Card Geotechnics Limited
Providing Ground Solutions

Ironside & Malone Design & Build Limited

9 Arkwright Road, Hampstead, London

Geotechnical Interpretative Report – Revision 1

May, 2012

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EXECUTIVE SUMMARY

Ironside & Malone Design and Build Limited (Ironside) is proposing the redevelopment of 9 Arkwright Road, Camden, London. It is understood that the proposed development will comprise the part-demolition and extension of the existing building with the provision of a new basement.

The site is roughly square and about 0.17 hectares in area. A 19th century building is located in the north-western half of the site with a garden to the rear. An access way extends along the north-eastern site boundary terminating at a small car park at the rear. The site is bound by Arkwright Road to the north-west and residential properties on all other boundaries.

The site remained relatively undeveloped until around 1894 when the current site boundary was established and the western half of the existing building was constructed. Mapping from 1915 shows the completion of the current building on the site.

The ground conditions encountered during the investigation were in general agreement with the published geology. These comprised Made Ground to depths of between 1.6mbgl and 3.7mbgl, over the Claygate Beds and the London Clay Formation. The top of the London Clay was encountered at depths of between 7.1mbgl and 9.4mbgl. Groundwater was recorded at levels of between 86mAOD and 89mAOD.

The proposed formation level for the majority of the new basement structure is 89.35mAOD. At this level shallow foundations would be expected to be founded on the Claygate Beds, with a typical thickness of approximately 4.0m of Claygate Beds over the London Clay Formation. An allowable bearing capacity of 75kPa is recommended for shallow foundation design.

Piled foundations will be required to support the increased loads of the new building. CFA or cased Bored piled methods will be most appropriate to limit noise and vibration impacts. CFA piling is considered preferable as it is less likely to be affected by the presence of potential water bearing sands in the Claygate Beds. It would be prudent to allow for casing in the Claygate Beds during pile construction to limit ground loss local to the piles (flighting) due to water ingress.

Retaining walls should be designed by the temporary works contractor using the parameters set out in Section 5 of this report. Secant piles are recommended for the majority of the retaining walls. It is recommended that they are toed into the London Clay to provide an effective groundwater seal. Care should be taken during construction to limit ground loss local to the piles due to water ingress within the granular, potentially water bearing, Claygate Beds. Ground surface

movements due to excavation in front of the wall would typically be expected to be some 0.15% of the total retained height for this type of wall, assuming high support stiffness (high propped wall, top-down construction). A building damage assessment/ground movement analysis may be required to establish acceptable movement limits.

It is understood that traditional underpinning will be required along the southern half of the existing north-eastern building façade due to space constraints inhibiting the construction of a secant pile wall. Assuming a formation level of approximately 89.35mAOD, these foundations are likely to be formed within the Claygate Beds, and an allowable bearing capacity of 75kPa is recommended for design. This may potentially give rise to differential settlement between the different foundation segments and it is recommended that a settlement analysis is undertaken to assess this effect over the long-term.

Typical excavations to achieve the proposed formation level of 89.35mAOD are some 3m to 4m resulting in an unloading of the underlying Claygate Beds of the order of 54kPa to 72kPa during excavation. Under these conditions the amount of heave is likely to be around 30mm to 40mm. The majority of excavations will be within the Claygate Beds and will have to be shored or battered back to stable angles (approximately 30°) to remain stable in the short term.

Recorded standing groundwater levels were within the Claygate Beds and indicated that the basement will generally rest at or above site groundwater level. Excavations will take place within an effectively sealed box and as such there will be a finite volume of groundwater to be removed during excavation. It is proposed to use secant piled retaining walls, which will limit groundwater ingress during construction. Sump-pumping may be required to remove any residual seepage.

Low infiltration rates (10^{-7} to 10^{-8} m/s) have been recorded in the existing rear garden area of the site and relatively higher infiltration rates (10^{-6} m/s) were recorded in the vicinity of the proposed basement (BH01 and BH04). Therefore, soakaways are not considered suitable at this site.

A CBR value of 2% is recommended for roads and pavements founded on the Made Ground and Claygate Beds.

Buried concrete in the Made Ground and Claygate Beds should be designed to Design Sulphate Class DS-2 and ACEC Class AC-2s according to BRE guidance and based on the results of geotechnical sulphate and pH testing on the soils.

The results of ground gas monitoring indicate that the site conforms to Characteristic Situation 1 and NHBC Green. On this basis no specific gas protection measures are considered necessary.

1. INTRODUCTION

Ironside & Malone Design and Build Limited (Ironside) is proposing the redevelopment of 9 Arkwright Road, Camden, London. It is understood that the proposed development will comprise the part-demolition and extension of the existing building. A new basement will be constructed under the south-eastern corner of the proposed building footprint and in the eastern quadrant of the site, under the existing car parking area and rear garden.

Card Geotechnics Limited (CGL) has been commissioned by Adair Associates on behalf of Ironside to undertake a desk based study and Phase 2 geotechnical intrusive investigation.

The objectives of the investigation are to;

- Provide information on the ground conditions;
- Confirm the presence and extent of existing foundations;
- Provide geotechnical recommendations for foundation, retaining wall, pavement, drainage and concrete design.

This report discusses the work undertaken and presents information that may be used in the planning, design and construction of the development. This document does not address the geoenvironmental aspects of the project, which have been discussed previously in CGL's *Geoenvironmental and Flood Risk Interpretative Report*[1].

[1] Card Geotechnics Limited. September 2011. *Arkwright Road, Hampstead London: Geoenvironmental and Flood Risk Interpretative Report*. Reference CG/5595

2. SITE CONTEXT

2.1 Site location

The site is located on 9 Arkwright Road, Camden, London, and is currently occupied by a large 19th century house, previously converted into offices. The approximate National Grid Reference for the centre of the site is 526421, 185320. A Site location plan is presented in Figure 1.

2.2 Site description

The site is roughly square in shape and covers an area of approximately 0.17 hectares. The 19th century building is located in the north-western half of the site and comprises two buildings with a link in the middle. A small grassed slope extends across much of the north-western site boundary, between Arkwright Road and the front façade of the existing building. The area between this soft landscaping and the façade is covered with paving stones with light wells, which extend to the level of the ground floor (at approximately 93mAOD). Additional light wells are located on the north-eastern façade of the property. A basement boiler room is located in the northern corner of the existing building and is accessible via a stairwell in the northern corner of the site.

An access road adjoining Arkwright Road (at an elevation of around 96mAOD) slopes down towards the south-east on the north-eastern site boundary. This access road terminates at a relatively flat area of hardstanding, currently used as a small car park, at an elevation of approximately 94mAOD, which occupies around half of the eastern quadrant of the site.

The rear garden of the property is situated in the remaining area of the eastern and southern quadrants. This area comprises soft landscaping with turf and several trees, including young to mature cypress, sycamore and birch species. Full details of vegetation and trees on the site are provided separately in a Arboriculture Impact Assessment Report produced by Landmark Trees. The area between the garden and the rear of the existing building is currently covered with slab paving and tarmac hardstanding.

The site is bound by Arkwright Road to the north-west and residential properties to the north-east, south-west and south-east.

The current site layout is presented in Figure 2.

2.3 Proposed development

It is understood that the proposed development consists of the part demolition and reconfiguration of the rear façade of the current building. The garden level is to be extended to the south-east to occupy the patio area of the existing rear garden. A new basement is proposed under the south-eastern corner of the proposed footprint and will extend under the current parking area and rear garden. The proposed basement level is approximately 89.35mAOD. The existing access road will remain relatively unchanged.

The proposed development plans are included in Appendix A.

2.4 Ground and groundwater conditions

2.4.1 Published geology

According to British Geological Map Sheet 256[2], the site lies on the Claygate Member over London Clay Formation. A nominal layer of Made Ground is anticipated across the site, given the lack of historic development.

The Claygate Member[3] is the top part of the London Clay Formation and generally consists of a repetitive sequence of low to very high plasticity, overconsolidated, fissured, firm to very stiff, silty clays, silts and medium dense to dense, fine sands. The clay beds are subject to shrinkability and this is further compounded by the more permeable sandy beds, which act as conduits for the movement of moisture in and out of the clay units. The response of moisture content to seasonal changes may therefore be more pronounced and occur more rapidly. In its weathered state, the clays are brown in colour, but in general show little difference in behaviour compared to the unweathered material. According to the BGS geological map[2], the Claygate Member can be up to 10m to 20m thick in the area of the site. However, given the location of the site in relation to the lateral extent of these deposits, the Claygate Member is more likely to be in the region of 5m thick over the site.

The London Clay Formation[3] is an overconsolidated, firm to very stiff, fissured, silty clay of low to very high plasticity. The clay is susceptible to shrinkage and swelling under the effects of seasonal change in moisture content and tree growth or removal. In its weathered state the clay becomes brown in colour and is accompanied by an increase in

[2] British Geological Survey. (1993). *North London.* England and Wales Sheet 258. 1:50,000 Series. Solid and Drift Geology, Sheet 258.
[3] British Geological Survey. (1997. *The Engineering Geology of the London Area*. Technical Report: WN/97/27.

moisture content. In dry periods, a superficial desiccation zone may form, reversing the moisture content and strength profile. Weathering may be present to a depth of up to 5m to 10m below the surface of the formation. The BGS geology map indicates the base is at approximately -10mOD to -20mOD, with a thickness[2] of about 80m to 90m.

2.4.2 Unpublished geology

British Geological Survey (BGS) borehole records were obtained to confirm the published geology in the area of the site. The records are located at either end of Arkwright Road, approximately 180m to the north-east (BH reference TQ28NE44) and around 500m the south-west (TQ28NE129 & TQ28NE130) of the site. The ground conditions encountered generally confirmed the published geology, with the Claygate Beds overlying the London Clay Formation.

The BGS borehole records are presented in Appendix B.

2.5 Hydrology and hydrogeology

The Environment Agency has produced an aquifer designation system consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geology, and are based on the importance of aquifers for potable water supply and their role in supporting surface water bodies and wetland ecosystems.

With reference to the Environment Agency website[4], the bedrock geology (Claygate Beds) has been classified as a Secondary A aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow for rivers. The underlying London Clay Formation is classified as an unproductive stratum. These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. No superficial deposits are located on the site.

The site does not lie within a Groundwater Source Protection Zone. The nearest surface water body to the site has been identified between 51-250m of the site boundary. Although this is not evident from the mapping within the environmental disclosure report, it is understood to relate to a tributary of the Westbourne at a level of approximately 70mAOD. The River Thames is located some 6km to the south-east of the site.

[4] http://maps.environment-agency.gov.uk

The site is not located within 250m any Environment Agency indicative Zone 2 or 3 floodplains. With reference to the Environment Agency website[5], the site is significantly outside the area susceptible to flooding from rivers or sea without defences and the extent of extreme flooding.

2.5.1 Radon gas

A radon risk report was obtained from *UKradon* for the site in order to assess the risks posed by radon gas on existing properties and new buildings. Based on this report, and with reference to BRE and HPA guidance on radon protection, the site is situated in an area where less than 1% of homes are at or above the action level for radon. On this basis, no radon protection measures are considered necessary. The radon risk report is included in Appendix C.

[5] http://maps.environment-agency.gov.uk/wiyby/

3. PRESENT GROUND INVESTIGATION

3.1 Fieldwork

An intrusive investigation was undertaken between 25th July 2011 and 2nd August 2011. The investigation comprised the excavation of two machine dug trial pits (TP01 to TP02), four cable percussion boreholes (BH01 to BH04) and fifteen foundation inspection pits (FIP01 to FIP15).

The cable percussion boreholes were excavated to a depth of between 10mbgl to 25mbgl with in-site testing (SPTs) and undisturbed sample (U100s) recovery. Groundwater and soil gas monitoring standpipes were installed in each borehole.

In order to obtain samples for laboratory chemical testing and to fully characterise the near surface ground conditions across the site, the trial pit and borehole arisings were recorded and representatively sampled by an suitably qualified engineer from CGL.

Service drawings were provided prior to the intrusive investigation and each exploratory hole location was surveyed by a specialist service location contractor and was also scanned with a cable avoidance tool (CAT) prior to the works commencing.

The locations of all the exploratory holes are indicated in Figure 2 and copies of the exploratory hole records and photographic sheets are provided in Appendix D and E, respectively.

The investigation was undertaken generally in accordance with the requirements of current UK guidance including BS 5930:1999[6] (incl. amendment 2) and BS 10175:2001[7].

3.2 Laboratory testing

3.2.1 Chemical

Representative soil and groundwater samples were sent to i2 Analytical Limited (a UKAS and MCERTS accredited laboratory) for chemical testing. The results of analyses, which included the following potential contaminants, are included in Appendix F. These have

[6] British Standards Institution. (1999). *Code of practice for site investigations*. BS5930:1999.
[7] British Standards Institution. (2001). *Investigation of potentially contaminated sites: Code of practice.* BS10175:2001.

been assessed and discussed in the previous geoenvironmental interpretative report and are not considered further in this report.

- Soil Organic Matter (SOM);
- Heavy metals including; arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc;
- Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) compounds;
- Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAH);
- Total Monohydric Phenols;
- Total cyanide,
- Sulfate; and
- pH determination.

Results and interpretation are reported separately in the companion report on geo-environmental issues.

3.2.2 Geotechnical

Selected representative soil samples were sent to the laboratories of K4 Soils to undergo the following testing and the full results are presented in Appendix G:

- Moisture content and Atterberg limits;
- Sulphate testing to BRE SD1;
- Bulk and dry density;
- Particle size distribution by sieving and sedimentation;
- Quick undrained triaxial;

3.3 Monitoring

Groundwater level and soil gas monitoring visits were undertaken on three separate occasions between 1st September and 15th September 2011. Groundwater sampling was

undertaken on 7th September 2011. Copies of the monitoring records are presented in Appendix H.

Rising head tests were undertaken within the standpipes in each borehole position on 7th September 2011 and the records are presented in Appendix I.

4. GROUND AND GROUNDWATER CONDITIONS

4.1 Summary

The ground conditions encountered during the intrusive investigation generally confirmed those expected from the desk study and are summarised in Table 1 below.

Table 1. Summary of ground conditions.

Strata	Depth encountered (mbgl)	Thickness (m)
[MADE GROUND] Medium dense light brown gravelly sand and sandy gravel, and soft to firm brownish grey gravelly very sandy clay and silt. Gravel is typically fine to coarse rounded to angular of brick and flint.	0.0	1.6 to 3.7
Loose to medium dense ochreous brown slightly clayey very silty fine SAND & firm light ochreous brown clayey very sandy SILT and CLAY. [CLAYGATE BEDS]	1.6 to 3.7	3.4 to 7.8
Firm, becoming very stiff with depth, dark grey sandy silty CLAY with occasional sand partings. [LONDON CLAY]	7.1 to 9.4	Proven to 25m bgl

4.2 Made Ground

Made Ground was encountered within each exploratory hole below hardstanding or topsoil, with thicknesses ranging between 1.6m to 3.7m. The Made Ground was encountered at its maximum thickness in BH02 (2.6m) and BH03 (3.7m) within the rear garden area of the site. Given the site and surrounding topography slopes towards the south-east, it is likely that this Made Ground is associated with site level make up.

The Made Ground generally comprised sands, clays and silts with variable proportions of minor constituents including sand, clay and gravel. The gravel was typically fine to coarse, rounded to angular of brick and flint.

No visual or olfactory evidence of contamination was noted in the boreholes or trial pits. However, ashy material was noted in the shallow Made Ground beneath hardstanding within the foundation inspection pits.

SPT 'N' values in the Made Ground were typically in the range of 6 to 9, corresponding to a relative density of 'loose' or consistencies of 'soft' to 'firm' (Cu of 30kPa to 45kPa based on $f_1 = 5$[8]). Plots of SPT 'N' values and Cu versus level are presented in Figures 3 and 4, respectively.

Based on a typical design SPT 'N' value of 7, a design angle of friction of 29°[9] and Cu of 35kPa is recommended for the granular and cohesive elements of the Made Ground, respectively.

4.3 Claygate Beds

The Claygate Beds were encountered at typical depths of between 1.6mbgl and 3.7mbgl. As previously discussed, the Made Ground/Claygate Beds interface was found to be at greater depths within the soft landscaped area in the south-west quadrant of the site, increasing in depth towards the centre and south of the site (boreholes BH02 and BH03). This is considered to be representative of the erosional surface at the top of the Claygate Beds (i.e. natural ground level before re-profiling of the site), given the topography of the surrounding area.

The Claygate Beds generally comprised a combination of granular and cohesive horizons. The granular horizons were found to occasionally grade into cohesive material, however clear definition between these deposits has not been possible.

The granular horizons of the Claygate Beds generally comprised loose to medium dense, ochreous, brown, slightly clayey, very silty, fine SAND. These horizons were encountered in BH01 between 3.4mbgl and 9.3mbgl, in BH02 between 3.4mbgl and 5.3mbgl and in BH04 between 4.4mbgl and 9.4mbgl, but were generally absent in BH03. The material was noted to occasionally grade into very clayey, sandy SILT in BH01 between 3.4mbgl and 9.3mbgl. A relatively thin horizon of slightly silty, slightly sandy gravel was noted between 3.7mbgl and 4.8mbgl in BH03.

[8] Stroud, M.A. (1975). The standard penetration test in insensitive clays and soft rocks. *Proceedings of the European Symposium on Penetration Testing in the UK*, **2**, 367-375.
[9] Peck et al. (1967). *Foundation Engineering*. 2nd Edition, John Wiley, New York.

The cohesive horizons of the Claygate Beds generally comprised firm, light ochreous brown, clayey, very sandy, SILT and CLAY and was mottled grey where encountered at greater depths. This material was encountered at the following depths in the following boreholes:

- BH01, 2.9mbgl to 3.4mbgl,
- BH02, 2.6mbgl to 3.4mbgl, and 5.3mbgl to 7.8mbgl,
- BH03, 4.8mbgl to 7.1mbgl, and
- BH04, 3.0mbgl to 4.4mbgl.

Moisture content and Atterberg limit testing within the cohesive horizons of the Claygate Beds recorded moisture contents in the range of 14% to 29%, Liquid Limits of between 32% and 45%, and Plastic Limits of between 17% and 24%. Plasticity indices were in the range of 8% to 25% corresponding to a clay of 'low' to 'intermediate' plasticity and silt of 'low plasticity'[6]. On this basis the cohesive elements of the Claygate Beds have a low to medium volume change potential[10].

SPT 'N' values in the Claygate Beds were typically in the range of 6 to 15, corresponding to relative densities of 'loose to 'medium dense' or consistencies of 'soft' to 'firm' (Cu of 30kPa to 75kPa based on $f_1 = 5$[8]). A SPT 'N' value of 21 was recorded in BH03 at 6mbgl, which is outside of the typically range recorded in the formation. Plots of SPT 'N' values and Cu versus level are presented in Figures 3 and 4, respectively.

Based on a typical design SPT 'N' value of 7, a design angle of friction of 29°[9] and Cu of 35kPa is recommended for the granular and cohesive elements of the Claygate Beds, respectively.

4.4 London Clay Formation

The top of the London Clay Formation was encountered below the Claygate Beds at depths of between 7.1mbgl and 9.4mbgl and was proven to a depth of 25mbgl in BH01. The material generally comprised firm, becoming stiff with depth, dark grey sandy, silty clay with occasional sand partings.

[10] NHBC. (2007). *NHBC Standards*.

A cemented claystone was encountered at a depth of 13.6mbgl in borehole BH02 and is reflected in a very high SPT 'N' value in this location.

Moisture contents within the London Clay were recorded in the range of 26% to 31%.

SPT 'N' values within the London Clay were generally found to increase with depth from a typical value of 12 at the top of the stratum to 40 at the base corresponding to an undrained shear strength (Cu) in the order of 54kPa to 180kPa, or 'firm' to 'very stiff' (based on f_1 = 4.5[8]). These values are consistent with the results of quick undrained triaxial (QUU) testing, which recorded undrained shear strength (Cu values) in the range of 58kPa to 81kPa, generally increasing with depth.

The Cu value of 58kPa was recorded from borehole BH02 at a depth of 12mbgl. This value is consistent with the generally increasing shear strength of the London Clay with depth in BH02. Plots of SPT 'N' values and Cu versus level are presented in Figures 3 and 4, respectively.

Based on established correlations for the London Clay[11] and undrained triaxial testing, the following design shear strength is recommended for the London Clay:

Cu = 45 + 10z (kPa)

Where z = depth below the top of the London Clay stratum.

4.5 Groundwater

Groundwater levels were recorded in the monitoring standpipes in the boreholes between 1st and 15th September 2011 and are summarised in Table 2 below. Groundwater strikes were encountered during the investigation at depths of between 9.2mbgl (84.8mAOD) and 13.7mbgl (81mAOD). Groundwater seepage and slightly wet to wet material was recorded at depths of between 3.4mbgl (89.4mAOD) and 9.6mbgl (83.2mAOD).

Standing groundwater levels were recorded within the Claygate Beds at elevations of between 89.07mAOD to 89.36mAOD across much of the site (BH01, BH02 and BH04) and at 86.70mAOD (BH03) in the southern corner of the site. Given the topography of the site and surrounding area, which dips towards the south, the lower groundwater level

[11] Stroud, M.A., The standard penetration test in insensitive clays and soft rocks. *Proceedings of the European Symposium on Penetration Testing,* **2,** 367-375 (1975).

recorded in BH03 is likely to represent the generally southerly slope of the phreatic surface.

Rising head tests were undertaken in each borehole on 7th September 2011 and recorded infiltration rates of the order of 10^{-6} to 10^{-8} m/s, with the lower infiltration rates recorded in BH02 and BH03, which are both positioned in the rear garden of the property.

Table 2. Summary of groundwater monitoring.

Exploratory hole number	Groundwater level (approx. mAOD) [Depth bgl]		
	1st September 2011	7th September 2011	15th September 2011
BH01	89.19 [4.82mbgl]	89.22 [4.78mbgl]	89.17 [4.83mbgl]
BH02	89.07 [3.73mbgl]	89.41 [3.39mbgl]	89.09 [3.71mbgl]
BH03	86.74 [5.56mbgl]	86.70 [5.60mbgl]	86.70 [5.60mbgl]
BH04	89.34 [5.36mbgl]	89.36 [5.34mbgl]	89.20 [5.50mbgl]

4.6 Foundation inspection pits

Fifteen foundation inspection pits have been excavated to investigate the foundations of the existing building and the north-eastern and south-western site boundary walls. Records and photographs are included in Appendix D and E respectively.

North-western façade

Along the north-western building façade the walls are generally shown to be founded at depths of between 1.23mbgl and 2.63mbgl (90.43mAOD to 91.97mAOD). The foundations exposed in each of these pits (FIP01, FIP02 and FIP13) comprised corbelled brick over concrete stepping out a total of between 0.22m and 0.49m. The foundation inspection pits (FIP03 and FIP04) located in the vicinity of the existing boiler basement in the north-eastern corner of the existing building did not encounter the base of this structure.

North-eastern façade

Two inspection pits were located along the north-eastern façade (FIP04 and FIP05). FIP04 was located at the bottom of the stairs leading to the existing basement boiler room. A significant amount of concrete was encountered in this location, and the formation level

was not encountered. The inspection pit was noted to fill with water, although a source was not determined. FIP05 was located in a light well towards the south-east corner of the existing building. The foundations exposed comprised corbelled brick over concrete founded at a depth of approximately 2.63mbgl (90.83mAOD) and stepped out a total of 0.42m.

South-eastern façade

Along the south-eastern building façade the walls are shown to be founded at depths of between 1.15mbgl to 2.13mbgl (91.39mAOD to 92.05mAOD). The foundations exposed in each of these pits (FIP06 to FIP08) comprised corbelled brick over concrete stepping out a total of between 0.15m to 0.7m.

South-western façade

The foundations along the south-western façade were found to comprise corbelled brick over mass concrete, founded at between 1.14mbgl to 1.15mbgl (approximately 92.2mAOD), stepping out a total of between 0.34m and 0.41m .

South-western boundary wall

The base of the south-western boundary wall (FIP10 and FIP12) was encountered at depths of between 1.0mbgl and 1.3mbgl (approximately 91.9mAOD to 92.43mAOD) and comprised corbelled brick over mass concrete stepping out between 0.14m and 0.2m.

North-eastern boundary wall

The north-eastern boundary wall (FIP14 and FIP15) was founded at depths of between 0.5mbgl and 0.98mbgl (approximately 94.5mAOD and 93.16mAOD) and comprised corbelled brick over mass concrete in FIP15. The corbelled brick was absent in FIP14.

4.7 Soil gas

Soil gas concentrations and flow rates were recorded from the monitoring standpipes in the boreholes between 1st and 15th September 2011. The results indicate that there are negligible concentrations of methane in the ground and concentrations of carbon dioxide are consistent with natural soils with low organic content or 'typical' made ground. Oxygen levels are generally normal, or slightly depressed where measureable concentrations of carbon dioxide were present. A maximum flow rate of 0.5 l/h was

recorded. Full records of soil gas monitoring are included as Appendix H and a summary of the soil gas monitoring is presented in Table 3.

Table 3. Summary of soil borne gas monitoring.

	Ranges of Recorded Values from All Boreholes			
Date	**CH_4 (% Vol.)**	**CO_2 (% Vol.)**	**Oxygen (min % by vol)**	**Flow (l/hr)**
1st September 2011	0.0	0.0 to 3.3	14.7	-0.1 to 0.1
7th September 2011	0.0	0.1 to 4.2	13.4	-0.4 to 0.5
15th September 2011	0.0	0.0 to 2.4	16.8	-0.4 to 0.0

The results of the monitoring from across the site have been converted into Gas Screening Values (GSV) in accordance with CIRIA Report C665[12]. The calculated GSV for carbon dioxide of 0.021 l/hr indicates that the site conforms to Characteristic Situation 1 and NHBC Green.

[12] Wilson, S. et al. (2007). *Assessing the risks posed by hazardous ground gases to buildings.* C665. CIRIA.

5. GEOTECHNICAL DESIGN PARAMATERS

Geotechnical design parameters for the proposed development are summarised in Table 4 below, these are based on the results of SPT testing and published data for the well-studied London Geology.

Table 4: Geotechnical design parameters.

Stratum	Design Level (mOD)	Bulk Unit Weight γ_b (kN/m^3)	Undrained Cohesion c_u (kPa) [c']	Friction Angle ϕ' (°)	Young's Modulus E_u (MPa) [E']
Made Ground (Cohesive)	92.3 to 94.73	18	25 [0]	25[a]	12.5[d] [9.4][e]
Made Ground (Granular)		18	-	29[b]	[9.4]
Claygate Beds (cohesive)	88.6 to 93.13	18	35	29[b]	17.5[d] [13][e]
Claygate Beds (granular)		18	-	29[b]	[13]
London Clay	84.2 to 85.33	20	45 + 10z[c] [5]	22[a]	22.5 + 4.8z[d] [16.9 + 3.6z][e]

a. BS 8002:1994 Code of practice for Earth retaining structures, British Standards institution.
b. Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2nd Edn, John Wiley, New York, 1967, p.310.
c. z = depth below surface of the London Clay
d. Based on 500 Cu
e. Based on 0.75Eu

The parameters in Table 3 are unfactored 'moderately conservative' design values.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Proposed development

It is understood that the proposed development will comprise the part-demolition and extension of the existing building with the provision of a new basement under the south-eastern corner of the proposed building footprint and in the south-eastern quadrant of the site, under the existing car parking area and rear garden. The front and side façades are to be retained from garden level with the rear façade retained for the two main parts of the existing building, excluding the link, from ground level. The internal walls and floors of the existing structure will be removed and replaced with a reinforced concrete frame.

The proposed structure will be significantly heavier than the existing building and it is proposed that the increased loads will be supported by pile foundations. The existing façades may also be tied to the new foundations to limit differential settlement.

6.2 Foundations

The proposed formation level for the majority of the new structure is 89.35mAOD. At this level shallow foundations would be expected to be founded on the Claygate Beds, with a typical thickness of approximately 4.0m of Claygate Beds over the London Clay Formation.

No significant increase in shear strength with depth has been identified within the Claygate Beds, and on this basis an allowable bearing capacity at formation level of 75kPa is recommended for shallow foundation design. Given the proposed loads will likely apply pressures greater than the allowable bearing capacity, piled foundations are likely to be required to transfer the loads to the underlying London Clay Formation.

Given the urban nature of the site it is likely that CFA or cased bored piled methods will be appropriate to limit disturbance to neighbours. CFA piling is considered preferable as it is less likely to be affected by the presence of potential water bearing sands in the Claygate Beds, although it would be prudent to allow for casing in the Claygate Beds during pile construction to limit ground loss local to the piles (flighting) due to water ingress.

Preliminary pile working loads are presented in Figure 5 based on CFA piles with an adhesion value of 0.5 within the London Clay and a factor of safety of 2.6 as recommended

in current LDSA guidance[13]. This assumes that no pile testing is undertaken. It should be noted that this factor of safety can be reduced to 2.2 on completion of a representative number (1% of total number of piles) of working load tests and to 2.0 on completion of working load tests and preliminary pile tests.

6.3 Retaining walls

Retaining walls should be designed by the temporary works contractor using the parameters set out in Section 5 of this report.

Secant piles are recommended for the majority of the retaining walls for the construction of the proposed basement. It is recommended that they are toed into the London Clay to provide an effective groundwater seal. Care should be taken during construction to limit ground loss local to the piles (flighting) due to water ingress within the granular, potentially water bearing, Claygate Beds.

It is understood that the majority of the proposed superstructure load will be on dedicated foundation piles and there will be minimal loading of the retaining walls. However, it is recommended that additional analysis should be undertaken should significant loading of the retaining walls be required.

There are existing structures along each of the proposed basement walls that may be sensitive to ground movements. Ground surface movements due to excavation in front of the wall would typically be expected to be some 0.15% of the total retained height[14] for this type of wall, assuming high support stiffness (high propped wall, top-down construction). A building damage assessment/ground movement analysis may be required to establish acceptable movement limits.

It is understood that traditional underpinning will be required along the southern half of the existing north-eastern building façade due to space constraints, associated with the swimming pool within the basement, inhibiting the construction of a secant pile wall. Assuming a formation level of approximately 89.35mAOD, these foundations are likely to be formed within the Claygate Beds, and an allowable bearing capacity of 75kPa is recommended for design. This may potentially give rise to differential settlement between

[13] London District Surveyor's Association. 2009. Foundations, No.1 Guidance Notes for the Design of Straight Shafted Bored Piles in London Clay. LDSA publications

[14] CIRIA. 2003. *Embedded retaining walls – guidance for economic design*. CIRIA C580.

the different foundation segments and it is recommended that a settlement analysis is undertaken to assess this effect over the long-term.

6.4 Excavations

Typical excavations to achieve the proposed formation level of 89.35mAOD are between around 3m to 4m resulting in an unloading of the underlying Claygate Beds of the order of 54kPa to 72kPa during excavation. Under these conditions the amount of heave is likely to be around 30mm to 40mm[15, 16].

Excavations will take place within an effectively sealed box and as such there will be a finite volume of groundwater to be removed during excavation. It is proposed to use secant piled retaining walls, which will limit groundwater ingress during construction. Sump-pumping may be required to remove any residual seepage.

The majority of excavations will be within the Claygate Beds and will have to be shored with trench sheets/boxes or battered back to stable angles (approximately 30°) to remain stable in the short term.

6.5 Groundwater

Standing groundwater levels were recorded at elevations of between 86.7mAOD and 89.36mAOD within the Claygate Beds indicating that the basement will generally rest at or above site groundwater level. Although it is considered that the proposed basement will not form an obstruction to regional flow due to the size of the basement being considered, control of groundwater migration into basement excavations is likely to be required during the construction phase of the works, although this will be subject to seasonal variation in groundwater levels.

The sealed basement box approach limits the volume of groundwater likely to be encountered. Should the groundwater not be entirely removed from the box then an alternative drainage strategy – possibly local sumps and drainage – will be required.

[15] Newmark, N.M. (1935). *Simplified computations of vertical pressure in elastic foundations*. University of Illinois Engineering Experiment Station Bulletin No. 429.
[16] Terzaghi, K. & Peck, R. B. (1967). *Soils Mechanics in Engineering Practice*, 3rd Edition, John Wiley, New York.

6.6 Drainage

Rising head tests indicate infiltration rates in the Claygate Beds of the order of 1 x 10^{-6} to 1 x 10^{-8} m/s, with the lower infiltration rates recorded in BH02 and BH03 which are both positioned in the rear garden of the property. Given that relatively higher infiltration rates were recorded in areas in the vicinity of the proposed basement (BH01 and BH04) and that low infiltration rates have been recorded elsewhere on site, soakaways are not considered suitable for the proposed development. Instead, active drainage will be required.

6.7 Pavement design

Given the vertical extent of the Made Ground recorded on the site, particularly in areas likely to be developed (i.e. the rear garden of the existing property), proposed roads and pavements will likely be founded on this material. On this basis, a CBR value of 2% is recommended for roads and pavements founded on the Made Ground or Claygate Beds.

6.8 Concrete design

Buried concrete in the Made Ground and Claygate Beds should be designed to Design Sulphate Class DS-2 and ACEC Class AC-2s according to BRE guidance and based on the results of geotechnical sulphate and pH testing on the soils.

6.9 Gas protection measures

The maximum GSV calculated for the site (carbon dioxide at 0.021 l/hr) based on results of ground gas monitoring indicate that the site generally conforms to Characteristic Situation 1 and NHBC Green in accordance with current guidance. On this basis no specific gas protection measures are considered necessary.

6.10 Health and safety

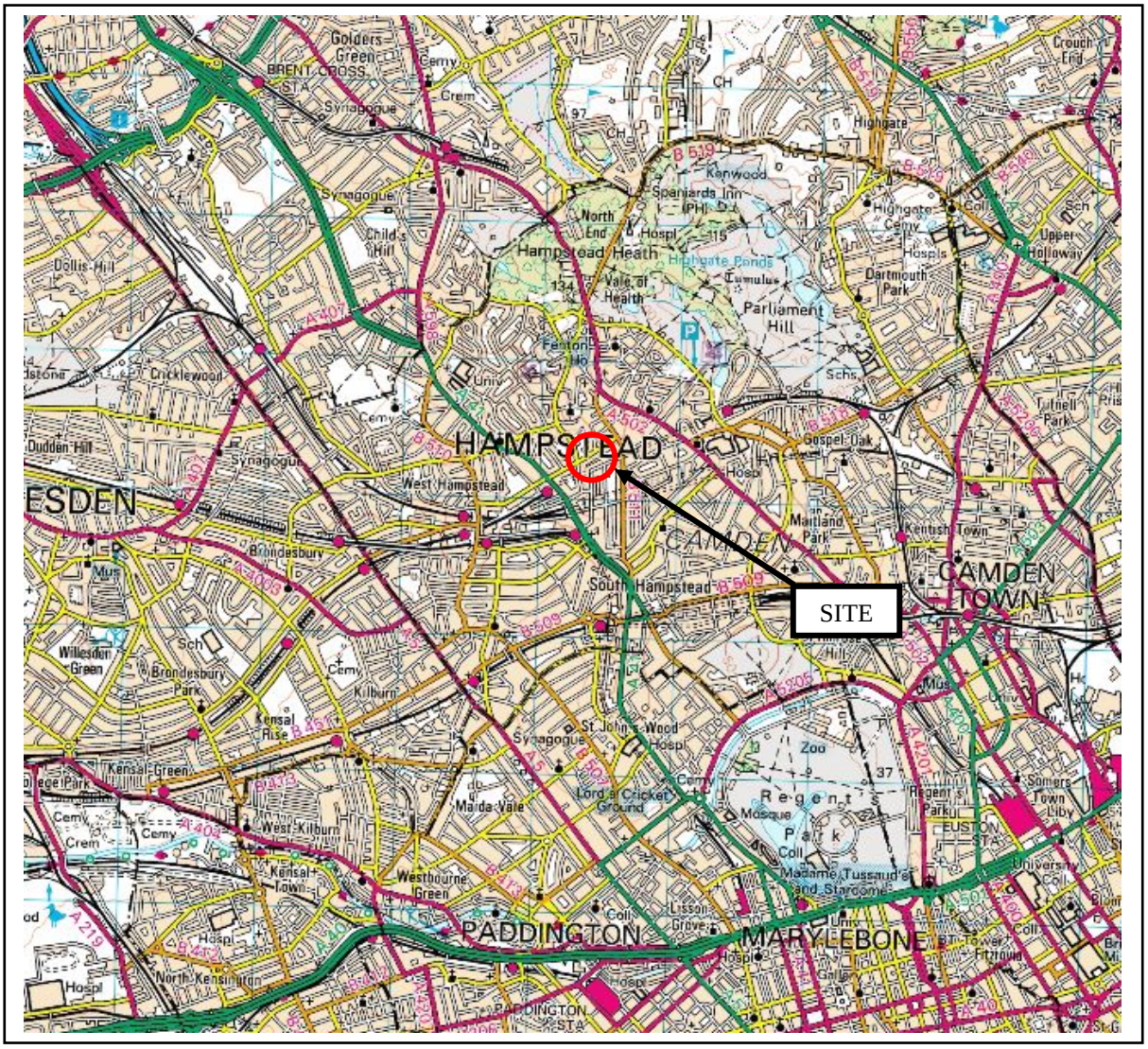
All site works should be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (HSE, 1991). In this context, the risks should be negligible to low and nominal safety precautions should be acceptable (the adoption of good hygiene practices and the use of overalls, gloves and dust masks if necessary).

During the redevelopment, precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances. Attention should also be paid to

restricting possible off-site nuisance such as dust and odour emissions. Such precautions should include, but not be limited to:

- Personal hygiene, washing and changing procedures.
- Personal protective equipment, including disposable overalls, gloves etc.
- Measures to avoid surface water ponding and positive collection and disposal of all on-site run-off.
- Regular cleaning of all site roads, access roads and the public highway including dust suppressions methods (e.g. water spraying), if necessary.

FIGURES

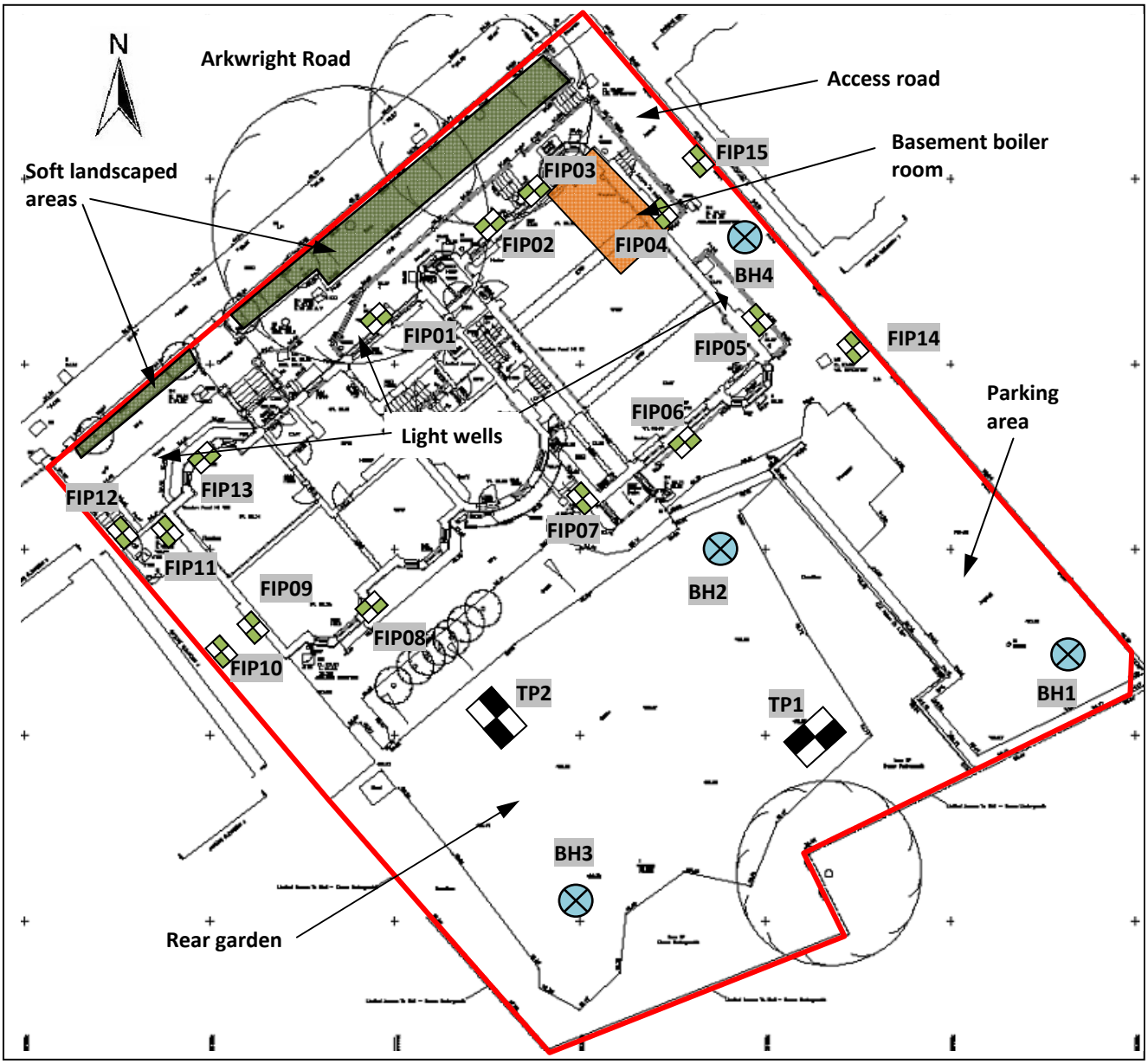


Reproduced from the Ordnance Survey 1:50,000 map with permission of the Controller of Her Majesty's Stationary Office, Crown Copyright.

Licence No. 100012585

N

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title **Site location plan**	**Figure 1**



Key;

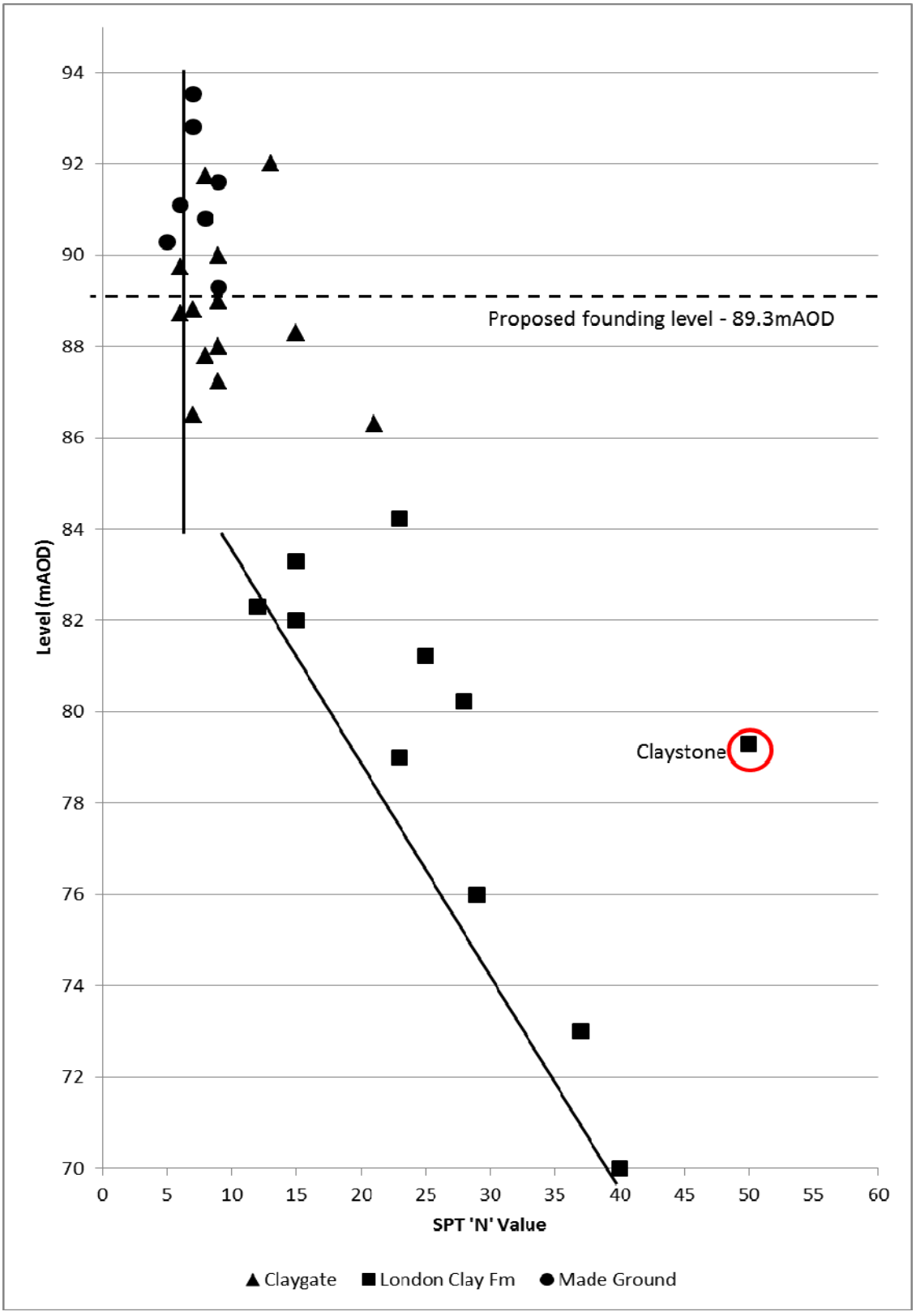
FIP01 – Foundation inspection pit

TP01 – Trial pit location

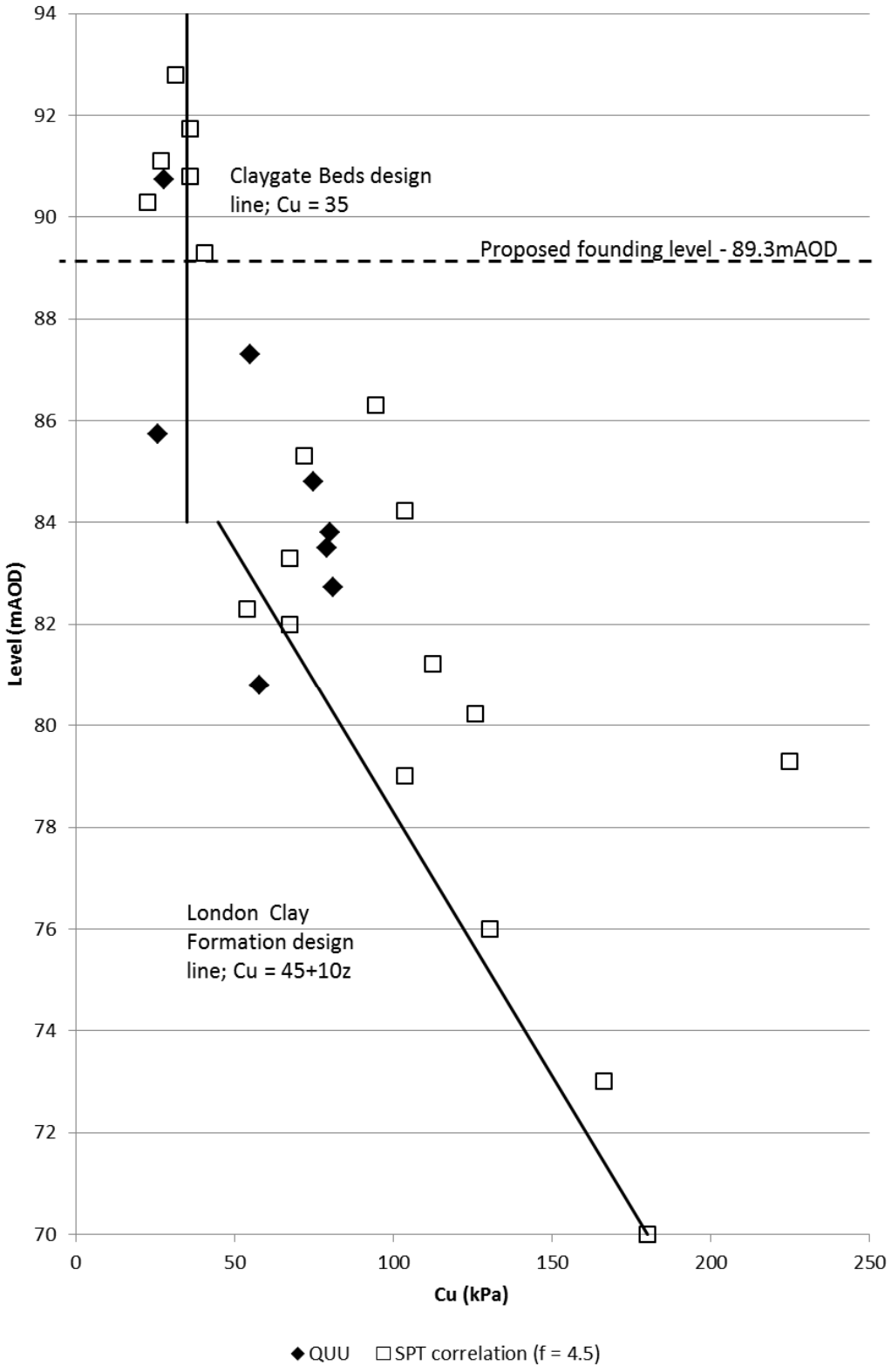
BH01 – Cable percussion borehole

NOT TO SCALE

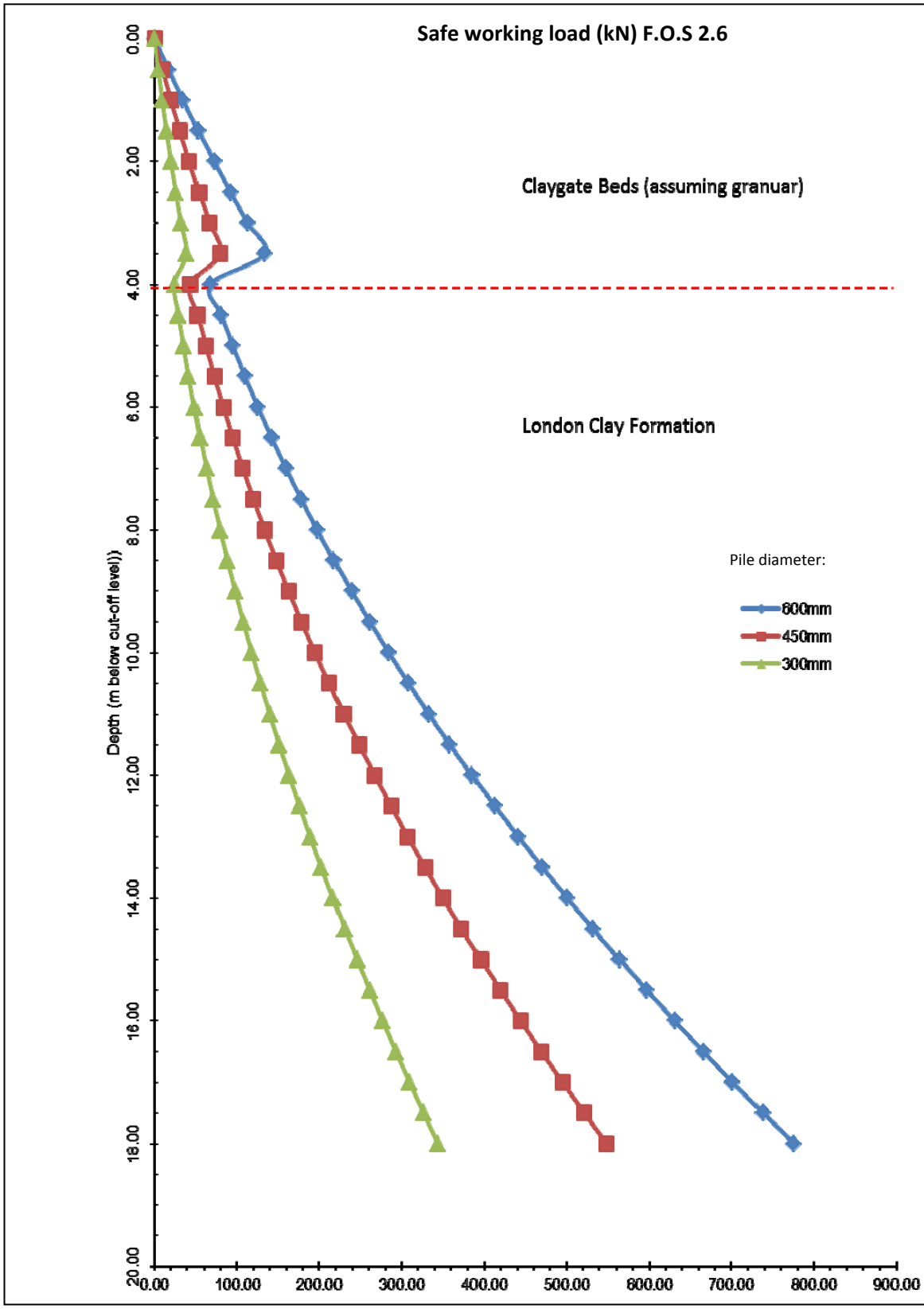
Client	Project	Job No
Ironside & Malone Design and Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Site layout and exploratory hole location pan**	**Figure 2**



Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
	Title	
	SPT 'N' versus level	**Figure 3**



Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Cu versus level**	**Figure 4**



Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title **Preliminary pile working loads**	**Figure 5**

APPENDIX A

Proposed development plans

d

11c

11b

11a

7

Utility

Wine

WC

bar

Cinema

AV

Riser

Lift

Riser

Beauty

Jacuzzi

Pool

Store

Plant

Plant

Car park

Plant

N

status

PLANNING

— DO NOT SCALE FROM THIS DRAWING : Verify all dimensions on site

P K S
architects

project 9 Arkwright Road NW3

title Proposed Basement Floor Plan

scale 1:100@A1-1:200@A3 CSp

date MAY 2012

job no. 804

dwg no. 010-B1

rev. B

d

11c

11b

11a

7

Store

Lounge / Play

Office

Service kitchen

Lower Hall

Staff lounge

Bedroom

Bedroom

Shower

Changing

Steam

Gym

Lift

Kitchen

Dining

Sitting

jacuzi

Pool

N

PLANNING

DO NOT SCALE FROM THIS DRAWING : Verify all dimensions on site

P K S architects

project: 9 Arkwright Road NW3

title: Proposed Garden Floor Plan

scale: 1:100@A1-1:200@A3 Csp

date: MAY 2012

job no. 804

dwg no. 010-G2

rev. B

d

11c

11b

11a

7

Dressing

Nursery/Office

Bedroom 3

Landing

Bar

Lounge

Kids lounge

Bathroom

Master Bedroom

Lift

Terrace

Bedroom 2

N

PLANNING

DO NOT SCALE FROM THIS DRAWING ; Verify all dimensions on site

PKS architects

project 9 Arkwright Road NW3

title Proposed First Floor Plan

scale 1:100@A1-1:200@A3 CSp

dwg no. 010-01

rev. B

date MAY 2012

job no. 804

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d

11c

11b

11a

7

Nanny

Void

Bridge

Bedroom 5

Void

Bedroom 7
(Guest)

Bedroom 6
(Guest)

Void

Terrace

Void

Bedroom 4

N

status

PLANNING

DO NOT SCALE FROM THIS DRAWING ; Verify all dimensions on site

P K S
architects

project 9 Arkwright Road NW3

title Proposed Second Floor Plan

scale 1:100@A1-1:200@A3 | author CSp | dwg no. 010-02 | rev. B

date MAY 2012 | job no. 804

d

11c

11b

11a

Family

Opening skylight

Terrace

Roof't

Lounge bar

WC

7

N

status

PLANNING

DO NOT SCALE FROM THIS DRAWING : Verify all dimensions on site

P K S architects

project 9 Arkwright Road NW3

title Proposed Attic Floor Plan

scale 1:100@A1-1:200@A3 author CSp

date MAY 2012 job no. 804 dwg no. 010-03 rev. B

d

11c

11b

11a

7

N

status

PLANNING

DO NOT SCALE FROM THIS DRAWING ; Verify all dimensions on site

P K S
architects

project 9 Arkwright Road NW3

title Proposed Roof Plan

scale 1:100@A1-1:200@A3 CSp

date MAY 2012

job no. 804

dwg no. 010-04

rev. B

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APPENDIX B

BGS boreholes records

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoRecords Plus+

Adam Cadman
Card Geotechnics Limited
No. 1 Pickford Street
Aldershot
Hampshire
GU111TY
United Kingdom

Borehole Data Pack:

This package provides additional data relating to your selected borehole record ordered via GeoRecordsPlus. It provides index listings of other information held in some key BGS databases for your site and a geological map extract for the surrounding area, taken from the 1:50.000 scale BGS digital geological map of Great Britain (DiGMapGB-50).

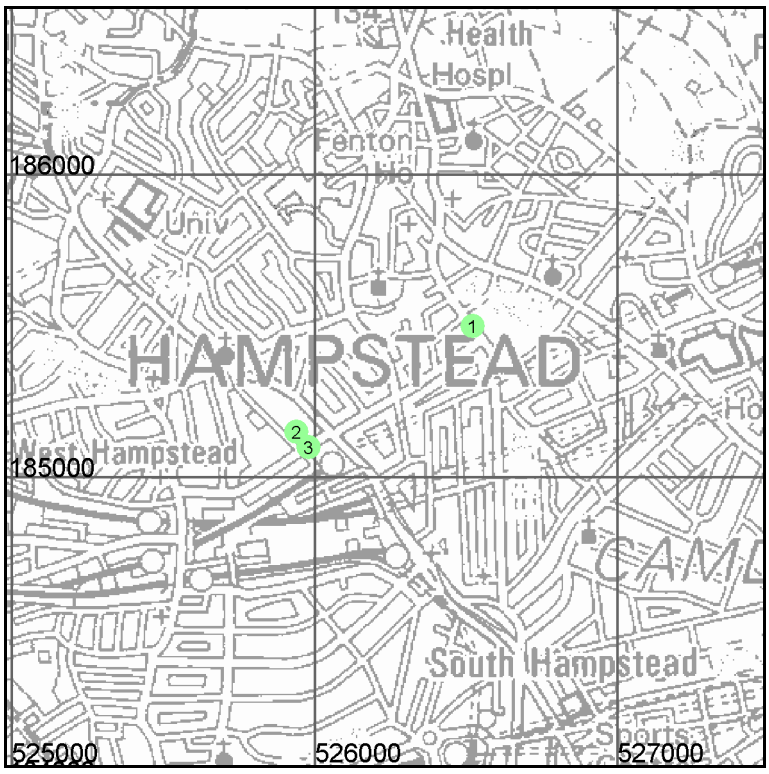
It should be noted that this package is not a comprehensive listing of all BGS data holdings and other data may be available. Note that index data is also accessible through the BGS Internet Geoscience Data Index on the BGS website at www.bgs.ac.uk If you wish to place an order for any of the index data please e-mail enquiries@bgs.ac.uk

Report Id: *BH_117152_1*

Client reference: CG/5595 - 9 Arkwright Road

Borehole location map

This map shows the locations of the boreholes you have ordered.



Scale: 1:25 000 (1cm = 250 m)

Key

Number on Map	Borehole Number
1	TQ28NE44
2	TQ28NE129
3	TQ28NE130

Geological Map Extracts

This part of the pack contains extracts of geological maps taken from the 1:50 000 scale BGS Digital Geological Map of Great Britain (DiGMapGB-50). The geological information in DiGMapGB is separated into four themes: artificial ground, landslide deposits, superficial deposits and bedrock, shown here in separate maps. The fifth 'combined geology' map superimposes all four of these themes, to show the geological formations that occur at the surface, just beneath the soil.

More information about DiGMapGB-50 and how the various geological units are classified can be found on the BGS website (www.bgs.ac.uk). The maps are labelled with two-part computer codes that indicate the name of the geological unit and its composition. Descriptions of the units listed in the map keys may be available in the BGS Lexicon of Named Rock Units, which is also on the BGS website (http://www.bgs.ac.uk/lexicon/). If available, these descriptions can be found by searching against the first part of the computer code used on the maps. Please treat this labelling with caution in areas of complex geology, where some of the labels may overlap occurrences of several geological formations. If in doubt, please contact BGS Enquiries for clarification.

In the map keys the geological units are listed in order of their age, as defined in the BGS Lexicon, with the youngest first. However, where units are of the same defined age they are listed alphabetically and this may differ from the actual geological sequence.

Artificial ground: This is ground at or near the surface that has been modified by man. It includes ground that has been deposited (Made Ground), landscaped, disturbed, excavated (Worked Ground) or some combination of these.

Landslide deposits: These are deposits formed by localised mass-movement of soils and rocks on slopes under the action of gravity. Landslides may occur within the bedrock, superficial deposits or artificial ground; and the landslide deposits may themselves be artificially modified.

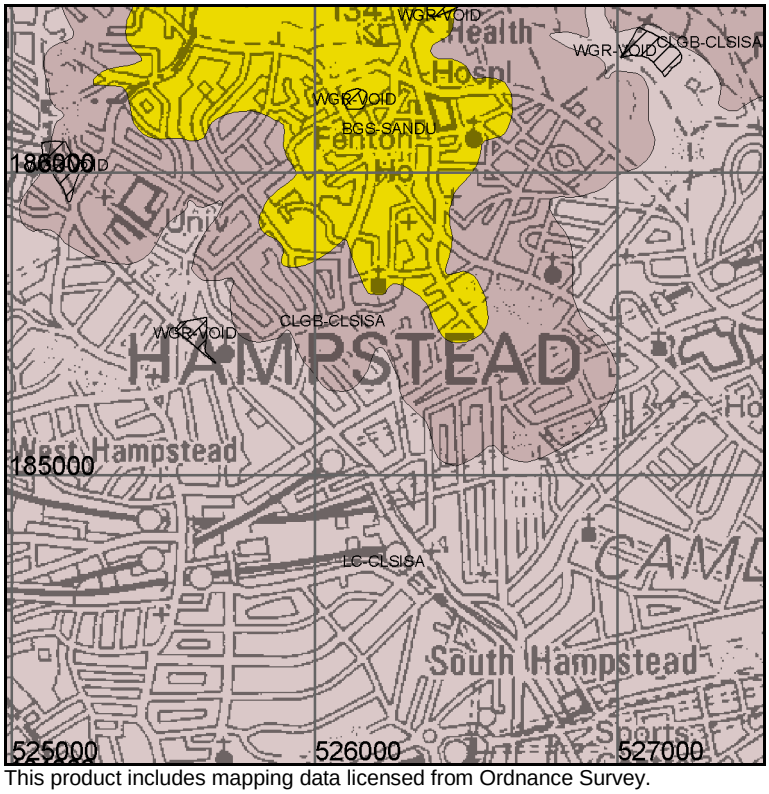
Superficial deposits: These are relatively young geological deposits, formerly known as 'Drift', which lie on the bedrock in many areas. They include deposits such as unconsolidated sands and gravels formed by rivers, and clayey tills formed by glacial action. They may be overlain by landslide deposits or by artificial deposits, or both.

Bedrock: Bedrock forms the ground underlying the whole of an area, commonly overlain by superficial deposits, landslide deposits or artificial deposits, in any combination. The bedrock formations were formerly known as the 'Solid Geology'.

Combined 'Surface Geology' Map: This map shows all the geological themes from the previous four maps overlaid in order of age.

Combined 'Surface Geology' Map

This map shows the surface elements of all four geological layers. Please see keys to the Artificial, Landslide, Superficial and Bedrock geology maps



Scale: 1:25 000 (1cm = 250 m)

Fault

Coal, ironstone or other mineral vein

Note: Faults and Coals, ironstone & mineral veins are shown for illustration and to aid interpretation of the map. Not all such features are shown and their absence on the map face does not necessarily mean that none are present

Key to Artificial ground:

Map colour	Computer Code	Name of geological unit	Composition
	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID

Key to Landslide deposits:

No deposits found in the search area

Key to Superficial deposits:

No deposits found in the search area

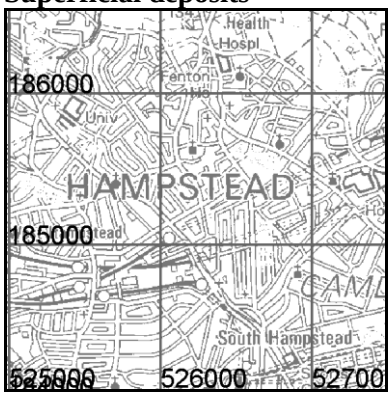
Key to Bedrock geology:

Map colour	Computer Code	Name of geological unit	Rock type
	BGS-SANDU	BAGSHOT FORMATION	SAND
	CLGB-CLSISA	CLAYGATE MEMBER	CLAY, SILT AND SAND
	LC-CLSISA	LONDON CLAY FORMATION	CLAY, SILT AND SAND

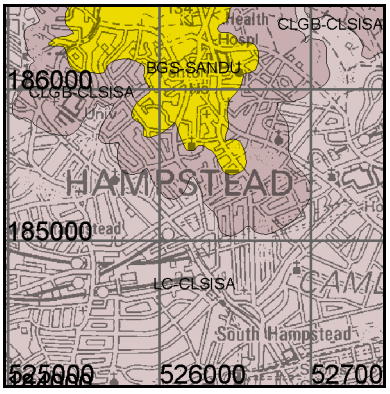
Artificial ground

Landslide deposits

Superficial deposits



Bedrock



Please see key on previous page.

Geoscience Data List

List of available geological data

This section lists the data sets, in addition to boreholes and well records, that are held in the National Geoscience Records Centre that are relevant to your enquiry. Users with access to computing facilities can make their own index searches using the BGS Internet; go to 'Online shops' at www,bgs.ac.uk This will give access to the BGS Bookshop, Publications catalogue, GeoRecords (borehole browser) and GeoReports.

If you want to order any of the data please contact enquiries on enquiries@bgs.ac.uk. For current pricing see internet pages above or do not hesitate to contact us using the list found at the back of this pack.

Note that this list contains selective datasets and is not a definitive listing of all data held in BGS

Site investigation reports
Number of records in search area: 450

Additional laboratory and test data may be available in these reports, subject to any copyright and confidentiality conditions. The grid references used are based on an un-refined rectangle and therefore may not be applicable to a specific site. Borehole records in these reports will be individually referenced within the borehole records collection.

Number	Site investigation title
230	WESTERN AVENUE EXTENSION ST MARKS ROAD TO PADDINGTON GREEN
1883	HAMPSTEAD LONDON NW3 TELEPHONE EXCHANGE EXTENSION
3847	NEW CIVIC CENTRE HAMPSTEAD
3850	PROPOSED VICTORIA LINE UNDERGROUND RAILWAY
4720	PROPOSED BRIDGE DECK REPLACEMENT OF BRIDGES NO MR 18 AND MR 19 AT WILLESDEN GREEN
5751	A406 NORTH CIRCULAR ROAD EAST OF FALLODEN WAY TO EAST OF HIGH ROAD FINCHLEY IMPROVEMENT
5873	JUBILEE LINE EXTENSION PACKAGES 1 AND 2 GREEN PARK TO EWER STREET
8015	GRANVILLE ROAD CHILDS HILL BARNET
8036	THE BURROUGHS HENDON
8321	SOMERTON ROAD-CLAREMONT ROAD CRICKLEWOOD
8587	A406 EAST END ROAD JUNCTION IMPROVEMENTS FINCHLEY LONDON
8799	HENDON AERODROME
8802	56-63 WELLINGTON ROAD LONDON NW8
8810	CYPRUS BANK CHARLOTTE STREET LONDON W1
8814	PORCHESTER SUARE DEVELOPMENT LONDON W2
8820	LORDS VIEW 38-42 ST JOHNS WOOD ROAD LONDON NW8
8825	TAVISTOCK CRESCENT LONDON W11
8826	DEVONSHIRE PLACE LONDON W1
8835	MAPLES LTD GRAFTON WAY LONDON WC1
8841	84-90 HOLLAND PARK AVENUE LONDON W11
8904	OLD MARYLEBONE ROAD LONDON
8914	HIGHGATE BOWL HOLMESDALE ROAD LONDON
8925	123 PALL MALL LONDON
8926	LADBROKE GROVE UNDERGROUND STATION LONDON
8930	74 SOUTH AUDLEY STREET LONDON
8936	A4000 PRINCIPAL ROAD IMPROVEMENT BRIDGES AVON
8938	SWISS COTTAGE
8939	WHARNCLIFFE GARDENS LONDON
8953	H D A 92 HILLDROP ROAD HILLDROP CRESCENT NO. 7
8977	20-21 ST JAMES SQUARE LONDON
8980	WATES HOUSE UNIVERSITY COLLEGE LONDON
8999	TRAINMANS ACCOMODATION GOLDERS GREEN
9001	BRENT PARK NEASDEN LONDON
9046	PROPOSED SWIMMING POOL MACDONALD ROAD ARCHWAY LONDON
9052	CARRIAGE WAY RECONSTRUCTION NORTH CIRCULAR ROAD WELSH HARP
9053	133 LANCESTER ROAD LONDON
9059	90-100 PICCADILLY LONDON
9075	WESTERN AVENUE (A40) GYPSY CORNER IMPROVEMENTS
9083	LISSON GROVE LONDON
9084	7-9 LADBROKE GROVE LONDON

Number	Site investigation title
9337	SCHEME NO 151 LONDON
9634	FORTIS GREEN LONDON
9637	A40 WESTERN AVENUE GYPSY CORNER IMPROVEMENTS
9638	GLOUCESTER SQUARE LONDON
10887	CLITTERHOUSE SCHOOL
10888	WEST HENDON SWIMMING POOL PROPOSED REDEVLOPMENT
10892	1000 NORTH CIRCULAR ROAD
11045	19-21 GREAT PORTLAND STREET LONDON
11079	111 SHIRLAND ROAD PADDINGTON LONDON
11080	GROSVENOR STREET
11082	GROSVENOR STREET LONDON
11083	THAYER STREET LONDON
11084	190-192 EDGWARE ROAD AND 3-7 CRAWFORD PLACE LONDON
11085	LISSON GREEN AND BLANDFORD SQUARE
11086	SOMERIES HOUSE ST ANDREWS PLACE REGENTS PARK
11087	10-12 CARLISLE STREET SOHO LONDON
11088	PROPOSED RECONSTRUCTION
11089	NORTH WHARF PADDINGTON
11090	HAWLEY ROAD CAMDEN LONDON
11091	WESTLAND HOUSE CURZON STREET
11092	YORK TERRACE REGENTS PARK
11093	AVENUE ROAD ST JOHNS WOOD
11094	BRYANSTON SQUARE LONDON
11095	GLOUCESTER AVENUE CAMDEN
11096	HAYS MEWS LONDON
11101	27 CAMDEN ROAD ST PANCRAS
11110	PROPOSED EUSTON STATION REDEVELOPMENT
11133	PADDINGTON GREEN SCHOOL
11134	112-126 HAVERSTOCK HILL LONDON
11135	REGENTS CANAL REGENTS PARK
11140	KINGS TERRACE
11141	BEDFORD THEATRE SITE
11142	BISHOPS BRIDGE ROAD LONDON
11861	HENDON URBAN MOTORWAY SOUTHERN EXTENSION
11869	MILEAGE YARD PADDINGTON
11871	WAREHOUSE COMPLEX EDGWARE ROAD
11872	THE BURROUGHS HENDON
12332	17-22 MASONS YARD LONDON SW1
12353	WEST ROW,LONDON
12372	PROPOSED DEVELOPMENT AT TOTTENHAM COURT ROAD
12482	COSPEL OAK DEVELOPMENT LAMBLE STREET EXTENSION 2
12498	BARLBY ROAD LONDON
12596	THE PROPOSED WHITE CITY CENTRE LONDON W12 AREA A B AND C
12608	GOSPEL OAK NURSERY SCHOOL CAMDEN
12615	WALES FARM ROAD ACTON
12621	GAMAGES HOLBURN
12624	HYTHE ROAD WILLESDEN LONDON
12636	7-13 CRESCENT ROAD LONDON N8
12637	PEMBERTON GARDENS ISLINGTON
12671	CAMLEY STREET CAMDEN LONDON NW1
12681	THE PROPOSED WHITE CITY CENTRE LONDON AREAS A-D
12683	HARGRAVE PARK ISLINGTON
12699	CURNOCK STREET ST PANCRAS

Number	Site investigation title
12701	37 LYNTON ROAD LONDON NW6
12721	OAKBANK COURTENAY AVENUE HAMPSTEAD LONDON
12918	WALTERON ROAD WESTMINSTER
13303	LONDON ZOO - PROPOSED AMPHITHEATRE
14237	STANDS F, G, H AND I, LORDS CRICKET GROUND
14668	WILDWOOD GROVE FLOOD RELIEF SCHEME
14709	ALRIC AVENUE, HARLESDEN
15083	GOODGE STREET, STATION AT TOTTENHAM COURT ROAD, LONDON, W1. PROPOSED STATION REDEVELOPMENT
15221	MUSWELL HILL, LONDON N10
15460	STANDS F, G, H AND I, LORDS CRICKET GROUND
15814	UNION RAILWAYS BOREHOLES CONTRACT D PHASE 1. THAMES RIVER CROSSING
16086	110-112 HENDON LANE, LONDON
16796	LONDON REGENTS PARK. OPEN AIR THEATRE - TOILET BLOCK EXTENSION
17059	ALEXANDRA PALACE
17286	MAPESBURY ROAD, WILLESDEN
17287	LODGE ROAD, LONDON NW8
17361	GOSPEL OAK, NW5
17365	WOODSIDE AVENUE, MUSWELL HILL ROAD, LONDON N10
17366	HYDE PARK ESTATE - SITE C
17385	CHANNING SCHOOL, HIGHGATE
17390	GLADSTONE PARK SWIMMING BATHS
17393	BRANCH HILL LODGE, HAMPSTEAD
17403	CREWE HOUSE, CURZON STREET W1
17443	SOUTH KILBURN, AREA C
17444	EDGWARE ROAD, LONDON W2
17452	TAMWORTH LANE, MITCHAM
17491	EAST CHURCHFIELD ROAD, ACTON
17500	150-151, NEW BOND STREET, LONDON, W.1
17503	113-115 HORNSEY LANE, LONDON, N6
17569	NORTHERN POLYTECHNIC EXTENSION, HOLLOWAY ROAD, LONDON N7
17574	16 PARLIAMENT HILL, HAMPSTEAD NW3
17585	SEYMOUR PLACE
17741	LONDON. REGENTS PARK. QUEEN MARYS GARDEN, NEW BRIDGE
17775	58 BROOK STREET, LONDON
19050	313-333 HIGH ROAD, WILLESDEN
19105	SILCHESTER ESTATE
19138	HORNSEY LANE
19141	9 AND 10 ALBEMARLE STREET
19145	ULSTER TERRACE, W.1
19155	HOLLYBUSH VALE, HAMPSTEAD
19165	STAPLES CORNER, HENDON, NW2
19174	395-405 ARCHWAY ROAD, LONDON N6
19196	WEST END LANE, HAMPSTEAD
19218	96-98 BAKER STREET, LONDON W1
19230	WEST END SIDINGS, WEST HAMPSTEAD
19328	BLOCK 5 SILCHESTER ESTATE, HAMMERSMITH
19356	MARYLEBONE GOODS YARD
19389	OXGATE LANE, CRICKLEWOOD
19395	BOLSOVER STREET,ISLAND SITE,LONDON
19396	REGENTS PARK, LONDON
19406	CAMDEN TOWN (MANLEY STREET AREA)
19472	ARCHWAY DEVELOPMENT

Number	Site investigation title
19671	GROVE END ROAD, ST. JOHNS WOOD
19680	ELM VILLAGE INDUSTRIAL ESTATE, CAMDEN
19705	421 HARROW ROAD, LONDON
19714	43-49 MORTIMER STREET AND 55-58 WELLS STREET, LONDON
19841	A1 FALLODEN WAY & LYTLETON ROAD CULVERT RECONSTRUCTION
19939	19,20 WOODSTOCK STREET, LONDON
20075	MAPLES LIMITED
20076	31-32 EASTCASTLE STREET, LONDON
20403	9-13 GEORGE STREET, LONDON
20415	27-31 BIRKBECK ROAD, ACTON, LONDON
20467	INVER COURT, INVERNESS TERRACE, LONDON W.2
20618	1-11 WESTERN AVENUE, ACTON, LONDON W3
20630	2-4 HYDE PARK GATE, LONDON
20710	HIGH ROAD, EAST FINCHLEY
20999	15 WEST HEATH ROAD, HAMPSTEAD, LONDON NW3
21053	HARROW ROAD TO MARLYBONE ROAD IMPROVEMENTS
21098	PROPOSED FIVE STOREY OFFICE BLOCK AT HARROW ROAD, WILLESDEN, LONDON
21112	SHEPHERDS HILL, HIGHGATE, LONDON
21144	11 FITZROY SQUARE, LONDON
21176	ST MARTS CHURCH OF ENGLAND, JUNIOR MIXED INFANT SCHOOL, WILLESDEN, LONDON
21185	33-37 CASTELLAIN MANSIONS, CASTELLAIN ROAD, LONDON
21288	CROMWELL LODGE
21294	ST. MARYS HOSPITAL, HEREFORD ROAD, LONDON
21296	16-20 NORTH AUDLEY STREET, LONDON
21297	14/15 CONNOUGHT SQUARE, LONDON
21298	RANDOLPH AVENUE, MAIDA VALE, LONDON
21299	23-24 KING STREET, LONDON
21300	HAMMERSMITH SWIMMING POOL
21310	DEVELOPMENT AT ST. GILES CIRCUS, LONDON
21321	SPRING PLACE
21347	38 GROSVENOR SQUARE, LONDON
21445	PROPOSED WAREHOUSE AND OFFICES AT PRAED STREET PADDINGTON LONDON W2
21515	13-15 NEWBURGH STREET LONDON W1
21639	12 KENSINGTON PALACE GARDENS LONDON W8
21645	3-6 ST JAMES TERRACE LONDON NW8
21656	12 AVENUE ROAD ST JOHNS WOOD LONDON NW8
21657	GOODGE STREET LONDON UNDERGROUND STATION LONDON W1
21692	EUSTON ROAD, LONDON,NW1
21716	HARROW ROAD
21785	PROPOSED SCHOOL AT ST JOHNS WOOD, LONDON, NW8
21941	24 CONDUIT STREET W1
21966	MAPLES LIMITED, HEAD OFFICE, TOTTENHAM COURT ROAD, WC1
21975	HARROW ROAD TO MARYLEBONE ROAD IMPROVEMENT
22023	ENDSLEIGH STREET LONDON WC1
22028	EDGWARE ROAD STATION, LONDON NW1
22029	3-4 ENDSLEIGH STRET, LONDON, WC1
22105	26 MANGCHESTER SQUARE
22106	THE LONDON - EDINBURGH - THURSO TRUNK ROAD (A1)
22186	EDGEWARE ROAD LONDON
22193	PARK PLAZA HOTEL BAYSWATER

Number	Site investigation title
22274	BRICK STREET LONDON W1
22927	WALES FARM ROAD
22943	WHITTINGTON HOSPITAL LONDON N19
24011	TUNNEL BENEATH SOMERS TOWN GOODS DEPOT OSSULSTON STREET EUSTON
24020	PROPOSED REDEVELOPMENT BOLDERO STREET LONDON SW1
24031	RATHBONE PLACE
25452	WALES FARM ROAD ACTON
25471	CAMDEN GOODS YARD
25672	HAMSTEAD ROAD CARDINGTON STREET LONDON
25717	87 LANCASTER ROAD LONDON
25723	ALBERT TERRACE MEWS LONDON NW1
25724	GROVEDALE ROAD LONDON N19
25725	ZOOLOGICAL GARDENS REGENTS PARK
25916	DEANERY STREET LONDON W1
25943	CONNAUGHT HOTEL ADAMS ROW LONDON W1
25948	PADDINGTON STATION LAWN CONCOURSE PRAED STREET LONDON
25968	PRIMROSE HILL CHALK FARM
25995	29 SOUTHWOOD LAWN ROAD HIGHGATE LONDON
26007	WESTWAY CENTRE MALTON ROAD LONDON
26011	19-21 GREAT PORTLAND STREET LONDON W1 ROYAL LIVER FRIENDLY SOCIETY
26048	VICTORIA ROAD NORTH ACTON
26060	VICTORIA ROAD ACTON W10
26095	YORK TERRACE REGENTS PARK
26096	DRUMMOND STREET CAMDEN
26101	1-2 WELBECK STREET LONDON W1
26113	44-46 WHITFIELD STREET LONDON W
26115	25-26 IVOR PLACE LONDON NW1
26118	WINDMILL STREET LONDON W1
26152	MILL LANE HAMSTEAD
26160	NORTH ACTON TUBE STATION NORTH ACTON LONDON W3
26218	IVERSON ROAD NW6
26266	MARYLEBONE ROAD LONDON NW1
26269	115 HAMILTON TERRACE
26276	YORK TERRACE YORK GATE LONDON NW1
26284	48 CURZON STREET LONDON
26292	LONG LANE EAST FINCHLEY LONDON N2
26301	THE MARYLEBONE ROAD DEVELOPMENT INTERSECTION MARYLBONERD/ALBANY STR.
26334	WILLESDEN GREEN BUS GARAGE POUND LANE
26347	6 BELGRAVE SQUARE LONDON SW1
26353	ALEXANDRA ROAD HAMPSTEAD LONDON
26388	A406 NORTH CIRCULAR ROAD RAILWAY BRIDGES STONEBRIDGE FARM
26430	BRYANSTON SQUARE WI
26457	152 BRENT STREET HENDON
26473	23 BERKELY SQUARE LONDON W1
26497	UNIVERSITY COLLEGE HOSPITAL LONDON WC1
26503	AVENUE CLOSE LONDON NW8
26534	THE FRIARY ACTON LONDON W3
26556	DUNCOMBE ROAD LONDON N19
26558	WOOD LANE LONDON W12
26561	12 GOLDEN SQUARE LONDON W1
26564	PEUGEOT AUTOMOBILES UK LTD WESTON AVENUE ACTON
26709	36/42 NORTH HILL HIGHGATE

Number	Site investigation title
26716	CARLTON HOUSE TERRACE LONDON SW1
26723	CRICKLEWOOD BUS GARAGE LONDON NW2
26724	CUMBERLAND TERRACE REGENTS PARK
26736	90 MUSWELL ROAD LONDON N10
26749	SAVILLE ROW
26751	IOA WOODLANE LONDON
26824	KINGS COURT 38-42 WHITFIELD STREET LONDON W1
26860	KING STREET ACTON
26863	BOOK CENTRE EXTENSION NORTH CIRCULAR ROAD
27090	WILLESDEN SPORTS CENTRE
27173	BOUNDARY ROAD ST JOHNS WOOD
27178	BRENT TERRACE LONDON
27179	MAIDAVALE LONDON BBC STUDIOS
27810	30-44 QUEENSWAY BAYSWATER 2
28227	30-44,QUEENSWAY,BAYSWATER W.2
28323	1-6 SEYMOUR STREET/MARYLEBONE W1
29791	QUEENSWAY
29830	ST JAMES STREET LONDON SW 1
30280	CHURCH OF LITTLE ST. PETER CLAREMONT WAY BARNET
30293	WHITFIELD SCHOOL BARNET
30320	13 COOLHURST ROAD CROUCH END
30439	CEDERS CLOSE HENDON LONDON NW4
30518	48-49 MANCHESTER STREET LONDON W1
30692	320 KILBURN HIGH ROAD
30694	WILLESDEN GREEN
31542	MIDDLESEX UNIVERSITY
31827	PADDINGTON LIBRARY, PADDINGTON
32085	83/85 PALL MALL LONDON SW1
32550	MASONS YARD WESTMINSTER SW1
32625	ARCHWAY DEVELOPMENT PHASE II
32738	THE BURROUGHS, HENDON LONDON
32912	698 FINCHLEY ROAD HOOP LANE
33013	THE ECONOMIST ST JAMES ST - RYDER ST LONDON
33464	DIRECTORATE OF TECHNICAL SERVICES LONDON
33471	LONDON BOROUGH OF BARNET CHRIST'S COLLEGE LOWER SCHOOL
33472	62 SHIRLAND ROAD,LONDON W9
33506	LADBROKE GROVE CANAL BRIDGE
33509	BRENT TERRACE CRICKLEWOOD LONDON
33515	NEW BOND STREET LONDON W1
33544	GLADSTONE PARK GARDENS CRICKLEWOOD
33592	65/66 FRITH STREET W1
33597	97/115 ADELAIDE ROAD NW3
33601	CHALTON STREET LONDON NW1
33602	72 CHARLOTTE STREET LONDON
33889	ACTON
33910	EAST FINCHLEY
34073	LADBROKE HALL
34076	ROE GREEN SWIMMING POOL WEMBLEY
34139	GOWER STREET
34145	SUNNYFIELDS PRIMARY SCHOOL HENDON
34179	NORTH ACTON ROAD PARK ROYAL
34788	HAZELTON HOUSE CHEVERTON ROAD ISLINGTON
34837	EUSTON STATION RECONSTRUCTION

Number	Site investigation title
34842	THE ROUNDHOUSE DEVELOPMENT, CHALK FARM ROAD, LONDON
35208	PARK ROYAL LONDON
35306	LECONFIELD HOUSE CURZON STREET
35570	152 HIGH STREET HARLESDEN
35692	3 NORTH END AVENUE HAMPSTEAD
35823	CAMDEN ROAD DEVELOPMENT, LONDON NW1
35824	RABBIT ROW, LONDON, W.8
36001	EUSTON STATION RECONSTRUCTION
36101	EUSTON STATION RECONSTRUCTION
36102	EUSTON STATION
36180	WILLESDEN CEMETERY NEW CHAPEL
36181	FRANKLYN ROAD CLEANSING DEPOT
36198	ELSWORTHY ROAD LONDON NW3
36288	ODEON CINEMA SITE HARLESDEN LONDON
36946	QUEENS WOOD HIGHGATE LONDON
37047	MAITLAND PARK ST PANCRAS
37108	117/118 BAYSWATER ROAD BAYSWATER
37156	65 PRIORY ROAD HAMPSTEAD
37184	42 ST DUNSTANS AVENUE ACTON LONDON
37222	11 WATERLOO PLACE ST JAMES'S LONDON
37533	REGENT STREET BOROUGH OF WESTMINSTER LONDON
37556	95 SUNNY GARDENS HENDON
37597	4 LANSDOWNE WALK HOLLAND PARK LONDON
37620	COLINDALE AVENUE BOROUGH OF BARNET
37628	TEMPLEHOF AVENUE BRENT CROSS
37629	THAMES ROAD CRAYFORD
37640	66 HAMILTON TERRACE MAIDA VALE
37864	CLAREMONT ROAD QUEENS PARK LONDON BOROUGH OF BRENT
38176	CAIRD ST LONDON W 10
38290	1 CORNWALL TERRACE REGENTS PARK
38309	160 NEW BOND STREET
38318	87 - 89 BAKER STREET
38376	265 CAMDEN ROAD LONDON
38405	DUPLEX WORKS (UNIT 8) THE HYDE HENDON
38466	CHILTERN STREET LONDON W1
38544	COMPRESSOR HOUSE WILLESDEN
38546	GLOUCESTER HOUSE MARYLEBONE ROAD
38569	GROSVENOR SQUARE UNDERGROUND CAR PARK
38590	EARTH MOVEMENT AT NORTH ACTON STATION
38597	GARRICK ROAD INDUSTRIAL ESTATE HENDON
38609	24-26 AVENUE ROAD PRIMROSE HILL
38646	GARRICK ROAD INDUSTRIAL ESTATE HENDON
38669	TOLMERS SQUARE AREA 1 NETLEY STREET SITE
38678	DOLLIS HILL SCHOOL WILLESDEN
38707	LATIMER ROAD HAMMERSMITH W.10
38708	TECHNICAL COLLEGE PADDINGTON W.2
38710	SILCHESTER ROAD KENSINGTON W.10
38713	WELL STREET REDEVELOPMENT
38751	MULTI-STOREY CAR PARK WOOD LANE LONDON W12
38785	PROPOSED OFFICE BLOCK EDGWARE ROAD COLINDALE
38862	PROPOSED DEVELOPMENT AT 20-28 LODGE ROAD ST MARYLEBONE
39047	198 ALBANY STREET REGENTS PARK
40333	NEASDEN FACTORY

Number	Site investigation title
40485	MAIDA VALE
40615	STANHOPE STREET REGENTS PARK
40693	LANCASTER ROAD KENSINGTON
40702	RUSTON MEWS W11
42230	HORNSEY LANE HARINGEY
42578	3 - 5 GLOUCESTER ROAD LONDON NW1
42584	149 SCRUBS LANE NW10
42704	SHINFIELD STREET
42742	UNITY HOUSE 195 - 205 EUSTON ROAD NW1
42905	C/1212 BRENT TERRACE CRICKLEWOOD
43073	PREMIER PARK TWYFORD EAST PARK ROYAL LONDON
43075	SOUTHWOOD HOUSE 41-49 AVONDALE PARK ROAD LONDON
43079	UNIT 9 REVISED POSITION STAPLES CORNER RETAIL PARK
43105	MONOPOLE HENDON
43375	THE ELMS HAMPSTEAD VOLUMES 1 & 2
43621	29- 31 FARM STREET LONDON W1
43637	SPEDAN TOWERS HAMPSTEAD
43679	L.T. DEVELOPMENT WHITE CITY W12
43680	MADDOX STREET SITE
43686	18-20 GROVE END ROAD ST JOHNS WOOD
43690	REDEVELOPMENT OF BLUE STAR GARAGE HAMPSTEAD
43703	51 - 53 GREAT MARLBOROUGH STREET LONDON W1
43761	TOLMERS SQUARE CAMDEN
43870	ST AGNES CHURCH CRICKLEWOOD LANE
43974	INDUSTRIAL ESTATE HENDON
44005	OLD PEOPLES DWELLINGS REGENTS PARK
44865	DANE COURT THE BISHOPS AVENUE LONDON
44877	17 THE BISHOPS AVENUE LONDON
46171	CROSSRAIL PACKAGE A
46172	CROSSRAIL PACKAGE B
51134	PORCHESTER LEISURE CENTRE LONDON
51548	CONNAUGHT HOTEL MAYFAIR LONDON
51865	15 STANHOPE GARDENS LONDON N6
51895	CHALK FARM LONDON
51996	EAST ACTON LANE
51997	HUNTS FARM BOROUGH GREEN
52076	HERMITAGE STREET PADDINGTON
52214	OXFORD STREET/DERING STREET LONDON W1
52508	9-13 GEORGE STREET LONDON W1
52511	PARK PLAZA HOTEL BAYSWATER
52518	THE PICCADILLY ESTATE TROCADERO SITE COVENTRY STREET LONDON W1
52529	12 AVENUE ROAD NW8
52535	COMBINED REPORTS 39-41 CHARING CROSS ROAD
52536	TAUNTON PLACE BALCOMBE STREET LONDON NW1
52546	PROPOSED OFFICE DEVELOPMENT AT 10-12 GREAT MARLBOROUGH STREET LONDON W1
52548	10-12 GREAT MARLBOROUGH STREET LONDON W1
52568	PADDINGTON GOODS YARD
52572	120-126 TOTTENHAM COURT ROAD LONDON W1
52573	120-126 TOTTENHAM COURT ROAD LONDON W1
52574	120-126 TOTTENHAM COURT ROAD LONDON W1
52706	WILLESDEN ECR DEPOT
52712	A5 KILBURN HIGH ROAD - OB19

Number	Site investigation title
52721	KENSAL ROAD LONDON W10
52799	WHITE CITY AFFORDABLE HOMES PHASES 1 AND 2
53209	GYPSY CORNER NORTH ACTON
53518	ARLINGTON HOUSE 220 ARLINGTON ROAD CAMDEN LONDON NW1
53528	MOST HOLY TRINTY WITH ST BARNABAS CHURCH KENTISH TOWN LONDON
53660	18 BISHOPSWOOD ROAD LONDON N6
53728	64-70 CAMDEN HIGH STREET LONDON NW1
53729	24 CANDOVER ROAD HORNCHURCH ESSEX
53751	31 GREEN LANE LONDON NW4
53752	44 GROVE END ROAD LONDON NW8
53757	114-118 HARLEY STREET LONDON W1
53760	HEATHWAYS COURTENAY AVENUE LONDON N6
53793	DORIC VILLA
53794	EAST HEATH ROAD HAMSTEAD LONDON NW3
53798	378 FINCHLEY ROAD CHILDS HILL LONDON NW3
53799	3, 5 AND 7 FITZJOHN`S AVENUE SOUTH HAMPSTEAD LONDON
53890	31 THE BISHOPS AVENUE LONDON N2
53902	14 VIEW ROAD HIGHGATE LONDON N6
53916	MAGISTRATES COURTS MARYLEBONE ROAD LONDON W1
53917	MARYLEBONE MAGISTRATES COURTS LONDON
54277	BOURCHIER STREET SOHO
54279	BRENT STREET HENDON
54347	CROWNHILL ROAD NW10
54428	HARROW ROAD LONDON W9 13 PHASE III
54429	HARROW ROAD LONDON W9
54538	45 NETHERHALL GARDENS HAMPSTEAD
56228	PROPOSED EXTENSION TO THE HOSPITAL OF ST JOHN & ST ELIZABETH LONDON
56232	ELLIS HOTEL DOWN STREET LONDON W1
56234	PROPOSED LEB SUBSTATION AT LEICESTER SQUARE LONDON
56241	THE EASTERN YARD CAMDEN LOCK LONDON
56254	NEW LIFT SHAFT AT LA SAINTE UNION CONVENT SCHOOL HIGHGATE ROAD NW5
56466	26 WILDWOOD RISE LONDON NW11
56513	PROPOSED ACHILLES WAY CAR PARK PARK LANE LONDON W1
56537	NEASDEN DEPOT NEASDEN
56576	NEASDEN TO DOLLIS LU INCLINOMETER DATA
56582	WEMBLEY PARK TO KINGSBURY NEASDEN TO DOLLIS HILL LU
56584	11 HALL ROAD LONDON NW8
56590	ACTON WASTE TRANSFER STATION
56595	WEST HAMPSTEAD STATION NORTH LONDON LINE
56596	11 BRICK STREET MAYFAIR LONDON W1
56642	PROPOSED NEW DEVELOPMENT 14-16 WARWICK STREET LONDON
56732	100 ILBERT STREET WEST KILBURN NW10
56793	32 THORPBANK RD SHEPHERDS BUSH LONDON W12
56828	RETAIL DEVELOPMENT 6-17 TOTTENHAM COURT ROAD LONDON
56867	THE RYDINGS COURTENAY AVENUE HAMPSTEAD LONDON N6

National Grid geological maps (1:10 000 and 1:10 560 scale)

Number of records in search area: 4

Map	Type	Survey
TQ28NE	C	1922
TQ28NW	C	1922
TQ28SE	C	1899
TQ28SW	C	1899

County Series geological maps (1:10 560 scale)

Number of records in search area: 13

Map	Type	Published
London1FS		1922
London1FS	C	0
London1SE	C	1934
London1SE	C	0
London1SE		1934
London1SE	D	1934
London2SE	C	0
London4FS		1919
London4NE	D	1934
London4NE		1934
London4NE	C	0
London4NE	C	1934
London6NE	C	0

New Series medium scale geological maps (1:50 000 and 1:63 360 scale)

Number of records in search area: 4

Sheet number	Sheet name	Type	Published
256	North London	C	2006
256	North London	C	1993
256	North London	D	1925
256	North London	D	1951

Old Series one inch geological maps (1:63 360 scale)

Number of records in search area: 2

Sheet number	Sheet name	Type	Published
7	St. Albans	D	1871
7	St. Albans	S	1861

Hydrogeological maps (various scales)

Number of records in search area: 0

BGS holds no hydrogeological maps for the selected area

Geological Memoirs

Number of records in search area: 2

Geological memoir	Date
Geology of London Sheets 256,257,270,271	2004
North London	1925

Technical reports

Technical reports may be available for this area. Please see http://geolib.bgs.ac.uk

Waste sites

Number of records in search area: 0

Listing of some 3500 waste sites for England and Wales identified by BGS as part of a survey carried out on behalf of the Department of the Environment in 1973. Later information may be available from the Local authority.

BGS holds no records of waste sites for the selected area

Mining plans

Number of records in search area: 0

This listing includes plans of various types, principally relating to mining activity including abandonment plans. The coverage is not comprehensive; however that for Scotland is most complete.

BGS holds no records of mining plans for the selected area

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11. The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
12. Note that for some sites, the latest available records may be quite historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

Availability of goods

The maps provided on this website show where the various records are available. However, if for some reason, after you have paid for a record, the BGS is unable to provide it (for example, due to data or computing problems), we will inform you and offer an alternative record or a full refund.

Some of the records held in the National Geoscience Data Centre (NGDC) were donated under conditions of confidentiality. For most of these confidential records, the BGS is able to tell you that the records exist, and their location will, therefore, be displayed on the index maps on this website but we will not be able to provide you with a copy immediately. You will, however, be able to place a request to obtain details about the owners of the records who you can then contact to request release of the data. Once this is obtained you will then have to supply the BGS with written confirmation of release, and we will then be able provide you with a copy of the records concerned.

Prices, payment and VAT

Prices quoted in printed leaflets and internet pages are liable to change without prior notice.

Payment can currently only be accepted in Sterling, but may be made by credit or debit card (not by charge card, e.g. Amex), International Money Order, or Bankers' Draft. Electronic Fund Transfers, such as BACS (Bank Automated Clearing System) are also possible, please contact us for details.

The BGS reserve the right not to supply goods to purchasers who have previously defaulted on payment, or where there is reasonable evidence that a fraudulent credit card payment may be involved.

Value Added Tax (VAT) will be charged in accordance with current regulations.

The charges for obtaining copies of records are detailed on this website. There is a minimum charge of £26+VAT on all orders to reflect our minimum administration costs.

Delivery

Records ordered through this website will be dispatched using your requested method, options being: prints/photocopies by standard post/special delivery/faxing, or digital files (secure PDF format) by e-mail (if file size allows) or on CD by post. Records will normally be dispatched within 10 working days from receipt of the order. However, a special 24 hour Premium delivery can be requested at an additional charge, details of which can be found on this website.

On top of these quoted dispatch times, please allow five days for postage in the UK, seven days in the EU and up to 30 days elsewhere. If your order is delayed beyond this time, please contact the Central Enquiries Desk immediately (contact details below). Standard Postal Delivery charges are included in the price of the records. You will only be charged the amount quoted. If you require special delivery arrangements to be made, please contact us before placing your order.

Lost, damaged or incorrectly supplied goods

The BGS will take all reasonable steps to replace items damaged in transit or those that have been supplied in error. Where this is not possible, a full refund will be made (please see Availability above).

If goods are lost or damaged in transit, or have been incorrectly supplied, you should retain them together with all packaging and documents, and notify the BGS immediately. You should do this by letter, fax or email within 7 days of receiving the goods: beyond this period we cannot guarantee that replacements will be available. You then have the choice of having a replacement item or a full refund. Please ensure you quote any customer order numbers and include your full name and address in any communications.

Please do not return any faulty or incorrect goods unless asked to do so. We will give you instructions on how, or whether, to return these items, and may ask you to supply appropriate documents.

Complaints

We would hope that the vast majority of potential problems can be resolved by simply contacting the BGS through the Central Enquiries Desk. If, however, you are not satisfied that the problem has been resolved or handled to your satisfaction, you may wish to make a formal complaint. Your complaint can be sent to the BGS by post, fax or e-mail. In all cases you should aim to provide as much relevant information as possible so that we can deal with your complaint as promptly as possible. Please also include your contact details in case we need to obtain more details from you.

All complaints should be sent to the Central Enquiries Desk (contact details below).

You will receive an acknowledgement within five working days that your complaint has been received. If you do not receive an acknowledgement, please contact the Head of Enquiry Service at the same address.

When acknowledging receipt of your complaint, we will give an indication of how long it will take to send you a detailed response. In most cases, we would aim to provide a detailed response within ten working days. However, this may not always prove possible, especially if we need to obtain further information. In these cases, we will keep you fully informed on the progress of your complaint, and endeavour to provide you with as full a response as possible as soon as we can.

Legal issues

In the event of a dispute over the description or supply of goods, payment, or ownership, the contract will be deemed to have been made within England and will therefore be subject to the laws of England and Wales.

The BGS regret that we are only able to handle enquiries and conduct business matters in English.

The historical records held by the BGS date back to the 18th Century. During this long period the meaning of some words has changed, and the meaning of some of the colloquial descriptive terms has been lost. In rare instances some historic records contain words once used commonly that might now cause offence. BGS policy is to provide the records in their original state without amendment or excision of content. This policy is consistent with that of The National Archives.

Data protection

Please see our 'Privacy policy'.

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http://www.bgs.ac.uk/about/copyright/home.html

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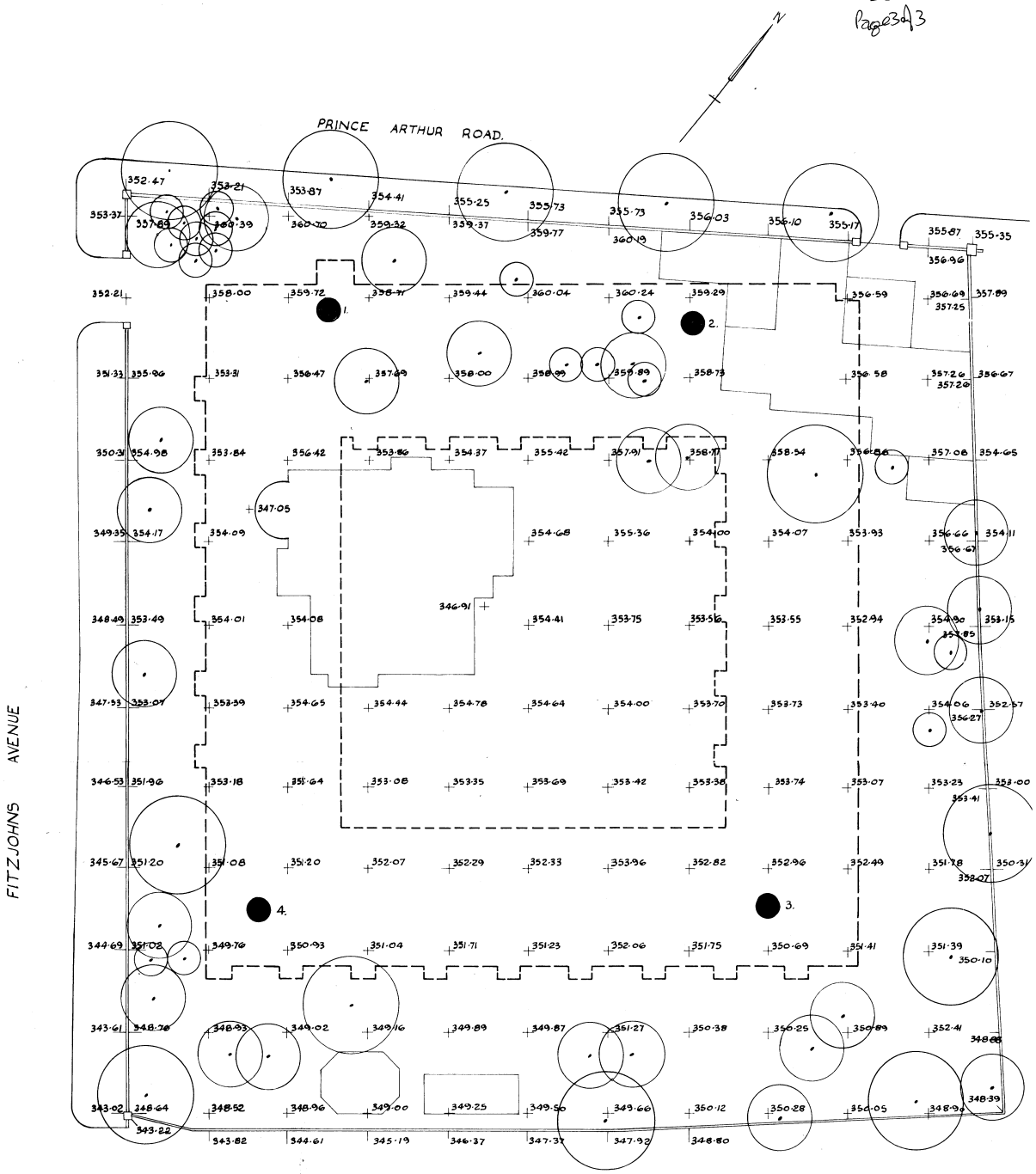
256
Page343



PLAN.

OUTLINES OF EXISTING BUILDINGS SHEWN THUS, _____
OUTLINES OF PROPOSED NEW BUILDINGS SHEWN THUS, — — —

TQ 28 NE/44
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256
Page 1 of 3

BOROUGH OF HAMPSTEAD.

CHARLES E. JACOB
A.R.I.B.A.
CHARTERED ARCHITECT

HOUSING ARCHITECT

TELEPHONE: HAMPSTEAD 7171/EXT. 131

HOUSING ARCHITECT'S DEPARTMENT,
222, HAVERSTOCK HILL,
N.W.3.

YOUR REF. .....

MY REF. MW/PA. P/43

11th December, 1963.

Rec'd by Mr. 12 Dec '63

The Director,
Geological Survey & Museum,
Exhibition Road,
South Kensington, S.W.7.

Dear Sir,

102, Fitzjohn's Avenue. N.W.3.

I refer to Circular No.18/62 from the Ministry of Housing and Local Government and enclose copies of the following documents, for your information, giving details of the trial boreholes that were sunk on this site during July 1963:-

1/1250 O.S.Sheet showing the location of the site
Drawing No.899/4 showing the position of the boreholes on the site.

The following deposits were encountered in the boreholes:-

No.1 Boring	Thickness	Depth below surface.
Topsoil	3'0"	3'0"
Brown fine sand with a little silt and small clay pockets	14'0"	17'0"
Stiff to very stiff laminated grey sandy clay and brown silty fine sand	13'0"	30'0"
Total from surface	30'0"	30'0"

No.2 Boring		
Made ground (sand, ashes, stones etc.)	2'0"	2'0"
Yellow/brown fine sand with a little silt and small clay pockets	15'6"	17'6"
Stiff laminated grey sandy clay and orange/brown silty fine sand	12'6"	30'0"
Total from surface	30'0"	30'0"

/contd:

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The Director,
Geological Survey & Museum

Continuation Sheet No.1. Page 2 of 3

		Thickness	Depth below surface.
	No.3 Boring (+106.98 m)		
	Topsoil	2'6"	2'6"
Bagshot Beds	Stiff laminated grey sandy clay and brown silty fine sand	11'6"	14'0"
	Yellow/brown silty fine sand, clayey at some levels	19'0"	33'0"
Claygate Beds	Coarsely laminated grey sandy clay and orange/brown silty sand	4'0"	37'0"
	Brown silty very fine sand with trace of clay	3'0"	40'0"
	Total from surface	40'0"	40'0"
	No.4 Boring		
	Made ground (clayey sand, gravel, topsoil, etc.)	3'6"	3'6"
	Sandy clay with stones	1'0"	4'6"
	Firm to stiff laminated grey sandy clay and silty fine sand	15'6"	20'0"
	Total from surface	20'0"	20'0"

Yours faithfully,

H.L. Jacob.

Housing Architect.

Encls:

Department of the Environment
CIVIL ENGINEERING LABORATORY Cardington

Investigation No. FGE/1491

Appendix A
Sheet No. 2

T. E. Extension

HAMPSTEAD

BOREHOLE LOG

TQ 28 NE/129
2594 8515

Borehole No. 1
Ground Level 62·0m A.O.D (approx.)
Date 11th-12th, 16th-18th June 1981

Note:-
1. Light Cable Percussion Borehole
2. Casing - 250mm dia. to 1·8m below G.L
   Open hole boring from 1·8 to 29·5m below G.L
3. Standpipe installed - details below

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
			G.L	62·0	
CONCRETE			0·2	61·8	
MADE GROUND:- CLAY, sandy, brown, soft to firm, contains scattered cinders, brick fragments and flints with lenses and layers of soft organic clay		9	0·7		Standpipe installed to 29·0m below G.L. Bottom 3m of pipe slotted and surrounded by a 4·0m response zone of gravel. Gravel response zone sealed by a 2·0m thick Bentonite plug. Hole backfilled with clay.
			1·2		
			1·5	60·5	
CLAY, Brown, firm, silty, lightly fissured with occasional thin orange silt/sand layers Class? CH		28	2·0		
			2·5		
CLAY, Brown mottled blue grey, firm to stiff, silty, fissured. Contains scattered small Gypsum crystals throughout which are occasionally concentrated into thin layers and pockets, there are also a few small isolated carbonaceous pockets Class? CH	LW	44	3·5		
			4·0		Reduced to 200mm dia. boring from 4·0m below G.L
CLAY, as above, becoming stiff with more pronounced fissuring Class? CH		56	5·0		
			5·5		
CLAY, Brown, stiff, silty, well fissured, with scattered small Gypsum crystals throughout and occasional very thin layers of orange silt/sand		59	6·5		
			7·0		
CLAY, as above, becoming darker brown Class? CH		31	8·0		
			8·5		
CLAY, Grey brown, stiff, fairly silty, well fissured, with numerous small Gypsum crystal throughout (WEATHERED LONDON CLAY)		41	9·5		Water added in small quantities to assist boring throughout
			10·0	52·0	

contd.

Department of the Environment | Investigation No. | Appendix A
CIVIL ENGINEERING LABORATORY Cardington | FGE/1491 | Sheet No. 3

T.E. Extension

HAMPSTEAD

BOREHOLE LOG

TQ 28 NE 129
2594 8515

Borehole No. 1 contd.
Ground Level
Date

Note:-

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
			10·0	52·0	
CLAY, as previous sheet (WEATHERED LONDON CLAY)	LW		10·5	51·5	
CLAY, Grey, stiff, fairly silty, well fissured with scattered small pockets of brown silt. Class? CH		101	11·0 / 11·1	50·9	▼ Ground water level at 11·1m below G.L on 27·8·81
			11·5		
CLAY, as above with the addition of a few scattered fossil shell fragments		68	12·5		
			13·0		
CLAY, as above, contains a few small nodules of Pyrites. Class? CH	L	64	14·0		
			14·5		
		36	15·5		
			16·0		
		21	17·0		
			17·5		
CLAY, as above, becoming stiffer and very fissured with a blocky and brittle structure. Class? CH		69	18·5		
			19·0		Reduced to 150mm dia. boring from 19·0m below G.L
(LONDON CLAY)			20·0	42·0	

contd.

Department of the Environment
CIVIL ENGINEERING LABORATORY Cardington

Investigation No. FGE/1491

Appendix A
Sheet No. 4

T. E. Extension

HAMPSTEAD

BOREHOLE LOG

TQ 28 NE/129
2594 8515

Borehole No 1 contd.
Ground Level
Date

Note:-

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
CLAY, as previous sheet		55	20·0	42·0	
			20·5		
		85	21·5		
			22·0		
CLAY, becoming very stiff and extremely fissured and brittle below 24·0m B.G.L. Too hard to sample, threads sheared on sampling tubes when attempting withdrawal. Clay contains numerous fossil fragments, pyrites and fairly frequent thin layers and lenses of dark grey silt/sand	L	05	23·0		
			23·5		
Classed CH		52	24·7		
		57	26·2		
		47	27·7		
(LONDON CLAY)		64	29·2		No water entries observed during boring
			29·5	32·5	Borehole dry on completion of boring
					End of borehole

Department of the Environment
CIVIL ENGINEERING LABORATORY Cordington

Investigation No. FGE/1491

Appendix A
Sheet No. 5

T.E. Extension

HAMPSTEAD

BOREHOLE LOG

TQ 28 NE/130
2598 8510

Borehole No. 3
Ground Level 60·7 m A.O.D (approx.)
Date 23rd – 25th June 1981

Note:-
1. Light Cable Percussion Borehole
2. Casing – 200mm dia. to 1·8m below G.L
Open hole boring from 1·8m to 15·0m below G.L
3. Standpipe installed – details below

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
REINFORCED CONCRETE			G.L	60·7	Standpipe installed to 15·0m below G.L
MADE GROUND; Clay, very sandy, soft and organic with flints and brick fragments etc.			0·3	60·4	Pipe slotted over whole length
MGRP			0·7		Hole backfilled with gravel
CLAY, Orange brown, slightly sandy, structureless with scattered rounded stones (SOLIFLUCTION DEPOSIT?)	C	22	0·9	59·8	
k			1·2		
			1·5	59·2	▼ Ground water level at 1·5m below G.L on 27·6·81
CLAY, Brown, stiff, slightly silty, extremely fissured and brittle with occasional small carbonaceous pockets Class? CH		22	2·0		
			2·5		
LC (w)		22	3·5		
CLAY, as above but fissuring so pronounced as to cause samples from 3·5 to 6·5m to fall apart during extrusion. There was no evidence of any polishing along the fissure surfaces Class? CH	LW		4·0		Water added in small quantities to assist boring from 4·0m below G.L onwards
		50	5·0		
			5·5		
		42	6·5		
			7·0		
CLAY, Dark brown, stiff, silty, very fissured with numerous small Gypsum crystals. Contained a few thin layers of weakly cemented yellow iron pan		45	8·0		
			8·5		
(WEATHERED LONDON CLAY)		40	9·5		Borehole dia. 200mm throughout
			10·0	50·7	

contd.

Department of the Environment
CIVIL ENGINEERING LABORATORY Cardington

Investigation No. FGE/1491

Appendix A
Sheet No. 6

T. E. Extension

HAMPSTEAD

BOREHOLE LOG

TQ 28 NE/130
2698 8510

Borehole No 3 contd.
Ground Level
Date

Note:-

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
			10·0	50·7	
LC (w) CLAY, as previous sheet (WEATHERED LONDON CLAY)	LW		10·5	50·2	
LC CLAY, Grey, stiff, extremely fissured, slightly silty with isolated small lenses and layers of brown silt. Contains scattered fossil fragments and small nodules of Pyrites throughout. Class? CH	L	98	11·0		
			11·5		
		71	13·0		
			13·5		
(LONDON CLAY)					No water entries observed during boring
		35	14·5		Borehole dry on completion of boring
			15·0	45·7	End of boring

APPENDIX C

Radon risk report

Radon Risk Report for addresses in England and Wales

Issued by the Health Protection Agency and the British Geological Survey using Address Point®. Fee paid £3.00 + VAT. Email receipt issued by Secure Trading Ltd.

Address searched: 9 Arkwright Road, London, NW36AA

Numerical grid reference for this address:

526409 East

185324 North

Date of report: 16/03/2011

Guidance for existing properties

Is this property in a radon Affected Area? - NO

The answer to the standard enquiry on house purchase known as CON29 Standard Enquiry of Local Authority; 3.13 Radon Gas: Location of the Property in a Radon Affected Area is:

No, this property is not in a Radon Affected Area as defined by the Health Protection Agency.
The estimated probability of the property being above the Action Level for radon is:0-1%

The result covers a 75 metre zone around the grid references above to allow for uncertainties in locations.

This report informs you of the estimated probability that this particular property is above the Action Level for radon. This does not necessarily mean there is a radon problem in the property; the only way to find out whether it is above or below the Action Level is to carry out a radon measurement in an existing property.

Radon Affected Areas are designated by the Health Protection Agency. HPA advises that radon gas should be measured in all properties within Radon Affected Areas.

If you are buying a currently occupied property in a Radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the Radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and the results of re-testing confirmed the effectiveness of the measures.

Further information is available from HPA or www.ukradon.org.

Guidance for new buildings and extensions to existing properties

What is the requirement under Building Regulations for radon protection in new buildings and extensions at the property location? - None

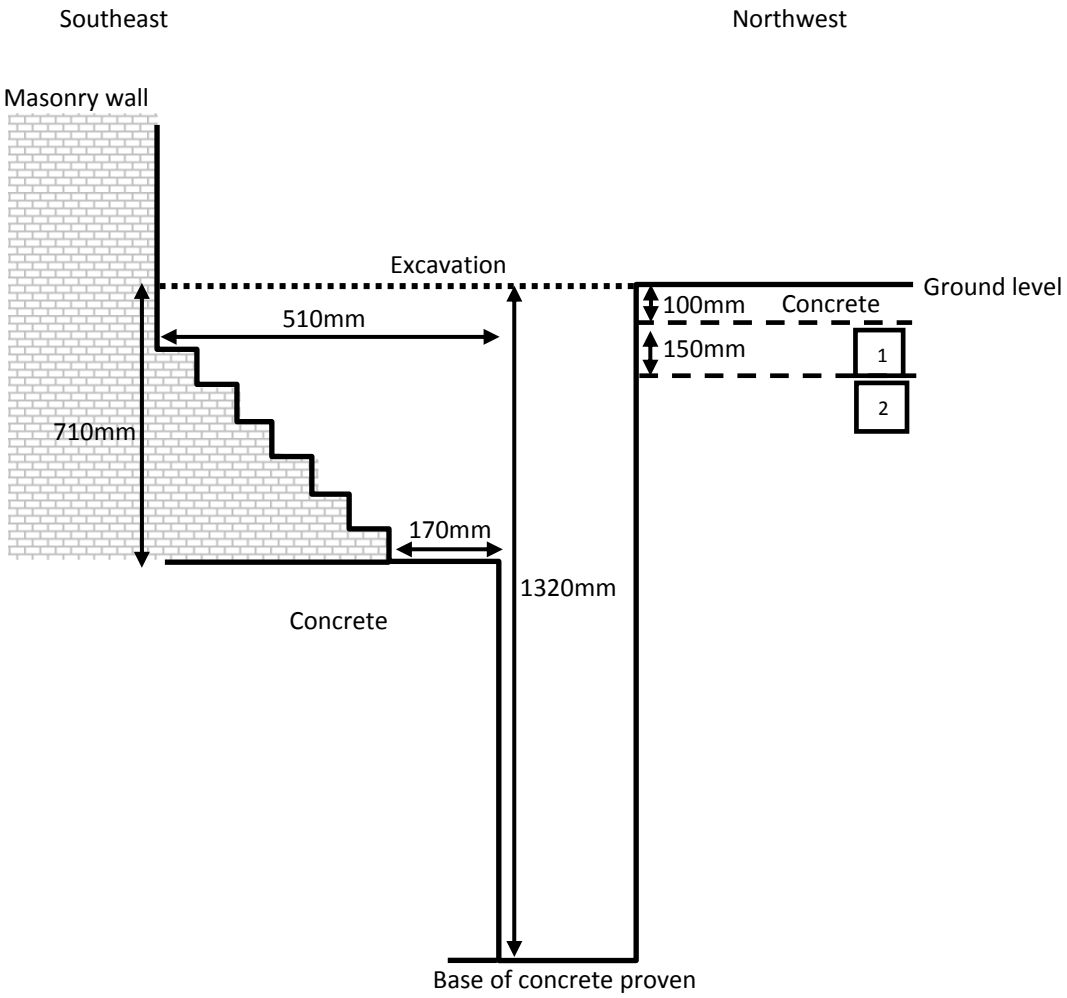
If you are buying a new property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

See the Radon and Building Regulations for more details.

APPENDIX D

Exploratory hole records

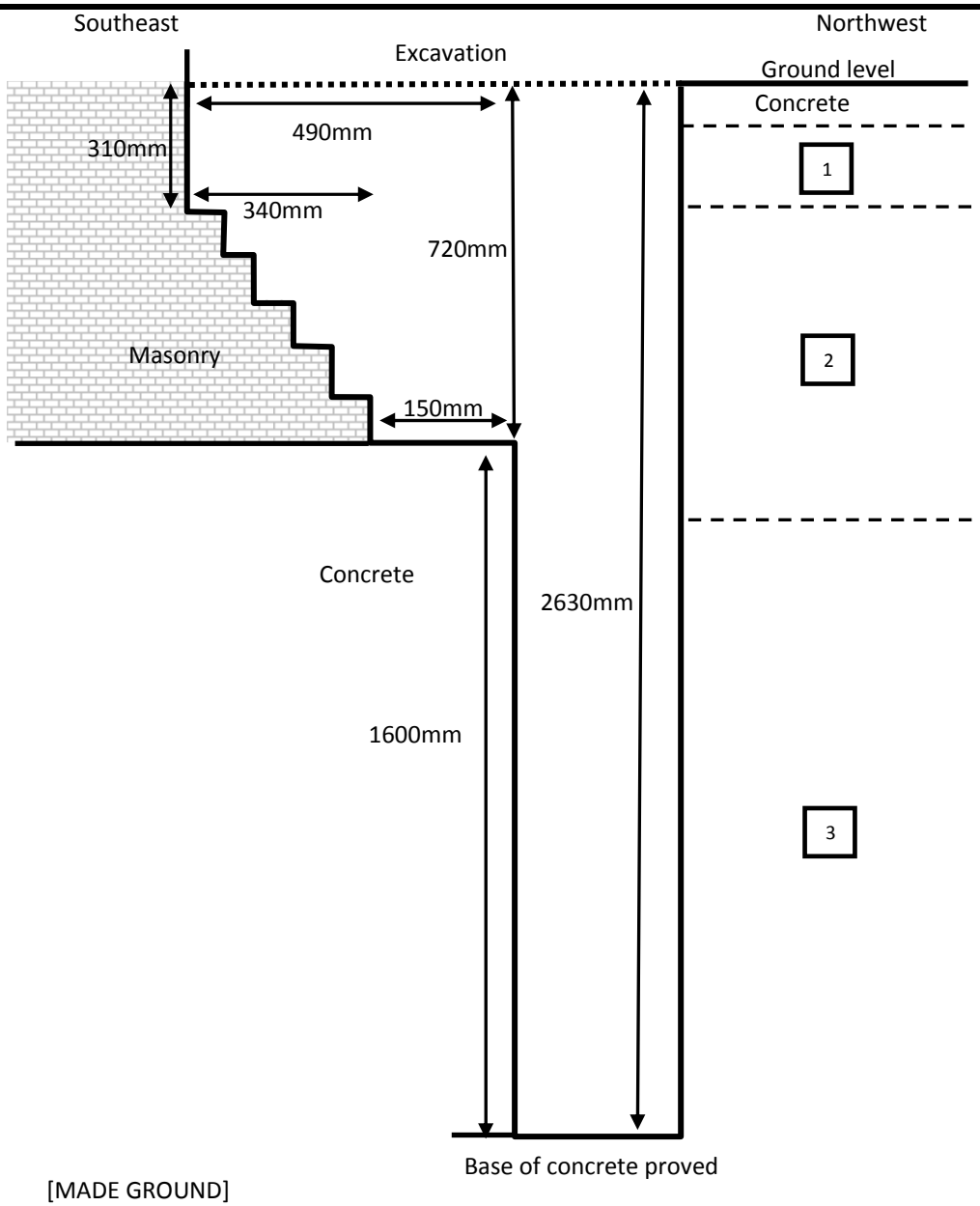
NOT TO SCALE



1 [MADE GROUND]
Loose to medium dense dark greyish black slightly gravely slightly clayey fine sand. Gravel is fine to medium angular to rounded of flint. Occasional red brick fragments of small to medium gravel size noted. Roots & rootlets noted.

2 Soft to firm dark orangish brown, mottled grey, sandy to very sandy gravely CLAY. Sand is fine. Occasional fine to medium subangular to rounded gravel of flint with occasional fine to medium gravel sized fragments of brick.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 1 Record**	**Appendix D**



[MADE GROUND]

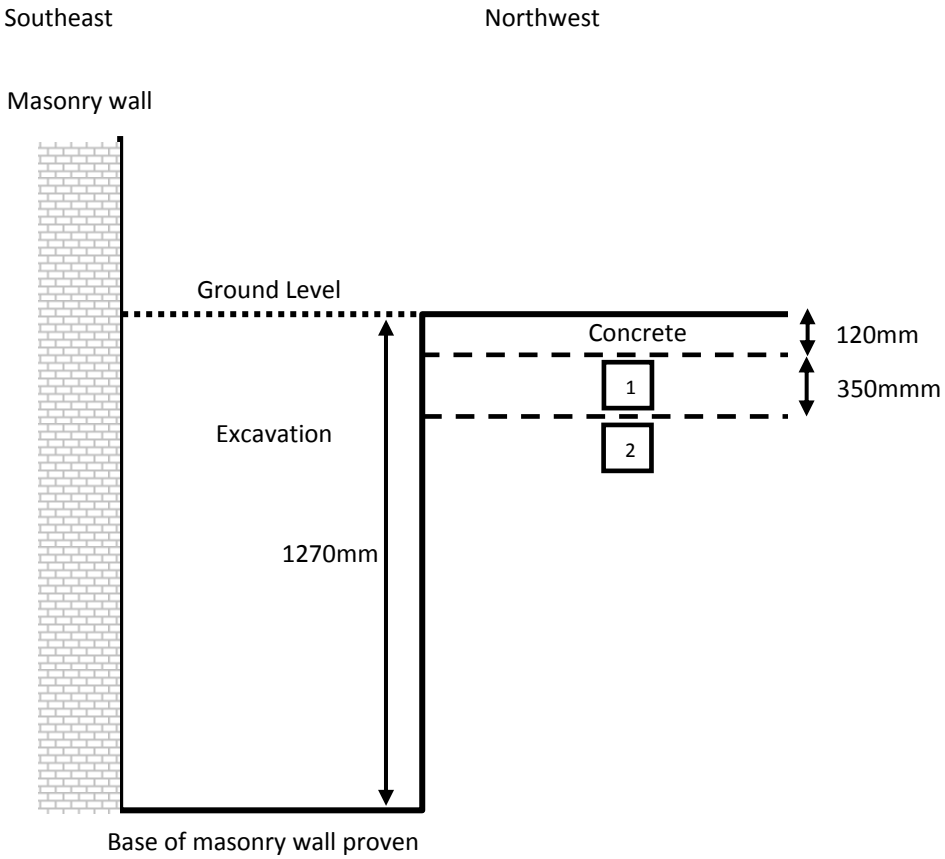
1 Loose to dense dark grey black slightly gravelly clayey sand. Sand is fine to medium. Gravel is rounded to subangular, fine to medium of flint and brick. Occasional roots and rootlets.

2 Soft to firm dark orange brown, mottled blue grey, very sandy CLAY. Sand is fine. Rare rounded to subangular, medium to coarse gravels of flint.

3 Medium dense to dense light orange brown slightly clayey gravelly SAND. Sand is fine to medium. Gravel is rounded to angular, fine to coarse of flint. Becoming less gravelly from 1.06m to 2.30 bgl. Roots and rootlets noted between 1.95-2.30m bgl.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 2 Record**	**Appendix D**

NOT TO SCALE

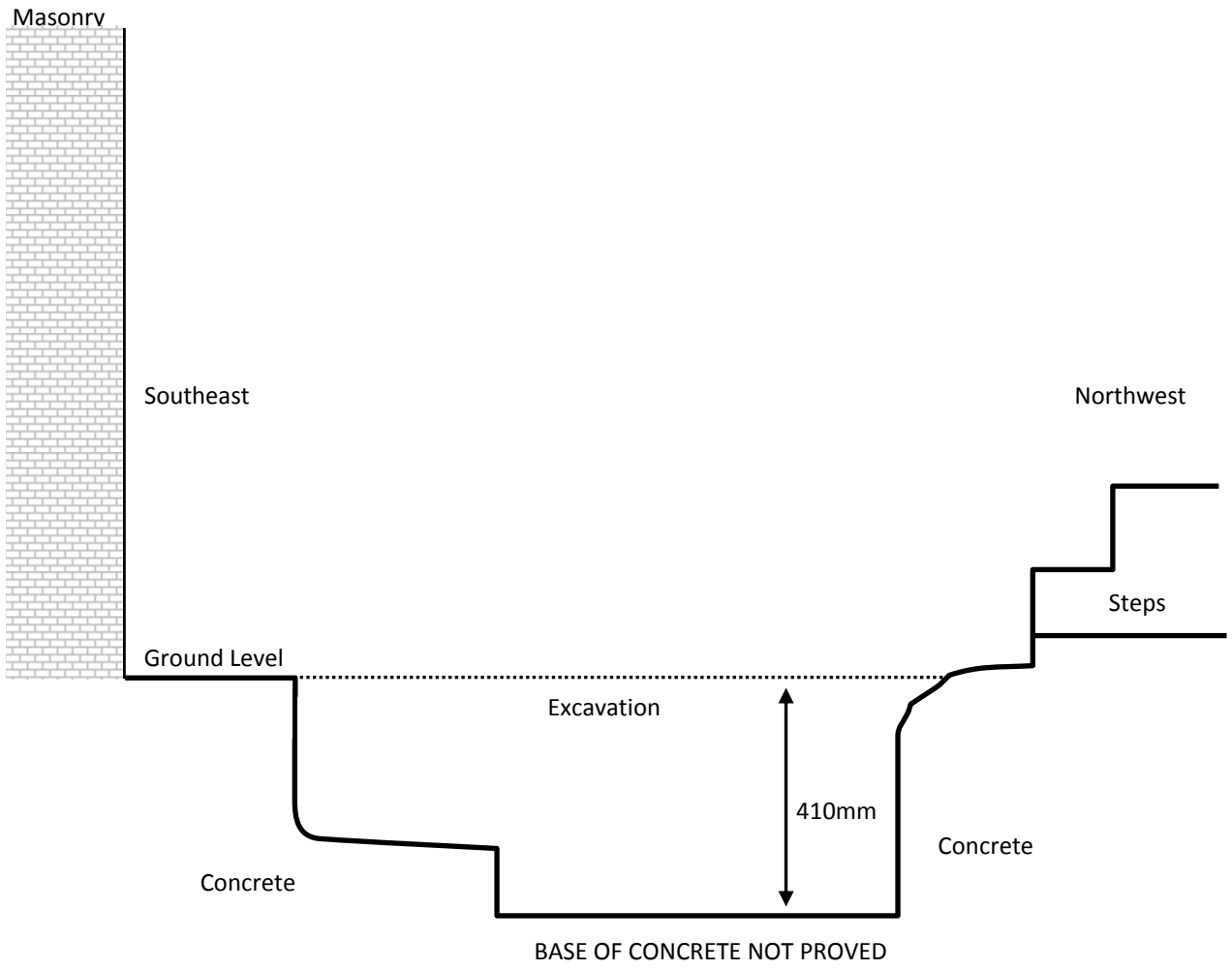


1 [MADE GROUND]
Loose to medium dense dark greyish black slightly gravely slightly clayey fine sand. Gravel is fine to medium angular to rounded of flint. Occasional red brick fragments of small to medium gravel size noted. Roots & rootlets noted.

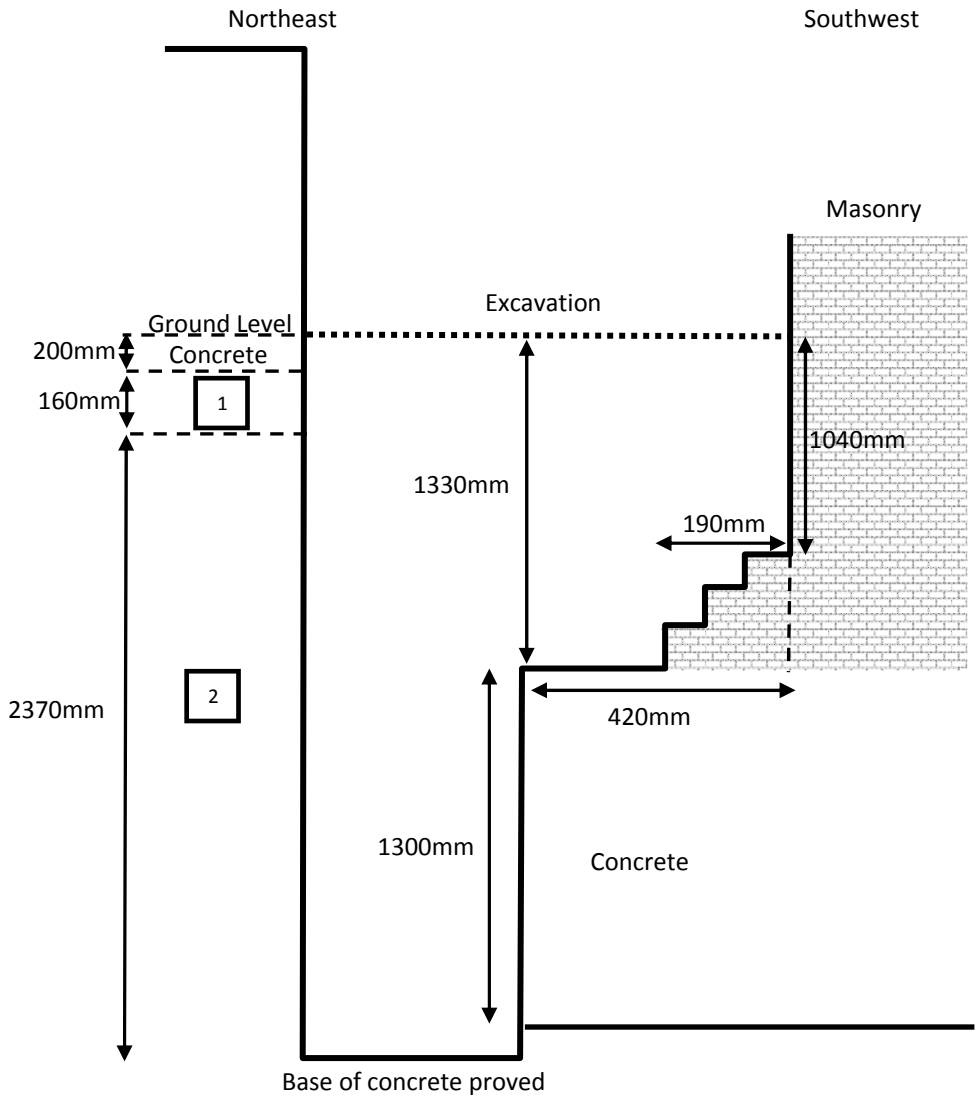
2 Soft to firm dark orangish brown sandy to very sandy CLAY. Occasional fine to medium subangular to rounded gravel of flint. Sand is fine.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 3 Record**	**Appendix D**

NOT TO SCALE



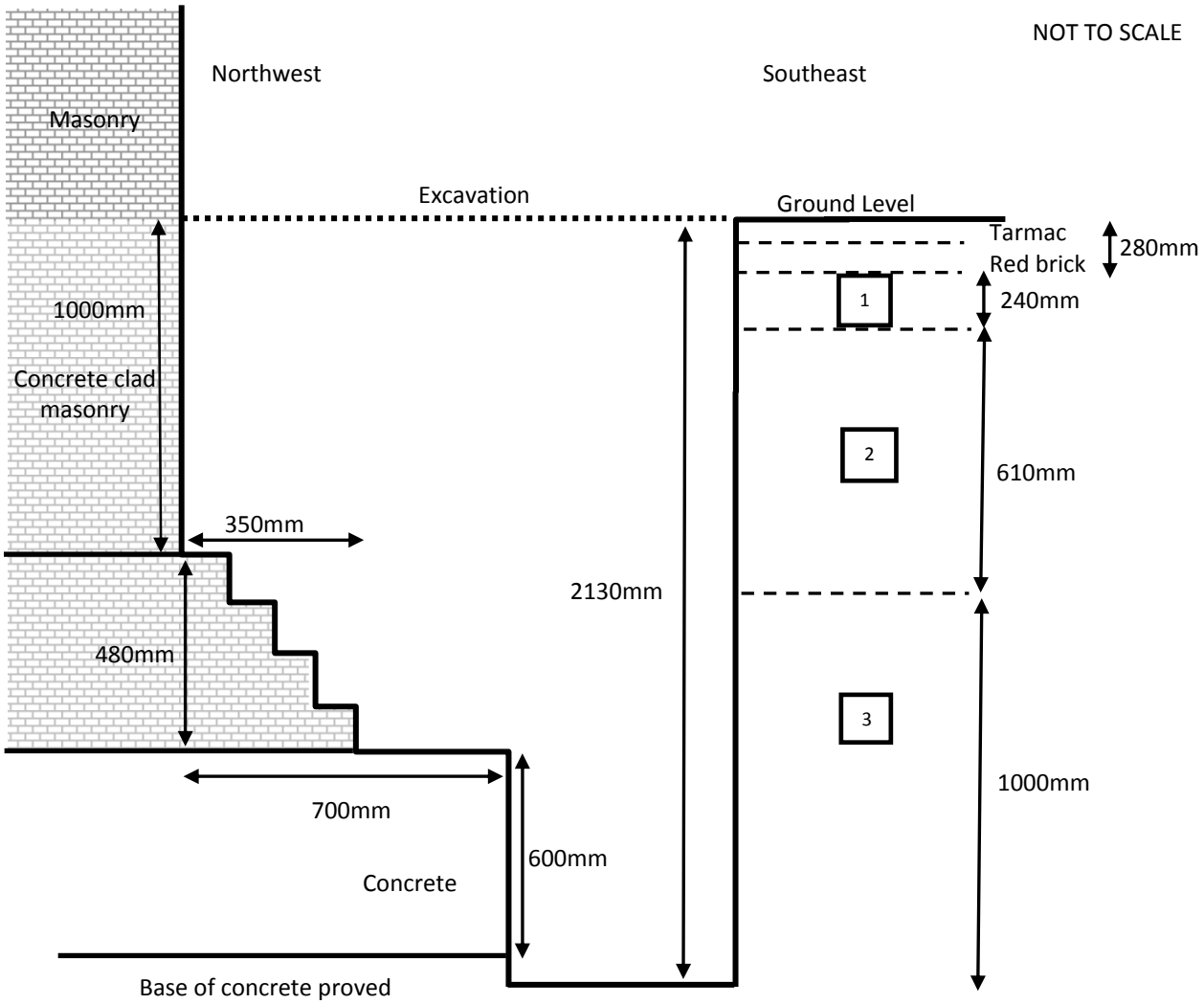
Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title **Hand Dug Foundation Inspection Pit 4 Record**	**Appendix D**



1 [MADE GROUND]
Loose dark orange brown sand and gravel. Gravel is rounded to angular fine to coarse of flint and brick. Sand if medium to coarse.

2 Medium dense to dense dark orange brown, mottled blue grey, very clayey SAND. Sand is fine to medium. Rare subrounded fine gravels of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title **Hand Dug Foundation Inspection Pit 5 Record**	**Appendix D**

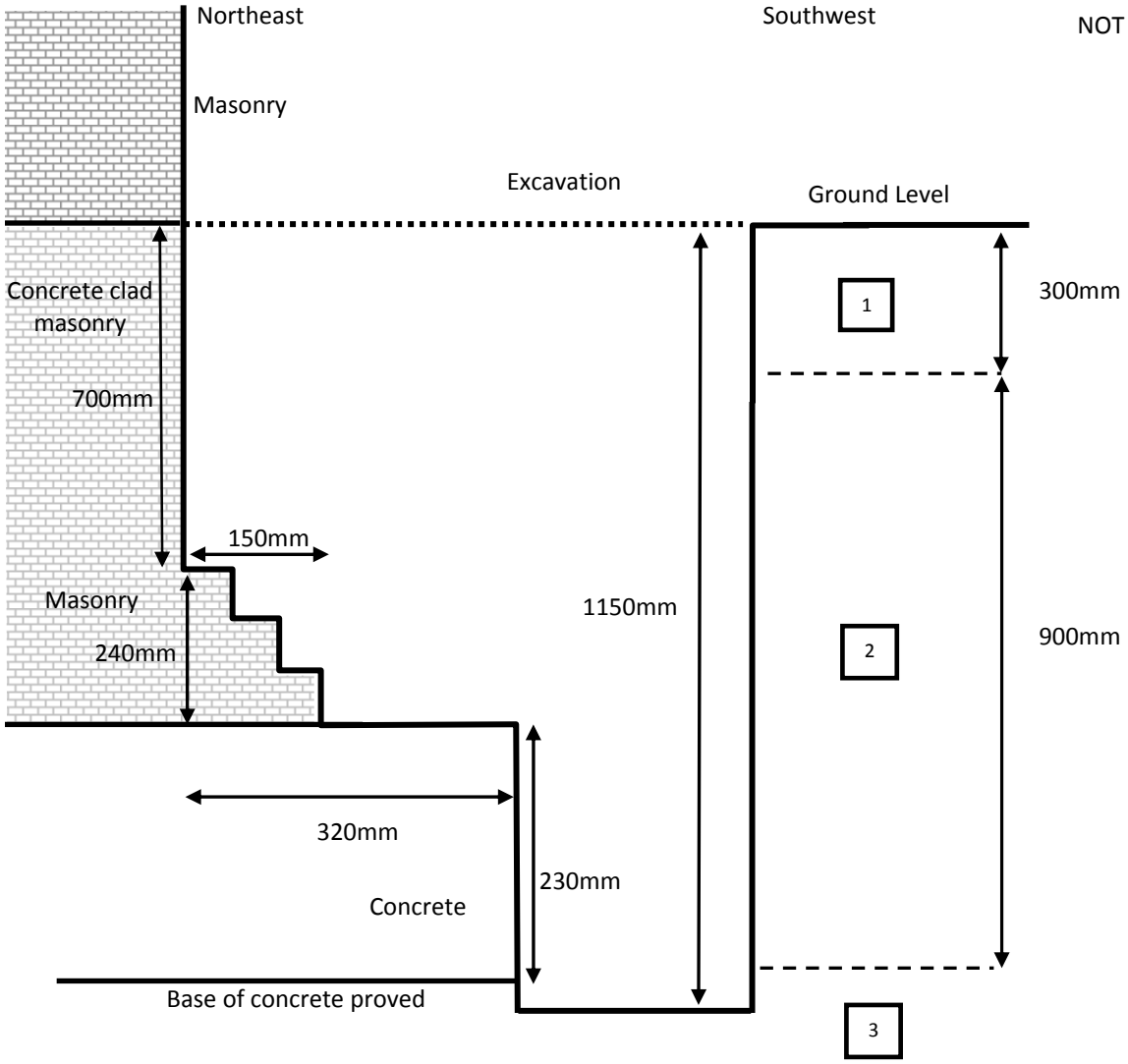


1 [MADE GROUND]
Loose to medium dense dark greyish black slightly gravely slightly clayey fine sand. Gravel is fine to medium angular to rounded of flint. Occasional red brick fragments of small to medium gravel size noted. Roots & rootlets noted.

2 Medium dense to dense light grey brown, mottled blue grey, very clayey fine SAND. Rare fine gravels.

3 Soft to firm light brown grey, mottled blue grey, slightly sandy CLAY. Sand is fine. Occasional rounded to angular, fine to medium gravels of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 6 Record**	**Appendix D**

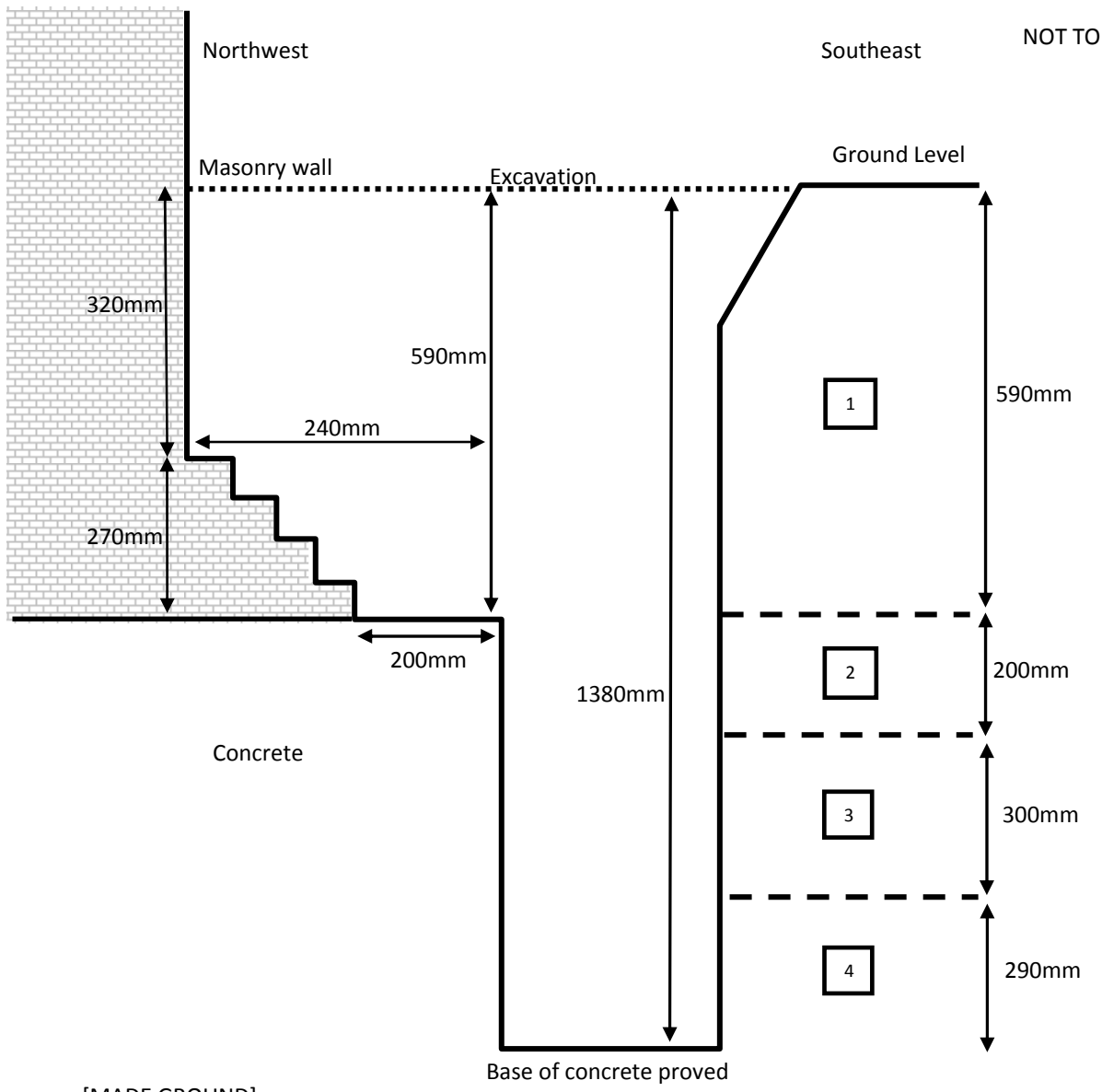


1 [TOPSOIL]
Loose dark greyish black slightly gravelly slightly clayey fine sand. Gravel is rounded to angular fine to medium of flint. Roots & rootlets noted.

2 Medium dense to dense light grey brown, mottled blue grey, very clayey fine SAND. Rare fine gravels.

3 Soft to firm light brown grey, mottled blue grey, slightly sandy CLAY. Sand is fine. Occasional rounded to angular, fine to medium gravels of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 7 Record**	**Appendix D**



1 [MADE GROUND]
Loose dark greyish black slightly gravelly slightly clayey fine sand. Gravel is rounded to angular fine to medium of flint. Roots & rootlets noted.

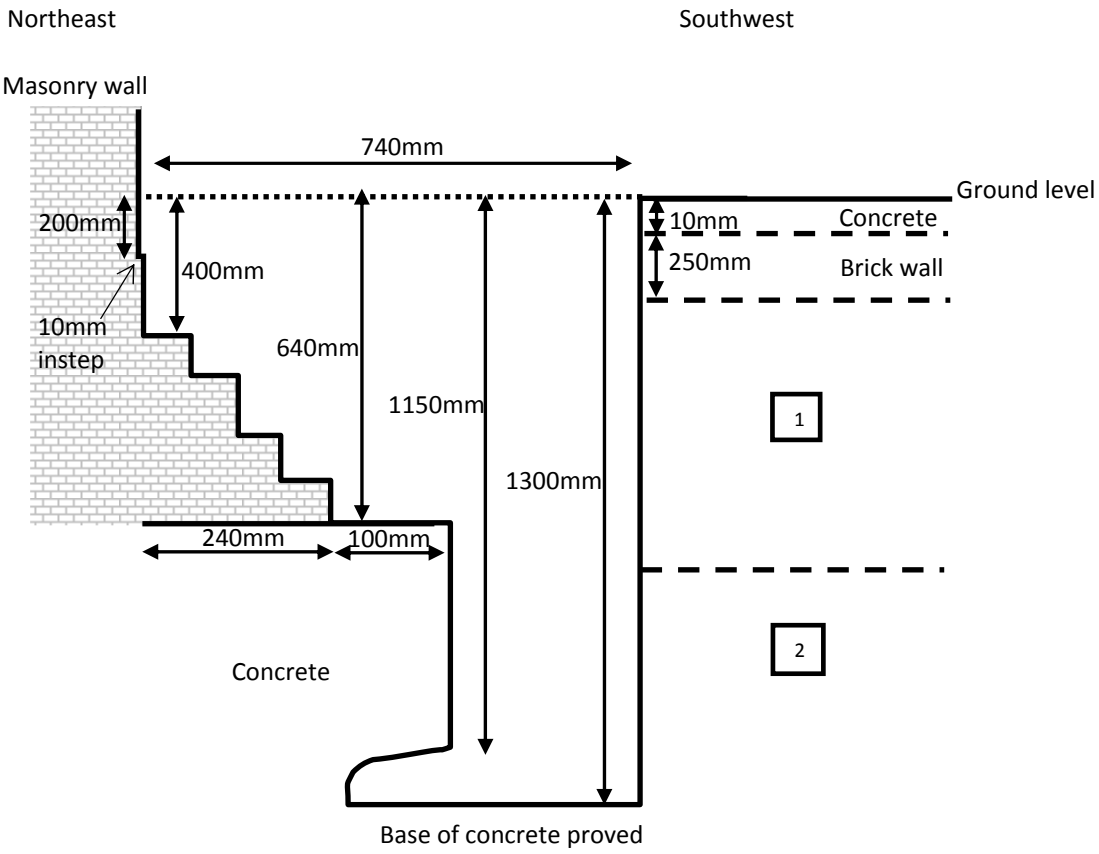
2 Loose to medium dense light greyish brown clayey fine SAND.

3 Soft to firm dark greyish brown very sandy CLAY. Sand is fine. Rare subrounded to angular fine to medium gravels of flint.

4 Loose to medium dense dark greyish brown slightly clayey gravelly fine SAND. Gravel is rounded to angular fine to coarse of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 8 Record**	**Appendix D**

NOT TO SCALE



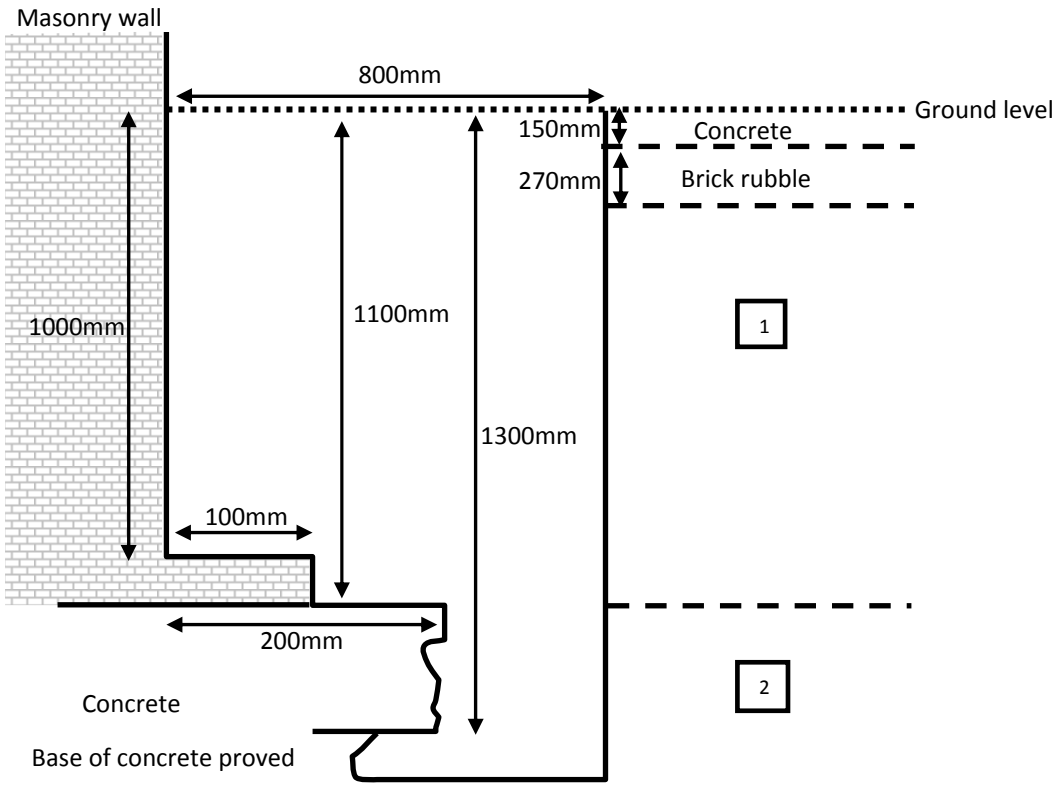
1 Loose to medium dense dark brown slightly clayey gravely fine to coarse SAND. Gravel is fine to coarse angular to subrounded of flint & brick.

2 Soft to firm dark grey mottled orange gravely very sandy CLAY. Gravel is fine to coarse angular to subrounded of flint & brick. Sand is fine to coarse.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 9 Record**	**Appendix D**

NOT TO SCALE

Southwest Northeast

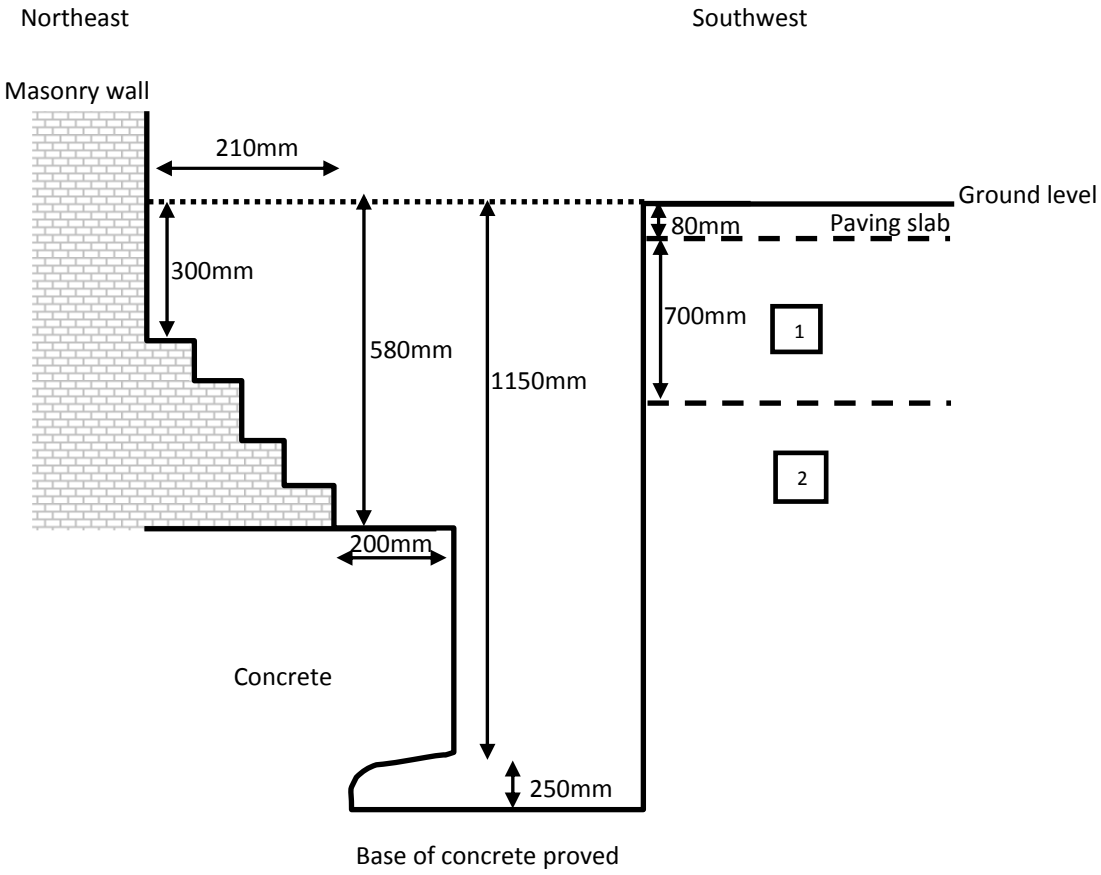


1 Loose to medium dense dark brown slightly clayey gravely fine to coarse SAND. Gravel is fine to coarse angular to subrounded of flint & brick.

2 Soft to firm dark grey mottled orange gravely very sandy CLAY. Gravel is fine to coarse angular to subrounded of flint & brick. Sand is fine to coarse.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 10 Record**	**Appendix D**

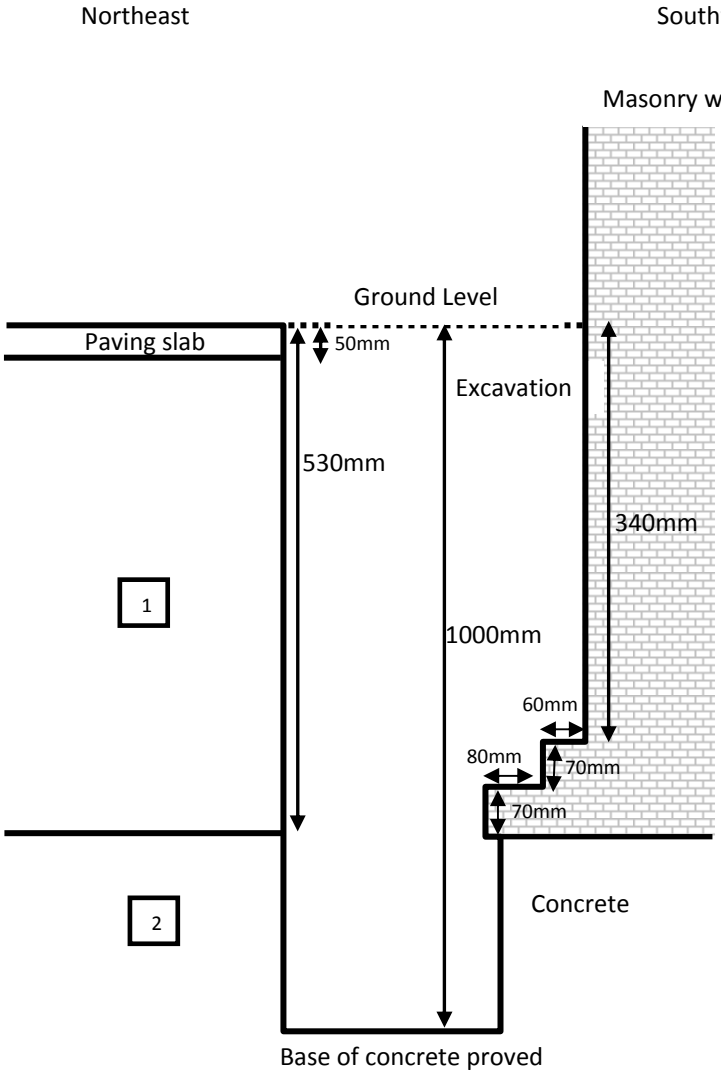
NOT TO SCALE



1 Loose to medium dense dark brown slightly clayey gravely fine to coarse SAND. Gravel is fine to coarse angular to subrounded of flint & brick.

2 Soft to firm dark grey mottled orange gravely very sandy CLAY. Gravel is fine to coarse angular to subrounded of flint & brick. Sand is fine to coarse.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 11 Record**	**Appendix D**

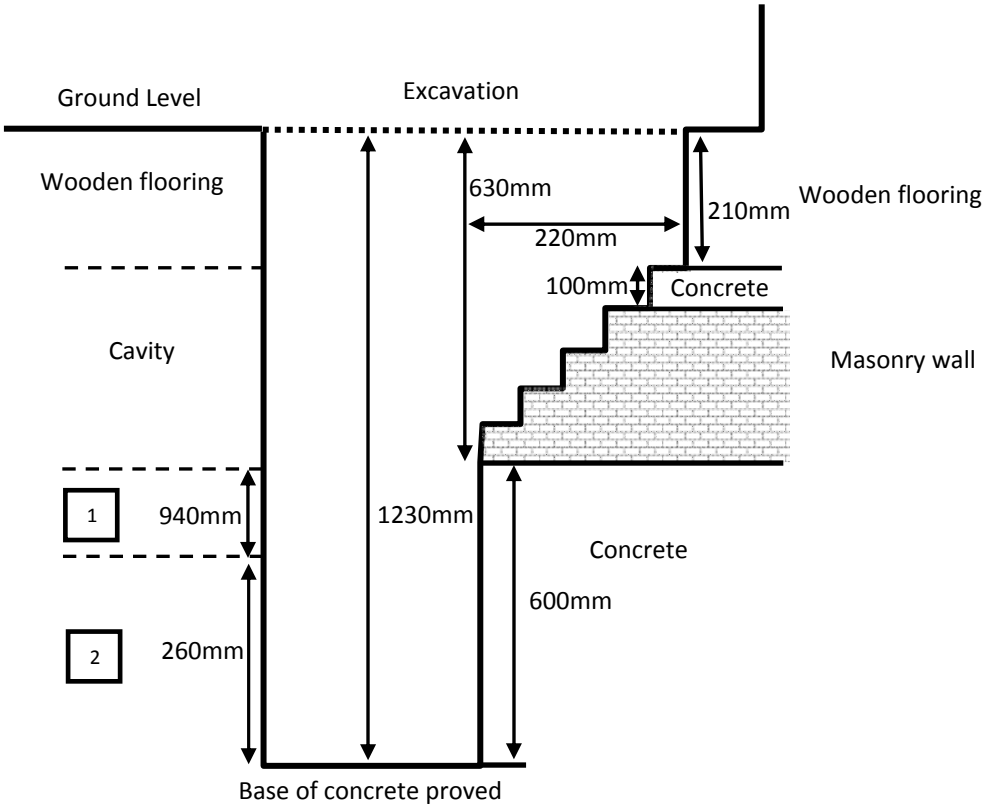


1 [MADE GROUND]
Loose to medium dense dark greyish brown clayey fine to coarse sand. Frequent red brick fragments of fine to medium gravel size noted.

2 Soft to firm greyish brown sandy CLAY. Sand is fine. Rare fine to medium subangular to subrounded gravel of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 12 Record**	**Appendix D**

NOT TO SCALE

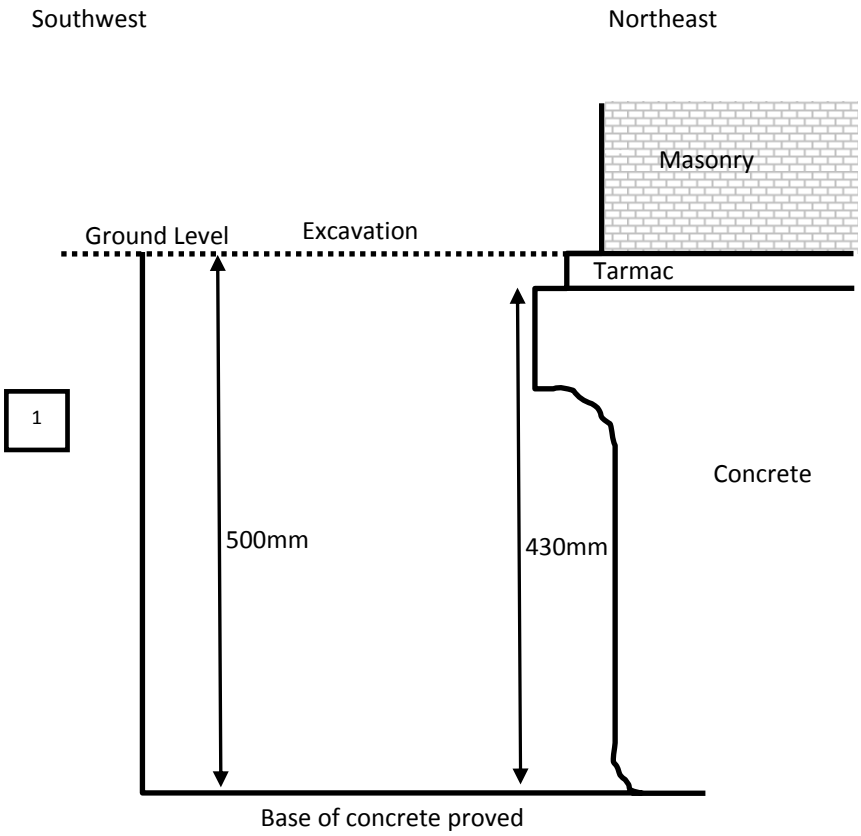


1 Loose to dense dark orange brown slightly gravelly clayey fine SAND. Gravel is subrounded to angular, fine to medium of flint.

2 Firm dark orange brown mottled grey sandy to very sandy CLAY. Sand is fine. Rare subrounded to angular, fine to medium gravel of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 13 Record**	**Appendix D**

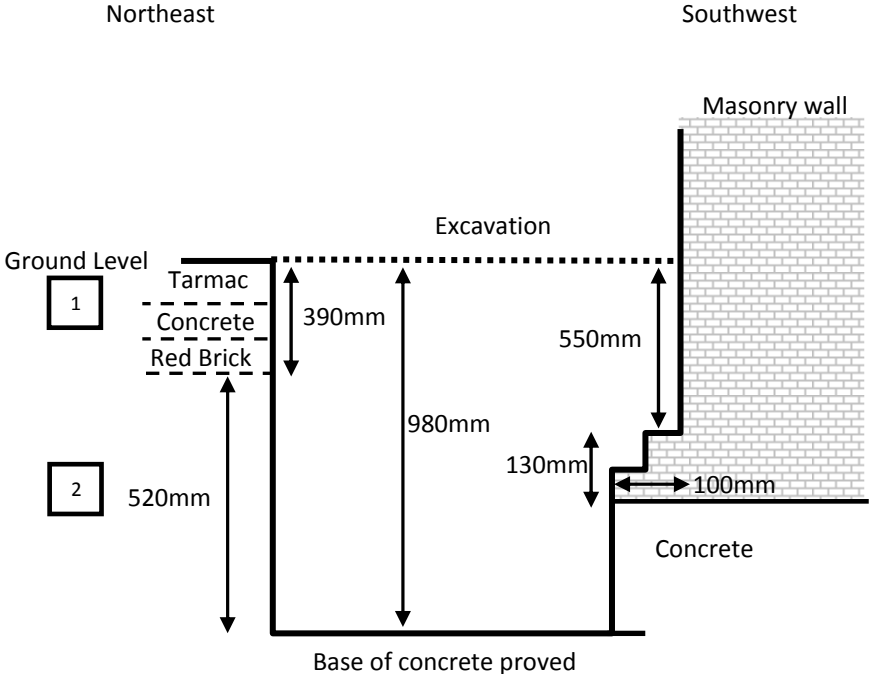
NOT TO SCALE



1 [MADE GROUND]
Loose to medium dense dark brown very gravelly sand. Sand is medium to coarse. Gravel is rounded to angular of flint and brick. Roots & rootlets noted.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Hand Dug Foundation Inspection Pit 14 Record**	**Appendix D**

NOT TO SCALE



1 [MADE GROUND]
Loose to medium dense dark grey brown very gravelly sand. Sand is coarse. Gravel is subangular to angular, fine to coarse of concrete and brick. Occasional concrete and brick cobbles.

2 Loose to medium dense dark grey brown slightly gravelly fine SAND. Gravel is rounded to angular, fine to coarse of flint.

Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title **Hand Dug Foundation Inspection Pit 15 Record**	**Appendix D**

Borehole BH01

Project: Arkwright Road

Client: Ironside & Malone Design & Build

Location: Hampstead, London

Project No: CG/5595

Date: 22-23/08/2011

Ground level: ~94.00mOD

Sheet: 1 of 5

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
0.00	Ground Surface								
	Tarmacadam		0		B	0.30 - 0.40			
0.65	[MADE GROUND] comprising medium dense, light brown gravelly sand. Gravel is medium-coarse, sub-rounded to angular of brick and chert.				B	0.70 - 0.80			
			1		SPT	1.2 - 1.65	7		
					D B	1.2 - 1.65			
1.70	[MADE GROUND] comprising soft to firm brownish grey gravelly, very sandy clay. Gravel is fine-coarse, rounded to sub-angular of chert and occasional brick.								
			2		SPT	2.0 - 2.45	13		
	Medium dense light brown and grey slightly clayey, very silty fine SAND.				D B	2.0 - 2.45			
2.90	[CLAYGATE BEDS]								
			3		U100	3.0 - 3.45	39 blows		
3.40	Firm light ochreous brown clayey very sandy SILT				B	3.45 - 3.55			
	[CLAYGATE BEDS]								
			4		SPT	4.0 - 4.45	9		
	Loose to medium dense ochreous brown slightly clayey very silty fine SAND occasionally grading to firm slightly silty sandy CLAY.				D B	4.0 - 4.45			
	[CLAYGATE BEDS]		5		SPT	5.0 - 5.45	9		
					D B	5.0 - 5.45			
			6		SPT	6.0 - 6.45	9		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet from 5.80m. Seepage from 8.40m. Waterstrike at 9.20m - rose to 8.10m after 30mins.
2. Groundwater at 4.8m during monitoring visit.
3. J = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with benonite seal
   1-12m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH01

Project: Arkwright Road

Client: Ironside & Malone Design & Build

Location: Hampstead, London

Project No: CG/5595

Date: 22-23/08/2011

Ground level: ~94.00mOD

Sheet: 2 of 5

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS				Well data	Depth to water (m)
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value		
	Continued. Loose to medium dense ochreous brown slightly clayey very silty fine SAND occasionally grading to firm very clayey sandy SILT. [CLAYGATE BEDS]		7 8 9		D B SPT D B SPT D B	6.0 - 6.45 7.5 - 7.95 7.5 - 7.95 9.0 - 9.45 9.0 - 9.45	9 7 8		
9.30	Firm becoming stiff dark grey sandy silty CLAY with occasional sand partings. [LONDON CLAY]		10 11 12		U100 B SPT	10.5 - 10.95 10.95 - 11.0 12.0 - 12.45	51 blows 15		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet from 5.80m. Seepage from 8.40m. Waterstrike at 9.20m - rose to 8.10m after 30mins.
2. Groundwater at 4.8m during monitoring visit.
3. J = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with benonite seal
   1-12m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH01

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 22-23/08/2011

Location: Hampstead, London

Ground level: ~94.00mOD

Sheet: 3 of 5

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Continued. Stiff dark grey sandy silty CLAY with occasional sand partings. [LONDON CLAY]		13 14 15 16 17 18		D B B SPT D B B SPT	12.0 - 12.45 13.5 - 13.95 15.0 - 15.45 15.0 - 15.45 16.5 - 16.95 18.0 - 18.45	15 U100 N\R 23 U100 N\R 29		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet from 5.80m. Seepage from 8.40m. Waterstrike at 9.20m - rose to 8.10m after 30mins.
2. Groundwater at 4.8m during monitoring visit.
3. J = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with benonite seal
   1-12m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH01

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 22-23/08/2011

Location: Hampstead, London

Ground level: ~94.00mOD

Sheet: 4 of 5

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Continued.				D B	18.0 - 18.45	29		
	Stiff dark grey silty CLAY.								
	[LONDON CLAY]		19						
					B	19.5 - 19.95	U100 N\R		
			20						
					D B	21.0 - 21.45			
			21		SPT	21.0 - 21.45	37		
			22						
					B	22.5 - 22.95	U100 N\R		
			23						
			24		SPT	24.0 - 24.45	40		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet from 5.80m. Seepage from 8.40m. Waterstrike at 9.20m - rose to 8.10m after 30mins.
2. Groundwater at 4.8m during monitoring visit.
3. J = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with benonite seal
   1-12m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH01

Project: Arkwright Road

Client: Ironside & Malone Design & Build

Location: Hampstead, London

Project No: CG/5595

Date: 22-23/08/2011

Ground level: ~94.00mOD

Sheet: 5 of 5

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
25.00	Continued. Stiff dark grey silty CLAY. [LONDON CLAY]		25 26 27 28 29 30		D B	24.0 - 24.45			

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet from 5.80m. Seepage from 8.40m. Waterstrike at 9.20m - rose to 8.10m after 30mins.
2. Groundwater at 4.8m during monitoring visit.
3. J = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with benonite seal
   1-12m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/2011

Location: Hampstead, London

Ground level: ~92.80mOD

Sheet: 1 of 4

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
0.00	Ground Surface								
0.30	TOPSOIL comprising loose dark brown gravelly sand with occasional rootlets.		0						
	MADE GROUND comprising loose light grey brown slightly clayey gravelly sand. Gravel is medium to coarse, sub-angular to rounded of chert and occasional brick.		1		B	0.50 - 0.60			
					SPT	1.2 - 1.65	9		
					D B	1.2 - 1.65			
2.00			2		SPT	2.0 - 2.45	8		
	Soft to firm light brown and mottled grey slightly sandy, slightly gravelly clayey SILT. Gravel is medium to coarse, angular to rounded of chert.				D B	2.0 - 2.45			
2.60	[POSSIBLE MADE GROUND]		3		U100	3.0 - 3.45	52 blows		
	Firm light orange brown and occasionally mottled grey slightly clayey very sandy SILT. Sand is fine.				B	3.45 - 3.55			
3.40	[CLAYGATE BEDS]								
	Loose to medium dense ochreous brown slightly clayey very silty fine SAND.		4		SPT	4.0 - 4.45	7		
					D B	4.0 - 4.45			
	[CLAYGATE BEDS]								

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet at 3.40m. Wet at 9.60m. Waterstrike at 11.20m - rose to 9.80m after 30mins.
2. Groundwater at 3.7m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-3m Plain Pipe with bentonite seal
   3-6m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/2011

Location: Hampstead, London

Ground level: ~92.80mOD

Sheet: 2 of 4

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
5.30			5		SPT D B	5.0 - 5.45 5.0 - 5.45	8		
7.80	Firm ochreous brown and mottled grey slightly silty sandy CLAY. Sand is fine. [CLAYGATE BEDS]		6 7		U100 B	6.0 - 6.45 6.45 - 6.50	69 blows		
	Firm becoming stiff dark grey sandy silty CLAY Very sandy between 9.60m and 11.90m [LONDON CLAY]		8 9		SPT D B U100	7.5 - 7.95 7.5 - 7.95 9.0 - 9.45	16 78 blows		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet at 3.40m. Wet at 9.60m. Waterstrike at 11.20m - rose to 9.80m after 30mins.
2. Groundwater at 3.7m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-3m Plain Pipe with bentonite seal
   3-6m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/2011

Location: Hampstead, London

Ground level: ~92.80mOD

Sheet: 3 of 4

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Continued.						78 blows		
	Firm becoming stiff dark grey sandy silty CLAY				B	9.40 - 9.50			
	Very sandy between 9.60m and 11.90m		10						
					SPT	10.5 - 10.95	12		
					D B	10.5 - 10.95			
			11						
	Possible claystone band at 13.60m								
			12		U100	12.0 - 12.45	80 blows		
					B	12.45 - 12.5			
			13				50		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet at 3.40m. Wet at 9.60m. Waterstrike at 11.20m - rose to 9.80m after 30mins.
2. Groundwater at 3.7m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-3m Plain Pipe with bentonite seal
   3-6m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/2011

Location: Hampstead, London

Ground level: ~92.80mOD

Sheet: 4 of 4

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Continued. Stiff dark grey sandy silty CLAY with occasional sand partings. [LONDON CLAY]		14		SPT D B	13.5 - 13.95 13.5 - 13.95	50 claystone		
15.00					U100	14.5 - 14.95	N\R		
	End of hole		15 16 17 18						

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Wet at 3.40m. Wet at 9.60m. Waterstrike at 11.20m - rose to 9.80m after 30mins.
2. Groundwater at 3.7m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-3m Plain Pipe with bentonite seal
   3-6m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH03

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 23/08/2011

Location: Hampstead, London

Ground level: ~92.30mOD

Sheet: 1 of 2

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
0.00	Ground Surface		0						
1.10	MADE GROUND comprising soft to firm dark brown very sandy gravelly clay. Gravel is fine to coarse, angular to rounded of chert and brick.		1		B	0.30 - 0.40			
3.70	MADE GROUND comprising soft to firm light grey and yellowish brown very clayey sandy SILT with occasional medium to coarse sub-angular to rouned chert and brick gravel.		2		SPT D B	1.2 - 1.65 1.2 - 1.65	6		
			3		SPT D B	2.0 - 2.45 2.0 - 2.45	5		
4.80	Medium dense grey very slightly siltly sandy GRAVEL. Gravel is fine to coarse, sub-rounded to rounded of chert. [CLAYGATE BEDS]		4		SPT D B	3.0 - 3.45 3.0 - 3.45	9		
			5		SPT D B	4.0 - 4.45 4.0 - 4.45	15		
					U100	5.0 - 5.45	59 blows		

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. No groundwater strike. Water measured at 9.10m on 24/08/11.
2. Groundwater at 5.56m during monitoring visit (01.09.11).
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with bentonite
   1-10m Slotted pipe with geosock with gravel filter
   Flush cover and gas bung.

Borehole BH03

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 23/08/2011

Location: Hampstead, London

Ground level: ~92.30mOD

Sheet: 2 of 2

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Firm light ochreous brown and mottled grey slightly sandy silty CLAY. Sand is fine. Fine to coarse subrounded to angular gravel noted at 5.45mbgl.				B	5.45 - 5.50			
	[CLAYGATE BEDS]		6		SPT	6.0 - 6.45	21		
					D B	6.0 - 6.45			
7.10			7						
	Firm to stiff orange brown slightly sandy silty CLAY.				U100	7.5 - 7.95	72 blows		
	[LONDON CLAY]		8		B	7.95 - 8.0			
8.40									
	Firm to stiff dark grey very sandy silty CLAY.								
	[LONDON CLAY]		9		SPT	9.0 - 9.45	15		
					D B	9.0 - 9.45			
10.00									
	End of hole.		10						

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. No groundwater strike. Water measured at 9.10m on 24/08/11.
2. Groundwater at 5.56m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-1m Plain Pipe with bentonite
   1-10m Slotted pipe with geosock with gravel filter
   Flush cover and gas bung.

Borehole BH04

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 25/08/2011

Location: Hampstead, London

Ground level: ~94.73mOD

Sheet: 1 of 3

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
0.00	Ground Surface								
	Tarmacadam		0						
0.40	MADE GROUND comprising dark brown very gravelly clayey sand. Gravel is fine to coarse, sub-angular to rounded of chert and brick.				B	0.50 - 0.60			
	MADE GROUND comprising loose to medium dense grey brown clayey very gravelly sand. Gravel is medium to coarse angular to rounded of chert and occasional brick.		1		SPT	1.2 - 1.65	7		
1.60					D B	1.2 - 1.65			
	Loose to medium dense light ochreous brown and grey slightly clayey very silty fine SAND.		2		U100	2.0 - 2.45	34 blows		
	[CLAYGATE BEDS]				B	2.45 - 2.50			
3.00									
	Firm ochreous brown and mottled grey sandy very silty CLAY. Sand is fine.		3		SPT	3.0 - 3.45	8		
	[CLAYGATE BEDS]				D B	3.0 - 3.45			
			4		U100	4.0 - 4.45	41 blows		
4.40									
	Loose light ochreous brown silty very clayey fine SAND.				B	4.45 - 4.50			
	[CLAYGATE BEDS]		5		SPT	5.0 - 5.45	6		
					D B	5.0 - 5.45			

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Damp from 4.40m. Waterstrike at 13.70m - rose to 11.55m after 30mins.
2. Groundwater at 5.36m during monitoring visit (01.09.11).
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-7m Plain Pipe with bentonite
   7-10m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH04

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 25/08/2011

Location: Hampstead, London

Ground level: ~94.73mOD

Sheet: 2 of 3

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value	Well data	Depth to water (m)
	Continued Loose light ochreous brown silty very clayey fine SAND. [CLAYGATE BEDS]		6		SPT D B	6.0 - 6.45 6.0 - 6.45	6		
			7		SPT D B	7.5 - 7.95 7.5 - 7.95	9		
			8						
			9		U100 B	9.0 - 9.45 9.45 - 9.50	62 blows		
9.40									
	Firm light brown very silty CLAY [LONDON CLAY]		10						
9.90									

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Damp from 4.40m. Waterstrike at 13.70m - rose to 11.55m after 30mins.
2. Groundwater at 5.36m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-7m Plain Pipe with bentonite
   7-10m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Borehole BH04

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 25/08/2011

Location: Hampstead, London

Ground level: ~94.73mOD

Sheet: 3 of 3

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS				Well data	Depth to water (m)
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	SPT N-value		
	Firm becoming stiff dark grey sandy occasionally very sandy silty CLAY. [LONDON CLAY]		11		SPT D B	10.5 - 10.95 10.5 - 10.95	23		
			12		U100 B	12.0 - 12.45 12.45 - 12.5	N\R		
			13		SPT D B	13.5 - 13.95 13.5 - 13.95	25		
			14		SPT D B	14.5 - 14.95 14.5 - 14.95	28		
15.00									
	End of hole.		15						

Logged by: RDB

Checked by: AOD

Excavation Method: Dando 2000

Orientation:

Dimensions:

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Damp from 4.40m. Waterstrike at 13.70m - rose to 11.55m after 30mins.
2. Groundwater at 5.36m during monitoring visit.
3. D = small disturbed sample
   B = bulk sample
   SPT = standard penetration test
   N\R = no recovery
4. Installation details :
   0-7m Plain Pipe with bentonite
   7-10m Slotted pipe with geosock and gravel filter
   Flush cover and gas bung.

Trial Pit TP01

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/11

Location: Hampstead, London

Ground level:

Sheet: 1 of 1

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS				Well data	Depth to water (m)
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	Undrained Shear Strength		
0.00	Ground Surface								
0.30	[TOPSOIL] Comprising loose to medium dense dark grey brown slightly gravelly very silty fine to medium sand. Gravel is fine to coarse, rounded to sub-rounded of flint and occasional brick. Frequent roots and rootlets.		0		ES	0.2			
					B	0.4			
	Medium dense light brown slightly gravelly silty fine to medium SAND. Gravel is fine to coarse sub-rounded of flint. Brick fragments at 0.7m.		1						
					B	1.5			
1.90	[POSSIBLE REWORKED CLAYGATE BEDS]								
	Medium dense to dense light brownish grey very gravelly fine to medium SAND. Gravel is fine to coarse rounded to sub-rounded of flint. Very occasional sandy silt inclusions.		2		B	2.0			
2.50	[CLAYGATE BEDS]				B	2.7			
	Firm light grey slightly sandy silty CLAY. Sand is fine to medium. Occasional black organic inclusions.		3		HSV	3.0	93 (10)		
					HSV	3.2	72 (21)		
					HSV	3.5	70 (12)		
					B	3.5			
4.20	Becoming firm light bluish grey sandy very gravelly SILT at 4.1mbgl. Gravel is fine to coarse rounded of flint with occasional fine to coarse sand lenses.		4		B	4.2			
	[CLAYGATE BEDS]		5						

Logged by: ADC

Checked by: AOD

Excavation Method: JCB

Orientation: E-W

Dimensions: 0.45m x 2.5m

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Hole terminated at 4.2mbgl.
2. No groundwater strikes encountered.
3. ES = Environmental sample;
   B = Bulk Sample;
   HSV = Hand shear vane test (kPa);
4. Pit backfilled with arisings on completion.
5. Pit sides remained stable.

Trial Pit TP02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/11

Location: Hampstead, London

Ground level:

Sheet: 1 of 2

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS				Well data	Depth to water (m)
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	Undrained Shear Strength		
0.00	Ground Surface								
0.30	[TOPSOIL] comprising loose dark brown gravelly silty fine to medium sand. Gravel is fine to coarse sub-rounded to rounded of flint. Frequent roots and rootlets. Occasional brick fragments.		0		ES	0.2			
	[MADE GROUND] comprising soft to firm dark brown slightly gravelly sandy clay with occasional brick fragments. Gravel is fine to coarse, sub-rounded of flint.		1		ES	1.0			
1.66					B	1.5			
2.10	Loose to medium dense very silty fine to medium SAND. Becoming loose to medium dense light grey very clayey very gravelly fine to coarse SAND at 1.8mbgl. Gravel is fine to coarse rounded to sub-rounded of flint		2		B	2.0			
	[CLAYGATE BEDS]				HSV	2.4	64 (14)		
					B	2.4			
			3		HSV	3.0	80 (15)		
			4		HSV	4.0	51		

Logged by: ADC

Checked by: AOD

Excavation Method: JCB

Orientation: N-S

Dimensions: 0.45m x 2.5m

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Hole terminated at 4.3mbgl.
2. No groundwater strikes encountered.
3. ES = Environmental sample;
   B = Bulk Sample;
   HSV = Hand shear vane test (kPa);
4. Pit backfilled with arisings on completion.
5 Pit sides remained stable.

Trial Pit TP02

Project: Arkwright Road

Project No: CG/5595

Client: Ironside & Malone Design & Build

Date: 24/08/11

Location: Hampstead, London

Ground level:

Sheet: 2 of 2

Card Geotechnics Limited

SUBSURFACE PROFILE				SAMPLE/TESTS					
Depth	Description	Legend	Depth (m)	Number	Type	Depth (m)	Undrained Shear Strength	Well data	Depth to water (m)
4.30	Firm dark orange mottled grey gravelly slightly sandy CLAY. Gravel is fine to coarse rounded to sub-rounded of flint. Sand is fine to medium. Fine to medium sand lense at 3.4m (slightly damp) and at 4.0m (wet). Becoming very sandy below 3.4m - gravel absent.Clay is soft to firm in proximity to sand lenses. [CLAYGATE BEDS] End of hole.		5 6 7 8						

Logged by: ADC

Checked by: AOD

Excavation Method: JCB

Orientation: N-S

Dimensions: 0.45m x 2.5m

Card Geotechnics Limited
No.1 Pickford Street
Aldershot
Hampshire

Comments and Notes

1. Hole terminated at 4.3mbgl.
2. No groundwater strikes encountered.
3. ES = Environmental sample;
   B = Bulk Sample;
   HSV = Hand shear vane test (kPa);
4. Pit backfilled with arisings on completion.
5. Pit sides remained stable.

APPENDIX E

Photograph sheets

PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ASB	AOD	01

FIP1 - Overview

FIP1 - Content

FIP2 - Overview

FIP2 - Content

FIP3 - Overview

FIP3 - Content

Notes

PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ASB	AOD	02

FIP4 - Overview

FIP4 - Content

FIP5 - Overview

FIP5 - Content

FIP6 - Overview

FIP6 - Content

Notes

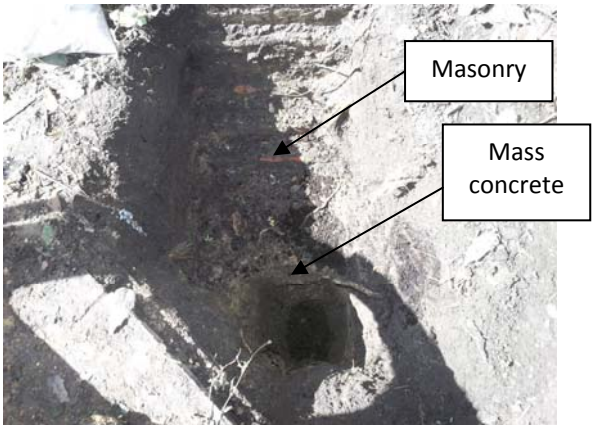
PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ASB	AOD	03

FIP7 - Overview

FIP7 - Content

FIP8 - Overview



FIP8 - Content

FIP9 - Overview

FIP9 - Content

Notes

PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ASB	AOD	04

FIP10 - Overview


FIP10 - Content


FIP11 - Overview


FIP11 - Content


FIP12 - Overview


FIP12 - Content

Notes

PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ASB	AOD	05

FIP13 - Overview

FIP13 - Content

FIP14 - Overview

FIP14 - Content

FIP15 - Overview

FIP15 - Content

Notes

PHOTO SHEET

Date	Job No	Made by	Checked by	Sheet No
October 2011	CG/5595	ADC	AOD	06

TP01 - Overview

TP02 - Overview

TP01 - Content

TP02 - Content

Notes

APPENDIX F

Chemical analysis

Adam Cadman
Card Geotechnics Ltd
No. 1 Pickford Street
Aldershot
Hampshire
GU11 1TY

t: 01252 310364

e: adamc@cardgeotechnics.co.uk

i2 Analytical Ltd.
Building 19,
BRE,
Garston,
Watford,
WD25 9XX

t: 01923 67 00 20
f: 01923 67 00 30
e: reception@i2analytical.com

Analytical Report Number : 11-29753

Project / Site name:	Arkwright Road	**Samples received on:**	08/09/2011
Your job number:	CG/5595	**Samples instructed on:**	08/09/2011
Your order number:		**Analysis completed by:**	14/09/2011
Report Issue Number:	1	**Report issued on:**	14/09/2011
Samples Analysed:	8 soil samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Thurstan Plummer
Organics Technical Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting

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Analytical Report Number: 11-29753

Project / Site name: Arkwright Road

Lab Sample Number				189695	189696	189697	189698	189699
Sample Reference				TP01	TP02	BH01	BH01	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.00	0.70	1.20	2.00
Date Sampled				24/08/2011	24/08/2011	24/08/2011	24/08/2011	24/08/2011
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	29	< 0.1	< 0.1	26	26
Moisture Content	%	N/A	NONE	13	13	19	12	11
Total mass of sample received	kg	0.001	NONE	0.66	0.79	0.78	0.73	0.89
General Inorganics								
pH	pH Units	N/A	MCERTS	7.5	7.3	7.7	7.6	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	100	ISO 17025	< 100	180	250	310	< 100
Organic Matter	%	0.1	MCERTS	2.5	1.2	1.5	1.9	0.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.42	< 0.10
Fluorene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	0.32	< 0.20
Phenanthrene	mg/kg	0.2	MCERTS	0.20	< 0.20	< 0.20	2.3	< 0.20
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.82	< 0.10
Fluoranthene	mg/kg	0.2	MCERTS	0.88	0.23	0.41	4.4	< 0.20
Pyrene	mg/kg	0.2	MCERTS	0.79	0.20	0.32	3.5	< 0.20
Benzo(a)anthracene	mg/kg	0.2	MCERTS	0.52	< 0.20	0.22	1.9	< 0.20
Chrysene	mg/kg	0.05	MCERTS	0.49	< 0.05	0.20	1.7	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.76	< 0.10	0.31	2.3	< 0.10
Benzo(k)fluoranthene	mg/kg	0.2	MCERTS	0.28	< 0.20	< 0.20	0.93	< 0.20
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.53	< 0.10	0.18	1.5	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	MCERTS	0.33	< 0.20	< 0.20	1.1	< 0.20
Dibenz(a,h)anthracene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.40	< 0.05	< 0.05	0.97	< 0.05
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Total WAC-17 PAHs	mg/kg	1.6	NONE	5.2	< 1.6	1.6	22	< 1.6
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	8.1	10	9.4	4.3
Barium (aqua regia extractable)	mg/kg	1	MCERTS	97	94	87	86	45
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.9	0.7	1.0	0.7	0.3
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.3	< 0.2	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27	24	32	22	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	32	21	28	23	10
Lead (aqua regia extractable)	mg/kg	2	MCERTS	200	110	160	160	18
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	2	MCERTS	12	9.2	14	8.8	6.8
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	50	36	60	36	20
Zinc (aqua regia extractable)	mg/kg	2	MCERTS	82	61	180	83	30

Analytical Report Number: 11-29753

Project / Site name: Arkwright Road

Lab Sample Number				189695	189696	189697	189698	189699
Sample Reference				TP01	TP02	BH01	BH01	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.00	0.70	1.20	2.00
Date Sampled				24/08/2011	24/08/2011	24/08/2011	24/08/2011	24/08/2011
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH7 - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH7 - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH7 - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH7 - Aliphatic >EC21 - EC40	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH7 - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH7 - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH7 - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	2.0	< 2.0
TPH7 - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	36	< 10
TPH7 - Aromatic >EC21 - EC40	mg/kg	10	NONE	< 10	< 10	< 10	99	< 10

Analytical Report Number: 11-29753

Project / Site name: Arkwright Road

Lab Sample Number				189700	189701	189702		
Sample Reference				BH02	BH03	FIP08		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				3.45	1.20	0.59		
Date Sampled				24/08/2011	24/08/2011	24/08/2011		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	18	14	20		
Total mass of sample received	kg	0.001	NONE	0.85	0.85	0.73		
General Inorganics								
pH	pH Units	N/A	MCERTS	7.4	6.7	7.1		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	100	ISO 17025	< 100	110	810		
Organic Matter	%	0.1	MCERTS	< 0.1	0.4	5.1		
Total Phenols								
Total Phenols (monohydric)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20		
Phenanthrene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	1.3		
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.33		
Fluoranthene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	3.9		
Pyrene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	3.4		
Benzo(a)anthracene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	2.5		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.5		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	3.4		
Benzo(k)fluoranthene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	1.1		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	2.1		
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	1.7		
Dibenz(a,h)anthracene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	0.22		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.7		
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05		
Total PAH								
Total WAC-17 PAHs	mg/kg	1.6	NONE	< 1.6	< 1.6	24		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.3	9.7	25		
Barium (aqua regia extractable)	mg/kg	1	MCERTS	21	56	290		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.8	0.7	1.2		
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.6		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.6		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	27	28		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	15	53		
Lead (aqua regia extractable)	mg/kg	2	MCERTS	9.6	57	1700		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	2	MCERTS	12	10	18		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	49	40	52		
Zinc (aqua regia extractable)	mg/kg	2	MCERTS	30	38	400		

Analytical Report Number: 11-29753

Project / Site name: Arkwright Road

Lab Sample Number				189700	189701	189702		
Sample Reference				BH02	BH03	FIP08		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				3.45	1.20	0.59		
Date Sampled				24/08/2011	24/08/2011	24/08/2011		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH7 - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH7 - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH7 - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH7 - Aliphatic >EC21 - EC40	mg/kg	10	NONE	< 10	14	12		
TPH7 - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH7 - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH7 - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH7 - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	13		
TPH7 - Aromatic >EC21 - EC40	mg/kg	10	NONE	< 10	< 10	52		

Analytical Report Number : 11-29753

Project / Site name: Arkwright Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 2 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
189695	TP01	None Supplied	0.20	Brown topsoil and sand with stones and vegetation.
189696	TP02	None Supplied	1.00	Brown clay.
189697	BH01	None Supplied	0.70	Brown clay with vegetation.
189698	BH01	None Supplied	1.20	Brown topsoil and sand with stones and brick.
189699	BH02	None Supplied	2.00	Light brown clay with stones.
189700	BH02	None Supplied	3.45	Light brown clay.
189701	BH03	None Supplied	1.20	Light brown clay.
189702	FIP08	None Supplied	0.59	Brown clay.

Analytical Report Number : 11-29753

Project / Site name: Arkwright Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080	W	MCERTS
Organic matter in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Stones not passing through a 2 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results are not corrected for the stone content of the sample.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	ISO 17025
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX G

Geotechnical analysis

Project Name:	Arkwright Road, Hampstead, London	**Samples Received:**	09/09/2011
		Project Started:	12/09/2011
Client:	Card Geotechnics Ltd	**Testing Started:**	21/09/2011
Project No:	CG/5595 **Our job/report no:** 11586	**Date Reported:**	22/09/2011

K4 SOILS

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH1	-	3.00 - 3.45	Brown, pale grey and orange brown sandy CLAY	26	34	21	13	100	
BH1	-	5.00 - 5.45	Brown and pale grey slightly silty clayey SAND	29	41	20	21	100	
BH2	-	3.00 - 3.45	Brown and blue grey slightly clayey slightly silty SAND	27	32	24	8	100	
BH3	-	5.45 - 5.50	Brown and blue grey slightly silty slightly clayey sandy GRAVEL (gravel is fmc and sub rounded to angular)	14	41	20	21	48	
BH3	-	6.00	Brown and blue grey slightly sandy clayey SILT	29	45	20	25	99	
BH4	-	4.45 - 4.50	Brown slightly mottled blue grey slightly silty clayey SAND	26	42	17	25	100	

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.

BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved

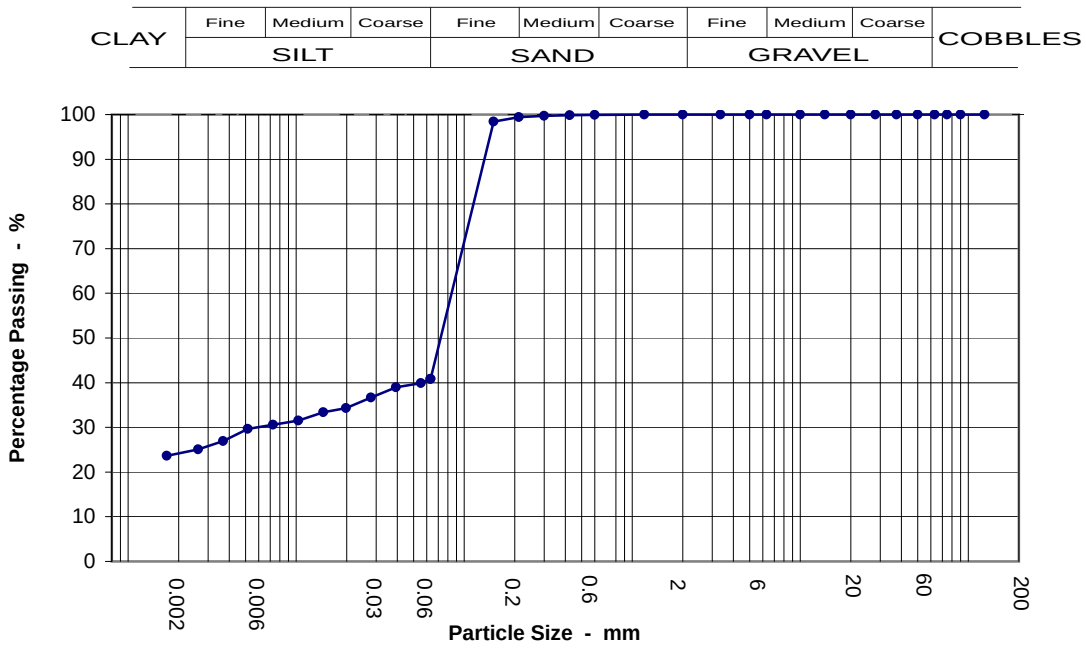
Initials: K.P

Date: 22/09/2011

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH1
		Depth	5.00 - 5.45 m
Visual Soil Description	Brown and pale grey slightly silty clayey SAND	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.055	40
90	100	0.039	39
75	100	0.028	37
63	100	0.020	34
50	100	0.015	33
37.5	100	0.010	32
28	100	0.007	31
20	100	0.005	30
14	100	0.004	27
10	100	0.003	25
6.3	100	0.002	24
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	99		
0.15	98		
0.063	41		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	59.5
Silt	16.3
Clay	24.1

Grading Analysis	
D100	125.0
D60	0.1
D10	
Uniformity Coefficient	N/A

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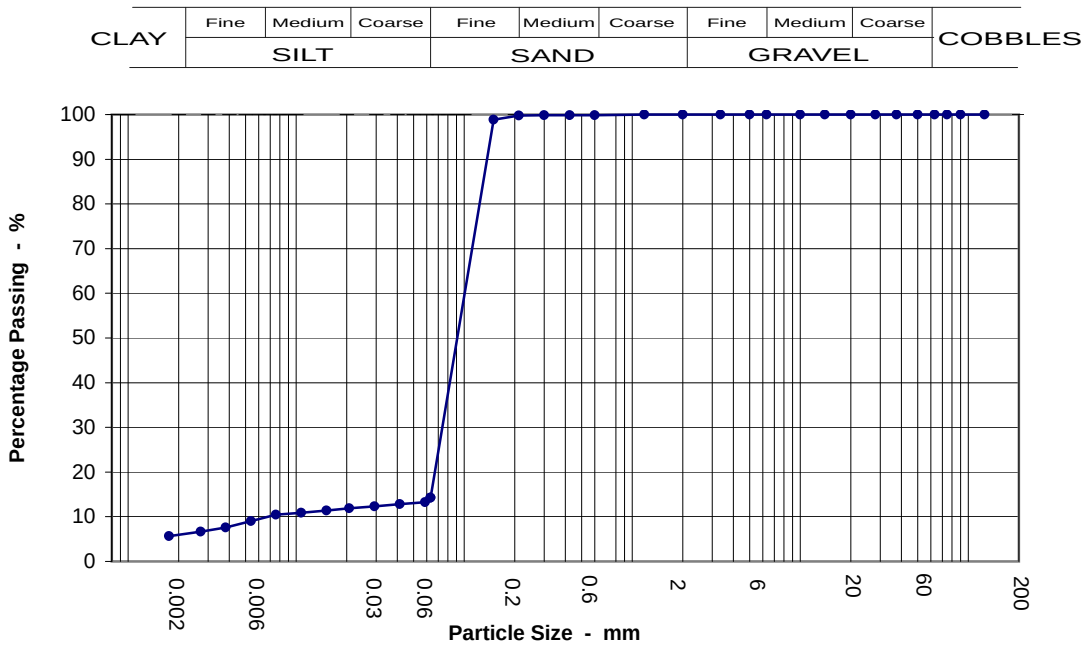
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 21/09/2011

UKAS TESTING
2519

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH2
		Depth	3.00 - 3.45 m
Visual Soil Description	Brown and blue grey slightly clayey slightly silty SAND	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.059	13
90	100	0.041	13
75	100	0.029	12
63	100	0.021	12
50	100	0.015	11
37.5	100	0.011	11
28	100	0.008	10
20	100	0.005	9
14	100	0.004	8
10	100	0.003	7
6.3	100	0.002	6
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	14		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	86.4
Silt	7.7
Clay	5.9

Grading Analysis	
D100	125.0
D60	0.1
D10	
Uniformity Coefficient	N/A

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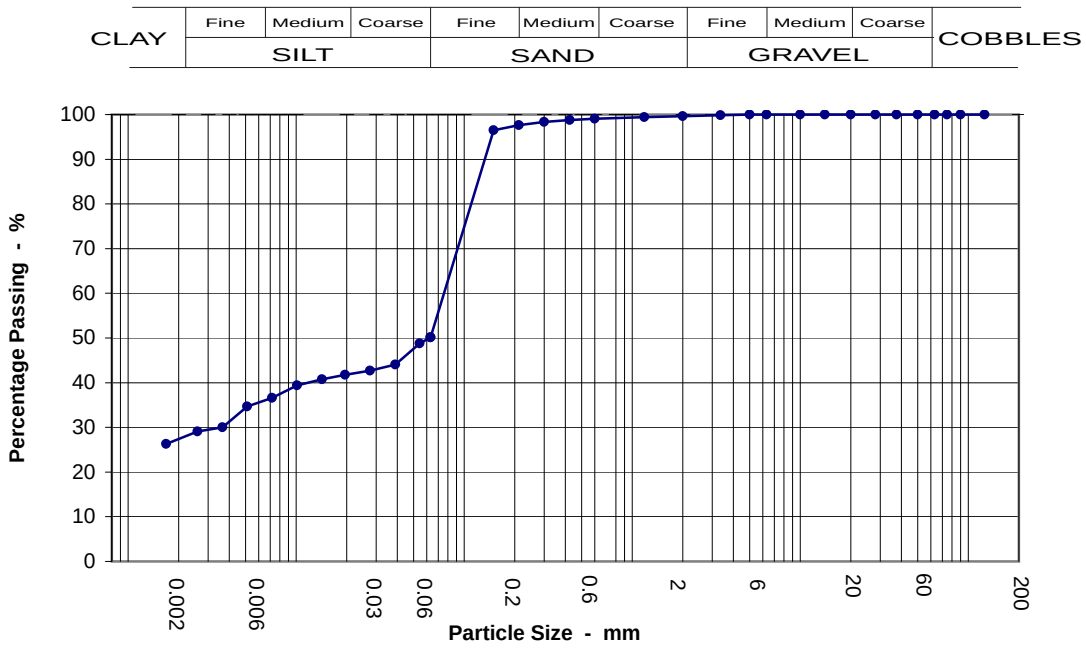
Initials: kp
Date: 21/09/2011

UKAS TESTING
2519

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH2
		Depth	6.00 - 6.45 m
Visual Soil Description	Orange brown, brown and blue grey slightly silty clayey SAND	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.054	49
90	100	0.039	44
75	100	0.028	43
63	100	0.020	42
50	100	0.014	41
37.5	100	0.010	39
28	100	0.007	37
20	100	0.005	35
14	100	0.004	30
10	100	0.003	29
6.3	100	0.002	26
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	99		
0.3	98		
0.212	98		
0.15	96		
0.063	50		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.3
Sand	50.0
Silt	22.4
Clay	27.2

Grading Analysis	
D100	125.0
D60	0.1
D10	
Uniformity Coefficient	N/A

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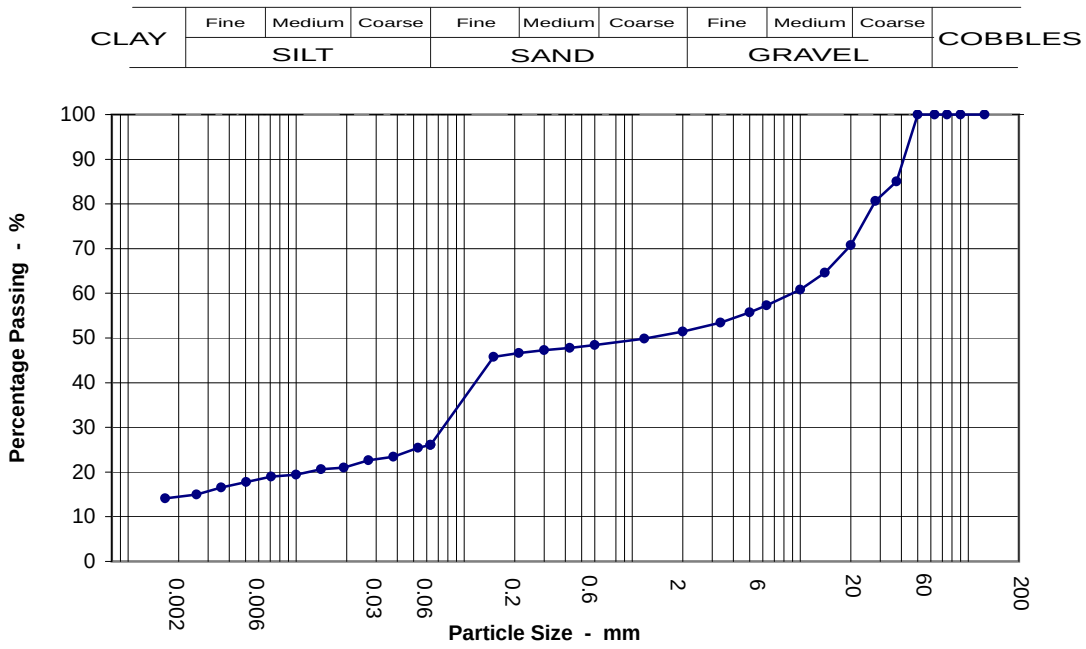
Initials: kp
Date: 21/09/2011

UKAS TESTING
2519

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH3
		Depth	5.45 - 5.50 m
Visual Soil Description	Brown and blue grey slightly silty slightly clayey sandy GRAVEL (gravel is fmc and sub rounded to angular)	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.053	25
90	100	0.038	23
75	100	0.027	23
63	100	0.019	21
50	100	0.014	21
37.5	85	0.010	19
28	81	0.007	19
20	71	0.005	18
14	65	0.004	17
10	61	0.003	15
6.3	57	0.002	14
5	56		
3.35	53		
2	51		
1.18	50		
0.6	48		
0.425	48		
0.3	47		
0.212	47		
0.15	46		
0.063	26		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	48.6
Sand	25.5
Silt	11.4
Clay	14.4

Grading Analysis	
D100	125.0
D60	9.1
D10	
Uniformity Coefficient	N/A

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Checked and Approved
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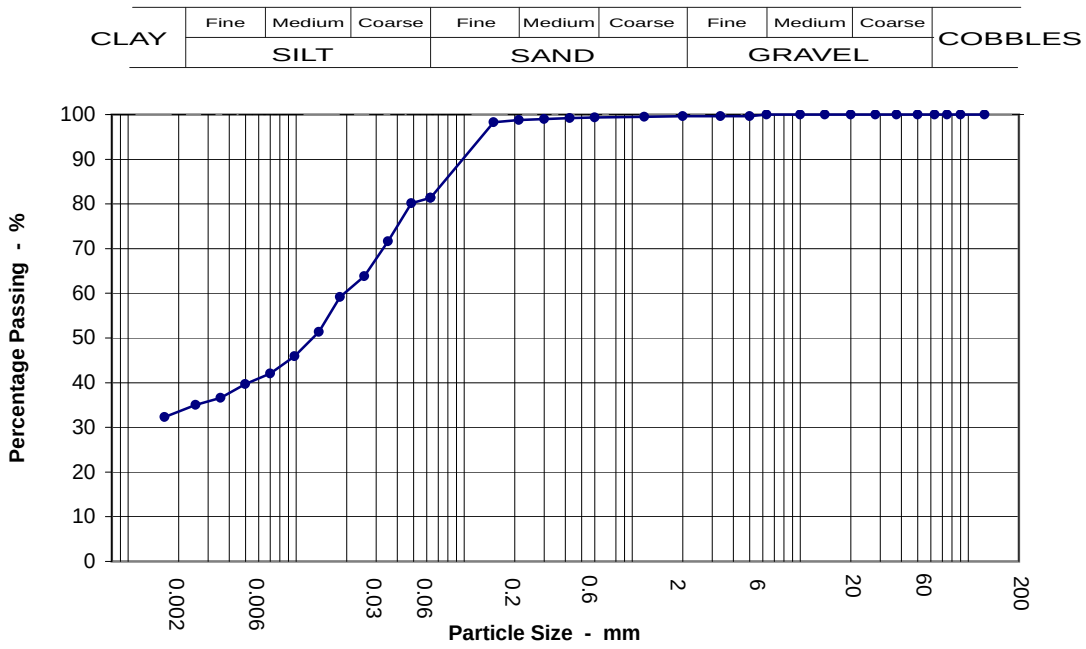
Date: 21/09/2011

UKAS TESTING
2519

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH3
		Depth	6.00 m
Visual Soil Description	Brown and blue grey slightly sandy clayey SILT	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.048	80
90	100	0.035	72
75	100	0.025	64
63	100	0.018	59
50	100	0.014	51
37.5	100	0.010	46
28	100	0.007	42
20	100	0.005	40
14	100	0.004	37
10	100	0.003	35
6.3	100	0.002	32
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	81		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving Sedimentation	Clause Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.4
Sand	18.5
Silt	47.7
Clay	33.4

Grading Analysis	
D100	125.0
D60	
D10	
Uniformity Coefficient	N/A

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Checked and Approved
Initials: kp
Date: 21/09/2011

UKAS TESTING
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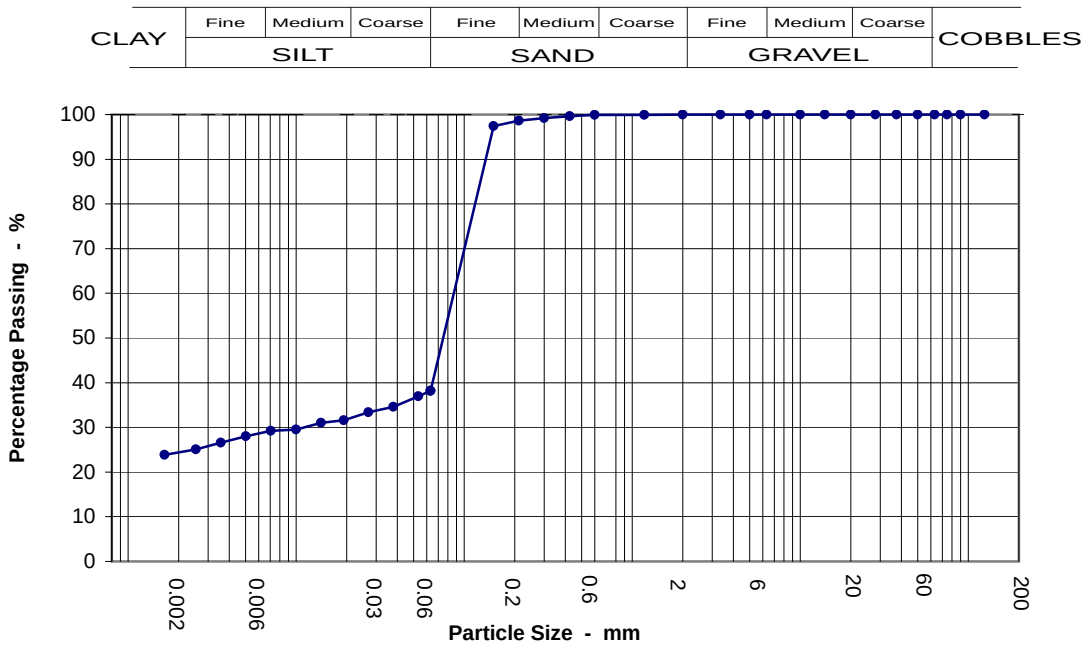
K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH4
		Depth	4.45 - 4.50 m
Visual Soil Description	Brown slightly mottled blue grey slightly silty clayey SAND	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.053	37
90	100	0.038	35
75	100	0.027	33
63	100	0.019	32
50	100	0.014	31
37.5	100	0.010	30
28	100	0.007	29
20	100	0.005	28
14	100	0.004	27
10	100	0.003	25
6.3	100	0.002	24
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	97		
0.063	38		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	62.2
Silt	13.5
Clay	24.3

Grading Analysis	
D100	125.0
D60	0.1
D10	
Uniformity Coefficient	N/A

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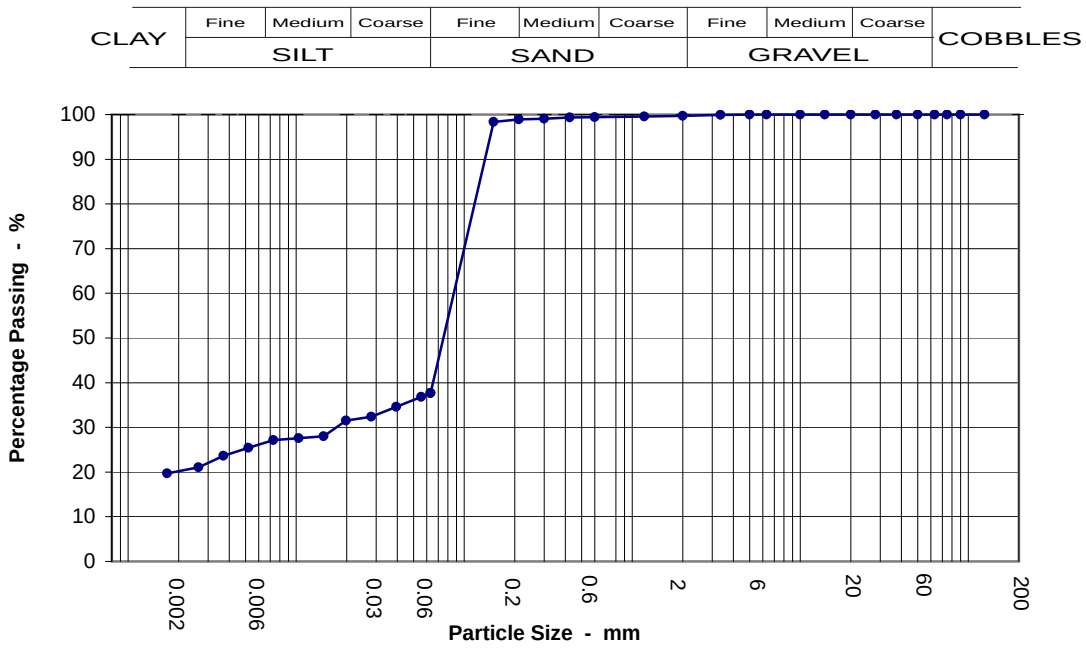
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 21/09/2011

UKAS TESTING
2519

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	11586
		Project No:	CG/5595
Location	Arkwright Road, Hampstead, London	Borehole / Trial Pit No:	BH4
		Depth	7.50 - 7.95 m
Visual Soil Description	Brown slightly silty slightly clayey SAND	Sample Type/No	-



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.056	37
90	100	0.039	35
75	100	0.028	32
63	100	0.020	32
50	100	0.015	28
37.5	100	0.010	28
28	100	0.007	27
20	100	0.005	25
14	100	0.004	24
10	100	0.003	21
6.3	100	0.002	20
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	38		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving Sedimentation	Clause Clause 9.5
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	0.3
Sand	62.4
Silt	17.2
Clay	20.1

Grading Analysis	
D100	125.0
D60	0.1
D10	
Uniformity Coefficient	N/A

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Approved Signatories:
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Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 21/09/2011

UKAS TESTING
2519

Project Name:	Arkwright Road, Hampstead, London				K4 SOILS
Client:	Card Geotechnics Ltd	Project no:	CG/5595		
		Our job no:	11586		

Borehole No:	Sample No:	Depth m	Description	pH	Sulphate content (g/l)
BH1	-	3.00	Brown, pale grey and orange brown sandy CLAY	6.9	0.59
BH1	-	5.00	Brown and pale grey slightly silty clayey SAND	7.1	0.51
BH2	-	3.00	Brown and blue grey slightly clayey slightly silty SAND	7.1	0.40
BH3	-	5.45	Brown and blue grey slightly silty slightly clayey sandy GRAVEL (gravel is fmc and sub rounded to angular)	7.3	0.55
BH4	-	4.45	Brown slightly mottled blue grey slightly silty clayey SAND	7.3	0.47

Date 21/09/2011

Summary of Test Results

BS 1377 : Part 3 :Clause 5 : 1990

Determination of sulphate content of soil and ground water : gravimetric method

Checked and Approved

Initials : kp

Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Client :	Card Geotechnics Ltd	Our Job/report no:	11586	Samples Rec :	09/09/2011	Testing Started:	14/09/2011
Project name:	Arkwright Road, Hampstead, London	Project No:	CG/5595	Project Started:	12/09/2011	Date reported:	21/09/2011

BH / TP No	Sample no / ref	Sample depth (m)	Description	Moisture content (%)	Bulk Density (Mg/m3)	Dry density (Mg/m3)	Cell Pressure (kPa)	Strain at failure (%)	Max Deviator Stress (kPa)	Mode of failure	Shear Strength (kPa)	Phi (deg)
BH1	-	10.50	High strength slightly fissured grey slightly silty CLAY	30	1.93	1.48	250	9.0	157	Brittle	79	NA
BH2	-	9.00	High strength slightly fissured grey slightly silty CLAY with very occasional partings of fine grey sand	27	1.94	1.53	200	9.0	160	Brittle	80	NA
BH2	-	12.00	Medium strength fissured grey silty CLAY with partings of fine grey sand	31	1.95	1.49	280	20	115	Brittle	58	NA
BH3	-	5.00	Medium strength orange brown and grey silty sandy CLAY with occasional gravel at base and occasional rootlets (gravel is fm and rounded)	22	2.13	1.75	120	20	109	Brittle	55	NA
BH3	-	7.50	High strength fissured brown slightly sandy CLAY with partings of yellow sand	30	1.90	1.46	150	9.5	150	Brittle	75	NA
BH4	-	4.00	Low strength light brown clayey silty SAND/very sandy silty CLAY	25	1.94	1.55	100	20	56	Brittle	28	NA
BH4	-	9.00	Low strength orange brown and brown mottled slightly silty slightly sandy CLAY with partings of fine yellow sand	30	1.89	1.46	220	18	51	Brittle	26	NA
BH4	-	12.00	High strength slightly fissured grey slightly silty CLAY with partings of fine grey sand	26	1.94	1.54	280	10	162	Brittle	81	NA

K4 SOILS

Summary of Undrained Triaxial Compression Testing

BS 1377 : Part 7 : Clause 8 : 1990

Checked and approved

Initials kp

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH1	**Sample no:**		**Depth (m):**	10.50

Soil Description: High strength slightly fissured grey slightly silty CLAY

Sample Details		**Specimen** 1
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	30
Bulk Density	Mg/m³	1.93
Dry Density	Mg/m³	1.48

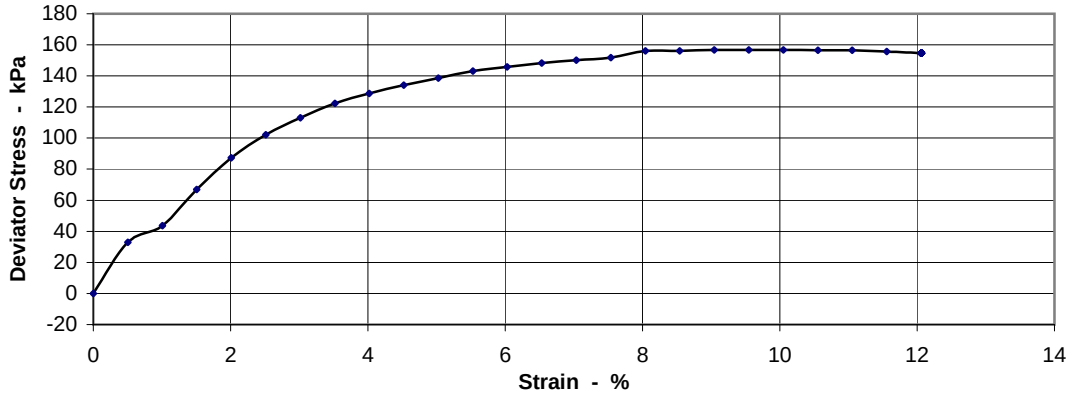
Position and orientation within the original sample

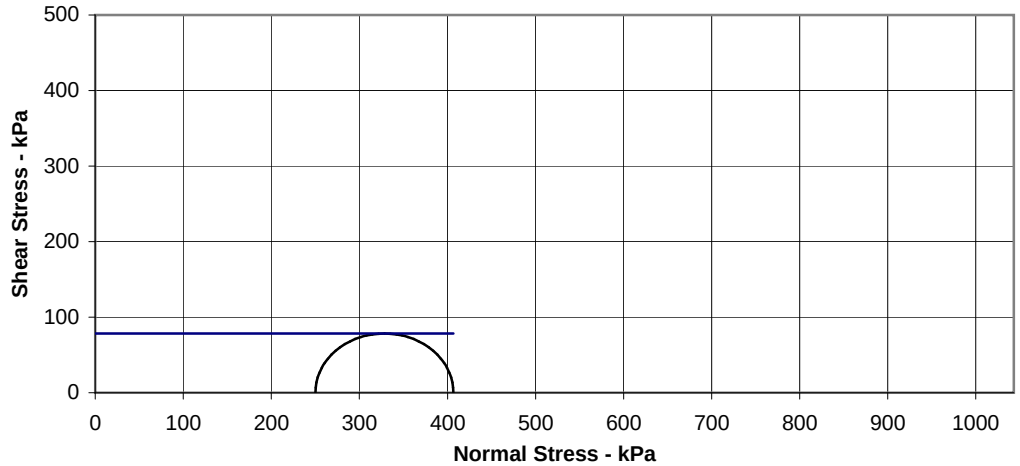
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.40
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	250
Strain at Failure	%	9.0
Maximum Deviator Stress	kPa	157
Shear Strength	kPa	78
Mode of Failure		Brittle

Shear Strength Parameters	
C	78 kPa
Phi	0.0 °

Specimen 1





K4 SOILS LABORATORY
Unit 8, Olds Close, Watford, Herts, WD18 9RU.
Tel:01923711288 Fax:01923711311
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)
J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 21/09/2011

UKAS TESTING

2519

K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH2	**Sample no:**		**Depth (m):**	9.00

Soil Description: High strength slightly fissured grey slightly silty CLAY with very occasional partings of fine grey sand

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	27
Bulk Density	Mg/m³	1.94
Dry Density	Mg/m³	1.53

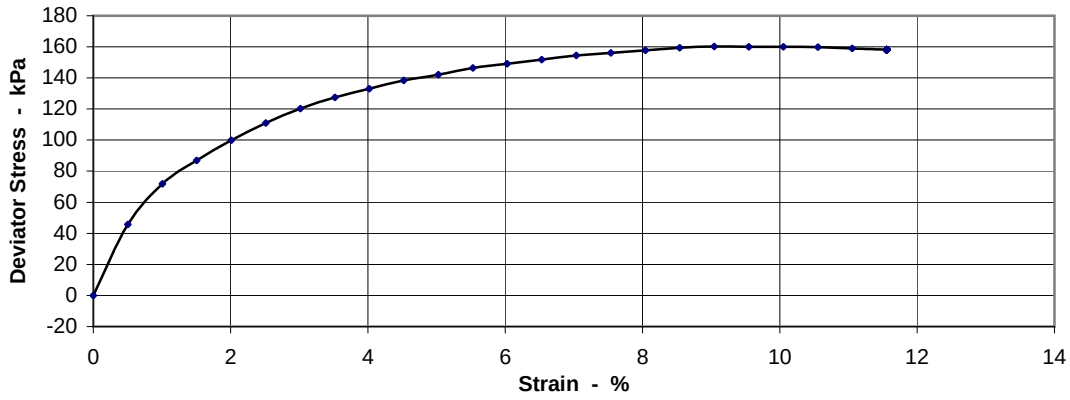
Position and orientation within the original sample

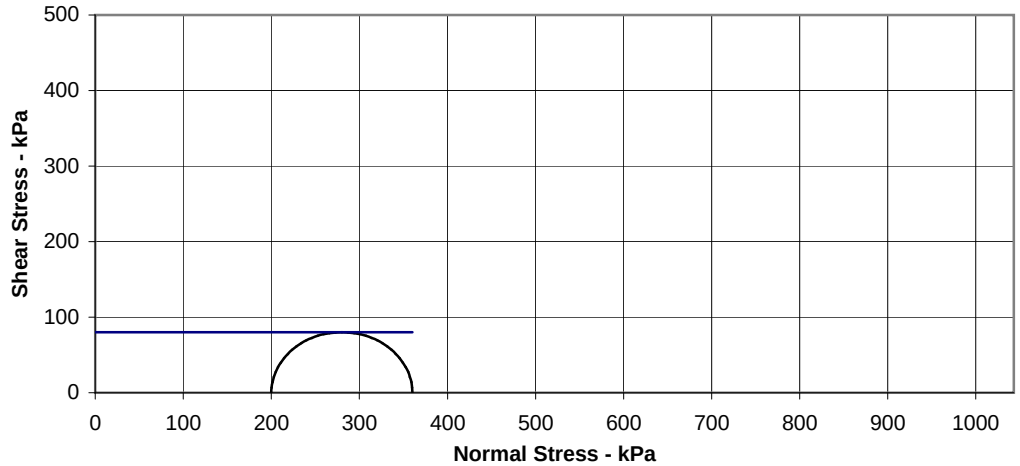
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.40
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	200
Strain at Failure	%	9.0
Maximum Deviator Stress	kPa	160
Shear Strength	kPa	80
Mode of Failure		Brittle

Shear Strength Parameters	
C	80 kPa
Phi	0.0 °

Specimen 1





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BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH2	**Sample no:**		**Depth (m):**	12.00

Soil Description: Medium strength fissured grey silty CLAY with partings of fine grey sand

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	31
Bulk Density	Mg/m³	1.95
Dry Density	Mg/m³	1.49

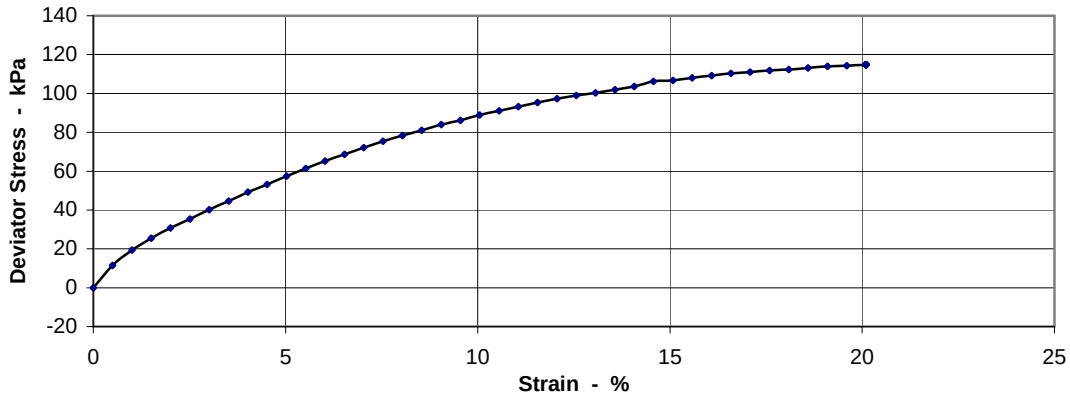
Position and orientation within the original sample

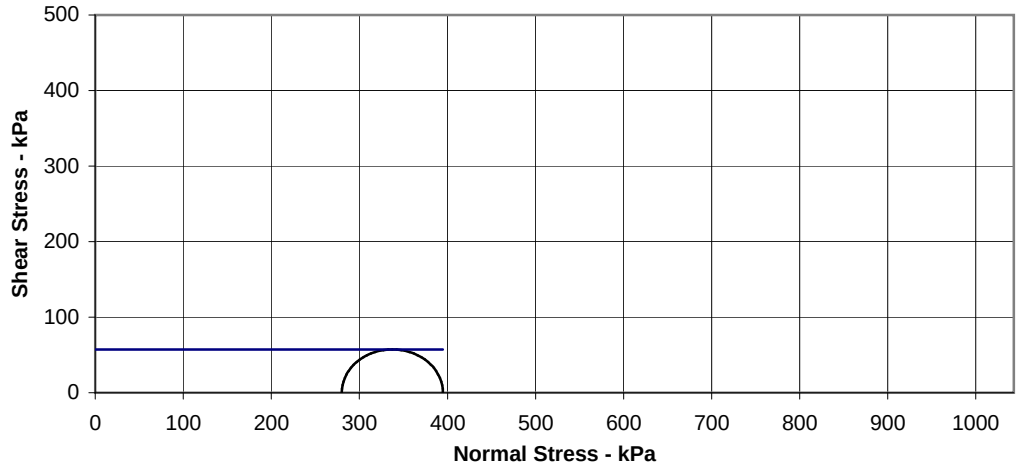
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.73
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	280
Strain at Failure	%	20.1
Maximum Deviator Stress	kPa	115
Shear Strength	kPa	57
Mode of Failure		Brittle

Shear Strength Parameters	
C	57 kPa
Phi	0.0 °

Specimen 1





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Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH3	**Sample no:**		**Depth (m):**	5.00

Soil Description: Medium strength orange brown and grey silty sandy CLAY with occasional gravel at base and occasional rootlets (gravel is fm and rounded)

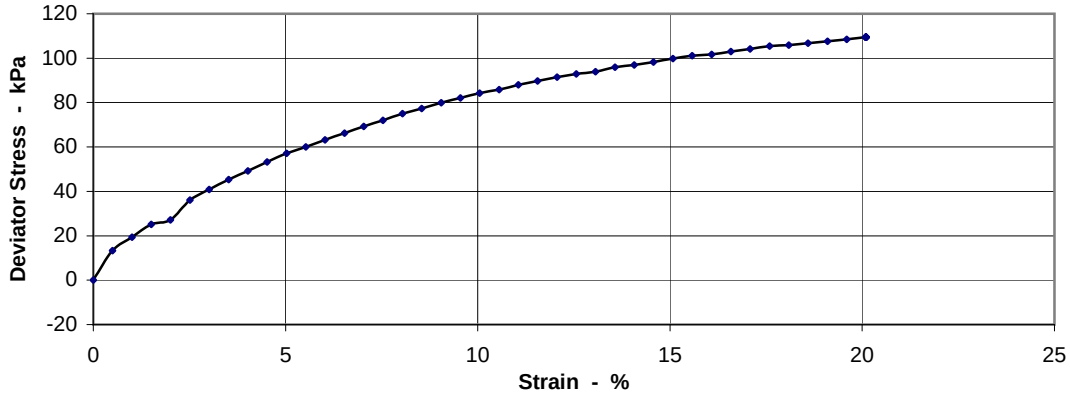
Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	22
Bulk Density	Mg/m³	2.13
Dry Density	Mg/m³	1.75

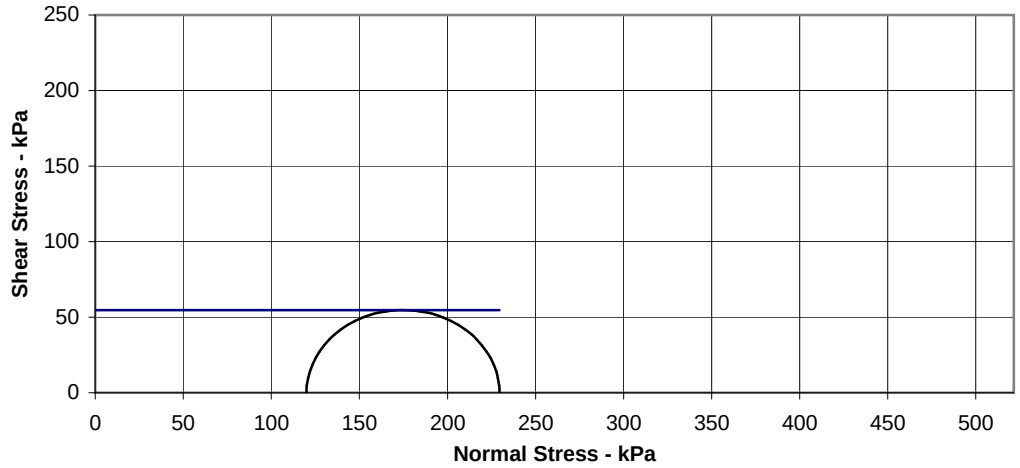
Position and orientation within the original sample

Test Details		
Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.73
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	120
Strain at Failure	%	20.1
Maximum Deviator Stress	kPa	109
Shear Strength	kPa	55
Mode of Failure		Brittle

Shear Strength Parameters	
C	55 kPa
Phi	0.0 °

Specimen 1





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Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH3	**Sample no:**		**Depth (m):**	7.50

Soil Description: High strength fissured brown slightly sandy CLAY with partings of yellow sand

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	30
Bulk Density	Mg/m³	1.90
Dry Density	Mg/m³	1.46

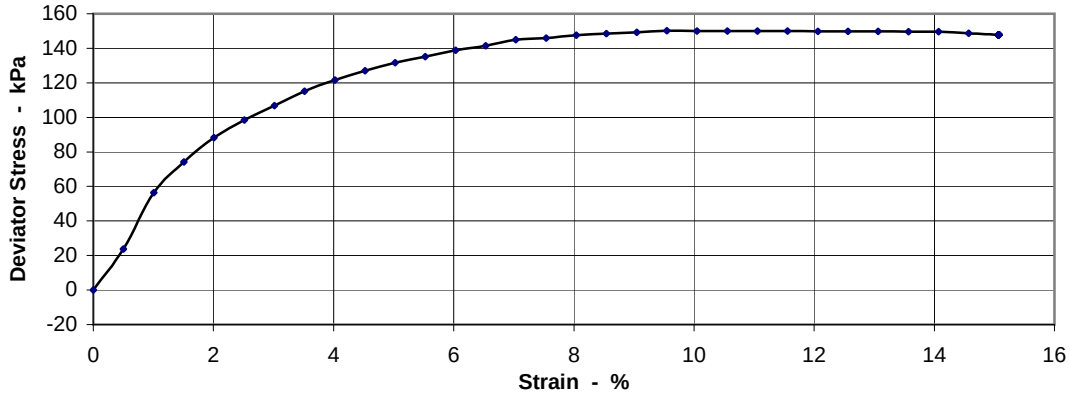
Position and orientation within the original sample

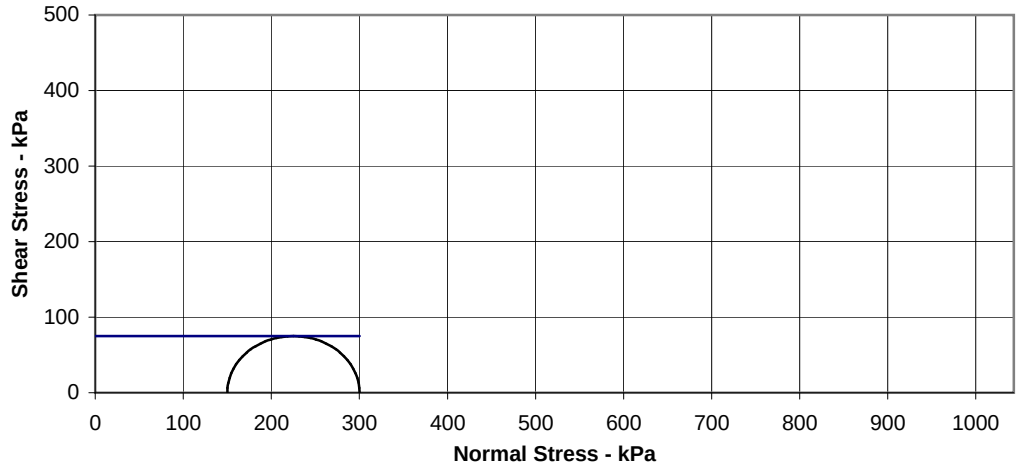
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.42
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	150
Strain at Failure	%	9.5
Maximum Deviator Stress	kPa	150
Shear Strength	kPa	75
Mode of Failure		Brittle

Shear Strength Parameters	
C	75 kPa
Phi	0.0 °

Specimen 1





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K4 SOILS

Report of Undrained Triaxial Compression Test

BS 1377 : Part 7 : 1990 Clause 8.0

Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH4	**Sample no:**		**Depth (m):**	4.00

Soil Description: Low strength light brown clayey silty SAND/very sandy silty CLAY

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	25
Bulk Density	Mg/m³	1.94
Dry Density	Mg/m³	1.55

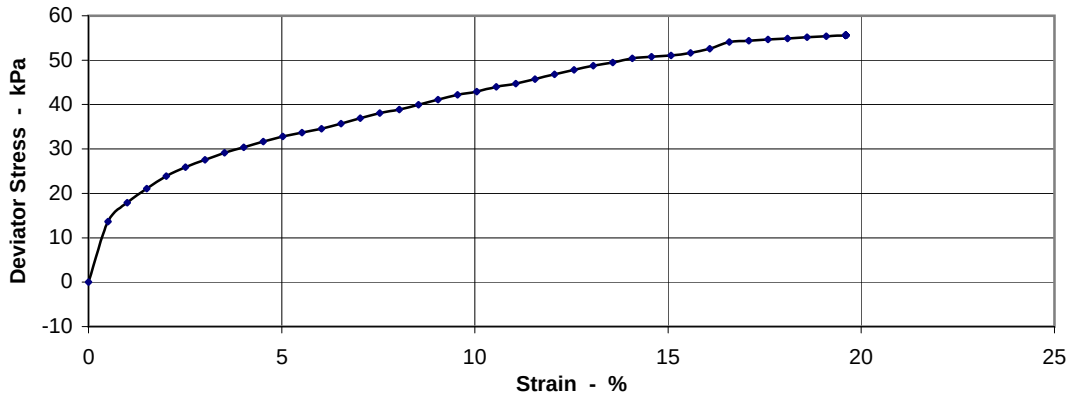
Position and orientation within the original sample

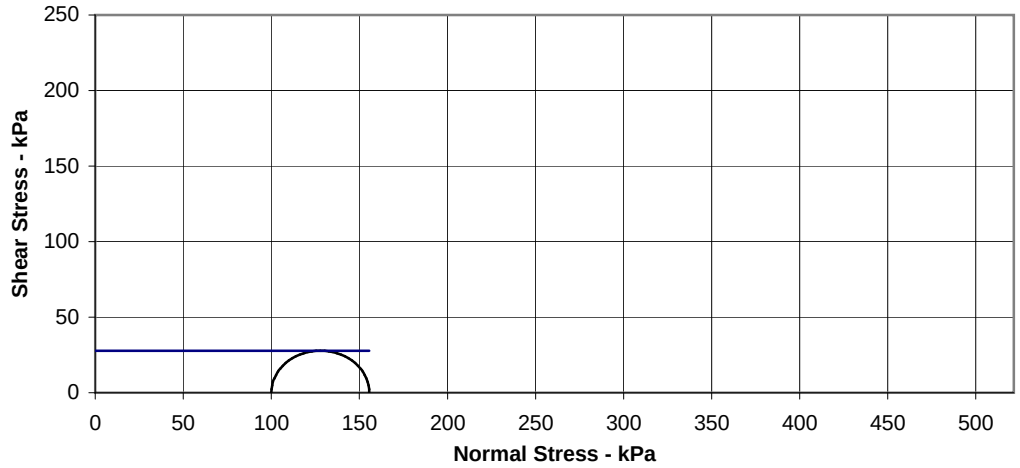
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.72
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	100
Strain at Failure	%	19.6
Maximum Deviator Stress	kPa	56
Shear Strength	kPa	28
Mode of Failure		Brittle

Shear Strength Parameters	
C	28 kPa
Phi	0.0 °

Specimen 1





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				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH4	**Sample no:**		**Depth (m):**	9.00

Soil Description: Low strength orange brown and brown mottled slightly silty slightly sandy CLAY with partings of fine yellow sand

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	30
Bulk Density	Mg/m³	1.89
Dry Density	Mg/m³	1.46

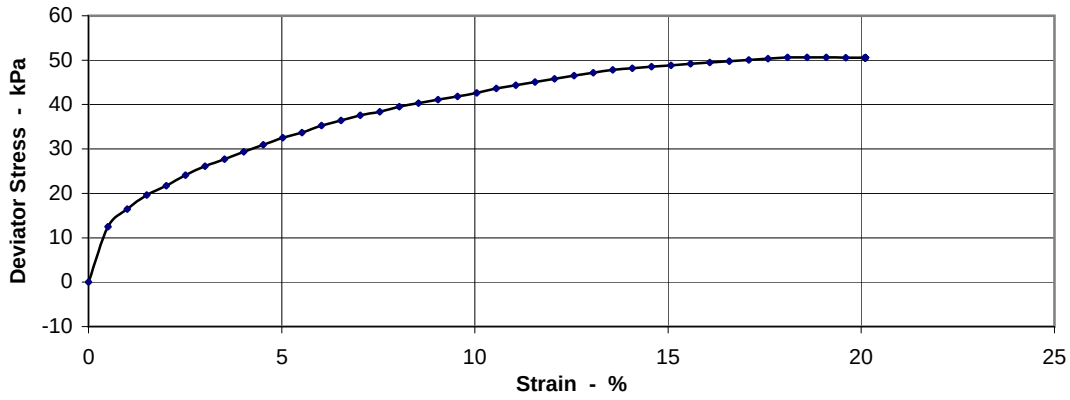
Position and orientation within the original sample

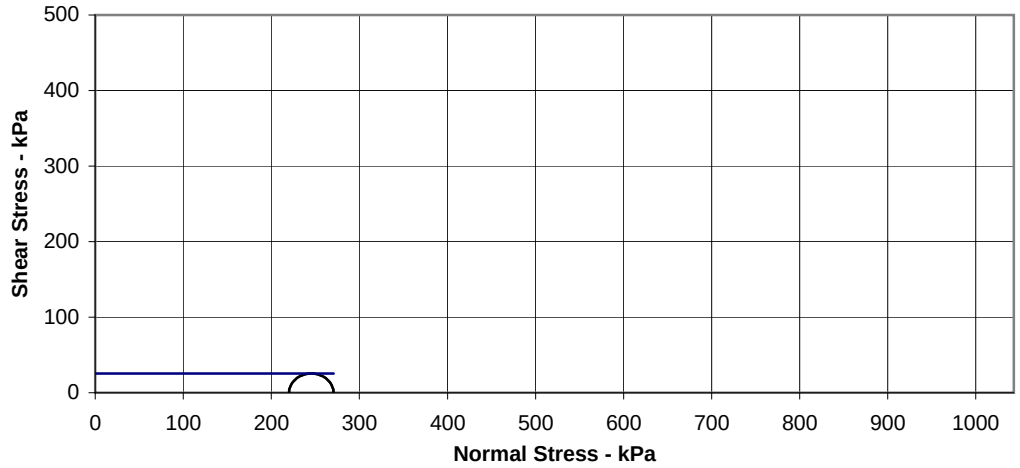
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.68
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	220
Strain at Failure	%	18.1
Maximum Deviator Stress	kPa	51
Shear Strength	kPa	25
Mode of Failure		Brittle

Shear Strength Parameters	
C	25 kPa
Phi	0.0 °

Specimen 1





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Project name:	Arkwright Road, Hampstead, London			**Samples Received:**	09/09/2011
				Project Started:	12/09/2011
Client:	Card Geotechnics Ltd			**Testing Started:**	14/09/2011
Project no:	CG/5595	**Our job /report no:**	11586	**Date Reported:**	21/09/2011
BH / TP no:	BH4	**Sample no:**		**Depth (m):**	12.00

Soil Description: High strength slightly fissured grey slightly silty CLAY with partings of fine grey sand

Sample Details	**Specimen**	**1**
Sample Condition		Undisturbed
Height	mm	199.0
Diameter	mm	104.0
Moisture Content	%	26
Bulk Density	Mg/m³	1.94
Dry Density	Mg/m³	1.54

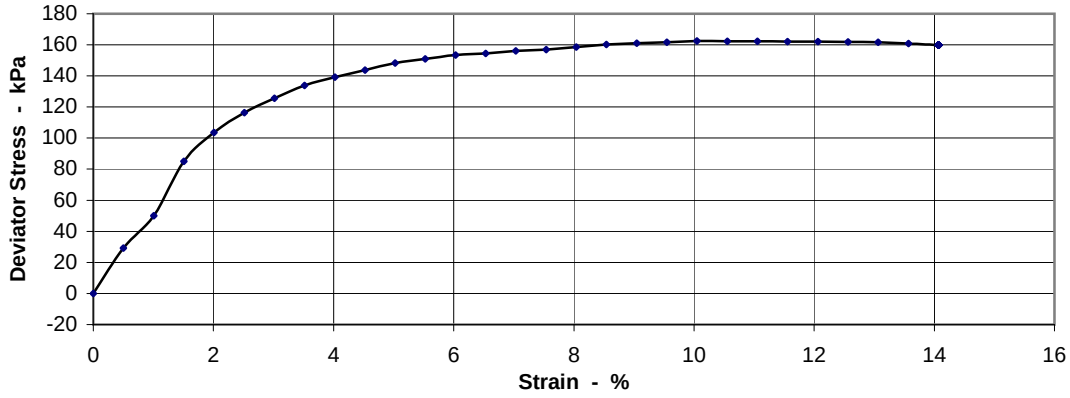
Position and orientation within the original sample

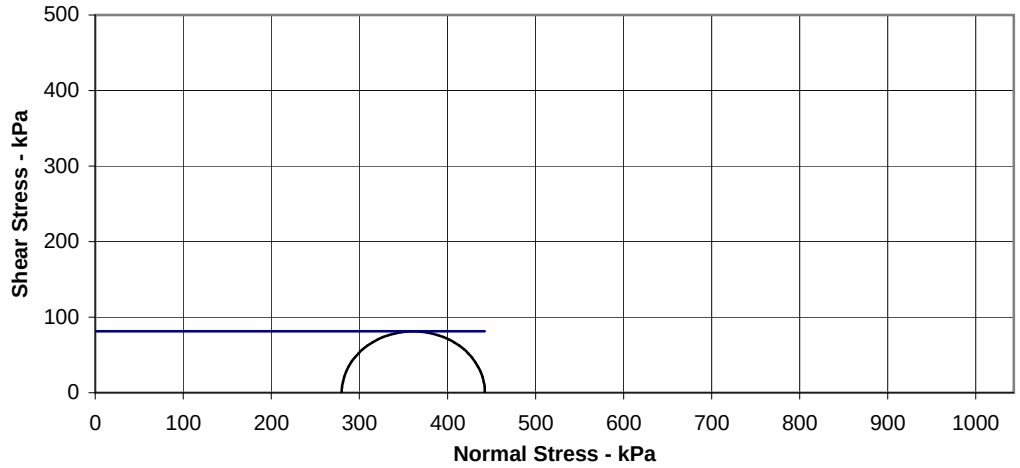
Test Details

Membrane Thickness	mm	0.2
Membrane Correction	kPa	0.44
Rate of Axial Displacement	%/min	2.01
Cell Pressure	kPa	280
Strain at Failure	%	10.1
Maximum Deviator Stress	kPa	162
Shear Strength	kPa	81
Mode of Failure		Brittle

Shear Strength Parameters	
C	81 kPa
Phi	0.0 °

Specimen 1





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APPENDIX H

Monitoring records

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Arkwright Road, Hampstead	Job No:	CG/5595
Date:	1.9.11	Engineer:	ASB
Time:	14:44	Client	Ironside & Malone Design & Build

METEOROLOGICAL & SITE INFORMATION									
State of ground:	x	Dry		Moist		Wet			
Wind:		Calm	x	Light		Moderate		Strong	
Cloud cover:		None	x	Slight		Cloudy		Overcast	
Precipitation:	x	None		Slight		Moderate		Heavy	
Barometric pressure (mb):	1003/1002				Air temperature (oC):				

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O_2 (% vol. in air)	CO_2 (% vol. in air)	CH_4 (% vol. in air)	H_2S (ppm)	PID (ppm)	Depth to GW (mbgl)	Free product (mm)	Comments
	0	0	0	19.2	0.1	0	0	0	4.82		depth of BH = 11.12m
	15	0	0.2	16.2	3	0	0	0			
	30	0	0	15.1	3.2	0	0	0			
	45	0	-0.2	14.9	3.3	0	0	0			
BH 1	60	0	-0.2	14.9	3.3	0	0	0			
	90	0.1	0.6	14.9	3.3	0	0	0			
	120	0	0.1	14.8	3.3	0	0	0			
	150	0.1	0.3	14.8	3.3	0	0	0			
	180	0	0	14.7	3.3	0	0	0			
	0	0	0.1	20.3	0.1	0	0	1.4	3.73		depth of BH = 5.00m
	15	0	0	20.3	0.2	0	0	1.3			
	30	0	0.1	20.4	0.2	0	0	1.15			
	45	0	0	20.4	0.1	0	0	1			
	60	0	0.1	20.4	0.1	0	0	0.9			
	90	0	0.1	20.4	0.1	0	0	0.3			
	120	0	0	20.5	0.1	0	0	0			
	150	0	0	20.5	0.1	0	0	0			
BH 2	180	0	0.1	20.5	0	0	0	0			
	0	-0.1	-0.4	20.3	0.1	0	0	1.4	5.56		depth of BH = 8.17m
	15	0	-0.2	17.3	1.6	0	0	1.1			
	30	0	0	16.4	1.7	0	0	0.9			
	45	0	0	16.4	1.8	0	0	0.7			
	60	0	0	16.3	1.8	0	0	0.4			
	90	0	0	16.3	1.8	0	0	0			
	120	0	0	16.1	1.8	0	0	0			
	150	0	0	16.2	1.8	0	0	0			
BH 3	180	0	0	16.2	1.8	0	0	0			
	0	-0.1	-0.3	20.1	0	0	0	0	5.36		depth of BH = 10.13m
	15	0	0.1	18.6	0.5	0	0	0			
	30	0	0.1	18.1	0.6	0	0	0			
	45	0	0.1	17.8	0.7	0	0	0			
	60	0	0.2	17.8	0.8	0	0	0			
	90	0.1	0.3	17.8	0.8	0	0	0			
	120	0	0.1	17.8	0.8	0	0	0			
	150	0	0.2	17.8	0.8	0	0	0			
BH 4	180	0	0	17.8	0.8	0	0	0			

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Arkwright Road, Hampstead	Job No:	CG/5595
Date:	7.9.11	Engineer:	ASB
Time:	08:00	Client	Ironside & Malone Design & Build

METEOROLOGICAL & SITE INFORMATION

State of ground:		Dry	x	Moist		Wet		
Wind:		Calm		Light	x	Moderate		Strong
Cloud cover:		None		Slight	x	Cloudy		Overcast
Precipitation:	x	None		Slight		Moderate		Heavy
Barometric pressure (mb):	1001/1000/999				Air temperature (oC):			

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O_2 (% vol. in air)	CO_2 (% vol. in air)	CH_4 (% vol. in air)	H_2S (ppm)	PID (ppm)	Depth to GW (mbgl)	Free product (mm)	Comments
	0	0.2	0.6	19.3	0.1	0	0		4.78		depth of BH = 11.00m
	15	-0.4	-1.5	18	2.9	0	0				
	30	0	0.2	15.7	3.9	0	0				
	45	0.2	0.6	14.9	4.2	0	0				
BH 1	60	-0.2	-0.8	14.7	4.2	0	0				
	90	0	0	14.7	4.2	0	0				
	120	0.3	1.3	14.7	4.2	0	0				
	150	0	0	14.7	4.2	0	0				
	180	-0.2	-0.6	14.7	4.1	0	0				
	0	0	0	20.7	0.1	0	0		3.39		depth of BH = 4.86m
	15	0	0.1	19.6	0.9	0	0				
	30	0	0	19.1	1	0	0				
	45	0	-0.1	19.2	1	0	0				
	60	0	0	19.9	0.6	0	0				
	90	0	0	20.3	0.5	0	0				
	120	0	-0.3	20.5	0.3	0	0				
	150	-0.1	-0.4	20.8	0.2	0	0				
BH 2	180	0	0	20.8	0.2	0	0				
	0	0	0	19	1.1	0	0		5.6		depth of BH = 8.15m
	15	0	0	18.6	1.1	0	0				
	30	0	0	16	2.7	0	0				
	45	0	0	15.2	2.3	0	0				
	60	0	0	14.7	2.7	0	0				
	90	0	0	15.4	2.4	0	0				
	120	0	0	15.9	2.2	0	0				
	150	0	0	13.4	4.1	0	0				
	180	0	0	15.1	3.6	0	0				
	210			14.8	2.8	0	0				
BH 3	240	0	0	14.7	3.4	0	0				
	0	0.2	0.9	19.2	0.7	0	0		5.34		depth of BH = 10.00m
	15	0.1	0.4	18	0.9	0	0				
	30	0.5	1.9	17.7	1	0	0				
	45	0	-0.2	17.7	1	0	0				
	60	0	0	17.5	1	0	0				
	90	0.2	0.7	17.5	1	0	0				
	120	0.2	0.9	17.5	1	0	0				
	150	0	0.1	17.5	1	0	0				
BH 4	180	0.1	0.3	17.5	1	0	0				

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Arkwright Road, Hampstead	Job No:	CG/5595
Date:	15.9.11	Engineer:	ADC
Time:	10:00	Client	Ironside & Malone Design & Build

METEOROLOGICAL & SITE INFORMATION

State of ground:		Dry	x	Moist		Wet		
Wind:		Calm	x	Light		Moderate		Strong
Cloud cover:		None	x	Slight		Cloudy		Overcast
Precipitation:	x	None		Slight		Moderate		Heavy
Barometric pressure (mb):	1009				Air temperature (oC):			

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O_2 (% vol. in air)	CO_2 (% vol. in air)	CH_4 (% vol. in air)	H_2S (ppm)	PID (ppm)	Depth to GW (mbgl)	Free product (mm)	Comments
BH 1	0	-0.1	-0.4	20.3	0	0	0	-	4.83		depth of BH = 11.00m
	15	0	0	20.8	0	0	0				
	30	0	0	21	0	0	0				
	45	0	0	19.8	1	0	0				
	60	0	0	18.2	1.8	0	0				
	90	0	0	17.2	2.1	0	0				
	120	0	0	17	2.1	0	0				
	180			16.8	2.4	0	0				
BH 2	0	0	-0.1	20.4	0	0	0	-	3.71		depth of BH = 4.86m
	15	0	0	17.8	1.5	0	0				
	30	0	0	18.2	1.3	0	0				
	45	0	0	18.6	1.1	0	0				
	60	0	0	18.9	1	0	0				
	90	0	0	19.3	0.8	0	0				
	120	0	0	19	0.6	0	0				
BH 3	0	0	0.2	20.5	0	0	0	-	5.6		depth of BH = 8.15m
	15	0	-0.2	20.6	0.1	0	0				
	30	0	-0.2	20.8	0	0	0				
	45	0	-0.2	21	0	0	0				
	60	0	-0.2	21	0	0	0				
	90	0	-0.1	21	0	0	0				
	120	0	-0.1	21	0	0	0				
	180			20	0.1	0	0				
BH 4	0	-0.4	-1.5	20.4	0	0	0	-	5.5		depth of BH = 10.00m
	15	0	-0.2	20.3	0.3	0	0				
	30	0	0	20.4	0.3	0	0				
	45	0	0	20.8	0	0	0				
	60	0	0	20.8	0	0	0				
	90	0	0	21	0	0	0				
	120	0	0	21	0	0	0				
	180	0	0	21	0	0	0				

APPENDIX I

Rising head test records

Rising Head Test - BH01

9 Arkwright Road, Hampstead
CG/5595
7th September 2011

Time (mins)	Time(s)	Depth (m)	H (m)	H/Ho
0	0	5.44	-0.66	1
1	60	5.34	-0.56	0.848485
2	120	5.31	-0.53	0.80303
3	180	5.28	-0.5	0.757576
4	240	5.23	-0.45	0.681818
5	300	5.18	-0.4	0.606061
6	360	5.15	-0.37	0.560606
7	420	5.12	-0.34	0.515152
8	480	5.1	-0.32	0.484848
10	600	5.04	-0.26	0.393939
15	900	4.97	-0.19	0.287879
25	1500	4.9	-0.12	0.181818
46	2760	4.84	-0.06	0.090909
62	3720	4.84	-0.06	0.090909
75	4500	4.83	-0.05	0.075758

General Case

F	0.1375	intake Factor - Fig 6 BS5930
D	0.05	m - Diameter of standpipe
H1	-0.56	m
H2	-0.06	m
t1	60	s
t2	3720	s
A	0.001963495	m2
BH depth	11	m
k	8.71465E-06	m/s

Basic Time Lag Method

T	650	Basic Time Lag - from graph (s)
k	2.19692E-05	m/s

Rising Head Test - BH02

9 Arkwright Road, Hampstead
CG/5595
7th September 2011

Time (mins)	Time(s)	Depth (m)	H (m)	H/Ho
0	0	3.85	-0.46	1
1	60	3.84	-0.45	0.978261
2	120	3.84	-0.45	0.978261
3	180	3.83	-0.44	0.956522
4	240	3.83	-0.44	0.956522
5	300	3.83	-0.44	0.956522
6	360	3.82	-0.43	0.934783
7	420	3.82	-0.43	0.934783
8	480	3.81	-0.42	0.913043
9	540	3.81	-0.42	0.913043
10	600	3.81	-0.42	0.913043
15	900	3.8	-0.41	0.891304
25	1500	3.79	-0.4	0.869565
35	2100	3.78	-0.39	0.847826
60	3600	3.75	-0.36	0.782609
80	4800	3.72	-0.33	0.717391
95	5700	3.67	-0.28	0.608696

General Case

F	0.1375	intake Factor - Fig 6 BS5930
D	0.05	m - Diameter of standpipe
H1	-0.45	m
H2	-0.33	m
t1	60	s
t2	4800	s
A	0.001963495	m2
BH depth	4.86	m
k	9.34E-07	m/s

Basic Time Lag Method

T	n/a	Basic Time Lag - from graph (s)
k	n/a	m/s

Rising Head Test - BH03

9 Arkwright Road, Hampstead
CG/5595
7th September 2011

Time (mins)	Time(s)	Depth (m)	H (m)	H/Ho
0	0	7.23	-1.63	1
1	60	7.23	-1.63	1
2	120	7.23	-1.63	1
3	180	7.225	-1.625	0.996933
4	240	7.225	-1.625	0.996933
5	300	7.22	-1.62	0.993865
6	360	7.22	-1.62	0.993865
7	420	7.22	-1.62	0.993865
8	480	7.22	-1.62	0.993865
9	540	7.22	-1.62	0.993865
10	600	7.22	-1.62	0.993865
15	900	7.22	-1.62	0.993865
20	1200	7.22	-1.62	0.993865
30	1800	7.22	-1.62	0.993865
45	2700	7.22	-1.62	0.993865
60	3600	7.215	-1.615	0.990798

General Case

F	0.1375	intake Factor - Fig 6 BS5930
D	0.05	Diameter of standpipe
H1	-1.63	m
H2	-1.62	m
t1	60	s
t2	2700	s
A	0.001963495	m2
BH depth	8.15	m
k	3.33E-08	m/s

Basic Time Lag Method

T	n/a	Basic Time Lag - from graph (s)
k	n/a	m/s

Rising Head Test - BH04

9 Arkwright Road, Hampstead
CG/5595
7th September 2011

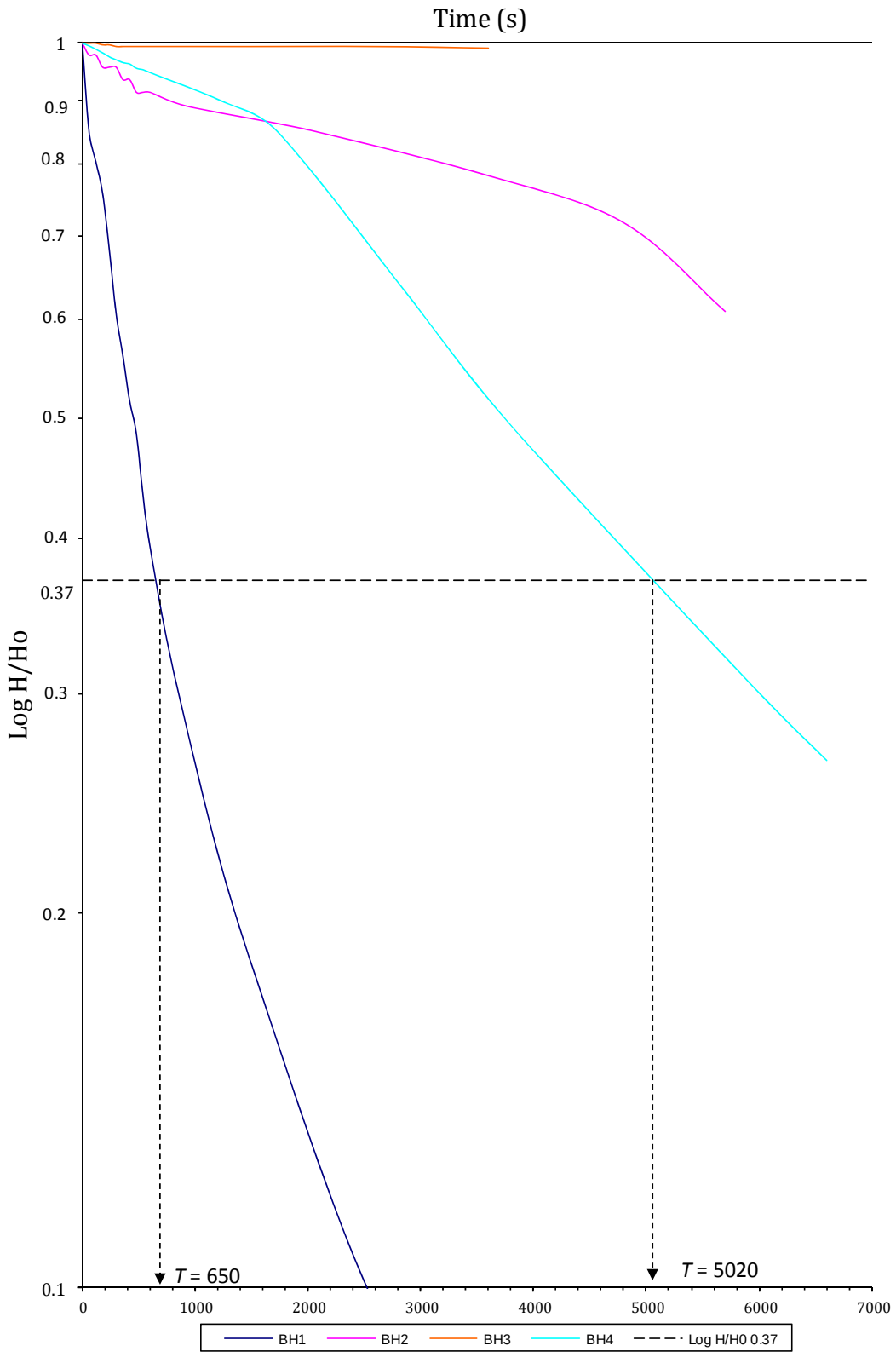
Time (mins)	Time(s)	Depth (m)	H (m)	H/Ho
0	0	9.3	-3.96	1
1	60	9.28	-3.94	0.994949
3	180	9.23	-3.89	0.982323
4	240	9.2	-3.86	0.974747
5	300	9.18	-3.84	0.969697
6	360	9.16	-3.82	0.964646
7	420	9.15	-3.81	0.962121
8	480	9.12	-3.78	0.954545
9	540	9.11	-3.77	0.95202
10	600	9.09	-3.75	0.94697
21	1260	8.89	-3.55	0.896465
29	1740	8.695	-3.355	0.847222
47	2820	7.87	-2.53	0.638889
60	3600	7.39	-2.05	0.517677
76	4560	6.98	-1.64	0.414141
100	6000	6.53	-1.19	0.300505
110	6600	6.39	-1.05	0.265152

General Case

F	0.1375	intake Factor - Fig 6 BS5930
D	0.05	Diameter of standpipe
H1	-3.96	m
H2	-1.19	m
t1	0	s
t2	6000	s
A	0.001963495	m2
BH depth	10	m
k	2.86E-06	m/s

Basic Time Lag Method

T	5020	Basic Time Lag - from graph (s)
k	2.84E-06	m/s



Client	Project	Job No
Ironside & Malone Design & Build Ltd	**9 Arkwright Road, Hampstead, London**	**CG/5595**
CGL	Title: **Log H/Ho versus time**	**Appendix I**