39a Fitzjohn's Avenue
London
NW3 5JY

Ground Investigation &
Basement Impact Assessment

39 Fitzjohn's Avenue Limited

February 2024

J23003
Rev 1

Report prepared by

Matt Legg BSc MSc FGS
Senior Geotechnical Engineer

Report checked and approved for issue by

Steve Branch BSc MSc CGeol FGS FRGS
Managing Director

Rev No	Status	Revision Details	Date	Approved for Issue
0	Final		12 December 2023	
1	Final	Updated development details	7 February 2024	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the report project engineer at the office indicated or to Steve Branch in our main Herts office.

✓	Hertfordshire	tel 01727 824666
	Nottinghamshire	tel 01509 674888
	Manchester	tel 0161 209 3032

Contents

Executive summary

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

Brief

This report describes the findings of a ground investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of 39 Fitzjohn's Avenue Limited, with respect to the partial demolition of the existing building and the subsequent construction of a new four-storey property with a single level basement below the building footprint and out below part of the rear garden. The building will be divided into two maisonettes and two townhouses. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions, to provide an indication of the presence of contamination and to provide information to assist with the design of retaining walls and foundations. The report also includes information required to comply with London Borough of Camden Planning Guidance (CPG) Basements, relating to the requirement for a Basement Impact Assessment (BIA), including a ground movement analysis (GMA).

Summary of Site History

The earliest historical map studied, a historical town plan dated 1850, provides little detail but indicates that the site was undeveloped with none of the existing immediate surrounding road network in existence. The earliest OS map, dated 1871, provides more detail and shows the site to be undeveloped, although some form of track or path bisected the centre of the site in a north-south orientation, whilst a pond that was fed by a stream was present in the eastern half of the site. Reference to relevant literature indicates that the stream was a tributary of the River Tyburn. The 1871 map also indicates that the southern Belsize Railway Tunnel (Tunnel 1) was established by that time, and online information indicates that the tunnel was opened in 1867. By 1896, essentially the existing road network had been established, with No 39 Fitzjohn's Avenue constructed on the neighbouring site to the south, with a pair of semi-detached properties to the north. The site however remained undeveloped, although the former tributary and the associated pond on the site are no longer shown. The presence of an air shaft to the northeast of the site and an additional tunnel portal to the southwest, suggests that the northern Belsize Railway Tunnel (Tunnel 2) had been established by that time. Online information indicates that the tunnel was completed in 1884.

The site remained unchanged until some time between 1935 and 1946, when what is thought to be the existing building was constructed, along with the associated tennis court.

Ground conditions

The investigation has encountered the expected ground conditions, in that below a nominal to moderate thickness of made ground, the London Clay Formation extends to the full depth of the investigation. Made ground was encountered to depths of between 0.30 m (76.89 m OD) and 0.80 m (76.26 m OD) and generally comprised a matrix of dark brown, greyish brown silty sandy gravelly clay and gravelly sand with rootlets, ash and fragments of brick, concrete and clinker. The London Clay comprised an initial weathered horizon comprising firm becoming stiff high strength fissured brown and light brown mottled orange-brown and grey silty slightly sandy clay with selenite crystals and partings and pockets of fine orange-brown sand. In Borehole No 1, the initial horizon also noted contain gravel to a depth of 2.00 m (74.74 m OD), indicating the clay to have been naturally re-worked, such that these soils in that location are considered to form Head Deposits.

The initial horizon extended to depths of between 3.10 m (73.96 m OD) and 5.00 m (71.74 m OD), whereupon stiff high strength fissured dark grey and brownish grey silty clay with mica and occasional fine partings of pale brownish grey and pale grey fine sand and silt was proved to the full depth investigated, of 15.00 m (61.74 m OD).

Roots and rootlets were encountered throughout the initial clay horizons to depths of between 1.40 m and 3.00 m, with the clay in Borehole No 1 noted to be very stiff and of very high strength, and has been assessed as desiccated to a depth of 2.00 m (74.74 m OD). Groundwater was not encountered during the investigation.

Contamination testing has identified elevated concentrations of total PAH and a number of individual PAH compounds, in addition to fibres of amosite asbestos in a single sample of made ground.

Recommendations

Formation level for the basement is likely to be within the stiff clay of the London Clay at a depth of 3.50 m (73.30 m OD). The London Clay is of low permeability, which will not typically support a continuous "water table" or significant groundwater flow. Therefore, significant groundwater inflows are not generally expected to be encountered in the basement excavation. The London Clay did, however, initially comprise a naturally reworked horizon, which was typically slightly sandy and locally slightly gravelly, which could potentially give rise to a slight increase in permeability. Minor and localised groundwater inflows may therefore be encountered, in addition to perched groundwater from the overlying made ground. Any such inflows or seepages should be adequately dealt with through sump pumping, although it would be prudent for the chosen contractor to have a contingency plan in place to deal with more significant or prolonged inflows as a precautionary measure. In the absence of significant groundwater inflows and the underlying clay soils, the use of a contiguous bored piled wall and cast insitu reinforced concrete retaining walls is considered suitable.

The use of a basement raft is considered a suitable foundation solution, although further analysis will be required at detailed design stage.

Further contamination sampling and testing should be undertaken to determine the extent of the contamination encountered, although it is likely that in areas of proposed soft landscaping a suitable thickness of made ground will need to be removed to allow the placement of a 300 mm thickness of clean subsoil and topsoil. Site workers should adopt suitable precautions when handling soil, particularly with respect to the presence of asbestos.

Basement Impact Assessment

The BIA has not indicated any concerns with regard to the effects of the proposed basement on the site and surrounding area. It has been concluded that the impacts identified can be mitigated by appropriate design and standard construction practice. The ground movement analysis and building damage assessment has indicated that the basement is not expected to cause unacceptable movements or levels of damage to surrounding sensitive structures, including the Network Rail railway tunnels below the site.

Part 1: Investigation Report

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

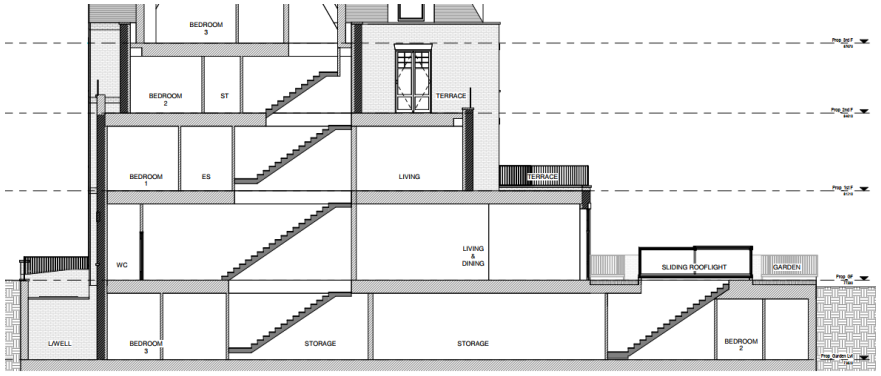
1.0 Introduction

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by 39 Fitzjohn's Avenue Limited to carry out a desk study and ground investigation at 39a Fitzjohn's Avenue, London NW3 5JY. Price and Myers are the consulting structural engineers for the project and Buro Four are the project managers.

The site was investigated as part of a wider development site, which also includes the neighbouring plot of no 46 Maresfield Gardens to the west. This report also forms part of a Basement Impact Assessment (BIA), which has been carried out in accordance with guidelines from the London Borough of Camden (LBC) in support of a planning application.

1.1 Proposed Development

It is understood that it is proposed to partially demolish the existing building and subsequently construct a four-storey building with a single level basement below the building footprint and extending out below the rear garden. The building will be divided into two maisonettes and two townhouses, with off-street parking along the eastern elevation and private and communal garden areas across the west of the site.



As shown on the proposed cross-section, the basement is proposed to have a formation level of about 73.30 m OD, requiring an excavation of about 3.50 m.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site with respect to previous contaminative uses;
- to provide an assessment of the risk of encountering UXO;
- to confirm the ground conditions and their engineering properties;
- to use the above information to provide recommendations with respect to the design of suitable foundations and retaining walls;
- to determine the configuration of existing foundations;
- to provide a preliminary indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database;
- a review of readily available geology maps;
- the commissioning of preliminary and detailed UXO risk assessments from 1st Line Defence, a UXO specialist, and

- a walkover survey of the site carried out in conjunction with the fieldwork.

Following the desk study, an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- a single borehole advanced to a depth of 15 m using a cable percussion drilling rig;
- an additional two boreholes advanced to a maximum depth of 5.45 m using an opendrive sampling rig;
- standard penetration tests (SPTs) carried out at regular intervals within the boreholes to provide quantitative data on the strength of the soils;
- the installation of a groundwater monitoring standpipe in the cable percussion borehole to a depth of 6.00 m and a single monitoring visit undertaken to date;
- four manually excavated trial pits to expose existing foundations;
- testing of selected soil samples for contamination and geotechnical purposes; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

This report includes a contaminated land assessment which has been undertaken by a suitably qualified and competent professional in accordance with the methodology presented by the Environment Agency in their Land contamination risk assessment (LCRM)[1] published 19 April 2021. This involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. Risk management is divided into three stages; Risk Assessment, Options Appraisal and Remediation, and each stage comprises three tiers. The Risk Assessment stage includes preliminary risk assessment (PRA), generic quantitative risk assessment (GQRA) and detailed quantitative risk assessment (DQRA)and this report includes the PRA and GQRA.

The exploratory methods adopted in this investigation have been selected on the basis of the constraints of the site including but not limited to access and space limitations, together with any budgetary or timing constraints. Where it has not been possible to reasonably use an EC7 compliant investigation technique a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

1.3.1 Basement Impact Assessment

The work carried out includes a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment). These assessments form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG[2] and their Guidance for Subterranean Development[3] prepared by Arup (the "Arup report") in accordance with Policy A5 of the Camden Local Plan 2017. The aim of the work is to provide information on surface water, groundwater and land stability and in particular to assess whether the development will affect neighbouring properties or groundwater movements and whether any identified impacts can be appropriately mitigated by the design of the development.

1.3.2 Qualifications

The land stability element of the Basement Impact Assessment (BIA) has been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng), member of the Institution of Civil Engineers (MICE), and Fellow of the Geological Society (FGS) who has over 20 years' specialist experience in ground engineering. The subterranean (groundwater) flow assessment has been carried out by Nick Mannix, MSc in Hydrogeology, Chartered Geologist (CGeol) and Fellow of the Geological Society of London (FGS). The surface water and flooding assessment has been carried out by Rupert Evans, a hydrologist with more than ten years consultancy experience in flood risk assessment, surface water drainage schemes and hydrology / hydraulic modelling. Rupert Evans is a Chartered Environmentalist, Chartered Water and Environmental Manager and a Member of CIWEM.

The assessments have been made in conjunction with Steve Branch, a BSc in Engineering Geology and Geotechnics, MSc in Geotechnical Engineering, a Chartered Geologist (CGeol) and Fellow of the Geological Society (FGS) with some 30 years' experience in geotechnical engineering and engineering geology.

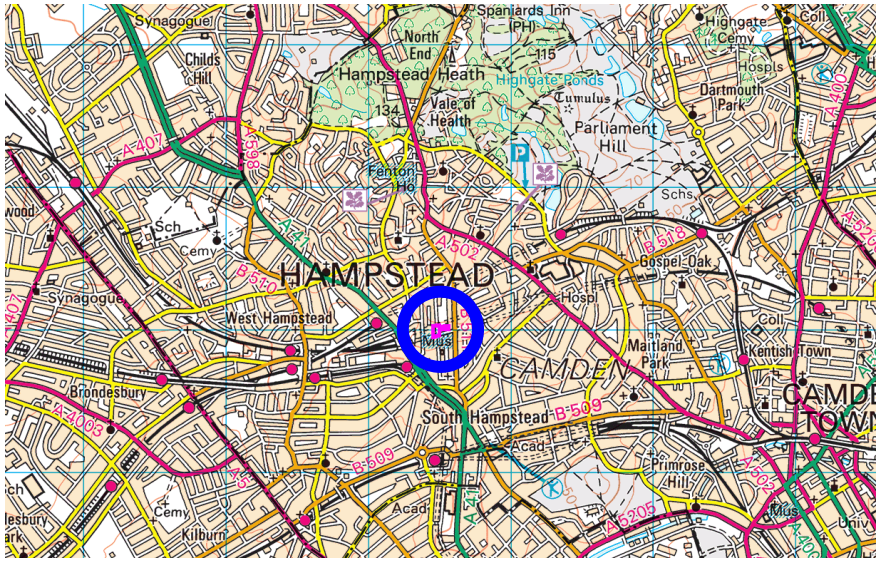
All assessors meet the qualification requirements of the Council guidance.

1 https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm
2 London Borough of Camden Planning Guidance CPG (January 2021) *Basements*
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

2.0 The Site

2.1 Site Description

The site is located in the London Borough of Camden, approximately 370 m to the northeast of Finchley Road London Underground station and 450 m east/southeast of Finchley Road & Frognal London Overground station. It fronts onto and is accessed from Fitzjohn's Avenue to the east and is bounded by the adjoining 39 Fitzjohn's Avenue to the south, by a vacant plot of land that is associated with the former house of No 46 Maresfield Gardens to the west and to the north by 43-45 Fitzjohn's Avenue, a four-storey property that is divided into a number of apartments, with a single storey annex to the rear that includes a single storey basement. The site may be additionally located by National Grid Reference 526544, 185016 and is shown on the location map below.



A site walkover was undertaken at the time of the fieldwork by a geotechnical engineer from GEA. The site forms a roughly rectangular shaped area with maximum dimensions of approximately 65 m east-west by 25 m north-south, and is occupied by No 39a Fitzjohn's Avenue, a three-storey brick-built building with a number of single storey elevations; it does not include any subterranean levels. It is understood that the building had previously been used as a care home, although was vacant at the time of the investigation, other than live-in guardians temporarily occupying the property for security arrangements.

The building is present across the eastern half of the site, along with a tarmac covered front driveway, whilst the western half of the site previously formed part of larger rear garden area shared with the neighbouring 39 Fitzjohn's Avenue. This part of the site was quite overgrown with weeds, shrubs and bushes, although mostly occupied by a tennis court. A number of semi-mature and mature deciduous trees are present along the boundaries of the site. Notable species include Silver Birch, Ash, Sycamore and Elder, with the trees standing at heights of up to approximately 20 m. A mature London plane tree is also present along the footway of Fitzjohn's Avenue, adjacent to the eastern boundary of the site.

The topography of the local area generally slopes down to the south and west. The site however forms a relatively flat area, at a level of about 77 m OD.

2.1.1 Neighbouring Structures

The site is adjoined to the north by No 39 Fitzjohn's Avenue, a four-storey building that includes a lower ground floor level. At the time of the investigation, it had been subject to localised demolition and strip out works, with a previous three-storey rear extension demolished and the floor slab left insitu. It is known that a planning application has been made for the partial demolition of this building, whilst retaining the façade, and the subsequent construction of a five-storey building with a lower ground floor level and single level basement below the rear third of the budling footprint and extending out below the rear garden.

A separate planning application is also being made for the development of No 46 Maresfield Garden plot to the west of the site, through the construction of a five-storey building with a single level basement below the building footprint.

No 45 Fitzjohn's Avenue to the north is a four-storey apartment building, which includes No 43 Fitzjohn's Avenue, a two-storey annex to the rear of the main building, along the northern boundary of the site. Planning records indicate that this single storey structure includes a single level basement.

The footways and carriageway of Fitzjohn's Avenue are present along the eastern boundary of the site.

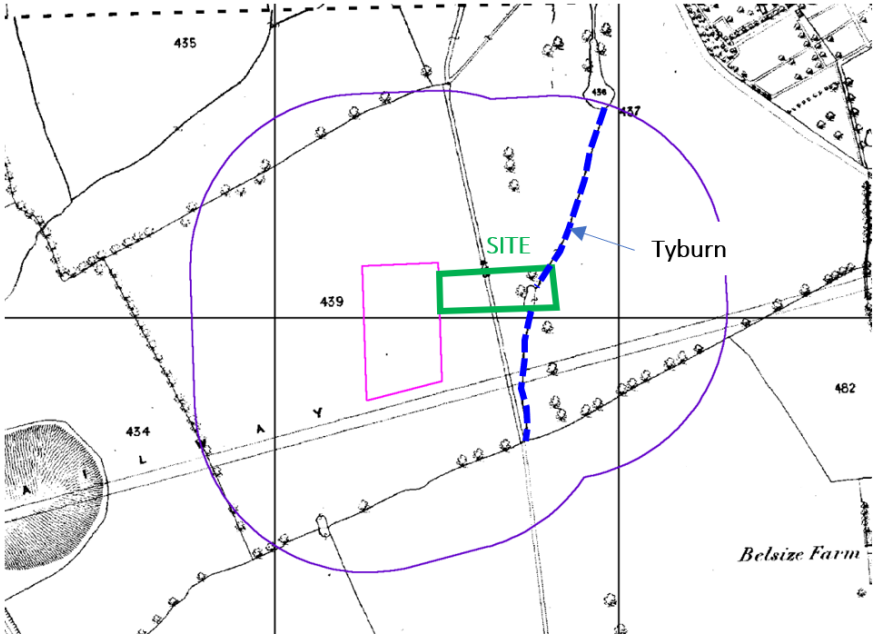
In addition to the above, the site is located over and close to two railway tunnels, known as the Belsize railway tunnels. As shown on the plan below, Tunnel 2, known as the slow

tunnel, runs in a northeast and southwest orientation directly below the site, whilst Tunnel 1 runs in the same orientation below the alignment of Nutley Terrace, approximately 30 m to the south of the site. Information provided by Price and Myers indicates that the tunnel crowns are at a level of 56.10 m OD, approximately 20 m below the level of the site. The tunnels have an approximate diameter of 7.5 m.

2.2 Site History

The site history has been researched by reference to internet sources and historical Ordnance Survey (OS) maps obtained from the Envirocheck database.

The earliest historical map studied, a historical town plan dated 1850, provides little detail but indicates that the site was undeveloped with none of the existing immediate surrounding road network in existence. The earliest OS map dated 1871 provides more detail and shows the site to be undeveloped, although some form of track or path bisected the centre of the site in a north-south orientation, whilst a pond that was fed by a stream was present in the eastern half of the site, as shown by the extract of the 1871 map below.



Reference to the 'Lost Rivers of London'[4] indicates that the alignment of the stream highlighted on the map above is consistent with the position of a former tributary of the River Tyburn. The 1871 map also indicates that the southern Belsize Railway Tunnel (Tunnel 1) was established at that time and online information indicates that the tunnel was opened in 1867 following construction commencing in 1865. By 1896, essentially the existing road network had been established, with No 39 Fitzjohn's Avenue constructed on the neighbouring site to the south, with a pair of semi-detached properties to the north. The site however remained undeveloped, although the former tributary and the associated pond on the site are no longer shown. The presence of an air shaft to the northeast of the site and an additional tunnel portal to the southwest, suggests that the northern Belsize

4 Barton, N, & Meyers, S (2016) *The Lost Rivers of London (revised and extended edition with colour maps).* Historical Publications Ltd.

Railway Tunnel (Tunnel 2) had been established by that time. Online information indicates that the tunnel was completed in 1884.

The site remained unchanged until some time between 1935 and 1946, when what is thought to be the existing building was constructed, along with the associated tennis court. The building is shown to be connected to the neighbouring No 39 Fitzjohn's Avenue, suggesting it was constructed as an extension. The site and immediate surrounding area are shown to have remained essentially unchanged from that time to the present day.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search can be provided if required.

The Envirocheck report indicates that there are no existing or historical landfill sites, waste management, transfer, treatment of disposal sites within 250 m of the site. There are no registered contaminated land sites within 1 km of the site, no Local Authority Pollution Prevention and Controls enforced within 250 m and there have been no recorded pollution incidents to controlled waters within 250 m of the site.

Reference to records compiled by the Health Protection Agency (formerly the National Radiological Protection Board) indicates that the site falls within an area where less than 1% of homes are affected by radon emissions and therefore radon protective measures will not be necessary.

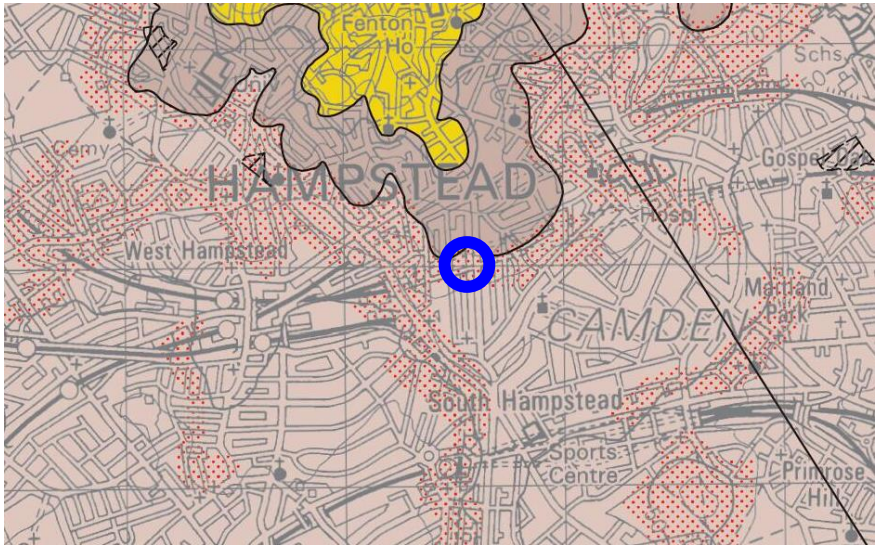
2.4 UXO Risk Assessment

A Preliminary UXO Risk Assessment has been completed by 1st Line Defence (report ref PA17844a-00, dated May 2023), and the report is included in the appendix. The risk assessment has been carried out in accordance with the guidelines provided by CIRIA[5], which state that the likelihood of encountering and detonating UXO below a site should be assessed along with establishing the consequences that may arise. The first phase comprises a preliminary risk assessment, which should be undertaken at an early stage of the development planning. If such an assessment identifies a high level of risk then a detailed risk assessment should be carried out by a UXO specialist, which will identify an appropriate course of action with regard to risk mitigation.

The report indicates that, during WWII, the site was located within the Municipal Borough of Hampstead, which sustained an overall very high density of bombing. London bomb census mapping does not indicate the site to have sustained any direct bombing strikes, with the building occupying the site not shown to have suffered any bomb damage. The neighbouring No 39 Fitzjohn's Avenue is indicated to have suffered minor blast damage, although this is thought to be as a result of incendiary bombing. It is considered that access to the site would have been maintained and as such the risk assessment concludes there to be a low risk of encountering UXO below the site.

2.5 Geology

The British Geological Survey (BGS) map of the area (Sheet 256) indicates the site is directly underlain by the London Clay, as shown on the map extract below.



According to the BGS memoir, the London Clay is homogenous, slightly calcareous silty clay to very silty clay, with some beds of clayey silt grading to silty fine-grained sand. The London Clay overlies a downwards sequence of Lambeth Group (sandy clays) overlying Thanet Sand

5 CIRIA C681 (2009) *Unexploded ordnance (UXO) A guide for the construction industry*

(fine grained sands), which in turn overlies the Cretaceous Chalk. A review of archive records or boreholes held by BGS indicates that the London Clay extends to a depth of 80 m.

The geological map also indicates that the site is located close to the boundary with the overlying Claygate Member, which is located approximately 100 m to the north. The site is also shown as being in an area with a covering of "Head Propensity". Head propensity is shown on the BGS map as areas denoted as most likely to be covered by Quaternary Head Deposits as interpreted from digital slope analysis and confirmed by borehole data. These deposits are not mapped and have not been verified by fieldwork. These deposits are noted as having properties similar to that of the London Clay and are typically present close to the boundary with the overlying Claygate Member.

It is possible that due to the former alignment of the tributary of the River Tyburn, alluvial soils may locally be present below the site.

2.6 Hydrology and Hydrogeology

The London Clay Formation is classified as Unproductive Strata, referring to rock layers or drift deposits with low permeability and that have negligible significance for water supply or river base flow.

As the London Clay is likely to comprise predominantly clay soils, it cannot support groundwater flow over any significant distance, nor can it be considered to support a "water table" or continuous piezometric surface. Boreholes constructed within clays do fill with water, due to the often high water content of shallow clays draining into the standpipe or by the collection of surface water drainage, which is unable to drain through the clay; however, this is not reflective of the type of groundwater flow that would occur in a porous and permeable saturated stratum.

The permeability of the London Clay will be predominantly secondary, through fissures in the clay. Published data indicates the horizontal permeability of the London Clay to generally range between 1×10^{-11} m/s and 1×10^{-9} m/s. Any reworked surface layers will be expected to have a higher permeability, but the granular soils have not typically been encountered as continuous layers, such that the overall permeability will be governed by the permeability of the surrounding clay.

There are no natural surface water features within 500 m of the site, which is therefore not located within an area at risk of flooding from rivers or sea, as defined by the Environment Agency (EA). The site is not shown to be at risk of surface water flooding, although the section of Fitzjohn's Avenue adjacent to the eastern site boundary is shown as being at low risk of surface water flooding from a 1 in 1000-year storm event. The site is not listed within the London Borough of Camden report[6] as having suffered from surface water flooding in the 1975 or 2002 flooding events.

Spring lines are present at the interface of the Bagshot Beds and the Claygate Member in the area of Hampstead Heath and, to a lesser extent, near the boundary between the Claygate Member and the underlying lowly permeable London Clay. These springs have been the source of a number of London's lost rivers, including the Tyburn and Westbourne. Historical mapping, Figure 11 of the Arup report and reference to the Lost Rivers of London indicates that a tributary of the River Tyburn formerly flowed southwards through eastern part of the site, which a fed a pond that was also present on site. The river is not shown on historical maps after 1896 and it is known that former water courses flow through culverts and the sewer network.

The site is largely covered by the existing buildings and external areas of hardstanding, including the front driveway and the tennis court to the rear. Therefore, infiltration of rainwater into the ground beneath the site is limited to localised areas of soft landscaping. The majority of surface runoff is therefore likely to drain into combined sewers in the road. The proposed development will not increase the ratio of hardstanding with the proposed building footprint essentially occupying the existing building footprint and the area currently occupied by the tennis court. There will therefore not be an increase in runoff rate or volume into the existing sewer system, or that could have a potentially adverse impact on the surrounding area. There should not, therefore, be any requirement for any mitigation measures.

6 London Borough of Camden (2003) *Floods in Camden, Report of the Floods Scrutiny Panel*

2.7 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.7.1 Source

The desk study has indicated that the site does not have a contaminative history as it has been occupied by the existing building since around the 1940s and is understood to have been used as a care home / assisted living facility. As such no potential sources of contamination were identified. The immediate surrounding area has also been predominantly occupied by residential streets and as such no off-site sources of contamination have been identified by the desk study. No potential sources of landfill or hazardous soil gases have been identified.

2.7.2 Receptor

Following the proposed redevelopment, the site will continue to have a residential end use, such that end users will represent highly sensitive receptors. Neighbouring sites are potentially sensitive receptors, although as the site is underlain by the non-aquifer of the London Clay, groundwater is not a sensitive receptor. Site workers during groundworks and construction works are sensitive receptors, as are new buried services and buried concrete.

2.7.3 Pathway

It is understood that the site will have both private and communal garden areas, with areas of soft landscaping forming a pathway by which end users could come into contact with any contaminants in the shallow soils. These areas of soft landscaping also form a pathway for the infiltration of rain and surface water. Any made ground will theoretically form a pathway for any perched groundwater inflows to flow onto and off of site. The groundworks and construction works form a pathway by which construction workers, new buried services and buried concrete may be exposed to any contaminants present within the shallow soils.

2.7.4 Preliminary Risk Appraisal

It is considered that there is a LOW risk of there being a contaminant linkage at this site that could result in a requirement for major remediation work.

3.0 Screening

The Camden planning guidance suggests that any development proposal that includes a basement should be screened to determine whether or not a full BIA is required.

3.1 Screening Assessment

A number of screening tools are included in the Arup document and for the purposes of this report reference has been made to Appendices E1, E2 and E3 which include a series of questions within screening flowcharts for surface flow and flooding, subterranean (groundwater) flow and land stability. The flowchart questions and responses to these questions are tabulated below.

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for 39a Fitzjohn's Avenue
1a. Is the site located directly above an aquifer?	No. The site is underlain by the London Clay which is designated as Unproductive Strata by the Environment Agency and cannot store and transmit water in sufficient quantities to support groundwater abstractions or watercourses.
1b. Will the proposed basement extend beneath the water table surface?	No. The London Clay and clay dominated Head Deposits, if present, cannot support groundwater flow and cannot therefore support a water table consistent with a permeable water bearing strata.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	*Yes. Historical mapping, the Lost Rivers of London and Figure 11 of the Arup Report show a former tributary of the River Tyburn flowing through the site in the19th Century, although it is no longer present at surface, having been diverted to form part of the local surface water sewer system.*
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report confirms that the site is not located within this catchment area
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. The proportion of hardstanding will remain roughly the same.

Question	Response for 39a Fitzjohn's Avenue
5. As part of the 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. Given that the site is underlain by clay soils and is unlikely to be suitable for a soakaway or similar SUDS based system, the site drainage will therefore be directed to public sewer. Site drainage will therefore be designed to generally maintain the existing situation.
6. 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. There are no groundwater dependent ponds or spring lines present within 500 m of the site. The flow of the former Tyburn watercourse was perched on the London Clay.

The above assessment has identified the following potential issues that need to be assessed:

Q2 A former tributary of the River Tyburn historically flowed through the site.

3.1.2 Stability Screening Assessment

Question	Response for 39a Fitzjohn's Avenue
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No, as indicated on the Slope Angle Map Fig 16 of the Arup report.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No. The site is not to be significantly re-profiled as part of the development.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No. As indicated on the Slope Angle Map Fig 16 of the Arup report.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No. As indicated on the Slope Angle Map Fig 16 of the Arup report.
5. Is the London Clay the shallowest strata at the site?	*Yes. As indicated on the geological map and Figures 3, 5 and 8 of the Arup report*
6. Will any trees be felled as part of the proposed development and / or are any works proposed within any tree protection zones where trees are to be retained?	*Yes. A number of immature and semi-mature trees will be felled as part of the development, although more mature established trees will be retained.*
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 area is prone to these effects as a result of the presence of shrinkable London Clay.*
8. Is the site within 100 m of a watercourse or potential spring line?	*Yes. Historical mapping, the Lost Rivers of London and Figure 11 of the Arup Report show a former tributary of the River Tyburn flowing through the site in the19th Century, although it is no longer present at surface, having been diverted to form part of the local surface water sewer system.*
9. Is the site within an area of previously worked ground?	No. The geological map of the area and Figures 3, 4 and 8 of the Arup report do not indicate any worked ground.
10a. Is the site within an aquifer?	No. The site is underlain by the London Clay which is designated as Unproductive Strata by the Environment Agency and cannot store and transmit usable amounts of water.
10b. Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No. The London Clay cannot support a continuous water table.
11. Is the site within 50 m of Hampstead Heath ponds?	No. Figure 14 of the Arup report confirms that the site is not located within 50 m of the Hampstead Heath ponds.
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes. The site fronts on to Avenue Road to the east*
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No. The proposed basement does not share a party wall with any neighbouring properties.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	*Yes. Tunnel 2 of the Belsize Railway Tunnels, as operated by Network Rail, is present at a depth of approximately 20 m below the site. This is confirmed with reference to Figure 18 of the ARUP report.*

The above assessment has identified the following potential issues that need to be assessed:

Q5 The London Clay is the shallowest strata beneath the site.
Q6 A number of trees will be felled as part of the development
Q7 The site is in an area likely to be affected by seasonal shrink-swell.
Q8 A former tributary of the River Tyburn historically flowed through the site.
Q12 The site is located within 5 m of a public highway.
Q14 A Network Rail railway tunnel is present beneath the site.

3.1.3 Surface Flow and Flooding Screening Assessment

Question	Response for 39a Fitzjohn's Avenue
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of Arup report confirms that the site is not located within this catchment area.
2. 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. Any additional surface water from the marginal increase in hardstanding area will be attenuated and discharged into the Thames Water sewers to ensure the surface water flow regime will be unchanged. The basement will mainly be beneath the footprint of the building and existing hardstanding areas, and the 1m distance between the roof of the basement and ground surface as recommended by section 3.2 of the CPG Basements 2021 does not apply across these areas.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. The new building will mostly cover the existing footprint with the proportion of hardstanding remaining essentially unchanged.
4. Will the proposed basement development 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. Any additional surface water from the marginal increase in hardstanding area will be attenuated and discharged into the Thames Water sewers to ensure the surface water flow regime will be unchanged. The basement will be beneath the footprint of the building, and the 1m distance between the roof of the basement and ground surface as recommended by section 3.2 of the CPG Basements 2021 does not apply across these areas.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No. The proposal is very unlikely to result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses as the surface water drainage regime will be unchanged and the land uses will remain the same.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk of flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	*Yes. The Camden Flood Risk Management Strategy dated 2013, together with Figures 3v, 4e, 5a and 5b of the SFRA dated 2014, and Environment Agency online flood maps show that the site has a very low flooding risk from sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses.* *The Environment Agency online flood maps and Figure 3v of the SFRA show that the site has a very low to low flooding risk from surface water. The flood depth is shown to be <0.3m during the low risk event.*
	It is possible that the basement will be constructed within pockets of perched water and the recommendations outlined in the BIA with regards to water-proofing and tanking of the basement will reduce the risk to acceptable levels. *In accordance with paragraph 5.11 of the CPG, a positive pumped device will be installed in the basement in order to further protect the site from sewer flooding.*

The above assessment has identified the following potential issues that need to be further assessed:

Q6 The site is at a low risk of surface water flooding. Whilst it is shown to be in an area at risk of surface water flooding, it is classified as a very low to low risk and as such it is not considered necessary to take it forward to the scoping stage.

4.0 Scoping and Site Investigation

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

4.1 Potential Impacts

The following potential impacts have been identified by the screening process.

Potential Impact	Consequence
London Clay is the shallowest stratum at the site.	The London Clay is prone to seasonal shrink-swell (subsidence and heave).
Seasonal shrink-swell can result in foundation movements.	Multiple potential impacts depending on the specific setting of the basement development. For example, the implications of a deepened basement/foundation system on neighbouring properties should be considered.
A number of trees will be felled as part of the development	The removal of trees may lead to the recovery of any moisture deficit due to previous tree growth, which can lead to the heave of clay soils and the potential damage of neighbouring buildings and structures.
A tributary of the River Tyburn is shown to have historically flowed through the site	If the groundwater regime of a watercourse or spring line is affected by the proposed basement, water flows may increase or decrease, whilst there is the potential for new or old spring lines to be activated/reactivated. Seasonal changes in water flow can also affect slope stability.
The site is within 5 m of Fitzjohn's Avenue and the adjoining footpath.	Should the design of retaining walls and foundations not take into account the presence of nearby infrastructure, it may lead to the structural damage of footways, highways and associated buried services.
A Network Rail tunnel is present below the site.	The proposed building within the zone of influence of the tunnel and movements associated with the basement construction and excavation may potentially lead to unacceptable movements and increase in strain to the tunnel structure.

These potential impacts have been investigated through the site investigation, as detailed in Section 13.0.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2, a single borehole was advanced to a depth of 15.00 m using a cable percussion rig, with the depth of borehole limited by the presence of the railway tunnels. This borehole was supplemented by two boreholes advanced to a maximum depth of 5.45 m using a tracked opendrive sampler. Standard Penetration Tests (SPTs) were carried out at regular intervals in the boreholes to provide quantitative data on the strength of the soils and disturbed and undisturbed samples were obtained from the boreholes for subsequent laboratory examination and testing.

A groundwater monitoring standpipe was installed in the cable percussion borehole to a depth of 6.00 m to facilitate future groundwater monitoring, with a single monitoring visit undertaken. A selection of the samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

In order to investigate the configuration of the existing foundations, a series of four trial pits was manually excavated adjacent to the northern, eastern and western elevations of the existing building. All of the above work was carried out under the supervision of a geotechnical engineer from GEA. The borehole and trial pit records are appended, together with a site plan indicating the exploratory positions.

3.1 Sampling Strategy

The boreholes were positioned on site by a geotechnical engineer from GEA, with due regard to the proposed development and avoiding locations of known buried services, including the railway tunnels. The trial pit locations were specified by Price and Myers and positioned on site by the GEA engineer in accessible locations, whilst avoiding known buried services.

Three samples of made ground have been tested for the presence of contamination. The analytical suite was selected to identify a range of typical contaminants for the purposes of general coverage and included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The samples were also screened for the presence of asbestos. The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

5.0 Ground Conditions

The investigation has encountered the expected ground conditions, in that below a nominal to moderate thickness of made ground, the London Clay Formation extended to the full depth of the investigation.

5.1 Made Ground

Made ground was encountered to depths of between 0.30 m (76.89 m OD) and 0.80 m (76.26 m OD) and generally comprised a matrix of dark brown, greyish brown silty sandy gravelly clay and gravelly sand with rootlets, ash and fragments of brick, concrete and clinker.

With the exception of the presence of fragments of extraneous material, no other visual or olfactory evidence of contamination was observed during the fieldwork. Three samples of made ground were sent to a laboratory for a suite of analysis for a range of contaminants and the results are detailed within Section 5.4.

5.2 London Clay

The London Clay comprised an initial weathered horizon comprising firm becoming stiff high strength fissured brown and light brown mottled orange-brown and grey silty slightly sandy clay with selenite crystals and partings and pockets of fine orange-brown sand. In Borehole No 1, the initial horizon also noted contain gravel to a depth of 2.00 m (74.74 m OD), indicating the clay to have been naturally re-worked, such that these soils in that location are considered to form Head Deposits.

The initial horizon extended to depths of between 3.10 m (73.96 m OD) and 5.00 m (71.74 m OD), whereupon stiff high strength fissured dark grey and brownish grey silty clay with mica and occasional fine partings of pale brownish grey and pale grey fine sand and silt was proved to the full depth investigated, of 15.00 m (61.74 m OD).

Roots and rootlets were encountered throughout the initial clay horizons to depths of between 1.40 m and 3.00 m, with the clay in Borehole No 1 noted to be very stiff and of very high strength, and has been assessed as desiccated to a depth of 2.00 m (74.74 m OD). This has been confirmed by the results of laboratory moisture content and Atterberg Limit testing, which has also indicated the clay to be of medium-volume change potential and high plasticity, with plasticity indices of between 31% and 36%. The results of undrained triaxial tests undertaken on undisturbed samples of the clay generally indicate the clay to be of high strength, with undrained shear strength increasing with depth from 72 kPa to 140 kPa.

These soils were observed to be free from the evidence of contamination.

5.3 Groundwater

Groundwater was not encountered during the investigation and a subsequent monitoring visit carried out approximately three weeks after the drilling of the boreholes recorded the standpipe to be dry.

5.4 Soil Contamination

The table below summarises the results of the contamination analyses carried out on the three samples of made ground; all concentrations are in mg/kg unless otherwise stated. A copy of the full results is included in the appendix.

Determinant	BH5 – 0.25 m	BH4 – 0.10 m	BH4 – 0.50 m
pH	7.7	7.5	8.2
Arsenic	10	12	120
Cadmium	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	< 1.8	3.5	< 1.8
Chromium	15	19	25
Copper	49	47	65
Lead	56	95	320
Mercury	< 0.3	< 0.3	0.8
Nickel	26	34	19
Selenium	< 1.0	< 1.0	< 1.0
Zinc	42	89	100

Determinant	BH5 – 0.25 m	BH4 – 0.10 m	BH4 – 0.50 m
Sulphide	37	34	30
Total Phenols	<1.0	<1.0	<1.0
Cyanide	<1.0	1.4	<1.0
Total PAH	**885**	**128**	8.62
Naphthalene	0.22	0.08	< 0.05
Benzo(a)pyrene	**61**	**11**	1.1
TPH	1100	570	15
Total Organic Carbon %	5	3.8	2.1
Note: Figures in bold indicate values in excess of the generic guideline screening values.			

The results of the contamination testing have indicated elevated concentrations of total PAH, including a benzo(a)pyrene and a number of other PAH compounds were recorded in the samples of made ground recovered from Borehole No 4 at 0.10 m and Borehole No 5 at 0.25 m.

The sample of made ground recovered from Borehole No 5 at 0.25 m was found to include fibres of amosite asbestos, although at a concentration of less than 0.001 %.

5.4.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. Contaminants of concern are those that have values in excess of generic human health risk-based guideline values, which are either the CLEA[7] Soil Guideline Values where available, the Suitable 4 Use Values[8] (S4UL) produced by LQM/CIEH calculated using the CLEA UK Version 1.07[9] software, or the DEFRA Category 4 Screening values[10], assuming a residential end use without plant uptake. The key generic assumptions for this end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be young female children aged less than six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and indoor dust, and inhalation of indoor and outdoor dust and vapours; and

It is considered that these assumptions are acceptable for this generic assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

The significance of these results is considered further in Part 2 of the report.

7 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

8 *The LQM/CIEH S4Uls for Human Health Risk Assessment* S4UL3065 November 2014

9 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.071 Environment Agency 2015

10 CL:AIRE (2013) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Final Project Report SP1010 and DEFRA (2014) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Policy Companion Document SP1010

5.5 Existing Foundations

The findings of the trial pits are summarised in the table below. Sketches and photographs of each pit are included in the Appendix.

Trial Pit No	Structure	Foundation detail	Bearing Stratum
1	Northern elevation	Concrete strip Top 0.72 m Base 0.90 m. Lateral projection 220 mm	Firm brown silty slightly sandy CLAY
2	Western rear elevation	Concrete strip Top 0.57 m Base 0.90 m. Lateral projection 250 mm	Firm brown silty slightly sandy
3	Eastern front elevation	Concrete strip Top 1.25 m Base not determined Lateral projection 500 mm	Not determined but expected to be London Clay
4	Eastern front elevation	Concrete strip Top 1.50 m Base not determined Lateral projection 320 mm	Not determined but expected to be London Clay

Part 2: Design Basis Report

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to the proposed development. Part 3 details the results of the Ground Movement Analysis.

6.0 Ground Model

It is understood that it is proposed to partially demolish the existing building, and subsequently construct a four-storey building with a single level basement that will be present below the building footprint and extend out below the rear garden. The building will have a residential end use and be divided up into two maisonettes and two townhouses. The proposed formation level of the basement will be circa 73.30 m OD, around 3.50 m below ground level.

The desk study has indicated that the site does not have contaminative history, having only been occupied by the existing building that has bene used as a care home. On the basis of the fieldwork, the following ground model has been established.

Geological Formation	Depth to base (m) [Level m OD]	Thickness (m)
Made Ground	0.30 m (76.89 m OD) to 0.80 m (76.26 m OD)	0.30 and 0.80
Weathered / re-worked London Clay (locally comprising Head Deposits)	3.10 m (73.96 m OD) and 5.00 m (71.74 m OD)	2.30 to 4.40
Unweathered London Clay	Not proved at 15.00	>11.90 m

A continuous groundwater table is not present below the site. Desiccated clay soils have been locally encountered to a depth of 2.00 m (74.74 m OD). Contamination testing carried out has indicated elevated concentrations of PAH, and the presence of asbestos within the made ground.

7.0 Advice & Recommendations

Excavations for the proposed basement structure will require temporary support to maintain stability and to prevent any excessive ground movements. Formation level for the basement will be within the initial weathered London Clay at a depth of 3.50 m below ground level, circa. On the basis of the investigation observations and the underlying ground conditions, significant groundwater inflows are not expected to be encountered within the basement excavation.

Taking into account the development proposals and the contamination testing undertaken to date, there is not considered to be a requirement for remedial works, but consideration will need to be given to further investigation in the areas of proposed soft landscaping and the importation of clean material to form a suitable growing medium.

7.1 Basement Construction

Formation level for the basement is likely to be within the stiff clay of the London Clay at a depth of 3.50 m (73.30 m OD). The London Clay is of low permeability, so will not typically support a continuous "water table" or significant groundwater flow. Therefore, significant groundwater inflows are not generally expected to be encountered in the basement excavation. The London Clay did, however, initially comprise a naturally reworked horizon, which was typically slightly sandy and locally slightly gravelly, which could potentially give rise to a slight increase in permeability. Minor and localised groundwater inflows may therefore be encountered, in addition to perched groundwater with the overlying made ground. Any such inflows or seepages should be adequately dealt with through sump pumping, although it would be prudent for the chosen contractor to have a contingency plan in place to deal with more significant or prolonged inflows as a precautionary measure.

The design of basement support in the temporary and permanent conditions needs to take account of the need to maintain the stability of the excavation and surrounding structures, and to protect against potential shallow groundwater inflows. There are a number of methods by which the sides of the basement excavation could be supported in the temporary and permanent conditions. The choice of wall may be governed to a large extent by whether it is to be incorporated into the permanent works and have a load bearing function.

The final choice will depend to a large extent on the need to protect nearby structures from movements, the required overall stiffness of the support system, and the need to control

groundwater movement through the wall in the temporary condition. In this respect the stability of the existing and adjacent buildings will be paramount.

In the absence of significant groundwater inflows and the presence of clay soils, the use of a contiguous bored piled wall or a temporary or permanent sheet piled wall could be adopted. Consideration would however need to be given to the noise and vibrations associated with the installation of sheet piles.

The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition. Thus, a suitable amount of propping will be required to provide the necessary rigidity. In this respect the timing of the provision of support to the wall will have an important effect on movements. Consideration will also need to be given to a retention system that maintains the stability at all times of neighbouring properties and structures. An assessment of the potential movements as a result of the proposed basement construction has been carried out as part of the Ground Movement Analysis, which is reported in Part 3.

7.1.1 Basement Retaining Walls

The following parameters are suggested for the design of the permanent basement retaining walls.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion (c' – kN/m^2)	Effective Friction Angle (ϕ' – degrees)
Made ground	1800	Zero	27
London Clay	2000	Zero	23

Significant groundwater inflows are not anticipated within the basement excavation. Provided that a fully effective drainage system can be ensured in order to prevent the build-up of groundwater behind the retaining walls, it should be possible to design the basement on the basis that water will not collect behind the walls. If an effective drainage system cannot be ensured, then a water level of three-quarters of the basement depth, subject to a minimum depth of 1.0 m, should be assumed. The advice in BS8102:2009[11] should be followed in this respect and with regard to the provision of suitable waterproofing.

7.1.2 Basement Heave

The 3.50 m deep excavation will lead to an unloading of around 80 kN/m^2, which will result in heave of the underlying London Clay. This will comprise immediate elastic movement, which will account for approximately 40 % of the total movement and be expected to be complete during the construction period, and long-term movements, which will theoretically take many years to complete. These movements will, to some extent, be mitigated by the loads applied by the proposed development, however it is recommended that further analysis is undertaken in this respect once the design has been finalised.

7.2 Basement Raft Foundation

It is understood that consideration is being given to the use of a basement raft foundation, which is considered to be a feasible option. The suitability of a such a foundation solution will depend on whether or not it can be designed to sufficiently accommodate likely variations in the proposed loads. Additionally, consideration will need to be given to differential movements between the different sections of building and the potential impact on the Network Rail railway tunnel below the site. This is considered further in Part 3 of this report.

7.3 Piled Foundations

For the ground conditions at this site some form of bored pile could be considered. In view of the limited thickness of made ground and underlying clay soils, conventional rotary bored piles could be adopted with relatively short lengths of casing or consideration could be given to the use of bored piles installed using continuous flight auger (cfa) techniques, which would negate the requirement for temporary casing.

The following table of ultimate coefficients may be used for the preliminary design of bored piles, based on the SPT and cohesion / level graph in the appendix.

Stratum	Depths m [level m OD]	kN / m^2
Ultimate Skin Friction		
Basement Excavation	GL to 3.50 (73.24)	Ignore
London Clay	3.50 (73.24) to 15.00 (61.74)	Increasing linearly from 40 to 75

11 BS8102 (2009) *Code of practice for protection of below ground structures against water from the ground*

Ultimate End Bearing		
London Clay	12.00 to 15.00	Increasing linearly from 1100 to 1350

BS EN 1997-1:2004; Eurocode 7: Geotechnical Design Part 1 (Eurocode 7) provides factors to be applied to the ultimate skin friction and ultimate end bearing capacity in calculating pile resistance ($R_{d,GEO}$). For bored piles, in the absence of either working load tests or combined working load tests and preliminary pile tests, a model factor of 1.4 should be combined with a factor of 1.6 to be applied to the skin friction, and a factor of 2.0 to be applied to the end bearing.

On the basis of the above, the table opposite shows the estimated pile resistance for 450 mm and 600 mm diameter piles at various depths. Average ultimate skin friction has been limited to 110 kN/m^2 and an adhesion factor of 0.5 has been adopted, in accordance with guidance from the London District Surveyors Association (LDSA)[12].

Pile diameter mm	Toe Depth (m)	Pile length (m)	$R_{d,GEO}$ (kN)
450	12	7	325
	15	10	485
600	12	7	465
	15	10	690

In order to determine the required pile lengths, the above outline pile resistances need to be compared with structural loads (actions) that have been factored to determine the design effect, in accordance with Eurocode 7.

The above examples are not intended to constitute any form of recommendation with regard to pile size or type, but merely serve to illustrate the use of the above coefficients. Specialist piling contractors should be consulted with regard to the design of an appropriate piling scheme and their attention should be drawn to the presence of claystones within the London Clay.

If piles are to be considered further analysis and consultation is likely to be required with respect to the Belsize railway tunnels.

7.5 Shallow Excavations

On the basis of the trial pit findings, it is considered that it will be generally feasible to form relatively shallow excavations terminating within the London Clay without the requirement for lateral support, although localised instabilities may occur where more granular material or groundwater is encountered.

Significant inflows of groundwater into shallow excavations are not generally anticipated, although seepages may be encountered from perched water tables within the made ground, particularly within the vicinity of existing foundations, although such inflows should be suitably controlled by sump pumping.

If deeper excavations are considered or if excavations are to remain open for prolonged periods it is recommended that provision be made for battered side slopes or lateral support. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides considered in order to comply with normal safety requirements.

7.6 Basement Floor Slab

Following excavation of the basement, in the absence of a basement raft foundation, the basement floor slab will need to be suspended over a void or a layer of compressible material to accommodate the anticipated heave and any potential uplift forces from groundwater pressures, unless the slab can be suitably reinforced to cope with these movements.

7.7 Effect of Sulphates

Chemical analyses have revealed relatively low concentrations of soluble sulphate and near-neutral pH in accordance with Class DS-2 conditions of Table C2 of BRE Special Digest 1:SD Third Edition (2005). The measured pH values of the samples show that an ACEC class of AC-1s would be appropriate for the site. This assumes a static water condition at the site. The guidelines contained in the digest should be followed in the design of foundation concrete.

12 LDSA (2017) *Guidance notes for the design of straight shafted bored piles in London Clay*. LDSA

7.8 Contamination Risk Assessment

The site does not have a potentially contaminative history as it has only been developed with the existing property that has been used as a care home. Furthermore, no potential offsite sources of contamination have been identified, with the site located within a predominantly residential area. The contamination testing has however indicated elevated concentrations of a number of PAH compounds within samples of made ground. A single sample was also found to contain amosite asbestos fibres, although at very low concentrations.

Further analysis of the PAH concentrations indicates that the PAH is likely to be of pyrogenic origin, meaning that it originates from the partial combustion of hydrocarbons. The source of the elevated concentrations is likely to be the ash encountered in the made ground, such that they are not considered to be in soluble form and do not pose a risk to end users via vapours or to off-site sensitive receptors.

As asbestos is insoluble it is not considered to pose any meaningful risk to groundwater, the development or to neighbouring sites through migration in the ground. It is however potentially hazardous to human health as airborne fibres and could thus pose a risk through inhalation during construction works and to end users through direct contact pathways. The asbestos was found to be present at a concentration of less than 0.001 %, and as a result there is a negligible risk of fibres dusting into the air with respect to end users[13]. However, it would be prudent to provide suitable protection to site workers during the groundworks. All work being carried out within asbestos containing soils should be carried out in accordance with the Control of Asbestos Regulations, including toolbox talks for all workers and having the correct PPE in place. During the excavation and movement of any soils, an asbestos specialist should be appointed and will need to hand pick and suitably bag any asbestos containing material and also monitor dust levels using air monitoring equipment. Any asbestos containing soil will need to be covered, either by a cover system, or by hardstanding in order to protect end users from exposure to fibres dusting from the shallow soil during activities on site.

Whilst below the proposed building and any areas of hardstanding there is not considered to be a risk to end users, within any areas of proposed soft landscaping, exposure pathways will existing by which end users may come into contact with elevated contaminants measured. Further targeted sampling and testing should be considered within areas of proposed soft landscaping, in order to confirm the measures required. However in the absence of such further investigation a suitable thickness of clean material will need to be imported to ensure successful plant growth and to protect future end users. It is recommended that in communal areas, that a suitable thickness of made ground be removed to allow the placement of a 300 mm thickness of clean subsoil and topsoil, increasing to 600 mm in private gardens. Any material brought onto site should be certified as clean and accompanied by the necessary documentation.

7.8.1 Protection of Site Workers

Site workers should be made aware of the potential contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE[14] and CIRIA[15] and the requirements of the Local Authority Environmental Health Officer.

A watching brief should be maintained during the site works and if any suspicious soil is encountered, it should be inspected by a suitably qualified engineer and further testing carried out if required.

7.9 Waste Disposal

Under the European Waste Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste classification is a staged process and this investigation represents the preliminary sampling exercise of that process. Once the extent and location of the waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[16] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

13 *The Release of Dispersed Asbestos Fibres from Soils, Addison et. al., 1988 http://www.iom-world.org/pubs/IOM_TM8814.pdf*

14 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land*

15 CIRIA (1996) *A guide for safe working on contaminated sites.* Report 132, Construction Industry. Research and Information Association

16 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[17] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the standard rate of £102 per tonne (about £190 per m^3) or at the lower rate of £3.25 per tonne (roughly £6.10 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based on the technical guidance provided by the EA it is considered likely that the soils encountered during this ground investigation, as represented by the chemical analyses carried out, would be generally classified as follows.

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Current applicable rate of Landfill Tax
General made ground	Non-hazardous (17 05 04)	No	£102.10 / tonne (Standard rate)
Natural Soils	Inert non-hazardous (17 05 04)	Should not be required but confirm with receiving landfill	£3.25 / tonne (Reduced rate for uncontaminated naturally occurring rocks and soils)

Any soil containing asbestos materials will be classified as a mixed waste and hazardous waste, as well as soil containing concentrations of asbestos fibres of over 0.1 %. It would be prudent to screen the made ground for asbestos before exporting off-site, with the hand picking out any asbestos material but suitably qualified contractors. Further sampling and testing Is likely to be required around Borehole Nos 4 and 5 in order to zone potential hazardous soils from non-hazardous.

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[18] which states that in certain circumstances, segregation at source may be considered as pre-treatment so excavated material may not have to be treated prior to landfilling if it can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

17 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2

18 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

Part 3: Ground Movement Analysis

This section of the report comprises an analysis of the ground movements arising from the proposed basement and foundation scheme discussed in Part 2 and the information obtained from the investigation, presented in Part 1 of the report.

8.0 Introduction

The sides of an excavation will move to some extent regardless of how they are supported. The movement will typically be both horizontal and vertical and will be influenced by the engineering properties of the ground, groundwater level and flow, the efficiency of the various support systems employed and the efficiency or stiffness of any support structures used.

An analysis has been carried out of the likely movements arising from the proposed excavation and the results of this analysis have been used to predict the effect of these movements on surrounding structures.

9.0 Basis of Ground Movement Assessment

9.1 Nearby Sensitive Structures

Sensitive structures relevant to this assessment include Nos 43-45 Fitzjohn's Avenue to the north, the footway of Fitzjohn's Avenue along the site frontage to the east, and the Belsize Tunnels, one of which passes directly below the site in a northeast-southwest orientation.

The formation levels for the Nos 43-45 Fitzjohn's Avenue have been determined through a review of planning drawings held on the London Borough of Camden planning portal. No 43 forms an annex building to No 45 and is formed over basement and ground floor level, with the building shown to be supported on a basement raft foundation at a depth of 4.00 m below ground level. No 45 is formed of four storeys, including a lower ground floor level that extends to 2.00 m below ground level. It has been assumed that it is supported on spread foundations bearing at a depth of 0.50 m below lower ground floor level.

The two Network Rail (NR) tunnels have a crown level of 56.10 m OD, approximately 19.00 m to 20.00 m below ground level. The tunnels have an approximate diameter of 7.50 m.

The heights and foundation levels of each of the neighbouring buildings are summarised in the table below.

Structure	Structure Reference	Foundation Depth (m) [level m OD]	Height of building above foundation level (m)
43 Fitzjohn's Avenue	43A to 43D	4.00 [72.95]	6.50
45 Fitzjohn's Avenue	45A to 45D	2.50 [75.80]	13.50

A plan indicating the locations of each of the sensitive structures, including the railway tunnels, and the positions of the individual elevations are shown on the GMA plan included in the appendix.

9.2 Construction Sequence

In general, the sequence of works for excavation and construction, are assumed to comprise the following stages.

1. demolish the superstructure;
2. install contiguous bored piled wall;
3. install insitu concrete walls in limited panel widths;
4. excavate down;
5. install top level props;
6. excavate down to formation level and install lower level props;
7. cast basement raft foundation;
8. construct load bearing walls;
9. construction up to ground floor level and cast ground floor slab;
10. removal of props once concrete sufficiently cured; and
11. continue with superstructure.

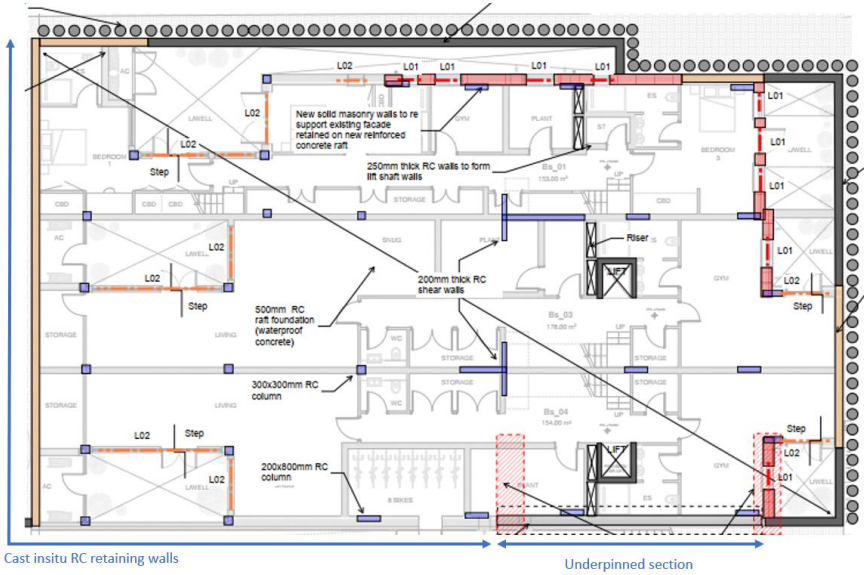
10.0 Ground Movements

An assessment of ground movements within and surrounding the excavation has been undertaken using the P-Disp and X-Disp computer programs licensed from the OASYS suite of geotechnical modelling software from Arup. These programs are commonly used within the ground engineering industry and are considered to be appropriate tools for this analysis.

The X-Disp and P-Disp programs have been used to predict ground movements likely to arise from the excavation and construction of the proposed basement. This includes the heave / settlement of the ground (vertical movement) and the lateral movement of soil behind the proposed retaining walls (horizontal movement). Both the P-Disp and X-Disp programs are commonly used within the ground engineering industry and are considered to be appropriate tools for the purpose of this analysis.

For the purpose of these analyses, the corners have been defined by x and y coordinates, with the x-direction approximately parallel with the orientation north-south, whilst the y-direction is approximately parallel with the orientation of east-west. Vertical movement is in the z-direction. Wall lengths of less than 10 m have been modelled as 1 m long structural elements, while walls greater than 10 m in length have been modelled as 2 m elements to reflect their greater stiffness.

The basement structure has been modelled as a polygon, with the basement retaining walls formed of a combination of a contiguous bored piled wall and insitu reinforced concrete (RC) retaining walls installed in underpinning like sequence with limited width panels. Part of the southern elevation will be underpinned during the development of the neighbouring 39 Fitzjohn's Avenue. The proposed retaining wall layout is shown on the plan opposite.



It is assumed that suitable propping will be provided during the construction of the basement and in the permanent condition, such that the walls can be considered to be stiff for the purpose of the ground movement modelling.

The full outputs of all the analyses can be provided on request but samples of the output movement contour plots are included within the appendix.

10.1 Ground Movements – Surrounding the Basement

10.1.1 Model Used

For the X-Disp analysis, the soil movement relationships used for the embedded retaining walls are the default values within CIRIA report C760[19], which were derived from a number of historic case studies.

19 Gaba, A, Hardy, S, Powrie, W, Doughty, L and Selemetas, D (2017) *Embedded retaining walls – guidance for economic design* CIRIA Report C760

For the installation movements, the movement curves for 'installation of contiguous bored pile wall' and 'installation of planar diaphragm wall' have been used for the installation of the contiguous bored pile wall and insitu RC walls respectively. For the excavation stage, the movement curve or excavation against 'stiff wall in stiff clay' has been adopted.

10.2.2 Results

The results are presented to the degree of accuracy required to allow predicted variations in ground movements around the structure(s) to be illustrated, but may not reflect the anticipated accuracy of the predictions.

The predicted movements are based on the worst case of the individually analysed segments of 'hogging' and 'sagging' and these are summarised in the tables below.

Phase of Works	Maximum Movements due to wall deflection (mm)	
	Vertical Settlements	Horizontal Movement
Contiguous bored pile wall installation	5	5
Cast insitu RC wall installation	<5	<5
Combined movements from installation and excavation	4-7	5-10

The analysis has indicated that the maximum vertical settlement and horizontal movements that will result from the installation and subsequent excavation will be in the region of 4 mm and 10 mm.

10.2 Ground Movements – Resulting from Excavation

10.2.1 Model Used

Unloading of the London Clay will take place as a result of the excavation of the proposed basements and the reduction in vertical stress will cause heave to take place. Undrained soil parameters have been used to estimate the potential short-term movements, which include the "immediate" or elastic movements as a result of the basement excavation.

Drained parameters have been used to provide an estimate of the total long-term movement.

The elastic analysis requires values of soil stiffness at various levels to calculate displacements. Values of stiffness for the soils at this site are readily available from published data[20] and a well-established method has been used to provide estimated values. Relationships of $E_u = 600\ C_u$ and $E' = 450\ C_u$ for the cohesive soils have been used to obtain values of Young's modulus.

The 3.50 m deep excavation of the basement will result in an unloading of between around 70 kN/m^2 and 80 kN/m^2, which will result in heave of the underlying London Clay. Information provided by Price and Myers indicates that the raft will apply a bearing pressure of about 90 kN/m^2.

The soil parameters used in this analysis and tabulated below have been primarily derived from the data from acquired from the site investigation.

Stratum	Level Range (m OD)	Eu (MPa)	E' (MPa)
Made Ground	77 to 76	9	4.8
London Clay	76 to 37	36 to 169	27 to 127

A rigid boundary for the analysis has been set at 37 m OD, which equates to about 40 m below ground level. Below this depth the London Clay is not considered to be affected by the scale of the development and the soils are considered to be essentially incompressible.

10.2.2 Results

The P-Disp analysis indicates short-term undrained heave movements of the order of 2 mm are expected to occur at the center of the excavation, whilst total heave movements of approximately 5 mm have been indicated by the analysis. The analysis has indicated negligible movements outside of the basement excavation, which is to be expected, and as such these movements are not considered to impact the surrounding structures. The relatively low movements are due to the fact that the raft has a net bearing pressure of

20 Burland JB, Standing, JR, and Jardine, FM (2001) *Building response to tunnelling, case studies from construction of the Jubilee Line Extension.* CIRIA Special Publication 200

about 10 kN/m²to 15 kN/m². The expected movements are summarized in the table overleaf.

Location	Settlement (mm)	
	Short-term	Total
Centre of the excavation	1.5	4
Edges of the excavation	<1	2
5 m from the basement	<1	<1

If a compressible material is used beneath the slab, it will need to be designed to be able to resist the potential uplift forces generated by the ground movements. In this respect, potential heave pressures are typically taken to equate to around 40% of the total unloading pressure.

10.2.3 Tunnel Assessment

In order to assess the impact of the proposed basement unloading and the loads associated with the raft, the alignment of the crowns of each tunnel have been modelled as displacement lines within the P-disp analysis, with displacement points placed at 2 m intervals across the lengths of tunnels analysed.

Information provided by Price and Myers indicates that Network Rail require any movement at the tunnel crown to remain within 3 mm, with changes in stress to be limited to less than 20 kN/m². The graphs included in the appendix indicate that for both tunnels, movements of less than 1 mm can be expected, whilst changes in stress also fall below 5 kN/m². As such the Network Rail requirements are satisfied and the proposed development is not considered to pose a risk to the structural integrity of the tunnels.

11.0 Damage Assessment

In addition to the above assessment of the likely movements that will result from the proposed development, any neighbouring buildings within the zone of influence of the excavations are considered to be sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 6.4 of CIRIA report C760.

The sensitive structures outlined previously have been modelled as displacement lines in the analysis along which the damage assessment has been undertaken.

11.1 Damage to Neighbouring Structures

The ground movements resulting from the piling, underpinning and basement excavation phases have been calculated using X-Disp modelling software to carry out an assessment of the likely damage to adjacent properties and the results are discussed below.

The building damage reports for sensitive structures previous discussed are included in the appendix and indicate that predominantly the damage to the adjoining and nearby structures due to basement construction are expected to fall within Category 0 'Negligible, as shown in the summary table below.

Structure	Elevation	Category*
43 Fitzjohn's Avenue	All elevations	Negligible (0)
45 Fitzjohn's Avenue	All elevations	Negligible (0)

The GMA has indicated that negligible movements of less than 5 mm are expected to occur along the footway of Fitzjohn's Avenue.

11.2 Monitoring of Ground Movements

The predictions of ground movement based on the ground movement analysis should be checked by monitoring of the adjacent properties and structures. The structures to be monitored during the construction stages should include the existing property and the neighbouring structure assessed above. Condition surveys of the above existing structures should be carried out before and after the proposed works.

The precise monitoring strategy will be developed at a later stage, and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.

12.0 GMA Conclusions

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the proposed basements would be 'Negligible'. The adjacent footway structure, any below ground services and the Network Rail tunnels are not expected to be impacted by the proposed development.

On this basis, the damage that has been predicted to occur as a result of the construction the proposed basement falls within the limits acceptable to the London Borough of Camden assuming that the careful control is taken during construction of the proposed excavations, and monitoring will be required to ensure that no excessive movements occur that would lead to damage in excess of these limits.

The separate phases of work, including underpinning and subsequent excavation of the proposed basement, will in practice be separated by a number of weeks. This will provide an opportunity for the ground movements during and immediately after installation of the retaining walls to be measured and the data acquired can be fed back into the design and compared with the predicted values. Such a comparison will allow the ground model to be reviewed and the predicted wall movements to be reassessed prior to the main excavation taking place so that propping arrangements can be adjusted if required.

Part 4: Basement Impact Assessment

This section of the report evaluates the direct and indirect implications of the proposed project, based on the findings of the previous screening and scoping, site investigation and ground movement assessment.

13.0 Introduction

The screening identified a number of potential impacts. The desk study and ground investigation information has been used below to review the potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

13.1 Potential Impacts

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

Potential Impact	Consequence
London Clay is the shallowest stratum at the site.	The London Clay is prone to seasonal shrink-swell (subsidence and heave).
Seasonal shrink-swell can result in foundation movements.	Multiple potential impacts depending on the specific setting of the basement development. For example, the implications of a deepened basement/foundation system on neighbouring properties should be considered.
A number of trees will be felled as part of the development	The removal of trees may lead to the recovery of any moisture deficit due to previous tree growth, which can lead to the heave of clay soils and the potential damage of neighbouring buildings and structures.
A tributary of the River Tyburn is shown to have historically flowed through the site	If the groundwater regime of a watercourse or spring line is affected by the proposed basement, water flows may increase or decrease, whilst there is the potential for new or old spring lines to be activated/reactivated. Seasonal changes in water flow can also affect slope stability.
The site is within 5 m of Fitzjohn's Avenue and the adjoining footpath.	Should the design of retaining walls and foundations not take into account the presence of nearby infrastructure, it may lead to the structural damage of footways, highways and associated buried services.
A Network Rail tunnel is present below the site.	The proposed building within the zone of influence of the tunnel and movements associated with the basement construction and excavation may potentially lead to unacceptable movements and increase in strain to the tunnel structure.

The results of the site investigation have therefore been used below to review the remaining potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

London Clay is the shallowest stratum / Seasonal Shrink-Swell/Trees will be felled

The investigation indicated that beneath a moderate thickness of made ground, the London Clay is present. The London Clay has been classified as being of medium volume change potential, which are prone to seasonal shrink-swell (settlement and heave).

Shrinkable clay is present within a depth that can be affected by tree roots and desiccation of the initial London Clay has been locally encountered to a depth of 2.00 m (74.74 m OD). As the basement will extend to a depth of 3.50 m (73.24 m OD), it is considered to be below the potential depth of root action and the zone of desiccation. Additionally, the proposed basement is not considered to pose a risk to neighbouring properties, which are considered to be outside the zone of influence of the trees where the desiccation has been encountered, with all neighbouring properties including either a basement or lower ground floor structure.

Similarly, to the above, although a number of trees will be felled as part of the proposed development, they are not considered to have the potential the stability of neighbouring properties, particularly as only immature and semi-mature trees will be removed, leaving the more established mature trees present. There is therefore not considered to be potential for significant heave movements to occur as a result of the tree removal.

Tributary of the River Tyburn historically flowing through the site

Historical maps indicated that the former tributary had been re-aligned or culverted prior to the start of the 20th Century. The investigation has not encountered any evidence of alluvial soils associated with the former flow path, with significant groundwater inflows also not encountered. The proposed basement is therefore not considered to intercept the

former river channel and therefore there is not considered to be risk of the alteration of groundwater flows or the activation or re-activation of spring lines.

The site is within 5 m of Fitzjohn's Avenue and the adjoining footpath
The ground movement analysis has indicated that negligible movements along the alignment of the adjacent footway.

The site is located over a Network Rail Tunnel
The ground movement analysis has indicated that movements of less than 1 mm can be expected at crowns of the tunnels, whilst changes in stress also fall below 5 kN/m^2. As such Network Rail requirements are satisfied and the proposed development is not considered to pose a risk to the structural integrity of the tunnels.

13.2 BIA Conclusions

A Basement Impact Assessment has been carried out following the information and guidance published by the London Borough of Camden.

It is concluded that the proposed development is unlikely to result in any specific land or slope stability issues.

13.3 Non-Technical Summary of Evidence

This section provides a short summary of the evidence acquired and used to form the conclusions made within the BIA.

13.3.1 Screening

The following table provides the evidence used to answer the subterranean (groundwater flow) screening questions.

Question	Evidence
1a. Is the site located directly above an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
1b. Will the proposed basement extend beneath the water table surface?	Previous nearby GEA investigations and BGS archive borehole records.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	Topographical and historical maps acquired as part of the desk study, reference to the Lost Rivers of London and Figures 11 and 12 of the Arup report.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	Figures 12 and 14 of the Arup report
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	A site walkover and existing plans of the site have confirmed the proportions of hardstanding and soft landscaping, which have been compared to the proposed drawings to determine the changes in the proportions.
5. As part of the 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)?	The details of the proposed development do not indicate the use of soakaway drainage.
6. 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?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report.

The following table provides the evidence used to answer the slope stability screening questions.

Question	Evidence
1. Does the existing site include slopes, natural or manmade, greater than 7°?	Topographical maps and Figures 16 and 17 of the Arup report and confirmed during a site walkover
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	The details of the proposed development provided do not include the re-profiling of the site to create new slopes

Question	Evidence
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	Topographical maps and Figures 16 and 17 of the Arup report
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	
5. Is the London Clay the shallowest strata at the site?	Geological maps and Figures 3, 5 and 8 of the Arup report
6. Will any trees be felled as part of the proposed development and / or are any works proposed within any tree protection zones where trees are to be retained?	The details of the proposed development.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Knowledge on the ground conditions of the area and reference to NHBC guidelines were used to make an assessment of this, in addition to a visual inspection of the buildings carried out during the site walkover.
8. Is the site within 100 m of a watercourse or potential spring line?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report
9. Is the site within an area of previously worked ground?	Geological maps and Figures 3, 5 and 8 of the Arup report
10. Is the site within an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
11. Is the site within 50 m of Hampstead Heath ponds?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report
12. Is the site within 5 m of a highway or pedestrian right of way?	Site plans and the site walkover.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Camden planning portal and the site walkover confirmed the position of the proposed basement relative the neighbouring properties.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Maps and plans of infrastructure tunnels were reviewed.

The following table provides the evidence used to answer the surface water flow and flooding screening questions.

Question	Evidence
1. Is the site within the catchment of the pond chains on Hampstead Heath?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report
2. 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?	A site walkover confirmed the current site conditions and the details provided on the proposed development, including reference to the FRA for the site.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	
4. Will the proposed basement development result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	
6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?	Flood risk maps acquired from the Environment Agency as part of the desk study, Figure 15 of the Arup report, the Camden Flood Risk Management Strategy dated 2013 and the North London Strategic Flood Risk Assessment dated 2008.

13.3.2 Scoping and Site Investigation

The questions in the screening stage that there were answered 'yes', were taken forward to a scoping stage and the potential impacts discussed in Section 4.0 of this report, with reference to the possible impacts outlined in the Arup report.

A ground investigation has been carried out, which has allowed an assessment of the potential impacts of the basement development on the various receptors identified from the screening and scoping stages. Principally the investigation aimed to establish the ground conditions, including the groundwater level, the engineering properties of the underlying soils to enable suitable design of the basement development and the configuration of existing party wall foundations. The findings of the investigation are discussed in Section 5.0 of this report and summarized in both Section 7.0 and the Executive Summary.

14.0 Outstanding Risks & Issues

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work may be required.

14.1 Site-Specific Risks

It is recommended that further groundwater monitoring is undertaken in order to establish the presence of shallow inflows from within the made ground and the naturally reworked London Clay.

It is recommended that further sampling and contamination testing is undertaken to target the areas of proposed soft landscaping, in order to fully determine the requirement for remedial measures.

As with any site there is a potential for further areas of contamination to be present within the made ground beneath parts of the site not covered by the investigation it is recommended that a watching brief is maintained during any groundworks for the proposed new foundations and that if any suspicious soils are encountered that they are inspected by a geoenvironmental engineer and further assessment may be required. Additionally, site workers should be made aware of the presence of asbestos and elevated concentrations of lead and total PAH within the made ground.

Further analysis will need to be carried out upon completion of the final design and loading arrangement in order to determine, if any, the potential impact of the development on the Belsize railway tunnels running adjacent to the site at depth.

These areas of doubt should be drawn to the attention of prospective contractors and further investigation will be required or sufficient contingency should be provided to cover the outstanding risk.

14.2 General Risks

The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the general ground conditions based on the discrete points at which the ground was sampled, but there may be ground conditions (including soil, rock, gas and groundwater) elsewhere on site that have not been revealed by this investigation and therefore could not have been taken into account in this report. The ground conditions should be subject to review as the development proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

Where any conclusions and recommendations contained in this report have been based upon information provided by others, it has been assumed that all relevant information has been provided by those parties and that such information is accurate. Any such information has not been independently verified by GEA, unless otherwise stated in the report. GEA accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to GEA from others.

Appendix

a. Field Work

Site Plan
Borehole Records
Trial Pit Records

b. Lab Testing

Geotechnical Test Results
SPT & Cohesion / Depth Plot
Chemical Test Results
Generic Risk Based Screening Values

c. Desk Study

Envirocheck Extracts
Historical Maps
Preliminary UXO Risk Assessment

d. Ground Movement Analysis

Proposed Drawings and Cross-Sections
GMA Reference Plan
X-Disp Inputs
Installation Movement Contours
Combined Installation and Excavation Movement Contours
Displacement Graph along Fitzjohn's Avenue
P-Disp Inputs
Undrained Vertical Movement Contours
Drained Vertical Movement Contours
Displacement Graphs for Tunnel Crown
Stress Graph for Tunnel Crown
Building Damage Assessment Table

appendix a

Field Work

Site Plan
Borehole Records
Trial Pit Records

appendix a

GEA

Geotechnical & Environmental Associates

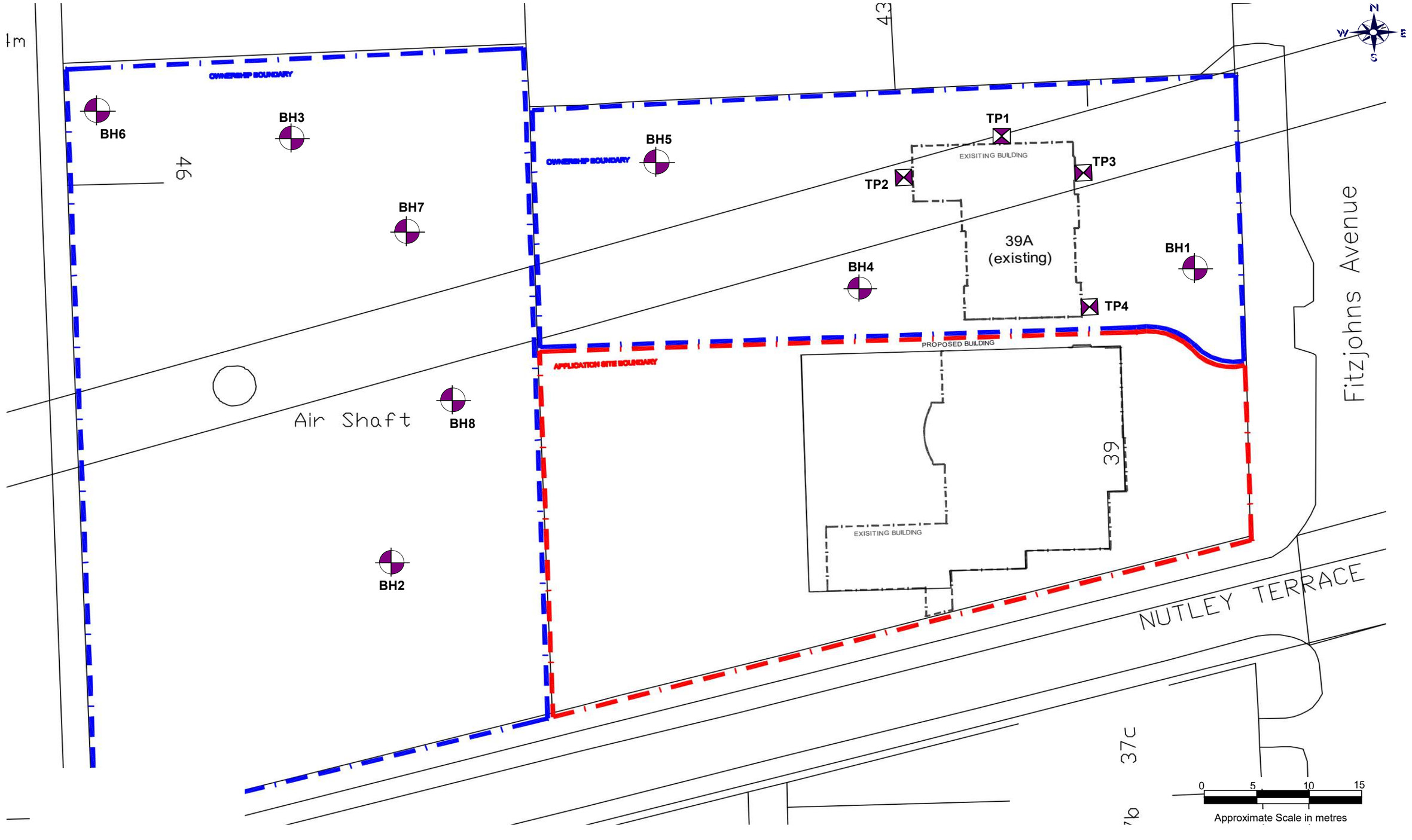
www.gea-ltd.co.uk

Site Plan

Site	39A Fitzjohns Avenue & 46 Maresfield Gardens, London NW3 5JU
Client	39 Fitzjohns Avenue Limited
Engineer	Price and Myers

Job Number J23003 & J23181

Sheet 1/1



GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
39a Fitzjohn's Avenue, London NW3 5JY				1
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J23003	24-01-23 24-01-23	76.74		
Client	Engineer			Sheet
39 Fitzjohn's Avenue Limited	Price and Myers			1 of 2

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.30	D			76.14		(0.60) 0.60	MADE GROUND (dark brown clayey sandy gravelly silt with abundant brick and concrete fragments)	
0.50	D							
1.20-1.65	UT	2,2/3,3,3,4 N60 = 15 13 blows				(1.40)	Very stiff very high strength brown mottled orange-brown and grey silty slightly sandy slightly gravelly CLAY with roots and rootelts. Gravel is fine to medium angular to subrounded. DESICCATED SOIL	
1.75	D			74.74		2.00		
2.00-2.45	SPT						Stiff high strength fissured brown mottled orange-brown and grey silty slightly sandy CLAY with selenite crystals, occasional black flecks and partings and pockets of orange-brown fine sand. Rootlets to 3.00 m	
2.75	D							
3.00-3.45	UT	2,3/4,3,4,4 N60 = 17 15 blows				(3.00)		
3.75	D							
4.00-4.45	SPT							
4.75	D			71.74		5.00		
5.00-5.45	UT	3,3/4,4,5,4 N60 = 19 19 blows					Stiff high strength fissured dark grey silty CLAY with mica and pcokets of pale grey and pale brownish grey silt and fine sand and occasional pyrite nodules	
6.00	D							
6.50-6.95	SPT							
7.50	D							
8.00-8.45	UT	3,4/5,5,5,6 N60 = 23 22 blows						
9.00	D							
9.50-9.95	SPT							

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Excavating services inspection pit from GL to 12.0 m for 1 hr.
Groundwater not encountered.
Groundwater monitoring standpipe installed to 6.00 m.

All dimensions in metres Scale 1:62.5	Method/ Plant Used Cable Percussion Drilling Rig	Logged By ML

Report ID: CABLE PERCUSSION || Project: J23003 LOGS.GPJ || Library: GEA LIBRARY.GLB || Date: 14 December 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
39a Fitzjohn's Avenue, London NW3 5JY				1
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J23003	24-01-23 24-01-23	76.74		
Client		Engineer		Sheet
39 Fitzjohn's Avenue Limited		Price and Myers		2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
						(10.00)	Stiff high strength fissured dark grey silty CLAY with mica and pcokets of pale grey and pale brownish grey silt and fine sand and occasional pyrite nodules(continued)	
10.50	D							
11.00-11.45	UT	4,4/5,5,6,6 N60 = 25 25 blows						
12.00	D							
12.50-12.95	SPT							
13.50	D							
14.00	D							
14.55-15.00	UT	4,5/6,6,7,7 N60 = 29 28 blows		61.74		15.00		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Excavating services inspection pit from GL to 12.0 m for 1 hr.
Groundwater not encountered.
Groundwater monitoring standpipe installed to 6.00 m.

All dimensions in metres Scale 1:62.5	Method/ Plant Used Cable Percussion Drilling Rig	Logged By ML

Report ID: CABLE PERCUSSION || Project: J23003 LOGS.GPJ || Library: GEA LIBRARY.GLB || Date: 14 December 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
39a Fitzjohn's Avenue, London NW3 5JY				4
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J23003	24-01-23 24-01-23	77.06		
Client	Engineer			Sheet
39 Fitzjohn's Avenue Limited	Price and Myers			1 of 2

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.10	ES						MADE GROUND (dark greyish brown silty sandy gravelly clay with ash and fragments of brick, concrete and occasional clinker and roots)	
0.50	ES					(0.80)		
				76.26		0.80		
0.90	D	1,1/2,2,2,2 N60 = 9					Firm fissured light brown and brown mottled orange-brown and grey silty slightly sandy CLAY with selenite crystals, occasional partings and pockets of orange-brown fine sand. Rootlets to 1.50 m	
1.50	D							
1.90	D	2,2/2,2,3,3 N60 = 11				(2.30)		
2.40	D							
2.80	D							
		2,1/3,2,3,4 N60 = 14		73.96		3.10		
3.40	D						Stiff fissured brown mottled grey and orange-brown silty CLAY with selenite crsytals, partings of orange-brown silt	
3.85	D					(1.40)	3.80 - 3.90 .....CLAYSTONE	
		2,2/2,3,3,4 N60 = 14						
4.30	D			72.56		4.50		
4.70	D						Stiff fissured dark grey silty CLAY	

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Groundwater not encountered.

All dimensions in metres Scale 1:31.25	Method/ Plant Used Opendrive Percussive Sampler	Logged By ML

Report ID: CABLE PERCUSSION || Project: J23003 LOGS.GPJ || Library: GEA LIBRARY.GLB || Date: 14 December 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
39a Fitzjohn's Avenue, London NW3 5JY				4
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J23003	24-01-23 24-01-23	77.06		
Client		Engineer		Sheet
39 Fitzjohn's Avenue Limited		Price and Myers		2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
		1,1/2,2,3,3 N60 = 11				(0.95)	Stiff fissured dark grey silty CLAY(continued)	
				71.61		5.45		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Groundwater not encountered.

All dimensions in metres Scale 1:31.25	Method/ Plant Used Opendrive Percussive Sampler	Logged By ML

Report ID: CABLE PERCUSSION || Project: J23003 LOGS.GPJ || Library: GEA LIBRARY.GLB || Date: 14 December 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
39a Fitzjohn's Avenue, London NW3 5JY				5
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J23003	24-01-23 24-01-23	77.19		
Client	Engineer			Sheet
39 Fitzjohn's Avenue Limited	Price and Myers			1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
				76.89		(0.30) 0.30	MADE GROUND (dark greyish brown gravelly sand with abundant ash and fragments of brick and occasional clinker)	
0.25	ES						Firm becoming stiff fissured light brown and brown mottled orange-brown and grey silty slightly sandy CLAY with selenite crystals, occasional partings and pockets of orange-brown fine sand. Rootelts to 1.40 m	
0.60	D							
0.90	D	2,1/2,3,2,3 N60 = 11						
1.50	D							
1.80	D					(3.20)		
2.10	D	2,1/2,3,2,3 N60 = 11						
2.70	D							
3.20	D	2,1/2,3,2,3 N60 = 11		73.69		3.50		
3.70	D						Stiff fissured dark brownish grey silty CLAY	
		2,1/3,3,3,4 N60 = 15				(0.95)		
				72.74		4.45		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Groundwater not encountered.

All dimensions in metres Scale 1:31.25	Method/ Plant Used Opendrive Percussive Sampler	Logged By ML

Report ID: CABLE PERCUSSION || Project: J23003 LOGS.GPJ || Library: GEA LIBRARY.GLB || Date: 14 December 2023

appendix b

Lab Testing

Geotechnical Test Results
SPT & Cohesion / Depth Plot
Chemical Test Results
Generic Risk Based Screening Values

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Location	Depth (m)	Sample Ref	Type	Description	WC %	LL %	PL %	PI %	<425 µm %	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 g/L	W/S Mg mg/L	
BH4	0.90		D	Orangish brown and dark brown slightly sandy CLAY with rare rootlets. Sand is fine.	28.4														
BH4	1.50		D	Brown slightly sandy slightly gravelly CLAY. Sand is fine.	26.6	61	25	36	97										
BH4	1.90		D	Brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium.	29.6														
BH4	2.40		D	Brown and grey slightly sandy CLAY. Sand is fine.	27.1	52	21	31	100										
BH4	2.80		D	Brown and grey slightly sandy CLAY. Sand is fine.	30.2														
BH4	3.40		D	Brown and grey slightly sandy CLAY. Sand is fine.	29.6														
BH5	0.60		D	Brown and orangish brown slightly sandy CLAY. San dis fine.	27.6														
BH5	0.90		D	Multicolour slightly sandy CLAY.	26.1	51	21	30	100										
BH5	1.50		D	Brown and orangish brown mottled black slightly sandy CLAY. Sand is fine.	28.2														
BH5	1.80		D	Orangish brown and grey slightly sandy CLAY. Sand is fine.	27.8														

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
03/03/2023

Project Number:

GEO / 37414

Project Name:

39A FITZJOHN'S AVENUE, LONDON NW3 5JU
J23003

GEOLABS®

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Location	Depth (m)	Sample Ref	Type	Description	WC %	LL %	PL %	PI %	<425 µm %	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 g/L	W/S Mg mg/L	
BH5	2.10		D	Brown and grey slightly sandy CLAY. Sand is fine.	27.9	51	21	30	100										
BH5	2.70		D	Brown and grey mottled orangish brown slightly sandy CLAY. Sand is fine.	26.6														
BH5	3.20		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	32.8														
BH5	3.70		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	32.2														
BH6	1.50		D	Brown and orangish brown mottled black slightly sandy CLAY. Sand is fine.	24.1														
BH6	1.80		D	Brown and orangish brown slightly sandy CLAY with rare rootlets. Sand is fine.	24.4														
BH6	2.20		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	34.0	71	25	46	100										
BH6	2.50		D	Brown and orangish brown mottled grey slightly sandy CLAY. Sand is fine.	33.9														
BH6	2.80		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	34.4														
BH6	3.10		D	Brown mottled grey slightly sandy CLAY with middle core of sandy gravel. Sand is fine. Gravel is fine to medium.	37.2														

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
03/03/2023

Project Number:

GEO / 37414

Project Name:

39A FITZJOHN'S AVENUE, LONDON NW3 5JU
J23003

GEOLABS®

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Location	Depth (m)	Sample Ref	Type	Description	WC %	LL %	PL %	PI %	<425 µm %	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 g/L	W/S Mg mg/L	
BH6	3.40		D	Brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium.	37.1														
BH6	3.80		D	Brown mottled grey slightly sandy CLAY with rare gypsum. Sand is fine.	32.4														
BH7	0.50		D	Brown and orangish brown mottled black slightly sandy CLAY. Sand is fine.	24.7														
BH7	0.70		D	Brown and orangish brown mottled black slightly sandy CLAY. Sand is fine.	22.2														
BH7	1.10		D	Brown and light grey mottled black slightly sandy gravelly CLAY with rare rootlets. Sand is fine.	24.8	53	19	34	100										
BH7	1.40		D	Brown and orangish brown mottled grey slightly sandy CLAY.	27.3														
BH7	1.70		D	Brown and orangish brown mottled grey slightly sandy CLAY.	25.8														
BH7	2.10		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	28.4	57	22	35	100										
BH7	2.40		D	Brown mottled grey slightly sandy CLAY. Sand is fine.	31.0														

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
03/03/2023

Project Number:

GEO / 37414

Project Name:

39A FITZJOHN'S AVENUE, LONDON NW3 5JU
J23003

GEOLABS®

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
33034	39a Fitzjohn's Avenue, London NW3	Samples received	02/02/2023
		Schedule received	21/02/2023
Project No.	Client	Project started	22/02/2023
J23003	GEA	Testing Started	28/02/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure: Axial strain %	At failure: σ1 - σ3 kPa	At failure: cu kPa	At failure: Mode	Remarks
BH1	-	1.20	-	U	Very high strength brown, orangish brown and grey mottled slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)	UU	2.10	1.76	19	198	102	25	10	426	213	C	
BH1	-	3.00	-	U	High strength brown slightly mottled grey and orangish brown slightly fine sandy silty CLAY with rare fine rootlets	UU	1.98	1.54	28	198	102	60	16	187	94	C	
BH1	-	5.00	-	U	High strength dark brown slightly mottled brown silty CLAY	UU	1.89	1.42	33	198	102	100	5.1	180	90	B	
BH1	-	8.00	-	U	High strength dark grey silty CLAY	UU	1.92	1.45	33	198	102	160	8.1	225	113	B	
BH1	-	11.00	-	U	Medium strength dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments and rare fm pyrite nodules	UU	1.98	1.53	29	198	102	220	12	144	72	C	
BH1	-	14.55	-	U	High strength dark grey slightly fine sandy silty CLAY	UU	2.02	1.57	28	198	102	290	6.6	280	140	B	
BH2	-	1.20	-	U	Medium strength brown slightly mottled orangish brown and grey silty CLAY with occasional fm calcareous fragments	UU	1.91	1.44	33	198	102	25	9.1	145	73	C	
BH2	-	3.00	-	U	High strength brown silty CLAY with occasional selenite deposits, rare pockets of orangish brown silt, fm siltstone fragments and rare fine rootlets	UU	1.94	1.46	33	198	102	60	11	227	114	C	Sample partially remoulded at base
BH2	-	8.00	-	U	High strength dark grey slightly fine sandy silty CLAY	UU	1.99	1.53	30	198	102	160	8.6	211	105	B	
BH2	-	11.00	-	U	High strength dark grey silty CLAY with occasional fine pyrite nodules	UU	1.99	1.54	30	198	102	220	4.0	197	99	B	
BH3	-	2.00	-	U	Medium strength brown slightly motted grey silty CLAY with occasional pockets of orangish brown fine sand, rare fine rootlets and rare fm sub-angular gravel	UU	1.85	1.37	35	198	102	40	7.1	136	68	B	
BH3	-	4.00	-	U	High strength brown slightly mottled grey silty CLAY with rare selenie deposits	UU	1.91	1.42	34	198	102	80	17	217	109	C	
BH3	-	6.50	-	U	High strength dark grey silty CLAY with occasional pockets of fine sand and rare coarse claystone fragments	UU	1.98	1.56	27	198	102	130	13	182	91	C	

Legend
UU - single stage test (single and multiple specimens) — σ3 Cell pressure — Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen — σ1 - σ3 Maximum corrected deviator stress — P - Plastic
suffix R - remoulded or recompacted — cu Undrained shear strength, ½ (σ1 - σ3) — C - Compound

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

Checked and Approved

Initials:

Date: 07/03/2023

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
33034	39a Fitzjohn's Avenue, London NW3	Samples received	02/02/2023
		Schedule received	21/02/2023
Project No.	Client	Project started	22/02/2023
J23003	GEA	Testing Started	28/02/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure Axial strain %	At failure σ1 - σ3 kPa	At failure cu kPa	At failure Mode	Remarks
BH3	-	9.50	-	U	High strength dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments	UU	2.00	1.58	26	170	102	190	23	190	95	C	Sample disturbed - short sample
BH3	-	12.50	-	U	High strength dark grey silty CLAY with occasional pockets of fine sand	UU	2.00	1.53	31	198	102	250	9.6	223	112	B	

Legend
- UU - single stage test (single and multiple specimens)
- UUM - Multistage test on a single specimen
- suffix R - remoulded or recompacted
- σ3 Cell pressure
- σ1 - σ3 Maximum corrected deviator stress
- cu Undrained shear strength, ½ (σ1 - σ3)
- Mode of failure ; B - Brittle ; P - Plastic ; C - Compound

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

Checked and Approved

Initials:

Date: 07/03/2023

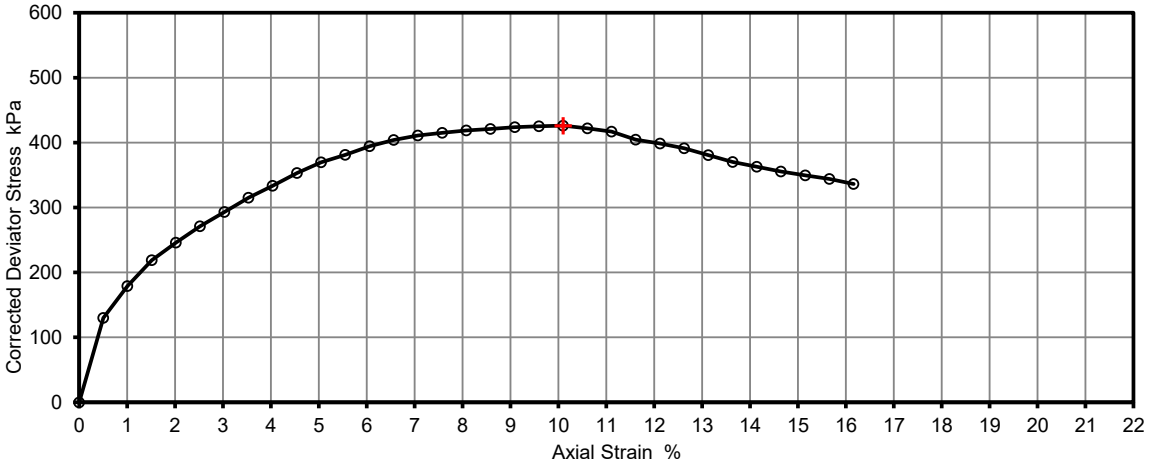
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	1.20 m
Soil Description	Very high strength brown, orangish brown and grey mottled slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

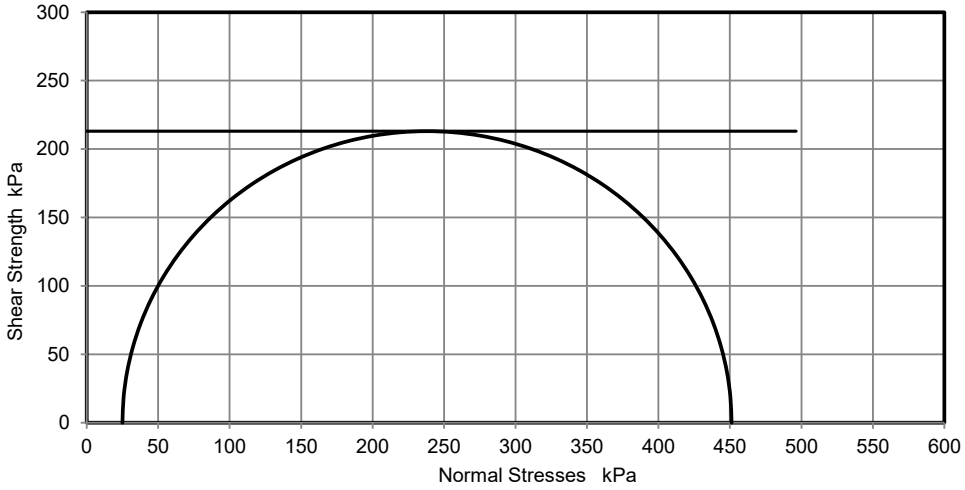
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.10	Mg/m3
Moisture Content	19	%
Dry Density	1.76	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	25	kPa
Axial Strain	10	%
Deviator Stress, (σ1 - σ3)f	426	kPa
Undrained Shear Strength, cu	213	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

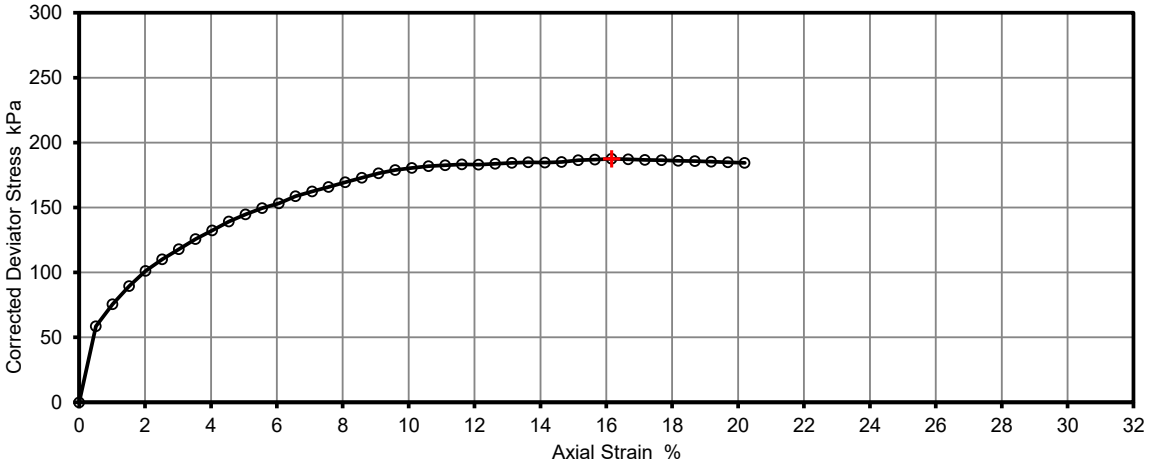
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	3.00 m
Soil Description	High strength brown slightly mottled grey and orangish brown slightly fine sandy silty CLAY with rare fine rootlets			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

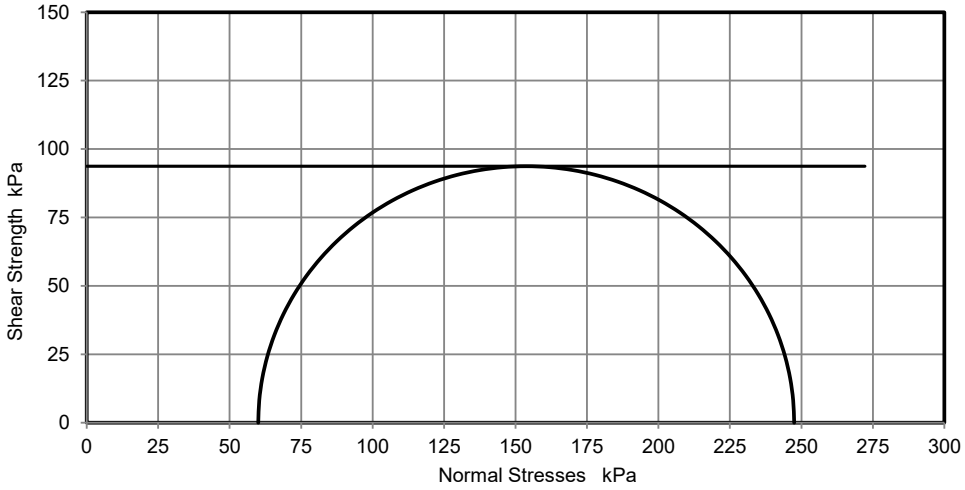
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.98	Mg/m3
Moisture Content	28	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	60	kPa
Axial Strain	16	%
Deviator Stress, (σ1 - σ3)f	187	kPa
Undrained Shear Strength, cu	94	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

2519 *Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)* MSF-5 R7

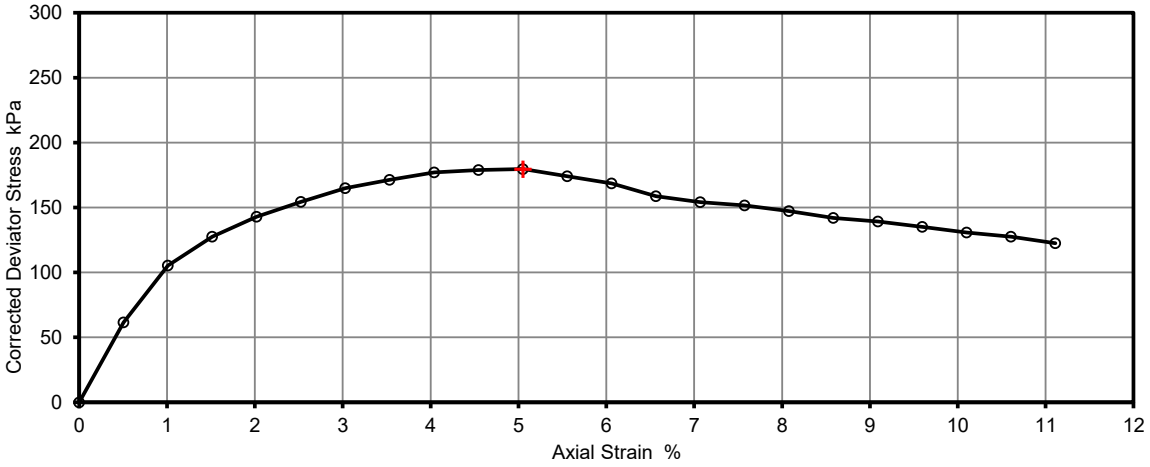
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	5.00 m
Soil Description	High strength dark brown slightly mottled brown silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

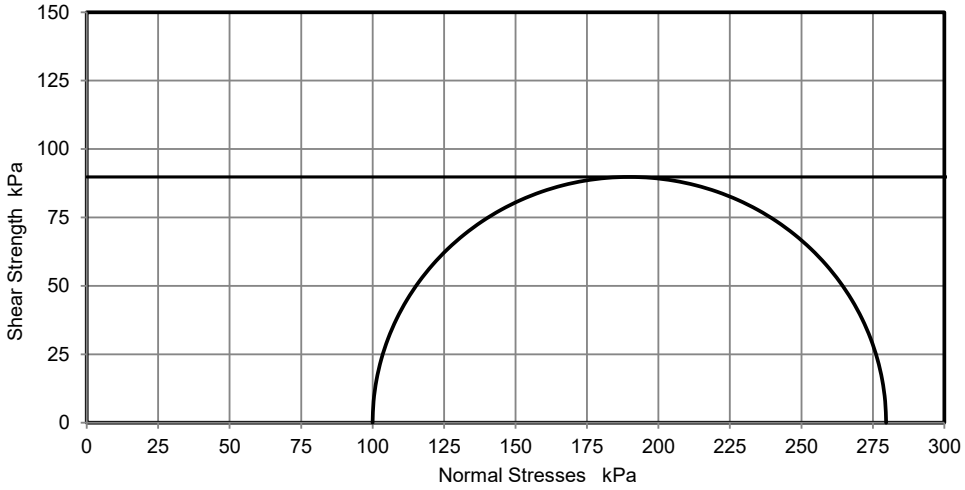
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	33	%
Dry Density	1.42	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	100	kPa
Axial Strain	5.1	%
Deviator Stress, (σ1 - σ3)f	180	kPa
Undrained Shear Strength, cu	90	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

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

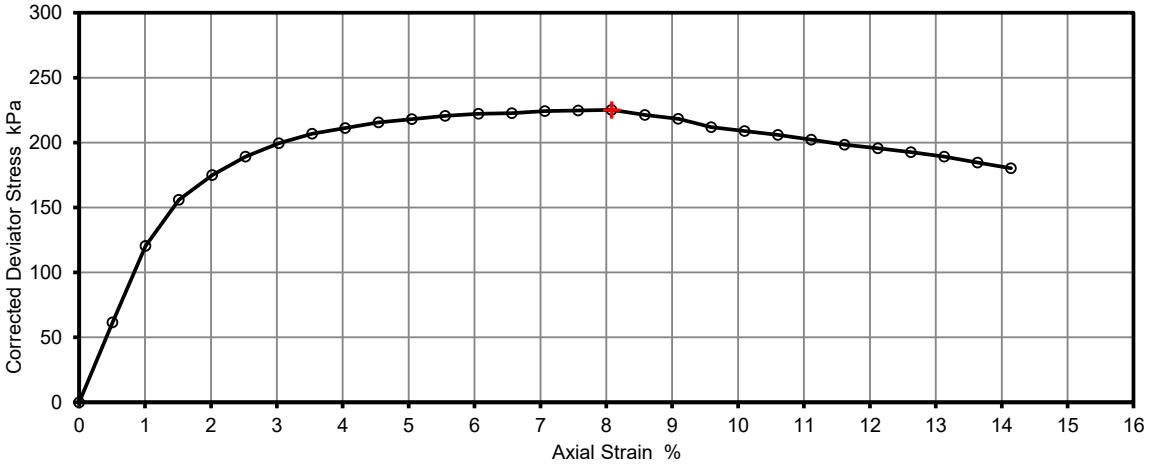
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	8.00 m
Soil Description	High strength dark grey silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

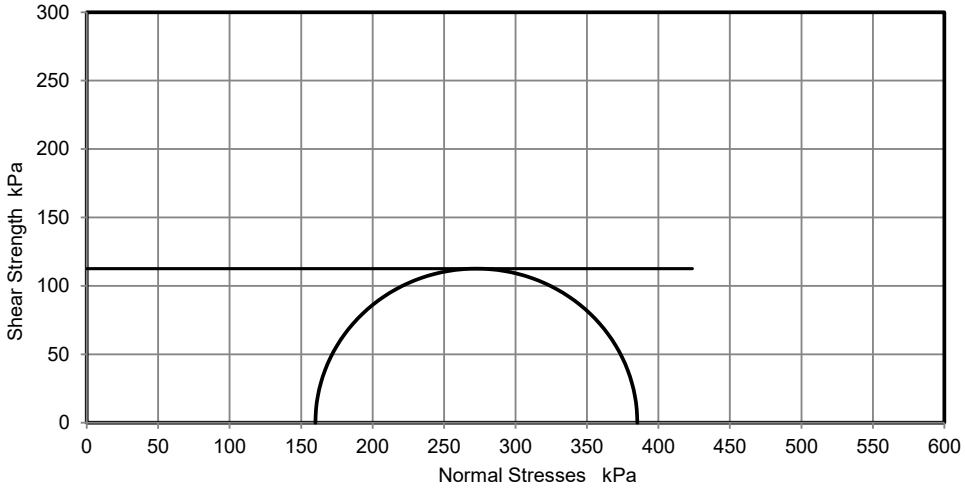
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.92	Mg/m3
Moisture Content	33	%
Dry Density	1.45	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	160	kPa
Axial Strain	8.1	%
Deviator Stress, (σ1 - σ3)f	225	kPa
Undrained Shear Strength, cu	113	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

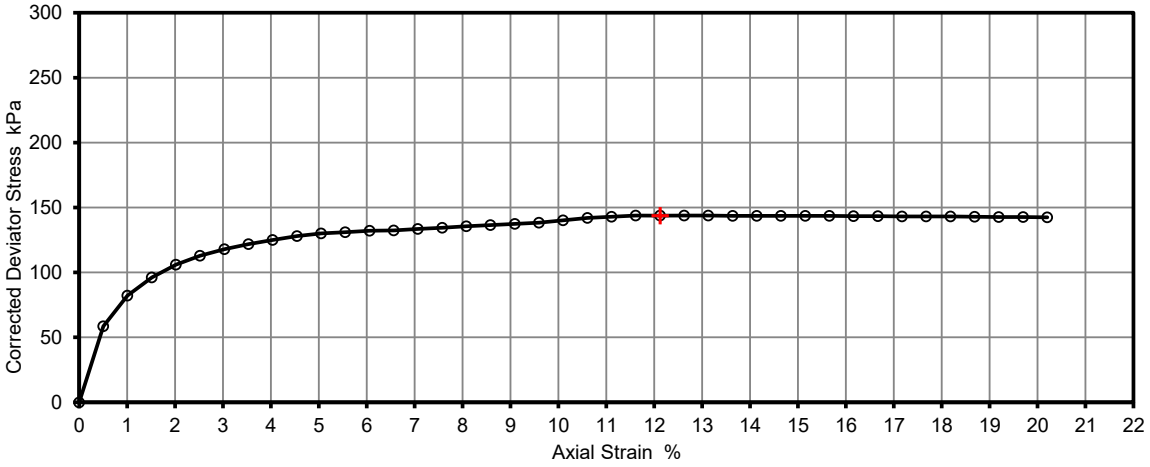
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	11.00 m
Soil Description	Medium strength dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments and rare fm pyrite nodules			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

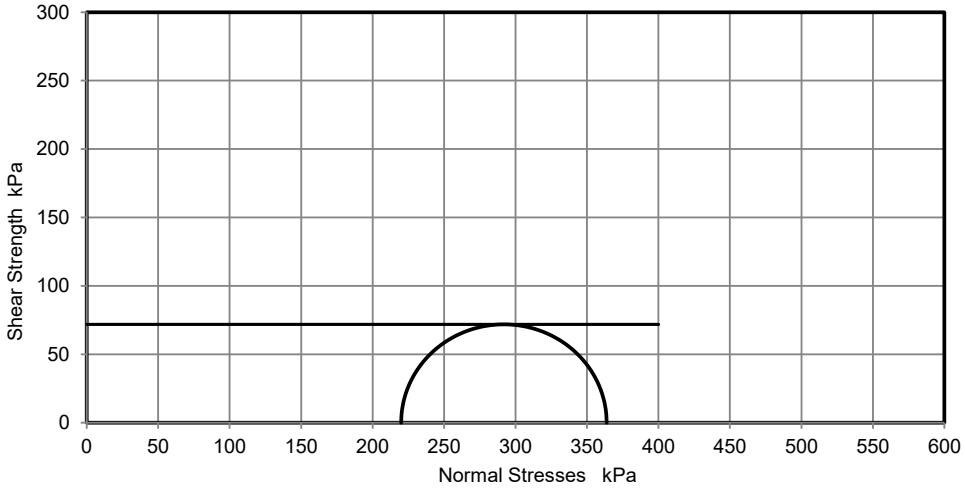
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.98	Mg/m3
Moisture Content	29	%
Dry Density	1.53	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	220	kPa
Axial Strain	12	%
Deviator Stress, (σ1 - σ3)f	144	kPa
Undrained Shear Strength, cu	72	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

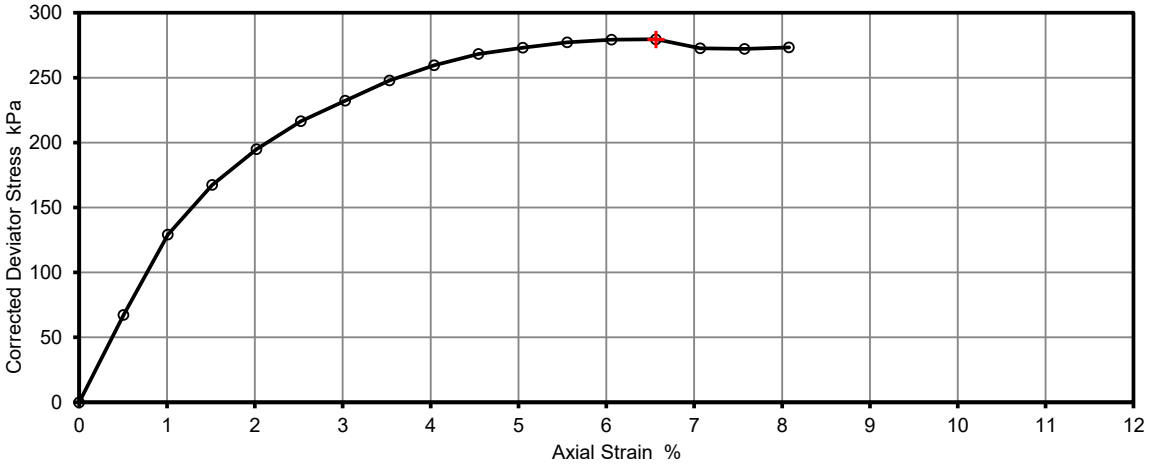
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH1
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	14.55 m
Soil Description	High strength dark grey slightly fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

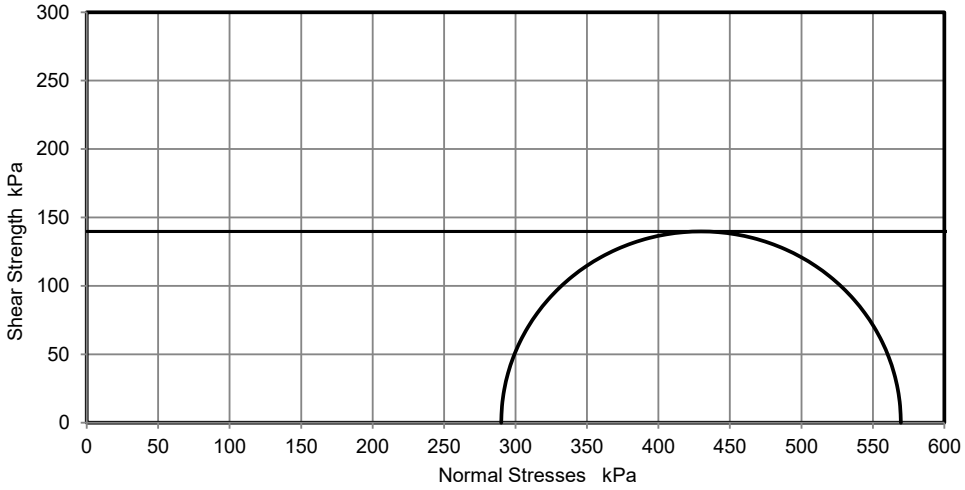
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	28	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	290	kPa
Axial Strain	6.6	%
Deviator Stress, (σ1 - σ3)f	280	kPa
Undrained Shear Strength, cu	140	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

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

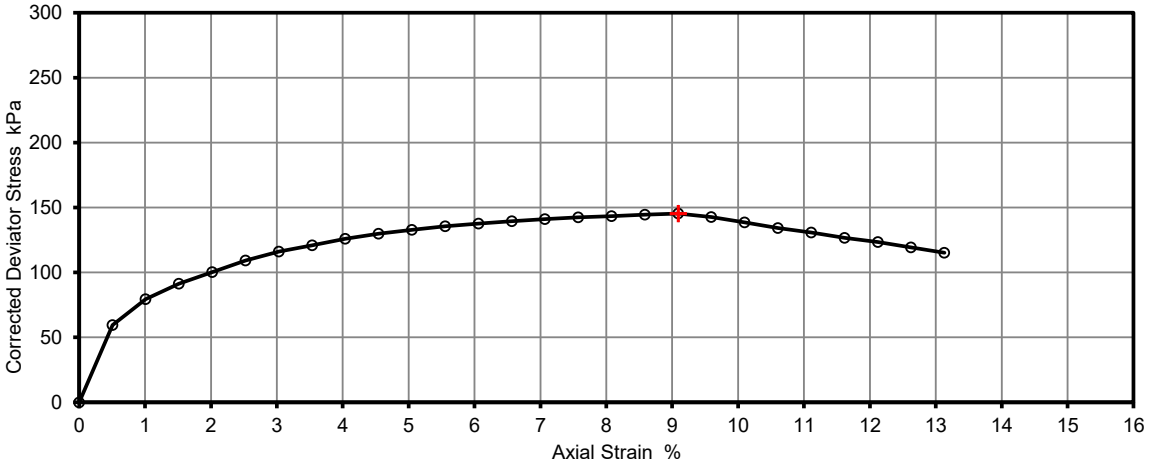
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH2
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	1.20 m
Soil Description	Medium strength brown slightly mottled orangish brown and grey silty CLAY with occasional fm calcareous fragments			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

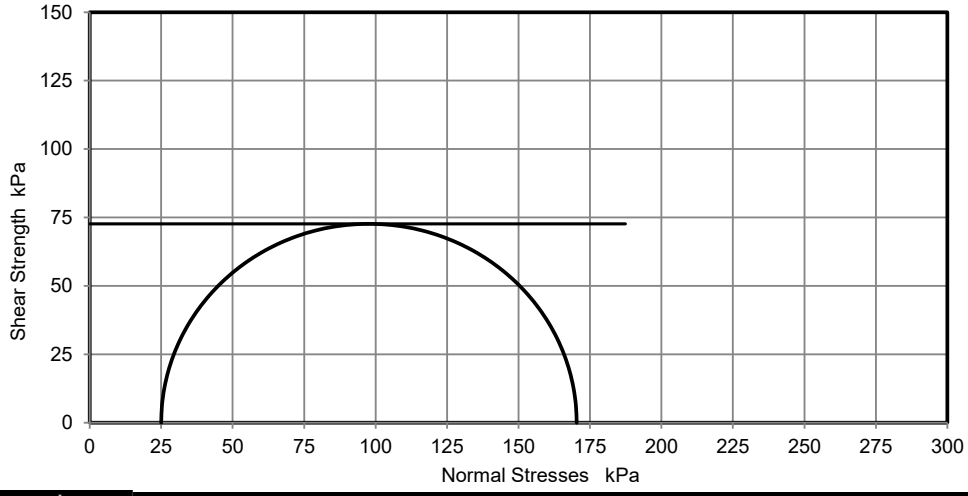
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.91	Mg/m3
Moisture Content	33	%
Dry Density	1.44	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	25	kPa
Axial Strain	9.1	%
Deviator Stress, (σ1 - σ3)f	145	kPa
Undrained Shear Strength, cu	73	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

2519 *Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)* MSF-5 R7

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH2
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	3.00 m
Soil Description	High strength brown silty CLAY with occasional selenite deposits, rare pockets of orangish brown silt, fm siltstone fragments and rare fine rootlets			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

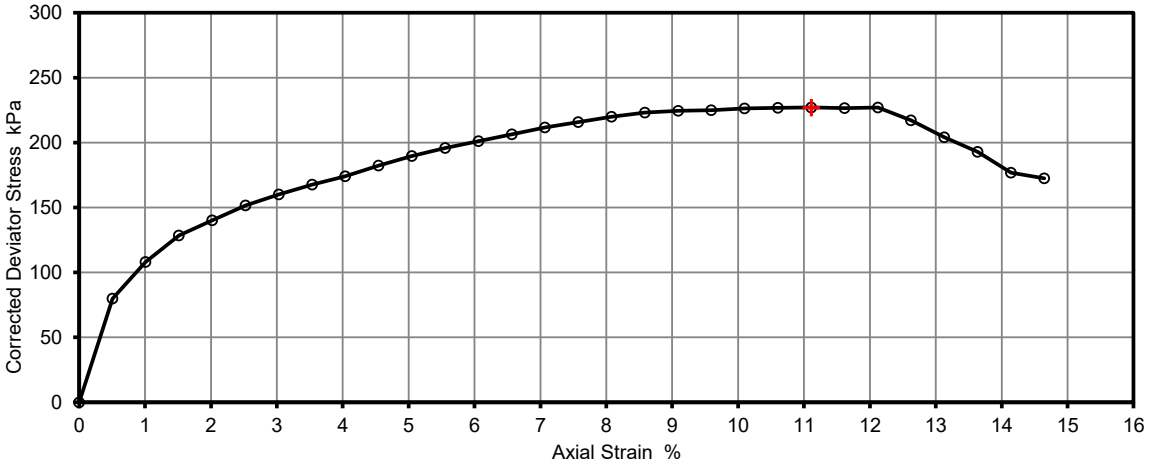
Remarks

Sample partially remoulded at base

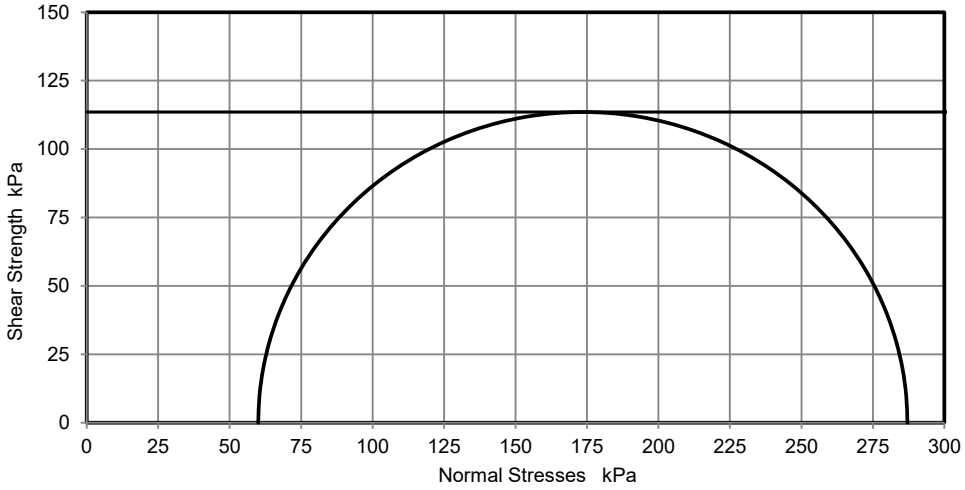
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.94	Mg/m3
Moisture Content	33	%
Dry Density	1.46	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	60	kPa
Axial Strain	11	%
Deviator Stress, (σ1 - σ3)f	227	kPa
Undrained Shear Strength, cu	114	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

UKAS TESTING 2519

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

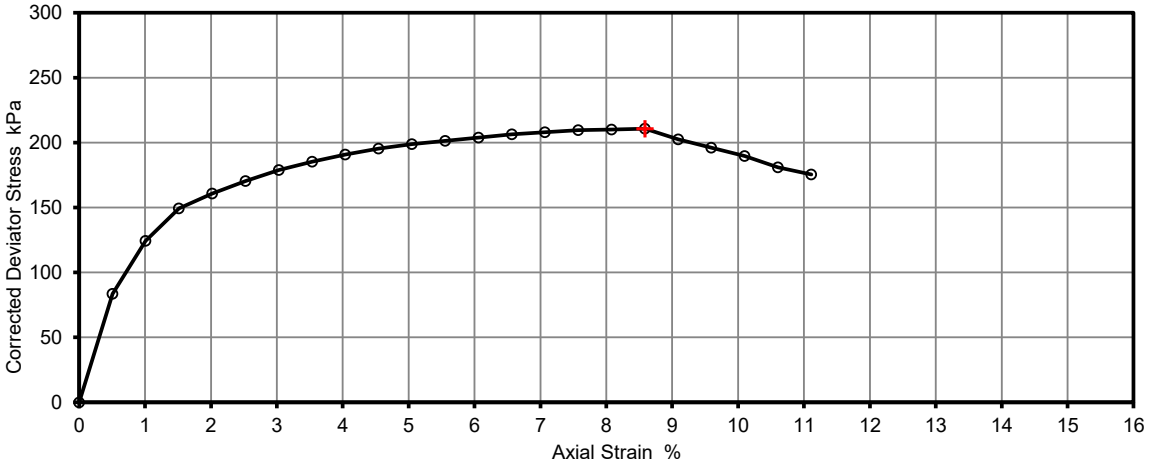
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH2
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	8.00 m
Soil Description	High strength dark grey slightly fine sandy silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

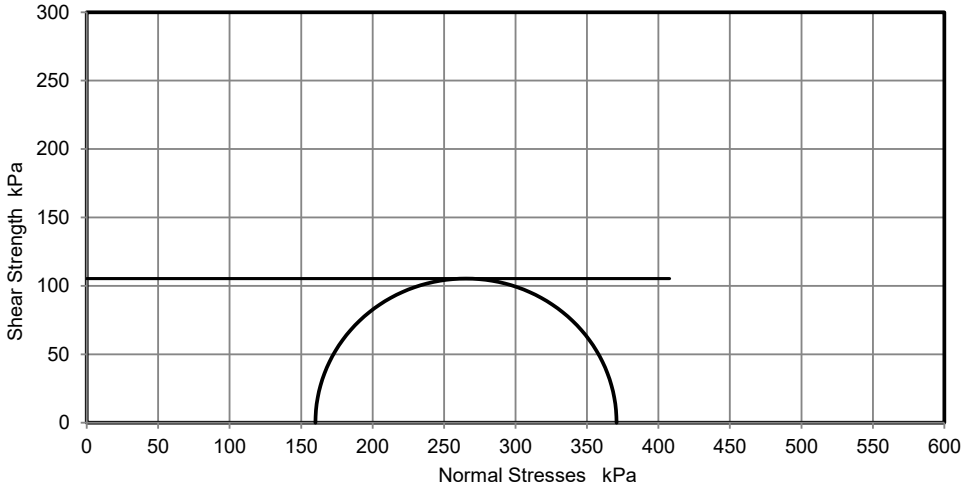
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.99	Mg/m3
Moisture Content	30	%
Dry Density	1.53	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	160	kPa
Axial Strain	8.6	%
Deviator Stress, (σ1 - σ3)f	211	kPa
Undrained Shear Strength, cu	105	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

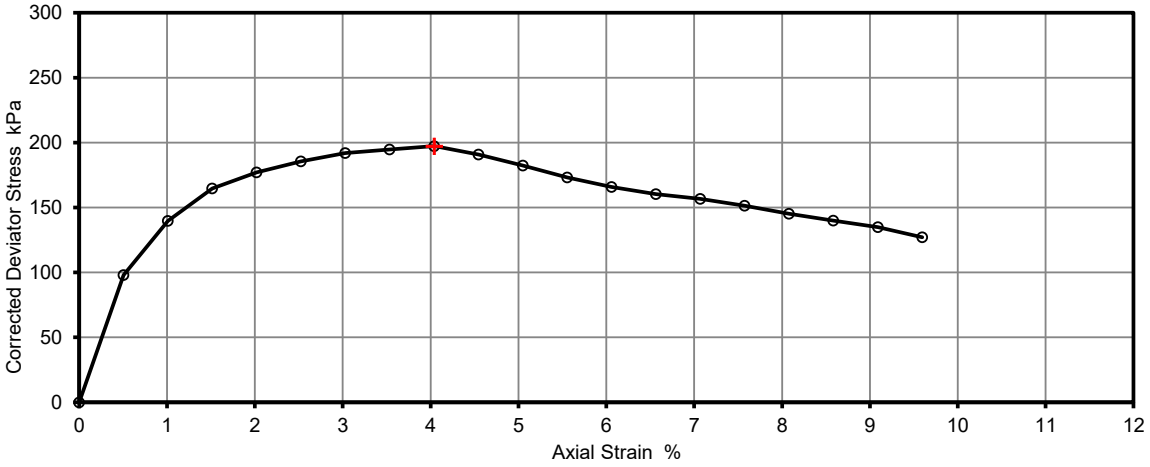
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	33034
				Borehole/Pit No.	BH2
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	11.00 m
Soil Description	High strength dark grey silty CLAY with occasional fine pyrite nodules			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

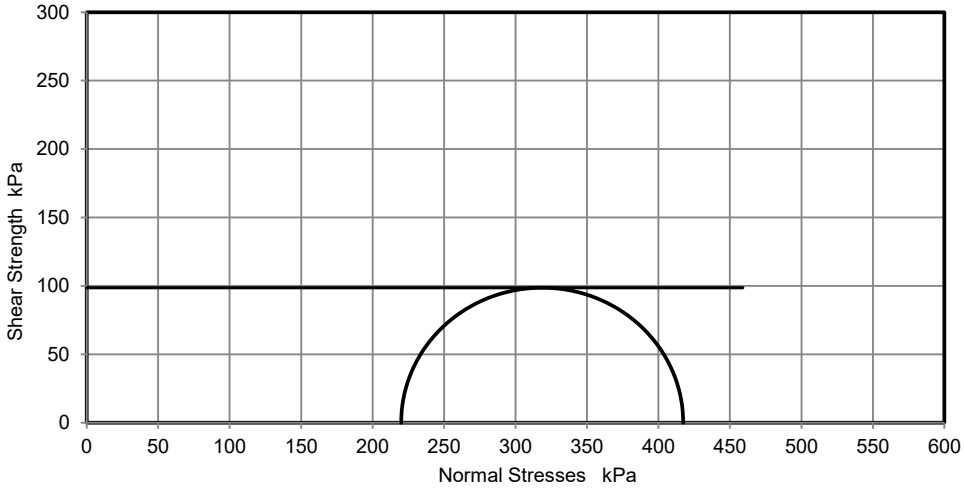
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.99	Mg/m3
Moisture Content	29	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	220	kPa
Axial Strain	4.0	%
Deviator Stress, (σ1 - σ3)f	197	kPa
Undrained Shear Strength, cu	99	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

UKAS TESTING 2519

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

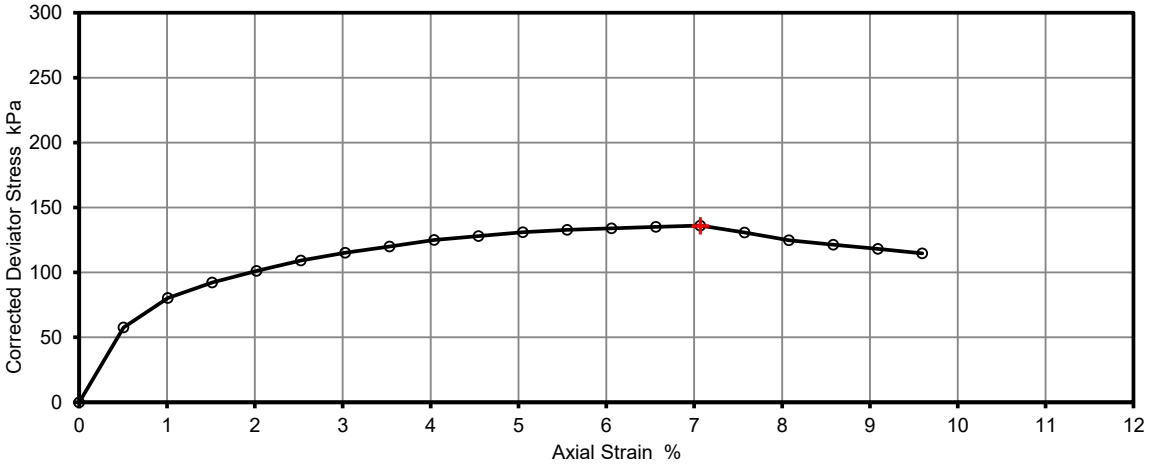
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH3
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	2.00 m
Soil Description	Medium strength brown slightly motted grey silty CLAY with occasional pockets of orangish brown fine sand, rare fine rootlets and rare fm sub-angular gravel			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

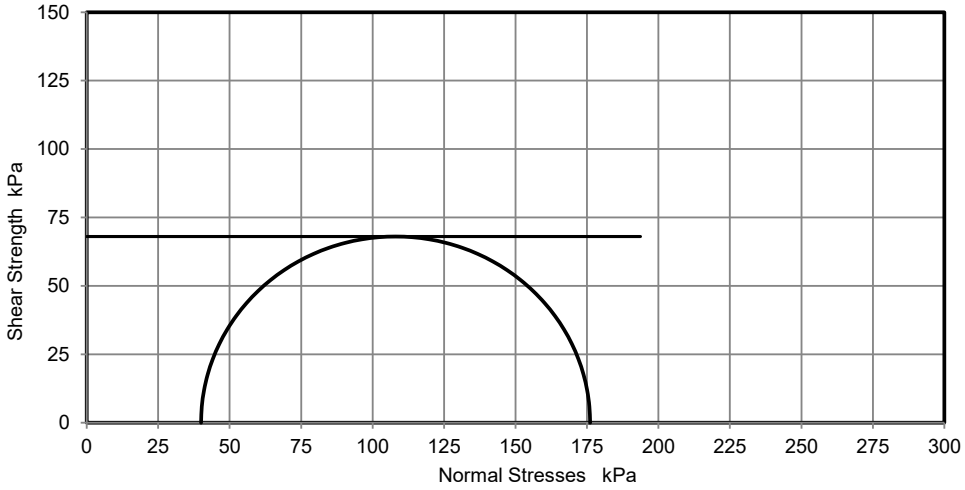
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.85	Mg/m3
Moisture Content	35	%
Dry Density	1.37	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	40	kPa
Axial Strain	7.1	%
Deviator Stress, (σ1 - σ3)f	136	kPa
Undrained Shear Strength, cu	68	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

UKAS TESTING 2519

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

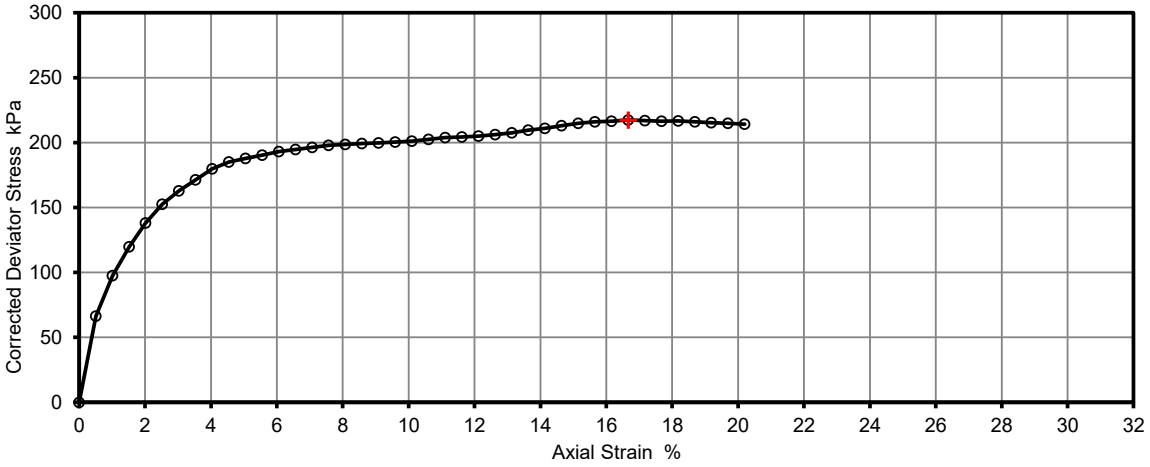
K4 SOILS	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	33034
				Borehole/Pit No.	BH3
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	4.00 m
Soil Description	High strength brown slightly mottled grey silty CLAY with rare selenie deposits			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

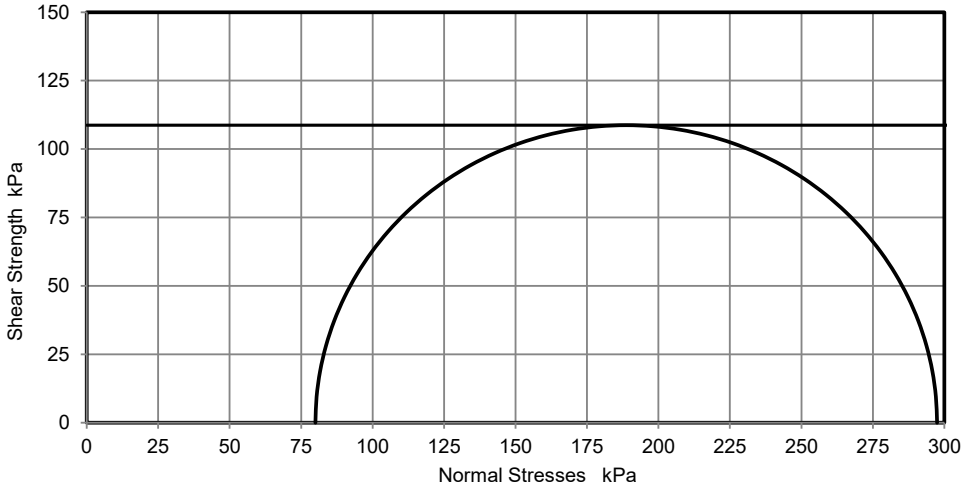
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.91	Mg/m3
Moisture Content	34	%
Dry Density	1.42	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	80	kPa
Axial Strain	17	%
Deviator Stress, (σ1 - σ3)f	217	kPa
Undrained Shear Strength, cu	109	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

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

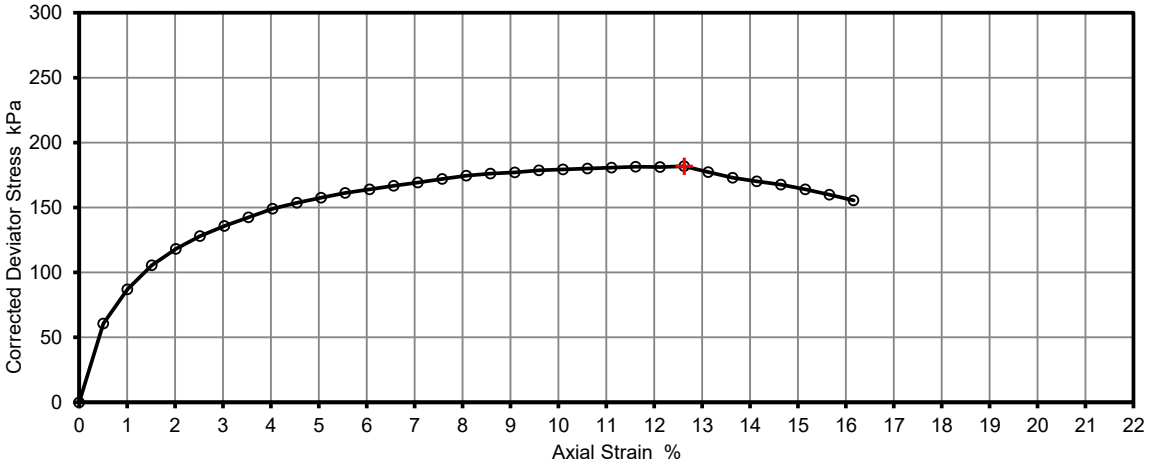
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH3
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	6.50 m
Soil Description	High strength dark grey silty CLAY with occasional pockets of fine sand and rare coarse claystone fragments			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

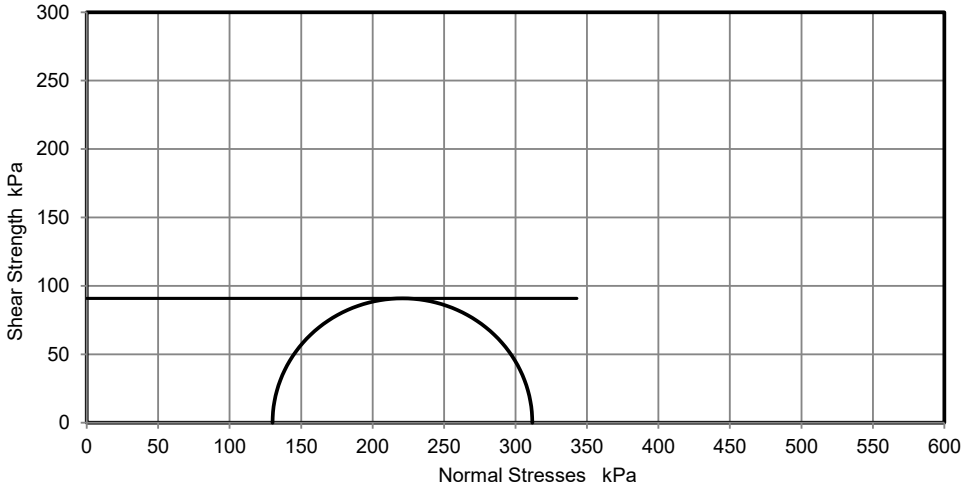
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.98	Mg/m3
Moisture Content	27	%
Dry Density	1.56	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	130	kPa
Axial Strain	13	%
Deviator Stress, (σ1 - σ3)f	182	kPa
Undrained Shear Strength, cu	91	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH3
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	9.50 m
Soil Description	High strength dark grey slightly fine sandy silty CLAY with rare decomposed shell fragments			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

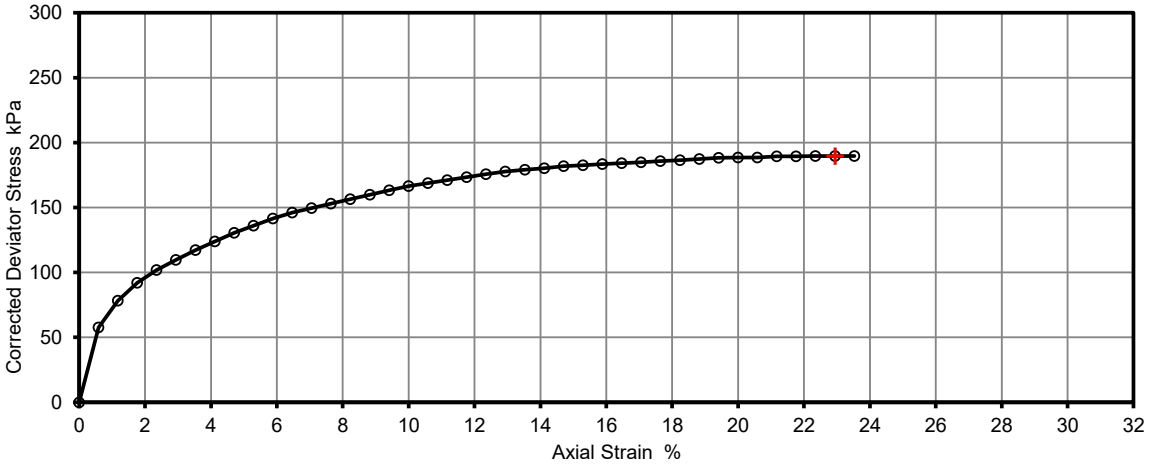
Remarks

Sample disturbed - short sample

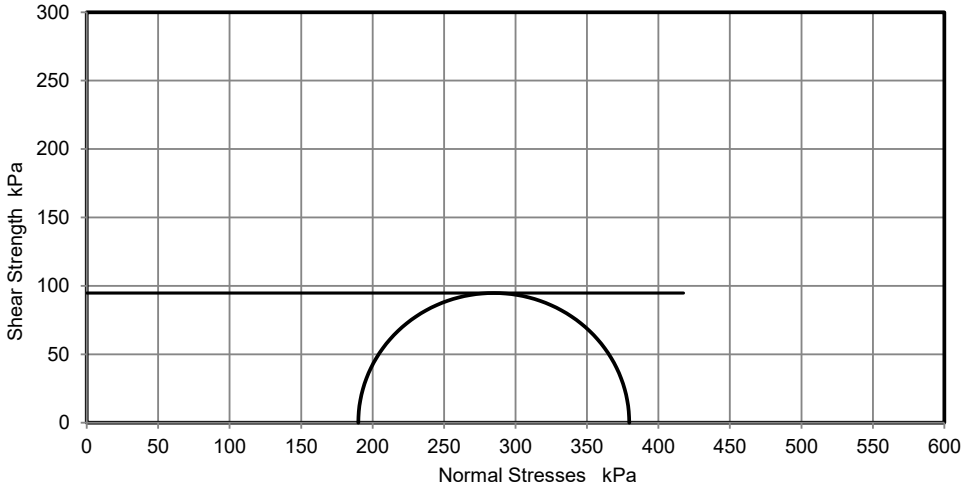
Position within sample

Test Number	1	
Length	170.0	mm
Diameter	102.0	mm
Bulk Density	2.00	Mg/m3
Moisture Content	26	%
Dry Density	1.58	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	190	kPa
Axial Strain	23	%
Deviator Stress, (σ1 - σ3)f	190	kPa
Undrained Shear Strength, cu	95	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

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

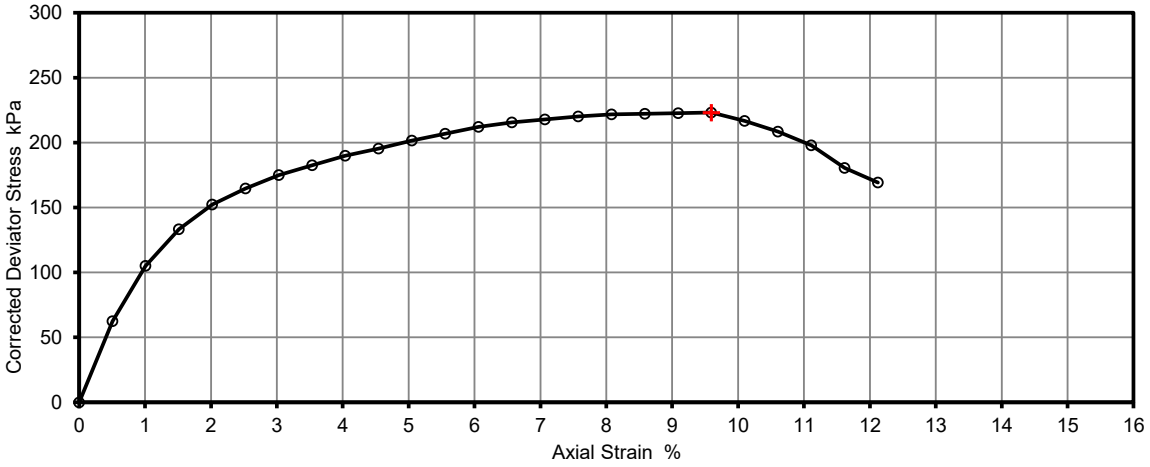
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33034
				Borehole/Pit No.	BH3
Site Name	39a Fitzjohn's Avenue, London NW3			Sample No.	-
Project No.	J23003	Client	GEA	Depth Top	12.50 m
Soil Description	High strength dark grey silty CLAY with occasional pockets of fine sand			Depth Base	- m
				Sample Type	U
				Samples received	02/02/2023
				Schedules received	21/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

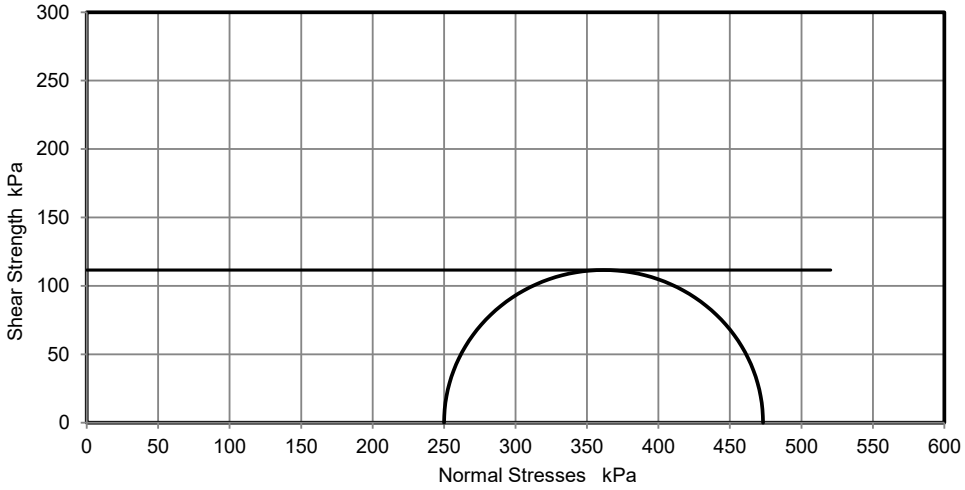
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.00	Mg/m3
Moisture Content	31	%
Dry Density	1.53	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	250	kPa
Axial Strain	9.6	%
Deviator Stress, (σ1 - σ3)f	223	kPa
Undrained Shear Strength, cu	112	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 07/03/2023

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

Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results

Tested in accordance with BS1377 : Part 3 : 2018, Clause 7.6 & Clause 12

Job No.	Project Name	Programme	
33034	39a Fitzjohn's Avenue, London NW3	Samples received	02/02/2023
		Schedule received	21/02/2023
Project No.	Client	Project started	22/02/2023
J23003	GEA	Testing Started	02/03/2023

Hole No.	Sample				Soil description	Dry Mass passing 2mm	SO4 Content	pH	Remarks
	Ref	Top m	Base m	Type		%	mg/l		
BH1	-	9.00	-	D	Dark grey silty CLAY with occasional pockets of fine sand	100	1020	7.4	
BH2	-	6.00	-	D	Dark grey silty CLAY with occasional pockets of fine sand and rare black carbonaceous deposits	100	670	7.6	
BH3	-	11.00	-	D	Dark grey silty CLAY with rare pockets of fine sand	100	370	7.6	

UKAS TESTING

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

These results only apply to the items tested

Checked and Approved

Initials J.P

Date: 07/03/2023

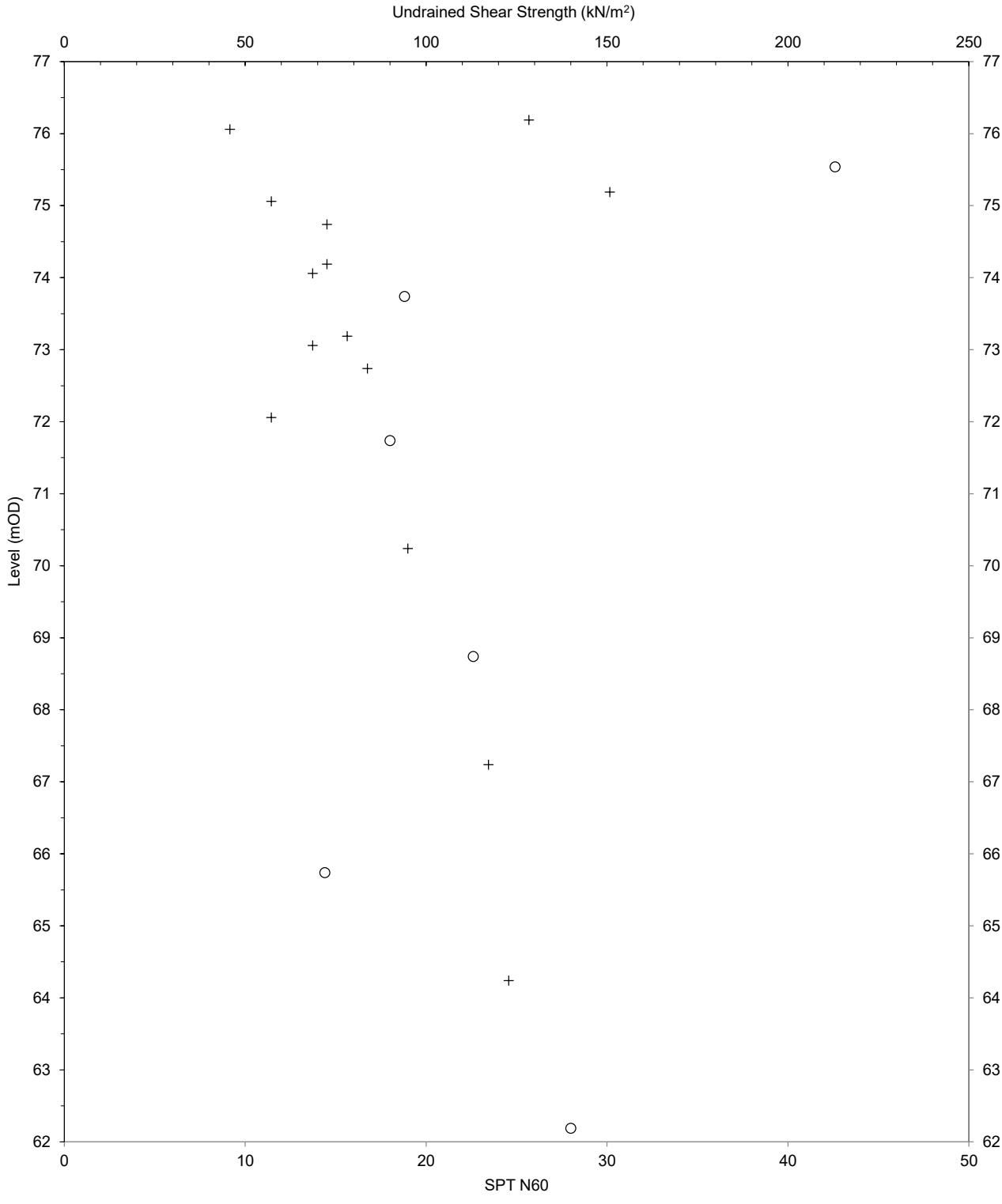
GEA
www.gea-ltd.co.uk
Herts | 01727 824666 Notts | 01509 674888

SPT & Cohesion / Depth Graph

Site	39a Fitzjohn's Avenue, London NW3 5JY
Client	39 Fitzjohn's Avenue Limited
Engineer	Price and Myers

Job Number J23003

Sheet 1 / 1



Cu = SPT_{N60} x 5

o = cohesion + = SPT_{N60}

Matt Legg
Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
Hertfordshire
SG127QE

e: matt.legg@gea-ltd.co.uk

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

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

Analytical Report Number : 23-16013

Project / Site name:	39a Fitzjohns Avenue, London NW3 5JU	**Samples received on:**	27/01/2023
Your job number:	J23003	**Samples instructed on/ Analysis started on:**	06/02/2023
Your order number:	J23003	**Analysis completed by:**	14/02/2023
Report Issue Number:	1	**Report issued on:**	14/02/2023
Samples Analysed:	6 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
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: 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU
Your Order No: J23003

Lab Sample Number				2576082	2576083	2576084	2576085	2576086
Sample Reference				BH4	BH5	BH5	BH6	BH6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.10	0.50	0.20	1.00
Date Sampled				25/01/2023	25/01/2023	25/01/2023	25/01/2023	25/01/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	9	16	12	19
Total mass of sample received	kg	0.001	NONE	1.3	1.3	1.3	1.3	1.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Amosite	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	< 0.001	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO	PDO	PDO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	7.5	8.2	9.1	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	1.4	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	430	360	610	3100	2100
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.031	0.098	0.021	0.35	0.19
Sulphide	mg/kg	1	MCERTS	37	34	30	240	3.7
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	12	13	6.8	35	3.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	5	3.8	2.1	1	1

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.22	0.08	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	1	0.51	< 0.05	0.08	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	7.5	0.47	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	9.1	0.87	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	120	13	0.42	0.43	0.33
Anthracene	mg/kg	0.05	MCERTS	29	3	0.11	0.16	0.09
Fluoranthene	mg/kg	0.05	MCERTS	160	24	1.1	1.3	0.68
Pyrene	mg/kg	0.05	MCERTS	150	17	1.2	1.2	0.67
Benzo(a)anthracene	mg/kg	0.05	MCERTS	71	12	0.83	0.83	0.38
Chrysene	mg/kg	0.05	MCERTS	68	11	0.95	0.79	0.43
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	95	15	1.3	1.1	0.4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	21	4.8	0.51	0.52	0.21
Benzo(a)pyrene	mg/kg	0.05	MCERTS	61	11	1.1	0.84	0.36
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	42	7.1	0.52	0.55	0.17
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	11	2	0.12	0.12	0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	40	7.6	0.53	0.55	0.21

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	885	128	8.62	8.4	3.98

Analytical Report Number: 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU
Your Order No: J23003

Lab Sample Number				2576082	2576083	2576084	2576085	2576086
Sample Reference				BH4	BH5	BH5	BH6	BH6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.10	0.50	0.20	1.00
Date Sampled				25/01/2023	25/01/2023	25/01/2023	25/01/2023	25/01/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	12	120	15	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	3.5	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	19	25	28	32
Copper (aqua regia extractable)	mg/kg	1	MCERTS	49	47	65	29	31
Lead (aqua regia extractable)	mg/kg	1	MCERTS	56	95	320	160	93
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.8	0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	34	19	18	28
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	42	89	100	97	65
Petroleum Hydrocarbons								
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	1100	570	15	170	< 10
TPH (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	MCERTS	2.3	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	17	4.1	< 4.0	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	220	32	2.8	17	< 1.0
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	590	290	12	97	< 1.0
TPH Total C8 - C35 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	830	330	15	110	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

" Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and therefore may be unreliable.

Analytical Report Number: 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU
Your Order No: J23003

Lab Sample Number				2576087
Sample Reference				BH7
Sample Number				None Supplied
Depth (m)				0.30
Date Sampled				25/01/2023
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	9.4
Total mass of sample received	kg	0.001	NONE	1.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-
Asbestos Quantification Total	%	0.001	ISO 17025	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	9600
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.2
Sulphide	mg/kg	1	MCERTS	21
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	71
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.3

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05*
Acenaphthene	mg/kg	0.05	MCERTS	0.11*
Fluorene	mg/kg	0.05	MCERTS	0.09
Phenanthrene	mg/kg	0.05	MCERTS	1
Anthracene	mg/kg	0.05	MCERTS	0.15
Fluoranthene	mg/kg	0.05	MCERTS	0.99
Pyrene	mg/kg	0.05	MCERTS	0.98
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.35
Chrysene	mg/kg	0.05	MCERTS	0.45
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.31
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.22
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.33
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.23
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.25

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	5.47

Analytical Report Number: 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU
Your Order No: J23003

Lab Sample Number				2576087
Sample Reference				BH7
Sample Number				None Supplied
Depth (m)				0.30
Date Sampled				25/01/2023
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25
Lead (aqua regia extractable)	mg/kg	1	MCERTS	41
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	58

Petroleum Hydrocarbons

TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10

TPH (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	MCERTS	< 2.0
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	< 4.0
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	< 1.0
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	< 1.0
TPH Total C8 - C35 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

" Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and therefore may be unreliable.

UKAS TESTING
4041

Analytical i2 Environmental Science

Analytical Report Number: 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU
Your Order No: J23003

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2576082	BH4	0.25	160	Loose Fibres	**Amosite**	< 0.001	**< 0.001**
2576085	BH6	0.20	164	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU

* 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 *
2576082	BH4	None Supplied	0.25	Brown gravelly sand.
2576083	BH5	None Supplied	0.1	Brown gravely sand with gravel and clinker
2576084	BH5	None Supplied	0.5	Brown clay with gravel and vegetation.
2576085	BH6	None Supplied	0.2	Light brown gravelly sand with rubble and brick.
2576086	BH6	None Supplied	1	Brown clay and sand with gravel.
2576087	BH7	None Supplied	0.3	Light brown gravelly sand with rubble and gravel

Analytical Report Number : 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU

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
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
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
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

Analytical Report Number : 23-16013
Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU

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
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

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.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report

Analytical Report Number : 23-16013

Project / Site name: 39a Fitzjohns Avenue, London NW3 5JU

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH4	None Supplied	S	2576082	c	Sulphide in soil	L010-PL	c
BH4	None Supplied	S	2576082	c	Total cyanide in soil	L080-PL	c
BH5	None Supplied	S	2576083	c	Sulphide in soil	L010-PL	c
BH5	None Supplied	S	2576083	c	Total cyanide in soil	L080-PL	c
BH5	None Supplied	S	2576084	c	Sulphide in soil	L010-PL	c
BH5	None Supplied	S	2576084	c	Total cyanide in soil	L080-PL	c
BH6	None Supplied	S	2576085	c	Sulphide in soil	L010-PL	c
BH6	None Supplied	S	2576085	c	Total cyanide in soil	L080-PL	c
BH6	None Supplied	S	2576086	c	Sulphide in soil	L010-PL	c
BH6	None Supplied	S	2576086	c	Total cyanide in soil	L080-PL	c
BH7	None Supplied	S	2576087	c	Sulphide in soil	L010-PL	c
BH7	None Supplied	S	2576087	c	Total cyanide in soil	L080-PL	c

GEA

Geotechnical & Environmental Associates

www.gea-ltd.co.uk

Generic Risk-Based Soil Screening Values

Site	39a Fitzjohn's Avenue, London NW3 5JY
Client	39 Fitzjohn's Avenue Limited
Engineer	Price and Myers

Job Number J23003

Sheet 1 / 1

Proposed End Use Residential with plant uptake

Soil Organic Matter content % 2.5

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	26	C4SL
Chromium (III)	910	S4UL
Chromium (VI)	21	C4SL
Copper	2,400	S4UL
Lead	200	C4SL
Elemental Mercury	1.2	S4UL
Inorganic Mercury	40	S4UL
Nickel	180	S4UL
Selenium	350	SGV
Zinc	3,700	S4UL
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	290	SGV
PAH		
Naphthalene	5.60	S4UL
Acenaphthylene	420	S4UL
Acenaphthene	510	S4UL
Fluorene	400	S4UL
Phenanthrene	220	S4UL
Anthracene	5,400	S4UL
Fluoranthene	560	S4UL
Pyrene	1,200	S4UL
Benzo(a)anthracene	11.0	S4UL
Chrysene	22	S4UL
Benzo(b)fluoranthene	3.3	S4UL
Benzo(k)fluoranthene	93.0	S4UL
Benzo(a)pyrene	4.40	C4SL
Indeno(1 2 3 cd)pyrene	36.0	S4UL
Dibenz(a h)anthracene	0.28	S4UL
Benzo (g h i)perylene	340	S4UL
Total PAH Screen	**62.9**	B(a)P / 0.15

Contaminant	Screening Value mg/kg	Data Source
Hydrocarbons		
Banded TPH (8-10)	128	Calc1
Banded TPH (10-12)	277	Calc1
Banded TPH (12-16)	508	Calc1
Banded TPH (16-21)	831	Calc1
Banded TPH (21-35)	2308	Calc1
Benzene	0.34	C4SL
Toluene	320	SGV
Ethyl Benzene	180	SGV
Xylene	120	SGV
Aliphatic C5-C6	78	S4UL
Aliphatic C6-C8	230	S4UL
Aliphatic C8-C10	65	S4UL
Aliphatic C10-C12	330	S4UL
Aliphatic C12-C16	2400	S4UL
Aliphatic C16-C35	92,000	S4UL
Aromatic C6-C7	See Benzene	S4UL
Aromatic C7-C8	See Toluene	S4UL
Aromatic C8-C10	83	S4UL
Aromatic C10-C12	180	S4UL
Aromatic C12-C16	330	S4UL
Aromatic C16-C21	540	S4UL
Aromatic C21-C35	1500	S4UL
PRO (C_5 –C_{10})	776	Calc2
DRO (C_{12} –C_{28})	95,270	Calc2
Lube Oil (C_{28} –C_{44})	93,500	Calc2
TPH	**500**	Trigger to consider speciated testing
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	18	S4UL
tetrachloroethane (PCA)	2.8	S4UL
tetrachloroethene (PCE)	0.7	C4SL
trichloroethene (TCE)	0.02	C4SL
1,2-dichloroethane (DCA)	0.18	C4SL
vinyl chloride (Chloroethene)	0.001	C4SL
tetrachloromethane (Carbon tetra	0.056	S4UL
trichloromethane (Chloroform)	1.7	S4UL

Notes

Concentrations measured below these screening values may be considered to represent 'uncontaminated conditions' which pose a 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009 - where not superseded by C4SL

S4UL - LQM/CIEH Suitable for use Level (2015) based on 'minimal' level of risk

Calc1 - sum of thresholds for Ali & Aro fractions - assuming a 35% Aro:65% Ali ratio as is commonly encountered in the soil

Calc2 - sum of nearest available carbon range specified including BTEX for PRO fraction

Total PAH based on B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene rarely exceeds 15% of the total PAH concentration

appendix c

Desk Study

Envirocheck Extracts
Historical Maps
Preliminary UXO Risk Assessment

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
308918980_1_1

Customer Reference:
J23003

National Grid Reference:
526500, 185000

Slice:
A

Site Area (Ha):
0.48

Search Buffer (m):
1000

Site Details:

39A Fitzjohns Avenue & 46 Marefield Gardens
LONDON
NW3 5JY

Client Details:

Mr S Branch
GEA Ltd
Widbury Barn
Widbury Hill
Ware
Herts
SG12 7QE

GEA

Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.
In this datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

Report Version v53.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1		Yes		n/a
Contaminated Land Register Entries and Notices					
Discharge Consents					
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 1			6	13
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 3				Yes
Pollution Incidents to Controlled Waters					
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances	pg 3				40
River Quality					
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions	pg 10				4 (*3)
Water Industry Act Referrals					
Groundwater Vulnerability Map	pg 11	Yes	n/a	n/a	n/a
Groundwater Vulnerability - Soluble Rock Risk			n/a	n/a	n/a
Groundwater Vulnerability - Local Information			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 12	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones	pg 12			1	
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
OS Water Network Lines	pg 12				2

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites	pg 13			1	
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Landfill Coverage	pg 13	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 13	1	1	1	3
Potentially Infilled Land (Water)	pg 13				2
Registered Landfill Sites					
Registered Waste Transfer Sites	pg 14			2	1
Registered Waste Treatment or Disposal Sites					
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Geological					
BGS 1:625,000 Solid Geology	pg 15	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry					
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 15		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 18	Yes			
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities					
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 18	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards				n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 19	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 19	Yes		n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 19	Yes		n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
Industrial Land Use					
Contemporary Trade Directory Entries	pg 20		13	86	216
Fuel Station Entries	pg 46			1	2
Points of Interest - Commercial Services	pg 46		8	19	46
Points of Interest - Education and Health	pg 52			1	5
Points of Interest - Manufacturing and Production	pg 53	1	2	4	12
Points of Interest - Public Infrastructure	pg 54			8	16
Points of Interest - Recreational and Environmental	pg 56			2	18
Gas Pipelines					
Underground Electrical Cables	pg 58		4	4	10

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland					
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves	pg 61				1
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones					
Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (N)	18	1	526499 185050
1	**Local Authority Pollution Prevention and Controls** Name: Hampstead Express Dry Cleaning Location: 279a Finchley Road, London, Nw3 6lt Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC6 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A13SW (W)	281	2	526178 184902
2	**Local Authority Pollution Prevention and Controls** Name: Janet'S Hand Laundry Ltd Location: 281a Finchley Road, London, Nw3 6nd Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC14 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A12SE (W)	288	2	526167 184924
3	**Local Authority Pollution Prevention and Controls** Name: Pyramid Cleaners Location: 52 Besize Lane, London, Nw3 5ar Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC8 Dated: 1st January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A14SW (E)	310	2	526872 184985
4	**Local Authority Pollution Prevention and Controls** Name: Is Dry Cleaners Location: 6 Canfield Gardens, London, Nw6 3bs Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC18 Dated: 5th February 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A13SW (SW)	351	2	526257 184662
5	**Local Authority Pollution Prevention and Controls** Name: B P Harmony Location: 104a Finchley Road, London, NW3 5EY Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: 1st July 1999 Process Type: Local Authority Air Pollution Control Description: PG1/14 Petrol filling station **Status:** **Authorised** Positional Accuracy: Automatically positioned to the address	A8NW (S)	398	2	526471 184554
5	**Local Authority Pollution Prevention and Controls** Name: Bp Harmony Location: 104a Finchley Road, LONDON, NW3 5EY Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC18 Dated: 1st July 1999 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status:** **Permitted** Positional Accuracy: Automatically positioned to the address	A8NW (S)	398	2	526471 184554
6	**Local Authority Pollution Prevention and Controls** Name: Belsize Park Service Station Location: 215 Haverstock Hill, LONDON, NW3 4RE Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC21 Dated: 2nd January 1999 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status:** **Permitted** Positional Accuracy: Automatically positioned to the address	A14NE (E)	656	2	527187 185227

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
12	**Local Authority Pollution Prevention and Controls** Name: Connoisseur Dry Cleaners Location: 3-5 Fairhazel Gardens, London, Nw6 3qe Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC11 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A8SW (S)	855	2	526262 184119
13	**Local Authority Pollution Prevention and Controls** Name: Shamrock Express Cleaners Location: 210 West End Lane, London, Nw6 1uu Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC33 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A12NW (W)	935	2	525517 185048
14	**Local Authority Pollution Prevention and Controls** Name: Masterclean Dry Cleaners Location: 6 Langtry Walk, London, Nw8 0du Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC38 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A8SW (S)	954	2	526352 184004
15	**Local Authority Pollution Prevention and Controls** Name: Madame George Dry Cleaners Location: 227 West End Lane, London, Nw6 1xj Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC15 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A12SW (W)	958	2	525499 184882
16	**Local Authority Pollution Prevention and Controls** Name: William J Humpage Location: 12-13 West Hampstead Mews, LONDON, NW6 3BB Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: Not Supplied Process Type: Local Authority Air Pollution Control Description: Part B process (no specific reference) **Status: Application Withdrawn** Positional Accuracy: Manually positioned to the address or location	A7NW (SW)	977	2	525567 184544
	Nearest Surface Water Feature	A8SE (S)	720	-	526768 184296
17	**Registered Radioactive Substances** Name: Royal Free Hampstead NHS Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AV8011 Dated: 25th October 1996 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A19SE (NE)	819	4	527292 185400
17	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AT8398 Dated: 17th January 1996 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A19SE (NE)	822	4	527292 185405

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Thames Water Utilities Ltd Licence Number: Th/039/0039/058 Permit Version: 1 Location: Borehole At Barrow Hill Authority: Environment Agency, Thames Region Abstraction: Public Water Supply: Potable Water Supply - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 1st April 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1693	4	527636 183697
	Water Abstractions Operator: Thames Water Utilities Ltd Licence Number: 28/39/39/0231 Permit Version: 1 Location: Barrow Hill Pumping Station - Borehole Authority: Environment Agency, Thames Region Abstraction: Public Water Supply: Potable Water Supply - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Barrow Hill Pumping Station Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2007 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1701	4	527640 183690
	Water Abstractions Operator: Thames Water Utilities Ltd Licence Number: 28/39/39/0202 Permit Version: 1 Location: Barrow Hill Pumping Station - Borehole Authority: Environment Agency, Thames Region Abstraction: Public Water Supply: Potable Water Supply - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Barrow Hill Pumping Station Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 26th September 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1701	4	527640 183690
	Groundwater Vulnerability Map Combined Classification: Unproductive Aquifer (may have productive aquifer beneath) Combined Vulnerability: Unproductive Combined Aquifer: Unproductive Bedrock Aquifer, No Superficial Aquifer Pollutant Speed: Low Bedrock Flow: Mixed Dilution: 300-550 mm/year Baseflow Index: 40-70% Superficial Patchiness: <90% Superficial Thickness: <3m Superficial Recharge: No Data	A13NW (S)	0	5	526499 185000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Groundwater Vulnerability Map Combined Classification: Unproductive Aquifer (may have productive aquifer beneath) Combined Vulnerability: Unproductive Combined Aquifer: Unproductive Bedrock Aquifer, No Superficial Aquifer Pollutant Speed: Intermediate Bedrock Flow: Mixed Dilution: 300-550 mm/year Baseflow Index: 40-70% Superficial Patchiness: <90% Superficial Thickness: <3m Superficial Recharge: No Data	A13NW (N)	0	5	526499 185000
	Groundwater Vulnerability - Soluble Rock Risk None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13NW (S)	0	5	526499 185000
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13NW (N)	0	5	526499 185000
	Superficial Aquifer Designations No Data Available				
21	**Source Protection Zones** Name: Not Supplied Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone II (Outer Protection Zone): Either 25% of the source area or a 400 day travel time whichever is greater.	A8NE (SE)	477	4	526777 184578
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
22	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 5204.1 Watercourse Level: Underground Permanent: True Watercourse Name: The Fountains Catchment Name: Thames Primacy: 1	A14SE (E)	641	6	527203 184976
23	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 13.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A19SE (NE)	985	6	527315 185663

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
24	**Historical Landfill Sites** Licence Holder: Not Supplied Location: London NW6 Name: Canfield Place Operator Location: Not Supplied Boundary Accuracy: As Supplied Provider Reference: EAHLD12043 First Input Date: Not Supplied Last Input Date: Not Supplied Specified Waste Type: Not Supplied EA Waste Ref: 0 Regis Ref: Not Supplied WRC Ref: Not Supplied BGS Ref: Not Supplied Other Ref: DON009	A12SE (SW)	404	4	526075 184812
	Local Authority Landfill Coverage Name: London Borough of Camden - Has no landfill data to supply		0	7	526499 185000
25	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1991	A13NW (W)	0	9	526467 184999
26	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A13NE (E)	201	9	526763 185029
27	**Potentially Infilled Land (Non-Water)** Bearing Ref: N Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A13NE (N)	273	9	526616 185296
28	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14NE (E)	749	9	527284 185228
29	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14NE (E)	801	9	527347 185189
30	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14NE (E)	941	9	527473 185261
31	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1896	A17SW (NW)	927	9	525731 185613
32	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A19SE (NE)	930	9	527250 185654

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
33	**Registered Waste Transfer Sites** Licence Holder: P B Donoghue Licence Reference: DL140 Site Location: BR Goods Yard at 269 Finchley Road, CAMDEN, London, NW3 Operator Location: As Site Address Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence lapsed/cancelled/defunct/not applicable/surrenderedCancelled Dated: 1st February 1992 Preceded By Licence: DL140 Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Lwra Cat. A = Inert Wastes Lwra Cat. Bi Gen.Non-Putresc Max.Waste Permitted By Licence-Stated Prohibited Waste: Clinical - As In Coll/Disp.Regs Of '88 Liquid/Slurry/Sludge Wastes Poisonous, Noxious, Polluting Wastes Special Wastes Waste N.O.S.	A13SW (SW)	307	4	526200 184780
33	**Registered Waste Transfer Sites** Licence Holder: P B Donoghue Licence Reference: DL140 Site Location: BR Goods Yard, 269 Finchley Road, CAMDEN, London, NW3 Operator Location: As Site Address Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Record supersededSuperseded Dated: 1st August 1983 Preceded By Licence: Not Given Superseded By Licence: DL140 Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Commercial Waste Construction Ind. Wastes Max.Waste Permitted By Licence(Stated) Prohibited Waste: Clinical Waste -Clause 2 & 4 Hsc 1982 Notifiable Wastes Putrescible Waste Special Wastes	A13SW (SW)	307	4	526200 184780
34	**Registered Waste Transfer Sites** Licence Holder: L.B. of Camden Licence Reference: DL137 Site Location: 152 West End Lane, CAMDEN, London, NW6 Operator Location: Old Town Hall, Haverstock Hill, CAMDEN, London, NW3 4QP Authority: Environment Agency - Thames Region, North East Area Site Category: Transfer Max Input Rate: Very Small (Less than 10,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Licence Status: Licence lapsed/cancelled/defunct/not applicable/surrenderedCancelled Dated: 1st August 1983 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the road within the address or location Boundary Quality: Not Supplied Authorised Waste: Asbestos Elect.Capacitors Cont'G Pcb Fluid Prohibited Waste: Biodegradable/Putrescible Waste Clinical Wastes Notifiable Wastes Special Wastes	A12SW (W)	938	4	525530 184790

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Thames Group	A13NW (N)	0	1	526499 185000
	BGS Estimated Soil Chemistry No data available				
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526763, 185153 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 17.60 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 55.10 mg/kg Lead Measured Concentration: 617.70 mg/kg Nickel Measured Concentration: 22.30 mg/kg	A13NE (NE)	237	1	526763 185153
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526344, 184653 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 47.30 mg/kg Cadmium Measured Concentration: 2.00 mg/kg Chromium Measured Concentration: 111.00 mg/kg Lead Measured Concentration: 1462.80 mg/kg Nickel Measured Concentration: 71.20 mg/kg	A8NW (SW)	319	1	526344 184653
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526703, 184701 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 32.80 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 79.00 mg/kg Lead Measured Concentration: 770.10 mg/kg Nickel Measured Concentration: 44.30 mg/kg	A13SE (SE)	334	1	526703 184701
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526278, 185352 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 25.30 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 122.20 mg/kg Lead Measured Concentration: 273.70 mg/kg Nickel Measured Concentration: 19.50 mg/kg	A18SW (NW)	366	1	526278 185352

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527207, 184291 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 13.10 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 81.00 mg/kg Lead Measured Concentration: 714.00 mg/kg Nickel Measured Concentration: 26.50 mg/kg	A9SE (SE)	963	1	527207 184291
	BGS Urban Soil Chemistry Averages Source: British Geological Survey, National Geoscience Information Service Sample Area: London Count Id: 7209 Arsenic Minimum Concentration: 1.00 mg/kg Arsenic Average Concentration: 17.00 mg/kg Arsenic Maximum Concentration: 161.00 mg/kg Cadmium Minimum Concentration: 0.10 mg/kg Cadmium Average Concentration: 0.90 mg/kg Cadmium Maximum Concentration: 165.20 mg/kg Chromium Minimum Concentration: 13.00 mg/kg Chromium Average Concentration: 79.00 mg/kg Chromium Maximum Concentration: 2094.00 mg/kg Lead Minimum Concentration: 11.00 mg/kg Lead Average Concentration: 280.00 mg/kg Lead Maximum Concentration: 10000.00 mg/kg Nickel Minimum Concentration: 2.00 mg/kg Nickel Average Concentration: 28.00 mg/kg Nickel Maximum Concentration: 506.00 mg/kg	A13NW (N)	0	1	526499 185000
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13SW (SW)	217	1	526317 184784
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	0	1	526499 185000
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	526499 185000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
35	**Contemporary Trade Directory Entries** Name: Ampersand Location: 37c, Maresfield Gardens, London, NW3 5SG Classification: Lampshade Manufacturers & Distributors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	64	-	526425 184896
36	**Contemporary Trade Directory Entries** Name: Hot Chiu Location: Garden Flat, 26, Fitzjohns Avenue, London, NW3 5NB Classification: Food Products - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	166	-	526607 184839
37	**Contemporary Trade Directory Entries** Name: B C O M Location: Frazer House, 6, Netherhall Gardens, London, NW3 5RR Classification: Hospitals **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	191	-	526375 184778
38	**Contemporary Trade Directory Entries** Name: S E Ltd Location: 8, Frognal, London, NW3 6AJ Classification: Textile Manufacturing **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (W)	200	-	526253 184987
39	**Contemporary Trade Directory Entries** Name: Continental Autos Location: 10, Daleham Mews, London, NW3 5DB Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	206	-	526749 184917
39	**Contemporary Trade Directory Entries** Name: Daleham Garage Location: 14, Daleham Mews, London, NW3 5DB Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	217	-	526749 184894
39	**Contemporary Trade Directory Entries** Name: Comac Motors Location: 19, Daleham Mews, London, NW3 5DB Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	228	-	526770 184911
39	**Contemporary Trade Directory Entries** Name: Auto Reliant Suspension Co Location: 25, Daleham Mews, London, NW3 5DB Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	239	-	526768 184884
39	**Contemporary Trade Directory Entries** Name: Smoother You Ltd Location: 1, McCrone Mews, Belsize Lane, London, NW3 5BG Classification: Electrolysis **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	247	-	526777 184884
39	**Contemporary Trade Directory Entries** Name: Gems Dry Cleaning Co Ltd Location: 90, Belsize Lane, London, NW3 5BE Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	259	-	526784 184870
39	**Contemporary Trade Directory Entries** Name: Mr Lewis Cohens Fry Cleaning Co Location: 90, Belsize Lane, London, NW3 5BE Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	259	-	526784 184870
39	**Contemporary Trade Directory Entries** Name: Daily Carpet Cleaning Location: 90 Belsize Lane, London, NW3 5BE Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	260	-	526784 184870

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
234	**Local Nature Reserves** Name: Belsize Wood Multiple Area: N Area (m2): 2723 Source: Natural England Designation Date: 1st October 2004	A14NE (E)	940	10	527479 185232

Data Suppliers

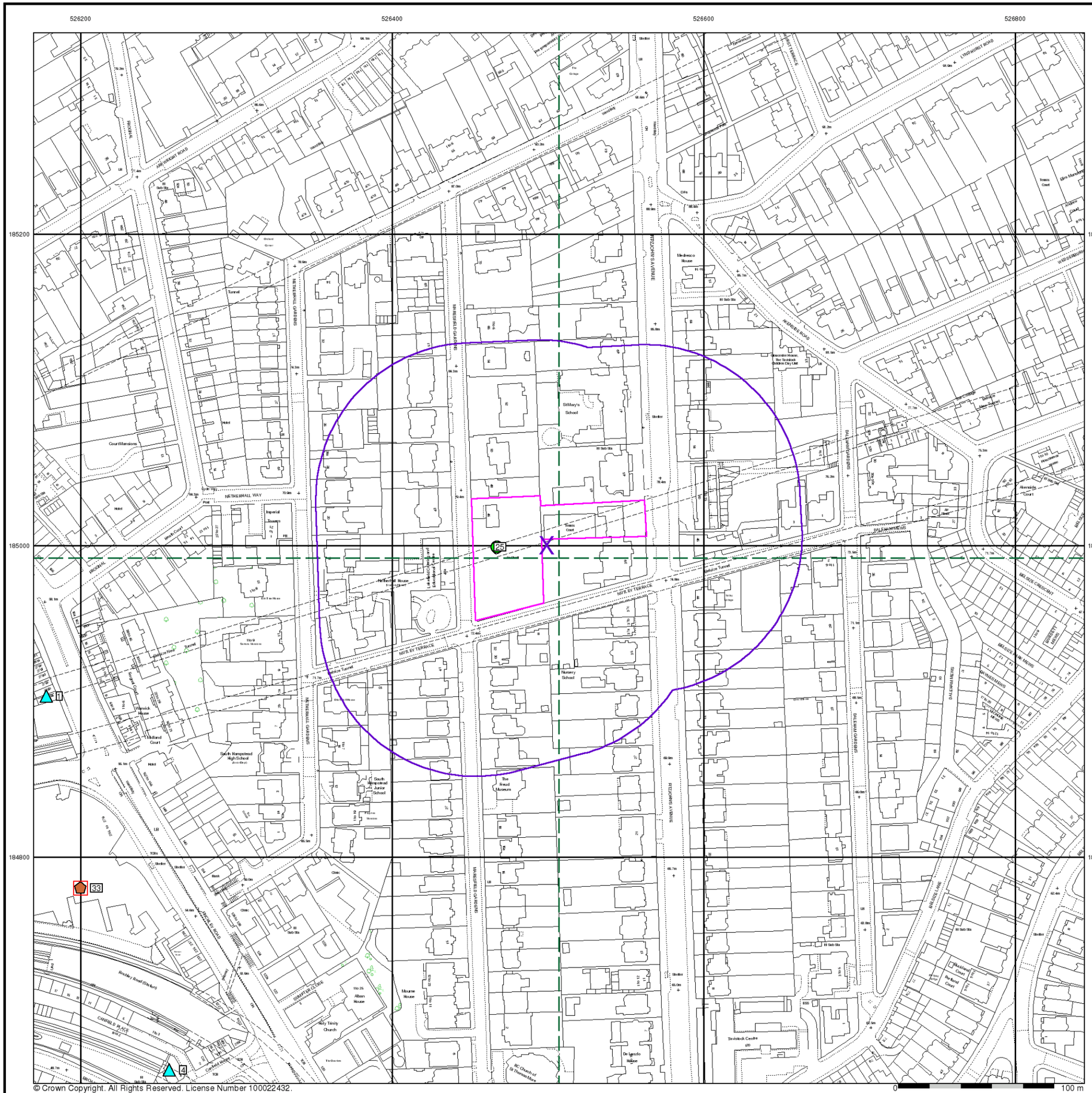
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	
Centre for Ecology and Hydrology	
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Stantec UK Ltd	

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**London Borough of Camden - Pollution Projects Team** Seventh Floor, Town Hall Extension, Argyle Street, London, WC1H 8EQ	Telephone: 020 7278 4444 Fax: 020 7860 5713 Website: www.camden.gov.uk
3	**London Borough of Waltham Forest - Environmental Health Department** 154 Blackhorse Road, Walthamstow, London, E17 6NW	Telephone: 020 8496 3000 Fax: 0181 524 8960 Website: www.lbwf.gov.uk
4	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
5	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
6	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
7	**London Borough of Camden** Town Hall, Judd Street, London, WC1H 9JE	Telephone: 020 7974 4444 Fax: 020 7974 6866 Email: info@camden.gov.uk Website: www.camden.gov.uk
8	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
9	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9966 Fax: 0844 844 9951 Email: helpdesk@landmark.co.uk Website: www.landmark.co.uk
10	**Natural England** County Hall, Spetchley Road, Worcester, WR5 2NP	Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk Website: www.naturalengland.org.uk
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



GEA

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

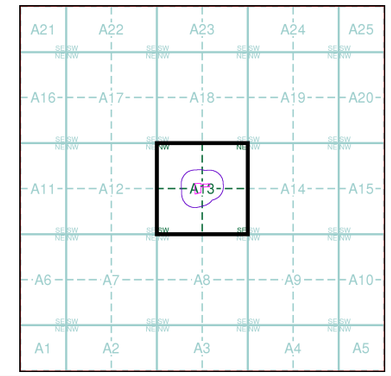
Geological

- BGS Recorded Mineral Site

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Segment A13



Order Details

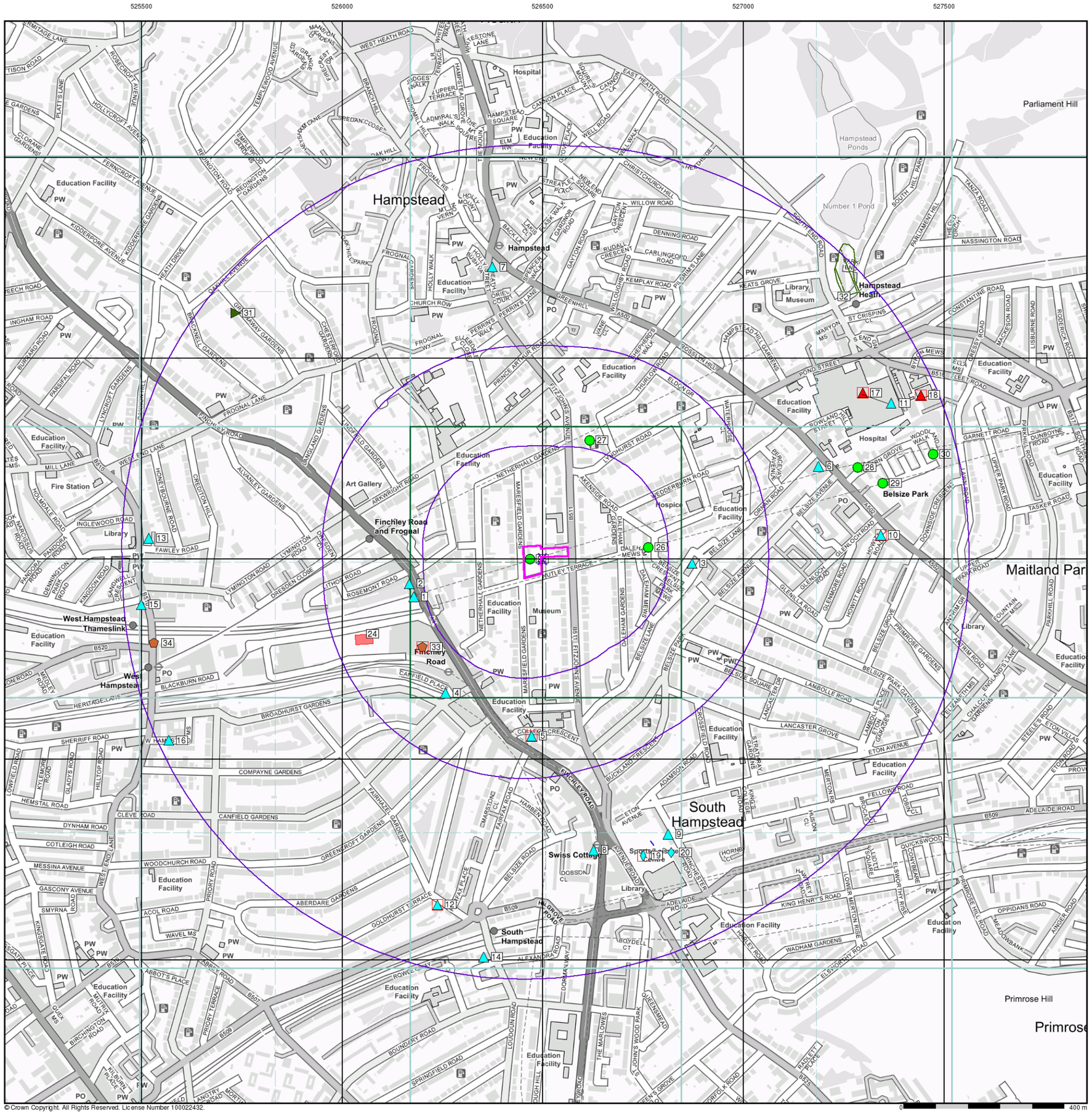
Order Number:	308918980_1_1
Customer Ref:	J23003
National Grid Reference:	526500, 185000
Slice:	A
Site Area (Ha):	0.48
Plot Buffer (m):	100

Site Details

39A Fitzjohns Avenue & 46 Marefield Gardens, LONDON, NW3 5JY

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point | 8 Map ID

Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

COMAH Site | Explosive Site | NIHHS Site

- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

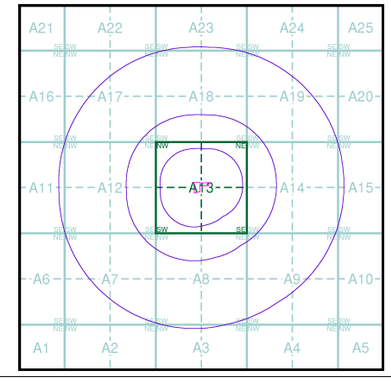
Geological

- BGS Recorded Mineral Site

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Slice A



Order Details

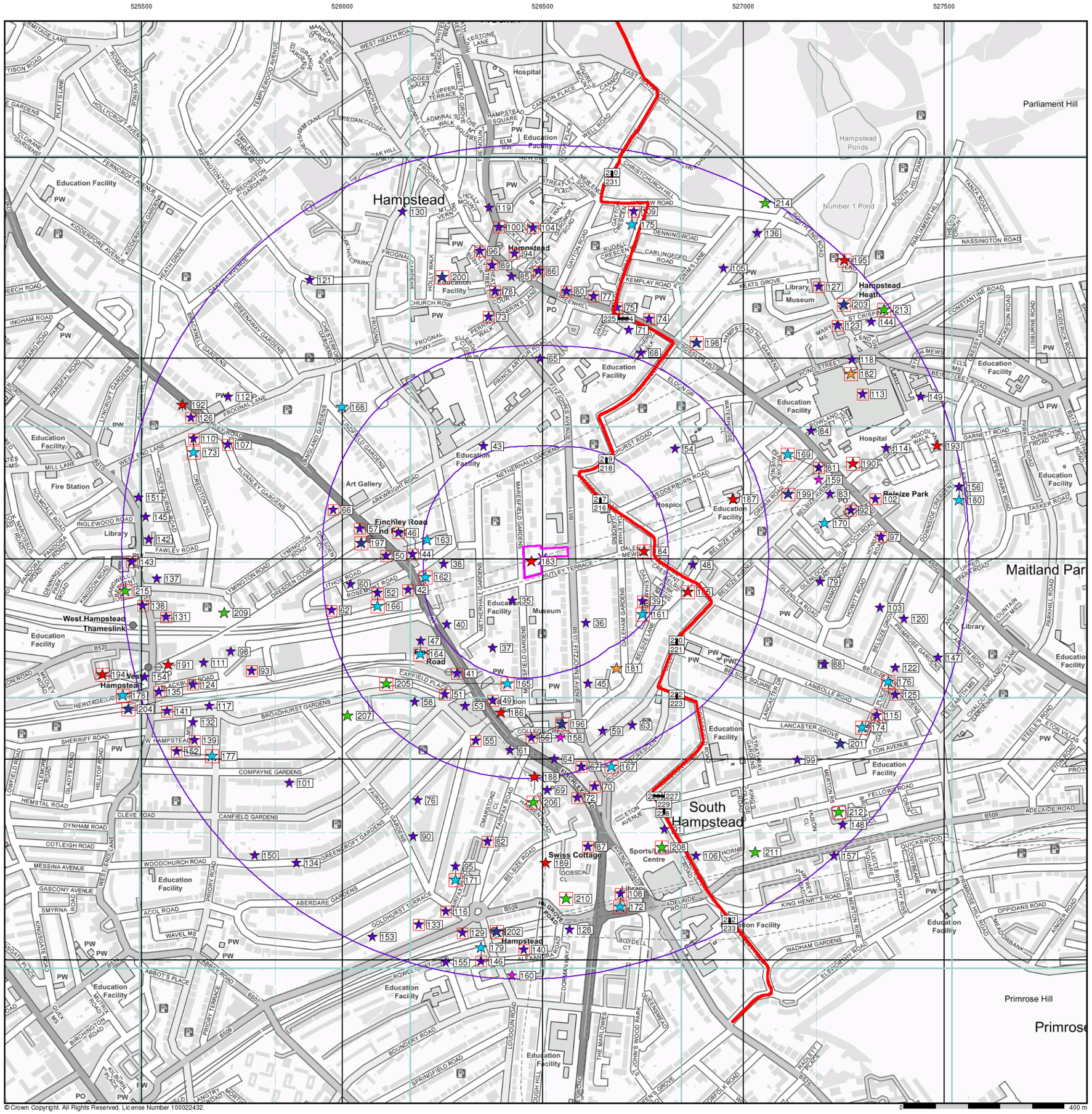
Order Number:	308918980_1_1
Customer Ref:	J23003
National Grid Reference:	526500, 185000
Slice:	A
Site Area (Ha):	0.48
Search Buffer (m):	1000

Site Details

39A Fitzjohns Avenue & 46 Marefield Gardens, LONDON, NW3 5JY

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA

Industrial Land Use Map

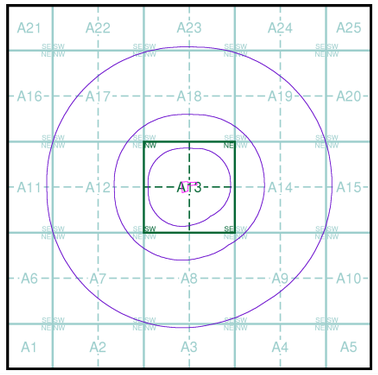
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Gas Pipeline
- Points of Interest - Commercial Services
- Points of Interest - Education and Health
- Points of Interest - Manufacturing and Production
- Points of Interest - Public Infrastructure
- Points of Interest - Recreational and Environmental
- Underground Electrical Cables

Industrial Land Use Map - Slice A



Order Details

Order Number:	308918980_1_1
Customer Ref:	J23003
National Grid Reference:	526500, 185000
Slice:	A
Site Area (Ha):	0.48
Search Buffer (m):	1000

Site Details

39A Fitzjohns Avenue & 46 Marefield Gardens, LONDON, NW3 5JY

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk