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DEPARTMENT OF MINES
SOUTH AUSTRALIA

PRELIMINARY REPORT ON FOUNDATION CONDITIONS FOR PROPOSED OSBORNE "C" POWER STATION WESTERN SIDE, PORT RIVER, OSBORNE NORTH.

by

R.D. Steel, B.Sc.

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21st April, 1958.

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PRELIMINARY REPORT ON FOUNDATION CONDITIONS FOR PROPOSED OSBORNE "C" POWER STATION WESTERN SIDE, PORT RIVER, OSBORNE NORTH.

1. SUMMARY

Five test boreholes were put down on the above site, each having a proposed maximum depth of 150'. Generally uniform conditions were experienced in each hole, hence correlation on a broad scale was reasonably good.

Cinders and similar fill material covered the site as a reclaiming medium, except in the N.E. corner, where natural fossiliferous sand was exposed. From approximately 9' - 32', soft wet, clayey sands and limey sands were encountered. In some areas these grade into a thin shellgrit band, thence generally into fossiliferous sandy marl, cemented to form hard lumps in softer groundmass. From approximately 40', the sequence changed sharply into a continuous succession of generally very stiff, moist silty clays, clayey to sandy silts, and fine to coarse sands.

The material to 40' was generally saturated, whilst below this level, water occurred in a series of shallow sandy pockets at very irregular intervals. Some small variation of static water level has been noted with tidal influence.

Material capable of adequately supporting piling occurs from 42', however, it is suggested tentatively that piles be driven to an arbitrary depth of 55'.

The above remarks apply on the assumption that the information so far available, is truly representative of the area.

2. INTRODUCTION

The enquiry for this investigation was initiated by Mr. R.S. Gerry, of the Civil Design Branch, Electricity Trust of South Australia.

The site is situated on the Western bank of the Port River, in the suburb of Osborne North. It is on Harbours Board Block No. 1 in the Hundred of Port Adelaide. The area has been a depository for slag and other waste products from the nearby Osborne Power Station, for a number of years. The depth of this slag is a maximum of about 10' in the South East Corner, where

it lies directly on an old swamp surface. To the North and North East, the thickness of this fill becomes increasingly less, as it tapers off to form a level platform with the natural sandy river bank. The site thus represents for the greater part, a reclaimed swamp area.

Test boring was carried out by means of Hydromaster (D.H. No. 6) and Huston (D.H. No. 15) boring plants. Both sealed tube and open tube samples were recovered, while slush pump samples were taken, when the material penetrated became too soft and wet to recover intact. Core recovery was almost 100%, hence a completely continuous stratigraphic log has been possible for each hole.

Water samples were taken at appropriate intervals and submitted to the Chief Chemist Osborne "B" Power Station for analysis.

Representative samples at each minor change of strata have been kept for future reference of The Electricity Trust Design Section.

This report is based on purely preliminary investigations and more intensive testing will be required, when the proposed layout and load distributions have been decided.

3. TEST BORING

Five holes were put down, having a proposed maximum depth of 150'. Distribution of bores was such as to uniformly cover the site, one hole being placed at each of the four corners and the other placed centrally.

Wherever possible, samples were taken using a 4" diameter open tube sampler, the core so enclosed being subsequently pushed from the tube with special equipment designed for this purpose. The sample was then immediately labelled and details relating to its firmness and moisture content were noted. The notation "soft"

was given to material that could be easily indented with the finger, "firm" where pressure of the finger was required, "stiff" where pressure of the thumb was required to produce any indentation and "very stiff" where the sample could only be marked with a finger nail. In the absence of a geologist on the site, this procedure was performed by the drilling crew, to the writer's complete satisfaction.

Sealed tube samples were taken at appropriate intervals. Some attempt was made to obtain them at 15' intervals, or at any significant changes of strata. This procedure however proved most impracticable, due to the occurrence of small water pockets at irregular intervals. This water had the effect of lubricating the inside of the tubes and resulted in the loss of the sample. It was then found necessary to case off the water horizon, sample past the shoe of the casing with open tube samples and then try again for a sealed tube sample, in the undisturbed region below the casing. When such sealed tube samples were successfully recovered, they were immediately trimmed and coated with a layer of hot paraffin wax on each end. The metal caps were firmly screwed on and again sealed with wax. After appropriate labelling, they were stored in a cool shaded area, until removal to the University for testing.

Logging of the core was delayed until the samples had dried out sufficiently to split them cleanly lengthwise with a hammer and chisel. It was found that the detailed changes, so apparent in these cores, were much more readily discernible in the dry condition.

Some attempts were made to discover a quantitative method of separating the sand, silt and clay fractions by gravitational settling in water. No satisfactory laboratory method could be devised, due to swelling of the clay fraction when wet. It is felt that even if such a method had been available, the results would have proved misleading, as the samples were mainly heterogeneous mixtures of the sand, clay and silt fractions and

were in no way uniform in condition, even at any point in a particular sample.

After logging, small representative samples were kept and initially stored in small plastic tubes, appropriately labelled. After consultation with Mr. Gerny this practice was discontinued in favour of the more satisfactory method of skeletonising the core. This procedure consisted of keeping a representative section of core approximately 3" long, from each significant change in strata, based on colour or composition.

These skeletonised samples have been appropriately labelled with Bore Number, depth and condition upon first removal from sample tubes. The boxes containing these cores have been forwarded to the Civil Design Branch of The Electricity Trust for their future reference. These cores have been closely correlated with the detailed borelogs appended to this report. After personal inspection by Mr. Gerny, the remainder of the samples were discarded.

4. BORE PENETRATION RATE

A record of the number of blows required to penetrate each successive foot of strata was maintained throughout and a copy of this record is included with the accompanying borelogs. These figures can only be used as a general guide to the relative strengths of the materials penetrated. The individual figures fo r each foot are not necessarily significant, due to a number of contributing factors.

Open tube samples were taken with a bell mouthed shoe and resulted in compaction of core in the sample tube. On the other hand, sealed tube samples were obtained with a different type of shoe, which cut a uniform section. An adaptor was used

in conjunction with the sealed tube sampler, and being of necessity, driven down simultaneously with the sample tube, tended to largely increase the cross sectional area. This adaptor also tended to act as a piston against the walls of the hole, thus affecting the number of blows per foot by frictional resistance.

In the softer material, there was a strong tendency for the hole to cave in, having the effect of slowing the downward fall of the striker bar. In certain instances therefore, some of the more uniform very stiff material, may have required less blows per foot penetration than the softer material. Other factors which also influenced the penetration rate, were the presence of lime rubble and nodules, small limestone lumps and the increasing weight of striker bar plus cable, with increase in depth.

An average figure taken over 20' or so, should give a fair indication of the relative strengths of the various horizons. In view of the similarity between the five bores above and below 40', the average number of blows taken over all holes, should give some fair indication of the overall condition at any specific depth. The method is thus too inaccurate to allow of any precise mathematical treatment.

As a result of the experience gained here, new tools have been designed and fabricated, to give more uniform working conditions, and consequently allow of more uniformity of results. These tools will be available for any future testing programme.

5. WATER STATUS

Apart from the first 6' to 10', which is generally loose and dry, the material to approximately 40' is in a saturated condition. At any depth above 40', water would rise to within 7' from the surface. This water is very saline and is usually associated with a strong smell of H_2S. It was found necessary

to drive the casing well ahead of the sampling to recover this soft, wet material. In many cases special basket retainers attached to the sampling tubes were utilized, while in a few cases, samples could only be retrieved with a slush pump.

Below 40', water occurred in a series of shallow aquifers, from a few inches up to several feet in thickness. These water pockets were usually associated with a marked increase in sand content and in many cases, in a wholly sand horizon. It is felt that for the most part, the material is actually saturated, resulting in a moist condition to the stiffer clays and allowing free water to accumulate between the grains in the looser sandy portions. This feature is evidenced by the fact that stiff moist clay and soft wet sand, can occur simultaneously in the one sample. All cores have shown shrinkage cracks of some degree, after standing open for some length of time.

These water pockets have been a constant source of trouble to drilling progress, as it was found necessary to case them off and then clean out all the loose sandy material that had encroached into the hole, before any further useful samples could be recovered. No correlation of water status can be effected with different holes, since these water bearing sandy areas, seem to occur only as isolated lenses.

Some variation of the static water level with tide level has been noted. For a series of readings taken at each bore, three times daily for a number of consecutive days, the maximum total variation was of the order of 6" adjacent to the river bank. The effect at any appreciable distance from the river itself, could be considered negligible. However, it might be noted that these bores are open and uncased to approximately 150', hence water at depth may annul any effects that might occur from tidal influence. The results of these water table measurements are included as a separate appendix.

6. GENERAL GEOLOGY

The strata so penetrated can be divided roughly into four different zones.

The surface material is either loose, dry fill material from the nearby Osborne Power Station, or is loose, dry, limey and fossiliferous sand, containing lumps of hard grey fossiliferous limestone. The gradation from fill to sand, is due to the fact that the original swampy surface slopes gradually up from the S.E. to the N. and N.E., to form a natural elevated terrace. The fill material serves only to make the site level with this terrace, hence its thickness depends only on the depth to the underlying swamp surface.

From a depth of from 6' to 10', soft wet sandy clays and sands are encountered, usually of grey to grey-brown colour. These are estuarine, littoral and aeolian deposits, of probable PLEISTOCENE TO RECENT age. Small fossil fragments are present throughout in irregular abundance, as also seaweed fibres and lumps of dark semi-decomposed organic matter, from whence arises the smell of H_2S.

Below this sandy zone, which generally terminates at about 32', there is an intermediate horizon, being in part coarse calcareous shellgrit and partly light grey to bluish-grey sandy marl. This is generally very fossiliferous, soft and wet, but contains hard lumps of lime cemented material.

From a minimum depth of 33' in Bore No. 4 to 40'6" in Bore No. 3, the sequence undergoes a sharp stratigraphic change, and becomes a highly irregular mixture of clays, silty clays, clayey silts, sandy silts and fine to coarse sands. These occur to the full depth of 150', and are generally very coarsely and irregularly notched, with grey, brown, yellow-brown and red-brown predominating. They are mainly stiff to very stiff and moist to almost dry where dominantly clayey or silty, but become soft and wet where dominantly sandy. Lime is present throughout in

irregular abundance, as whitish to light brown chalky pockets, hard rubble, nodules and grit. Quartz grit and gravel fragments and small mica flakes occur intermittently.

No attempt has been made to correlate any particular horizons in adjacent bores. The overall pattern thus appears to be a coarse interfingering of the major constituents, with lesser variations in composition, colour and texture, occurring haphazardly throughout. Great variations can occur within a single sample while pockets of finely silty clay can occur side by side with pockets of gritty sand. Closer investigation from additional boring may reveal some significant characteristics which can be correlated.

The five bores have been logged in close detail and are included as an appendix to this report. Where possible, logging has followed the pattern of colour, degree of stiffness and moisture content, type of material and finally accessory constituents e.g. lime, grit fragments etc. These logs should be closely studied to clarify the nature of the material at any specific depth, as some variation must be expected from the generalisations given above. In all cases, where any change of description occurs in the logs, there is an accompanying sample at the same depth, given in the skeletonized core boxes.

2. CONCLUSIONS

The knowledge so far gained from this site, suggests that further investigation is necessary. A closer pattern of drilling should be carried out when the layout and proposed load distributions of the proposed powerhouse have been decided. Until such data are available, the number and distribution of such additional bores and the depths to which they should penetrate, can not readily be determined.

Material of sufficient strength to support piling, is available over the entire site from a depth of 45'. It is suggested that piling be driven to some arbitrary depth of say 55', to allow of sufficient anchorage and increase the bearing capacity by friction with the strata they penetrate. The suggested depth must be considered as tentative only, until further data are available.

In conclusion, it is pointed out that a strong smell of H_2S was evident from 10' to 30', being particularly strong on the Western side of the site. This may constitute a hazard to excavations, as at some depths it becomes quite overpowering. The static water level ranges from about 6' - 7' below the surface, hence this will present an additional problem, if excavations are carried out below 7', especially as this water is strongly charged with the H_2S gas mentioned above.

R.D. Steel

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R.D. Steel
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION.

RDS:AGK
21/4/58

P.W. 632/58
D.R. 1692/57

PERCUSSION TEST BOREHOLE No 1. (G)

Locality: S.E. Corner, Site for Proposed Osborne 50' Power Station. Western side, Ft. River, Osborne North.

Purpose: Preliminary Test of Foundation Conditions.

Plant: No 6.

Driller: John Key Assistant D. Constantinou.

Date Commenced 2.12.57 Date Completed 9.1.58

Depth	Description	Depth	No of Blows
0' - 5'0"	Cinders and associated loose dry fill material.	0'-1'	21
		1'-2'	16
5'0"- 7'0"	Cinders and associated loose dry fill material, with pockets of soft, moist sandy clay increasing with depth.	2'-3'	10
		3'-4'	7
		4'-5'	5
7'0"- 8'0"	Cinders, with pockets of soft, moist sandy clay and lumps of dark brown seaweed.	5'-6'	3
		6'-7'	10
8'0"-8'10"	Dark grey and dark brown, very soft moist clay, with some light brown and light grey mottling. Pockets of dark decomposed seaweed.	7'-8'	11
		8'-9'	9
8'10-10'0"	Light grey, soft damp sand. Numerous small shell fragments and intermittent pockets of decomposed seaweed.	9'-10'	-
		10'-11'	19
10'0"-14'0"	Grey to light brown soft muddy sand, with abundant generally small fossil fragments. Small pockets of dark fibrous seaweed.	11'-12'	5
		12'-13'	5
		13'-14'	8
14'0"-18'0"	Grey sand, soft and wet and somewhat clayey in part. Very abundant minute fossil fragments, and seaweed pockets, with strong smell of H_2S	14'-15'	8
		15'-16'	9
		16'-17'	10
		17'-18'	12
18'0"-22'0"	Grey and light grey soft wet sand. Fairly abundant small fossil fragments decreasing with depth. Pockets of brown fibrous seaweed, with strong smell of H_2S	18'-19'	10
		19'-20'	10
		20'-21'	16
22'0"-26'0"	Grey and light grey soft wet sand, with few small fossil fragments and patches of decomposed seaweed, strong H_2S smell	21'-22'	20
		22'-23'	28
		23'-24'	37
		24'-25'	-
		25'-26'	-
26'0"-30'0"	Grey to grey-brown fine soft, wet sand, tendency to clayey in part. Fairly abundant small fossil fragments and seaweed fibres, with smell of H_2S.	26'-27'	-
		27'-28'	
		28'-29'	
		29'-30'	
30'0"-32'6"	Grey to grey-brown coarse shell grit with abundant coarse quartz grit, fragments. Moist, but relatively firm.	30'-31'	
		31'-32'	

32'6"-34'0"	Grey to grey-brown fine sandy marl, with abundant small fossils and fossil fragments. Generally soft and wet but with harder cemented lumps.	32'-33' 33'-34'	
34'0"-36'6"	Grey to grey-brown soft wet, silty to sandy clay. Few small cemented lumps and abundant small fossil fragments.	34'-35' 35'-36' 36'-37'	20
36'6"-39'0"	Grey-brown sandy to silty marl, with some grey-brown mottling. Soft and wet, but with harder cemented lumps Numerous small fossil fragments.	37'-37'6 37'7-38'7 38'7-38'10	375. 42 10
39'0"-39'10	Coarsely mottled dark to light greenish grey, stiff, dry silty clay, with lesser brown to yellow-brown mottling.	38'10-39'9	40
39'10-43'0"	Sealed Tube Sample	40'-41'4	16?
43'0"-47'0"	Pale green-grey silty to sandy and limey clay, with light brown to yellow brown mottling. Generally firm and dry but with lumps of lime cemented material. Few small fossil remains Very wet from 46'-47'	41'4-42'10 43'-44' 44'-45' 45'-46' 46'-47'	24 80? 30 40 50.
47'0"-49'0"	Light grey to light green-brown fine sandy silt, with brownish mottling. Moist and relatively soft. Occasional minute fossil fragments.	47'-48' 48'-49'	60 35
49'0"-55'0"	Light grey, light brown and light reddish-brown mottled, fine sandy silt, with some quartz grit and small fossil fragments. Firm and moist to soft and wet irregularly. Occasional small pockets of lime and light brown sand.	49'-50' 50-51' 51'-52' 52'-53' 53'-54' 54'-55'	30 35 37 40 35 25
55'0"-57'0"	Light grey, light brown and light reddish brown mottled fine sandy clay. Generally firm and moist, with small lime and light brown sand pockets.	55'-56'	29
57'0"-58'4"	Sealed Tube Sample	57'-58'4	30
58'4"-59'0"	Light grey, light brown and red-brown mottled, fine sandy silt. Firm and moist, to soft and wet irregularly. Few small pockets of white earthy lime, lime nodules and grit.	58'-59'	10
59'0"-60'0"	Light grey and yellow-brown, soft and wet, sandy to silty clay, with slight brown and reddish-brown mottling. Somewhat limey in part, with lime grit and nodules.	59'-60'	7
60'0"-63'0"	Light grey, very stiff, moist silty clay, with coarse brown and yellow-brown mottling. Finely sandy in part, with few pockets of earthy lime, lime nodules and odd grit fragments.	60'-61' 61'-62' 62'-63'	15 14 20
63'0"-64'0"	Brown to reddish-brown very stiff, dry silty clay, with lesser light grey mottling. Few quartz grit and gravel fragments, abundant lime grit and nodules.	63'-64'	24

64'0"-65'0"	Brown, reddish-brown and grey mottled, very stiff clayey silty, becoming somewhat sandy in part. Numerous small chalky lime pockets and quartz grit fragments.	64'-65'	25
65'0"-66'0"	Brown, reddish-brown and grey mottled very stiff, dry sandy silt. Numerous quartz and mica grit fragments, with small sandy lime pockets, lime nodules and grit.	65'-66'	40
66'0"-68'0"	Coarsely mottled grey, brown and reddish-brown, very stiff sandy silt, with coarse grit and gravel fragments irregularly abundant. Occasional small earthy lime pockets and nodules.	66'-67' 67'-68'	32 39
68'0"-70'0"	Brown to reddish-brown very stiff silty sand, with slight grey mottling. Coarse quartz grit fragments irregularly abundant.	68'-69' 69'-70'	49 40
70'6"-74'6"	Coarsely mottled grey, brown and red-brown very silty clay. Stiff and moist to wet, but becoming drier. Lime irregularly abundant as white earthy pockets, nodules and grit. Sealed tube sample from 70'-71'6".	70'-71' 71'-72'6 72'6-73' 73'-74'6	55 50 55 40
74'6"-76'6"	Coarsely mottled grey to light grey, brown and yellow-brown, very stiff clayey silt. Abundant lime and quartz grit and pockets of white earthy lime.	74'6"-75'6 75'6-76'6 76'6-77'6	52 38 39
76'0"-77'6"	Brown, red-brown and grey mottled, very stiff, dry silty clay. Becoming finely sandy in part, with quartz and mica grit fragments. Pockets of white earthy lime, lime nodules etc. Very abundant.	77'6-78'6	55
77'6"-80'6"	Grey to light grey, very stiff dry silty to finely sandy clay, with coarse brown and light reddish-brown mottling. Pockets of white earthy lime, lime nodules and rubble irregularly, but very abundant from 79'6".	78'6"-79'6 79'6-80'6	51 46
80'6"-82'0"	Sealed Tube Sample	80'6-82'	49
82'0"-84'0"	Grey to light grey very stiff, gritty silty clay, with brown to dark yellow-brown mottling. Tendency to muddy in part, with occasional limestone pockets, nodules and grit.	82'-83' 83'-84'	-
84'0"-86'0"	Light grey, light brown and yellow brown mottled, very firm and gritty silty clay to clayey silt. Somewhat sandy in part, with mica flakes, lime grit, nodules and rubble.	84'-85' 85'-86'	-
86'0"-89'6"	Light grey, light brown, yellow-brown and red-brown mottled, firm, moist clayey silt. Becoming fine sand, in part, soft and wet, with quartz and laterite fragments.	86'-87' 87'-88' 88'-89' 89'-90'	- 55 55 20

89'6"- 95'0"	Grey to light grey, firm and stiff silty clay to fine sandy silt, with coarse brown; yellow brown and reddish-brown mottling. Occasional lime pockets, rubble, nodules and grit with some quartz and mica fragments.	90'-91'	20
		91'-92'	39
		92'-93'	40
		93'-94'	36
		94'-95'	35
95'0"- 98'6"	Brown to reddish-brown very stiff silty clay to clayey silt, with irregular grey mottling. Becoming sandy in part, with abundant grit fragments. Odd small lime nodules, grit etc.	95'-96'	32
		96'-97'	30
		97'- 98'	35
		98'- 99'	35
98'6"- 99'6"	Light brown to light reddish-brown very stiff, sandy, calcareous clay. Pockets of moist light grey clay, and whitish earthy lime, with abundant hard lime rubble and nodules.	99'-100'	35
99'6"-104'0"	Coarsely mottled, light grey, brown and yellow-brown very stiff silty clay, becoming finely sandy in part, with odd gritty fragments. Chalky lime pockets and lime nodules at intervals.	100'-101'	35
		101'-102'	35
		102'-103'	35
		103'-104'	40
104'0"-106'0"	Brown to reddish-brown very stiff silty clay, with lesser green-grey mottling. Numerous chalky lime pockets, lime nodules, and occasional lime and laterite grit fragments.	104'-105'	30
		105'-106'	30
106'0"-108'0"	Coarsely mottled light grey to brown and red-brown, very stiff, silty clay. Mica, quartz, laterite and travertine grit fragments irregularly abundant.	105'-107'	30
		107'-108'	35
108'0"-112'0"	Coarsely mottled, light grey, brown and red brown very stiff clayey silt. Few small lime, quartz, mica and laterite fragments.	108'-109'	30
		109'-110'	30
		110'-111'	30
112'0"-115'0"	Coarsely mottled light grey, brown and yellow-brown, very stiff clayey silt, becoming sandy in part, with quartz, mica and lime grit fragments.	111'-112'	30
		112'-113'	30
		113'-114'	30
		114'-115'	30
115'0"-117'6"	Coarsely mottled grey, brown, yellow-brown and red-brown, firm, peggy clayey silt. Mica and quartz grit fragments.	115'-116'	30
		116'-117'	30
		117'-118'	30
117'6"-120'0"	Light grey to pale green-grey, very stiff silty clay to sandy silt, with some coarse brown to reddish-brown mottling. Lime irregularly abundant as white chalky pockets, nodules and rubble	118'-119'	30
		119'-120'	30
		120'-121'	30
		121'-122'	25
		122'-123'	25
122'0"-124'0"	Light grey, light reddish-brown and yellow-brown very stiff sandy silt, with numerous quartz and mica grit fragments and isolated small lime pockets.	123'-124'	27
124'0"-126'0"	Coarsely mottled light grey, brown and dark yellow-brown, very stiff silty clay to clayey silt. Odd lime pockets and nodules, quartz, mica and lime grit.	124'-125'	25
		125'-126'	20
		126'-127'	25
		127'-128'	20
128'0"-128'6"	Light brown very stiff sandy and limey clay with grey, brown and red-brown mottling. Abundant white chalky lime pockets, nodules, rubble and grit.	128'-129'	30

128'6"-129'0"	Grey to brown and dark yellow-brown mottled, very stiff silty clay, with occasional lime nodules and grit.		
129'0"-130'0"	Light brown, very stiff sandy and limey clay, with grey, brown and red-brown mottling. Abundant white chalky lime pockets, nodules, rubble, and grit.	129'-130'	15
130'0"-131'0"	Coarsely mottled light grey, dark yellow brown and dark red-brown silty to sandy clay. Moist and wet, but with stiffer lumps. Small lime nodules pockets and grit irregularly abundant. Few quartz and mica fragments.	130'-131'	28
131'0"-132'6"	Mainly brown to dark brown and reddish-brown sandy clay, with slight grey mottling. Moist and soft but with stiff lumps. Lime irregularly abundant as small nodules, chalky pockets and grit.	131'-132' 132'-133'	20 25
132'6"-135'6"	Grey to light grey very stiff silty clay with coarse brown, yellow-brown and dark red-brown mottling. Somewhat sandy in part with abundant quartz and mica grit fragments. Occasional small pockets of white chalky lime, lime nodules etc.	133'-134' 134'-135' 135'-136'	20 20 20
135'6"-137'6"	Brown and dark red-brown very stiff, sandy to silty clay, with light grey mottling. Large pockets of light brown and light red-brown chalky lime, with abundant small lime nodules rubble and grit.	136'-137' 137'-138'	25 25
137'6"-141'0"	Mainly light grey very stiff, silty clay with brown to reddish-brown mottling becoming finely sandy in part. Occasional large pockets of white chalky lime and irregularly abundant lime nodules and grit	138'-139' 139'-140' 140'-141'	25 25 25
141'0"-145'0"	Brown, red-brown and green-brown very stiff, finely sandy to silty clay with some grey mottling. Small lime pockets, nodules and grit at irregular intervals, becoming very abundant from 143'0"-143'4" and 144'5"-145'0".	141'-142' 142'-143' 143'-144' 144'-145'	25 30 25 25
145'0"-148'0"	Light grey, reddish-brown and yellow-brown mottled, very stiff silty clay to clayey silt. Irregularly abundant quartz, mica and lime grit fragments. Isolated small white lime pockets.	145'-146' 146'-147' 147'-148'	25 30 25
148'0"-150'0"	Coarsely mottled, light grey, brown, yellow-brown, and reddish-brown very stiff clayey to finely sandy silt. Odd lime and quartz grit fragments and fairly abundant mica flakes.	148'-149' 149'-150'	25 25

END OF BORE

K. W. BROWN
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION

21/4/58

D.M. 1692/57.

BOREHOLE No 2 (H)

Locality: N.W. Corner Site for proposed Osborne "C" Power Station, Eastern Side, Pt. River, Osborne North.

Purpose: Preliminary Test of Foundation Conditions

Plant No. 5.

Driller: J. [illegible] **Assistant:** [illegible] Gustafson

Date Commenced: [illegible] **Date Completed:** 3/2/58.

Depth	Description	Depth	No. of Blows
0' 0" - 4' 0"	Light brown loose dry, fine grained limey sand, with abundant fossil fragments. Cemented in part, to form lumps of fossiliferous limestone.	0' - 1' 1' - 2' 2' - 3'	11 10 15
4' 0" - 7' 0"	Light brown, loose dry limey sand, with abundant fossil fragments. Some hard lumps of fossiliferous limestone. Large pockets of grey-brown and yellow-brown limey clay.	3' - 4' 4' - 5' 5' - 6' 6' - 7'	15 11 8 9
7' 0" - 10' 2"	Light brown fine limey sand, with abundant small fossil fragments. Lumps of of fine grained fossiliferous limestone.	7' - 8' 8' - 9' 9' - 10'	10 15 13
10' 2" - 12' 0"	Light brown, grey and yellow-brown, soft wet calcareous sand, with small lumps of grey and reddish brown sandy clay. Abundant fossil fragments and hard lime cemented nodules.	10' - 12'	13
12' 0" - 14' 0"	Mottled light grey, and light brown, soft wet sand, somewhat clayey in part. Abundant generally small fossil fragments and occasional hard grey limestone lumps.	12' - 13' 13' - 14'	- [illegible]
14' 0" - 17' 0"	Light brown to light grey, soft wet calcareous clayey sand. Abundant small fossils and grit fragments. Large pockets of dark semi-decomposed seaweed, irregularly abundant.	14' - 15' 15' - 16' 16' - 17'	25 20 15
17' 0" - 19' 0"	Mottled grey, and light brown, soft wet limey and clayey sand. Small pockets of decomposing seaweed and numerous small fossil fragments.	17' - 18' 18' - 19'	15 15
19' 0" - 22' 0"	Light grey, soft wet sand, with some brown to light brown mottling. Numerous small fossil fragments and thin bands of semi-decomposed seaweed.	19' - 20' 20' - 21' 21' - 22'	20 10
22' 0" - 24' 0"	Grey to grey-brown, very soft and wet clayey sand. Fairly abundant small fossil fragments and seaweed fibres.	22' - 23' 23' - 24'	10 10
24' 0" - 29' 0"	Light grey, soft wet sand, with scarce grey and grey-brown mottling somewhat clayey in part, with few small fragments, and pockets of decomposed seaweed.	24' - 25' 25' - 26' 26' - 27' 27' - 28' 28' - 29'	15 15 15 15 15
29' 0" - 31' 0"	Light grey, soft wet sand, with some grey-brown mottling. Thin bands of dark organic matter irregularly distributed.	29' - 30' 30' - 31'	15 15

Depth	Description	Depth	No. of Blows
31'0" - 34'0"	Grey and brown mottled, soft wet sand, somewhat clayey in parts. Fairly numerous small fossil fragments and pockets of decomposed seaweeds.	31'-32' 32'-33' 33'-34'	15 15 25
34'0" - 36'0"	Light grey and grey-brown, soft and wet, medium to coarse grained sand. Numerous small fossil fragments.	34'-35' 35'-36'	20 20
36'0" - 38'0"	Light grey to grey-brown, soft wet limey and clayey ooze. Abundant small fossil fragments, seaweeds fibres and few lumps of limestone.	36'-37' 37'-38'	25 25
38'0" - 40'6"	Light grey to grey-brown and yellow-brown mottled, soft wet, gritty calcareous sand. Abundant small fossils.	38'-39' 39'-40' 40'-41'	25 20 20
40'6"-42'6"	Light grey, brown and yellow-brown mottled, stiff moist clayey silt, with small mica fragments. Pockets of whitish earthy lime and lime nodules, very abundant.	41'-42' 42'-43'	20 20
42'6" - 43'6"	Brown, grey-brown and yellow-brown mottled, stiff and moist, fine sandy silt. Small pockets of white chalky lime, lime nodules etc.	43'-44'	20
43'6" - 44'0"	Grey to green-brown and red-brown mottled, stiff moist sandy clay. Abundant whitish lime pockets, nodules and coarse fossil fragments.	44'-45'	20
44'0" - 44'6"	Light grey, brown and yellow-brown mottled, stiff moist silty clay, somewhat sandy in part, with some grit fragments. Pockets of light brown earthy lime irregularly abundant.		
44'6" - 49'0"	Light grey, stiff moist clayey silt, with some brown, red-brown and yellow-brown mottling. Abundant quartz and mica grit fragments and irregularly abundant lime.	45'-46' 46'-47' 47'-48' 48'-49'	20 15 13 13
49'0" - 52'0"	Light grey, brown and yellow-brown sandy silt. Stiff and moist, but becoming fine wet sand at depth, with abundant mica and quartz grit fragments. Occasional lime pockets and hard travertine nodules.	49'-50' 50'-51' 51'-52'	10 10 10
52'0" - 53'0"	Light grey, brown and yellow-brown mottled stiff moist, fine sandy silt, with abundant quartz and mica grit fragments.	52'-53'	35
53'0" - 54'6"	Solid tube sample	53'-54'6"	20
54'6" - 56'0"	Light grey, brown and yellow-brown mottled, soft wet, fine sandy silt, becoming fine sand in part, with quartz and mica grit fragments abundant.	54'6"-55' 55'-56'	20 20
56'0" - 58'0"	Coarsely mottled, grey, brown and red-brown, fairly soft and wet, fine sandy silt, becoming fine sand in part. Odd quartz and mica fragments and small lime pockets.	56'-57' 57'-58'	15 10

PIEZOMETER TEST BOREHOLE No. 2.

Depth	Description	Depth	No. of Blows
58'0" - 59'0"	Coarsely mottled, grey, brown and red-brown, stiff moist clayey to sandy silt, becoming fine sand in part. Abundant chalky lime pockets and lime nodules.	58'-59'	20
59'0" - 63'6"	Coarsely mottled grey, brown, red-brown and yellow-brown silty clay. Some silty small lime nodules irregularly, with lime abundant from 62'6"-63'6".	59'-60' 60'-61' 61'-62' 62'-63'	15 15 15 15
63'0" - 63'3"	Grey to light grey, stiff moist clayey sand, with slight brown to yellow-brown mottling.	63'-64'	15
63'6"-66'0"	Mainly grey sandy clay, with coarse brown and yellow-brown mottling, stiff and moist, becoming wet. Fairly abundant mica flakes, quartz grit and gravel fragments.	64'-66' 65'-66'	25 20
66'6" - 67'0"	Grey and brown mottled, stiff wet clayey sand, with very abundant coarse quartz grit and gravel fragments.	66'-67'	10
67'0" - 72'2"	Brown, grey and red-brown mottled, coarse clayey sand, with very abundant coarse quartz grit and small gravel fragments.	67'-68' 68'-69' 69'-70' 70'-71'	10 10 15 17
72'2" - 74'6"	Coarsely mottled grey, brown and red brown, stiff moist silty clay. Somewhat sandy to gritty in part, with lime pockets irregularly abundant.	71'-72' 72'-73' 73'-74' 74'-75'	30 25 20 20
74'6"- 79'6"	Brown and grey, very stiff moist sandy to silty clay, with brown and yellow-brown mottling. Abundant white lime pockets and hard lime nodules. Occasional quartz grit fragments.	75'-76' 76'-77' 77'-78' 78'-79' 79'-80'	25 25 25 25 25
79'6" - 83'4"	Coarsely mottled brown, grey-brown and yellow-brown, stiff moist clayey sand to sandy clay. Coarsely gritty in part, with isolated pockets of white crystal lime, lime nodules and small mica flakes.	80'-81' 81'-82' 82'-83' 83'-83'6"	20 20 25 -
84'0" - 98'6"	Coarsely mottled grey, green and red-brown, stiff dry silty clay. Occasional lime pockets, rubble, grit and laterite nodules.	83'6"-89' 89'-95'	30 20
95'6" - 96'0"	Coarsely mottled, grey, brown and yellow-brown, very stiff dry silty clay. Odd small laterite and travertine nodules.	86'-87' 87'-88' 88'-89'	30 30 30
96'0" - 98'0"	Grey, brown and reddish-brown mottled, stiff dry silty clay. Few small quartz and laterite grit fragments. Odd lime pockets and lime nodules.	89'-90'4" 90'4"-91' 91'-92' 92'-93'	30 25 30 30
98'0" -101'0"	Brown, red-brown and grey mottled, stiff moist silty clay. Few small quartz and laterite grit fragments, odd lime pockets and nodules.	93'-94' 94'-95' 95'-96' 96'-97'	30 20 30 25
101'0"-108'0"	Coarsely mottled, light grey, brown and yellow-brown, stiff dry silty to sandy clay. Abundant whitish lime pockets and occasional small lime nodules.	97'-98' 98'-99' 100'-101' 102'-103'4"	25 25 25 30

PERCUSSION TEST BOREHOLE NO.2.

Depth	Description	Depth	No. of Blows
108'0"-111'0"	Mainly grey, stiff dry silty clay, with coarse brown mottling. Becoming very sandy in part, with quartz laterite and mica fragments. Occasional lime pockets and lime rubble.	103'4"-104'	15
		104'-105'	15
		105'-106'	18
		106'-107'	25
		107'-108'	25
111'0"-114'0"	Coarsely mottled, grey, brown, red-brown and yellow-brown, stiff moist silty clay, becoming somewhat sandy and wet in part. Old small lime nodules.	108'-109'	25
		109'-110'	25
		110'-111'	20
		111'-112'	20
114'0"-116'0"	Missing.	112'-113'	20
116'0"-119'10"	Coarsely mottled grey, brown and red-brown, very stiff dry silty clay, becoming somewhat sandy in part.	113'-116'	-
		116'-117'	25
		117'-118'	30
119'0"-119'10"	Grey, brown and red-brown mottled, very stiff dry silty to sandy clay. Abundant small lime pockets, coarse lime rubble and grit.	118'-119'	30
		119'-120'	25
119'10"-122'6"	Mainly grey, stiff dry silty clay, with red-brown and yellow-brown mottling. Occasional small lime nodules and lime grit.	120'-121'	30
		121'-122'	25
122'6"-124'6"	Grey and brown mottled, sandy and limey clay, with small pockets of light grey silty clay, stiff, but moist to wet. Marthy lime pockets, nodules and grit irregularly abundant.	122'-123'	25
		123'-124'	20
		124'-125'4"	32
		125'-125'	-
124'6"-131'6"	Coarsely mottled, grey, brown and yellow-brown, very stiff moist silty clay, to clayey silt, with small lime sandy silt. Lime rubble nodules and grit irregularly abundant.	126'-126'8"	-
		126'8"-128'	15
		128'-129'	30
131'6"-134'6"	Grey, brown and dark red-brown mottled, silty clay to clayey silt, with small pockets of fine brown sand. Mica quartz and lime grit fragments. Becoming very soft and wet.	129'-130'	20
		130'-131'	20
		131'-132'	-
		132'-133'	1[illegible]
		133'-134'	15

END OF BOR2

APPENDIX A

M. 712/58
D.M. 1692/57

PENETRATION TEST BOREHOLE NO. 3. (J)

Locality: Centre Site for proposed Osborne "C" Power Station, Western Side, Port River, Osborne North.

Purpose: Preliminary Test of Foundation conditions.

Mast: No. 15

Driller: John May Assistant: F. Shulte

Date Commenced: 4/2/58 Date Completed: 20/2/58.

Depth	Description	Depth	No. of Blows
0 - 2'0"	Cinders and associated loose, dry, fill material.	0-1' 1'-2'	15 10
2'0" - 6'0"	Light grey to light brown, loose dry, limey sand, with some cinders and associated fill material. Abundant small fossil fragments and lumps of hard fossiliferous limestone.	2'-3' 3'-4' 4'-5') 5'-6')	10 7 5
6'0" - 8'0"	Light brown to grey-brown clayey sand; loose and dry, but becoming moist. Abundant small fossil fragments and lumps of fossiliferous limestone. Pockets of fibrous seaweed.	6'-8'	5
8'0" - 11'0"	Grey, light brown or green brown, soft wet clayey sand, becoming silty clay in part. Abundant small fossil fragments, lime nodules and pockets of fibrous seaweed.	8'-9' 9'-10' 10'-11'	2 2 2
11'0" - 14'0"	Light brown soft wet, limey and clayey sand, with abundant small fossil fragments. Pockets of brown to green-brown silty clay, with large patches of decomposed seaweed. Some smell of H_2S. Occasional lumps of hard grey fossiliferous limestone.	11'-12' 12'-13' 13'-14'	3 3 3
14'0" - 15'0"	Grey to dark grey soft, wet clay, with coarse brown and green-brown mottling. Pockets of light brown limey and clayey, fossiliferous sand. Large lumps of decomposed seaweed.	14'-15'	12
15'0" - 18'0"	Coarsely mottled brown, and grey-brown, soft wet clayey sand, becoming soft clay in part. Fairly abundant small fossil fragments and seaweed fibres. Occasional lumps of light-brown fossiliferous limestone.	15'-16' 16'-17' 17'-18'	14 13 25

Depth	Description	Depth	No. of Blows
18'0" - 20'0"	Grey-brown soft wet clayey sand. Abundant small fossil fragments and seaweed fibres.	18'-19' 19'-20'	- -
20'0" - 23'0"	Light grey and grey-brown, fine wet sand, somewhat clayey in part. Abundant small fossil fragments and seaweed fibres, with smell of H_2S.	20'-22' 22'-23'	39 19
23'0" - 29'0"	Grey to light grey, soft wet sand, somewhat clayey in part. Abundant small fossil fragments and odd seaweed fibres, with smell of H_2S.	23'-24'	20
29'0" - 31'0"	Light grey and light grey-brown soft wet sand, with fairly abundant small fossil fragments.	24'-30' 30'-31'	S.P. - 10
31'0" - 34'0"	Light grey to light grey-brown, very soft wet sand. Small pockets of dark decomposed seaweed, with smell of H_2S. Occasional small fossil fragments.	31'-32' 32'-33' 33'-34'	18 10 25
34'0" - 35'0"	Grey sand, very soft and wet, with odd small fossil fragments and seaweed fibres.	34'-35'	17
35'0" - 36'0"	Grey and grey-brown mottled soft, wet sand, somewhat clayey in part. Occasional fossil fragments and seaweed fibres, with smell of H_2S.	35'-36'	25
36'0" - 37'0"	Grey, brown and grey-brown mottled, soft wet sand, with abundant gritty fragments, and fossil fragments. Odd pockets and fibres of seaweed.	36'-37'	30
37'0" - 38'0"	Grey, light grey and green-grey mottled soft wet calcareous sand, somewhat clayey in part. Abundant small fossil fragments. Cemented in part to form lumps of fossiliferous limestone.	37'-38'	15
38'0" - 40'4"	Light grey to light bluish-grey soft wet limey and clayey sand, with abundant small fossil fragments. Cemented in part to form lumps of blue-grey fossiliferous limestone.	38'-39' 39'-40' 40'-41'	15 21 18
40'4" - 42'6"	Brown, grey and reddish-brown mottled, stiff moist sandy clay to sandy silt. Abundant white lime pockets, nodules and grit.	41'-42' 42'-43'	19 18
42'6" - 46'0"	Coarsely mottled grey, light brown and yellow-brown, very sandy and limey clay. Stiff and moist to wet. Abundant lime, as white earthy pockets, soft nubble and occasional lumps of hard grey fossiliferous limestone.	43'-44' 44'-45' 45'-46'	26 10 7

Depth	Description	Depth	No. of Blows
46'0" - 47'0"	Grey, yellow-brown and reddish-brown mottled, stiff, moist sandy silt, becoming firm wet sand in part. Some small lime nodules, pockets and grit.	46'-47'	10
47'0" - 55'0"	Coarsely mottled light grey, yellow-brown and reddish-brown stiff moist silty clay to clayey silt. becoming light green-brown silty sand from 48'0" - 48'4". Small lime nodules and grit irregularly abundant.	47'-48' 48'-49' 49'-50' 50'-51' 51'-52' 52'-53'	15 15 20 15 15 15
53'0" - 54'5"	Coarsely mottled light grey, brown, yellow-brown and red-brown. Stiff moist clayey silt, becoming sandy to gritty in part, with mica and quartz grit fragments. Old small lime pockets, nodules and grit.	53'-54' 54'-55'	15 15
54'5" - 63'4"	Coarsely mottled grey, brown and reddish-brown, firm moist silty clay to clayey sand. becoming coarse soft, wet sand in large irregular pockets. Few mica grit and quartz gravel fragments.	55'-56' 56'-57' 57'-58' 58'-59' 59'-60' 60'-61' 61'-62'	25 15 7 17 15 17 23
63'6" - 66'0"	Light grey, brown and yellow-brown, stiff moist clayey sand, becoming coarse soft wet sand in patches. Very abundant coarse quartz and mica grit fragments.	62'-63' 63'-64' 64'-65' 65'-66'	- 30 18 23
66'0" - 69'0"	Light grey fine sandy silt, with coarse irregular brown and yellow-brown mottling. Becoming fine sand in part, with finely abundant mica fragments. Stiff and moist, becoming wet at depth.	66'-67' 67'-68' 68'-69'	20 30 30
69'0" - 70'6"	Light grey, brown and reddish-brown mottled, fine sandy silt, with large pockets of fine brown sand. Numerous mica fragments. Stiff to soft and very wet.	69'-70' 70'-71'	15 -
70'6" - 75'8"	Coarsely mottled grey, brown and reddish-brown stiff, moist silty clay to clayey silt. Small pockets of fine brown sand, with quartz and mica grit fragments.	71'-72' 72'-73' 73'-74'	- 18 30
75'8" - 76'0"	Coarsely mottled grey, brown and red-brown stiff, moist very silty clay. Old small pockets of fine light brown sand, with quartz and mica fragments. Lime occasionally abundant as small earthy pockets, grit and small nodules.	74'-75' 75'-76'	28 26

Depth	Description	Depth	No. of Blows
76'0" - 79'0"	Coarsely mottled brown, red-brown and grey, stiff moist silty to very sandy clay, with occasional small pockets of fine light brown sand and grit. Lime very abundant as large earthy pockets, nodules, rubble and grit.	76'-77' 77'-78' 78'-79'	26 18 22
79'0" - 82'0"	Coarsely mottled grey to reddish-brown and dark yellow-brown, stiff moist fine sandy silt to fine sand. Fairly abundant quartz and mica grit fragments and occasional lime pockets etc.	79'-80' 80'-81' 81'-82'	20 15 15
82'0" - 86'0"	Coarsely mottled grey, brown and reddish-brown stiff and moist silty clay, becoming light brown sandy and limey clay. Lime irregularly abundant as earthy pockets, nodules, rubble and grit.	82'-83' 83'-84' 84'-85' 85'-86'	20 - 20 23
86'0" - 88'0"	Grey and brown mottled stiff moist silty clay. Abundant lime pockets and rubble from 86'8" - 87'0".	86'-87' 87'-88'	20 15
88'0" - 88'5"	Brown to light brown very stiff, dry limey clay. Very abundant whitish lime pockets and soft lime rubble.	88'-89'	25
88'5" - 92'0"	Coarsely mottled brown, reddish-brown and grey silty to finely sandy clay, with small pockets of light brown sand. Lime Pockets and soft rubble irregularly abundant.	89'-90'4" 90'4"-91' 91'-92'	25 - 23
92'0" - 92'10"	Brown and red-brown stiff, dry silty clay, with some grey mottling. becoming somewhat sandy in irregular patches, with some coarse grit fragments. Isolated lime pockets and nodules.	92'-93'	18
92'10" - 95'0"	Grey, brown and reddish-brown mottled very stiff dry silty clay, becoming very sandy and limey in irregular patches. Pockets of white earthy lime, lime rubble nodules and grit.	93'-94' 94'-95'	25 25
95'0" - 98'0"	Coarsely mottled brown, red-brown and grey, very stiff, dry silty clay. Pockets of fine brown sand irregularly abundant. Occasional lime pockets, nodules and grit.	95'-96' 96'-97' 97'-98'	20 28 25
98'0" - 107'0"	Brown and reddish-brown very stiff, dry silty clay with some grey mottling. Becoming sandy irregularly. Lime present as scattered small chalky pockets, scattered nodules and grit.	98'-99' 99'-100' 100'-101' 101'-102' 102'-103' 103'-104' 104'-105' 105'-105'8" 105'8"-107' 107'-108'	25 25 25 25 30 30 30 - 30 28

Depth	Description	Depth	No.of Blows
107'0" - 108'6"	Brown, reddish-brown and grey, very stiff silty to sandy and limey clay. Large irregular pockets of white earthy lime, nodules and grit.	107'-108'	28
108'6" - 111'0"	Coarsely mottled grey, brown and reddish-brown very stiff, slightly moist, silty clay. Occasional large lime pockets and lime rubble.	108'-109' 109'-110' 110'-111'	28 25 25
111'0" - 113'0"	Coarsely mottled grey, reddish-brown and yellow-brown silty to sandy clay. Very stiff and moderately dry. Occasional small lime nodules and grit fragments.	111'-112' 112'-113'	25 20
113'0" - 114'0"	Grey and brown mottled very stiff, slightly moist silty to sandy clay. Pockets of brown to yellow-brown sand, somewhat gritty in part.	113'-114'	25
114'0" - 114'10"	Grey, brown and yellow-brown, coarsely mottled very stiff, dry clay. Becoming silty to finely sandy in part, with occasional small lime pockets and nodules.	114'-115'	20
114'10" - 117'0"	Coarsely mottled grey, brown, reddish-brown and yellow-brown silty clay, becoming very sandy to gritty in part. Very stiff, slightly moist. Isolated lime and mica grit fragments.	114'-115' 115'-116' 116'-117'	20 25 25
117'0" - 120'0"	Coarsely mottled grey, brown and yellow-brown very stiff dry, silty clay. Few small sandy pockets, with scattered quartz, mica and lime grit fragments.	117'-118' 118'-119' 119'-120'	25 25 26
120'0" - 123'0"	Coarsely mottled grey, reddish-brown and yellow-brown very stiff, dry clay, becoming sandy in part. Whitish lime pockets, nodules and hard rubble irregularly abundant.	120'-121' 121'-122' 122'-123'	25 25 25
123'0" - 129'0"	Coarsely mottled light grey, brown and yellow-brown, very stiff clayey silt, becoming sandy in part. Occasional pockets of grey clay. Quartz, laterite and lime grit fragments. Abundant soft lime rubble from 128'0" - 128'3".	123'-124' 124'-125' 125'-126' 126'-127'4" 127'4"-128' 128'-129'	25 25 25 30 25 30
129'0" - 130'0"	Brown, reddish-brown and light red-brown, very limey and sandy clay. Very stiff, but becoming wet. Lime abundant as whitish pockets, coarse rubble, nodules and grit. Occasional quartz and laterite grit fragments.	129'-130'	

Depth	Description	Depth	No. of Blows
130'0" - 132'0"	Grey, brown and reddish-brown, stiff moist silty clay to clayey silt. Lime pockets, lime rubble and mica fragments irregularly abundant.	130'-131' 131'-132'	- -
132'0" - 135'0"	Coarsely mottled grey, brown and reddish-brown, very stiff, dry clayey silt, with very abundant whitish lime pockets, nodules and small rubble.	132'-133' 133'-134' 134'-135'	- - -
135'0" - 136'6"	Coarsely mottled light grey, brown and yellow-brown very stiff and moist, fine sandy silt, becoming reddish-brown and very sandy in part. Occasional small lime pockets and nodules.	135'-136' 136'-137'	- -
136'6" - 138'4"	Coarsely mottled grey, reddish-brown and yellow-brown very stiff, moist sandy silt, becoming fine sand in part, with odd quarts and mica grit fragments. Odd small lime nodules etc.	137'-138' 138'-139'	- -
138'4" - 140'0"	Grey, brown and red-brown mottled very stiff, moist clayey to finely sandy silt, becoming very sandy at depth. Pockets of white earthy lime, lime nodules and grit abundant.	139'-140'	-

END OF BORE.

PERCUSSION TEST BOREHOLE NO 4. (K)

Locality: N.E. Corner, Site for Proposed Osborne "C" Power Station Western Side, Ft. River, Osborne North.

Purpose: Preliminary Test of Foundation Conditions.

Plant: No 15.

Driller: J. May. Assistant E. Schultz.

Date Commenced: 25.2.58. Date Completed: 7.3.58.

Depth	Description	Depth	No of Blows.
0'0"- 4'0"	Dark red-brown fine sandy fill. Loose and dry.	0- 1'	9
		1'- 2'	13
4'0"- 5'0"	Light brown fine limey sand, with pockets of fine red fill material. Abundant small fossils and fossil fragments. Generally loose and dry.	2'- 3'	20
		3'- 4'	20
		4'- 5'	9
		5'- 7'	9
5'0"- 7'0"	Reddish-brown to yellow-brown mottled, soft and moist, fine limey sand. Fairly abundant small fossil fragments.	7'- 9'	6
		9'-11'	9
7'0"-13'0"	Brown, yellow-brown and reddish-brown mottled, fine limey sand, with pockets of brown to greenish-brown soft, moist sandy clay. Small lime fragments and pockets of dark organic matter. Smell of H_2S.	11'-13'	19
13'0"-15'0"	Brown, green-brown and red-brown mottled, soft wet clay. Small pockets of light brown limey sand and dark organic matter, with smell of H_2S Fairly abundant small fossil fragments.	13'-14'	15
		14'-15'	15
15'0"-16'0"	Light grey and light grey-brown mottled soft, moist sandy. Numerous small fossil fragments and isolated seaweed fibres, with smell of H_2S	15'-16'	20
16'0"-17'6"	Dark brown and grey-brown mottled, soft, moist sandy clay. Abundant small fossil fragments, grit and seaweed fibres. Smell of H_2S	16'-17'	25
		17'-18'	25
17'6"-27'0"	Grey and light grey mottled fine limey sand. Soft and moist to wet. Numerous small fossils and fossil fragments. Small dark pockets and fibres of seaweed, with strong smell of H_2S	18'-19'	25
		19'-20'	20
		20'-22'	30
		22'-23'	30
		23'-24'	30
27'0"-29'0"	Light grey and light grey-brown mottled, soft wet limey sand. Abundant small fossil fragments and off seaweed fibres. Smell of H_2S	24'-25'	30
		25'-27'	100
		27'-28'	30
		28'-29'	30
29'0"-32'0"	Grey and grey-brown mottled soft wet limey sand. Abundant fossil fragments, small seaweed fibres and pockets with smell of H_2S. Somewhat clayey in part.	29'-30'	30
		30'-31'	30
		31'-32'	30
		32'-33'	30

32'0"-35'0"	Grey to grey-brown very soft and wet clayey sand. Scattered small fossil fragments, seaweed fibres, etc. Smell of H_2S.		
33'0"-34'0"	Light grey to light bluish-grey marl, partially cemented to form hard lumps in wet sandy groundmass. Scattered small fossil fragments. Strong smell of H_2S.	33'-34' 34'-35'	30 30
34'0"-35'0"	Grey to blue-grey clay; very soft and wet, with pockets of light grey limey sand. Cemented in part to form lumps of light grey fossiliferous limestone.		
35'0"-37'0"	Brown grey to bluish grey, stiff, wet limey clay (marl). Cemented in part to form lumps of blue-grey fossiliferous limestone.	35'-36' 36'-37'	20 30
37'0"-38'0"	Grey-brown and yellow-brown mottled stiff and moist silty clay, sometimes sandy in part. Occasional small lime nodules, pockets and fossil fragments.	37'-38'	20
38'0"-40'0"	Coarsely mottled grey, brown and dark yellow brown stiff, moist, silty to finely sandy clay, with numerous quartz and mica grit fragments. Small earthy lime pockets and lime nodules irregularly abundant.	38'-39' 39'-40' 40'-41'	20 (20) 17
40'6"-42'0"	Grey, brown and yellow-brown, very stiff, moist, silty clay with scattered quartz and mica grit fragments.	41'-42'	17
42'0"-43'10"	Coarsely mottled grey, brown and dark yellow-brown, stiff, moist, silty clay. Abundant lime as earthy pockets, nodules and small rubble.	42'-43' 43'-44' 44'-45'	20 20 15
43'10-48'0"	Coarsely mottled grey, brown and yellow brown, very stiff and moist, silty to finely sandy clay. Abundant quartz and mica grit fragments, and isolated small lime pockets and nodules.	45'-46' 46'-47' 47'-48'	15 15 20
48'0"-50'0"	Grey and reddish brown mottled, stiff but wet silty clay, with grit fragments and small pockets of yellow-brown sandy clay.	48'-49' 49'-50'	30 30
50'0"-51'0"	Irregularly mottled, grey, brown, red-brown and yellow brown silty clay to fine sandy silt. Wet and stiff, but with soft patches. Numerous quartz and mica grit fragments.		
51'0"-52'0"	Brown and reddish-brown mottled, stiff and wet, very silty clay to fine sandy silt. Abundant small quartz and mica grit fragments.	51'-52'	30
52'0"-56'0"	Mainly grey, brown and red-brown mottled, stiff, moist silty clay, with numerous grit fragments and isolated lime pockets and hard nodules.	52'-53' 53'-54' 54'-55' 55'-56'	20 25 25 20

55'8"-61'0"	Grey, reddish-brown and yellow-brown silty clay to fine silty sand, with numerous quartz and mica grit fragments. Moist and stiff to very stiff. Abundant lime pockets and rubble from 57'2"-57'8" and odd lime nodules elsewhere.	56'-57' 57'-58' 58'-59' 59'-60' 60'-61'	25 20 20 20 20
61'0"-64'0"	Grey, brown and yellow-brown mottled stiff, moist silty clay, becoming fine sandy silty in irregular patches, with abundant quartz and mica grit fragments.	61'-62'6" 61'6"-63' 63'-64'	14 20 15
64'0"-65'3"	Brown, red-brown and grey mottled, very stiff, dry silty clay. Very abund. lime pockets, nodules and small rubble.	64'-65' 65'-66'	20 15
65'3"-67'2"	Brown, red-brown and grey mottled, stiff, dry silty clay, with occasional lime pockets and nodules.	66'-67'	15
67'2"-72'0"	Grey, brown and dark brown mottled very stiff and dry, silty clay. Lime irregularly abundant as hard rubble, pockets and grit fragments.	67'-68' 68'-69' 69'-70'	20 20 20
72'0"-79'0"	Grey, brown and light brown mottled stiff, dry to moist silty clay. Abundant white lime pockets and small rubble. Odd quartz grit fragments.	70'6-71' 71'-72' 73'-73'6 73'-74'	20 25 25
79'0"-79'6"	Grey, brown and dark yellow-brown very stiff, moist sandy silt, with abundant quartz and mica grit fragments.	74'-75' 75'-76' 76'-77' 77'-78'	25 25 25 25
79'6"-79'0"	Grey and yellow-brown mottled, fine, soft, wet sand.	78'-79'	30
79'0"-80'0"	Grey, brown and red-brown, stiff wet silty clay, becoming somewhat sandy in part, with scattered small mica fragments.		
80'0"-81'0"	Grey, brown and dark brown mottled soft and wet, fine silty sand.	80'-81'	15
81'0"-83'0"	Grey, brown and red-brown stiff, moist, silty clay, with small pockets of yellow-brown silty sand. Odd mica fragments, etc.	81'-82' 82'-83'	20 25
83'0"-86'0"	Grey, brown and reddish-brown mottled very stiff, dry silty clay, with fairly abundant earthy white lime pockets, nodules and small lime rubble.	83'-84' 84'-85' 85'-86'	25 25 25
86'0"-87'0"	Grey and dark yellow-brown mottled stiff, moist sandy silt, with abundant quartz and mica fragments.	86'-87'	25
87'0"-88'0"	Grey, brown and reddish brown mottled soft, moist clayey silt, becoming coarse wet gritty sand in irregular patches. Abundant quartz and mica grit and small gravel fragments.	87'-88' 88'-89' 89'-90'4	25 25 25
88'0"-89'0"	Grey and brown mottled, stiff moist silty clay, with pockets of light brown fine silty sand. Numerous quartz and mica grit fragments.		

89' 0"- 90' 4"	Sealed Tube Sample	90' 4-91"	16
90' 4"- 91' 0"	Grey, brown and red-brown mottled, stiff moist silty clay. Lime nodules and earthy lime rubble irregularly abundant		
91' 0"-92' 0"	Grey brown and red-brown mottled stiff, moist silty clay, with small pockets of light brown sandy clay. Scattered small lime nodules.	91'- 92'	25
92' 0"- 95' 0"	Grey, brown and reddish-brown mottled very stiff, dry, silty and limey clay. Abundant lime pockets, nodules and coarse rubble. Quartz and mica grit fragments. etc.	92'- 93' 93'- 94' 94'- 95'	25 25 25
95' 0"- 98' 0"	Mainly brown to reddish-brown stiff moist silty clay, with light brown mottling. Becoming soft and wet, sandy to gritty in irregular patches. Occasional earthy lime pockets and gritty lime rubble.	95'- 96' 96'- 97' 97'- 98'	30 30 12
98' 0"-99' 9"	Brown and grey-brown, very stiff, dry, silty to finely sandy clay. Abundant lime pockets, nodules and hard rubble, quartz and mica grit fragments.	98'- 99'	23
99' 0"-105' 0"	Brown yellow-brown and grey mottled silty clay, becoming finely sandy to gritty irregularly. Occasional lumps of hard lime rubble and earthy lime pockets. Stiff and moist, but becoming wet and soft from 102'-103'	99'-100' 100'-101' 101'-102' 102'-103' 103'-104' 104'-105'	23 22 25 15 23 23
105' 0"-108' 9"	Grey, brown and yellow-brown mottled, stiff and moist sandy silt. with scattered quartz and mica grit fragments. Occasional chalky white lime pockets and hard lime nodules	105'-106' 106'-107' 107'-108' 108'-109' 109'-110'	27 15 25 15 15
108' 9"-115' 0"	Coarsely mottled grey, brown and red-brown soft wet silty sand with abundant quartz and mica grit fragments. Irregular pockets of coarse light brown sand.	110'-111' 111'-112' 112'-113' 113'-114'	15 20 15 20
115' 0"-116' 0"	Grey, brown and yellow-brown mottled very stiff, moist silty clay to finely sandy silt. Quartz grit and gravel fragments very abundant from 115' 10" and irregularly abundant elsewhere.	114'-115' 115'-116'	20 25
116' 0"-118' 0"	Coarsely mottled grey, yellow-brown and red-brown, very stiff moist clay, becoming silty to finely sandy in small pockets. Odd quartz grit and gravel fragments and small lime pockets.	116'-117' 117'-118'	25 20
118' 0"-120' 0"	Coarsely mottled grey, brown and reddish-brown very stiff moist clay. Somewhat sandy to gritty in patches, with odd quartz and mica grit fragments. Occasional small lime pockets.	118'-119' 119'-120'	20 30
120' 0"-120' 6"	Grey and brown mottled, very stiff moist clay, with abundant coarse light brown lime rubble.	120'-121'	30

P.D. 743/58
D.H. 1692/58

PENETRATION TEST BOREHOLE No. 5. (4)

Locality: S.E. Corner. Site for Proposed Osborne "B" Power Station. Eastern Side, Port River, Osborne North.

Purpose: Preliminary Test of Foundation Conditions

Plant: No. 15.

Driller: J. Hay **Assistant:** R. Shulze

Date Commenced: 18/3/58 **Date Completed:** 20/3/58

Depth	Description	Depth	No. of Blows
0'0" - 10'0"	Cinders and associated loose dry fill material.	0-1'	10
		1'-2'	7
		2'-3'	10
10'0" - 14'0"	Dark grey limey and clayey sand, with numerous fossil fragments. Occasional sewered fibres. Loose and dry, becoming soft and moist.	3'-4'	10
		4'-5'	10
		5'-6'	15
		6'-7'	20
		7'-8'	20
14'0" - 18'0"	Grey to grey-brown soft, wet clayey sand, with abundant small fossil fragments, sewered fibres and lumps of dark organic matter. Smell of H_2S.	8'-9'	15
		9'-10'	15
		10'-11'	12
		11'-12'	12
		12'-13'	12
		13'-14'	12
18'0" - 23'0"	Dark grey and light brown, soft, wet sandy clay. Occasional shell fragments and abundant lumps and fibres of partly decomposed sewered.	14'-15'	12
		15'-16'	15
		16'-17'	15
		17'-18'	15
		18'-19'	15
		19'-20'	15
23'0" - 29'0"	Mid-grey to grey-brown, soft wet clayey sand, with fairly abundant small fossil fragments, occasional sewered fibres and coarse plant remains. Smell of H_2S.	20'-21'	12
		21'-22'	15
		22'-23'	15
		23'-24'	15
		24'-25'	15
		25'-26'	15
29'0" - 30'0"	Grey to light grey and grey-brown, fine, soft, wet sand. Occasional small fossil fragments. Sewered fibres and coarse plant remains abundant. Smell of H_2S.	26'-27'	15
		27'-28'	20
		28'-29'	15
		29'-30'	10
30'0" - 31'0"	Light grey and light brown, soft wet calcareous sand, with very abundant coarse fossils and fossil fragments.	30'-31'	10
31'0" - 35'0"	Light grey to light grey-brown sandy marl, with fairly abundant generally small fossil fragments. Generally soft and wet, but with hard lumps of grey fossiliferous limestone.	31'-32'	10
		32'-33'	20
		33'-34'	23
		34'-35'	28
35'0" - 37'0"	Light grey to light grey-brown, fine sandy marl, with abundant small fossil fragments. Soft and wet, but with numerous small hard cemented lumps.	35'-36'	28
		36'-37'	30

Depth	Description	Depth	No. of Blows
37'0" - 38'0"	Light grey to grey-brown sandy marl, with abundant small fossil fragments. Small pockets of soft, wet, blue-grey clay.	37'-38'	30
38'0" - 39'0"	Light bluish-grey stiff, moist sandy marl, with pockets of blue-grey clay. Becoming brown to greenish brown silty clay in part, with lime pockets and small lime nodules.	38'-39'	30
39'0" - 40'6"	Brown, grey and greenish-brown mottled, stiff, moist silty clay, becoming light grey and light brown silty sand in large irregular patches. Somewhat calcareous in part, with old lime pockets and nodules.	39'-40' 40'-41'	30 30
40'6" - 43'0"	Grey, brown and yellow-brown mottled, very stiff, dry silty clay, with old pockets of brown to reddish-brown sand. Lime irregularly abundant as earthy pockets and small nodules.	41'-42' 42'-43'	25 30
43'0" - 45'6"	Light brown, light grey and light yellow-brown mottled, very stiff, dry silty to sandy and limey clay. Abundant chalky white lime pockets.	43'-44' 44'-45'	30 20
45'0" - 47'6"	Grey, brown and yellow-brown mottled very stiff, dry silty clay, with lime irregularly abundant as off white chalky pockets and small nodules.	45'-46' 46'-47' 47'-48'	20 15 15
47'6" - 51'0"	Grey, brown and dark yellow-brown mottled, stiff moist silty clay, becoming fine sandy silt to fine wet sand in irregular patches. Occasional small lime nodules and pockets.	48'-49' 49'-50' 50'-51'	15 15 15
51'0" - 55'6"	Grey, brown and dark yellow-brown stiff, moist silt to silty sand. Tendency to clayey in part. Occasional small lime pockets, mica and quartz grit fragments.	51'-52' 52'-53' 53'-54' 54'-55' 55'-56'	15 15 15 15 20
55'6" - 62'0"	Grey, brown and yellow-brown clayey silt to fine sandy silt, with small pockets of light brown sand. Stiff and moist, becoming firm and wet. Abundant quartz and mica grit fragments, occasional lime pockets and small nodule.	56'-57' 57'-58' 58'-59' 59'-60' 60'-61' 61'-62'	15 20 20 20 20 15
62'0" - 65'0"	Grey, brown and dark brown mottled, very stiff, dry silty clay, with small pockets of light-brown fine silty sand. Occasional quartz grit and gravel fragments.	62'-63' 63'-64' 64'-65'	15 15 15

Depth	Description	Depth	No. of Blows
65'0" - 67'0"	Grey, brown and yellow-brown mottled, very stiff dry, fine sandy silt, with old quartz and mica grit fragments. Becoming silty clay in small pockets.	65'-66' 66'-67'	15 15
67'0" - 70'0"	Grey, brown and dark red-brown mottled, very stiff, dry silty clay, with small pockets of light-brown sand. Fairly abundant lime as white earthy pockets, nodules and small rubble.	67'-68' 68'-69' 69'-70'	20 25 25
70'0" - 73'0"	Coarsely mottled light grey and brown, firm moist to wet sand. Pockets of grey silty clay from 72'6".	70'-71' 71'-72' 72'-73'	15 15 15
73'0" - 76'0"	Grey, brown and yellow-brown mottled stiff, moist very silty clay. Becoming finely sandy to gritty in patches. Occasional lime pockets and nodules.	73'-74' 74'-75' 75'-76'	15 15 20
76'0" - 79'0"	Grey, brown and reddish-brown very stiff, dry silty clay to clayey silt. Becoming sandy in pockets, with numerous quartz and mica grit fragments. Lime irregularly abundant as white earthy pockets, small rubble, nodules and grit.	76'-77' 77'-78' 78'-79'	20 15 20
79'0" - 82'6"	Grey, brown and yellow-brown mottled, firm moist sandy silt, with abundant quartz and mica fragments. Small pockets of fine brown sand and odd lime nodules.	79'-80' 80'-81' 81'-82' 82'-83'	20 20 20 10
82'6" - 85'0"	Grey, brown and yellow-brown mottled, very stiff, dry silty clay, with occasional chalky white lime pockets and nodules.	83'-84' 84'-85'	20 20
85'0" - 91'0"	Grey, brown and red-brown mottled, very stiff, dry silty clay, becoming fine brown sand in patches, with quartz and mica grit fragments. Lime irregularly abundant as white chalky pockets, rubble, nodules and grit.	85'-86' 86'-87' 87'-88' 88'-89' 89'-90'4" 90'4"-91'	20 20 20 20 15 15
91'0" - 93'0"	Light grey, brown and yellow-brown mottled, very stiff, dry silty clay, with old gritty fragments.	91'-92' 92'-93'	15 25
93'0" - 96'0"	Grey, brown and red-brown mottled very stiff, dry silty clay, with old gritty fragments.	93'-94' 94'-95' 95'-96'	12 12 12
96'0" - 98'0"	Grey, brown and red-brown mottled, very stiff dry, silty to finely sandy clay, with abundant lime, as white earthy pockets, rubble, nodules and grit. Occasional quartz gravel fragments.	96'-97' 97'-98'	15 15

Depth	Description	Depth	No. of Blows
98'0" - 100'4"	Grey, dark brown and red-brown mottled very stiff, dry silty clay. Slightly sandy in part, with some quartz and mica grit fragments.	98'-99'	18
		99'-100'	15
		100'-101'	20
100'4" - 107'0"	Grey, dark brown and red-brown, very stiff, dry silty clay, with irregularly abundant lime, as white chalky pockets, nodules, small pebble and grit. Few quartz and mica fragments	101'-102'	16
		102'-103'	20
		103'-104'	23
		104'-105'	20
		105'-106'	25
107'0" - 109'0"	Grey, brown and yellow-brown very stiff, dry silty clay to fine sandy silt. Occasional lime pockets and nodules.	106'-107'	20
		107'-108'	20
109'0" - 112'0"	Grey, brown and reddish-brown mottled, very stiff, dry silty clay. Slightly sandy in part, with some grit fragments and small lime nodules.	108'-109'	25
		109'-110'	20
		110'-111'	20
		111'-112'	20
112'0" - 116'0"	Grey, dark brown and yellow-brown mottled, very stiff, dry silty clay, with old quartz and mica grit fragments.	112'-113'	15
		113'-114'	15
		114'-115'	20
		115'-116'	20
116'0" - 118'0"	Grey, brown and yellow-brown mottled, very stiff, dry silty clay, becoming sandy in patches, with quartz and mica grit fragments. Occasional small lime pockets.	116'-117'	25
		117'-118'	20
118'0" - 122'0"	Grey, brown and dark yellow-brown mottled very stiff, dry silty clay, with old small quartz and mica grit fragments.	118'-119'	25
		119'-120'	20
		120'-121'4"	20
121'0" - 122'0"	Grey, brown and dark yellow-brown mottled, stiff moist silty clay, becoming finely sandy in part, with abundant quartz and mica grit fragments. Coarse lime grit and nodules.	121'4"-122'	15
122'0" - 126'0"	Grey, brown and reddish brown mottled, very stiff, moist silty clay, with abundant quartz and few lime grit fragments.	122'-123'	20
		123'-124'	20
		124'-125'	20
		125'-126'	15
		126'-127'	20
126'0" - 128'0"	Grey, dark brown and dark red-brown, firm, moist silty clay, becoming sandy in patches. Fairly abundant lime, as earthy pockets, small pebble, nodules and grit.	127'-128'	20
128'6" - 135'6"	Grey, brown and yellow-brown mottled, very stiff, dry silty clay to fine sandy silt. Becoming light brown and sandy in irregular patches, with quartz grit fragments. Old pockets of white chalky lime.	128'-129'	20
		129'-130'	25
		130'-131'	20
		131'-132'	20
		132'-133'	20
		133'-134'	20
		134'-135'	20
135'6" - 138'0"	Grey, brown and red-brown, very stiff dry clayey silt to fine light brown silty sand irregularly. Occasional small pockets of white chalky lime, small lime nodules and grit. Quartz and mica grit fragments.	135'-136'	20
		136'-137'	15
		137'-138'	20

Depth	Description	Depth	No. of Blows
139'0" - 140'0"	Light grey, light brown and yellow-brown mottled stiff, moist clayey to sandy silt, with few small pockets of grey clay.	138'-139' 139'-140'	15 17
140'0" - 150'0"	Mainly grey silty clay to clayey silt, with irregular brown, yellow brown and red-brown mottling. Becoming sandy in patches, with some quartz and mica grit fragments. Scattered lime pockets, nodules and grit. Stiff and dry, but becoming firm to soft and moist with depth.	140'-141' 141'-142' 142'-143' 143'-144' 144'-145' 145'-146' 146'-147' 147'-148' 148'-149' 149'-150'	20 20 15 15 17 16 20 10 7 -

END OF BORE.

RECORD OF WATER LEVELS IN BOREHOLES AT PROPOSED SITE FOR OSBORNE "C" POWER STATION, OSBORNE NORTH.

Date	Time	Bore No.1	Bore No.2	Bore No.3	Bore No.4	Bore No.5a.
11-3-58	4 pm.	6'2"	10'7"	6'6"	7'5"	7'4"
12-3-58	8 am.	6'2"	-	6'6"	7'6"	7'4"
"	1 pm.	6'2"	-	6'6"	7'6"	7'5"
"	4 pm.	6'2"	-	6'6"	7'5"	7'4"
13-3-58	8 am.	6'2"	-	6'8"	7'6"	7'5"
"	1 pm.	6'2"	-	6'8"	7'6"	7'5"
"	4 pm.	6'2"	-	6'7"	7'5"	7'4"
14-3-58	8 am.	6'2"	-	6'8"	7'6"	7'5"
"	1 pm.	6'2"	-	6'8"	7'6"	7'5"
"	4 pm.	6'2"	-	6'7"	7'5"	7'4"
17-3-58	8 am.	6'2"	-	6'8"	7'6"	7'6"
"	1 pm.	6'2"	-	6'8"	7'6"	7'7"
"	4 pm.	6'2"	-	6'8"	7'6"	7'4"
18-3-58	8 am.	6'2"	-	6'8"	7'6"	7'5"
"	1 pm.	6'2"	-	6'7"	7'5"	7'5"
"	4 pm.	6'2"	-	6'7"	7'5"	7'4"
19-3-58	8 am.	6'2"	-	6'7"	7'5"	7'4"
"	1 pm.	6'2"	-	6'7"	7'5"	7'5"
"	4 pm.	6'2"	-	6'7"	7'5"	7'4"
20-3-58	8 am.	6'2"	-	6'7"	-	7'0"

Bore No. 2 was in progress whilst these readings were being recorded and no record for that bore was possible.

Levels shown are depths below collars of bores.

123'6"-124'0"	Brown, grey and reddish-brown mottled very stiff, moist clay. Irregular pockets of yellow-brown silty sand. with abundant quartz and mica grit. fragments. Lime pockets and coarse lime rubble irregularly abundant.	121'-122'	30
		122'-123'	30
		123'-124'	30
124'0"-128'6"	Coarsely mottled grey, brown and red-brown very stiff moist clay, becoming silty to sandy in irregular patches	124'-125'	25
		125'-126'	15
128'6"-130'0"	Coarsely mottled grey, brown and red-brown very stiff, slightly moist clay, with abundant small patches of yellow-brown sand. Abundant quartz and mica fragments.	126'-127'	20
		127'-128'	20
		128'-129'	20
		129'-130'	20
130'0"-132'0"	Grey, brown and red-brown stiff moist silty clay, with very abundant whitish lime pockets, nodules and small rubble.	130'-131'	30
		131'-132'	30
132'0"-133'0"	Sealed Tube Sample		
133'0"-133'0"	Coarsely mottled grey, brown and reddish very stiff and dry, silty clay becoming finely sandy in part. Occasional lime pockets, nodules and small rubble.	132'-133'4	30
		133'4-134'	25
		134'-135'	25
		135'-136'	25
		136'-137'	25
138'0"-140'0"	Coarsely mottled grey, brown and reddish-brown stiff moist silty clay. Irregular pockets of yellow-brown sand, with quartz and mica fragments.	137'-138'	30
		138'-139'	30
		139'-140'	30
140'0"-142'0"	Coarsely mottled grey, brown and reddish brown stiff moist silty clay, becoming finely sandy in part. Scattered small lime nodules and lime grit.	140'-141'	15
		141'-142'	15
142'0"-145'0"	Grey, brown and red-brown mottled, silty to sandy clay, becoming fine. yellow-brown sand in patches. Stiff to firm and very moist. Abundant quartz and mica grit fragments and odd small lime nodules.	142'-143'	10
		143'-144'	10
		144'-145'	10
145'0"-149'0"	Grey, brown and yellow-brown, soft wet silty to sandy clay, with large pockets of coarse brown to reddish-brown sand, increasing with depth.	145'-146'	10
		146'-147'	10
		147'-148'	10
		148'-149'	7
149'0"-150'0"	Coarse brown to reddish-brown very wet sand, mainly quartz but with numerous mica fragments. etc.	149'-150'	5

END OF BORE

F. H. STARK
for CEYLON GEOLOGIST
GOLD GEOLOGY SECTION

DM1692/57

DEPARTMENT OF MINES

SOUTH AUSTRALIA

Progress Report No 2. - Week Ending 13.12.57

FOUNDATION TEST BOREHOLE NO 1.

SITE FOR PROPOSED OSBORNE "C" POWER STATION

WESTERN SIDE, PT. RIVER, OSBORNE NTH.

Drilling commenced at a depth of 58' 0" and continued to 124' 0", making a total footage of 66'. The strata penetrated were in general fairly uniform and consisted of strongly mottled, grey brown, yellow brown and reddish brown silty clays to sandy and clayey silts. Lime was present in irregular abundance as chalky pockets, hard cemented nodules and lime grit. The clays and silts were for the main stiff to very stiff, dry to somewhat moist. Several small water horizons were encountered, some were sampled, the remainder being either present in too small a quantity, or mixed with too much mud to collect.

It was found necessary to progressively ream out the hole and drive the casing past each successive water layer, in order to permit further uncontaminated sampling. Driving of the casing proved somewhat difficult due to the heavy nature of the clay being penetrated. At one stage the casing became buckled due to a faulty thread, and had to be withdrawn with special jacking equipment.

Water samples were collected at 70' and 104' and forwarded to the Chief Chemist, Osborne Power Station for analysis. Two further sealed tube samples were taken at depths from 71'8" - 73' 0" and 80'8" - 82' 0".

A number of representative samples were taken at each change of strata and stored in small plastic tubes. A complete log of all strata penetrated has been continued, along with a record of all other relevant information on method of sampling, water status, blows per foot, penetration of casing and sampling tools etc.

A generalized log is here presented.

Generalized Log of Strata penetrated Bore 1

Depth	Description
58'0" - 60'0"	Coarsely mottled light grey, yellow-brown and reddish-brown sandy to silty clay, soft and wet. Some small lime nodules.
60'0" - 63'0"	Light-grey, very stiff silty clay, with coarse brown, yellow-brown and reddish-brown mottling. Small lime pockets, lime nodules etc, irregularly abundant.
63'0" - 66'0"	Brown to reddish-brown, very stiff silty clay to clayey silt, with some coarse, light grey mottling. Pockets of whitish earthy lime, quartz grit etc, irregularly abundant.
66'0" - 68'0"	Coarsely mottled, grey to light grey and brown to reddish-brown very stiff sandy silt. Abundant grit and pockets of white earthy lime.
68'0" - 70'0"	Brown to reddish-brown, very firm fine silty sand, with fairly abundant grit.
70'0" - 76'0"	Coarsely mottled, grey to light grey clayey silt, very stiff. Patches of white earthy lime, lime nodules, etc. irregularly abundant.
76'0" - 77'8"	Ditto. Lime pockets very abundant.
77'8" - 79'6"	Grey to light grey, very stiff and dry, silty to sandy clay, with coarse brown and reddish-brown mottling. Small pockets of white earthy lime irregularly abundant.
79'6" - 80'8"	Ditto, lime very abundant.
80'8" - 85'0"	Grey to light grey very silty clay with brown to dark yellow-brown mottling or streaking. Lumps of hard white limestone. Few small lime pockets and som lime grit.
85'0" - 89'6"	Ditto, only soft and wet in part due to water contamination.
89'6" - 93'0"	Grey to light grey very firm silty clay to clayey silt. Brown to yellow brown stains, streaks and mottling. Odd pockets of white earthy lime, lime nodules, grit etc.
93'0" - 95'0"	Ditto, but moist in part.
95'0" - 98'6"	Brown to reddish-brown very stiff silty clay to clayey silt, with coarse irregular green grey streaks. Sandy in part with some small grit fragments.
98'6" - 99'6"	Light brown to reddish-brown sandy marl, very stiff. Pockets of white earthy lime, lime kernels etc, irregularly abundant.
99'6" - 104'0"	Light grey-brown and yellow-brown very silty clay, very stiff. Pockets of white earthy lime, lime nodules etc. irregularly abundant.
104'0" - 108'0"	Mainly brown to reddish-brown very silty clay with green grey mottling. Very stiff. Abundant small chalky lime pockets and coarse lime nodules.
108'0" - 117'6"	Coarsely mottled light grey, brown and reddish-brown very stiff clayey silt. Few small lime grit fragments Becoming firm to slightly moist at depth.

Depth	Description
117' 6" - 124' 0"	Light grey to pale green-grey sandy to clayey silt. Very stiff, with coarse brown to reddish-brown mottling. White chalky lime pockets and nodules irregularly abundant.

Bore in progress.

R.D. Steel.

R. D. STEEL
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION

RDS:CERF
19/12/57

DM. 1692/57.

DEPARTMENT OF MINES,

SOUTH AUSTRALIA.

FOUNDATION TEST BOREHOLE NO. 1.

SITE FOR PROPOSED OSBORNE "C" POWER STATION,

WESTERN SIDE PT. RIVER, OSBORNE NORTH.

PROGRESS REPORT NO. 3. WEEK ENDING 20/12/57.

Drilling commenced at a depth of 124 ft. and continued to the proposed maximum depth of 150 ft. A total of 26 ft. was drilled. The strata penetrated were again mainly strongly mottled grey, brown, red-brown and yellow-brown, silty clays or clayey silts. Lime was present in irregular abundance as chalky pockets, hard cemented nodules and lime grit. The material penetrated was uniformly very stiff and relatively dry, except at 132 ft. where a small water layer was encountered, which caused considerable contamination of the samples at that depth. The bore was subsequently cased to 134 ft. and sampling proceeded uninterrupted to 150 ft.

Representative samples of all strata changes were collected, while a comprehensive log and record of all relevant drilling information was continued.

After completion of drilling the casing was withdrawn. This proved to be a slow laborious process, as it had become firmly wedged in the hole and could only be removed inch by inch, using special manually operated hydraulic jacks.

The drilling rig was then dismantled and set up over the site of Bore No. 2, on the North East corner of the proposed building area. Drilling operations were suspended on December 20th, for the Christmas Shutdown period. The plant now remains ready for immediate operation when work again commences in the New Year.

A Generalized log is here submitted.

DEPTH.	DESCRIPTION.
124' 0"-128' 0"	Coarsely mottled, light grey and brown very stiff silty clay.
128' 0"-130' 0"	Light brown mottled, very stiff sandy and limy clay, with abundant chalky lime.
130' 0"-131' 0"	Coarsely mottled light grey, yellow-brown and red-brown very stiff silty to sandy clay, with lime irregularly abundant.
131' 0"-132' 6"	Mainly brown to dark brown stiff to wet sandy clay, with lime pockets irregularly abundant.
132' 6"-135' 6"	Grey to light grey very silty clay, with coarse yellow-brown and red-brown mottling. Occasional lime. Very stiff.
135' 6"-137' 6"	Mainly brown to red-brown sandy to silty clay with slight grey mottling. Few large pockets of white chalky lime. Stiff and dry.
137' 6"-141' 0"	Light grey very stiff silty clay, with brown to reddish brown mottling. Occasional large lime pockets, lime nodules etc.
141' 0"-145' 0"	Brown, red-brown and grey-brown, finely sandy to silty clay. Generally small lime pockets etc., but with occasional large patches.
145' 0"-147' 0"	Light grey, reddish brown and yellow-brown very stiff silty clay. Isolated small lime pockets, but fairly abundant lime and quartz grit.
147' 0"-150' 0"	Coarsely mottled light grey-brown and yellow-brown finely sandy silt, very stiff. Odd lime and grit fragments.

R D Steel

A. D. STEEL.

FOR SENIOR GEOLOGIST
SOILS GEOLOGY SECTION.

3rd January, 1958.

Section

D.M. ~~23/58~~
1692/57

DEPARTMENT OF MINES
SOUTH AUSTRALIA

PROGRESS REPORT NO. 7 - WEEK ENDING 7/2/58

FOUNDATION TEST BOREHOLE NO. 3

SITE FOR PROPOSED OSBORNE "C" POWER STATION

WESTERN SIDE, PT. RIVER, OSBORNE NTH.

Plant No. 6 was dismantled at Bore No. 2 on Monday morning 3.2.58 and set up on the site of Boro No. 3, which is in the centre of the testing area. Drilling of this hole commenced at 8.00 a.m. the following day, and a total footage of 80' was completed to the end of this period.

Using a special basket retainer, the material to a depth of 40' was readily recovered, but since it was of a very soft, wet and sandy nature, it was again found necessary to drive the casing ahead of the sampling for most of this distance. This material was essentially similar to that encountered in Bores 1 and 2 at the same depth, i.e. loose dry fossiliferous sand and fill material to 8', thence grading into grey and grey-brown clay, sand or clayey-sand, generally very soft and wet, and containing irregular pockets of decomposed seaweed. A smell of H_2S was noted in all samples from about 18'. Fossils and fossil fragments were common throughout and were in part cemented to form hard lumps of fossiliferous limestone.

At 38', a light bluish-grey clayey and limey sand was penetrated, which was in part cemented and abundantly fossiliferous. From a depth of 40'4", the strata become a highly irregular sequence of sands, sandy silts, clayey silts and silty clays. These were in general coarsely mottled with grey, brown, red-brown and yellow brown predominating. Hardness also varied considerably, from very stiff and dry where dominantly clay, to soft and wet in some of the sandier portions. It has been shown that, in this hole, as also in the first two drilled, the presence of sand or

sandy pockets are generally associated with the presence of free water. Bore No. 3, has a greater thickness of sandy material to a depth of 60' than had Bores No. 1, and No. 2, consequently much more water has been encountered. Often this water serves only to make the recovery of open tube or undisturbed samples difficult, and as a result, it has not been possible to obtain sealed tube samples at any regular intervals. It has become necessary to case off these wet and often shallow horizons, in order to recover the drier material beneath in a suitably uncontaminated condition. Since frequent changes of tools are necessary in driving casing generally only a few feet at a time, these small sandy horizons have considerably hampered drilling progress.

Lime is present as elsewhere, in irregular abundance as whitish earthy pockets, soft rubble, nodules and grit. There are also present, occasional lumps of hard grey fossiliferous limestone.

A complete log of the strata penetrated has been made and a generalized version presented to accompany this report. Sealed tube samples have been taken at appropriate intervals, likewise water samples, where water was suitably abundant and uncontaminated. Representative samples of all strata penetrated have been collected and stored in small plastic tubes. A complete record of all relevant drilling information, blows per foot penetration etc. has been maintained throughout.

During this period Plant No. 6 was replaced by Plant No. 15, and a delay of several hours involved in the transfer.

R.D. Steel

R.D. Steel,
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION

RDS: AGK
17/2/58.

GENERALIZED LOG OF BORE NO. 3.

Depth	Description
Surface - 2'0"	Cinders and associated fill material.
2'0" - 6'0"	Light grey and brown, loose dry sand, with few cinder fragments etc. Abundant small fossil fragments, and occasional lumps of hard fossiliferous limestone.
6'0" - 8'0"	Light brown and grey-brown clayey sand. Loose and dry, but becoming moist with depth. Fairly abundant small fossil fragments and lumps of fossiliferous limestone. Small pockets of fibrous seaweed.
8'0" - 11'0"	Grey, light brown and green-brown mottled, soft, wet clayey sand, becoming silty clay in part. Abundant small fossil fragments, lime nodules and pockets of light brown fibrous seaweed.
11'0" - 14'0"	Alternate pockets of light brown, soft, wet, limey and clayey sand, with abundant small fossil fragments and pockets of brown to green-brown, soft, wet, silty clay, with dark grey decomposed seaweed. Occasional lumps of hard, grey, fossiliferous limestone.
14'0" - 15'0"	Mainly grey to dark grey, soft, wet clay, with brown and green-brown mottling. Pockets of light brown limey, clayey and fossiliferous sand. Large patches of dark grey-brown decomposed seaweed.
15'0" - 18'0"	Coarsely mottled brown, green-brown and grey-brown, soft, wet, clayey sand, becoming soft, brown clay in part. Abundant fossil fragments and occasional lumps of light brown fossiliferous limestone.
18'0" - 23'0"	Grey-brown, soft, wet, fine clayey sand, with pockets of light grey sand, increasing. Abundant minute fossil fragments and occasional seaweed fibres. Smell of H_2S.
23'0" - 25'0"	Grey to light grey, fine, wet sand, somewhat clayey in part. Abundant generally small fossil fragments, isolated seaweed fibres etc. Smell of H_2S.
25'0" - 31'0"	Light grey to light grey-brown mottled, soft, wet sand. Fairly abundant, generally minute shell fragments. Smell of H_2S.
31'0" - 34'0"	Grey to light grey and grey brown mottled, fine, soft, wet sand. Few small fossil fragments and irregularly abundant pockets of dark grey-brown decomposed seaweed. Smell of H_2S.
34'0" - 36'0"	Dark grey to light grey and grey-brown mottled, soft, wet sand; tendency to clayey in part. Occasional small fossil fragments, seaweed fibres, etc. Smell of H_2S.
36'0" - 37'0"	Mainly light brown to grey-brown, soft wet sand, with light to dark grey mottling. Abundant grit, fossils and fossil fragments. Odd small seaweed pockets and fibres.
37'0" - 38'0"	Grey to light grey and green-grey, soft, wet, calcareous sand to sandy clay, with abundant fossil fragments. Cemented in part, to form hard lumps of fossiliferous limestone.

Bore No. 3 (Contd.)

Depth	Description
38'0" - 40'4"	Light grey to bluish-grey soft, wet, limey and clayey sand, with abundant fossil fragments. Cemented in part to form lumps of blue-grey, fossiliferous limestone.
40'6" - 42'6"	Mainly brown, stiff, moist sandy silt to sandy clay, with irregular grey and reddish-brown mottling. Abundant whitish lime pockets, small lime nodules and grit.
42'6" - 46'0"	Coarsely mottled, grey, light brown and light yellow-brown, stiff, moist, sandy and limey clay, becoming fine wet sand in part. Abundant white earthy lime pockets and soft lime rubble. Occasional lumps of hard grey fossiliferous limestone.
46'0" - 47'0"	Mainly grey and yellow-brown, stiff and moist, fine sandy silt, with slight red-brown and green-brown mottling. Becoming fine wet sand in part, with small lime pockets, nodules and grit.
47'0" - 53'0"	Coarsely mottled, light grey, yellow brown and reddish brown, stiff and moist, very silty clay. Light green-brown silty sand, abundant between 48'0" - 48'4" and in small irregular patches elsewhere.
53'0" - 54'5"	Becoming light grey, brown, red-brown and yellow-brown stiff, moist, clayey silt. Quartz and mica grit fragments irregularly abundant. Odd small lime pockets, nodules, grit etc.
54'5" - 63'6"	Coarsely mottled grey, brown and reddish-brown, firm and moist clayey sand, to coarse wet siliceous sand, in large irregular pockets. Few mica and quartz gravel fragments.
63'6" - 66'0"	Light grey, to brown and yellow-brown stiff, moist, clayey silt, with pockets of fine to coarse, wet, gritty sand. Occasional mica flakes etc.
66'0" - 69'0"	Light grey, stiff and moist firm sandy silt, with brown and yellow-brown mottling. Becoming fine, wet sand in part, with fairly abundant mica fragments.
69'0" - 70'6"	Light grey, brown and reddish-brown mottled, stiff but wet, fine sandy silt, with large pockets of fine brown, wet sand. Occasional small mica fragments etc.
70'6" - 73'8"	Coarsely mottled grey, brown and reddish brown, stiff and moist silty clay, to clayey silt. Small quartz and mica grit fragments.
73'8" - 76'0"	Coarsely mottled grey, brown and red-brown, stiff and moist, very silty clay. Odd pockets of fine, light brown sand, with abundant quartz and mica grit fragments. Occasional small lime pockets, nodules and grit.
76'0" - 79'0"	Coarsely mottled, brown, red-brown and grey, silty to very sandy, stiff, moist clay.

Bore No. 3 (Contd.)

76'0" - 79'0" (Contd.)	Occasional patches of light brown sand, grit etc. Lime very abundant as large earthy pockets, rubble, nodules and grit.
79'0" - 81'0"	Coarsely mottled grey to reddish-brown and dark yellow-brown, stiff and moist, fine sandy silt, to fine sand. Fairly abundant quarts and mica grit fragments.

R.D. Steel
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION

17/2/58

DM1692/57.

Department of Mines
South Australia

PROGRESS REPORT NO. 8 - WEEK ENDING 14/2/58

FOUNDATION TEST BORE HOLE NO. 3

SITE FOR PROPOSED OSBORNE "C" POWER STATION

WESTERN SIDE, PT. RIVER, OSBORNE NTH.

During this period further unavoidable delays were experienced, which considerably hampered drilling progress. A footage of only 50' was completed for the five day period, leaving the hole standing at a total depth of 130'. Assistant driller D. Gustaffson resigned Monday 10/2/57 as he was unable to cope with the heavy work involved in pushing out cores from the sample tubes. A replacement was not made available until Wednesday.

Water was struck at 84' and an attempt was made to case it off. Under the constant impact of driving, the screw thread on the top length of casing sheared through. A whole day was spent jacking out the damaged section and replacing it with a new length.

Drilling proceeded without further trouble to 130', with continuous sealed tube and open tube samples being recovered, in very stiff silty clay etc. A further water horizon was encountered at approximately 130' whence casing was again driven to close it off. Casing was first put down to 120' and the hole cleaned out with a bell mouthed reamer bit. At 122', the sampling tool became firmly wedged in the hole and all attempts to free it were unsuccessful. A request was forwarded for a sinker bar, but this did not arrive until the following Monday, morning.

The strata penetrated from 80' to 130' was again a repetition of that encountered at similar depth in the first two bores, ie. mainly coarsely mottled brown, grey, red-brown and yellow-brown silty clays, clayey silts and sandy silts with fine to coarse sandy patches at intervals. Lime was present throughout in irregular abundance as whitish

earthy pockets, nodules, rubble and grit. A generalized log of this sequence is presented to accompany this report.

Logging, sampling, and the recording of other relevant drilling information has been maintained as usual.

R D Steel

R. D. STEEL.
for SENIOR GEOLOGIST
SOILS GEOLOGY SECTION

RDS:CMZ
26/2/58

DEPTH			DESCRIPTION
80' 0"	-	82' 0"	Coarsely mottled grey, red-brown and yellow-brown, fine sandy silt to fine sand. Stiff and moist, and with abundant quartz and mica fragments.
82' 0"	-	86' 0"	Coarsely mottled, grey, brown and red-brown stiff, moist, silty clay. Becoming light brown sandy clay, with abundant lime pockets, rubble, nodules and grit.
86' 0"	-	88' 0"	Mottled grey and brown, stiff, moist, silty clay. Abundant lime rubble etc., from 86'8"-87'0".
88' 0"	-	88' 5"	Brown to light brown, very stiff, dry, limey clay. Abundant lime pockets and soft rubble.
88' 5"	-	92' 0"	Coarsely mottled brown, red-brown and grey silty clay, with small pockets of light brown sand. Stiff, moderately dry, and with irregularly abundant lime pockets, rubble etc.
92' 0"	-	98' 0"	Coarsely mottled brown, red-brown and grey silty clay. Very stiff and moderately dry. Becoming sandy and limey in irregular pockets. Lime present as occasional large pockets, scattered nodules, grit etc.
98' 0"	-	107' 0"	Mainly brown, reddish brown and lesser grey mottled, very stiff, dry silty clay, becoming sandy in part. Scattered lime pockets, nodules and grit
107' 0"	-	108' 6"	Mainly brown to reddish brown silty to sandy and limey clay. Stiff and somewhat moist. Large irregular lime pockets, nodules, grit etc.
108' 6"	-	111' 0"	Coarsely mottled grey, brown, and red-brown, very stiff silty clay. Occasional large lime pockets.
111' 0"	-	113' 0"	Coarsely mottled grey, red-brown and yellow brown silty to sandy clay. Stiff and dry, with occasional lime nodules and grit fragments
113' 0"	-	114' 0"	Mottled grey and brown, very stiff, silty to sandy clay. Pockets of brown to yellow-brown sand
114' 0"	-	114'10"	Coarsely mottled grey, brown and yellow brown stiff, moist clay. Becoming silty to finely sandy in part. Occasional small lime pockets, nodules etc,
114'10"	-	117' 0"	Coarsely mottled grey, brown red-brown and yellow brown very stiff, moist silty clay, becoming very sandy to gritty in part.
117' 0"	-	120' 0"	Coarsely mottled grey, brown and yellow-brown very stiff silty clay. Few small sandy pockets, with quartz, mica and lime grit fragments.
120' 0"	-	123' 0"	Coarsely mottled grey, red-brown and yellow- brown clay to sandy clay. Very stiff, slightly moist and with irregularly abundant lime pockets, nodules and travertine rubble.
123' 0"	-	129' 0"	Coarsely mottled light grey, brown and yellow-brown clayey silt, with few pockets of grey clay. Stiff, moist and sandy in part with occasional quartz, laterite and lime grit fragments. Abundant lime pockets, rubble etc., from 128'0"-128'3".
129' 0"	-	130' 0"	Coarsely mottled brown and red-brown very limey and sandy clay. Very stiff, but becoming wet. Abundant lime pockets, rubble, nodules and grit. Few small clay pockets and grit fragments.