SITE INVESTIGATION AND BASEMENT IMPACT ASSESSMENT REPORT

76 Fitzjohns Avenue
London NW3

Client: Zain & Gulseren Naqi

Engineer: Michael Barclay Partnership

J16214

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GEA Geotechnical & Environmental Associates

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	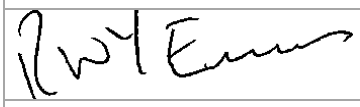		
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This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

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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 site investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Zain & Gulseren Naqi, with respect to the proposed construction of single storey basement to a depth of about 3.50 m beneath the existing house. 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 and hydrogeology, to assess the extent of any contamination and to provide information to assist with the design of suitable foundations and retaining walls. The report also includes a Basement Impact Assessment carried out in accordance with guidelines from London Borough of Camden in support of a planning application.

SITE HISTORY

The earliest map studied, dated 1879, shows the site to be undeveloped in an area of fields with a track running along the eastern boundary of the site and two springs to be present nearby, located approximately 90 m to the south and 150 m to the west of the site. By the time of the next map studied, dated 1896, much of the existing road network and existing buildings in the surrounding area had been constructed, although the site itself remained undeveloped. The site was developed with the existing house at some time between 1915 and 1934, at which time the existing adjacent buildings to the north and south were also constructed. The site and surrounding area have since remained essentially unchanged.

GROUND CONDITIONS

The investigation encountered a nominal to moderate thickness of made ground overlying the Claygate Member which extended to the full depth of the investigation, of 18.00 m. The made ground generally comprised dark grey silty clayey sand with variable amounts of gravel, brick, ash and concrete fragments and extended to depths of between 0.27 m and 1.75 m. The Claygate Member generally comprised interbedded horizons of stiff orange-brown mottled grey and pale brown silty sandy clay and clayey silty sand and extended to the full depth of the investigation, of 18.00 m.

Groundwater was not encountered in Borehole Nos 2 and 3 but was encountered at a depth of 7.00 m within Borehole No 1. Three groundwater monitoring standpipes were installed and groundwater has subsequently been measured at depths of between 1.05 m and 4.51 m.

The results of the testing have indicated two of the four samples tested to contain elevated concentrations of lead, while all other contaminant concentrations have been found to be below the respective guideline values.

RECOMMENDATIONS

It is proposed to excavate the proposed basement to a depth of 3.50 m, while supporting the basement excavation through the installation of concrete underpins beneath the existing foundations. New spread foundations may be designed to apply a net allowable bearing pressure of 150 kN/m² below the level of the proposed basement floor. Care should be taken at all times to ensure the stability of neighbouring properties.

The majority of the made ground is to be excavated as part of the basement excavation but in view of the elevated concentrations of lead identified by the contamination testing remedial measures may be required in any proposed areas of soft landscaping.

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.

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 (GEA) has been commissioned by Zain & Gulseren Naqi to carry out a desk study and ground investigation at No 76 Fitzjohn's Avenue, London, NW3 5LS. Michael Barclay Partnership are the structural engineers for the project.

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 in support of a planning application.

1.1 Proposed Development

It is understood that it is proposed to construct a new single storey basement beneath the footprint of the existing house. The basement is to extend to a depth of approximately 3.50 m.

This report is specific to the proposed development and the advice herein should be reviewed if the 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 and surrounding areas with respect to previous contaminative uses;
- to determine the ground conditions and their engineering properties;
- to assess the possible impact of the proposed development on the local hydrogeology;
- to provide advice with respect to the design of suitable foundations and retaining walls;
- to provide an 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 readily available geological and hydrogeological maps;
- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database; and
- a walkover survey of the site carried out in conjunction with the fieldwork.

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

- a single cable percussion borehole advanced to a depth of 18.00 m;
- two boreholes advanced to a depth of 5.00 m by window sampling methods;
- installation of three groundwater monitoring standpipes, to a maximum depth of 9. 00 m;
- a series of three trial pits advanced to a maximum depth of 0.96 m;
- laboratory testing of selected soil samples for geotechnical purposes and for the presence of contamination; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11[1] and 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. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment.

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 GEA's engineering experience, local precedent where applicable and relevant published information.

1.3.1 Basement Impact Assessment

The work carried out also includes a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment), all of which form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG4[2] and their Guidance for Subterranean Development[3] prepared by Arup (the "Arup report"). The aim of the work is to provide information on surface water, land stability and groundwater 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 John Evans, 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

1 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004
2 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

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.

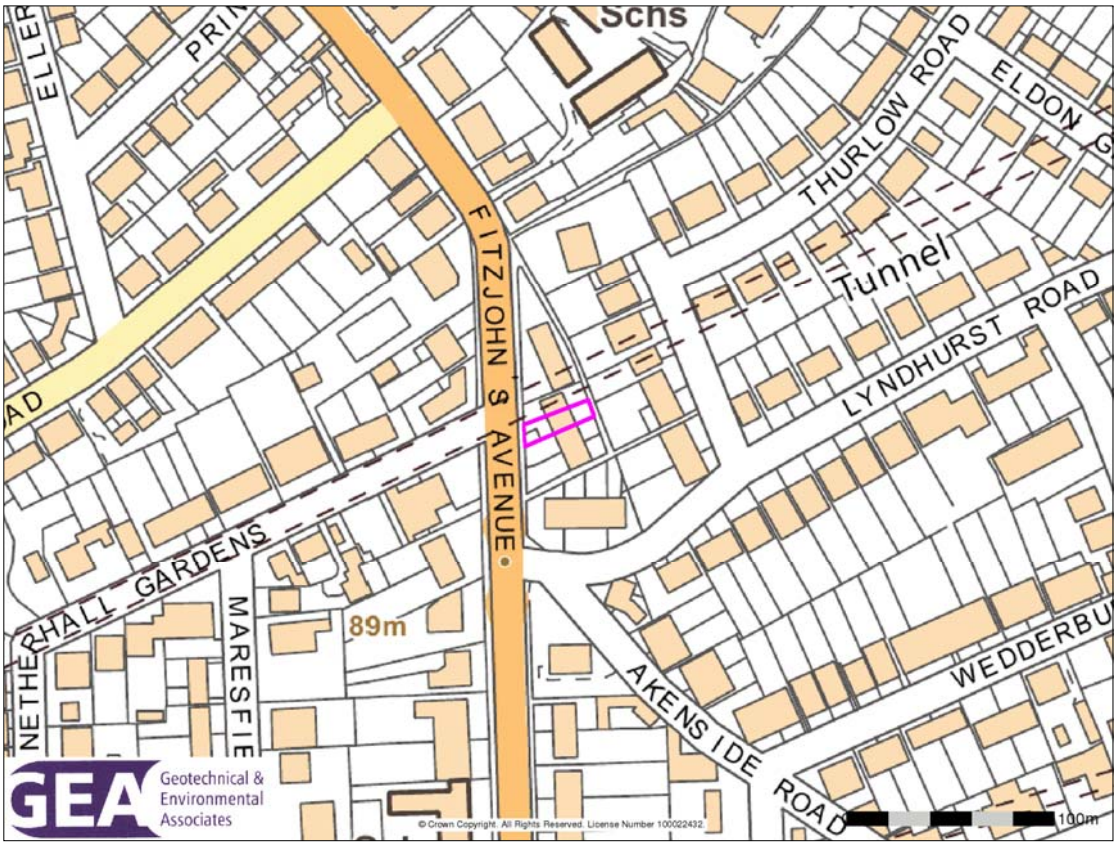
All assessors meet the qualification requirements of the Council guidance.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted and the number of locations where the ground was sampled. No liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 THE SITE

2.1 Site Description



The site is located in the northwest of the London Borough of Camden, approximately 550 m northeast of Finchley Road and Frognal London Underground and Railway Station and 750 m southwest of Hampstead Heath Railway station. It is accessed via a gate from Fitzjohn's Avenue and is bounded by No 74 Fitzjohn's Avenue to the north and 78 Fitzjohn's Avenue to the south. Spring Path, a narrow pathway, bounds the site to the east. The site may be additionally located by National Grid Reference 526591, 185294 and is shown on the map extract on the previous page.

A walkover of the site was carried out by a geotechnical engineer from GEA at the time of the fieldwork. The site covers a broadly rectangular area measuring approximately 9 m north-south by 35 m east-west, and is currently occupied by a two-storey house with front and rear gardens and a driveway. The site is essentially level and both the front driveway and rear garden are free of vegetation. The front garden comprises a central lawn with hardstanding around the boundaries and planted beds along the northern and southern boundaries. A single mature London Plane tree that measures about 20 m in height is present in the front garden,

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 map studied, dated 1879, shows the site to be undeveloped in an area of fields with a track running along the eastern boundary of the site and two springs to be present nearby, located approximately 90 m to the south and 150 m to the west of the site. By the time of the next map studied, dated 1896, much of the existing road network and existing buildings in the surrounding area had been constructed, although the site itself remained undeveloped.

The site was developed with the existing house at some time between 1915 and 1934, at which time the existing adjacent buildings to the north and south were also constructed. The site and surrounding area have since remained essentially unchanged.

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 has not indicated any recorded historical or active landfill sites within 500 m of the site. In addition, no waste management or waste transfer sites are located within 500 m and there have been no pollution incidents within 1 km 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.

The site is not located within a nitrate vulnerable zone or any other sensitive land use.

2.4 Geology

The British Geological Survey (BGS) map of the area (Sheet 256) indicates that the site is underlain by the Claygate Member, over the London Clay.

The geology in this area is generally horizontally bedded such that the boundary between the geological formations roughly follows the ground surface contour lines. The boundary between the Claygate Member and overlying Bagshot Beds is located 85 m to the northwest of the site, at a level of approximately 105 m OD. The boundary between the Claygate Member and the upper unit of the London Clay is located approximately 230 m southwest of the site, at a level of approximately 80 m OD, approximately 20 m below the site. The Claygate Member is described in the geological memoir as typically comprising interbedded fine grained sand, silt and clay.

2.5 Hydrology and Hydrogeology

The Claygate Member is classified as a Secondary 'A' Aquifer, which refers to strata that contain permeable layers capable of supporting water supply at a local level and in some cases may form an important source of base flow for local rivers, as defined by the Environment Agency (EA). The underlying London Clay is classified as a Non-Aquifer and Unproductive Stratum, which refers to a soil or rock with low permeability that has a negligible effect on local water supply or river base flow.

The nearest surface water feature is a pond in the east of Hampstead Heath located 798 m northeast of the site.

Groundwater flow is considered to be in a southerly direction, towards the River Thames and with the local topography.

The Claygate Member is predominantly cohesive in nature and therefore groundwater flow is likely to be relatively slow, although horizons of more sandier soils are present, resulting in the permeability ranging from "very low" to "high". Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1×10^{-10} m/s and 1×10^{-8} m/s, with an even lower vertical permeability.

Reference to the Lost Rivers of London[4] indicates that the site lies in close proximity of two of London's former water courses, the Tyburn and the Westbourne. The source of the Tyburn was located at the junction of Lyndhurst Road and Fitzjohn's Avenue, approximately 80 m to the south of the site and probably accounts for the name of Spring Path, which leads southwards behind the site. The Tyburn then flowed in a southerly direction, through Regents Park and Green Park, before issuing into the River Thames close to Westminster Bridge. The source of the Westbourne was located about 850 m to the west of the site. The river flowed in a south easterly direction, through the Serpentine in Hyde Park, before issuing into the Thames opposite Battersea Park.

The site is not at risk of flooding from rivers or sea, as defined by the Environment Agency and is shown as being within an area at low risk of surface water flooding.

2.6 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

[4] Barton, N and Myers, S (2016) *The Lost Rivers of London* 3rd Edition, Historical Publications Ltd

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.

2.6.1 Source

The desk study research has indicated that the site has only been developed with the existing residential property for its entire known developed history. The site and immediate surrounding areas are not considered to have had a particularly contaminative history. In addition, there are no historical or existing landfill sites within 500 m and a risk of soil gas has not been identified.

2.6.2 Receptor

The site will have a residential end use, which is considered a high sensitivity end-use. Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are likely to come into direct contact with any contaminants present in the soil and through inhalation of vapours during basement excavation and construction. Groundwater and adjacent sites are considered high sensitivity receptors due to the presence of a Secondary 'A' Aquifer beneath the site.

2.6.3 Pathway

End users will be isolated from any potential contaminants in the ground by the presence of the proposed buildings and hardstanding and in any case, the vast majority of the made ground will be removed as part of the basement excavation. Groundwater within the Secondary 'A' Aquifer is considered to be a potential pathway by which any soluble contaminants may migrate off and onto to the site, although this pathway is already in existence. The presence of negligibly permeable London Clay at depth will limit the potential for groundwater percolation into the underlying chalk aquifer, and thus a pathway is not considered likely to exist to the Principal Aquifer. Except for the pathway of direct contact for site workers, no new pathways will be created by the basement excavation and services will come into contact with any contamination within the soils in which they are laid.

There is thus considered to be limited potential for a significant contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant beneath the new building and extent of any hardstanding and a moderate potential exists within any proposed soft landscaped or garden areas.

2.6.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a LOW risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work. Furthermore, there is not considered to be a significant potential for hazardous soil gas to be present on or migrating towards the site: there should thus be no need to consider landfill gas exclusion systems.

3.0 SCREENING

The London Borough of Camden guidance suggests that any development proposal that includes a subterranean basement should be screened to determine whether or not a full Basement Impact Assessment (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 Appendix E which includes a series of questions within a screening flowchart for three categories; groundwater flow, land stability and surface water flow. Responses to the questions are tabulated on the following pages.

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for 76 Fitzjohn's Avenue
1a. Is the site located directly above an aquifer?	Yes, a Secondary 'A' Aquifer.
1b. Will the proposed basement extend beneath the water table surface?	Possibly, but on the basis of nearby previous investigations it is considered relatively unlikely.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	*Yes. Reference to the Lost River of London indicates a spring known to be the source of the Tyburn to be located 80 m to the south of the site.*
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No.
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. The claygate Member is not considered suitable for the use of soakaways due to its variable nature and as a result provision will need to be made for surface water drainage through the existing infrastructure.
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.

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

Q1a The site is located directly above the Claygate Member, which is a Secondary 'A' Aquifer.
Q1b There is a possibility that the proposed basement may extend beneath the water table.
Q2 The site is within 100 m of a watercourse, well (used/disused) or potential spring line.

3.1.2 Stability Screening Assessment

Question	Response for 76 Fitzjohn's Avenue
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No. The site walkover indicated no slopes with angles greater than 7°
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No. The site profile is unlikely to change significantly.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No, reference to Fig 16 of the Arup report indicates no slopes of greater than 7° on neighbouring land
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No. The site is on a gentle southwards slope, but Ordnance Survey maps of the area and Fig 16 of the Arup report do not indicate that this is greater than 7°

Question	Response for 76 Fitzjohn's Avenue
5. Is the London Clay the shallowest stratum at the site?	No.
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?	No.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	No.
8. Is the site within 100 m of a watercourse or potential spring line?	*Yes. Reference to the Lost Rivers of London indicates a spring known to be the source of the Tyburn to be located 80 m to the south of the site.*
9. Is the site within an area of previously worked ground?	No. Historical maps indicate that the site has been in its existing condition since the early 20th Century and there is no evidence of extraction having taken place.
10a. Is the site within an aquifer?	Yes a Secondary 'A' Aquifer.
10b. Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Unlikely. The proposed basement excavation is unlikely to require dewatering as the excavation will not extend beneath the water table, although localised inflows may occur from perched water tables within the sandy horizons of the Claygate Member.
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes. The site fronts onto the public highway of Fitzjohn's Avenue and backs onto Spring Path.*
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	*Possibly. The founding depths of surrounding properties are unknown and as such the proposed founding depth could be significantly deeper.*
14. Is the site over (or within the exclusion zone of) any tunnels, eg railway lines?	No. A search of publicly available maps has not indicated tunnels under the site, although a Network Rail tunnel is known to lie beneath the adjacent site to the north.

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

Q8 The site is within 100 m of a watercourse or potential spring line.
Q10a The site is located within the Secondary 'A' Aquifer of the Claygate Member.
Q12 The site is within 5 m of a public highway.
Q13 The development will potentially increase the foundation depths relative to the neighbouring properties.

3.1.3 Surface Flow and Flooding Screening Assessment

Question	Response for 76 Fitzjohn's Avenue
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. The 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. There will not be an increase in impermeable area across the ground surface above the basement, so the surface water flow regime will be unchanged. The basement will be beneath the footprint of the existing building, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 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. There will not be an increase in impermeable area across the ground surface above the basement.

Question	Response for 76 Fitzjohn's Avenue
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. There will not be an increase in impermeable area across the ground surface above the basement, so the surface water flow regime will be unchanged. The basement will be beneath the footprint of the existing building, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 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 proposed basement 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?	No. The findings of this BIA together with the Camden Flood Risk Management Strategy dated 2013 and Figures 3iv of the SFRA dated 2014, in addition to the Environment Agency online flood maps show that there is a very low flooding risk from surface water across the building (and proposed basement below it) despite part of the rear garden having a medium risk. Figures 4e, 5a and 5b of the SFRA and EA maps indicate that there is a low risk from sewers, reservoirs (and other artificial sources) and fluvial/tidal watercourses. 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 site is located within the Critical Drainage Area Group3_005 as identified in the Camden SWMP and Updated SFRA Figure 6/Rev 2.

The above assessment has not identified any potential issues that need further assessment, although the hydrological setting is discussed further within this report.

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.

The potential impacts of the proposed development on surface flow and flooding and subterranean flow will need to be dealt with in separate assessments, such that the following section focuses on the potential impacts that may have an impact on slope stability.

4.1 Potential Impacts

The following potential impacts have been identified.

Potential Impact	Consequence
The site is located directly above an aquifer	The site is underlain by the Claygate Member, which is classified as a Secondary 'A' Aquifer. This has the potential of being able to support local water supplies as well as forming an important source of base flow for local rivers. There is the potential for the hydrogeological setting to be affected by a basement development.

Potential Impact	Consequence
The proposed basement extends beneath the water table surface	As stated above, groundwater would be expected to be encountered within the Claygate Member and therefore it is possible that the basement excavation will extend below the water table. Should this happen, the basement structure is capable of diverting groundwater flow such that groundwater level is affected on both the up slope and down slope side of the basement structure. This in turn has the potential to affect the local hydrogeology and any adjacent structures.
The site is within 100 m of a watercourse or potential spring line	The site is located 80 m from a former spring line which was the source for the Tyburn. If the basement structure extends below the water table it will potentially be capable of diverting groundwater flow causing groundwater to find an alternative route to a spring resulting in a change of the groundwater level and surface water features.
The site is within 5 m of a highway or pedestrian right of way.	Excavation of a basement may result in structural damage to the road or footway.
The development will increase the founding depths relative to neighbours.	If not designed and constructed appropriately, the excavation of a basement may result in structural damage to neighbouring buildings and structures.

These potential impacts have been investigated through the site investigation, as detailed in Section 9.0.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2, a single borehole was advanced to a depth of 18.00 m by means of a dismantlable cable percussion rig; the borehole casing could not be advanced below 15 m, so the borehole was completed to 18 m by continuous standard penetration testing. In addition, two window sampler boreholes were advanced to a depth of 5.00 m and a series of three trial pits were hand excavated to depths of between 0.89 m and 0.96 m.

During boring, disturbed and undisturbed samples were obtained from the boreholes for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were carried out at regular intervals in the borehole to provide quantitative data on the strength of soils encountered.

Three groundwater monitoring standpipes were installed in the boreholes, extending to a maximum depth of 9.00 m, which has been monitored on a single occasion to date, approximately five weeks after installation.

All of the above work was carried out under the part-time supervision of a geotechnical engineer from GEA.

A selection of the samples recovered from the borehole was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

The borehole and trial pit records and results of the laboratory analyses are appended, together with a site plan indicating the position.

4.3 Sampling Strategy

The scope of the works was specified by the client, with input from GEA.

The borehole and trial pit positions were positioned on site by GEA with respect to the proposed structure while avoiding areas of buried services.

Four samples of made ground were analysed for a range of common industrial contaminants and contamination indicative parameters. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification.

The contamination analysis was carried out at a MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. Details of the MCERTs accreditation and test methods are included in the Appendix together with the analytical results.

5.0 GROUND CONDITIONS

The investigation encountered a nominal to moderate thickness of made ground overlying the Claygate Member, which extended to the full depth of the investigation, of 18.00 m.

5.1 Made Ground

The made ground generally comprised dark grey silty clayey sand with variable amounts of gravel, brick, ash and concrete fragments and extended to depths of between 0.27 m and 1.75 m.

No visual or olfactory evidence of contamination was observed during the fieldwork. Four samples of the made ground were tested for the presence of contamination as a precautionary measure and the results are presented in Section 5.4.

5.2 Claygate Member

The Claygate Member generally comprised interbedded horizons of stiff orange-brown mottled greyish brown and greenish grey silty sandy clay and clayey silty sand and extended to the full depth of the investigation, of 18.00 m.

The Claygate Member was found to be predominantly cohesive in nature below a depth of about 5.00 m, but contained frequent bands of clayey sand.

No evidence of contamination was noted in these soils.

5.3 Groundwater

Groundwater was not encountered in Borehole Nos 2 and 3 but was encountered at a depth of 7.00 m within Borehole No 1 and was also measured at 7.00 m at the commencement of the second day's drilling with the borehole at 15 m and the casing at a depth of 11 m.

Three groundwater monitoring standpipes were installed and groundwater has subsequently been measured at depths of 1.05 m in Borehole No 2 and 4.51 m in Borehole No 1. The standpipe installed in Borehole No 3 was found to be dry to the full depth of 4.41 m.

Borehole No 2 was located within a flower bed and it is likely that watering of the flower bed has resulted in the high water level measured in the standpipe. This water level is not considered to be representative of the groundwater level beneath the site, especially in view of the water levels found in the other two standpipes.

5.4 Soil Contamination

The table below sets out the values measured within the four samples of the made ground analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	TP1 0.20 m	TP3 0.20 m	TP2 0.30 m	BH3 0.30 m
pH	7.8	8.8	8.3	8.0
Arsenic	14	9	11	7
Cadmium	1.0	<0.2	<0.2	<0.2
Chromium	41	29	40	38
Copper	45	30	32	9.2
Mercury	<0.3	<0.3	<0.3	<0.3
Nickel	15	8.8	11	4.1
Lead	**810**	200	**230**	11
Selenium	<1.0	<1.0	<1.0	<1.0
Zinc	290	140	180	18
Total Cyanide	<1	<1	<1	<1
Total Phenols	<1.0	<1.0	<1.0	<1.0
Sulphide	3.0	<1.0	<1.0	<1.0
Total PAH	17.4	3.94	1.82	<1.60
Benzo(a)pyrene	1.7	0.32	0.23	<0.10
Naphthalene	<0.05	<0.05	<0.05	<0.05
TPH	95.1	20.6	9.2	8.1
Total organic carbon %	2.7	0.5	0.8	0.1

Notes: Figure in **bold** indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report.

The results of the testing have indicated two of the four samples tested to contain elevated concentrations of lead, while all other contaminant concentrations have been found to be below the respective guideline values.

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. To this end, the table below indicates those contaminants of concern that have values in excess of a generic human

health risk based guideline values which is either the CLEA[5] Soil Guideline Value where available, or is a Generic Screening Value calculated using the CLEA UK Version 1.06[6] software assuming a residential end use with plant uptake, or is based on the DEFRA Category 4 Screening values[7]. 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 zero to 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
- that the building type equates to a two-storey small terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site, albeit somewhat conservative as a portion of the site will be used for commercial usage. 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 results of the testing have indicated two of the four samples tested to contain elevated concentrations of lead, with a further sample containing a concentration equal to the guideline value.

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

5 *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.
6 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.06 Environment Agency 2009
7 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

4.7 Existing Foundations

The findings of the trial pits are summarised in the table on the following page. Sketches of each pit are included in the Appendix.

Trial Pit No	Structure	Foundation detail	Bearing Stratum
1	Front Façade	Concrete footing Top: 420 mm Base: 690 mm Lateral projection: 310 mm	Orange-brown and pale brown very clayey fine to coarse SAND
2	Rear Façade	Concrete footing Top: 540 mm Base: 740 mm Lateral projection: 650 mm	Orange-brown and pale brown very clayey fine to coarse SAND
3	Rear Façade (extension)	Concrete footing Top: 480 mm Base: 660 mm Lateral projection: 340 mm	Orange-brown and pale brown very clayey fine to coarse SAND

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 basement excavation and the potential impact on hydrogeology.

6.0 INTRODUCTION

It is understood that it is proposed to construct a new single storey basement beneath the footprint of the existing house. The basement is to extend to a depth of approximately 3.50 m.

7.0 GROUND MODEL

The desk study has revealed that the site does not have a potentially contaminative historical use as it has been occupied by the existing residential property for its entire known developed history, and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- below a nominal to moderate thickness of made ground, the Claygate Member was encountered and extends to the full depth of investigation, of 18.00 m;
- the made ground generally comprises dark grey silty clayey sand with variable amounts of gravel, brick, ash and concrete fragments and extends to depths of between 0.27 m and 1.75 m;
- the Claygate Member generally comprises interbedded horizons of stiff orange-brown mottled grey and pale brown silty sandy clay and clayey silty sand extending to a depth of 18.00 m;
- groundwater is apparently present at a depth of approximately 4.50 m; and
- contamination testing has revealed two of the samples tested to contain elevated concentrations of lead.

8.0 ADVICE AND RECOMMENDATIONS

The ground investigation has indicated that formation level for the proposed 3.50 m deep basement will be within the Claygate Member. Significant groundwater inflows are not anticipated in the basement excavation and in view of the anticipated light loads it should be possible to adopt spread foundations or a raft foundation constructed from basement level to support the building. Alternatively, if loads are such that spread foundations are not economic a piled foundation could be considered.

The excavation for the proposed basement structures will require temporary support to maintain stability of the excavation and surrounding structures at all times.

8.1 Basement Construction

8.1.1 Basement Excavations

The formation level for the basement is likely to be within the interbedded clayey silty sand and silty sandy clay of the Claygate Member at a depth of approximately 3.50 m below ground level. On the basis of the groundwater observations to date, groundwater is not expected to be encountered in the basement excavation, having been encountered at a depth of approximately 4.50 m below ground level, which equates to 1.00 m below the level of the proposed basement. However, it is possible that inflows may be encountered at shallower depths from perched groundwater within the granular layers of the Claygate Member and made ground which may account for the higher groundwater level encountered in the standpipe within Borehole No 2. It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations and to carry out simply rising head tests to determine the rate at which groundwater is recharged.

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 building will be paramount.

It is likely that most appropriate method of supporting the basement will be through conventional concrete underpinning. Significant inflows of groundwater are not expected to be encountered in the basement excavation, but it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows from within granular layers of the Claygate Member and the made ground as a precautionary measure.

The use of underpinning will require the soils being underpinned to stand unsupported and difficulties may be encountered with unsupported excavations in the made ground and the underlying sandy horizons of the Claygate Member, particularly where groundwater is encountered. Ideally a number of trial excavations should be carried out, to depths as close to the proposed basement depth in order to check the stability of the soil and to provide an indication of the extent to which the basement excavation will be affected by groundwater inflows.

Alternatively, consideration could be given to the use of a bored pile wall. On the basis of the monitoring results to date, the use of a contiguous bored pile wall should be suitable, with localised grouting between piles to prevent any minor inflows.

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 and the timing of the provision of support to the wall will have an important effect on movements. The stability of the existing foundations will need to be ensured at all times and the retaining walls will need to be designed to support the loads from these foundations unless they are underpinned. Careful workmanship will be required in the construction of the underpins and it is recommended that a suitable specialist contractor is consulted in this respect.

8.1.2 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	1700	Zero	20
Claygate Member (sand)	1900	Zero	32
Claygate Member (clay)	1950	Zero	25

Groundwater is unlikely to be encountered within the excavation, although monitoring of the standpipes should be continued in order to establish equilibrium levels. At this stage, it is recommended that for the design of the retaining walls, groundwater level can be assumed to be below the depth of the basement, as indicated by the investigation carried out to date. However, it is recommended that this is reviewed following further monitoring and investigation into the presence of perched groundwater within the made ground, as consideration should be given to the risk of groundwater and surface water collecting behind the retaining walls within granular horizons. The use of a fully effective drainage system would be prudent in this respect. The advice in BS8102:2009[8] should be followed in the design of the basement retaining walls and with regard to waterproofing requirements.

8.2 Spread Foundations

The excavation of the proposed basement is likely to result in formation level within the Claygate Member and it should be possible to adopt moderate width pad or strip foundations in the sandy clay, designed to apply a net allowable bearing pressure of 150 kN/m^2 below basement level. The recommended bearing pressure provides an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

8.3 Basement Raft Foundation

A basement raft foundation may be an appropriate foundation solution, as it would take advantage of the unloading at formation level as a result of the excavation; the suitability of a raft foundation will depend on the resultant net pressure to be applied by the new structure, taking into consideration the overburden and potential heave associated with the basement excavation. The raft would need to be designed to be rigid to resist any variation in upwards and downwards forces, in order to prevent differential movements. In this respect, if a raft is considered and once the loads have been finalised, it would be prudent to carry out additional analysis in order to determine the likely heave / settlements associated with the use of a raft foundation.

8.4 Piled Foundations

For the ground conditions at this site, some form of bored pile is likely to be the most appropriate. A conventional rotary augered pile may be appropriate but consideration will need to be given to the possible instability and water ingress in the made ground and within any silty or sandy zones within the Claygate Formation. The use of bored piles installed using continuous flight auger (cfa) techniques may therefore be the most appropriate, especially as the use of a limited access rig may be required.

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

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

Stratum	Depths m	kN / m^2
Ultimate Skin Friction		
Made Ground & Basement Excavation	GL to 3.50	Ignore (Basement excavation)
Claygate Member (sand)	3.50 to 4.75	10
Claygate Member (clay) (α = 0.4)	4.75 to 15.00	Increasing linearly from 30 to 35
Ultimate End Bearing		
Claygate Member	10.00 to 15.00	Increasing linearly from 750 to 900

In the absence of pile tests, guidance from the London District Surveyors Association (LDSA)[9] suggests that a factor of safety of 3.0 should be applied to the above coefficients in the computation of safe theoretical working loads. On the basis of the above coefficients, the following preliminary pile capacities have been estimated.

Pile diameter mm	Depth Below Ground Level m	Safe Working Load kN
450	10	125
	12	150

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 potential groundwater inflows within the made ground and silt and sand partings within the Claygate Formation.

8.5 Basement Floor Slab

Following the excavation of the basement, it is likely that the floor slab for the proposed basement will need to be suspended over a void 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.

8.6 Shallow Excavations

On the basis of the borehole findings and trial pits, it is considered that shallow excavations for foundations and services that extend through the made ground or Claygate Formation should remain generally stable in the short term, although some instability may occur. However, should deeper excavations be considered or if excavations are to remain open for prolonged periods it is recommended that provision be made for battered side slopes or lateral

[9] LDSA (2009) *Foundations No 1 – Guidance notes for the design of straight shafted bored piles in London Clay*. LDSA Publications

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.

Groundwater inflows may be encountered within the made ground, particularly within the vicinity of existing foundations. Some form of groundwater may therefore be required and should be suitably controlled by sump pumping, although this should be confirmed by additional investigations, ideally in the form of trial excavations to the full depth of the proposed basement.

8.7 Effect of Sulphates

Chemical analyses carried out on a single sample of the Claygate Formation have revealed concentrations of soluble sulphate and near-neutral pH in accordance with Class DS-1. The measured pH value of the samples show that an ACEC class of AC-1 of Table C2 would be suitable. This assumes a mobile water condition at the site. The guidelines contained in the above digest should be followed in the design of foundation concrete.

8.8 Site Specific Risk Assessment

The desk study research has indicated that the site has not had a potentially contaminative history, having been occupied by the existing house for its entire known developed history. In addition, no sources of potential contamination have been identified across the site or the immediate surrounding area. The contamination testing has however indicated two of the four samples of made ground tested to contain elevated concentrations of lead.

The exact source of the contamination is unknown, however the made ground was noted as containing variable inclusions of extraneous material such as ash, which if present in the samples tested may have accounted for the elevated concentrations. In addition, in view of the age of the site and its location lining Fitzjohn's Avenue it is possible that the elevated concentrations have been caused by the emissions of cars using leaded fuel. In any case, the contamination is not considered likely to be in a soluble form, as if it were soluble it would not likely to be present, and therefore does not pose a risk to groundwater and thus neighbouring sites.

The majority of the soil is likely to be excavated and removed from site in any case as part of reducing the level of the site to that of the proposed basement but could pose a risk to end users in areas of soft landscaping. In addition, the contamination poses a risk to site workers during the groundworks, as discussed in turn below.

8.8.1 End Users

End users will be effectively isolated from direct contact with the identified contaminants by the extent of buildings and areas of external hardstanding. Only in garden areas could end users conceivably come into direct contact with the contaminated soils and suitable precautions will need to be taken in these areas to protect end users and to allow successful plant growth. At this stage it is recommended that a cover thickness of imported subsoil and topsoil of 600 mm in thickness should be specified to ensure successful plant growth, in accordance with recommendations from BRE[10]. It may be possible to reduce the final thickness of cover required, but this will need to be determined once final levels have been established and the concentrations of potential contaminants within the imported material is known.

[10] BRE (2004) *Cover systems for land regeneration. Thickness of cover systems for contaminated land.* BRE pub 465

8.8.2 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[11] and CIRIA[12] and the requirements of the Local Authority Environmental Health Officer.

A watching brief should also be maintained during the groundwork, and if suspicious soils are encountered then a suitably qualified engineer should inspect the soils and further testing carried out if required.

8.9 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[13] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[14] 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 £ £84.40 per tonne (about £150 per m^3) or at the lower rate of £2.65 per tonne (roughly £5 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 Environment Agency 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?	Comments
Made ground	Non-hazardous (17 05 04)	No	-
Claygate Member	Inert (17 05 03)	Should not be required but confirm with receiving landfill	-

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

[11] HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO
[12] CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association
[13] Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
[14] CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2

Environment Agency has issued a position paper[15] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils 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.

9.0 BASEMENT IMPACT ASSESSMENT

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

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

The site investigation indicates that the site is directly underlain by the Claygate Member, which is classified as an unproductive stratum.

Potential Impact	Site Investigation Conclusions
The site is located directly above an aquifer	The site lies directly above a Secondary 'A' Aquifer but the investigation has indicated that the groundwater table is at significant depth beneath the base of the proposed basement. No evidence of permeable contamination was recorded during the investigation and as a result, no additional engineering precautions should need to be made in this respect.
The proposed basement extends beneath the water table surface	Groundwater was not encountered during drilling and the groundwater monitoring standpipes installed on the site have been found to be dry to their full depths of 9.00 m. As a result, the proposed 3.50 m deep basement will not extend below the water table.
The site is within 100 m of a watercourse or potential spring line	The site is located about 80 m to the north of a former spring. The results of the investigation has indicated that the basement will not extend beneath the groundwater table or increase the area of hardstanding on the site and is therefore not considered to have a significant effect on the groundwater regime of the area.
The site is within 5 m of a highway or pedestrian right of way.	The investigation has not indicated any specific problems, such as weak or unstable ground, voids, or a high water table, that would make working within 5 m of public infrastructure particularly problematic at this site, although best practice in design and construction will ensure the stability of the highway.
The development will increase the founding depths relative to neighbours.	The retention system will ensure the stability of the excavation and neighbouring properties at all times.

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

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

The site is located directly above an aquifer.

There is a potential for groundwater to be present within the Secondary 'A' Aquifer beneath the site. This could arise to water ingress into the basement excavation and cause instabilities and difficulties during construction. Groundwater was not encountered during drilling and groundwater was subsequently measured at a depth of 4.51 m within one of the standpipes while another was found to be dry to the full depth of 4.41 m. A groundwater level of 1.05 m was recorded within the standpipe in Borehole No 2, but as detailed earlier in the report, this level is considered anomalous and is likely due to the build-up of surface water within the standpipe. As a result, it is deemed the proposed basement will not have any effect on groundwater flow, and that no significant perched groundwater inflows, that can't be dealt with by standard sump pumping, will be encountered.

The proposed basement extends beneath the water table surface.

On the basis of the findings of the ground investigation and subsequent monitoring, the basement is not considered to extend beneath the groundwater table. However, the Claygate Member is capable of supporting perched groundwater within granular layers that could build up behind the retaining walls and as a result the basement will need to be designed to resist such occurrences.

The site is within 100 m of a watercourse or potential spring line

The desk study has indicated the site to be within about 80 m of a former spring line that was one of the sources of the Tyburn, one of London's Lost Rivers. The Tyburn now flows entirely underground and has been culverted in some sections. In any case, the basement will not extend beneath the water table or increase the area of the hardstanding at the site and is therefore not considered likely to affect the groundwater regime in the surrounding area and will therefore not affect the quality or volume of water in the area of the former spring.

Location of public highway

The basement excavation will extend to within 5.0 m from the pathways and highways to the east and therefore the basement excavation may affect the highway. A retention system will need to be adopted that maintains the stability of the excavation at all times.

The proposed basement will significantly increase differential depth of foundations to neighbouring properties

At the time of writing this report the presence of neighbouring basements and founding levels is not known. To this extent and to remain conservative it has been assumed that surrounding properties do not have basements and are founded on shallow foundations. Therefore the proposed basement will extend to a significant depth relative to the existing foundations of the neighbouring properties and will need to be designed to ensure the stability of the site and any potentially sensitive structures that are in close proximity to the site.
Appropriate propping and temporary works installed during basement construction may limit the effect of ground movements to the surrounding properties, however, it would be prudent to conduct a full Ground Movement Analysis with building damage assessment, in order to better establish the ground movements associated with the works and whether protective measures are necessary.

9.1 BIA Conclusion

A Basement Impact Assessment has been carried out following the information and guidance published by the London Borough of Camden. Information from the site investigation has been used to assess potential impacts identified by the screening process.

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

9.2 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.

9.2.1 Screening

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?	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 and existing plans of the site have confirmed that the proposed basement scheme will not increase the amount of hardstanding.
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?	As above.
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 SFRA dated 2014.

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?	Site investigation.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	Historical maps acquired as part of the desk study 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.

Question	Evidence
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 that the basement development will only replace existing hardstanding areas.
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 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°?	Site survey drawing 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.
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 and confirmed during a site walkover
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?	There are no known plans to remove any trees and an arboriculturist should be consulted to ensure no damage to tree roots and if trees are to be removed
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 and the Lost Rivers of London book.
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.

9.2.2 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 and the engineering properties of the underlying soils to enable suitable design of the basement development. The findings of the investigation are discussed in Part 2 of this report and summarised in the Executive Summary.

9.2.3 Impact Assessment

Section 10.0 of this report summarises whether or not, on the basis of the findings of the investigation, the potential impacts still need to be given consideration and identifies ongoing risks that will require suitable engineering mitigation. Section 9.0 of this report also provides recommendations for the design of the proposed development.

A ground movement analysis and building damage assessment has been commissioned and will be used to provide a conclusion on any potential impacts from the proposed basement development to the surrounding structures.

10.0 OUTSTANDING RISKS AND 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 is considered to be required.

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 ground conditions based on the discrete points at which the ground was sampled, but the ground conditions should be subject to review as the work proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

Groundwater monitoring should be continued out to confirm that significant groundwater inflows will not be encountered during basement excavation as well as trial excavations, ideally, to depths as close to the full basement depth as possible.

It is assumed that the basement will extend beneath the depth of any potential desiccation, but foundations should be inspected by a suitably qualified engineer.
It is recommended that neighbouring founding depths are determined in order to aid any future ground movement analysis.

If during ground works any visual or olfactory evidence of contamination is identified it is recommended that further investigation be carried out and that the risk assessment is reviewed. 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.

A ground movement assessment should be carried out in order to provide an assessment of the likely ground movements that will be experienced as a result of the basement development and consider the impact of such movements on nearby structures. This assessment forms part of the BIA and is a planning requirement.

APPENDIX

Borehole Records

Trial Pit Records

Laboratory Geotechnical Test Results

SPT & Cohesion / Depth & Level Graph

Laboratory Contamination Test Results

Generic Risk-Based Guideline Values

Envirocheck Report Extracts

Historic Maps

Site Plan

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Borehole Number** **BH1**
Boring Method Cable Percussion	**Casing Diameter** 150 mm to 15.00 m	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 30/11/2016-01/12/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.15) 0.15	Made Ground (brick paving over orange-brown sand)		
0.30	D1					0.25 (0.25)	Concrete		
0.50	B1					0.50 (0.70)	Made Ground (dark grey silty slightly clayey sand with roots, gravel and brick and concrete fragments)		
							Made Ground (dark brown sand with rootlets and brick fragments)		
1.20-1.65	SPT(C)		DRY	5,8/9,8,10,8		1.20	Greyish brown slightly clayey fine to coarse SAND with fine to coarse sub-angular to sub-rounded gravel		
1.20-1.65	B2					(0.55)			
1.75	D2					1.75	Medium dense greenish grey and greyish brown silty sandy CLAY with rootlets and occasional fine to coarse sub-angular to sub-rounded gravel		
2.00-2.45	SPT(C)		DRY	3,5/6,7,5,7					
2.00-2.45	B3					(1.25)			
2.75	D3								
3.00-3.45	SPT(C)		DRY	2,3/4,3,3,4		3.00	Medium dense brown silty clayey fine SAND with occasional flint gravel and bands of silty sandy clay		
3.00-3.45	B4								
3.75	D4					(1.75)			
4.00-4.45	SPT(C)	3.00	DRY	3,4/3,3,4,5					
4.00-4.45	B5								
4.75	D5					4.75	Firm brown, orange-brown and greyish brown silty sandy CLAY with occasional bands of silty clayey sand		
5.00-5.45	SPT(C)	4.00	DRY	3,2/3,2,4,4					
5.00-5.45	B6								
6.00	D6								
6.50-6.95	SPT(C)	6.00	DRY	6,4/4,3,4,5					▽1
6.50-6.95	B7								
				Slow Inflow(1) at 7.00m.					
7.50	D7								
8.00-8.45	SPT	6.00	DRY	2,2/3,3,5,5					
8.00-8.45	B8								
9.00	D8								
9.50-9.95	SPT	7.00	DRY	3,2/3,4,4,5					
9.50-9.95	D9					(10.25)			

Remarks
Borehole casing could not be advanced below 15.0 m, so borehole completed to 18.0 m by means of continuous standard penetration testing
Groundwater monitoring standpipe installed to a depth of 9.00 m.

Scale (approx)	**Logged By**
1:50	AT

Figure No.
J16214.BH1

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Borehole Number** **BH1**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150 mm to 15.00 m		Zain & Gulseren Naqi	J16214
	Location	**Dates** 30/11/2016- 01/12/2016	**Engineer** Michael Barclay Partnership	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50	D10								
11.00-11.45	SPT	9.00	8.00	1,2/2,4,5,5					
11.00-11.45	D11								
12.00	D12								
12.50-12.95	SPT(C)	10.00	7.00	3,3/4,4,5,5					
12.50-12.95	D13								
13.50	D14								
14.55-15.00	SPT(C)	11.00	7.00	1,2/4,4,5,5					
14.55-15.00	D15								
15.00-15.45	SPT(C)	11.00	7.00	2,4/3,4,4,6		15.00	Complete at 18.00m		
15.45-15.90	SPT(C)	11.00	7.00	3,4/3,4,5,5					
15.90-16.35	SPT(C)	11.00	7.00	4,6/4,5,5,6					
16.35-16.80	SPT(C)	11.00	7.00	6,4/6,5,5,4					
16.80-17.25	SPT(C)	11.00	7.00	2,3/4,4,6,7					
17.25-17.70	SPT(C)	11.00	7.00	6,7/5,5,7,7					

Remarks
Borehole casing could not be advanced below 15.0 m, so borehole completed to 18.0 m by means of continuous standard penetration testing

Scale (approx)	**Logged By**
1:50	AT

Figure No.
J16214.BH1

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Number** **BH2**	
Excavation Method Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 20/09/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.27)	Made Ground (brown silty sandy clay with gravel, brick and occasional ash fragments)		
					0.27			
					(0.73)	Stiff orange-brown and pale brown very sandy CLAY		
					1.00			
1.20	D1				(0.80)	Orange-brown and pale brown silty SAND		
					1.80			
2.00	D2				(1.60)	Stiff orange-brown mottled grey and pale brown sandy slightly silty CLAY		
3.00	D3				3.40			
					(1.10)	Orange-brown mottled grey and pale brown clayey slightly silty SAND		
					4.50			
					(0.50)	Brown very clayey SAND		
5.00	D4				5.00			
						Complete at 5.00m		

Remarks
Borehole carried out through the base of Trial Pit No 1.
Groundwater monitoring standpipe installed to a depth of 5.00 m.
Groundwater not encountered.

Scale (approx)	Logged By
1:50	AT

Figure No.
J16214.BH2

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Number** **BH3**
Excavation Method Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 20/09/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D1				(0.50) 0.50	Made Ground (brown slightly clayey slightly silty sand with occasional gravel)		
					(0.90)	Firm becoming stiff orange-brown mottled grey sandy CLAY		
1.20	D2				1.40			
1.50	D3				(0.30) 1.70	Orange-brown mottled grey clayey fine to coarse SAND		
2.50	D4				(3.30)	Stiff orange-brown mottled grey sandy CLAY, becoming very sandy from 4.00 m		
4.00	D5				5.00	Complete at 5.00m		

Remarks
Groundwater not encountered.
Groundwater monitoring standpipe installed to a depth of 5.00 m

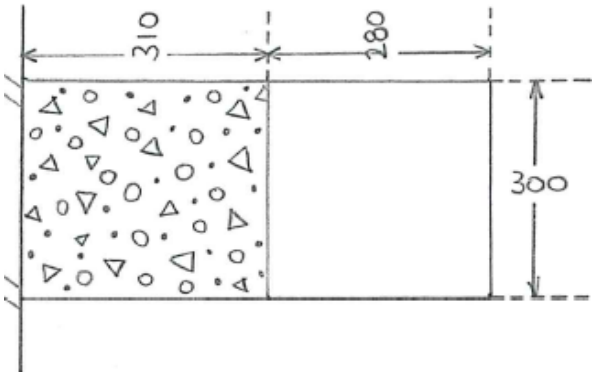
Scale (approx)	Logged By
1:50	AT

Figure No.
J16214.BH3

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware Herts SG13 7QE			**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Trial Pit Number** **1**
Excavation Method Manual	**Dimensions** 590 x 300 x 890	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 20/09/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1 / 1

Plan: -



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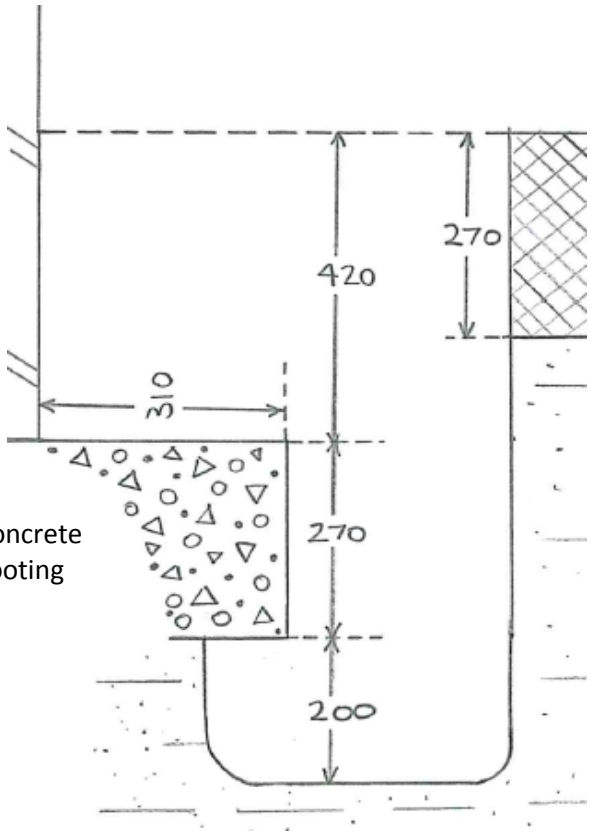


Made Ground (brown silty sandy clay with gravel, brick and occasional ash fragments)

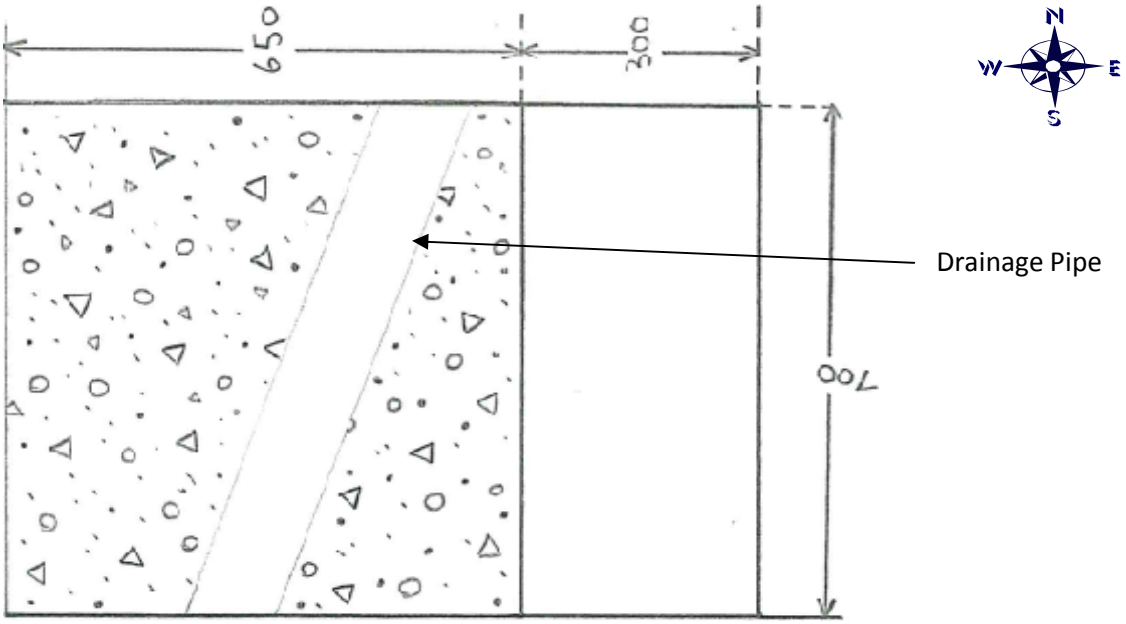
Concrete Footing

Orange-brown and pale brown very clayey fine to coarse SAND

Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Scale: 1:10 Logged by: AT

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware Herts SG13 7QE			**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Trial Pit Number** 2
Excavation Method Manual	**Dimensions** 950 x 700 x 940	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 20/09/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1 / 1

Plan: -



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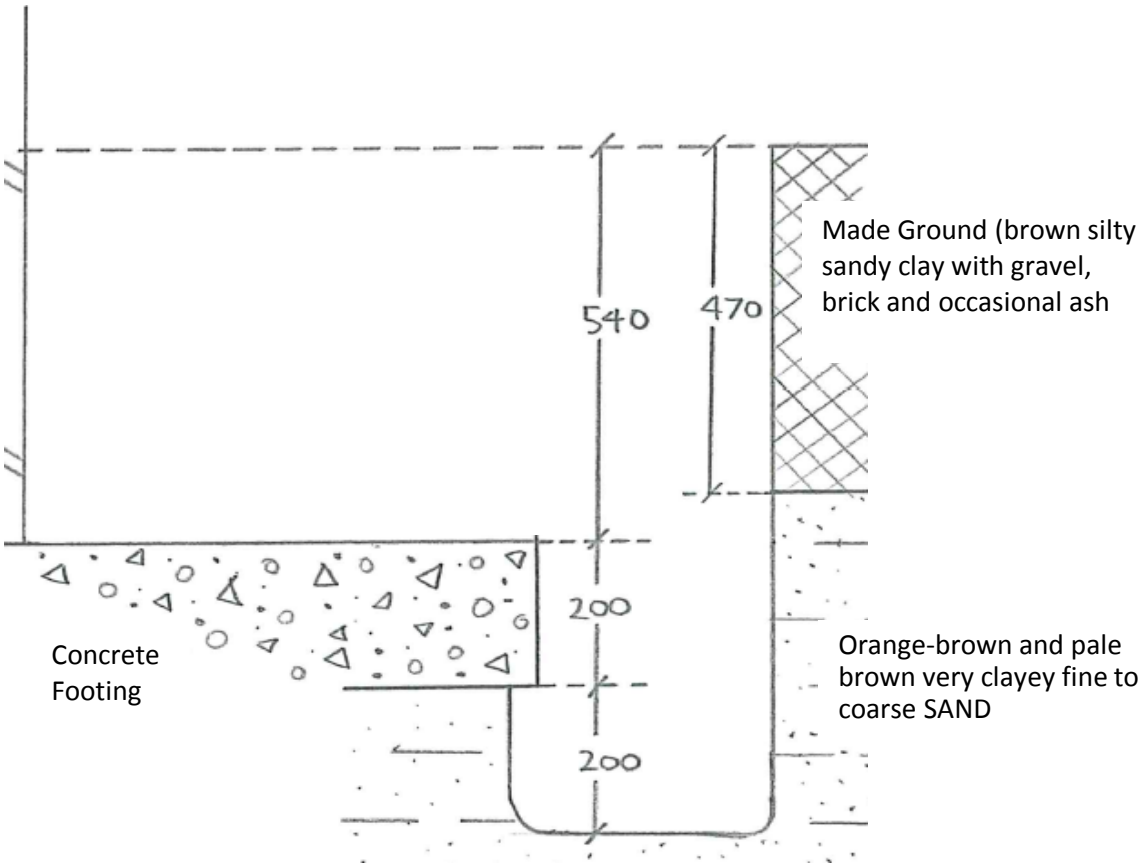
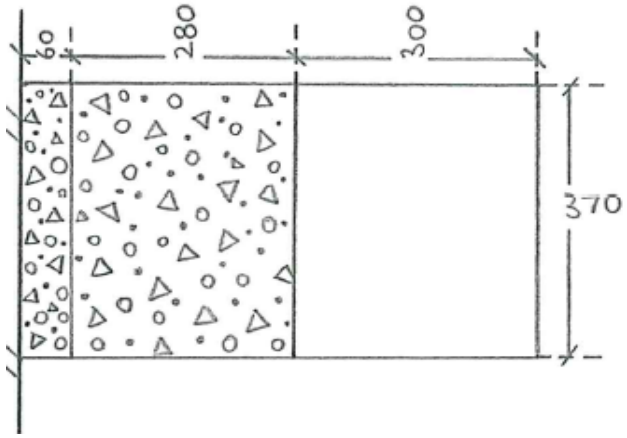


Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Scale: 1:10 Logged by: AT

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware Herts SG13 7QE			**Site** 76 Fitzjohns Avenue, London, NW3 5LS	**Trial Pit Number** 3
Excavation Method Manual	**Dimensions** 640 x 370 x 960	**Ground Level (mOD)**	**Client** Zain & Gulseren Naqi	**Job Number** J16214
	Location	**Dates** 20/09/2016	**Engineer** Michael Barclay Partnership	**Sheet** 1 / 1

Plan: -



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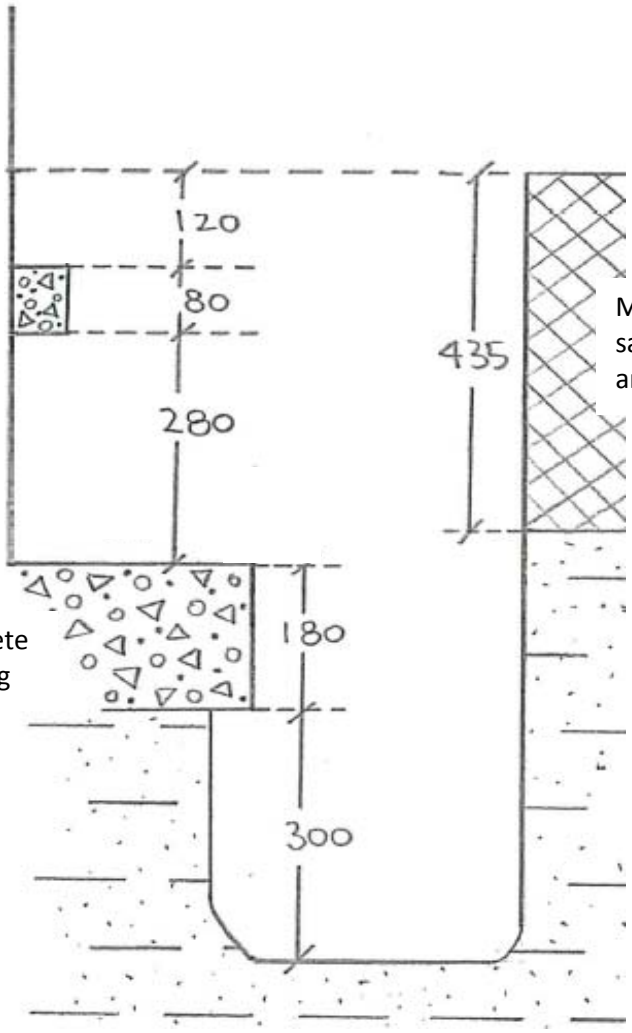


Made Ground (brown silty sandy clay with gravel, brick and occasional ash fragments)

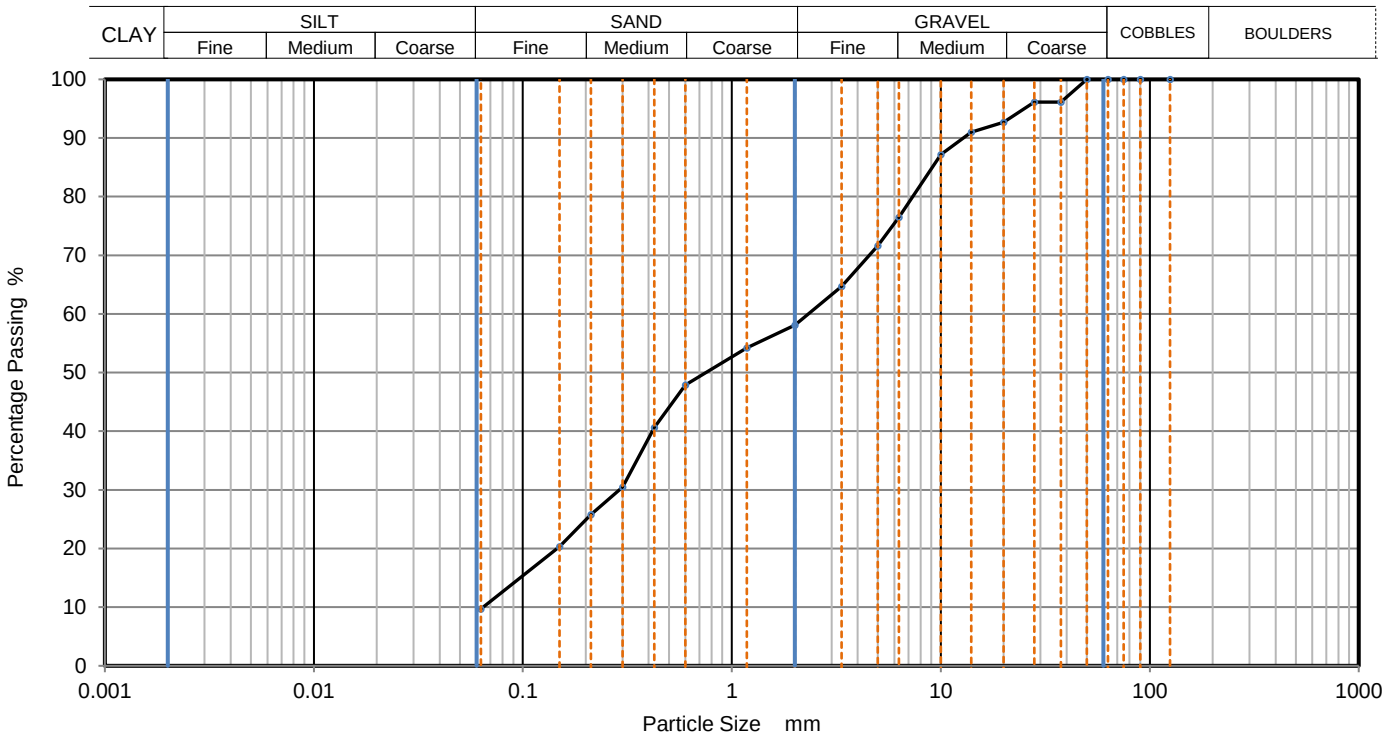
Concrete Footing

Orange-brown and pale brown very clayey fine to coarse SAND

Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Scale: 1:20 Logged by: AT

PARTICLE SIZE DISTRIBUTION

Site Name	76 Fitzjohns Avenue			Job Ref	22064
				Borehole/Pit No.	BH1
				Sample No.	-
Project No.	J16214	Client	GEA	Depth	1.20 m
Soil Description	Greyish brown slightly clayey gravelly SAND/sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	96		
20	93		
14	91		
10	87		
6.3	77		
5	72		
3.35	65		
2	58		
1.18	54		
0.6	48		
0.425	41		
0.3	31		
0.212	26		
0.15	20		
0.063	10		

Dry Mass of sample, g	2920

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	41.9
Sand	48.4
Fines <0.063mm	9.7

Grading Analysis		
D100	mm	
D60	mm	2.33
D30	mm	0.29
D10	mm	0.0647
Uniformity Coefficient		36
Curvature Coefficient		0.56

Remarks

Preparation and testing in accordance with BS1377 unless noted below

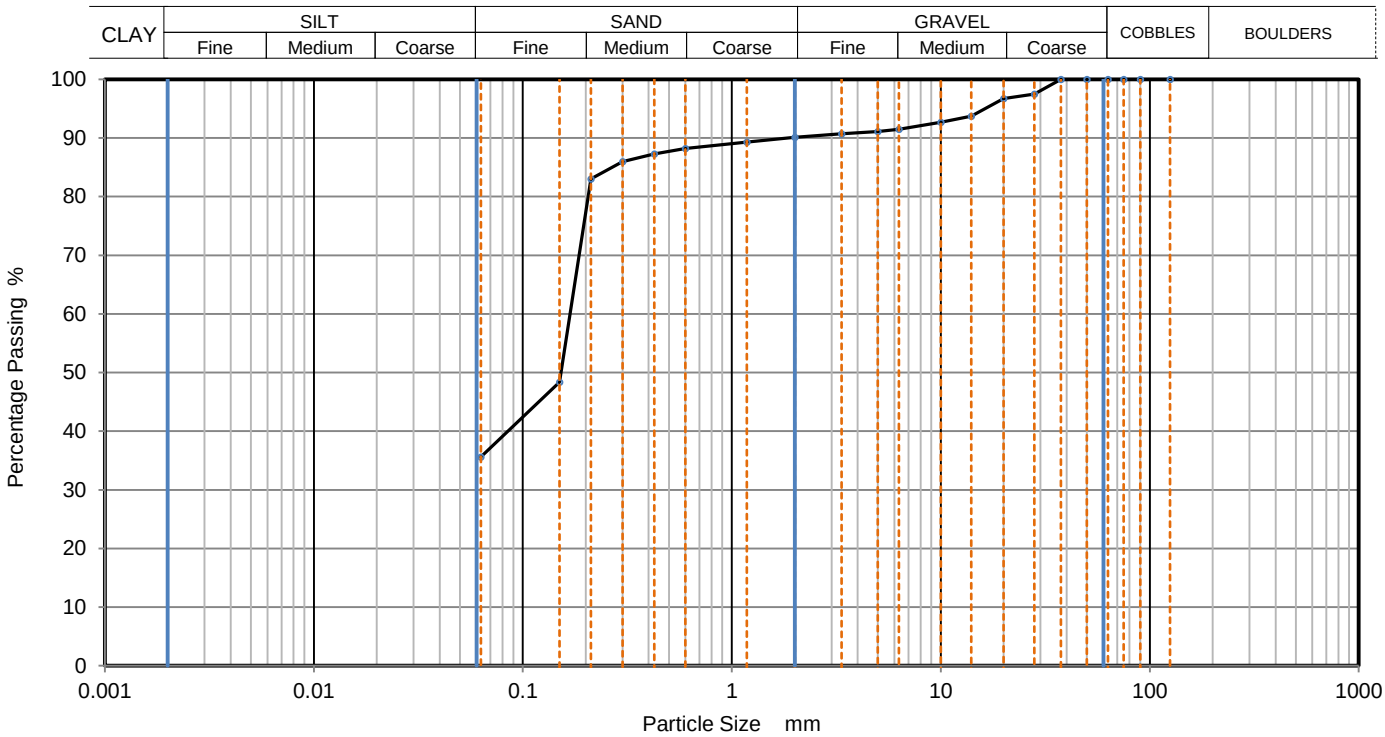
K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved
Initials: **kp**
Date: 21/12/2016

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

				Job Ref	22064
				Borehole/Pit No.	BH1
Site Name	76 Fitzjohns Avenue			Sample No.	-
Project No.	J16214	Client	GEA	Depth	2.00 m
Soil Description	Greenish grey and greyish brown slightly gravelly sandy silty CLAY with traces of rootlets (gravel is fmc and sub-rounded to sub-angular)			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	98		
20	97		
14	94		
10	93		
6.3	92		
5	91		
3.35	91		
2	90		
1.18	89		
0.6	88		
0.425	87		
0.3	86		
0.212	83		
0.15	48		
0.063	36		

Dry Mass of sample, g	1492

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	9.9
Sand	54.4
Fines <0.063mm	35.6

Grading Analysis		
D100	mm	
D60	mm	0.168
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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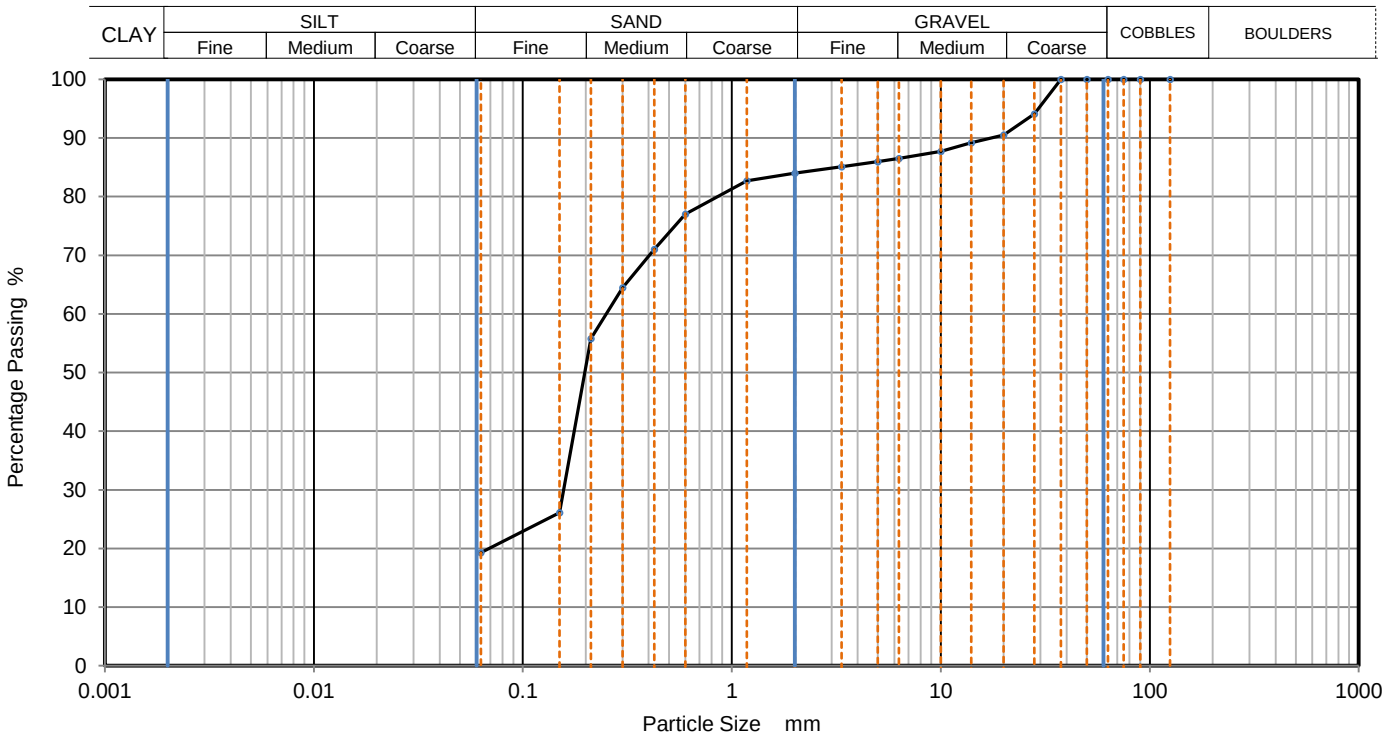
Checked and Approved
Initials: **kp**
Date: 21/12/2016

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

Job Ref	22064				
Borehole/Pit No.	BH1				
Site Name	76 Fitzjohns Avenue			Sample No.	-
Project No.	J16214	Client	GEA	Depth	4.75 m
Soil Description	Greenish brown gravelly clayey SAND (gravel is fmc and sub-rounded)			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	94		
20	91		
14	89		
10	88		
6.3	87		
5	86		
3.35	85		
2	84		
1.18	83		
0.6	77		
0.425	71		
0.3	65		
0.212	56		
0.15	26		
0.063	19		

Dry Mass of sample, g	939

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	16.0
Sand	64.7
Fines <0.063mm	19.3

Grading Analysis		
D100	mm	
D60	mm	0.251
D30	mm	0.157
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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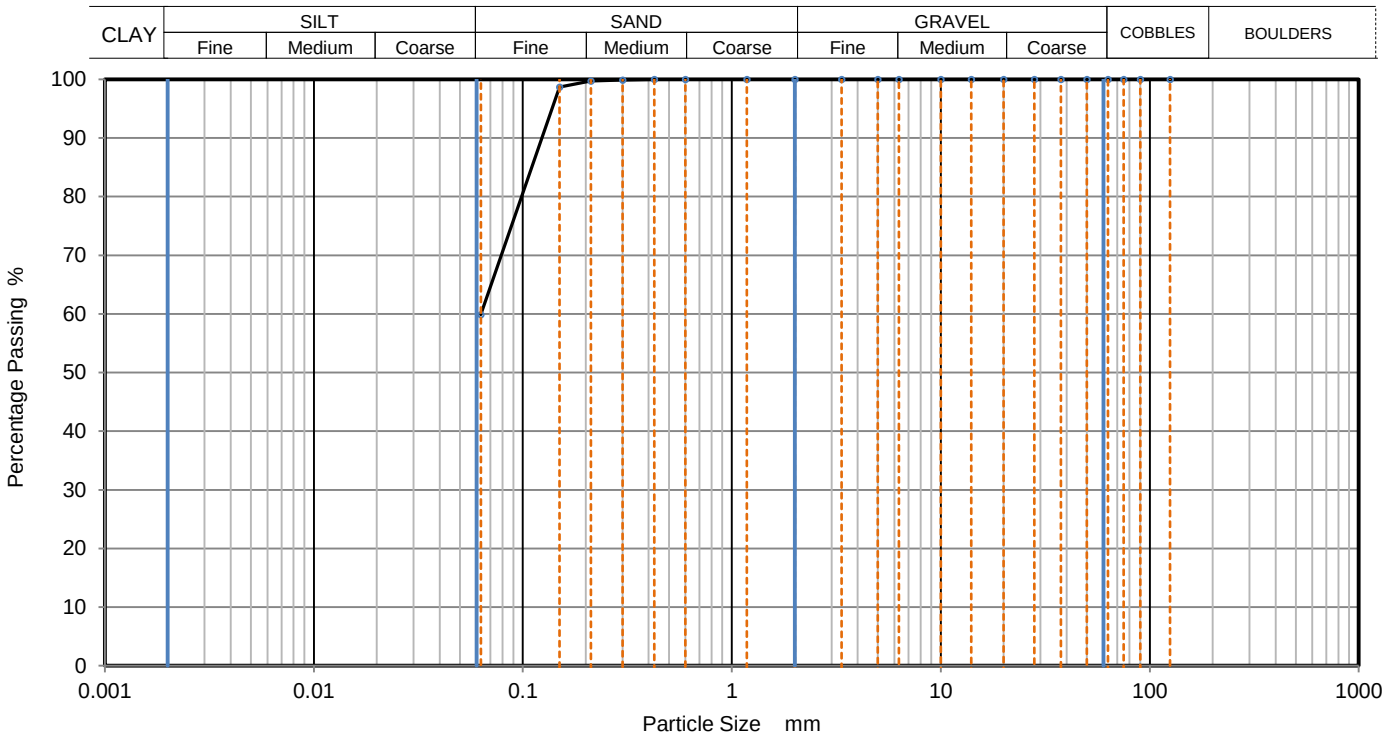
Checked and Approved
Initials: **kp**
Date: 21/12/2016

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

				Job Ref	22064
				Borehole/Pit No.	BH1
Site Name	76 Fitzjohns Avenue			Sample No.	-
Project No.	J16214	Client	GEA	Depth	7.50 m
Soil Description	Light orangish brown fine sandy silty CLAY			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	60		

Dry Mass of sample, g	216

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	40.1
Fines <0.063mm	59.9

Grading Analysis		
D100	mm	
D60	mm	0.0631
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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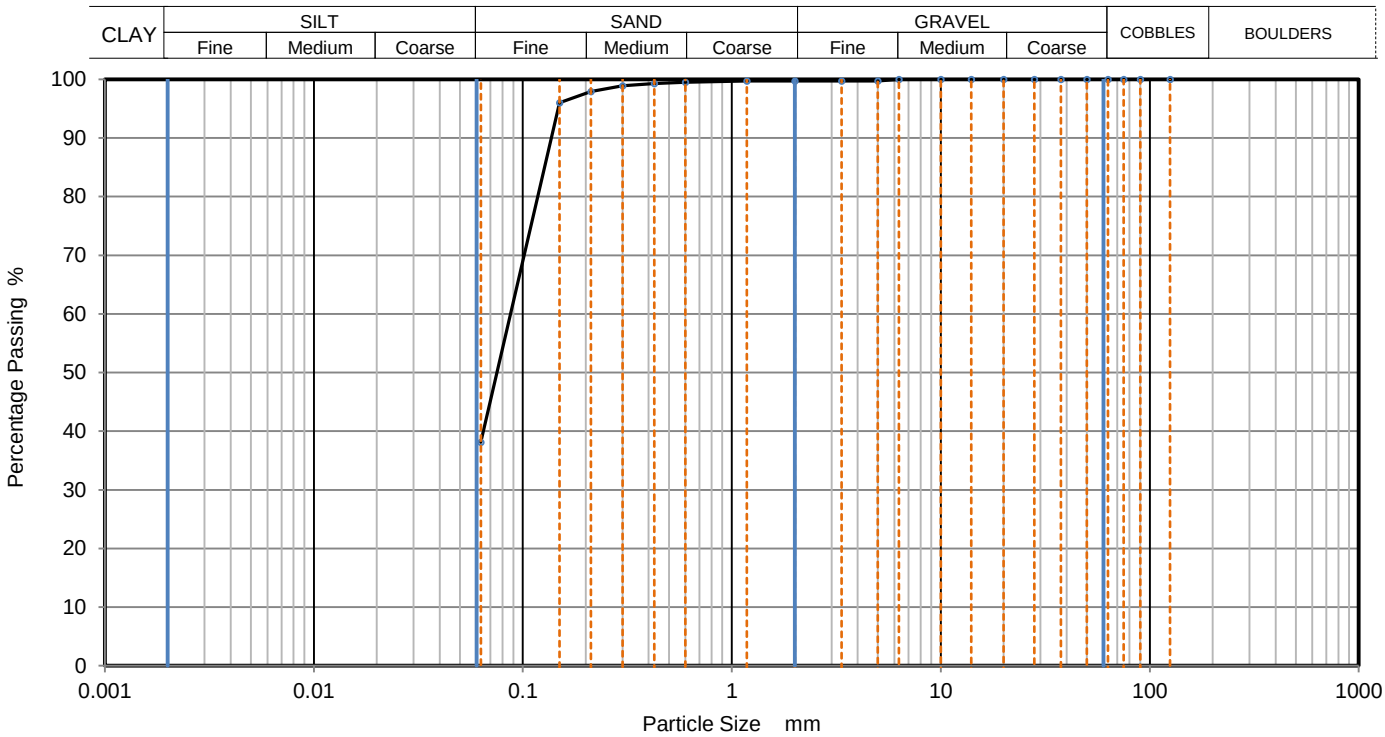
Checked and Approved
Initials: kp
Date: 21/12/2016

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

				Job Ref	22064
				Borehole/Pit No.	BH1
Site Name	76 Fitzjohns Avenue			Sample No.	-
Project No.	J16214	Client	GEA	Depth	10.50 m
Soil Description	Greenish brown and orangish brown fine sandy silty CLAY with rare siltstone fragments			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	99		
0.212	98		
0.15	96		
0.063	38		

Dry Mass of sample, g	362

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	61.6
Fines <0.063mm	38.1

Grading Analysis		
D100	mm	
D60	mm	0.0875
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

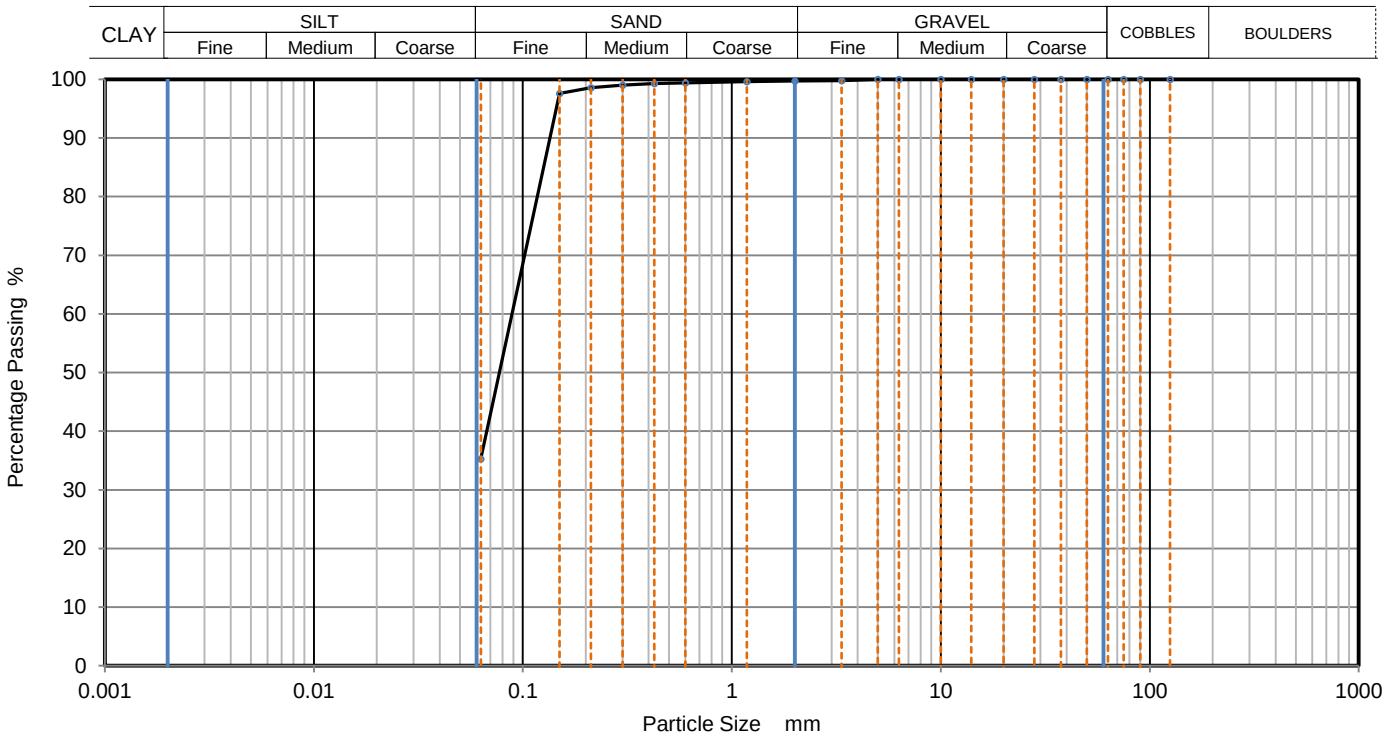
Preparation and testing in accordance with BS1377 unless noted below

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

Checked and Approved
Initials: **kp**
Date: 21/12/2016

PARTICLE SIZE DISTRIBUTION

				Job Ref	22064
				Borehole/Pit No.	BH1
Site Name	76 Fitzjohns Avenue			Sample No.	-
Project No.	J16214	Client	GEA	Depth	13.50 m
Soil Description	Light brown fine sandy silty CLAY with occasional siltstone fragments			Sample Type	D
				Samples received	08/12/2016
				Schedules received	08/12/2016
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	08/12/2016
				Date tested	19/12/2016



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	98		
0.063	35		

Dry Mass of sample, g	447

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	64.4
Fines <0.063mm	35.3

Grading Analysis		
D100	mm	
D60	mm	0.0889
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory
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Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved
Initials: kp
Date: 21/12/2016

2519 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 : 1990, clause 5.3 and clause 9

Job No.	Project Name	Programme	
22064	76 Fitzjohns Avenue	Samples received	08/12/2016
		Schedule received	08/12/2016
Project No.	Client	Project started	08/12/2016
J16214	GEA	Testing Started	18/12/2016

Hole No.	Sample				Soil description	Dry Mass passing 2mm	SO3 Content	SO4 Content	pH	Remarks
	Ref	Top	Base	Type		%	g/l	g/l		
BH1		2.00		D	Greenish grey and greyish brown slightly gravelly sandy silty CLAY with traces of rootlets (gravel is fmc and sub-rounded to sub-angular)	91	0.08	0.09	7.46	

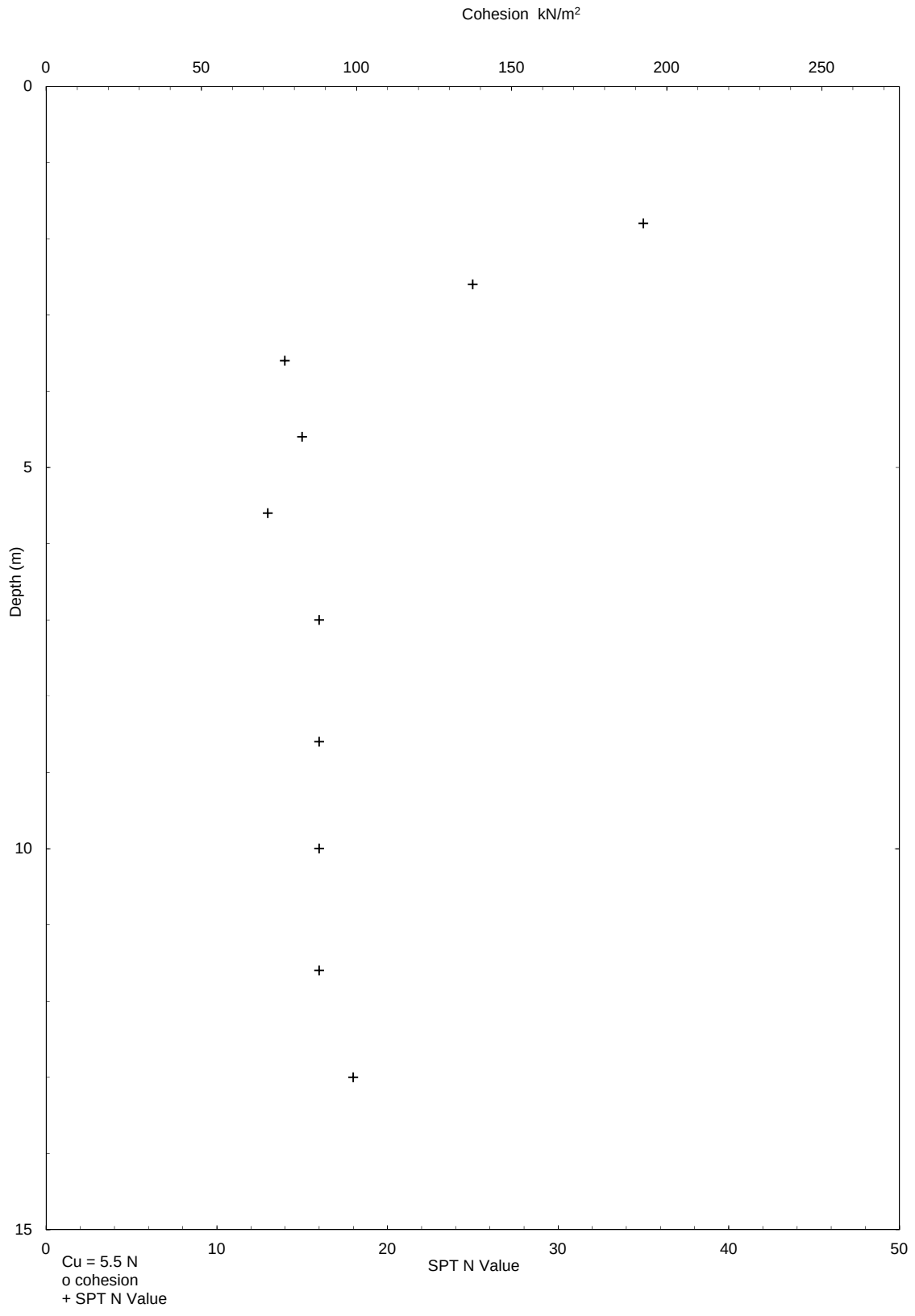
Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials **kp**

Date: **21/12/2016**

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware Herts SG12 7QE	**SPT & Cohesion / Depth Graph**	
Site	76 Fitzjohns Avenue, London, NW3 5LS	**Job Number**	J16214
Client	Zain & Gulseren Naqi	**Sheet**	1 / 1
Engineer	Michael Barclay Partnership		



Alex Taylor
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i2 Analytical Ltd.
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WD18 8YS

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e: reception@i2analytical.com

Analytical Report Number : 16-28912

Project / Site name:	76 Fitzjohns Avenue, London, NW3 5LS	**Samples received on:**	27/09/2016
Your job number:	J16214	**Samples instructed on:**	29/09/2016
Your order number:	J16214	**Analysis completed by:**	05/10/2016
Report Issue Number:	1	**Report issued on:**	05/10/2016
Samples Analysed:	4 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

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

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

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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

Analytical Report Number: 16-28912

Project / Site name: 76 Fitzjohns Avenue, London, NW3 5LS
Your Order No: J16214

Lab Sample Number				636399	636400	636401	636402	
Sample Reference				TP1	TP3	TP2	BH3	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.20	0.20	0.30	0.30	
Date Sampled				20/09/2016	20/09/2016	20/09/2016	20/09/2016	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	18	15	21	20	
Total mass of sample received	kg	0.001	NONE	0.48	1.6	2.0	1.4	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.8	8.8	8.3	8.0	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Total Sulphate as SO_4	mg/kg	50	MCERTS	710	700	450	180	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.025	0.049	0.012	0.031	
Sulphide	mg/kg	1	MCERTS	3.0	< 1.0	< 1.0	< 1.0	
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	9.3	8.7	5.2	27	
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.7	0.5	0.8	0.1	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	mg/kg	0.1	MCERTS	1.1	0.33	0.22	< 0.10	
Anthracene	mg/kg	0.1	MCERTS	0.20	< 0.10	< 0.10	< 0.10	
Fluoranthene	mg/kg	0.1	MCERTS	3.2	0.71	0.47	< 0.10	
Pyrene	mg/kg	0.1	MCERTS	2.8	0.64	0.42	< 0.10	
Benzo(a)anthracene	mg/kg	0.1	MCERTS	1.5	0.34	0.24	< 0.10	
Chrysene	mg/kg	0.05	MCERTS	1.7	0.42	0.24	< 0.05	
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	2.3	0.50	< 0.10	< 0.10	
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.90	0.19	< 0.10	< 0.10	
Benzo(a)pyrene	mg/kg	0.1	MCERTS	1.7	0.32	0.23	< 0.10	
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.99	0.23	< 0.10	< 0.10	
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.2	0.26	< 0.05	< 0.05	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	17.4	3.94	1.82	< 1.60	
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	9.0	11	7.0	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.0	< 0.2	< 0.2	< 0.2	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41	29	40	38	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	45	30	32	9.2	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	810	200	230	11	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	8.8	11	4.1	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	290	140	180	18	
Petroleum Hydrocarbons								
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
TPH (C10 - C12)	mg/kg	2	ISO 17025	< 2.0	< 2.0	< 2.0	< 2.0	
TPH (C12 - C16)	mg/kg	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	
TPH (C16 - C21)	mg/kg	1	ISO 17025	24	6.6	2.1	< 1.0	
TPH (C21 - C35)	mg/kg	1	ISO 17025	65	7.9	< 1.0	< 1.0	

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

Analytical Report Number : 16-28912

Project / Site name: 76 Fitzjohns Avenue, London, NW3 5LS

* 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 *
636399	TP1	None Supplied	0.20	Brown loam and clay with gravel.
636400	TP3	None Supplied	0.20	Brown loam and clay with gravel.
636401	TP2	None Supplied	0.30	Brown clay and sand.
636402	BH3	None Supplied	0.30	Brown clay and sand.

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Analytical Report Number : 16-28912

Project / Site name: 76 Fitzjohns Avenue, London, NW3 5LS

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	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
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	NONE
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 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 in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
BH3		S	16-28912	636402	c	Sulphide in soil	L010-PL	c
TP1		S	16-28912	636399	c	Sulphide in soil	L010-PL	c
TP2		S	16-28912	636401	c	Sulphide in soil	L010-PL	c
TP3		S	16-28912	636400	c	Sulphide in soil	L010-PL	c

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GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	76 Fitzjohns Avenue, London, NW3 5LS	**Job Number** J16214
Client	Zain & Gulseren Naqi	**Sheet** 1 / 2
Engineer	Michael Barclay Partnership	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	26	C4SL
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	21	C4SL
Copper	2,330	LQM/CIEH
Lead	200	C4SL
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	97	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.2	C4SL
Toluene	120	SGV
Ethyl Benzene	65	SGV
Xylene	42	SGV
Aliphatic C5-C6	30	LQM/CIEH
Aliphatic C6-C8	73	LQM/CIEH
Aliphatic C8-C10	19	LQM/CIEH
Aliphatic C10-C12	93	LQM/CIEH
Aliphatic C12-C16	740	LQM/CIEH
Aliphatic C16-C35	45,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	27	LQM/CIEH
Aromatic C10-C12	69	LQM/CIEH
Aromatic C12-C16	140	LQM/CIEH
Aromatic C16-C21	250	LQM/CIEH
Aromatic C21-C35	890	LQM/CIEH
PRO (C_5 –C_{10})	269	Calc
DRO (C_{12} –C_{28})	46,130	Calc
Lube Oil (C_{28} –C_{44})	45,890	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
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	184	SGV
PAH		
Naphthalene	2.20	C4SL exp & LQM/CIEH
Acenaphthylene	170	LQM/CIEH
Acenaphthene	210	LQM/CIEH
Fluorene	160	LQM/CIEH
Phenanthrene	92	LQM/CIEH
Anthracene	2,300	LQM/CIEH
Fluoranthene	260	LQM/CIEH
Pyrene	560	LQM/CIEH
Benzo(a) Anthracene	4.3	C4SL exp & LQM/CIEH
Chrysene	8	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	7.7	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	12.1	C4SL exp & LQM/CIEH
Benzo(a) pyrene	4.35	C4SL
Indeno(1 2 3 cd) Pyrene	4.4	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	1.10	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	65	C4SL exp & LQM/CIEH
Screening value for PAH	**62.1**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	11.7	LQM/CIEH
tetrachloroethane (PCA)	0.56	LQM/CIEH
tetrachloroethene (PCE)	1.01	LQM/CIEH
trichloroethene (TCE)	0.134	LQM/CIEH
1,2-dichloroethane (DCA)	0.0054	LQM/CIEH
vinyl chloride (Chloroethene)	0.000953	LQM/CIEH
tetrachloromethane (Carbon tetra	0.018	LQM/CIEH
trichloromethane (Chloroform)	0.888	LQM/CIEH

Notes

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

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

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

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health croiteria values

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

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	76 Fitzjohns Avenue, London, NW3 5LS	**Job Number** J16214
Client	Zain & Gulseren Naqi	**Sheet** 2 / 2
Engineer	Michael Barclay Partnership	

Proposed End Use **Residential with 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 a young female aged 0 to 6 years old;
- ❑ that the exposure duration will be six years;
- ❑ that the building type equates to a terraced house.
- ❑ that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of home grown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours

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 the generic screening value 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.

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
97518978_1_1

Customer Reference:
J16214

National Grid Reference:
526590, 185290

Slice:
A

Site Area (Ha):
0.04

Search Buffer (m):
1000

Site Details:

76 Fitzjohns Avenue
LONDON
NW3 5LS

Client Details:

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

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 the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Report Version v50.0

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	pg 1				1
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			2	11
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				37
River Quality					
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions	pg 9				(*7)
Water Industry Act Referrals					
Groundwater Vulnerability	pg 11	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 11	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones	pg 11				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
Detailed River Network Lines					n/a
Detailed River Network Offline Drainage					n/a

Summary

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 12				1
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Landfill Coverage	pg 12	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 12		1	2	3
Potentially Infilled Land (Water)	pg 12				3
Registered Landfill Sites					
Registered Waste Transfer Sites	pg 13				2
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					

GEA Geotechnical & Environmental Associates

Summary

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 14	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry					
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 14		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 17	Yes			
Brine Compensation Area			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 17	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 17	Yes		n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 17	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 17	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 19		2	48	148
Fuel Station Entries	pg 35				2
Points of Interest - Commercial Services	pg 35			11	37
Points of Interest - Education and Health	pg 39				9
Points of Interest - Manufacturing and Production	pg 40			2	3
Points of Interest - Public Infrastructure	pg 41			2	17
Points of Interest - Recreational and Environmental	pg 42				6
Gas Pipelines					
Underground Electrical Cables	pg 43		4	4	8

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 45				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 (E)	0	2	526591 185286
1	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: Reservoir/Borehole Site Location: Hampstead Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0140 Permit Version: 1 Effective Date: 15th September 1989 Issued Date: 15th September 1989 Revocation Date: 5th October 2000 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: River Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A17NE (NW)	897	3	526200 186100
2	**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	A13SE (SE)	403	4	526872 184985
3	**Local Authority Pollution Prevention and Controls** Name: Perkins Dry Cleaners Location: 40 Heath Street, London, Nw3 6te Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC9 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	A18SW (NW)	483	4	526374 185724
4	**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	A7NE (SW)	539	4	526167 184924
4	**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	A7NE (SW)	546	4	526178 184902
5	**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	A14SW (E)	582	4	527187 185227

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
11	**Local Authority Pollution Prevention and Controls** Name: Kings Dry Cleaners Location: 25 Winchester Road, London, E4 Authority: London Borough of Waltham Forest, Environmental Health Department Permit Reference: DC05 Dated: 6th July 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A8SE (S)	994	5	526812 184310
	Nearest Surface Water Feature	A19SE (NE)	798	-	527315 185663
12	**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 variationSuperseded** Positional Accuracy: Automatically positioned to the address	A14NE (E)	693	3	527292 185400
12	**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 variationSuperseded** Positional Accuracy: Automatically positioned to the address	A14NE (E)	693	3	527292 185405
12	**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: AR0446 Dated: 12th July 1995 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 variationSuperseded** Positional Accuracy: Automatically positioned to the address	A14NE (E)	694	3	527292 185410
12	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Fleet Road, London, NW3 2QR Authority: Environment Agency, Thames Region Permit Reference: CB1915 Dated: 2nd October 2007 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Application has been authorised and any conditions apply to the operatorAuthorised** Positional Accuracy: Manually positioned to the address or location	A14NE (E)	698	3	527296 185410
12	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: CD3170 Dated: 13th July 2009 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Application has been authorised and any conditions apply to the operatorAuthorised** Positional Accuracy: Automatically positioned to the address	A14NE (E)	699	3	527297 185410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
12	**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: AE8658 Dated: 24th March 1992 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of multiple open sources which are also the subject of authorisations **Status: Authorisation superseded by a substantial or non substantial variationSuperseded** Positional Accuracy: Automatically positioned to the address	A14NE (E)	703	3	527302 185405
12	**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: AR0373 Dated: 11th July 1995 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variationSuperseded** Positional Accuracy: Automatically positioned to the address	A14NE (E)	704	3	527302 185410
13	**Registered Radioactive Substances** Name: Polymasc Pharmaceuticals Plc Location: Anthony Nolan Building, Royal Free Hospital Site, Fleet Road; Hampstead, LONDON, Greater London, NW3 2EZ Authority: Environment Agency, Thames Region Permit Reference: AU4924 Dated: 20th February 1996 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation either revoked or cancelledCancelled** Positional Accuracy: Manually positioned to the address or location	A14NE (E)	915	3	527500 185495
	Water Abstractions Operator: London Borough Of Camden Licence Number: 28/39/39/0219 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London. Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A8SE (S)	1020	3	526800 184280
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3NE (S)	1029	3	526750 184261

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: General Washing/Process Washing Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3NE (S)	1029	3	526750 184261
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Lake And Pond Throughflow Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3NE (S)	1029	3	526750 184261
	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	A5SW (SE)	1895	3	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	A5SW (SE)	1903	3	527640 183690

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	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	A5SW (SE)	1903	3	527640 183690
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise Map Sheet: Sheet 39 West London Scale: 1:100,000	A13NW (E)	0	3	526591 185286
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Secondary Aquifer - A	A13NW (E)	0	2	526591 185286
	Superficial Aquifer Designations No Data Available				
14	**Source Protection Zones** Name: Barrow Hill Source: Environment Agency, Head Office Reference: Th405 Type: Zone II (Outer Protection Zone): Either 25% of the source area or a 400 day travel time whichever is greater.	A8NE (S)	713	3	526859 184621
	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				
	Detailed River Network Lines None				
	Detailed River Network Offline Drainage None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
15	**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	A7NE (SW)	683	3	526072 184813
	Local Authority Landfill Coverage Name: London Borough of Camden - Has no landfill data to supply		0	6	526591 185286
16	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A13NE (E)	9	8	526616 185296
17	**Potentially Infilled Land (Non-Water)** Bearing Ref: SW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1991	A13SW (SW)	297	8	526467 184999
18	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A13SE (SE)	303	8	526763 185029
19	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14SE (E)	678	8	527284 185228
20	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14SE (E)	745	8	527347 185189
21	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14SE (E)	865	8	527473 185261
22	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A19SW (NE)	737	8	527250 185654
23	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A18NE (N)	740	8	526813 186007
24	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1896	A12NW (W)	906	8	525731 185613

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
25	**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.	A7NE (SW)	622	3	526200 184780
25	**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	A7NE (SW)	622	3	526200 184780

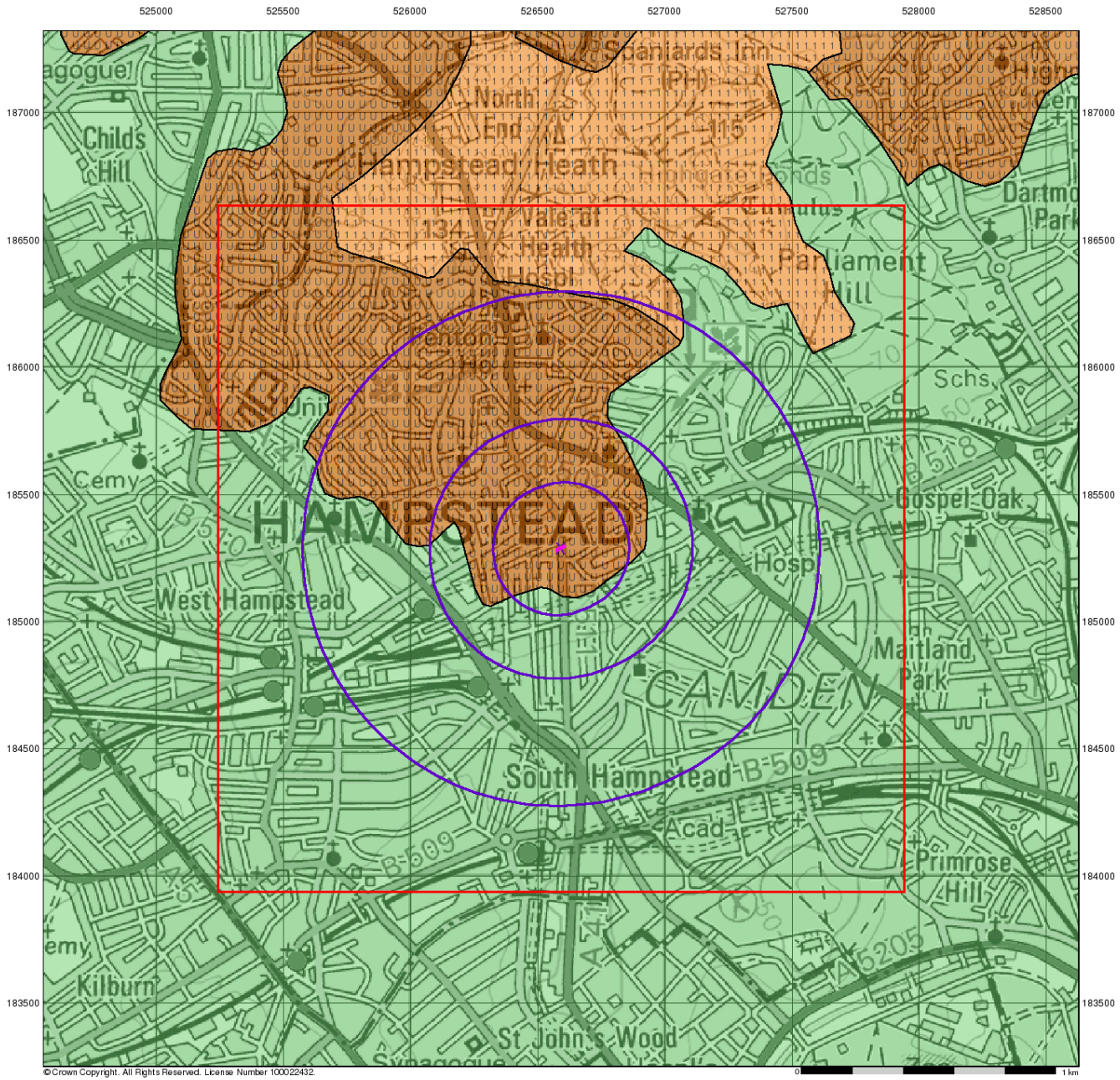
Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Thames Group	A13NW (E)	0	2	526591 185286
	BGS Estimated Soil Chemistry No data available				
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National 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	A13SE (SE)	206	2	526763 185153
	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	A13NW (W)	305	2	526278 185352
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526732, 185657 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 40.30 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 97.40 mg/kg Lead Measured Concentration: 660.40 mg/kg Nickel Measured Concentration: 34.00 mg/kg	A18SE (N)	381	2	526732 185657
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526223, 185630 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 19.70 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 127.10 mg/kg Lead Measured Concentration: 514.80 mg/kg Nickel Measured Concentration: 23.20 mg/kg	A17SE (NW)	493	2	526223 185630

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	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 (E)	0	2	526591 185286
	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 (E)	0	2	526591 185286
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (E)	0	2	526591 185286
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (E)	0	2	526591 185286
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (E)	0	2	526591 185286
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (E)	0	2	526591 185286
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	174	2	526527 185453
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	176	2	526590 185100
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (E)	0	2	526591 185286
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	174	2	526527 185453
	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 (E)	0	2	526591 185286

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	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 (E)	0	2	526591 185286

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
26	**Contemporary Trade Directory Entries** Name: Camden & Islington Trust Location: 17, Lyndhurst Gardens, London, NW3 5NU Classification: Hospitals **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	221	-	526829 185274
27	**Contemporary Trade Directory Entries** Name: Hampstead Waste Location: Flat 68, Henderson Court, 102, Fitzjohns Avenue, London, NW3 6NR Classification: Medical Waste Disposal **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (NW)	228	-	526493 185498
28	**Contemporary Trade Directory Entries** Name: Tenancy Cleaners London Location: 4, Shepherds Walk, London, NW3 5UE Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	256	-	526744 185512
29	**Contemporary Trade Directory Entries** Name: Hampstead Cleaners Location: 63, Rosslyn Hill, London, NW3 5UQ Classification: Carpet, Curtain & Upholstery Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	294	-	526714 185571
30	**Contemporary Trade Directory Entries** Name: Fast Cash 4 Scrap Cars London Aeg Location: 64, Rosslyn Hill, London, NW3 1ND Classification: Car Breakers & Dismantlers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (N)	338	-	526708 185619
30	**Contemporary Trade Directory Entries** Name: Snappy Snaps Location: 80, Rosslyn Hill, London, NW3 1ND Classification: Photographic Processors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SE (N)	338	-	526685 185626
31	**Contemporary Trade Directory Entries** Name: Cleaning Services Hampstead Location: 58a, Rosslyn Hill, London, NW3 1ND Classification: Carpet, Curtain & Upholstery Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (N)	338	-	526723 185614
31	**Contemporary Trade Directory Entries** Name: Farrow & Ball Ltd Location: 58, Rosslyn Hill, London, NW3 1ND Classification: Wallpapers & Wall Coverings **Status: Active** Positional Accuracy: Automatically positioned to the address	A13NE (N)	338	-	526723 185614
31	**Contemporary Trade Directory Entries** Name: Bang & Olufsen Location: 44, Rosslyn Hill, London, NW3 1NH Classification: Electrical Goods Sales, Manufacturers & Wholesalers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	340	-	526764 185598
31	**Contemporary Trade Directory Entries** Name: Lily'S Kitchen Location: 6, Rosslyn Mews, London, NW3 1NN Classification: Pet Foods & Animal Feeds **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	354	-	526769 185611
32	**Contemporary Trade Directory Entries** Name: Radici Plastics Uk Ltd Location: 6a, Hampstead High Street, London, NW3 1PR Classification: Plaster Manufacturers & Suppliers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SE (N)	357	-	526626 185654
32	**Contemporary Trade Directory Entries** Name: Cleaners Hampstead Location: 8, Hampstead High Street, London, NW3 1PR Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SE (N)	359	-	526614 185656

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
161	**Local Nature Reserves** Name: Belsize Wood Multiple Area: N Area (m2): 2722.99 Source: Natural England Designation Date: 28th March 2012	A14SE (E)	867	9	527475 185278



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GEA Geotechnical & Environmental Associates

Groundwater Vulnerability

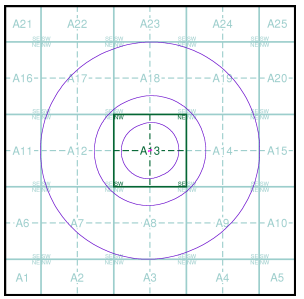
General

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

Agency and Hydrological

Geological Classes	Soil Classes
Major Aquifer (Highly Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Minor Aquifer (Variably Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Non Aquifer (Negligibly Permeable)	
Water or Sea	
Drift Deposit	

Site Sensitivity Context Map - Slice A



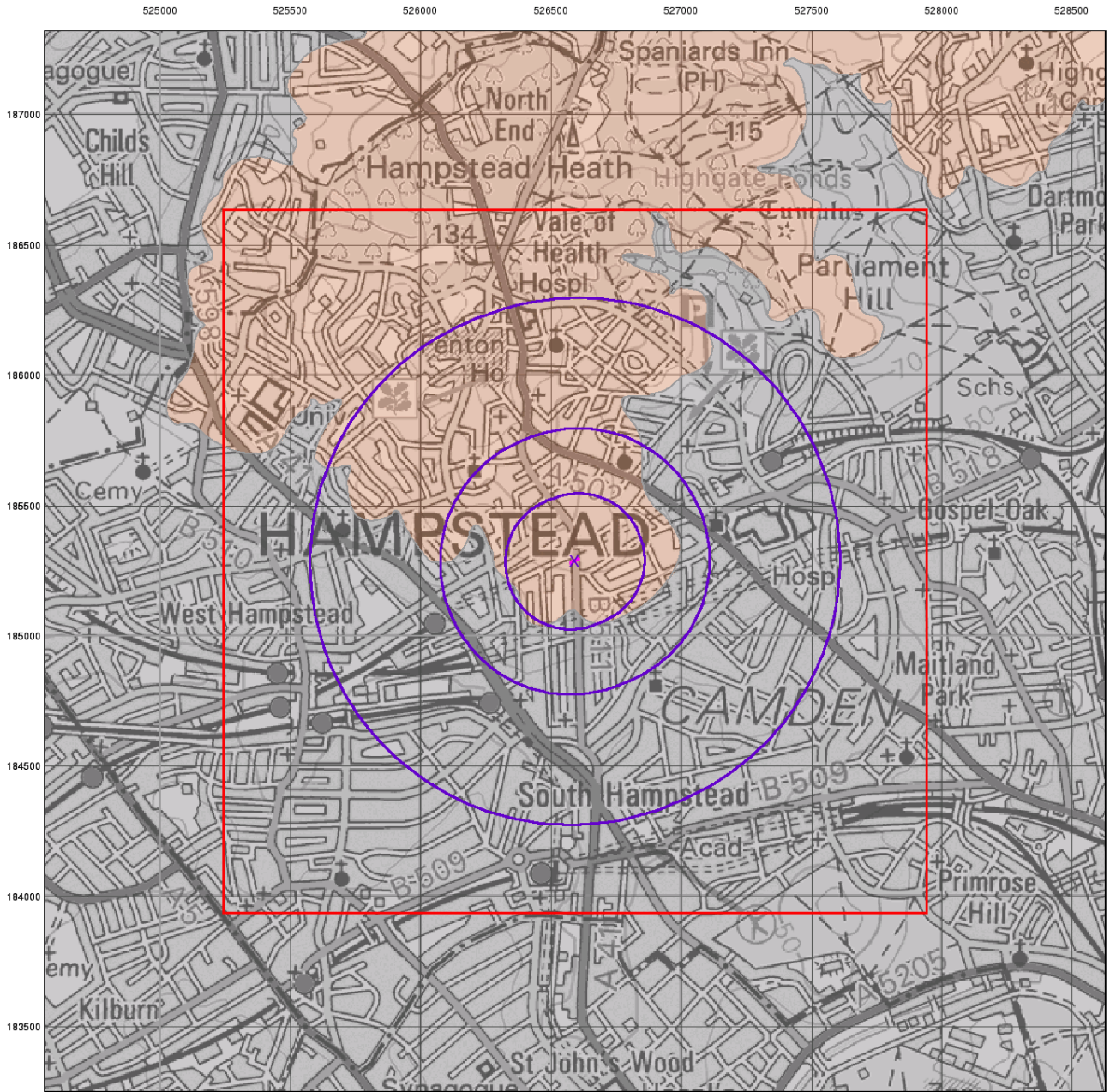
Order Details

Order Number:	97518978_1_1
Customer Ref:	J16214
National Grid Reference:	526590, 185290
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

76 Fitzjohns Avenue, LONDON, NW3 5LS

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



GEA Geotechnical & Environmental Associates

Bedrock Aquifer Designation

General

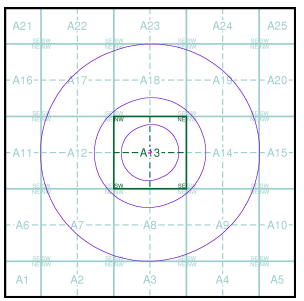
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

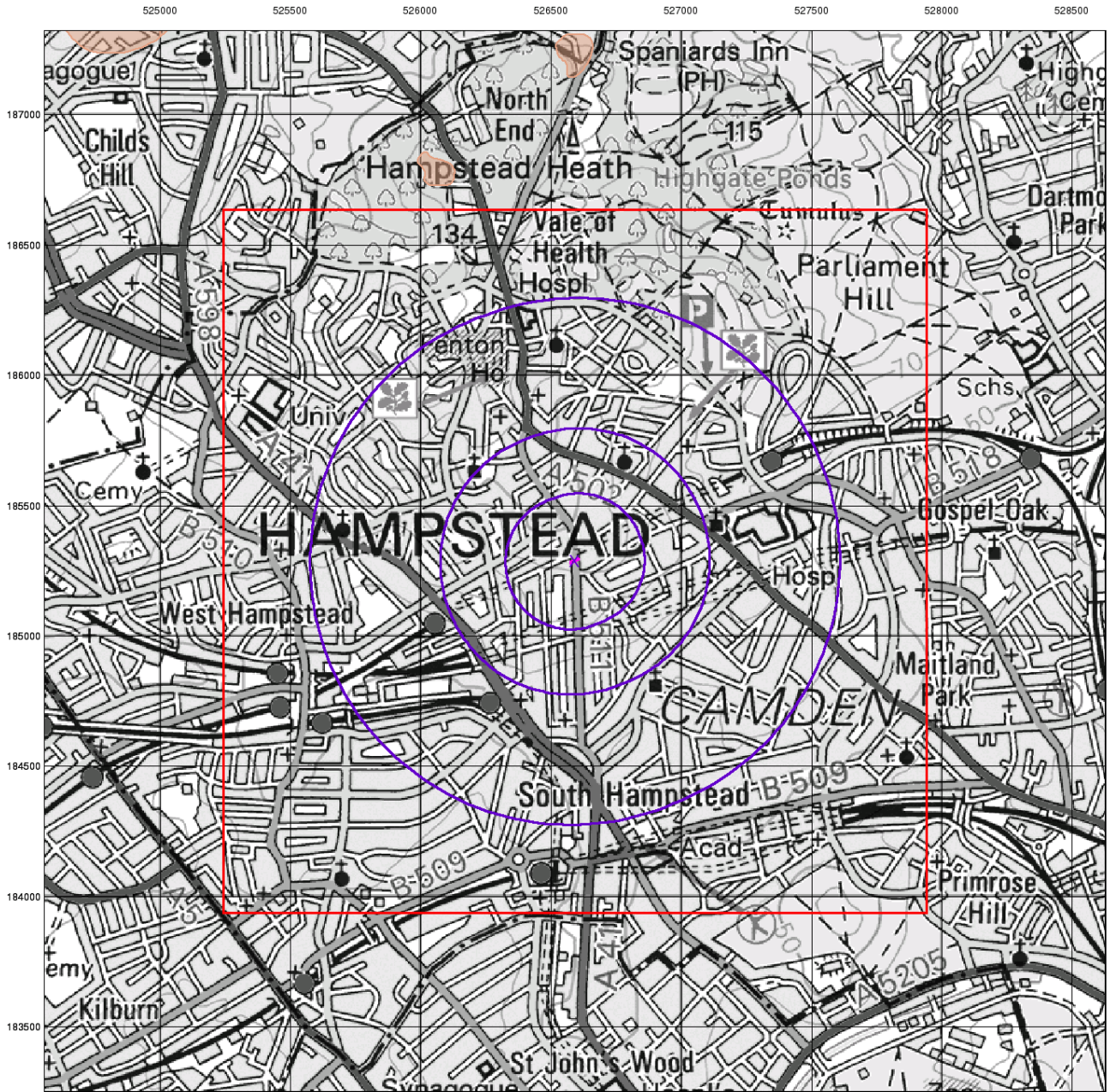


Order Details

Order Number:	97518978_1_1
Customer Ref:	J16214
National Grid Reference:	526590, 185290
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

76 Fitzjohns Avenue, LONDON, NW3 5LS



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Superficial Aquifer Designation

General

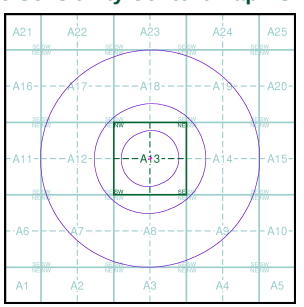
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

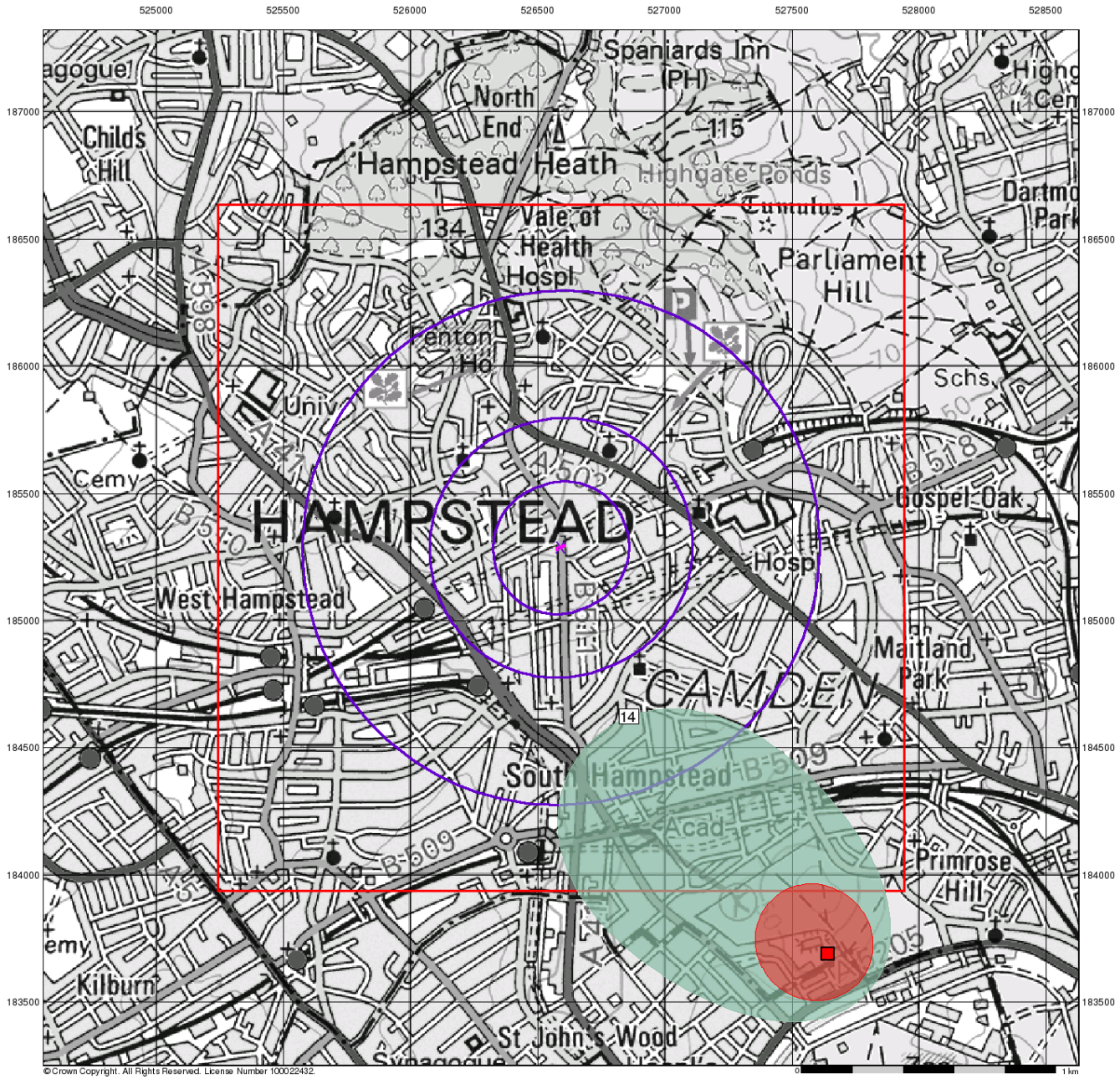


Order Details

Order Number:	97518978_1_1
Customer Ref:	J16214
National Grid Reference:	526590, 185290
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

76 Fitzjohns Avenue, LONDON, NW3 5LS



GEA Geotechnical & Environmental Associates

Source Protection Zones

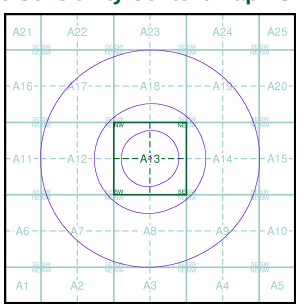
General

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

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A



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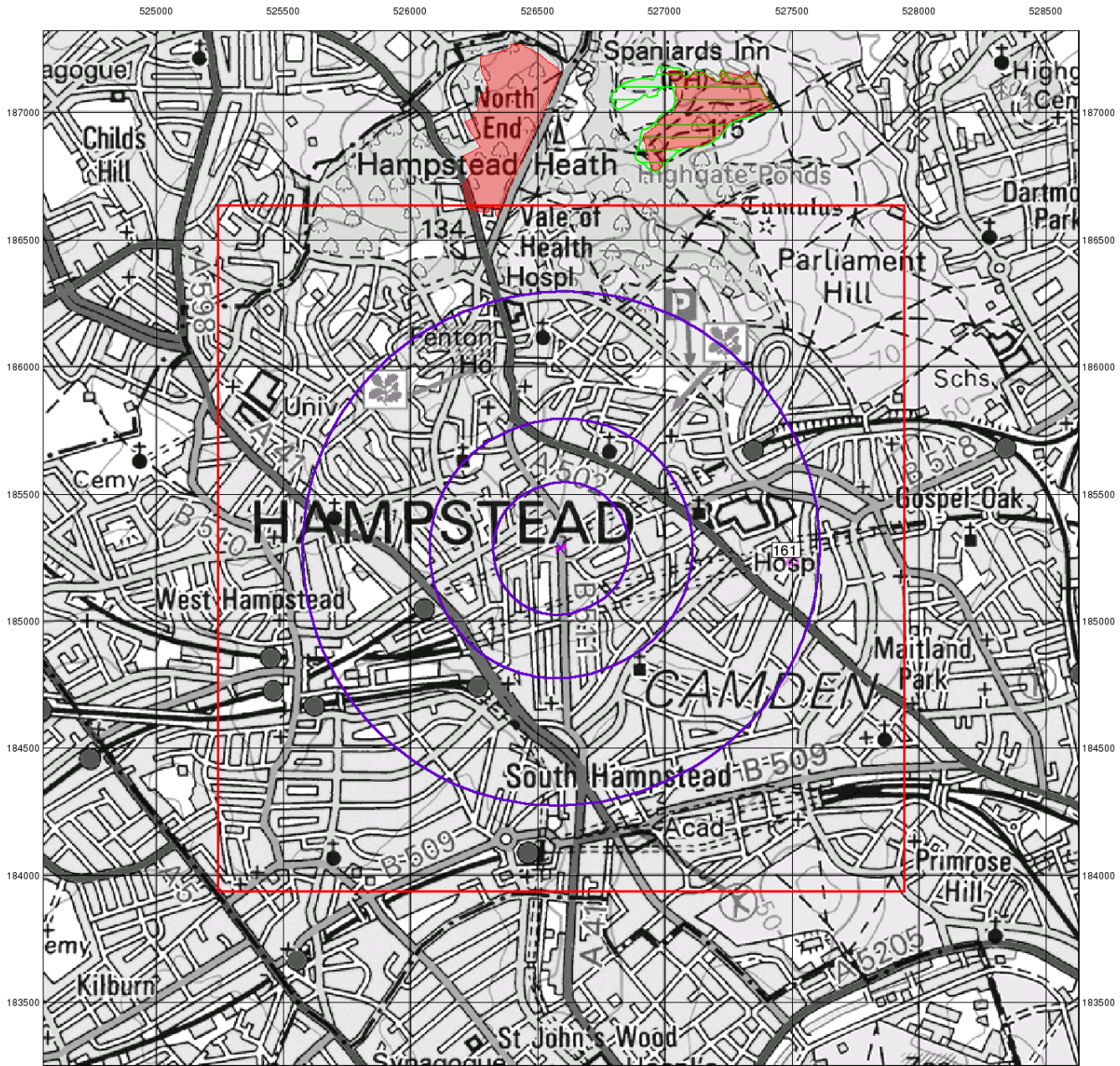


GEA Geotechnical & Environmental Associates

Sensitive Land Uses

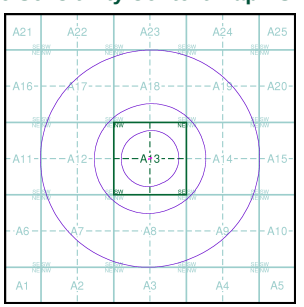
General

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

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A



Order Details

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Slice:	A
Site Area (Ha):	0.04
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Site Details

76 Fitzjohns Avenue, LONDON, NW3 5LS