GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

43a Redington Road, London, NW3 7RA

Geotechnical Interpretative Report

Report/Project No: 2021-028-SYM-RED

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Geofirma Ltd
The Old Bank
153 The Parade
High Street
Watford
WD17 1NA

020 3432 3695
geofirmaconsultants.co.uk

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Signature				
Checked by	Ebenezer Adenmosun	Ebenezer Adenmosun		
Signature				
Authorised by	Ebenezer Adenmosun	Ebenezer Adenmosun		
Signature				
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PREAMBLE

The work undertaken to provide the basis of this report comprised a study of the available documented information from a variety of sources, together with (where appropriate) meetings and discussions with relevant authorities and other interested parties. The information reviewed should not be considered exhaustive and has been accepted in good faith by Geofirma Ltd as providing a true description of site conditions. However, no liability can be accepted for the detailed accuracy or otherwise of any of the reports or documents prepared by others for the Client or for third parties, or for any associated errors or omissions.

The investigation of the site has been carried out to provide information concerning the ground conditions to allow a reasonable site assessment to be made.

The exploratory holes undertaken during the fieldwork only represent a small volume of the ground in relation to the size of the site and can therefore only provide a general indication of the site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised variations in the ground condition or 'hot spots' of contamination where elevated levels of contaminants may be significantly higher than those encountered. It should be noted that this ground investigation comprises 2No window sample boreholes and 2No hand dug trial pits. A desk study was undertaken to assess historical risks, however, no liability for unforeseen geotechnical or contamination hazards can be accepted by Geofirma Ltd.

The comments and recommendations given in this report are based on the ground conditions apparent at the borehole and inspection pit locations. It is likely ground conditions elsewhere on the site have not been disclosed by this investigation and have therefore not been included in this report.

The comments made on groundwater conditions are based on observations made at the time that site works were undertaken. It should be noted that groundwater levels can vary owing to seasonal or other effects, and additional groundwater measurements should be conducted immediately prior and during the construction works.

In relation to asbestos, we are unable to accept the associated liability as indemnity covering asbestos related matters is restricted from our policy. This is typically the industry norm. If we do find or suspect the presence of asbestos, we will state in the exploratory logs and notify the client, and it will be their responsibility to engage a specialist contractor to investigate the issue further.

The scope of the investigation was decided in consultation with the Client and the limitations of which were made clear. This report is produced solely for the use of the Client and his/her agent and should not be relied upon in any way by any third party.

TABLE OF CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

1.1 APPOINTMENT AND BRIEF SITE SUMMARY

Geofirma Ltd has been appointed by Symmetrys Ltd, on behalf of Joelle and Josef Fuss to carry out a ground investigation at 43a Redington Road, London, NW3 7RA to provide geotechnical information for the construction of the proposed basement extension and internal alterations to a 4-storey building.

The Site is located in the London Borough of Camden, some 575 m to the west of Hampstead town centre and underground station and at its nearest point is approximately 400 m from Hampstead Heath. The Site is generally rectangular in shape with its long axis generally orientated northeast / southwest and occupies an area of approximately 0.11ha.

The site is located on a grid reference TQ257858.

1.2 REPORT CONTEXT

The current proposal for the redevelopment is understood to comprise refurbishment of the existing 4-storey building, with the extension and deepening of the one-storey basement to the rear and side and internal alterations.

The purpose of this report is to present the findings of the ground investigation and geotechnical advice to aid with the assessment of the suitability of the existing foundations and determine the ground and groundwater conditions to assist in the design and construction of the basement.

1.3 OBJECTIVES AND METHODOLOGY

The objectives of this report are to provide information on the following areas:

- Geology of the site;
- To record details of the ground investigation works undertaken;
- To discuss site groundwater and ground conditions established from the intrusive works;
- To derive geotechnical parameters to inform the design of a suitable foundations to the proposed basement; and
- Present geotechnical advice on other ground related issues.

2. SITE DETAILS

2.1 SITE LOCATION AND DESCRIPTION

The site summary is in Table 1 below:

Table 1: Site Summary

Location	The Site is located in Hampstead, some 575 m to the west of Hampstead town centre and underground station and at its nearest point is approximately 400 m from Hampstead Heath.
Full Address	43a Redington Road, London NW3 7RA.
Grid Reference	TQ257858.
Area & Shape	The Site is generally rectangular in shape with its long axis generally orientated northeast / southwest and occupies an area of approximately 0.11ha.
Development Proposals	The development shall comprise a basement extension and internal alterations to a 4-storey building.

2.2 GEOLOGY

The published geology based on the British Geological Survey (BGS) map 1:50,000 geological map series, solid and drift Ref. 1, indicates the site is underlain directly by the Claygate Member of the London Clay Formation. This geological sequence is also confirmed by the BGS boreholes included in the desk study report titled ‘‘Phase 1 Desk Study and Preliminary Risk Assessment Report No: 2021/028/SYM/RED/Rep.001’’. The geological sequence is summarised in **Table 2** below.

Table 2: Summary of Published Geology

Geological Unit	Description	Composition	BGS Lexicon Description
Superficial	None	-	-
Bedrock	Claygate Member of the London Clay Formation	Clay, silt and sand	Comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.

3. GROUND INVESTIGATION

3.1 FIELDWORK

The investigation was carried out between 1st and 2nd July 2021 by Geofirma Ltd and comprised the following:

- The drilling of two (2No.) window sample boreholes (numbered BH1 and BH2) on the site to depths varying between 6.45 m and 7.45 m below ground level (bgl). These were sunk to confirm the ground and groundwater conditions and permit in-situ geotechnical testing and sampling of the strata encountered;
- Hand dug inspection pit preceded all the drilling works. The trial hole TP1 and TP2 were dug to expose the existing foundation solution and to inform the party wall sections of the redevelopment;
- Installation of monitoring standpipes within all window sample boreholes to monitor groundwater; and
- Standard Penetration Tests (SPTs) were performed in all the window sample boreholes together with sampling at varying intervals to provide an indication of soil density/strength.

The fieldwork was supervised on a full-time basis by an Engineer from Geofirma Ltd with due regard to existing standards and guidelines including BS EN 1997-2 (2005), BS 5930 (2015), BS EN ISO 22476-3 (2011) and TRL PR/INT/277 (2004). All soil description and sample logging were carried out in accordance with BS 5930:2015 and BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. The exploratory hole records are included in Appendix A prepared by Geofirma Ltd.

The locations of the exploratory holes are shown in Appendix B.

Disturbed samples were recovered from the exploratory holes as necessary to facilitate sample description and for subsequent laboratory testing.

Observations of groundwater encountered during the fieldwork are included on the relevant exploratory hole logs.

3.2 LABORATORY TESTING

Routine geotechnical laboratory testing comprising Moisture Content (MC), Atterberg Limits, Particle Size Distribution Determination (PSD), Quick Undrained Triaxial Testing and BRE sulphate testing was carried out on representative samples of all materials recovered from the exploratory holes. The laboratory results are presented in Appendix C.

Chemical and WAC testing were also performed on selected samples of Made Ground obtained during the ground investigations.

3.3 GROUNDWATER MONITORING

Following the completion of ground investigation works, a groundwater monitoring visit was carried out on a single occasion in all the drilled boreholes. The groundwater monitoring visit was undertaken on the 10 August 2021 which recorded water levels at 4.04 m and 1.01 m bgl within BH1 and BH2 respectively. Based on the ground levels estimated from the topographical survey it would appear the groundwater level relative to the site datum are the same at approximate 8.8 m (to the relative site datum).

4. GROUND CONDITIONS

4.1 INTRODUCTION

Full details of the ground conditions encountered are presented on the exploratory hole records included in Appendix A.

Table 3: Proven Ground Conditions

Strata	Depth to Top (m bgl)	Thickness (m)	Exploratory Holes
Made Ground	0.00	0.60 – 1.40	All
Claygate Member	0.60 to 1.40	0.40 – 5.70	All
London Clay Formation (possible)	5.50 to 6.30	0.95 – 1.15 (Full thickness unproven)	All exploratory holes except TP1 and TP2

4.2 MADE GROUND

Made Ground was encountered in all the exploratory holes excavated on site and was highly variable. Typically, the shallow Made Ground encountered comprised concrete/paving slab over dark brown clayey slightly gravelly Sand. The gravel consists of angular to subangular flint, brick, concrete and tile.

Based on the description of the material and inference from BS8002, a unit weight of 18 kN/m^3 is assumed suitable for this material. Based on the descriptions of the material being predominantly granular an angle of friction of 28° is deemed acceptable for design purposes.

Three samples were recovered from BH1 at depths of between 0.50 to 1.20 m bgl within the Made Ground, to determine its moisture contents. The results ranged between 22% to 62% indicative of a general trend of gradual increase in moisture content within the Made Ground with depth. The high moisture content of 62% measured at 1.20 m bgl is considered anomalous and possibly associated with the seepage recorded at 2.30 m within this same borehole.

Atterberg limit test was also performed on a selected sample within BH1 at 1.20 m bgl. The result of the test recorded liquid limit of 32%, plastic limit of 19% with plasticity index of 13, indicative of clay of low plasticity. The modified plasticity index is 13 which suggests a low soil material.

Based on the material description the Youngs Modulus of the Made Ground has been assumed to be 5 MPa for the purposes of the settlement assessment.

4.3 CLAYGATE MEMBER

4.3.1 General Classification

Beneath the Made Ground, a stratum interpreted as Claygate Member was encountered in all the exploratory boreholes. It generally comprised soft (becoming firm at 2.00 m bgl) orange, brown mottled grey clayey sandy slightly gravelly SILT or silty slightly sandy CLAY. Rare bands of brown silty sand were noted in BH1 and BH2. At shallow depth where gravel was encountered in BH2 and TP1, it was described as comprising medium to coarse, rounded flint.

4.3.2 Moisture Contents

17No. natural moisture contents were measured on samples taken from depths ranging between 0.70 m and 4.60 m bgl with values ranging between 23% and 37%.

4.3.3 Particle Size Distribution (PSD)

Particle Size Distribution (PSD) test was carried out on three bulk samples of the Claygate Member recovered from BH1 and BH2.

Table 4: Laboratory Testing for PSD

Exploratory Hole	Sample Type	Depth (m bgl)	Geology
BH1	Bulk	3.60	Claygate Member
BH2	Bulk	1.80	Claygate Member
BH2	Bulk	5.00	Claygate Member

The results indicate the recovered samples are either clayey very silty SAND with rare fine gravel or very sandy CLAY/SILT with rare fine gravel. The grading envelope is included within Appendix D. Table 5 below summarises the PSD result.

Table 5: Results of the Grading Analysis

Exploratory Hole	Depth (m bgl)	Composition (%)					Uniformity Coefficient
		Clay	Silt	Sand	Gravel	Cobbles	
BH1	3.60	10.9	27.7	60.5	0.9	0.0	52
BH2	1.80	53.0		45.5	1.5	0.0	Not calculated
BH2	5.00	7.9	21.7	70.4	0.0	0.0	53

The curvature coefficients for the above grading analysis were determined as 1.3, 0 and 9.8 respectively. Given the uniformity coefficients determined from the grading curve, the

granular soil sample recovered from the Site is classified as multi-graded material in accordance with BS EN ISO 14688-2:2004.

Atterberg limit tests were also performed on selected samples within the boreholes at depths of between 1.10 and 6.00 m bgl. The result of the test recorded liquid limits of 32% to 49%, plastic limits of 21% to 23% with plasticity indices of 11 and 27, indicative of clay of low to intermediate plasticity. All samples passed through the 425µm sieve and therefore, there is no requirement to modify plasticity indices.

4.3.4 Strength Characteristics

Standard Penetration Testing was carried out and the uncorrected SPT 'N' Values were recorded on the exploratory hole records. The data indicates a general trend of increasing N-value with depth.

Undrained triaxial tests have been undertaken on representative sample of the Claygate Member recovered. The undrained shear strength of 130 kPa recorded in the laboratory for a sample retrieved in BH1 at 3.60 m bgl is considered anomalous and is likely to be due to gravel content within material.

Shear strengths were also derived from SPT 'N' using the empirical formula Cu = 5*N (Stroud and Butler (1975) and CIRIA 143 Ref. [2]).

Based on the data the following undrained shear strength vs depth relationship has been adopted as shown in Figure 3:

$C_u = 35 + 6.7z$ (z = depth below the surface of the Claygate Member)

4.3.5 Frictional Angle

A significant amount of geotechnical data relating to the Claygate Member is available from historical archives. Furthermore, four Atterberg limit test results have been obtained for samples retrieved within the Claygate Member to determine the index properties of the soil, and hence derive the characteristic critical state effective angles of friction using guidelines from BS8002 (2015). The critical state angles of friction derived based on the plasticity indices yielded values of between 24° and 29°. However, angle of friction of 27° is considered representative for this material. The worst case characteristic critical state effective cohesion *c'* is assumed to be zero.

4.3.6 Young Modulus/Compressibility

The value of undrained Young's Modulus, E_u, of more competent Claygate Member can be determined by using SPT 'N' values and CIRIA recommendations as Ref. [3] states for design purposes of shallow foundations, the relationship of $E_u = 600C_u$ is a reasonable estimation of the small strain range of stiffnesses used for the calculation of lateral movements associated with retaining wall movements. . Since the movements associated with foundations are due

to larger strains and the stiffness of soil is strain dependant a reduced Eu = 300 Cu should be adopted for calculation of foundation settlements.

Therefore for retaining wall analysis and the GMA assessment an E_u = 21 +4z in MPa (with z measured from from the surface of the is recommended for shallow foundation design purposes. Assuming a Poisson's ratio (ν') of 0.15, an *E'* (drained Young modulus) of 0.75* E_u should be adopted. The relationship *E'* =15.75 +3*z in MPa is therefore recommended.

For foundation settlements computation an E_u = 11.5 +2z in MPa (with z measured from from the surface of the is recommended for shallow foundation design purposes. Assuming a Poisson's ratio (ν') of 0.15, an *E'* (drained Young modulus) of 0.75* E_u should be adopted. The relationship *E'* =7.9 + 1.5 *z in MPa is therefore recommended.

The coefficient of compressibility (m_v) has been estimated for the underlying Claygate Member based on the expressions:

$$m_v = 1/f_2 Nm^2/MN$$

Based on the above correlation a m_v value of 0.3 m^2/MN has calculated. This value seems fairly conservative bearing in mind the existing building on the site has been on the site for over 100 years and no signs of settlement distress were noted. Hence taking experience into account experience an m_v value of 0.15 m^2/MN is deemed realistic for the estimation of settlement under loadings.

4.3.7 General Groundwater Regime

Groundwater was encountered in boreholes BH1 and BH2 during drilling at 4.41 m and 4.00 m bgl respectively. It is suspected that the groundwater encountered during the drilling works may have led to the low SPT values recorded within the boreholes drilled across site.

Groundwater monitoring installations were placed in boreholes BH1 and BH2 with water levels of 4.04 m bgl and 1.01 m bgl measured respectively on the 10 August 2021.

Groundwater levels are susceptible to seasonal fluctuations and may be higher during wetter periods than dryer periods.

4.4 LONDON CLAY FORMATION (WEATHERED)

4.4.1 General Classification

Beneath the Claygate Member, a stratum interpreted as weathered London Clay Formation was encountered in the BH1 and BH2 at depths of between 5.50 m bgl and 6.30 m bgl. The full thickness of the material was unproven up to the maximum drilled depth of 7.45 m bgl at which depth the boreholes were terminated. The probable weathered portion of the stratum was described as generally comprising firm grey mottled brown silty CLAY with rare partings of silt and sand. However, the SPT results indicate that the cohesive stratum encountered were at least stiff.

Based on the description on the laboratory test results carried out within this material at 6.60 m bgl, a bulk unit weight of 19 kN/m^3 was recorded. Based on the descriptions of the material being predominantly cohesive and well documented data about London Clay Formation, an effective critical state angle of friction of 24° is deemed acceptable for design purposes.

At 6.60 m bgl, natural moisture content was measured on the same sample to determine its moisture contents. A result of 29% was recorded.

An undrained triaxial test carried on representative sample of the weathered London Clay Formation recorded 60 kPa, indicative of medium strength clay.

Based on the strength data the Undrained and drained Young's Moduli are assumed to be 36 MPa and 27MPa at the surface of the clay, respectively. An m_v value 0.1 m/MN has been assumed for the purposes of the settlement assessment.

4.5 SUMMARY OF GEOTECHNICAL PARAMETERS

Based on the ground investigation and laboratory testing, the following design parameters have been derived and presented in Table 6 below. These may be relied upon in the design of geotechnical structures.

Table 6: Summary of Geotechnical Parameters

Stratum	Typical thickness Range (m)	Bulk Density (kN/m^3)	C_u (kN/m^2)	Φ'_{cv} (°)	m_v (m^2/MN)	$E_{u\ wall}$ (MN/m^2)	$E_{u\ settlemsnt}$ (MN/m^2)	E'_{wall} (MN/m^2)	$E'_{settlemsnt}$ (MN/m^2)
Made Ground	0.60 – 1.40	18	-	28	-	-	-	5	10
Claygate Member	0.40 - 5.70	19	35+6.7z	27	0.15	21+4z	11.5+2z	15.75+3z[1]	7.9+1.5z
London Clay Formation (Properties at surface)	0.95 – 1.15 (Full thickness unproven)	19	60	24	0.1	36	18	27	13.5

(1) z is measured from the top of the Claygate Member

5. ENGINEERING CONSIDERATIONS

5.1 FOUNDATION DESIGN ISSUES

5.1.1 Introduction

The existing foundations are located within the shallow Claygate Member; however, it is important to note that there has been construction and demolition works on the site since early 1915 (based on the historical maps) and hence the shallow Claygate Member has likely undergone consolidation and strengthened under the building foundations loads in that time.

A conservative undrained shear strength (C_u) of 35 kPa at the surface of the clay has therefore been assumed in the assessment of the allowable bearing capacity at the site. The expression used to determine the allowable bearing capacity of foundations in clay is:

$$\mathbf{q_{all} = N_c\, d_c\, S_c\, Cu\ /\ FOS + q}$$

N_c = Bearing capacity factor corrected for depth/breadth ratio and shape factor (see fig.1)

Cu = Undrained shear strength

FOS = Factor of safety = 3

q = Overburden above foundation formation level

Fig.1 Bearing Capacity Factor after Skempton

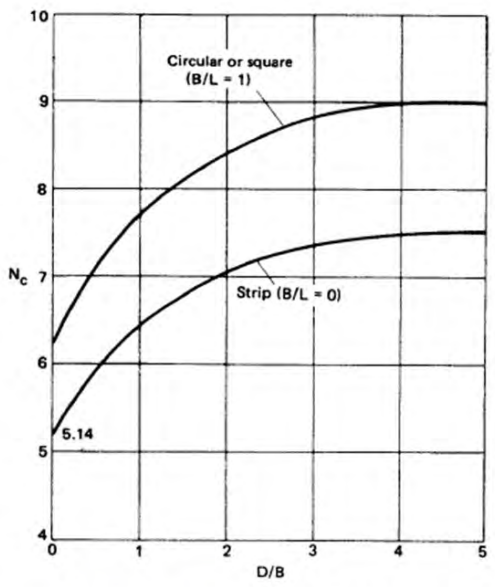

Figure 8.5 Skempton's values of N_c for $\phi_u = 0$. (Reproduced from A.W. Skempton (1951) *Proceedings of the Building Research Congress*, Division 1, p. 181, by permission of the Building Research Establishment, © *Crown copyright*.)

Table 7: Summary of Assessment of Allowable Bearing Capacity

Depth below ground level (base of footing)	**1.0 m**	**1.5 m**	**2.0 m**
Foundation Width (m)	0.6	0.6	0.6
Undrained Shear Strength Cu (kN / m²)	35	40	45
Overburden Pressure (kN / m²)	19.0	28	38.0
Allowable Bearing Capacity (kN / m²) (assuming foundations are a 0.6 m strip and FOS = 3)	95	125	145

As part of this redevelopment new foundations may be required and existing foundations may have to be underpinned to form the basement boundary walls. Based on the available load takedown sketches provided by Symmetrys (21141-SK02-Rev P3 dated 20/08/2021 in appendix E). The sketch indicates most of the existing walls shall be left in place with only small increases in the current loads (5kN/m or 10 kN/m). In the redeveloped building there are approximately 4 new walls with the most heavily loaded wall exerting a maximum load of 105 kN/m at formation level. It is important to note this load is considerable less than the loads currently acting on the current foundations as the maximum estimated load is approximately 165 kN/m. This implies that bearing capacity is unlikely to be an issue. This observation also indicates the undrained shear strengths assumed from the ground investigation of the Claygate Beds is conservative because even if the estimated loads were

half the estimated 165 kN/m, with an assumed factor of safety of 3, the undrained shear strength is still nearly double that assumed in Table 7.

Based on the assumption above concerning the allowable bearing capacity, the differential settlements relative to the new and old walls are probably of more importance on this scheme. Using reasonable parameters, the anticipated settlement under the new load is not anticipated to exceed 10-15 mm. Of this up to 50% of the settlements are expected to be instantaneous, and the remaining likely to take place over the design life of the structure. This should be with within the tolerance of the existing structure, because the structural integrity of the building appears to be sound.

5.2 PROPOSED BASEMENT EXTENSION

For the proposed basement extension, the foundations are likely to be in the Claygate Member of the underlying London Clay Formation.

To ensure the foundations for structures founded in the Claygate Member are economical, the depth to suitable founding material must be confirmed on site by a suitably experienced Geotechnical Engineer or Engineering Geologist.

5.3 BASEMENT CONSTRUCTION

Current information indicates the basement depth will be increased by a maximum of 2.7 m. Based on the ground investigation data available, the base of the structure is anticipated to be in the Claygate Member. Groundwater monitoring undertaken at the site has indicated groundwater was present at a datum level of 8.8 m which is approximately 1 m below the anticipated dig level. It is assumed perched or trapped water maybe present within granular lenses of the Claygate Bed and hence groundwater inflows may occur into the excavation If flows of groundwater are encountered during the excavation of the basement, ingress should be controllable by sump pumping. It is however recommended additional groundwater monitoring visits are performed, especially following periods of heavy rainfall to assess the likely highest water levels likely to occur during the construction of the basement.

Suitable geotechnical parameters to use in the design of the basement walls can be obtained from Table 6.

The basement is to be constructed adjacent to neighbouring building foundations of 41 and 45 Redington Road. In order to negate the impact of excavation induced ground movements temporary propping or the use of excavation supports maybe necessary. If the basement is to be constructed using underpinning methods it is imperative that the works are undertaken by an experience contractor with experience of using the technique in similar ground conditions.

5.4 EXCAVATIONS

Excavation of the materials encountered during the ground investigation should be easily achieved using conventional digging techniques.

Care should be taken to limit the exposure of any excavation surface before the actual placement of the concrete as groundwater or rainwater could result in deterioration of the formation surface. Foundation excavations should be inspected by qualified personnel and any soft or loose materials that are encountered should be removed and replaced with a blinding layer as quickly as possible.

Based on the findings of this investigation, groundwater seepages may occur locally in shallow temporary excavations. Any localised ingress should be controllable by sump pumping, if required.

5.5 FLOOR SLABS

The ground bearing floor slabs may be suitable on site. Due to the anticipated levels of the basement slab, it is anticipated the slab will be founded in the Claygate Beds. Based on the Atterberg Limits the soil is classified as low to medium volumetric potential using the NHBC guidelines, however, the basement slab will be placed at depth and there are no trees close to the proposed foundations. It should be highlighted that the existing building has been in place for around 100 years and no signs of desiccation damage was observed.

5.6 PAVEMENT DESIGN

In the absence of CBR test results, site observations suggest that where encountered, natural granular materials are likely to have minimum CBR values of 2%. If less conservative CBR values are required for road and pavement design in situ CBR tests should be performed.

5.7 CONCRETE SULPHATE RESISTANCE

Soil samples were tested for sulphates from two of the exploratory holes at depth of between 0.70 m bgl and 1.20 m bgl with the water-soluble sulphate values varying between 70 mg/l and 110 mg/l. Hence in accordance with BRE Guidance Special Digest 1:2005, and assuming mobile groundwater and brownfield location, a Design Sulphate Class of DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1 should be used for the design of buried concrete structures at the site.

The pH values of the retrieved soils indicate near neutral to alkaline conditions on site. The result has been included in Appendix C of this report.

5.8 CONTAMINATION ASSESSMENT

5.8.1 Introduction

A phase 1 desk study including site walkover and preliminary risk assessment was undertaken in July 2021.

The desk study identified a number of potentially significant pollutant linkages classified with very low risk. A suitable scheme of environmental testing was subsequently developed and carried out during the geotechnical investigation.

A tier 1 quantitative risk assessment has been undertaken by screening measured contaminant concentrations against available reference values. Concentrations of contaminants exceeding the relevant reference values are described as 'elevated' and indicate a requirement to for further assessment or mitigation measures.

Historical development on the site and locally has generally been limited to use for residential. Some Made Ground is to be expected across the site given previous demolition and redevelopment which is confirmed by the presence of Made Ground encountered during the ground investigation. However, significant quantities of mobile or leachable contamination are not anticipated and risk to controlled waters is considered to be low.

In view of the proposed development, which includes residential dwellings including basement, private garden and public open space, a ''residential with consumption of homegrown produce'' end use conceptual model is deemed appropriate for the project site. However, it is likely as part of the proposed development, that the site will be either covered by hardstanding or the proposed construction, hence the main risk to human health will be to construction workers, rather than the end site users.

5.8.2 Human Health Risk Assessment

A Tier 1 (generic) quantitative risk assessment has been undertaken by screening measured contaminant concentrations derived from the exploratory investigation works against reference values for chronic (long term) risk to human health known as generic assessment criteria (GAC).

In line with the conceptual site model, GAC for the residential exposure scenario have been utilised. The GAC are based on 1% soil organic matter (SOM) as established by the testing.

The below contaminants have subsequently been targeted for chemical analysis.

Table 8: Summary of the Contamination Assessment – Soils

Determinant	Measured Concentration*		GAC (SOM 1%)	Number of results above GAC (No. of samples tested)
	Minimum	Maximum		
Arsenic	-	18	37	0 (2)
Cadmium	-	<0.2	22	0 (2)
Chromium (hexavalent)	-	<1.2	21	0 (2)
Chromium III	-	29	910	0 (2)
Copper	-	73	2400	0 (2)
Total Cyanide	-	<1.0	24	0 (2)
Lead	-	1500	200	1 (2)
Mercury	-	<0.3	40	0 (2)
Nickel	-	24	130	0 (2)
Selenium	-	<1.0	250	0 (2)
Zinc	-	220	3700	0 (2)
Total Phenols	-	<1.0	120	0 (2)
TOC	0.8	1.2	3[X]	0 (2)
Acenaphthene	-	1.4	210	0 (2)
Acenaphthylene	-	0.24	170	0 (2)
Anthracene	-	2.8	2400	0 (2)
Benzo(a)anthracene	-	10	7.2	1 (2)
Benzo(a)pyrene	-	8.5	5	1 (2)
Benzo(b)fluoranthene	-	8.0	2.6	1 (2)

Determinant	Measured Concentration*		GAC (SOM 1%)	Number of results above GAC (No. of samples tested)
	Minimum	Maximum		
Benzo(ghi)perylene	-	4.4	320	0 (2)
Benzo(k)fluoranthene	-	4.3	77	0 (2)
Chrysene	-	8.6	15	0 (2)
Dibenz(a,h)anthracene	-	0.96	0.24	1 (2)
Fluoranthene	-	19	280	0 (2)
Fluorene	-	1.1	170	0 (2)
Indeno(1,2,3-cd)pyrene	-	4.1	27	0 (2)
Naphthalene	-	<0.05	2.3	0 (2)
Phenanthrene	-	14	95	0 (2)
Pyrene	-	16	620	0 (2)
TPH	All fractions are either below laboratory limit of detection or their respective GAC			
Asbestos	None detected in sample			
**Concentration expressed in mg/kg except where listed*				
[X]Based on Insert Waste Landfill Acceptance Criteria				

Direct analysis of all the chemical assessment data indicates that all potential contaminants of concern are below their relevant GAC, with the exception of lead, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, and Dibenz(a,h)anthracene.

The elevated readings (see Table 8 above) recorded in BH1 (at 0.30 m bgl) is potentially associated with the anthropogenic materials (brick, concrete and tile fragments) within the shallow Made Ground. Accordingly, the elevated result poses a potential risk to site workers during construction with less likelihood to significantly impact the residential end users, thus, further assessment is recommended. Further assessment would be required in the vicinity of

BH1 to attempt to delineate the extent of potential contamination from lead, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, and Dibenz(a,h)anthracene.

In addition to the above contaminants, a sample was screened for asbestos due to the potential spread of asbestos from historic on-site development (existing building) and development on adjacent land. No asbestos fibres were detected in the sample scheduled for screening. Accordingly, the risk posed by asbestos within the shallow Made Ground is considered negligible on the basis of current information.

Based on the information, because the site is likely to be covered by the proposed building or hardstanding the risk of harm to human health via ingestion by future site users will be negligible. Based on the chemical test results the risk to construction works will be medium, however, PPE shall be worn to mitigate the risk and necessary COSHH assessment shall be performed in advance of the works.

A copy of the laboratory chemical assessment data is presented in Appendix C of this Report.

5.8.3 Hydrocarbons – Soils

No visual or olfactory indication of petroleum hydrocarbon contamination was noted during the investigation. However, as there is the potential for petroleum hydrocarbons to be present due to the adjacent development (Redington Road), a sample from BH1 (@ 0.30 m bgl) was scheduled for speciated petroleum hydrocarbon testing (TPH CWG) in order to evaluate any potential risks during the investigation.

The direct assessment of the chemical data for the speciated TPH (TPH CWG) indicates that the potential contaminants were either below the laboratory detection limit or significantly below their respective thresholds. This sample is considered to be representative of conditions on the site. Accordingly, no further assessment for petroleum hydrocarbon is considered necessary for the project.

5.8.4 Waste Acceptance Criteria (WAC)

WAC testing was carried out on a sample retrieved from the site BH2 in the Made Ground and all values were under the Inert Waste Landfill limit criteria. A copy of the WAC assessment data is presented in Appendix C of this Report.

However, it is recommended that the Contractor undertakes further testing during construction prior to removal of the spoil off site to classify the site soils to be transported to a suitably licenced landfill facility.

5.8.5 Qualitative Risk Assessment

A qualitative risk assessment has been formulated for the potential source-pathway-receptor linkages identified in the conceptual model. The risk assessment is based on the suggested approach set out in the available guidance Ref. 11. The guidance uses a combination of the likelihood of a pollution event to occur, taking account of the presence of a hazard (or source)

and integrity of a pathway versus the consequence of a pollution occurrence, which is essentially a measure of the severity of a hazard to an identified receptor (such as a principal aquifer or site end-user).

Table 4: Phase II Conceptual Site Model

Source	Pathway	Receptor	Consequence	Likelihood	Classification*	Rationale / Mitigation
Organic and inorganic contaminants potentially present in Made Ground	Dermal contact, ingestion, particulate inhalation	Nearby site occupants & users (from on-site sources) Future site occupants & users	Low to Medium	Unlikely	Low to moderate	No elevated results, and no asbestos, except elevated lead, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, and Dibenz(a,h)anthracene. Further sampling and speciated testing (TPH CWG) is recommended around BH1. Appropriate PPE to be worn by site workers and COSHH assessment to be carried out. Risk is considered low if PPE is worn and general hygiene rules are followed on site.. On completion of construction works site will be covered by building/hardstanding, hence risk to future site users will be low. Capping layer of clean imported material maybe required subject to future landscaping proposals.
	Diffusion through plastic water supply pipes	Water supply pipes	Low	Unlikely	Very Low	Relates to local deposits of Made Ground / fill associated with construction of foundations and hardstanding. No organics observed during the ground investigation or elevated TPH results so risk to water pipes is negligible.
	Leaching into groundwater; subsurface migration.	Secondary A Aquifer	Low to Medium	Unlikely	Low to moderate	Low permeability London Clay Formation underlying the Claygate Member is classed as unproductive strata and will restrict vertical migration of lead, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, and

Source	Pathway	Receptor	Consequence	Likelihood	Classification*	Rationale / Mitigation
						Dibenz(a,h)anthracene. The cohesive component of the Claygate Member is likely to further restrict lateral migration of contaminants as perched water encountered is unlikely to be in hydraulic continuity. The site is not designated to be within Groundwater Source Protection Zones within 2000m radius of site. Leachate testing recommended to confirm this assessment.
Made Ground: historic Infilled stream on central areas on-site	Accumulation of ground gases then by potential asphyxiation/ explosion	residential end users and construction workers	Low to medium	Unlikely	Very Low	No organics or odours detected during the ground investigation.
Potential asbestos containing materials in structure	Release of asbestos fibres; subsequent inhalation	Site occupants & users Construction workers	Low	Unlikely	Very Low to negligible	No asbestos encountered during the ground investigation. However, assumes if buildings are to be demolished, or if asbestos is encountered during ground works, controlled removal by licensed contractor following an asbestos survey, if required.

6. REFERENCES

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[3] Padfield C.J, and Sharrock M.J CIRIA Special Publication 27. Settlement of structures on clay soils, 1983 .

[4] Building Research Establishment, BRE Special Digest 1- Concrete in Aggressive Ground., London: BRE, 2005.

[5] British Standard Institution, BS 5930:2015, Code of Practice for Site Investigation., London: BSI, 2015.

[6] British Standard Institution, BS EN 1997_2 - Geotechnical Design Part 2: Ground Investigation, BSI, 2005.

[7] British Standard Institution, BS EN ISO 14688-2 2004 - Soil test principal of classification, BSI, 2004.

[8] British Standard Institution, BS EN ISO 22476 Part 3 2005 + A1 2011 - Geotechnical Field testing, Standard Penetration Test (SPT), BSI, 2011.

[9] British Standards Institution, BS10175:2011+A1:2013, Investigation of Potentially Contaminated Sites – Code of Practice and its Investigation, London: BSI, 2013.

[10] British Standards Institution, BS8004, Code of practice for foundation design, London: BSI, 2015.

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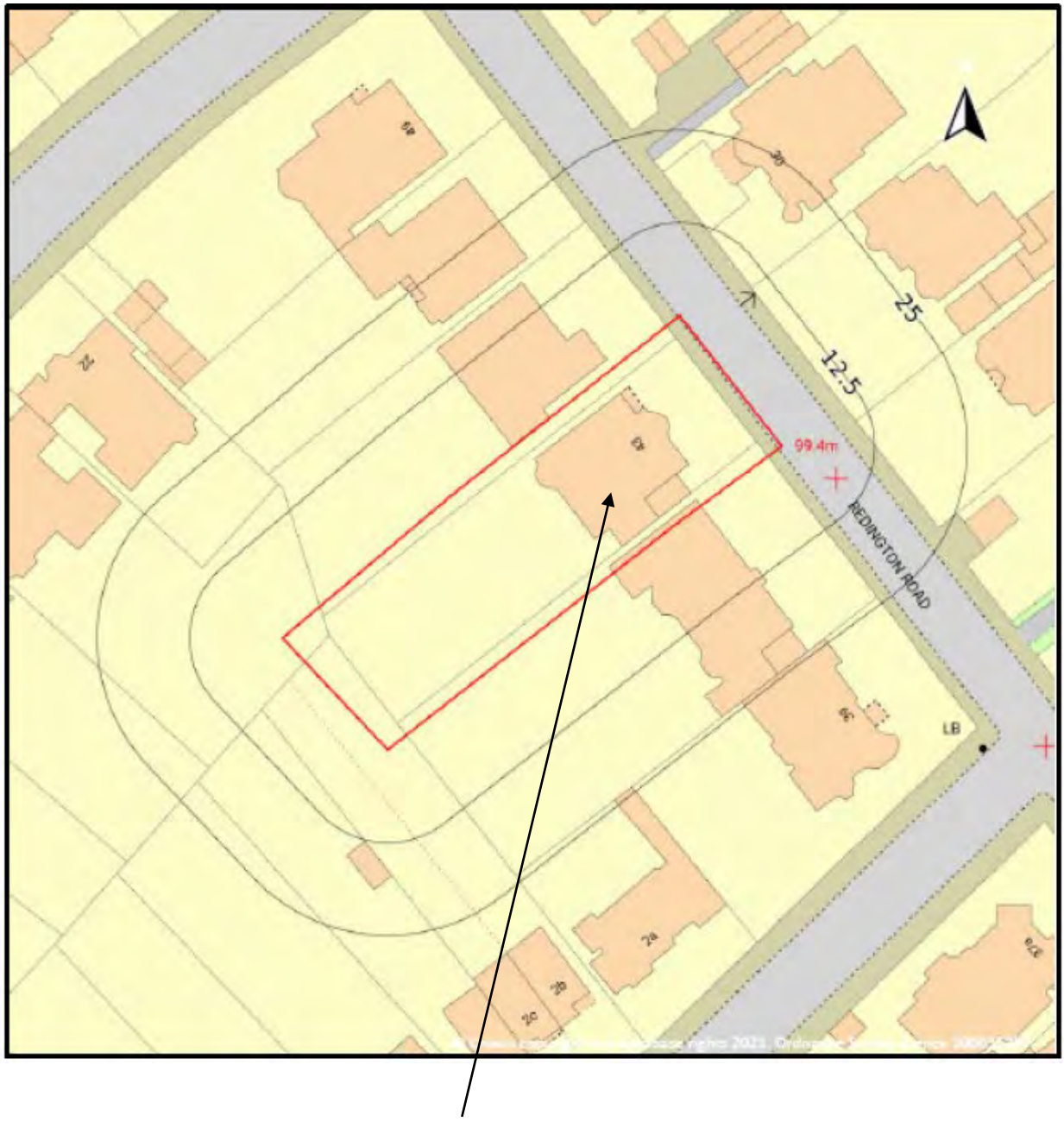
[12] British Standards Institution, Methods for tests for soils for civil engineering purposes, BS1377, BSI., London., 1990.

[13] NHBC, Standards - Part 4, Foundations, NHBC, 2020.

[14] British Standards Institution, BS8002, Code of practice for earth retaining structures, London: BSI, 2015.

FIGURES

Figure 1: Site Location Plan

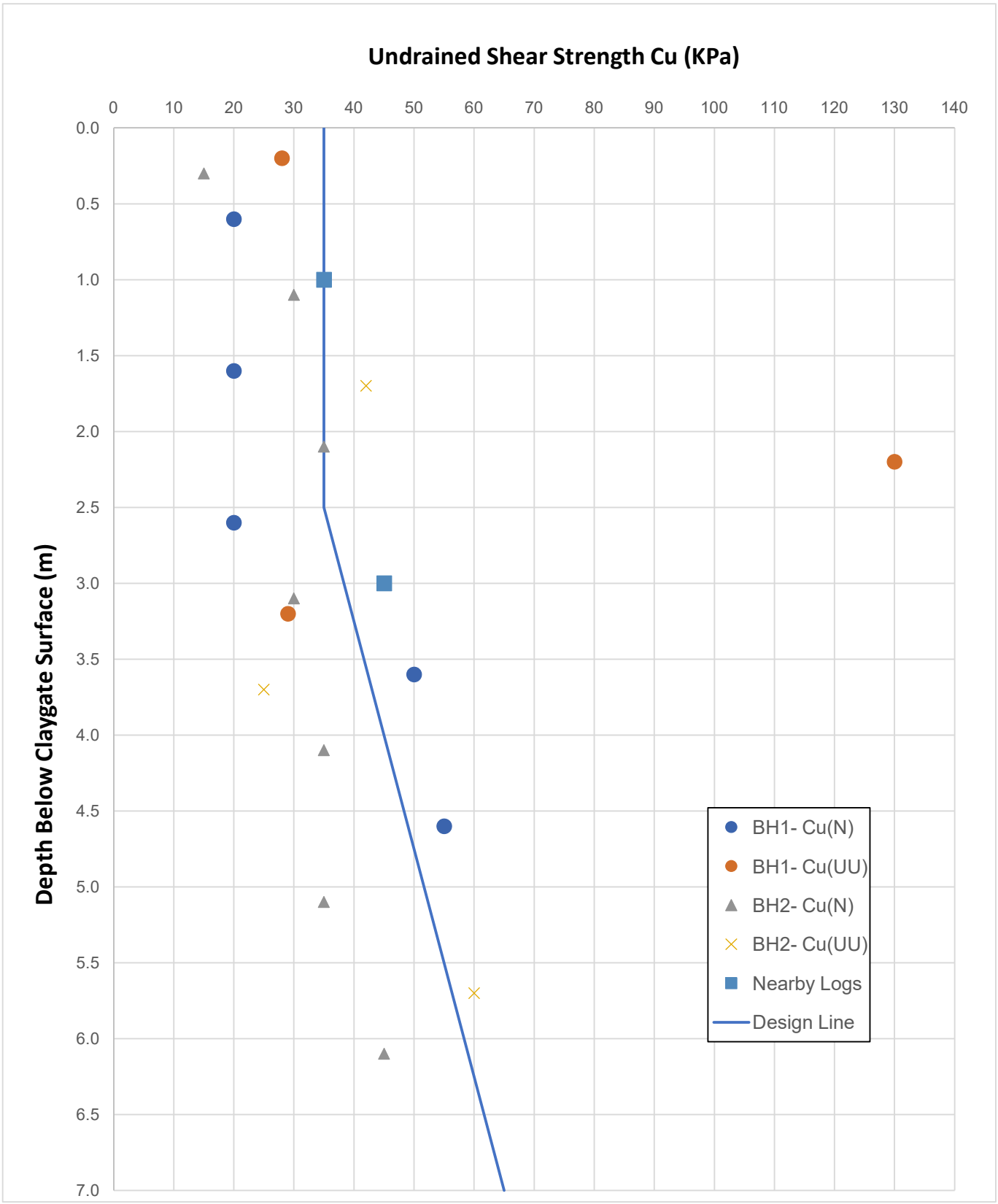


Site Location

FIGURES

Figure 2 Aerial Photograph of site

Figure 3: Plot of Undrained Shear Strength vs Depth for Claygate Member


Undrained Shear Strength Cu (KPa)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Depth Below Claygate Surface (m)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
BH1- Cu(N)
BH1- Cu(UU)
BH2- Cu(N)
BH2- Cu(UU)
Nearby Logs
Design Line

APPENDIX A – EXPLORATORY HOLE RECORDS

APPENDIX A – EXPLORATORY HOLE RECORDS

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43a Redington Road

NW3 7RA

Window Sample Log

BH1

Start Date: **01/07/2021** Eastings: **N/A** Drilled By: **Geofirma Ltd**

Finish Date: **01/07/2021** Northings: **N/A** Drill Rig/ Team: **Premier 110 WS** Logged By: **ES**

Termination Depth (mBGL): **6.45** Elevation (mAD): **N/A** Driller: **LC/ NS** Checked By: **EA**

Exploratory Hole Progress, Details with Depth and General Remarks

Hole Depth (mBGL)	Hole Diameter (mm)	Casing Depth (mBGL)	Casing Diameter (mm)	Depth to Water (mBGL)	Comments
1.20	Pit	Nil	N/A	Dry	All works undertaken on 01/07/2021
2.00	116	Nil	N/A	Dry	
3.00	101	Nil	N/A	NR	
4.00	92	Nil	N/A	NR	
5.00	79	Nil	N/A	NR	
6.00	79	Nil	N/A	NR	

Water Strikes

Depth of Strike (mBGL)	Depth of Casing (mBGL)	Date and Time	Post Strike Depth (mBGL)	Minutes After Strike	Sealed at (mBGL)	Remarks
2.30	Nil	01/07/2021	2.30	NR	NA	Seepage at hole depth of 2.3m did not rise
NA	Nil	01/07/2021	4.41	NR	NA	Water at 4.41mbgl at end of hole

Termination: Hole terminated at 6.45mBGL as per. Geofirma's Specification.

Groundwater: Seepage at 2.3mBGL. No rise. Water at 4.41mBGL at E.O.H (6.45mBGL)

Sampling: 5no. D, 3no. ES, 6no. SPTD, 3no. U

Backfill: Hole backfilled with standpipe on completion with flush cover. 2m plain pipe then 3m slotted pipe.

Weather: Sunny

Notes:

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43a Redington Road

NW3 7RA

Window Sample Log

BH1

Start Date: **01/07/2021** Eastings: **N/A** Drilled By: **Geofirma Ltd**

Finish Date: **01/07/2021** Northings: **N/A** Drill Rig/ Team: **Premier 110 WS** Logged By: **ES**

Termination Depth (mBGL): **6.45** Elevation (mAD): **N/A** Driller: **LC/ NS** Checked By: **EA**

Legend	Depth From/ To (mBGL)	Description	Reduced Level and Thickness (mAD) and (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
	0.00-0.04	Paving Slab.	0.00-0.04 Thickness: 0.04							
	0.04-0.35	MADE GROUND: Dark brown SAND with rare pockets of light brown clay up to 45mm in size slightly sandy slightly gravelly clay. Gravel is angular to subangular brick, concrete and tile.	0.04-0.35 Thickness: 0.31	0.3	D	1				
	0.35-1.40	MADE GROUND: Dark brown slightly clayey slightly gravelly SAND. Gravel is angular to subangular brick, concrete and tile.	0.35-1.40 Thickness: 1.05	0.3 0.5 0.5	ES D ES	2 3 4				
				1.2	D	5				
				1.2	ES	6	1.20-1.65	SPT N=3	0,0/0,1,1,1	
				1.2	SPTD	7				
	1.40-5.50	Soft becoming firm orange brown mottled grey slightly sandy silty CLAY with bands of brown silty sand (between 2.3 and 2.4 m and 5.1 and 5.5 m).	1.40-5.50 Thickness: 4.10	1.60-2.00	U	8				
				2	SPTD	9	2.00-2.45	SPT N=4	1,1/1,1,1,1	
				2.80-3.00	D	10				
				3	SPTD	11	3.00-3.45	SPT N=4	1,1/1,1,1,1	
				3.60-4.00	U	12				
				4	SPTD	13	4.00-4.45	SPT N=4	1,1/1,1,0,2	
				4.60-5.00	U	14				
				5	SPTD	15	5.00-5.45	SPT N=10	1,1/2,2,3,3	
	5.50-6.45	Firm grey mottled orange brown silty CLAY with occasional silt and sand bands .	5.50-6.45 Thickness: 0.95							
				5.80-6.00	D	16				
				6	SPTD	17	6.00-6.45	SPT N=11	2,2/2,2,3,4	

Hand dug inspection pit then hole advanced using Premier 110 window sample rig. Slotted pipe installed on completion. Seepage at 2.3mBGL. No rise noted. Water at 4.41mBGL at end of hole.

For explanation of abbreviations and legend refer to Key

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43a Redington Road

NW3 7RA

Window Sample Log

BH2

Start Date: **01/07/2021** Eastings: **N/A** Drilled By: **Geofirma Ltd**

Finish Date: **01/07/2021** Northings: **N/A** Drill Rig/ Team: **Premier 110 WS** Logged By: **ES**

Termination Depth (mBGL): **7.45** Elevation (mAD): **N/A** Driller: **LC/ NS** Checked By: **EA**

Exploratory Hole Progress, Details with Depth and General Remarks

Hole Depth (mBGL)	Hole Diameter (mm)	Casing Depth (mBGL)	Casing Diameter (mm)	Depth to Water (mBGL)	Comments
1.20	Pit	Nil	N/A	Dry	All works undertaken on 01/07/2021
2.00	116	Nil	N/A	Dry	
3.00	101	Nil	N/A	Dry	
4.00	92	Nil	N/A	NR	
5.00	92	Nil	N/A	NR	
6.00	79	Nil	N/A	NR	
7.00	79	Nil	N/A	NR	

Water Strikes

Depth of Strike (mBGL)	Depth of Casing (mBGL)	Date and Time	Post Strike Depth (mBGL)	Minutes After Strike	Sealed at (mBGL)	Remarks
2.30	Nil	01/07/2021	4.00	NR	NA	Seepage at hole depth of 4.0m did not rise
NA	Nil	01/07/2021	5.00	NR	NA	Water at 5.00mbgl at end of hole

Termination: Hole terminated at 7.45mBGL as per. Geofirma's Specification.

Groundwater: Seepage at 4mBGL. No rise. Water at 5mBGL at E.O.H (7.45mBGL)

Sampling: 6no.D, 2no. ES, 7no. SPTD, 3no. U

Backfill: Hole backfilled with standpipe on completion with flush cover. 2m plain pipe then 4m slotted pipe.

Weather: Sunny

Notes:

GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

43a Redington Road

NW3 7RA

Window Sample Log

BH2

Start Date: **01/07/2021** Eastings: **N/A** Drilled By: **Geofirma Ltd**

Finish Date: **01/07/2021** Northings: **N/A** Drill Rig/ Team: **Premier 110 WS** Logged By: **ES**

Termination Depth (mBGL): **7.45** Elevation (mAD): **N/A** Driller: **LC/ NS** Checked By: **EA**

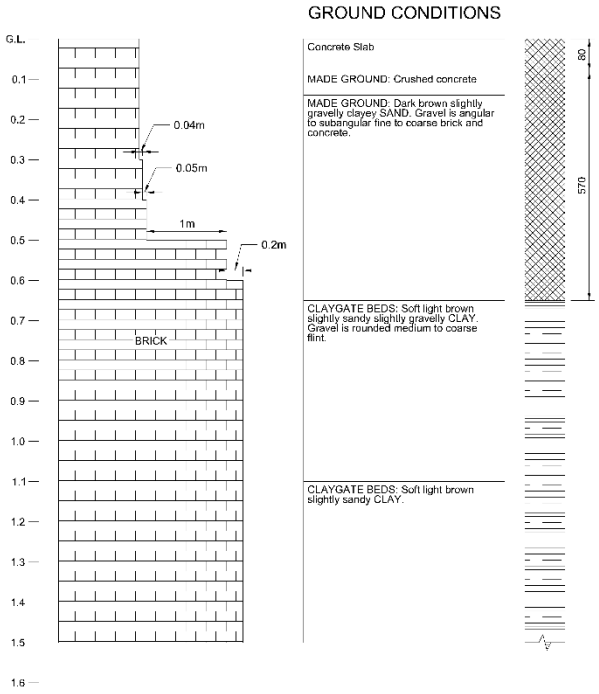
Legend	Depth From/ To (mBGL)	Description	Reduced Level and Thickness (mAD) and (m)	Sampling From/ To (mBGL)	Sampling Type	Sampling No.	Testing From/ To (mBGL)	Testing Type/ Result	Field Records	Backfill/ Installation
	0.00-0.05	Paving Slab.	0.00-0.05 Thickness: 0.05							
	0.05-0.15	Building SAND.	0.05-0.15 Thickness: 0.10	0.3 0.3	D ES	1 2				
	0.15-0.60	MADE GROUND: Dark brown SAND with pockets of light brown sandy slightly gravelly clay. Gravel is angular to rounded fine to coarse brick flint and concrete.	0.15-0.60 Thickness: 0.45	0.7 0.7	D ES	3 4				
	0.60-0.90		0.60-0.90 Thickness: 0.30	1.1 1.2	D SPTD	5 6	1.20-1.65	SPT N=3	0,0/1,0,1,1	
	0.90-4.65	Soft grey slightly sandy slightly gravelly SILT with occasional pockets of very soft clay up to 60mm in size. Gravel is rounded coarse flint.	0.90-4.65 Thickness: 3.75	2	SPTD	8	2.00-2.45	SPT N=6	1,1/2,1,2,1	
		Sot to firm light brown mottled light greenish grey slightly sandy CLAY.		3	SPTD	10	3.00-3.45	SPT N=7	2,2/1,2,2,2	
				4	SPTD	12	4.00-4.45	SPT N=6	1,1/2,1,1,2	
	4.65-6.10	Soft to firm orange mottled grey slightly sandy clayey SILT with sand and clay bands.	4.65-6.10 Thickness: 1.45	5	SPTD	14	5.00-5.45	SPT N=7	1,1/1,2,2,2	
	6.10-6.30	Firm grey very sandy SILT.	6.10-6.30 Thickness: 0.20	6	SPTD	16	6.00-6.45	SPT N=7	1,1/1,2,2,2	
	6.30-7.45	Firm grey mottled brown slightly sandy silty CLAY with occasional partings of silt and sand.	6.30-7.45 Thickness: 1.15	7	SPTD	18	7.00-7.45	SPT N=9	1,1/2,2,2,3	

Hand dug inspection pit then hole advanced using Premier 110 window sample rig. Slotted pipe installed on completion. Water strikke at 4.0mBGL. No rise noted. Water at 5.0mBGL at end of hole.

For explanation of abbreviations and legend refer to Key

Position Name	TP 1	Date	02/07/2021
Location	In basement store	Project Number	2021-028-SYM-RED
Depth	1.5 m	Client	Joelle and Josef Fuss
Orientation	North West to South East	Project Title	43a Redington Road NW3 7RA

Cross Sectional Sketch and Ground Description



Photograph

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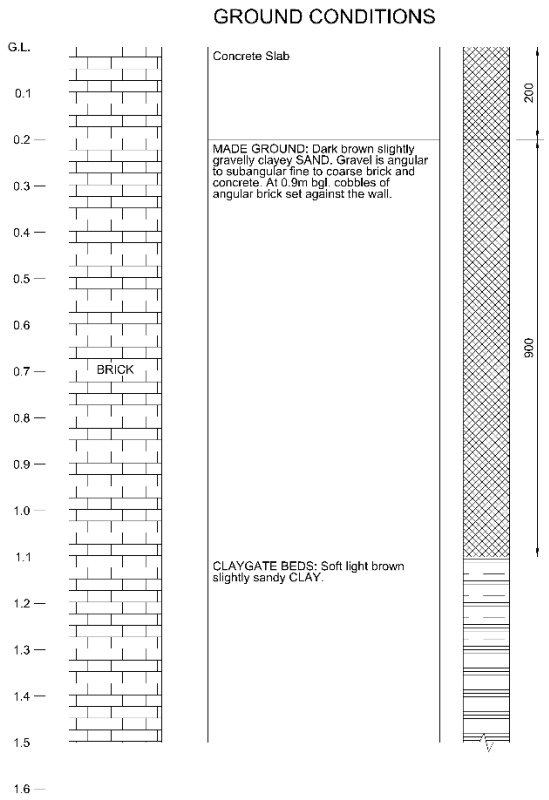
Position Name	TP2	Date	02/07/2021
Location	Garage	Project Number	2021-028-SYM-RED
Depth	1.5 m	Client	Joelle and Josef Fuss
Orientation	North West to South East	Project Title	43a Redington Road NW3 7RA

Cross Sectional Sketch and Ground Description



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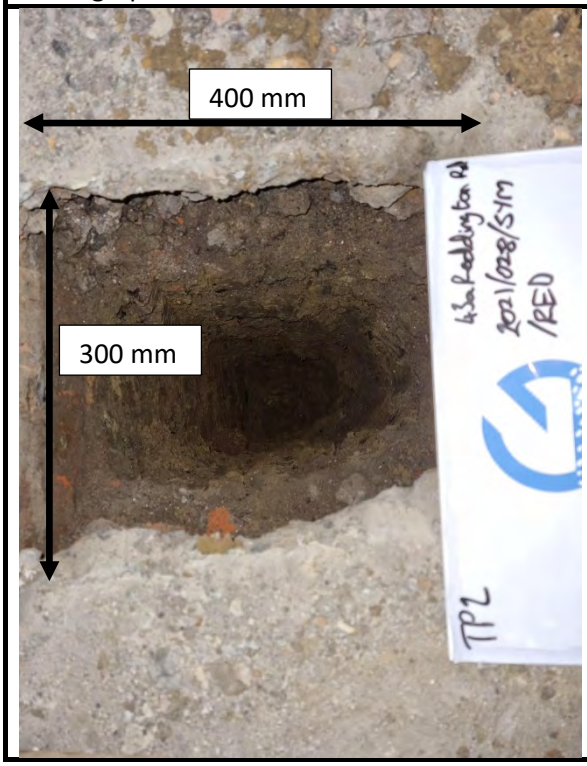

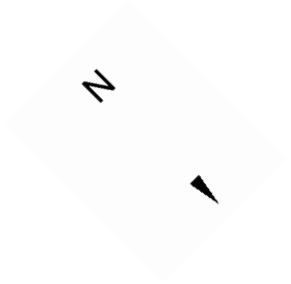

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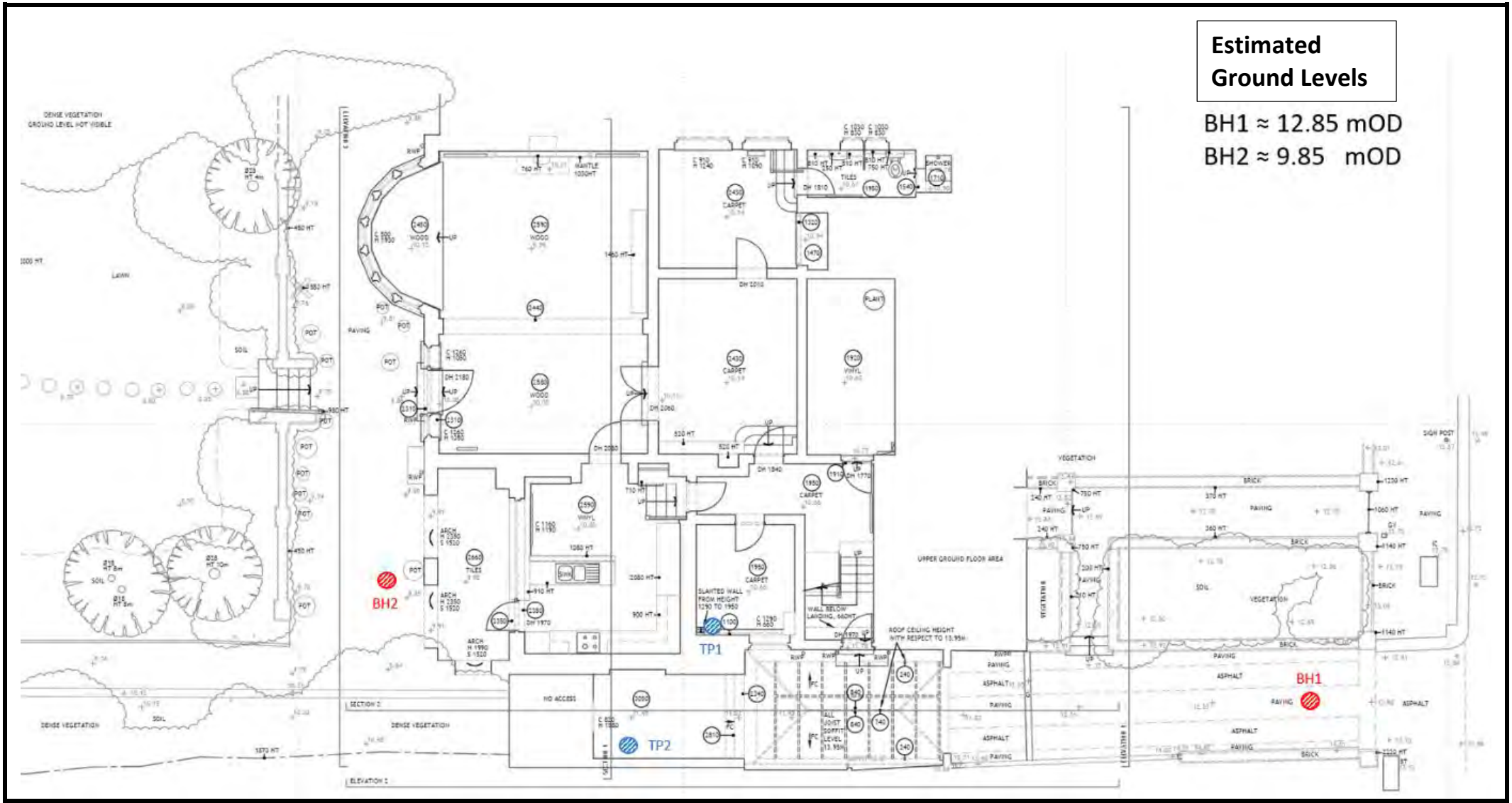
APPENDIX B – EXPLORATORY HOLE LOCATION PLAN



Exploratory Hole Location Plan

Client	Joelle and Josef Fuss
Project Title	43a Redington Road
Project No	2021/028/SYM/RED

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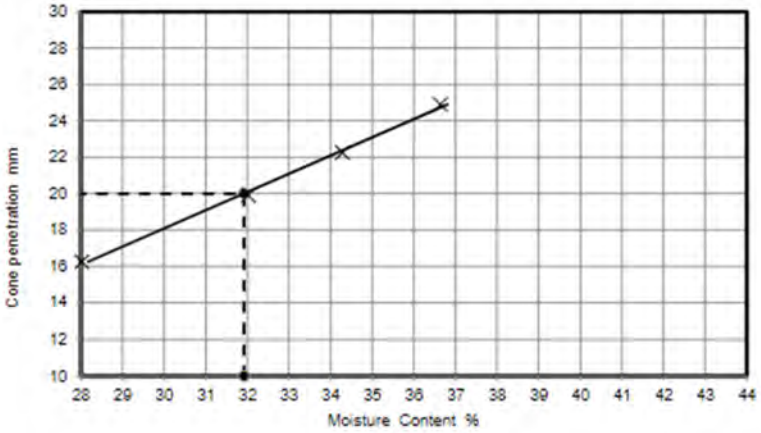
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

APPENDIX C – GEOTECHNICAL AND CHEMICAL LABORATORY TEST RESULTS

APPENDIX C – GEOTECHNICAL AND CHEMICAL LABORATORY TEST RESULTS

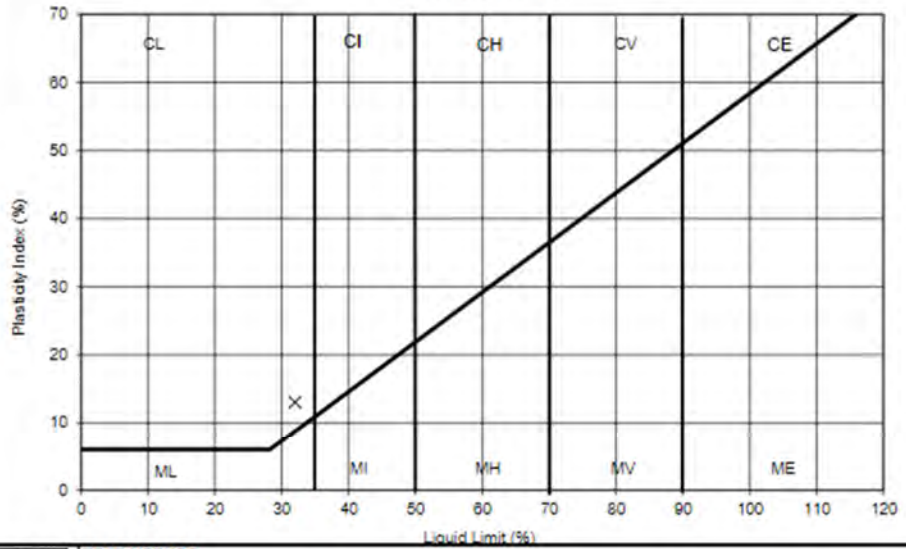
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	30356
				Borehole/Pit No.	BH1
Site Name	43a Redington Road NW3 7RA			Sample No.	5
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	1.20 m
Soil Description	Orangish brown slightly mottled dark grey sandy silty CLAY with occasional brick fragments and fine rootlets			Depth Base	- m
				Sample Type	D
				Samples received	02/07/2021
				Schedules received	05/07/2021
				Project Started	06/07/2021
				Date Tested	28/07/2021



NATURAL MOISTURE CONTENT	22	%
% PASSING 425µm SIEVE	97	%
LIQUID LIMIT	32	%
PLASTIC LIMIT	19	%
PLASTICITY INDEX	13	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

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

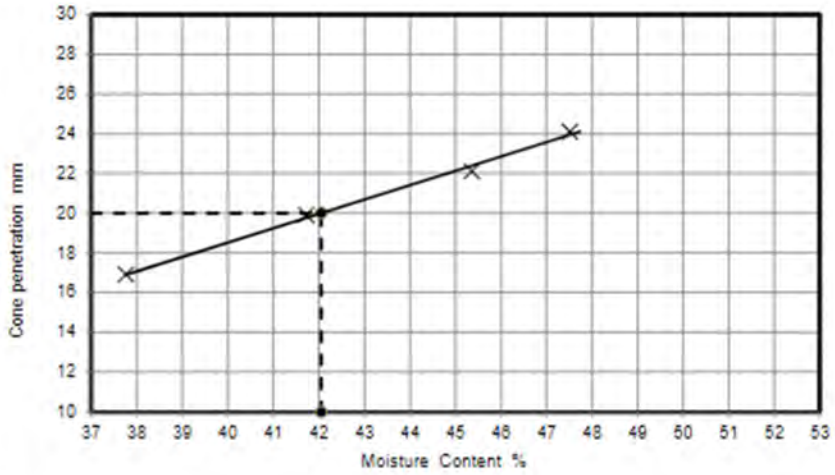
Checked and Approved

Initials: J.P
Date: 29/07/2021

MSF-5 R2

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

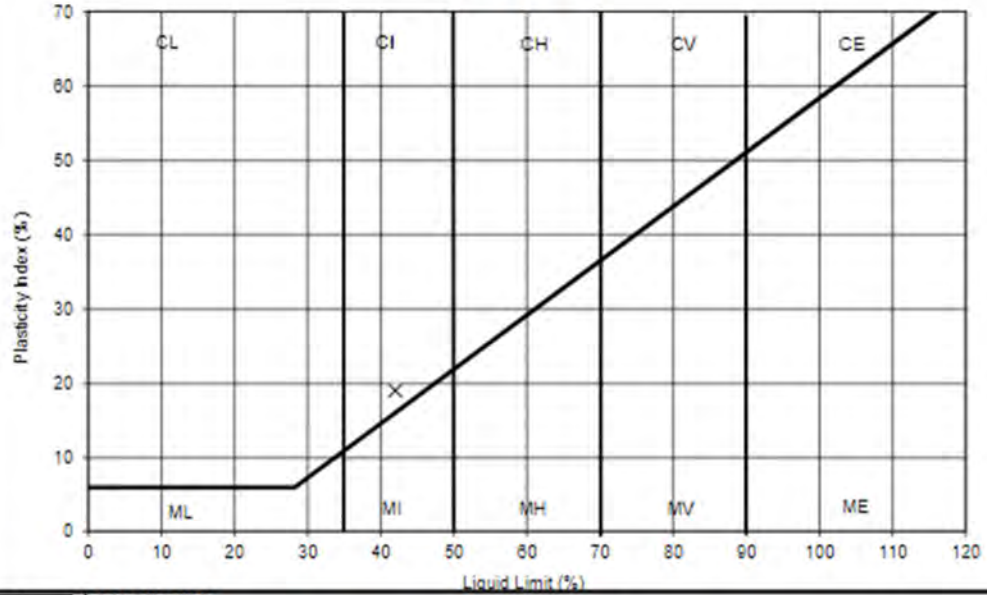
				Job No.	30356
				Borehole/Pit No.	BH1
Site Name	43a Redington Road NW3 7RA			Sample No.	10
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	2.80 m
				Depth Base	- m
Soil Description	Brown slightly mottled bluish grey sandy silty CLAY			Sample Type	D
				Samples received	02/07/2021
				Schedules received	05/07/2021
				Project Started	06/07/2021
				Date Tested	28/07/2021



NATURAL MOISTURE CONTENT	28	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	42	%
PLASTIC LIMIT	23	%
PLASTICITY INDEX	19	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Checked and Approved

Initials: J.P

Date: 29/07/2021

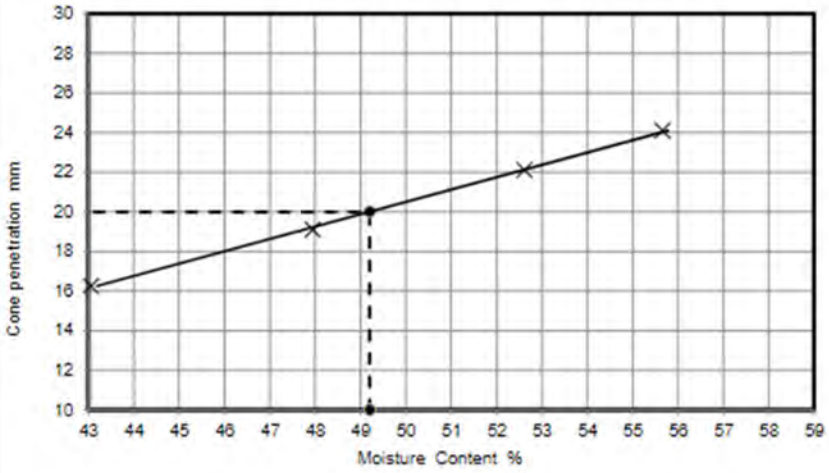
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

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

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

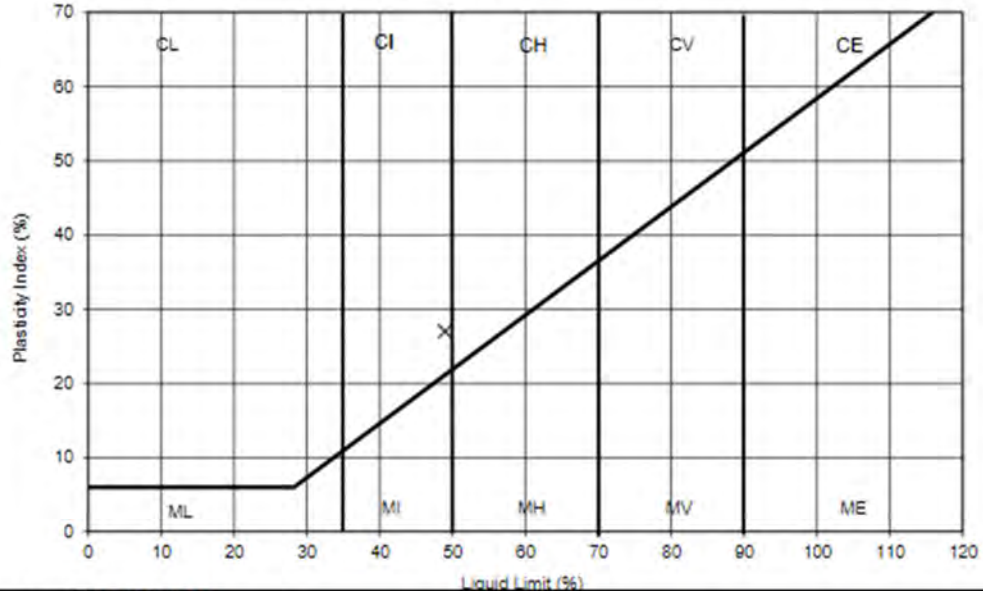
				Job No.	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	5
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	1.10 m
				Depth Base	- m
				Sample Type	D
Soil Description	Orangish brown slightly mottled grey slightly sandy silty CLAY			Samples received	02/07/2021
				Schedules received	05/07/2021
				Project Started	06/07/2021
				Date Tested	28/07/2021



NATURAL MOISTURE CONTENT	35	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	49	%
PLASTIC LIMIT	22	%
PLASTICITY INDEX	27	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Checked and Approved
Initials: J.P
Date: 29/07/2021

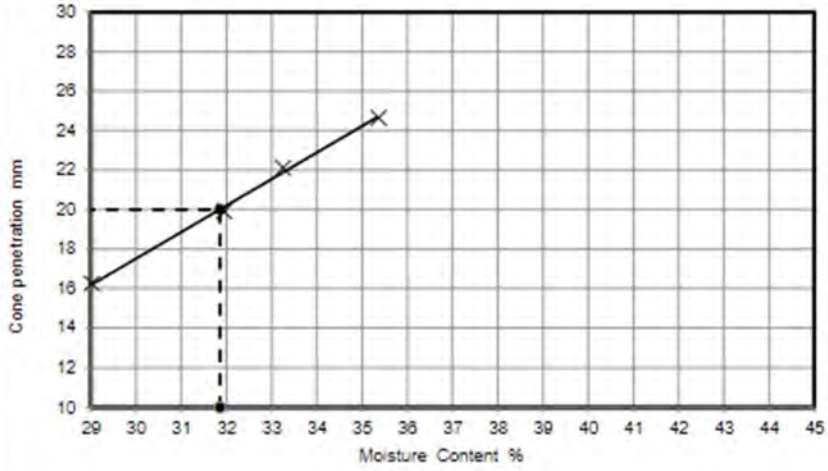
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

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

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

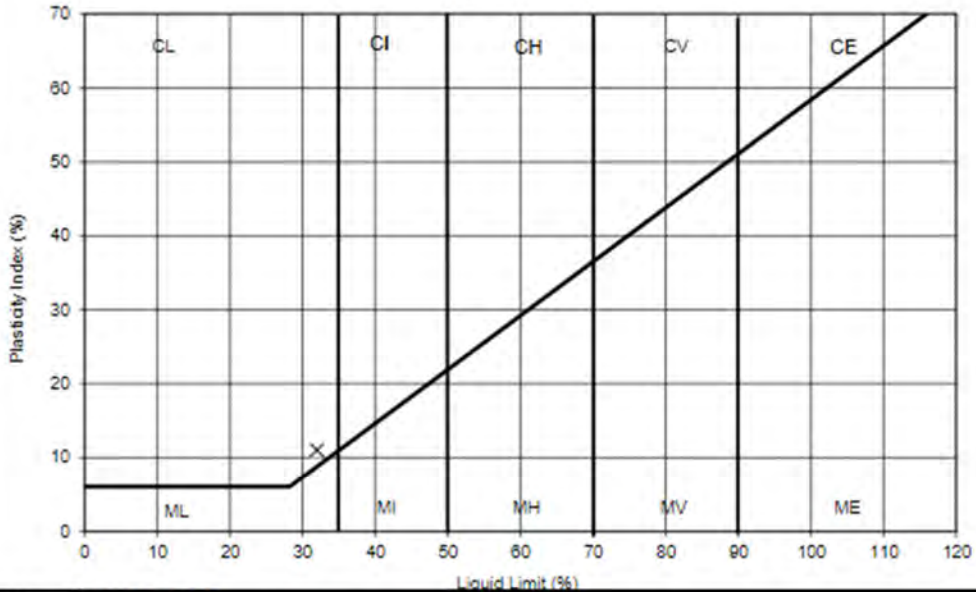
				Job No.	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	11
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	3.80 m
				Depth Base	- m
				Sample Type	D
Soil Description	Orangish brown slightly mottled grey sandy silty CLAY			Samples received	02/07/2021
				Schedules received	05/07/2021
				Project Started	06/07/2021
				Date Tested	28/07/2021



NATURAL MOISTURE CONTENT	27	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	32	%
PLASTIC LIMIT	21	%
PLASTICITY INDEX	11	%

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

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Tel: 01923 711 288 Email: James@k4soils.com

2519

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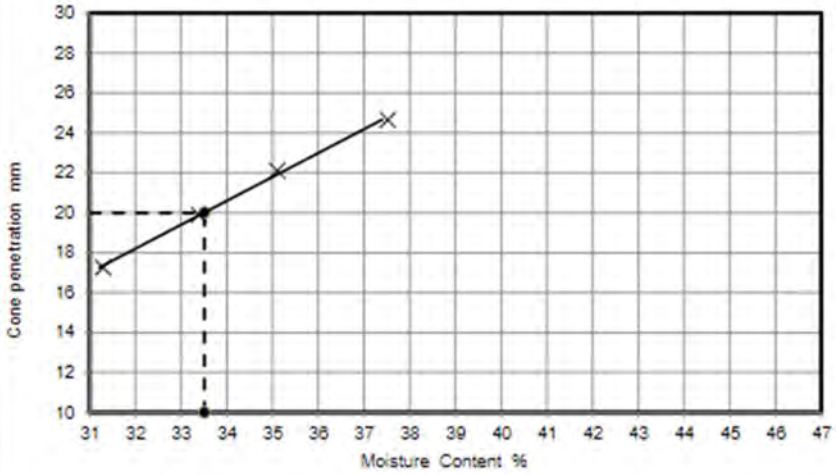
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

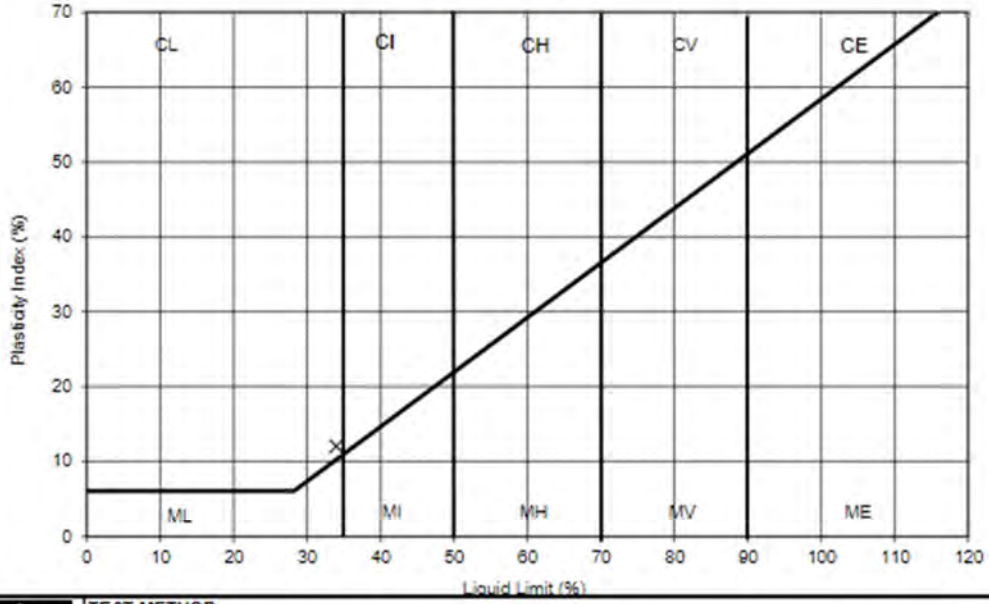
				Job No.	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	16
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	6.00 m
				Depth Base	- m
				Sample Type	D
Soil Description	Dark bluish grey slightly mottled brown sandy silty CLAY			Samples received	02/07/2021
				Schedules received	05/07/2021
				Project Started	06/07/2021
				Date Tested	28/07/2021



NATURAL MOISTURE CONTENT	30	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	34	%
PLASTIC LIMIT	22	%
PLASTICITY INDEX	12	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

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Tel: 01923 711 288 Email: James@k4soils.com

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Checked and Approved

Initials: J.P

Date: 29/07/2021

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MSF-5 R2

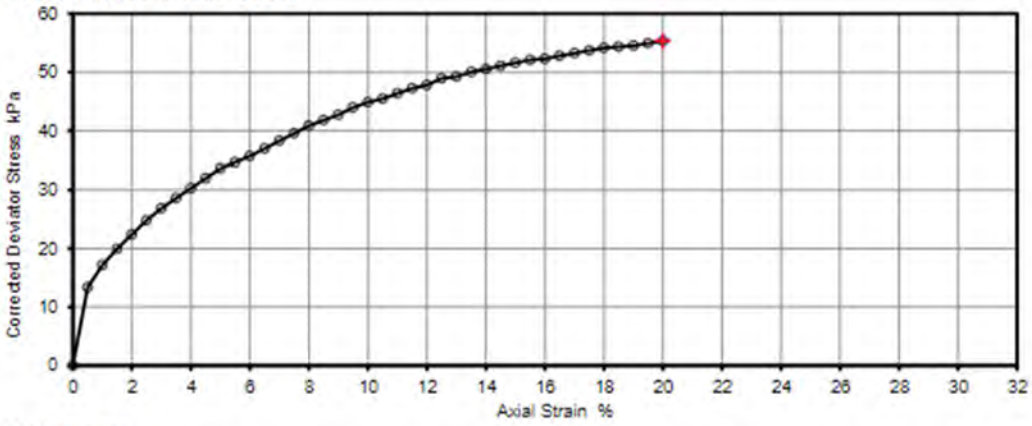
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	30356
				Borehole/Pit No.	BH1
Site Name	43a Redington Road NW3 7RA			Sample No.	8
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	1.60 m
Soil Description	Low strength grey mottled black slightly gravelly slightly sandy silty CLAY becoming at 1.85m grey mottled brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	16/07/2021

Remarks

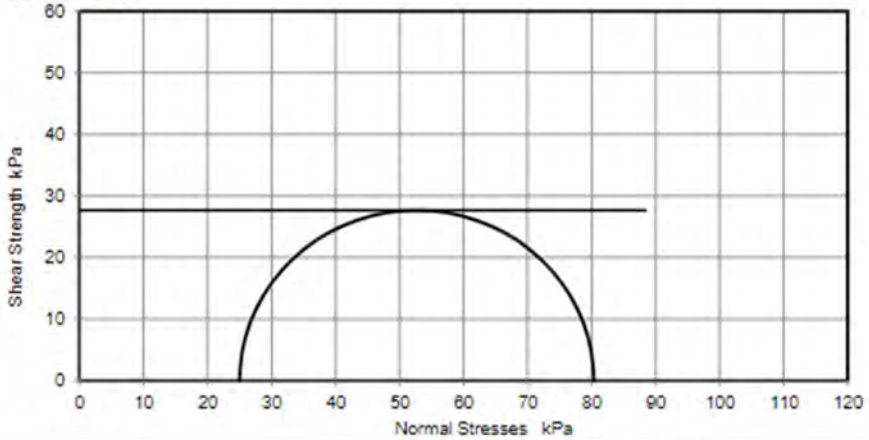
Position within sample

Test Number	1	
Length	200.0	mm
Diameter	100.0	mm
Bulk Density	2.13	Mg/m3
Moisture Content	23	%
Dry Density	1.73	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	25	kPa
Axial Strain	20.0	%
Deviator Stress, (σ1 - σ3)f	55	kPa
Undrained Shear Strength, cu	28	kPa ½(σ1 - σ3)f
Mode of Failure	Plastic	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 28/07/2021

UKAS TESTING 2519

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

MSF-5 R7

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

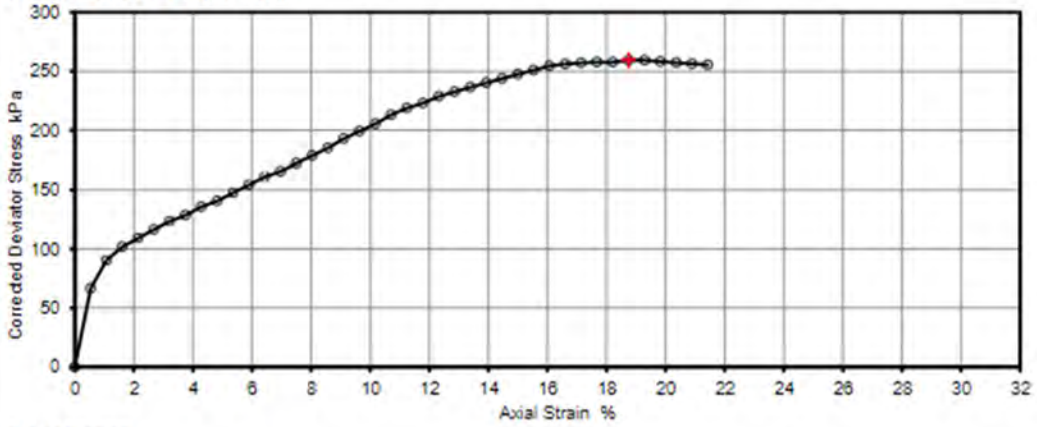
Site Name	43a Redington Road NW3 7RA			Job Ref	30356
				Borehole/Pit No.	BH1
Project No.	2021/028/SYM/RED	Client	Geofirma	Sample No.	12
				Depth Top	3.60 m
Soil Description	High strength dark grey fine sandy silty CLAY with rare fine gravel			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	16/07/2021

Remarks

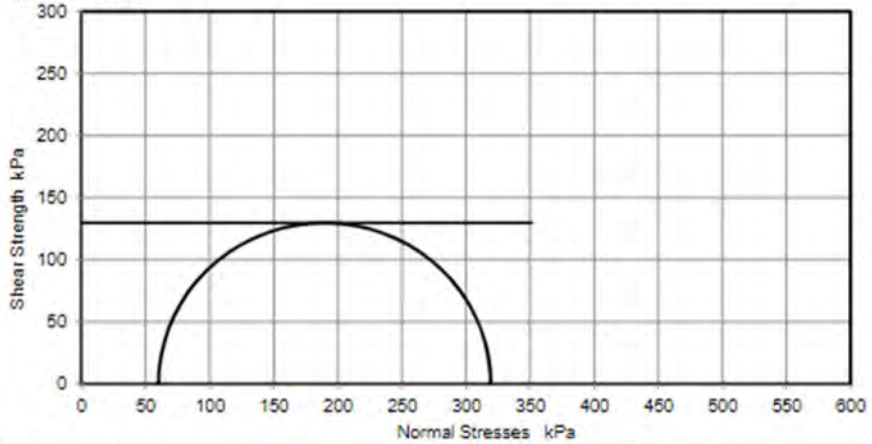
Position within sample

Test Number	1	
Length	140.0	mm
Diameter	70.0	mm
Bulk Density	2.09	Mg/m3
Moisture Content	32	%
Dry Density	1.59	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	60	kPa
Axial Strain	18.8	%
Deviator Stress, (σ1 - σ3)f	259	kPa
Undrained Shear Strength, cu	130	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

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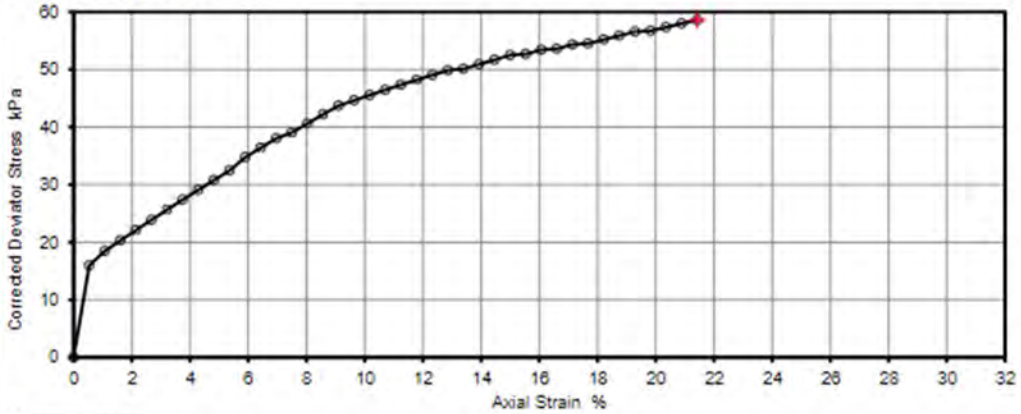
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	30356
				Borehole/Pit No.	BH1
Site Name	43a Redington Road NW3 7RA			Sample No.	14
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	4.60 m
Soil Description	Low strength dark grey slightly mottled brown fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	16/07/2021

Remarks

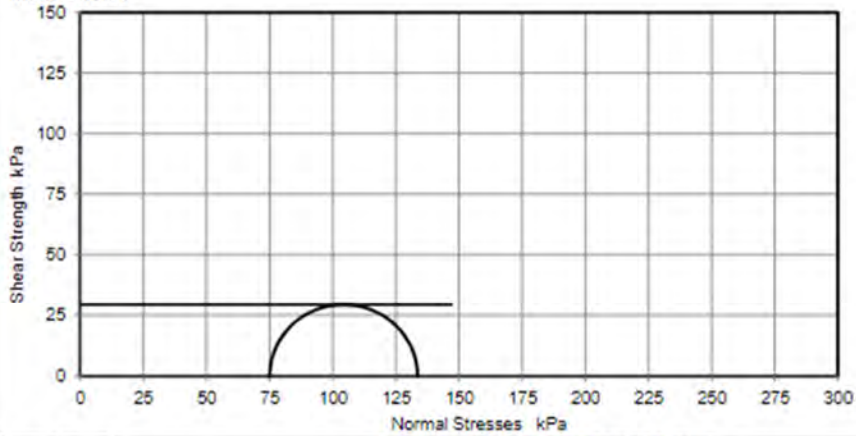
Test Number	1	
Length	140.0	mm
Diameter	70.0	mm
Bulk Density	2.08	Mg/m3
Moisture Content	31	%
Dry Density	1.58	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	75	kPa
Axial Strain	21.4	%
Deviator Stress, (σ1 - σ3)f	59	kPa
Undrained Shear Strength, cu	29	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

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

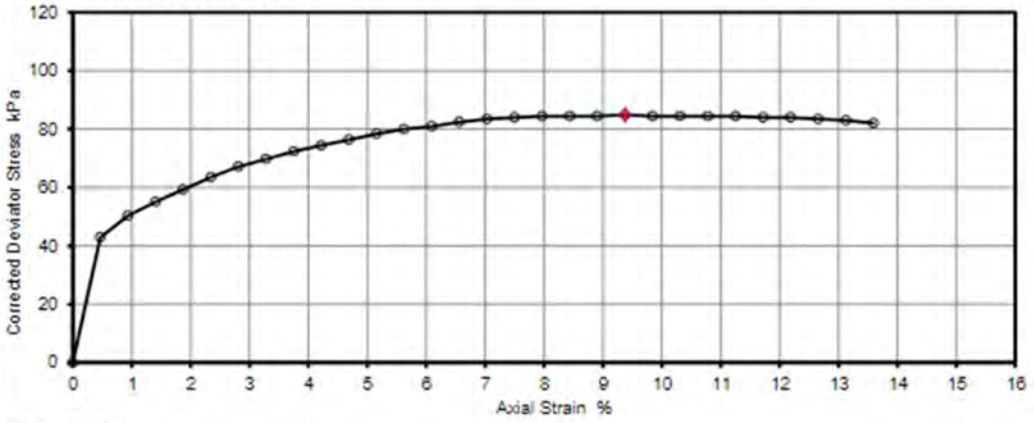
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	9
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	2.60 m
Soil Description	Medium strength brown mottled orangish brown slightly fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	16/05/2021

Remarks

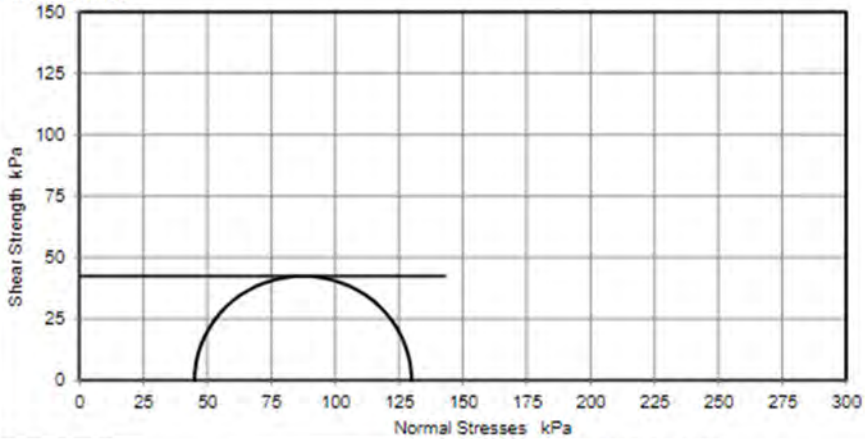
Position within sample

Test Number	1	
Length	160.0	mm
Diameter	80.0	mm
Bulk Density	1.71	Mg/m3
Moisture Content	36	%
Dry Density	1.26	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	45	kPa
Axial Strain	9.4	%
Deviator Stress, (σ1 - σ3)f	85	kPa
Undrained Shear Strength, cu	42	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
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UKAS TESTING 2519

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MSF-5 R7

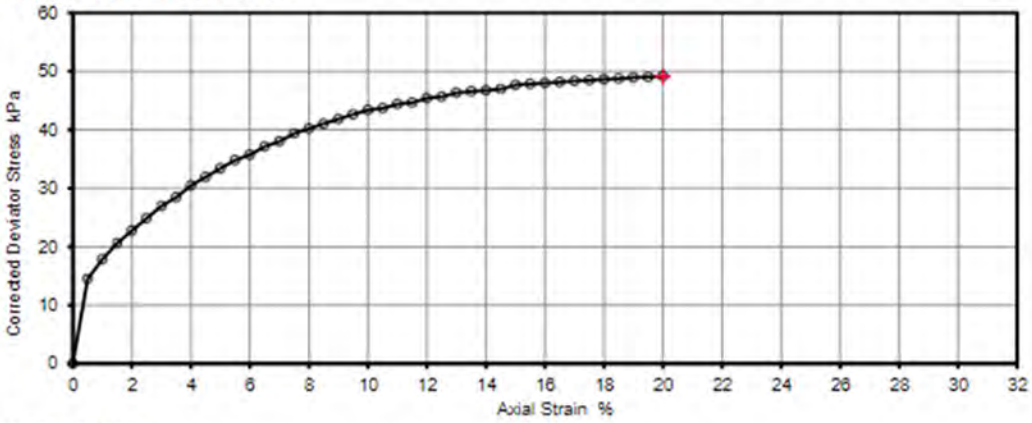
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	13
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	4.60 m
Soil Description	Low strength dark grey slightly fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	19/07/2021

Remarks

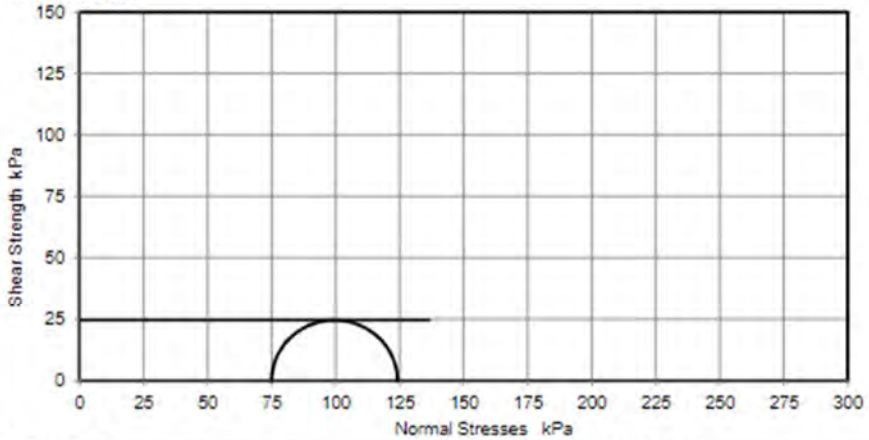
Position within sample

Test Number	1	
Length	150.0	mm
Diameter	75.0	mm
Bulk Density	1.92	Mg/m3
Moisture Content	30	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	75	kPa
Axial Strain	20.0	%
Deviator Stress, (σ1 - σ3)f	49	kPa
Undrained Shear Strength, cu	25	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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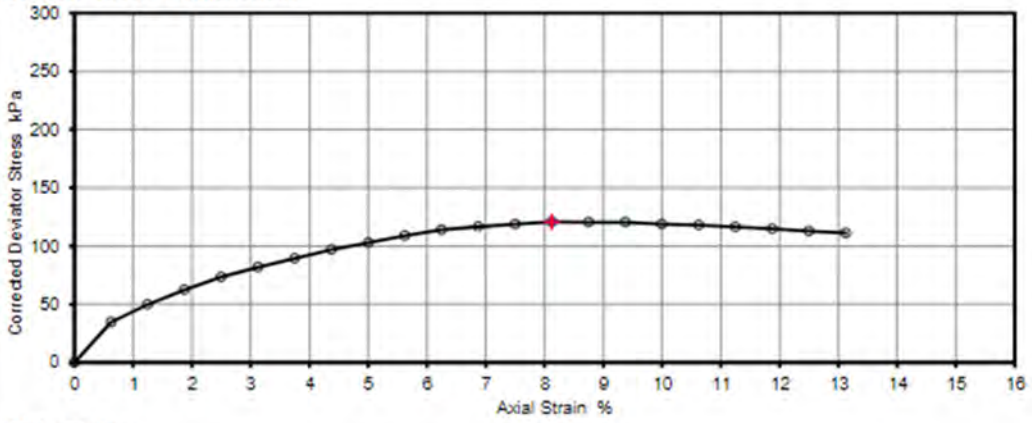
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	30356
				Borehole/Pit No.	BH2
Site Name	43a Redington Road NW3 7RA			Sample No.	17
Project No.	2021/028/SYM/RED	Client	Geofirma	Depth Top	6.60 m
Soil Description	Medium strength dark grey slightly fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	19/07/2021

Remarks

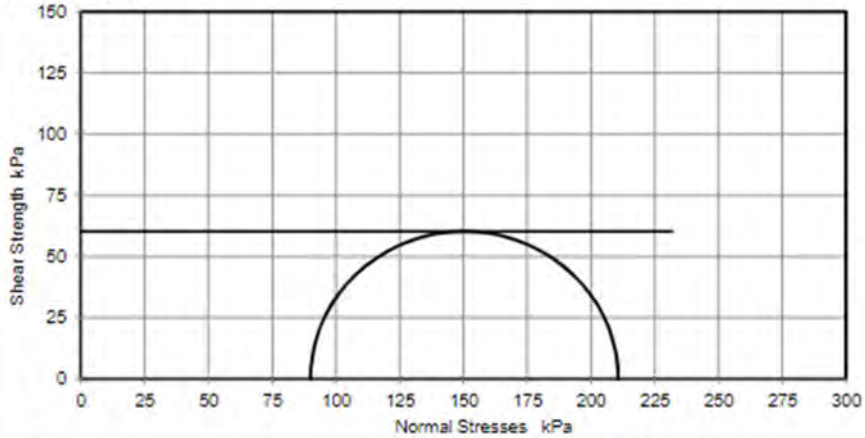
Position within sample

Test Number	1	
Length	120.0	mm
Diameter	65.0	mm
Bulk Density	1.95	Mg/m3
Moisture Content	29	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	90	kPa
Axial Strain	8.1	%
Deviator Stress, (σ1 - σ3)f	121	kPa
Undrained Shear Strength, cu	60	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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MSF-5 R7

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
30356	43a Redington Road NW3 7RA	Samples received	02/07/2021
		Schedule received	05/07/2021
Project No.	Client	Project started	06/07/2021
2021/028/SYM/RED	Geofirma	Testing Started	28/07/2021

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH1	3	0.50	-	D	Brownish grey mottled orangish brown slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to angular)	34					
BH1	5	1.20	-	D	Orangish brown slightly mottled dark grey sandy silty CLAY with occasional brick fragments and fine rootlets	22	97	32	19	13	
BH1	7	1.20	-	D	Dark grey slightly mottled orangish brown sandy silty CLAY with rare fine gravel	62					
BH1	8	1.60	-	U	Low strength grey mottled black slightly gravelly slightly sandy silty CLAY becoming at 1.85m grey mottled brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub angular to rounded)	23					
BH1	9	2.00	-	D	Orangish brown slightly mottled bluish grey slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)	23					
BH1	10	2.80	-	D	Brown slightly mottled bluish grey sandy silty CLAY	28	100	42	23	19	
BH1	11	3.00	-	D	Orangish brown slightly mottled bluish grey slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to angular)	36					
BH1	12	3.60	-	U	High strength dark grey fine sandy silty CLAY with rare fine gravel	32					
BH1	13	4.00	-	D	Dark grey slightly mottled brown slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to rounded)	34					
BH1	14	4.60	-	U	Low strength dark grey slightly mottled brown fine sandy silty CLAY	31					
BH2	3	0.70	-	D	Light brown slightly mottled grey and orangish brown slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to rounded)	28					
BH2	5	1.10	-	D	Orangish brown slightly mottled grey slightly sandy silty CLAY	35	100	49	22	27	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

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Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

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Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
30356	43a Redington Road NW3 7RA	Samples received	02/07/2021
		Schedule received	05/07/2021
Project No.	Client	Project started	06/07/2021
2021/028/SYM/RED	Geofirma	Testing Started	28/07/2021

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH2	6	1.20	-	D	Orangish brown slightly mottled bluish grey sandy silty CLAY	32					
BH2	8	2.00	-	D	Orangish brown slightly mottled bluish grey sandy silty CLAY	37					
BH2	9	2.60	-	U	Medium strength brown mottled orangish brown slightly fine sandy silty CLAY	36					
BH2	11	3.80	-	D	Orangish brown slightly mottled grey sandy silty CLAY	27	100	32	21	11	
BH2	13	4.60	-	U	Low strength dark grey slightly fine sandy silty CLAY	30					
BH2	16	6.00	-	D	Dark bluish grey slightly mottled brown sandy silty CLAY	30	100	34	22	12	
BH2	17	6.60	-	U	Medium strength dark grey slightly fine sandy silty CLAY	29					

UKAS TESTING 2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

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Watford Herts WD18 9RU

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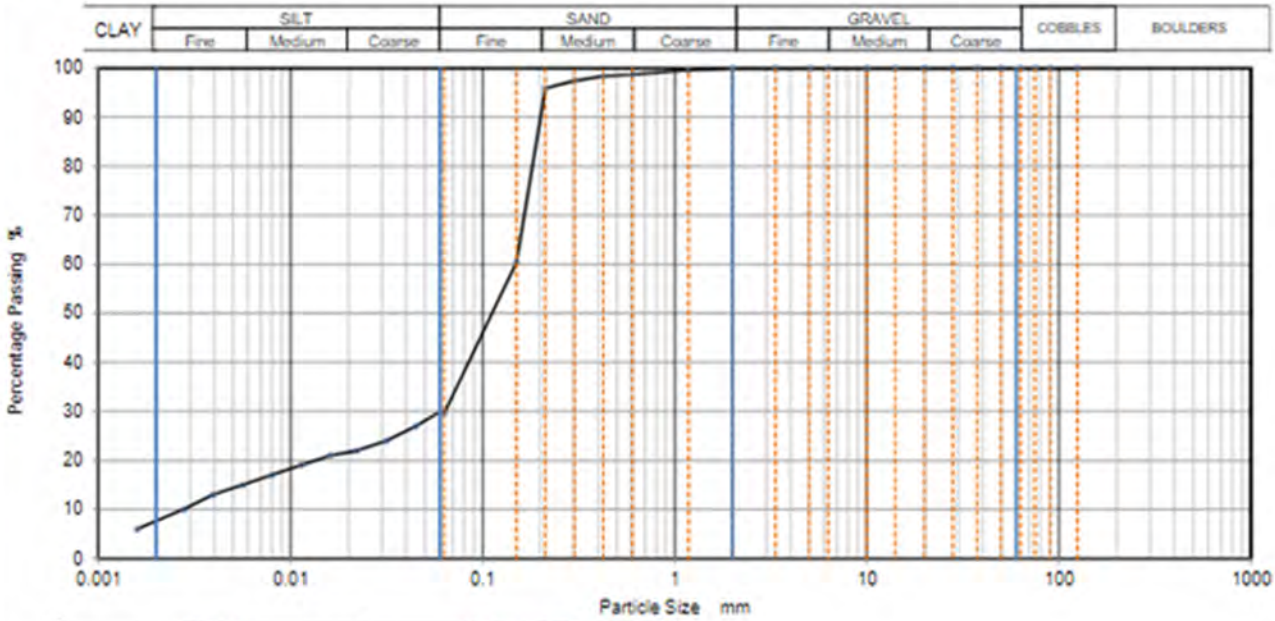
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

Site Name	43a Redington Road NW3 7RA			Job Ref	30356
				Borehole/Pit No.	BH2
Project No.	2021/028/SYM/RED	Client	Geofirma	Sample No.	14
				Depth Top	5.00 m
Soil Description	Dark grey slightly mottled orangish brown clayey very silty SAND			Depth Base	- m
				Sample Type	D
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	05/07/2021
These results only apply to the items tested				Date tested	21/07/2021



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0807	30
90	100	0.0449	27
75	100	0.0315	24
63	100	0.0222	22
50	100	0.0162	21
37.5	100	0.0114	19
28	100	0.0080	17
20	100	0.0056	15
14	100	0.0040	13
10	100	0.0028	10
6.3	100	0.0016	8
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density	(assumed)
0.425	98	2.70	Mg/m3
0.3	97		
0.212	96		
0.15	61		
0.063	30		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	70.4
Silt	21.7
Clay	7.9

Grading Analysis		
D100	mm	
D60	mm	0.148
D30	mm	0.0637
D10	mm	0.00279
Uniformity Coefficient		53
Curvature Coefficient		9.8

Remarks
Preparation and testing in accordance with BS1377 unless noted below

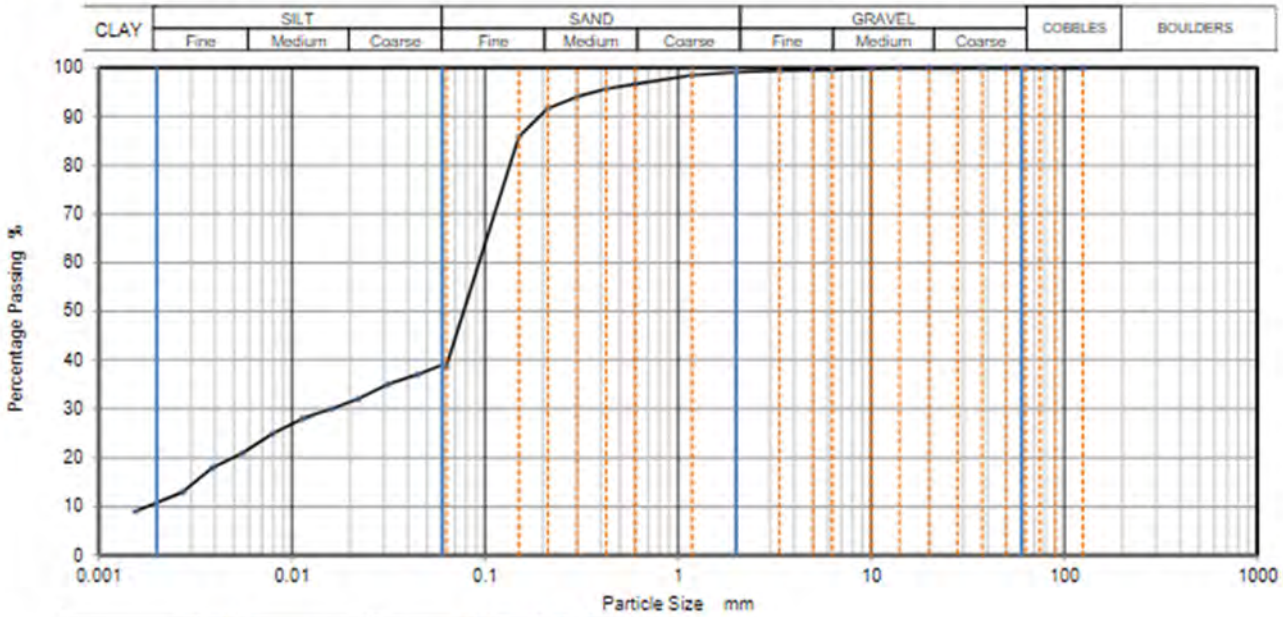
K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved
Initials: J.P
Date: 28/07/2021

PARTICLE SIZE DISTRIBUTION

Site Name	43a Redington Road NW3 7RA			Job Ref	30356
				Borehole/Pit No.	BH1
Project No.	2021/028/SYM/RED	Client	Geofirma	Sample No.	12
				Depth Top	3.60 m
Soil Description	High strength dark grey fine sandy silty CLAY with rare fine gravel			Depth Base	- m
				Sample Type	U
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	05/07/2021
				Date tested	21/07/2021

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0605	39
90	100	0.0448	37
75	100	0.0315	35
63	100	0.0221	32
50	100	0.0161	30
37.5	100	0.0113	28
28	100	0.0079	25
20	100	0.0055	21
14	100	0.0039	18
10	100	0.0027	13
6.3	100	0.0015	9
5	100		
3.35	100		
2	99		
1.18	99		
0.6	97	Particle density	(assumed)
0.425	96	2.70	Mg/m3
0.3	94		
0.212	92		
0.15	88		
0.063	39		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.9
Sand	60.5
Silt	27.7
Clay	10.9

Grading Analysis		
D100	mm	
D60	mm	0.0933
D30	mm	0.015
D10	mm	0.00179
Uniformity Coefficient		52
Curvature Coefficient		1.3

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

Initials: J.P

Date: 28/07/2021

2519

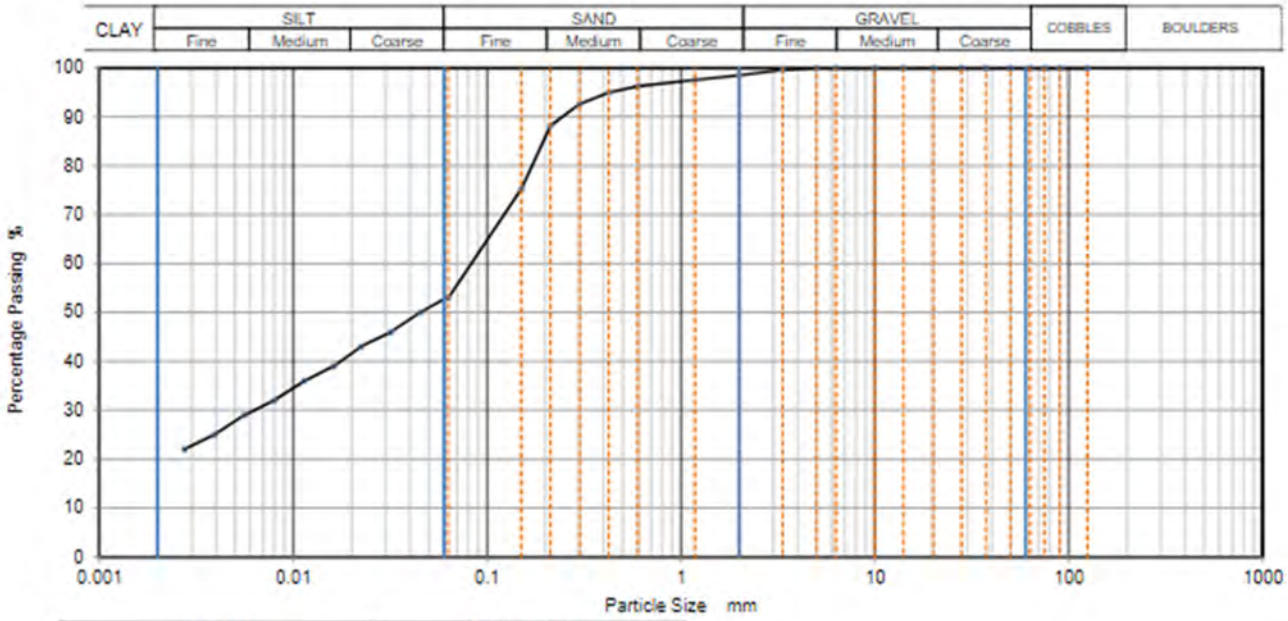
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	43a Redington Road NW3 7RA			Job Ref	30356
				Borehole/Pit No.	BH2
Project No.	2021/028/SYM/RED	Client	Geofirma	Sample No.	7
				Depth Top	1.80 m
Soil Description	Orangish brown mottled grey fine sandy silty CLAY with traces of decayed, fine rootlets and rare fine gravel			Depth Base	- m
				Sample Type	D
				Samples received	02/07/2021
				Schedules received	05/07/2021
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	06/07/2021
				Date tested	21/07/2021

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0615	53
90	100	0.0454	50
75	100	0.0318	46
63	100	0.0223	43
50	100	0.0162	39
37.5	100	0.0114	36
28	100	0.0080	32
20	100	0.0056	29
14	100	0.0039	25
10	100	0.0027	22
6.3	100		
5	100		
3.35	100		
2	99		
1.18	98		
0.6	96	Particle density	(assumed)
0.425	95	2.70	Mg/m3
0.3	93		
0.212	88		
0.15	75		
0.063	53		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	1.5
Sand	45.5
Fines <0.063mm	53.0

Grading Analysis		
D100	mm	
D60	mm	0.0828
D30	mm	0.00635
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: J.P

Date: 28/07/2021

Ebenezer Adenmosun
Geofirma Ltd
Cash Room
The Old Bank
153 The Parade
High Street
Watford
WD17 1NA

e: ebenezer.adenmosun@geofirmaconsultants.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-86121

Project / Site name:	43a Redington Road	**Samples received on:**	02/07/2021
Your job number:	2021 028 SYM RED	**Samples instructed on/ Analysis started on:**	12/07/2021
Your order number:		**Analysis completed by:**	20/07/2021
Report Issue Number:	1	**Report issued on:**	20/07/2021
Samples Analysed:	2 soil samples		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Lab Sample Number				1933453	1933454
Sample Reference				BH1	BH2
Sample Number				None Supplied	None Supplied
Depth (m)				0.30	0.30
Date Sampled				01/07/2021	01/07/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	22
Total mass of sample received	kg	0.001	NONE	1.1	1.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.0	-
Free Cyanide	mg/kg	1	MCERTS	< 1.0	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.2	0.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	0.24	-
Acenaphthene	mg/kg	0.05	MCERTS	1.4	-
Fluorene	mg/kg	0.05	MCERTS	1.1	-
Phenanthrene	mg/kg	0.05	MCERTS	14	-
Anthracene	mg/kg	0.05	MCERTS	2.8	-
Fluoranthene	mg/kg	0.05	MCERTS	19	-
Pyrene	mg/kg	0.05	MCERTS	16	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	10	-
Chrysene	mg/kg	0.05	MCERTS	8.6	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	8.0	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	4.3	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	8.5	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	4.1	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.96	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.4	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	103	-

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	4.6	-
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	18	-
Boron (total)	mg/kg	1	MCERTS	15	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	-
Chromium (III)	mg/kg	1	NONE	29	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	73	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	1500	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	1.7	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	220	-

Analytical Report Number: 21-86121
Project / Site name: 43a Redington Road

Lab Sample Number				1933453	1933454
Sample Reference				BH1	BH2
Sample Number				None Supplied	None Supplied
Depth (m)				0.30	0.30
Date Sampled				01/07/2021	01/07/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-
Petroleum Hydrocarbons					
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	13	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	49	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	71	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-86121
Project / Site name: 43a Redington 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 loam (MCERTS) 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 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1933453	BH1	None Supplied	0.3	Brown clay and loam with gravel and brick.
1933454	BH2	None Supplied	0.3	Brown clay and sand.

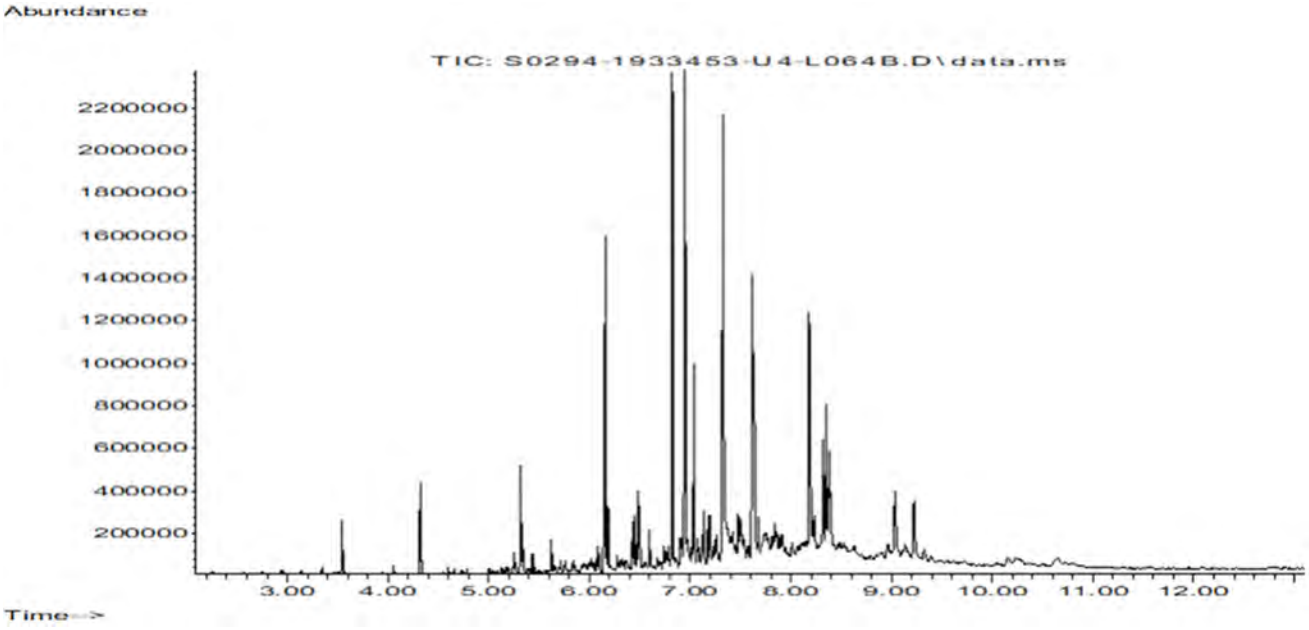
Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1.5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determinad gravimetrically. (30 oC)	In house method.	L019-UK/PL	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-PL	W	MCERTS
Speciated EPA-16 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	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-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.

Sample Deviation Report

Analytical Report Number : 21-86121
Project / Site name: 43a Redington Road

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH1	None Supplied	S	1933453	c	Free cyanide in soil	L080-PL	c



Ebenezer Adenmosun
Geofirma Ltd
Cash Room
The Old Bank
153 The Parade
High Street
Watford
WD17 1NA

e: ebenezer.adenmosun@geofirmaconsultants.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-86123

Project / Site name:	43a Redington Road	**Samples received on:**	02/07/2021
Your job number:	2021 028 SYM RED	**Samples instructed on/ Analysis started on:**	12/07/2021
Your order number:		**Analysis completed by:**	20/07/2021
Report Issue Number:	1	**Report issued on:**	20/07/2021
Samples Analysed:	10:1 WAC sample		

Signed: Izabela Wójcik

Izabela Wójcik
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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
asbestos - 6 months from reporting

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Waste Acceptance Criteria Analytical Results

Report No:	21-86123						
					Client: GEOFIRMA		
Location	43a Redington Road						
Lab Reference (Sample Number)	1933460 / 1933461				Landfill Waste Acceptance Criteria Limits		
Sampling Date	01/07/2021				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH2						
Depth (m)							
Solid Waste Analysis							
TOC (%)**	0.7				3%	5%	6%
Loss on Ignition (%) **	3.2				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	30.5				100	--	--
pH (units)**	7.6				--	>6	--
Acid Neutralisation Capacity (mol / kg)	2.7				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.0010			< 0.0100	0.5	2	25
Barium *	0.0099			0.0771	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0023			0.018	0.5	10	70
Copper *	0.0078			0.061	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	< 0.0004			< 0.0040	0.5	10	30
Nickel *	0.0042			0.033	0.4	10	40
Lead *	0.0028			0.022	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.017			0.13	4	50	200
Chloride *	1.0			8.1	800	15000	25000
Fluoride	0.71			5.6	10	150	500
Sulphate *	11			87	1000	20000	50000
TDS*	60			470	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.91			69.7	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.3						
Dry Matter (%)	78						
Moisture (%)	22						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

* = UKAS accredited (liquid eluate analysis only)

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 21-86123
Project / Site name: 43a Redington 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 loam (MCERTS) 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 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1933460	BH2	None Supplied	None Supplied	Brown clay and sand.

Analytical Report Number : 21-86123
Project / Site name: 43a Redington 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
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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. MCERTS accredited except Coronene.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	21-35085
Issue:	1
Date of Issue:	02/08/2021
Contact:	James Phaure
Customer Details:	K4 Soils Laboratory Ltd Unit 8 Watford HertfordshireWD18 9RU
Quotation No:	Q16-00568
Order No:	Not Supplied
Customer Reference:	30356
Date Received:	27/07/2021
Date Approved:	02/08/2021
Details:	43a Redington Road, NW3 7RA
Approved by:	

Tim Reeve, Quality Officer

Sample Summary

Report No.: 21-35085, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
246018	BH1 5 1.20	27/07/2021	27/07/2021	Silty clayey loam	
246019	BH2 3 0.70	27/07/2021	27/07/2021	Sandy clayey loam	

Results Summary

2683

Report No.: 21-35085, issue number 1

ELAB Reference	246018	246019
Customer Reference	5	3
Sample ID		
Sample Type	DISTURBED	DISTURBED
Sample Location	BH1	BH2
Sample Depth (m)	1.20	0.70
Sampling Date	27/07/2021	27/07/2021

Determinand	Codes	Units	LOD		
Soil sample preparation parameters					
Material removed	N	%	0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	none	none
Anions					
Water Soluble Sulphate	M	g/l	0.02	0.07	0.11
Inorganics					
Total Sulphur	N	%	0.01	0.03	0.02
Acid Soluble Sulphate (SO4)	U	%	0.02	0.05	0.04
Miscellaneous					
pH	M	pH units	0.1	8.2	7.9

2683

Method Summary

Report No.: 21-35085, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	29/07/2021	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	30/07/2021	115	Ion Chromatography
Water soluble anions	M	Air dried sample	29/07/2021	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	30/07/2021	216	IR

Tests marked N are not UKAS accredited

APPENDIX D – GROUNDWATER AND GAS LEVELS

APPENDIX D – GROUNDWATER LEVEL

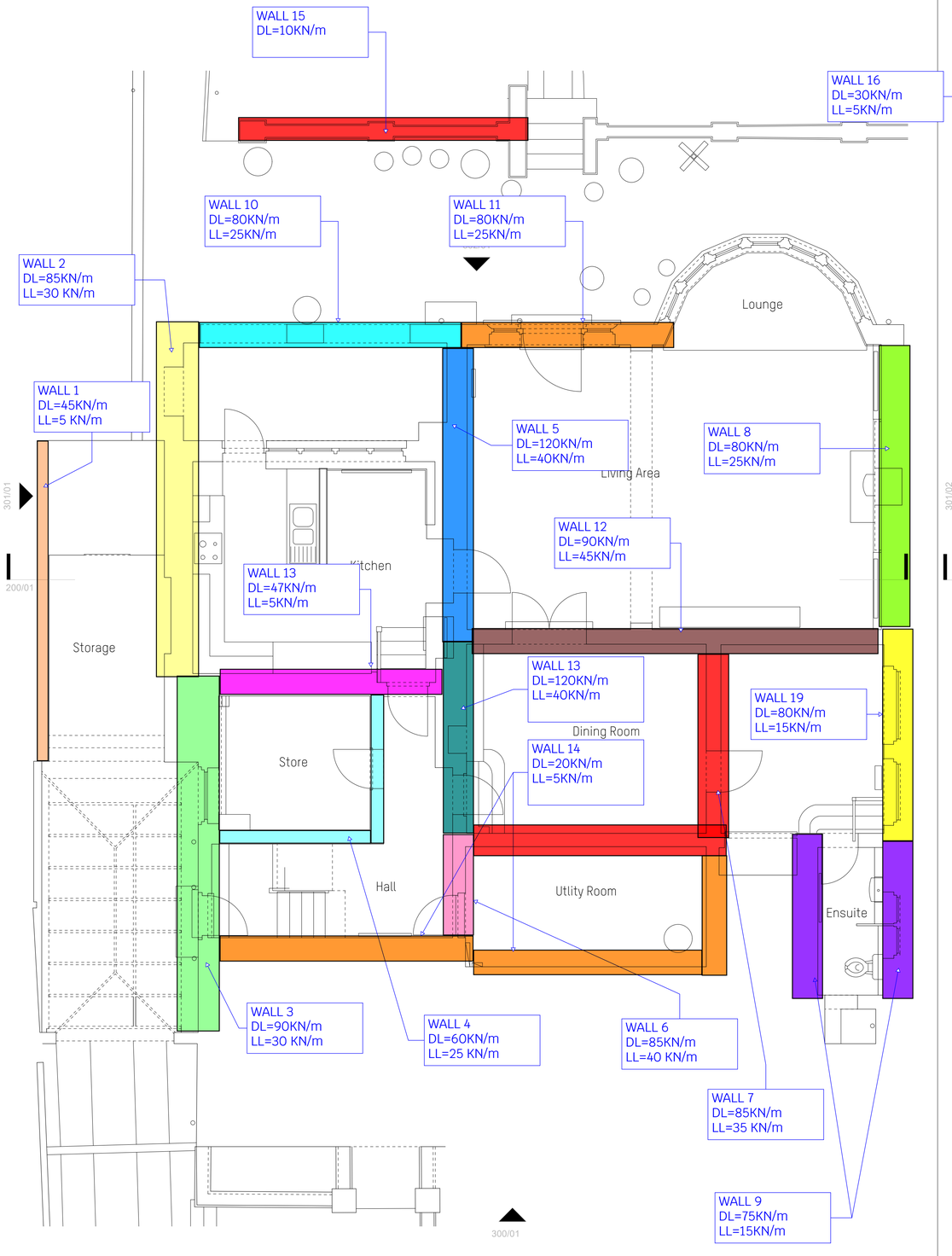
Client	Geofirma		Project Code	2021-028-SYM-RED
	Project Name	43a Reddington Road NW3 7RA		

GEOFIRMA
GEOTECHNICAL & CIVIL ENGINEERING CONSULTANTS

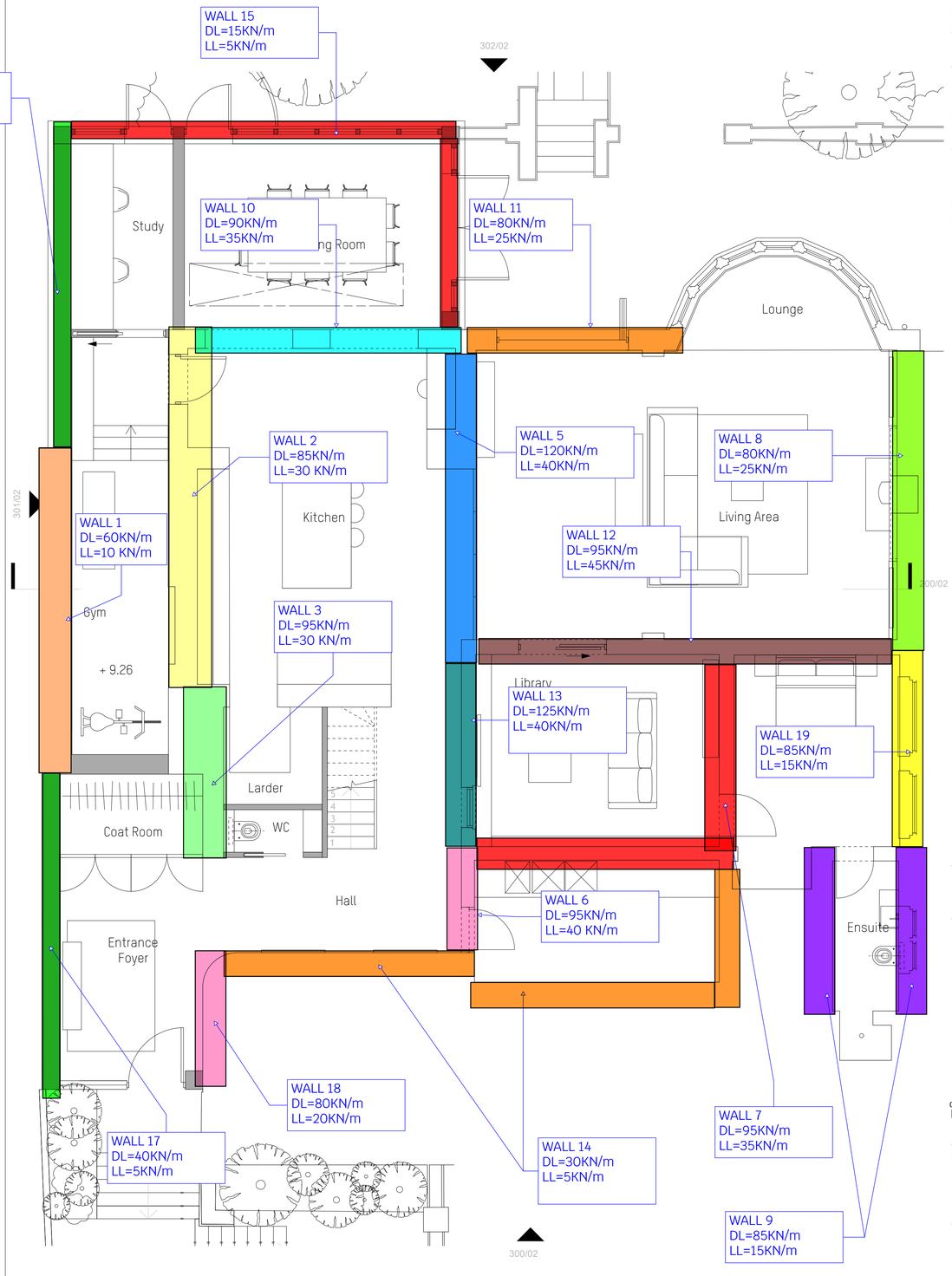
Ground Water Level Log

Borehole Reference	GWL Depth (metres below ground level)				
	10/08/2021				
BH1	4.03				
BH2	1.01				

APPENDIX E – LOAD TAKE DOWN SKETCHES



1 Existing Lower Ground Floor Plan
Scale: 1:50



2 Proposed Lower Ground Floor Plan
Scale: 1:50

NOTES:

This drawing is issued for information only.

All dimensions to be checked on site and any discrepencies are to be raised with the drawing issuer for clarification.

Dimensions are not to be scaled from this drawing.

The information shown on this drawing is subject to measured surveys and structural engineer's designs.

No building work is to be carried out on the basis of this drawing, without the written consent of Amos Goldreich Architecture.

SYMMETRYS
STRUCTURAL / CIVIL ENGINEERS

21141-Sk02-Rev P3
Prop and ex loadings for comments
43a Redington Road, London
SB
20.08.2021

rev	date	initials	description

location

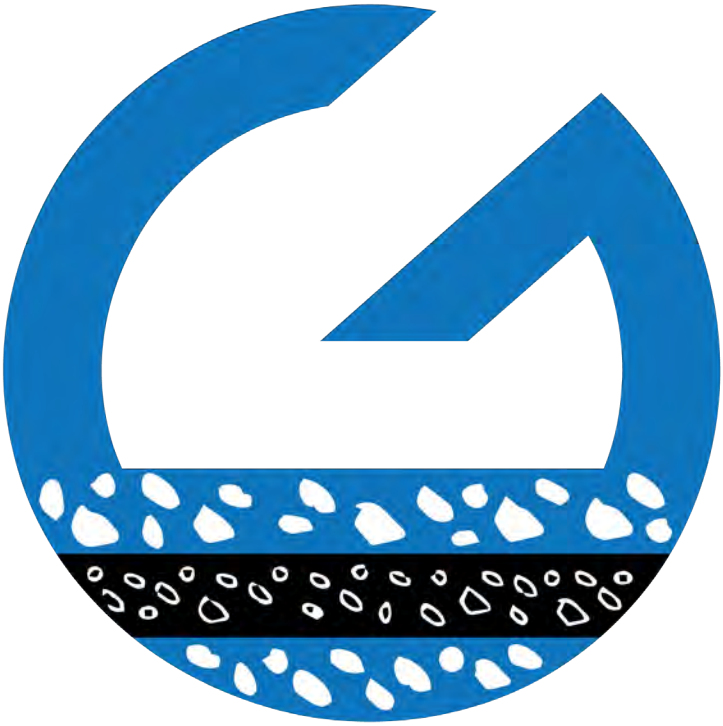
0 1 2 3 4 5 M

Amos Goldreich Architecture
Studio 32
Bickerton House
25 Bickerton Road
London N19 5JT
T +44(0)207272 6592
E info@agarchitecture.net
www.agarchitecture.net

project
43A Redington Road

drawing title
Lower Ground Floor Plans

drawn		
AM		
date	scale @ A1	status
April 2021	1:50	Draft
project number	drawing number	rev.
340	101	C



Geofirma Ltd
The Old Bank
153 The Parade
High Street
Watford
WD17 1NA

geofirmaconsultants.co.uk