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GEOTECHNICAL GROUND INVESTIGATION & BASEMENT IMPACT ASSESSMENT REPORT

47 WOODLAND GARDENS,
LONDON,
N10 3UE



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EXECUTIVE SUMMARY

Dimitrios Bismpas commissioned Jomas Associates Ltd to prepare a Basic Geotechnical Assessment and Basement Impact Assessment at the site located at 47 Woodland Gardens, London, N10 3UE.

The principal objectives of the study were as follows:

- To obtain geotechnical parameters to inform preliminary foundation design; and,
- To undertake a Basement Impact Assessment (BIA).

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Site History and Ground Investigation	
Current Site Use	3-storey residential building including an existing lower ground level.
Proposed Site Use	An extension to the lower ground floor at the rear of the building comprising of 3.0m lateral extension and vertical deepening of 0.80m, alterations to the side access levels to create steps and widening of the existing front light well and additional of adjacent basement level plant room. As the site is currently split-level, this will result in the basement being formed at a depth of around 3m bgl at the front of the property and around 0.8m bgl at the rear of the property.
Basement Structural Method Statement Review	A report titled 'Structural engineer's suggested basement structural method statement produced in support of an application for planning' has been produced for the site by Mint Structures (May 2020), report ref. M20078/LS. A brief overview of the relevant information is presented below. Reference should be made to the full report for detailed information. The site was reported to be directly underlain by solid deposits of the London Clay Formation; a soil investigation was recommended to confirm the geology beneath the site. Borehole records from approximately 600m to the east and west of the site show predominantly London Clay Formation and no groundwater was reported within the boreholes. Isolated pockets of perched groundwater may be present within made ground deposits beneath the site. Groundwater monitoring wells were recommended to measure groundwater levels, if any, beneath the site over an extended period of 4-6 weeks. Gypsum may be present within the underlying London Clay Formation and so a class DS-2 buried concrete design was recommended. Rainfall within the local area was reported around 610mm, lower than the national average. The surrounding area is highly developed and holds a large proportion is hardstanding. On this basis, most of the rainfall is expected to run-off into the sewage system. The site is located within a Flood Zone 1 and is therefore considered to be at low risk of flooding. The site is reported to be at a very low risk of flooding from rivers and sea and surface water flooding. Groundwater is unlikely to be present beneath the site within the London Clay Formation at the depths relevant to the proposed development and therefore the impacts of the proposed development on groundwater flow are expected to be limited. Although no drainage details of the proposed development are known, it was assumed that the drainage system serving the proposed basement will utilise a pumped drainage arrangement and minimise flood risks.

Site History and Ground Investigation	
	The site exhibits 2No downslopes; from south to north and west to east, a full slope assessment is not considered necessary. The site is not located in close proximity to the London Underground network of tunnels. Heave protection is recommended.
Intrusive Investigation	A ground investigation was undertaken on 3rd December 2021, and consisted of the following: • 3No. window sampling boreholes, drilled up to 7.00m below ground level (bgl), with associated in situ testing and sampling; • Recording of foundations exposed in pits excavated by others; • Laboratory analysis for chemical and geotechnical purposes, • 1No. return visit to monitor groundwater levels has been completed.
Ground Conditions	The results of the ground investigation revealed a ground profile comprising Made Ground over deposits of a brown/dark grey to black sandy clay of which has been interpreted as 'Possible Made Ground' to a depth of around 3.80mbgl. This was underlain by the London Clay Formation to the base of the boreholes at 7.00mbgl. During drilling, no groundwater strikes were encountered. During 1No return monitoring visit, water was reported within the installed wells WS1 and WS2 at 4.87m and 1.77mbgl. These water levels are assumed to be a result of surface water run-off and perched groundwater within the 'Possible Made Ground' respectively. It should be noted that WS1 was drilled from ground level at the front of the site, whilst WS2 and WS3 were drilled at the rear of the site at lower ground floor level, approximately 1.80mbgl lower than WS1.
Geotechnical Considerations	It is considered that conventional cantilever retaining walls may be formed within the underlying London Clay Formation for an allowable bearing capacity of 90kPa. 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. Suspended floor slabs are recommended due to the presence of shrinkable soils and due to the depths of Made Ground encountered. Any surface water/groundwater encountered during construction works should be addressed by conventional pumping from a sump. 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. Based on the results of chemical testing, the required concrete class for the site is DS-3 assuming an Aggressive Chemical Environment for Concrete classification of AC-2s for the London Clay Formation in accordance with the procedures outlined in BRE Special Digest 1.
Basement Impact Assessment	The overall assessment of the site is that the creation of a basement for the proposed development should not adversely impact the site or its immediate environs, providing measures are taken to protect surrounding land and properties during construction. The proposed basement excavation will be within 5m of a public pavement. It is also laterally within 5m of neighbouring properties. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services.

Site History and Ground Investigation	
	During the construction phase careful and regular monitoring will need to be undertaken to ensure that the neighbouring properties are not adversely affected. This may mean that structures will need to be suitably propped and supported.
Recommended Further Work	The following works are recommended: • Completion of a Ground Movement Assessment – in progress.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Dimitrios Bimpas (“The Client”) has commissioned Jomas Associates Ltd, to carry out a ground investigation at a site referred to as 47 Woodland Gardens, London, N10 3UE, and to prepare a Basement Impact Assessment and provide indicative recommendations for foundation design prior to the redevelopment of the site. .

1.1.2 The intrusive investigation was undertaken in accordance with Jomas proposal dated 23rd September 2021.

1.2 Proposed Development

1.2.1 The proposed development is to comprise an extension to the lower ground floor at the rear of the building comprising of 3.0m lateral extension and vertical deepening of 0.80m, alterations to the side access levels to create steps and widening of the existing front light well and additional of adjacent basement level plant room.

1.2.2 As the site is currently split-level, this will result in the basement being formed at a depth of around 3m bgl at the front of the property and around 0.8m bgl at the rear of the property.

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. GC 2 projects are defined as involving:

1.3 Objectives

1.3.1 The objectives of Jomas’ investigation were as follows:

- To conduct an intrusive investigation, to determine the ground conditions present beneath the site;
- To obtain geotechnical parameters to inform preliminary foundation design; and,
- To undertake a Basement Impact Assessment to assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs.

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;
- Undertaking of laboratory chemical and geotechnical testing upon samples obtained;
- Carrying out a Basement Impact Assessment;
- 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 Supplied Documentation

- 1.5.1 A number of reports previously prepared by third parties were supplied to Jomas Associates at the commencement of this investigation. Table 1.1 details the documents supplied:

Table 1.1: Supplied Reports

Title	Author	Reference	Date
Structural Engineer's suggested basement structural method statement (SMS) produced in support of an application for planning.	Mint Structures	M20078/LS	May 2020

1.6 Limitations

- 1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Dimitrios Bismpas, 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 Associates Limited. 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.
- 1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas Associates Limited has actual knowledge to the contrary, information obtained from public sources or provided to Jomas Associates Limited by site personnel and other information sources, have been assumed to be correct. Jomas Associates Limited 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.
- 1.6.3 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.
- 1.6.4 Any reports provided to Jomas Associates Limited have been reviewed in good faith. Jomas Associates Limited cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.
- 1.6.5 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.
- 1.6.6 *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 SITE SETTING

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	47 Woodland Gardens, London, N10 3UE
Approx. National Grid Ref.	528734, 188991
Site Area (Approx)	0.03ha
Site Occupation	Residential
Local Authority	London Borough of Haringey
Proposed Site Use	An extension to the lower ground floor at the rear of the building comprising of 3.0m lateral extension and vertical deepening of 0.80m, alterations to the side access levels to create steps and widening of the existing front light well with addition of adjacent plant room.

2.2 Basement Structural Method Statement review

2.2.1 A report titled 'Structural Engineer's Suggested Basement Structural Method Statement Produced in Support of an Application for Planning' has been produced for the site by Mint Structures (May 2020), report ref. M20078/LS.

2.2.2 A brief overview of the relevant information is presented below. Reference should be made to the full report for detailed information.

Geological Information

2.2.3 The site is directly underlain by solid deposits of the London Clay Formation; a soil investigation was recommended to confirm the geology beneath the site.

Existing Site Investigation Data

2.2.4 Borehole records from approximately 600m to the east and west of the site show predominantly London Clay Formation and no groundwater was reported within the boreholes. Isolated pockets of perched groundwater may be present within made ground deposits beneath the site.

2.2.5 Groundwater monitoring wells were recommended to measure groundwater levels, if any, beneath the site over an extended period of 4-6 weeks.

Chemical Attack on Buried Concrete

2.2.6 Gypsum may be present within the underlying London Clay Formation and so a class DS-2 buried concrete design was recommended.

Hydrology and drainage

- 2.2.7 Rainfall within the local area was reported around 610mm, lower than the national average.
- 2.2.8 The surrounding area is highly developed and holds a large proportion is hardstanding. On this basis, most of the rainfall is expected to run-off into the sewage system.
- 2.2.9 The site is located within a Flood Zone 1 and is therefore considered to be at low risk of flooding. The site is reported to be at a very low risk of flooding from rivers and sea and surface water flooding.
- 2.2.10 Groundwater is unlikely to be present beneath the site within the London Clay Formation at the depths relevant to the proposed development and therefore the impacts of the proposed development on groundwater flow are expected to be limited.
- 2.2.11 Although no drainage details of the proposed development are known, it was assumed that the drainage system serving the proposed basement will utilize a pumped drainage arrangement and minimise flood risks.

Land Stability

- 2.2.12 The site exhibits 2No downslopes; from south to north and west to east, a full slope assessment is not considered necessary.
- 2.2.13 The site is not located in close proximity to the London Underground network of tunnels.
- 2.2.14 Heave protection is recommended.

Basement Construction

- 2.2.15 The report provides the following details on the proposed basement construction:

The structural proposals for the proposed basement deepening and lightwell construction are included in the Appendix. The deepening of the existing basement will be carried out in non-sequential underpinning. The majority of the underpinning required will be low-level and formed in reinforced concrete with short stem heights. The excavation of the new light wells will require full height underpinning from ground level and will therefore also be formed in reinforced concrete as shown in the Appended scheme. The proposed basement will require a Grade 3 rated basement (BS8102) providing a watertight construction and it is assumed that an internal cavity drained system will be installed to achieve this.

3 GROUND INVESTIGATION

3.1 Rationale for Ground Investigation

3.1.1 The site investigation has been undertaken generally in accordance with BS5930, NHBC Standards Chapter 4.1, and other associated Statutory Guidance. If required, further targeted investigations would be dependent on the findings of this site investigation.

3.1.2 The sampling proposal was designed in order to gather data representative of the site conditions; to provide information relevant to the assessment of risk posed to the proposed basement identified during the Screening and Scoping stage of the BIA.

3.2 Scope of Ground Investigation

3.2.1 The ground investigation was undertaken on 3rd December 2021.

3.2.2 The work was undertaken in accordance with BS5930 'Code of Practice for Ground Investigations'. All works were completed without incident.

3.2.3 The investigation focused on collecting data on the following:

- Quality of Made Ground/natural ground within the site boundaries;
- Presence of groundwater beneath the site (if any), perched or otherwise;
- Obtaining geotechnical parameters to allow initial design to take place.

3.2.4 A summary of the fieldwork carried out at the site, with justifications for exploratory hole positions, are offered in Table 3.1 below.

Table 3.1: Scope of Intrusive Investigation

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved (mbgl)	Justification
Window Sample Boreholes	3	WS1-WS3	Up to 7.00mbgl	Obtain shallow samples for laboratory and geotechnical testing. To allow in-situ geotechnical testing. WS1 – to target proposed extension. WS2 – to target proposed extension.
Hand dug Trial Pits (Excavated prior to Jomas arrival on site)	9	TP1 - 9	Up to 1.50mbgl	All pits excavated by others prior to Jomas arrival. To allow the inspection of the existing structure foundations.

3.2.5 The exploratory holes were completed to allow soil samples to be taken in the areas of interest identified in Table 3.1 above. In all cases, all holes were logged in accordance with BS5930:2015.

3.2.6 Exploratory hole positions were located approximately with reference to known features on site as shown in the exploratory hole location plan presented in Figures 2 & 3, Appendix 1. The exploratory hole records are included in Appendix 2.

3.2.7 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.

3.3 In-situ Geotechnical Testing

3.3.1 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.

3.4 Sampling Limitations

3.4.1 All of the boreholes were drilled in their proposed locations.

3.4.2 WS3 was terminated at 5mbgl due to time constraints.

3.5 Laboratory Analysis

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

Geotechnical Laboratory Testing

3.5.2 Soil samples were submitted to the UKAS Accredited laboratory of i2 Analytical Ltd. for a series of analyses.

3.5.3 This testing was specifically designed to:

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

3.5.4 The following laboratory geotechnical testing (as summarised in Table 3.2) was carried out:

Table 3.2 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

3.5.5 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. The results of this testing are presented in Appendix 3.

-
- 3.5.6 The results of the geotechnical laboratory testing are presented as Appendix 4 and discussed in Section 5 of this report.

4 GROUND CONDITIONS

4.1 Soil

4.1.1 Ground conditions were logged in accordance with the requirements of BS5930:2015. Detailed exploratory hole logs are provided in Appendix 2. The ground conditions encountered are summarised in Table 4.1 below, based on the strata observed during the investigation.

Table 4.1: Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Concrete/Timber/Tile/Paving slab over sub-base over/mid-brown/dark brown/grey to black sandy clay/sandy gravelly clay with high cobble content. Gravel and cobbles consists of brick and concrete and occasional charcoal. (MADE GROUND).	0.0	0.30 - 1.50	0.30 - 1.50
Soft consistency* brown sandy clay. (POSSIBLE MADE GROUND).	0.30 - 1.40	1.60 - 2.30	0.90 – 1.70
Soft consistency to very soft consistency* dark grey/grey to black slightly sandy clay. Organic content present. (POSSIBLE MADE GROUND).	1.60 - 2.30	2.20 - 3.80	0.60 - 1.50
Firm to stiff consistency* mid brown mottled grey silty CLAY. (LONDON CLAY FORMATION)	2.20 - 3.80	>5.00 - >7.00 (base not proven)	>2.80 - >3.70 (thickness not proven)

4.1.2 It should be noted that WS1 was drilled from ground level at the front of the site, whilst WS2 and WS3 were drilled at the rear of the site at lower ground floor level, approximately 1.80mbgl lower than WS1.

4.1.3 Based on geological mapping, it is considered that the encountered strata represent Made Ground over the London Clay Formation.

4.1.4 The London Clay Formation is described by the BGS as consisting of;

“bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.”

4.1.5 Organic content and low strength material was encountered within the boreholes overlying the London Clay Formation. No such material was expected prior to the investigation and the characteristics of the material do not match the underlying London Clay Formation. It is therefore considered that this material likely represents made ground rather than natural deposits.

4.1.6 The base of the London Clay Formation was not encountered within the boreholes, drilled to a maximum depth of 7.00mbgl.

4.2 Existing Foundations

4.2.1 Details of the observed foundations as exposed by the inspection pits are summarised in Table 4.2. The pits were all excavated by others prior to Jomas' arrival.

Table 4.2: Foundation Inspection Pit Summary

Hole	Location	Total Step Out (m)	Assumed Width (m)	Proven Depth (mbgl)	Founding Strata
TP1	North west corner of the lower ground level	N/A	N/A	1.50	Made Ground
TP2	North east corner of the lower ground level	N/A	N/A	1.06	Made Ground
TP3	Eastern extent of lower ground level in the middle of the site.	0.13	0.56	0.72	Made Ground
TP4-South wall	South east corner of the lower ground level	0.10	0.50	0.57	Made Ground
TP4-East wall	South east corner of the lower ground level	0.31	0.92	0.86	Made Ground
TP5 – South wall	Southern extent of the lower ground level	0.19	0.68	0.72	Made Ground
TP5 – West wall	Southern extent of the lower ground level	0.09	0.48	0.74	Made Ground
TP6	Southern extent of the lower ground level	0.05	0.40	0.72	Made Ground
TP7	South west corner of the lower ground level	0.11	0.52	0.86	Made Ground

Hole	Location	Total Step Out (m)	Assumed Width (m)	Proven Depth (mbgl)	Founding Strata
TP8	Western extent of the lower ground level	0.21	0.72	Not proven	Base of excavation within made Ground
TP9	Western extent of the lower ground level	N/A	N/A	Not proven	Base of excavation within made Ground

4.2.2 The following has been assumed:

- Walls were constructed symmetrically and centrally on the strip footing to prevent overturning and eccentric loading.
- Where the width of the wall is not known, it is assumed to be 0.30m wide to take into account the walls and any cavity.

4.3 Hydrogeology

4.3.1 Groundwater was not encountered in any of the exploratory holes during drilling.

4.3.2 WS1 and WS2 were installed with groundwater monitoring wells.

4.3.3 1No return groundwater monitoring visit was undertaken on 10th December 2021 and the results are provided below.

Table 4.3: Groundwater Monitoring Summary

Exploratory Hole ID	Depth Encountered (mbgl)	Depth to Base of Well (mbgl)	Stratum
WS1	4.87	4.94	London Clay Formation
WS2	1.77	5.25	Possible Made Ground

4.3.4 The minimal depth of water encountered within WS1 is assumed to be a result of surface water run-off.

4.3.5 The water encountered within WS2 likely represents perched groundwater within the 'Possible Made Ground' deposits. A continuous groundwater body is not expected to be present within the London Clay Formation.

4.4 Physical and Olfactory Evidence of Contamination

4.4.1 With the exception of black arisings within WS1 and WS2, no other visual or olfactory evidence of contamination was observed during the course of the investigation.

5 GEOTECHNICAL TESTING RESULTS

5.1.1 Standard Penetration Tests (SPT) were undertaken in the borehole locations to a maximum depth of 7.00mbgl. SPT 'N' values ranged between N=6 and N=14 within the cohesive London Clay Formation. SPT 'N' values ranged between N=2 and N=5 within the 'Possible Made Ground' encountered beneath the site.

5.1.2 This disparity in N-values is further evidence that the 'Possible Made Ground' is unlikely to part of the natural London Clay Formation.

5.1.3 The results of the geotechnical laboratory testing are summarised in Table 5.1.

Table 5.1: Summary of Geotechnical Test Results

Parameter	'Possible Made Ground'	London Clay Formation
Moisture Content (%)	34 - 38	33 - 38
Liquid Limit (%)	34 - 69	70 - 82
Plastic Limit (%)	18 - 29	30 - 33
Plasticity Index (%)	16 - 40	40 - 49
Modified Plasticity Index (%)	14.24 - 40	40 - 49
Volume Change Potential [NHBC and BRE]	Low to High	High
pH	7.2	7.2 - 7.9
Water soluble sulphate (g/l)	0.58	0.37 - 0.58
SPT (N) values	2 - 5	6 - 14

5.1.4 It should be noted that the engineering characteristics of Made Ground are variable and unpredictable. Nevertheless, the 'Possible Made Ground' strata will be included within the geotechnical assessment.

5.1.5 WS2 at 3.00mbgl was reported by the laboratory as 'sandy, slightly gravelly clay'. All remaining samples tested were reported by the laboratory as a pure 'clay'.

5.1.6 With the exception of WS2 at 3.00m, the samples tested within the 'Possible Made Ground' and the London Clay Formation showed similar Atterberg Limits results. WS2 at 3.00m showed a similar moisture content to the rest of the samples but showed a lower liquid and plastic limit, plasticity index and consequently modified plasticity index. This is assumed to be due to the granular content within the sample.

5.2 Summary of Derived General Properties

5.2.1 Based on the analysis of the ground investigation data and past experience with similar deposits, the following derived general parameters are given in Table 5.2.

Table 5.2: Derived General Parameters

Property*	Possible Made Ground	London Clay Formation
Unit Weight	19	19.5
Drained Friction, ϕ' (°)	21.97 - 26.95	20.87 - 21.97
Drained Cohesion, c' (kPa)	0	0
SPT 'N' Value	2 - 5	6 - 14
Undrained Young's Modulus, E_u (MPa) ²⁾	2.4 - 6	7.5 - 16.8
Undrained Shear Strength, c_u (kPa) ³⁾	9 - 22.5	27 - 63
Plasticity Index (%)	16 - 40	40 - 49
Modified Plasticity Index (%)	14.24 - 40	40 - 49
Volume Change Potential [NHBC]	High	High
Modulus of Volume Compressibility, m_v (m ² /MN) ⁵⁾	0.444 - 1.111	0.159 - 0.370

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 $PI > 25\%$).

⁵⁾ 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) as presented in Figure 27 of CIRIA Report 27 or $10/c_u$.

6 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

6.1 General

- 6.1.1 Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.
- 6.1.2 The proposed development is to comprise an extension to the lower ground floor at the rear of the building comprising of 3.0m lateral extension and vertical deepening of 0.80m, alterations to the side access levels to create steps and widening of the existing front light well and additional of adjacent basement level plant room.
- 6.1.3 As the site is currently split-level, this will result in the basement being formed at a depth of around 3m bgl at the front of the property and around 0.8m bgl at the rear of the property.

6.2 Proposed Foundations

General

- 6.2.1 Deep Made Ground has been encountered at the site. Given the hilly nature in which the site is situated, it is possible that this could be a result of backfilling beside former excavations (especially at the front of the house) and attempting to create relatively level garden areas for this and adjacent properties using foundation and lower ground floor excavation arisings during construction.
- 6.2.2 Both the proven Made Ground and 'Possible Made Ground' are not considered to provide suitable bearing strata due to their low strength, the variability of the composition and the unacceptable risk of total and differential settlement anticipated throughout.
- 6.2.3 It is recommended that all foundations should be deepened beneath these deposits, soft clay, organic, root or desiccated zones, or disturbed ground, and founded within underlying competent strata.
- 6.2.4 It should be noted that, as mentioned previously, the boreholes were undertaken at different starting levels. WS1 was undertaken at the front of the property, approximately 1.80m higher than WS2 and WS3 which were undertaken at current basement level at the rear of the property.
- 6.2.5 If and where foundations need to change levels, 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.
- 6.2.6 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. Foundations should be designed in accordance with any other recommendations provided in NHBC Standards Chapter 4.2.
- 6.2.7 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.

Conventional Foundations

- 6.2.8 Based on the ground and groundwater conditions encountered, conventional foundations might be suitable.
- 6.2.9 Foundations are not recommended to be formed within the Made Ground and 'Possible Made Ground'.
- 6.2.10 It is considered that conventional cantilever retaining walls may be formed within the underlying London Clay Formation for an allowable bearing capacity of 90kPa. Total and differential settlements should be contained within tolerable limits.

6.3 Retaining Walls

- 6.3.1 Based on the analysis of the available site investigation data and past experience with similar deposits the parameters in Table 6.1 are considered appropriate for the potential retaining structure(s).

Table 6.1: Geotechnical Parameters for Retaining Wall Design

	Possible Made Ground	London Clay Formation
Critical state angle of shearing resistance (ϕ')°	22	21
Effective Cohesion kN/m ²	0	0
Saturated Bulk Weight (γ_{sat}) kN/m ³	19	19.5

- 6.3.2 In addition, the specialist contractor should ensure the stability of the cut-face during the temporary works.
- 6.3.3 As an alternative to cantilever retaining walls, fully embedded retaining walls comprising a contiguous/secant piled basement box could be formed. The piles would need to act as retaining walls as well as carry the structural loadings. The piles should be designed to withstand the earth pressures, and still meet the required structural requirements regarding issues such as deflection, deformation and bending.
- 6.3.4 To provide sufficient support for the excavation, it is recommended that un-propped piles are formed to at least three times the depth of excavation.
- 6.3.5 If these piles can be suitably propped, then this depth may be reduced. Suitable propping could be provided by the basement floor and the ground floor if they are suitably tied into the piles and suitably reinforced. This may require specialist construction techniques.

6.4 Sulphates

- 6.4.1 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.

- 6.4.2 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 6.2: 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

- 6.4.3 Table 6.3 summarises the analysis of the aggressive nature of the ground for each of the strata encountered within the ground investigation.

Table 6.3: Concrete in the Ground Classes

Stratum	No Samples	pH range	Characteristic WS Sulphate (mg/l)	Design Sulphate Class	ACEC Class
Made Ground/Possible Made Ground	2	7.2 – 8.0	580	DS-2	AC-1s
London Clay Formation	2	7.2 – 7.9	2550	DS-3	AC-2s

- 6.4.4 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.

6.5 Ground Floor Slabs

- 6.5.1 Given the presence of shrinkable soils and the depth of suspected Made Ground, 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 where high volume change potential soils are present at shallow depth.

6.6 Excavations

- 6.6.1 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.
- 6.6.2 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.
- 6.6.3 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.

7 BASEMENT IMPACT ASSESSMENT

7.1 Proposed Changes to Areas of External Hardstanding

7.1.1 The proposed development is to comprise an extension to the lower ground floor at the rear of the building comprising of 3.0m lateral extension. However, this area is currently covered by hardstanding.

7.1.2 As a result, there are unlikely to be significant changes in impermeable areas, and so it is not considered necessary to undertake any further investigations, studies or impact assessment in relation to the proposed changes to areas of external hardstanding.

7.1.3 If SuDS are required, e.g. due to planning requirements, these should not include plans for soil infiltration drainage, to avoid the potential for leaching of contaminants within Made Ground, and due to the low permeability of the underlying London Clay Formation. However, if they can incorporate attenuation and discharge to the drainage network this would result in betterment to surface water flow.

7.2 Geological Impact

7.2.1 The published geological maps indicate that the London Clay Formation directly underlies the site. The ground investigation proved deposits of Made Ground overlying the London Clay Formation.

7.2.2 Geotechnical laboratory analysis has indicated these deposits to have high volume change potential. 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.

7.3 Hydrology and Hydrogeology Impact

7.3.1 Based on all the information available at the time of writing, the risk of flooding from groundwater is considered to be low. The proposed basement is unlikely to have a detectable impact on the local groundwater regime. Appropriate water proofing measures should be included within the whole of the proposed basement wall/floor design as a precaution.

7.3.2 As discussed by Mint Structures (May 2020), significant groundwater flow is unlikely within the London Clay Formation.

7.3.3 During the drilling of the boreholes, no groundwater strikes were reported. Following a single return monitoring visit, groundwater was encountered within WS1 and WS2 at depths of 4.87m and 1.77mbgl, respectively. This is likely representing surface water run off within WS1 and perched groundwater within the 'Possible Made Ground' in WS2.

7.3.4 The proposed development will lie outside of flood risk zones and is therefore assessed as being at a very low probability of fluvial flooding.

7.3.5 There are no surface water features on or in the immediate vicinity of the site. It is therefore not anticipated that the site will make any impact upon the hydrology of the area.

7.3.6 The information provided by Mint Structures suggests that the site lies in an area that is at a very low risk of river and tidal flooding. Flooding via this source is therefore considered to be low.

- 7.3.7 The information provided by Mint Structures suggests that the site lies in an area that is at a very low to low risk of surface water flooding. Flooding via this source is therefore considered to be low.
- 7.3.8 No risk of flooding to the site from artificial sources has been identified.
- 7.3.9 The creation of the basement is therefore considered unlikely to have any significant impact upon the hydrology or hydrogeology of the area.
- 7.4 Impacts of Basement on Adjacent Properties and Pavement**
- 7.4.1 The proposed basement excavation will be within 5m of a public pavement. It is also within 5m from neighbouring properties. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services and structures.
- 7.4.2 It is recommended that the site is underpinned using props and cantilever walls. This will ensure that the adjacent land is adequately supported in the temporary and permanent construction. This will ensure that the adjacent land is adequately supported in the temporary and permanent construction.
- 7.4.3 Careful and regular monitoring of the structure will need to be undertaken during the construction phase to ensure that vertical movements do not adversely affect the property or adjacent properties.
- 7.4.4 It will be necessary to ensure that the basements are designed in accordance with the NHBC Standards and take due cognisance of the potential impacts highlighted above. This may be achieved by ensuring best practice engineering and design of the proposed scheme by competent persons and in full accordance with the Construction (Design and Management) Regulations. This will include:
- Establishment of the likely ground movements arising from the temporary and permanent works and the mitigation of excessive movements;
 - Assessment of the impact on any adjacent structures (including adjacent properties and the adjacent pavement with potential services);
 - Determination of the most appropriate methods of construction of the proposed basements;
 - Undertake pre-condition surveys of adjacent structures;
 - Monitor any movements and pre-existing cracks during construction;
 - Establishment of contingencies to deal with adverse performance;
 - Ensuring quality of workmanship by competent persons.
- 7.4.5 Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Developer to the London Borough of Haringey.

7.4.6 A Ground Movement Assessment is underway for the study site.

7.5 Previous Site Investigations

7.5.1 No previous site investigation reports were provided at the time of writing.

7.6 Ground Movement

7.6.1 CIRIA C580 Table 2.5 uses information on the damage to walls of buildings based on Burland et al (1977), Boscardin and Cording (1989) and Burland (2001) to categorise damage into 5 categories. A summary of Table 2.5 from CIRIA C580 is provided below.

7.6.2 It would be generally good practise to ensure that the design and construction should aim to limit damage to all buildings to a maximum of Category 2 (Slight) as set out in CIRIA Report 580.

Table 7.1: Summary of CIRIA C580 Table 2.5 (after Burland et al (1977), Boscardin and Cording (1989) and Burland (2001))

Category of damage		Description of Typical Damage	Approximate crack width (mm)	Limiting tensile strain (%)
0	Negligible	Hairline cracks of less than about 0.1mm are classes as negligible.	< 0.1	0.0-0.05
1	Very Slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	<1	0.05-0.075
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weather tightness. Doors and windows may stick slightly	<5	0.075-0.15
3	Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired.	5-15 or a number of cracks >3	0.15 – 0.3
4	Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floors sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15-25 but also depends on number of cracks	>0.3
5	Very Severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25 but depends on number of cracks	

7.6.3 The first three categories (namely Negligible, Very Slight and Slight categories) are generally regarded as acceptable for buildings where no structural damage is permissible.

-
- 7.6.4 Using an underpinning methodology, it is considered that in the short term maintaining the category of damage to Category 1 could be relatively easily achieved. It would be recommended that a full inspection of the property should be undertaken prior to starting work and a watching brief of the structure, the excavations and the adjacent structure is maintained during the works.
- 7.6.5 In the long term a suitably designed and constructed retaining wall should provide sufficient support to ensure that post construction movement is minimal and the damage classification post construction of any cracks caused in the short term should not get worse. It is considered unlikely that new cracks would occur post construction.
- 7.6.6 This advice is provided based on the limited ground investigation undertaken and is not a full Ground Movement Assessment. A Ground Movement Assessment is underway.

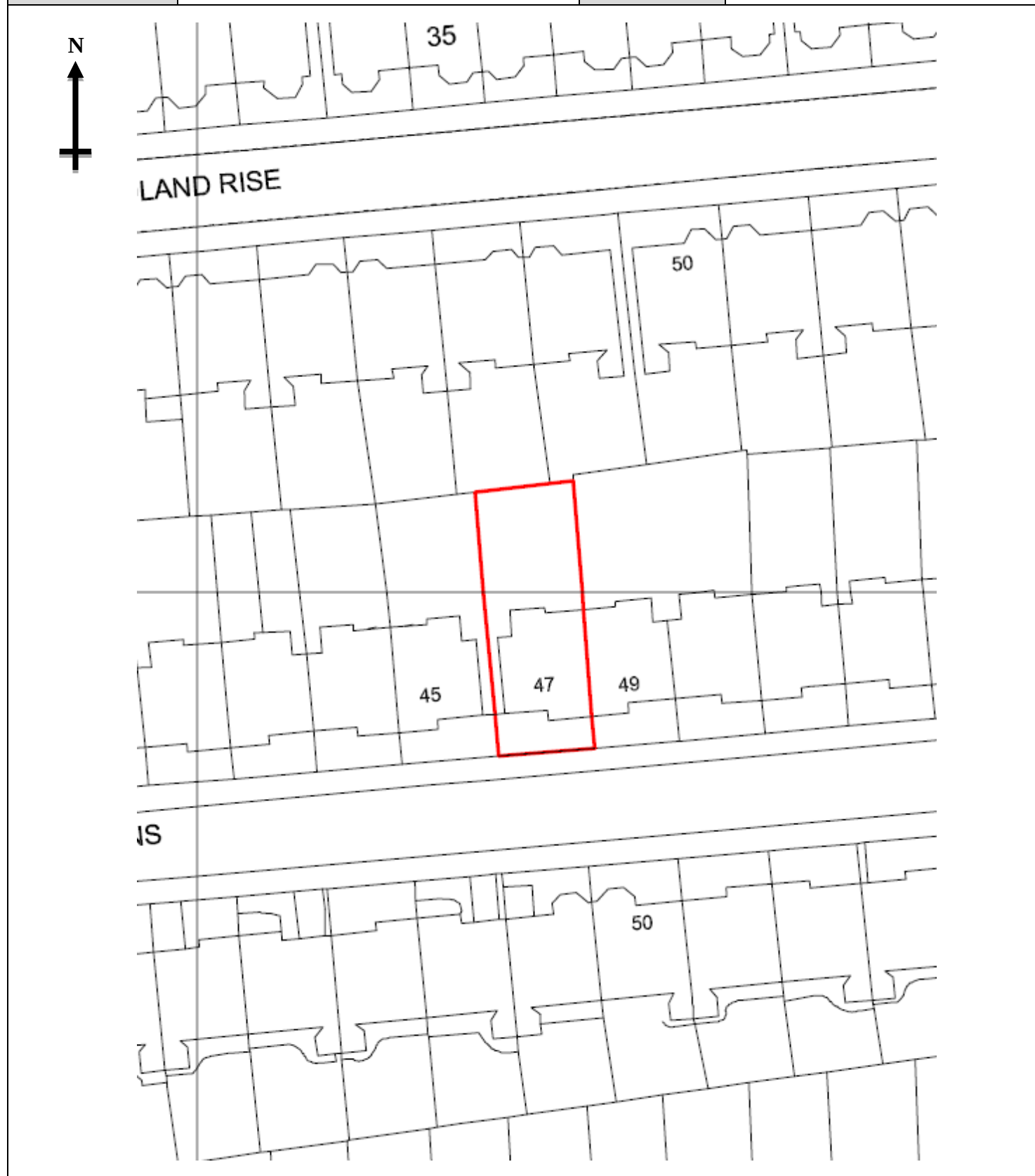
8 REFERENCES

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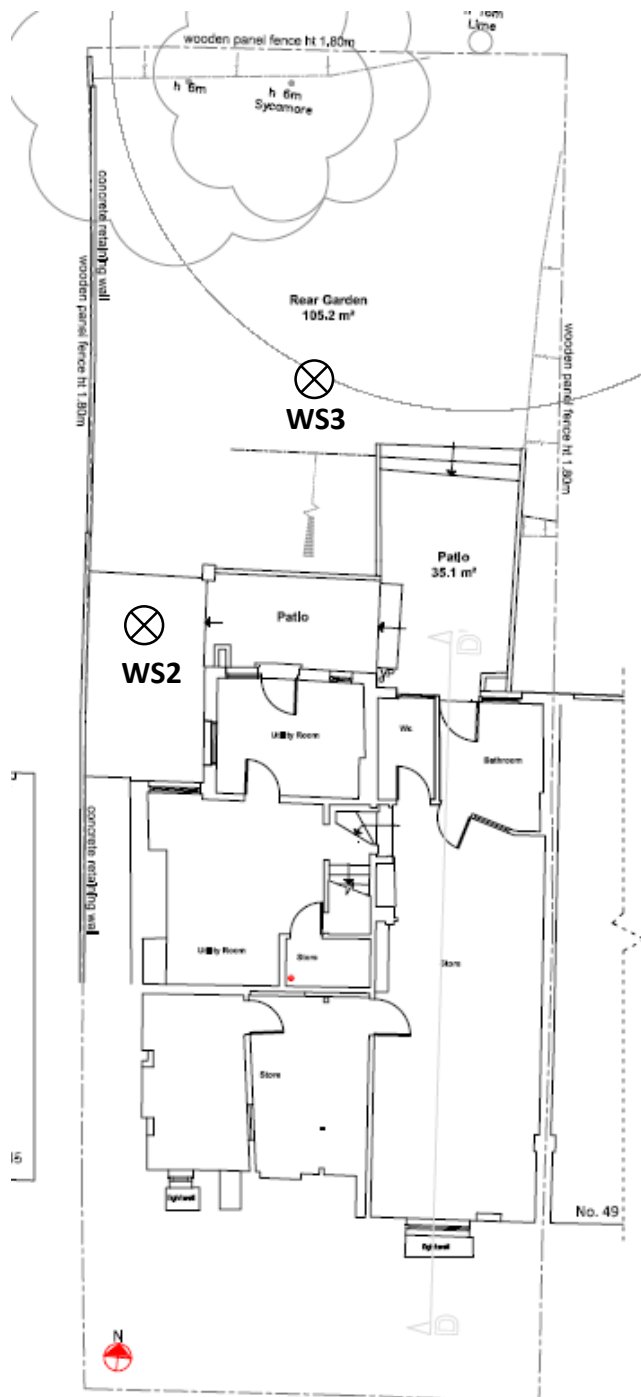
APPENDICES

APPENDIX 1 – FIGURES

PROJECT NAME	47 Woodland Gardens, London, N10 3UE	CLIENT	Dimitrios Bismpas
TITLE	Site Location Plan	PROJECT NO.	P3963J2460
DATE	November 2021	FIGURE NO.	1



PROJECT NAME	47 Woodland Gardens, London, N10 3UE	CLIENT	Dimitrios Bismpas
TITLE	Completed Exploratory Hole Plan	PROJECT NO.	P3963J2460
DATE	December 2021	FIGURE NO.	2

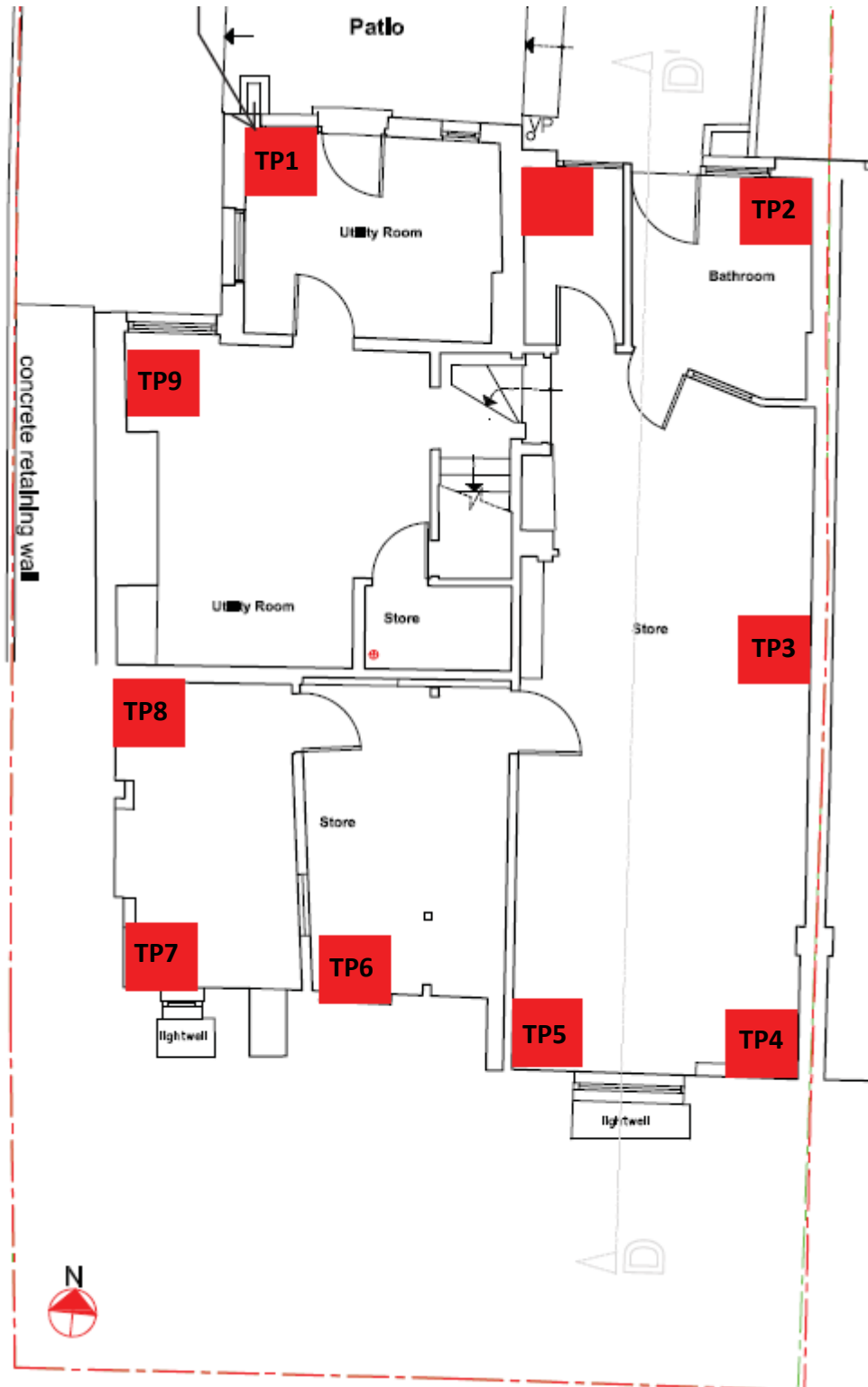


Existing Lower Ground Floor Plan
(Scale 1:100)

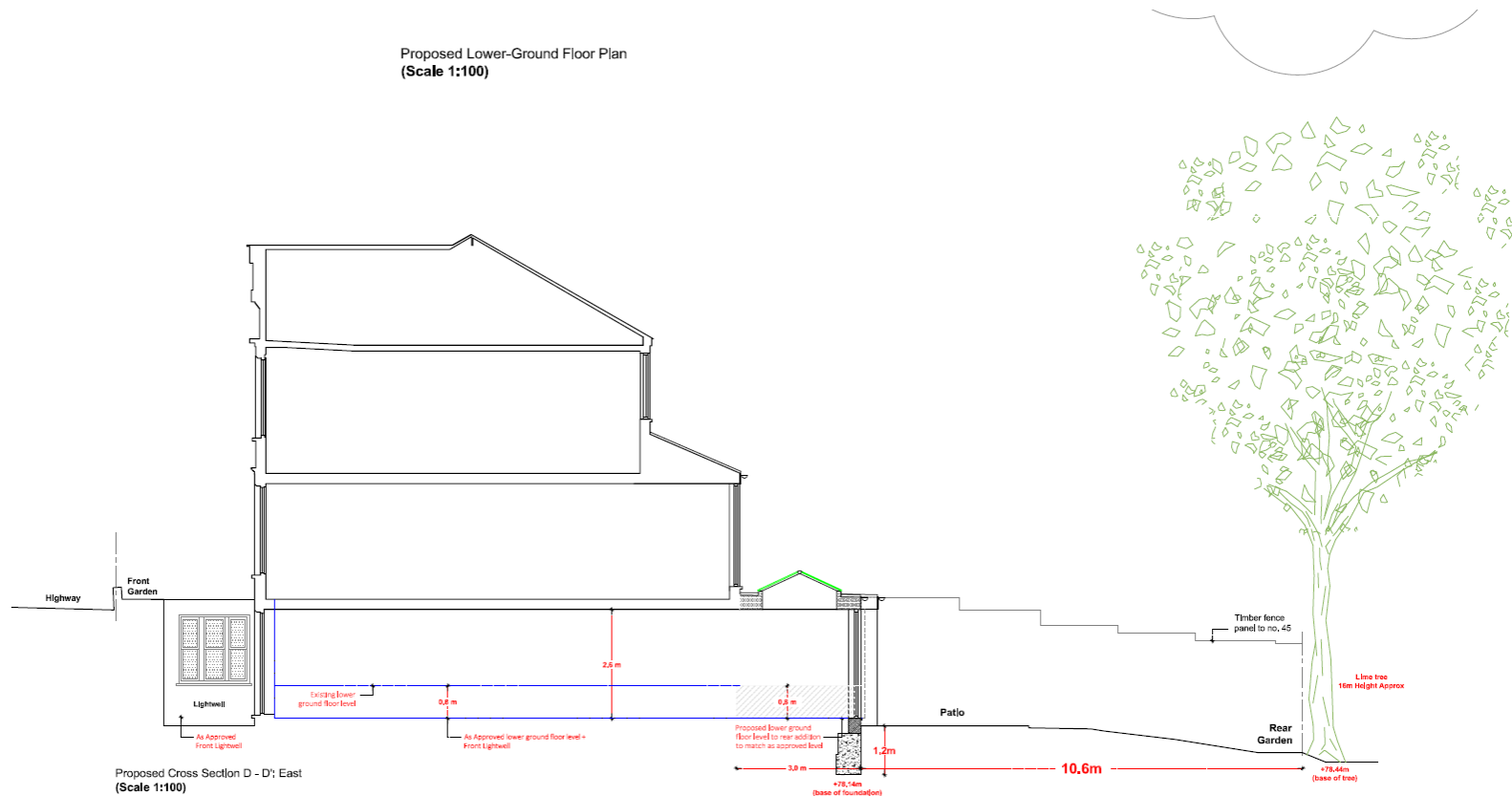


Existing Ground Floor Plan
(Scale 1:100)

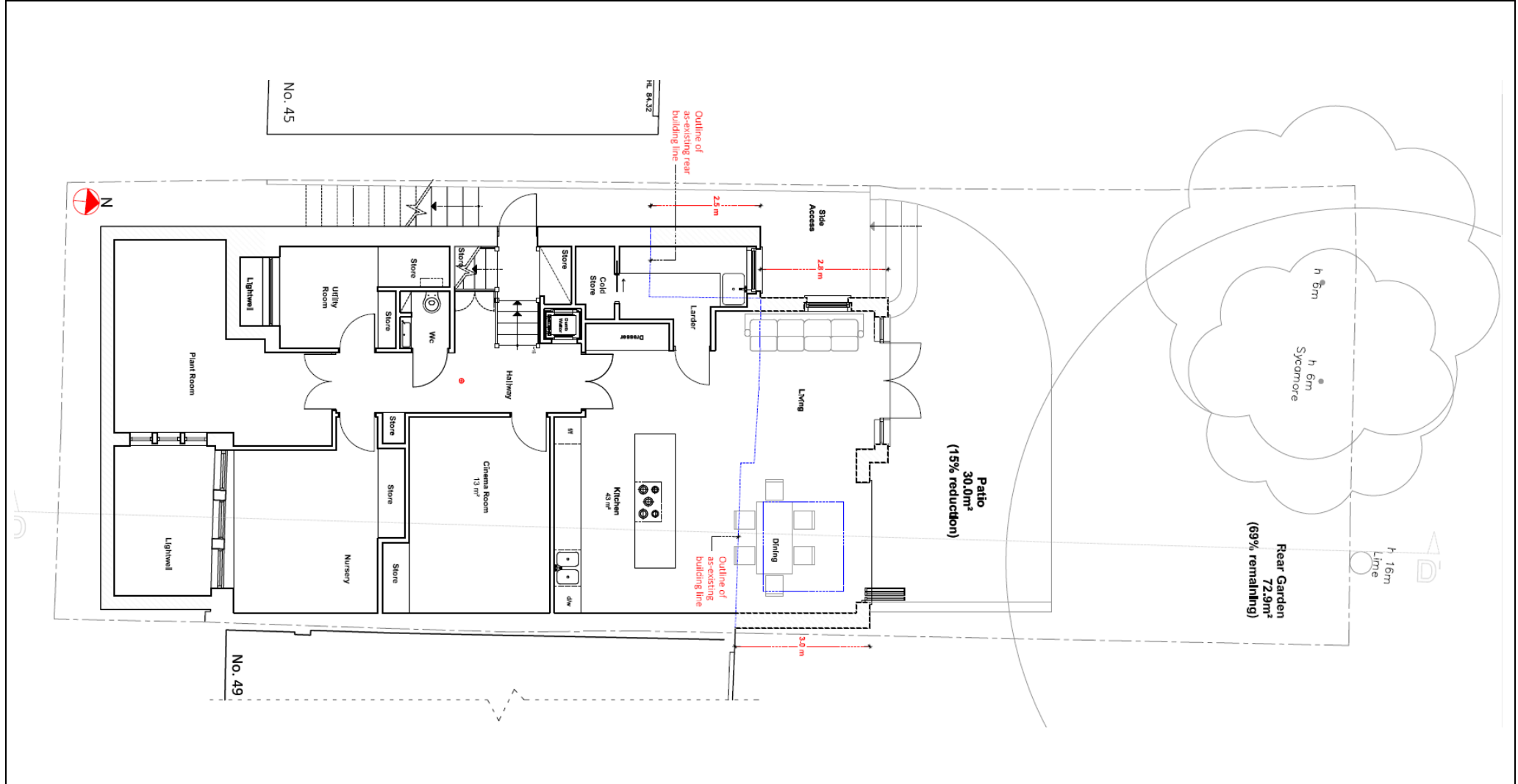
PROJECT NAME	47 Woodland Gardens, London, N10 3UE	CLIENT	Dimitrios Bismpas
TITLE	Completed Exploratory Hole Plan	PROJECT NO.	P3963J2460
DATE	December 2021	FIGURE NO.	3



PROJECT NAME	47 Woodland Gardens	CLIENT	Dimitrios Bismpas
TITLE	Proposed development – cross section	PROJECT NO.	P3963J2460
DATE	January 2022	FIGURE NO.	4



PROJECT NAME	47 Woodland Gardens	CLIENT	Dimitrios Bismpas
TITLE	Proposed development – lower ground level	PROJECT NO.	P3963J2460
DATE	January 2022	FIGURE NO.	5



APPENDIX 2 – EXPLORATORY HOLE RECORDS

Exploratory Hole No:

WS1

Site Address:	47 Woodland Gardens, London, N10 3UE	Project No:	P3963J2460
Client:	Dimitrios Bismpas	Ground Level:	
Logged By:	DB	Date Commenced:	03/12/2021
Checked By:	JF	Date Completed:	03/12/2021
Type and diameter of equipment:	Restricted-access Windowless Sampler Rig	Sheet No:	1 Of 2

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

Remarks						
1: *Field description.						
2: No water 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							
ES	0.50								0.00		0.05		Paving slab. (MADE GROUND)		
									0.15			Gravel. (MADE GROUND - Sub Base)			
											0.50				
ES SPT	1.00	1	1	0	1	1	0	2	1.00		1.40				
DD SPT	2.00	1	1	1	0	1	1	3	1.50				Soft consistency* mid-brown slightly sandy clay. (POSSIBLE MADE GROUND)		
									2.00						
									D SPT	3.00	1	1	1	1	2
3.00															
D SPT	4.00	1	1	2	2	3	3	10							
									4.00				Firm consistency* mid-brown mottled grey silty CLAY. (LONDON CLAY FORMATION)		
									4.50						
D SPT	5.00	1	2	2	2	2	3	9	5.00						

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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Exploratory Hole No:

WS1

Site Address:	47 Woodland Gardens, London, N10 3UE	Project No:	P3963J2460
Client:	Dimitrios Bismpas	Ground Level:	
Logged By:	DB	Date Commenced:	03/12/2021
Checked By:	JF	Date Completed:	03/12/2021
Type and diameter of equipment:	Restricted-access Windowless Sampler Rig	Sheet No:	2 Of 2

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

Remarks						
1: *Field description.						
2: No water 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 SPT	5.00	1	2	2	2	2	3	9	5.00				Firm consistency* mid-brown mottled grey silty CLAY. (LONDON CLAY FORMATION)	
									5.50					
D SPT	6.00	1	2	2	3	2	3	10	6.00					
									6.50					
D SPT	7.00	2	3	3	3	2	3	11	7.00		7.00			
									7.50					
									8.00					
									8.50					
									9.00					
									9.50					
									10.00					

Exploratory Hole No:

WS2

Site Address:	47 Woodland Gardens, London, N10 3UE	Project No:	P3963J2460
Client:	Dimitrios Bismpas	Ground Level:	
Logged By:	DB	Date Commenced:	03/12/2021
Checked By:	JF	Date Completed:	03/12/2021
Type and diameter of equipment:	Restricted-access Windowless Sampler Rig	Sheet No:	1 Of 2

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

Remarks						
1: *Field description.						
2: No water 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							
ES	0.50									0.00			Paving slab. (MADE GROUND)		
										0.05			Gravel. (MADE GROUND - Sub Base)		
										0.10			Dark brown to black sandy clay. Sand is fine to medium. (MADE GROUND)		
										0.40					
ES	0.50									0.50			Soft to firm consistency* mid-brown sandy clay. Sand is fine to medium. (POSSIBLE MADE GROUND)		
ES	1.00									1.00					
SPT	1.00	1	1	0	1	0	1	2							
										1.50					
D	2.00									2.00					
SPT	2.00	1	1	1	1	1	0	3			2.10				
										2.50			Soft consistency* dark grey sandy clay with low organic content. Sand is fine to medium. (POSSIBLE MADE GROUND)		
										3.00					
D	3.00														
SPT	3.00	1	2	1	0	1	1	3			3.30				
										3.50			Firm to stiff consistency* mid-brown mottled grey silty CLAY. (LONDON CLAY FORMATION)		
										4.00					
D	4.00														
SPT	4.00	1	1	1	1	2	2	6							
										4.50					
										5.00					
D	5.00														
SPT	5.00	1	1	1	2	3	3	9							

Site Address:	47 Woodland Gardens, London, N10 3UE
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Client:	Dimitrios Bimpas
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Logged By:	DB
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Checked By:	JF
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Type and diameter of equipment:	Restricted-access Windowless Sampler Rig
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Project No:	P3963J2460
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Ground Level:	
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Date Commenced:	03/12/2021
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Date Completed:	03/12/2021
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Sheet No:	2 Of 2
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Water levels recorded during boring, m

Date:

Hole depth:

Casing depth:

Level water on strike:

Water Level after 20mins:

Remarks

1: *Field description.

2:

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 SPT	5.00	1	1	1	2	3	3	9	5.00			Firm to stiff consistency* mid-brown mottled grey silty CLAY. (LONDON CLAY FORMATION)		
D SPT	6.00	1	2	3	2	3	3	11	5.50					
D SPT	7.00	3	4	3	3	4	4	14	7.00					
									7.50					
									8.00					
									8.50					
									9.00					
									9.50					
									10.00					

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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Exploratory Hole No:

WS3

Site Address:	47 Woodland Gardens, London, N10 3UE	Project No:	P3963J2460
Client:	Dimitrios Bismpas	Ground Level:	
Logged By:	DB	Date Commenced:	03/12/2021
Checked By:	JF	Date Completed:	03/12/2021
Type and diameter of equipment:	Restricted-access 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:						

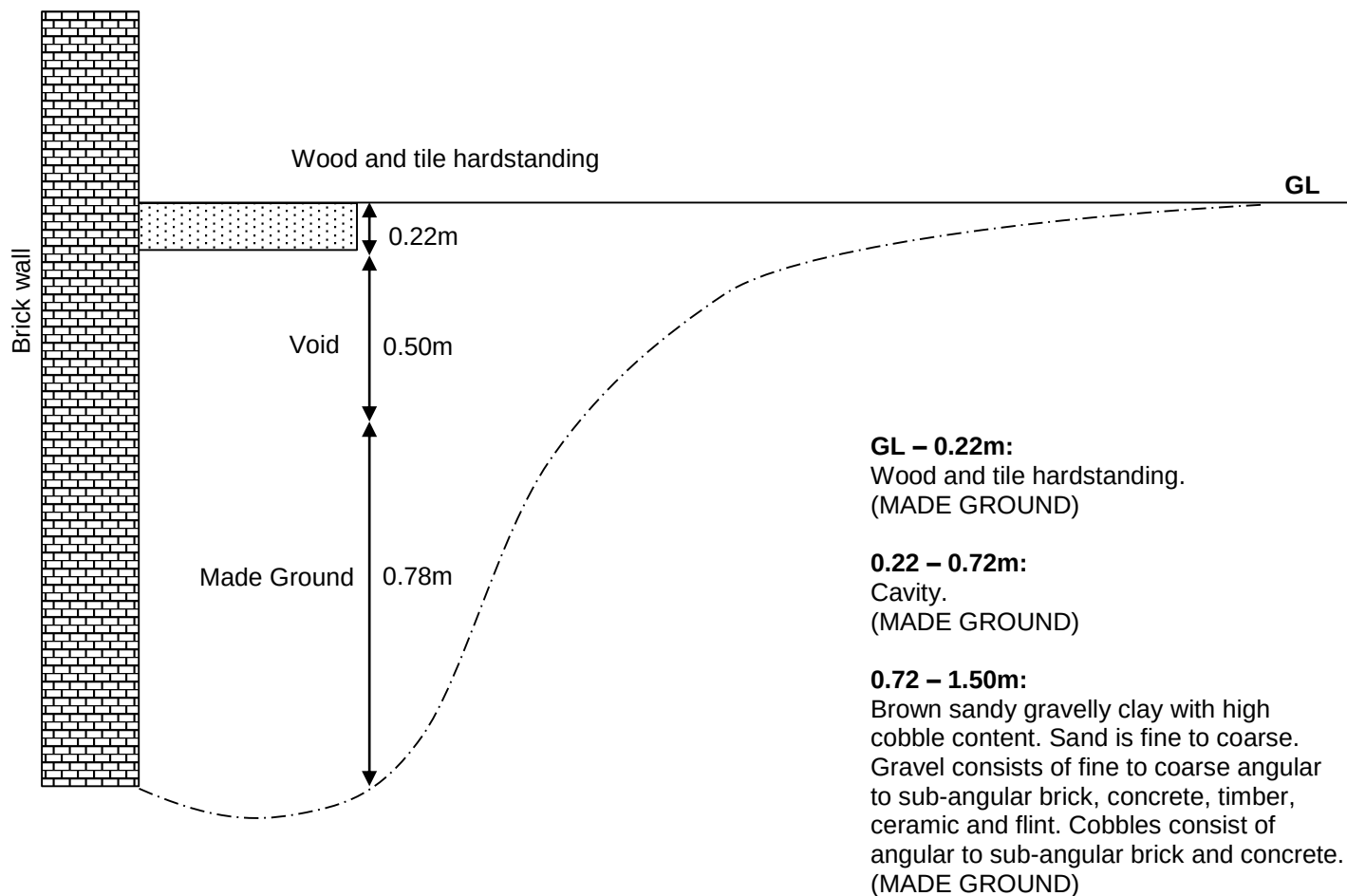
Remarks						
1: *Field description.						
2: No water reported.						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
ES	0.50								0.00				Mid-brown sandy very gravelly clay. Sand is fine to medium. Gravel consists of fine to medium brick. (MADE GROUND)	
										0.30		Soft consistency* mid-brown sandy clay. Sand is fine. (POSSIBLE MADE GROUND)		
ES	1.00								0.50					
SPT		1	0	1	1	1	1	4		1.00				
	2.00								1.50					
D									1.60		Soft consistency* grey very sandy clay. Sand is fine to medium. (POSSIBLE MADE GROUND)			
SPT	1	1	0	1	1	1	3		2.00					
	3.00								2.50					
D									3.00					
SPT	1	2	2	2	2	2	8		3.50					
	4.00								4.00					
D									4.50					
SPT	1	2	2	3	2	3	10		5.00					
D	5.00													
SPT		1	2	2	2	3	3	10						

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP1



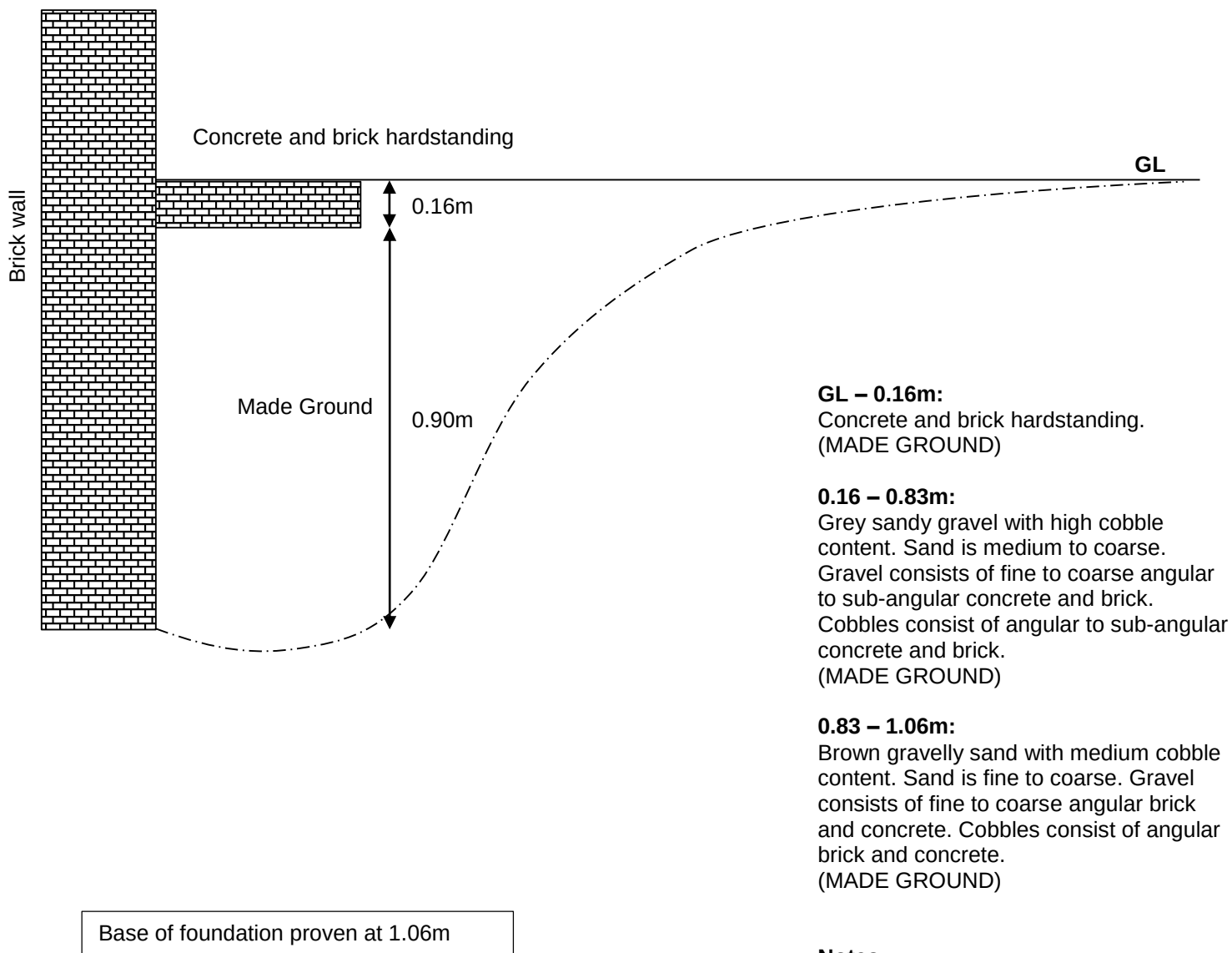
Notes:
Water pooling at base of foundation pit.

Base of foundation proven at 1.50mbgl.

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP2

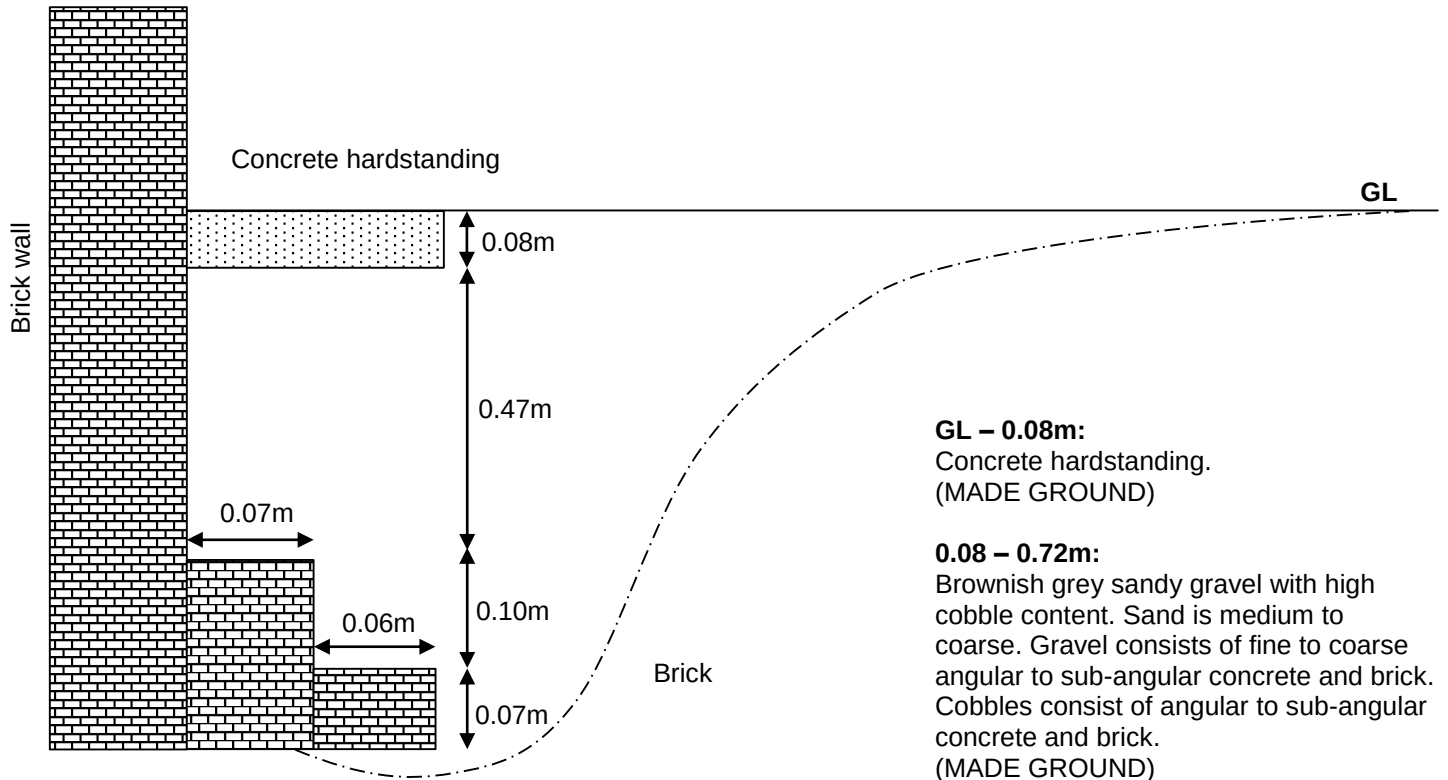


Notes:
No groundwater reported.

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP3



GL – 0.08m:
Concrete hardstanding.
(MADE GROUND)

0.08 – 0.72m:
Brownish grey sandy gravel with high
cobble content. Sand is medium to
coarse. Gravel consists of fine to coarse
angular to sub-angular concrete and brick.
Cobbles consist of angular to sub-angular
concrete and brick.
(MADE GROUND)

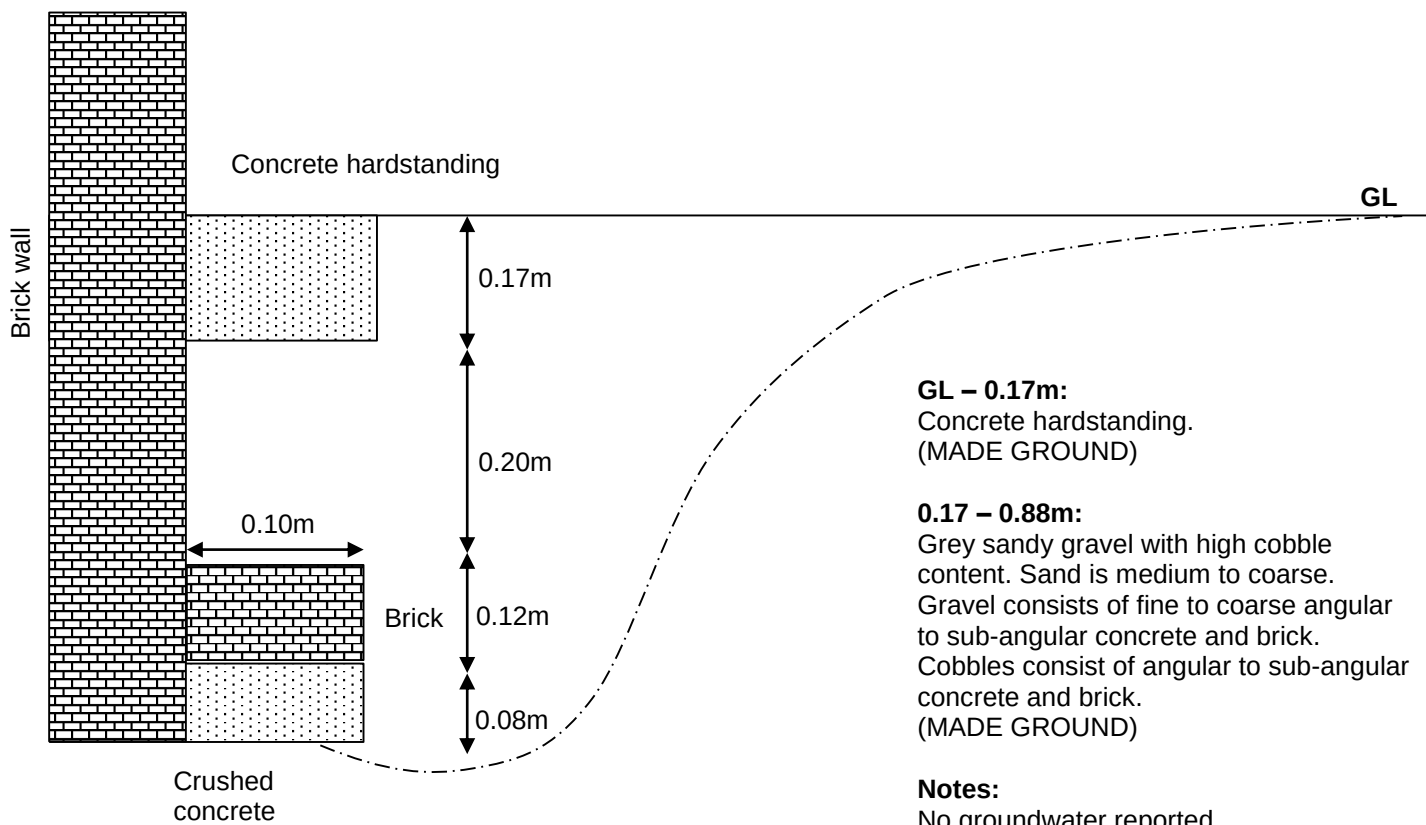
Notes:
No groundwater reported.

Base of foundation proven at 0.72m

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP4 – South Wall

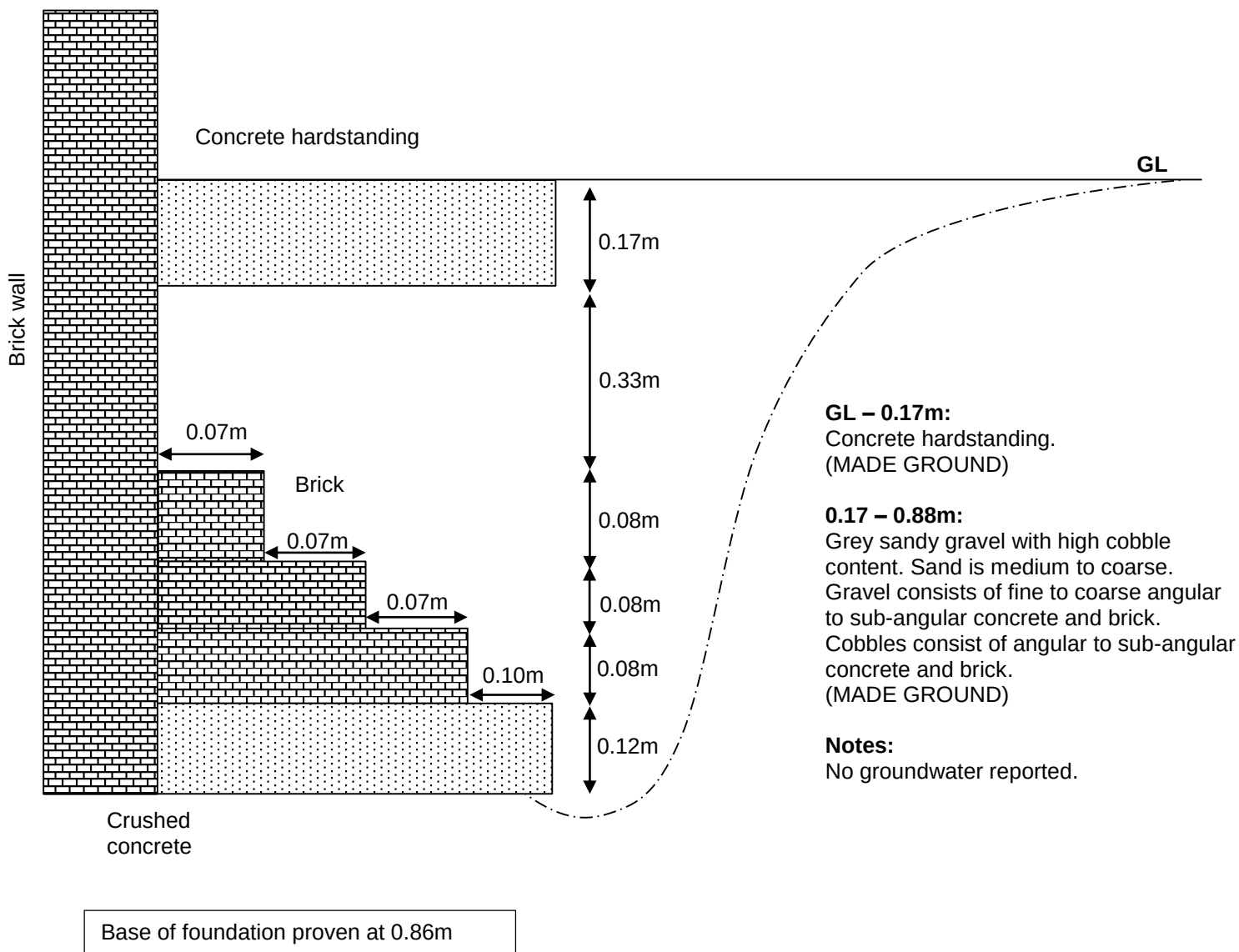


Base of foundation proven at 0.57m

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

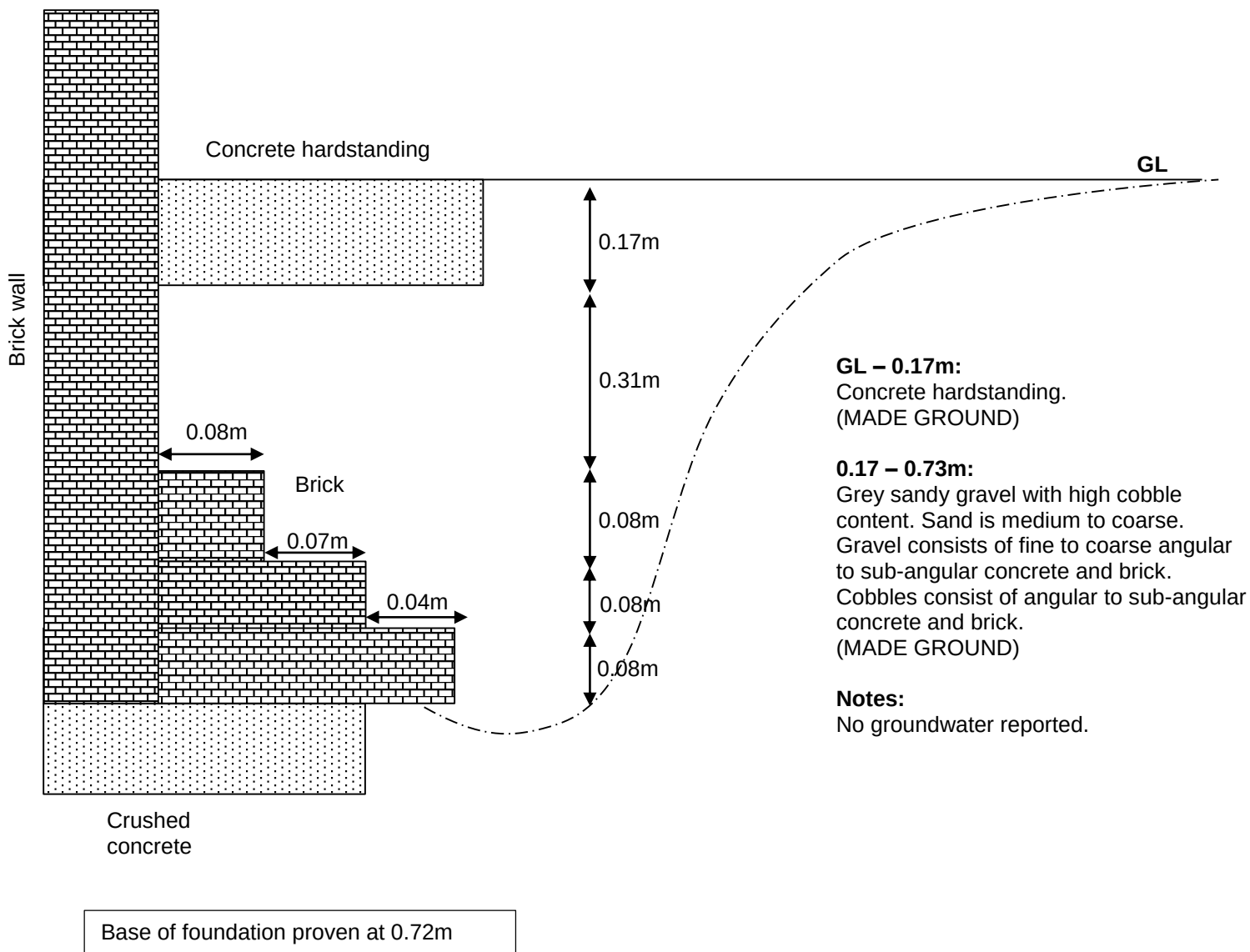
TP4 – East wall



Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

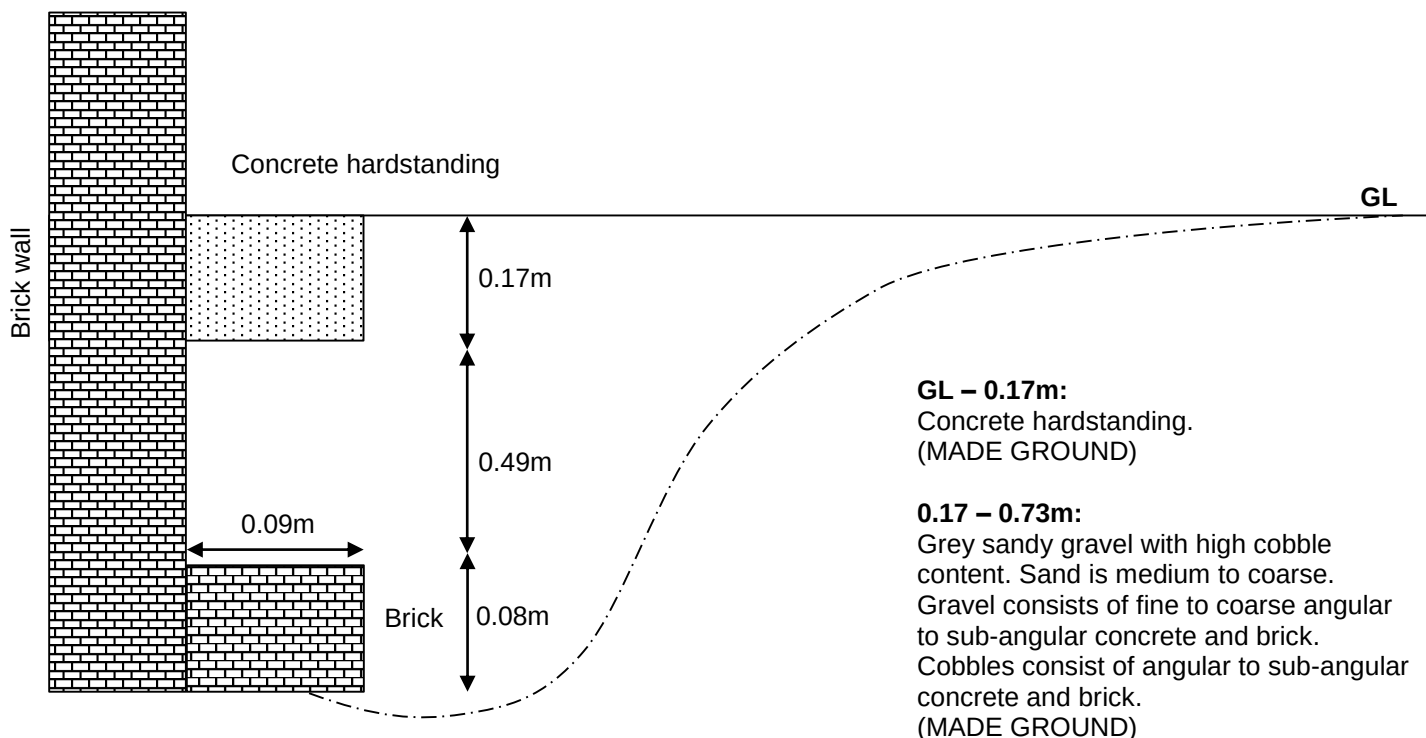
TP5 – South wall



Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP5 – West Wall



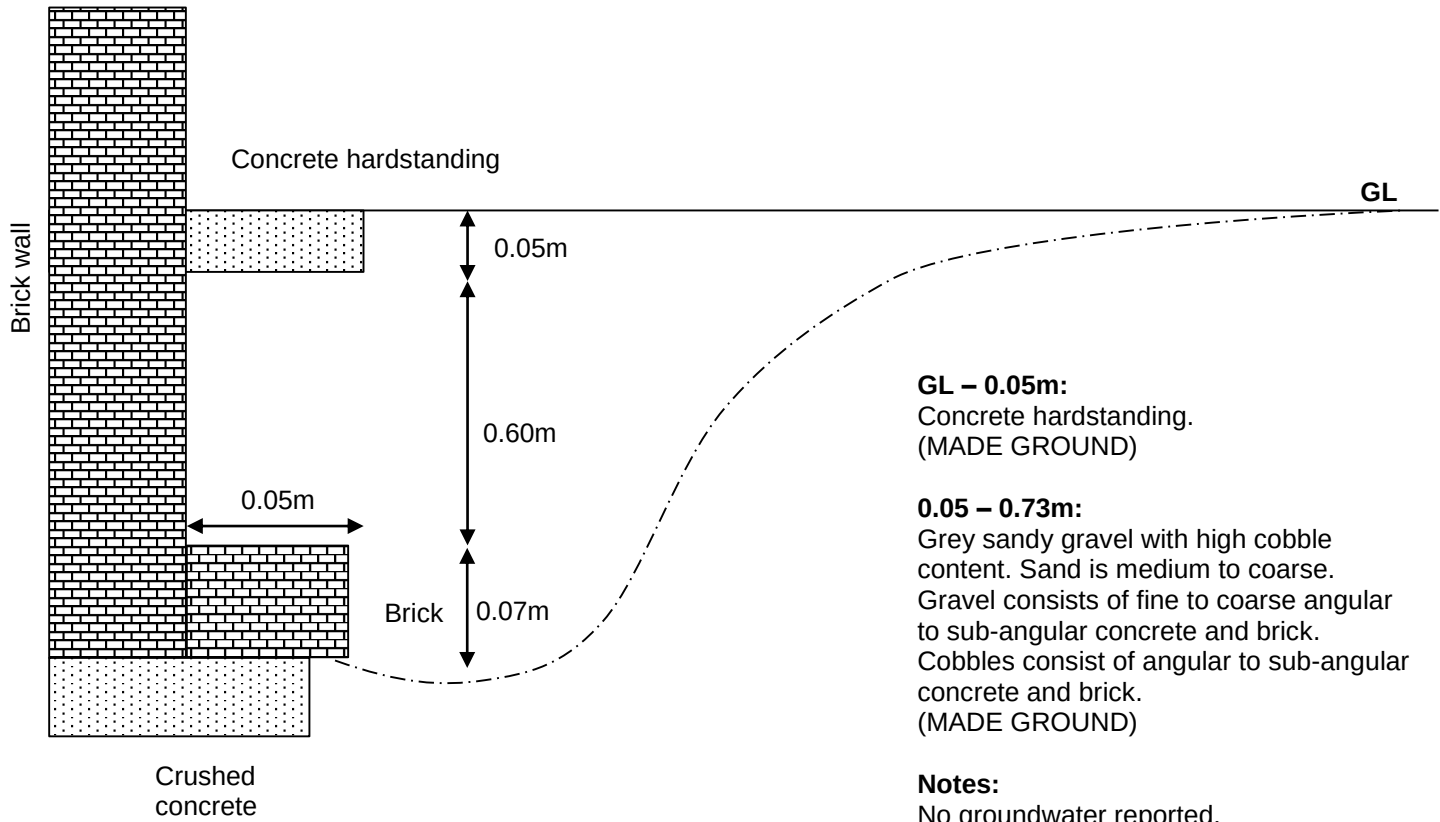
Notes:
No groundwater reported.

Base of foundation proven at 0.74m

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP6

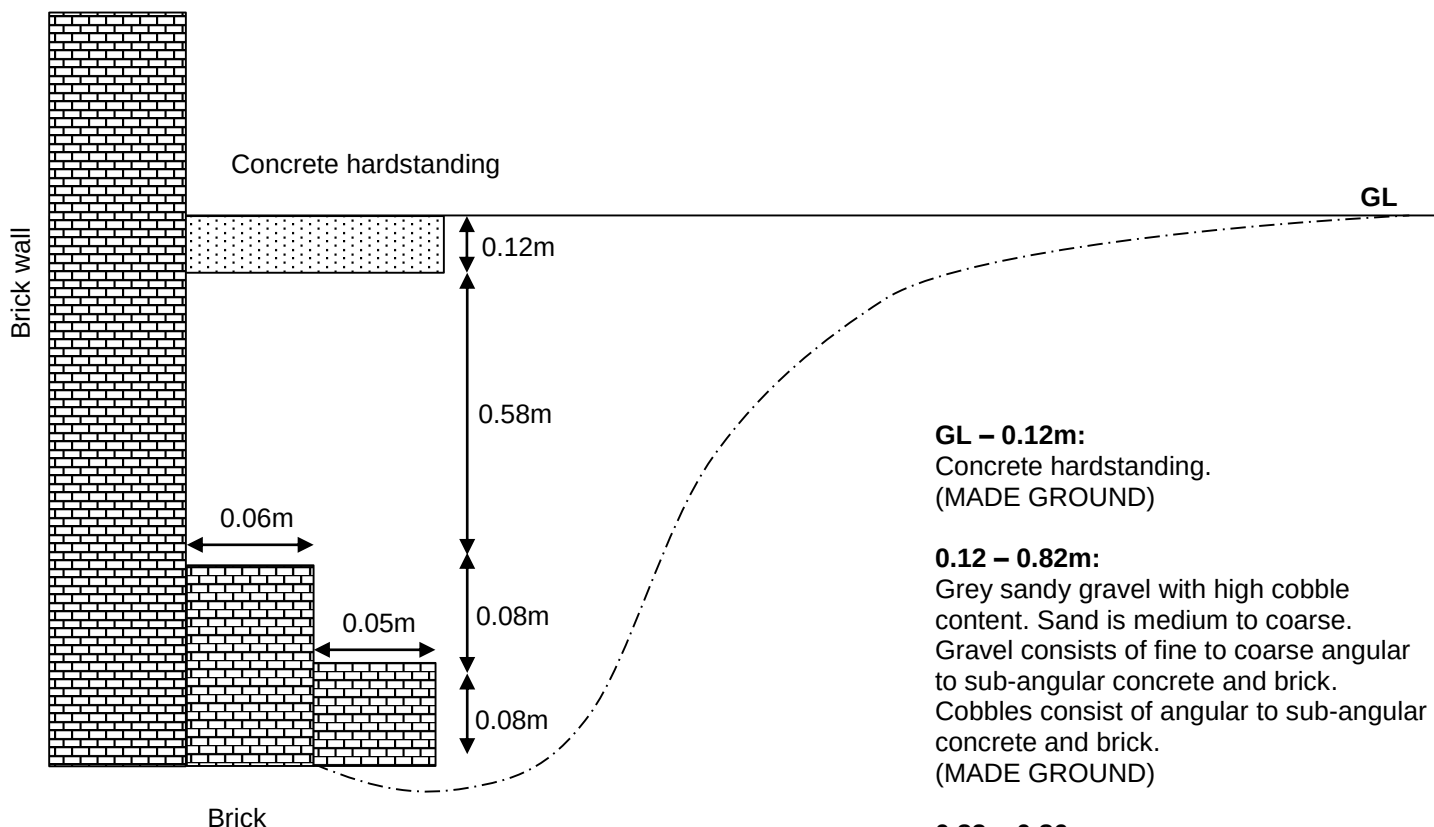


Base of foundation proven at 0.72m

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

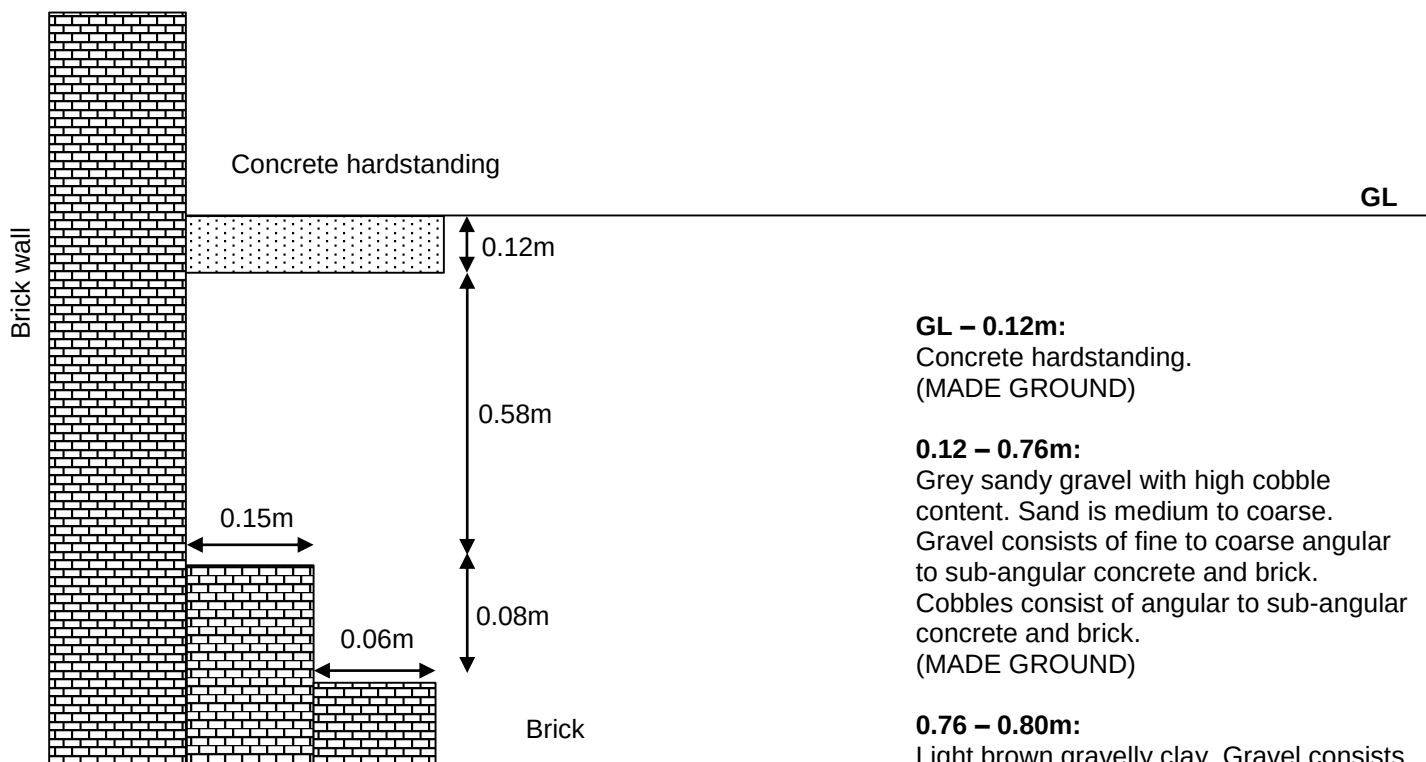
TP7 – South Wall



Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP8



GL – 0.12m:

Concrete hardstanding.
(MADE GROUND)

0.12 – 0.76m:

Grey sandy gravel with high cobble content. Sand is medium to coarse. Gravel consists of fine to coarse angular to sub-angular concrete and brick. Cobbles consist of angular to sub-angular concrete and brick.
(MADE GROUND)

0.76 – 0.80m:

Light brown gravelly clay. Gravel consists of fine to coarse angular to sub-angular charcoal, brick and concrete.
(MADE GROUND)

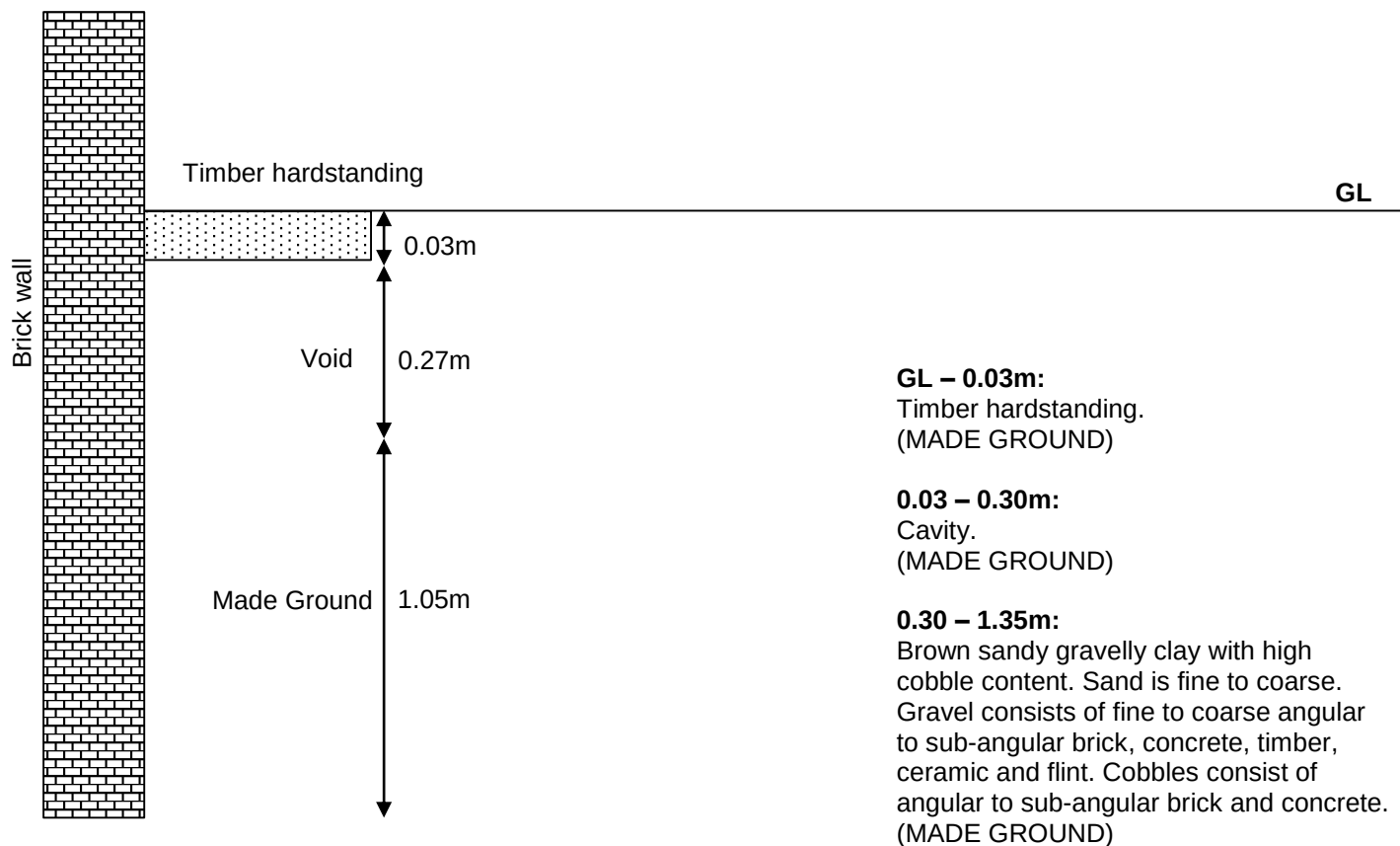
Notes:

No groundwater reported.

Not to scale

Job No.:	P3963J2460	Issue Date:	December 2021
Project:	47 Woodland Gardens, London, N10 3UE	Prepared by:	JRO
Subject:	Foundation Inspection Pit Sketches	Checked by:	JF

TP9



Notes:

No groundwater reported.

Base of foundation not proven

Not to scale

APPENDIX 3 – CHEMICAL LABORATORY TEST RESULTS

**Josephine Whitehead**

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 : 21-28856

Project / Site name:	47 Woodland Gardens, London, N10 3UE	Samples received on:	14/12/2021
Your job number:	JJ2460	Samples instructed on/ Analysis started on:	14/12/2021
Your order number:	P3963JJ2460.6	Analysis completed by:	21/12/2021
Report Issue Number:	1	Report issued on:	21/12/2021
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: 21-28856

Project / Site name: 47 Woodland Gardens, London, N10 3UE

Your Order No: P3963JJ2460.6

Lab Sample Number				2115297	2115298	2115299	2115300
Sample Reference				WS1	WS1	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	5.00	3.00	4.00
Date Sampled				03/12/2021	03/12/2021	03/12/2021	03/12/2021
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	20	21	20	20
Total mass of sample received	kg	0.001	NONE	0.90	0.60	0.30	0.60

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	7.2	7.2	7.9
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1100	26000	1000	20000
Total Sulphate as SO ₄	%	0.005	MCERTS	0.108	2.57	0.104	1.96
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.37	2.4	0.58	2.6
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	373	2370	580	2550
Total Sulphur	mg/kg	50	MCERTS	610	12000	380	13000
Total Sulphur	%	0.005	MCERTS	0.061	1.19	0.038	1.27

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



Analytical Report Number : 21-28856

Project / Site name: 47 Woodland Gardens, London, N10 3UE

* 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 *
2115297	WS1	None Supplied	0.5	Brown clay and loam with gravel.
2115298	WS1	None Supplied	5	Brown clay.
2115299	WS2	None Supplied	3	Brown clay.
2115300	WS3	None Supplied	4	Brown clay and sand.

Analytical Report Number : 21-28856

Project / Site name: 47 Woodland Gardens, London, N10 3UE

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
Total sulphate (as SO ₄ 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 Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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
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

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.

APPENDIX 4 – GEOTECHNICAL LABORATORY TEST RESULTS

4041

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

Contact: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

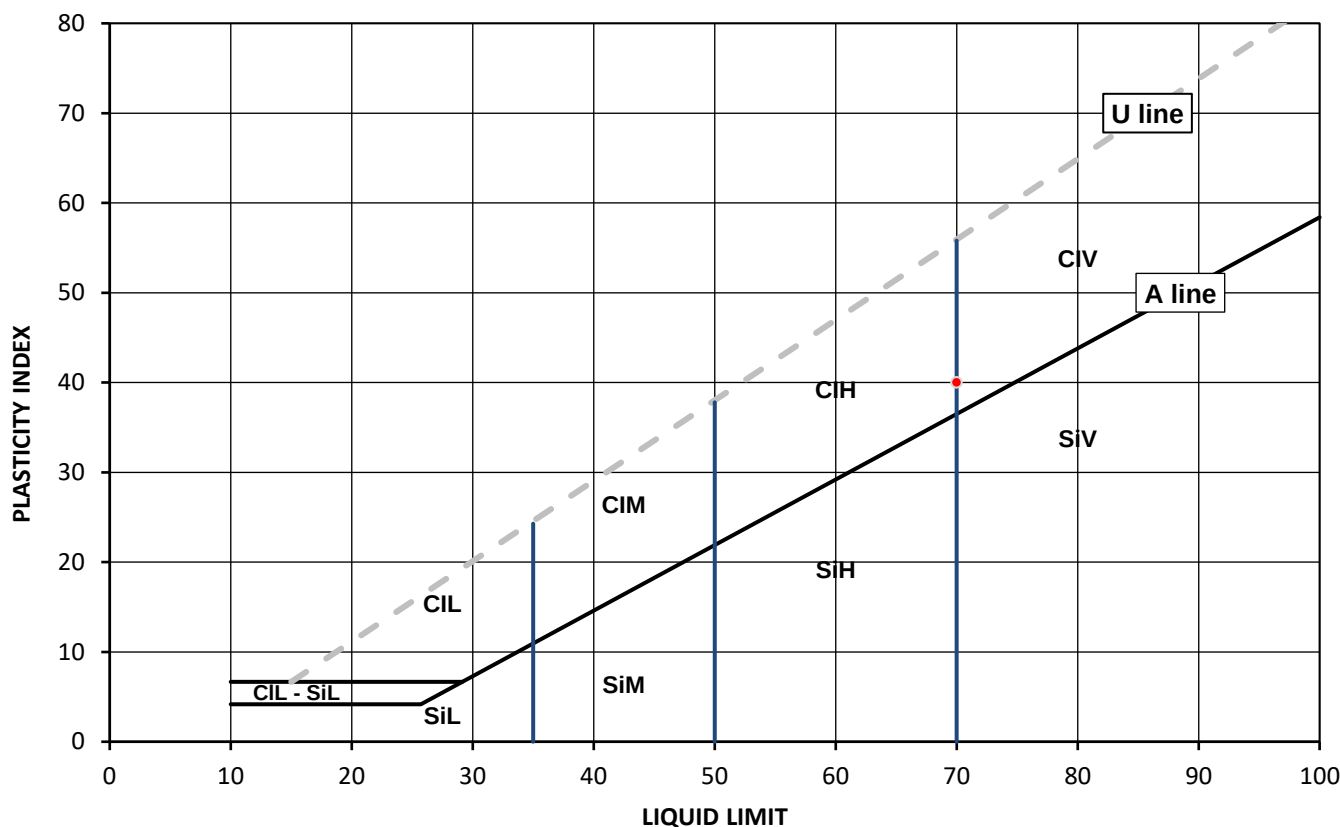
Test Results:

Laboratory Reference: 2124621
Hole No.: WS1
Sample Reference: Not Given
Sample Description: Brown CLAY

Depth Top [m]: 6.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
38	70	30	40	100



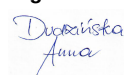
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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4041

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

Contact: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

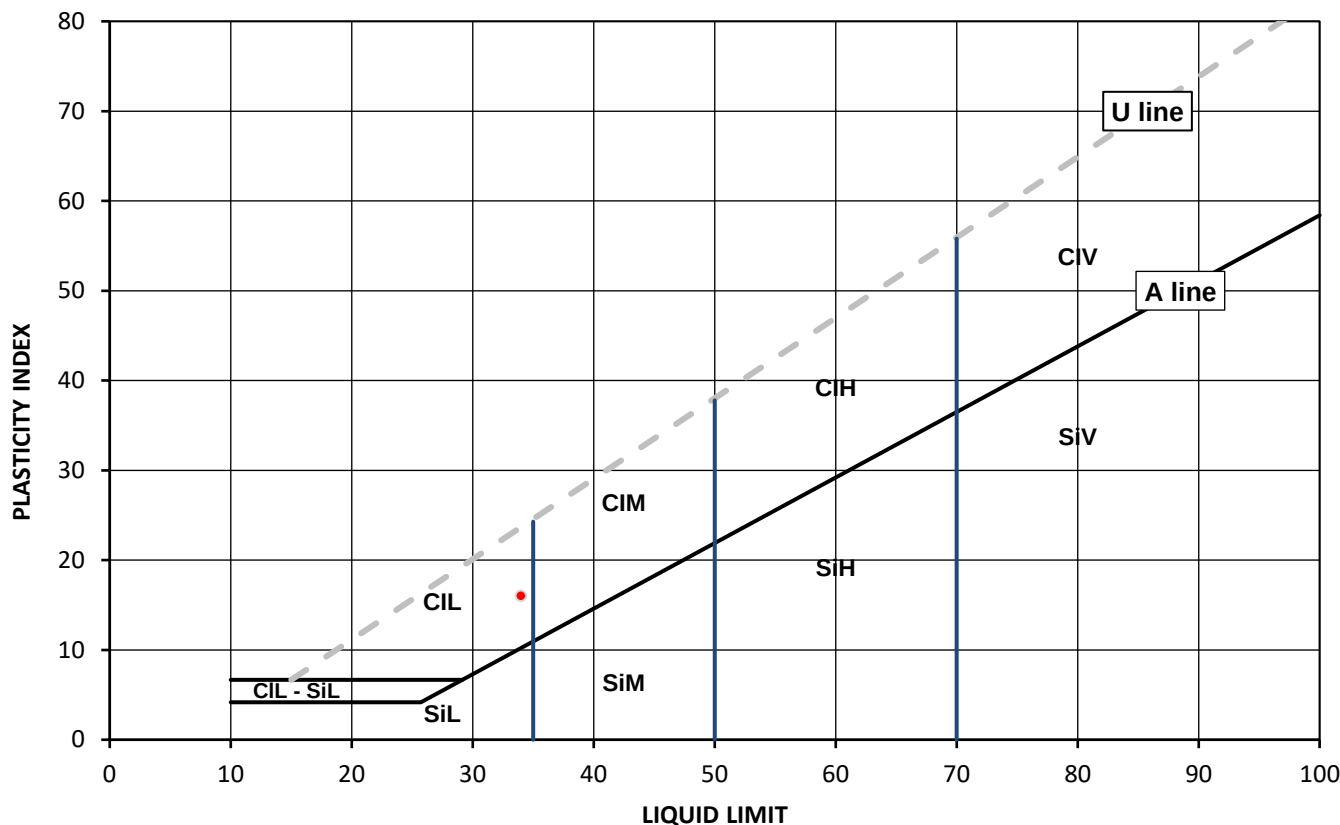
Test Results:

Laboratory Reference: 2124622
Hole No.: WS2
Sample Reference: Not Given
Sample Description: Orangish brown slightly gravelly very sandy CLAY

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

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
34	34	18	16	89



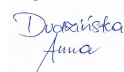
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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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: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

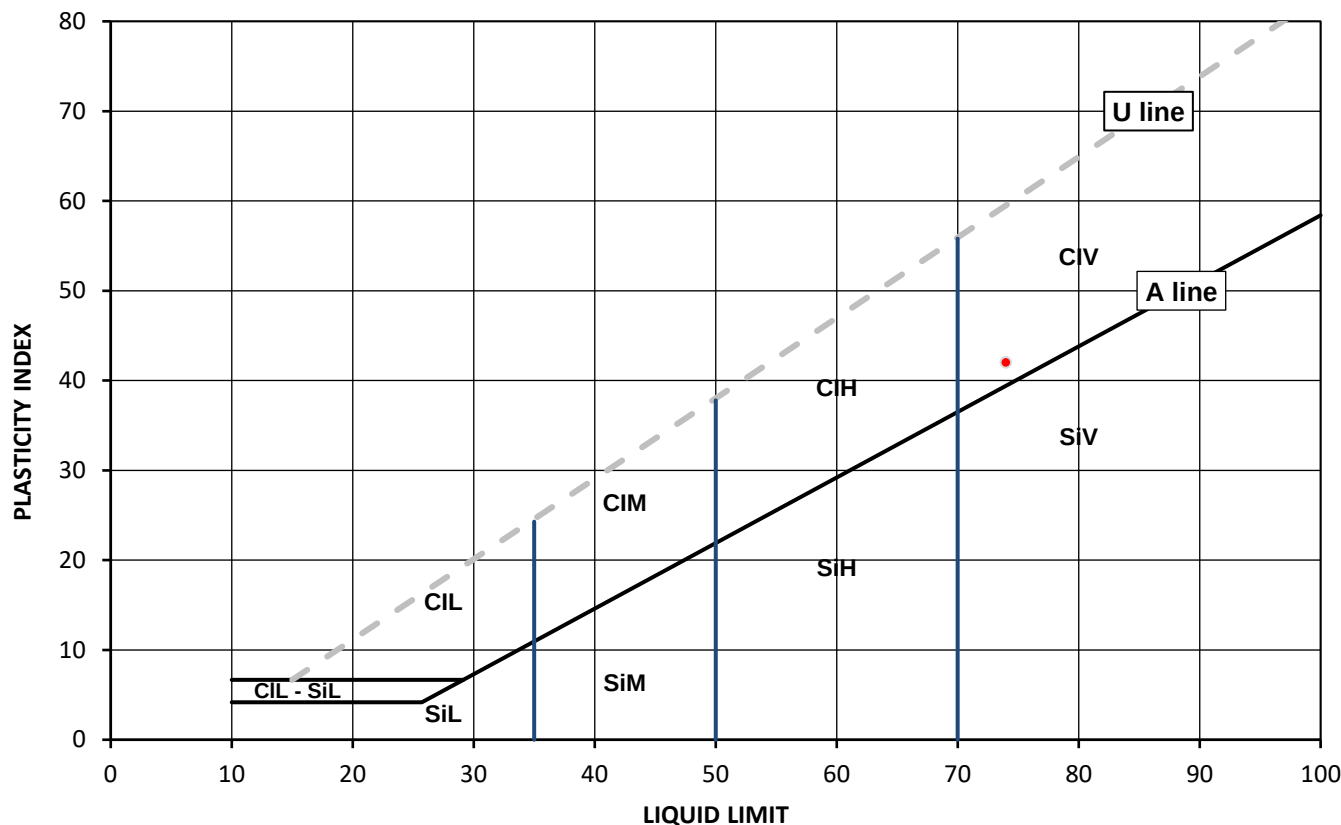
Test Results:

Laboratory Reference: 2124623
Hole No.: WS2
Sample Reference: Not Given
Sample Description: Brown CLAY

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

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
36	74	32	42	100



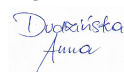
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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4041

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

Contact: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

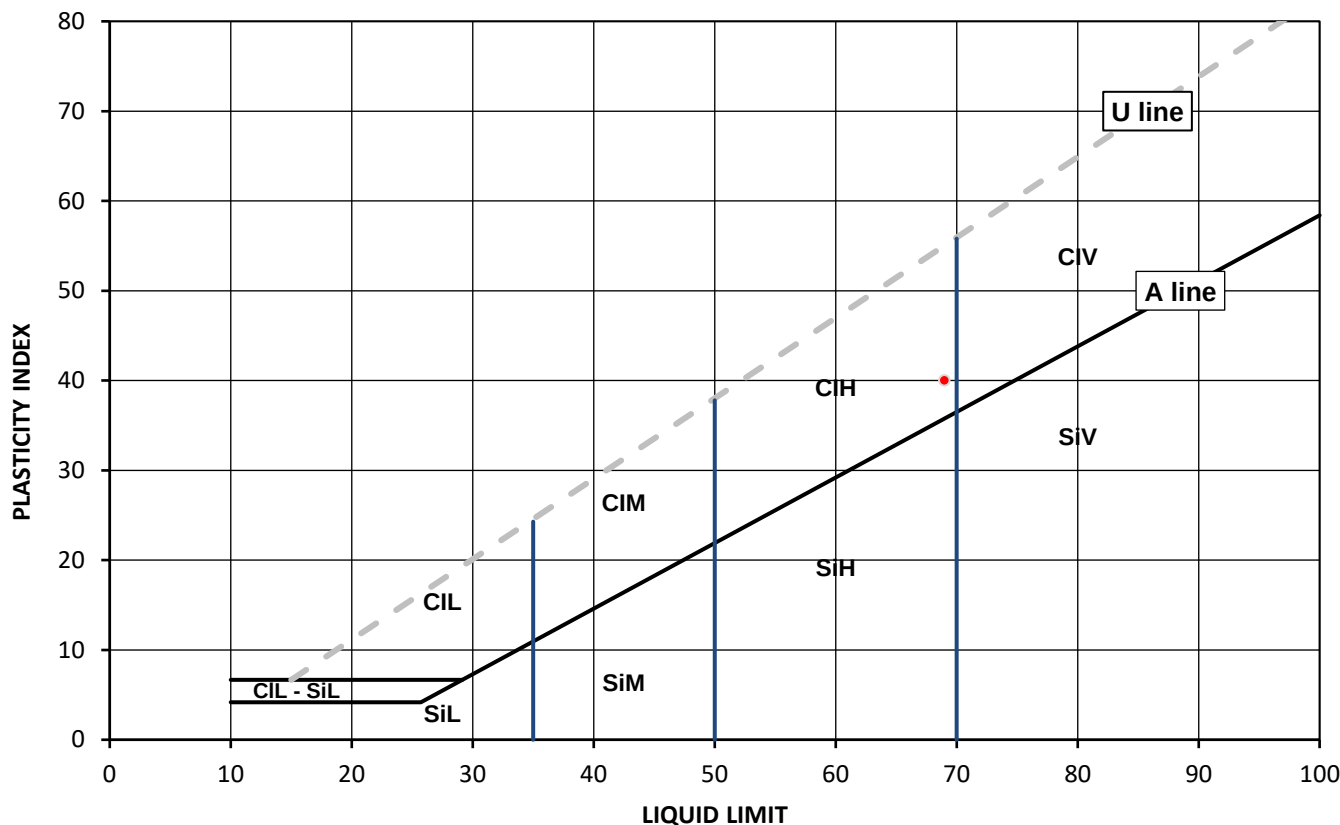
Test Results:

Laboratory Reference: 2124624
Hole No.: WS1
Sample Reference: Not Given
Sample Description: Brown CLAY

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

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
37	69	29	40	100



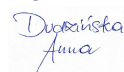
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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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: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

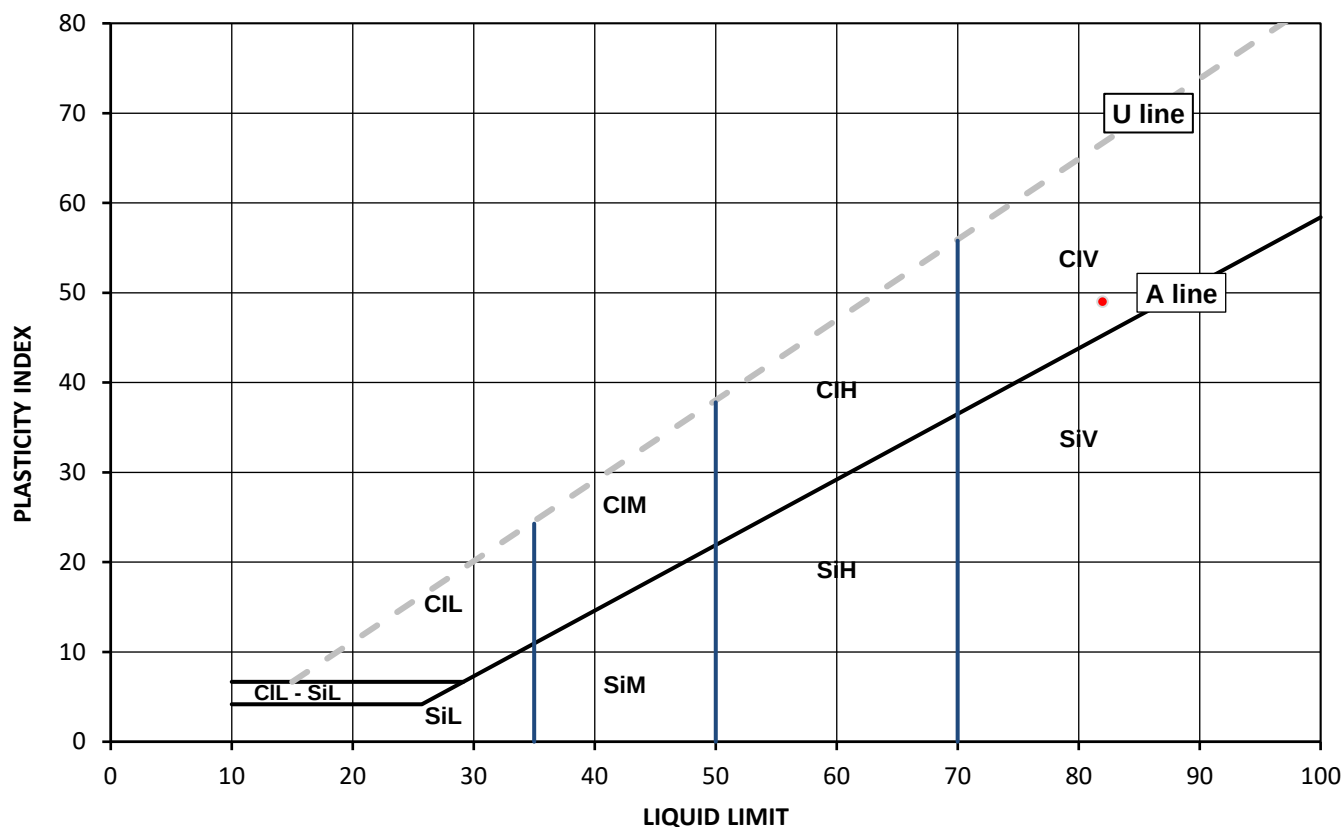
Test Results:

Laboratory Reference: 2124625
Hole No.: WS3
Sample Reference: Not Given
Sample Description: Brown CLAY

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

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
33	82	33	49	100



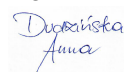
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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4041

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

Contact: JLW
Site Address: 47 Woodland Gardens, London, N10 3UE

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

Client Reference: JJ2460
Job Number: 21-30582
Date Sampled: 03/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Not Given

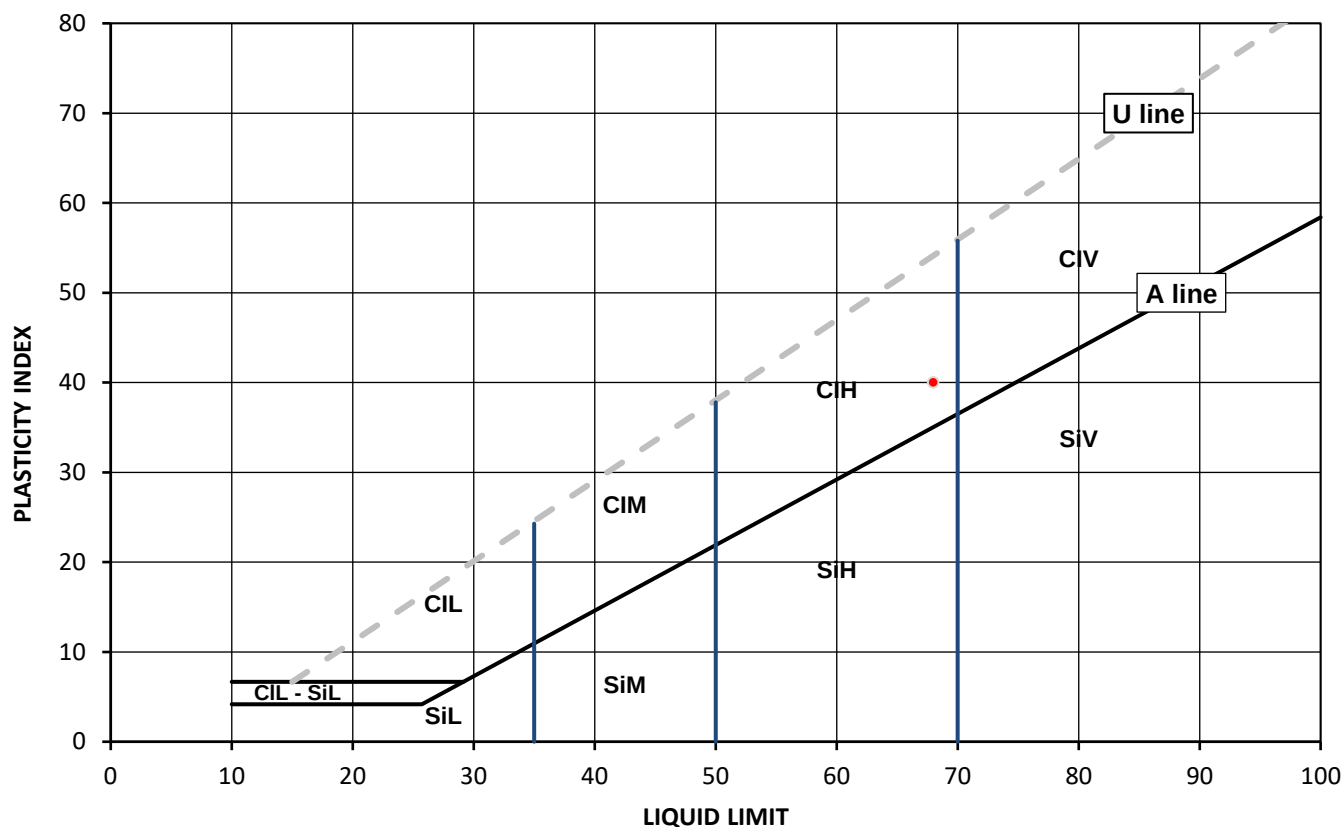
Test Results:

Laboratory Reference: 2124685
Hole No.: WS2
Sample Reference: Not Given
Sample Description: Brown CLAY

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

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
38	68	28	40	100



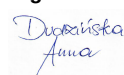
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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4041

Client: Jomas Associates Ltd

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

Contact: JLW

Site Address: 47 Woodland Gardens, London, N10 3UE

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:

Water Content by BS 1377-2:1990: Clause 3.2; 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 8.2i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client Reference: JJ2460

Job Number: 21-30582

Date Sampled: 03/12/2021

Date Received: 14/12/2021

Date Tested: 29/12/2021

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-2 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
2124624	WS1	Not Given	3.00	Not Given	B	Brown CLAY	Atterberg 4 Point	37		100	69	29	40						
2124621	WS1	Not Given	6.00	Not Given	B	Brown CLAY	Atterberg 4 Point	38		100	70	30	40						
2124685	WS2	Not Given	1.00	Not Given	B	Brown CLAY	Atterberg 4 Point	38		100	68	28	40						
2124622	WS2	Not Given	3.00	Not Given	B	Orangish brown slightly gravelly very sandy CLAY	Atterberg 4 Point	34		89	34	18	16						
2124623	WS2	Not Given	4.00	Not Given	B	Brown CLAY	Atterberg 4 Point	36		100	74	32	42						
2124625	WS3	Not Given	3.00	Not Given	B	Brown CLAY	Atterberg 4 Point	33		100	82	33	49						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

*Dudzińska Anna*Anna Dudzińska
Deputy Head of Geo Office Section
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: JLW

Site Address: 47 Woodland Gardens, London, N10 3UE

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

SUMMARY REPORT**DETERMINATION OF WATER CONTENT**

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

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

Environmental Science

Client Reference: JJ2460

Job Number: 21-30582

Date Sampled: 03/12/2021

Date Received: 14/12/2021

Date Tested: 29/12/2021

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2124624	WS1	Not Given	3.00	Not Given	B	Brown CLAY		37	Sample was quartered, oven dried at 106.3 °C			
2124621	WS1	Not Given	6.00	Not Given	B	Brown CLAY		38	Sample was quartered, oven dried at 106.3 °C			
2124685	WS2	Not Given	1.00	Not Given	B	Brown CLAY		38	Sample was quartered, oven dried at 106.3 °C			
2124622	WS2	Not Given	3.00	Not Given	B	Orangish brown slightly gravelly very sandy CLAY		34	Sample was quartered, oven dried at 106.3 °C			
2124623	WS2	Not Given	4.00	Not Given	B	Brown CLAY		36	Sample was quartered, oven dried at 106.3 °C			
2124625	WS3	Not Given	3.00	Not Given	B	Brown CLAY		33	Sample was quartered, oven dried at 106.3 °C			

Comments:

Signed:

Anna Dudzinska
Deputy Head of Geo Office Section
for and on behalf of i2 Analytical Ltd

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APPENDIX 5 – GROUNDWATER MONITORING RESULTS

GROUNDWATER MONITORING BOREHOLE RECORD SHEET						
Site: 47 Woodlands Gardens	Operative(s): HAH	Date: 10/12/2021	Time: 10:00	Round: 1	Page: 1	
MONITORING EQUIPMENT						
Instrument Type	Instrument Make		Serial No.	Date Last Calibrated		
Dip Meter – Interface Probe	In-Situ		-	-		
MONITORING CONDITIONS						
Weather Conditions: Sunny		Ground Conditions: Dry		Temperature: 18°C		
Barometric Pressure (mbar): N/A		Barometric Pressure Trend (24hr): N/A		Ambient Concentration: N/A		
MONITORING RESULTS						
Monitoring Point Location	VOC (ppm)		Depth to product (mbgl)	Depth to water (mbgl)	Depth to base of well (mbgl)	Comments
	Peak	Steady				
WS1	-	-	-	4.87	4.94	-
WS2	-	-	-	1.77	5.25	-

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