



BASEMENT IMPACT ASSESSMENT

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**10 Fordington Road
London
N6 4TJ**

Prepared for:
Simon & Sheila Fox

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Reg. Office: Units 14 +15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA
Business Reg. No. 2255616

☎ 020 8594 8134

🌐 www.siteanalyticalgroup.co.uk



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1.0 INTRODUCTION

1.1 Project Objectives

The purpose of this assessment is to consider the effects of a proposed basement construction on the local slope stability, surface water and groundwater regime at the residential property at 10 Fordnington Road, Haringey, London N6 4TJ.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the Client and other parties, including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

1.2 Planning Policy Context

The London Borough of Haringey policies on future developments in the borough are set out in the Council's Development Management DPD dated January 2016.

This document requires proposed developments to mitigate against the effects of ground and surface water flooding and to include drainage systems that do not impact neighbouring property of the site or the water environment by way of changing the groundwater regime.

This report is intended to address the issues set out in the council's basement policy. It will review existing site investigation data and provide a preliminary assessment of the issues identified by the Site Analytical Services Limited screening process.

This report also provides an impact assessment of the geo-environmental impacts on adjacent structures and the surrounding area based on available site investigation data.

As part of this guidance a subterranean (groundwater) flow screening chart is provided which follows current planning procedure for basements and lightwells adopted by other London Borough's, including Camden, Lambeth and Westminster.

1.3 Qualifications

The report has been prepared by Mr Thomas Murray MSc, BSc (Hons), FGS (10+ years' experience) in conjunction with Mr Andrew Smith BSc(Hons) FGS CGeol MCIWEM RoGEP (18+ years' experience).

2.0 SITE DETAILS

(National Grid Reference: TQ 277 889)

2.1 Site Location

The site is located on the north-eastern corner of the intersection between Fordington Road and The Drive, which is approximately 100m north-west of Woodside Avenue. The site is situated in London, at an approximate postcode N6 4TJ. It is bound by residential properties to the north and to the south-east, with similar properties opposite on the other side of Fordington Road to the south and to the west.

The site is rectangular in shape covers an approximate area of 0.06 Hectares with the general area being under the authority of the London Borough of Haringey.

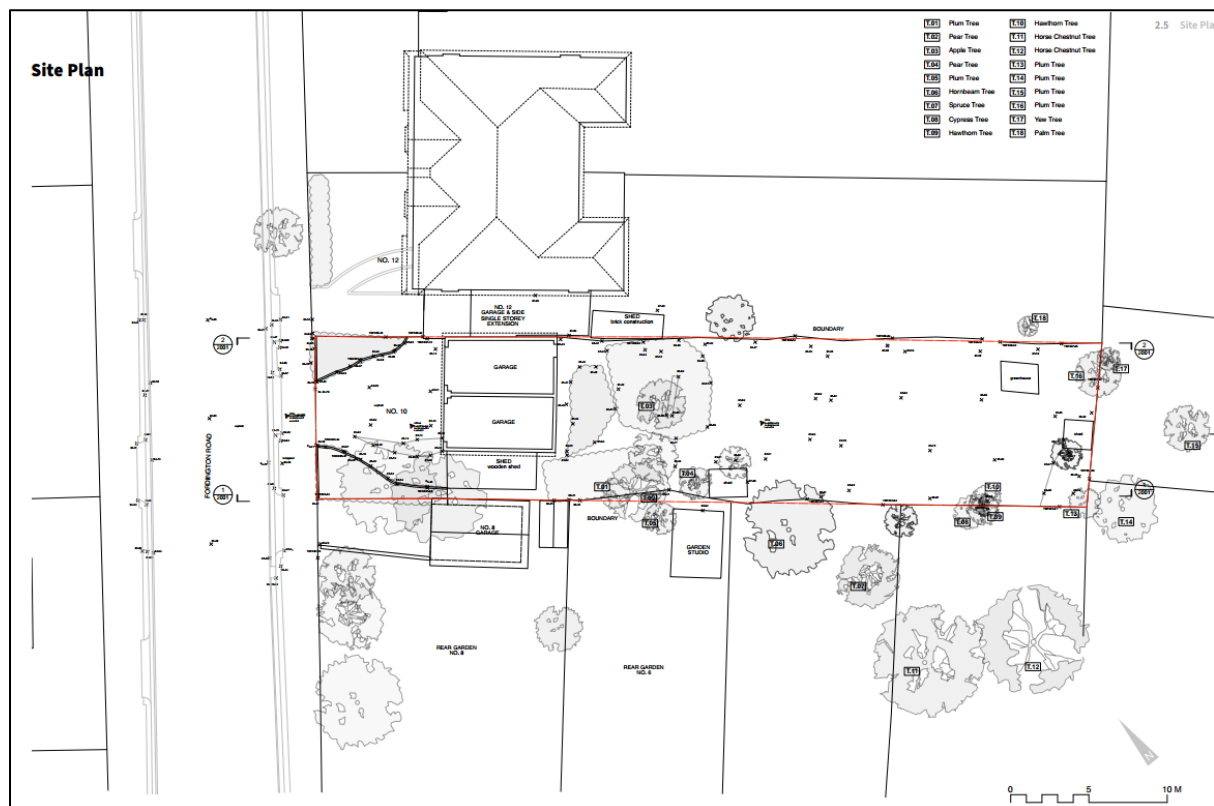


Figure 1. Site Location Plan

2.2 Site Layout and History

The site comprises two single storey garages with a large rear garden area. The front of the site covering is in the form of hardstanding (buildings, concrete and tarmac). There are large areas of soft landscaping in the form of soil (used for vegetation) located in the rear garden on-site.

From historical map evidence it would appear that the site was undeveloped prior to 1935, after which it appears to have been developed into a residential property. By 1970, the property on site had been split into two structures, which remains to the current day. Railway Tracks have been present within 250m.

The site history was compiled from information available from a Landmark Envirocheck Report consisting of a series of past Ordnance Survey maps (scale 1:1,250 and 1:2,500 which are presented in Appendix B). Information was also sourced from Envirocheck Analysis (online database) containing a series of more recent Ordnance Survey maps and satellite images (scale 1:10,000).

2.3 Geology

The Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain the London Clay Formation at depth.

The London Clay mainly comprises 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 occur in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS Limited has searched the database and have found a borehole located 423m to the north-east of the site at 'Woodside Avenue Fortis Green' and shows 100m of London Clay over 19m of Woolwich Reading Beds over 57m of Upper Chalk over 2m of Middle Chalk to a total depth 178m.



Figure 2. Superficial and Bedrock geology of the Site (Ref. BGS Geoindex)

2.4 Hydrology and drainage

2.4.1 Rainfall and run-off

According to Mayes (1997) rainfall in the local area averages around 610mm and is significantly less than the national average of around 900mm.

Evapotranspiration is typically 450mm/year resulting in about 160mm/year as 'hydrologically effective' rainfall which is available to infiltrate into the ground or run-off as surface water flow.

According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is over 1km north of the former Fleet River. The closest surface water feature is located 402m to the south-east of the site.

The area located immediately around the site is a mixed commercial and residential area with approximately 65% of the surface covered with hardstanding. Some of the rainfall in the area will run-off hard surface areas and be collected by the local sewer network the rest will be absorbed through ground infiltration.

2.4.2 Drainage

Based upon the topography, surface drainage from the site is assumed to be directed to drains along Fordington Road.

2.4.3 Flood Risk

River or Tidal flooding

The site is currently not located within 1km of an area at risk from extreme flooding from rivers or sea without defences (Zone 2) or an area at risk from rivers or sea without defences (Zone 3).

Surface water flooding

Modelling of surface water flooding has been undertaken by the Environment Agency and was published on its website in January 2014; an extract from their model is presented on the long term flood risk government website. Whilst this map identifies three levels of risk (high, medium and low) it is understood that it is based at least in part on depths of flooding. The modelling shows no risk of flooding for the majority of site, however there is high risk of flooding to the north of the site along Fordington Road, roughly 100m to the North of the site.

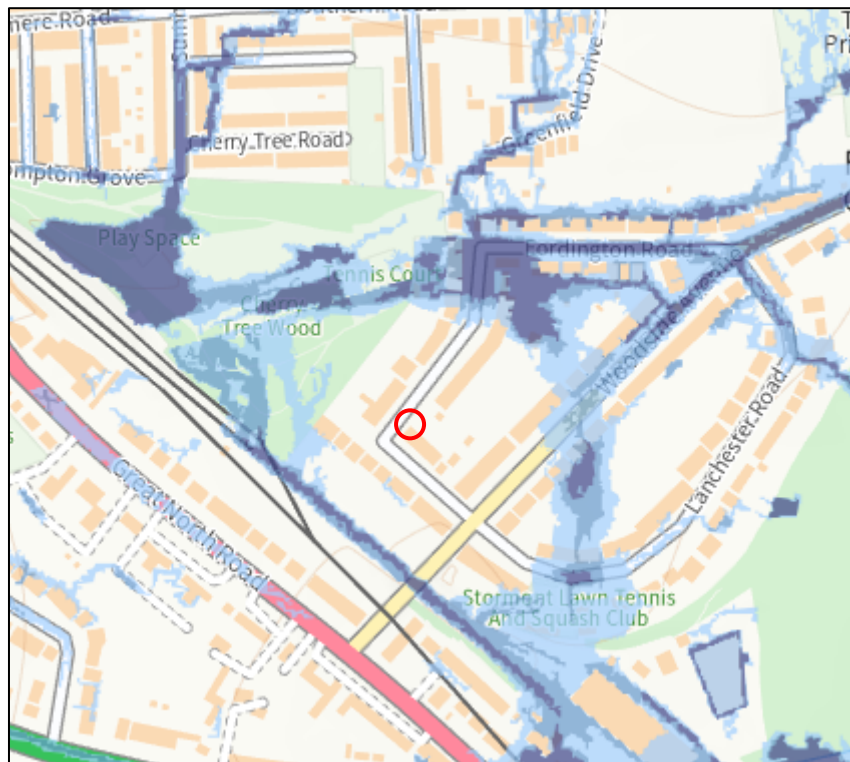


Figure 3. Extract from the Environment Agency's 'Risk of Flooding from Surface Water'. All rights reserved.

Sewer flooding

The London Regional Flood Risk Appraisal (2009) advises that foul sewer flooding is most likely to occur where properties are connected to the sewer system at a level below the hydraulic level of the sewage flow, which in general are often basement flats or premises in low lying areas. There is no record of sewer flooding having occurred at Fordington Road and therefore the risk of sewer flooding is considered low.

2.5 Hydrogeology

The Environment Agency Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) and also their role in supporting surface water flows and wetland ecosystems.

The Bedrock geology underlying the site (London Clay) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Other hydrogeological data obtained from the Desktop Study (SAS Report Ref: 24/37849) for the site include:

- The site is not located within 1km of a source protection zone.
- There are no water abstraction licences within 1 kilometre of the site.

2.6 Previous Reports

The results from a Geotechnical Desk Study and Site Investigation are presented under separate cover in Site Analytical Services Limited reports (Project Nos. 24/37849 and 24/37849-1), dated February 2024 respectively. The findings from these reports are described in this basement impact assessment.

2.7 Proposed Development

It is proposed to demolish the existing garages and shed and erect a residential 3-storey dwelling (plus excavation to form a basement level). The base of the excavation is 81.95mOD with this being 3.53m below the existing ground level adjacent to No. 8 and 3.17m below the existing ground level adjacent to No. 12.

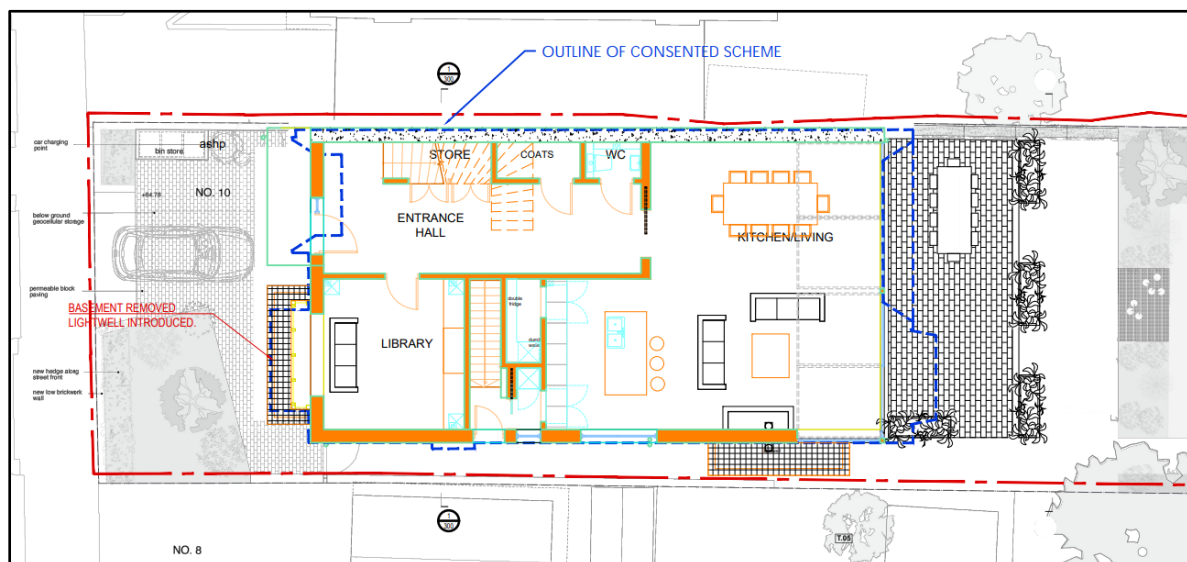


Figure 4. Proposed Basement Extension Plan



2.8 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	1b. Will the proposed basement extend beneath the water table surface.	Unknown – to be confirmed by Ground Investigation	Given the presence of a non-aquifer below the site it is unlikely that groundwater will be encountered during any excavations for the proposed basement, however this will be confirmed by the ground investigation.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	No	According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is over 1km north of the former Fleet River. The closest surface water feature is located 402m to the south-east of the site. The site is located 400m south west of a licenced abstraction point.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	Yes	The amount of hardstanding on-site is expected to increase.
	4. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS).	No	Drainage systems will be put in place with regards to the new build residential development. Whether soakaways/SUDS are used on the proposed development is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.
	5. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line.	No	According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is over 1km north of the former Fleet River. The closest surface water feature is located 402m to the south-east of the site. The site is located 400m south west of a licenced abstraction point.
Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8).	No	The site is essentially flat.
	2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8).	No	Re-profiling of landscaping at the site will not change slopes.

Item	Description	Response	Comment
	3. Does the development neighbor land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8).	No	The immediate surrounding area is essentially flat.
	4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8).	No	There is a general slope uphill from north to south along Cromwell Avenue, but this is approximately 1 in 20.
	5. Is the London Clay the shallowest strata at the site.	Yes	With reference to available BGS records, the London Clay Formation is expected to be encountered from ground level.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	No	It is understood that no trees are to be felled as part of the development.
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	Yes	The site lies above the London Clay Formation well known as having a high tendency to shrink and swell.
	8. Is the site within 100m of a watercourse or a potential spring line.	No	According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is over 1km north of the former Fleet River. The closest surface water feature is located 402m to the south-east of the site. The site is located 400m south west of a licenced abstraction point.
	9. Is the site within an area of previously worked ground.	No	According to the records held by the BGS the site is not underlain by any worked ground, Made Ground, infilled ground or landscaped ground.
	10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction.	Unknown – to be confirmed by Ground Investigation	Given the presence of a non-aquifer below the site it is unlikely that groundwater will be encountered during any excavations for the proposed basement, however this will be confirmed by the ground investigation.
	11. Is the site within 5m of a highway or pedestrian right of way.	Yes	The site lies 5m away from Fordington Road.
	12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	Yes	The development will increase the depths of foundation at the site, although the foundation depths of adjacent properties are not known.
	13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	No	No TfL or London Underground Assets runs are within close proximity to the site.

Item	Description	Response	Comment
Surface Water and Flooding	1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route.	No	No – any additional surface water generated from an increased hardstanding area will be attenuated to ensure they are not increased or altered.
	2. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	Yes	Yes, there will be a small change in the area of hard surfacing. The surface permeability will be affected with a slight increase in the amount of paved surface in relation to the total site.
	3. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses.	No	All surface water for the site will be contained within the site boundaries and collected as described above; hence there will be no change from the development on the quantity or quality of surface water being received by adjoining sites.
	4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	The surface water quality will not be affected by the development, as in the permanent condition collected surface water will generally be from roofs, domestic hard landscaping or collected from beneath the landscaping layer over the basement.
	5. Is the site in an area known to be at risk from surface water flooding.	No	According to Figure 3 from Environment Agency's 'Risk of Flooding from Surface Water' the area at no risk from surface water flooding.

The Screening Exercise has identified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Will the proposed basement extend beneath the water table surface?
- Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?

Slope Stability

- Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?
- Is the site within 5m of a highway or pedestrian right of way?

Surface water and flooding

- Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

3.0 SCOPING PHASE

The purpose of the scoping phase is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified impact factors and recommendations are stated.

A conceptual ground model is usually compiled at the scoping stage however, because the ground investigation has already been undertaken for this project, the conceptual ground model including the findings of the ground investigation is described under Chapter 4.

Subterranean (Groundwater Flow)

Potential Issue (Screening Question)		Potential impacts and actions
1b	Will the proposed basement extend beneath the water table surface?	Potential impact: Local restriction of groundwater flows (perched groundwater or below groundwater table). Action: Ground investigation required, the review.
3	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	Potential impact: May increase flow rates to sewer, and thus increase the risk of flooding. Action: Assess net change in hard surfaced/paved areas and, if required, recommend appropriate types of SUDS for use as site-specific mitigation.

Slope Stability

11	Is the site within 5m of a highway or a pedestrian right of way?	Potential impact: Excavation of basement causes loss of support to footway/highway and damage to the services beneath them. Action: Ensure adequate temporary and permanent support by use of best practice working methods.
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Subterranean (Surface Water Flooding)

Potential Issue (Screening Question)		Potential impacts and actions
2	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	Potential impact: May increase flow rates to sewer, and thus increase the risk of flooding. Action: Assess net change in hard surfaced/paved areas and, if required, recommend appropriate types of SUDS for use as site-specific mitigation.

These potential impacts have been further assessed through the ground investigation, as detailed in Section 4 below.

4.0 SITE INVESTIGATION DATA

4.1 Records of site investigations

The boreholes were completed at existing ground level and revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 0.70m in thickness resting on the London Clay Formation at depth.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Level to top of strata (mOD)	Depth to base of strata (mbgl)	Level to base of strata (mOD)	Description
Made Ground	0.00	85.30 - 85.00	0.45 - 0.70	84.85 – 84.30	Tarmac & concrete / Grass over brown silty sandy clay with brick and concrete fragments
London Clay Formation	0.45 - 0.70	84.85 – 84.30	15.00 (max depth of BH1)	75.30 – 70.00	Stiff silty CLAY containing partings of silty fine sand.

Summary of Ground Conditions in Exploratory Holes

4.2 Groundwater

Groundwater was not encountered in either Borehole 1 or 2 and the material remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Groundwater was encountered at respective depths of 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD) in Boreholes 1 and 2 after a period of approximately three to four weeks.

Given the presence of a non-aquifer below the site it is likely that the groundwater recorded within these soils relates to perched water within the Made Ground and is recharged via intermittent seepages from surface water associated with weather conditions rather than any large-scale subterranean groundwater flow. As a result, the impact on excavations carried out at the site from this perched water is expected to be minimal.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (January and February 2024) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

5.0 FOUNDATION DESIGN

5.1 General

It is proposed to demolish the existing garages and shed and erect a residential 3-storey dwelling (plus excavation to form a basement level). The base of the excavation is 81.95mOD with this being 3.53m below the existing ground level adjacent to No. 8 and 3.17m below the existing ground level adjacent to No. 12.

5.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessments should be undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man-made services are undertaken over the site prior to final design works.

5.3 Foundation Design

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the boreholes, it could, in theory, be possible to support the proposed new development on conventional strip foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff silty sandy clay deposits which occur at a depth of up to 0.70m across the site.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 60kN/m² at 3.00m depth below ground level increasing to 100kN/m² at 5.00m depth below ground level in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from "Foundation Design and Construction", Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

5.4 Piled Foundations

In the unlikely event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation may be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Piling methods should be capable of advancing pile bores through the surface Made Ground into the underlying natural soils.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

5.5 Retaining Walls

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in the table below to assist the design of these structures.

Stratum	Depth to top (m)	Bulk Density (kN/m ²) (γ)	Effective Angle of Internal Friction (Φ)
London Clay Formation	0.45 to 0.70	20	24

Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients k_a and k_p . The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

5.6 Ground Movement and Damage Impact Assessment

Introduction

In connection with the proposed basement construction a ground movement and damage assessment has been undertaken for the site. The purpose of the assessment is to determine the effects of the proposed basement construction upon the neighbouring structures.

The soil behaviour over the footprint of the excavated area is different from the behaviour outside and the associated ground movements require assessment using different approaches.

In the area of the new basement the soil will tend to move as a result of change in vertical load on the ground due to excavation and demolition. Movements in the long term would also be expected as a result of changes in the pore pressure in the clay layer/cohesive band under the basement.

Around the site the construction activities that may result in ground movements during and after the works are mainly related to the excavation, which would induce a reduction of vertical and lateral stresses in the ground along the excavation boundaries.

The magnitude and distribution of ground movements inside and outside the excavated area are a function of changes of load in the ground and also, critically, are a function of workmanship.

Ground movements within the area of the proposed excavation have been estimated using Geotechnical Software (PDISP by OASYS) whilst the expected movements and impact assessment of the area around the site and surrounding structures have been estimated using Geotechnical Software (XDISP by OASYS). The latter software relies on CIRIA report C580 Embedded Retaining Walls - Guidance for Economic Design (5) (superseded by C760, 2017 (6)) which is based on field measurements of movements from a number of basement constructions across London.

The calculations provided are specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

Building Damage Assessment

The building damage assessment has been carried out on the relevant adjacent structures, as detailed in Appendix B.

Tensile strains induced within the building walls have been evaluated based on the deflection ratios Δ/L and horizontal extension mechanisms estimated from the analyses. The assessment considers the well-established Burland (1977) damage classification method, as presented and summarised in Figure 5 and Figure 6 below.

This method involves a relatively simple but robust means of assessment, which is widely adopted and is considered to comprise an industry standard/best practice basis for impact assessments of this typology.

Potential damage categories are directly related to the tensile strains induced by the proposed construction stages, arising from a combination of direct tension and bending induced tensile mechanisms.

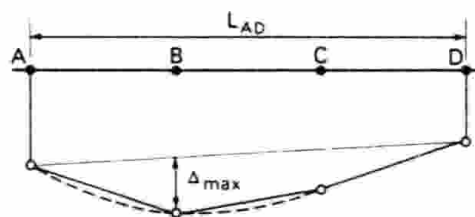


Figure 5. Definition of relative deflection Δ and deflection ratio Δ/L

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ϵ_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	<u>Fine cracks that can easily be treated during normal decoration.</u> Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	<u>Cracks easily filled. Redecoration probably required.</u> Several slight fractures showing inside of building. Cracks are visible externally and <u>some repointing may be required externally</u> to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	<u>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.</u> Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	<u>Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.</u> Windows and frames distorted, floor 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	<u>This requires a major repair involving partial or complete rebuilding.</u> Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Figure 6. Building damage classification – relationship between category of damage and limiting strain ϵ_{lim} After Burland et al. 1977, Boscardin and Cording 1989, and Burland 2001

Results

A building impact/damage assessment has been undertaken, assuming the existing buildings walls/façades to behave as equivalent beams subject to a combination of bending, shear and axial extension/compression mechanisms, resulting from the greenfield ground movements evaluated.

On the basis of the available information the predicted level of damage to the houses at Nos 8 and 12 Fordington Road arising from the excavation of a basement at No 10, is 'very slight' or less. The above assumes a high standard of workmanship.

It should be noted that these movements are likely to be more affected by the quality of the workmanship and propping of the basement excavations. The construction details adopted at the junctions with the party walls and at return walls will also have a significant influence on the likelihood of any future movement at these locations. Extra care should be taken in these sections to provide appropriate support to the existing walls to prevent any excessive deflection.

Based on these results it is considered that appropriate consideration to the support & stability of neighbouring walls will be needed in the detailed structural design of the basement.

Movement monitoring of the walls is recommended during the construction stage and trigger levels should be set in order to protect the neighbouring properties as a precautionary measure.

5.7 Basement Floor Slabs

Due to the presence of soils assessed to be of high swelling and shrinkage potential below, it is recommended that ground slabs should be fully suspended.

Within the zone of influence of trees, either retained or removed, floor slabs should incorporate either underfloor voids or suitable depths of compressible material in accordance with NHBC requirements, for soils with high volume change potential.

5.8 Excavations

Shallow excavations for foundations and services are likely to require nominal side support in the short term and groundwater is unlikely to be encountered in significant quantities once any accumulated surface water has been removed. Deeper and longer excavations below approximately 1.50m below existing ground level will require close side support and some seepages of groundwater could be encountered.

No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps.

Normal safety precautions should be taken if excavations are to be entered.

5.9 Chemical Attack on Buried Concrete

Using the results contained in Appendix B, the following table provides the highest values encountered for the BRE SD1 Suite D specification and the equivalent DS and ACEC classes, based on a static groundwater:

Strata	pH	2:1 Water Soluble SO ₄ (g/l)	2:1 Water Soluble Chloride (mg/l)	2:1 Water Soluble Nitrate (mg/l)	Total Sulphate (%)	Magnesium (mg/kg)	DS Class	ACEC Class
London Clay Formation	7.8-8.8	2.64	65	<2.0	0.542	600	DS-3	AC-2s

Worst case DS and ACEC classes based on the BRE SD1 Suite D results

6.0 BASEMENT IMPACT ASSESSMENT

6.1 Summary

The screening identified a number of potential impacts. The table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

Potential Impact	Site Investigation conclusions	Impact sufficiently addressed without further justification?
The proposed basement extends beneath the water table surface.	The maximum proposed dig level for the basement excavation (understood to be 2.80mbgl) lies below the minimum indicated groundwater level of 1.65m in BH1 however as the geology beneath the site is a non-aquifer, it is likely that this is surface water trapped within the standpipe and is not representative of any subterranean groundwater flow. Based on the basement being located above a non-aquifer, the construction is not expected to impact the wider hydrological environment.	Yes
The site is within 5m of a highway or pedestrian right of way.	The proposed basement is not to be extended below Fordington Road and therefore it is suggested that the impact on these access roads is likely to be minimal. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.	Yes.
The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.	The development will result in the extension of the foundation depth of the basement relative to neighbouring properties.	Yes – See Ground Movement Assessment (Chapter 6) for details.
The proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	There is an increase in impermeable area on-site following development, which equates to a decrease in the rate of run-off from the site.	No – see below for further details.

6.2 Outstanding Risks and Issues

The significant impacts which require further information have been described in detailed below in order to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

- a. Change in paved surfacing and surface water run-off.

As identified in the initial screening and scoping stages there will be a change in the amount of hard surfacing at the site where the property will be constructed and as a result total surface water flows may increase however, as the underlying geology is impermeable these changes will be negligible compared to the existing rates.

Overall, it is concluded that the surface water flows will not materially change in response to the increase in hardstanding. On completion of the development the surface water flows will be routed with rainwater run-off collected in a surface water drainage system and discharged to a combined sewer. It will not be necessary to consider additional mitigation measures such as SUDS or soft landscaping over to reduce the rate of any surface water run-off.

7.0 BIA CONCLUSIONS

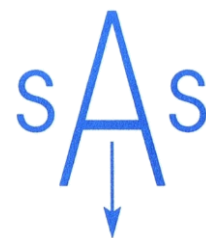
1. It is proposed to demolish the existing garages and shed and erect a residential 3-storey dwelling (plus excavation to form a basement level). The base of the excavation is 81.95mOD with this being 3.53m below the existing ground level adjacent to No. 8 and 3.17m below the existing ground level adjacent to No. 12.
2. Conditions at the site were investigated by Site Analytical Services Limited in January and February 2024 (SAS Report Reference 24/37849-1). The boreholes were completed at existing ground level and revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 0.70m in thickness resting on the London Clay Formation at depth. Water was encountered at respective depths of 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD) in Boreholes 1 and 2 after a period of approximately three to four weeks.
3. As proven from the site investigation, the Bedrock geology underlying the site (solid permeable formations) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
4. A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans.
5. The proposed development will not increase flood risk at the site or the surrounding area. Also, since the development is on already developed land, it will not adversely impact the Council's sustainability objectives.
6. The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works.

8.0 REFERENCES

1. CIRIA Special Publication 69, 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London
2. Environment Agency, 2006. Groundwater levels in the Chalk-Basal Sands Aquifer in the London Basin
3. British Standards Institution, 1999+A2. Code of Practice for Site Investigations, BS5930, BSI, London
4. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.
5. British Standards Institution, 2009. Code of Practice for Protection of Below Ground Structures Against Water from the Ground. BS 8102, BSI, London
6. CIRIA, 2000. Sustainable Urban Drainage Systems: Design Manual for England and Wales. CIRIA C522, Construction Industry Research and Information Association, London
7. Environment Agency Status Report 2010. Management of the London Basin Chalk Aquifer. Environment Agency
8. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.
9. Mayles, J. 1997. Regional climates of the British Isles, p74: Average precipitation for the period 1961-1990 St James Park, London = 611mm. Routledge
10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.
11. Environment Agency. (n.d.). Flood risk map. From <http://maps.environment-agency.gov.uk/>



9.0 APPENDIX A – GROUND INVESTIGATION FACTUAL REPORT



Factual Report on a **GEOTECHNICAL GROUND INVESTIGATION**

Ref: 24/37849-1 | Date: February 2024

**10 Fordington Road
London
N6 4TJ**

Prepared for:
Simon & Sheila Fox

DOCUMENT CONTROL

<i>Project</i>	10 Fordington Road, London, N6 4TJ
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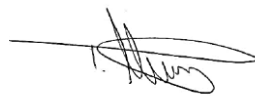
Checked

Author



Jim Warren
MRSC

Managing Director



Thomas Murray
BSc (Hons) MSc FGS

Director - Geotechnical

Reg. Office: Units 14 +15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA
Business Reg. No. 2255616

☎ 020 8594 8134

🌐 www.siteanalyticalgroup.co.uk



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APPENDIX A

BOREHOLE LOGS

APPENDIX B

LABORATORY TEST, RISING HEAD TEST & GROUNDWATER MONITORING DATA

1.0 Introduction

1.1 Outline and Limitations of Report

At the request of Simon & Sheila Fox, a ground investigation was carried out in connection with a proposed basement development at the above site. A Geotechnical Desk Study is presented under a separate cover in Site Analytical Services Limited Report Reference 24/37849, dated February 2024.

The information was required for the design and construction of foundations and infrastructure for the proposed development at the existing site, which includes the demolition of the existing garages and shed, and erection of a residential 3-storey dwelling (plus excavation to form a basement level).

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 Site Details

(National Grid Reference: TQ 277 889)

2.1 Site Location

The site is located on the north-eastern corner of the intersection between Fordington Road and The Drive, which is approximately 100m north-west of Woodside Avenue. The site is situated in London, at approximate postcode N6 4TJ. It is bound by residential properties to the north and to the south-east, with similar properties opposite on the other side of Fordington Road to the south and to the west.

The site is rectangular in shape covers an approximate area of 0.06 Hectares with the general area being under the authority of the London Borough of Haringey.

2.2 Published Geology

The Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by the London Clay Formation at depth.

3.0 Scope of Work

3.1 Site Works

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one rotary percussive borehole to a depth of 15.00m below ground level (Borehole 1).
- The drilling of one continuous flight auger borehole to a depth of 10.00m below ground level (Borehole 2).
- The installation of groundwater monitoring standpipes to a depth of up to 9.00m in Boreholes 1 and 2, together with two return monitoring visits.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the exploratory holes.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.

3.2 Ground Conditions

The approximate locations of the exploratory holes are illustrated on the site investigation plan, Figure 1 below.

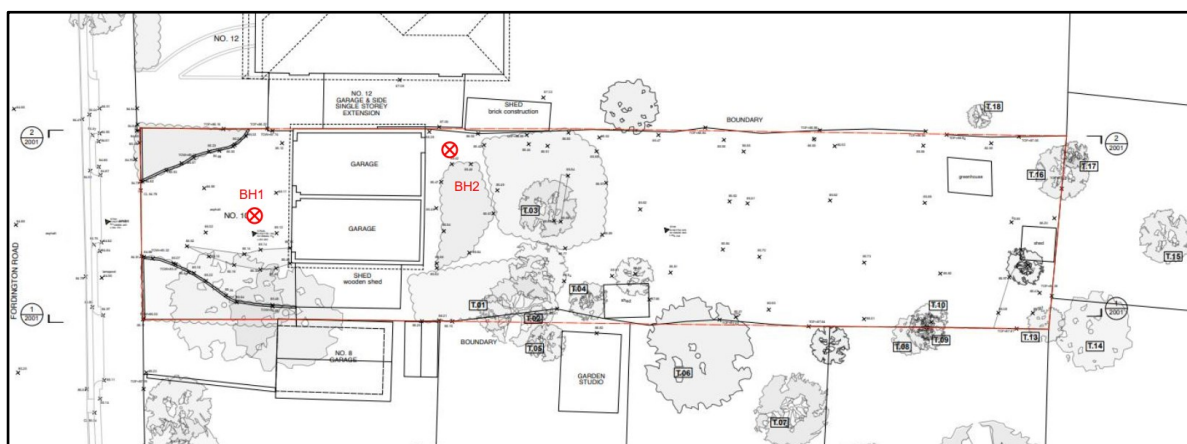


Figure 1. Site Investigation Plan

The boreholes were completed at existing ground level and revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 0.70m in thickness resting on the London Clay Formation at depth.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Level to top of strata (mOD)	Depth to base of strata (mbgl)	Level to base of strata (mOD)	Description
Made Ground	0.00	85.30 - 85.00	0.45 - 0.70	84.85 - 84.30	Tarmac & concrete / Grass over brown silty sandy clay with brick and concrete fragments
London Clay Formation	0.45 - 0.70	84.85 - 84.30	15.00 (max depth of BH1)	75.30 - 70.00	Stiff silty CLAY containing partings of silty fine sand.

Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered in either Borehole 1 or 2 and the material remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Groundwater was encountered at respective depths of 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD) in Boreholes 1 and 2 after a period of approximately three to four weeks.

Given the presence of a non-aquifer below the site it is likely that the groundwater recorded within these soils relates to perched water within the Made Ground and is recharged via intermittent seepages from surface water associated with weather conditions rather than any large-scale subterranean groundwater flow. As a result, the impact on excavations carried out at the site from this perched water is expected to be minimal.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (January and February 2024) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 In-Situ and Laboratory Tests

4.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A. SPT 'N' values range between 3 and 30.

The results of the tests are shown on the appropriate borehole records and summary sheets presented in Appendix A.

4.2 Undrained Triaxial Compression Test Results

Quick Undrained Triaxial Compression tests were conducted on six selected undisturbed 100mm diameter samples taken from Borehole 1. The results show the samples to be of medium, then high becoming very strength in accordance with BS 5930 (2015).

The results of the tests are presented on Table 1, contained in Appendix B.

4.3 In-Situ Tests

In predominantly cohesive soils, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930 (2015).

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

4.4 Classification Tests

Atterberg Limit tests were conducted on six selected samples taken from the cohesive portion of the natural soils in Boreholes 1 and 2 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

These are fine grained silty clay soils of high plasticity and as such generally have a low permeability and a medium to high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 34% and 43%, with three samples being above the 40% boundary between soils assessed as being of medium volume change potential and those assessed as being of high-volume change potential.

The results of the tests are presented on Table 2, contained in Appendix B.

4.5 Chemical Attack on Buried Concrete

Using the results contained in Appendix B, the following table provides the highest values encountered for the BRE SD1 Suite D specification and the equivalent DS and ACEC classes, based on a static groundwater:

Strata	pH	2:1 Water Soluble SO ₄ (g/l)	2:1 Water Soluble Chloride (mg/l)	2:1 Water Soluble Nitrate (mg/l)	Total Sulphate (%)	Magnesium (mg/kg)	DS Class	ACEC Class
London Clay Formation	7.8-8.8	2.64	65	<2.0	0.542	600	DS-3	AC-2s

Worst case DS and ACEC classes based on the BRE SD1 Suite D results

4.6 In-situ Rising Head Permeability Tests

In order to assess the soil infiltration characteristics of the natural superficial soils at the site, in-situ rising head permeability tests were carried out in Borehole 1, using the procedure recommended in BS 5930:2015.

The results of the in-situ permeability test indicated an apparent permeability or soil infiltration rate of 2.46×10^{-8} m/sec within Borehole 1. This soil infiltration rates lie within the range of published data of fissured and weather clays and are classed as being of very low permeability material with poor drainage characteristics.

The results are presented on the exploratory hole records, contained in Appendix B.

5.0 List of Appendices

Appendix A – Borehole Logs

Appendix B – Laboratory Test, Rising Head Test & Groundwater Monitoring Data

6.0 References

1. British Standards Institution, 2015. Code of practice for foundations, BS 8004, BSI, London.
2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London
3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London
4. British Standards Institution, Code of Practice for Site Investigations, BS5930: 2015, BSI, London
5. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London
6. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

APPENDIX A

Borehole Logs

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH1			
Boring Method ROTARY PERCUSSIVE		Casing Diameter 128mm cased to 0.00m			Ground Level (mOD) 85.00		Client SIMON & SHEILA FOX		Job Number 2437849			
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 1/2			
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water			
0.25	D1		DRY	0,1/1,0,1,1	84.97	0.03	MADE GROUND: Tarmac					
0.50	D2				84.90	0.10 (0.30)				MADE GROUND: Concrete		
0.75	D3				84.60	0.40 (0.30)					MADE GROUND: Brown orange silty clay containing brick and concrete fragments	
1.00-1.45	SPT N=3				84.30	0.70						MADE GROUND: Brown orange silty clay containing occasional brick fragments
1.00	D4											
1.50	D5											
2.00	U1	35 blows										
2.50	D6	(4.10)										
3.00-3.45	SPT N=7		DRY	1,1/1,2,2,2								
3.00	D7											
3.50	D8											
4.00	U2				50 blows							
4.50	D9											
5.00-5.45	SPT N=11		DRY	1,2/2,3,3,3	80.20	4.80	Firm, dark brown silty CLAY					
5.00	D10				(1.40)							
6.00	U3					65 blows						
7.00	D11											
7.50-7.95	SPT N=20					DRY				3,4/4,5,5,6		
7.50	D12											
8.00	D13	(3.80)										
9.00	U4		85 blows									

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH1	
Boring Method ROTARY PERCUSSIVE		Casing Diameter 128mm cased to 0.00m			Ground Level (mOD) 85.00		Client SIMON & SHEILA FOX		Job Number 2437849	
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 2/2	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
10.00	D14		DRY	4,5/5,6,6,7	75.00	10.00	Stiff, medium grey silty CLAY containing partings of silty fine grained sand and occasional gypsum crystals			
10.50-10.95 10.50	SPT N=24 D15									
11.00	D16									
12.00	U5		DRY	95 blows		(5.00)				
13.00	D17									
13.50-13.95 13.50	SPT N=30 D18									
14.00	D19		DRY	5,6/7,7,8,8						
15.00	U6									
Remarks Groundwater was not encountered during boring/excavation S= Standard Penetration Test - Cone U= Undisturbed 100mm Diameter Sample D= Disturbed Sample								Scale (approx)	Logged By	
								1:50	EW	
								Figure No. 2437849.BH1		

Standard Penetration Test Results

Job Number
2437849

Sheet

1 / 1

1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.00	1.15	1.45	SPT	0	1	1	0	1	1	N=3	
BH1	3.00	3.15	3.45	SPT	1	1	1	2	2	2	N=7	
BH1	5.00	5.15	5.45	SPT	1	2	2	3	3	3	N=11	
BH1	7.50	7.65	7.95	SPT	3	4	4	5	5	6	N=20	
BH1	10.50	10.65	10.95	SPT	4	5	5	6	6	7	N=24	
BH1	13.50	13.65	13.95	SPT	5	6	7	7	8	8	N=30	

Site Analytical Services Ltd.

Site

10 FORDINGTON ROAD, LONDON, N6 4TJ

Borehole Number	BH1
-----------------	-----

Installation Type
Single Installation

Dimensions

Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 128 mm

Client

SIMON & SHEILA FOX

**Job
Number**
2437849

Location

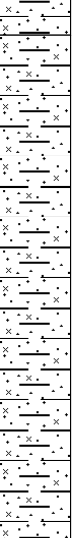
TQ277890

Ground Level (mOD)

85.00

Engineer

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling														
			84.00	1.00	Bentonite Seal	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)					
										5 min	10 min	15 min	20 min							
			84.00	1.00	Slotted Standpipe	Groundwater Observations During Drilling														
Date						Start of Shift					End of Shift									
						Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)					
								84.00	1.00	Slotted Standpipe										
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
																				
			76.00	9.00	Bentonite Seal	Date	Instrument [A]			Remarks										
			Time	Depth (m)	Level (mOD)															
		75.00				10.00	General Backfill													

Remarks

Lockable cover set in cement

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH2		
Boring Method CONTINUOUS FLIGHT AUGER		Casing Diameter 100mm cased to 0.00m			Ground Level (mOD) 85.30		Client SIMON & SHEILA FOX		Job Number 2437849		
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
0.25 0.50 0.75 1.00 1.00	D1				85.22	0.08 (0.37)	MADE GROUND: Grass over dark brown sandy topsoil				
	D2				84.85	0.45	MADE GROUND: Dark brown silty sandy clay containing brick and concrete fragments				
	D3						Stiff, brown orange silty CLAY				
1.50 1.50	D4 V1 78										
2.00 2.00	D5 V2 98										
2.50 2.50	D6 V3 115										
3.00 3.00	D7 V4 122										
3.50 3.50	D8 V5 140+										
4.00 4.00	D9 V6 140+										
4.50 4.50	D10 V7 140+										
5.00 5.00	D11 V8 140+										
6.00 6.00	D12 V9 140+										
7.00 7.00	D13 V10 140+										
8.00 8.00	D14 V11 140+										
9.00 9.00	D15 V12 140+										
10.00 10.00	D16 V13 140+										
	D17 V14 140+										
					75.30	10.00					
Remarks V= Vane Test - Results in kPa D= Disturbed Sample Groundwater was not encountered during boring/excavation								Scale (approx) 1:50	Logged By EW		
								Figure No. 2437849.BH2			

Site Analytical Services Ltd.

Site

10 FORDINGTON ROAD, LONDON, N6 4TJ

**Borehole
Number**
BH2

Installation Type
Single Installation

Dimensions

Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client

SIMON & SHEILA FOX

**Job
Number**
2437849

Location

TQ277890

Ground Level (mOD)

85.30

Engineer

Sheet
1/1

[illegible]

Remarks

Lockable cover set in cement

APPENDIX B

Laboratory Test, Rising Head Test & Groundwater Monitoring Data

UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No.	Moisture Content (%)	Bulk Density (Mg/m ³)	Lateral Pressure (kN/m ²)	Compressive Strength (kN/m ²)	Cohesion (kN/m ²)	Depth (m)
BH1	32	1.93	50	130	65	2.25
	29	1.97	80	177	89	4.25
	30	1.96	120	340	170	6.25
	30	1.96	180	380	190	9.25
	30	1.98	240	371	186	12.25
	27	1.97	300	380	190	15.25

Table 1

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

BH/TP No.	Depth (m)	Natural Moisture (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 μ m (%)	Modified Plasticity Index (%)	Class
BH1	1.00	28	69	26	43	100	43	CH
	2.50	31	64	27	37	100	37	CH
	3.50	31	68	27	41	100	41	CH
BH2	0.75	20	56	22	34	100	34	CH
	1.50	28	68	27	41	100	41	CH
	3.00	30	64	27	37	100	37	CH

Table 2

GROUNDWATER MONITORING

GROUNDWATER MONITORING RECORD				
Date	Weather Conditions		Ground Conditions	Temperature (°C)
23/01/2024	Raining		Wet	8.0
Monitoring Point Location	Depth to water (mBGL)	Depth to water (mOD)	Depth to Base of well (mBGL)	Depth to Base of well (mOD)
BH1	1.65	83.35	9.11	75.89
BH2	1.69	83.61	8.47	76.83

Table 3

GROUNDWATER MONITORING RECORD				
Date	Weather Conditions		Ground Conditions	Temperature (°C)
06/02/2024	Cloudy		Dry	12.0
Monitoring Point Location	Depth to water (mBGL)	Depth to water (mOD)	Depth to Base of well (mBGL)	Depth to Base of well (mOD)
BH1	1.63	83.37	9.11	75.89
BH2	1.56	83.74	8.47	76.83

Table 3a

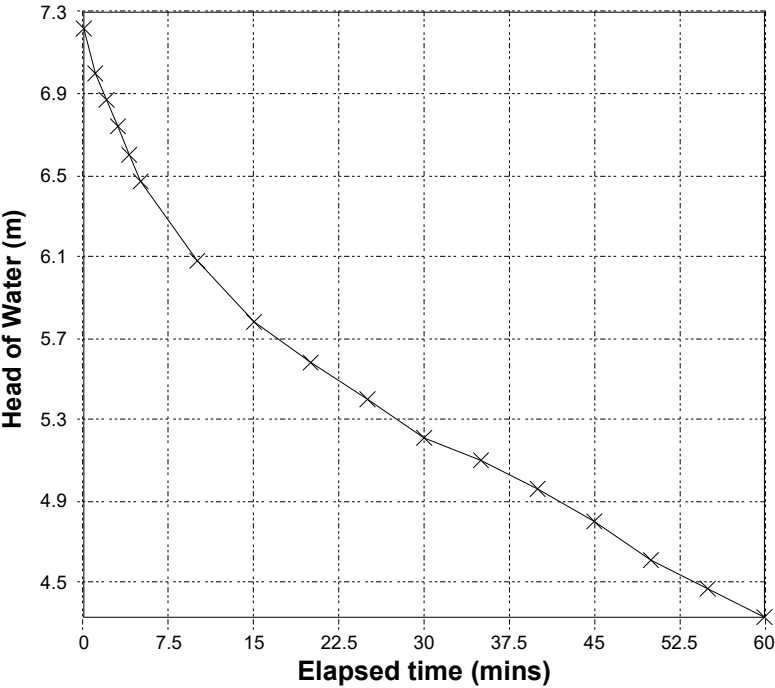
Site Analytical Services Ltd.

Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH1
In Situ Permeability Type Rising Head	Test No. 1	Ground Level (mOD) 85.00
	Location TQ277890	Dates 11/01/2024
Client SIMON & SHEILA FOX		Job Number 2437849
Engineer		Sheet 1/1

Height of Standpipe above ground level:	0.00 m
Depth to Base of Filter:	8.00 m bgl
Depth to Top of Filter:	1.00 m bgl
Depth to equilibrium water level:	1.54 m btoc
Test Length L:	7.00 m
Diameter of Test Length D:	0.05 m
Area of Test Section:	0.0020 m2
Intake Factor F: (after BS 5930, figure 7)	8.9405

PERMEABILITY (after Hvorslev, 1951)
General Approach
H1 selected at t= 6.04 m (=t1 = 596.4 secs)
H2 selected at t= 4.312 m (=t2 = 3610.2 secs)
k = 2.46E-08 ms-1

Elapsed time (mins)	Depth to water (m btoc)	Head of Water, H (m)	Ht / Ho
0.00	8.760	7.220	1.000
1.00	8.540	7.000	0.970
2.00	8.410	6.870	0.952
3.00	8.280	6.740	0.934
4.00	8.140	6.600	0.914
5.00	8.010	6.470	0.896
10.00	7.620	6.080	0.842
15.00	7.320	5.780	0.801
20.00	7.120	5.580	0.773
25.00	6.940	5.400	0.748
30.00	6.750	5.210	0.722
35.00	6.640	5.100	0.706
40.00	6.500	4.960	0.687
45.00	6.340	4.800	0.665
50.00	6.150	4.610	0.639
55.00	6.010	4.470	0.619
60.00	5.870	4.330	0.600



Remarks

Key: bgl = Below Ground Level btoc = Below Top of Casing

**Services**

Site Analytical Services Ltd
Units 14 -15
River Road Business Park
33 River Road
Barking
Essex
IG11 0EA

t: 0208 5948134
f: 0208 5948072
e: SAS -

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

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

Analytical Report Number : 24-78394

Project / Site name:	10 Fordington Road London N6 4TJ	Samples received on:	16/01/2024
Your job number:	24-37849	Samples instructed on/ Analysis started on:	16/01/2024
Your order number:	13006	Analysis completed by:	22/01/2024
Report Issue Number:	1	Report issued on:	23/01/2024
Samples Analysed:	4 soil samples		

Izabela Wójcik
Signed:
Izabela Wójcik
Senior Reporting Specialist
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: 24-78394

Project / Site name: 10 Fordington Road London N6 4TJ

Your Order No: 13006

Lab Sample Number				2929112	2929113	2929114	2929115
Sample Reference				BH1	BH1	BH2	BH2
Sample Number				D5	D11	D6	D12
Depth (m)				1.50	7.00	2.00	5.00
Date Sampled				11/01/2024	11/01/2024	11/01/2024	11/01/2024
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	17	19	20	20
Total mass of sample received	kg	0.001	NONE	1.9	1.8	1.9	1.8
Whole Sample Crushed				N/A	NONE	Crushed	Crushed

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.8	7.8	8.8
Total Sulphate as SO ₄	%	0.005	MCERTS	0.028	0.206	0.17	0.542
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0839	0.555	0.556	2.64
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.3	46	34	65
Total Sulphur	%	0.005	MCERTS	0.016	0.64	0.065	0.602
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	57	170	200	600
---------------------------	-------	---	------	----	-----	-----	-----

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

Analytical Report Number : 24-78394

Project / Site name: 10 Fordington Road London N6 4TJ

* 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 *
2929112	BH1	D5	1.5	Brown clay.
2929113	BH1	D11	7	Brown clay.
2929114	BH2	D6	2	Brown clay.
2929115	BH2	D12	5	Brown clay.

Analytical Report Number : 24-78394

Project / Site name: 10 Fordington Road London N6 4TJ

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
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
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
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
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-PL	D	NONE
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
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-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 or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.



10.0 APPENDIX B – GROUND MOVEMENT ASSESSMENT

10 FORDINGTON ROAD GROUND MOVEMENT ASSESSMENT

Curtins Ref: 085156-CUR-XX-XX-T-GE-00001

Revision: P01

Issue Date: 13th February 2024

Client Name: Site Analytical Services Limited

Client Address: 33 River Road, Essex, IG11 0EA

Site Address: 10 Fordington Road, London, N6 4TJ

Rev	Description	Issued by	Checked	Date
P01	Report for Issue	AS	LP	13/02/2024

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Reviewed	Signature	Date
Liam Pallett BSc (Hons) MSc Geotechnical Engineer		13/02/2024

Author	Signature	Date
Andrew Smith BSc (Hons) FGS CGeol MCIWEM RoGEP Associate		13/02/2024

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1 INTRODUCTION

1.1 Brief

Curtins have been commissioned by Site Analytical Services (SASL) to complete a Ground Movement Assessment (GMA) in connection with a proposed residential basement development at 10 Fordington Road, London, N6 which falls within the jurisdiction of the London Borough of Haringey. The location of the site is detailed on **Figure 1.1**. The purpose of this assessment is to determine what effects the permanent construction of the proposed basement may have on permanent structures which surround the property.

The report aims to demonstrate that the predicted level of damage at the time of the construction and subject to the report limitations outlined in section 1.3 will be no more than Burland Scale 1 “very slight” in relation to neighbouring buildings/ structures within the zone of influence as per planning condition (6) on London Borough of Haringey Planning Application Reference No. HGY/2021/1604.

A site-specific ground investigation was carried out at the site by SASL in January 2024, as summarised in the Factual Report Ref: 24/37849-1, dated February 2024. The ground investigation was designed by SASL, and results have been used in the derivation of parameters utilised in this assessment. Curtins cannot be held responsible for any inaccuracy in the factual data provided.



Figure 1.1 Site Location (Adapted from Yabsley Stevens Architects LTD Design & Access Statement dated 25th May 2021 – Available online at Haringey Planning Website)

1.2 Development Proposals

Based off of current development proposals (contained in **Appendix A**), the proposed development comprises the construction of a three-storey detached house with a basement level below. The site is currently occupied by two garages and a shed which are used for storage and is bound by the semi-detached house and garage at No. 12 Fordington Road to the north east and the garage to No. 8 to the south west.

In accordance with the proposed planning drawings (available online at Haringey planning website) and using topographical information in Yabsley Stevens Architects Design and Access Statement dated 25th May 2021 (also available online) the base of the proposed basement excavation reaches 81.95m AOD assuming an approximately 250mm ground floor slab.

This equates to an excavation to levels of approximately 3.53m below existing ground level adjacent to No. 8 Fordington Road and 3.17m below existing ground level adjacent to No. 12. This arrangement is summarised in Figure 1.2 below.

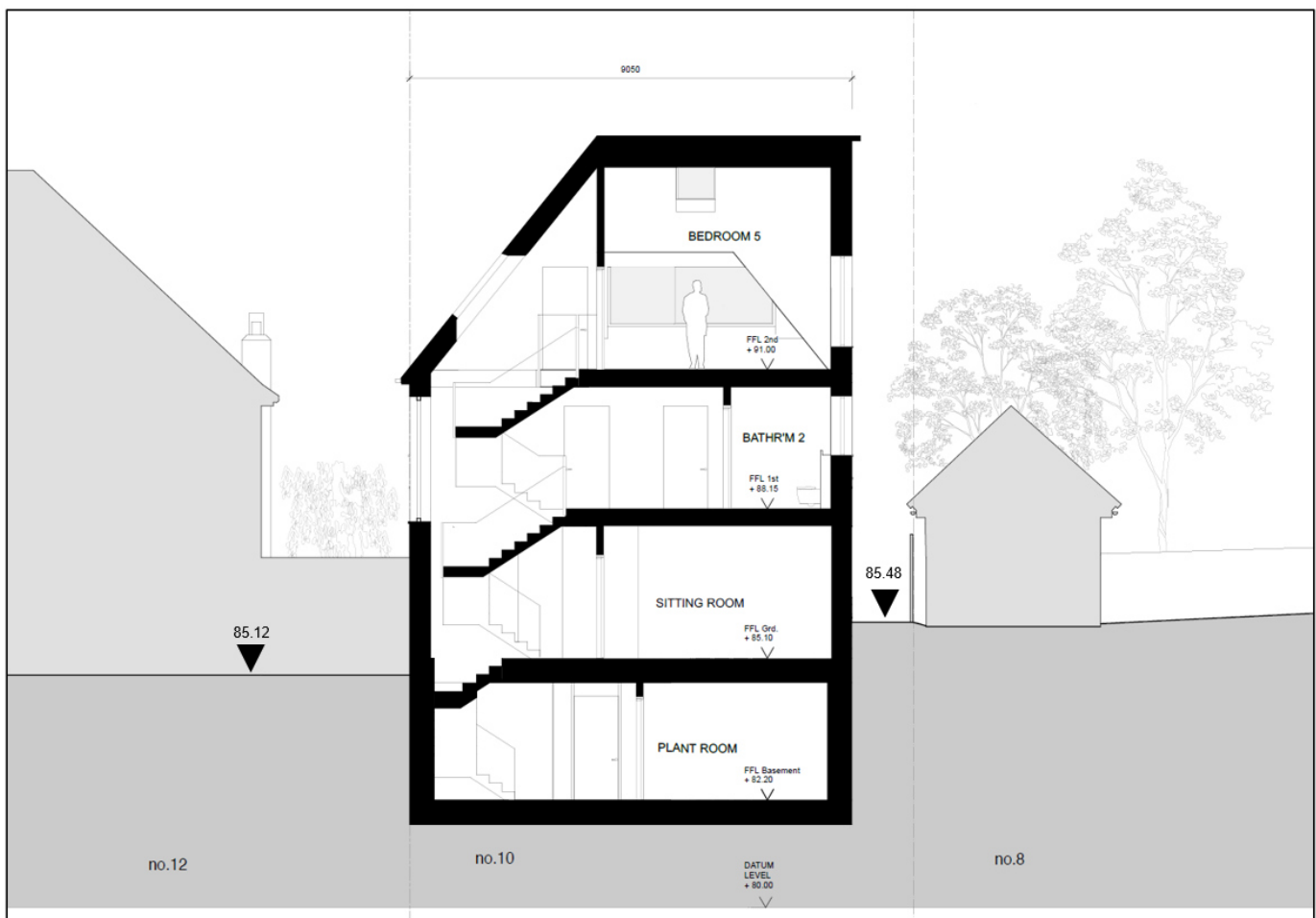


Figure 1.2 *Proposed Basement Section (Adapted from Yabsley Stevens Architects Drawing 10A2003)*

1.3 Limitations

The conclusions and recommendations made in this report are made on the basis of the site-specific ground investigation undertaken by Site Analytical Services (SAS) undertaken by in January 2024, as summarised in the Factual Report Ref: 24/37849-1, dated February 2024. The ground investigation was designed by Site Analytical Services (SAS), and the results of the work should be viewed in the context of the range of data sources consulted and the information provided along with the number of locations where the ground was sampled. No liability can be accepted for inaccuracies in the factual data, information in other data sources or conditions not revealed by the sampling or testing.

The effect of the proposed construction on existing subterranean assets (including services and tunnels) and any hydrological/dewatering assessments required are outside the scope of this report.

It should be noted that the movements described in this report are indicative only for the purposes of providing pre-planning guidance with regards to the development and should not be relied upon for detailed design. It is anticipated the actual movement observed on site will be heavily affected by the level of workmanship and therefore should be reviewed at detailed design following discussions with the structural engineer and appointed contractor.

The chosen methodology of this Ground Movement Assessment is intended for application in buildings with a fine plaster finish (Burland, 1997) and is not usually used for garages which are present adjacent to the site. Therefore the predicted level of damage to these structures should be treated as being conservative.

2 SITE SETTING

2.1 Site Description

The site is located on the south east side of Fordington road, closest to the southerly entrance when accessing the road from Woodside Avenue. The plot is currently occupied by two garages and a shed located at the end of a row of semi-detached 1930's houses. Existing plans are in **Appendix B**.

The site is bounded by the semi-detached house and garage at No. 12 Fordington Road and the garage to No. 8.

Specific details of the buildings located in close proximity to the property which have been considered in the analysis are summarised in **Table 2.1** and **Figure 2.1** below.

Table 2.1: A summary of the neighbouring properties in close proximity to 10 Fordington Road

Building Name	Description	Approximate Height (from ground level to roof)	Distance from Proposed Basement
No. 12 Fordington Road	3-storey terraced residential dwelling with single storey garage	10.70m (Building) 3.0m (Garage)	Garage shares party Wall
Garage (No. 8)	1-storey garage	5.00m	1m

The site is surrounded by smaller outbuildings including sheds in the garden areas of both No. 12 and No. 8 Fordington Road and a garden room in No. 8.

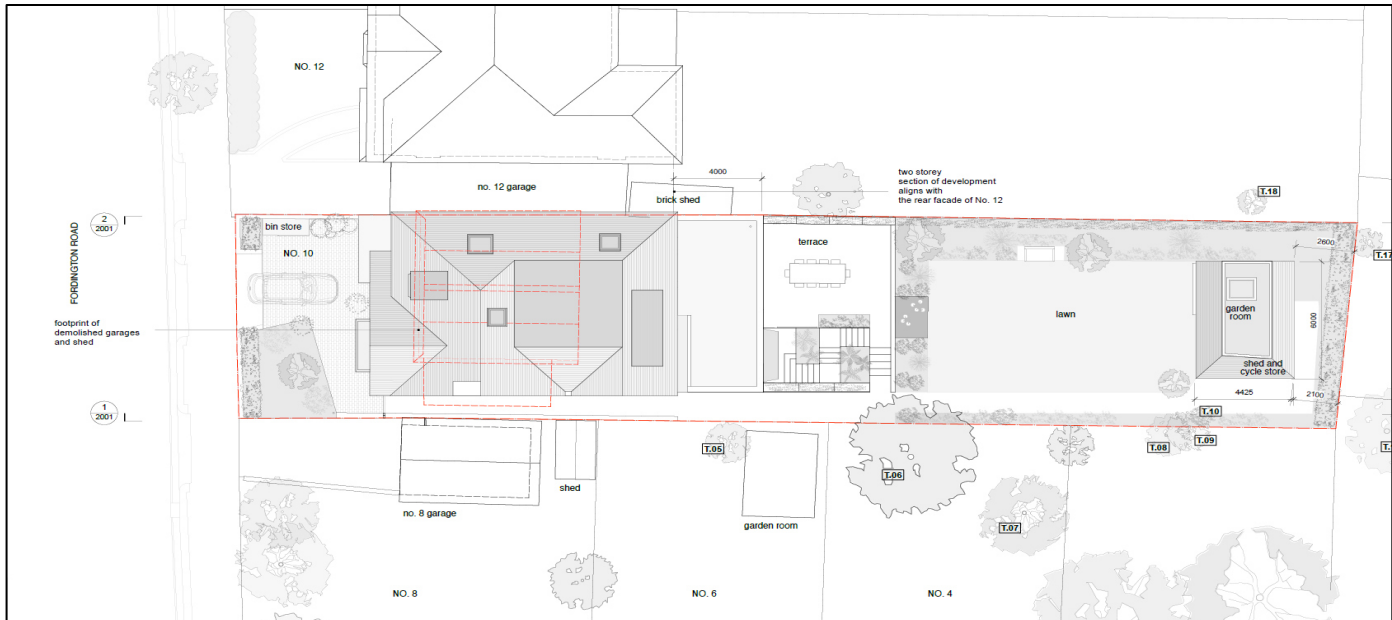


Figure 2.1. Summary of buildings surrounding the site (From Yabsley Stevens Architects Drawing 10A1002)

2.2 Geology

British Geological Survey (BGS) Geology Viewer, and 1:50,000 Geological Survey of Britain (England and Wales) Sheet 270 (North London) shows that the site is underlain directly by bedrock deposits comprising the London Clay Formation.

There are no BGS Boreholes within 250m of the site and no historic available site investigations available on the local authority website.

2.3 Hydrogeology

According to online information (<https://magic.defra.gov.uk/> (1)), the bedrock comprising the London Clay Formation is designated as an Unproductive Strata (negligible significance for water supply or baseflow to rivers, lakes and wetlands. They consist of bedrock or superficial deposits with a low permeability that naturally offer protection to any aquifers that may be present beneath).

3 GROUND INVESTIGATION

3.1 Encountered Ground Conditions

A site-specific Ground Investigation was undertaken by SASL at the site in January 2024. This investigation comprised the following.

- The drilling of a 15.00m deep borehole at the front of the site using rotary percussive drilling (Borehole 1)
- The drilling of a 10.00m deep borehole using continuous flight auger techniques (Borehole 2)
- Sampling and in-situ testing as appropriate to the ground conditions encountered within the boreholes.
- Installation of groundwater monitoring standpipes in the boreholes with post ground investigation monitoring visits spanning over 4 weeks.
- Geotechnical laboratory testing to determine the engineering properties of the soils encountered in the exploratory borehole.

The exploratory hole logs including an exploratory hole location plan are contained in the SASL Geotechnical Ground Investigation Report (24/37849-1) in **Appendix C**, the ground conditions encountered are summarised in **Table 3.1** below.

Table 3.1: Summary of Ground Conditions encountered in SASL Ground Investigation (January 2024)

Strata	Depth to Top m bgl (m AOD)	Proven Thickness Range (m)	Description
Made Ground	0.0 (85.00 to 85.30)	0.45 – 0.70	Tarmac (front of site) or topsoil (rear of site) overlying silty sandy clay with brick fragments
London Clay Formation	0.45 – 0.70 (84.30 to 84.85)	9.55 to 14.30*	Soft becoming firm and then stiff brown/grey silty sandy CLAY

*Base of unit not encountered

3.2 Groundwater

Groundwater was not encountered during drilling and the soils remained essentially dry throughout.

Monitoring standpipes were installed within Boreholes 1 and 2 to depths of 9.00m and 8.50m below ground level, respectively. Groundwater was encountered at respective depths of 1.63m below ground level (83.37m AOD) and 1.56m below ground level (83.74m AOD) in Boreholes 1 and 2 after a period of approximately three to four weeks.

As detailed in the SAS Report, *‘Given the presence of a non-aquifer below the site it is likely that the groundwater recorded within these soils relates to perched water within the Made Ground and is recharged via intermittent*

seepages from surface water associated with weather conditions rather than any large-scale subterranean groundwater flow. As a result, the impact on excavations carried out at the site from this perched water is expected to be minimal'. 'It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (January and February 2024) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions'.

3.3 In Situ and Laboratory Testing

A summary of laboratory and in-situ test results undertaken within the geological strata encountered during the SASL and ground investigation is presented below. Further detailed results are available in the SASL Factual Report (**Appendix C**). The following results will all be interpreted in **Section 4.3**.

3.3.1 Atterberg Limit Testing

6 No. samples of the London Clay Formation were subject to water content determinations (between 0.75 m to 3.00m bgl). Results recorded water contents of between 20% and 31% (Average 28%).

The same 6 No. samples were tested for Atterberg limits, with corresponding plasticity index results ranging from 34% (BH1, 0.75m bgl) to 43% (BH1, 1.00m bgl) classifying as high plasticity clay (CH) on the Casagrande plasticity chart (**Figure 3.1**)

3.3.2 Standard Penetration Testing

Standard Penetration testing (SPT) was undertaken in BH1 at regular intervals with the results summarised on **Figure 3.2**. 6 No. SPT's were carried out in the London Clay Formation with 'N' values of between 3 and 30 recorded between elevations of between 71.5m to 84m AOD.

3.3.3 Undrained Triaxial Testing

Undrained triaxial compression tests were carried out on 6 No. undisturbed 100mm diameter samples of London Clay taken from within BH1 at depths of between 2.25m and 15.25m bgl. Undrained shear strengths ranged from 65kPa (at 2.25m bgl, 82.75m AOD) to 190kPa (at 9.25m and 15.25m bgl, (75.75m and 69.75m AOD)) corresponding to medium to very high strength material in accordance with BS EN ISO 14688-2:2004. These results are summarised on **Figure 3.3**.

3.3.4 In-Situ (Shear) Vane Tests

In-situ hand vane testing was completed within the London Clay Formation bedrock, returning values of between 78kPa to >140kPa (140kPa is the max reading the equipment is capable of recording) and are summarised in **Figure 3.3**.

These results equate to soils of high strength in accordance with guidance from BS EN ISO 14688-2:2004.

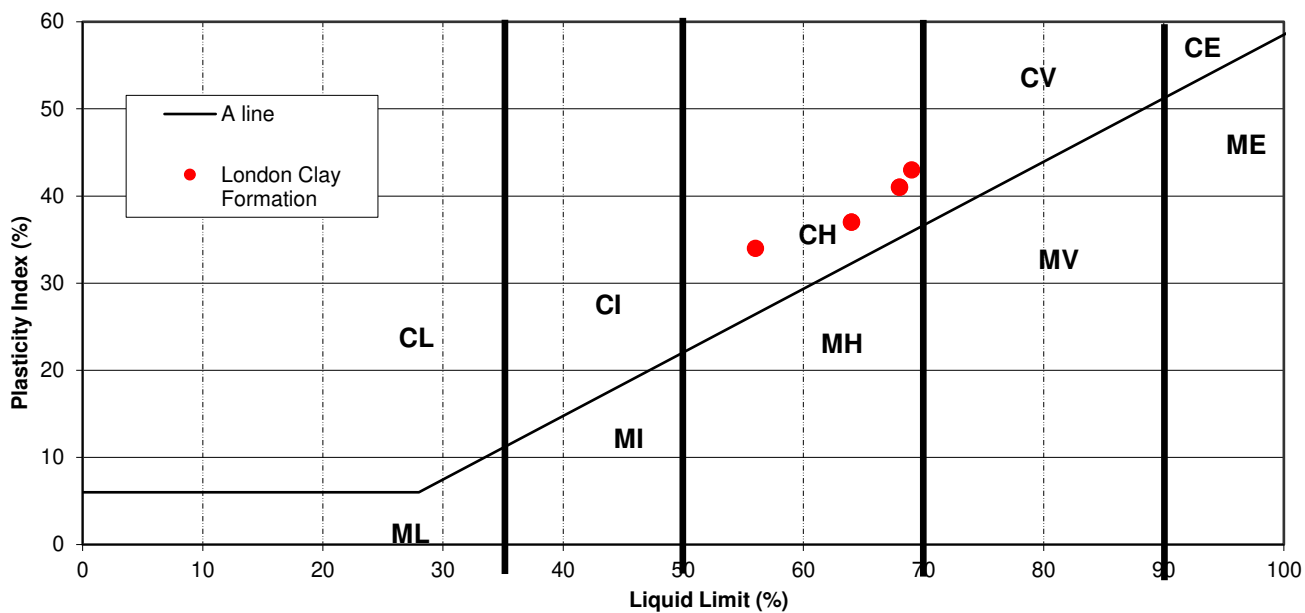


Figure 3.1. Casagrande Plot

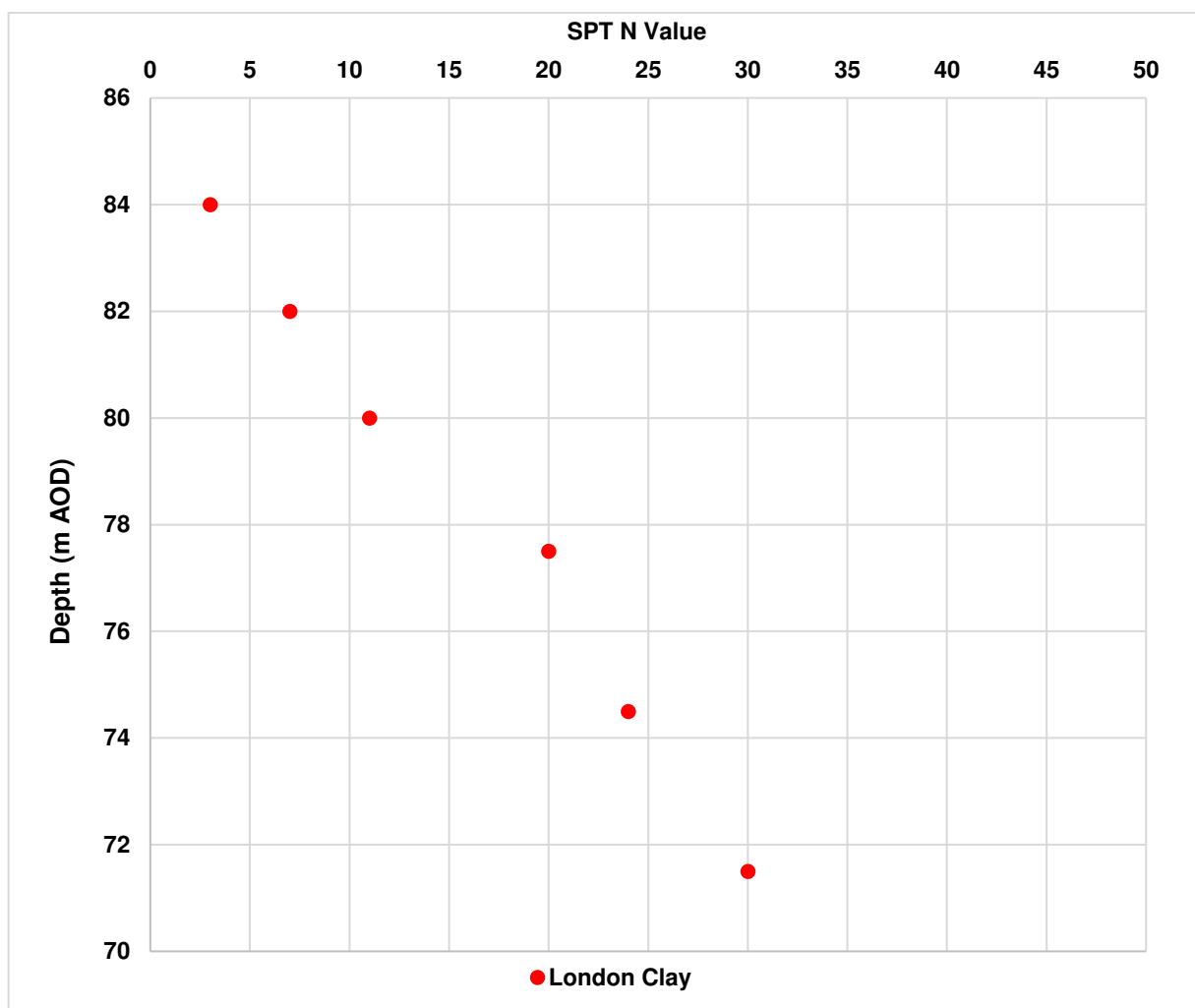


Figure 3.2: Derived SPT N values vs Elevation

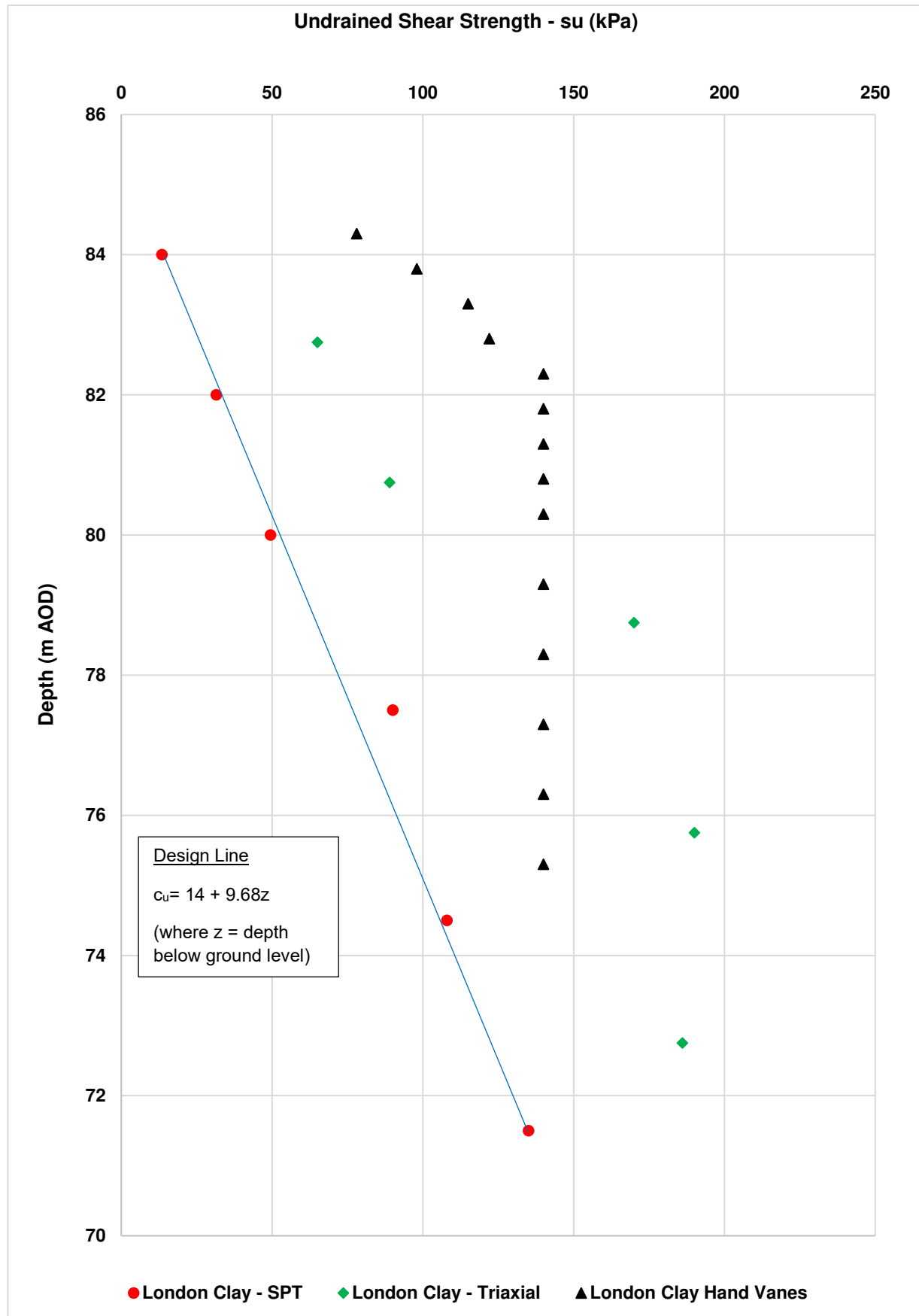


Figure 3.3: Undrained Shear Strength values vs Elevation (Conservative Design Line Detailed in blue)

4 PREDICTION OF GROUND MOVEMENTS AND DAMAGE ASSESSMENT

4.1 Introduction

In connection with the proposed basement construction, a ground movement and damage assessment has been undertaken at the site. The purpose of this assessment is to determine the effects of the proposed basement excavation upon neighbouring structures.

It is understood that the proposed basement will be constructed using a combination of mass concrete and reinforced concrete underpins carried out in in sequence to extend the walls to the new basement level along with continuous piling.

The soil behaviour over the footprint of the excavated area is different from the behaviour outside and the associated ground movements require assessment using different approaches.

In the area of the new basement the soil will tend to move as a result of change in vertical load on the ground due to excavation and demolition. Movements in the long term would also be expected as a result of changes in the pore pressure in the clay layer/cohesive band under the basement.

Around the site the construction activities that may result in ground movements during and after the works are mainly related to the excavation, which would induce a reduction of vertical and lateral stresses in the ground along the excavation boundaries.

The magnitude and distribution of ground movements inside and outside the excavated area are a function of changes of load in the ground and also, critically, are a function of workmanship.

Ground movements within the area of the proposed excavation have been estimated using Geotechnical Software (PDISP by OASYS) whilst the expected movements and impact assessment of the area around the site and surrounding structures have been estimated using Geotechnical Software (XDISP by OASYS). The latter software relies on CIRIA report C580 Embedded Retaining Walls - Guidance for Economic Design (3) (superseded by C760, 2017 (4)) which is based on field measurements of movements from a number of basement constructions across London.

The calculations provided are specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

4.2 Adjacent Properties

The properties or structures more likely to be affected by ground movements associated with the proposed basement construction, are summarised in **Figure 4.1** below.



Figure 4.1 Plan view of 10 Fordington road with proposed basement overlay. Red highlighted walls have been analysed within 'Oasys XDISP' software. Drawing adapted from Yabsley Stevens Architects Drawing 10A1003

4.3 Ground Model

The ground model utilised for this assessment is based on the site-specific ground investigation undertaken by SASL at the site (January 2024). It should be noted that Curtins can take no liability for inaccuracies in the factual data from the site specific nor adjacent site investigations.

The ground conditions adopted within the model and analysis are in accordance with the ground conditions inferred from borehole BH1 (the deeper of the 2 holes drilled on site) and comprise:

- Worst case (thickest) made ground of 0.70m has been assumed across the property footprint.
- London Clay to depths of at least 15m bgl (total thickness unproven).
- During groundwater monitoring, groundwater was encountered at depths between 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD) in Boreholes 1 and 2 after a period of approximately three to four weeks. This groundwater level is perceived to be a localised groundwater level within the weathered London Clay perched on the underlying essentially impermeable unweathered London Clay soils below.
- The maximum depth of the proposed basement has been inferred from the Architectural Drawings (**Appendix A**) as being approximately 81.95m AOD assuming a 250mm floor slab. This equates to approximately 3.53m below existing ground level adjacent to No. 8 Fordington Road and 3.17m below existing ground level adjacent to No. 12. A worst-case excavation level of 3.53m bgl has been assumed in the Geotechnical analyses presented in this document.

Made Ground

Case history values were consulted where estimating the linear elastic parameters for Made Ground. Specifically values for the drained case were adopted from:

'Burland, Standing, Jardine (2001). Volume 1 – Projects and Methods. Building response to Tunnelling – Case Studies from construction of the Jubilee Line Extension, London. CIRIA Special Publication 200, Section 12.2.3, page 180'

Using the results of this paper it has been assumed that the Poisson's Ratio (ν') would slightly increase for the undrained case (ν) from 0.2 to 0.3 but the Shear Stiffness / modulus (G) would be the same in the Made Ground for both the drained and undrained cases.

A bulk unit weight of 16kN/m^3 is considered appropriate for design based on guidance from BS8004 (2015).

London Clay Formation

The results of SPT can be correlated to an Undrained Shear Strength (c_u) when undertaken within cohesive deposits. For consolidated clays, Stroud (1975) (8) reported good correlations between N and c_u (**Equation 1**), where values of f_1 are a factor of the plasticity of the clay.

$$c_u = f_1 \times N \quad \text{Equation 1}$$

Based on an average plasticity Index of 39% recorded in the investigation and utilising an f_1 factor of 4.5, correlated undrained shear strengths ranged from 14kPa and 135kPa indicative of a very low to high strength clay in accordance with BS EN ISO 14688-2:2004. These results are detailed on **Figure 3-3** along with the results from insitu hand vane testing and triaxial testing.

A conservative design line has been utilised equating to:

$$c_u = 14 + 9.68z \quad \text{Equation 2}$$

(where z = depth below ground level)

Based on the maximum (i.e., most conservative) axial strain of 0.2% prescribed in BS8004:2015 (4), the following correlation (**Equation 3**) has been used to determine the Young's Modulus (E_u) of the London Clay Formation. The relationship has been taken from ICE manual of geotechnical engineering (2012), Volume II, chapter 53.7.2 (Page 792) (5) and matches ratio of Young's Modulus/Undrained shear strength (E_u/C_u) at 0.2% axial strain recommended in Tomlinson (7th, 2001 (6)):

$$E_u = 330 \times C_u \text{ (kN/m}^2\text{)} \quad \text{Equation 3}$$

The ratio of end of construction (undrained) settlement to total settlement (fully drained) was taken as 60% as specified in ICE manual of geotechnical engineering (2012), Volume II, chapter 53.6 (Page 783) (5). Therefore, Drained Young's Modulus can be calculated using **Equation 4** below:

$$E' = 200 \times C_u \text{ (kN/m}^2\text{)} \quad \text{Equation 4}$$

A Poisson's ratio of 0.5 is typical for cohesive soils in the short term (Undrained), and 0.3 in the long term (Drained), based on guidance from Tomlinson (2001) (6).

The design parameters adopted for this analysis are summarised in **Table 4.1** below.

Table 4.1: Ground Model with design parameters used in the analysis.

Strata	Level at Top (m AOD)	Unit Weight (kN/m ³)	Undrained Shear Strength c_u (kPa)	Short Term (Undrained)	Long Term (Drained)
Made Ground	85.00	16	-	$E_u = 3\text{MPa}$ $\nu_u = 0.3$	$E' = 3\text{MPa}$ $\nu' = 0.2$
London Clay Formation	84.30	19	$c_u = 14 + 9.68z$ (where z = depth below ground level)	$E_u = 4.6\text{MPa to } 44.5\text{MPa}$ $\nu_u = 0.5$	$E' = 2.8\text{MPa to } 27\text{MPa}$ $\nu' = 0.3$

4.4 Ground Movement inside the proposed basement

The stress conditions and resultant settlement/heave have been assessed using the Boussinesq's method and geotechnical software PDISP by Oasys. PDISP calculates vertical movements due to a uniformly distributed load applied to a specified plane of geometry within a 3-D space. The Boussinesq analysis method is used in this analysis.

The following assumptions have been made within the PDISP analysis:

- Assumes Boussinesq stress distributions.
- Uniform pressure loading.
- The proposed basement will be founded within soils at 3.53m bgl within the London Clay Formation (81.95m AOD)
- A conservative basement slab load of 25kN/m has been assigned.

No allowance is made for the stiffness of the structures (foundation slab).

Structural loading at foundation level and calculations for use in the ground movement analysis have been provided by the structural engineer (**Appendix D**).

The vertical boundary of the model was fixed at 15m bgl. At this depth, the effective vertical stress due to foundation unloading decreases to in excess of 20% of the effective overburden as required in EC7.

The results of PDISP analysis are based on an unrestrained excavation as the model is unable to take account of the mitigating effect of temporary works bounding the excavation, which in reality will combine to restrict these movements within the basement excavation. The movements predicted at or just beyond the site boundaries are unlikely to be realised and should not therefore have a detrimental impact upon any nearby structures.

Excavation unloading

Approximately 3.53m of soil removal is expected across the site to facilitate the construction of the proposed new basement. Undrained removal of the overburden calculated using unit weights shown in the ground model (**Table 4.1**), and the thickness of strata with therefore cause maximum unloading stresses of up to 64.97kPa at the base of the proposed basement level.

Loading, long term drained conditions

The results show that following construction of the basement and taking account of the unloading pressures detailed above, settlements of 5-10mm are detailed. Heave movements up to approximately 15-20mm has been detailed within the area of the proposed ground floor slab.

PDISP uses individual layer properties to calculate the displacements resulting from applied stresses. The heave values described are considered to be overestimated and therefore conservative. It should be noted, Bowles in his text (Foundation Analysis and Design-Fifth Edition) states that *“In general, where heave is involved, considerable experience and engineering judgment are necessary in estimating probable soil response, for currently there is no reliable theories in for the problem”*.

Final designs for the basement retaining walls, basement slabs and internal load-bearing basement walls and columns should be designed to support the calculated movements. These movements should be driven into account particularly at party walls where additional loadings are proposed. Any proposed drainage system or pipe works within the vicinity should be designed to accommodate the predicted movements. The PDISP analysis output showing the movements in Drained Conditions are presented in **Appendix E**.

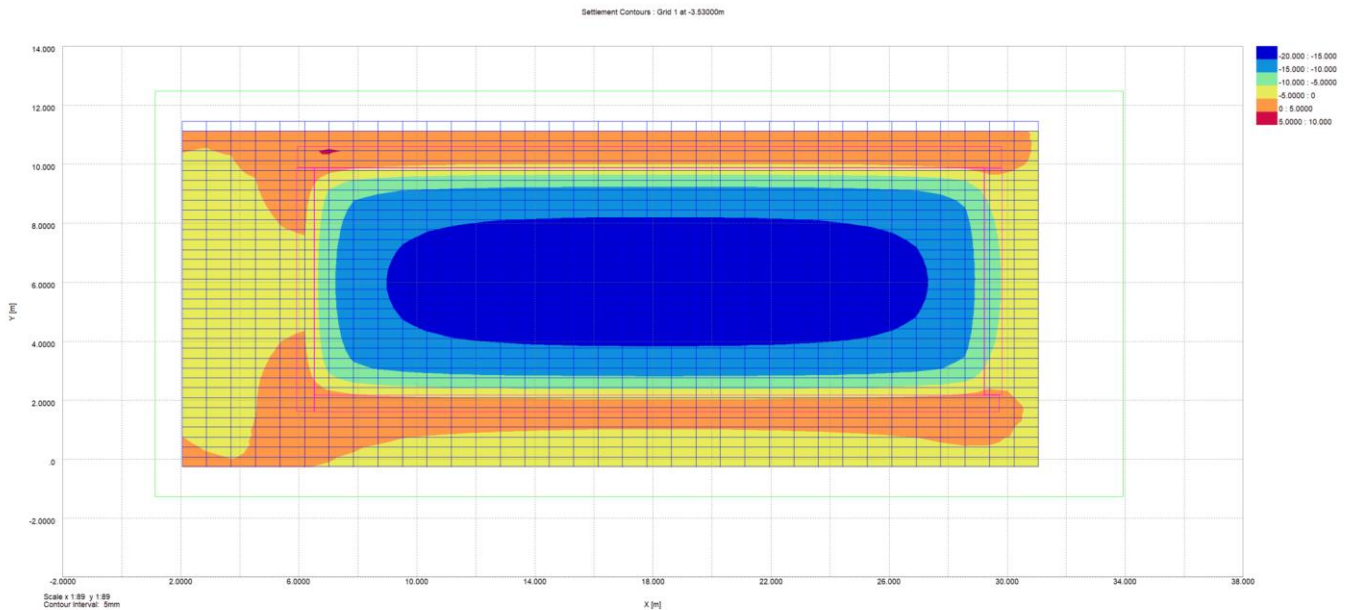


Figure 4.2 'PDISP Plan Graphical Output displaying the estimated immediate settlement at the proposed basement level

4.5 Ground Movement outside the proposed basement

Ground movements have been analysed using XDISP by Oasys and a building damage assessment has been undertaken based on the results of the analysis. Contours of vertical and horizontal ground movements are presented in **Appendix F**. As detailed in the proposal drawings in **Appendix A**, the proposed basement is to be constructed to a maximum depth of 3.53m bgl (81.95m AOD).

The basement is to be constructed using a combination of traditional underpinning and piling techniques. It has been assumed for the purposes of this analysis that propping will be included in the temporary and permanent cases over the proposed structure and therefore a high stiffness approach would apply to this situation. The proposed retaining walls are to be propped by the ground floor slab in the permanent case resisting lateral ground loads. Underpins and lining walls will be designed to support the surcharge from the soil & neighbouring buildings.

It is important to note that vertical wall movement related to underpinning is not defined by the CIRIA C580 / C760 data. Instead, the short-term settlement will be controlled by movements occurring during the underpin construction process.

On this basis the XDISP analysis considers both 'excavation in front a high stiffness wall in stiff clay' (CIRIA C760 Fig. 6.15(a)) (4) and Inst. of contiguous bored pile wall in stiff clay (CIRIA C760 Fig. 6.8b (4)) to simulate the effects from the underpinning adjacent to No. 12 Fordington Road. The combined cumulative movements resulting from the wall installation (which includes the underpinning) and basement excavation have been used to carry out an

assessment of the likely damage to adjacent properties as a conservative approach. The model also includes modelling of the proposed contiguous piled wall on other sides of the proposed basement.

Where appropriate the basement has been split into two polygons in XDISP to replicate the basement as a whole. In accordance with guidance from Oasys (<https://www.oasys-software.com>) and to avoid re-entrant corners, no movements have been modelled to those sides of the excavations that form attachments within the centre of the proposed basement but cannot be eliminated.

For the purposes of the XDISP model any existing lower ground floors beneath adjacent buildings have been ignored in modelling for conservatism.

Building Damage Assessment

The building damage assessment has been carried out on the relevant adjacent structures, as detailed in **Figure 4.3**.

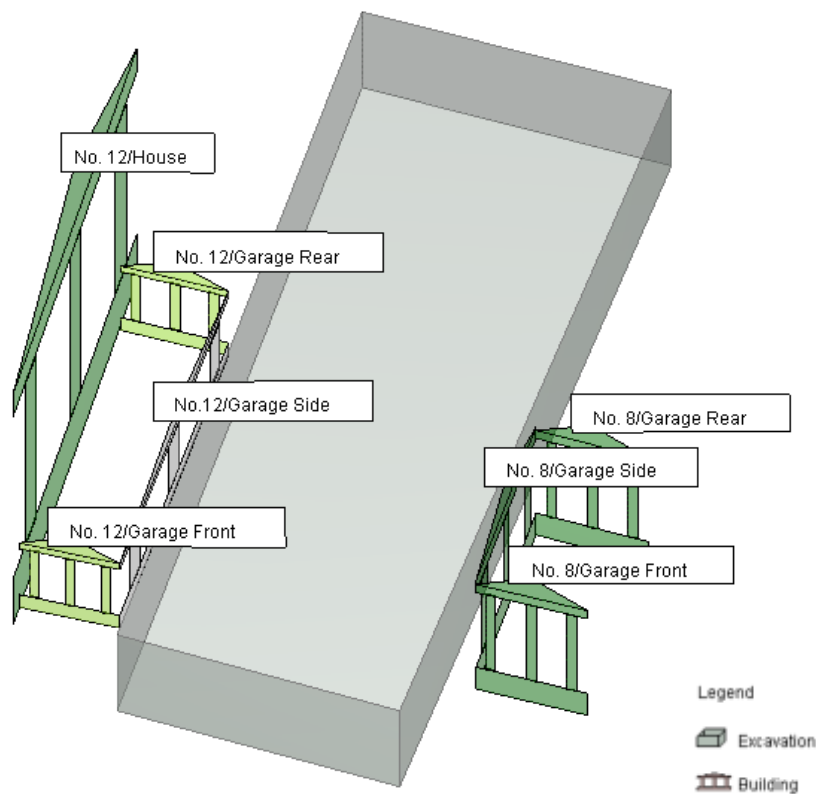


Figure 4.3: 3D graphic displaying Neighbouring Structures and XDISP Modelling

Tensile strains induced within the building walls have been evaluated based on the deflection ratios Δ/L and horizontal extension mechanisms estimated from the analyses. The assessment considers the well-established Burland (1977) (9) damage classification method, as presented and summarised in **Figure 4.4** and **4.5** below. This method involves a relatively simple but robust means of assessment, which is widely adopted and is considered to comprise an industry standard/best practice basis for impact assessments of this typology.

Potential damage categories are directly related to the tensile strains induced by the proposed construction stages, arising from a combination of direct tension, and bending induced tensile mechanisms.

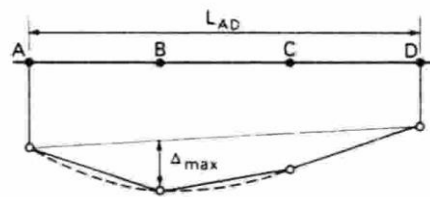


Figure 4.4: Definition of relative deflection Δ and deflection ratio Δ/L

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ϵ_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	<u>Fine cracks that can easily be treated during normal decoration.</u> Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	<u>Cracks easily filled. Redecoration probably required.</u> Several slight fractures showing inside of building. Cracks are visible externally and <u>some repointing may be required externally</u> to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	<u>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.</u> Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	<u>Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.</u> Windows and frames distorted, floor 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	<u>This requires a major repair involving partial or complete rebuilding.</u> Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Figure 4.5: Building damage classification – relationship between category of damage and limiting strain ϵ_{lim} (After Burland et al. 1977 (9), Boscardin and Cording 1989 (10), and Burland 2001 (11))

Results

A building impact/damage assessment has been undertaken, assuming the existing buildings walls to behave as equivalent beams subject to a combination of bending, shear, and axial extension/compression mechanisms, resulting from greenfield ground movements evaluated.

On the basis of the available information the predicted level of damage to the adjacent and nearby properties arising from the excavation of the basement at 10 Fordington Road is negligible to very slight, as defined in **Figure 4.4**.

Table 4.2. *Evaluated Damage categories from XDISP.*

Wall(s)* (See Fig. 4.1)	Details	Damage Category	
Wall 1 – No. 12 Garage Side	Shares party wall with No. 10	***	Negligible
Wall 2 - No. 12 Garage Front	Front of garage which adjoins No. 10	1	Very Slight
Wall 3 - No. 12 Garage Rear	Rear of garage which adjoins No. 10	1	Very Slight
Wall 4 - No. 12 Side (House)	Main House wall of No. 10	0	Negligible
Wall 5 - No. 8 Garage front	Front of garage 1m from to No. 10	0	Negligible
Wall 6 - No. 8 Garage side	Side of garage 1m from to No. 10	0	Negligible
Wall 7 - No. 8 Garage rear	Side of garage 1m from to No. 10	0	Negligible

***Wall section has damage categories calculated which are less than 'negligible' as wall will be underpinned during the works.

5 CONCLUSIONS

A ground movement assessment has been carried out for 10 Fordington Road, London to assist with pre-planning document submissions to the London Borough of Haringey.

Providing that appropriate consideration is given to the detailed design of the basement in order to limit future movement, that good workmanship and construction sequences are used with appropriate support during excavations and that groundwater management is employed, then the proposed basement construction is unlikely to cause significant damage to the surrounding structures. the predicted level of damage to the adjacent and nearby properties arising from the excavation of the basement at 10 Fordington Road is negligible to very slight.

Ground water has been recorded above the base of the proposed basement at depths between 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD). This groundwater level is perceived to be a localised groundwater level within the weathered London Clay perched on the underlying essentially impermeable unweathered London Clay soils below.

Given the cohesive nature and non-aquifer status of the London Clay, any minor inflows should be suitably controlled by sump pumping and it is concluded that the proposed basement would not present an effective barrier to flow or impact upon groundwater sensitive features. However, it is considered prudent to continue monitoring the existing standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations. The main contractor should provide details of how they intend to control the perched groundwater and maintain the stability of excavations.

A specification for movement monitoring should be incorporated into the final construction scheme for the proposed development to monitor the adjacent properties and establish the extent of any future potential movement to the building. Any temporary and permanent works should be designed to limit eventual movement.

A geotechnical/structural review of the underpinning method should be undertaken to ascertain the requirements for stability of the walls in the long term with consideration of likely earth pressures and any potential live loading behind the walls.

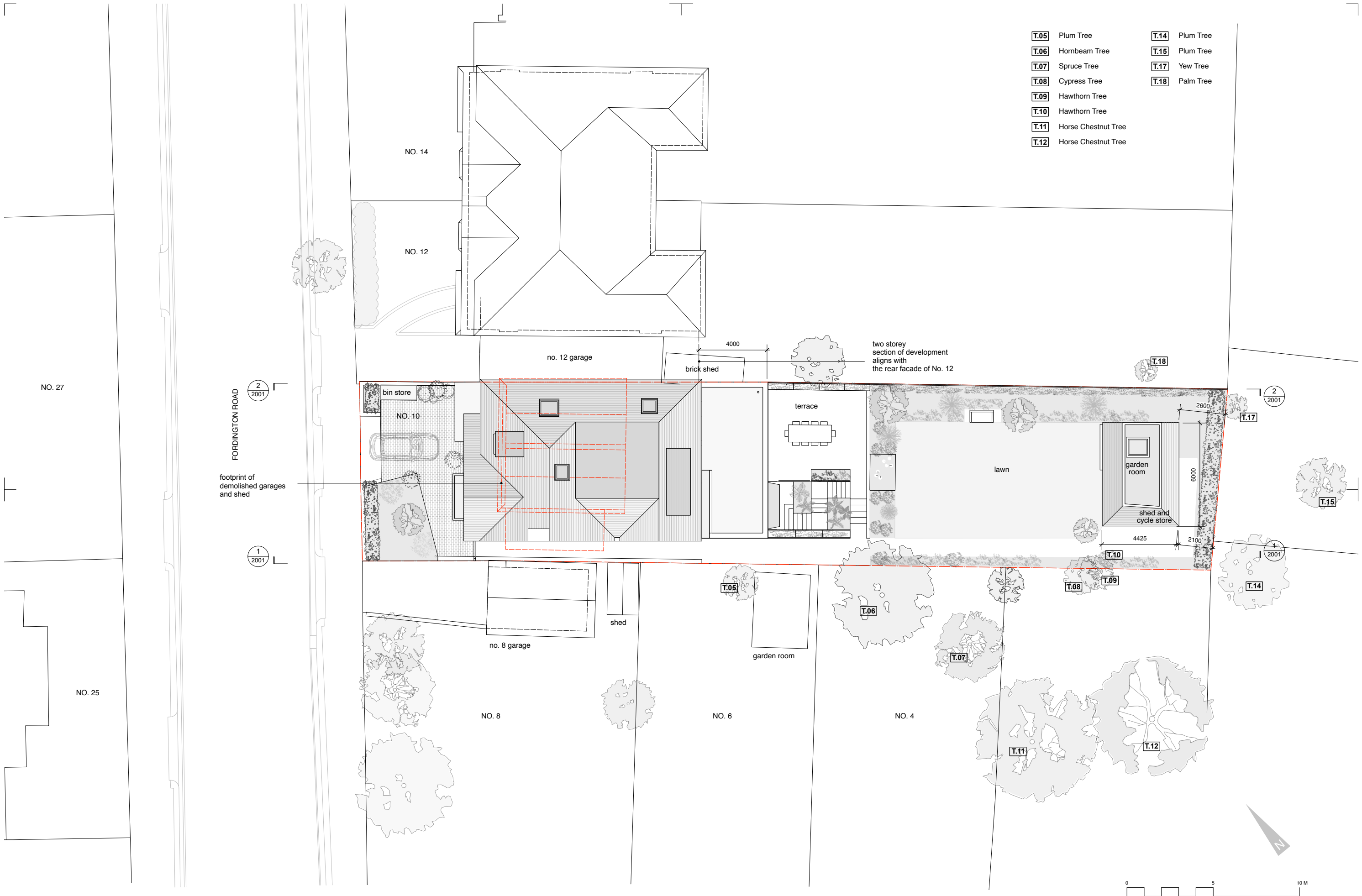
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7 APPENDICES

Appendix A

Proposed Plans



no. date revision			no. date revision			no. date revision			project title - client			drawing title			scale		
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project title - client

**10 Fordington Road,
London N6 4TJ**

John Attree

drawing status

Stage 3 Planning

drawing title

Proposed Block Plan

project number

2010

drawing no.

10A1002

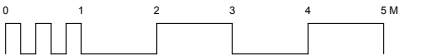
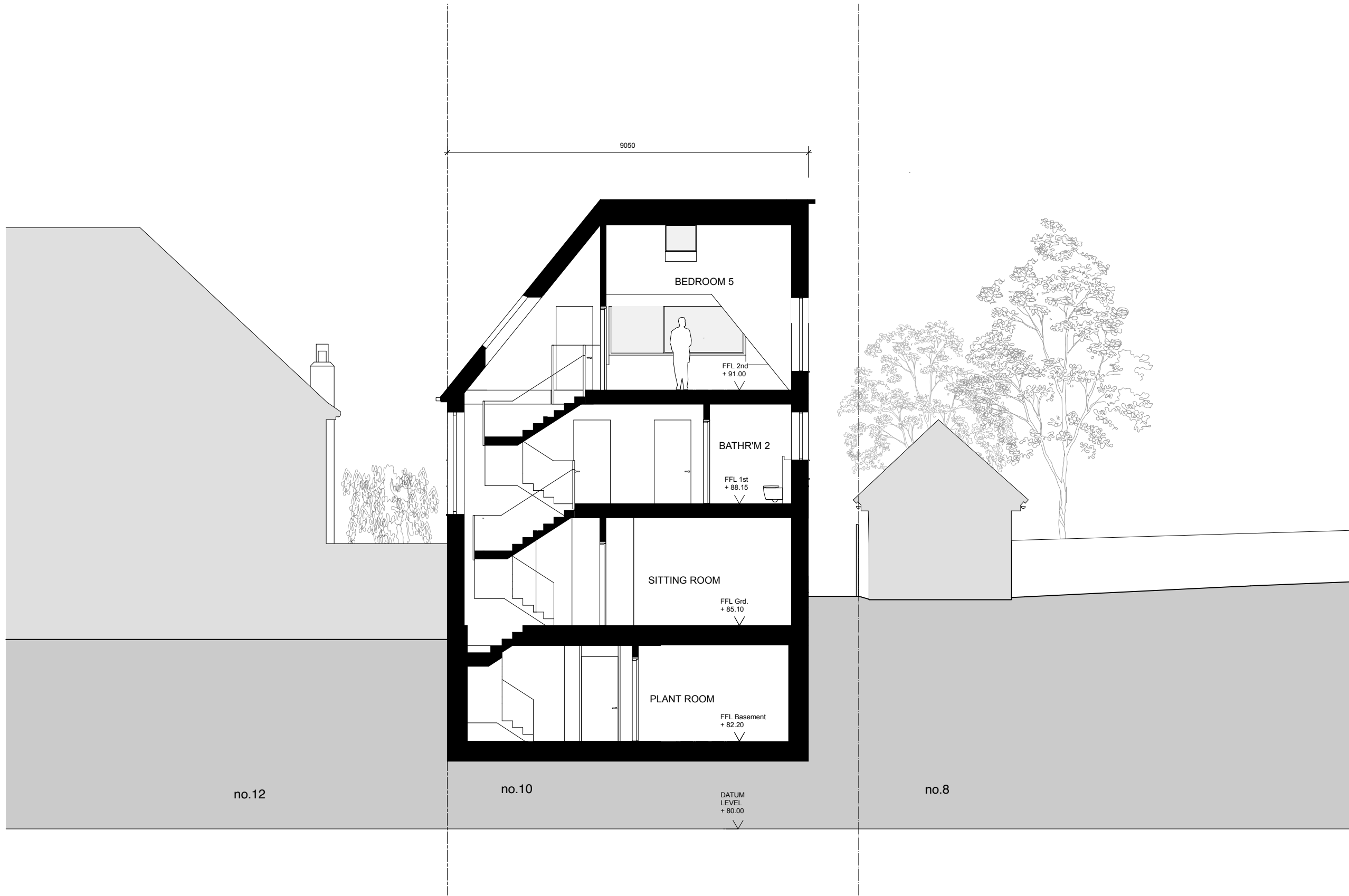
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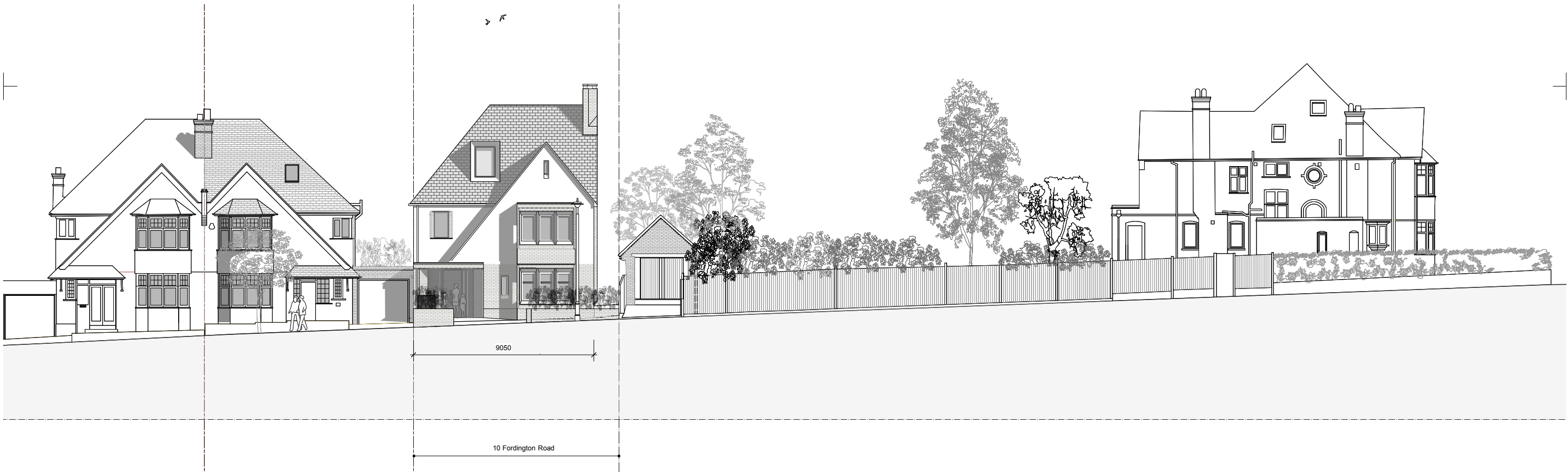
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Stage 3 Planning		2010		10A2003	
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Appendix B Existing Plans

- T.01Plum Tree

T.02Pear Tree

T.03Apple Tree

T.04Pear Tree

T.05Plum Tree

T.06Hornbeam Tree

T.07Spruce Tree

T.08Cypress Tree

T.09Hawthorn Tree
- T.10Hawthorn Tree

T.11Horse Chestnut Tree

T.12Horse Chestnut Tree

T.13Plum Tree

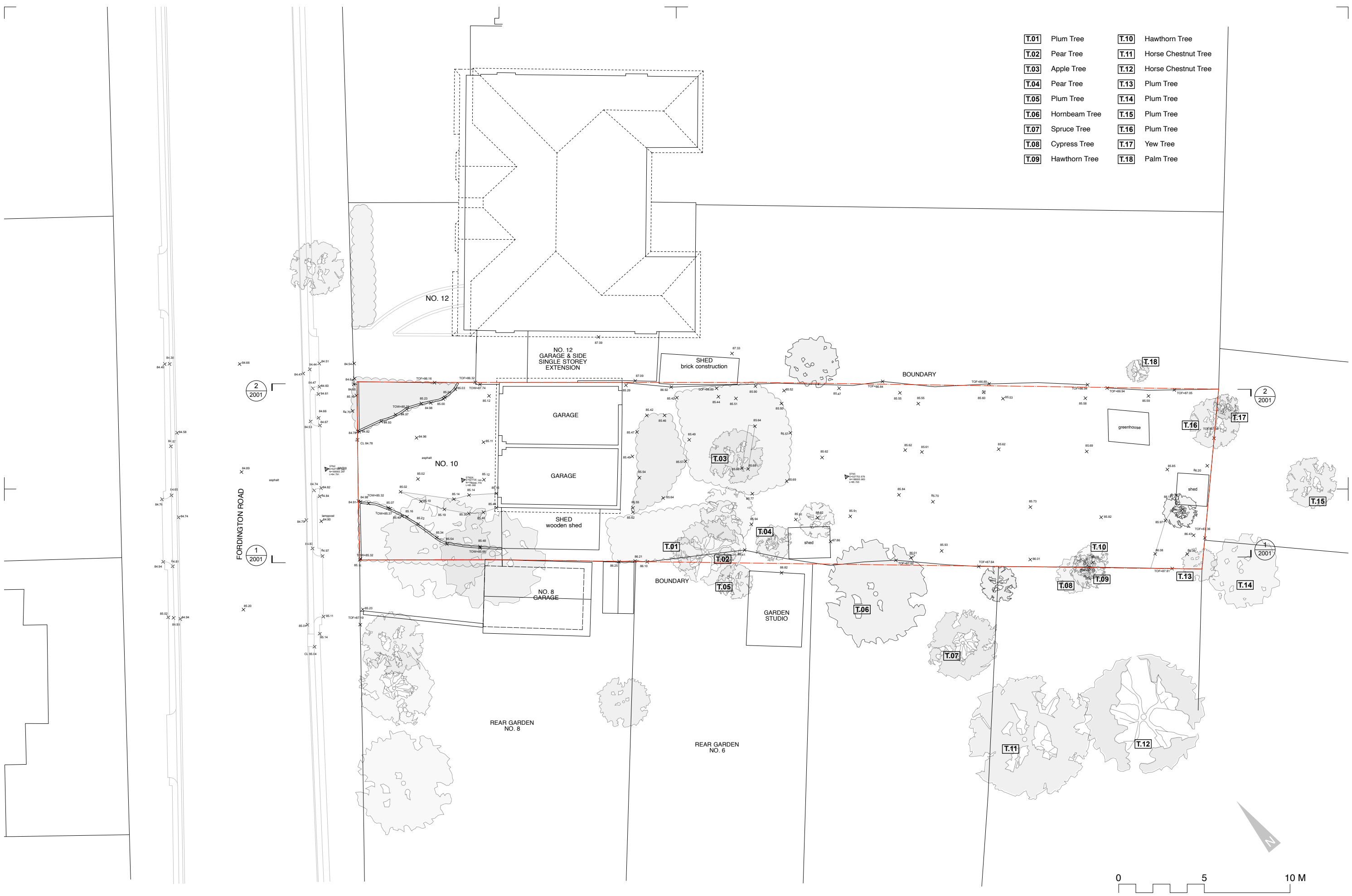
T.14Plum Tree

T.15Plum Tree

T.16Plum Tree

T.17Yew Tree

T.18Palm Tree

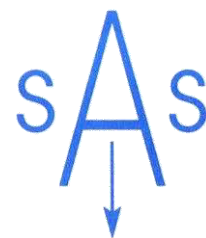




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Appendix C

SAS Ltd Ground Investigation Report



Factual Report on a **GEOTECHNICAL GROUND INVESTIGATION**

Ref: 24/37849-1 | Date: February 2024

**10 Fordington Road
London
N6 4TJ**

Prepared for:
Simon & Sheila Fox

DOCUMENT CONTROL

<i>Project</i>	10 Fordington Road, London, N6 4TJ
<i>Document Type</i>	Factual Report on a Geotechnical Ground Investigation
<i>Document Reference</i>	SAS 24/37849-1
<i>Document Status</i>	FINAL
<i>Revision</i>	0
<i>Changes</i>	-
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Checked

Author



Jim Warren
MRSC

Managing Director



Thomas Murray
BSc (Hons) MSc FGS

Director - Geotechnical

Reg. Office: Units 14 +15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA
Business Reg. No. 2255616

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APPENDIX A

BOREHOLE LOGS

APPENDIX B

LABORATORY TEST, RISING HEAD TEST & GROUNDWATER MONITORING DATA

1.0 Introduction

1.1 Outline and Limitations of Report

At the request of Simon & Sheila Fox, a ground investigation was carried out in connection with a proposed basement development at the above site. A Geotechnical Desk Study is presented under a separate cover in Site Analytical Services Limited Report Reference 24/37849, dated February 2024.

The information was required for the design and construction of foundations and infrastructure for the proposed development at the existing site, which includes the demolition of the existing garages and shed, and erection of a residential 3-storey dwelling (plus excavation to form a basement level).

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 Site Details

(National Grid Reference: TQ 277 889)

2.1 Site Location

The site is located on the north-eastern corner of the intersection between Fordington Road and The Drive, which is approximately 100m north-west of Woodside Avenue. The site is situated in London, at approximate postcode N6 4TJ. It is bound by residential properties to the north and to the south-east, with similar properties opposite on the other side of Fordington Road to the south and to the west.

The site is rectangular in shape covers an approximate area of 0.06 Hectares with the general area being under the authority of the London Borough of Haringey.

2.2 Published Geology

The Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by the London Clay Formation at depth.

3.0 Scope of Work

3.1 Site Works

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one rotary percussive borehole to a depth of 15.00m below ground level (Borehole 1).
- The drilling of one continuous flight auger borehole to a depth of 10.00m below ground level (Borehole 2).
- The installation of groundwater monitoring standpipes to a depth of up to 9.00m in Boreholes 1 and 2, together with two return monitoring visits.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the exploratory holes.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.

3.2 Ground Conditions

The approximate locations of the exploratory holes are illustrated on the site investigation plan, Figure 1 below.

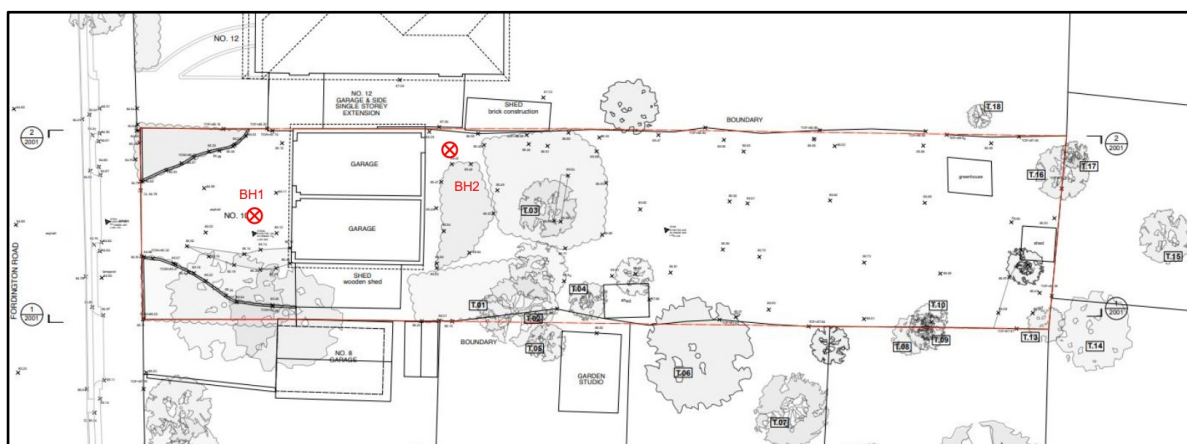


Figure 1. Site Investigation Plan

The boreholes were completed at existing ground level and revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 0.70m in thickness resting on the London Clay Formation at depth.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Level to top of strata (mOD)	Depth to base of strata (mbgl)	Level to base of strata (mOD)	Description
Made Ground	0.00	85.30 - 85.00	0.45 -0.70	84.85 – 84.30	Tarmac & concrete / Grass over brown silty sandy clay with brick and concrete fragments
London Clay Formation	0.45 - 0.70	84.85 – 84.30	15.00 (max depth of BH1)	75.30 – 70.00	Stiff silty CLAY containing partings of silty fine sand.

Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered in either Borehole 1 or 2 and the material remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Groundwater was encountered at respective depths of 1.63m below ground level (83.37mOD) and 1.56m below ground level (83.74mOD) in Boreholes 1 and 2 after a period of approximately three to four weeks.

Given the presence of a non-aquifer below the site it is likely that the groundwater recorded within these soils relates to perched water within the Made Ground and is recharged via intermittent seepages from surface water associated with weather conditions rather than any large-scale subterranean groundwater flow. As a result, the impact on excavations carried out at the site from this perched water is expected to be minimal.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (January and February 2024) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 In-Situ and Laboratory Tests

4.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A. SPT 'N' values range between 3 and 30.

The results of the tests are shown on the appropriate borehole records and summary sheets presented in Appendix A.

4.2 Undrained Triaxial Compression Test Results

Quick Undrained Triaxial Compression tests were conducted on six selected undisturbed 100mm diameter samples taken from Borehole 1. The results show the samples to be of medium, then high becoming very strength in accordance with BS 5930 (2015).

The results of the tests are presented on Table 1, contained in Appendix B.

4.3 In-Situ Tests

In predominantly cohesive soils, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930 (2015).

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

4.4 Classification Tests

Atterberg Limit tests were conducted on six selected samples taken from the cohesive portion of the natural soils in Boreholes 1 and 2 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

These are fine grained silty clay soils of high plasticity and as such generally have a low permeability and a medium to high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 34% and 43%, with three samples being above the 40% boundary between soils assessed as being of medium volume change potential and those assessed as being of high-volume change potential.

The results of the tests are presented on Table 2, contained in Appendix B.

4.5 Chemical Attack on Buried Concrete

Using the results contained in Appendix B, the following table provides the highest values encountered for the BRE SD1 Suite D specification and the equivalent DS and ACEC classes, based on a static groundwater:

Strata	pH	2:1 Water Soluble SO ₄ (g/l)	2:1 Water Soluble Chloride (mg/l)	2:1 Water Soluble Nitrate (mg/l)	Total Sulphate (%)	Magnesium (mg/kg)	DS Class	ACEC Class
London Clay Formation	7.8-8.8	2.64	65	<2.0	0.542	600	DS-3	AC-2s

Worst case DS and ACEC classes based on the BRE SD1 Suite D results

4.6 In-situ Rising Head Permeability Tests

In order to assess the soil infiltration characteristics of the natural superficial soils at the site, in-situ rising head permeability tests were carried out in Borehole 1, using the procedure recommended in BS 5930:2015.

The results of the in-situ permeability test indicated an apparent permeability or soil infiltration rate of 2.46×10^{-8} m/sec within Borehole 1. This soil infiltration rates lie within the range of published data of fissured and weather clays and are classed as being of very low permeability material with poor drainage characteristics.

The results are presented on the exploratory hole records, contained in Appendix B.

5.0 List of Appendices

Appendix A – Borehole Logs

Appendix B – Laboratory Test, Rising Head Test & Groundwater Monitoring Data

6.0 References

1. British Standards Institution, 2015. Code of practice for foundations, BS 8004, BSI, London.
2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London
3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London
4. British Standards Institution, Code of Practice for Site Investigations, BS5930: 2015, BSI, London
5. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London
6. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

APPENDIX A

Borehole Logs

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH1								
Boring Method ROTARY PERCUSSIVE		Casing Diameter 128mm cased to 0.00m			Ground Level (mOD) 85.00		Client SIMON & SHEILA FOX		Job Number 2437849								
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 1/2								
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water								
0.25 0.50 0.75	D1 D2 D3	DRY	DRY	0,1/1,0,1,1	84.97	0.03	MADE GROUND: Tarmac										
	84.90				0.10 (0.30)	MADE GROUND: Concrete											
	84.60				0.40 (0.30)												
1.00-1.45 1.00	SPT N=3 D4				DRY	DRY	1,1/1,2,2,2	84.30	0.70	MADE GROUND: Brown orange silty clay containing brick and concrete fragments							
1.50 2.00 2.50	D5 U1 D6							35 blows	(4.10)	Soft, brown orange silty CLAY							
	3.00-3.45 3.00											SPT N=7 D7	1,1/1,2,2,2	80.20	4.80	Firm, dark brown silty CLAY	
												3.50 4.00 4.50					
5.00-5.45 5.00	SPT N=11 D10							DRY	DRY	1,2/2,3,3,3	78.80		6.20	Stiff, medium grey silty CLAY containing partings of silty fine grained sand and occasional gypsum crystals			
6.00 7.00 7.50-7.95 7.50	U3 D11 SPT N=20 D12										65 blows	(3.80)					
	8.00 9.00														D13 U4	85 blows	
Remarks Groundwater was not encountered during boring/excavation S= Standard Penetration Test - Cone U= Undisturbed 100mm Diameter Sample D= Disturbed Sample											Scale (approx) 1:50	Logged By EW					
											Figure No. 2437849.BH1						

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH1	
Boring Method ROTARY PERCUSSIVE		Casing Diameter 128mm cased to 0.00m			Ground Level (mOD) 85.00		Client SIMON & SHEILA FOX		Job Number 2437849	
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 2/2	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
10.00	D14		DRY	4,5/5,6,6,7	75.00	10.00	Stiff, medium grey silty CLAY containing partings of silty fine grained sand and occasional gypsum crystals			
10.50-10.95 10.50	SPT N=24 D15									
11.00	D16									
12.00	U5		DRY	95 blows		(5.00)				
13.00	D17									
13.50-13.95 13.50	SPT N=30 D18									
14.00	D19		DRY	5,6/7,7,8,8						
15.00	U6									
Remarks Groundwater was not encountered during boring/excavation S= Standard Penetration Test - Cone U= Undisturbed 100mm Diameter Sample D= Disturbed Sample								Scale (approx)	Logged By	
								1:50	EW	
								Figure No. 2437849.BH1		

Standard Penetration Test Results

Job Number
2437849

Sheet

1 / 1

1 / 1

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Site Analytical Services Ltd.					Site 10 FORDINGTON ROAD, LONDON, N6 4TJ					Borehole Number BH1											
Installation Type Single Installation		Dimensions Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 128 mm			Client SIMON & SHEILA FOX					Job Number 2437849											
Location TQ277890			Ground Level (mOD) 85.00		Engineer					Sheet 1/1											
Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling															
			84.00	1.00	Bentonite Seal	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)						
											5 min	10 min	15 min	20 min							
						Groundwater Observations During Drilling															
						Date	Start of Shift					End of Shift									
							Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)					
						Instrument Groundwater Observations															
						Inst. [A] Type : Slotted Standpipe															
						Date	Instrument [A]			Remarks											
							Time	Depth (m)	Level (mOD)												
			76.00	9.00	Bentonite Seal																
						Instrument Groundwater Observations															
						Inst. [A] Type : Slotted Standpipe															
						Date	Instrument [A]			Remarks											
							Time	Depth (m)	Level (mOD)												
									75.00	10.00	General Backfill										
												Instrument Groundwater Observations									
Inst. [A] Type : Slotted Standpipe																					
Date	Instrument [A]			Remarks																	
	Time	Depth (m)	Level (mOD)																		
			70.00	15.00	General Backfill																
												Instrument Groundwater Observations									
						Inst. [A] Type : Slotted Standpipe															
						Date	Instrument [A]			Remarks											
							Time	Depth (m)	Level (mOD)												
						Remarks Lockable cover set in cement															

Site Analytical Services Ltd.							Site 10 FORDINGTON ROAD, LONDON, N6 4TJ		Borehole Number BH2			
Boring Method CONTINUOUS FLIGHT AUGER		Casing Diameter 100mm cased to 0.00m			Ground Level (mOD) 85.30		Client SIMON & SHEILA FOX		Job Number 2437849			
		Location TQ277890			Dates 11/01/2024		Engineer		Sheet 1/1			
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water			
0.25 0.50 0.75 1.00 1.00	D1				85.22	0.08 (0.37)	MADE GROUND: Grass over dark brown sandy topsoil					
	D2				84.85	0.45	MADE GROUND: Dark brown silty sandy clay containing brick and concrete fragments					
	D3						Stiff, brown orange silty CLAY					
1.50 1.50	D4 V1 78											
2.00 2.00	D5 V2 98											
2.50 2.50	D6 V3 115											
3.00 3.00	D7 V4 122							(4.15)				
3.50 3.50	D8 V5 140+											
4.00 4.00	D9 V6 140+											
4.50 4.50	D10 V7 140+											
5.00 5.00	D11 V8 140+							80.70		4.60	Stiff, dark brown grey silty CLAY containing partings of silty fine grained sand and occasional gypsum crystals	
6.00 6.00	D12 V9 140+											
7.00 7.00	D13 V10 140+											
8.00 8.00	D14 V11 140+									(5.40)		
9.00 9.00	D15 V12 140+											
10.00 10.00	D16 V13 140+											
	D17 V14 140+							75.30		10.00		
Remarks V= Vane Test - Results in kPa D= Disturbed Sample Groundwater was not encountered during boring/excavation								Scale (approx)	Logged By			
								1:50	EW			
								Figure No. 2437849.BH2				

Site 10 FORDINGTON ROAD, LONDON, N6 4TJ	Borehole Number BH2
Client SIMON & SHEILA FOX	Job Number 2437849
Engineer	Sheet 1/1

[illegible]

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APPENDIX B

Laboratory Test, Rising Head Test & Groundwater Monitoring Data

UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No.	Moisture Content (%)	Bulk Density (Mg/m ³)	Lateral Pressure (kN/m ²)	Compressive Strength (kN/m ²)	Cohesion (kN/m ²)	Depth (m)
BH1	32	1.93	50	130	65	2.25
	29	1.97	80	177	89	4.25
	30	1.96	120	340	170	6.25
	30	1.96	180	380	190	9.25
	30	1.98	240	371	186	12.25
	27	1.97	300	380	190	15.25

Table 1

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

BH/TP No.	Depth (m)	Natural Moisture (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 μ m (%)	Modified Plasticity Index (%)	Class
BH1	1.00	28	69	26	43	100	43	CH
	2.50	31	64	27	37	100	37	CH
	3.50	31	68	27	41	100	41	CH
BH2	0.75	20	56	22	34	100	34	CH
	1.50	28	68	27	41	100	41	CH
	3.00	30	64	27	37	100	37	CH

Table 2

GROUNDWATER MONITORING

GROUNDWATER MONITORING RECORD				
Date	Weather Conditions		Ground Conditions	Temperature (°C)
23/01/2024	Raining		Wet	8.0
Monitoring Point Location	Depth to water (mBGL)	Depth to water (mOD)	Depth to Base of well (mBGL)	Depth to Base of well (mOD)
BH1	1.65	83.35	9.11	75.89
BH2	1.69	83.61	8.47	76.83

Table 3

GROUNDWATER MONITORING RECORD				
Date	Weather Conditions		Ground Conditions	Temperature (°C)
06/02/2024	Cloudy		Dry	12.0
Monitoring Point Location	Depth to water (mBGL)	Depth to water (mOD)	Depth to Base of well (mBGL)	Depth to Base of well (mOD)
BH1	1.63	83.37	9.11	75.89
BH2	1.56	83.74	8.47	76.83

Table 3a

Site Analytical Services Ltd.

Site
10 FORDINGTON ROAD, LONDON, N6 4TJ

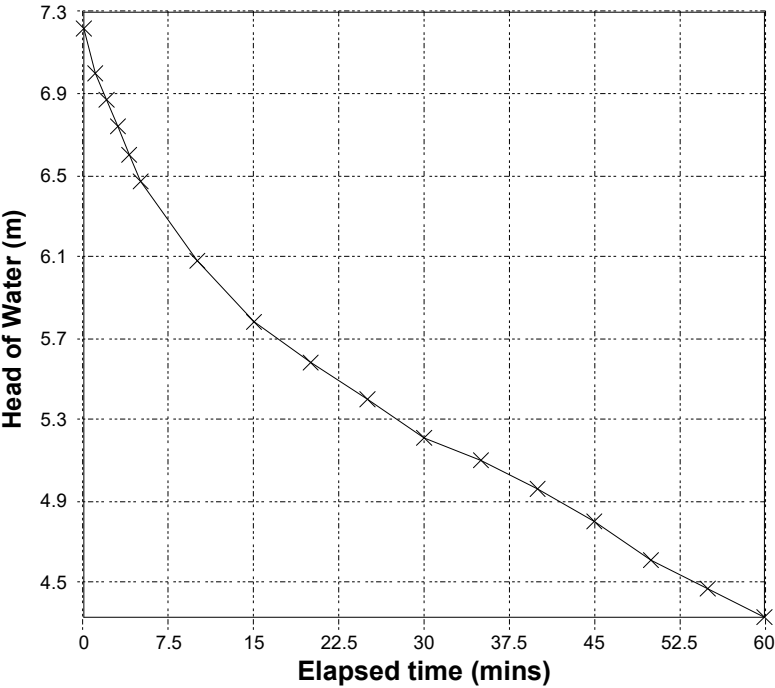
Borehole
Number
BH1

In Situ Permeability Type Rising Head	Test No. 1	Ground Level (mOD) 85.00	Client SIMON & SHEILA FOX	Job Number 2437849
	Location TQ277890	Dates 11/01/2024	Engineer	Sheet 1/1

Height of Standpipe above ground level:	0.00 m
Depth to Base of Filter:	8.00 m bgl
Depth to Top of Filter:	1.00 m bgl
Depth to equilibrium water level:	1.54 m btoc
Test Length L:	7.00 m
Diameter of Test Length D:	0.05 m
Area of Test Section:	0.0020 m2
Intake Factor F: (after BS 5930, figure 7)	8.9405

PERMEABILITY (after Hvorslev, 1951)
General Approach
H1 selected at t= 6.04 m (=t1 = 596.4 secs)
H2 selected at t= 4.312 m (=t2 = 3610.2 secs)
k = 2.46E-08 ms-1

Elapsed time (mins)	Depth to water (m btoc)	Head of Water, H (m)	Ht / Ho
0.00	8.760	7.220	1.000
1.00	8.540	7.000	0.970
2.00	8.410	6.870	0.952
3.00	8.280	6.740	0.934
4.00	8.140	6.600	0.914
5.00	8.010	6.470	0.896
10.00	7.620	6.080	0.842
15.00	7.320	5.780	0.801
20.00	7.120	5.580	0.773
25.00	6.940	5.400	0.748
30.00	6.750	5.210	0.722
35.00	6.640	5.100	0.706
40.00	6.500	4.960	0.687
45.00	6.340	4.800	0.665
50.00	6.150	4.610	0.639
55.00	6.010	4.470	0.619
60.00	5.870	4.330	0.600



Remarks

Key: bgl = Below Ground Level btoc = Below Top of Casing

**Services**

Site Analytical Services Ltd
Units 14 -15
River Road Business Park
33 River Road
Barking
Essex
IG11 0EA

t: 0208 5948134
f: 0208 5948072
e: SAS -

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

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

Analytical Report Number : 24-78394

Project / Site name:	10 Fordington Road London N6 4TJ	Samples received on:	16/01/2024
Your job number:	24-37849	Samples instructed on/ Analysis started on:	16/01/2024
Your order number:	13006	Analysis completed by:	22/01/2024
Report Issue Number:	1	Report issued on:	23/01/2024
Samples Analysed:	4 soil samples		

Izabela Wójcik
Signed:
Izabela Wójcik
Senior Reporting Specialist
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: 24-78394

Project / Site name: 10 Fordington Road London N6 4TJ

Your Order No: 13006

Lab Sample Number				2929112	2929113	2929114	2929115
Sample Reference				BH1	BH1	BH2	BH2
Sample Number				D5	D11	D6	D12
Depth (m)				1.50	7.00	2.00	5.00
Date Sampled				11/01/2024	11/01/2024	11/01/2024	11/01/2024
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	17	19	20	20
Total mass of sample received	kg	0.001	NONE	1.9	1.8	1.9	1.8
Whole Sample Crushed							
		N/A	NONE	Crushed	Crushed	Crushed	Crushed

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.8	7.8	8.8
Total Sulphate as SO ₄	%	0.005	MCERTS	0.028	0.206	0.17	0.542
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0839	0.555	0.556	2.64
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.3	46	34	65
Total Sulphur	%	0.005	MCERTS	0.016	0.64	0.065	0.602
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	57	170	200	600
---------------------------	-------	---	------	----	-----	-----	-----

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



Analytical Report Number : 24-78394
Project / Site name: 10 Fordington Road London N6 4TJ

* 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 *
2929112	BH1	D5	1.5	Brown clay.
2929113	BH1	D11	7	Brown clay.
2929114	BH2	D6	2	Brown clay.
2929115	BH2	D12	5	Brown clay.

Analytical Report Number : 24-78394

Project / Site name: 10 Fordington Road London N6 4TJ

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
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
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
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
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-PL	D	NONE
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
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-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 or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

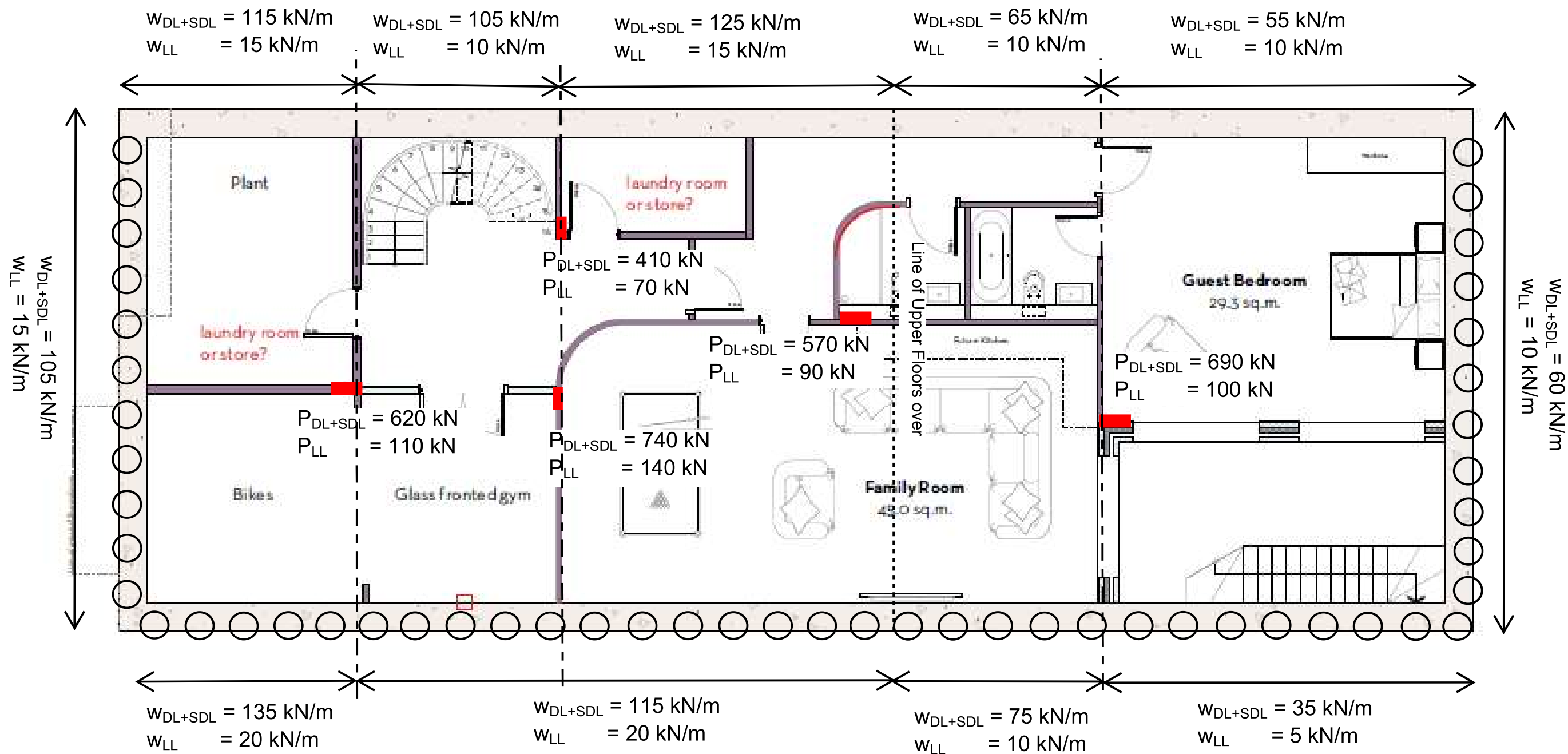
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.

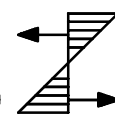
Appendix D Structural Loadings



NOTES

- DO NOT SCALE FROM THIS DRAWING
- LOADINGS SHOWN DO NOT INCLUDE THOSE FROM NEIGHBOURING STRUCTURES.
- POINT LOADS FROM COLUMNS DO NOT INCLUDE WEIGHT OF PAD FOOTING/ PILECAPS UNDER.

G.D.C.
Partnership
Consulting Engineers



THIRD FLOOR
29 LONDON ROAD
BROMLEY
KENT, BR1 1DG (UK)
Tel: +44(0)20 8460 2160
Fax: +44(0)20 8313 3122
www.gdcpartnership.co.uk

Project FORDINGTON ROAD
Title PROPOSED DEVELOPMENT LOADINGS

Scale NTS

Drn WN

Drg. No.

Date 26.01.24

Chkd. DSM

9198-GDC-00-XX-SK-S-0003

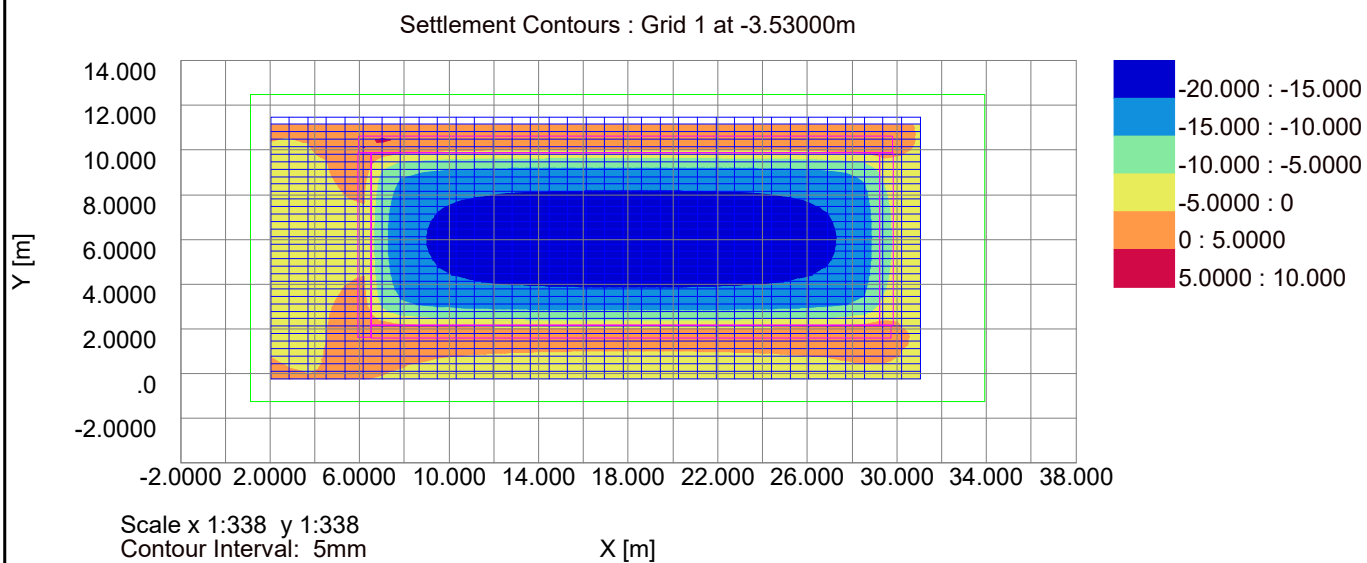
Appd.
DSM

Rev.
P01

Appendix E

Oasys PDisp Input and Output

Job No.	Sheet No.	Rev.
085156		
Drg. Ref.		
Made by AS	Date	Checked Date



Appendix F

Oasys XDisp Input and Output

Job No.	Sheet No.	Rev.
085156		
Drg. Ref.		
Made by AS	Date 09-Feb-2024	Checked Date

Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 1mm)

