DESK STUDY & GROUND INVESTIGATION REPORT

15 Ranulf Road
London
NW2 2BT

Client: Mr & Mrs G Arkus

Engineer: Michael Alexander Consulting Engineers

J15086

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GEA Geotechnical & Environmental Associates

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CONTENTS

EXECUTIVE SUMMARY

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

BRIEF

This report describes the findings of a site investigation by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Michael Alexander Consulting Engineers, on behalf of Mr & Mrs Arkus, with respect to the proposed extension of the existing basement, beneath the entire footprint of the existing house and the part of the rear garden. 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 the basement support and suitable foundations for the proposed development. The report also includes information required to comply with London Borough of Camden (LBC) Planning Guidance CPG4.

DESK STUDY FINDINGS

Ranulf Road was established between 1896 and 1912 and the site was subsequently developed with the existing building on the northern part of the site, at some time between 1920 and 1936. Prior to this the site had comprised a small area of rough pasture, with the Hampstead Cemetery established to the south of the site between 1873 and 1896. The adjoining sites along Ranulf Road had also been developed at this time and a pavilion building had been constructed within the athletic grounds, approximately 60 m to the southwest of the site. The site and immediate surrounding area have remained essentially unaltered from that time.

GROUND CONDITIONS

The investigation generally encountered the expected ground conditions in that, beneath a significant thickness of made ground, Head Deposits were encountered overlying the London Clay, which was proved to the maximum depth investigated. The made ground extended to depths of between 1.1 m (48.2 m AD) and 2.75 m (45.75 m AD) and comprised brown, orange-brown or brownish grey silty sandy clay with occasional gravel, rootlets, brick, ash and clinker. Directly below the made ground, an upper layer of soliflucted material, or 'Head Deposits', was encountered and proved in the cable percussion borehole only to a depth of 7.8 m (40.7 m AD). The London Clay initially comprised stiff high strength fissured brown slightly silty slightly sandy clay, which extended to a depth of 8.6 m (39.9 m AD). Below this depth, stiff becoming very stiff high strength to very high strength fissured dark grey slightly silty slightly sandy clay with occasional partings of silt and sand, was proved to the maximum depth investigated, of 18.45 m (30.05 m AD).

Monitoring has indicated groundwater to be present at depths of between 3.0 m (46.30 m AD) and 3.52 m (44.98 m AD).

Elevated concentrations of lead and PAH, including benzo(a)pyrene, were measured in a single sample of the made ground taken from within the footprint of the proposed basement.

RECOMMENDATIONS

Formation level for the proposed basement is likely to be within the firm Head Deposits that overlie the London Clay, which should provide an eminently suitable bearing stratum for spread foundations. The results of the groundwater monitoring to date indicate that it may not be possible to construct the basement without some form of groundwater control, although further monitoring and / or trial excavations are recommended to confirm this. Excavations for the proposed basement structure will require temporary support to maintain stability of the excavation and surrounding structures at all times. The existing foundations will need to be underpinned prior to construction of the proposed new basement or will need to be supported by new retaining walls.

The proposed development will result in the removal of the identified contamination, such that a requirement for any additional remediation measures is not deemed to be necessary. However, a watching brief should be maintained during any groundworks and if 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.

The proposed development is unlikely to result in any specific groundwater or land stability issues and a requirement for a flood risk assessment has not been identified.

Part 1: INVESTIGATION REPORT

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

1.0 INTRODUCTION

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Michael Alexander Consulting Engineers, on behalf of Mr & Mrs Arkus, to carry out a desk study, including hydrogeological assessment, and ground investigation at 15 Ranulf Road, London, NW2 2BT.

The report includes information to assist in the preparation of a Basement Impact Assessment (BIA) in accordance with the London Borough of Camden (LBC) Planning Guidance CPG4[1]

1.1 Proposed Development

The current proposal is to deepen and extend the existing basement beneath the entire footprint of the existing house and part of the rear garden. It has been assumed that this will be single level, extending to a depth of about 3.5 m below existing ground floor level, which has been assigned an arbitrary level of approximately 49.3 m AD.

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 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:

1 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells* September 2013

- a review of readily available geological and hydrogeological maps; and
- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database.

In the 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 18.45 m (30.05 m AD), by means of a dismantlable drilling rig;
- standard penetration tests (SPTs), carried out at regular intervals in the cable percussion borehole, to provide quantitative data on the strength of the soils;
- two additional boreholes, advanced to depths of 5.4 m (42.9 m AD) and 5.3 m (44.0 m AD) with window sampling equipment, to provide additional coverage of the site;
- the installation of groundwater monitoring standpipes to depths of between 5.0 m (45.0 m AD) and 6.0 m (42.5 m AD) and a subsequent monitoring visit;
- two internal and two external hand dug trial pits to expose the existing foundations;
- 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[2] 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.

1.3.1 Basement Impact Assessment (BIA)

The work carried out also includes information required for a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment), which form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG4[3] and their Guidance for Subterranean Development[4] prepared by Arup. Camden's approach has been adopted as it is now widely known and is considered to provide a robust approach to the issues of concern. The aim of this work is to provide information on the groundwater conditions specific to this site and land stability, in particular to assess whether the development will affect the stability of neighbouring properties and whether any identified impacts can be appropriately mitigated.

2 *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
3 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*
4 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

The BIA elements of the work have been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng) and member of the Institution of Civil Engineers (MICE), who has over 20 years specialist experience in ground engineering and 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 25 years' experience in geotechnical engineering, engineering geology and hydrogeology. Both assessors meet the Geotechnical Specialist criteria of the Site Investigation Steering Group and satisfy the qualification requirements of the Council guidance.

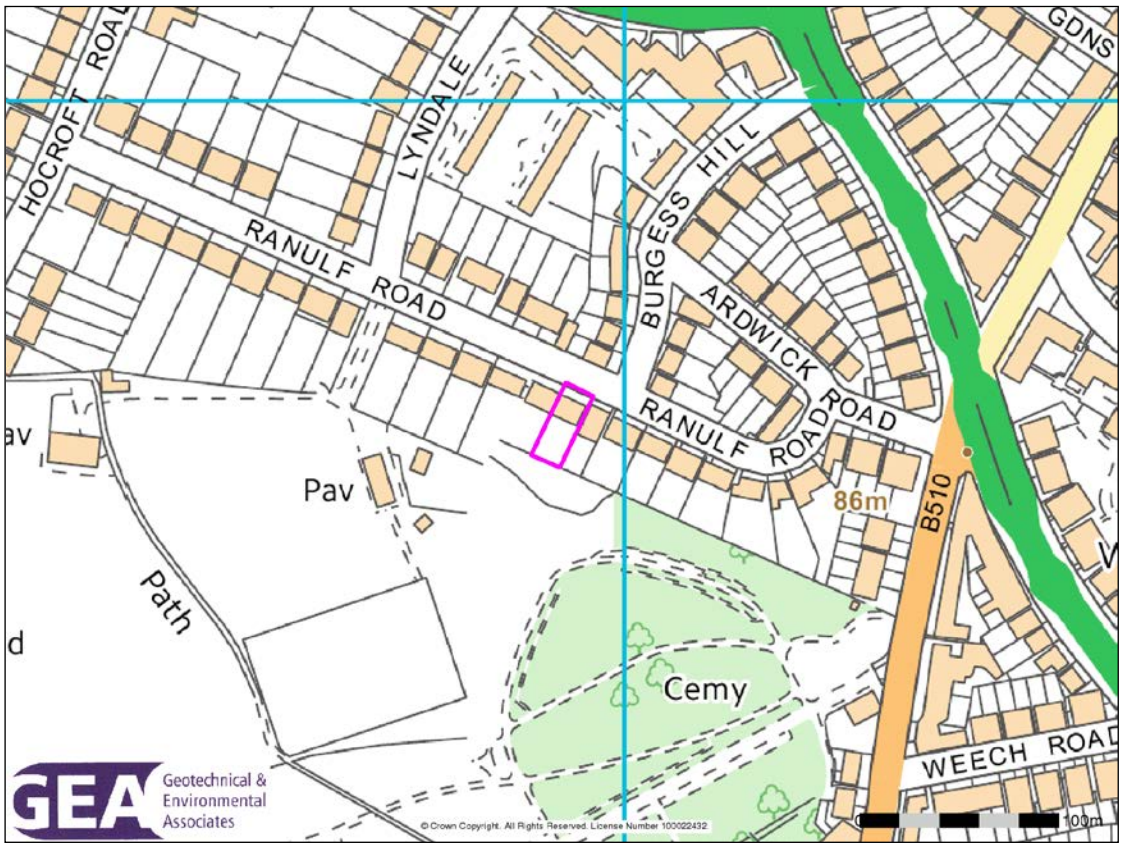
1.4 Limitations

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, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; 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 may be located by National Grid Reference 524970 185840 and is shown on the map extract below.



The site is located approximately 1 km to the east of Cricklewood railway station and approximately 1.2 km to the northwest of West Hampstead railway station and is bounded by Ranulf Road to the north, adjoining properties to the east and west and Hampstead Cemetery to the south.

The site is rectangular in shape and measures approximately 15 m east-west by 38 m north-south. The northern part of the site is occupied by the existing two storey brick built house, with a partial basement level. A side passage, proving access to the rear of the site, is present along the eastern side of the property, whilst a single storey garage is present on the western side that adjoins a similar structure on the adjoining site of No 17 Ranulf Road.

The site level drops around the house by approximately 1.0 m from the front of the site to the rear patio, with a further drop of approximately 0.5 m in the level of the garden which slopes down gently toward the south. A 1.5 m to 2.0 m high concrete panel retaining wall is present at the far southern end of the site, and separates the main garden from the boundary with the adjoining cemetery to the south. The wall was noted to have had suffered from some movement, with a noticeable lean and cracking observed along much of its length, particularly where existing trees and their associated roots were noted to be in close proximity.

A number of deciduous trees are present with the front and rear gardens and along the site boundaries within the gardens of the adjoining properties to the east and west. A row of trees, including a conifer, are also present on the far southern part of the site, in the narrow strip at the base of the retaining wall.

2.2 Site History

The history of the site and surrounding area has been researched by reference to historical Ordnance Survey (OS) maps sourced from the Envirocheck database.

The earliest map studied, dated 1865, shows the site to site to be undeveloped, comprising an area of rough pasture that was bounded to the north by the grounds of a large property, subsequently referred to on the 1894 map as Burgess Park. Hampstead Cemetery was established approximately 150 m to the south of the site some time between 1873 and 1894, whilst the area immediately to the west became part of an athletics ground.

Ranulf Road was established between 1896 and 1912 and the site was subsequently developed, with the present building on the northern part of the site, at some time between 1920 and 1936. The adjoining sites along Ranulf Road had also been developed at this time and a pavilion building had been constructed within the athletic grounds, approximately 60 m to the southwest of the site.

The site and immediate surrounding area have remained essentially unaltered from this time.

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 desk study research has indicated that there are no registered landfills, historic landfills, registered waste transfer sites or waste management facilities within 1 km of the site. In addition there have been no pollution incidents to controlled waters within 500 m of the site.

The search has indicated that the site is located in an area where less than 1% of homes are affected by radon emissions; which is the lowest classification given by the Health Protection Agency (HPA) and therefore no radon protective measures will 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 the site to be directly underlain by the London Clay, with the area also shown as having a "Head Propensity". Head propensity is shown on the BGS map as areas denoted as most likely to be covered by Quaternary Head Deposits as interpreted from digital slope analysis and confirmed by borehole data. These deposits are not mapped and have not been verified by fieldwork.

The London Clay Formation is homogenous, slightly calcareous silty clay to very silty clay, with some beds of clayey silt grading to silty fine grained sand. According to the BGS map, dated 2006, the Head propensity is based on the geotechnical properties of the London Clay and head may occur close to the Claygate Member / London Clay boundary.

A ground investigation has previously been carried out by GEA at No 19 Ranulf, which is located approximately 20 m to the west of the site. The investigation generally confirmed the expected ground conditions, in that, beneath a surface covering of topsoil or paving stone and concrete, a variable thickness of made ground was encountered overlying the Claygate Member, which in turn was underlain by London Clay to the full depth of the investigation of 15.0 m. Firm pale orange-brown mottled bluish grey silty sandy clay with occasional gravel and pockets of silt and sand, was encountered below the made ground and extended to depths of 2.5 m to 5.2 m, and was described at the time as the Claygate Member. However, this material is more likely to have comprised Head Deposits, as per the current map of the area.

A review of deep borehole records held on the British Geological Society (BGS) database, the closest of which is located 1200 m to the southeast of the site, indicates that the London Clay is likely to extend to a depth of approximately 60 m beneath the site, below which the Lambeth Group, Thanet Sand and Upper Chalk were found to be present.

2.5 Hydrology and Hydrogeology

The London Clay is classified by the Environment Agency as 'Unproductive Strata', as defined by the Environment Agency as rock or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Any groundwater flow within the London Clay will be at a very slow rate, due to its negligible permeability; the permeability will be predominantly secondary, through fissures in the clay. Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1×10^{-11} m/s and 1×10^{-9} m/s, with a lower vertical permeability.

There are no Environment Agency designated Source Protection Zones (SPZs) on the site and there are no listed water abstraction points within 1 km of the site. The Envirocheck report indicates that the nearest surface water feature is located 626 m west of the site, which is understood to comprise a small artificial pond within the grounds of Hampstead School.

The site lies outside the catchment of the Hampstead Heath chain of ponds.

A number of spring lines issue on Hampstead Heath at the interface of the Bagshot Beds and the Claygate Member, and to a lesser extent at the boundary between the Claygate Member and the underlying essentially impermeable London Clay. These springs have been the source of a number of London's "lost" rivers, notably the Fleet, Westbourne and Tyburn, which all rose on Hampstead Heath at the base of the Bagshot Beds.

It is likely that any groundwater beneath the site within the London Clay Formation would be controlled by local contours, thus flow would be towards the south and southwest towards the River Thames.

During the aforementioned GEA site investigation at No 19 Ranulf Road, seepages of groundwater were encountered in two locations, at depths of 3.0 m and 3.9 m.

The site is not at risk of flooding from rivers or sea, as defined by the Environment Agency; Frognal has not been identified as a street at risk of surface water flooding, specified in the London Borough of Camden (LBC) Planning Guidance CPG4 and therefore a flood risk assessment will not be required.

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 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 occupied by the existing residential property for its entire known developed history. The site and immediate surrounding areas are not considered to have had a contaminative history.

A risk of landfill gas migrating onto the site has not been identified.

2.6.2 Receptor

The residential use of the site may result in exposure to the soil and thus represents a relatively 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 contact with any contaminants present in the soils during construction works. Being underlain by unproductive strata groundwater is not considered to be a receptor.

2.6.3 Pathway

As the site is to remain, for the majority, covered by the footprint of the existing building there will be limited potential contaminant exposure pathways as the building will effectively form a barrier between any contaminants within the near-surface soils and end-users or infiltration of surface water. Only in proposed garden areas could there be a potential for contaminant exposure pathways, although such pathways are already in existence.

Buried services will be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the soils during construction works.

There is thus considered to be very low potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

2.6.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a VERY LOW risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work.

3.0 EXPLORATORY WORK

Access was severely limited by the presence of the existing house. In order to meet the objectives described in Section 1.2, as far as possible within the access restrictions, a single cable percussion borehole was drilled in the rear garden to a depth of 18.45 m (30.05 m AD) using a cable percussion drilling rig, which was taken through the existing garage in parts and assembled on site.

Standard Penetration Tests (SPTs) were carried out at regular intervals in the cable percussion borehole to provide quantitative data on the strength of soils encountered. Disturbed and undisturbed samples were recovered from the borehole for subsequent laboratory examination and testing.

Two additional boreholes were drilled to depths of 5.3 m (44.0 m AD) and 5.4 m (42.9 m AD), using hand held window sampling equipment, to provide additional coverage of the site and a series of for hand dug pits were excavated to expose the existing foundations.

Standpipes were installed into each of the boreholes to depths of between 5.0 m (44.3 m AD) and 6.0 m (42.5 m AD) and have been monitored on a single occasion to date, approximately four weeks after installation.

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

The borehole and trial pit records and results of the laboratory testing are enclosed, together with a site plan indicating the exploratory positions. The Datum level shown on the borehole and trial pit records have been interpolated from spot heights shown on a drawing by Laser Surveys (ref W7371/14/7920G), dated October 2014, which was provided by the consulting engineers. It is understood that these levels are related to an Arbitrary Datum (AD) set at 50.0 m and do not therefore represent Ordnance Datum Levels.

3.1 Sampling Strategy

The scope of the works was specified by the consulting engineers, with input from GEA. The trail pit positions were specified by the consulting engineers and positioned on site by GEA with due regard to the proposed development, whilst avoiding areas of known services, whilst the boreholes were positioned by GEA to provide optimum coverage of the site.

Due to the nature of the available access the cable percussion borehole was completed using a dismantlable rig.

Laboratory geotechnical classification and strength tests was undertaken on samples of the natural soil.

Four samples of the made ground were subjected to analysis 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 analyses were carried out at an 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.

4.0 GROUND CONDITIONS

The investigation generally encountered the expected ground conditions in that, beneath a relatively significant thickness of made ground, Head Deposits have been encountered over the London Clay, which was proved to the maximum depth investigated of 18.45 m (30.05 m AD).

4.1 Made Ground

Beneath a surface covering of grass or gravel surfacing, made ground, generally comprising brown, orange-brown or brownish grey silty sandy clay with occasional gravel, rootlets, brick, ash and clinker, was encountered and proved to depths of between 1.1 m (48.2 m AD) and 2.75 m (45.75 m AD) in the boreholes and external trial pits.

Within the existing basement, the made ground encountered in Trial Pit Nos 3 and 4, was found to extend below the existing floor slab to depths of 0.35 m (46.76 m AD) and 0.56 m (46.80 m AD) respectively.

The greatest thicknesses of made ground are noted to have been encountered within the rear garden and it is likely that this is an indication that the level of this area has been built up with respect to the original slope of the site.

No visual or olfactory evidence of contamination was noted in the made ground, apart from the presence of extraneous material such as ash and clinker. Four samples of the made ground have been sent for contamination testing as a precautionary measure and the results are presented in Section 4.5.

4.2 Head Deposits

This stratum comprised a weathered zone of firm orange-brown mottled brown and grey silty sandy clay with occasional partings of silt and sand, which extended to the base of Borehole Nos 1 and 2 and was proved in Borehole No 3 to a depth of 7.8 m (40.7 m AD).

This weathered material is sandier than would be expected for London Clay and is likely to represent a soliflucted material, or Head Deposits, derived in part from the overlying Claygate Member to the northeast of the site.

The results of laboratory testing indicate the clay to be of moderate volume change potential, whilst the undrained triaxial compression tests, which are plotted against depth on a graph in the appendix, indicate the Head Deposits to generally increase in strength with depth.

4.3 London Clay

The London Clay comprised an upper layer of stiff high strength fissured brown slightly silty slightly sandy clay, which extended to a depth of 8.6 m (39.9 m AD).

Below this, stiff becoming very stiff high strength to very high strength fissured dark grey slightly silty slightly sandy clay with occasional partings of silt and sand, was proved to the maximum depth investigated, of 18.45 m (30.05 m AD).

The results of laboratory testing indicate the clay to be of high volume change potential, whilst the undrained triaxial compression tests, which are plotted against depth on a graph in the appendix, indicate the London Clay to generally increase in strength with depth.

These soils were observed to be free of any evidence of soil contamination.

4.4 Groundwater

Groundwater inflows were not recorded in Borehole Nos 1 and 2, although the recovery in Borehole No 1 below a depth of 4.5 m was noted to be damp. Groundwater was, however, encountered within Borehole No 3, as slow seepages at depths of 5.0 m (43.5 m AD) and 12.5 m (36.0 m AD). In both instances, no observable rise in water level was recorded and both inflows were either sealed or dried out as the borehole was progressed.

Standpipes were installed into each of the three boreholes and have been monitored on a single occasion to date, after a period of approximately four weeks, at which time groundwater was recorded at depths of 3.46 m (44.84 m AD) in Borehole No 1, 3.00 m (46.3 m AD) in Borehole No 2 and 3.52 m (44.98 m AD) in Borehole No 3.

4.5 Soil Contamination

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

Determinant	BH1: 0.50 m	BH2: 0.50 m	TP3: 0.40 m	TP4: 0.30 m
pH	8.2	7.5	7.6	7.5
Arsenic	23.0	13.0	11.0	11.0
Cadmium	0.2	<0.10	<0.10	<0.10
Chromium	36.0	44.0	40.0	41.0
Copper	29.0	19.0	16.0	19.0
Mercury	0.4	<0.1	<0.1	<0.1
Nickel	26.0	20.0	23.0	28.0
Lead	**250.0**	36.0	14.0	21.0
Selenium	0.5	0.2	0.6	0.4

Determinant	BH1: 0.50 m	BH2: 0.50 m	TP3: 0.40 m	TP4: 0.30 m
Zinc	100.0	66.0	50.0	57.0
Total Cyanide	<0.5	<0.5	<0.5	<0.5
Total Phenols	<0.3	<0.3	<0.3	<0.3
Sulphide	6.6	0.7	3.6	1.1
Total PAH	**410.0**	<2.0	<2.0	<2.0
Benzo(a)pyrene	**39.0**	<0.1	<0.1	<0.1
Naphthalene	1.1	<0.1	<0.1	<0.1
TPH	**1400.0**	<10.0	<10.0	<10.0
Total organic carbon %	6.9	1.1	0.3	6.2

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

4.5.1 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 contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[5] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a residential end use. 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, consumption of homegrown produce, consumption of soil adhering to homegrown produce, 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 conservative, as the majority if the site will remain covered by the existing building and extent of the proposed basement, which will also result in the removal of a large portion of the made ground.

The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

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.

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.

This assessment is based upon the potential for risk to human health, which at this site is considered to be the critical risk receptor.

The contamination testing revealed elevated concentrations of lead and PAH, including benzo(a)pyrene, within the sample taken from Borehole No 1 at a depth of 0.5 m.

The Total Petroleum Hydrocarbons (TPH) concentration in the sample from Borehole No 1 was found to exceed the screening value of 500 mg/kg, but the results of speciated testing for the TPH aromatic /aliphatic split have not measured any elevated concentrations of speciated hydrocarbons above the generic risk based screening values for a residential end use. No further consideration is therefore required in this respect with regard to the total concentration.

No elevated concentrations in excess of the generic risk based screening values for a residential end-use with plant uptake were recorded in any of the other samples.

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

4.6 Existing Foundations

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

Trial Pit No	Structure	Foundation Detail	Bearing Stratum
1	Front of house (external)	Mass concrete strip / trench fill Top 1.5 m Base 1.7 m Lateral projection 200 mm	Made Ground (brown becoming orange-brown silty sandy clay with rootlets, occasional gravel, rare brick and ash)
2	Front of house (external)	Mass concrete strip / trench fill Top 1.4 m Base 1.7 m Lateral projection 250 mm	Firm orange-brown silty sandy CLAY
3	Existing basement (internal)	Mass concrete strip / trench fill Top 0.15 m Base 0.35 m Lateral projection 250mm	Firm orange-brown silty sandy CLAY

Trial Pit No	Structure	Foundation Detail	Bearing Stratum
4	Existing basement (Internal)	Mass concrete strip / trench fill Top 0.31 m Base 0.56 m Lateral projection 300mm	Firm orange-brown silty sandy CLAY

Groundwater was not encountered in any of the trial pit excavations.

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 foundation options and contamination issues.

5.0 INTRODUCTION

The current proposal is to deepen and extend the existing basement level beneath the entire footprint of the existing house and part of the rear garden.

The excavations are intended in part to create a fully useable space were only a partial height structure is present beneath the northern part of the site, but also to add additional space where the new basement will extend beyond the existing footprint, above which a new conservatory structure will be added to the rear of the house.

It has been assumed that this will be single level, extending to a depth of about 3.5 m below existing ground floor level, with formation at an arbitrary level of approximately 46.0 m AD.

Anticipated loads are not known at this stage but are expected to be light to moderate on the basis of the information provided to date.

6.0 GROUND MODEL

The desk study has revealed that the site and surrounding area have not had a potentially contaminative history, and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- the investigation has generally encountered the expected ground conditions in that, below a relatively significant thickness of made ground and Head Deposits, the London Clay Formation is present to the maximum depth investigated;
- externally, the made ground extends to depths of between 1.1 m (48.2 m AD) and 2.75 m (45.75 m AD) and comprises brown, orange-brown or brownish grey silty sandy clay with occasional gravel, rootlets, brick, ash and clinker;
- in the two internal pits, excavated from existing basement level, the made ground was found to extend to depths of between 0.35 m (46.76 m AD) and 0.56 m (46.80 m AD)
- directly below the made ground, an upper layer of soliflucted material, or ‘Head Deposits, was encountered and proved in the cable percussion borehole only to a depth of 7.8 m (40.7 m AD);
- the London Clay Formation then comprises stiff high strength fissured brown slightly silty slightly sandy clay over stiff becoming very stiff high strength to very high strength fissured dark grey slightly silty slightly sandy clay with occasional partings of silt and sand, which extends to the full depth investigated of 18.45 (30.05 m AD);
- groundwater was encountered as slow seepages within the cable percussion borehole

at depths of 5.0 m (43.5 m AD) and 12.5 m (36.0 m AD);

- subsequent monitoring has shown groundwater to be present at depths of between 3.00 m (46.30 AD) and 3.52 m (44.98 m AD); and

- elevated concentrations of lead and PAH, including benzo(a)pyrene, were recorded in a single sample of the made ground.

7.0 ADVICE AND RECOMMENDATIONS

Formation level for the proposed basement is likely to be within the Head Deposits that overlie the London Clay, which should provide an eminently suitable bearing stratum for spread foundations. The results of the groundwater monitoring to date indicate that it may not be possible to construct the basement without some form of groundwater control, although due to the predominantly clayey nature of the Head Deposits, any required measures should be minimal and are unlikely to have any adverse impact on the existing groundwater conditions or any nearby sites. However, further monitoring and / or trial excavations are recommended to confirm this.

Desiccation was not encountered at the single locality investigated, but may be encountered in the rear garden, within the vicinity of former trees.

Excavations for the proposed basement structure will require temporary support to maintain stability of the excavation and surrounding structures at all times. The existing foundations will need to be underpinned prior to construction of the proposed new basement or will need to be supported by new retaining walls.

7.1 Basement Construction

7.1.1 Basement Excavation

It is understood that the existing basement level will be deepened and extended beneath the entire footprint of the existing house to create a fully useable space, with additional excavation to extend the basement beyond the existing footprint beneath the rear patio and part of the existing garden; the proposed excavations are understood to extend to an arbitrary datum level of approximately 46.0 m AD (approx. 3.5 m below existing ground floor level), such that formation level is likely to be within the Head Deposits that overlie the London Clay.

Monitoring has indicated that groundwater is likely to be present towards the front of the site at a depth of 3.0 m (46.3 m AD) and between 3.46 m (44.84 m AD) and 3.52 m (44.98 m AD) on the rear part of the site. On this basis, groundwater may be encountered towards the base of the basement excavation, particularly where the existing basement is to be deepened beneath the front part of the existing house.

Whilst monitoring should be continued, it is not possible to draw entirely meaningful conclusions from the measurements made in the standpipes, as the level of the water table is not necessarily as significant as the volume of water that may flow into the excavation. For example, a high level of water measured in a standpipe may not be significant if this represents only a small volume of water. The Head Deposits includes thin partings of fine sand and silt and the occurrence of groundwater into the basement will to some extent be determined by the presence of these more permeable materials. Shallow inflows of perched water may also be encountered from within the made ground, particularly within the vicinity of the existing house.

The predominantly clayey nature of the Head Deposits, suggests that the rate of inflow is likely to be slow and unlikely to be significant and should therefore be adequately dealt with through sump pumping. However, it would be prudent for the chosen contractor to have a contingency plan in place to deal with more significant or prolonged inflows as a precautionary measure. It would also be prudent, once access is available, to carry out a number of trial excavations, to depths as close to the full basement depth as possible, to provide an indication of the likely ground water conditions.

The design of basement support in the temporary and permanent conditions needs to take account of the need to maintain the stability of the existing house and surrounding structures and the possible requirement to control ground water inflows. The choice of wall may be governed to a large extent by the access restrictions.

On the basis of the groundwater monitoring results to date and where the existing basement structure is to be deepened, it should be possible to form the retaining walls by underpinning of the existing foundations, using a traditional 'hit and miss' approach, subject to further monitoring or trial excavations. In any case, inflows could conceivably occur from perched water tables, particularly in the vicinity of existing foundations but should be adequately dealt with through sump pumping.

Careful workmanship will be required to ensure that movement of the surrounding structures does not arise during underpinning of the existing foundations, but this method will have the benefit of minimising the plant required and maximising usable space in the new basement. The contractor should have a contingency in place to deal with any groundwater inflows.

Consideration may also be given to piled retaining walls, particularly where the proposed basement extends beyond the footprint of the existing house and it should be possible to utilise contiguous bored piles without the requirement for significant groundwater control, with grouting between the piles if necessary. A contiguous bored piled wall would have the disadvantage of reducing usable space in the basement, and in this respect a secant wall may be preferable as it would overcome the requirement for any secondary groundwater protection in the permanent works and maximise the basement area.

Sheet piles may also be adopted to provide temporary support for the excavation of the rear garden, prior to the installation of the permanent retaining walls, although consideration would need to be given to the impact of the noise and vibration associated with this technique on the adjoining sites.

The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition. Thus, a suitable amount of propping will be required to provide the necessary rigidity. In this respect the timing of the provision of support to the wall will have an important effect on movements.

Consideration will need to be given to a retention system that maintains the stability at all times of the existing building, garden boundary walls, neighbouring properties and structures. The existing foundations will need to be underpinned prior to excavation of the basement or will need to be supported by new retaining walls.

7.1.2 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
Head Deposits	1900	Zero	25
London Clay	1950	Zero	25

Groundwater may be encountered towards the base of the proposed excavations during construction, although monitoring of the standpipes should be continued to confirm this view, along with trial excavations.

Provided a fully effective drainage system can be ensured in order to prevent the build-up of groundwater behind the retaining walls from surface water inflows and periodic seepages within the made ground, and sandier pockets within the Head Deposits / London Clay, it should be possible to design the basement on the basis that water will not collect behind the walls. If an effective drainage system cannot be ensured, then a water level of two-thirds of the basement depth should be assumed.

The advice in BS8102:2009[6] should be followed in this respect and with regard to the provision of suitable waterproofing.

7.1.3 Basement Heave

The proposed construction of the new basement will result in a net unloading of between 20 kN/m² to 60 kN/m², leading to elastic heave and long term swelling of the London Clay. However, the effects of the longer term swelling movement will be mitigated to some extent by the load applied by the new foundations and the continued presence of the existing house.

Consideration will need to be given to the effects of differential movement beneath the existing house where a partial basement is already present and the proposed extension beneath the rear garden.

It would be prudent to conduct an analysis of the heave movements once the basement design has been finalised.

7.2 Spread Foundations

All new foundations or underpins should bypass the made ground to bear within the Head Deposits that have been found to overlie the London Clay. Groundwater may be encountered towards the base of the proposed excavations, particularly on the northern part of the site where the highest water level has been recorded, and further groundwater monitoring should be carried out to confirm that a dry excavation can be maintained at formation level.

New foundations or underpins bearing in the firm Head Deposits may be designed to apply a net allowable bearing pressure of 100 kN/m² below the level of the proposed basement floor. This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

The depth of the basement excavation is expected to be such that foundations will be placed below the depth of actual or potential desiccation, but this should be checked once the

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

proposals have been finalised, with the survey drawing showing former and existing trees. Notwithstanding NHBC guidelines, all foundations should extend beyond the zone of desiccation. In this respect it would be prudent to have all foundation excavations inspected by a suitably experienced engineer. Due allowance should be made for future growth of existing / proposed trees. The requirement for compressible material alongside foundations should be determined by reference to the NHBC guidelines.

If for any reason spread foundations are not considered appropriate, piled foundations would provide a suitable alternative.

7.3 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 Head Deposits and underlying London Clay. 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.

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 vs Arbitrary Datum level graph in the appendix.

Stratum	Arbitrary Datum Level m	kN / m²
Ultimate Skin Friction		
Basement Excavation	GL to 46.0 m	Ignore
Head Deposits (α = 0.5)	46.0 m to 40.0 m	Increasing linearly from 25 to 45
London Clay (α = 0.5)	40.0 m to 30.0 m	Increasing linearly from 45 to 80
Ultimate End Bearing		
London Clay	40.0 m to 30.0 m	Increasing linearly from 810 to 1440

In the absence of pile tests, guidance from the London District Surveyors Association (LDSA)[7] suggests that a factor of safety of 2.6 should be applied to the above coefficients in the computation of safe theoretical working loads. On the basis of the above coefficients and a factor of safety of 2.6 it has been estimated that a 300 mm diameter pile extending 12.0 m below the proposed basement to an arbitrary datum level of 34.0 m AD, should provide a safe working load of about 230 kN, whilst a 450 mm diameter pile founding at the same depth should provide a higher safe working load of 370 kN.

The above example is 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 London Clay.

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

7.4 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. This should be reviewed once the levels and loads are known.

7.5 Shallow Excavations

On the basis of the borehole and trial pit findings it is considered likely that it will be feasible to form relatively shallow excavations for services terminating within the made ground without the requirement for lateral support, although localised instabilities 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 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.

Significant groundwater inflows are not anticipated during basement excavation, although this should be confirmed through additional investigation as discussed in Section 7.1. In addition seepages may also be encountered from perched water tables within the made ground, particularly within the vicinity of existing foundations and should be adequately dealt with through sump pumping.

7.6 Effect of Sulphates

Chemical analyses carried out on selected samples; including four samples of made ground and three samples of the natural soils have revealed concentrations of soluble sulphate and near-neutral pH in accordance with Class DS-1 of Table C2 of BRE Special Digest 1 Part C (2005). The measured pH value of the samples shows that an ACEC class of AC-1s would be appropriate for the site. This assumes a static water condition at the site. The guidelines contained in the above digest should be followed in the design of foundation concrete.

7.7 Hydrogeological Assessment

The site is currently occupied by a two-storey detached house with a partial height basement that extends beneath the entire footprint of the property.

The proposal is to deepen the existing basement structure, which will also be extended beneath the existing patio and part of the rear garden. It has been assumed that the new basement will extend to a depth of about 3.5 m below existing ground floor level, or to an arbitrary datum level of approximately 46.0 m AD.

The investigation has indicated that formation level of the basement will be within the firm clay of the Head Deposits, which overlie the London Clay at this site.

Groundwater was encountered as slow seepages within Borehole No 3 at depths of 5.0 m and 12.5 m and subsequent monitoring has shown groundwater to be present at depths of between 3.00 m (46.3 m AD) and 3.52 m (44.98 m AD). On this basis, groundwater may be encountered during basement excavations, particularly on the northern part of the site. However, due to the clayey nature of the Head Deposits, it is expected that permeability will be very low and that groundwater movement as a result will be very slow and of small

volumes. Groundwater inflows in the basement excavation are likely to be similarly slow and it is likely that these could be controlled by sump pumping, although it is recommended that further monitoring and trial excavations are carried out to confirm this.

It should be possible to adopt traditional underpinning techniques beneath the existing house, provided that any potential inflows can be controlled in order to maintain a dry excavation. Sheet piles or a contiguous bored piled wall may be used to support the excavation in the rear garden, where there are no existing foundations to underpin.

The proposed basement will be wholly within the Head Deposits, so does not provide any form of cut-off into less permeable strata. It is therefore considered that the proposed basement construction will not have a significant detrimental effect on groundwater flows or on groundwater level upstream of the development.

The amount of hardstanding will increase and will alter the amount of soft cover available for surface water infiltration. Given that the Head Deposits and underlying London Clay are relatively impermeable, the increase in the volume of surface water inflow from surface run-off is unlikely to change due to the proposed development. The development is therefore not considered to impact the surface water regime of the site or adjacent sites.

It is not known at this stage whether the adjoining properties of Nos 13 and No 17 Ranulf Road include existing basement structures, such that the proposed development may extend to a significant depth relative to the existing foundations of these properties. In any case the basement 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. A ground movement assessment may be required in this respect in due course.

Groundwater flow is expected to be controlled by local contours, thus flow would be towards the south and southwest towards the River Thames.

The site is not considered to be within an area at risk of flooding and therefore a flood risk assessment will not be required.

The proposed development will not alter any existing slopes such that instabilities may occur. On this basis consideration will not need to be given to slope stabilisation measures.

7.8 Site - Specific Risk Assessment

The desk study has not indicated the site to have had a potentially contaminative history, having been occupied by the existing property for its entire developed history.

No evidence of significant contamination was observed during the site investigation and this has generally been confirmed by the chemical analyses. However, the analyses have revealed elevated concentrations for lead and PAH, including benzo(a)pyrene in the sample of made ground tested from Borehole No 1, which could pose a potentially unacceptable risk to human health through direct contact, accidental ingestion or inhalation of soil or soil derived dust.

The sources of the lead and PAH contamination are unknown, but the made ground typically contained variable amounts of extraneous material including ash, and it is therefore likely that a fragment of such material was present within the samples tested, accounting for the elevated concentration. The potential contamination is therefore considered likely to be relatively immobile and unlikely to be in a soluble form, such that it does not therefore present a significant risk of leaching and migration within any perched groundwater.

End users will be effectively isolated from direct contact with the identified contaminants by the building and areas of external hardstanding. The contamination is likely to be removed as part of the basement excavation and only in proposed garden areas could end users conceivably come into direct contact with the contaminated soils, although this pathway is already in existence.

A requirement for remediation is not therefore envisaged. However, 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.

Site workers should be made aware of the 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[8] and CIRIA[9] and the requirements of the Local Authority Environmental Health Officer.

7.9 Waste Disposal

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE guidance[10], will need to be disposed of to a licensed tip. 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 going to landfill is subject to landfill tax at either the standard rate of £82.60 per tonne (about £145 per m^3) or at the lower rate of £2.60 per tonne (roughly £5 per m^3). However, the classification for tax purposes is not the same as that for disposal purposes. Currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring rocks and soils which are accurately described as such in terms of the 2011 Order[11] would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the Environment Agency[12] it is considered likely that the made ground from this site, as represented by the four chemical analyses carried out, would be classified as a NON-HAZARDOUS waste under the waste code 17 05 04 (soils and stones not containing dangerous substances) and would be taxable at the standard rate. It is likely that the natural soils, if separated out, could be classified as an INERT waste also under the waste code 17 05 04. This material would be taxable at the lower rate, if accurately described as naturally occurring sand and gravel in terms of the 2011 Order on the waste transfer note. As this site has not had a contaminative history there should be no requirement for WAC leaching analyses to confirm that this material is suitable for landfilling, although this would require confirmation from the receiving site.

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

8 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO
9 CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association
10 CL:AIRE (2011) *The Definition of Waste: Development Industry Code of Practice* Version 2, March 2011
11 *Landfill Tax (Qualifying Material) Order 2011*
12 Environment Agency (2013) *Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance* WM2 Third Edition, August 2013

Environment Agency has issued a position paper[13] 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 and its likely landfill taxable rate 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 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.

8.0 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.

Further groundwater monitoring should be carried out to confirm that groundwater will not be encountered during basement excavation or ideally trial excavations are undertaken, to depths as close to the full basement depth.

Whilst the use of NHBC guidelines will generally ensure that foundations extend to an appropriate depth, foundation excavation should be inspected by a geotechnical engineer to ensure that they are of sufficient depth.

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.

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

APPENDIX

Borehole Records

Trial Pit Records

Geotechnical Laboratory Test Results

SPT & Cohesion / Arbitrary Level Graph

Chemical Analyses (Soil)

Generic Risk Based Screening Values

Envirocheck Report Summary

Historical Maps

Site Plan

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT		**Number** **BH1**
Excavation Method Drive-in Window Sampler	**Dimensions**	**Ground Level (mAD)** 48.30	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				(2.50)	Made Ground (grass over brownish grey silty sandy clay with rare gravel, rootlets, brick, ash and mortar frgaments)		
1.50	D2							
2.25	D3			45.80	2.50			
2.75	D4					Firm orange-brown silty slightly sandy CLAY with occasional partings of silt and sand		
3.50	D5				(2.90)			
4.50	D6							
				42.90	5.40	Complete at 5.40m		

Remarks
Groundwater monitoring standpipe installed to 5.0 m
No groundwater inflows recorded, but recovered samples noted to be damp from 4.5 m

Scale (approx)	Logged By
1:50	MP

Figure No.
J15086.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Number** **BH2**

Excavation Method	**Dimensions**	**Ground Level (mAD)**	**Client**	**Job Number**
Drive-in Window Sampler		49.30	Mr & Mrs G Arkus	J15086
	Location	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water
				49.10	(0.20) 0.20	Made Ground (gravel surfacing over brown silty sandy clay with occasional gravel, rootlets, brick and ash)		
0.50	D1				(0.90)	Made Ground (orange-brown silty sandy clay with rare brick and rootlets)		
				48.20	1.10			
1.50	D2					Firm orange-brown becoming brownish grey silty slightly sandy CLAY with occasional partings of silt and sand		
2.50	D3							
					(4.20)			
3.50	D4							
4.50	D5							
				44.00	5.30			
						Complete at 5.30m		

Remarks
Groundwater monitoring standpipe installed to 5.0 m
Groundwater not encountered

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

Figure No.
J15086.BH1

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Borehole Number** **BH3**
Boring Method Cable Percussion	**Casing Diameter** 150mm cased to 6.00m	**Ground Level (mAD)** 48.50	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location	**Dates** 29/04/2015-30/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water
					48.30	(0.20)	Made Ground (grass over dark grey silty sandy clay with rare gravel and rootlets)		
0.25	D1					0.20	Made Ground (brownish grey silty sandy clay with rare gravel, brick, rootlets and ash)		
0.50	B1								
1.20-1.65	CPT N=7		DRY	2,1/2,1,2,2					
1.20-1.65	B2					(2.55)			
1.75	D2								
2.00-2.45	CPT N=6	2.00	DRY	1,0/1,1,2,2					
2.00-2.45	B3								
					45.75	2.75	Firm becoming stiff high strength fissured brown to orange-brown silty sandy CLAY with occasional partings of silt and sand		
2.75	D3								
3.00-3.45	CPT N=10	3.00	DRY	1,2/2,2,3,3					
3.00-3.45	B4								
3.75	D4								
4.00-4.45	U1								
4.75	D5								
5.00-5.45	D6			Slow Seepage(1) at 5.00m, sealed at 6.00m.					▽1
						(5.05)			
5.00-5.45	SPT N=12	5.00	WET	1,2/2,3,3,4					
6.00	D7								
6.50-6.95	U2								
7.50	D8								
					40.70	7.80	Stiff high strength fissured brown slightly silty slightly sandy CLAY		
8.00-8.45	SPT N=18	6.00	DRY	1,2/4,4,5,5					
8.00-8.45	D9					(0.80)			
					39.90	8.60	Stiff becoming very stiff high strength to very high strength fissured dark brownish grey becoming dark grey slightly silty slightly sandy CLAY with occasonal partings of silt and sand		
9.00	D10								
9.50-9.95	U3								

Remarks
Starter pit excavted to 1.2 m - 1 hour
Groundwater monitoring standpipe installed to 6.0 m

Scale (approx)	Logged By
1:50	MP

Figure No.
J15086.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Borehole Number** **BH3**

Boring Method	**Casing Diameter**	**Ground Level (mAD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 6.00m	48.50	Mr & Mrs G Arkus	J15086
	Location	**Dates** 29/04/2015- 30/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water
10.50	D11								
11.00-11.45 11.00-11.45	SPT N=22 D12	6.00	DRY	2,4/5,5,6,6					
12.00	D13								
12.50-12.95	U4			Slow Seepage(2) at 12.50m, not sealed.					▽2
13.00-13.45 13.00-13.45	CPT N=26 B5	6.00	WET	2,4/5,6,7,8					
14.00	D14					(9.85)			
14.50-14.95	U5								
15.50	D15								
16.00-16.45 16.00-16.45	SPT N=26 D16	6.00	DRY	4,5/6,6,7,7					
17.00	D17								
17.55-18.00	U6								
18.00-18.45 18.00-18.45	SPT N=32 D18	6.00	DRY	4,6/7,8,9,8					
					30.05	18.45	Complete at 18.45m		

Remarks

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

Figure No.
J15086.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Borehole Number** **BH1**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 19 mm Diameter of Filter Zone = 60 mm	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location	**Ground Level (mAD)** 48.30	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mAD)	Depth (m)	Description
			47.30	1.00	Bentonite Seal
			43.30	5.00	Slotted Standpipe

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mAD)	
27/05/15		3.46	44.84	

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Borehole Number** **BH2**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 19 mm Diameter of Filter Zone = 60 mm	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location	**Ground Level (mAD)** 49.30	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mAD)	Depth (m)	Description
					Bentonite Seal
			48.30	1.00	
					Slotted Standpipe
			44.30	5.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mAD)	
27/05/15		3.00	46.30	

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 15 Ranulf Road, London, NW2 2BT	**Borehole Number** **BH3**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location	**Ground Level (mAD)** 48.50	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mAD)	Depth (m)	Description
			47.50	1.00	Bentonite Seal
					Slotted Standpipe
	▽1		42.50	6.00	
	▽2		30.05	18.45	General Backfill

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	
29/04/15		5.00	5.00	Slow Seepage					6.00
30/04/15		12.50	6.00	Slow Seepage					NOT

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mAD)

Instrument Groundwater Observations

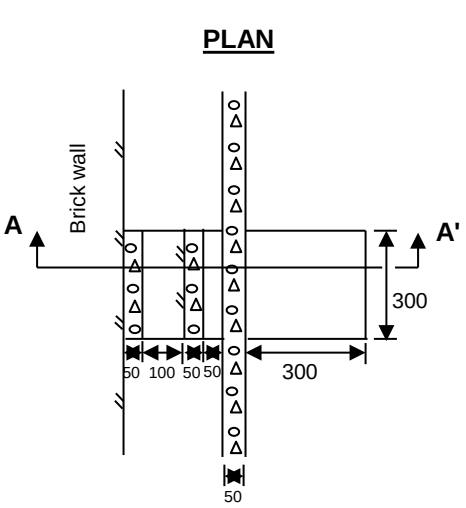
Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mAD)	
27/05/15		3.52	44.98	

Remarks

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 15 Ranulf Road, London, NW2 2BT	**Trial Pit Number** 1
Excavation Method Manual	**Dimensions** 300 x 600 x 1700	**Ground Level (mAD)** 49.43	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location Ground Level	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

PLAN



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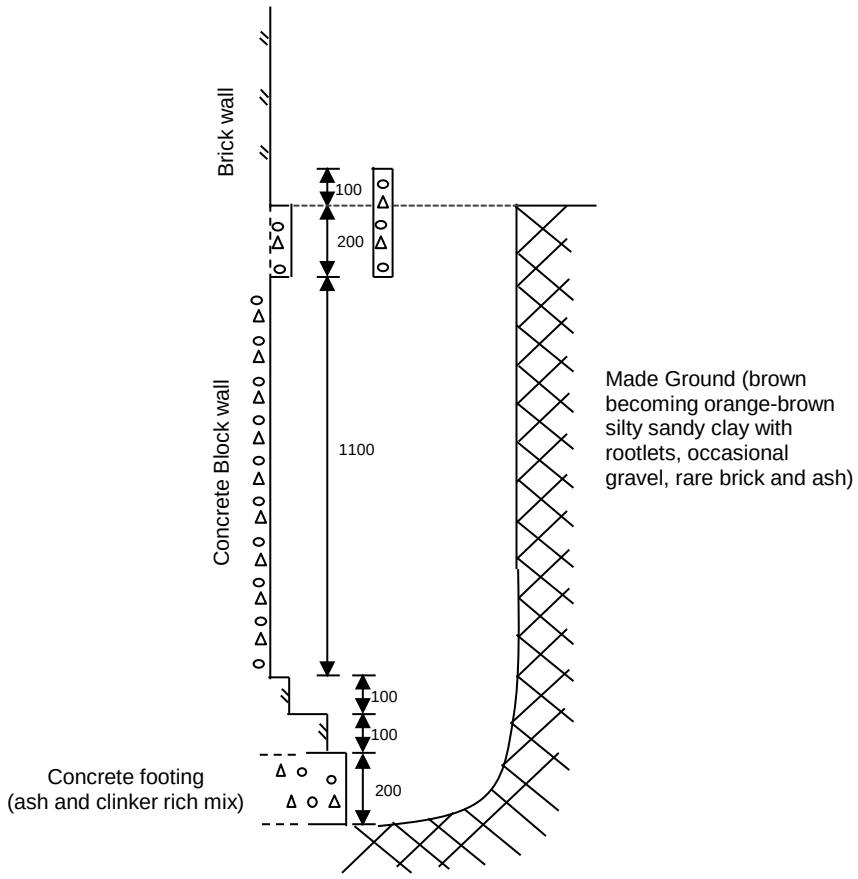
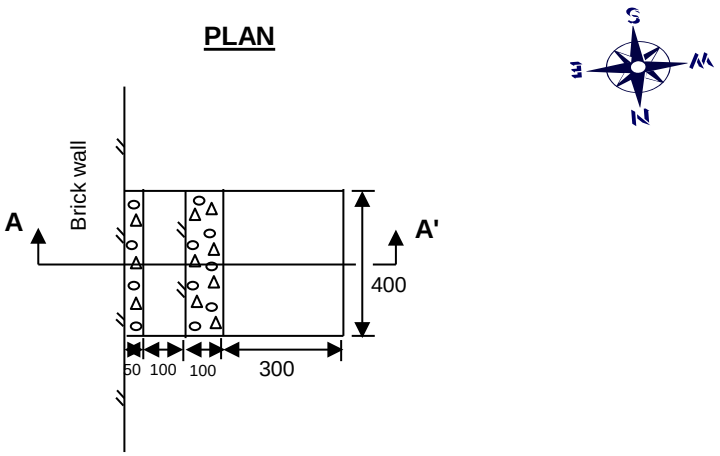


Remarks: All dimensions in millimetres Sides of pit remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: MP

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 15 Ranulf Road, London, NW2 2BT	**Trial Pit Number** **2**
Excavation Method Manual	**Dimensions** 300 x 600 x 1700	**Ground Level (mAD)** 49.00	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location Ground Level	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

PLAN



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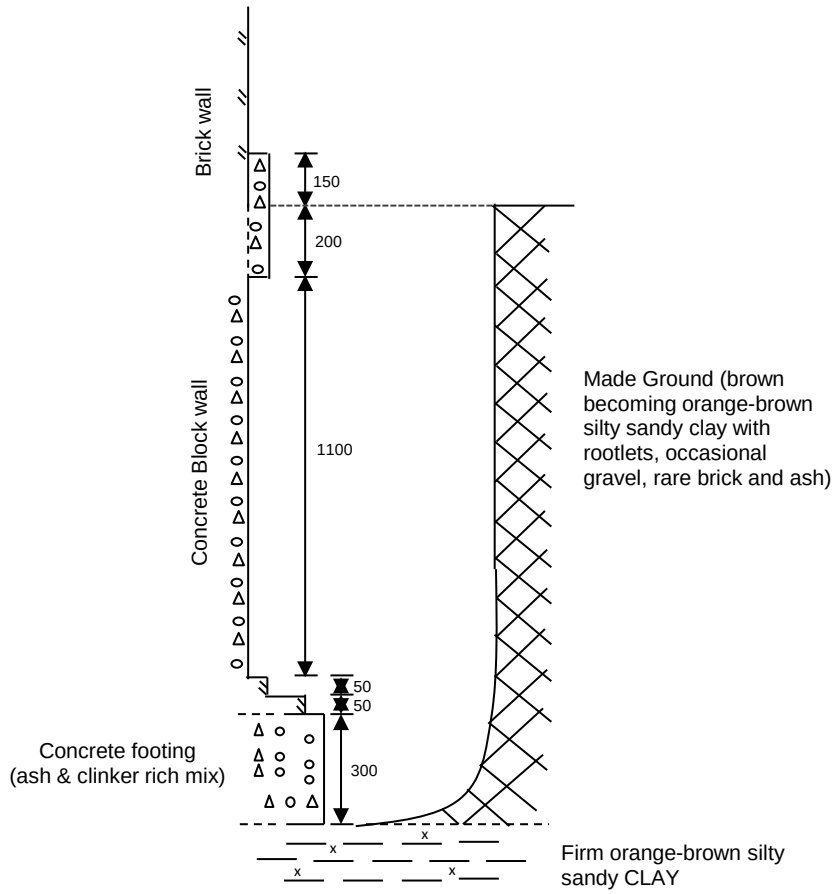
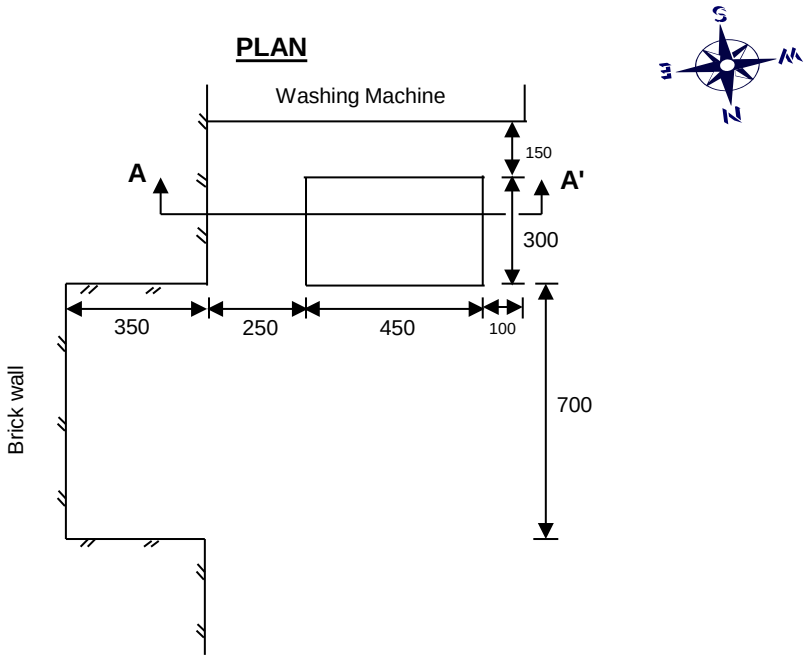


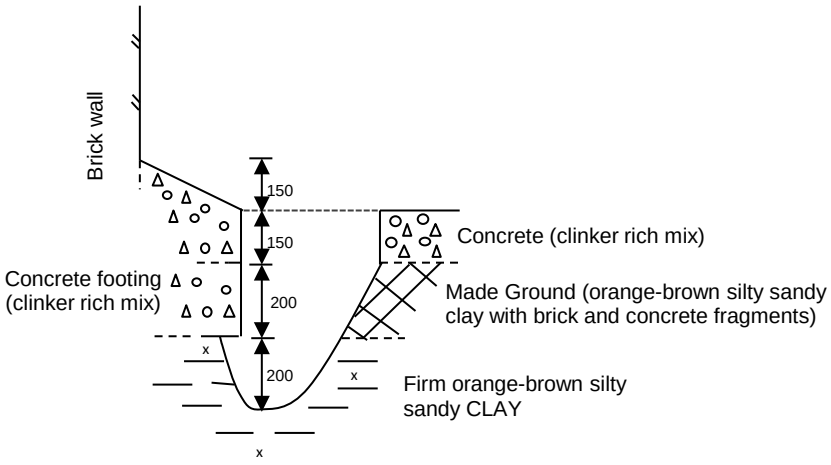
Remarks: All dimensions in millimetres Sides of pit remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: MP

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 15 Ranulf Road, London, NW2 2BT	**Trial Pit Number** 3
Excavation Method Manual	**Dimensions** 300 x 450 x 550	**Ground Level (mAD)** 47.11	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location Basement Level	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

PLAN



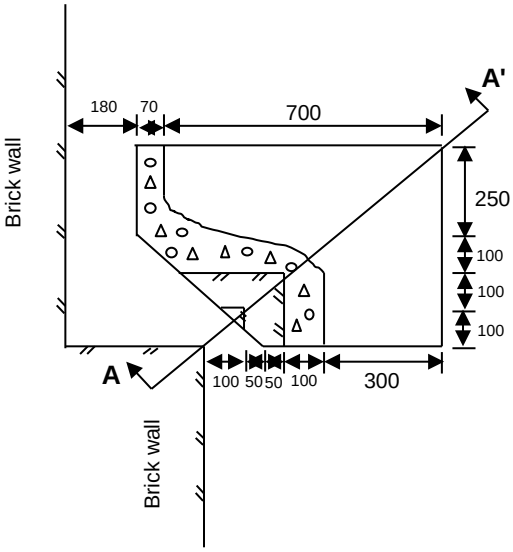
SECTION A - A'



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

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 15 Ranulf Road, London, NW2 2BT	**Trial Pit Number** 4
Excavation Method Manual	**Dimensions** 550 x 770 x 700	**Ground Level (mAD)** 47.36	**Client** Mr & Mrs G Arkus	**Job Number** J15086
	Location Basement Level	**Dates** 27/04/2015	**Engineer** Michael Alexander Consulting Engineers	**Sheet** 1/1

PLAN



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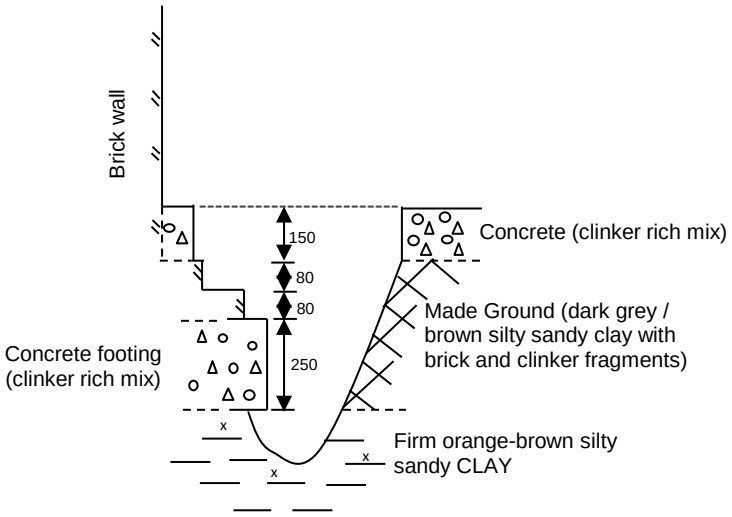

Remarks: All dimensions in millimetres Sides of pit remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: MP

Summary of Classification Test Results

Job No.	Project Name	Programme	
18797	15 Ranaulf Road, London NW2 2BT	Samples received	28/04/2015
		Schedule received	07/05/2015
Project No.	Client	Project started	08/05/2015
J15086	GEA	Testing Started	20/05/2015

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top	Base	Type		%	%	%	%	%	
BH1	5	3.50		D	Brown CLAY with occasional sandy patches	25	100	49	21	28	
BH2	3	2.50		D	Brown CLAY with numerous sandy patches	24	100	49	20	29	
BH2	5	4.50		D	Brown CLAY with numerous sandy patches	26	100	52	22	30	
BH3	1	4.00		U	High strength brown slighltly sandy CLAY with orange brown sand partings	27	100	51	22	29	
BH3	2	6.50		U	High strength slightly fissured brown slightly sandy silty CLAY	22	100	51	21	30	
BH3	4	12.50		U	Very high strength fissured dark grey CLAY	26	100	71	27	44	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3 and 5.0

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Checked and Approved

Initials **J.P**

Date: 22/05/2015

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

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

Job No.	Project Name	Programme	
18797	15 Ranaulf Road, London NW2 2BT	Samples received	28/04/2015
		Schedule received	07/05/2015
Project No.	Client	Project started	08/05/2015
J15086	GEA	Testing Started	18/05/2015

Hole No.	Sample				Soil Description	Test Type	Density		*w*	Length	Diameter	σ3	At failure				Remarks
	Ref	Top	Base	Type			bulk	dry					Axial strain	σ1 - σ3	cu	Mode	
							Mg/m3		%	mm	mm	kPa	%	kPa	kPa		
BH3	1	4.00		U	High strength brown slighltly sandy CLAY with orange brown sand partings	UU	2.04	1.61	27	198	102	80	17	151	75	C	
BH3	2	6.50		U	High strength slightly fissured brown slightly sandy silty CLAY	UU	2.05	1.66	23	198	102	130	9.1	225	113	C	
BH3	3	9.50		U	Hight strength slightly fissured dark grey silty CLAY with light grey fine sand partings	UU	2.03	1.6	27	198	102	190	3.5	179	89	B	
BH3	4	12.50		U	Very high strength fissured dark grey CLAY	UU	2.07	1.64	26	198	102	250	5.6	375	187	B	
BH3	5	14.50		U	High strength fissured dark grey CLAY	UU	2.01	1.56	29	198	102	290	7.6	266	133	C	
BH3	6	17.55		U	High strength slightly fissured dark grey CLAY	UU	2.02	1.57	29	198	102	351	9.1	186	93	B	

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

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Date: 22/05/2015

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R7b (Rev. 0)

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

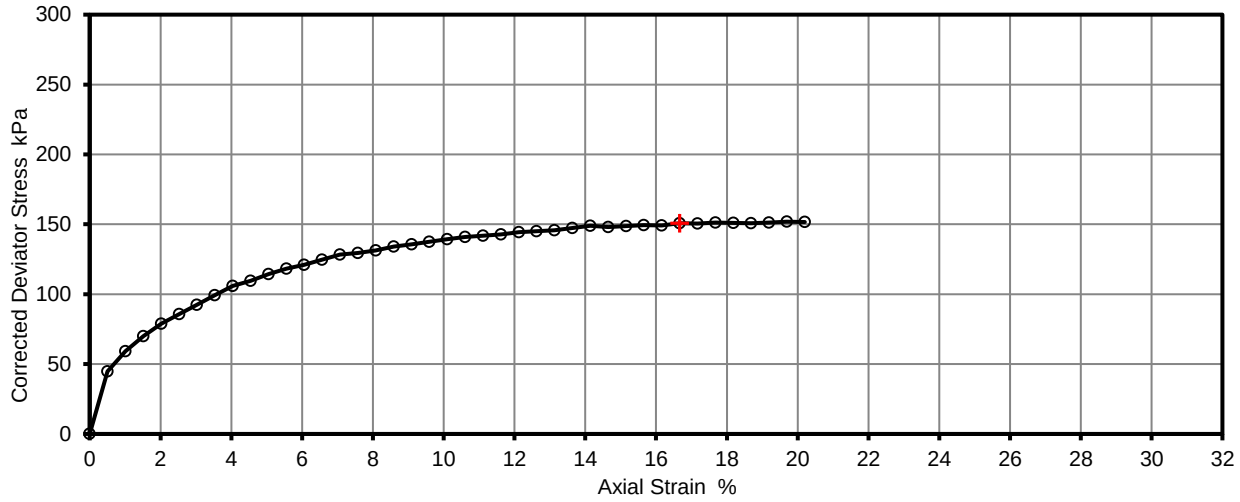
				Job Ref	18797
				Borehole/Pit No.	BH3
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	1
Project No.	J15086	Client	GEA	Depth	4.00 m
Soil Description	High strength brown slighltly sandy CLAY with orange brown sand partings			Sample Type	U
				Samples received	28/04/2015
				Schedules received	07/05/2015
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015

Remarks

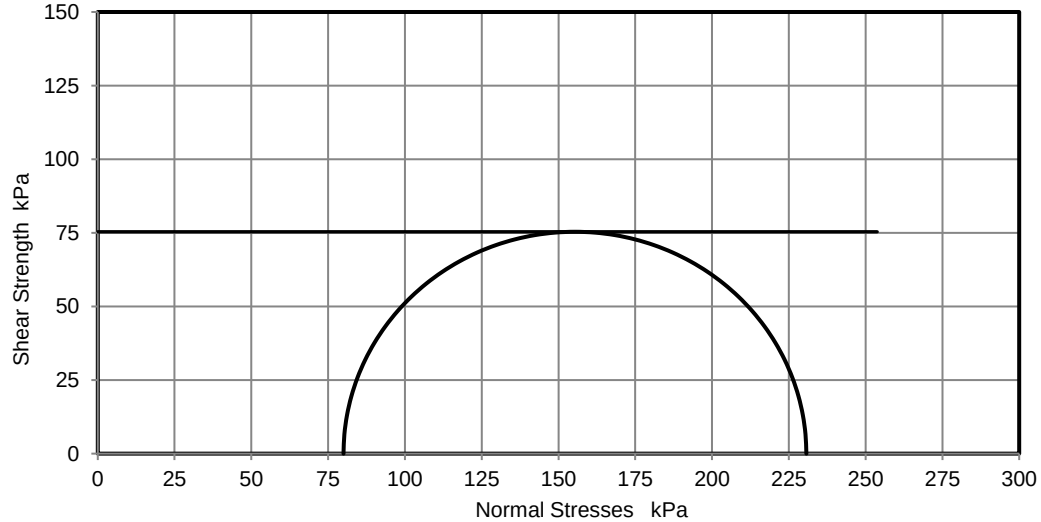
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.04	Mg/m3
Moisture Content	27.2	%
Dry Density	1.61	Mg/m3
Rate of Strain		%/min
Cell Pressure	80	kPa
Axial Strain	16.7	%
Deviator Stress, (σ1 - σ3)f	151	kPa
Undrained Shear Strength, cu	75	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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Checked and Approved
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UKAS TESTING 2519

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

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

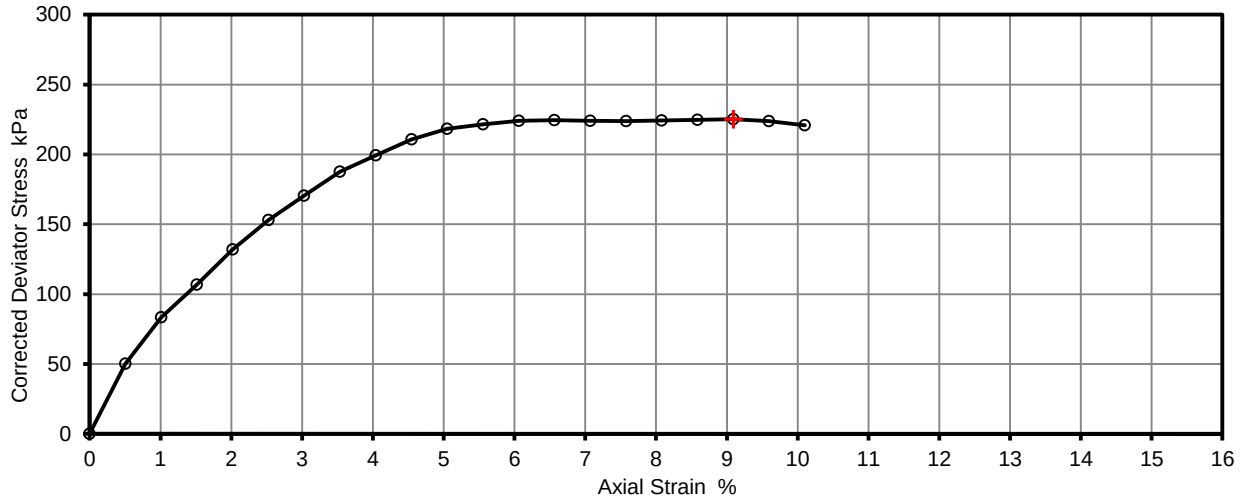
				Job Ref	18797
				Borehole/Pit No.	BH3
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	2
Project No.	J15086	Client	GEA	Depth	6.50 m
Soil Description	High strength slightly fissured brown slightly sandy silty CLAY			Sample Type	U
				Samples received	28/04/2015
				Schedules received	07/05/2015
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015

Remarks

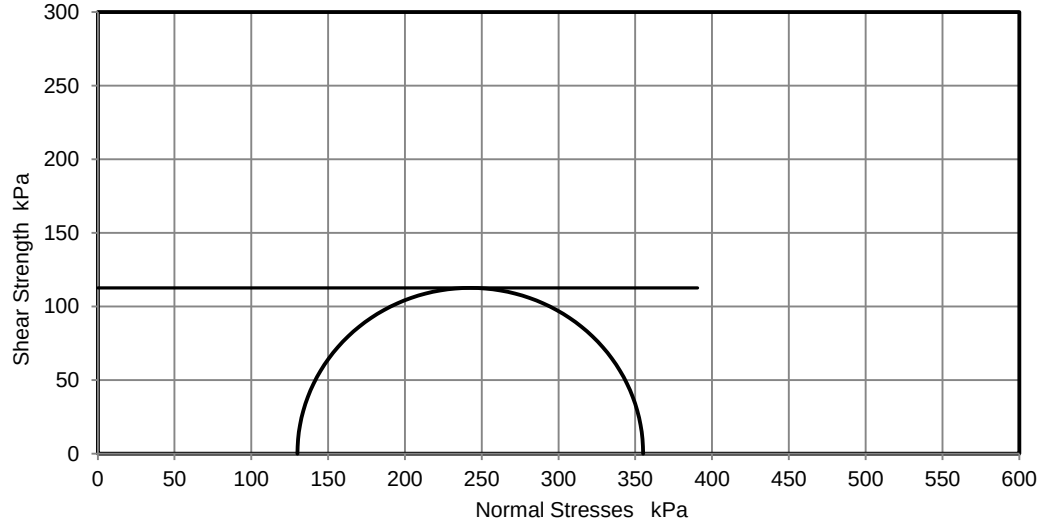
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.05	Mg/m3
Moisture Content	23.1	%
Dry Density	1.66	Mg/m3
Rate of Strain		%/min
Cell Pressure	130	kPa
Axial Strain	9.1	%
Deviator Stress, (σ1 - σ3)f	225	kPa
Undrained Shear Strength, cu	113	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

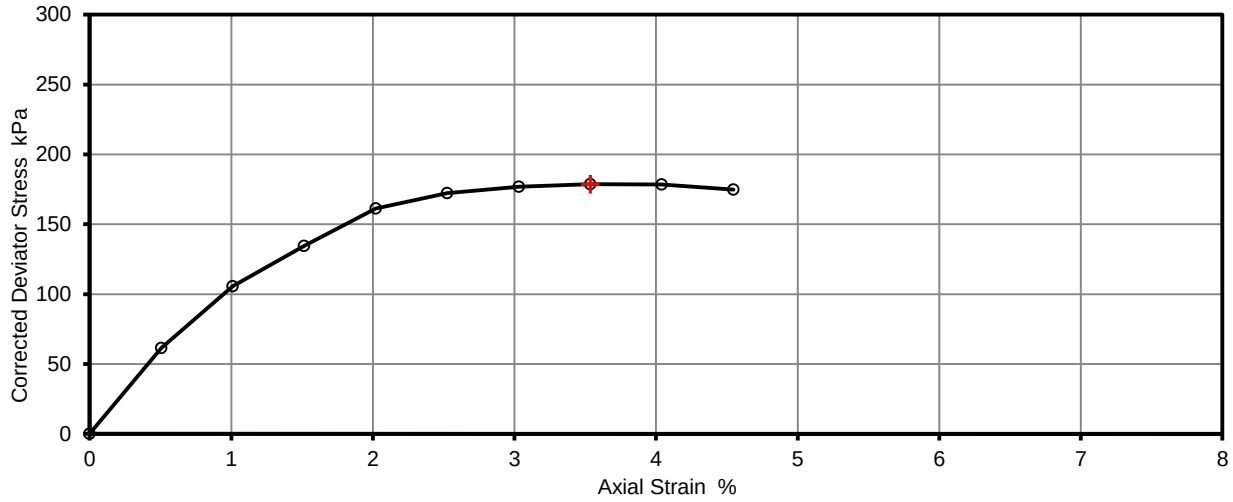
				Job Ref	18797
				Borehole/Pit No.	BH3
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	3
Project No.	J15086	Client	GEA	Depth	9.50 m
Soil Description	Hight strength slightly fissured dark grey silty CLAY with light grey fine sand partings			Sample Type	U
				Samples received	28/04/2015
				Schedules received	07/05/2015
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015

Remarks

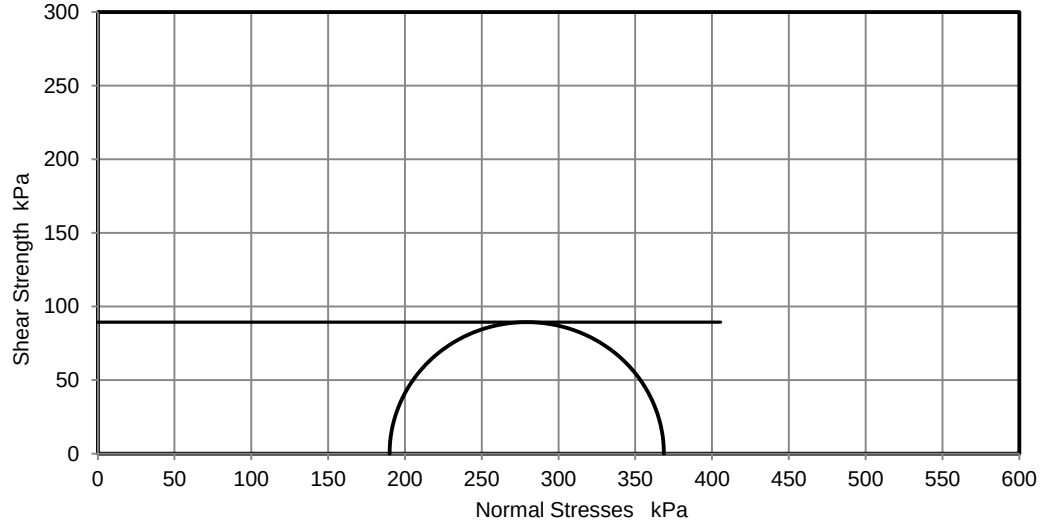
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.03	Mg/m3
Moisture Content	27.0	%
Dry Density	1.60	Mg/m3
Rate of Strain		%/min
Cell Pressure	190	kPa
Axial Strain	3.5	%
Deviator Stress, (σ1 - σ3)f	179	kPa
Undrained Shear Strength, cu	89	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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UKAS TESTING 2519

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

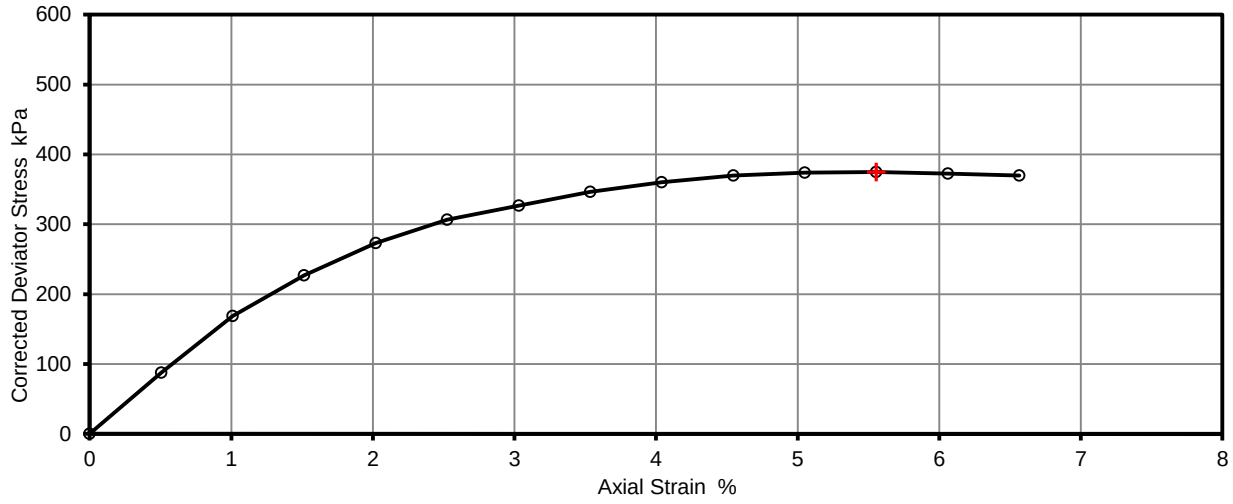
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	18797	
				Borehole/Pit No.	BH3	
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	4	
Project No.	J15086	Client	GEA	Depth	12.50	m
Soil Description	Very high strength fissured dark grey CLAY			Sample Type	U	
				Samples received	28/04/2015	
				Schedules received	07/05/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015	

Remarks

Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.07	Mg/m3
Moisture Content	26.1	%
Dry Density	1.64	Mg/m3
Rate of Strain		%/min
Cell Pressure	250	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	375	kPa
Undrained Shear Strength, cu	187	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



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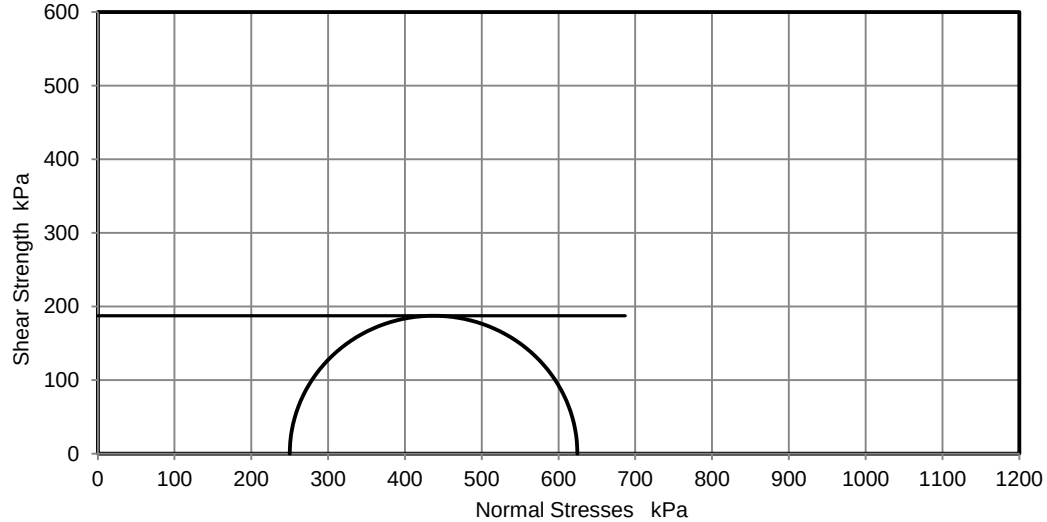

Deviator stress corrected for area change and membrane effects

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UKAS TESTING
2519

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

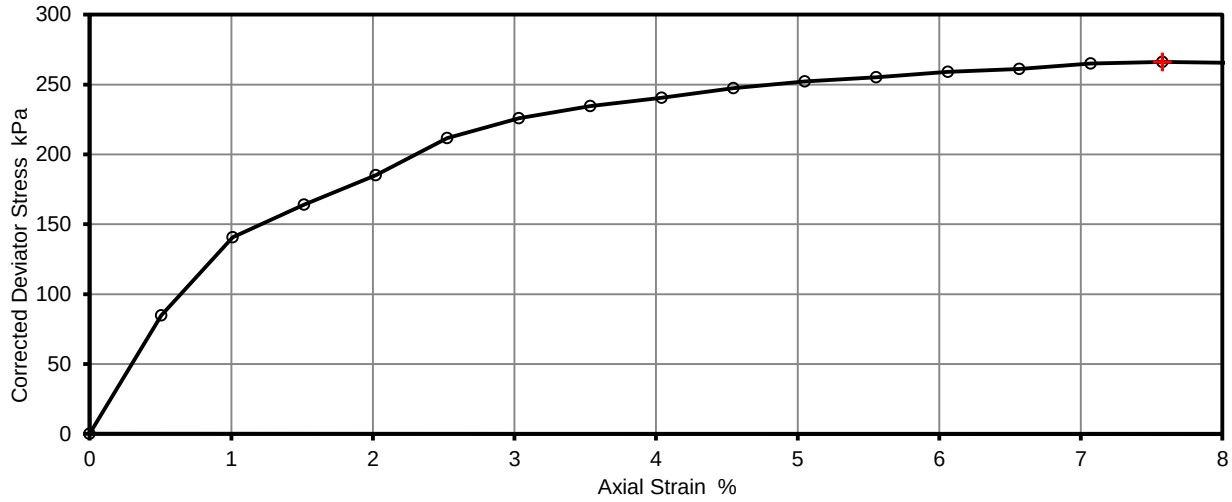
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	18797	
				Borehole/Pit No.	BH3	
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	5	
Project No.	J15086	Client	GEA	Depth	14.50	m
Soil Description	High strength fissured dark grey CLAY			Sample Type	U	
				Samples received	28/04/2015	
				Schedules received	07/05/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015	

Remarks

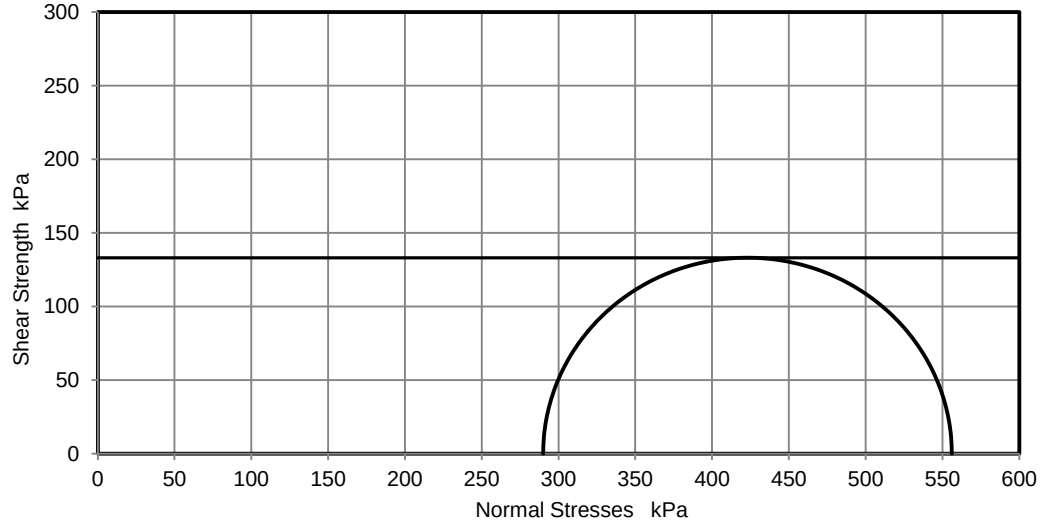
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.01	Mg/m3
Moisture Content	28.7	%
Dry Density	1.56	Mg/m3
Rate of Strain		%/min
Cell Pressure	290	kPa
Axial Strain	7.6	%
Deviator Stress, (σ1 - σ3)f	266	kPa
Undrained Shear Strength, cu	133	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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UKAS TESTING 2519

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

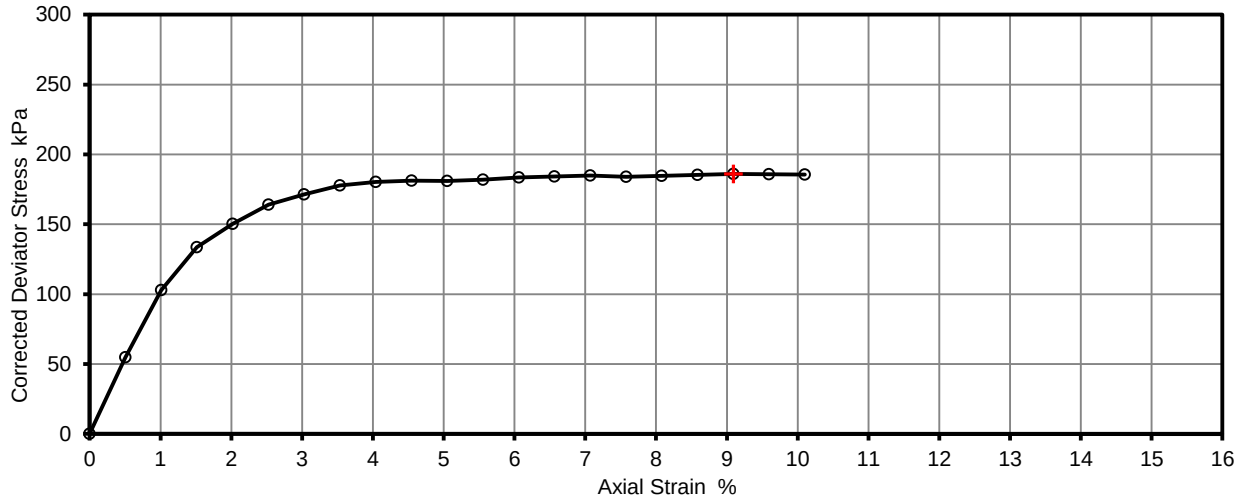
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	18797	
				Borehole/Pit No.	BH3	
Site Name	15 Ranaulf Road, London NW2 2BT			Sample No.	6	
Project No.	J15086	Client	GEA	Depth	17.55	m
Soil Description	High strength slightly fissured dark grey CLAY			Sample Type	U	
				Samples received	28/04/2015	
				Schedules received	07/05/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	20/05/2015	

Remarks

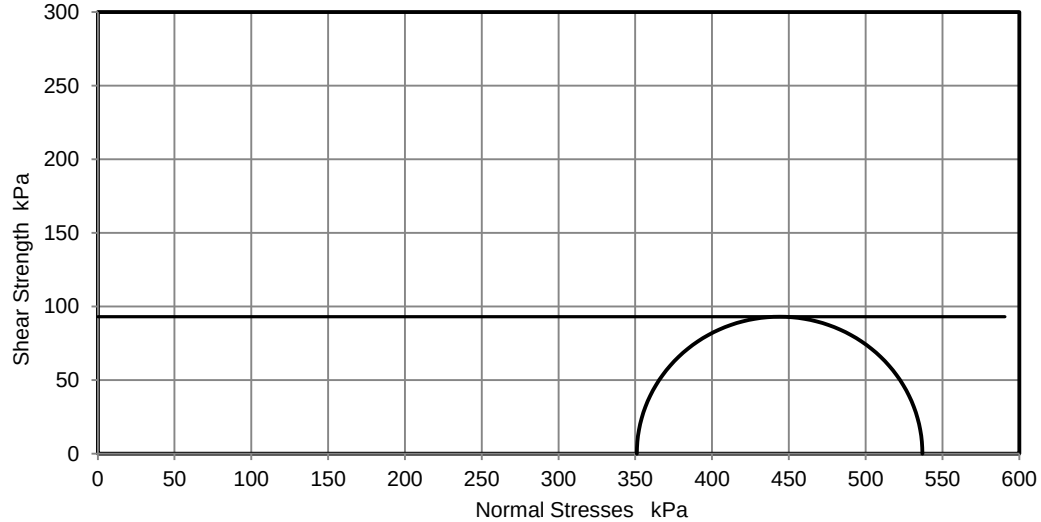
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	28.9	%
Dry Density	1.57	Mg/m3
Rate of Strain		%/min
Cell Pressure	351	kPa
Axial Strain	9.1	%
Deviator Stress, (σ1 - σ3)f	186	kPa
Undrained Shear Strength, cu	93	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

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

Checked and Approved
Initials: J.P
Date 22/05/2015

UKAS TESTING 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	
18797	15 Ranaulf Road, London NW2 2BT	Samples received	28/04/2015
		Schedule received	07/05/2015
Project No.	Client	Project started	08/05/2015
J15086	GEA	Testing Started	20/05/2015

Hole No.	Sample				Soil description	Dry Mass passing 2mm	SO3 Content	SO4 Content	pH	Remarks
	Ref	Top	Base	Type		%	g/l	g/l		
BH1	5	3.50		D	Brown CLAY with occasional sandy patches	100	0.16	0.20	8.09	
BH2	3	2.50		D	Brown CLAY with numerous sandy patches	100	0.11	0.13	8.13	
BH3	1	4.00		U	High strength brown slighltly sandy CLAY with orange brown sand partings	100	0.27	0.33	7.96	

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

Checked and Approved

Initials J.P

Date: 22/05/2015

Geotechnical & Environmental Associates

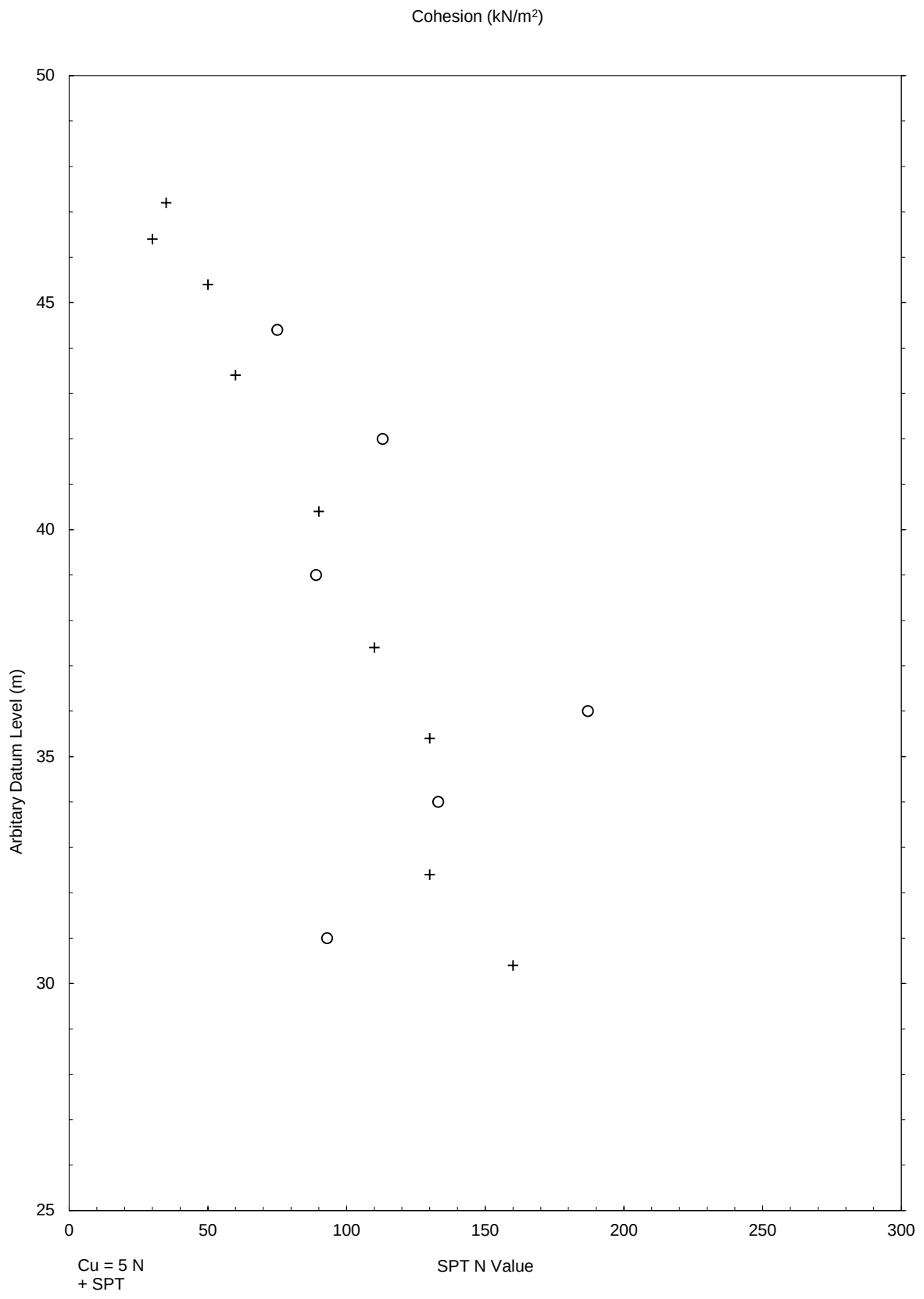
Widbury Barns
Widbury Hill
Ware
Herts SG12 7QE

SPT and Cohesion / Arbitary Datum Level Graph

Site	15 Ranulf Road, Lodnon, NW2 2BT
Client	Mr & Mrs G Arkus
Engineer	Michael Alexander Consulting Engineers

Job Number J15086

Sheet 1 / 1



Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

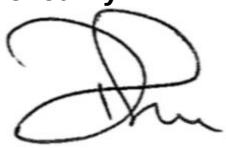
Final Report

Report Number:	15-09803 Issue-1
Initial Date of Issue:	08-May-2015
Client:	GEA
Client Address:	Widbury Barn Widbury Hill Ware Hertfordshire SG12 7QE
Contact(s):	Matt Penfold
Project:	J15086 - Ranulf Road

Quotation No.:		**Date Received:**	29-Apr-2015
Order No.:		**Date Instructed:**	01-May-2015
No. of Samples:	8	**Target Due Date:**	06-May-2015
Turnaround: (Wkdays)	5	**Results Due Date:**	08-May-2015

Date Approved: 08-May-2015

Approved By:



Details: Darrell Hall, Laboratory Director

Chemtest
The right chemistry to deliver results

Results Summary - Soil

Project: J15086 - Ranulf Road

Client: GEA								
Quotation No.:				**Chemtest Job No.:**	15-09803	15-09803	15-09803	15-09803
Order No.:				**Chemtest Sample ID.:**	134330	134333	134336	134337
				Client Sample Ref.:				
				Client Sample ID.:	BH1	BH2	TP3	TP4
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.50	0.40	0.30
				Bottom Depth(m):				
				Date Sampled:	27-Apr-15	27-Apr-15	27-Apr-15	27-Apr-15
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Moisture	N	2030	%	0.02	15	26	19	21
Stones	N	2030	%	0.02	< 0.020	< 0.020	< 0.020	< 0.020
Soil Colour	N				brown	brown	brown	brown
Other Material	N				stones	none	none	none
Soil Texture	N				clay	clay	clay	clay
pH	M	2010			8.2	7.5	7.6	7.5
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.01	< 0.010	0.041	0.13	0.10
Chloride (Extractable)	M	2220	g/l	0.01	0.016	< 0.010	0.057	0.012
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	6.6	0.71	3.6	1.1
Sulphate (Total)	M	2430	mg/kg	100	2500	1000	440	670
Arsenic	M	2450	mg/kg	1	23	13	11	11
Cadmium	M	2450	mg/kg	0.1	0.20	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1	36	44	40	41
Copper	M	2450	mg/kg	0.5	29	19	16	19
Mercury	M	2450	mg/kg	0.1	0.42	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.5	26	20	23	28
Lead	M	2450	mg/kg	0.5	250	36	14	21
Selenium	M	2450	mg/kg	0.2	0.48	0.23	0.57	0.37
Zinc	M	2450	mg/kg	0.5	100	66	50	57
Total Organic Carbon	M	2625	%	0.2	6.9	1.1	0.33	6.2
TPH >C5-C6	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C6-C7	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C7-C8	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1	3.8	< 1.0	< 1.0	< 1.0
TPH >C12-C16	N	2670	mg/kg	1	35	< 1.0	< 1.0	< 1.0
TPH >C16-C21	N	2670	mg/kg	1	310	< 1.0	< 1.0	< 1.0
TPH >C21-C35	N	2670	mg/kg	1	1200	< 1.0	< 1.0	< 1.0
Total TPH >C5-C35	N	2670	mg/kg	10	1600	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2675	mg/kg	0.1	< 0.10			
Aliphatic TPH >C6-C8	N	2675	mg/kg	0.1	< 0.10			
Aliphatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10			

Chemtest
The right chemistry to deliver results

Results Summary - Soil

Project: J15086 - Ranulf Road

Client: GEA								
Quotation No.:				**Chemtest Job No.:**	15-09803	15-09803	15-09803	15-09803
Order No.:				**Chemtest Sample ID.:**	134330	134333	134336	134337
				Client Sample Ref.:				
				Client Sample ID.:	BH1	BH2	TP3	TP4
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.50	0.40	0.30
				Bottom Depth(m):				
				Date Sampled:	27-Apr-15	27-Apr-15	27-Apr-15	27-Apr-15
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aliphatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0			
Aliphatic TPH >C12-C16	M	2675	mg/kg	1	< 1.0			
Aliphatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0			
Aliphatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0			
Aliphatic TPH >C35-C44	M	2675	mg/kg	1	< 1.0			
Total Aliphatic Hydrocarbons	M	2675	mg/kg	5	< 5.0			
Aromatic TPH >C5-C7	N	2675	mg/kg	0.1	< 0.10			
Aromatic TPH >C7-C8	N	2675	mg/kg	0.1	< 0.10			
Aromatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10			
Aromatic TPH >C10-C12	M	2675	mg/kg	1	5.5			
Aromatic TPH >C12-C16	M	2675	mg/kg	1	32			
Aromatic TPH >C16-C21	M	2675	mg/kg	1	330			
Aromatic TPH >C21-C35	M	2675	mg/kg	1	970			
Aromatic TPH >C35-C44	N	2675	mg/kg	1	67			
Total Aromatic Hydrocarbons	M	2675	mg/kg	5	1400			
Total Petroleum Hydrocarbons	M	2675	mg/kg	10	1400			
Naphthalene	M	2700	mg/kg	0.1	1.1	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.1	2.7	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.1	0.94	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.1	1.7	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.1	28	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.1	12	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.1	62	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.1	61	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.1	36	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.1	36	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	49	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	18	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.1	39	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	27	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	5.8	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	25	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2	410	< 2.0	< 2.0	< 2.0

Results Summary - Soil

Project: J15086 - Ranulf Road

Client: GEA								
			Chemtest Job No.:		15-09803	15-09803	15-09803	15-09803
Quotation No.:			**Chemtest Sample ID.:**		134330	134333	134336	134337
Order No.:			Client Sample Ref.:					
			Client Sample ID.:		BH1	BH2	TP3	TP4
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.50	0.40	0.30
			Bottom Depth(m):					
			Date Sampled:		27-Apr-15	27-Apr-15	27-Apr-15	27-Apr-15
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30	< 0.30

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

GEA Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	15 Ranulf Road, London, NW2 2BT	**Job Number** J15086
Client	Mr & Mrs G Arkus	**Sheet** 1 / 1
Agent	Michael Alexander Consulting Engineers	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 6.0

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	130	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.87	C4SL
Toluene	610	SGV
Ethyl Benzene	350	SGV
Xylene	230	SGV
Aliphatic C5-C6	110	LQM/CIEH
Aliphatic C6-C8	370	LQM/CIEH
Aliphatic C8-C10	110	LQM/CIEH
Aliphatic C10-C12	540	LQM/CIEH
Aliphatic C12-C16	3000	LQM/CIEH
Aliphatic C16-C35	76,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	151	LQM/CIEH
Aromatic C10-C12	346	LQM/CIEH
Aromatic C12-C16	593	LQM/CIEH
Aromatic C16-C21	770	LQM/CIEH
Aromatic C21-C35	1230	LQM/CIEH
PRO (C_5 –C_{10})	1352	Calc
DRO (C_{12} –C_{28})	80,363	Calc
Lube Oil (C_{28} –C_{44})	77,230	Calc
TPH	**500**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	0.5 g/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	420	SGV
PAH		
Naphthalene	12.40	Rev. LQM/CIEH
Acenaphthylene	850	LQM/CIEH
Acenaphthene	1,000	LQM/CIEH
Fluorene	780	LQM/CIEH
Phenanthrene	380	LQM/CIEH
Anthracene	9,200	LQM/CIEH
Fluoranthene	670	LQM/CIEH
Pyrene	1,600	LQM/CIEH
Benzo(a) Anthracene	8.7	Rev. LQM/CIEH
Chrysene	14	Rev. LQM/CIEH
Benzo(b) Fluoranthene	10.5	Rev. LQM/CIEH
Benzo(k) Fluoranthene	15.0	Rev. LQM/CIEH
Benzo(a) pyrene	5.00	C4SL
Indeno(1 2 3 cd) Pyrene	6.2	Rev. LQM/CIEH
Dibenzo(a h) Anthracene	1.35	Rev. LQM/CIEH
Benzo (g h i) Perylene	71	Rev. LQM/CIEH
Screening value for PAH	**71.4**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	28	LQM/CIEH
tetrachloroethane (PCA)	4.8	LQM/CIEH
tetrachloroethene (PCE)	4.8	LQM/CIEH
trichloroethene (TCE)	0.49	LQM/CIEH
1,2-dichloroethane (DCA)	0.014	LQM/CIEH
vinyl chloride (Chloroethene)	0.00099	LQM/CIEH
tetrachloromethane (Carbon tetra	0.089	LQM/CIEH
trichloromethane (Chloroform)	2.7	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

Rev 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

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
65835565_1_1

Customer Reference:
J15086

National Grid Reference:
524970, 185840

Slice:
A

Site Area (Ha):
0.07

Search Buffer (m):
1000

Site Details:

15 Ranulf Road
LONDON
NW2 2BT

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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Natural England Copyright Notice

Ove Arup Copyright Notice

Peter Brett Associates Copyright Notice

Radon Potential dataset Copyright Notice

Report Version v49.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1			2	
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		4	1	13
Local Authority Pollution Prevention and Control Enforcements	pg 4			1	
Nearest Surface Water Feature	pg 4				Yes
Pollution Incidents to Controlled Waters	pg 4				1
Prosecutions Relating to Authorised Processes					
Prosecutions Relating to Controlled Waters					
Registered Radioactive Substances					
River Quality					
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register	pg 4				1
Water Abstractions					
Water Industry Act Referrals					
Groundwater Vulnerability	pg 4	Yes	n/a	n/a	n/a
Bedrock Aquifer Designations	pg 4	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones					
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

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					
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Recorded Landfill Sites					
Registered Landfill Sites					
Registered Waste Transfer Sites					
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					
Geological					
BGS 1:625,000 Solid Geology	pg 6	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 6	Yes	Yes		Yes
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 8		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 10	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 11	Yes	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 11	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 11		Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 11	Yes	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

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Industrial Land Use					
Contemporary Trade Directory Entries	pg 12		8	22	102
Fuel Station Entries	pg 23		1	1	4
Sensitive Land Use					
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves	pg 24				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					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: Reservoir/Borehole Site Location: Shoot Up Hill Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0234 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	A13SW (SW)	357	3	524800 185500
2	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: Reservoir/Borehole Site Location: Kidderpore Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0165 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	A14NW (E)	419	3	525400 185900
3	**Local Authority Pollution Prevention and Controls** Name: EssoTower Service Station Location: 617 Finchley Road, LONDON, NW3 7BS Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: 1st December 1999 Process Type: Local Authority Air Pollution Control Description: PG1/14 Petrol filling station **Status: Authorised** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	183	4	525052 186022
3	**Local Authority Pollution Prevention and Controls** Name: Tower Service StationRoc Uk Ltd Location: 617 Finchley Road, Fortune Green, London, NW3 7BS Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPC53 Dated: 1st January 1999 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A13NE (NE)	183	5	525052 186022
4	**Local Authority Pollution Prevention and Controls** Name: Texaco Location: 63 Fortune Green, LONDON, NW6 1DR Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: 16th September 1998 Process Type: Local Authority Air Pollution Control Description: PG1/14 Petrol filling station **Status: Authorisation revokedRevoked** Positional Accuracy: Manually positioned to the address or location	A13SE (SE)	249	4	525083 185596
4	**Local Authority Pollution Prevention and Controls** Name: Fortune Green Filling Station (Texaco) Location: 63 Fortune Green Road, LONDON, NW6 1DR Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: 24th June 1998 Process Type: Local Authority Air Pollution Control Description: PG1/14 Petrol filling station **Status: Authorised** Positional Accuracy: Manually positioned to the address or location	A13SE (SE)	249	4	525083 185596

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
5	**Local Authority Pollution Prevention and Controls** Name: Starcraft Location: 394 Finchley Road, Hampstead, London, Nw2 2hr Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPCDC031 Dated: 2nd August 2006 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A18SE (N)	403	5	525083 186245
6	**Local Authority Pollution Prevention and Controls** Name: Speedy Motors Location: Unit 1 6 Devonshire Place, London, Nw2 2hx Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPC61 Dated: 12th February 2010 Process Type: Local Authority Pollution Prevention and Control Description: PG1/1Waste oil burners, less than 0.4MW net rated thermal input **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A18SE (N)	505	5	525081 186351
7	**Local Authority Pollution Prevention and Controls** Name: The London Dry Cleaning Company Location: 519a Finchley Road, London, Nw3 7bb Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC51 Dated: 1st March 2008 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	556	4	525432 185511
7	**Local Authority Pollution Prevention and Controls** Name: Cottontail Cleaners Location: 509 Finchley Road, London, Nw3 7bb Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC48 Dated: 1st January 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	A9NW (SE)	590	4	525454 185484
7	**Local Authority Pollution Prevention and Controls** Name: Cottontail Cleaners Location: 509 Finchley Road, London, Nw3 7bb Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC19 Dated: 5th February 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A9NW (SE)	591	4	525456 185484
8	**Local Authority Pollution Prevention and Controls** Name: D & T Dry Cleaners Location: 336 Cricklewood Lane, London, NW2 2QH Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPCDC020 Dated: 25th April 2006 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Manually positioned to the address or location	A18SW (N)	566	5	524908 186421
9	**Local Authority Pollution Prevention and Controls** Name: Crystalline Dry Cleaners Location: 450 Finchley Road, London, Nw2 2hy Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPCDC036 Dated: 24th August 2006 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status:** **Permitted** Positional Accuracy: Located by supplier to within 10m	A18SE (N)	567	5	525072 186416

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
10	**Local Authority Pollution Prevention and Controls** Name: Cotton Club Dry Cleaners Location: 57 Mill Lane, London, Nw6 1nb Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC19 Dated: 5th February 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A8NE (S)	605	4	525119 185231
11	**Local Authority Pollution Prevention and Controls** Name: Castle Service Station Location: 713 Finchley Road, LONDON, NW11 8DH Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPC31 Dated: 13th January 1999 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status: Authorisation revokedRevoked** Positional Accuracy: Manually positioned to the address or location	A18SE (N)	617	5	525037 186471
12	**Local Authority Pollution Prevention and Controls** Name: Savoy Dry Cleaners Location: 164 Cricklewood Lane, London, Nw2 2dx Authority: London Borough of Barnet, Environmental Health Department Permit Reference: PPCDC073 Dated: 26th October 2006 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A12NE (NW)	683	5	524341 186125
13	**Local Authority Pollution Prevention and Controls** Name: Sparkle Dry Cleaning Location: 329 West End Lane, London, Nw6 1rs Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC34 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	A9NW (SE)	741	4	525385 185205
14	**Local Authority Pollution Prevention and Controls** Name: Shamrock Express Cleaners Location: 210 West End Lane, London, Nw6 1uu Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC33 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A9SW (SE)	945	4	525517 185048
15	**Local Authority Pollution Prevention and Controls** Name: Sectorsure Ltd Location: 17-27 Cricklewood Broadway, LONDON, London, NW2 3JX Authority: London Borough of Brent, Environmental Health Department Permit Reference: PS/07883-03/v.2 Dated: 14th August 2000 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A7NW (SW)	987	6	524127 185283
15	**Local Authority Pollution Prevention and Controls** Name: Nobleclean Dry Cleaners Location: 39 Cricklewood Broadway, London, Nw2 3jx Authority: London Borough of Brent, Environmental Health Department Permit Reference: DC/06/14174/v.2 Dated: 12th June 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Authorisation revokedRevoked** Positional Accuracy: Manually positioned to the address or location	A7NW (SW)	996	6	524094 185319

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
16	**Local Authority Pollution Prevention and Control Enforcements** Location: 394 Finchley Road, Hampstead, London, Nw2 2hr Type: Air Pollution Control Enforcement Notice Reference: PPCDC031 Date Issued: 7th November 2008 Enforcement Date: Not Supplied Details: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	403	5	525083 186245
	Nearest Surface Water Feature	A12SE (W)	626	-	524369 185598
17	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Hendon Way, CRICKLEWOOD Authority: Environment Agency, Thames Region Pollutant: Chemicals - Unknown Note: Confirmed As A Pollution Incident Incident Date: 5th May 1989 Incident Reference: N1890239 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A17SE (NW)	577	3	524600 186300
18	**Substantiated Pollution Incident Register** Authority: Environment Agency - Thames Region, North East Area Incident Date: 8th January 2005 Incident Reference: 286177 Water Impact: Category 4 - No Impact Air Impact: Category 2 - Significant Incident Land Impact: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 10m Pollutant: Contaminated Water: Firefighting Run-Off	A12NW (W)	976	3	524005 186051
	Groundwater Vulnerability Soil Classification: Not classified Map Sheet: Sheet 39 West London Scale: 1:100,000	A13SW (NE)	0	3	524968 185837
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13SW (NE)	0	2	524968 185837
	Superficial Aquifer Designations No Data Available				
	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
	Local Authority Landfill Coverage Name: London Borough of Camden - Has no landfill data to supply		0	8	524968 185837
	Local Authority Landfill Coverage Name: London Borough of Barnet - Has supplied landfill data		14	9	524949 185850
	Local Authority Landfill Coverage Name: London Borough of Brent - Has supplied landfill data		959	6	524231 185191

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: London Clay	A13SW (NE)	0	2	524968 185837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SW (NE)	0	2	524968 185837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13SE (E)	16	2	525000 185837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NE (E)	42	2	525027 185853
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NW (N)	142	2	524968 186000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NE (N)	145	2	525000 186000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A13NE (NE)	185	2	525094 186000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A14NW (NE)	521	2	525401 186163
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A8SW (S)	816	2	524968 185000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A8SE (S)	817	2	525000 185000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A14SE (E)	831	2	525814 185837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A12SW (W)	953	2	524000 185837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: London Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: no data Nickel Concentration: no data	A12NW (W)	970	2	524000 186000

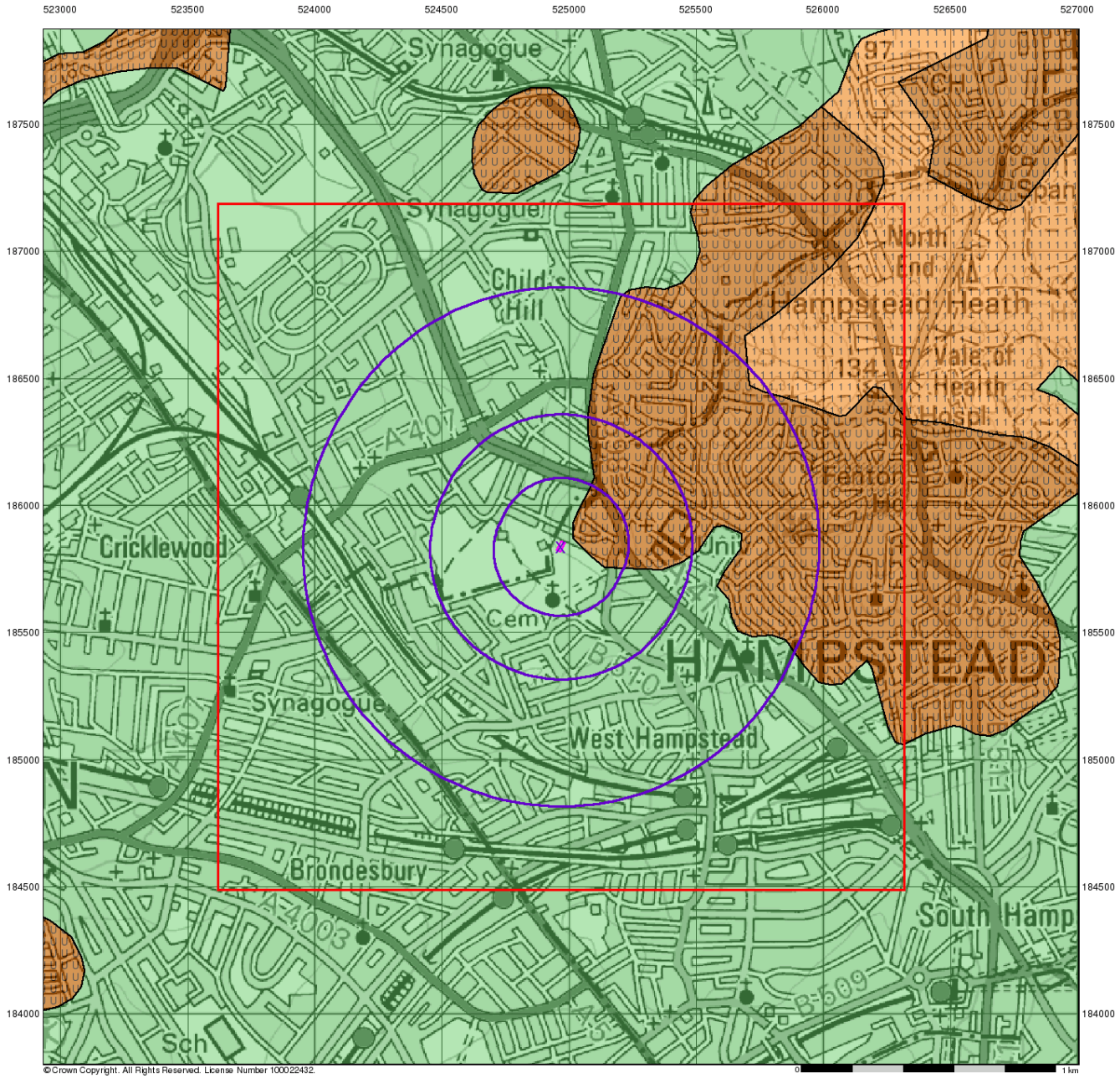
Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524773, 185748 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 27.00 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 104.00 mg/kg Lead Measured Concentration: 168.00 mg/kg Nickel Measured Concentration: 29.00 mg/kg	A13SW (SW)	195	2	524773 185748
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525369, 185647 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 22.00 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 96.00 mg/kg Lead Measured Concentration: 569.00 mg/kg Nickel Measured Concentration: 32.00 mg/kg	A14SW (SE)	436	2	525369 185647
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524757, 186356 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 33.00 mg/kg Cadmium Measured Concentration: 1.10 mg/kg Chromium Measured Concentration: 95.00 mg/kg Lead Measured Concentration: 731.00 mg/kg Nickel Measured Concentration: 47.00 mg/kg	A18SW (N)	542	2	524757 186356
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525393, 186257 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 12.00 mg/kg Cadmium Measured Concentration: 1.50 mg/kg Chromium Measured Concentration: 51.00 mg/kg Lead Measured Concentration: 269.00 mg/kg Nickel Measured Concentration: 21.00 mg/kg	A19SW (NE)	576	2	525393 186257
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524775, 185228 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 12.00 mg/kg Cadmium Measured Concentration: 0.80 mg/kg Chromium Measured Concentration: 59.00 mg/kg Lead Measured Concentration: 283.00 mg/kg Nickel Measured Concentration: 24.00 mg/kg	A8NW (S)	619	2	524775 185228

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524312, 185801 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 29.00 mg/kg Cadmium Measured Concentration: 1.00 mg/kg Chromium Measured Concentration: 60.00 mg/kg Lead Measured Concentration: 994.00 mg/kg Nickel Measured Concentration: 32.00 mg/kg	A12SE (W)	642	2	524312 185801
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525676, 185669 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 14.00 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 116.00 mg/kg Lead Measured Concentration: 247.00 mg/kg Nickel Measured Concentration: 23.00 mg/kg	A14SE (E)	716	2	525676 185669
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525300, 185159 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 15.00 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 67.00 mg/kg Lead Measured Concentration: 216.00 mg/kg Nickel Measured Concentration: 27.00 mg/kg	A8SE (SE)	737	2	525300 185159
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525663, 186188 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 16.00 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 157.00 mg/kg Lead Measured Concentration: 1131.00 mg/kg Nickel Measured Concentration: 23.00 mg/kg	A19SE (NE)	758	2	525663 186188
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524280, 186237 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 29.00 mg/kg Cadmium Measured Concentration: 1.10 mg/kg Chromium Measured Concentration: 114.00 mg/kg Lead Measured Concentration: 1081.00 mg/kg Nickel Measured Concentration: 39.00 mg/kg	A17SW (NW)	788	2	524280 186237

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524254, 185298 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 49.00 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 90.00 mg/kg Lead Measured Concentration: 1251.00 mg/kg Nickel Measured Concentration: 28.00 mg/kg	A7NW (SW)	874	2	524254 185298
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525271, 186726 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 17.00 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 184.00 mg/kg Lead Measured Concentration: 167.00 mg/kg Nickel Measured Concentration: 15.00 mg/kg	A18NE (N)	919	2	525271 186726
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 524719, 186750 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 38.00 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 106.00 mg/kg Lead Measured Concentration: 1096.00 mg/kg Nickel Measured Concentration: 55.00 mg/kg	A18NW (N)	927	2	524719 186750
	BGS Urban Soil Chemistry Averages Source: British Geological Survey, National Geoscience Information Service Sample Area: London Count Id: 7189 Arsenic Minimum Concentration: 1.00 mg/kg Arsenic Average Concentration: 17.00 mg/kg Arsenic Maximum Concentration: 161.00 mg/kg Cadmium Minimum Concentration: 0.30 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	A13SW (NE)	0	2	524968 185837

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	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	A13SW (NE)	0	2	524968 185837
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	206	2	525189 185828
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	42	2	525027 185853
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	16	2	525000 185837
	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	A13SW (NE)	0	2	524968 185837
	Radon Potential - Radon Affected Areas Affected Area: The property is in a lower probability radon area, as less than 1% of homes are above the action level Source: British Geological Survey, National Geoscience Information Service	A13SW (NE)	0	2	524968 185837

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
19	**Contemporary Trade Directory Entries** Name: Hampstead Cleaning Services Location: Flat 15, Durrisdeer House, Lyndale, London, NW2 2PA Classification: Cleaning Services - Domestic **Status: Active** Positional Accuracy: Automatically positioned to the address	A13NW (N)	136	-	524930 185988
20	**Contemporary Trade Directory Entries** Name: Esso Service Station Location: 617, Finchley Road, London, NW3 7BS Classification: Petrol Filling Stations **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	183	-	525052 186022
20	**Contemporary Trade Directory Entries** Name: Tower Service Station Location: 617, Finchley Road, London, NW3 7BS Classification: Petrol Filling Stations - 24 Hour **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	183	-	525052 186022
21	**Contemporary Trade Directory Entries** Name: Plastic Sandwich Location: 69, Fortune Green Road, London, NW6 1DR Classification: Bookbinding & Equipment **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	195	-	525119 185695
21	**Contemporary Trade Directory Entries** Name: Texaco Location: 63-65, Fortune Green Road, London, NW6 1DR Classification: Petrol Filling Stations - 24 Hour **Status: Inactive** Positional Accuracy: Automatically positioned in the proximity of the address	A13SE (SE)	227	-	525119 185648
21	**Contemporary Trade Directory Entries** Name: Star Service Stations Location: 63-65, Fortune Green Road, London, NW6 1DR Classification: Petrol Filling Stations **Status: Inactive** Positional Accuracy: Automatically positioned in the proximity of the address	A13SE (SE)	227	-	525119 185648
22	**Contemporary Trade Directory Entries** Name: 24 Hour Euro Windscreen Ltd Location: 571, Finchley Road, London, NW3 7BN Classification: Garage Services **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A13SE (E)	198	-	525173 185793
22	**Contemporary Trade Directory Entries** Name: Buzy Cleaning Location: 571, Finchley Road, London, NW3 7BN Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	199	-	525173 185793
23	**Contemporary Trade Directory Entries** Name: Hampstead Dry Cleaners Location: 57, Fortune Green Road, London, NW6 1DR Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	260	-	525105 185596
23	**Contemporary Trade Directory Entries** Name: Green & White Ltd Location: 112, Fortune Green Road, London, NW6 1DH Classification: Vacuum Cleaners, Industrial & Commercial - Repairs & Servicing **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	276	-	525137 185599
24	**Contemporary Trade Directory Entries** Name: Max Furnishing & Appliances Ltd Location: 86, Fortune Green Road, London, NW6 1DS Classification: Domestic Appliances - Servicing, Repairs & Parts **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	340	-	525123 185515
25	**Contemporary Trade Directory Entries** Name: V & V Chauffeur Cars Location: Flat 2, 384, Finchley Road, London, NW2 2HP Classification: Car Engine Tuning & Diagnostic Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A18SE (N)	364	-	525089 186202



GEA Geotechnical & Environmental Associates

Groundwater Vulnerability

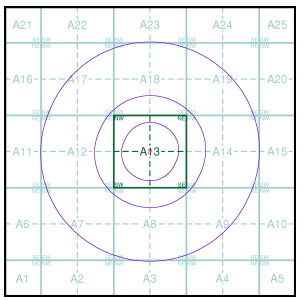
General

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



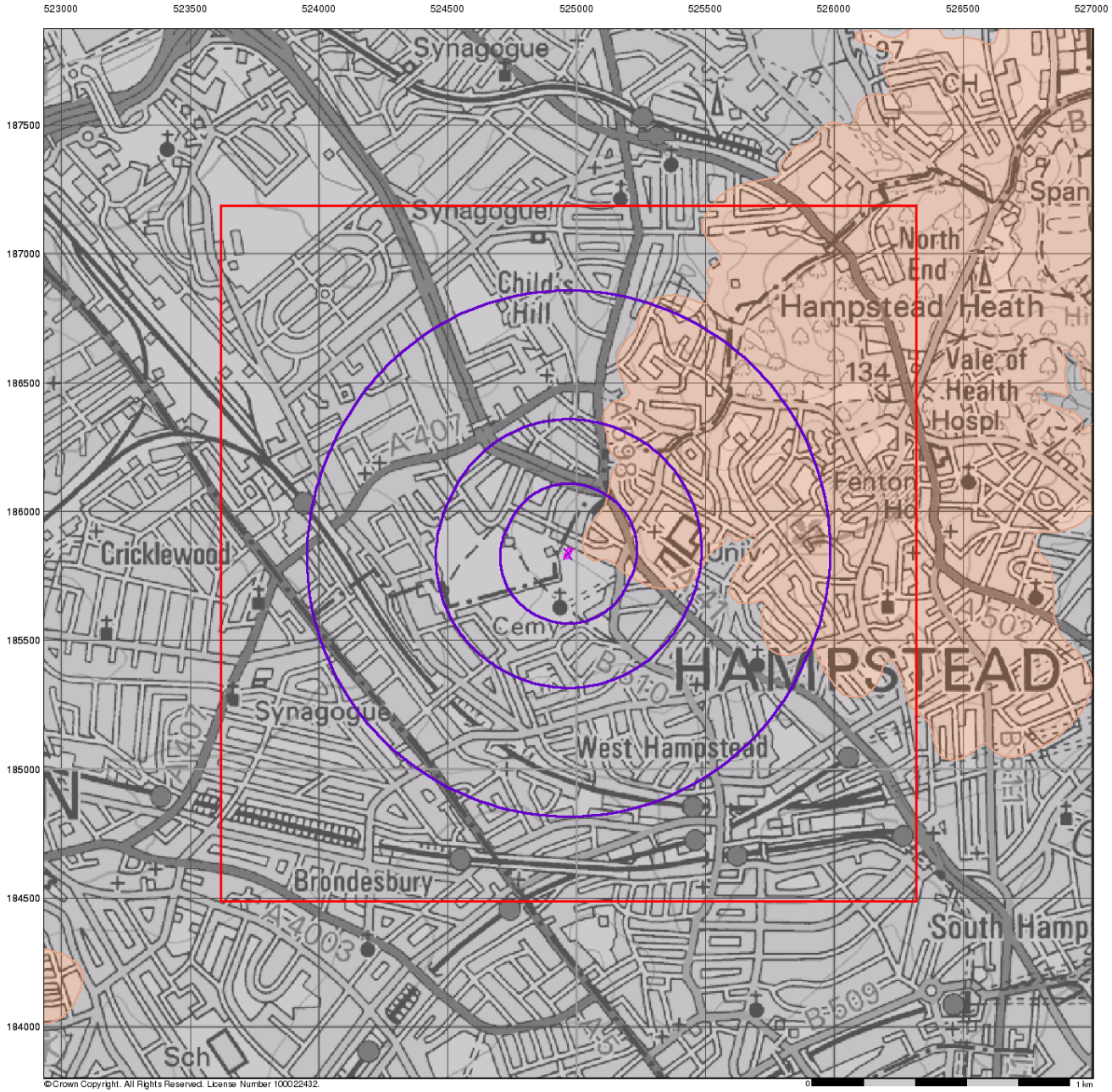
Order Details

Order Number:	65835565_1_1
Customer Ref:	J15086
National Grid Reference:	524970, 185840
Slice:	A
Site Area (Ha):	0.07
Search Buffer (m):	1000

Site Details

15 Ranulf Road, LONDON, NW2 2BT

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



GEA Geotechnical & Environmental Associates

Bedrock Aquifer Designation

General

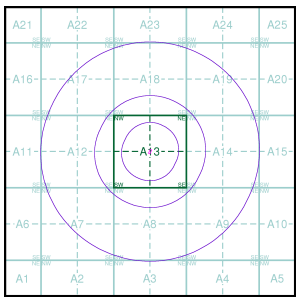
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Site Sensitivity Context Map - Slice A



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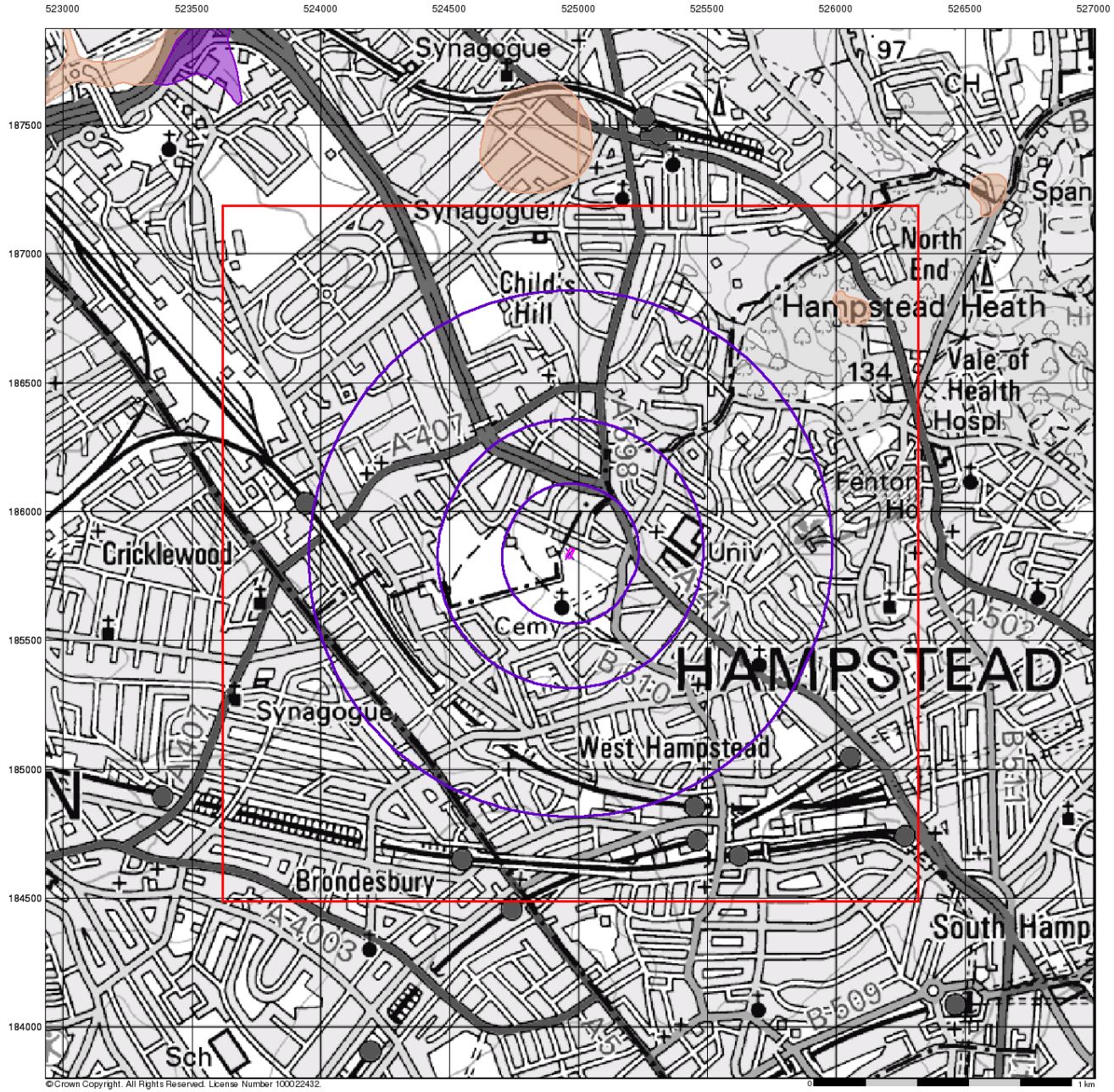


GEA Geotechnical & Environmental Associates

Superficial Aquifer Designation

General

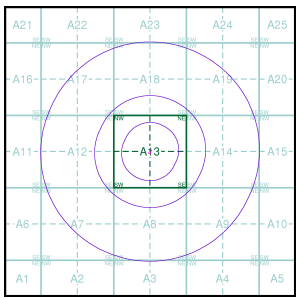
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Site Sensitivity Context Map - Slice A



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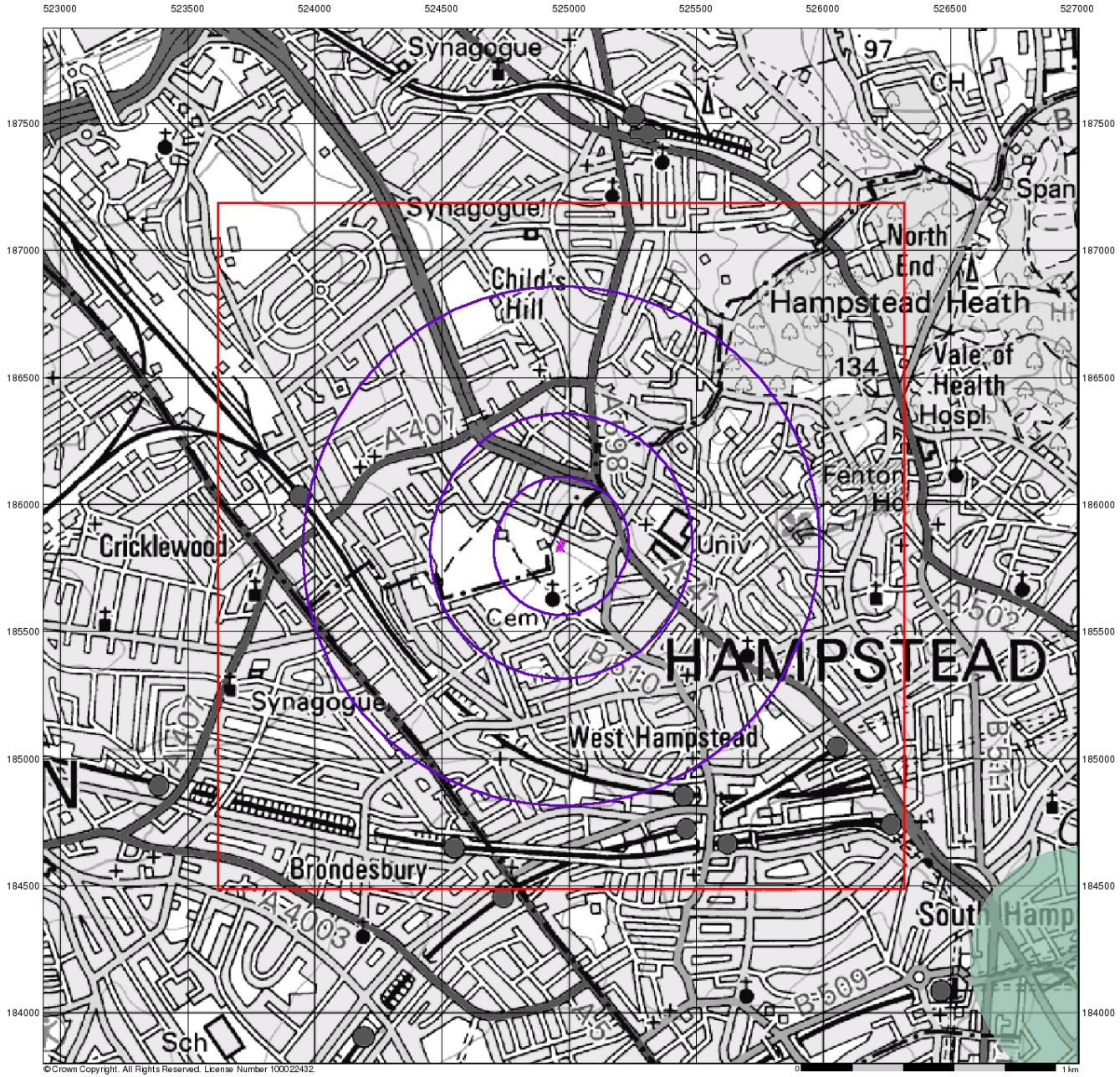


GEA Geotechnical & Environmental Associates

Source Protection Zones

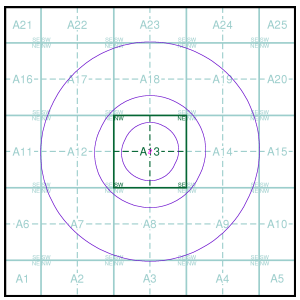
General

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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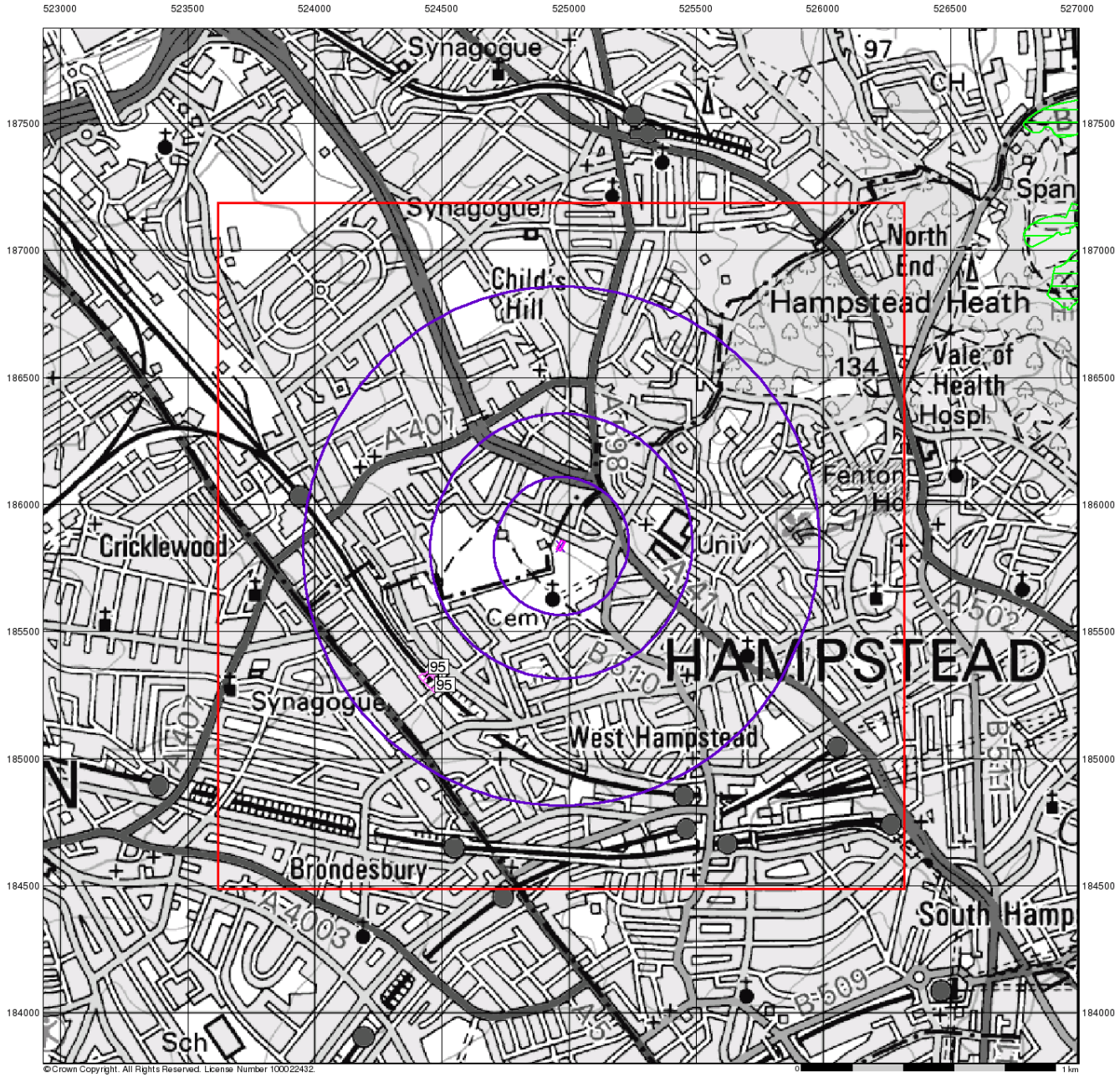


GEA Geotechnical & Environmental Associates

Sensitive Land Uses

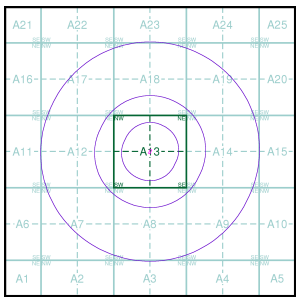
General

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

Sensitive Land Uses

- 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

Site Sensitivity Context Map - Slice A



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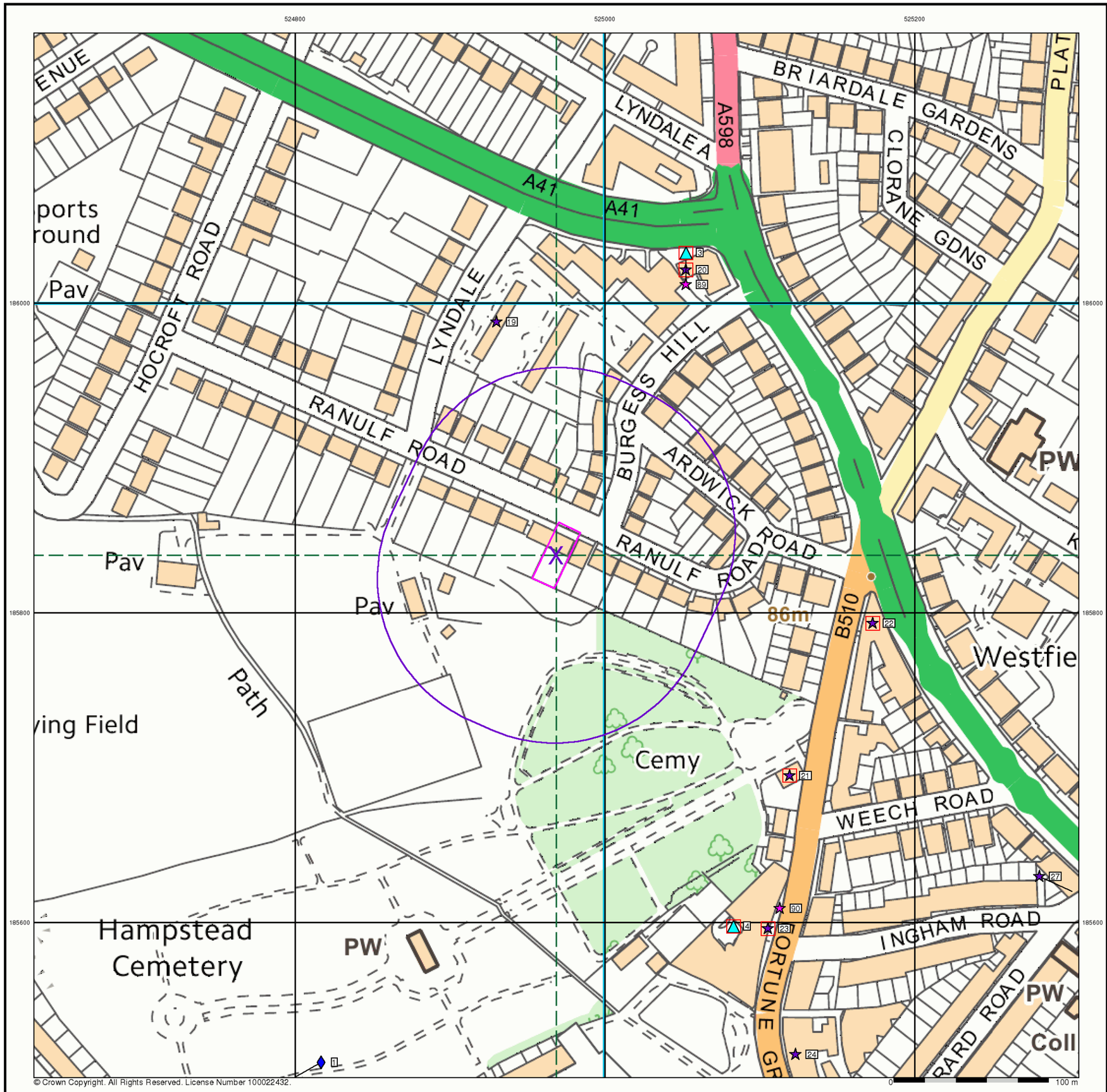


GEA Geotechnical & Environmental Associates

General

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

Agency and Hydrological

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

Waste

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

Geological

- BGS Recorded Mineral Site

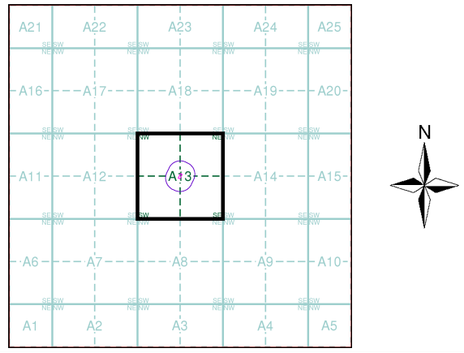
Hazardous Substances

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

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

Site Sensitivity Map - Segment A13



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[redacted]

General

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- Several of Type at Location

Agency and Hydrological

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- Integrated Pollution Prevention Control
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- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

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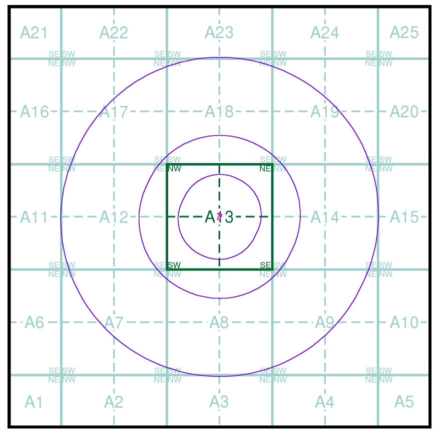
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Slice A



N

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