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SITE INVESTIGATION REPORT

ASHTON COURT
CAMDEN MEWS
LONDON NW1

Report Reference C14038

On behalf of:-

Rydon Maintenance Limited
c/o Calfordseaden LLP
St. John's House
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Orpington
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BR6 0JX

January 2017

RYDON MAINTENANCE LIMITED

CALFORDSEADEN LLP

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FOR

PROPOSED RESIDENTIAL DEVELOPMENT

AT

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INTRODUCTION

The client, Rydon Maintenance Limited, proposes to replace a part single-storey and part two-storey building at Ashton Court, between Camden Road and Camden Mews in London NW1. A communal hall and five mews houses which will have basements are proposed. The proposed building loads were not known at the time of report writing.

Ground Engineering Limited was commissioned by the client, under the direction of project managers Calfordseaden LLP, to carry out a site investigation to determine the nature and geotechnical properties of the underlying soils, and provide information for the design and construction of the foundations. A desk study checking past uses and a contamination assessment were also included within the scope of this report.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

Location/Description

The site is located at Ashton Court, Camden Road (A503), London NW1. Ashton Court is bounded by Camden Road to the north-west, Camden Park Road (A5200) to the north-east, and Camden Mews to the south-east. The area of the proposed redevelopment is the southern part of the site fronting Camden Mews and the south-eastern part fronting Camden Park Road. The National Grid Reference for the centre of the site is TQ 2974 8482 and its location is shown on a plan following this report text.

At the time of the investigation in December 2016 the southern part of the site fronting Camden Mews contained a two-storey care home building, with partial under-croft parking. A single-storey Common Room for the care home with paved area fronted Camden Park Road to the east, and a three-storey care home block fronted Camden Road to the north-west. The site of the proposed redevelopment was approximately 29m wide fronting Camden Mews, and extended north-west by approximately 25m along the south-west side of Camden Park Road. An under-croft car park was present fronting Camden Mews south-east of the site, which had a security gate to the rear, leading to an enclosed garden which contained a lawn, decked area, trees and shrubs.

An approximately 12m high Ash tree and a 10m high Cherry tree were present in the garden, approximately 4m and 11m to the north of the proposed mews houses. An approximately 12m high London Plane tree was present in the paved area fronting Camden Park Road pavement, which was approximately 4m north of the proposed mews houses.

Topography

This part of Camden stands at about 45mOD, on ground sloping down gently to the west.

Geology

The geological map, London sheet V NW (1935) at 1:10,560 scale, shows the site to be underlain by solid geology London Clay. Approximately 10m east of the site superficial Boyn Hill Gravel is shown covering the London Clay.

This map also depicts the concealed headwater stream of Fleet 'Brook', 900m to the south-west, which flows south-eastwards.

The more recent geological map, sheet 256 (2006) at 1:50,000 scale, shows the site directly underlain by the solid geology of the London Clay Formation.

A previous investigation in 2015 by Ground Engineering Limited on this site found made ground to 1.50m depth, covering the expected London Clay. No water was met during boring or on completion of the borehole. A 7m deep standpipe installed in the borehole subsequently yielded water levels at 5.23m depth, rising to 2.37m depth. The previous borehole record (WS1) and laboratory test results are presented in Appendix 3.

A well record on the 1935 geological map, 500m south-west of the site and at a lower elevation than the site, details a 45m thickness of London Clay, overlying Reading Beds (Lambeth Group) to 69m below ground level.

Hydrogeology

The site is designated by the Environment Agency (EA) as being underlain by the Unproductive stratum of the London Clay. Based on the topography of the local site area the direction of near surface groundwater and surface water flow would locally be from east to west.

Well records on the 1935 geological map indicate that the practically impervious Unproductive stratum of the London Clay is about 45m thick beneath this part of London and that the underlying Principal Aquifer of the White Chalk Subgroup lies about 75m below ground level, about -30mOD.

HISTORY OF THE SITE

Research into the site history involved reference to historical Ordnance Survey (OS) maps, photographs and information obtained from the internet. The map extracts studied are presented in the desk study map section, Appendix 1, and are described below. Distances are approximate.

OS Map Extract	*Description*
1827 Greenwood (Not presented)	The site is undeveloped within a field on the southern side of the 'Mary Le Bone to Holloway' road.
1862 Stanford's Library Map of London and its Suburbs Not to scale **Figure A**	Two houses are present on the site, fronting Camden Road to the north-west. Camden Park Road has been constructed adjacent the north-east of the site.
1873 Town Plan Scale 1:1056 **Figure B**	There were two large detached houses in the northern part of the site fronting Camden Road. The central and southern parts of the site comprised landscaped gardens to the rear of the houses, bounded by Camden Park Road to the east, Camden Mews to the south, and a house and garden to the west. The area around the site was generally residential, with a public house 35m south-east and a chapel 65m south-east.
1873-82 Middlesex sheets 12 & 17 Scale 1:10,560 **Figure C**	The site and immediate surrounding area appear unchanged. A reservoir is shown 90m east of the site.
1879 London sheet 16 Scale 1:2500 **Figure D**	The site and immediate surrounding area appear unchanged.
1896 Town Plan Scale 1:1056 **Figure E**	The northernmost house has a glass covered conservatory to the rear. The neighbouring property adjacent the west of the site has a fountain in the rear garden.
1916 London sheet 5.1 Scale 1:2500 **Figure F**	Mews buildings are shown in the southernmost part of the site fronting Camden Mews.

OS Map Extract	*Description*
1939-45 London County Council Bomb Damage Map Not to scale **Figure G**	The houses on the site are coloured yellow, indicating minor blast damage. An area 110m north of the site is shaded light green, indicating a clearance area. Approximately 180m north-east of the site buildings are coloured purple, denoting damaged beyond repair. The reservoir to the east of the site has been infilled and the site developed with flats.
1940s Aerial Photograph Not to scale **Figure H**	The site area appears unchanged with houses and gardens, and trees evident on the site. Areas have been cleared 110m north and 180m north-east of the site following bomb damage during the Second World War.
1952 Sheets TQ2984 & TQ2985 Scale 1:2500 **Figure I**	The site area appears generally unchanged, however the boundary line between the two properties is not shown. A warehouse and hall are shown at site of the former chapel 65m south-east. A printing works is shown 90m north of the site.
1955-60 Sheet TQ2984NE Scale 1:1250 **Figure J**	The site is named Camden Road Day Nursery. Houses on the north side of Camden Road have been demolished and area has been redeveloped with a school. An area of earthworks is shown 50m north of the site at the school, presumably to create a level playground.
1967-68 Sheets TQ2984 & TQ2985 Scale 1:2500 **Figure K**	The site area appears unchanged. The school to the north-west of the site has been extended and now has tennis courts.
1971-75 Sheets TQ28SE & TQ38SW Scale 1:10,000 **Figure L**	The two buildings have been cleared from the northern part of the site. The mews houses remain in the southernmost part of the site.
1975-80 Sheet TQ2984NE Scale 1:1250 **Figure M**	The site area appears unchanged. The site of two houses 30m to the south-west has been redeveloped with a block of flats. A builder's yard is shown 70m north-east of the site.
1982 Sheets TQ2984NE & TQ2985SE Scale 1:1250 **Figure N**	The mews houses in the southern part of the site have been cleared, and the site has been redeveloped with a 'U' shaped group of buildings with an under-croft in the southern part. New houses have been built along Camden Mews 20m north-east and 30m south of the site.
1991-92 Sheets TQ2984NE & TQ2985SE Scale 1:1250 **Figure O**	The site area appears unchanged. New mews houses are shown 100m south of the site.
2002 Raster Map Scale 1:10,000 **Figure P**	The site and immediate surrounding area appear unchanged.

OS Map Extract	*Description*
2014 Sheets TQ28SE & TQ38SW Scale 1:10,000 **Figure Q**	The site area appears unchanged. The site of the school on the northern side of Camden Road has been redeveloped with flats.
2015 **GroundSure** **Aerial Photograph of Site (Appendix 2)**	The buildings are shown on the site, with trees in the central garden area and fronting Camden Park Road to the north. New houses are evident adjacent the south of the site fronting Camden Mews.
2016 Sheet TQ2984 Not to Scale **Figure R**	The site area is unchanged. A row of residents' garages has been demolished 30m east of the site. The former warehouses 65m to the south-east of the site are denoted as Church Studios.

Summary of Historical Information

The map of 1862 showed the site was developed with two large houses and landscaped gardens. Mews houses were built in the southern part of the site by 1916. The site was denoted as a Day Nursery in the 1950s, which was cleared sometime between 1968 and 1973. New buildings were built by 1982, which remain to the present day (January 2017).

The area around the site was generally residential. A public house was present 30m south-east, and a chapel 65m south-east of the site. The chapel was subsequently used as warehouses and more recently as Church Studios. A school was built on the northern side of Camden Road in the 1950s, the site of which had been redeveloped as flats by 2010. A reservoir was present 90m east of the site, which had been infilled and the area redeveloped with flats between 1920 and 1938. A printing works was shown 90m to the north of the site in the 1950s.

SUMMARY OF ENVIRONMENTAL DATA

Appendix 2 contains information derived from Environmental Databases for a radius of up to 2,000m from the site. The information covers datasets held by Groundsure with contributors including the local authority, the Environment Agency (EA), British Geological Survey, Ordnance Survey and the Coal Authority and the results, within a radius of 250m, are summarised below:

1. Historical Industrial Sites	**On-Site**	**0 - 250m**
Potentially Contaminative Uses (1:10,000 mapping)	0	10
Historical Tank Database	0	1
Historical Energy Features Database	0	20
Historical Petrol & Fuel Site Database	0	0
Historical Garage & Motor Vehicle Repair Database	0	3
Potentially Infilled Land	0	7
2. Environmental Permits, Incidents and Registers	**On-Site**	**0 - 250m**
Sites Holding Environmental Permits/Authorisations	0	5
Records of COMAH and NIHHS Sites	0	0
Environment Agency Recorded Pollution Incidents	0	0
Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0
3. Landfill and Other Waste Sites	**On-Site**	**0 - 250m**
Landfill Sites	0	0
Landfill and Other Waste Sites	0	0
4. Current Land Use	**On-Site**	**0 - 250m**
Current Industrial Sites Data	0	12
Records of Petrol and Fuel Sites	0	1
Underground High Pressure Oil and Gas Pipelines	0	1
5. Geology		
Artificial Ground or Made Ground records	No	
Superficial Ground and Drift Geology records	No	
6. Hydrogeology and Hydrology	**On-Site**	**0 - 250m**
Productive strata within superficial geology	No	
Productive strata within solid geology	No	
Groundwater Abstraction Licences	0	0
Surface Water Abstraction Licences	0	0
Potable Water Abstraction Licences	0	0
Source Protection Zones	0	0
River Quality Data	No	No
Detailed River Network Entries	0	0
Surface Water Features	No	No

7. Flooding	
Environment Agency indicative Zone 2 floodplains within 250m of site	No
Environment Agency indicative Zone 3 floodplains within 250m of site	No
Risk of flooding from rivers & the sea (RoFRaS) rating	Very Low
Flood defences within 250m of site	No
Any areas benefitting from flood defences within 250m of site	No
Flood storage areas within 250m of site	No
Maximum BGS groundwater flooding susceptibility within 50m of site	Not prone
BGS confidence rating for groundwater susceptibility areas	Not applicable

8. Designated Environmentally Sensitive Sites	On Site	0 - 250m
Environmentally sensitive sites (Nitrate Vulnerable Zones)	0	0

9. Natural Hazards (on site)

Hazard	Negligible	Very Low	Low	Moderate	High
Shrinking or Swelling Clay	-	-	-	On-site	-
Landslides	-	On-site	-	-	-
Soluble rocks	On-site	-	-	-	-
Compressible Ground	On-site	-	-	-	-
Collapsible Rocks	-	On-site	-	-	-
Running Sand	On-site	-	-	-	-

9.2. Radon

The property is not in a Radon Affected Area, as less than 1% of properties are above the action level.
No Radon Protective Measures are required for new properties or extensions.

10. Mining	
Coal mining areas within 75m of site	No
Non coal-mining areas within 50m of site	No
Brine affected areas within 75m of study site	No

Database Summary

The potentially contaminative historical uses identified are for a railway station, associated sidings and tunnel 233m to the south-west. An unspecified tank was recorded 99m east of the site, beside the former reservoir. Electricity sub-stations are recorded around the site, the closest is 112m north. There are no historical petrol or fuel sites within 250m of the site. An historical garage and engineering works is recorded 237m south-west of the site. There are no areas of potentially infilled land on the site, the closest to the site is the reservoir 77m to the east and railway tunnel 245m south-west. Environmental permits are recorded for dry cleaners to the north and north-east, and for the unloading of petrol to the south-west. There are no pollution incidents recorded on, or within 250m of the site. There are no registered or historic landfills registered on, or within 250m of the site. Current industrial sites within 250m of the site include the office of Nuco Ltd. (recycling services) 29m west, electricity sub-stations, a works 119m north, ABC self store Camden, shops, taxi firm, and petrol station 245m south-east.

No superficial deposits are indicated to cover the site. The site is underlain by the solid geology of the London Clay Formation, which is designated by the EA as an 'Unproductive' stratum. There are no groundwater abstractions on or within 250m of the site. There are no river network entries, or surface water features, on or within 250m of the site. The site is not within a Zone 2 or Zone 3 floodplain. The site has a 'very low' risk of flooding by rivers and the sea (RoFRaS) rating.

The site is assessed as having a 'moderate' hazard from shrinking or swelling clay; and a 'very low' hazard from landslides and collapsible rocks. The site is assessed as having a 'negligible' hazard from soluble rocks, running sand and compressible ground. The site is not within designated environmentally sensitive areas. The site is not within an identified coal mining area, non-coal mining or brine affected area. No radon protection measures are required for new residential properties or extensions.

PRELIMINARY RISK ASSESSMENT

Potential sources of contamination present on or beneath the site would relate primarily to; the historical use of the site; the presence of contaminated soil; and the potential presence of hazardous or ground gas beneath the site.

In order to assess the risks associated with the presence of ground contamination, the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that;

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused.*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source – pathway – target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets.

Contaminants or ***potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed overleaf in Table 1.

Table 1: Identified Potential Contaminant Sources

Contaminant Source	*Comments*
Drainage/buildings	Effluent from leaking drains would provide a contaminant source. The buildings may contain asbestos.
Soil Beneath Site	Contamination may be present within any made ground materials on the site.
Soil Gas	Potential soil gas generated from made ground or underlying geology.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

Human Receptor-Mechanism	*Typical Exposure Pathway*
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -produce grown on contaminated soil Ingesting dust or soil on vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

Receptor-Water Environment	*Typical Exposure Pathway*
Groundwater The solid geology London Clay is indicated by the EA to be an 'Unproductive' stratum. The site is not within any Source Protection Zones.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water/Watercourses There are no surface water features or watercourses within 250m of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life.

Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model is presented below in Table 4.

Table 4: Preliminary Conceptual Model Relative to Proposed Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage/ Buildings	**Soil Beneath Site**	**Soil Gas**	**Ground Contamination Outside Site Boundary**
Human Health – ground or construction workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Likely	Low likelihood	Low likelihood	Low likelihood
Human Health – end users	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Unlikely	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or surrounding groundwater	Low likelihood	Low likelihood	Unlikely	Unlikely
Flora	Vegetation on site growing on contaminated soil	Low likelihood	Low likelihood	Low likelihood	Unlikely
Building Materials	Contact with contaminated soil	Low likelihood	Low likelihood	Low likelihood	Low likelihood

Key to Table 4 **Estimated Potential for Linkage with Contaminant Source**	**Definition**
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.
N/A	Not Applicable.

SITE WORK

The site work conducted on 20th December 2016 comprised a window sampled borehole (WSA) and a hand auger (HA1). The positions are shown on the exploratory hole location plan following this report text, together with that of the previous borehole position (WS1).

Public utility service drawings were sourced and consulted prior to determining the exploratory hole positions. Prior to excavation, a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests, and the groundwater conditions observed during and on completion of boring, and subsequent monitoring of the standpipes.

Window Sampled Borehole

The window sampled borehole, WSA, was sunk to a depth of 10.00m where it was completed. Prior to the start of boring, an inspection pit was dug to 1.20m below ground level using hand tools to ensure the absence of buried services.

Representative small disturbed samples of soil were taken from the starter pit at regular intervals throughout its depth. Samples of made ground were taken within polycarbonate pots and amber glass jars pending possible contamination testing.

The borehole was formed by a small track mounted window sampling and super heavy dynamic probing rig. The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrel was initially of 87mm internal diameter and was reduced in diameter with successive barrels with increasing depth. Upon extraction, a continuous 'undisturbed' profile of the soil was obtained within the plastic liners.

On completion of borehole WSA, a gas and groundwater monitoring standpipe was installed to a depth of 7.00m. The pipe was perforated to within 1.00m of ground level and the annulus backfilled with pea gravel. A bentonite seal was placed from ground surface to 1.00m depth and a gas tap fitted. A protective stopcock cover was concreted in place at ground level above the installation.

Hand Auger

The hand auger borehole, HA1, was sunk to a depth of 1.20m below ground level.

The exposed strata were logged and sampled by a Geo-environmental Engineer and samples collected for subsequent laboratory testing.

Representative small disturbed samples of soil were taken from the borehole at regular intervals throughout its depth. Samples of made ground were taken within polycarbonate pots and amber glass jars pending possible contamination testing.

On completion the exploratory hole was backfilled with arisings.

Gas and Groundwater Monitoring Visits

As part of this investigation two return visits were made to site on 3rd and 12th January 2017, when the standpipes installed within boreholes WS1 and WSA were monitored for a standing groundwater level and for landfill type gases using a Gasdata GFM430 analyser. The results of the monitoring visits are presented following the exploratory hole records.

LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the borehole records. The soil descriptions have been made in accordance with BS5930:2015. The geotechnical test results, undertaken in accordance with BS1377:1990, are presented following the exploratory hole records. The chemical test results follow the geotechnical test results.

The plastic liners were subsequently split by a geotechnical engineer who sub-sampled them, with the remaining samples re-sealed within the plastic liners.

The moisture content of selected samples were determined. The moisture content results have been plotted against depth in Figure 1, together with the results from WS1.

The index properties of a selected soil sample was determined as a guide to soil classification and behaviour. The liquid limit was determined by a cone penetrometer.

An immediate assessment of the apparent shear strength of clay was made within the liners using a hand shear vane, the average of three readings for each test depth have been recorded and presented on the borehole record in kilopascals (kPa), up to a maximum 130kPa. The apparent cohesion results have been plotted against depth in Figure 2.

Test specimens were prepared at full diameter from selected undisturbed samples. Immediate undrained triaxial compression tests were performed under single-stage confining cell pressures. The apparent cohesion results have been plotted against depth with the hand shear vane results in Figure 2, together with the results from WS1. The moisture content and bulk density of each specimen was also determined.

An indication of the swelling characteristics of a selected undisturbed sample was obtained from a test in the consolidation apparatus or oedometer. The test was performed on a sample approximately 19mm thick, contained in a steel ring. The sample was saturated and the swelling pressure balanced prior to applying a constant load with drainage allowed at both ends. When primary compression was complete, the load was increased and this repeated for three increments of load. The sample was then unloaded in two equal stages. The rate and total amount of consolidation were continually monitored using a computer controlled E.L.E. Datasystem 7 Unit. The results were plotted and analysed by the computer for each increment of load to obtain the coefficients of compressibility (m_v), and of consolidation (c_v), which govern the amount and rate of settlement respectively.

Selected samples of soil and groundwater were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

Chemical analysis of two soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'.

GROUND CONDITIONS

The ground conditions encountered comprised made ground to depths of between 1.00m and 1.50m, which locally (WSA) rested on a superficial Head Deposit, covering the expected solid geology London Clay. The London Clay was found to at least the base of the deepest boreholes at 10.00m depth.

Made Ground

Made ground was encountered to depths of between 1.00m and 1.50m.

From surface, yellow brown and brown, gravelly sand fill, varying to slightly silty sand and gravel fill, was encountered to depths of between 0.50m and 1.00m. The gravel fraction comprised angular and sub-angular flint, limestone, brick, mortar, concrete, glass, metal nail, tile and wood fragments.

Beneath the gravelly sand fill in WS1 at 0.50m depth, very stiff, dark brown and grey, sandy, gravelly clay fill, was encountered to a depth of 1.10m. From 1.10m to 1.50m depth (WS1), and 0.70m to 1.00m depth (HA1), firm, brown and dark brown, slightly sandy, slightly gravelly clay fill was encountered. The gravel fraction comprised very angular to sub-rounded flint, chalk, shells, ash, brick, concrete and asphalt fragments.

Head Deposit

Underlying the made ground at 1.00m to 1.35m depth in WSA, a superficial Head Deposit comprising stiff, brown and orange brown, slightly gravelly clay was encountered. The gravel fraction comprised angular to rounded flint and quartzite.

London Clay Formation

Underlying the made ground, and Head Deposit where present, at between 1.00m and 1.50m depth, the anticipated London Clay Formation was encountered.

The London Clay initially comprised firm or stiff, closely fissured, brown, orange brown and grey, clay to 7.00m below which the fissured clay was dark brown and grey. Selenite crystals were noted within the London Clay below about 3.50m depth. The London Clay Formation was encountered to at least the base of the boreholes at 10.00m depth.

Roots

Live roots were previously observed to a depth of 4.00m in WS1, which was bored close to the Ash tree in the southern part of the site. Live roots were also observed in WSA and HA1 to a maximum depth of 0.90m.

Groundwater

All of the boreholes were dry during boring and on completion. During monitoring of the standpipe installed in WS1 on 3rd February 2015, water was recorded at 5.23m below ground level, and was at 2.37m depth on the 29th April 2015. Monitoring of the standpipes installed in WS1 and WSA, during January 2017, recorded water levels of 2.51m and 2.50m in WS1, with borehole WSA dry.

Evidence of Contamination

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of hydrocarbon contamination. The made ground was noted to contain brick, mortar, concrete, glass, ash, asphalt, metal nail, tile and wood fragments. No asbestos containing materials were observed in any of the samples.

COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

The investigation confirmed the site to be underlain by made ground, locally resting on Head Deposit in turn covering the solid geology London Clay. The made ground soils had variable bearing properties and were found to a maximum depth of 1.50m. The made ground should be avoided as a bearing stratum and would be penetrated by any proposed basement structure. The proposed building loads and foundation levels were not known at the time of report writing. The underlying London Clay could offer adequate support for the proposed new foundations for the communal hall, and five mews houses which will have basements. Excavations to around 3.00m depth would be anticipated to encounter groundwater based on the findings of this investigation. The basement floor slab could be ground bearing, whilst the floor slab for the communal hall should be suspended.

Traditional Foundations

Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. By contrast, made ground whose history is not completely known, must, despite any amount of investigation, present the possibility of conditions existing which could not be accepted when considering the material as a bearing stratum.

The made ground initially comprised sand and gravel fill, covering layers of very stiff becoming firm, sandy, gravelly clay fill. The potential for variability within the made ground means that it should be avoided as a bearing stratum. In any case foundations for a basement would be extended through any made ground, which was found to extend locally to 1.50m depth.

A sample of the Head Deposit had a modified plasticity index of 46%, and a sample of the London Clay had a modified plasticity index of 56%, which indicate these clays have a high volume change potential based on NHBC Standards Chapter 4.2 'Building near trees'

(2016). Where no basement is constructed, on an open site, away from the influence of trees, a minimum foundation depth of 1.00m below current or proposed ground level, whichever is deeper, would be required within the naturally deposited clays, if present at such a depth, in order to be below the zone of seasonal volume change in accordance with the NHBC Standards.

The proposed buildings are within influencing distances of deciduous trees where clay soils are present, with an Ash tree in the garden, and London Plane tree noted in a paved area, approximately 4m north of the location of the proposed mews houses. There is also a Cherry tree in the garden on site 11m north of the proposed mews houses. Based on moderate water demand mature Ash and London Plane trees, at a distance of 4m from proposed foundations, minimum foundation depths would locally need to be 2.15m in these clay soils based on NHBC Standards, however excavations for any proposed basement structure will penetrate and remove any desiccated clays. Where no basement is proposed for the communal hall, for the adoption of the minimum foundation depth of 1.00m on this site in clay soils, foundations would need to be at least 18m from fully mature Ash trees and at least 20m from the fully mature London Plane. Within these distances, foundation depths will depend on the proximity of trees to new foundations and depths should be determined using the NHBC Standards.

Tree species within the site and along the site boundaries, and distances to the proposed buildings should be verified, before determining foundation depths based on NHBC Standards.

Some desiccation of the clay soils was noted in WS1, to approximately 2.60m depth (Figure 1), which was close to the existing Ash tree in the south of the site. Foundations should be taken at least 0.50m below the last vestiges of live roots in clay soils. Live roots were previously encountered to a maximum depth of 4.00m within WS1. Strip footings could be 'stepped' up along the length of wall runs where foundation depths vary due to the influence of trees, although stepped foundations are likely to suffer differential settlements. Steps should not exceed 0.50m and further guidance is provided in the aforementioned NHBC document.

In WS1, elevated swelling pressures of 101kN/m^2 at 2.90m depth and 107kN/m^2 at 3.90m depth also indicated the presence of desiccated clay, which gives an estimated heave of 25mm per 1.00m of desiccated clay. The swelling pressure in WSA at 1.90m depth was 46kPa, considered representative of equilibrium conditions at this depth. Potentially damaging swelling pressures could be generated following removal of nearby trees as any desiccated clay is allowed to become saturated. Incorporation of some void forming or compressible material against the sides of the foundations or basement walls, may also be required within the zones of influence of the existing trees in the shallow clay soils, especially where trees have been or are to be removed, in order to accommodate any vertical and horizontal movements caused by future heave of the clay.

Recommendations for foundation depths related to proposed tree planting are also provided in the NHBC Standards and the volume change potential should be considered for any proposed landscaping within a residential scheme on the site.

Bearing Capacity

The firm London Clay, where encountered at a depth of 1.00m has a net safe bearing capacity of 110kN/m^2 beneath a strip footing 0.60m wide, and 120kN/m^2 for a square pad foundation 1.20m by 1.20m in size. At 2.50m depth, the clay has a net safe bearing capacity of 185kN/m^2 based on strip foundations 0.60m wide, and 200kN/m^2 for a square pad foundation 1.20m by 1.20m in size. These bearing capacities incorporate a factor of safety of 3.0 against shear failure and should be sufficient to support the proposed buildings.

Basement Foundations

Foundations at estimated basement floor level (around 3.00m below ground level) would be within the London Clay and a basement raft foundation could be considered to support the building loads with a bearing pressure of 100kN/m^2 beneath a basement slab up to 8m wide. This does not consider any net effect of base heave or consolidation settlement. This bearing pressure incorporates a factor of safety of 3.0 against shear failure within the underlying clays.

A reinforced basement floor or basement raft could be cast on the excavated surface following proof rolling and careful inspection.

Piled Foundations

Alternatively piled foundations may be used to support the proposed mews houses, and may be incorporated into any basement construction. The underlying London Clay would provide a suitable pile bearing stratum. The advice of a specialist piling contractor should be sought with regard to suitable methods of pile installation. Installation of either single bored, CFA or interlocking sheet piles, contiguous bored or secant piles are likely to be best suited to these ground conditions. Vibrations from driven piles could be potentially damaging to neighbouring structures, particularly where they are supported by shallow footings.

Preliminary working loads for a single bored pile may be estimated for preliminary cost and design purposes using the pile bearing coefficients given below, which are based on the following assumptions;

1. The ultimate load on a pile would be the sum of the adhesion in clay, acting on the shaft of the pile together with the end bearing load.
2. The adhesion acting on the shaft of a pile is a function of the values of apparent cohesion within the clay, presented on the laboratory summary sheets and in Figure 2.
3. The end bearing load would be a function (9.0) of the average cohesion of the clay at the level of the pile base (Figure 2).
4. A factor of safety of at least 2.0 would be used to assess the working load and if test loading of selected piles were not practical, the factor of safety (F) would be increased to at least 2.5.

Item	Ultimate Pile Bearing Value (kN/m²)
Friction/adhesion in made ground	Ignored
Adhesion in London Clay within basement depth	Ignored
Adhesion in London Clay, 3.00m to 6.00m	50
Adhesion in London Clay, below 6.00m	60
End bearing in London Clay, 6.00m to 10.00m	1100

Based on these coefficients it is estimated that a single 300mm diameter bored pile installed to 6m depth within the London Clay, would have a working load of 85kN (F=2.5). Similarly, the same size pile extended to a depth of 9m within the London Clay would have a working load of 155kN (F=2.5).

Larger diameter piles would have increased working loads. For example, the same 6m and 9m length piles at 450mm diameter would have working loads of 155kN (F=2.5) and 255kN (F=2.5) respectively.

The final design of piles should be undertaken by a piling specialist.

Retaining Structures

The walls of the proposed basements will act as retaining walls and will need to be designed accordingly, together with allowance for potential swelling pressures in the upper clay soils. For a permanent retaining wall analysis effective stress parameters would be appropriate, however, in the absence of effective stress testing on samples from this site, published parameters and in-situ test results could be used as a conservative approach. The design of retaining walls may be based on the parameters in Table 5 below.

Table 5: Basement Retaining Walls

Soil Type	Bulk Density (Mg/m^3) γ_B	Angle of Shearing Resistance (degrees) ϕ'	Shear Strength (kPa) c_u	Effective Shear Strength (kPa) c'
Made Ground (Clay fill)	1.80	23	35	0
London Clay to 4.00m depth	2.00	23-26	80	0-2

Excavations/Groundwater

The excavation of the basement below existing ground floor level will require the construction of close support to its sides, the control of groundwater, and the need to avoid undermining adjacent structures.

The made ground together with the underlying soils should be easily removed within foundation excavations for the proposed development, although former foundations are likely to be more difficult to remove and require a breaker. The sides of excavations within the made ground soils are likely to be unstable and excavations should not be relied upon to stand unsupported.

Where basements are proposed, following the installation of either mass concrete walls, interlocking sheet piles, contiguous bored or secant piles, excavations for the basements should be fairly easily achieved within them in both made ground and stiff fissured clay alike, by means of modern mechanical plant. It should be noted that mass concrete lined excavations and some of the piled side support options would not be water tight.

In order to construct the basement beneath this site it will be necessary to provide permanent support to the adjacent structures, which are suspected to be based on relatively shallow strip foundations. This support will be provided by underpinning these structures prior to basement construction to prevent movement at the top of the retaining walls.

Such lateral movement would otherwise be accompanied by settlement of the ground behind the basement walls. As an example, Table 2.4 of CIRIA C580 (2003) indicates very small scale (<10mm) settlement at a distance of 0.50m from a wall to a 3m deep basement excavation in stiff clay. The use of a high support stiffness system (such as high propped walls and top down construction) to the basement excavation would prevent deflection of the proposed basement walls, resultant changes to the state of soil stress, and result in negligible structural movement of neighbouring structures.

The advice of specialist groundworks contractors with experience of constructing such basements should be sought, particularly in respect of other potential methods of providing support to the sides of the basement excavation.

The basement excavation should be inspected on completion to ensure that the condition of the soil complies with that assumed in design. Should pockets of inferior material be present, they should be removed and replaced with well graded hardcore or lean mix concrete. The excavated surface should be protected from deterioration and a blinding layer of concrete used where foundations are not completed without delay.

Groundwater levels in WS1 were previously recorded as high as 2.37m below ground floor level (April 2015), and more recently (January 2017) at 2.51m and 2.50m below ground level. The standpipe WSA, which was further west than WS1, was dry during boring, on completion, and during the monitoring period. It is recommended that the water level in the standpipes are rechecked nearer the proposed construction date. Based on the topography of the local site area the direction of near surface groundwater and surface water flow would locally be from east to west, and therefore the groundwater in WS1 is considered to be 'perched'.

With the recorded 'perched' water level above the proposed underpinning excavation depth on this site, dewatering will be necessary but could be significantly reduced by obtaining a cut off in the relatively impervious London Clay. Inflows of 'perched' water should be dealt with by careful pumping from sumps, screened in order to ensure that 'fines' are not removed. The near surface clays may be regarded as highly susceptible to 'loss of strength' if inundated, and so the control of groundwater and surface water run-off is important if the bearing properties of these strata are not to be compromised.

Potential flotation due to 'perched' groundwater on this site is considered unlikely to be a significant problem, but 5kN/m^2 to 10kN/m^2 of hydrostatic pressure should be taken into account during basement design.

With potential 'perched' water present above the floor level of the proposed basement, it will be considered necessary to waterproof the basement in order to prevent the ingress of water, including downward percolating surface water, into the completed structure. A drained cavity system could also be incorporated within the basement design.

Calculations based on the oedometer test results suggest that some theoretical base heave is possible. The basement excavation will result in the relief of approximately 60kPa of overburden pressure, and the resulting heave within the London Clay is calculated to be in the order of 45mm in the centre of the 8m wide and 3.00m deep unconfined excavation, reducing towards the edges of the excavation. Heave within the London Clay would begin to take place soon after excavation but would be confined by the basement floor once it had been constructed and further by any load carried by it.

Floor Slabs

Where basements are to be constructed, a reinforced basement floor or basement raft could be cast on the excavated surface following proof rolling and careful inspection. Excavations for the proposed basement structure will penetrate and remove any desiccated clays.

The floor slab for the communal hall will be in clay soils within the zones of influence of trees, either extant or recently removed, the root affected clay should be removed and replaced with well compacted non-shrinkable material or the slab suspended using the sub-floor gaps recommended in Table 7 of the NHBC Standards Chapter 4.2 (2016).

Sulphate Conditions

Sulphate analysis of selected samples of soil and groundwater yielded soluble sulphate concentrations within Design Sulphate Classes DS-1, DS-2, DS-3 and DS-4, of the BRE

Special Digest 1, Table C2 (2005), presented in Appendix 4. The pH results of samples ranged between 7.2 and 7.7, indicating alkaline conditions.

The London Clay Formation commonly contains sulphides, such as pyrite, and so following oxidation, after disturbance during excavation for the basement or foundations, there may be an increased total potential sulphate content. There was no visual evidence of pyrite in the London Clay.

These results indicate an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-4 for buried concrete. These ACEC Classes should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above cited BRE document.

Slope Stability

The ground within which the plot is located slopes down to the west/south-west and falls from 45.85mOD at the junction of Camden Park Road and Camden Mews, to 43.2mOD on Camden Road to the west of the site. This is an approximate slope angle of 1.5 degrees, and hence this slope is not marked on Figure 16 of the London Borough of Camden 'Guidance for subterranean development', which indicates slopes of greater than 7 degrees.

On this site, on a gentle slope bounded upslope and downslope by existing dwellings and gardens walls, with a 'perched' groundwater level, it is considered unlikely that the proposed basement development will induce slope instability.

There is no evidence of historical slope instability, nor would it be expected based on the topography of the immediate surrounding area.

Other Issues

The basement development beneath this site would only be considered likely to affect the drainage system of the site itself. However, drainage and sewerage records for the surrounding buildings will need to be referenced, if available, or perhaps surveyed to confirm that the site does not share a communal drainage system that runs beneath the site.

The flow of surface water within the surrounding area, to the west/south-west, should not be changed by the proposed redevelopment of this site.

As previously described, no groundwater beneath this site was met during boring or on completion within the London Clay to 10m depth, but 'perched' water may be encountered at shallower depths. The proposed basement depth extends a little way below the 'perched' groundwater level and so there should be minimal displacement of groundwater by its exclusion from beneath the area of the basements after they have been constructed.

The orientation of the proposed basements would be across the likely direction of near surface groundwater flow on this west/south-west facing slope, but as the proposed structures only extend a little way below the groundwater level, the drainage path would only be marginally increased and would not be expected to impact the adjoining properties downslope to the west/south-west.

COMMENTS ON SOIL CHEMICAL TESTING

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.04 and 1.06 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In March 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as "intervention values" in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 6 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 6: Comparison of Chemical Test Results for Made Ground Soil with Soil Screening Values (SSVs)

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Soil Screening Values (SSV) (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial	Assessment Method	Residential with home grown produce (mg/kg)	Residential without home grown produce (mg/kg)	Commercial/ Industrial (mg/kg)
Organic matter	2	1.9%	2.6%	-	-	-	-	-	-	-
Arsenic	2	17	17	0	0	0	S4UL	37	40	640
Cadmium	2	1.0	1.8	0	0	0	S4UL	11	85	190
Trivalent* Chromium	2	30	37	0	0	0	S4UL	910	910	8600
Hexavalent Chromium	2	<0.50	<0.50	0	0	0	S4UL	6	6	33
Lead	2	440	2200	2	2	0	C4SL	200	310	2330
Mercury	2	0.69	0.71	0	0	0	S4UL	11	15	320
Selenium	2	<0.20	<0.20	0	0	0	S4UL	250	430	12,000
Nickel	2	23	25	0	0	0	S4UL	130	180	980
Phenols	2	<0.30	<0.30	0	0	0	S4UL	120	440	440
Benzo[a]pyrene	2	0.65	4.9	1	1	0	S4UL	0.79	1.2	15
Copper	2	34	40	0	0	0	S4UL	2400	7100	68,000
Zinc	2	160	180	0	0	0	S4UL	3700	40,000	730,000
Free Cyanide	2	<0.50	<0.50	0	0	0	ATRISK	34	34	34

Notes
*The concentration of Trivalent Chromium is assumed to be equivalent to the Total Chromium concentration. This is because most naturally occurring chromium is in the trivalent (chromic) state.
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM

ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited

Discussion of Soil Results

The results of the laboratory analysis indicate the near surface soils to contain elevated concentration of benzo[a]pyrene and lead that exceeded the soil screening values for a residential with home grown produce end use, and a residential without home grown produce end use. The highest concentrations of benzo[a]pyrene and lead did not exceed the respective soil screening values for a commercial/industrial end use.

Levels of all the remaining elements and compounds tested were within the associated soil screening values for residential with home grown produce, residential without home grown produce and commercial/industrial end uses.

Due to the limited number of samples tested, statistical analysis is not considered to be meaningful.

Other Contaminants

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of hydrocarbon contamination. No asbestos containing materials were observed in any of the samples.

SOIL GAS MONITORING

The monitoring of soil gasses (methane, carbon dioxide and oxygen) within the standpipes installed within boreholes WS1 and WSA, was undertaken on 3rd February 2015, 3rd and 12th January 2017. The results of the monitoring are summarised in Table 7 below.

Table 7: Summary of Gas Monitoring Data

Hole Location	No. Visits	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Flow (l/hr)	Water Level (mbgl)	Atmospheric Pressure (mb)
WS1	3	<0.1	0.4-0.7	17.3-20.9	<0.1	2.50-5.23	999-1021
WSA	2	<0.1	0.6-1.3	19.9-20.0	<0.1	Dry	999-1021

The results of the soil gas monitoring of the installations indicated less than 0.1% by volume methane and a maximum 1.3% by volume carbon dioxide, recorded during the monitoring visits. The in-situ measurements recorded a gas emission rate of less than 0.1l/hr.

Using a flow rate of 0.1l/hr, the detection limit of the equipment used, these in-situ measurements indicate a gas screening value (GSV) of 0.0013l/h. This GSV falls within the modified Wilson and Card Characteristic Situation 1 or 'Green' classification of the NHBC traffic light system, as defined by the Construction Industry Research and Information Association, CIRIA Report C665, 'Assessing risks posed by hazardous ground gasses to buildings'. These results indicate no gas precautions measures are necessary.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model relative to the existing site and proposed new residential development use of the site is presented in Table 8 below.

Table 8: General Conceptual Model Relative to Future Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage	**Soil**	**Soil Gas**	**Off-Site Sources**
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low/ High (asbestos)	Moderate	Very low	Very Low
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	Moderate	Very Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	Low	Very Low	Very Low	Very Low
Flora	Vegetation on site growing on contaminated soil	Very Low	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	Very Low	Very Low	Very Low	Very Low

Key to Table 8 Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED RESIDENTIAL DEVELOPMENT

Anticipated exposure scenarios relating to the existing and proposed residential site, in the context of the conceptual model, are discussed as follows.

The proposed development is understood to comprise construction of a communal hall, and five mews houses which will have basements.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site work reveals materials that may appear to be contaminated.

Contaminated Soil

On the basis of the ground investigation the site is underlain by between 1.00m and 1.50m of made ground. The presence of contaminants (benzo[a]pyrene and lead) in the made ground indicates that there is a moderate risk of contaminants affecting groundworkers during any construction works and a moderate risk of affecting future end users of the site if the made ground is exposed in garden and landscaped areas. None of the concentrations exceed the screening values for a commercial or industrial end use.

Existing Drainage & Buildings

Redundant foul or surface water drain runs, if present, should be removed where encountered from beneath the site and precautions should ensure that any remaining effluent or sediment is directly disposed off-site. The integrity of the existing drains should be checked, and where they are to be retained, any damaged sections should be replaced prior to development.

The existing buildings may have asbestos containing materials within them. It is recommended that an asbestos survey be conducted in order to determine the presence, type and nature of such materials prior to any demolition. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during the demolition and site excavation phases.

Soil Gas

According to the environmental database there are no landfills within 250m of the site. The site is locally underlain by a Head Deposit covering London Clay.

The results of the soil gas monitoring of the installations indicated less than 0.1% by volume methane and a maximum 1.3% by volume carbon dioxide, recorded during the monitoring visits. There is a very low risk that hazardous gas would affect groundworkers during the construction phase and a very low risk of hazardous gas affecting future users of the site.

The site lies within an area where less than 1% of homes are above the BRE action level for radon and that no radon protection measures are required.

Human Health - Construction Workers

Based on the chemical test results, no special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during the construction phase.

Human Health - Users of Completed Development

The risk of the identified ground contamination (benzo[a]pyrene and lead) affecting the site users where a pathway is present, in a residential setting with private gardens and landscaping, would be considered to be moderate.

The results of the chemical analysis would indicate that the made ground should be considered to be unsuitable for re-use at the surface within any new garden and patio areas, due to the elevated concentrations of benzo[a]pyrene and lead. For private residential garden and patios areas it is recommended that the made ground should either be completely removed, or removed to a minimum depth of 1.00m below finished ground level, and replaced with an equivalent thickness of clean inert topsoil or clean granular fill. Any soil imported to site must be certified as "suitable for use".

The test results indicate that no scheme of remediation would be considered necessary for areas covered by buildings or hard surfaced areas, which would effectively provide a barrier between end users and the made ground.

Water Environment

The site is underlain by 'Unproductive' superficial strata, covering an 'Unproductive' solid geology stratum. There are no surface water features on or within 250m of the site. The site does not lie within a source protection zone. The site has a 'very low' risk of flooding by rivers and the sea (RoFRaS) rating.

The risk to the water environment is considered as low as it is unlikely that the proposed development and contaminants within the made ground soils would impact the quality of the water environment.

Effects on Building Materials and Buried Services

The sulphate requirements for buried concrete have been discussed in the previous section of this report.

The local water supply company should be consulted if new buried plastic water pipes within the made ground soils on this site are proposed.

Off-Site Disposal of Soil Arisings

The results of chemical analysis are provided following the exploratory hole records and can be used within the information necessary for basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM2 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code which is determined by the waste type.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer, whilst compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer, as the approach relies on the information from basic characterisation.

The clean arisings from the natural soils, excluding topsoil and peat, across this site should fall under the European Waste Catalogue description 'Soil and Stones', EWC code 17 05 04 inert category.

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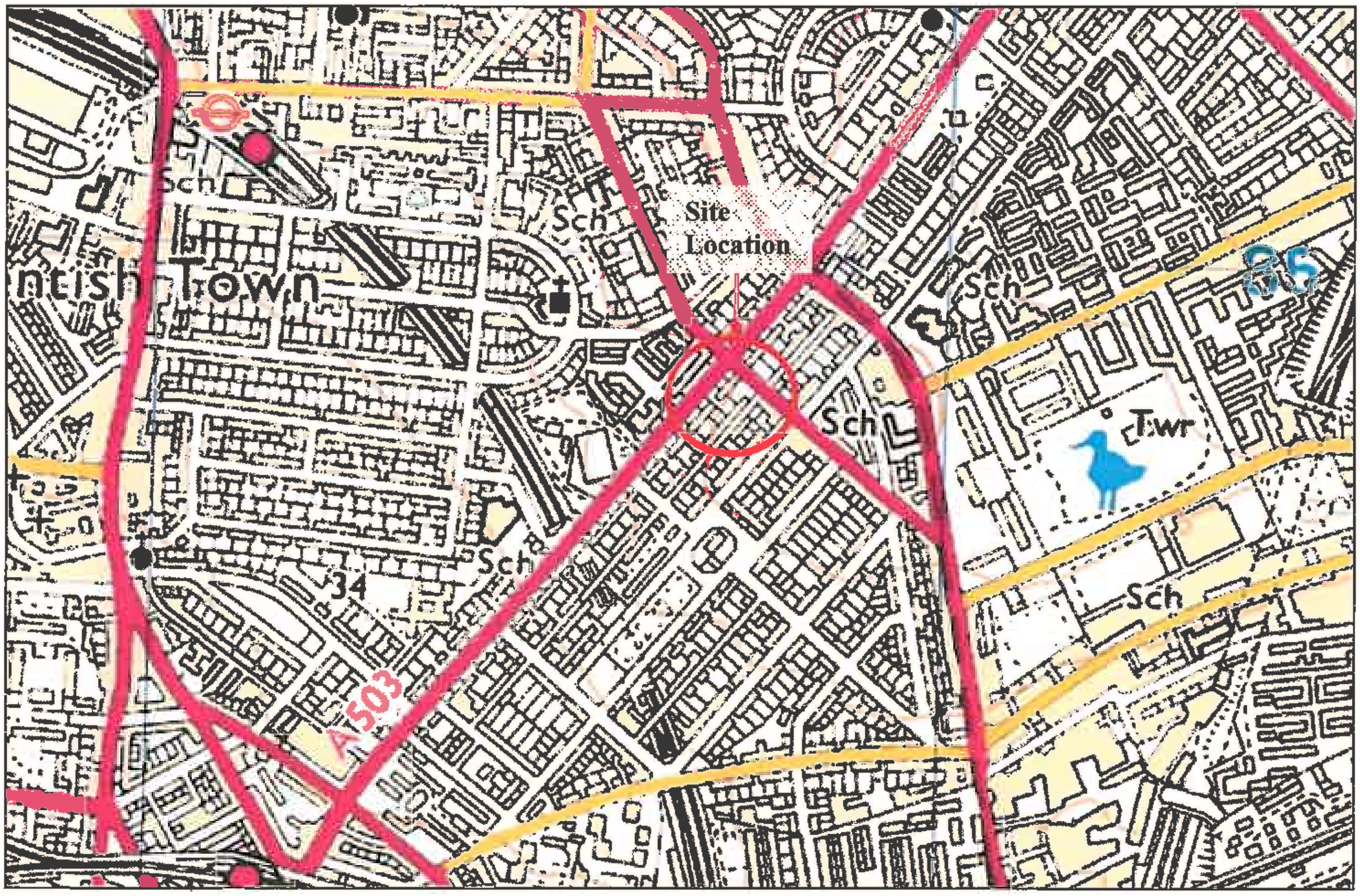
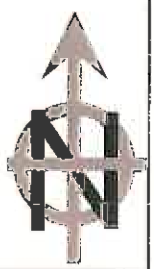
Site Location Plan



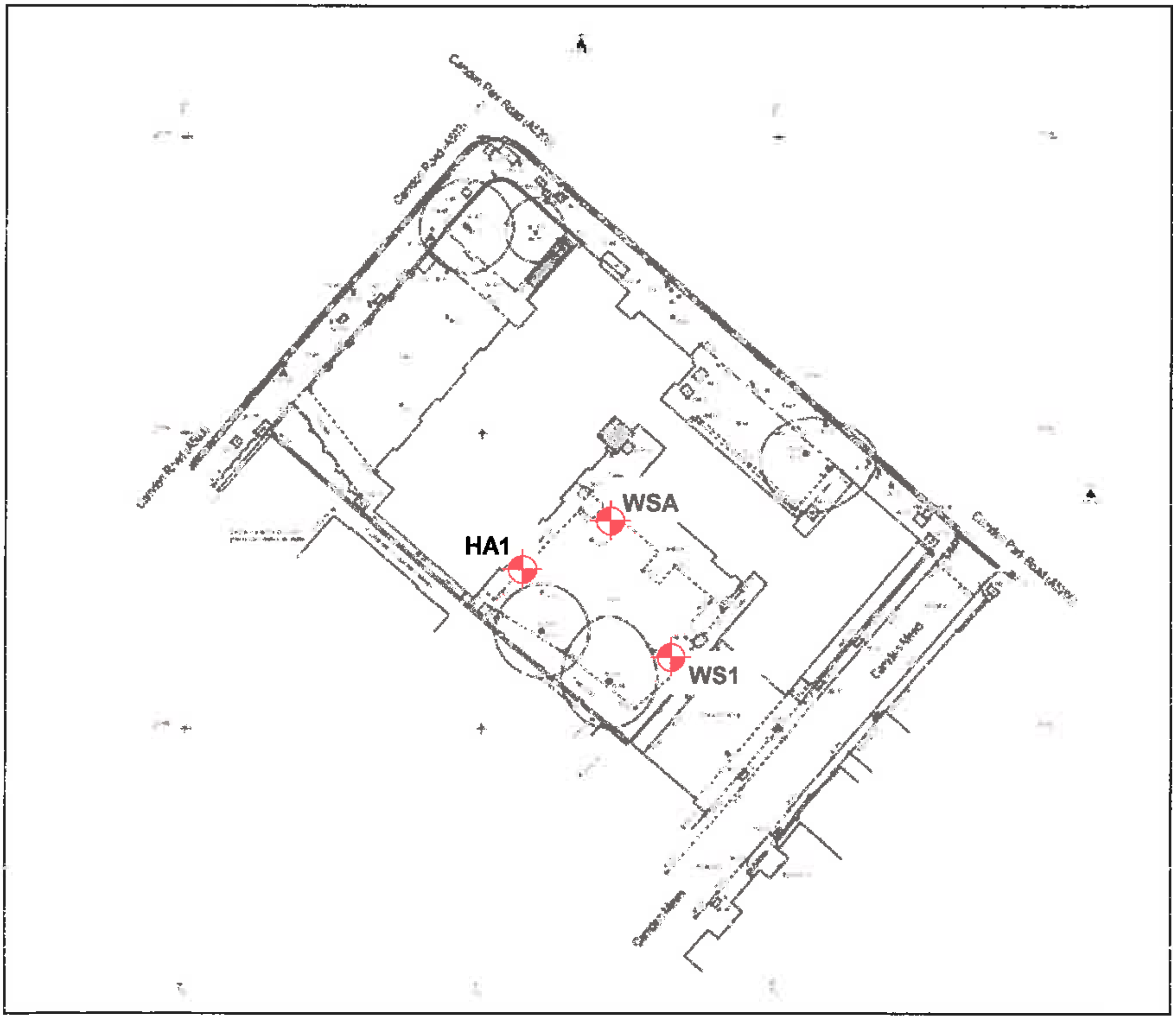


Not To Scale

Project : Ashton Court, Camden Road, London NW1 **Client : Rydon Maintenance Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14038**

Exploratory Hole Location Plan

Plan provided by Robert Lombardelli Partnership Ltd



Not To Scale

Project : Ashton Court, Camden Road, London NW1 **Client : Rydon Maintenance Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No. C14038**

GROUND ENGiNEERiNG LIMITED Tel: 01733-566566 www.groundengineering.co.uk	Site: ASHTON COURT, CAMDEN MEWS, LONDON NW1		WINDOW SAMPLE WSA
	Date: 20/12/16	Hole Size: 87mm dia to 2.00m 77mm dia to 5.00m 57mm dia to 10.00m	Ground Level:

Depth m	Type	Result	(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
0.30	D1				MADE GROUND - Brown and dark brown, slightly silty SAND AND GRAVEL. Gravel is angular to sub-rounded brick, mortar, concrete, glass, metal nail and tile fragments.			
0.60	D2							
0.90	D3						1.00	
1.20	D4				Stiff, brown and orange brown, slightly gravelly CLAY. Gravel is angular to rounded flint and quartzite. (HEAD DEPOSIT)		1.35	
1.20-2.00	U1							
1.50	V1	(61)						
1.50	U1A				Firm, becoming stiff below 3.00m depth, fissured, brown becoming dark brown, silty CLAY with selenite crystals below 3.50m depth.			
1.80-1.95	U1B							
2.00-3.00	U2							
2.20	U2A							
2.50	U2B							
2.80-2.95	U2C							
3.00-4.00	U3							
3.20	U3A							
3.50	U3B							
3.80-3.95	U3C							
4.00-5.00	U4							
4.20	U4A							
4.50	U4B							
4.80-4.95	U4C							
5.00-6.00	U5							
5.20	U5A							
5.50	U5B							
5.80-5.90	U5C							
6.00-7.00	U6				(LONDON CLAY)			
6.50-6.60	U6A							
7.00-8.00	U7							
7.00-7.10	U7A			BENEATH INSTALLATION				
8.00-9.00	B1			BENEATH INSTALLATION				
8.50	V2	(130+)		BENEATH INSTALLATION				
9.00-10.00	U8			BENEATH INSTALLATION				
				BENEATH INSTALLATION	Becoming very stiff below 9.50m depth.			
9.80-9.90	U8A			BENEATH INSTALLATION			10.00	

Borehole completed at 10.00m depth

REMARKS
1. Starter pit excavated from 0.00m to 1.20m depth
2. Live roots observed to 0.30m depth
3. Gas monitoring standpipe installed to 7.00m depth

Project No 14038

Scale 1:50 | Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
ES - Environmental Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed

Groundwater Observations

Date	Hole (Depth m)	Casing (Depth m)	Water (Depth m)
20/12/16	10.00		dry
03/01/17	7.00	1.00	dry
12/01/17	7.00	1.00	dry

GROUND ENGiNEERiNG LIMITED Tel: 01733-566566 www.groundengineering.co.uk	Site: ASHTON COURT, CAMDEN MEWS, LONDON NW1	HAND AUGER HA1
	Date: 20/12/16 — Hole Size: 70mm dia to 1.20m	Ground Level:

Samples and in-situ Tests: Depth m	Type	Result	(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
0.30	D1			MADE GROUND - Brown, dark brown and yellow brown, slightly silty SAND AND GRAVEL. Gravel is sub-angular and sub-rounded brick, mortar, concrete and flint.			
0.60	D2					0.70	
0.90	D3			MADE GROUND - Firm, brown, light brown and dark brown, slightly gravelly CLAY. Gravel is angular to sub-angular flint and brick fragments.		1.00	
1.20	D4			Firm, brown, silty CLAY. (LONDON CLAY)		1.20	
				Hole completed at 1.20m depth			

REMARKS 1. Live roots observed to 0.90m depth

Project No 14038 | Scale 1:25 | Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▼c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
ES - Environmental Sample
▼ Water Rise
▼s Standpipe Level

Groundwater Strikes: No	Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations: Date	Hole Depth m	Casing Depth m	Water Depth m
20/02/16	1.20		dry

Groundwater & Gas Monitoring Record

Site: **Ashton Court, Camden Road, London NW1**

Report Ref: **C14038**

Date	Borehole No.	Methane (% v/v)		Methane LEL %	Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmospheric Pressure (mb)	Depth of Well (mbgl)	Depth to Groundwater (mbgl)
		Peak	Steady		Peak	Steady	Min.	Max.				
03/01/17	WSA	<0.1	<0.1	<0.1	1.3	1.3	20.0	20.0	<0.1	1021	7.00	dry
	WS1	<0.1	<0.1	<0.1	0.6	0.6	20.9	20.9	<0.1	1021	7.00	2.51
12/01/17	WSA	<0.1	<0.1	<0.1	0.6	0.6	19.9	19.9	<0.1	999	7.00	dry
	WS1	<0.1	<0.1	<0.1	0.7	0.7	19.8	19.8	<0.1	999	7.00	2.50

LEL – Lower Explosive Limit

LABORATORY TEST RESULTS

CONTRACT ASHTON COURT, CAMDEN MEWS, LONDON NW1

Borehole	Sample	Depth m	Classification: Liquid Limit %	Classification: Plastic Limit %	Classification: Plasticity Index %	Classification: Moisture Content %	Density: Bulk Mg/m^3	Density: Dry Mg/m^3	Triaxial Compression: Type	Triaxial Compression: Principal Stress Difference kPa	Triaxial Compression: Cell Pressure kPa	Triaxial Compression: Shear Strength kPa	Triaxial Compression: Angle of Shear Resistance degrees	Sulphates (SO_4): Soil Total % Dry Wt.	Sulphates (SO_4): Soil Aqueous Extract mg/l	Sulphates (SO_4): Water mg/l	pH	Remarks
WSA	D4	1.20	68	22	46	33												SOIL CLASSIFICATION = CH 1% retained on 425µm sieve
	U1A	1.50				33									612		7.3	
	U1B	1.80 - 1.95				33	1.89	1.42	Q	99	50	49	0					
	U2A	2.20				33												
	U2B	2.50				31									954		7.3	
	U2C	2.80 - 2.95				31	1.95	1.49	Q	100	50	50	0					
	U3A	3.20				32												
	U3B	3.50				33									2756		7.2	
	U3C	3.80 - 3.95				33	1.85	1.39	Q	169	60	84	0					
	U4A	4.20				31												
	U4B	4.50				32												
	U4C	4.80 - 4.95				31	1.88	1.44	Q	149	80	75	0					
	U5A	5.20				30												

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

14038

LABORATORY TEST RESULTS

CONTRACT ASHTON COURT, CAMDEN MEWS, LONDON NW1

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil Total % Dry Wt.	Soil Aqueous Extract mg/l	Water mg/l	pH	
WSA	U5B	5.50				30												
	U5C	5.80 - 5.90				29	1.95	1.51	Q	243	100	121	0					
	U6A	6.50 - 6.60				25	1.97	1.57	Q	297	115	148	0					
	U7A	7.00 - 7.10				29	1.96	1.52	Q	215	120	107	0					
	U8A	9.80 - 9.90				29	2.00	1.55	Q	311	170	155	0					
WS1	W1	2.51														4017	7.2	

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

14038

GROUND ENGINEERING

TEST CERTIFICATE

One-Dimensional Consolidation Properties

(Tested in accordance with BS1377 : Part 5 1990)

Newark Road Peterborough
t:01733 566566 f:01733 315280
e: admin@groundengineering.co.uk

Client:	Ground Engineering Ltd	Certificate Number:	PL5693-1-3/731
Client Address:	Newark Road	Client Reference Number:	C14038
	Peterborough	Date Sampled:	Unknown
	Cambridgeshire	Date Received:	03.01.2017
Postcode:	PE1 5UA	Date Tested:	05.01.2017
Contact:	Simon Weatherley	Sampling Certificate No:	N/A
Site Name:	Ashton Court	Certificate of Sampling:	N/A
Site Address:	London NW1	Sampled By:	Client

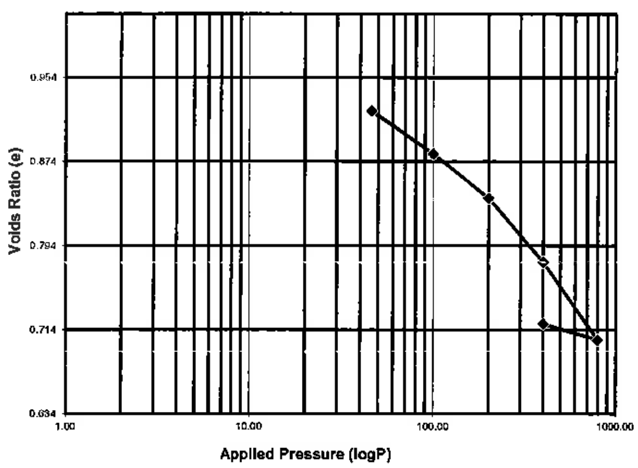
Test Details

Location:	WSA	
Sample Ref:	U1B	
Sample Description:	Firm brown grey slightly silty CLAY	
Particle Density (Mg/m^3):	2.74	Assumed
Mean Lab Temp. (°C):	22	
Variations from Standard:	None	
Lab Reference:	PL5693-1-3	
Depth:	1.90 m	

Specimen Details

	INITIAL	FINAL
Height (mm):	18.52	16.57
Bulk Density (Mg/m^3):	1.88	2.06
Moisture Content (%):	32	29
Dry Density (Mg/m^3):	1.43	1.59
Voids Ratio:	0.922	0.720
Degree of Saturation (%):	94.6	110.6
Diameter (mm):	75.12	N/A
Swelling Pressure (kPa):	46	N/A
Method of time fitting used:	Log Time	N/A

Voids Ratio against logarithm of Applied Pressure



Applied Pressure (kPa)	Coefficient of Compressibility m_v (m^2/MN)	Coefficient of Consolidation c_v (m^2/year)
46		
	0.40	0.27
100		
	0.22	0.24
200		
	0.17	0.22
400		
	0.10	0.22
800		
	0.02	---
400		

Comments:

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 17/01/2017

Registered in England Wales
Reg Number 6929574
Reg Office: Ground Engineering Ltd
Newark Rd
Peterborough PE1 5UA

UKAS TESTING 2183

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-31488-1		
Initial Date of Issue:	06-Jan-2017		
Client	Ground Engineering Limited		
Client Address:	Newark Road Peterborough Cambridgeshire PE1 5UA		
Contact(s):	Simon Weatherley		
Project	SW/C14038 Ashton Court, Camden Mews		
Quotation No.:		**Date Received:**	23-Dec-2016
Order No.:	SW/C14038	**Date Instructed:**	23-Dec-2016
No. of Samples:	2		
Turnaround (Wkdays):	4	**Results Due:**	06-Jan-2017
Date Approved:	06-Jan-2017		
Approved By:			
Details:	Keith Jones, Technical Manager		

Chemtest
The right chemistry to deliver results
Project: SW/C14038 Ashton Court, Camden Mews

Results - Soil

Client: Ground Engineering Limited				Chemtest Job No.:	16-31488	16-31488
Quotation No.:				Chemtest Sample ID.:	395204	395205
Order No.: SW/C14038				Client Sample Ref.:	WSA	HA1
				Client Sample ID.:	D2	D1
				Sample Type:	SOIL	SOIL
				Top Depth (m):	0.60	0.30
				Date Sampled:	20-Dec-2016	20-Dec-2016
Determinand	Accred.	SOP	Units	LOD		
pH	U	2010		N/A	8.9	8.7
Moisture	N	2030	%	0.020	8.4	8.9
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.022	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50	1.9	1.0
Arsenic	U	2450	mg/kg	1.0	17	17
Cadmium	U	2450	mg/kg	0.10	1.0	1.8
Chromium	U	2450	mg/kg	1.0	30	37
Copper	U	2450	mg/kg	0.50	34	40
Mercury	U	2450	mg/kg	0.10	0.71	0.69
Nickel	U	2450	mg/kg	0.50	25	23
Lead	U	2450	mg/kg	0.50	440	2200
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20
Zinc	U	2450	mg/kg	0.50	160	180
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.9	2.6
Acenaphthene	U	2700	mg/kg	0.10	1.4	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	0.16	< 0.10
Anthracene	U	2700	mg/kg	0.10	4.1	0.11
Benzo[a]anthracene	U	2700	mg/kg	0.10	7.0	0.46
Benzo[a]pyrene	U	2700	mg/kg	0.10	4.9	0.65
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	6.9	1.2
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	2.2	0.50
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	2.8	0.30
Chrysene	U	2700	mg/kg	0.10	7.2	0.81
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	1.3	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	13	1.2
Fluorene	U	2700	mg/kg	0.10	2.0	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	3.0	0.45
Naphthalene	U	2700	mg/kg	0.10	0.32	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	15	0.49
Pyrene	U	2700	mg/kg	0.10	12	1.1
Total Of 16 PAH's	U	2700	mg/kg	2.0	83	7.3
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30

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Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

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The right chemistry to deliver results

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, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

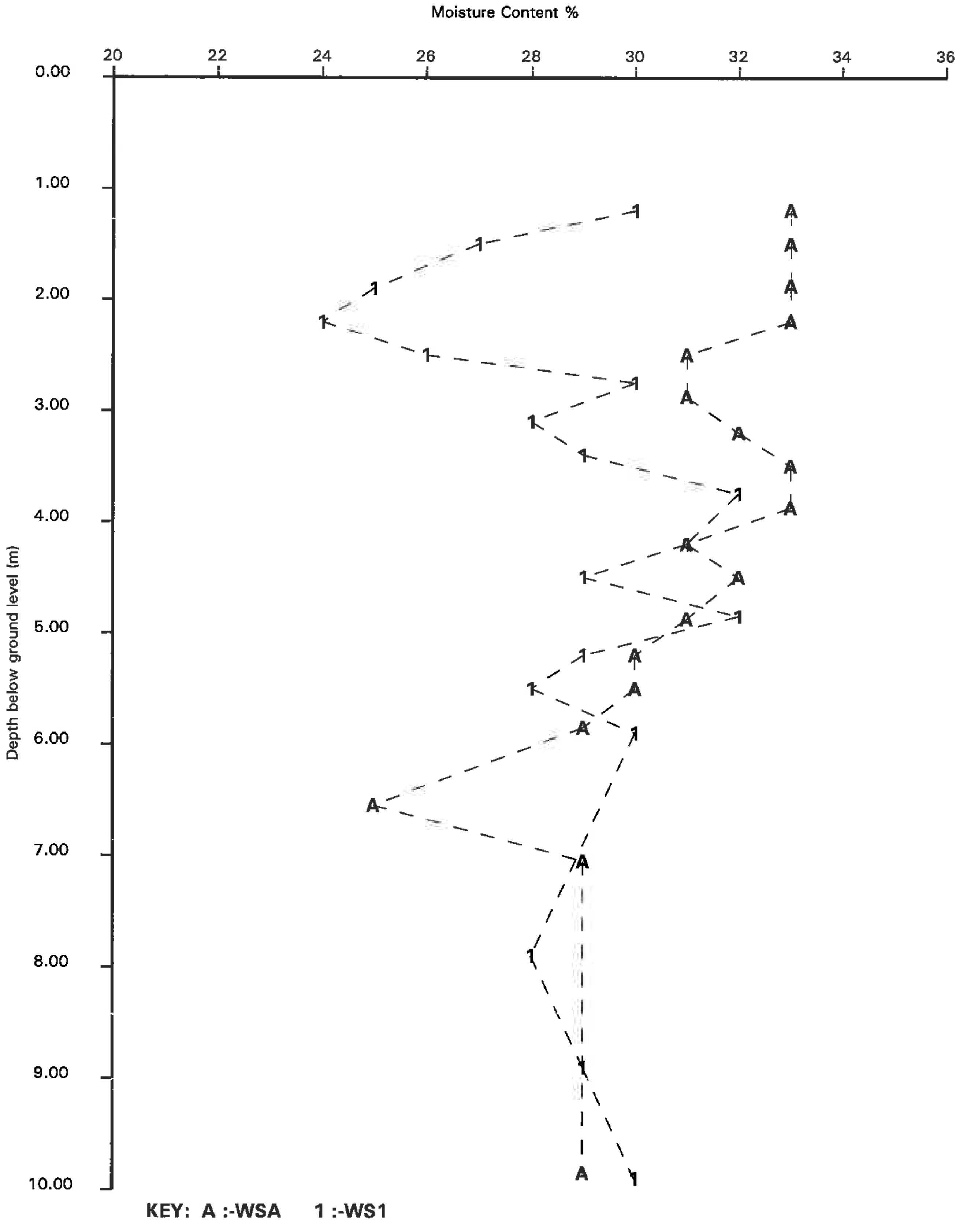
Sample Deviation Codes

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 45 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



Moisture Content % vs Depth below ground level (m).

SITE: ASHTON COURT, CAMDEN MEWS, LONDON NW1

CLIENT: RYDON MAINTENANCE LIMITED

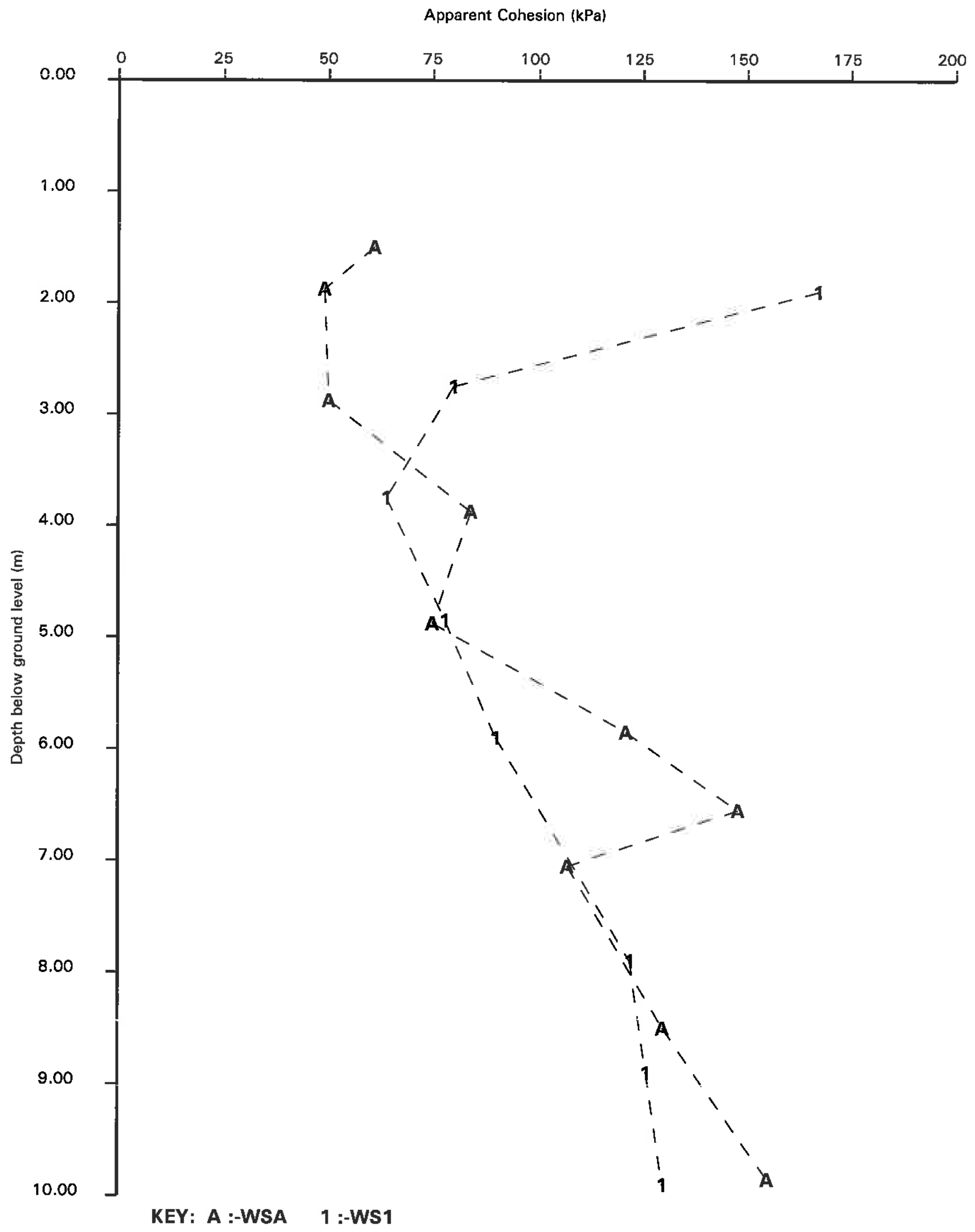
Contract Number: 14038

GROUND ENGiNEERiNG LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Date: 18/01/17

Figure: 1



Apparent Cohesion (kPa) vs Depth below ground level (m).

SITE	ASHTON COURT, CAMDEN MEWS, LONDON NW1	
CLIENT	RYDON MAINTENANCE LIMITED	Contract Number 14038
GROUND ENGiNEERiNG LIMITED Tel: 01733-566566 www.groundengineering.co.uk	Date 18/01/17	Figure 2

APPENDIX 1

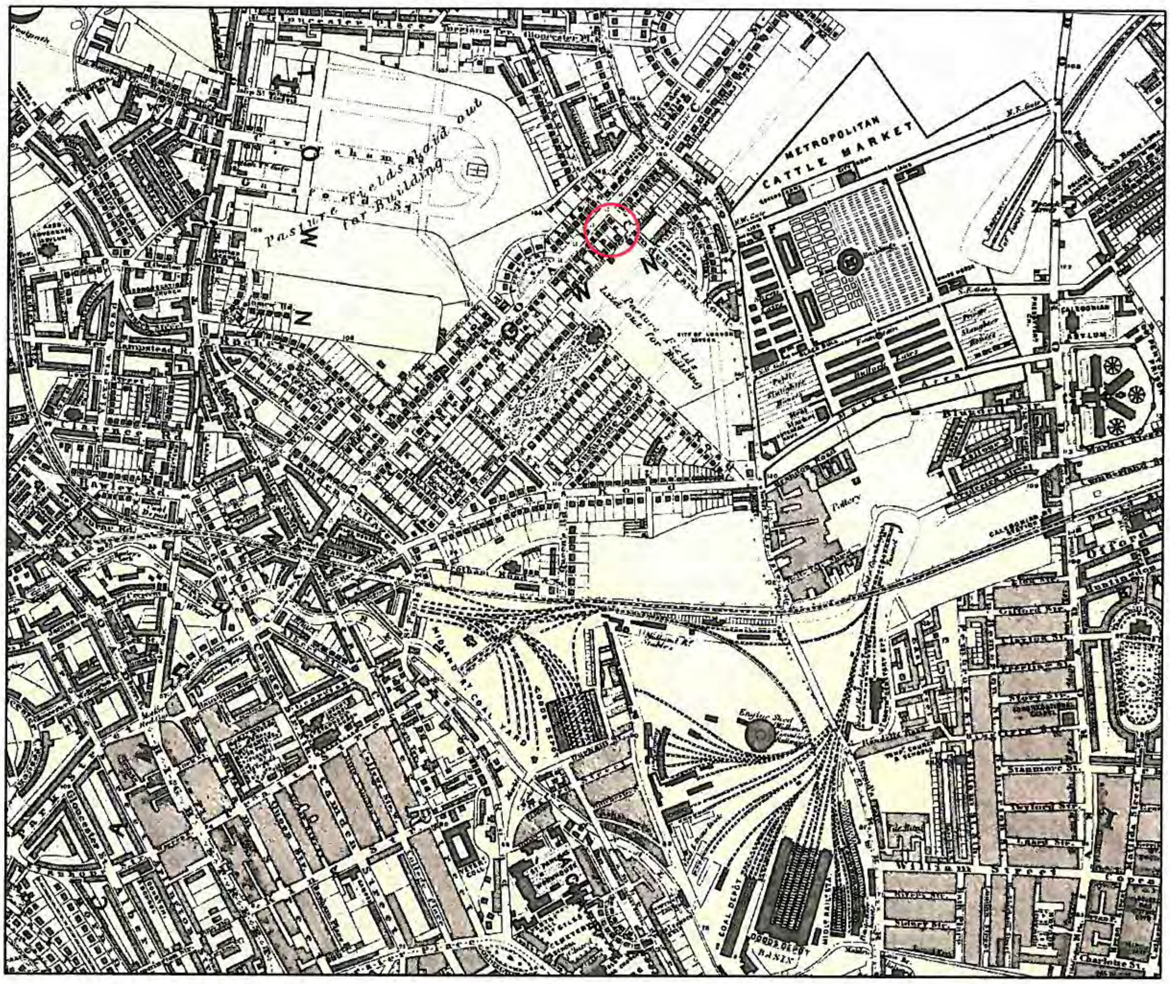
HISTORICAL MAP EXTRACTS

Site History

Figure A

Reproduced from the **1862** edition Stanford's **Library Map of London and its Suburbs, Not to scale.**

N

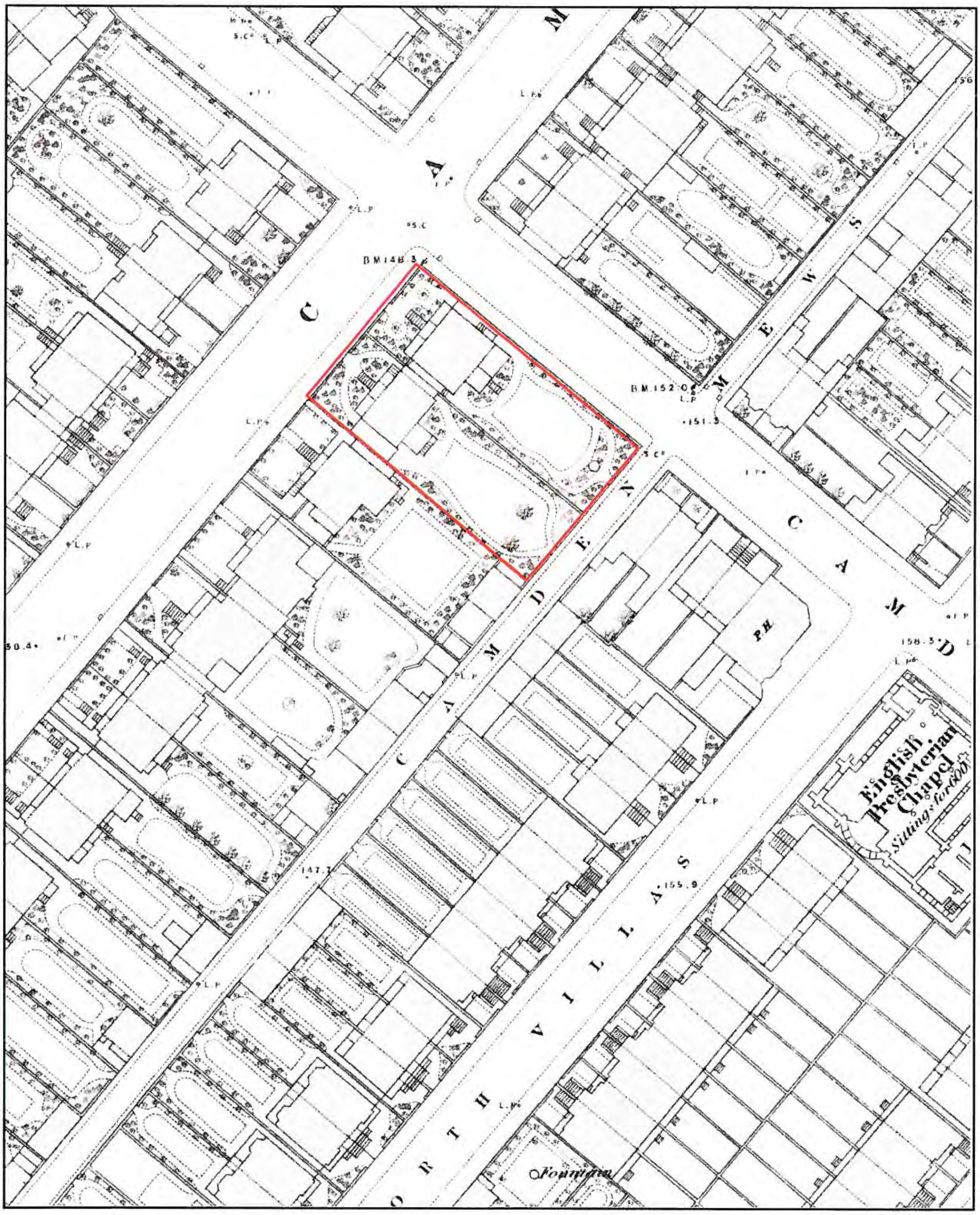


Project : Ashton Court, Camden Mews, London NW1 **Client : Rydon Maintenance Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14038**

Site History

Figure B

N



Project : Ashton Court, Camden Mews, London NW1 **Client : Rydon Maintenance Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14038**

Site History

Figure C

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Project : Ashton Court, Camden Mews, London NW1

Client : Rydon Maintenance Limited

GROUND ENGINEERING LIMITED
Peterborough Tel : 01733 566566

Project No.
C14038

Site History

Figure D

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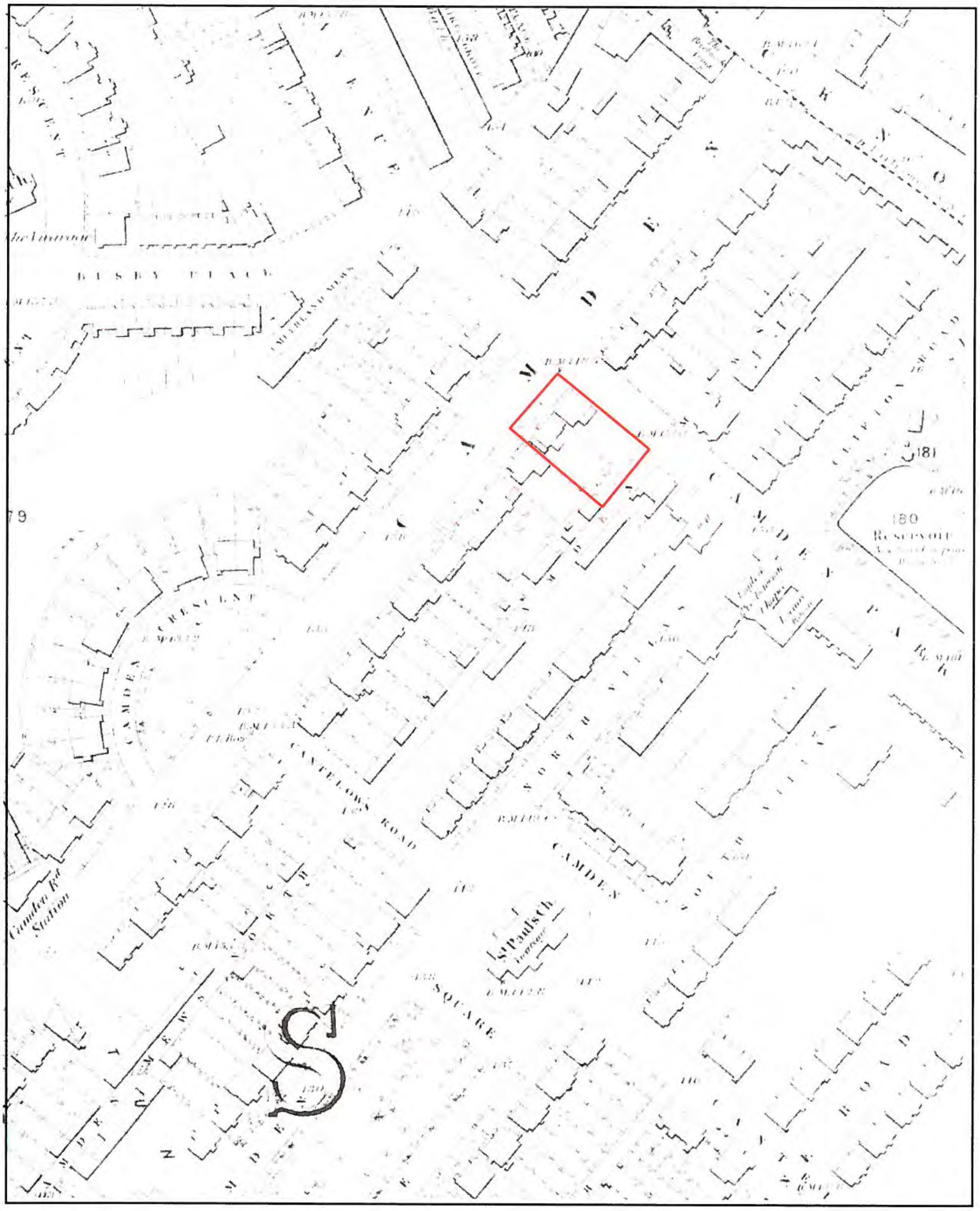

Project : Ashton Court, Camden Mews, London NW1 **Client : Rydon Maintenance Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14038**