WELSH INDUSTRIAL ESTATES CORPORATION

PROPOSED DEVELOPMENT OF THE NORTHERN SECTION

OF THE HIRWAUN INDUSTRIAL ESTATE

REPORT ON SITE INVESTIGATION

LAB. REF. NO. S/8731 JANUARY, 1972.

NOTES

GENERAL

(i) The comments given in this report and the opinions expressed are based on the soil conditions encountered in the boreholes and on the results of tests made in the field and in the laboratory. There may, however, be special conditions obtaining at the site which have not been disclosed by the boreholes and which have not been taken into account in the report.

(ii) The comments on ground-water conditions given on the borehole records are based on observations made at the time the boreholes were sunk. It should be noted, however, that groundwater levels vary due to seasonal or other effects.

SPECIAL FIELD TESTS

Where there is reference in the report to the undermentioned tests they were made in the field by the methods given below:----

Standard Penetration Test

This test is made using the procedure described by Terzaghi and Peck⁽¹⁾. A 50mm (2in) diameter split spoon sampler is driven into the soil using a 63.50kg (140lb) hammer with a 760mm (30in) drop and the 'penetration resistance' is expressed as the number of blows required to obtain 305mm (12in) penetration of the sampler. With soil of high resistance it is not always possible to attain 305mm (12in) penetration; in this case the number of blows required to obtain the actual penetration achieved is shown on the borehole record.

Dynamic Cone Penetration Test

This is made using a similar procedure to the standard penetration test, but with a 50mm (2in) diameter, 60 degree apex, solid cone fitted to the split spoon sampler.

PROCEDURE FOR SHEAR STRENGTH TESTS

The various types of shear strength test, when made, are denoted in the tables of laboratory test results by the following symbols:—

- U1(1½) Undrained Triaxial Compression Test on single 38mm (1½in) diameter specimen at a lateral pressure approximately equal to overburden pressure.
- U1(4) Undrained Triaxial Compression Test on single 102mm (4in) diameter specimen at a lateral pressure approximately equal to overburden pressure.
- U(1¹/₂) Undrained Triaxial Compression Test on set of three 38mm (1¹/₂in) diameter specimens at three different lateral pressures.
- UM(1½) Modified Undrained Triaxial Compression Test on single 38mm (1½in) diameter specimen. In this test an initial low lateral pressure is applied to the specimen and the deviator stress increased until failure is imminent. The lateral pressure is then increased and the procedure repeated, where possible, until the failure stresses at three different lateral pressures have been determined.
- UM(4) Modified Undrained Triaxial Compression Test on single 102mm (4in) diameter specimen. The procedure for this test is similar to that described above for a 38mm (14in) diameter specimen.
- UC Unconfined Compression Test on 38mm (13in) diameter specimen.
- LV Laboratory Vane Test.

- 1 -

(1) Terzaghi, K. and R. B. Peck, - 'Soil Mechanics in Engineering Practice', Second Edition, John Wiley, 1967, p. 304.

LAB 39

WELSH INDUSTRIAL ESTATES CORPORATION

PROPOSED DEVELOPMENT OF THE NORTHERN SECTION

OF THE HIRWAUN INDUSTRIAL ESTATE

REPORT ON SITE INVESTIGATION

Lab. Ref. No. S/8731

January, 1972.

1. Introduction

It is proposed to develop the northern section of the Hirwaun Industrial Estate at Hirwaun, South Wales. On the instructions of Wallace Evans and Partners, Consulting Engineers to the Welsh Industrial Estate Corporation, borings were sunk, trial pits excavated and in-situ and laboratory tests were made to provide information on the extent of pest deposits and on the soil conditions for foundation design.

Reports prepared by Soil Mechanics Ltd. which contain information relating to the southern section of the Industrial Estate were made available by the Consulting Engineers.

The site work was carried out during the period 12th to 30th November, 1971.

2. <u>Topography of Site</u>

The estate is situated about two miles west of Hirwaun, immediately north of the Heads of the Valleys road (A465) to Neath.

The northern section of the industrial estate has a complicated layout as shown on the site plan (Fig. 21). It is understood to be about 24 hectares in extent and is divided into three areas by a sewerage works, and a disused railway line which, together with an adjoining stream, crosses the site in a roughly north-west to south-east direction. The three areas referred to are described below:-

<u>Northern Area</u>: this is mainly waste ground which lies north of the disused railway line and was formerly occupied by an Ordnance Factory. The remains of this factory in the form of concrete roads, disused pillboxes, old foundations and a rubbish tip are evident, together with substation buildings. To the east of the waste ground is a hill-grassed higher area: a stream crosses this area to flow into the one referred to above.

<u>South-Eastern Area</u>: this is an elongated expanse of generally high ground covered by hill grass. It rises to the south from the disused railway line to the reservation for the extension of the Heads of the Valleys road; the maximum difference in level is about 15m. There is a 400kV power line mounted on pylons which crosses part of this area.

- 2 -

South-Western Area: this is a small isolated hill-grassed area which is separated from the south-eastern area described above by the sewerage works. It also rises southwards from the disused railway line to the Heads of the Valleys reservation, where work was in progress at the time of the investigation; the maximum difference in level is about 13m.

3. <u>Geclogy of Site</u>

Geological records available are the 1/63360 scale map (sheet 231) and the 1/10560 scale map (sheet49 Breconshire), which was mapped at a later date.

Both maps show that the site is covered by glacial drift (Boulder Clay) with areas of peat which is underlain by the Fairwell Rock sandstone of Carboniferous age. However, whilst both maps indicate a prominent peat deposit south of the disused railway line, only a small part of which occupies the site under consideration*, there is conflicting information as to the extent of the peat deposit north of the disused railway line: the 1/63360 scale map shows an area of peat, whilst the 1/10560 scale map shows the same area mapped as alluvium. The results of the investigation, discussed in Section 6, et seq. below, tend to confirm that the information provided by the 1/10560 scale map is to be preferred.

4. <u>Site Investigation</u>

Eight boreholes (Nos. 1 to 3, 5 and 6, and 8 to 10) were sunk by shell and auger methods and sixteen trial pits were excavated by mechanical digger at the positions shown on the site plan (Fig. 21). The depths of the boreholes and trial pits, the descriptions of the soils encountered and comments on ground-water conditions are given in the borehole records (Figs. 1 to 8) and the trial pit records (Figs. 9 to 16).

Representative disturbed and, where possible undisturbed samples, were taken at the depths shown on the borehole and trial pit records. and were despatched to the Laboratory at Hayes for examination and testing. Standard and dynamic cone penetration tests were made in the boreholes in sand and gravel to assess the relative density of the material; the values of penetration resistance are given in the borehole records.

A total of fifty-one Mackintosh probes were made to determine the presence or otherwise of peat. Twenty-two probes were made in the northern area and the results are given in Table 1; a further twenty-nine probes were made in the south-eastern area, and the positions and results of these probes are shown in Fig. 17.

Two shallow trenches were excavated to investigate two areas of suspected peat in the northern area. Descriptions of the materials encountered in the trenches, together with their approximate location are given in Fig. 18.

The ground levels at the borehole and trial pit positions. given on the records, were interpolated from contours given on the site survey drawings provided by the Consulting Engineers.

the southern extremity of the south-eastern area, referred to in Section 2, above.

5. Laboratory Testing

The natural moisture contents of three 0.10m diameter undisturbed samples and ten disturbed samples were determined and the results are given in Table 2, where the result of a natural wet density determination made on an 0.10m undisturbed sample is also given.

The natural moisture content/dry density relationships of three selected samples from the presumed cut areas were determined using the British Standard Compaction test (2.5kg rammer method); the results of these tests are given in Figs. 19 and 20.

Chemical analyses were made on one ground-water and nine soil samples to determine their total sulphate contents and, in the case of the water sample, the pH value. The results of these tests are given in Table 3.

6. <u>Comments on Scil Conditions in Relation to</u> Foundation Design

6.1 General

In the boreholes and trial pits, glacial drift often overlain by fill or alluvium was generally penetrated to the full depths bored. Numerous large boulders in the glacial drift precluded the positive identification of bedrock in any borehole, but it is possible that bedrock was met in boreholes 2 and 10 at depths of 3.00m and 11.00m below ground level, respectively. The term 'boulder or bedrock' has been used in the records.

The glacial drift was either sandy clay containing gravel, ocbles and boulders or clayey sand and gravel with cobbles and boulders. Trial pits 1 and 2 located at the rubbish tip in the northern area of the site revealed 1.85m of building rubble and industrial refuse underlain by glacial drift: clay fill was found in trial pits 4, 7 and 11 excavated in the same area of the site and, in trial pits 7 and 11, the fill was underlain by topsoil, presumably the original topsoil present prior to placing the fill. Alluvium comprising sandy silty clay with occasional gravel and cobbles was encountered in trial pits 4, 6 and 8, also in the northern area: the trial pits were excavated in a region mapped as alluvium on the 1/10560 scale geological map (see Section 3, above). Compressible organic clay was met in the low-lying parts of the site.

Ground-water was present in all boreholes and was observed at depths between 0.35m and 1.30m below ground level in the northern area, and at depths between ground level and 10.00m below ground level in the southeastern and south-western areas of the site. Ground-water was also met in all trial pits except trial pits 12 and 14; it quickly filled trial pits 1, 2, 4, 6 and 9 to the respective ground-water levels, and the sides of the trial pits collapsed.

Ground-water is unlikely to present problems when excavating the higher parts of the site, providing that cuts are shallow and that proper attention is paid to drainage. As much of the glacial drift is essentially granular, it should not be difficult to work even when ground-water is met.

- 4 -

6.2 Peat Deposits

6.2.1 Northern Area

The Mackintosh probes sunk in the northern areafailed to establish the presence of any extensive deposits of peat. It is understood that two confined areas of peat were disclosed during demolition of the factory buildings near the service ring road*: one near the south-west corner, and the other roughly between borehole 5 and fifth avenue. The areas were probably backfilled with hardcore and building rubble at the time of demolition, as there is now no surface evidence of peat in the areas. Two trial trenches excavated in the areas referred to revealed small thicknesses of organic clay, and near trial pit 6, some peat, sometimes overlain by hardcore and rubble; however, no extensive deposits of the peat were found (see Fig. 16).

6.2.2 South-Eastern Area

The extent of the peat deposits in the southern section of the estate is clearly shown on the 1/10560 scale geological map; information on the peat at this location is also given in the reports prepared by Soil Mechanics Ltd. (see Section 1, above). On the basis of this information, the peat deposits located in the south-eastern area of the site under consideration were explored by Mackintosh probes using a 15m grid. Reference to Fig. 17, where the results are shown, indicates that the peat deposits do not extend far into the south-eastern area of the site, and they decrease in thickness rapidly.

6.3 Foundation Design

6.3.1 General

It is understood that the site will be regraded by forming shallow cuts in the high ground and that where suitable, the excavated material will be used as fill over the remainder of the site. A maximum fill thickness of 2m is proposed; excess out material will be run to spoil.

Detailed information as to the type of structures to be built was not available at the time of writing this report, but they are expected to be light industrial buildings, some to be sited in the areas of out. and others in areas of fill.

6.3.2 Foundations in Cut

Where glacial drift is exposed, conventional spread foundations should be taken to a minimum depth of 0.75m below final ground level where, based on visual inspection of the soils exposed in the trial pits and the results of in-situ penetration tests made in the boreholes, an allowable net bearing pressure of $200 \text{km}/\text{m}^2$ may be adopted. This bearing pressure allows for a factor of safety generally in excess of about three: settlement should be small. Foundation bases should be inspected after excavation and where boulders have been removed the voids should be filled with mass concrete or suitable granular fill. As pointed out in Section 6.1, above, ground-water was present at shallow depths in places: consequently, a

- 5 -

÷

731

the names and locations of roads referred to in the text are given on the site plan (Fig. 21).

blinding layer of concrete should be placed over the foundation bases where an essentially clayey glacial drift is exposed, to prevent softening.

Because its presence is confined to the low-lying parts of the northern area of the site, alluvium and compressible organic clay are not expected to be exposed in cut, which as already pointed cut will be made in the high ground.

6.3.3 Foundations on Fill

Compressible clay fill and organic clay are present at the site as follows:-

- (a) in the southern portion of the northern area, bounded by the ring road, where up to 1.00m of soft to firm organic clay and, in places, peat were encountered beneath hardcore, rubble and old foundations (see Section 6.2.1, above).
- (b) in the low-lying part of the south-eastern area of the site where general probing suggested the presence of up to about lm of soft organic topsoil and clay, overlying glacial drift.
- (c) in the low-lying western margin of the northern area where general probing again suggested about 0.5m of organic clay underlain by glacial drift.

As the parts of the site occupied by compressible material are essentially low-lying, they will probably be covered by fill; consequently if large settlements of structures placed on fill are to be avoided, the compressible material should be removed prior to filling. Providing that this is done, and that the fill is adequately spread and compacted (see Section 6.4, below), conventional spread foundations placed on the fill at a minimum depth of 0.75m below final ground level may be designed to an allowable net bearing pressure of about 100kN/m². In the case of structures sensitive to differential settlement, or large or heavily loaded areas, foundations should be taken through the fill to the glacial drift using deep strip footings, piles or piers; structures supported in this manner should be separated from structures placed on fill by construction joints.

As an alternative to removal of all compressible material prior to site filling, consideration may be given to leaving it in place, filling over it, and then leaving for a period (say three years) before structures are built. In this way, much of the settlement due to the load of the fill on the compressible material should have taken place. However, in this case, it would be prudent to carry out a further investigation prior to construction to check that there is no extensive thickness of compressible material beneath the structure likely to give rise to further significant settlement. This would of course be especially necessary for structures sensitive to differential movement.

6.4 Compaction

The results of the moisture content determinations indicate that the natural moisture content of the essentially clayey glacial drift is wet of optimum as determined by the British Standard Compaction test (2.5kg rammer method), as will be seen by reference to Table 2, and Figs. 19 and 20. However, visual inspection of this material suggests that it should be suitable as fill, bearing in mind its relatively high granular content, and this conclusion is supported by the fact that in the cut and fill works now in progress for the Heads of the Valleys extension (see Section 2, above) glacial drift is extensively and apparently successfully employed. Compressible soils (if encountered in the cut areas) together with material from the rubbish tip should be run to spoil. The presence of cobbles and boulders in the glacial drift may well make compaction in layer thicknesses less than about 0.3m impracticable; this is considered too large a layer thickness where spread fundations are involved (see Section 6.5.3, above) and in these areas control should be exercised to ensure that cotbles and boulders are removed, so that adequate compaction using thinner layer thicknesses may be achieved (see below). Complete removal would be ensured by screening the fill; this would of course be expensive, involving as it does rehandling. Sufficient cobbles and boulders would probably be removed, however, by using a grader with a toothed attachment allowing material of cobble and boulder size to be removed prior to compaction. If this latter method were employed, it would again be prudent to carry out a further investigation prior to construction to check that adequate compaction has been achieved to support the structures without undue settlement.

Several passes of suitable compaction equipment. such as a metrum vibrating roller, using layer thicknesses of about 0.15m will be required in foundation areas. Depending on weather conditions during placing, it may be preferable to use smooth-wheel equipment, but with layer thicknesses of about 0.10m.

The comments made on ground-water in Section 6.1, above. will be relevant here.

7. <u>Chemical Attack of Euried Concrete</u>

The results of the chemical analyses indicate that Seterioration of good quality normal Portland cement concrete in foundations or other buried structures, due to sulphate attack, is unlikely to coour at this site. It is, however, well known that the water contained in streams in hilly or moorland areas is often acidic, and care should be taken to provide site drainage so that such water does not come into contact with concrete structures, unless suitable precautions are taken. Likewise, surface water may also become contaminated through contact with organic topsoil or pest and again site drainage should take this into account.

hul Trender

Senior Engineer

NT/MAB/BOH

Wimpey Laboratories Limited, Hayes, <u>Middlesex</u>.

- 7 -

TABLE 1

RESULTS OF MACKINTOSE PROBES MADE IN THE NORTHERN AREA OF THE SITE

Probe No.	Depth Penetrated m	Material Encountered				
1	push to 0.45 drive to 1.40	Brown sandy silty clay				
2	drive to 1,25	Brown sandy silty clay				
3	push to 0.60 drive to 1.00	Peat Blue grey silty clay				
4	drive to 0.08	Grey sandy silty clay with gravel, cobbles and boulders (rubble at surface)				
5	drive to 0.45	Grey sandy silty clay with gravel, cobbles and boulders (rubble at surface)				
6	drive to 0.30	Grey sandy silty clay with gravel, cobbles and boulders (rubble at surface)				
7	drive to 0.25	Probable fill (hardcore)				
8	drive to 1.00 drive to 1.15	Dark brown sandy silty clay Yellow-brown sandy silty clay				
9	drive to 0.30	Grey sandy silty clay with gravel, coobles and boulders (boulders at surface)				
10	drive to 0.45	Grey sandy silty clay with gravel, cobbles and boulders				
11	push to 0.25 drive to 0.30	Organic topscil Grey sandy silty clay with gravel, coobles and boulders				
12	drive to 0.08	Probable fill (hardcore)				
13	drive to 0.25	Grey sandy silty clay with gravel, cobbles and boulders (boulders at surface)				
14	push to 0.30 drive to 0.60	Organic topsoil Mottled yellow-brown and blue-grey sandy silty clay				
15	push to 0.75 drive to 1.05	Dark brown sandy silty clay Mottled yellow-brown and blue-grey sandy silty clay				
16	push to 0.20 drive to 0.75 drive to 1.00	Topsoil Firm grey sandy silty clay with gravel Very stiff grey sandy silty clay with gravel. cobbles and boulders				

Cont'd./....1

TABLE 1 (Cont'd.)

RESULTS OF MACKINTOSH PROBES MADE IN THE NORTHERN AREA OF THE SITE

.

31

Probe No.	Depth Penetrated m	Material Encountered
17	push to 0.08 drive to 0.15	Topsoil Grey sandy silty clay with gravel, cobbles and boulders
18	crive to 0.08	Grey sandy silty clay with gravel, cobbles and boulders
19	ārive to 0.15	Grey sandy silty clay with gravel, cobbles and boulders
20	árive to 0,08	Grey sandy silty clay with gravel, cobbles and boulders
21	drive to 0.45	Dark brown sandy silty clay
22	push to 0.20 drive to 0.75	Organic topsoil Mottled yellow-brown and blue-grey silty clay

2

TABLE 2

.

Borehole No.	Sample Depth m	Natural Moisture Content %	Natural Wet Density Mg/m ³
2	1.50	21	-
3	1.50	9	-
5	1.90 3.50	15 11	- -
6	1.50 4.00	7 14	
8	6.20	13	-
9	1.50 - 1.85 3.00 - 3.45	14 13	2.18 -
10	1.50 - 1.90 3.00 - 3.50 6.50	12 13 13	- -
<u>Triel Pit</u> 10	1.85	15	-

RESULTS OF LABORATORY TESTS

TABLE 3

RESULTS OF CHEMICAL ANALYSES ON GROUND-WATER AND SOIL SAMPLES

Borehale	Sample	Total Sulphat	e Content (as SO ₃)	дH
Ne.	Depth m	parts/100,000	per cent dry weight	Velue
2	1.50	-	<0.01	
3	1.50		0.01	
5	1,90 3,50	-	<0.01 <0.01	_
6	0.90 1.50	2* -	- 0.01	6.0 -
S	5.20		<0.01	
0,	3.00 - 3.45	_	<0.01	
<u>Trial Pit</u>				
10	0.60 1.20	-	<0.01 <0.01	-

* test made on ground-water sample.

'8731

Ground level: 199.30m above G.D.

Dia. of boring: 0.20m

Method of boring:_____Shell and Auger

Lining tubes: 0.20n to 4.50m

Daily	Sample	es	CI	nange of St	rata		
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata	
				1.50	197.80	Dark grey silty CLAY	
			\square			BOULDER	
	3.00	D	2-13	3.00	1 %. 30		
	3.50 + 3.90 3.80	D		u.00	195.30	Firm grey sandy silty CLAY with gravel, coobles and boulders	
19.11.71	4,00 - 2,50 4,65 - 4,80	50 C' 56		4,50	194.90	Very dense grey slightly clayey sandy fine to coarse GRAVEL with toppies	
						-	
	ľ						
ĺ							
ĺ							
			İ				
			Remark	(S): (Obe	ervations	on ground-water, etc.)	
sar	nple	istar bed	Grauna	-water wa	as encoun	tered at a depth of 3.95m below ground level and on removal of the lining tubes. Ground-water was	
BD — bu	lik disturbed sample	e i	a: a a	90 th ()1 ()	1,00m beix	ew ground level on the morning of 22.11.71. led between depths of 1.50m and 3.00m below ground	
$\begin{array}{c} S () - sta \\ C () - dy \end{array}$	indard penetration namic cone penetra	test	levei,				
Figure in bracke penetration give	ts is No, of blows for en in depth column						
ab. Ref. No. 5/8731		بل	HRWAU	JN INDU	USTRIAL	ESTATE FIG. I	
	19.11.71 Key to type U(4) D du Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y <td>Daily Progress Depth 3.30 3.50 - 3.90 3.50 - 2.50 4.00 - 2.50 4.65 - 4.80 19.11.71 4.65 - 4.80 5.00 0 - disturbed sample D - disturbed sample D - disturbed sample D - disturbed sample Sample - bulk disturbed sample Y - vane test S () standard perietration C () - dynamic cone penetra rigure in breckets is No. of blows for penetration given in depth column (rev. Notes, page 1).</td> <td>Daily Progress Depth Type 2.30 D 3.50 -3.90 U/ulx 3.20 D 3.20 D 19.11.71 4.65 4.65 -4.80 C:56 Key to type of sample: U(4) </td> <td>Daily Progress Depth Type Legend 3.50 3.50 9 9 3.50 3.60 9 9 19.11.71 4.65 4.90 C 56 19.11.71 4.65 4.90 C 56 19.11.71 4.65 4.90 C 56 19.11.71 4.65 1.90 C 56 19.11.71 102mm (4in.) diz. undisturbed sample Main and the sample C 5.0 19.11.71 102mm (4in.) diz. undisturbed sample C 5.0 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 10.55 10.55 C 7.56 C 7.56 11.1.71 10.5</td> <td>Daily Progress Depth Type Legend Depth 3.30 0 1.50 1.50 3.50 - 3.90 0 0 2.00 3.50 - 3.90 0 0 1.50 19.11.71 0.55 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.00 0.56 0 0 19.11.71 0.65 - 0.00 0.56 0 0 19.11.71 0.65 - 0.00 0.00 0.00 0 19.11.71 0.102 0.00 0.00 0.00 19.11.71 0.102 0.00 0.00 0.00 19.11.71 0.102 0.00 0.00 0.00</td> <td>Daily Progress Depth Type Legend Depth O.D. Level 1.50 1.50 197.80 1.50 197.80 2.00 12.30 0 0 0 3.50 3.90 0 0 0 1.51 197.80 0 195.30 0 13.11.71 0.65 - 0.80 0 0 0 0 13.11.71 0.65 - 0.80 0 0 0 0 0 13.11.71 0.65 - 0.80 <</td>	Daily Progress Depth 3.30 3.50 - 3.90 3.50 - 2.50 4.00 - 2.50 4.65 - 4.80 19.11.71 4.65 - 4.80 5.00 0 - disturbed sample D - disturbed sample D - disturbed sample D - disturbed sample Sample - bulk disturbed sample Y - vane test S () standard perietration C () - dynamic cone penetra rigure in breckets is No. of blows for penetration given in depth column (rev. Notes, page 1).	Daily Progress Depth Type 2.30 D 3.50 -3.90 U/ulx 3.20 D 3.20 D 19.11.71 4.65 4.65 -4.80 C:56 Key to type of sample: U(4)	Daily Progress Depth Type Legend 3.50 3.50 9 9 3.50 3.60 9 9 19.11.71 4.65 4.90 C 56 19.11.71 4.65 4.90 C 56 19.11.71 4.65 4.90 C 56 19.11.71 4.65 1.90 C 56 19.11.71 102mm (4in.) diz. undisturbed sample Main and the sample C 5.0 19.11.71 102mm (4in.) diz. undisturbed sample C 5.0 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 102mm (4in.) diz. undisturbed sample C 7.56 C 7.56 11.1.71 10.55 10.55 C 7.56 C 7.56 11.1.71 10.5	Daily Progress Depth Type Legend Depth 3.30 0 1.50 1.50 3.50 - 3.90 0 0 2.00 3.50 - 3.90 0 0 1.50 19.11.71 0.55 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.80 0.56 0 0 19.11.71 0.65 - 0.00 0.56 0 0 19.11.71 0.65 - 0.00 0.56 0 0 19.11.71 0.65 - 0.00 0.00 0.00 0 19.11.71 0.102 0.00 0.00 0.00 19.11.71 0.102 0.00 0.00 0.00 19.11.71 0.102 0.00 0.00 0.00	Daily Progress Depth Type Legend Depth O.D. Level 1.50 1.50 197.80 1.50 197.80 2.00 12.30 0 0 0 3.50 3.90 0 0 0 1.51 197.80 0 195.30 0 13.11.71 0.65 - 0.80 0 0 0 0 13.11.71 0.65 - 0.80 0 0 0 0 0 13.11.71 0.65 - 0.80 <	

HEGUND OF DUNCHULE 2

Ground level: 201.20m above 0.D.

Dia. of boring: 0.20m

Method of boring: Snell and Auger

.

Lining tubes: 0.20m to 3.00m

Daily	Sampl	Ch	lange of St	rata		
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
	0.00 - 1.50	. BD				Brown sandy silty CLAY with gravel, coobles and some organic matter
			\mathcal{O}	1.50	199.70	
			\bigcirc	2.00	199.20	BOULDER
	2.00 - 3.00 2.65 - 2.88 3.00	BD C/SU BD	• • • • • • • •	3.00	198.20	Very dense brown fine to coarse GRAVEL and medium to coarse SAND
0.44.74	4.00	D		±.00		Fine grey SANDSTONE with brown staining on fracture planes 'Boulder or Bedrock'
0.11.71	u.00 - u.08	C (30) ÷			197.20	
Key to type	of sample:					
U(4)10 sa D di BD bi V va S () st C () dy	2mm (4in.) dia. uno mple isturbed sample ulk disturbed samp ine test andard penetration ynamic cone penetr	le 1 test	Ground- was at at a de borenoi u.gom t	-water wa a cepth epth of (e was ca	as encour of 0.80m 0.35m belo hiselled t bund leve	on ground-water, etc.) tered at a depth of 1.50m below ground level and on removal of the line g tubes. Ground-water wa aw ground level on the morning of 22.11.71. The between depths of 1.50m to 2.00m and 3.00m to
Figure in brack	st ata is No. of blows for ren in depth column e 1).		Jeat	ag arow:	s un ry .	
b. Ref. No. / 8731			H I RWJ	UN INE	DUSTRIAL	. ESTATE FIG. 2

Dia. of boring: 0.20m

Method of boring:_____Shell and Auger

Lining tubes: 0.20m to 3.00m

Daily	Sampl	Change of Strata				
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
		υ(μ ^{. †}				Stiff grey sandy silty CLAY with gravel, cobules and boulders
	$ \begin{array}{r} 1.50 - 1.95 \\ 1.50 - 2.00 \end{array} $	80		2.00	202.60	
	2.15 - 2.45	C(49)				Dense grey clayey fine to coarse GRAVEL with cobbles and boulders
	3.00 - 4.00 3.65 - 3.95	BD C÷38				
22.11.71				u_00	200.60	
	e of sample:		Remar	ks: (Ob	servations	on ground-water, etc.)
D - 3 BD - 1	02mm (4in.) dia. un ample disturbed sample bulk disturbed samp		Green was a	u-water t a cept	was encou. h of 0.20	ntered at a depth of 1.50m below ground level a m on removal of the living tubes. The ocrendie as of 2.00m to 3.00m below ground level.
S () — s C () — c	vane test itandard penetratio dynamic cone penet iest	n test ration	Una	ol∉ to r	ecover sa	-pie.
Figure in brac penetration g (see Notes, pi	kets is No. of blows for iven in depth column uge 1).					
b. Ref. No.			HIR	WAUN TI	NDUSTRI	AL ESTATE FIG.

Dia. of boring: 0.20m

Method of boring: Shell and Auger

Daily	Samp		ange of Sti	rata		
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
			****			FILL (concrete)
		ປ (ພາ 🗄		1.00	175.50	
	1.90 - 2.15	50 1				
					-	Firm, becoming stiff, grey sandy silty CLAY wit
	3 50 - 3 80	U(u)				gravel, cobbles and boulders
	3.50 - 3.80 3.50 - 3.80	BD				
	4.00 - 4.50	BD		4,00	193.50	Grey slightly clayey sandy fine to coarse GRAVE
	4,50 4,55 - 5.00	0 U(4)	1	<u>и.50</u>	193.00	Firm grey sandy silty CLAY with gravel, cooples
18.11.71	5.00	D	3	5.00	192.50	and poulders
			1			
	i I			1		
				1	1	
		-				
	!					
			l			
				1		
	l					
			ļ			
			1	-		
	e of sample:	I	Rema	rks: (0	bservatio	ns on ground-water, etc.)
	02mm (4in.) dia. sample	undisturbed		.r. was ad	ded to as	sist parting from around level and the depth to an
D —	disturbed sample bulk disturbed sa		; ;	nd-water In was at	could no a renth	it be determined. Un removal of the lifting tubes of 1 Rom below pround level. Mater, propably
. v —	vane test standard penetra	-	sur:	ade run harnina	off, was of 22.11.	measured at a depth of C.10m befow ground fevel of 71. The borencie was chiselled between depths of
C ()	dynamic cone per	etration	0.10	m and 1.	COm Selow	ground level.
	test ckets is No. of blaws 1 given in depth colur	lor nn	÷ ur	able to	recover s	sample.
penetration (see Notes, ;			1			

UNPER LABORATORIES LIMITED

Dia. of boring: C 20m

Method of boring:_____Shell and Auger

Lining tubes: 0.20m to 5.00m

Daily	Sample	CI	ange of St	rata		
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
				0.20	206.30	Organic TOPSOIL
	1.50 - 1.95 1.50 - 2.90	נינעיד BD				Grey clayey medium to coarse GRAVEL, COBBLES and BOULDERS; very dense below 3.00m
	3.00 - 4.00 3.15 - 3.45 4.00	BD C(<i>{2</i> }) D		u.00	202.50	
	u.65 - u.80	C(67)		5.00	201.50	Firm mottled blue-grey and yellow-brown sardy silty CLAY with gravel, cobbles and boulders
23.11.71	5,65 - 5,68	C(50'	000			
	7.15 - 7.21	C(77	200			BOULDERS
24.11.71	8.65 - 8.68	C(SC)()() ()()			
25,11,71	10.15 - 10.18	01501	1-2	10.00	196.50	
SampleWater was idded to a ground-water could n ourstale advanced to tubes to a depth ofD— disturbed sampleground-water could n ourstale advanced to tubes to a depth ofBD— bulk disturbed sampleourstale advanced to tubes to a depth ofV— vane testlevel. It was at thi 24.11.71 with the bo tubes to a depth of ground level and was the hining tubes wat					ed to ass could not need to a pth of 5. at this the bore oth of 5. and was a bes water	s on ground-water, etc.) ⁺ Unable to recover sample, ist boring from ground level and the decth to any be betermined. On the evening of 23.11.71 with the capth of 6.00m below ground level and the level depth of 6.00m below ground level and the level depth the following morning. On the evening of hole advanced to a depth of 8.30m and the living 00m water was measured at a depth of 1.00m below to this depth the following morning. On removal of rose to a depth of 0.90m. A sample was taken. The between depths of 5.00m to 10.00m below ground level
Lab. Ref. No. S/ 8731			HIRV	470¥ 1a	IDUSTRI	AL ESTATE FIG. 5

WIMPEY LABORATORIES LIMITED

Ground level: 205.50m above 0.D.

Dia. of boring: C.20m

Method of boring: Shell and Auger

Lining tubes: 0.20m to 8.50m

Daily	Sample	Cł	nange of Si	trata		
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
27.11.71	2.00 - 3.00 3.15 - 3.38	3D C(82)				Brown slightly clayey sandy medium to ccarse GRAVEL with coobles; very dense below 3.20m
	5.15 - 5.45 5.20 - 6.50 6.65 - 6.95	C(32) BD C(40)		3.40	292.10	Dense, becoming very dense, brown clayey sandy fine to coarse GRAVEL with copoles; poulders below 7.00m
29.11.71	7.00 - 3.50 3.15 - 3 45	8D (187)		8.50	197.00	2614 052
				9.00	194.50	BOULDER Dense brown clayey sandy fine to coarse GRAVEL
30.11.71	11,15 - 11,29	C140		10.00	195.50	with coobles and bullers
			Remark	s: 'Übse	rvations	on ground-water, etc.
D dit BD bu V va S () sti C () dy Figure in bracket	2mm (4in.) dia. undi: mple sturbed sample ilk disturbed sample ne test andard penetration : mamic cone penetrat st st No. of blows for en in death column	test	The bo at a d in chi abando On the to a d a dept the bo level level ground	rencie w epth of selling ned, the evening epth of the on the renoie a water wat ght. Wit on remov level.	as initia 1.90m bel from this rig move o: 27.11 3.00m bel e morning Om below nd lining s at a de n the bor al of the The boren	ally started 2.00m away. A boulder was encountered low ground level and as little progress was made is depth to a depth of 2.00m the burenole was ed and the burehole restarted. 1.71 with the borehole and liping tubes advanced low ground level the burehole was dry and was g of 29.11.71. Ground-water was encountered at ground level. On the evening of 29.11.71 with g tubes advanced to a depth of 7.00m below ground epth of 6.00m below ground level. It rose to 3.75m reshe advanced to a depth of 10.00m below ground ething tubes, water was at a depth of 3.00m below bole was uniselled between depths of 3.50m to 4.75m by ground level.
ab. Ref. No. \$/8731			H I RWAU	וסאד אנ	JSTRIAL	ESTATE FLG. 6

Ground level: 205.50m above 0.D.

Dia. of boring: 0.20m

Method of boring: Shell and Auger

Lining tubes: 0.20m to 4.00m

Daily	Sample	:5	CH	nange of Sti	rata	
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
			8	0.75	204.75	BOULDERS
	1.50 - 1.85 1.95 2.25	Ufa}★ D D		2.70	202.00	Firm mottled blue-grey and yellow-brown sandy silty CLAY with gravel, coboles and boulders
	3.00 - 3.45	U [4]		2.70	202.80	Stiff yellow-brown sandy silty CLAY with gravel,
17.11.71	3.45	D		4.00	201.50	cupples and boulders
Salar	2mm (4in.) dia. und mple isturbed sample ulk disturbed sampl ane test iandard penetration ynamic cone penetri est est is No. of blows for yen in depth column	e test	boring of the The bo	-+Ater W Detween Dising Frencie #	as encour depths c tubes wat as chisel	son ground-water, etc.) stered at ground level. Mater was added to assist if 3.50m to 0.00m below ground level. On removal ster was at a depth of 2.00m below ground level. Hed between 3.50m to 4.00m below ground level. sampler not attained.
Lab. Ref. No. 5/ 8731	ι π ().		<u> </u> 	AUN EN	DUSTRI	AL ESTATE FIG.7
	ATORIES LIMITED	·				HAYES, MI DDLESEX

HEUDING OF BOHEHOLE -

Dia. of boring: 0.20m

Daily	Sample	Change of Strata				
Progress	Depth	Туре	Legend	Depth	O.D. Level	Description of Strata
				0.20	211.80	Organic TOPSOIL
	1.50 - 1.90	U(4)★		1.80	210.20	Yellow-brown silty fine to coarse SAND with gravel
	1.90 2.25 3.00 - 3.50	D D BD				
	3.15 - 3.45 4.65 - 4.93	C(43)				Firm to stiff brown sandy silty CLAY with gravel, copples and boulders and some organic
	5.00	90				mailer
	6.15 - 6.45 6.50	C(32) BD		7.50	204.50	
1?.11.71	7.65 - 7.95 8.90	BD Сійп,				Dense prown slightly clayey sandy fine to coarse GRAVEL with copples and boulders
	9.15 - 9.45 9.50	0:45) SD		10,50	201.50	
13.11.71	10.65 - 10.95 11.00	C 401 BD	5	11.00	201.00	Pense brown slightly clayey silty SAND with crayel, cobples and coulders
16.11.71	12.00 - 12.05	C- 50) 5	\square	12.00	200.00	BOULDER or BEDROCK
		·				
	2mm (4in.) dia. undi	isturbed	Remark On the	evening	of 12 11	on ground-water, etc.) Seating blows onl .71 with the borehole and lining tubes advanced to
D d BD b Y vi C () st C () d figure in brack	D disturbed samplea depth of S.O.BD bulk disturbed samplefollowing mormV vane testground level aS () standard penetration testwith the oorehC () dynamic cone penetration testa depth of S.O.Figure in brackets is No. of blows for penetration given in depth columnof the lining The borehole w					from a level the borerole was dry and was cr, the nd-water was encountered at a depth of 10.00m below o 9.50m in 30 minutes. On the evening of 12.11.71 ining tubes advanced to a depth of 10.50m water was the morning of 16.11.71 water was at a depth of at a depth of 12.00m below ground level on removal er was at a depth of 5.00m below ground level. led between depths of 3.50m to 4.00m, 8.00m to 00m. \pm Full penetration of sampler not attained.
Lab. Ref. No. 5/97 31						L ESTATE FIG. 8

WIMPEY LABORATORIES LIMITED

Ρ.

Rubbish Tip Level. 202.10m above 0.0. Size of Pit. 0.60m x 3.00m x 2.75m approx.

Daily	Sample:	s	Che	inge of S	trata	
Progress	Depth	Туре	Legend	Depth	0.D. Level	Description of Strata
						FILL "cinders, pricks, glass, metal and wood fragments"
				1.20	200,90	
						FILL (pulp cardboard and bricks)
				1.85	200.25	
						Soft to firm, becoming stiff, blue-grey sandy silty CLAY with gravel, cobbles and poulders;
23.11.71				2.7 =	179.35	trace of organic matter
		R	ECO	<u>rd</u> of	TRI	AL PIT 2
Ruppish Tig	o Level: 202.00	m above ().D.		Size	of Piti 0.60m x 3.00m x 2.75m approx.
				0.15	201.35	FILL . sinders
						FILL pricks, building rubble, reinforcing steel, concrete and some brown sandy silty clay?
	· ·					
				1.85	200.15	
						Soft to firm, becoming stiff, grey same, soity CLAY with gravel, cotoles and boulders
27.11.71				2.75	199.25	
			<u></u>			
Key to Typ	e of Sumple	L				ns on ground-water, etc.;
			Ţ. P.	tip le	evel and	was encountered at a depth of 1.85m below rubbish quickly filled the trial pit to this level. avate below a depth of 2.75m as bricks collapsed
			TP	in to	trial pi	
				tip li Un abli	evel and e to exci	quickly filled the trial pit to this level. avate below a depth of 2.75m as pricks and rubble
						o trial pit.
Lab.Ref.No			[<u> </u>
S 8731			94 J	erana I	HOUST	RIAL ESTATE FIG.9

6

Ground Level: 201.20m above 0.D.

Size of Pit: 0.40m x 3.00m x 2.75m approx.

	Daily	Sample	\$	Cha	inge of S	trata	· · · · · · · · · · · · · · · · · · ·	<u>-</u>
	Progress	Depth	Туре	Løgen d	Depth	0.D. Level	Description of Strata	
					0.15	201.05	TOPSOIL	
	23.11.71				2.75	198.43	Very stiff, becoming firm, mottled yellow-brown sampy silty CLAY with cobbles and boulders	blue-jrey and gravel,
4	Ground Level	: 197.40m above		<u>= C O R</u>	U OF		AL PIT 4 of Pitt 0.50m x 3.00m x 2.45m approx.	
	<u></u> 71				2.13	197.50 195.65 195.25 194.93	TOPSOIL Probable Fills white prevent double samey site, clay with gravely double coulders Firm blue-grey site, samey GLAY with gravel and cocoles Gray clayey same, replan to coarse a cooles	es ar: - Cocas.inal
	(<u>ey to Type</u>	of Sumple_		¥.P.3	A sligh 3.15m, below, trial 2.75m 4 seeps Ground ground	ht seepag Steauy s a depth c Dit occur Prevented age of gr -water fi level.	On ground-water, etc.: ge of ground-water was encountered at seepages of ground-water were encounter of 1.55m. Partial collapse of the side red below a depth of 1.55m. A large be d becor excavation. Found-water was encountered at a depth of 2.12 The sides of the trial pit collapsed below ground level.	ered at and es of the culder at h of 0.30m. Sm below
l	ab.Ref.No. S 8731			H1 <i>50</i>	AUN TH	DUSTRI	AL ESTATE	FIG. 10

WINPEY LABORATORIES I INITED

1

	Samples		Cha	nge of S	trata	
Daily Progress	Depth	Туре	Le gen d	Depth	0.D. Level	Description of Strata
				0.50	197.70	FILL cincers, gravel, conplex and boulders.
						Very stiff, becoming mand below 1.55m, blue-gray sandy silty CLAY with gravel, couples and boulders'
23.11.71				2.13	196.15	
		R	ECO		- TRI	AL PIT 6
Ground Level	i: 197.00m abov	e 0.D.			5'ze	of P t: 0.50m x 3.00m + 1.75m approx.
						Cark prown PEAT with some pryna c play
				0.60	196,40	
				1.20	195.60	Coft to find plug-grey sandy silt, CLAM + th some gravel, cotties and poulders
				1.45	194.53	Stiff mottled blue-gray and gray same slity CL. Sith gravel, pottles and poulders
23.11.71				0.75	194,25	Brown gamly fire to coarse GRAVEL with couples
			3			
<u>Key to Type</u>	or Sample					ns on ground-water, etc age of ground-water was encountered at a depth of round level. A large boulder at 2.15m prevented
				furth 6 Surfa prese Groun	er excava ce water nce of g u-water	round level, A large boulder at 2.15m presented ation, was present at the trial pit location and the round-water seepages could not always be determine flowed in and filled the trial pit at a depth of round level.
Lab.Ref.No. 3 8731				I SMAUN	ואסטאו	TPIAL ESTATE FIG. 11

.

Ground Level: 200.00m above 0.D. Size of P t: 0.60m x 3.00m x 2.75m approx.

•

0.11 L	Sample	es	Cha	nge of S	itrata	
Daily Progress	Depth	Туре	Legend	Depth	0.D. Level	Description of Strata
						FILL Inottled bise-grey and yellow-orden sandy silty clay with gravel, cobbles and
				0.00	199.10	silty clay with gravel,cobbles and boulders
				0,95	199.05	FILL icincers and fine to medium grave:
				1.20	198.80	TOPSOIL (black organ c clay with some peat
				2.75	197.25	Stiff to very stiff blue-gre, sandy silty CLAY with gravel, copoles and obulders
23.11.71						
round Level.	. 198.00m abc	_		עא טו		AL PIT 8 of Pick 0.60m x 3.00m x 3.55m aborow.
				2.95	197.05	FILL black slity fire same
23.11.71				<u>2.95</u> 3.65	197.05	
23.11.71						Firm, becoming stiff, they samples it. CLAY wi
23.11.71 Key 10 Type	ot Simple_		<u>.</u>	3.65 	194,35 servation ght seep n below g ght seep a below a	Firm, becoming stiff, trey samplie it. SLAY wi

Ground Level: 206.50m above 0.D.

Size of Pit: 0.60m x 3.00m x 2.15m approx.

	Sample	s	Cha	inge of S	trata	
Daily Progress	Depth	Туре	Legend	Depth	0.D. Level	Description of Strata
				0.30	206.20	108301 L
				1.20	205.30	St ff mottled blue-prey and yellow-brown sandy silty CLAY with gravel, cobbles and boulders
23.11.71) , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 ,	2.15	204.35	Brown clayey sandy fine to coarse GRAVEL with cocoles and occas chal boulders
						-
		R	ECO		FTR	IAL PIT 10
Ground Leve	1. 206.50m apo	 ve 0:D.			31 ze	об ^{ст} т: 0.60m x 3.00m к 2.95m арогок.
						TOPSOIL black organic play
	5.30	2		<u> </u>	206.36	
	0.90	C				Storf nottled blue-gree and yellow-orden sanay stort, CLAY with gravel, cooples and coulders
	1.20	D		1,20	205.30	
24.11.71	1.35	5			204.05	Firm plue-gray farms silty CLAY with gravel. cooples and poulders
	e of Sumple			2 Grava	a-water	was encountered at a depty of 1.20m and quickly
0 – a sta:	rbes sample			fille colla	d the tr psed in	rial pit to this level. The trial pit sides below this depth and excavation below 0.15m was not
			T.P.	1.20m	iges of g below osed below	pround-water were encountered at and below a depth of pround level. The sides of the trial pit partially low a depth of 1.20m and completely below 2.00m, idevation below 2.45m below ground level.
Lab.Ref.No S 9731				FBM708	INDUS.	TRIAL ESTATE FIG. 13

Ground Level. 201,10m above 0.0.

Size of Pitt 0.60m x 3.00m x 2.46m approv.

Da : 1	Sample:	5	Cha	nge of S	trata	
Daily Progress	Depth	Туре	Legend	Depth	0.D. Level	Description of Strata
				0.95 1.15	200.15 159.95	FILE couples, builders with placegrey sampy suity clay TOPSOIL Stiff blue-grey sampy silty CLAY with gravel,
24.11.71				2.45	198.65	cubbies and boulders
		R	ECOI		TRI	AL PIT 12
Ground Lev	e): 211,50m abo	ve 0.0.			3) ze -	of Fit: C.60m × 3.00m + 3.53m approx.
				0.20 0.40 0.75	211.30 211.10 210.75	Firm light grey sampy silty CLAY Firm, becoming staff, prange-prown sampy silty
		-				Light brown slightly playey fine to replum SAND v tr gravel, octoles and coulders
24.11.71			5.0 0.0	3.55	207.95	
Key to Type	e of Sumple		T.P.	11 Seep of 1	ages of 35m bel	ns on ground-water, etc ground-water were encountered at and below a septh ow ground level. - was not encountered ouring excavation.
Lab.Ref.No S 8731	•	· · · · · · · · · · · · · · · · · · ·	81	RWAUN	NDUST3	NIAL ESTATE FIG.14

Ground Level: 204,50m above 0.D. Size of Pitt 0.60m × 3.00m × 3.55m approx.

	Sample	es	Cha	nge of S	trata	Description of Strata
Daily Progress	Depth	Туре	Legen d	Depth	0.D. Level	Description of Strata
				0.39	204.20	TJPSJIL
						Stiff mottled plue-grey and yellow-prown sendy
				0.95	203.55	silty CLAY with gravel, coobles and boulders
			C . O . L		1 1	
			0.0.7			
			0.00			
			0.0			Light brown slightly clayey fine to mealum SAND
			0.0			. in gravel, cobbles and boulders
			000			
			000			
			0.0.0			
24.11.71			0.00		200.95	
	. <u>.</u>					AL DIT 10
		⊦ 	RECO	יט עא		AL PIT 14
rouna Level.	20 7.50m abb	ve 0.D.			5 Z€	25 211. 0.00m x 3.00m x 3.55m approx.
				0.30	203.20	TOPCOLL
						Stiff mottled blue-tre, and tellow-prove sampy slity GLAY with gravel, popules and poulders
	•			1.35	202.13	
					에 도망하도도 같이 한	
			0.0	-		
			0.00			
			00000			
			0000			Lijnt prown sjighti, pisyey 2440 k th travel, poppies and popularis
			0.0.0.0.0.0.0 0.0.0.0.0.0.0 0.0.0.0.0.0			Light crown silghtig ciayeg CAHC x th thatai, coobles and couldena
						Light prown of ightly playey CA40 × th thatai, cooples and pouldens
						Light prown slightly playey CAHC / th thatai, cootles and powldena
24.11.71					195.95	Lijnt onown sjighti, playey 2440 × th travel, popples and poulders
24.11.71					195. 95	Lijrt prown sjignti, pisyey 2440 k tr praval, poppies and poulders
24.11.71					195.95	Light prown offightly playey 2440 x th thatai, cootles and bouldens
24.12.~1					195.35	L'art prown silarth, piages 2440 × th thatai, cobhes ang pouldena
	of Sumple			3.55 rks: (Ob	servation	is on ground-water, etc.
	of Simple			3.55 7ks: {Ob .13 Seep.	servatio; ages of 3	ts on ground-water, etc. round-water were encountered at and below a septh marging level. The suces of the trial pit also
24.11.~1 Key to Type	of Sumple			3.55 7ks: (Ob .13 Seep. .cf 1 par: .14 Group	servatio; ages of g .35m belo ially col nd-water	son ground-water, etc. round-water were encountered at and below a septh more ball of the sides of the trial pit also lassed below this dept. was not encountered during excavation. The sides
	or Sumple			3.55 rks: (Ob .13 Seep. .13 Ground of t	servatio; ages of g .35m belo ially col nd-water	son ground-water, etc. round-water were encountered at and below a septh more place below this depth. was not encountered during excavation. The sides pit partially collapsed below a depth of 1.35m
	of Sumple			3.55 rks: (Ob .13 Seep. .13 Ground of t	servatio; ages of g .35m belo ially col nd-water he trial	son ground-water, etc. round-water were encountered at and below a septh more place below this depth. was not encountered during excavation. The sides pit partially collapsed below a depth of 1.35m
	of Sumple			3.55 rks: (Ob .13 Seep. .13 Ground of t	servatio; ages of g .35m belo ially col nd-water he trial	son ground-water, etc. round-water were encountered at and below a septh more place below this depth. was not encountered during excavation. The sides pit partially collapsed below a depth of 1.35m

RECORD OF INIAL PILES

Ground Level: 198.40m above 0.0.

Size of Pit: 0.60m x 3.00m x 2.35m approv.

~Daily	Sample:	s	Cha	inge of S	strata	
Progréss	Depth	Туре	Løgen d	Depth	0.D. Level	Description of Strata
			K	0.95	197.65	TOPSOIL organic peaty silty clay
		1		1.7)	191.05	
						: Stiff blue-grey samdy silty CLAY with-gray coobles and boulders
24.11.71				2 75	196.25	
					13.44	
				•		
					• • •	
Groups Lave	1: 199.30m abov					AL PIT 16
					- 2÷	of Pitt 0.605 + 3.705 + 3.00% approv.
						7.22311
				0.25 0.95	<u>199.03</u> 198.33	TOPSOIL St ff nottled blue-grey and yellow-prown is
						St ff nottled blue-grey and yellow-prown is Tis.lty CLAY with occasional gravel
				2.93	199.33	St ff nottled blue-grey and yellow-prown sa Tis.lty CLAY with occasional gravel
				2.93		St ff nottled blue-grey and yellow-prown is Tis.lty CLAY with occasional gravel
				2.93	199.33	Stiff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copples and boulders
				2.93	199.33	Stiff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copples and boulders
				1.35	198.33	Stiff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copoles and powleers
24.11.71				1.35	199.33	Stiff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copoles and powleers
24.11.71				1.35	198.33	St ff nottled blue-trey and vellow-prown is
24.11.71				1.35	198.33	St ff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey samp, silty CLAY with grave copples and positions
24.11.71				1.95	198.33	Stiff nottled blue-grey and yellow-prown is Tailty CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copoles and powleers
				3.00	198.33 197.95	Stiff nottled blue-grey and yellow-prown se suity CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave cooples and boulders - git from al gith claye, SAME with grave cooples and boulders
24.11.71 Key to Type	of Sumple		Remark	3.00 (s: (Obs 5 A slig	198.33 197.95 196.30 ervations	Stiff notiled blue-grey and yellow-prown as Stiff blue-grey sand, silty CLAY with grave Stiff blue-grey sand, silty CLAY with grave cooples and boulders Solles and boulders solles and boulders solles and boulders
	of Sumple		Remark	3.00 3.00 5 A slig 0.95m 6 A slig	198.33 197.95 197.95 195.30 ervation: nt seepa pelow gr ht seepa	Stiff notiled blue-grey and yellow-prown as suity CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave copples and boulders son ground-water, etc ge of ground-water was encountered at a depth out level. se of ground-water was encountered at a depth
	of Sumpie		Remark	2.95 1.35 2.09 3.09 5.4 slig 0.95m 6.4 slig 0.95m 6.4 slig a depti was equ	198.33 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95	Stiff notiled blue-jrey and yellow-prown is sity CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave cooples and boulders son ground-water, etc ge of ground-water was encountered at a destr- ound level. ge of ground-water was encountered at and bellow of ground-water was encountered at and bellow ge of ground-water was encountered bellow ge of ground-water was encountered at and bellow ge of ground-water was encountered bellow ge of ge of ge of ground-water was encountered bellow ge of ge ge of ge
	of Sumple		Remark	2.95 1.35 2.09 3.09 5.4 slig 0.95m 6.4 slig 0.95m 6.4 slig a depti was equ	198.33 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95	Stiff notiled blue-jrey and yellow-prown is sity CLAY with occasional gravel Stiff blue-grey sand, silty CLAY with grave cooples and boulders socies and
	of Sumpie		Remark T.P. 1	2.95 1.35 3.00 3.00 5 A slig 0.95m 6 A slig a depti *as en *itn pi	198.33 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95 197.95	S on ground-water, etc g of ground-water was encountered at and period g of g of

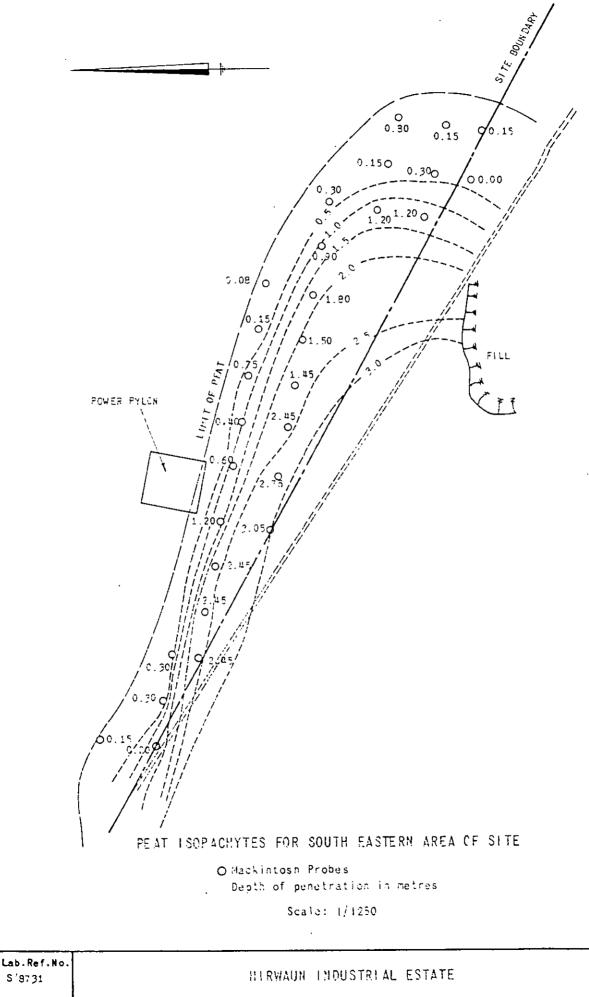
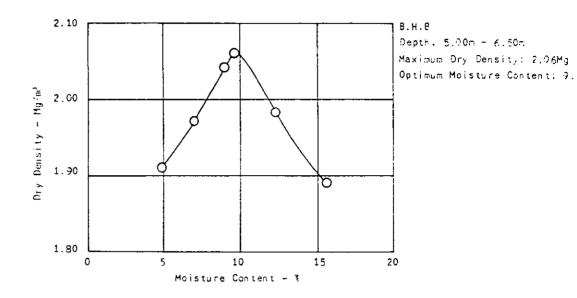
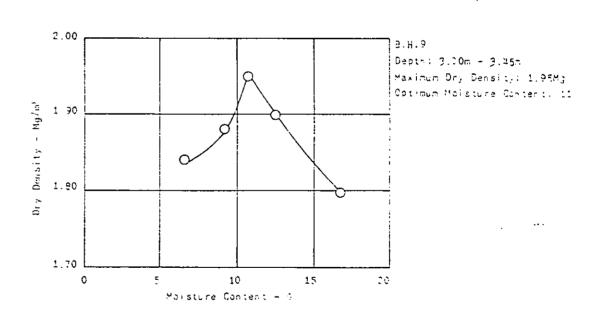


FIG.17





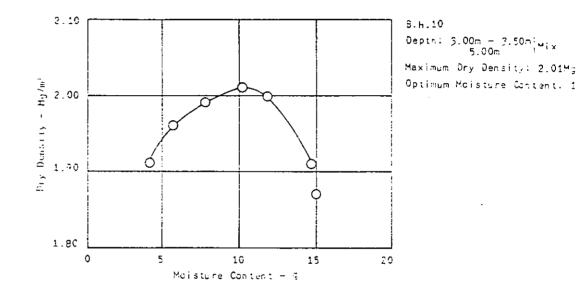
COMPACTION TESTS (2.5kg RAMMER METHOD)

HIRWAUN INDUSTRIAL ESTATE

F1G 19

. -

.



.

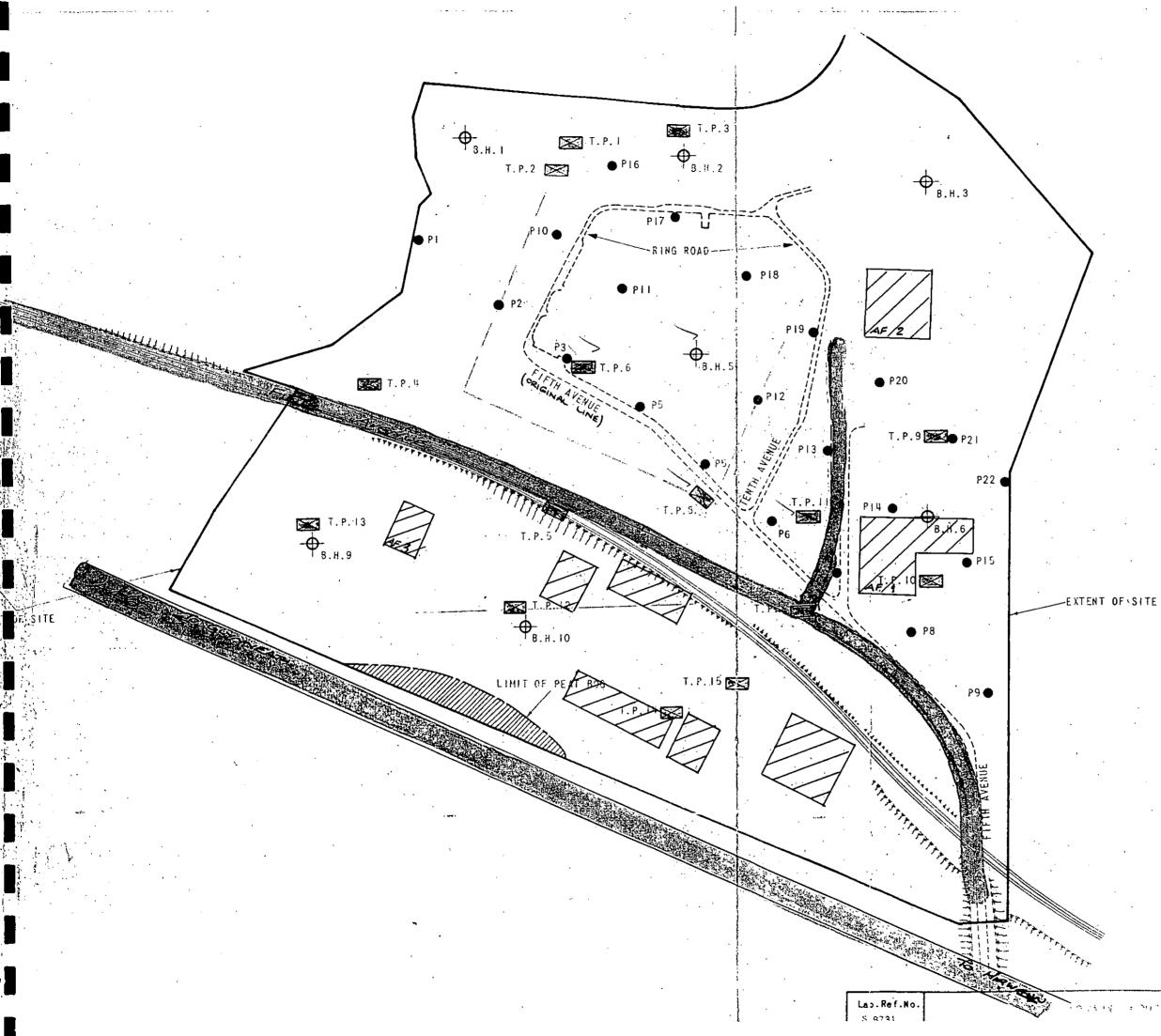
COMPACTION TEST (2.5kg RAMMER METHOD)

•

HIRWAUN INDUSTRIAL ESTATE

FIG. 20

- -



SITE PLAN

Scale: 1/2500

- Denotes Borehole

Denotes Trial Pit

● Denotes Probe

