Blanchetown Clay (Lake Deposit)	Clay bound sand, red-brown
Pliocene	Loxton Sand (Lacustrine Deposit)	Sands, poorly graded.

Exposures and drilling throughout the area indicates that these materials occur in roughly horizontal beds.

SITE GEOLOGY

The site lies within the E. & W.S. Department Works Depot at Barmera (Fig. 1) and the surface is formed by a silty sand compacted by vehicular traffic to form a hard crust.

The drill hole showed about 12ft. of limy wind blown dune sand (Woorinen Formation) underlying the surface crust. Below 12ft. the clay content of the sand increases until between 14 and 20ft. it is estimated at about 40%. It is probable that this horizon represents a re-worked deposit on the top of the calcrete ho horizon, with the clay fines originating from erosion of the underlying Blanchetown Clay.

Below 20ft. the push tube was unable to penetrate further. The section between 20 and 25ft. was rotary air drilled and the blown cuttings recovered at the surface indicate at least 2ft. of calcrete in a limy clay sand soil (Calcrete in Barkara Soil) overlying a red-brown sand with excess clay fines (Blanchetown Clay).

The sealed tube samples recovered between 25ft. and the end of the hole at 25ft. 11 inches have not been logged in detail.

CONCLUSIONS

The upper 12ft. of wind blown sand appear to be of the type known as "collapsing" soils, that is they show a decrease in volume when their moisture content is increased. They possess a little dry strength, probably due to small amounts of calcareous cement or clay-silt binder.

The underlying clayey sand is comparable in consistency to a stiff to very stiff clay.

The nature and strength of the calcrete layer could not be determined from the air blown cuttings.

WRPB:AVR:CFL
17.12.1967

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APPENDIX A

PUSH TUBE SAMPLING WITH MAYHEW ROTARY DRILLING PLANT

Push samples were obtained using a modified Rotary drill as follows:-

Plant - Mayhew 1000, 34ft. mast, mounted on an International R196, 6 x 6.

Rods - Kelly Bar; 20ft. long (Weight 400 lbs.) Additional Rods, about 15ft. (Weight 6.25 lbs/ft).

Penetration Power - Flow hydraulic pull down with chain attachments.

Modifications (a) An open push-tube sampling tube with a vacuum head is attached to the bottom of the drilling rods.

(b) An hydraulic piston assembly with pressure gauge is attached to the top of the kelly bar.

Sampling Tubes - 2 types of sampling tubes were used.

(a) Open tube with "A" type shoe (SA type tube assembly as used in cable tool drilling).

(b) Open tube of 17 gauge Mild Steel with one end champered at 20°, and other end threaded for attachment to vacuum head.

Open tube samples for extrusion were obtained using an "A" type tube as follows:-

(a) the tube was lowered to the bottom of the hole and the distance below the ground surface measured to the nearest ¼ inch.

(b) the tube was forced into the ground without rotation using the hydraulic pull down, and the following recorded:dread

...readings on the pressure gauge at the top of the kelly bar.

...The distance penetrated by the tube - to the nearest ¼ inch.

... On recovery of the tube and sample, the length of undisturbed core in the tube - to the nearest ¼ inch.

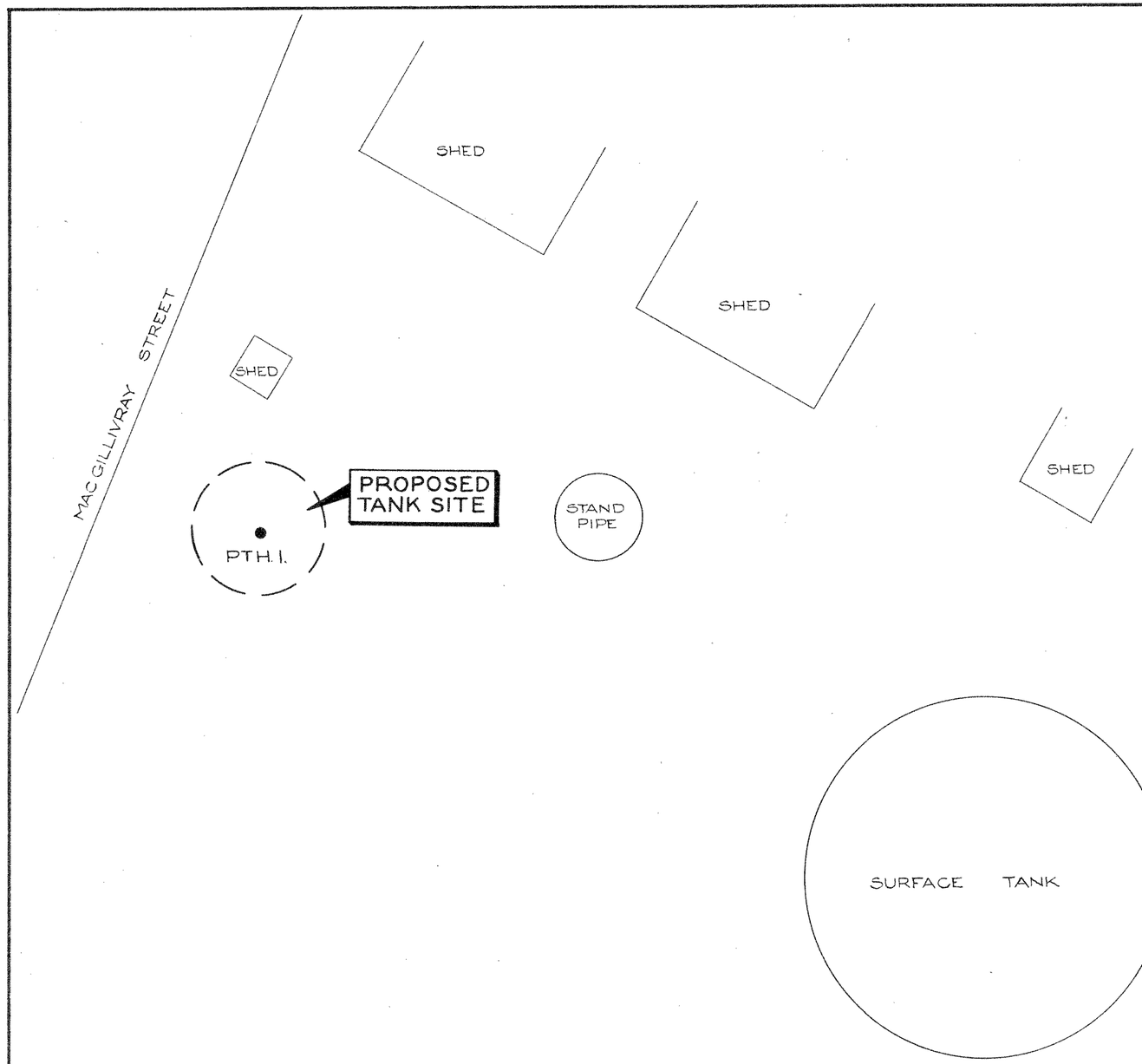
(c) The sample was extruded into a plastic bag, sealed and labelled with hole number and depth of sample (top and bottom) before placing in a core box.

Sealed tube samples were obtained in the same manner and the same information recorded, but in thiskcase an open tube with a chamfered end was used. The sample was immediately sealed in the tube which was clearly labelled with hole number and depth of sample (top and bottom).

Notes on Procedure

...Before commencing the push tube hole a "shot" hole was drilled adjacent to the proposed hole and air blown samples collected every 1ft. and placed in labelled plastic bags. This hole can be put down in a very short time (less than ½ hour for up to 50ft.) and gives an indication of the geological succession, and thus where each type of sample should be taken.

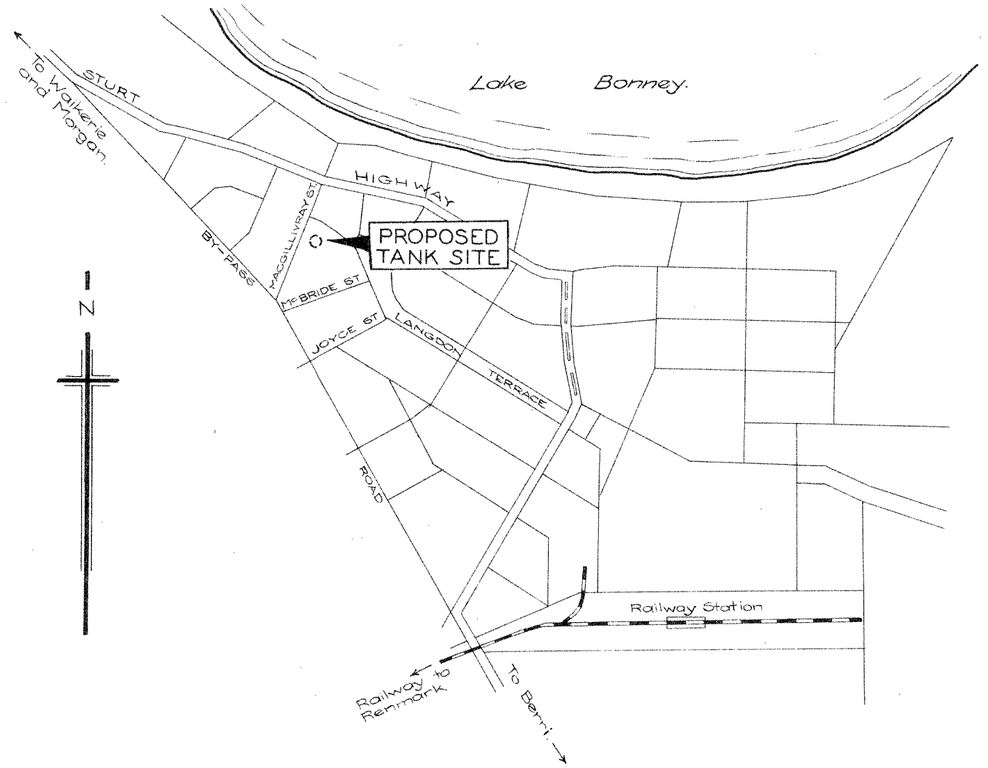
...If bands of material too strong to be penetrated by the push tube are met, these can be easily drilled using the normal bit, and air blown samples collected to give an indication of the material. If weak material is again encountered (as indicated by the drilling rate) further push tube samples can be taken.



SCALE

FEET 0 50 100 150 FEET

CHAINS 0 1/2 1 1 1/2 2 CHAINS



LOCALITY PLAN

Scale : Approx. 1" = 16 chains.

FIG.1

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
ELEVATED TANK - BARMERA CROWN LAND, BARMERA TOWNSHIP, Co. HAMLEY LOCATION OF PUSH TUBE HOLE.			
ENGINEERING GEOLOGY SECTION	M.A.O'B Bassett GEOLOGIST	Drn. W.R.P.B	SCALE : As Shown
		Tcd. A.M.c.D.	67-837 Gg
	M.A.O'B.	Ckd. L.V.W.	
Director of Mines	SEN. GEOLOGIST.	Exd. W.R.P.B	DATE : 23 Nov 1967

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF PUSH TUBE HOLE

PROJECT: TANK SITE – BARMERA

FEATURE: FOUNDATIONS

LOCATION:

SECTION: CROWNLAND

TOWNSHIP: BARMERA

CO-ORDS:

HOLE NO: PTH. 1.

SERIAL No.

R.L. Surface ... FT.

R.L. Collar ... FT.

Datum

Lift	Length of core recorded
1 FT	
2 FT	10 INS
3 FT	
3 FT 6 INS	6.25 INS
	11 INS
4 FT 6 INS	
	12 INS
5 FT 6 INS	
	6.75 INS
6 FT 1 IN.	
7 FT	
7 FT 8 INS	
9 FT.	
9 FT 8 INS	
10 FT 8 INS	
12 FT	
12 FT 6 INS	6 INS
13 FT 6 INS	
14 FT 6 INS	
15 FT	6 INS
16 FT	
17 FT	
17 FT 6 INS	6 INS
18 FT 6 INS	
19 FT 6 INS	
20 FT 6 INS	
25 FT	
25 FT 5 INS	5 INS
	6 INS

Depth (feet)	Soil type / Geological description	Soil description / Group name (Unified Soil Classification, U.S.B.R. Earth Manual 1st Edition 1963)
0–11	SAND. is quartz subrounded to rounded. (QUATERNARY)	SAND, fine to medium grained limey 0.1 to 0.4 mm. dia, few up to 0.9 mm. Estimated less than 5% fines. Red-brown. Low to moderate dry strength.
11–14		Increasing clay content.
14–20	Core breaks to smooth irregular, mainly vertical faces.	SAND, excess clayey fines, limey estimated up to 40% CLAYSOIL high plasticity. Red-brown. Lime in irregular patches and nodules throughout.
20–22	GRAVEL is calcrete.	Cuttings:- SAND excess clay fines, limey with up to 50% GRAVEL fragments to 10 mm. dia. red brown to white.
22–25		SAND, excess clay fines, grains 0.1 to 0.4 mm. dia., few up to 0.7 mm..
25–		Not Logged
		END OF HOLE 25 FT. 11. INCHES

Water level: No Water Cut. (14–20 ft)

Moisture content: I (0–14 ft); MC < PL (14–20 ft)

Consistency: ST. / V. St. (14–20 ft)

Field test data – Hydraulic pressure (lbs/sq.in x 100): NO PRESSURE (about 7–10 ft); AIR DRILLED (20–25 ft); NO PRESSURE (25 ft and below)

FIG: 2

TYPE OF SAMPLE	CONSISTENCY	COMPACTNESS	RELATIVE DENSITY	MOISTURE CONTENT
A ... (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 – SAI	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) – WC Water cut

ENGINEERING GEOLOGY SECTION

DRILL No. 179

TYPE MAYHEW 1000

DRILLER CUTTE

START 26 OCT '67

FINISH 26 OCT '67

LOGGED BY W.R.P.B

DATE 20 NOV '67

TRACED AM^cD.

CHECKED L.V.W.

SHEET 1 OF 1

DRG No. S6244