

WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.

GEO-ENVIRONMENTAL & GEOTECHNICAL ASSESSMENT (GROUND INVESTIGATION) REPORT

Partridge Way
Wood Green
N22 8DT



JOMAS ASSOCIATES LTD

6-9 The Square, Stockley Park, Uxbridge, UB11 1FW

www.jomasassociates.com 0843-289-2187 info@jomasassociates.com

Report Title: Geo-environmental & Geotechnical Assessment Ground Investigation Report for Partridge Way, Wood Green, N22 8DT

Report Status: Final v1.0

Job No: P2794J2049/TE

Date: 20 October 2021

QUALITY CONTROL - PREVIOUS VERSIONS

Version	Date	Issued By

Prepared by: JOMAS ASSOCIATES LTD **For:** LONDON BOROUGH OF HARINGEY

Prepared by
Alice Barrington BSc (Hons)
Geo-environmental Engineer



.....

Reviewed by
Tom Elbourne BSc (Hons),
CGeol, FGS, RoGEP -
Professional
Senior Geo-environmental
Engineer



.....

Approved by
James Field BSc (Hons), CGeol,
FGS, RoGEP - Professional
Principal Engineer



.....

Should you have any queries relating to this report, please contact

JOMAS ASSOCIATES LTD

www.jomasassociates.com

0843 289 2187

info@jomasassociates.com

CONTENTS

	Page
EXECUTIVE SUMMARY	IV
1 INTRODUCTION	1
1.1 Terms of Reference	1
1.2 Proposed Development.....	1
1.3 Objectives	1
1.4 Scope of Works	2
1.5 Limitations	2
2 DESK STUDY SUMMARY	3
2.1 Site Information	3
2.2 Summary of Preliminary Risk Assessment (Desk Study)	3
3 GROUND INVESTIGATION	6
3.1 Scope of Works	6
3.2 In-situ Geotechnical Testing	6
3.3 Laboratory Analysis	7
4 GROUND CONDITIONS ENCOUNTERED	9
4.1 General	9
4.2 Ground Conditions	9
4.3 Limitations	9
4.4 Geotechnical Testing Results	10
4.5 Summary of General Derived Properties	10
5 RISK ASSESSMENT – ANALYTICAL FRAMEWORK	12
5.1 Context and Objectives	12
5.2 Analytical Framework – Soils.....	12

5.3	BRE.....	13
6	GENERIC QUANTITATIVE RISK ASSESSMENT – SOIL DATA.....	14
6.1	Screening of Soil Chemical Analysis Results – Human Health Risk Assessment	14
6.2	Asbestos in Soil	15
6.3	Summary of Human Health Generic Quantitative Risk Assessment	15
6.4	Screening of Soil Chemical Analysis Results – Potential Risks to Plant Growth	15
6.5	Screening for Water Pipes Materials	16
6.6	Assessment of soil analytical data with respect to controlled waters.....	16
6.7	Waste Characterisation	17
7	GEO-ENVIRONMENTAL ASSESSMENT SUMMARY AND RECOMMENDATIONS... 18	
7.1	Land Quality Impact Summary	18
7.2	Review of Pollutant Linkages Following Ground Investigation	18
8	GEOTECHNICAL ENGINEERING RECOMMENDATIONS.....	20
8.1	General	20
8.2	Proposed Foundations.....	20
8.3	Sulphates	22
8.4	Ground Floor Slabs	22
8.5	Falling Head Permeability Testing	23
8.6	Excavations	23
8.7	Pavement and Subgrade.....	23
9	REFERENCES	24

APPENDICES**APPENDIX 1 – FIGURES****APPENDIX 2 – EXPLORATORY HOLE RECORDS****APPENDIX 3 – CHEMICAL LABORATORY TESTING RESULTS****APPENDIX 4 – GEOTECHNICAL LABORATORY TEST RESULTS****APPENDIX 5 – FALLING HEAD PERMEABILITY TESTING RESULTS**

EXECUTIVE SUMMARY

Site Details	Site Address	Partridge Way, Wood Green, N22 8DT
	National Grid	E: 530422, N: 190897
	Site Area	0.05Ha (approx.)
	Proposed Development	The proposed development is understood to comprise the redevelopment of the existing garages on site and the construction of a 7 storey building containing 15no. residential apartments.
Encountered Conditions	Scope of Works	The assessment involved an intrusive investigation to confirm the ground and groundwater conditions and support the development of a geotechnical and geo-environmental assessment.
	Ground Conditions	The ground conditions encountered broadly consistent with those anticipated from the previously issued desk study, and comprised Made Ground, to depths of up to 0.30m, underlain by soft to very stiff clay of the London Clay Formation to the base of the boreholes (maximum depth of 30.0m).
	Groundwater	Groundwater was not encountered during the ground investigation.
Geo-environmental Assessment Summary and Recommendations		Following generic risk assessments, no elevated concentrations were detected in soils in excess of generic assessment criteria for the protection of human health within a “residential with plant uptake” end-use scenario. Therefore, based on the information obtained to date, no remediation is required. No asbestos fibres were detected in the samples analysed in the laboratory. As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out, and caution must be exercised during construction works. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.
Geotechnical Considerations	Foundations	It is considered that strip/trench-fill foundations may be formed within the underlying London Clay Formation at a minimum depth of 1.0m for an allowable bearing capacity of 85kPa. Foundations could be deepened to a depth of 2.0m for an allowable bearing capacity of 100kPa. Foundations may need to be deepened further due to NHBC building near tree requirements. Based on the anticipated loads, a piled foundation is likely to be preferable and indicative pile carrying capacities are given in Table 8.1. Heave precautions are required for soils of high volume change potential.
	Ground Floor Slabs	Given the presence of shrinkable soils, it is recommended that suspended floor slabs are used with an adequate void designed according to NHBC Standards. As a guide, initial modelling indicates a requirement for a sub-floor void of at least 300mm due to the presence of shrinkable soils of high volume change potential.
	Sulphates	Buried concrete for foundations should be designed to Class DS-3 (AC-2s).
	Excavations	Temporary excavations are unlikely to remain stable and some form of temporary support or battering back to a safe angle and dewatering are likely to be required. Subject to seasonal variations, surface water/groundwater encountered during site works could likely be dealt with by conventional pumping from a sump used to collate waters.
	Pavement and Subgrade	Preliminary CBR design values of 2.5% are recommended for pavements constructed within Made Ground or London Clay Formation.

	Infiltration Testing	Based on the results of in-situ testing, it is considered that conventional soakaways are not suitable for discharging storm water run-off to the ground.
Recommended Further Work		The following works are recommended:) Seek approval of the Generic Quantitative Risk Assessment from the Local Authority, NHBC and other relevant stakeholders;) Seek confirmation of the water supply pipe requirements by the appropriate service provider.
<i>This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the full text.</i>		

1 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 London Borough of Haringey ("The Client") has commissioned Jomas Associates Ltd ('Jomas') to undertake an investigation of the geotechnical and geo-environmental factors pertaining to the proposed development at a site located at Partridge Way, Wood Green, N22 8DT (herein referred to as 'the site'). The site's location is presented in Figure 1.
- 1.1.2 A Phase 1 Desk Study has been produced for the site and issued separately (detailed in Table 1.1 below), followed by an intrusive investigation (detailed in this report).
- 1.1.3 Relevant reports prepared by or supplied to Jomas Associates prior to the commencement of this investigation are detailed in Table 1.1:

Table 1.1: Previous/Supplied Reports

Title	Author	Reference	Date
Desk Study/Preliminary Risk Assessment Report for Partridge Way, Wood Green, N22 8DT	Jomas Associates Ltd	P2794J2049/JWT	25 th September 2020

- 1.1.4 An intrusive investigation has been undertaken in accordance with Jomas' proposal dated 21st August 2020.

1.2 Proposed Development

- 1.2.1 The proposed development is to comprise the redevelopment of the existing garages on site to accommodate the construction of a 7 storey block containing 15no. residential units. There is the potential this may be increased to an 8 storey building with 17no. units.
- 1.2.2 Proposed development plans are provided as Figure 3.
- 1.2.3 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997.

1.3 Objectives

- 1.3.1 The objectives of Jomas' investigation are as follows:
-) To undertake an intrusive investigation, to determine the ground and groundwater conditions as well as to assess the nature and extent of contaminants (if any) potentially present at the site;
 -) To establish the presence of significant pollutant linkages, in accordance with the procedures set out within Part IIA of the Environmental Protection Act 1990, associated statutory guidance and current best practice including the Land Contamination Risk Management (LCRM); and,

-) To determine soil/rock properties to inform the geotechnical assessment for foundations, drainage, excavation stability, pavement design and buried concrete and recommendations for further action (if required).

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

-) Intrusive ground investigation to determine shallow ground conditions, and potential for contamination at the site;
-) Undertaking of laboratory chemical and geotechnical testing upon samples obtained;
-) Undertaking of soil infiltration tests to determine the permeability of the soils;
-) Return ground gas/groundwater monitoring;
-) The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Limitations

- 1.5.1 Jomas has prepared this report for the sole use of London Borough of Haringey, in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.
- 1.5.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.
- 1.5.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.5.4 Any reports provided to Jomas have been reviewed in good faith. Jomas cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.
- 1.5.5 This investigation and report has been carried out in accordance with the relevant standards and guidance in place at the time of the works. Future changes to these may require a re-assessment of the recommendations made within this report.
- 1.5.6 This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.

2 DESK STUDY SUMMARY

2.1 Site Information

2.1.1 The site location plan is appended to this report in Figure 1, Appendix 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	Partridge Way Wood Green N22 8DT
Approx. National Grid Ref.	530422 190897
Site Area (Approx)	0.05ha
Site Occupation	Garages and lock ups
Local Authority	London Borough of Haringey

2.2 Summary of Preliminary Risk Assessment (Desk Study)

- 2.2.1 As detailed in Table 1.1, a Phase 1 Desk Study report has been produced for the site and issued separately (Jomas Associates Ltd – P2794J2049 – September 2020). The findings of the Phase 1 Desk Study are presented in the following section. Reference should be made to the original reports and documents for further details. Where appropriate, this information will be used in the later sections of this report as supplementary information to assist in the evaluation of the ground conditions and aid the identification of geotechnical and geochemical constraints and hazards that could impact on the scheme.
- 2.2.2 A review of historical Ordnance Survey maps indicates that on the earliest available map (1864) the site was occupied predominantly by roadways. The southern corner appeared undeveloped and was part of an agricultural field. By 1896 the southern corner has been developed into a verge way for the adjacent Bounds Green Lane. By 1935 a club is present in the southern corner, however by 1952 this building is no longer identified as a club. By 1971 the site has been redeveloped to domestic lock ups and garages along the northern boundary. The site remains unchanged to the present day.
- 2.2.3 The surrounding areas have been predominantly residential use with occasional industrial features, although these are considered to be at such a distance that their impact is considered negligible.
- 2.2.4 Information provided by the British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation.
- 2.2.5 The solid deposits directly underlying the site are identified as Unproductive.
- 2.2.6 A review of the Envirolnsight report indicates that the site is located directly within a groundwater source protection zone 1.
- 2.2.7 There are 20no. groundwater or potable water abstractions reported within 2km of the site. 18no. of these are for potable use. The closest record is identified as an active potable water abstraction source located 478m to the south of the site.

- 2.2.8 The nearest detailed river entry and surface water feature is reported 68m east of the site. There are no Environment Agency Zone 2 or Zone 3 floodplains reported within 50m of the site.
- 2.2.9 An intrusive investigation was recommended confirm the preliminary geo-environmental risks identified and to provide geotechnical information for use in design. A UXO Risk Assessment was also recommended.
- 2.2.10 The conceptual site model is reproduced in Table 2.2 overleaf.

SECTION 2
DESK STUDY SUMMARY

Table 2.2: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
J Potential for contaminated ground associated with previous site use (roadway / verge, lock-up garages) – on site (S1) J Potential for Made Ground associated with previous development operations – on site (S2) J Potential asbestos containing materials within existing buildings – on site (S3)	J Ingestion and dermal contact with contaminated soil (P1) J Inhalation or contact with potentially contaminated dust and vapours (P2) J Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	J Construction workers (R1) J Maintenance workers (R2) J Neighbouring site users (R3) J Future site users (R4) J Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low	Moderate	GI – Ground Investigation
			Severe for Asbestos	Low	Moderate	
	J Accumulation and migration of soil gases (P5)		Severe	Unlikely	Low	
	J Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) J Horizontal and vertical migration of contaminants within groundwater (P4)	J Neighbouring site users (R3) J Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Unlikely	Low	

3 GROUND INVESTIGATION

3.1 Scope of Works

- 3.1.1 A ground investigation was undertaken on the 6th and 7th September 2021.
- 3.1.2 A summary of the fieldwork carried out at the site, with justifications for exploratory hole positions, is presented in Table 3.1 below.

Table 3.1: Scope of Intrusive Investigation

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved	Justification
Windowless Sample Boreholes	5	WS1-5	Up to 5m bgl	Obtain shallow samples for laboratory geotechnical testing. To allow in-situ geotechnical testing. Falling head permeability tests were conducted within 2No borehole.
Cable Percussion Boreholes	1	BH1	Up to 30m bgl	Obtain deeper samples for laboratory geotechnical testing. To allow in-situ geotechnical testing.

- 3.1.3 The ground investigation was undertaken in accordance with British Standard BS5930:2015+A1:2020 "Code of practice for ground investigations", British Standard BS10175:2011+A2:2017 "Investigation of potentially contaminated sites - code of practice", NHBC Standards, Chapter 4.1 and AGS Guidelines for Good Practice in Site Investigations.
- 3.1.4 Exploratory hole positions are shown on the exploratory hole location plan presented in Figure 2, Appendix 1. The exploratory hole records are included in Appendix 2.
- 3.1.5 Where monitoring well installations were not installed, the exploratory holes were backfilled with the arisings (in the reverse order in which they were drilled) and the ground surface was reinstated so that no depression was left.

3.2 In-situ Geotechnical Testing

- 3.2.1 In-situ geotechnical testing included Standard Penetration Tests. The determined 'N' values have been used to determine the relative density of granular materials and have been used with standard correlations to infer various other derived geotechnical parameters including the undrained shear strength of the cohesive strata. The results of the individual tests are on the appropriate exploratory hole logs in Appendix 2.
- 3.2.2 The determination of permeability of the underlying ground was undertaken by carrying out in-situ falling head tests. These were carried out to conform with the methodology for falling head permeability test formerly outlined in BS: 5930 (1999) and recently in BS EN ISO 22282-2. Copies of the results and calculations are provided in Appendix 5.

3.3 Laboratory Analysis

3.3.1 A programme of laboratory testing, scheduled by Jomas Associates Limited, was carried out on selected samples of Made Ground and natural strata.

Chemical Testing

3.3.2 Soil samples were submitted to i2 Analytical (a UKAS and MCerts accredited laboratory) for analysis.

3.3.3 The samples were analysed for a wide range of contaminants as shown in Table 3.2 below:

Table 3.2: Chemical Tests Scheduled

Test Suite	No. of tests	
	Made Ground / Topsoil	Natural
Basic Suite 3	5	-
Total Organic Carbon	3	-
Water Soluble Sulphate	-	4
Asbestos Screen & ID	5	-

3.3.4 The determinands contained in the Basic Suite 3 are as detailed in Table 3.3 below.

Table 3.3: Basic Suite of Determinands

DETERMINAND	LIMIT OF DETECTION (mg/kg)	UKAS ACCREDITATION	TECHNIQUE
Arsenic	1	Y (MCERTS)	ICPMS
Cadmium	0.2	Y (MCERTS)	ICPMS
Chromium	1	Y (MCERTS)	ICPMS
Chromium (Hexavalent)	4	Y (MCERTS)	Colorimetry
Lead	1	Y (MCERTS)	ICPMS
Mercury	0.3	Y (MCERTS)	ICPMS
Nickel	1	Y (MCERTS)	ICPMS
Selenium	1	Y (MCERTS)	ICPMS
Copper	1	Y (MCERTS)	ICPMS
Zinc	1	Y (MCERTS)	ICPMS
Boron (Water Soluble)	0.2	Y (MCERTS)	ICPMS
pH Value	0.1 units	Y (MCERTS)	Electrometric
Sulphate (Water Soluble)	0.0125g/l	Y (MCERTS)	Ion Chromatography
Total Cyanide	1	Y (MCERTS)	Colorimetry
Speciated/Total PAH	0.05/0.80	Y (MCERTS)	GCFID
Phenols	1	Y (MCERTS)	HPLC
Total Petroleum Hydrocarbons (banded)	-	N Y (MCERTS)	Gas Chromatography

3.3.5 To support the selection of appropriate tier 1 screening values, 3no. samples were analysed for total organic carbon.

3.3.6 The laboratory test results are included in Appendix 3.

Geotechnical Laboratory Testing

3.3.7 In addition to the contamination assessment, soil samples were submitted to the UKAS Accredited laboratory of i2 Analytical Ltd. for a series of analyses.

3.3.8 This testing was designed to classify the samples; and to obtain parameters (either directly or sufficient to allow relevant correlations to be used) relevant to the technical objectives of the investigation.

3.3.9 The following laboratory geotechnical testing was carried out:

Table 3.4 Laboratory Geotechnical Analysis

Methodology	Test Description	Number of tests
BS EN 17892	Moisture Content Determination	6
BS1377:1990	Liquid and Plastic Limit Determination (Atterberg Limits)	6
BS1377:1990	Determination of the undrained shear strength in triaxial compression with single stage loading and without measurement of pore pressure	6

3.3.10 In addition, 4no. soil samples were analysed for a modified BRE Special Digest 1 suite (acid and water soluble sulphate, total sulphur and pH) to assist with the ACEC classification for buried concrete.

3.3.11 The laboratory test results are included in Appendix 4.

4 GROUND CONDITIONS ENCOUNTERED

4.1 General

4.1.1 A summary of the conditions encountered during the physical investigation of the site is presented in the following section.

4.2 Ground Conditions

4.2.1 The ground conditions encountered were broadly consistent with those anticipated, i.e. a thickness of Made Ground overlying the London Clay Formation, and are summarised in Table 4.1 below.

Table 4.1 : Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Paving slab/asphalt/concrete. (MADE GROUND)	0.00-0.10	0.05-0.20	0.05-0.10
Brown sandy gravelly clay. Gravel consists of brick. (MADE GROUND)	0.00-0.20	0.20-0.30	0.10-0.20
Orange brown gravel. (MADE GROUND)	0.10	0.25	0.15
Soft to very stiff consistency** grey mottled brown/grey silty CLAY. (LONDON CLAY FORMATION)	0.20-0.30	>1.00->30.00 [base not proven]	>0.80->29.75 [thickness not proven]

***Consistency estimated using semi-empirical correlations with SPT N-values, Plasticity Indices and published literature*

4.2.2 No visual or olfactory evidence of potential contamination was identified within the investigation positions.

4.2.3 Groundwater was not encountered during the course of the investigation.

4.2.4 It should be noted that changes in groundwater levels can occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a standpipe or piezometer installed within appropriate response zones. Changes in groundwater level can have a direct effect on excavation stability and dewatering requirements, and cohesive soils can soften under rising or high groundwater levels.

4.3 Limitations

4.3.1 During the intrusive ground investigation, WS5 could not be drilled using a windowless sampling rig due to the presence of nearby services and access issues. This was instead excavated by hand to a depth of 1.00mbgl.

4.3.2 WS3 was terminated at a depth of 2.5m due to refusal of the sample barrel in hard natural ground.

- 4.3.3 The possible presence of natural and/or manmade obstructions elsewhere on site cannot be discounted.

4.4 Geotechnical Testing Results

- 4.4.1 32no. Standard Penetration Tests (SPT) were undertaken in the borehole locations to a maximum depth of 29m bgl. SPT 'N' values ranged between N=8 and N=>50+ within the cohesive soils of the London Clay Formation. This corresponded with a low to very high strength in the cohesive soils (based on correlations postulated by Stroud & Butler, 1975 and Stroud, 1989) of the London Clay Formation. The blow counts showed a general trend of increasing with depth. The test results indicate that the minimum SPT 'N' value of 8 was recorded within soft becoming firm brown clay in WS1, WS2 at a depth of between 0.2m and 5m bgl. In contrast, the highest SPT 'N' values were recorded where stiff to very stiff grey clay of the London Clay Formation was encountered.
- 4.4.2 The results of geotechnical laboratory testing undertaken from the recovered samples of the London Clay Formation (excluding Topsoil and Made Ground) are summarised in Table 4.2.

Table 4.2: Summary of Geotechnical Test Results

Parameter	Made Ground	London Clay Formation
Moisture Content (%)	16-21	13-37
Liquid Limit (%)	-	67-80
Plastic Limit (%)	-	26-32
Plasticity Index (%)	-	38-50
Modified Plasticity Index (%)	-	35.42-50
Volume Change Potential [NHBC and BRE]	-	Medium to High
pH	8.5-12.1	8.1-8.5
Water soluble sulphate (g/l)	0.01-0.30	0.78-2.0
SPT (N)	-	8-50

4.5 Summary of General Derived Properties

- 4.5.1 Based on the analysis of the ground investigation data and past experience with similar deposits, the general parameters given in Table 4.3, have been derived for the London Clay Formation materials.

Table 4.3: Derived Parameters for London Clay Formation

Property*	London Clay Formation
Unit Weight	18.5
Drained Friction, ϕ' (°)	20.76-22.25 ¹⁾
SPT 'N' Value	8-50

Property*	London Clay Formation
Undrained Young's Modulus, E_u (MPa) ²⁾	9.6-60
Undrained Shear Strength, c_u (kPa) ³⁾	36-280
Plasticity Index (%)	38-50
Modified Plasticity Index (%)	35-50
Volume Change Potential [NHBC and BRE]	Medium to High
Modulus of Volume Compressibility, m_v (m ² /MN) ⁴⁾	<0.044 – 0.278
¹⁾ Calculated from: $\phi' = (42^\circ - 12.5 \log_{10} I_p)$ for $5\% \leq I_p \leq 100\%$ Where, I_p is the soil's plasticity index (BS8002:2015)	
²⁾ Calculated from: $E_u = 1.2 \text{ N MPa}$, based on the guidance given in CIRIA Report 143.	
³⁾ The undrained shear strength (c_u) of the cohesive soils was correlated to the SPT "N" values using Stroud (1974), where $c_u = f_1 N$ and f_1 is factor related to the Plasticity Index (PI) of the clay (a value of f_1 equal to 5.0 for $PI \leq 25\%$ and a value of f_1 value equal to 4.5 for $PI > 25\%$).	
⁴⁾ Calculated from: $m_v = 1/f_2 \text{ N m}^2/\text{MN}$, f_2 is a coefficient proposed by Stroud and Butler (1975) and varies with Plasticity Index (PI) and presented in Figure 27 of CIRIA Report 27.	
*These reported values are not considered as 'Characteristic Values'.	

5 RISK ASSESSMENT – ANALYTICAL FRAMEWORK

5.1 Context and Objectives

5.1.1 This section seeks to evaluate the level of chronic risk pertaining to human health and the environment which may result from both the existing use and proposed future use of the site. It makes use of the ground investigation findings, as described in the previous sections, to evaluate further the potential pollutant linkages identified in the desk study. A combination of qualitative and quantitative techniques is used, as described below.

5.1.2 The purpose of generic quantitative risk assessment is to compare concentrations of contaminants found on site against generic assessment criteria (GAC) to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed assessment is required. The approaches detailed all broadly fit within a tiered assessment structure in line with the framework set out in the Department of Environment, Food and Rural Affairs (DEFRA), EA and Institute for Environment and Health Publication, Guidelines for Environmental Risk Assessment and Management.

5.2 Analytical Framework – Soils

5.2.1 There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

5.2.2 The CLEA model provides a methodology for quantitative assessment of the long term risks posed to human health by exposure to contaminated soils. Toxicological data have been used to calculate Soil Guideline Values (SGV) for individual contaminants, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

5.2.3 In the absence of any published SGVs for certain substances, or where the assumptions made in generating the SGVs do not apply to the site, Jomas Associates Limited have compared the soil analytical results to other available GAC, including the LQM/CIEH S4ULs and DEFRA C4SL. Site-specific assessments are undertaken wherever possible and/or applicable. All assessments are carried out in accordance with the CLEA protocol.

5.2.4 The assessment criteria used for the screening of determinands within soils are identified within Table 5.1.

Table 5.1: Selected Assessment Criteria – Contaminants in Soils

Substance Group	Determinand(s)	Assessment Criteria Selected
<u>Organic Substances</u>		
Non-halogenated Hydrocarbons	Total Petroleum Hydrocarbons (TPHCWG banded)	S4UL
	Total Phenols	S4UL
Polycyclic Aromatic Hydrocarbons (PAH-16)	Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(ghi)perylene	S4UL
Volatile Organic Compounds (VOCs/sVOCs).	Toluene, Ethylbenzene, Benzene, Xylenes	S4UL
<u>Inorganic Substances</u>		
Heavy Metals and Metalloids	Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Copper, Zinc	S4UL
	Copper, Zinc, Nickel	BS: 3882 (2015).
Cyanides	Free Cyanide	CLEA v1.06
Sulphates	Water Soluble Sulphate	BRE Special Digest 1:2005

5.2.5 Proposed development plans indicate private amenity space to be included as part of the proposed development. As a result, the site has been assessed with regards to a “residential with plant uptake” end use scenario.

5.3 BRE

5.3.1 The BRE Special Digest 1:2005, ‘Concrete in Aggressive Ground’ is used with soluble sulphate and pH results to assess the aggressive chemical environment of future underground concrete structures at the site.

6 GENERIC QUANTITATIVE RISK ASSESSMENT – SOIL DATA

6.1 Screening of Soil Chemical Analysis Results – Human Health Risk Assessment

6.1.1 Laboratory analysis for soils are summarised in Tables 6.1 to 6.3. Raw laboratory data is included in Appendix 3.

Table 6.1: Soil Laboratory Analysis Results – Metals, Metalloids, Phenol, Cyanide

Determinand	Unit	No. samples tested	Screening Criteria	Min	Max	No. Exceeding
Arsenic	mg/kg	5	S4UL 37	7.3	24	0
Cadmium	mg/kg	5	S4UL 11	<0.2	<0.2	0
Chromium	mg/kg	5	S4UL 910	<4.0	<4.0	0
Lead	mg/kg	5	C4SL 200	15	30	0
Mercury	mg/kg	5	S4UL 40	<0.3	<0.3	0
Nickel	mg/kg	5	S4UL 180	11	47	0
Copper	mg/kg	5	S4UL 2400	22	32	0
Zinc	mg/kg	5	S4UL 3700	59	100	0
Total Cyanide ^A	mg/kg	5	CLEA v 1.06 33	<1.0	<1.0	0
Selenium	mg/kg	5	S4UL 250	<1.0	<1.0	0
Boron Water Soluble	mg/kg	5	S4UL 290	0.4	2.0	0
Phenols	mg/kg	5	S4UL 120	<1.0	<1.0	0

Notes: ^A Generic assessment criteria derived for free inorganic cyanide.

Table 6.2: Soil Laboratory Analysis Results – Polycyclic Aromatic Hydrocarbons (PAHs)

Determinand	Unit	No. Samples Tested	Screening Criteria	Min	Max	No. Exceeding
Naphthalene	mg/kg	5	S4UL 2.3	<0.05	<0.05	0
Acenaphthylene	mg/kg	5	S4UL 170	<0.05	<0.05	0
Acenaphthene	mg/kg	5	S4UL 210	<0.05	<0.05	0
Fluorene	mg/kg	5	S4UL 170	<0.05	<0.05	0
Phenanthrene	mg/kg	5	S4UL 95	<0.05	1.0	0
Anthracene	mg/kg	5	S4UL 2400	<0.05	<0.05	0
Fluoranthene	mg/kg	5	S4UL 280	<0.05	1.6	0
Pyrene	mg/kg	5	S4UL 620	<0.05	1.4	0
Benzo(a)anthracene	mg/kg	5	S4UL 7.2	<0.05	0.81	0
Chrysene	mg/kg	5	S4UL 15	<0.05	0.76	0

Determinand	Unit	No. Samples Tested	Screening Criteria	Min	Max	No. Exceeding	
Benzo(b)fluoranthene	mg/kg	5	S4UL	2.6	<0.05	0.93	0
Benzo(k)fluoranthene	mg/kg	5	S4UL	77	<0.05	0.27	0
Benzo(a)pyrene	mg/kg	5	S4UL	2.2	<0.05	0.74	0
Indeno(123-cd)pyrene	mg/kg	5	S4UL	27	<0.05	0.40	0
Dibenzo(ah)anthracene	mg/kg	5	S4UL	0.24	<0.05	<0.05	0
Benzo(ghi)perylene	mg/kg	5	S4UL	320	<0.05	0.41	0
Total PAH	mg/kg	5	-	-	<0.80	8.34	-

Table 6.3: Soil Laboratory Analysis Results – Total Petroleum Hydrocarbons (TPH)

TPH Band	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
C ₈ -C ₁₀	mg/kg	5	S4UL	27	<0.1	<0.1	0
>C ₁₀ -C ₁₂	mg/kg	5	S4UL	74	<2.0	<2.0	0
>C ₁₂ -C ₁₆	mg/kg	5	S4UL	140	<4.0	5.3	0
>C ₁₆ -C ₂₁	mg/kg	5	S4UL	260	<1.0	33	0
>C ₂₁ -C ₃₅	mg/kg	5	S4UL	1100	<10	110	0
Total TPH	mg/kg	5	-	-	17.1	150.4	-

Note: *The lower value of guidelines for Aromatic/Aliphatics has been selected

6.2 Asbestos in Soil

6.2.1 No asbestos fibres were reported in samples analysed in the laboratory.

6.3 Summary of Human Health Generic Quantitative Risk Assessment

6.3.1 In summary, no exceedances of contaminants above the GAC were recorded in any of the soil samples tested.

6.4 Screening of Soil Chemical Analysis Results – Potential Risks to Plant Growth

6.4.1 Zinc, copper and nickel are phytotoxins and could therefore inhibit plant growth in soft landscaped areas. Concentrations measured in soil for these determinands have been compared with the pH dependent values given in BS:3882 (2015). This does not constitute a full BS:3882 topsoil test.

6.4.2 Table 6.4 shows the soil analytical results compared with the relevant screening values, adopting a pH value of greater than 7, as indicated by the results of the laboratory analysis.

Table 6.4: Soil Laboratory Analysis Results – Phytotoxic Determinands

Determinand	Threshold level (mg/kg)	Min (mg/kg)	Max (mg/kg)	No. Exceeding
Nickel	110	11	47	0
Copper	200	22	32	0
Zinc	300	59	100	0

6.4.3 None of the samples exceeded the threshold levels and a significant risk to plant growth has not been identified.

6.5 Screening for Water Pipes Materials

6.5.1 The results of the analysis have been assessed for potential impact upon water supply pipes. Table 6.5 below summarises the findings of the assessment:

Table 6.5: Screening Guide for Water Pipes

Determinand	No. of tests	Threshold adopted for PE (mg/kg)	Value for site data (mg/kg)		No of Exceedances
			Min	Max	
Total VOCs	5	0.5	N/A	N/A	N/A
BTEX	5	0.1	N/A	N/A	N/A
MTBE	5	0.1	N/A	N/A	N/A
EC5-EC10	5	1	<0.1	<0.1	0
EC10-EC16	5	10	<6.0	5.3	0
EC16-EC40	5	500	<11.0	143	0
Naphthalene	5	5	<0.05	<0.05	0
Phenols	5	2	<1	<1	0

*Laboratory detection limit

6.5.3 Determinands marked “N/A” were not analysed for as no evidence of their presence was obtained from the Desk Study.

6.5.4 The above suggests that upgraded pipe work is unlikely to be required.

6.6 Assessment of soil analytical data with respect to controlled waters

6.6.1 At the Preliminary Risk Assessment (Desk Study) stage, risk to controlled waters were considered to be low.

6.6.2 The following controlled waters receptors were identified:

-) Potable abstraction 478m south of the site
-) SPZ1 on site
-) Surface waters located 68m east

- 6.6.3 Pathways for migration of leachable leachable/mobile contamination were not considered to be present within the underlying, relatively impermeable London Clay Formation.
- 6.6.4 The ground conditions encountered are considered to confirm the expected geological succession and confirm the lack of pathways for migration of leachable / mobile contamination.
- 6.6.5 In addition, with reference to Section 4.2, no visual / olfactory evidence of potentially mobile contamination was encountered, and therefore a pollutant linkage to controlled waters is not considered to exist.
- 6.7 Waste Characterisation**
- 6.7.1 The classification of materials for waste disposal purposes was outside the scope of this report. Should quantities of material require off-site disposal, waste classification will be required to determine whether soils may be treated as hazardous or non-hazardous.
- 6.7.2 Note that Waste Acceptance Criteria (WAC) analysis may then be required by the landfill operator to determine whether materials can be disposed of at either an inert, stable non-reactive hazardous or hazardous landfill.

7 GEO-ENVIRONMENTAL ASSESSMENT SUMMARY AND RECOMMENDATIONS

7.1 Land Quality Impact Summary

7.1.1 Following the ground investigation, the following is noted:

-) It is understood that the proposed development will comprise the erection of 15no. residential units in a 7-storey block which may increase to 17 units in an 8-storey block. Private amenity space is understood to be proposed.
-) Following generic risk assessments, no elevated concentrations of contaminants were detected in soils in excess of generic assessment criteria for the protection of human health within a “residential with plant uptake” end-use scenario.
-) No asbestos fibres were detected in the samples analysed in the laboratory.
-) No significant risk to plant growth has not been identified.
-) The risk to controlled waters from soils is considered negligible.
-) Upgraded potable water supply pipe materials are unlikely to be required. The water supply pipe requirements for this site should be discussed at an early stage with the relevant utility provider.
-) Following the land contamination assessment, no further assessment or risk mitigation is required, and the site can be considered suitable for the proposed use.
-) As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.

7.1.2 The above conclusions are made subject to approval by the statutory regulatory bodies.

7.2 Review of Pollutant Linkages Following Ground Investigation

7.2.1 The site CSM has been revised and updated from that suggested in the desk study in view of the ground investigation data, including soil laboratory analysis results. Table 9.1 highlights whether pollutant linkages identified in the original CSM are still relevant following the risk assessment, or whether pollutant linkages, not previously identified, exist.

SECTION 7
GEO-ENVIRONMENTAL ASSESSMENT SUMMARY AND
RECOMMENDATION



Table 7.1: Plausible Pollutants Linkages Summary (Pre Remediation)

Potential Source (from desk study)	Pathway	Receptor	Relevant Pollutant Linkage?	Comment
)] Potential for contaminated ground associated with previous site use (roadway / verge, lock-up garages) – on site (S1))] Potential for Made Ground associated with previous development operations – on site (S2))] Potential asbestos containing materials within existing buildings – on site (S3)	)] Ingestion and dermal contact with contaminated soil (P1)	)] Construction workers (R1)	N	No formal remedial measures considered necessary.
	)] Inhalation or contact with potentially contaminated dust and vapours (P2)	)] Maintenance workers (R2)		The findings of this report should be included in the construction health and safety file, with adequate measures put in place for the protection of construction and maintenance workers.
	)] Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	)] Neighbouring site users (R3)		Contact should be made with relevant utility providers to confirm if upgraded materials are required.
		)] Future site users (R4)		The concrete classification to protect buried concrete is discussed in Section 8.3
	)] Accumulation and migration of soil gases (P5)	)] Building foundations and on site buried services (water mains, electricity and sewer) (R5)	N	No potential source of ground gas identified by the Desk Study.
	)] Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3)	)] Neighbouring site users (R3)	N	A significant risk of impact to controlled waters has not been identified.
	)] Horizontal and vertical migration of contaminants within groundwater (P4)	)] Building foundations and on site buried services (water mains, electricity and sewer) (R5)		The concrete classification to protect buried concrete is discussed in Section 8.3

8 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

8.1 General

- 8.1.1 Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

8.2 Proposed Foundations

General

- 8.2.1 The Made Ground and any low strength clays of the London Clay Formation are not considered to provide suitable bearing strata due to their variability and the unacceptable risk of total and differential settlement.
- 8.2.2 All foundations should be deepened beneath these deposits, soft clay, root or desiccated zones, or disturbed ground, and founded within underlying competent strata.
- 8.2.3 As soils of high volume change potential are present, heave precautions will be required against the side of foundations and ground beams in accordance with the requirements set out in NHBC Standards Chapter 4.2.

Conventional Foundations

- 8.2.4 Based on the ground and groundwater conditions encountered, conventional shallow foundations are likely to be suitable for the proposed development.
- 8.2.5 It is considered that strip/trench-fill foundations may be formed within the underlying London Clay Formation at a minimum depth of 1.0m for an allowable bearing capacity of 85kPa. Foundations could be deepened to a depth of 2.0m for an allowable bearing capacity of 100kPa. Total and differential settlements should be contained within tolerable limits.
- 8.2.6 These depths, however, do not take into account the depth of Made Ground or the distance to and species of any previous, existing and proposed trees, and foundations may need to be deepened further accordingly, in accordance with NHBC requirements, for soils of high volume change potential.
- 8.2.7 Where foundations need to change levels as a result, the foundations should be stepped and reinforced. These steps should be no deeper than half of the width of the foundation and each step should not exceed 0.5m.
- 8.2.8 Foundations greater than 2.50m deep would require structure-specific design by a structural engineer.
- 8.2.9 Where any unexpected or soft ground conditions are encountered during the groundworks, works in that area should cease and the advice of a suitably qualified geotechnical engineer sought.

Piled Foundations

- 8.2.10 Given the anticipated loads of the currently proposed seven-storey building, it is considered that conventional foundations are not likely to be suitable due to the high structural loads. Piled foundations are therefore recommended.
- 8.2.11 Preliminary load capacities calculated for varying diameter of CFA piles taken into the London Clay Formation are given in Table 8.1. The design should be used for preliminary purposes only as the actual working load is dependent on the type of pile and method of installation.

Table 8.1: Indicative Pile Capacities (kN)

Pile toe depth (m bgl)	Pile diameter (mm)		
	450	600	800
Indicative Allowable Pile Capacity (kN)			
14	366	518	743
16	428	603	861
18	494	694	989
20	566	793	1126
22	643	899	1272
24	726	1012	1428
<i>26</i>	<i>814</i>	<i>1132</i>	<i>1593</i>

- 8.2.12 To comply with BS EN 1997 and the guidance given by the Federation of Piling Specialists the ground must be proven to a minimum of 5m below the proposed toe of the piles. Consequently, values below 25m bgl have been given indicatively in grey italics.
- 8.2.13 The construction of a piled foundation is a specialist job and the advice of a reputable local contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design.
- 8.2.14 These working loads have been calculated on the basis of the ground and groundwater conditions encountered in the boreholes and assume the following:
- ⌋ Partial factors were applied on the sum of the end bearing and skin friction working loads as defined by BS EN 1997 using Design Approach 1 Combination 2.
 - ⌋ No allowance has been made for additional forces acting on the pile shaft, such as negative skin friction, or loading due to desiccation or heave forces.
 - ⌋ Groundwater level was adopted as 31.0m bgl.
- 8.2.15 The preliminary working loads given are applicable to single vertically loaded piles. Where groups of piles are to be constructed, the working load of each individual pile should be reduced by a factor of 0.8 and a calculation made to check for the factor of safety against block failure.

- 8.2.16 A temporary working platform is likely to be required. In addition, some form of temporary drainage may also be required to prevent the working platform becoming waterlogged or deteriorating during use. A working platform should be designed in accordance with BRE BR470, or similar design standard.

8.3 Sulphates

- 8.3.1 Sulphate attack on building foundations occurs where sulphate solutions react with the various products of hydration in Ordinary Portland Cement (OPC) or converted High-Alumina Cement (HAC). The reaction is expansive, and therefore disruptive, not only due to the formation of minute cracks, but also due to loss of cohesion in the matrix.

- 8.3.2 In accordance with BRE Special Digest 1, the characteristic values of sulphate used to determine the concrete classification are determined using the methodology summarised in the table below.

Table 8.2: Concrete in the Ground Characteristic Value Determination

No Samples in the dataset	Method for determining the sulphate characteristic value
1 - 4	Highest value
5-9	Mean of the top 2No highest results
10 or greater	Mean of the top 20% highest results

- 8.3.3 Table 8.3 summarises the analysis of the aggressive nature of the ground for each of the strata encountered within the ground investigation.

Table 8.3: Concrete in the Ground Classes

Stratum	No Samples	pH range	Characteristic WS Sulphate (mg/l)	Design Sulphate Class	ACEC Class
Made Ground	5	11.6	168.8	DS-1	AC-1s
London Clay Formation	4	8.5	2000	DS-3	AC-2s

- 8.3.4 It should be noted that the BGS description of the London Clay Formation notes that it includes “disseminated pyrite”. It is therefore common practice to ensure that buried concrete formed in London Clay Formation has a Design Sulphate Class of at least DS-2.

- 8.3.5 The concrete structures, including foundations, will need to be designed in accordance with BS EN 1992-1-1:2004+A1:2014. It is recommended that the advice of this publication be taken for the design and specification of all sub-surface concrete.

8.4 Ground Floor Slabs

- 8.4.1 Given the presence of shrinkable soils, it is recommended that suspended floor slabs are used with an adequate void designed according to NHBC Standards. As a guide, initial modelling indicates a requirement for a sub-floor void of 300mm due to the presence of shrinkable soils of high volume change potential.

8.5 Falling Head Permeability Testing

- 8.5.1 2No falling head permeability tests were undertaken within WS1 and WS3 to assess infiltration potential, in general accordance with BS EN ISO 22282-2.
- 8.5.2 The first tests in each location were undertaken at a depth of 2mbgl, within the London Clay Formation. Water was introduced to the open hole up to 0.20mbgl and was monitored for a period of 30 minutes. The head of water did not drop. The results indicate that the London Clay Deposits are “practically impermeable”.
- 8.5.3 Infiltration drainage is therefore not considered to be suitable.

8.6 Excavations

- 8.6.1 Temporary excavations within the Made Ground are unlikely to remain stable and some form of temporary support or battering back to a safe angle and dewatering are likely to be required.
- 8.6.2 Temporary excavations within the cohesive soils are likely to remain relatively stable in the short term though some spalling may be anticipated.
- 8.6.3 Ground works should always be designed in such a manner to avoid entry into excavations by construction or maintenance personnel. However, in the event that such works cannot be avoided or designed out, they should only be undertaken in accordance with a safe system of work, following an appropriate risk assessment and in accordance with any legislative requirements, e.g. Confined Spaces Regulations.
- 8.6.4 Subject to seasonal variations, surface water/groundwater encountered during site works could likely be dealt with by conventional pumping from a sump used to collate waters.

8.7 Pavement and Subgrade

- 8.7.1 With reference to TRRL report LR1132 (1984) and the laboratory test data, it is recommended that an equilibrium suction-index CBR value of 2.5% is used for preliminary design in the London Clay Formation.
- 8.7.2 Where Made Ground is encountered at formation, a characteristic CBR value of 2.5% should also be adopted, or the materials be excavated and replaced with suitably compacted granular fill (geotechnically and chemically suitable).
- 8.7.3 CBR testing should be undertaken ahead of detailed design to confirm.
- 8.7.4 These strata should be treated as being potentially frost susceptible.

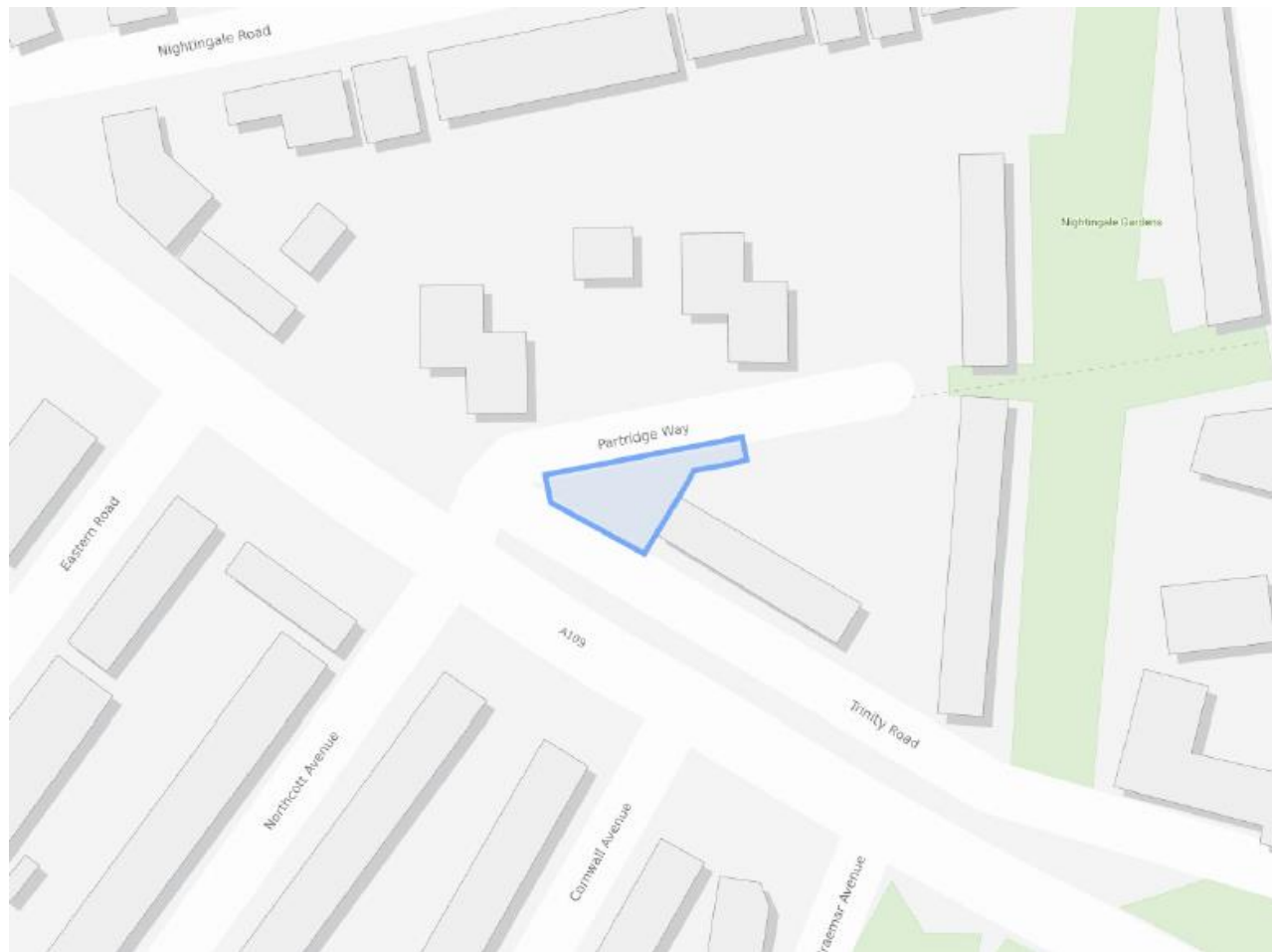
9 REFERENCES

- BRE Report BR211: Radon: Protective measures for new dwellings, 2015
- BRE Special Digest 1: Concrete in Aggressive Ground, 2005
- British Standards Institution (2004) Eurocode 7 – Geotechnical design - Part 1: General rules. BS EN 1997-1. Incorporating Corrigendum No.1. BSI, London
- British Standards Institution (2007) Eurocode 7 – Geotechnical design - Part 2: Geotechnical investigation and testing. BS EN 1997-2. BSI, London
- British Standards Institution (2007) BS 3882:2007 *Specification for topsoil and requirements for use*. Milton Keynes: BSI
- British Standards Institution (2011) BS 10175:2011 *Code of practice for the investigation of potentially contaminated sites*. Milton Keynes: BSI
- British Standards Institution BS 5930:2015+A1:2020 *Code of practice for ground investigations*. Milton Keynes: BSI
- British Standards Institution (2015) BS 8485:2015 Incorporating corrigendum No.1 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* Milton Keynes: BSI
- CIEH & CL:AIRE (2008) *Guidance on comparing soil contamination data with a critical concentration*. London: Chartered Institute of Environmental Health (CIEH) and CL:AIRE
- Environment Agency (2020) *Land contamination risk management (LCRM)*
- Environment Agency, NHBC & CIEH (2008) *Guidance for the safe development of housing on land affected by contamination*. R & D Publication 66. London: Environment Agency
- Environment Agency (2006) *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination* Environment Agency
- LQM/CIEH S4ULs. LQM, 2014
- Ministry of Housing, Communities & Local Government: *National Planning Policy Framework*. February 2019.
- NHBC Standards 2021. NHBC, Milton Keynes
- The Highways Agency (2009) *Design Manual for Roads and Bridges: Design Guidance for Road Pavement Foundations (Draft HD25) Interim Advice Note 73/06 Revision 1* (2009)
- Transport and Road Research Laboratory (1984) *The Structural Design of Bituminous Roads*, TRRL report LR1132

APPENDICES

APPENDIX 1 – FIGURES

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Site Location Plan	PROJECT NO.	P2794J2049
DATE	October 2021	FIGURE NO.	1

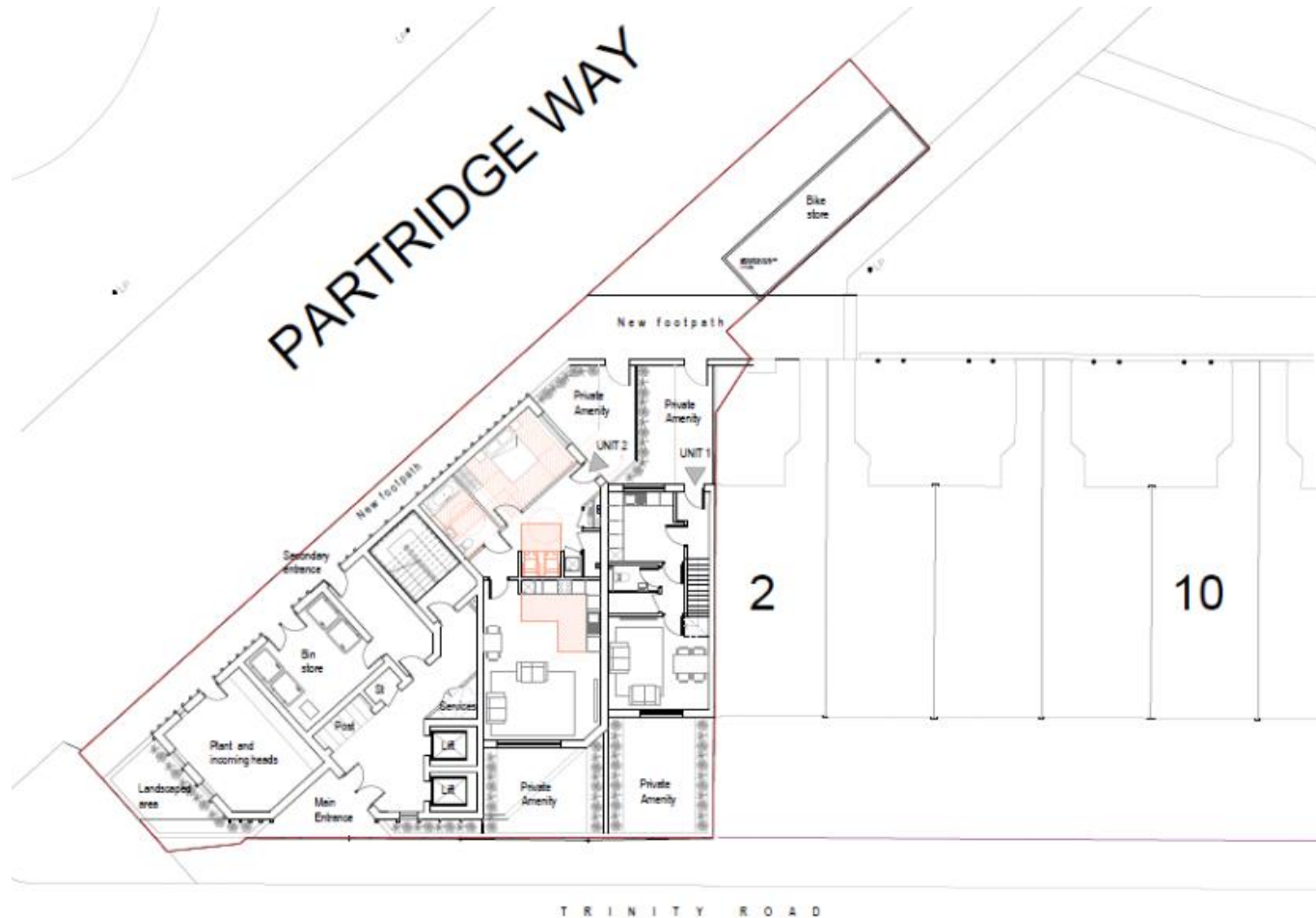


The site map shows a residential area with several roads: Partridge Way, Trinity Road, and Bounds Green Road. A building labeled 'Finsbury House' is located near the top left. A 'TCB' (Traffic Control Box) is marked on Trinity Road. A 'Sub Sta' (Substation) is located near the bottom right. The map highlights several water service locations: WS1/FHT, WS2, WS3/FHT, WS4, and WS5*. A borehole, BH1, is also indicated. The locations are marked with symbols: a circle with a cross for WS1/FHT, WS2, WS3/FHT, and WS4; a circle with a dot for BH1; and a circle with a cross for WS5*. The map also shows property boundaries and a 'play' area.

Notes:

- *completed as hand dug pit due to proximity to services and lack of access to garage.

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Proposed Development Plan	PROJECT NO.	P2794J2049
DATE	October 2021	FIGURE NO.	3



PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Walkover Photo Plan	FIGURE	3
Photo 1: The site, as viewed east from Partridge Way.		Photo 2: The site, as viewed west from Partridge Way	
			

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Walkover Photo Plan	FIGURE	3
Photo 3: Domestic lock-up garages onsite, viewed south form Partridge Way.		Photo 4: Paved area in the south of the site, viewed east.	
			

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Walkover Photo Plan	FIGURE	3
Photo 5: Paved area in the south of the site, viewed west.		Photo 6: Manhole adjacent to the south of garage block.	
			

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Walkover Photo Plan	FIGURE	3
Photo 7: Island of turf in south of site, viewed north.		Photo 8: Trinity Road, adjacent to the south of site, viewed southeast.	
			

PROJECT NAME	Partridge Way, Wood Green, N22 8DT	CLIENT	London Borough of Haringey
TITLE	Walkover Photo Plan	FIGURE	3
Photo 9: Junction of Trinity Road and Partridge Way bounding site to the west, viewed north.		Photo 10: Partridge Way bounding the site to the north, with high rise residential block further north. Viewed northeast.	
			

APPENDIX 2 – EXPLORATORY HOLE RECORDS

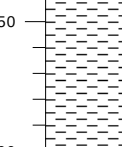
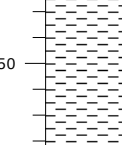
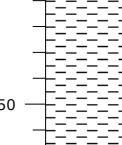
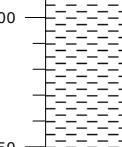
Exploratory Hole No:

WS1

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	JC	Date Commenced:	07/09/2021
Checked By:	LD	Date Completed:	07/09/2021
Type and diameter of equipment:	Premier Windowless Sampler Rig	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3: Falling head test was carried out at 2m bgl and filled to 0.2m bgl						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
E	0.10								0.00		0.05		Paving slab. (MADE GROUND)	
											0.20		Brown gravelly clay. Gravel consists of brick. (MADE GROUND)	
D S	1.00								0.50					
		1	1	2	2	2	2	8	1.00					
									1.50					
D S	2.00								2.00					
		2	2	3	2	3	3	11	2.50					
									3.00					
D S	3.00								3.50					
		2	3	3	3	3	3	12	4.00					
									4.50					
D S	4.00								5.00					
		3	4	3	3	4	4	14						
D S	5.00													
		4	5	4	5	5	5	19						

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
 Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
 T: 0843 289 2187 E: info@jomasassociates.com W: www.jomasassociates.com

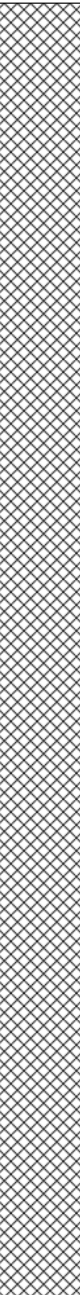
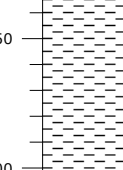
Exploratory Hole No:

WS2

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	JC	Date Commenced:	07/09/2021
Checked By:	LD	Date Completed:	07/09/2021
Type and diameter of equipment:	Premier Windowless Sampler Rig	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: *Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation	
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)			
		75	75	75	75	75	75	N							
E	0.10								0.00		0.10		Asphalt. (MADE GROUND)		
											0.20		Concrete. (MADE GROUND)		
												0.30			Brown gravelly clay. Gravel consists of brick. (MADE GROUND)
															Soft to firm consistency* brown CLAY. (LONDON CLAY FORMATION)
D S	1.00								0.50						
		1	2	1	2	2	3	8	1.00						
									1.50						
									2.00						
D S	2.00	2	2	2	3	2	3	10	2.00						
									2.50						
									3.00						
									3.50						
D S	3.00	3	2	2	3	4	3	12	3.00						
									4.00						
									4.50						
									5.00						
D S	4.00	3	4	3	4	4	5	16	4.00						
									4.50						
									5.00						
D S	5.00														
		4	4	5	5	5	6	21							

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
 Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
 T: 0843 289 2187 E: info@jomasassociates.com W: www.jomasassociates.com

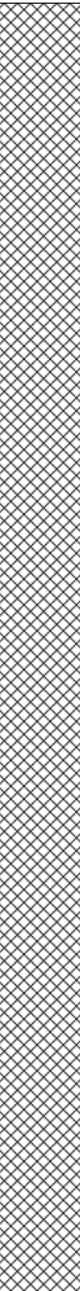
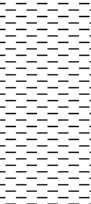
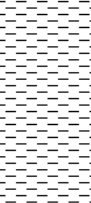
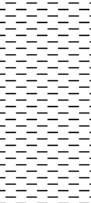
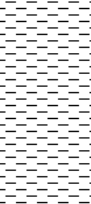
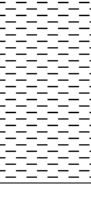
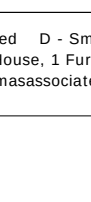
Exploratory Hole No:

WS3

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	JC	Date Commenced:	07/09/2021
Checked By:	LD	Date Completed:	07/09/2021
Type and diameter of equipment:	Premier Windowless Sampler Rig	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3: Falling head test carried out at 2m bgl to 0.2m bgl						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
E	0.10								0.00		0.20		Grass over brown sandy gravelly clay. Gravel consists of brick. (MADE GROUND)	
D S	1.00	1	1	2	2	3	3	10	0.50					
D S	2.00	2	3	2	3	2	3	10	1.00					
D S	3.00	3	4	3	4	3	3	13	1.50					
D S	4.00	4	3	4	5	4	4	17	2.00					
D S	5.00	5	4	5	5	5	6	21	2.50					
D S	5.00	5	4	5	5	5	6	21	3.00					
D S	5.00	5	4	5	5	5	6	21	3.50					
D S	5.00	5	4	5	5	5	6	21	4.00					
D S	5.00	5	4	5	5	5	6	21	4.50					
D S	5.00	5	4	5	5	5	6	21	5.00		5.00			

Exploratory Hole No:

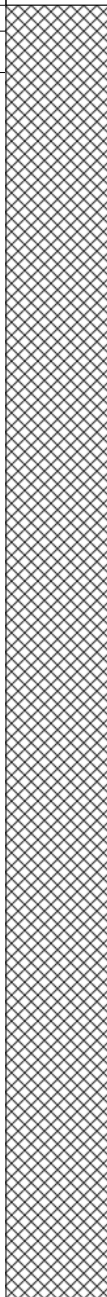
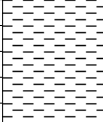
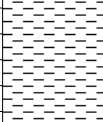
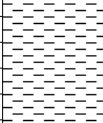
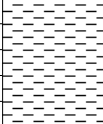
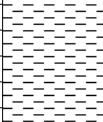
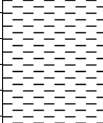
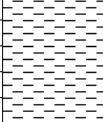
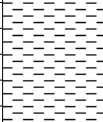
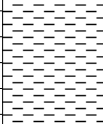
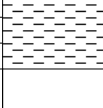
WS4

Site Address: Partridge Way, Wood Green, N22 8DT
Client: London Borough of Haringey
Logged By: JC
Checked By: LD
Type and diameter of equipment: Premier Windowless Sampler Rig

Project No: P2794J2049
Ground Level:
Date Commenced:
Date Completed:
Sheet No: 1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks
1: * Denotes filed observation
2: No Groundwater strike reported
3:
4:

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
E	0.10								0.00				Paving slab. (MADE GROUND)	
											0.10		Brown sandy gravelly clay. Gravel consists of brick. (MADE GROUND)	
												0.20		
D S	1.00								0.50					
		1	1	2	2	3	2	9	1.00					
									1.50					
D S	2.00								2.00					
		2	2	2	3	3	3	11	2.50					
									3.00					
D S	3.00								3.50					
		2	3	4	3	3	4	14	4.00					
									4.50					
D S	4.00								5.00					
		3	4	4	5	4	4	17						
D S	5.00													
		4	5	6	5	5	5	21						

Exploratory Hole No:

WS5

Site Address: Partridge Way, Wood Green, N22 8DT

Client: London Borough of Haringey

Logged By: JC

Checked By: LD

Type and diameter of equipment: Hand Tools

Project No: P2794J2049

Ground Level:

Date Commenced: 07/09/2021

Date Completed: 07/09/2021

Sheet No: 1 Of 1

Water levels recorded during boring, m

Date:

Hole depth:

Casing depth:

Level water on strike:

Water Level after 20mins:

Remarks

1: * Denotes field observation

2: No Groundwater strike reported

3: Completed as hand dug pit due to proximity to services and lack of access to garage

4:

Sample or Tests

Strata

Type

Depth (mbgl)

Result

Legend

Depth (mbgl)

Water Strikes (mbgl)

Strata Description

Installation

75

75

75

75

75

75

75

N

0.00

0.10

Paving slab. (MADE GROUND)

0.20

Brown sandy gravelly clay. Gravel consists of brick. (MADE GROUND)

Firm consistency* brown CLAY. (LONDON CLAY FORMATION)

0.50

1.00

1.00

1.50

2.00

2.50

3.00

3.50

4.00

4.50

5.00

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	1 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D	0.25								0.00		0.10		Paving slab. (MADE GROUND)	
									0.25		Orange-brown gravel. (MADE GROUND)			
									0.50		Soft consistency* brown silty CLAY. (LONDON CLAY FORMATION)			
D	0.50								0.50			Firm to stiff consistency* grey mottled brown CLAY. (LONDON CLAY FORMATION)		
D	1.00								1.00					
S	1.20	1	2	2	3	3	3	11						
									1.50					
D	2.00								2.00					
S		1	2	2	3	3	3	11						
									2.50					
D	3.00								3.00					
U									3.50					
50 blows for 50% recovery														
									4.00					
D	4.00								4.00					
S		3	3	4	4	4	4	16						
									4.50					
D	5.00								5.00					
U														

70 blows for 100% recovery

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
T: 0843 289 2187 E: info@jomasassociates.com W: www.jomasassociates.com

Exploratory Hole No:

BH1

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	2 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D U	5.00								5.00			Firm to stiff consistency* grey mottled brown CLAY. (LONDON CLAY FORMATION)		
70 blows for 100% recovery														
D	6.00													
S	6.50	4	4	5	5	5	6	21						
D	7.00													
D U	8.00								8.00		Stiff to very stiff consistency* grey CLAY. (LONDON CLAY FORMATION)			
95 blows for 70% recovery														
D	9.00													
S	9.50	4	5	5	6	6	8	25						
D	10.00													

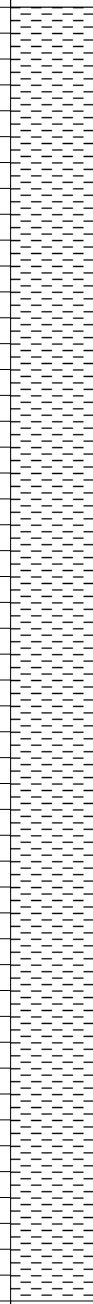
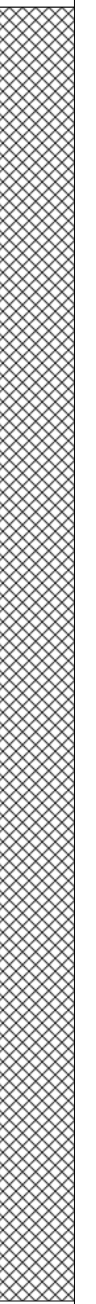
Exploratory Hole No:

BH1

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	3 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D	10.00								10.00			Stiff to very stiff consistency* grey CLAY. (LONDON CLAY FORMATION)		
									10.50					
									11.00					
D	11.00													
U		100 blows for 100% recovery												
									11.50					
									12.00					
D	12.00													
S	12.50	5	5	6	7	7	9	29	12.50					
									13.00					
D	13.00													
									13.50					
									14.00					
D	14.00													
U		100 blows for 50% recovery-Claystone												
									14.50					
									15.00					
D	15.00													

Exploratory Hole No:

BH1

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	4 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D	15.00								15.00			Stiff to very stiff consistency* grey CLAY. (LONDON CLAY FORMATION)		
S	15.50	5	7	7	8	8	10	33	15.50					
D	16.00								16.00					
									16.50					
D	17.00								17.00					
U	100 blows for 90% recovery													
									17.50					
D	18.00								18.00					
S	18.50	5	6	8	8	9	10	35	18.50					
D	19.00								19.00					
									19.50					
D	20.00								20.00					
U														
	100 blows for 90% recovery													

Exploratory Hole No:

BH1

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	5 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D U	20.00								20.00			Stiff to very stiff consistency* grey CLAY. (LONDON CLAY FORMATION)		
100 blows for 90% recovery														
									20.50					
D	21.00								21.00					
S	21.50	5	8	8	10	10	12	40	21.50					
D	22.00								22.00					
									22.50					
D U	23.00								23.00					
120 blows for 65% recovery														
									23.50					
D	24.00								24.00					
S	24.50	6	7	7	9	9	11	36	24.50					
D	25.00								25.00					

Site Address:	Partridge Way, Wood Green, N22 8DT	Project No:	P2794J2049
Client:	London Borough of Haringey	Ground Level:	
Logged By:	RD	Date Commenced:	06/09/2021
Checked By:	LD	Date Completed:	06/09/2021
Type and diameter of equipment:	Dando 4000 Cable Percussive Rig	Sheet No:	6 Of 6

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: * Denotes field observation						
2: No Groundwater strike reported						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
D	25.00									25.00			Stiff to very stiff consistency* grey CLAY. (LONDON CLAY FORMATION)	
										25.50				
										26.00				
D	26.00									26.00				
U	120 blows for 90% recovery													
										26.50				
										27.00				
D	27.00									27.00				
										27.50				
S	27.50	7	6	10	10	12	14	46		27.50				
										28.00				
D	28.00									28.00				
										28.50				
										29.00				
D	29.00									29.00				
S		8	10	10	12	14	14	50		29.50				
										30.00				
D	30.00									30.00	30.00			
S														

APPENDIX 3 – CHEMICAL LABORATORY TESTING RESULTS

**Accounts**

Jomas Associates Ltd
Lakeside House
1 Furzeground Way
Stockley Park
UB11 1BD

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

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: Jomas Associates -

Analytical Report Number : 21-98289

Project / Site name:	Partridge Way, Wood Green, N22 8DT	Samples received on:	08/09/2021
Your job number:	JJ2049	Samples instructed on/ Analysis started on:	09/09/2021
Your order number:	P2794JJ2049.7	Analysis completed by:	20/09/2021
Report Issue Number:	1	Report issued on:	20/09/2021
Samples Analysed:	5 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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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.

Analytical Report Number: 21-98289

Project / Site name: Partridge Way, Wood Green, N22 8DT

Your Order No: P2794JJ2049.7

Lab Sample Number				2004448	2004449	2004450	2004451	2004452
Sample Reference				WS1	WS2	WS3	WS4	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	0.10	0.10
Date Sampled				06/09/2021	06/09/2021	06/09/2021	06/09/2021	06/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	19	13	21	16	17
Total mass of sample received	kg	0.001	NONE	0.50	0.50	0.50	0.50	0.50

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.1	12.1	9.1	8.5	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1200	7700	300	420	260
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.30	0.025	0.042	0.014	0.010
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	296	24.7	41.6	14.4	10.1
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	0.2	-	0.3	0.2

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.0	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.6	< 0.05	1.4	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	1.4	< 0.05	1.3	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.81	< 0.05	0.63	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.76	< 0.05	0.64	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.93	< 0.05	0.71	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.27	< 0.05	0.24	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.74	< 0.05	0.65	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.40	< 0.05	0.31	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.41	< 0.05	0.36	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	8.34	< 0.80	6.20	< 0.80	< 0.80
-----------------------------	-------	-----	--------	------	--------	------	--------	--------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	7.3	17	24	18
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	0.4	0.7	2.0	0.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	15	54	49	38
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22	22	32	24	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	30	15	22	25	29
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	11	47	42	32
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	59	100	84	76	73

Analytical Report Number: 21-98289

Project / Site name: Partridge Way, Wood Green, N22 8DT

Your Order No: P2794JJ2049.7

Lab Sample Number				2004448	2004449	2004450	2004451	2004452
Sample Reference				WS1	WS2	WS3	WS4	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	0.10	0.10
Date Sampled				06/09/2021	06/09/2021	06/09/2021	06/09/2021	06/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	5.3	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	33	< 1.0	26	< 1.0	< 1.0
TPH (C21 - C40)	mg/kg	10	MCERTS	110	< 10	54	< 10	< 10

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

Analytical Report Number : 21-98289

Project / Site name: Partridge Way, Wood Green, N22 8DT

* 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 *
2004448	WS1	None Supplied	0.1	Brown clay and sand with gravel.
2004449	WS2	None Supplied	0.1	Brown clay and sand with gravel.
2004450	WS3	None Supplied	0.1	Brown clay with gravel.
2004451	WS4	None Supplied	0.1	Brown clay and sand with gravel.
2004452	WS5	None Supplied	0.1	Brown clay and sand with gravel.

Analytical Report Number : 21-98289

Project / Site name: Partridge Way, Wood Green, N22 8DT

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
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
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined 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
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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 cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
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
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS



Analytical Report Number : 21-98289
Project / Site name: Partridge Way, Wood Green, N22 8DT

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
----------------------	-------------------------------	-----------------------------	---------------	--------------------	----------------------

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.

**Accounts**

Jomas Associates Ltd
Lakeside House
1 Furzeground Way
Stockley Park
UB11 1BD

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

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: Jomas Associates -

Analytical Report Number : 21-98667

Project / Site name:	Partridge Way, Wood Green, N22 8DT	Samples received on:	08/09/2021
Your job number:	JJ2049	Samples instructed on/ Analysis started on:	09/09/2021
Your order number:	P2794JJ2049-7	Analysis completed by:	22/09/2021
Report Issue Number:	1	Report issued on:	22/09/2021
Samples Analysed:	4 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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.

Analytical Report Number: 21-98667

Project / Site name: Partridge Way, Wood Green, N22 8DT

Your Order No: P2794JJ2049-7

Lab Sample Number				2006675	2006676	2006677	2006678
Sample Reference				WS1	WS2	BH1	BH1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.00	4.00	9.00	18.00
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	16	16	16
Total mass of sample received	kg	0.001	NONE	1.2	0.70	2.0	2.0

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	8.1	8.2	8.5
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	2.0	0.95	1.1	0.78

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

Analytical Report Number : 21-98667

Project / Site name: Partridge Way, Wood Green, N22 8DT

* 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 *
2006675	WS1	None Supplied	3	Brown clay and loam with gravel and vegetation.
2006676	WS2	None Supplied	4	Brown clay.
2006677	BH1	None Supplied	9	Brown clay and loam.
2006678	BH1	None Supplied	18	Brown clay.

Analytical Report Number : 21-98667

Project / Site name: Partridge Way, Wood Green, N22 8DT

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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

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.

Sample Deviation Report



Analytical Report Number : 21-98667

Project / Site name: Partridge Way, Wood Green, N22 8DT

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH1	None Supplied	S	2006677	a	None Supplied	None Supplied	None Supplied
BH1	None Supplied	S	2006678	a	None Supplied	None Supplied	None Supplied
WS1	None Supplied	S	2006675	a	None Supplied	None Supplied	None Supplied
WS2	None Supplied	S	2006676	a	None Supplied	None Supplied	None Supplied

APPENDIX 4 – GEOTECHNICAL LABORATORY TEST RESULTS

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

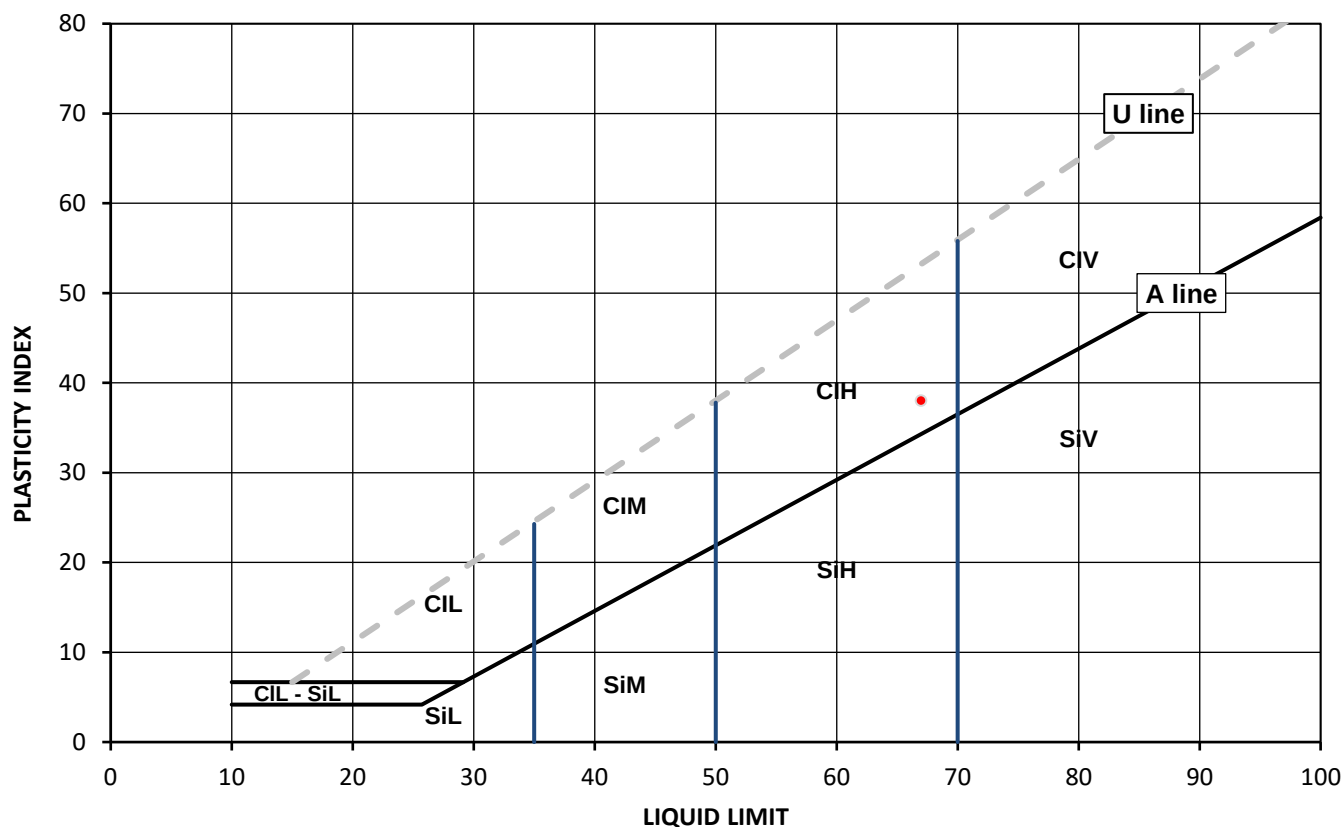
Test Results:

Laboratory Reference: 2005598
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Yellowish brown slightly gravelly CLAY

Depth Top [m]: 0.50
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
27	67	29	38	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L Low	50 to 70
	M Medium	exceeding 70
	H High	
	V Very high	
	O Organic	append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: Not Given
Date Received: 08/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

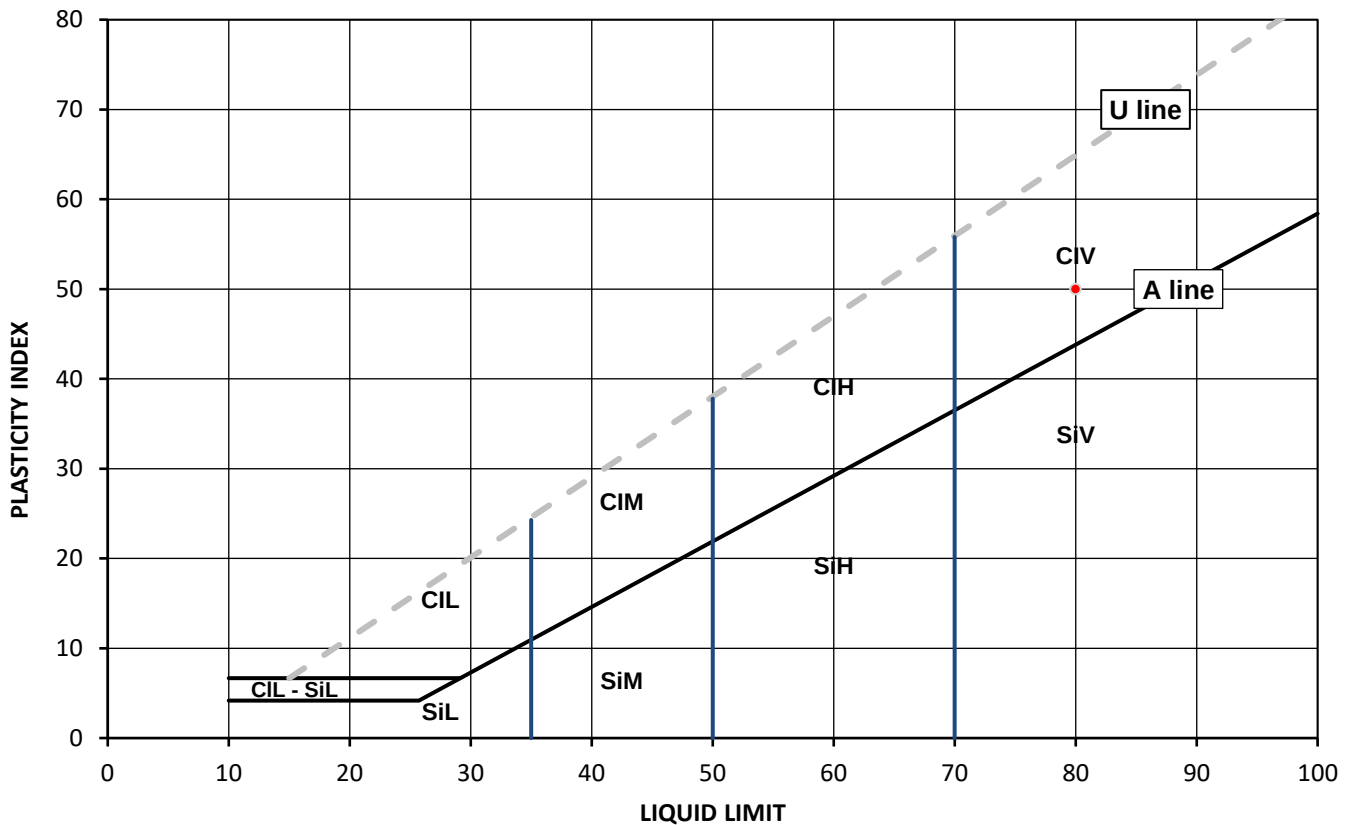
Test Results:

Laboratory Reference: 2006584
Hole No.: WS1
Sample Reference: Not Given
Sample Description: Greyish brown mottled grey CLAY

Depth Top [m]: 2.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
25	80	30	50	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

4041

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: Not Given
Date Received: 08/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

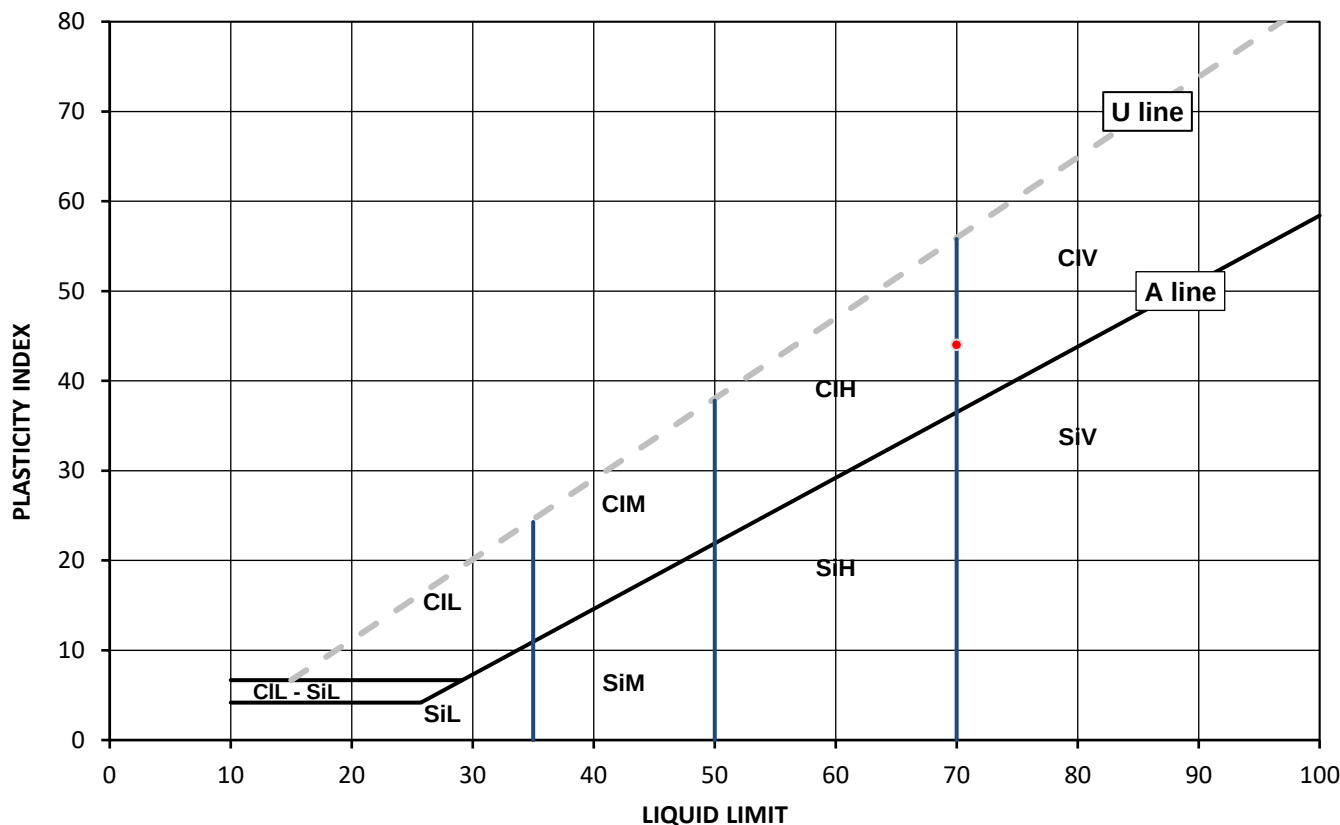
Test Results:

Laboratory Reference: 2006585
Hole No.: WS2
Sample Reference: Not Given
Sample Description: Yellowish brown slightly gravelly CLAY

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425um BS Test Sieve
28	70	26	44	87



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek

Page 1 of 1

Date Reported: 01/10/2021

GF 236.11

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: Not Given
Date Received: 08/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

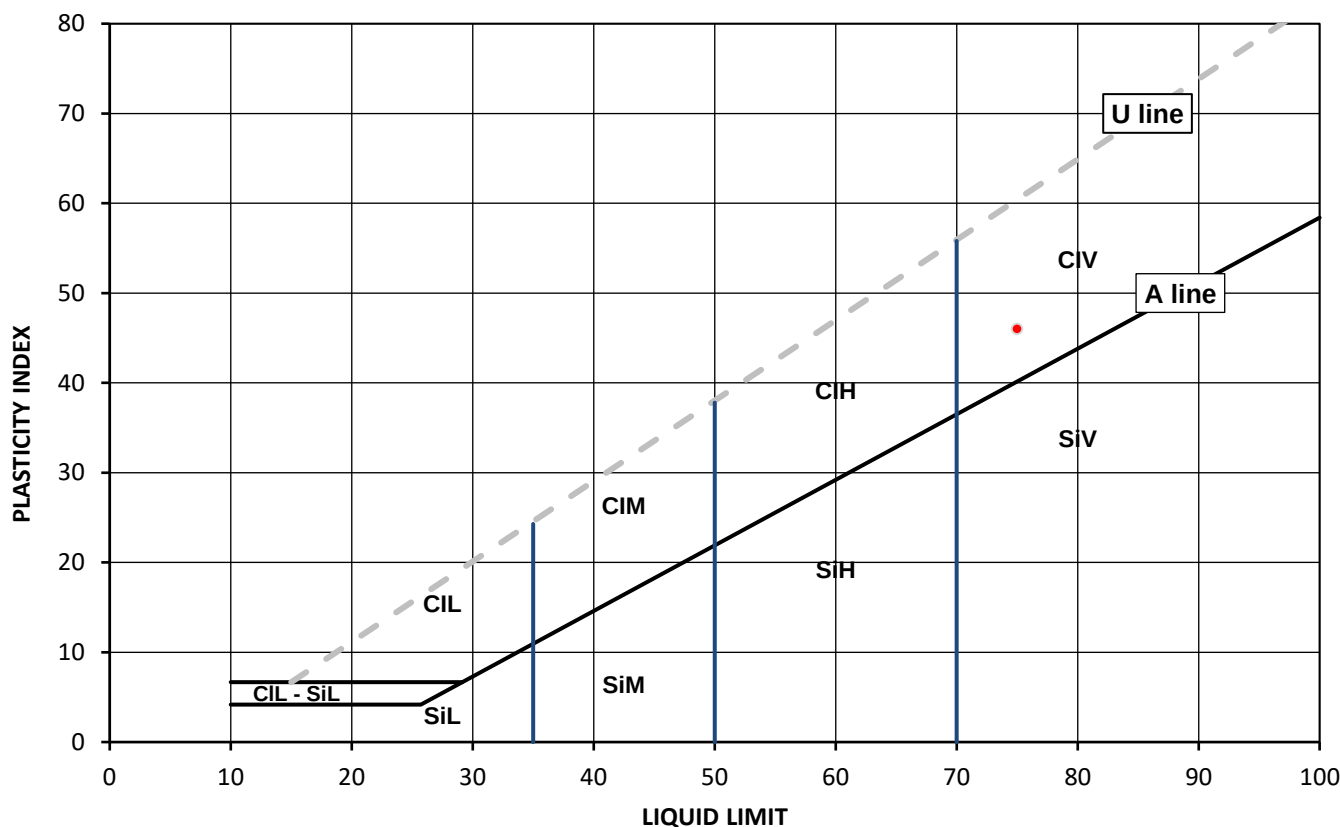
Test Results:

Laboratory Reference: 2006586
Hole No.: WS3
Sample Reference: Not Given
Sample Description: Yellowish brown mottled grey CLAY

Depth Top [m]: 3.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
28	75	29	46	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



Page 1 of 1

Date Reported: 01/10/2021

GF 236.11

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: Not Given
Date Received: 08/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

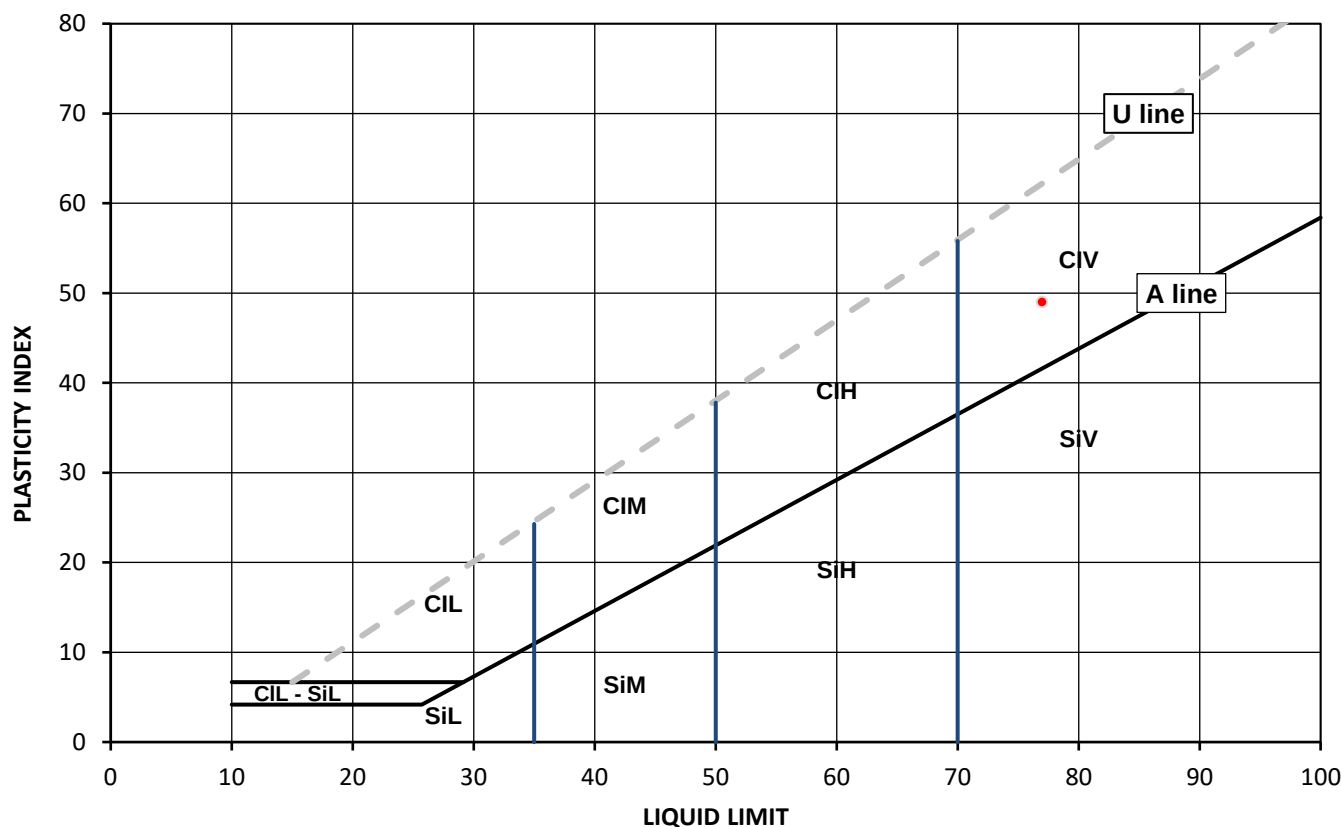
Test Results:

Laboratory Reference: 2006587
Hole No.: WS4
Sample Reference: Not Given
Sample Description: Greyish brown mottled grey CLAY

Depth Top [m]: 4.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
28	77	28	49	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	L	Low	Liquid Limit	below 35
Si	Silt		M	Medium		35 to 50
			H	High		50 to 70
			V	Very high		exceeding 70
			O	Organic		append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek

4041

Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BD

Contact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: Not Given
Date Received: 08/09/2021
Date Tested: 28/09/2021
Sampled By: Not Given

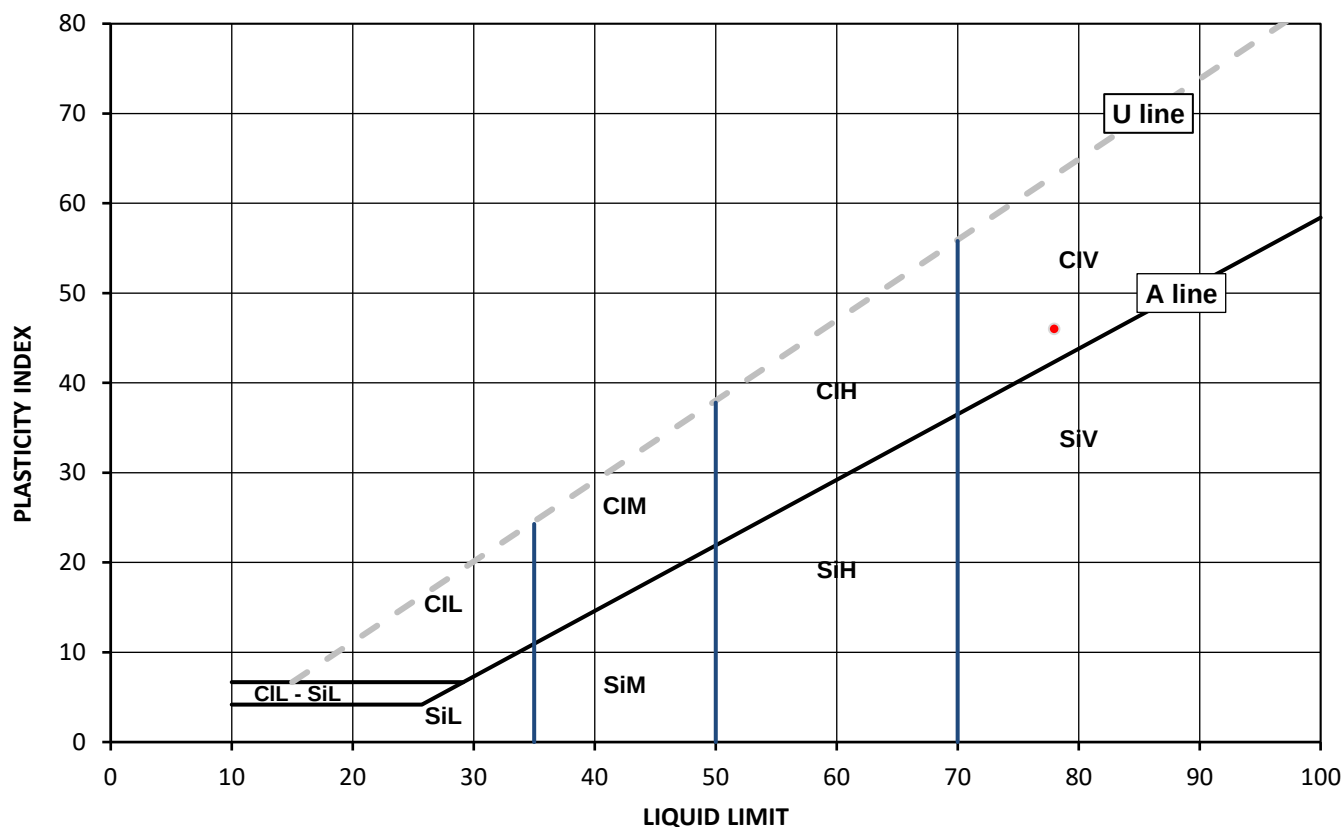
Test Results:

Laboratory Reference: 2006588
Hole No.: WS4
Sample Reference: Not Given
Sample Description: Yellowish brown slightly gravelly CLAY

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
37	78	32	46	77



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek

Page 1 of 1

Date Reported: 01/10/2021

GF 236.11



4041

Client: Jomas Associates Ltd
 Client Address: Lakeside House, 1 Furzeground Way,
 Stockley Park, UB11 1BD

Contact: Accounts
 Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN
 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test),
 Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB



Environmental Science

Client Reference: JJ2049
 Job Number: 21-98536
 Date Sampled: 06/09/2021
 Date Received: 07/09/2021
 Date Tested: 28/09/2021
 Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m															
2005598	BH1	Not Given	0.50	Not Given	D	Yellowish brown slightly gravelly CLAY	Atterberg 4 Point	27		99	67	29	38						
2006584	WS1	Not Given	2.00	Not Given	B	Greyish brown mottled grey CLAY	Atterberg 4 Point	25		100	80	30	50						
2006585	WS2	Not Given	1.00	Not Given	B	Yellowish brown slightly gravelly CLAY	Atterberg 4 Point	28		87	70	26	44						
2006586	WS3	Not Given	3.00	Not Given	B	Yellowish brown mottled grey CLAY	Atterberg 4 Point	28		100	75	29	46						
2006588	WS4	Not Given	1.00	Not Given	B	Yellowish brown slightly gravelly CLAY	Atterberg 4 Point	37		77	78	32	46						
2006587	WS4	Not Given	4.00	Not Given	B	Greyish brown mottled grey CLAY	Atterberg 4 Point	28		100	77	28	49						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Janoszek

Monika Janoszek
 PL Deputy Geotechnical Laboratory Manager
 for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



4041

TEST CERTIFICATE
Unconsolidated Undrained**Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

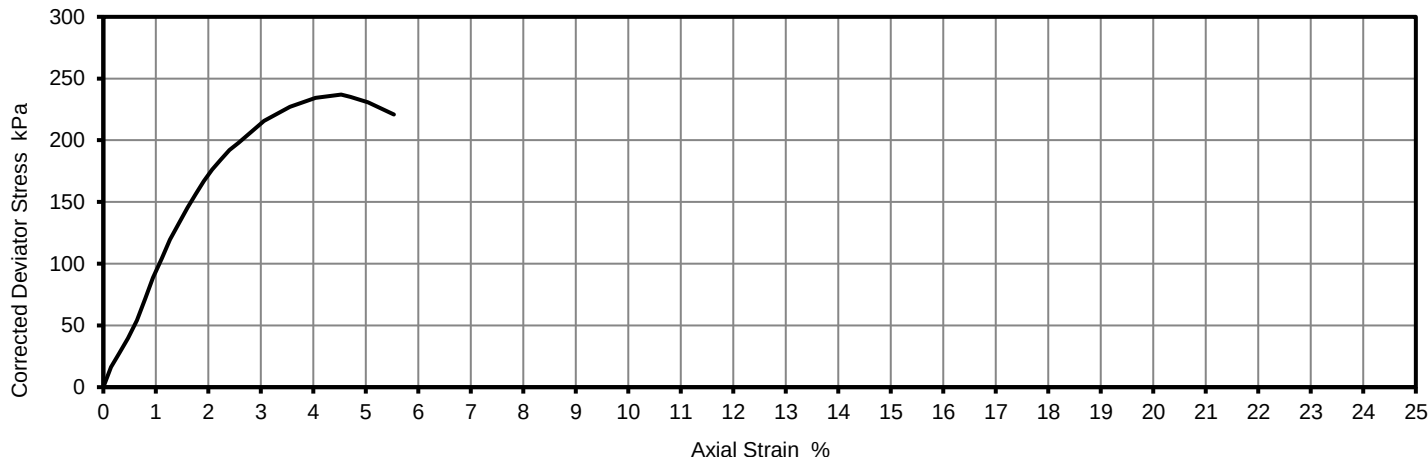
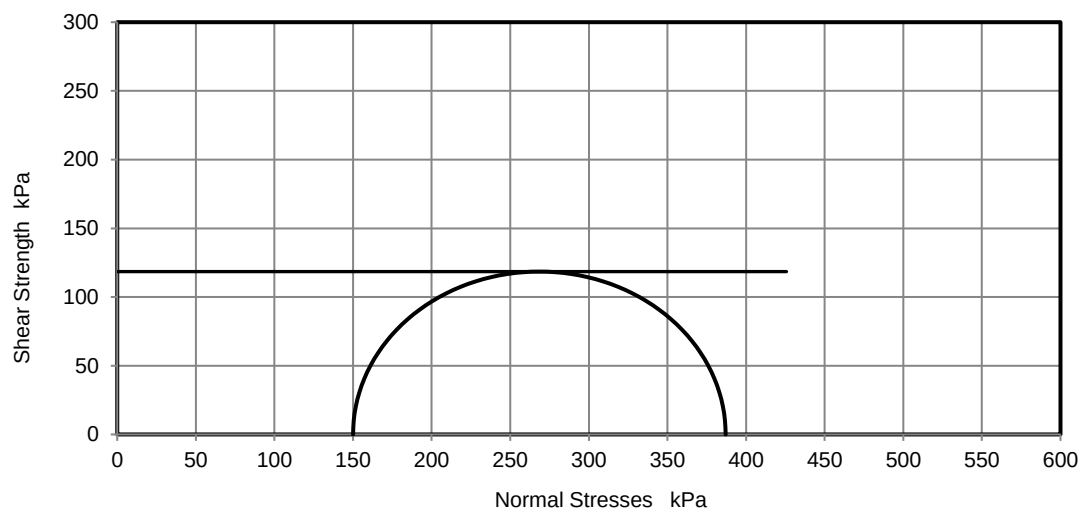
Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005597
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Brown CLAYDepth Top [m]: 5.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	201.11 mm
Diameter	101.71 mm
Bulk Density	1.93 Mg/m ³
Moisture Content	29 %
Dry Density	1.50 Mg/m ³
Membrane Correction	0.34 kPa

Rate of Strain	1.99 %/min
Cell Pressure	150 kPa
Axial Strain at failure	4.5 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	237 kPa
Undrained Shear Strength, c_u	119 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane thickness	0.28 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:****Signed:**Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



4041

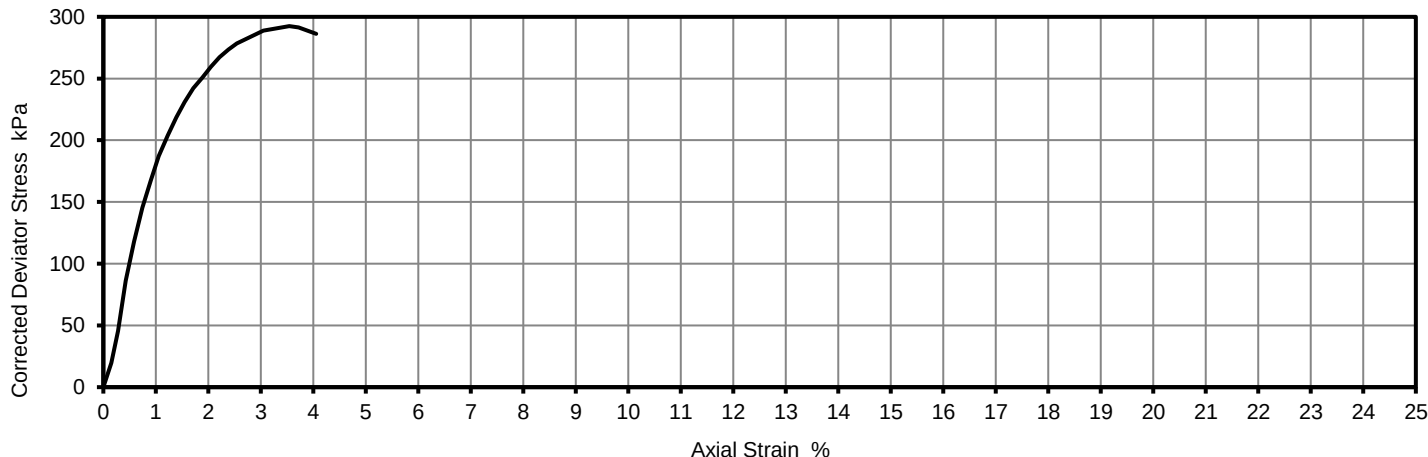
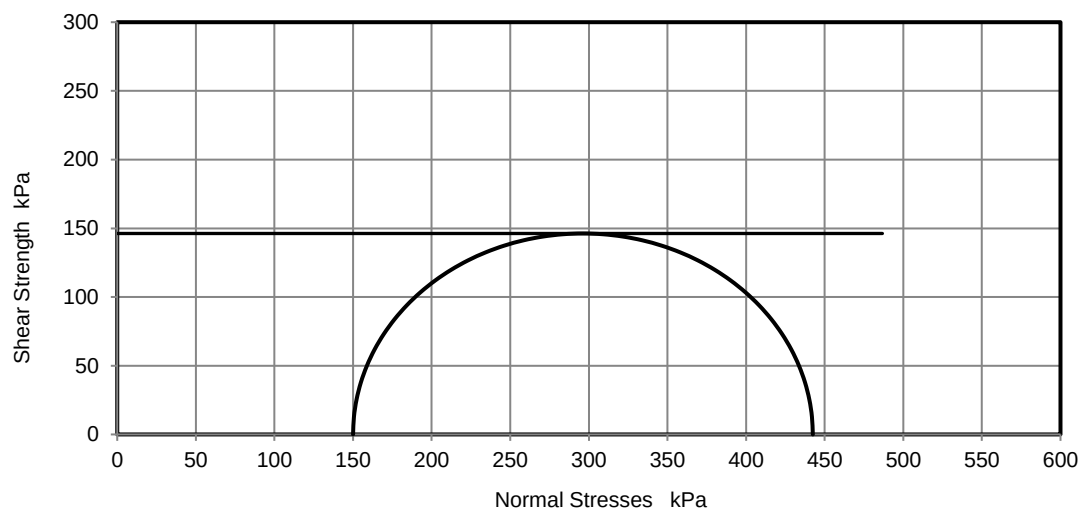
TEST CERTIFICATE
Unconsolidated Undrained**Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EBClient: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

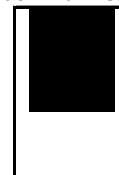
Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005599
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Greyish brown CLAYDepth Top [m]: 8.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	140.10 mm
Diameter	69.09 mm
Bulk Density	2.00 Mg/m ³
Moisture Content	27 %
Dry Density	1.57 Mg/m ³
Membrane Correction	0.35 kPa

Rate of Strain	2.00 %/min
Cell Pressure	150 kPa
Axial Strain at failure	3.5 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	292 kPa
Undrained Shear Strength, c_u	146 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane thickness	0.25 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



4041

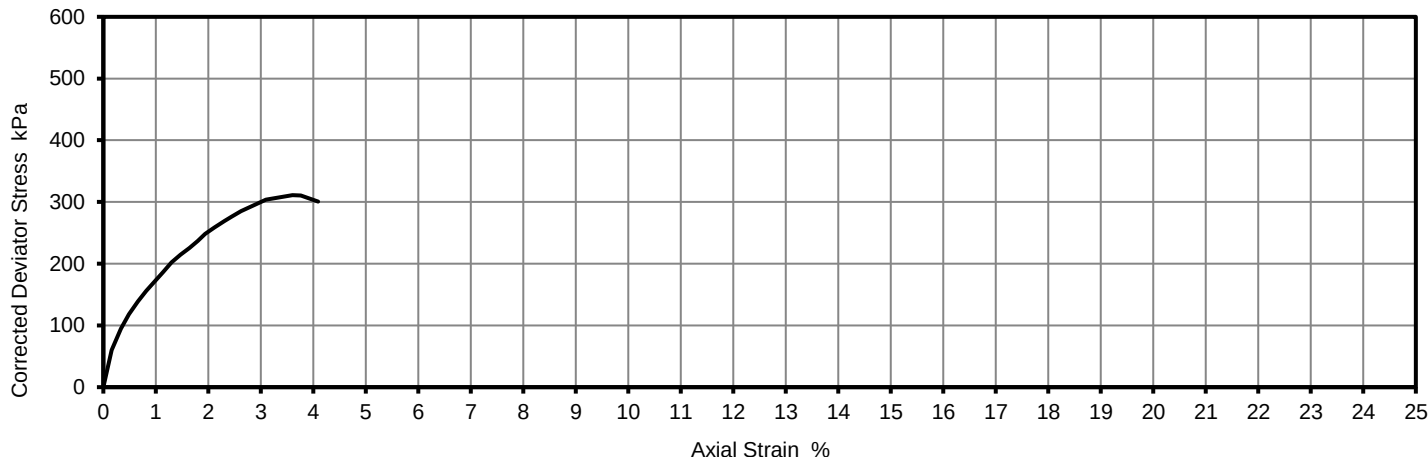
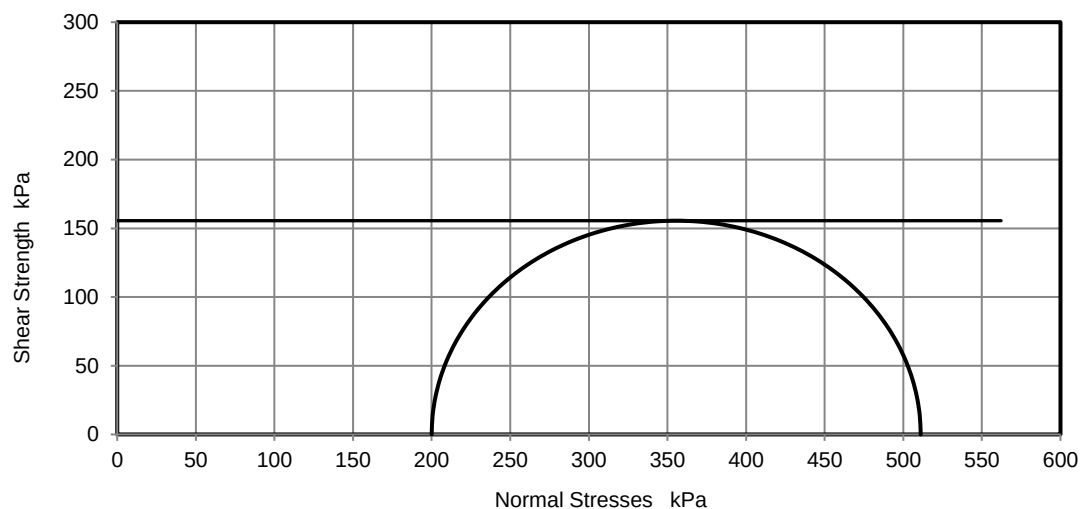
TEST CERTIFICATE
Unconsolidated Undrained**Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EBClient: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

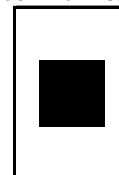
Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005600
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Greyish brown CLAYDepth Top [m]: 11.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	100.71 mm
Diameter	49.50 mm
Bulk Density	1.99 Mg/m ³
Moisture Content	26 %
Dry Density	1.58 Mg/m ³
Membrane Correction	0.48 kPa

Rate of Strain	2.00 %/min
Cell Pressure	200 kPa
Axial Strain at failure	3.6 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	311 kPa
Undrained Shear Strength, c_u	156 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane thickness	0.24 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



4041

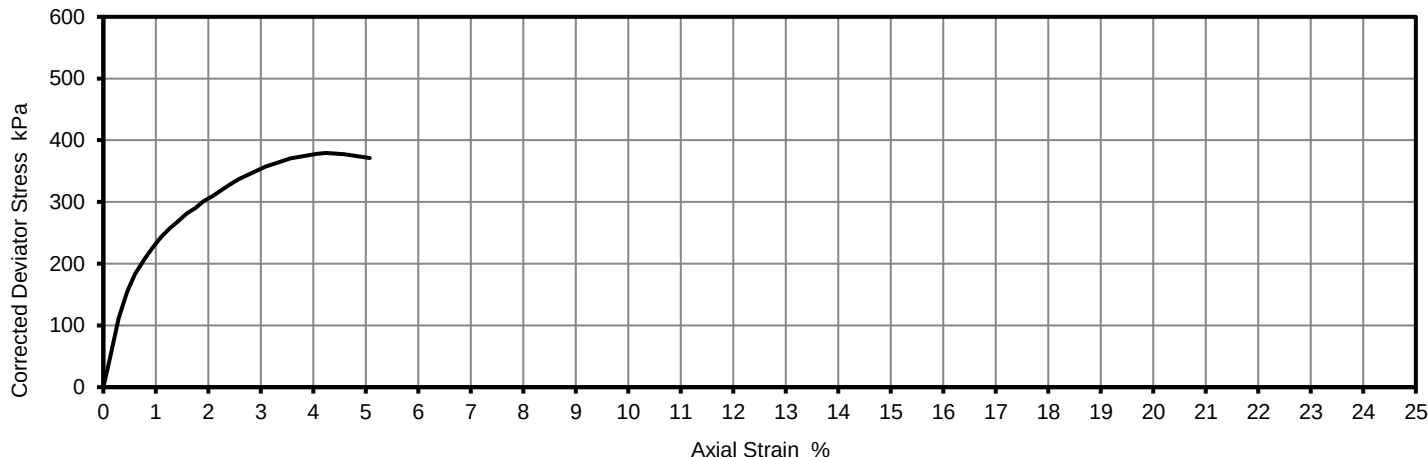
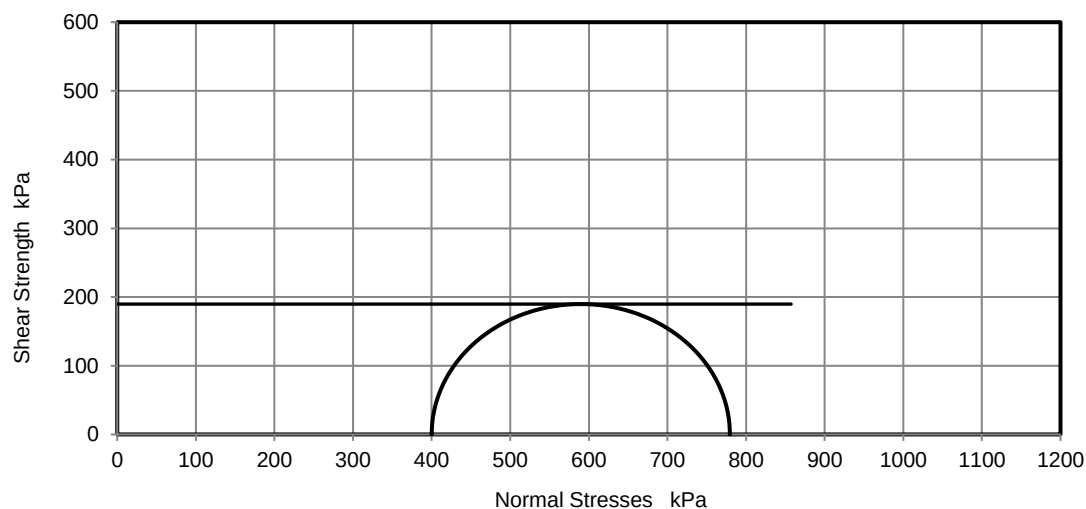
TEST CERTIFICATE
Unconsolidated Undrained**Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EBClient: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

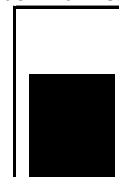
Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005601
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Greyish brown CLAYDepth Top [m]: 17.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	140.31 mm
Diameter	69.51 mm
Bulk Density	2.02 Mg/m ³
Moisture Content	26 %
Dry Density	1.61 Mg/m ³
Membrane Correction	0.42 kPa

Rate of Strain	2.00 %/min
Cell Pressure	400 kPa
Axial Strain at failure	4.2 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	379 kPa
Undrained Shear Strength, c_u	190 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane thickness	0.25 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:****Signed:**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



4041

TEST CERTIFICATE
Unconsolidated Undrained**Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

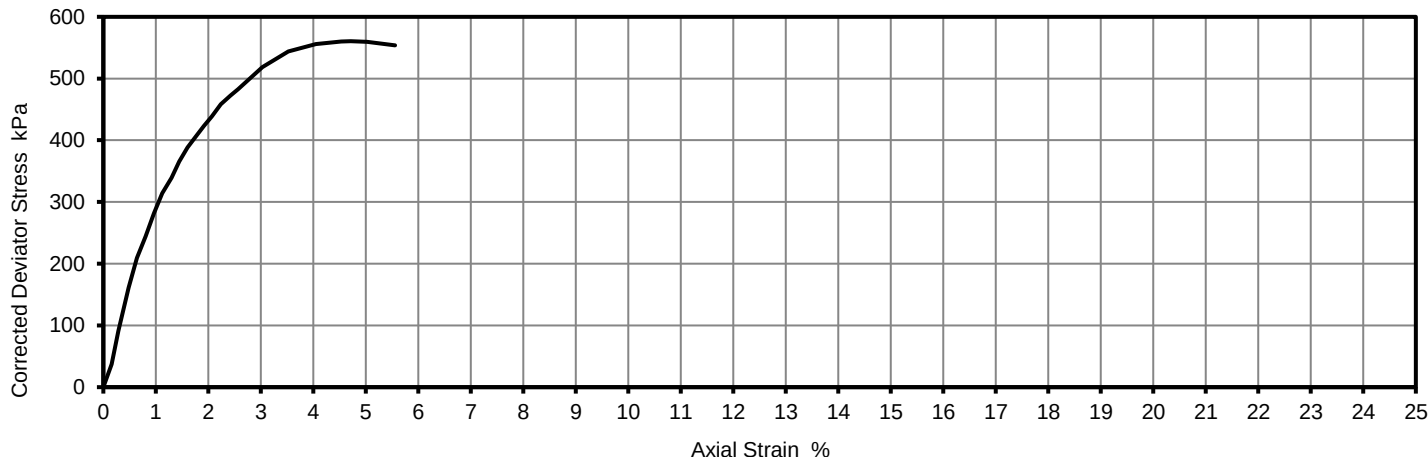
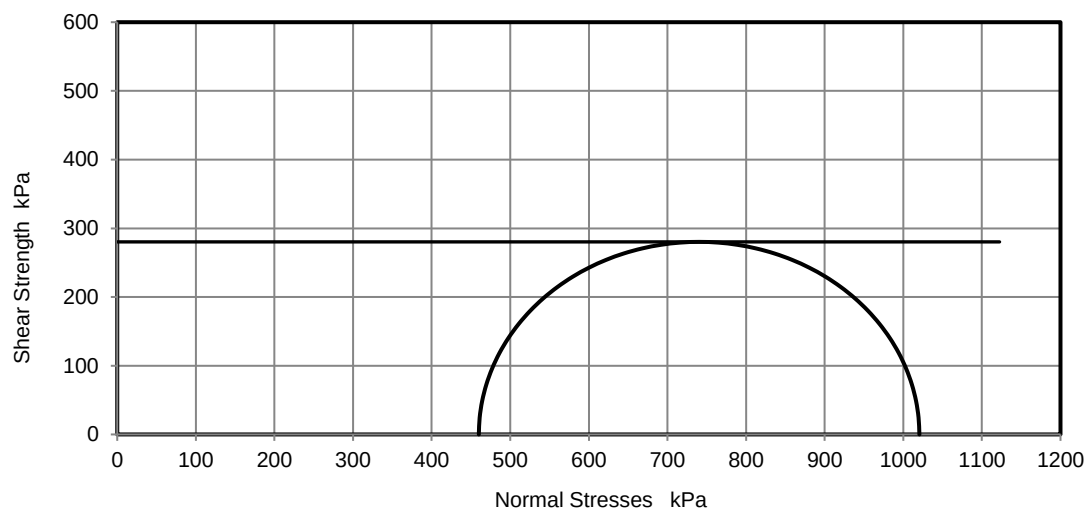
Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

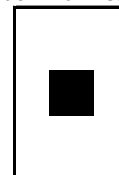
Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005602
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Greyish brown CLAYDepth Top [m]: 23.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	76.85 mm
Diameter	37.91 mm
Bulk Density	2.00 Mg/m ³
Moisture Content	26 %
Dry Density	1.59 Mg/m ³
Membrane Correction	0.85 kPa

Rate of Strain	2.00 %/min
Cell Pressure	460 kPa
Axial Strain at failure	4.7 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	560 kPa
Undrained Shear Strength, c_u	280 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane thickness	0.25 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



4041

TEST CERTIFICATE**Unconsolidated Undrained****Triaxial Compression**Tested in Accordance with:
BS 1377-7: 1990: Clause 8i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

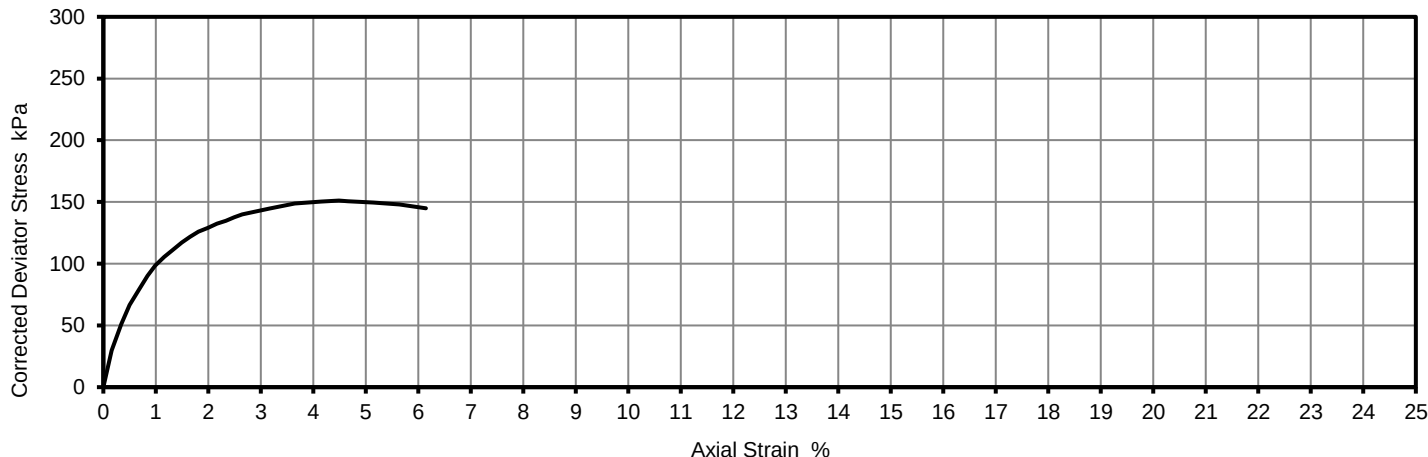
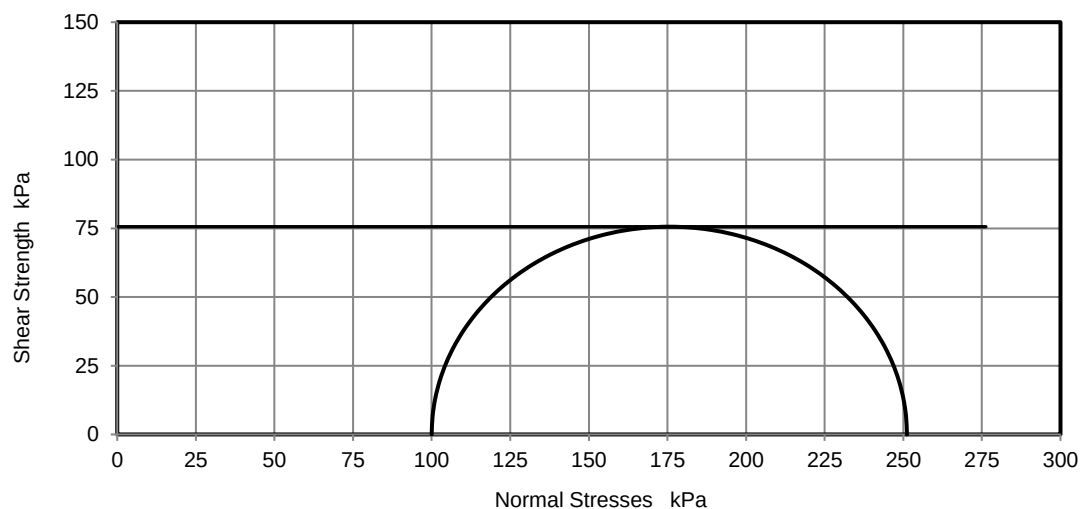
Client: Jomas Associates Ltd
Client Address: Lakeside House, 1 Furzeground Way,
Stockley Park, UB11 1BDContact: Accounts
Site Address: Patridge Way, Wood Green, N22 8DT

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

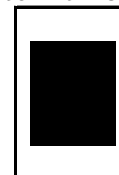
Client Reference: JJ2049
Job Number: 21-98536
Date Sampled: 06/09/2021
Date Received: 07/09/2021
Date Tested: 22/09/2021
Sampled By: Not Given**Test Results:**Laboratory Reference: 2005603
Hole No.: BH1
Sample Reference: Not Given
Sample Description: Brown CLAYDepth Top [m]: 3.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Length	140.62 mm
Diameter	69.20 mm
Bulk Density	1.94 Mg/m ³
Moisture Content	30 %
Dry Density	1.49 Mg/m ³
Membrane Correction	0.46 kPa

Rate of Strain	2.00 %/min
Cell Pressure	100 kPa
Axial Strain at failure	4.5 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	151 kPa
Undrained Shear Strength, c_u	76 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane thickness	0.26 mm

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample

Note: 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.**Remarks:**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

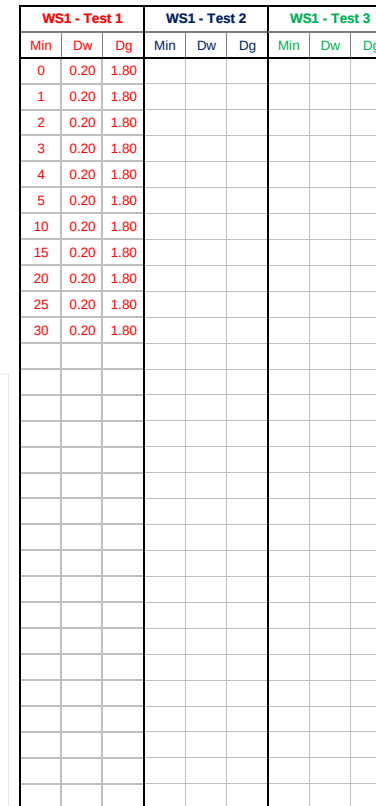
APPENDIX 5 – FALLING HEAD PERMEABILITY TESTING RESULTS

JOMAS | ENGINEERING
ENVIRONMENTAL

DATE: 13 October 2021

DATE: 18 October 2021

#DIV/0!



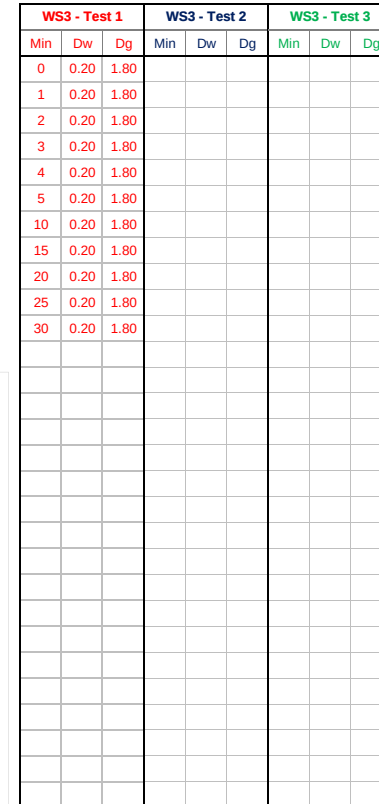
D_g = head of water in the exploratory hole

JOMAS | ENGINEERING
ENVIRONMENTAL

DATE: 13 October 2021

DATE: 18 October 2021

#DIV/0!



D_g = head of water in the exploratory hole

WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.



JOMAS ASSOCIATES LTD

6-9 The Square
Stockley Park
Uxbridge
UB11 1FW

CONTACT US

Website: www.jomasassociates.com
Tel: 0843-289-2187
Fax: 0872-115-4505
Email: info@jomasassociates.com