

DUNELM DRILLING CO.

DRILLING & BORING ENGINEERS
SITE INVESTIGATION
SOIL TESTING
CONCRETE CORING

BLEACH GREEN
HETTON-LE-HOLE
TYNE & WEAR
DH5 9HH
Tel: (091) 526 2534
Fax: (091) 517 0085



MR R NIPPER

SITE INVESTIGATION

PROPOSED BUNGALOW

NEWCASTLE ROAD SOUTH SHIELDS

REPORT

OCTOBER 1993

Introduction

As requested by Mr R W Nipper a resident of Jarrow, Tyne & Wear, a Site Investigation was carried out over a plot of land off Newcastle Road, South Shields adjacent to the Simonside Arms Public House where it is proposed to construct a domestic bungalow.

In total three dynamic sample boreholes were put down across the site and their approximate locations can be seen on the Borehole Location Sketch Plan a copy of which accompanies this Report.

The main purpose of the Investigation was to determine the underlying ground conditions below the site so that suitable foundations could be designed for the proposed development as well as to highlight any problems there might be when considering this site for the proposed development.

Site Investigation

The boreholes were put down using a light weight specialised dynamic probing and sampling rig and in each borehole the types and changes of strata were noted and these are duly recorded on the graphic borehole record sheets which accompany this Report.

In addition insitu hand vane tests were carried out at various levels within the boreholes with the use of an insitu hand vane tester in order to determine the approximate shear strength of these clays.

Bulk samples recovered from the sampling probe were taken to the laboratory for further testing.

Contd/.....

- 2 -

Site Investigation (Contd)

No major problems were experienced when gaining access to the borehole positions across the site which it is understood was previously used as a hard standing area for caravans as well as tennis courts and this resulted in a thin concrete surfacing being located in two of the boreholes.

In addition it should also be noted to the rear of the site a pond is present the outfall of which may well flow beneath this site. Therefore it is suggested reference is made to the relevant statutory body so that the route of this and any other drainage services below the site can be checked in order to prevent damage occurring once construction is under way.

Strata

In general the deeper ground conditions below the site were pretty uniform although significant variations were noted in the top 2.00m in all three boreholes.

Borehole 1 revealed 0.75m of firm medium brown and grey mottled clay underlying 0.50m of concrete surfacing. Underneath this mottled clay at a depth of 0.80m was stiff dark brown and grey mottled stony clay which continued for just 0.30m before soft to firm moist brown and grey mottled sandy clay was noted. Underlying this soft to firm material at a depth of 1.60m was stiff dark brown and grey mottled stony clay and it was within this lower stony clay that this borehole was terminated at a depth of 2.90m below current ground levels once sufficient resistance to the sampling probe had been obtained.

Borehole 2 revealed again 0.50m of concrete surfacing below which soft to firm very silty grey and green clay with peat intrusions was noted. This soft organic material continued to a depth of 1.40m before stiff to very stiff dark brown and mottled stony clay was encountered and it was within this lower stony clay that this borehole was terminated at a depth of 3.00m below current ground levels.

There was no ground water encountered in either of these

Contd/.....

Strata (Contd)

boreholes both of which remained dry throughout the period of the Investigation.

Borehole 3 revealed 0.10m of topsoil below which a brick and ash and clay fill was encountered. This fill continued to a depth of 0.40m before soft to very soft silty brown and green clay was noted. Underlying this soft clay at a depth of 1.10m was soft to firm silty brown and grey mottled clay which continued for a further 0.70m before very stiff brown and grey mottled stony clay was noted at 1.80m below current ground levels. The borehole was finally terminated within this lower very stiff clay at a depth of 2.50m below current ground levels once sufficient resistance to the sample probe had been obtained.

Ground water was encountered in this borehole at a depth of 1.30m and resulted in a similar standing level. However it is felt that this is a pocket of water trapped within the silty clays rather than representing a general water table below the site.

Insitu Testing

Insitu Hand Vane Tests were carried out at various levels within all three boreholes with the use of an insitu hand vane tester in order to determine the approximate shear strength of these clays. The results of these tests are shown on the borehole record sheets and correlate to apparent cohesion values. Alongside these results the natural moisture contents of the clays at these depths have also been given.

As can be seen from the results of the tests carried out within the dark brown and grey mottled stony clays these materials tend to be of a firm to very stiff nature with shear strengths ranging from 96 kN/m² to in excess of 130 kN/m² suggesting that these clays would be capable of supporting moderate to heavy loadings without the risk of failure or excessive settlements occurring.

The remaining tests were carried out in the various bands of softer silty clays which produced shear strengths ranging from 34 kN/m² up to 50 kN/m² which again would suggest these

Contd/.....

Insitu Testing (Contd)

materials would be capable of supporting lighter loadings compared to the underlying stony clays. As expected the lower shear strengths were generally accompanied by higher values of natural moisture content which in some cases would be classed as very high and consequently these materials would also be susceptible to significant consolidation settlements when loaded.

The results of all these tests can be found adjacent to the appropriate sample level on the borehole record sheets along with the values of natural moisture content.

Laboratory Testing

Determination of Atterburg Limits - Representative samples of the clays encountered in the boreholes were tested in order to determine the liquid and plastic limits so that these clays might be classified. The results are as follows:-

BH	DEPTH	M/C%	PL	LL	PI	CLASS
1	1.00-1.50	33.3	23.0	36.0	13.0	CI
1	1.50-2.00	14.8	17.0	37.0	20.0	CI
2	0.50-1.00	19.5	19.0	43.0	24.0	CI
2	2.00-2.30	13.0	27.0	42.0	15.0	MI
3	1.00-1.50	32.3	25.0	55.0	30.0	CH

From these results it can be seen that all the samples tested are generally of an inorganic nature and when plotted on the plasticity chart fall within the intermediate to high plasticity range and from the resulting plasticity indices would appear to be of a low to moderate shrinkability potential. Therefore it can be seen that there is a risk of some of these clays undergoing significant changes in volume if large changes in their natural moisture content were to occur due to seasonal variations or the like and thus if foundations are to be based within these clays they will have to be taken down to such a depth that will ensure that any future shrinkage and swelling of the clays does not affect the structural stability of the proposed development. It should be noted the depth to which

Contd/.....

Laboratory Testing (Contd)Determination of Atterburg Limits (Contd)

these movements can occur would be greatly increased by the presence or removal of any large mature trees or vegetation within the near vicinity of these clays and consequently reference should be made to the relevant NHBC Recommendations for foundations based in shrinkable clay soils when determining the actual finished depth of the foundations below this site.

Determination of pH & So_3 - Representative samples of the materials encountered on the site were also tested in order to determine their acidity and soluble sulphate contents with the following results:-

BH	DEPTH	TYPE	pH	So_3
2	1.50-2.00	St/Clay	7.5	0.02
3	0.00-0.50	Fill	7.5	0.02
3	1.50-2.00	Sl/Clay	8.5	0.02

From these results it can be seen that all three samples tested are generally of an alkaline disposition and the amount of soluble sulphate present is fairly consistent falling well within the negligible range indicating there will be little risk of aggression towards buried concrete coming into contact with these materials and thus Ordinary Portland Cement will be perfectly satisfactory for all foundation and buried concrete.

Conclusions

From the information gained in this Investigation and from the results of the tests carried out it would appear that some problems do arise when considering the site for the proposed development although provided certain precautions are undertaken these can be taken care of relatively easily.

The site itself would appear to be overlain by a thin surface layer of topsoil and/or concrete and brick ash and clay fill

Contd/.....

- 6 -

Conclusions (Contd)

materials extending to a maximum depth of 0.40m below current ground levels before soft to firm silty sandy mottled brown grey and green clays are encountered. In the area of Borehole 2 these clays would appear to have some organic content with intrusions of peat but on the whole these soft ground conditions do extend to depths of between 1.40m and 1.80m before stiff to very stiff brown and grey mottled stony clays are noted. These clays extend to a depth of at least 2.50m below current ground levels and no doubt extend to even greater depths below current ground levels before the natural bedrock is encountered.

There was no ground water encountered in Boreholes 1 and 2 which remained dry throughout the period of the Investigation. However in Borehole 3 some water was encountered within the lower silty clays although it is felt that this represents a pocket of trapped water within these clays rather than a general water table below the site. Consequently it is suggested that provision is made for the possible introduction of pumping equipment for any deep excavations for drainage foundation service runs or the like that may be required when the site is developed.

In addition for any deep excavations which extend to depths below 1.20m below current ground levels it is felt some form of nominal lateral trench support should be installed in order to ensure that trench wall collapse or over-excavation does not occur particularly within the overlying softer clays.

When considering the type of foundations required for the proposed bungalow which it is understood is to be positioned towards the rear of the site towards the area of Boreholes 1 and 2 it can be seen that two options arise depending upon the actual magnitude of the proposed loadings.

The first option would be to support the proposed bungalow upon a rafted or semi-rafted foundation based at a relatively high level within the upper silty clays. In this case an adequate depth of the overlying fill materials and silty clays should be removed in order to accommodate a minimum of 400mm of compacted

Contd/.....

Conclusions (Contd)

inert granular subbase material placed or compacted below the foundation. Prior to the placing and compaction of this imported subbase the reduced level of ground should be compacted in order to highlight any soft spots which can then be taken care of by the introduction of extra subbase material. Some benefit may also be gained by the introduction of a fabric reinforcement placed between the imported subbase and the underlying natural clays in order to help firm up the underlying soft clays prevent loss of subbase into these materials during compaction and further reduce the risk of differential settlements occurring. Once the imported subbase has been placed and compacted the rafted or semi-rafted foundation can be constructed on top of this 'mat' and should be designed to a maximum bearing pressure not to exceed 40 kN/m^2 in order to ensure that all normal settlements are within acceptable limits and the risk of differential settlement is reduced to an absolute minimum. In addition the raft should be designed to bridge soft spots of up to 3.00m across since the presence of small peat intrusions within the silty clays noted in Borehole 2 could cause localised consolidation in the future. However this should still prove both adequate and economic for the size and type of development while ensuring that all normal settlements are well within acceptable limits and the risk of differential settlement is reduced to an absolute minimum. If the magnitude of the proposed loadings is too great for this kind of foundation then it is suggested that the second option is considered and this may well prove the more economic and the easier in the long run.

This would be to support the proposed bungalow upon deep trench fill taken down through the overlying bands of soft silty clays and mottled sandy clays and based within the lower stiff to very stiff dark brown grey mottled stony clay encountered at the base of all three boreholes at depths of between 1.40m and 1.80m below current ground levels. In this case the footings themselves can be based directly within these stony clays or taken down with the use of a suitable lean mix trench fill. Although from some of the shear strength tests these clays would appear to be capable of supporting loads in excess of 200 kN/m^2 and it is felt the maximum allowable bearing pressure should be restricted to

Contd/.....

Conclusions (Contd)

150 kN/m² in order to ensure that all normal settlements are well within acceptable limits and the risk of differential settlement is reduced to an absolute minimum.

DUNELM DRILLING CO.

BOREHOLE RECORD

Contract No. Client MR R. DIPPER
 Ground Level Location NEWCASTLE RD - SOUTHSHIELDS
 Date OCTOBER 1993 BOREHOLE No. BH 1+2

Depth	Thick- ness	Legend	Description of Strata	Type of Sample	C kN/m ²	M %	Ø	Density Kg/m ³	N
<u>BH1</u>									
0-05	0-05		CONCRETE (OVERLAIN WITH GRASS)						
	0-75		FIRM MEDIUM BROWN + GREY MOTTLED CLAY						
0-80	0-30		STIFF DK. BROWN + GREY MOTTLED STONY CLAY	V 1-00	104.0	28.3			
1-10	0-50		SOFT-FIRM MOIST BROWN + GREY MOTTLED SANDY CLAY	V 2-00	98.0	14.9			
1-60	1-30		STIFF DARK BROWN + GREY MOTTLED STONY CLAY	V 2-90	130.0+	13.2			
2-90									
<u>DRY</u>									
<u>BH2</u>									
0-05	0-05		CONCRETE (OVERLAIN WITH GRASS)						
	1-35		SOFT-FIRM U. SILTY GREY/GREEN CLAY WITH INTRUSIONS OF PEAT PRESENT	V 0-50	36.0	30.5			
1-40				V 1-00	46.0	41.5			
	1-60		STIFF-V. STIFF DARK BROWN + GREY MOTTLED STONY CLAY	V 2-00	130.0+	13.1			
3-00									
<u>DRY</u>									

Water Struck at AS SHOWN Standing Water Level

DUNELM DRILLING CO.

BOREHOLE RECORD

Contract No. Client. MR R. NIPPER
 Ground Level Location. NEWCASTLE RD - SALTSHIELDS
 Date OCTOBER 1993 BOREHOLE No. BH 3

Depth	Thick- ness	Legend	Description of Strata	Type of Sample	C kN/m ²	M %	Ø	Density Kg/m ³	N
			<u>BH3</u>						
0-10	0-10	///	TOPSOIL						
0-40	0-30	///	BRICK + ASH + CLAY FILL						
1-10	0-70	XX	SOFT VERY SILTY BROWN/GREEN CLAY	V-00	34.0	37.1			
1-80	0-70	XX	SOFT-FIRM SILTY BROWN + GREY MOTTLED CLAY	V-50	50.0	32.3			
2-50	0-70	XX	V. STIFF BROWN + GREY MOTTLED STONY CLAY	V-00	96.0	32.6			
				V-50	130.0	26.1			
			WATER STRUCK AT APPROX. 1-30m						
			<u>BH</u>						

Water Struck at AS SHOWN Standing Water Level

DUNELM DRILLING CO.

DRILLING & BORING ENGINEERS

SITE INVESTIGATION

SOIL TESTING

CONCRETE CORING

BLEACH GREEN
HETTON-LE-HOLE
TYNE & WEAR
DH5 9HH

Tel: (091) 526 2534

Fax: (091) 517 0085

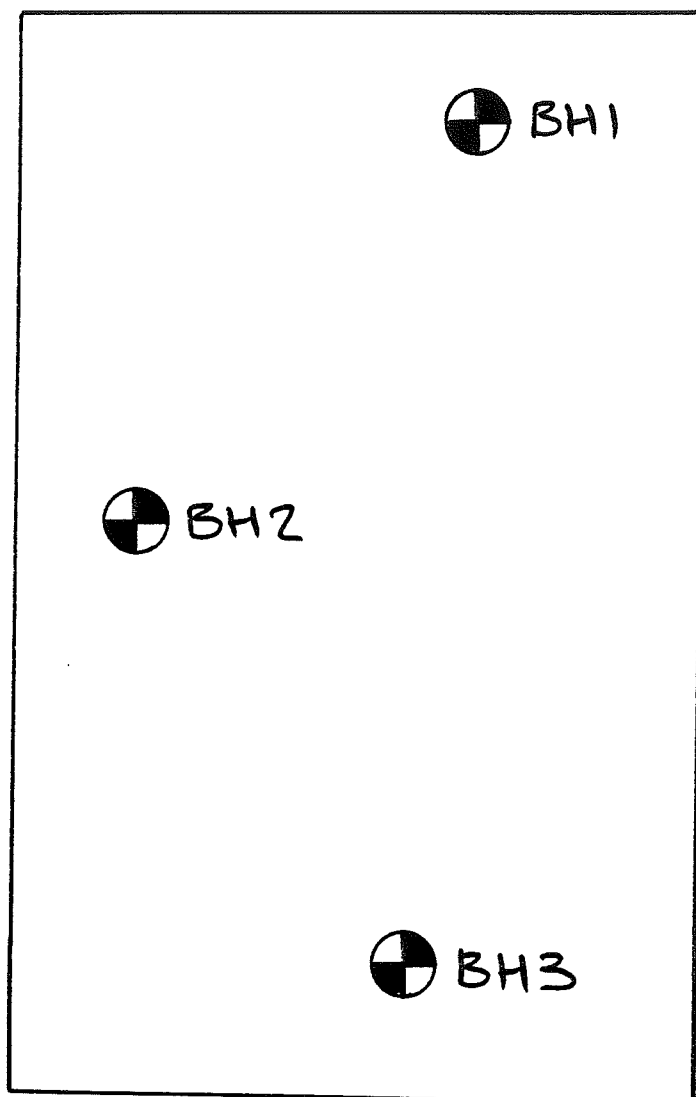


BOREHOLE LOCATION

SKETCH PLAN

NOT TO SCALE

SIMONSIDE
ARMS
PUBLIC
HOUSE



NEWCASTLE ROAD.