40 - 68 SILVER STREET
READING

SILVER STREET DEVELOPMENTS LTD.

COMBINED PHASE 1 & PHASE 2 GROUND INVESTIGATION REPORT

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Document Verification

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1227-003-001	22/02/2019	First Issue. Pre-demolition GI.
1227-003-002	26/09/2019	Second Issue. Additional post-demolition GI and infiltration tests.

Executive Summary

Site	The site is located at 40-68 Silver Street, Reading, Berkshire, RG1 2SU near National Grid ref 471896, 172730. The site is circa 0.13 ha in area and currently comprises two disused commercial buildings with surrounding hardstanding/vegetation.
Development Use	It is understood that the site would be developed for residential use. New buildings may be up to 4 storeys in height plus a single level basement.
History	Historically the site has been used for residential houses with gardens (in the east), and as parkland (in the west). 62-68 Silver Street was subsequently used as commercial premises since the 1930's whilst 40 Silver Street was used for commercial purposes including an engineering works since the 1950's. Historical land uses identified within the surrounding area include a garage opposite the site across Silver Street, nearby engineering works to the west and an unspecified works adjacent to the northeast of the site. There are no landfill sites within at least 730m of the site.
Ground Investigation	Ground investigation (GI) was undertaken at 40 Silver Street by Westlakes between 29th and 30th of January 2018 and comprised drilling 2 cable percussive boreholes (BH1 and BH2) to 13m below ground level (bgl) and 5 window sampling boreholes (WS1 to WS5) to between 3m and 5m bgl. GI was undertaken both inside and around the building at 40 Silver Street. An additional programme of GI was undertaken across the site in August 2019, following demolition of previous structures and site clearance. To assist with quantifying geotechnical ground properties in-situ standard penetration tests (SPTs) were undertaken in all boreholes and subsequent geotechnical laboratory tests were also scheduled. To quantify potential contamination risks, samples were sent for a range of chemical analysis and ground gas monitoring has been undertaken.
Ground Conditions	The site is underlain by Made Ground to depths of between 1.5m and 2.5m bgl. Beneath the Made Ground, superficial clay/sand/gravel of the Taplow Gravel Member and Lambeth Group clay overlie weathered chalk bedrock. The chalk was encountered at depths of 6.2m to 7.0m bgl. Groundwater monitoring recorded groundwater between 11.2m to 11.6m bgl, but deposits were noted to be wet from 2.5m in WS5.
Geotechnical	Foundations should be taken through any made, soft or loose ground. If potential differential settlements can be tolerated, then strip and pad footings may be utilised on the natural Taplow Gravels alternatively piled foundations will be required. Pile design should be undertaken by a specialist piling contractor. Assuming foundations would be below basement level it is noted that at 3.75m bgl the Taplow Gravel and Lambeth Group are expected to provide an allowable bearing capacity around 100kN/m^2. A ground bearing floor slab is expected to be acceptable on the Taplow Gravel. A retaining structure will be required, to safely construct the basement, for which sheet or contiguous piles could be considered.

	A CBR value of 2% is assumed for roadway design on any Made Ground and cohesive strata. The natural granular Taplow Gravel is expected to have a CBR of at least 5%. Any soft spots should also be removed and replaced with suitably compacted granular fill and the ground at formation level suitably proof rolled. To assist more economic roadworks and piling mat design; it is recommended that plate bearing tests are undertaken prior to construction to determine CBR values and to inform bearing capacity. Soakaways may be feasible within the granular Taplow Gravel deposits.
Contamination	A programme of ground gas monitoring, comprising 6 monitoring visits, classifies the site as Characteristic Situation 1 where gas protective measures are not required. Nine potential pollution linkages have been identified within the GI Conceptual Site Model. The majority of the potential risks will be mitigated by removal of Made Ground for construction of the basement. Residual risks are thought to be very low providing the remedial measures suggested within Section 11 are followed during construction. Safe and appropriate working practices should be followed during construction. Below ground concrete should be designed to DS-3 and ACEC AC-3 for concrete in contact with Made Ground. DS-1:AC-1 applies to the natural ground. Radon protective measures are not required.

The conclusions and recommendations made within this report should be agreed by the approving bodies, such as the Local Authority and Environment Agency, prior to commencing construction.

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1 Introduction

Westlakes Environmental, as a division of Westlakes Engineering Limited, has been commissioned by Silver Street Developments Ltd. to produce a Combined Phase 1 Geo-environmental Desk Study and Phase 2 Ground Investigation (GI) Report for a 0.13 hectare (ha) site located at 40 - 68 Silver Street in Reading.

This report develops a geotechnical and geo-environmental understanding of the site, including a review of historical land use and the sites relationship with the surrounding land. A preliminary conceptual site model (CSM), identifying possible pollutant linkages (contaminant-pathway-receptor) is presented as part of the Desk Study. The CSM is updated following GI as site specific quantified information becomes available. The findings of the GI at 40 - 68 Silver Street are discussed, including contamination testing, with the aim of establishing on-site ground conditions, contamination risks and to provide foundation recommendations.

The report is based on the following data sources:

- Historical Ordnance Survey maps
- Groundsure Enviro Insight Report
- Groundsure Geo Insight Report
- Published British Geological Survey (BGS) geology maps
- A site walkover survey and the ground conditions encountered during the GI
- The results of laboratory contamination testing
- Various technical and best practice documents (see Bibliography, Section 7)

A Preliminary Risk Assessment (PRA) Report, reference LW26135/ds, was produced for 40 Silver Street by Ashdown Site Investigation Limited in May 2015. That report is included as Appendix 7 for reference purposes.

The GI report is based on the conditions encountered during the fieldwork in January 2018 at 40 Silver Street, and in August 2019 at 40 to 68 Silver Street, along with the results of on-site and laboratory testing. Conditions between, beyond or below excavation and sampling points may vary from those stated due to the unpredictable nature of ground and groundwater conditions. All distances, measurements and locations given are approximate.

The information has been assessed in the context of our understanding of the proposed development. If the end use changes, or if there have been significant changes to the site or best practice guidance, then the conclusions and recommendations of this report will need to be reassessed to check they are still valid.

1.1 Objectives

- Produce a clear and concise combined Phase 1 Geo-environmental Desk Study and Phase 2 GI Report, in accordance with CLR 11 guidance.
- Conduct a site walkover survey of the site and GI to BS5930: Code of Practice for GI.
- Critically review the available information.
- Provide preliminary geotechnical assessment of the site to assist the design development.
- Develop and update a conceptual site model, identifying pollution linkages relevant to the site.
- Provide clear justification for conclusions and recommendations reached.
- Provide recommendations for further works (if required).

2 Site Description and History

2.1 Site Description

The site address is 40 - 68 Silver Street in Reading, Berkshire, RG1 2SU. The site forms a roughly L-shaped parcel of land with an area of approximately 0.13 ha (1,300m^2) and is located near National Grid reference 471896, 172730. A site location plan is included in the drawings section of this report.

An initial site walkover was undertaken in January 2018, and subsequently in August 2019. The site has recently been cleared of all former buildings and is currently (August 2019) used as a site compound and storage area for a nearby construction site. The site was previously used in association with two commercial premises:

- 40 Silver Street. A single storey disused warehouse occupied most of the site with surrounding hardstanding. Some vegetation, including trees, remains in August 2019 around the site perimeter.
- 62 to 68 Silver Street. An L - shaped commercial building and associated hardstanding occupied the site. There was no access available to the inside of 62 to 68 Silver Street prior to demolition. Concrete foundations were still present in the south-eastern corner of the site in August 2019.

Photographs of the site prior to demolition are included as part of Appendix 7. The site appearance post-demolition, in August 2019, is shown on the front cover of this report.

Overall the site is relatively flat and lies at approximately 49.5m Above Ordnance Datum (AOD).

The site is located in a generally residential area and is surrounded by residential gardens and buildings to the north, west and south. To the immediate east of the site is the pavement and then carriageway of Silver Street, which is a one-way street. A small business complex, known as Windsor Square, is located opposite the site.

2.2 Intended Future Use

It is proposed that the site will be redeveloped for residential use. The development plans are yet to be finalised, but it is understood that the new buildings will be up to 4 storeys in height, and will include a single level basement. A proposed future site layout is shown in the Drawings Section; however, this will be subject to obtaining planning permission, and may therefore be slightly modified.

It is assumed that if the new buildings are of masonry construction, then net line loads may be 250kN/m.

The basement level is assumed to have a height of circa 3m, thereby requiring an excavation at least 3m deep to construct the basement.

Parking spaces are assumed to be minimal, and the development may include some landscaped areas.

2.3 Historical Mapping

Historical maps are included in Appendix 8. The maps have been reviewed to identify previous uses of the site and the surrounding area, particularly in terms of identification of potential sources of contamination.

2.3.1 On Site

Following review of the available historical maps, the following site features have been noted:

- The earliest map from 1879 shows the site has a split use: as residential houses with gardens (in the east), and as parkland (in the west).
- By the early 1930's, the existing building at 62-86 Silver Street has been constructed and previous residential style buildings have been removed. The previous use of the existing building is unknown although its layout and appearance suggests a commercial use from the 1930's onwards.
- In the 1950's, the current on-site building at 40 Silver Street was constructed and the previous residential buildings are removed. The general site layout of this part of the site has not been altered up to the

present day, except for a couple of smaller building over the south of the site which are no longer present. 40 Silver Street has been used for commercial purposes including as an unspecified works, engineering works and more recently as a tool hire business.

From what is known of the site from its historical uses, it is considered unlikely that significant contamination would be present. Nonetheless, potential on-site sources of contamination may include:

- Made Ground associated with previous development of the site. Made Ground may contain anthropogenic materials including asbestos containing materials (ACM) and, depending on its composition, biodegradable materials that could generate landfill gases.
- Contaminants associated with previous site uses as an engineering works (40 Silver Street).
- Contaminants associated with previous unspecified commercial use (62-68 Silver Street).
- Historic fuel spillage/leaks associated with vehicles using the site or alternatively heating systems, such as the possible boiler room to the rear of 62-68 Silver Street, and associated fuel storage may have resulted in localised hydrocarbon contamination of the ground at the site.

These potential sources of contamination are considered further within this report.

2.3.2 Surrounding Area

The following is noted from the historical maps of the surrounding area:

- The surrounding area appears mainly residential on the earliest map from 1879. The layout of the surrounding area is well established as part of Reading. Silver Street is next to the east of the site.
- A smithy is denoted circa 15m to 25m south of the site (1910, 1911-1912).
- By the 1930s commercial premises have been introduced into the area including an engineering works located to the west, although the engineering works building is circa 50m to the west of the site.
- A large commercial building is shown adjacent to the northeast of the site at 36 Silver Street (1957), later shown as an unspecified works (1981). No longer present by 2010.
- Another engineering works is present 50m southwest of the site (1968), although is removed by 2002.
- A garage is shown across Silver Street to the east (1957), later shown simply as depot (early 1980s) and later in the 1980s is redeveloped as its current business park use as Windsor Square.
- Another garage is shown 100m north-west of the site (1957), later becoming a furniture factory (1968) and then a warehouse (1970s).
- A factory is located circa 190m northwest of the site (1957); becoming government offices (1980s).

Historically, the surrounding area has been used for residential and commercial purposes. Many of the surrounding land uses identified above are considered unlikely to have the potential to influence the contamination status of the development site itself as they involved activities that are unlikely to have resulted in lateral transfer of contaminants off-site over the distances present between the source and the site.

However, surrounding area uses that are considered further are identified as:

- The former garage located to the east on the opposite side of Silver Street (1957 to 1980s).
- Engineering works in the surrounding area including close to the west of the site (1957 to circa 2002).
- An unspecified works adjacent to the northeast of the site (1957-2010).

These surrounding area uses are discussed further within the contamination risk assessment of this report.

3 Environmental Setting

This section has been compiled from information provided within the Groundsure reports and analysis of historical maps (Appendix 8), the BGS website and geological maps, anecdotal information and observations from the walkover survey and intrusive GI.

3.1 Made Ground

Made Ground is present beneath previously developed areas of the site. The 1:10,000 Artificial Ground Map within the Groundsure report shows there are no records of worked or infilled ground within at least 250m of the site.

3.2 Geology

The site is underlain by the Taplow Gravel Member (sand and gravel) superficial deposits over bedrock of the Lambeth Group (clay, silt and sand). There are also bedrock outcrops of the London Clay Formation and the Seaford/Newhaven Chalk Formation within the surrounding area, which depending on the local geology may also underlie the site at depth. There are no known records of faults within at least 500m of the site.

3.3 Hydrogeology

The EA designates aquifer types based on geological mapping provided by the BGS. The EA defines an aquifer as 'underground layers of water-bearing rock or drift deposits from which groundwater can be extracted'.

The superficial (Taplow Gravel Member) and bedrock (Lambeth Group) aquifers are classified as Secondary (A) aquifers (aquifers formerly classified as minor aquifers). These are permeable layers capable of supporting water supplies at a local rather than strategic level, and in some cases form an important source of base flow to rivers. London Clay is classed as unproductive strata and Chalk as a Principal aquifer.

Soil leaching potential is rated "high" as the site is in an urban area where a worst-case scenario is assumed until proven otherwise.

There are no Source Protection Zones identified within at least 500m of the site.

The nearest groundwater / potable water abstraction licence is circa 485m east of the site.

The nearest surface water abstraction licence is circa 500m northwest of the site.

3.4 Hydrology

There are no known watercourses near to the site. The nearest main river is the River Kennet located circa 450m to the west of the site.

3.5 Flooding

The site is in an EA Flood Zone 1 and therefore has a low probability of flooding from rivers and the sea. Areas susceptible to Groundwater flooding are identified by Groundsure within circa 50m of the site.

3.6 Mining

The site is in not in an area affected by coal mining or brine abstraction.

The Mining, Extraction and Natural Cavities Map within the Groundsure Report notes "non-coal mining cavities" are "highly unlikely" to have occurred and would relate to rare and localised small-scale mining of chalk. There is a non-coal mining activity noted very close to the south of the site (potentially located at 62-68 Silver Street, although the scale of the map makes it difficult to be sure). This relates to an entry of "The Old Orchard Kiln" where the commodity is given as "chalk". It is therefore considered possible that localised mining of chalk may have occurred historically in the area, including potentially on the site itself. It is however also noted that this entry is located close to an area denoted as a smithy on the historical maps (1910-1912) and the kiln may therefore relate to blacksmith activities, rather than mining.

3.7 Ground Stability Hazards

Groundsure data rates the following ground stability hazards:

• Shrink-swell potential of clay	Moderate
• Landslide potential	Very Low
• Dissolution risk	Negligible
• Compressible ground	Negligible
• Potential for collapsible ground	Very Low
• Running sand potential	Very Low

3.8 Landfill and Waste Sites

There are no landfill or other waste sites within at least 730m of the site.

3.9 Radon

The site is not located in a radon protection area; therefore, no radon protective measures are required.

4 Preliminary Contamination Risk Assessment

This section comprises a preliminary risk assessment for the site, the aim of which is to establish whether there are potentially unacceptable contamination risks. An initial conceptual site model (CSM) has been developed, which identifies source-pathway-receptor 'pollutant linkages' potentially present at the site. If potentially unacceptable risks are identified, then it is suggested what further action may be appropriate. This assessment is based on the information contained within this report.

Historically the site has been occupied by residential houses with gardens (in the east), and used as parkland (in the west). Subsequent commercial use has occurred at 62-68 Silver Street since the 1930's and at 40 Silver Street since the 1950's.

Made Ground is likely to be present below previously developed areas, although the depth of such Made Ground is expected to vary. Vehicles have also had access to parts of the site and former heating systems and associated storage could have leaked small quantities of oil/fuel onto the ground at the site.

Historical land uses identified within the surrounding area include a garage opposite the site across Silver Street, nearby engineering works to the west and an unspecified works adjacent to the northeast of the site.

There are no landfill sites within at least 730m of the site.

The site is expected to be underlain by superficial sand/gravel over clays and possible chalk bedrock. The superficial and bedrock aquifers are Secondary (A) Aquifers (formerly minor aquifers). The nearest river is circa 450m west of the site.

4.1 Potential Contaminative Land Uses In and Around the Site

From the available information, the following potential sources of contamination have been identified:

On-Site Sources
• Made Ground associated with previous development of the site. Made Ground may contain anthropogenic materials including asbestos containing materials (ACM) and depending on its composition it may also contain biodegradable materials that could generate landfill gases. • Contaminants associated with previous engineering works use (40 Silver Street). • Contaminants associated with unspecified commercial use (62-68 Silver Street). • Contaminants associated with an old kiln – chalk, possibly formerly present at 62-68 Silver Street. • Historic fuel spillage/leaks associated with vehicles using the site or alternatively heating systems, such as the possible boiler room to the rear of 62-68 Silver Street, and associated fuel storage may have resulted in localised hydrocarbon contamination of the ground at the site.
Off-Site Sources
• A former garage located to the east on the opposite side of Silver Street (1957 to 1980s), which may have resulted in hydrocarbon contamination of the nearby ground, which (if present) could migrate and influence at the site. • Engineering works in the surrounding area including close to the west of the site (1957 to circa 2002). The nature of the engineering businesses is unknown however it is possible that previous activity may have resulted in later migration of contaminants off site. • An unspecified works adjacent to the northeast of the site (1957 - 2010). The nature of these works is unknown however as a commercial enterprise it is possible that previous activity may have resulted in later migration of contaminants off site.

4.2 Preliminary Conceptual Site Model

An initial conceptual site model (CSM) has been developed, which identifies source-pathway-receptor, 'pollutant linkages' potentially present at the site.

Preliminary Conceptual Site Model (CSM)		
Source (including potential contaminants)	**Pathway**	**Receptor**
On-site Made Ground (heavy metals, phenol, speciated Polycyclic Aromatic Hydrocarbons (PAH))	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
On-site Made Ground (sulphates, pH)	Direct contact	Below ground concrete
On-site Made Ground (landfill gases such as methane and carbon dioxide)	Migration through the ground and inhalation	Humans: future site users, visitors, neighbours and construction workers
On-site Made Ground (ACM and asbestos fibres)	Inhalation	Humans: future site users, visitors, neighbours and construction workers
On-site hydrocarbon impacted ground (speciated Total Petroleum Hydrocarbons (TPH), Benzene Toluene Ethylene Xylene (BTEX), PAH)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
On-site engineering works (40 Silver Street) (heavy metals, phenol, speciated PAH, acids, alkalis, solvents, fuels and oils inc speciated TPH, VOCs and SVOCs)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
On-site unknown commercial use (62-68 Silver Street) (heavy metals, phenol, speciated PAH, acids, alkalis, solvents, fuels and oils inc speciated TPH, VOCs and SVOCs)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation

Source (including potential contaminants)	Pathway	Receptor
An old kiln – chalk, possibly formerly at 62-68 Silver Street. (heavy metals, ash, speciated PAH, possible infilled ground)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
Off-site former garage on the opposite side of Silver Street (heavy metals, phenol, speciated PAH, speciated TPH, BTEX, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs).	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
Off-site former engineering works near to the west of the site (heavy metals, phenol, speciated PAH, speciated TPH, BTEX, SVOCs, VOCs)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation
Off-site former unspecified works adjacent to the northeast of the site (heavy metals, phenol, speciated PAH, acids, alkalis, solvents, fuels and oils inc speciated TPH, VOCs and SVOCs)	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
	Migration through the ground	Underlying Aquifers and groundwater
	Direct uptake from soil	Vegetation

4.3 Preliminary Risk Assessment

Following on from the identification of potential pollutant linkages at this site, and compilation of an initial CSM, overall contamination risks are considered to be very low to moderate with the main risks being to human health of construction workers, future site users and visitors. After completion of the Desk Study, it is recommended that the potential pollutant linkages identified within the preliminary CSM are quantified by undertaking intrusive site investigations, and this is considered within the following GI sections of this report.

5 Ground Investigation Works

5.1 Rationale

Following completion of the Phase 1 Desk Study, Ground Investigation (GI) was undertaken at 40 Silver Street in January 2018, and at 40 to 68 Silver Street post-demolition in August 2019, to assist with the following:

- Contamination Risk Assessment: To facilitate update of the preliminary CSM. Chemical testing of soil samples including Made Ground for potential contaminants. The specific analytical suite was chosen to take into account on-site conditions and the recommendations of the CSM.
- Geotechnical Appraisal: confirmation of the depth of on-site Made Ground, and the strength and nature of the underlying natural ground, to aid foundation, ground bearing slab and drainage design.

Exploratory locations were targeted to enable geotechnical and geo-environmental assessment of the site and were also dictated by the need to avoid damage to underground services, existing buildings and obstructions within the ground.

5.2 Ground Investigation

The GI at 40 Silver Street was undertaken between 29th and 30th January 2018 and comprised drilling two cable percussive boreholes (BH1 and BH2) and five window sampling boreholes (WS1 to WS5) across the site. Weather conditions were dry during the GI.

Both cable percussive boreholes were drilled to 13m below ground level (bgl) and WS1 to WS4 were drilled to 3m bgl and WS5 was taken to 5m bgl.

The GI at 62 to 68 Silver Street was undertaken on 19th and 20th January 2018, and comprised drilling two cable percussive boreholes (BH3 and BH4), and the excavation of three hand-dug pits (HDP1 to HDP3) across both sites to allow shallow soil sampling for supplementary contamination testing. Weather conditions were warm and dry during the GI.

BH3 was drilled to 15m below ground level (bgl), and BH4 drilled to 5m bgl with falling head permeability testing undertaken at two different levels.

The GI positions are shown in the drawings section. Exploratory logs are included within Appendix 1.

All exploratory locations were scanned with a cable avoidance tool (CAT) prior to excavation.

5.3 On-site Testing

To assist with quantifying geotechnical ground properties, in-situ Standard Penetration Tests (SPTs) were undertaken during the GI in all boreholes except BH4; the results are shown on the logs within Appendix 1.

5.4 Laboratory Testing

5.4.1 Geotechnical

The following geotechnical laboratory tests were scheduled:

- 5 samples of natural clay for Atterberg Limits testing to ascertain plasticity and shrinkage potential.
- 1 sample of natural clay for quick undrained triaxial testing. A second sample of clay was also scheduled for this testing although there was insufficient intact sample to enable testing.
- 2 samples of natural granular sandy gravel for Particle Size Distribution (PSD) analysis.
- 5 samples of chalk for intact dry density and saturated moisture content testing.

The samples were sent to the UKAS accredited geotechnical testing laboratories, Professional Soils Ltd (PSL), based in Doncaster, and i2 Analytical, based in Watford. The test results are included in Appendix 3 and are discussed within Section 6.

5.4.2 Geo-environmental

As identified in the Desk Study, a quantitative programme of contamination testing was scheduled in accordance with the preliminary CSM and adjusted to take into account the encountered ground conditions. Representative (not composite) samples were collected during the January 2018 site works for subsequent laboratory testing. In total 13 soil samples were scheduled for analysis. Samples were sent to the UKAS accredited Derwentside Environmental Testing Services Ltd (DETS) laboratories in Northumberland for accredited MCERTS testing.

Representative (not composite) samples were also collected during the August 2019 site works for subsequent laboratory testing. In total 6 soil samples were scheduled for analysis. Samples were sent to the UKAS accredited i2 Analytical laboratories in Watford for accredited MCERTS testing.

The chemical testing results are included in Appendix 4 and are discussed in Section 8.

6 Ground Conditions

Ground condition assessments are based on site observations made during the GI and the results of on-site and laboratory testing. The GI relates to 40 to 68 Silver Street.

Soils and rocks were logged in accordance with BS5930 and CIRIA 574 (Engineering in Chalk). The exploratory logs are presented in Appendix 1.

The former surface layer of concrete and other areas of hardstanding are now removed. The site is underlain by Made Ground, which extended to between 1.5m and 2.5m bgl on 40 Silver Street, and to depths of 0.7m to 0.9m bgl on 62 to 68 Silver Street. The Made Ground is underlain by natural superficial clay/sand/gravel of the Taplow Gravel Member over Lambeth Group clay over weathered chalk bedrock.

Groundwater was encountered during drilling at approximately 12m bgl in BH1, at approximately 13.2m in BH3, and deposits were noted to be wet from 2.5m in WS5. Groundwater monitoring has detected groundwater between 11.23m and 11.60m bgl in BH1.

Ground conditions are discussed in greater detail in the following sub-sections.

6.1 Topsoil

Topsoil was not encountered during the GI.

6.2 Hardstanding

The former building at 40 Silver Street, had a concrete floor circa 0.1m - 0.2m in thickness. A thin layer (0.05m-0.1m in thickness) of aggregate including flint was encountered directly beneath the concrete in some locations.

Concrete was also encountered within the external areas at 40 Silver Street. In BH2, outside the front (east) of the building, this comprised a thin layer of asphalt overlying a thin concrete layer 0.1m thick. In the rear yard area to the south of the main building, concrete was also found to be 0.1m thick (WS5).

At the time of the GI at 62 to 68 Silver Street, all hardstanding had been removed, although some concrete foundations were still present in the south-eastern corner of the site.

6.3 Made Ground

Made Ground was encountered across 40 Silver Street to depths between 1.5m and 2.5m bgl, however in the south of the site (in BH1) Made Ground was only encountered to a depth of 0.4m bgl.

Made Ground generally comprised granular sand including gravel of red brick and concrete with rarer amounts of pottery, glass and flint.

The Made Ground was found to be very loose to medium dense with SPT N values ranging from 2 to 18 measured at depths between 1.2m and 2m bgl. SPT values are collated in Section 6.7.

At 62 to 68 Silver Street, Made Ground was encountered from ground level to depths of 0.7m to 0.9m bgl. The Made Ground was found to comprise a compact red-brown sandy fine to coarse angular gravel of brick and concrete with a high content of whole and part bricks and cobble-sized fragments of concrete and a low content of metal and ceramic pipe fragments

6.4 Superficial Deposits – Taplow Gravel

Beneath the Made Ground, natural superficial deposits were encountered. These comprised a mix of sand, sand/gravel and gravel along with cohesive clay deposits. The Taplow Gravels at this site appear to be intermixed cohesive and granular deposits, with no consistent pattern encountered.

6.4.1 Cohesive

Atterberg limit testing on three samples of cohesive Taplow Gravel deposits gave the following results:

Location	Sample Depth (m bgl)	Moisture Content (%)	Plastic Limit (%)	Plasticity Index (%)	% passing the 450µm sieve	Volume Change Potential
BH1	1.2 - 1.7	19	16	17	94	Low
BH2	1.2 - 1.7	21	17	18	93	Low
BH2	2.0 - 2.45	16	23	26	91	Medium

A U100 sample (BH2 at 2.0-2.45m) of the Taplow Gravel clay was scheduled for triaxial undrained shear strength testing, however there was insufficient intact cohesive material to enable the testing to proceed.

SPT results are plotted in Section 6.7. Nine SPT results were taken in these cohesive deposits and recorded N values between 7 and 27, with an average value of 14. The average SPT N value correlates to an undrained shear strength of circa 75kN/m^2 (based on the relationship established by Stroud), although the lowest and highest results respectively give varying undrained shear strengths of circa 35kN/m^2 and 135kN/m^2. The results therefore correspond to Low to High Strength clays in accordance with BS5930.

6.4.2 Granular

PSD analysis on two bulk samples of granular Taplow deposits showed a very sandy gravel with a silt/clay content which breaks down as:

Sample	Fraction%			
	Cobbles	Gravel	Sand	Silt/Clay
BH2 at 4 - 5m	0	53	36	11
BH3 at 4 – 4.5m	0	64.5	24.8	10.7

Eleven SPT's were undertaken in these granular deposits and results varied from 2 to 50 with the average value of 19. The highest result may have been influenced by the presence of coarse gravels and should therefore be interpreted with caution. The deposits were found to be range from very loose to medium dense through to dense. The results are plotted in Section 6.7.

It is noted that granular Taplow Gravels were encountered in WS5 and that in this location the strata recorded very low SPT N values, compared to the other areas of the site. SPT N values at 2m, 3m, 4m and 5m were respectively: 2, 4, 4 and 13. The results indicate very loose /loose materials until circa 5m where the strata fall into the lower end of medium dense. Strata within this borehole were noted to be wet and the drilling induced groundwater flow may have affected the SPT results obtained however there may also be a localised reduction in density in this area of the site. The Taplow Gravels are also deep here, similar in depth to BH2.

6.5 The Lambeth Group

The Lambeth Group was interpreted to have been encountered in the locations noted in the table overleaf:

Location	Depth Encountered At (m bgl)	Depth Extended To (m bgl)	Thickness (m)
BH1	5.8	7.0	1.2
BH2	5.8	6.2	0.4
BH3	5.2	6.3	1.1
BH4	4.1	5.0 (end of BH)	At least 0.9
WS3	2.0	3.0 (end of BH)	At least 1.0
WS4	2.2	3.0 (end of BH)	At least 0.8

The strata were encountered directly beneath the Made Ground in WS3 and in BH1 to BH4 and WS4 directly below the Taplow Gravel deposits. Where encountered the Lambeth Group directly overlies Chalk.

The clay was firm to very stiff, sandy and slightly gravelly, exhibiting a variety of colours including grey brown with mottled red patches and a slight green tint (this colouring being typical of the Lambeth Group), and also a slight orange/brown colour in WS3 and WS4.

Two samples of this clay underwent Atterberg limit testing and gave the following results:

Location	Sample Depth (m bgl)	Moisture Content (%)	Plastic Limit (%)	Plasticity Index (%)	% passing the 450µm sieve	Volume Change Potential
BH1	6.5 - 6.95	22	23	25	96	Medium
BH4	4.5	18	NP	NP	98	Very low

NP – non-plastic

A U100 sample (BH1 at 6.5-6.95m) of the Lambeth Group clay underwent triaxial undrained shear strength testing, recording an undrained shear strength of 104kPa. The result falls into the High Strength classification in accordance with BS5930, however there is only one result and it should therefore be interpreted with caution.

6.6 Chalk Bedrock

Structureless weathered chalk bedrock (Grade Dm) was found beneath the entire site, underlying the Taplow Gravels and Lambeth Group clays.

The upper surface of the chalk was encountered at depths of 6.2m bgl (BH2) in the east of the site and at 7m bgl (BH1) in the south of the site, and extended to the maximum drilled depth of 15m bgl.

The chalk was recovered as a soft to firm white to cream slightly clayey slightly gravelly to gravelly silt.

Five chalk samples were analysed for intact dry density and saturated moisture content and the results, with increasing depth, are shown below:

Location	Depth	Moisture Content	Saturated MC	Dry Density
BH2	6.5 - 6.95m	20%	19%	1.77 Mg/m^3
BH1	7.5 - 8.0m	28%	29%	1.50 Mg/m^3

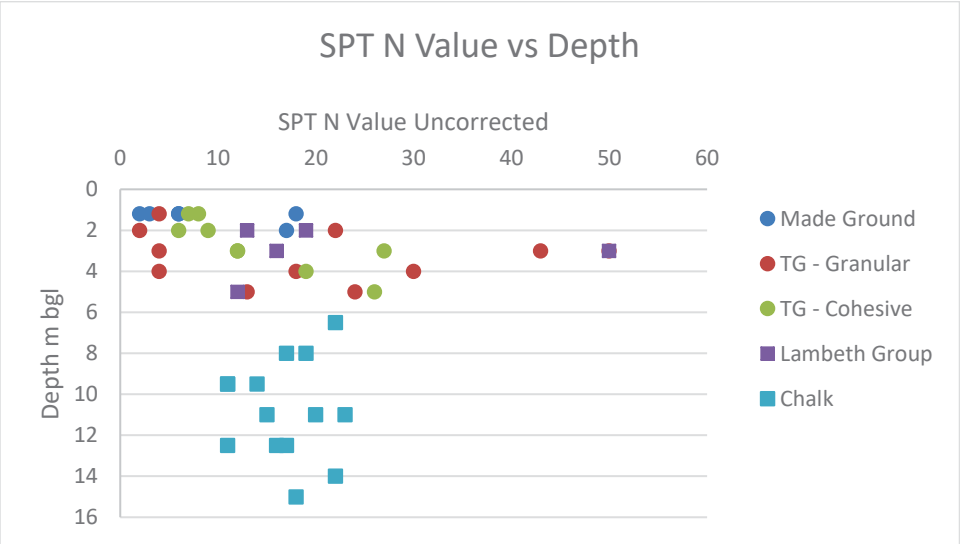
Location	Depth	Moisture Content	Saturated MC	Dry Density
BH3	7.5 - 8.0m	30%	31%	1.47 Mg/m^3
BH1	8.0 - 8.45m	28%	28%	1.55 Mg/m^3
BH2	12.0 - 13.0m	29%	30%	1.49 Mg/m^3

The above results place the chalk into CIRIA C574 low density to high density classifications indicating approximate unconfined compressive strength (UCS) values would vary from <3MN/m^2 up to around 5MN/m^2.

Fourteen SPT results were obtained within the chalk, and N values ranged from 11 to 23, with an average of 17. Results are plotted in Section 6.7.

6.7 In-Situ Testing

SPTs were undertaken in all the boreholes except BH4, and the N value results are plotted against depth. The SPT results are distinguished based on ground type, and there is no clear increase in strength with depth.



Tabulation of SPT N Results recorded at 3m and 4m bgl including simplistic ground type:

Location	Depth (m bgl)	SPT N	Ground Type
WS3	3	50	Lambeth Group - Cohesive
WS4	3	16	Lambeth Group - Cohesive
BH1	3	27	Taplow Gravel - Cohesive
BH2	3	12	Taplow Gravel - Cohesive
BH3	3	12	Taplow Gravel - Cohesive
WS1	3	50	Taplow Gravel - Granular
WS2	3	43	Taplow Gravel - Granular

Location	Depth (m bgl)	SPT N	Ground Type
WS5	3	4	Taplow Gravel - Granular
BH1	4	19	Taplow Gravel - Cohesive
WS5	4	4	Taplow Gravel - Granular
BH2	4	18	Taplow Gravel - Granular
BH3	4	30	Taplow Gravel - Granular

Considering the above results, there is a large variation in ground strength between SPT N results of 4 to 50. Excluding the lowest results (WS5) and the highest three results, then the results range from 12 to 30 around 3m to 4m bgl. The results should be interpreted with caution depending on the location of the new building.

6.8 Groundwater

Groundwater was noted during the GI as follows:

- BH1. Groundwater struck at 12.5m bgl and rose to 12m bgl after 20 minutes.
- BH3. Groundwater seepage at approximately 13.2m bgl.
- WS5. Strata noted to be wet between 2.5m and 3.8m bgl.

Groundwater level monitoring has been undertaken by Geoprobe Environmental Limited as part of a program of gas monitoring, and the results are included in Appendix 6. Following six visits; groundwater was detected in BH1 between 11.2m to 11.6m bgl. BH1 has a maximum drilled depth of 13m bgl.

7 Geotechnical Appraisal

The geotechnical appraisal is based on the encountered ground conditions and the results of on-site and laboratory testing along with the current understanding of the development proposals. The development is expected to comprise buildings up to four storeys with a single level basement as discussed in Section 2.2. Net line loads may be 250kN/m.

7.1 Foundations

The on-site Made Ground was found to be very loose to medium dense and extended in depth to 2.5m bgl. The Made Ground is considered to be an unsuitable founding material due to its inherent variability, low bearing capacity and high differential settlement potential. Foundations should therefore be taken through any made, soft or loose ground.

Construction of the single level basement with a FFL at ca 3m bgl will require excavation to around 3.5m deep, which will consequently mean that all Made Ground will have been removed from the area of the basement footprint. The building layout is subject to planning approval and therefore the following discussion is based on a number of assumptions.

At 3.5m bgl natural ground is expected to be encountered; comprising intermixed cohesive and granular Taplow Gravel deposits. SPT N values have shown a large variation in ground strength during the GI at around 3m to 4m bgl. In general, an allowable bearing capacity in the order of 100kN/m^2 (for a 2m wide strip footing founded circa 3.75m bgl) is assigned to the Taplow Gravels at this site. In the area of WS5 the ground is noted to be loose or very loose.

If potential differential settlements can be tolerated, then strip or pad footings may be utilised on the natural Taplow Gravels. Alternatively, piled foundations will be required.

The foundation design will need to consider the GI data along with the location of the new building and the influence of differential settlement. Settlement will depend upon the loads and foundation sizes, types and depths. Settlement will also vary between foundations placed on the granular and cohesive strata. Once foundation loads, layout and sizes are known, settlements can be estimated. These are likely to show some degree of differential settlement depending upon the foundation type, shape, loading and underlying variations in geology. If the differential settlements calculated are unacceptable then consideration should be given to the use of piled foundations.

A retaining structure will be required to safely construct the basement and support the sides of the excavation. It is expected that either sheet piles or a bored pile retaining wall are likely to be feasible, however the feasibility to drive sheet piles through the strata will need to be considered by the piling contractor. The design of the temporary and permanent works to form the basement will need to consider the development of ground movements and their effect on adjacent structures and utilities.

All pile design should be undertaken by a specialist piling contractor.

7.2 Floor Slabs

Loads imposed on floor slabs are expected to be low. A ground bearing slab is considered to be viable at basement level on the Taplow Gravels, subject to proof rolling and placement of 150mm of suitably compacted granular fill. If soft spots are encountered, then these should be removed and replaced with suitably compacted granular fill.

If a significant depth of Made Ground remains on site, then it is unlikely to be suitable for a ground bearing slab unless ground improvement is undertaken. This would apply if the basement did not to extend beneath the entire building footprint.

7.3 Roadworks

The site is likely to be significantly remodelled due to the demolition and subsequent basement construction. A California Bearing Ratio (CBR) value of 2% is assumed at this stage for roadway design on any Made Ground and cohesive strata although the natural granular Taplow Gravels are expected to have a CBR of at least 5%. Any soft spots should be removed and replaced with suitably compacted granular fill and the ground at formation level suitably proof rolled.

It is recommended that plate bearing tests are undertaken prior to construction to determine CBR values and inform bearing capacity. This could lead to more economic roadworks and will assist with piling mat design.

7.4 Excavation Issues

The basement construction and design will need to be cognisant of the adjacent properties and nearby in-ground utilities. It is assumed that basement FFL will be around 3m bgl, with a required excavation depth of around 3.5m to 4.0m bgl. Adjacent properties are close to (within 5m) some of the site boundaries. The type and distance to buried utilities is not known at this stage but these will need to be accounted for in the design and construction of both temporary and permanent works.

Where room allows it may be possible to batter back excavation sides to appropriate angles. For relatively short-term slopes, slope angle of 1:2.0 (v:h) is considered appropriate although this will need to be validated as part of the temporary works. Cut slopes will need to be assessed by an appropriately qualified person, such as a geotechnical engineer. For longer term slopes a more detailed assessment will be required which will need to account for ground water levels and the drained strength parameters of the soils.

Given the need for a permanent retaining wall for the basement the use of a bored pile wall or sheet pile wall should be considered, and this may be used as temporary support with appropriate design considerations. These will need to be designed to account for both earth and ground water pressures and superstructure loads. An assessment of the likely magnitude of ground movement is advisable given the close proximity of some adjacent buildings and the potential for the effect on services.

The Groundsure report provided as part of the Desk Study states that the site is in an area where rare and localised small-scale mining may have occurred relating to chalk. The Groundsure report also identifies a former kiln adjacent to the south of the site (or possibly on site at 62 - 68 Silver Street), referred to as “The Old Orchard Kiln” which states that chalk was extracted. There are no signs of extraction on the historical maps. However, it is possible that chalk extraction may have occurred adjacent to the site which could have extended into the site. It is noted that the ground in WS5, which is located in the south of the site, was found to be softer than recorded elsewhere beneath the site. This localised softening could potentially relate to historic excavation and backfill activities.

The site has previously been developed and existing building foundations, services and slabs will be encountered at the site. These obstructions may cause localised foundation difficulties and will therefore either need to be removed or isolated from the new substructure. Obstructions which remain in the ground may also act as hard spots and contribute to poor performance of the floor slab.

The influence of groundwater will need to be considered during construction, particularly when designing the basement. After 6 monitoring visits; groundwater has been encountered from 11.23m bgl.

7.5 Surface Water Drainage

To assist with soakaway design, falling head permeability tests have been undertaken in BH4. Three consecutive tests were undertaken on 20th August 2019.

Test 1 was undertaken at a depth of 4.5m to 5.0m bgl, within the sandy slightly gravelly clay of the Lambeth Group only. The infiltration rate was noted to be relatively slow.

Test 2 and 3 were undertaken consecutively at a depth of 3.5m to 5.0m bgl, within both the sandy slightly gravelly clay and the sandy gravel of the Taplow Gravel, and the underlying Lambeth Group. Slightly better infiltration rates were obtained within the Taplow Gravel which included more granular soils, compared to the Lambeth Group. It is noted that more granular soils will exhibit a better infiltration rate compared to clays.

The results of the falling head tests are presented in Appendix 2.

Soakaways may be appropriate for the disposal of site surface water however this depends on several factors:

- Underlying ground. The site is underlain by a mix of granular deposits, clays and chalk. The granular Taplow Gravel deposits may support the use of soakaways however they also have some fines content and are intermixed with cohesive Taplow Gravel which may hinder use as good infiltration medium. Clays are likely to exhibit poor infiltration rates and therefore soakaway drainage into the superficial clays or the Lambeth clays is likely to be inefficient. Chalk bedrock may support soakaway drainage although it is noted that chalk is vulnerable to dissolution. This potential risk should be considered when designing the site drainage strategy. In principle, soakaways may be feasible, and their success will be location (ground type) dependant.
- Infiltration rates. To assist soakaway design, falling head tests have been undertaken in BH4. The rate of infiltration will need to be considered for the strata into which surface waters would discharge (e.g. granular deposits) and should be considered alongside development of the future site layout and drainage strategy.
- Space restrictions. The proposed development includes a basement. Based on the current proposals for future site layout there may be enough space to locate soakaway drainage within the landscaping area towards the middle of the site. BRE365 recommends that soakaways should be placed at least 5m away from building foundations.

There are no nearby watercourses into which surface waters could be disposed. Surface waters may require disposal via the public sewers where discharge restrictions and charges may apply. This should be discussed with the local water company.

7.6 Sulphate Precautions

Below ground concrete in contact with natural ground can be designed to DS-1: AC-1. Below ground concrete in contact with any residual Made Ground should be designed to DS-3: AC-3. These classifications are discussed in Section 8.3.4.

8 Contamination Appraisal

This section develops the preliminary risk assessment undertaken as part of the earlier Desk Study. Potential sources of contamination identified within the preliminary conceptual site model (CSM) have been quantified by the GI. The contamination appraisal and outcomes of the investigation are discussed here.

The site is underlain by Made Ground to depths between 0.7m and 2.5m bgl. Natural superficial deposits are clay/sand/gravel of the Taplow Gravel Member and the Lambeth Group clay over weathered chalk bedrock. Groundwater monitoring has found groundwater from 11.23m bgl.

The Taplow Gravel and Lambeth Group are both classified as secondary A aquifers, although the chalk bedrock is likely to be a principal aquifer. The site soils are expected to have variable leaching potentials.

There were no obvious visual or olfactory signs of contamination noted during the GI works, except within a thin band of chalk in BH1 at 12.7m depth which had a hydrocarbon odour and a slight grey-blue tint. Note that this is a similar depth to the groundwater strike.

8.1 Sampling Strategy

On the basis of the information above, samples of soil were collected with the objective of determining the concentrations of possible contaminants associated with the site. The analysis suites were targeted to cover potential anthropogenic and naturally occurring contaminants, which were thought possible to occur at this site, as identified in the preliminary CSM and also to take into account encountered site conditions.

In total 18 soil samples were scheduled for analysis including ten samples of Made Ground, five samples of Taplow Gravel, one sample of Lambeth Group and two samples of chalk.

Intrusive areas and sampling points were selected to enable assessment of potential contamination across the site including targeting areas identified in the preliminary CSM. Sampling locations were also chosen to facilitate assessment of potential off-site sources of contamination identified in the preliminary CSM.

The soil samples were collected in 1000ml plastic tubs, 250ml amber glass jars and 60ml amber glass vials. All samples were labelled with the sample location, depth and date of sampling. The samples were stored with ice packs within cool boxes and sent to the labs for analysis. No samples were deviating.

Select soil samples were analysed for the following determinants:

- metals and metalloids (Arsenic, Cadmium, Chromium, Hexavalent Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc),
- total sulphur, acid soluble sulphate and soluble sulphate (2:1 extract) and pH.
- redox potential, conductivity. Soil Organic Matter (SOM) content.
- phenol, volatile organic compounds (VOCs) including tentative identification of compounds (TIC) and semi-volatile organic compounds (SVOCs) including TIC (which include speciated polyaromatic hydrocarbons (PAH) and benzene, toluene, ethylene, xylene (BTEX)).
- speciated total petroleum hydrocarbons (TPH) analysis.

In addition, Made Ground samples were scheduled for identification of asbestos and one sample for further quantification testing. Four samples of Made Ground underwent Waste Acceptance Criteria tests to assist with the off-site disposal of waste arisings.

8.2 Chemical Assessment Values

When assessing the chemical test results, the results are compared with an assessment value.

The most appropriate assessment value to use depends on the type of sample being tested (soil, water, leachate) and the receptor (human, plant, water, concrete) at risk from potential contamination. Therefore, different assessment values are applicable when assessing different receptors.

Initially test results are compared against Generic Assessment Criteria (GAC). Results below the GAC are widely considered to present acceptably low levels of risk. Results above GAC require further assessment as they may present an unacceptable level of risk. This further assessment may take the form of developing Site Specific Assessment Criteria (SSAC) or taking into account other specific factors at this site. The assessment values used within this investigation are included within Appendix 5 and are discussed further here.

8.2.1 Human Health

Published guidance available for assessment of potential human health risks from contaminants within soils has been updated in the UK and the background to these changes is discussed in Appendix 5. With the above in mind, soil contamination test results have been assessed against Suitable 4 Use Levels (S4ULs) which are based on 'minimal' and 'tolerable' risk as adopted by Environment Agency publication SR2. If S4ULs are exceeded, then Category 4 Screening Levels (C4SLs) will be used to assess the test results although it will be stated where this approach has been adopted.

The C4SLs are based on a 'Low Level of Toxicological Concern' (LLTC) which is a 'pragmatic intake level that remains sufficiently protective of health but represents a level of concern that is 'low' rather than 'minimal' or 'tolerable' and as such is less conservative than the S4ULs. The C4SL has been used for lead as no S4UL is available.

The GAC values used within this assessment are for a proposed residential end use without plant uptake. If the development end use changes then the results should be reassessed using assessment values more appropriate to that end use.

Risks posed to potable drinking water pipes have been considered using the United Kingdom Water Industry Research (UKWIR) Report 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' to avoid risk from ingestion of tainted drinking waters and corrosion of metal pipework.

Landfill gas risks have been assessed in accordance with CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings.

8.2.2 Plant Health

Landscaped areas form part of the development and risks to plant health have been assessed the using assessment values taken from within 'The Soil Code', MAFF 1998, BS3882 Specification for Topsoil and Guidance 'Sewerage Sludge on Farmland' DEFRA 2017.

8.2.3 Controlled Waters

Soil samples have been analysed for concentrations of potential contaminants. If significant concentrations of contaminants are measured within the soils then leachate analysis would be undertaken and results assessed against GAC for controlled water based risks, such as EQS freshwater and UK and WHO drinking water standards. However, it should be remembered that the groundwater on-site would not be used as drinking water and that risks to potable water supply pipes are considered using the UKWIR Guidance as part of the human health assessment.

8.2.4 Cementitious Products

Risks to below ground concrete structures have been assessed using recommendations and assessment values taken from BRE Special Digest 1:2005 'Concrete in Aggressive Ground'. The site is classified as a brownfield site and water is expected to be mobile. Samples have been tested for water soluble sulphate, acid soluble sulphate, total sulphur and pH.

8.2.5 Waste Acceptance Criteria

Waste Acceptance Criteria (WAC) tests have been assessed against guidance values based on the Environment Agency Guidance within Waste Sampling and Testing for Disposal to Landfill. These values are included on the test results within Appendix 4 and have therefore not been reproduced within Appendix 5. Overall acceptance for landfill disposal would rest with the landfill operator and the assessment is for guidance purposes only.

8.3 Contamination Test Results

The chemical test results are included within Appendix 4. The results have been compared with the GAC discussed above and provided in Appendix 5. The results are discussed further below.

8.3.1 Soils – Human Health Assessment

All soil samples analysed had concentrations of contaminants below the soil GAC for a residential end-use without plant uptake, or below the detection limits of the analysis, with the exception of the following:

- Lead in Made Ground samples WS3 at 0.5m, WS4 at 0.5m and BH2 at 0.4m, where the concentrations were 530 mg/kg, 470 mg/kg, 360 mg/kg respectively, compared to an assessment value of 310mg/kg.
- Arsenic in one sample of natural clay (BH2 at 6m bgl), where the soil concentration was 91 mg/kg compared to an assessment value of 40 mg/kg.
- Asbestos was detected in one sample of Made Ground (BH2 at 0.4m bgl) as a bundle of chrysotile fibres; asbestos quantification showed the total mass of asbestos in soil as 0.001%.

8.3.2 Potable Water Supply

The results were mainly within the GAC UKWIR assessment values for selection of potable water supply pipes, however the following elevations were noted in regard to water pipe selection:

Parameter	Exceeded UKWIR Assessment Value	Samples exceeding Assessment Value
SVOC	PVC 1.4 mg/kg PE 2.0 mg/kg	12 mg/kg – WS1 at 0.35m 6.0 mg/kg – WS4 at 0.5m 4.4 mg/kg – BH2 at 0.4m 10.82 mg/kg – HDP1 at 0.5m 5.37 mg/kg – HDP2 at 1.0m
Phenol	PVC 0.4 mg/kg PE 2.0 mg/kg	0.7 mg/kg (PVC) - WS3 0.5m

Parameter	Exceeded UKWIR Assessment Value	Samples exceeding Assessment Value
Mineral oil C_{11}-C_{20}	PE 10mg/kg	BH1 at 12.7m – chalk with hydrocarbon odour: Aliphatic C_{12}-C_{16} - 16 mg/kg Aliphatic C_{16}-C_{21} - 20 mg/kg Aromatic C_{12}-C_{16} - 18 mg/kg Aromatic C_{16}-C_{21} - 21 mg/kg
Positive redox potentials and elevated pH values (>8) were recorded for 12 samples of Made Ground and 3 samples of natural soil, which exceed the UKWIR threshold values for copper pipes.		

SVOCs can degrade PVC and PE, and positive redox potentials and elevated pH can be corrosive to copper.

8.3.3 Soils – Plant Health Assessment

Eighteen soil samples were tested for nickel, zinc and copper which are particularly phytotoxic elements. The test results have been assessed and were below the GAC with the exception of one sample of Made Ground (WS1 at 0.35m) which had concentrations of copper (380mg/kg) and zinc (360mg/kg) above their respective GACs (200mg/kg for copper and 300mg/kg for zinc).

8.3.4 BRE Special Digest 1 Tests

The site is classified as brownfield and water is assumed to be mobile. To assist concrete classification, 9 samples of Made Ground and 4 samples of natural ground were analysed for water soluble sulphate, acid soluble sulphate, total sulphur and pH. The test results show the following range of results:

	Soil Type	
	Made Ground (9 samples)	Natural (4 samples include Taplow Gravel, Lambeth Group and Chalk)
Water soluble sulphates (mg/l)	15 -1820 (DS1 to DS3)	11 - 37 (DS1)
Total potential sulphates (%)	Max 0.855 (AC3)	Max 0.07 (AC1)
Oxidisable sulphides (%)	<0.3	<0.3

Calculation indicates that oxidizable sulphides are less than 0.3%, and therefore not likely to be present.

Results for the Made Ground vary; 7 results are DS-1:AC-1, 1 result (BH4 at 0.5) is DS-2:AC-2, 1 result (HDP1 at 0.5m) is DS-3:AC-3. Two out of the nine Made Ground results indicate that sulphate resistance would be required for below ground concrete and therefore DS-3:AC-3 is assigned to the Made Ground.

Results are within DS-1 and ACEC Class AC-1 for the natural ground.

8.3.5 Waste Acceptance Criteria

WAC test results on four samples of Made Ground (WS4 at 0.5m, BH1 at 0.3m, BH3 at 0.5m and HDP1 at 0.5m) generally fall into the inert classification, with the exception of sulphate and total dissolved solids in HDP at 0.5m, which would place this sample in the ‘Stable Non-Reactive Hazardous’ category.

8.3.6 Gas Monitoring Results

During the GI, combined ground gas/groundwater monitoring wells were installed in WS1, WS2 and BH1.

A programme of gas monitoring was undertaken by Geoprobe Environmental Ltd and the results are enclosed in Appendix 6. The results have been assessed in accordance with CIRIA Guide C665.

Six monitoring visits were undertaken between February and May 2018, over a range of atmospheric pressures, ranging from 989 mbar to 1023 mbar.

The wells were allowed to equilibrate with their surroundings prior to commencement of the gas monitoring programme. During each monitoring visit; the atmospheric pressure, flow rate, methane, carbon dioxide and oxygen concentrations were recorded, along with the groundwater level.

Recorded gas flow rates were zero over the monitoring period.

The highest recorded methane concentration was 0.0% by volume. Therefore, the Gas Screening Value (GSV) for methane at the site is 0.0 l/hr (no methane detected). The GSV threshold for methane suggested by C665 is 0.07 l/hr.

Low concentrations of carbon dioxide were measured within all the monitoring wells; the maximum concentration was 2.5%. The GSV for CO2 is calculated to be 0.0025 l/hr, based on using a positive flow rate of 0.1 l/hr and a maximum CO2 concentration of 2.5%. This is well below the GSV threshold for CO2 of 0.07 l/hr, suggested by C665.

Based on the gas monitoring results, the site therefore falls within Characteristic Situation 1; a very low risk classification where gas protection measures are not required.

9 Conceptual Site Model

An initial conceptual site model (CSM) was developed during the desk study. The CSM is refined and updated in this section, taking into account site specific information, the GI works and the chemical test results on soils.

The CSM identifies potential source-pathway-receptor, 'pollutant linkages' that may be present at the site, however site-specific risk factors are considered within Section 10, which should also be referred to when considering relevant pollutant linkages.

Conceptual Site Model (CSM)		
Source	**Pathway**	**Receptor**
Elevated lead in three samples of Made Ground compared to GAC for residential without plant uptake.	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
Elevated arsenic in one sample (BH2 at 6m bgl) of natural ground compared to GAC for residential without plant uptake.	Ingestion, inhalation, dermal contact	Humans: future site users, visitors and construction workers
Asbestos in one sample of Made Ground (BH2 at 0.4m bgl)	Inhalation	Humans: future site users, visitors and construction workers
Elevated water soluble sulphate in Made Ground	Direct contact, groundwater	Below ground concrete
Elevated SVOCs in four samples of Made Ground and one sample of natural ground when compared to drinking water GAC for PE and PVC pipes	Direct contact and migration through the ground	PE and PVC drinking water pipes/ human health
Elevated mineral oil concentration in one sample of chalk displaying a hydrocarbon odour (BH1 at 12.7m bgl)	Direct contact and migration through the ground	PE drinking water pipes/ human health
	Migration through the ground	Underlying aquifers
Elevated phenol in one sample of Made Ground (WS3 at 0.35m) compared to drinking water GAC for PVC pipes	Direct contact and migration through the ground	PVC drinking water pipes/ human health
pH>8 and Eh positive in the Made Ground and natural ground compared to drinking water GAC for copper pipes	Direct contact and migration through the ground	Copper drinking water pipes/ human health
Elevated copper and zinc in one sample of Made Ground (WS1 at 0.35m)	Direct contact and migration through the ground	Plants

There are eight potential pollution linkages identified which are discussed further within the contamination risk assessment which follows.

10 Contamination Risk Assessment

This section considers the outcomes of the GI, the comparison of encountered contamination concentrations against GAC's and where appropriate the mitigating circumstances present at this site in terms of contamination risk assessment. The following section goes on to develop a preliminary remediation strategy.

10.1 Human Health

10.1.1 Soils

Potential soil contaminants have been tested for and were found to be mainly below GAC for a residential use without plant uptake, except for some heavy metals which were found to be above GAC (lead in three samples of shallow Made Ground, and arsenic in one sample of natural ground at 6m depth). Asbestos was also identified in one sample of Made Ground, although following quantification the total mass of asbestos in soil was found to be 0.001%.

As part of the development process, the majority of the on-site Made Ground will be removed from site to facilitate construction. This will consequently break the pollutant linkage between the sources of lead and ACM and future receptors. If any Made Ground were to remain on site, then this would not provide a nutritious growth medium for plants, and residual Made Ground should therefore not be placed in landscaped areas.

Topsoil will need to be imported to site for use in landscaped areas. Imported topsoil should be tested to ensure it is suitable for use in a residential setting. At least 150mm depth of topsoil will be needed to facilitate plant growth. Placement of topsoil will break the pathway between any remaining Made Ground and future site users thereby removing any remaining pollutant linkage with future site users.

At a depth of 6m bgl the elevated arsenic concentration within the natural clay is not considered to be a cause for concern as there is no pathway between these materials and future site users.

The GAC used in this assessment are considered to be conservative as they assume that all the measured soil concentration would be bioavailable, which is unlikely to be the case.

Construction workers should follow safe, hygienic and appropriate working practices including use of PPE to protect themselves from Made Ground and potential contaminants. A health and safety risk assessment and method statement should be developed by the contractor ahead of any construction or preparatory works.

10.1.2 Waters

Depending on the location of proposed future potable water supply pipes, then PE and PVC pipes may not be suitable, although this mainly depends on whether any Made Ground remains on site. Copper pipes also may be unsuitable. Barrier piping may be needed; the selection of water supply pipes should be discussed with the local water supplier prior to laying any potable water pipes at the site. A copy of this report should be provided to the statutory undertaker, who may require a separate risk assessment.

10.1.3 Gases

The site is not in a radon affected area and, based on the gas monitoring results (methane and carbon dioxide), the site falls in Characteristic Situation 1; a very low risk classification where gas protection measures are not required.

10.2 Plant Health

Slightly elevated concentrations of phytotoxic metals were recorded in one sample of Made Ground, which may influence sensitive plant species. However, Made Ground is expected to be mostly removed from site to allow construction. The Made Ground does not represent a nutritious medium for plant growth, although the test results indicated that overall the site soils should pose low risks to plants.

Topsoil will be required in landscaping areas to provide a suitable growth medium for plants.

10.3 Controlled Waters

Overall, levels of contamination measured within soil samples were found to be within acceptable levels (below GAC and/or the detection limit of the analysis) with few exceptions. Most Made Ground is likely to be removed from site to allow construction. There were no visual or olfactory signs of contamination at the site except for at 12.7m depth in BH1 relating to a thin band within the chalk which had a hydrocarbon odour. Testing on this sample indicates that this material does not pose a risk to human health. The source of this contamination is unknown, although it may have originated off-site given the depth encountered, and the fact that no other evidence of on-site hydrocarbons was noted during the GI.

The nearest watercourse is circa 475m to the west of the site. The site is not located in a source protection zone and the nearest potable water extraction point is circa 500m east of the site. The site is underlain directly by Secondary (A) aquifers, although at depth the chalk is likely to be a Principal aquifer. Groundwater has been recorded from 11.23m bgl during groundwater level monitoring.

Based on the above, risks posed to controlled waters are considered to be very low.

Safe and appropriate working practices should be adopted by the Contractor during construction, which will act to protect controlled waters during the construction process.

10.4 Cementitious Products

Based on the results of chemical analysis, the risks to below ground concrete structures from sulphates in the ground are low, although some sulphate protection will be required for concrete in contact with any residual Made Ground. A Design Sulphate Class DS-2 with ACEC of AC-2 is assigned to concrete in contact with the Made Ground; however for the natural ground DS-1 with ACEC of AC-1 is assigned. Oxidisable sulphates are unlikely to be present.

10.5 Waste

Some soils will require removal from site to facilitate construction. Four WAC tests indicate that the Made Ground is expected to be classified as inert. Acceptance for disposal at landfill resides with the landfill operators, who may have their own requirements, and further testing may be required depending upon the amount sent for disposal.

10.6 Summary

An updated CSM has been produced which identifies remaining potential pollutant linkages. Mitigating circumstances have also been discussed. The probability vs. consequence of each identified linkage are considered below along with the residual level of risk.

The risks are based upon CIRIA good practice guidance; principally detailed within C552 and C665. A summary of this descriptive information is included within Appendix 5.

Potential Hazard	Potential Receptor	Residual Risk
Elevated lead in three samples of Made Ground compared to GAC for residential without plant uptake.	Humans: future site users, visitors and construction workers	Risk mitigated by removal of most Made Ground during construction and by not placing Made Ground directly within landscaped areas. Residual risk to future site users very low. Residual risk to construction workers to be addressed by the Contractor on site via adopting safe working practices and use of PPE.

Potential Hazard	Potential Receptor	Residual Risk
Elevated arsenic in one sample (BH2 at 6m bgl) of natural ground compared to GAC for residential without plant uptake	Humans: future site users, visitors and construction workers	Pathway between source and receptors is not present therefore residual risk is negligible.
Asbestos detected in one sample of Made Ground (BH2 at 0.4m bgl)	Humans: future site users, visitors and construction workers	Risk mitigated by removal of Made Ground to facilitate construction, and by not placing Made Ground directly within landscaped areas. Residual risk to future site users very low. Residual risk to construction workers to be addressed by the Contractor on site via adopting safe working practices and use of PPE.
Elevated water-soluble sulphate in Made Ground	Below ground concrete	Risk mitigated by concrete design incorporating sulphate resistance. DS-3:AC-3 assigned.
Elevated SVOCs in four samples of Made Ground and one sample of natural ground when compared to drinking water GAC for PE and PVC pipes	PE and PVC drinking water pipes/ human health	Risk reduced/removed by removal of Made Ground to facilitate construction. If pipes are to be placed in residual Made Ground, then PE and PVC pipes may not be suitable and barrier pipes may be needed. This should be discussed with the local water supplier. Residual risk very low.
Elevated mineral oil concentration in one sample of chalk displaying a hydrocarbon odour (BH1 at 12.7m bgl)	PE drinking water pipes/ human health	Drinking water pipes are not expected to be installed at this depth therefore the pathway between the source and the receptor is not present. Residual risk very low.
	Underlying aquifers	Concentrations well below human health GAC. Not detected elsewhere on site. At this depth likely to be from offsite source. Residual risk very low.
Elevated phenol in one sample of Made Ground (WS3 at 0.35m) compared to drinking water GAC for PVC pipes	PVC drinking water pipes/ human health	Risk reduced/removed by removal of Made Ground to construct the basement. If pipes are to be placed in Made Ground, then PVC pipes may not be suitable and barrier pipes may be needed. This should be discussed with the local water supplier. Residual risk very low.
pH>8 and Eh positive in the Made Ground and natural ground compared to drinking water GAC for copper pipes	Copper drinking water pipes/ human health	Copper pipes are not considered appropriate for this site and therefore alternative pipes should be selected in discussion with the local water supplier. Residual risk negligible.

Elevated copper and zinc in one sample of Made Ground (WS1 at 0.35m)	Plants	Risk mitigated by removal of Made Ground to facilitate construction, and by not placing Made Ground directly within landscaped areas. Residual risk to plants is very low.

11 Remediation Strategy

Following the ground investigation, laboratory testing and development of an updated CSM, it has been demonstrated that remaining contamination pollution linkages present overall very low risks at this site.

The following recommendations are made to enable the identified contamination risks to be appropriately managed for safe site development:

- Construction workers should follow safe, hygienic and appropriate working practices including use of PPE to protect themselves from Made Ground during the excavation and construction of the basement, during which the majority of Made Ground will be removed from the site. Given the nature of the Made Ground and its likely origins (from previous development activity), the presence of asbestos cannot be discounted. The contractor's risk assessment, method statement and subsequent working practices at the site should therefore account for the possibility of encountering ACM. Asbestos awareness training should be provided to ground workers and a management system put in place to evaluate asbestos risk and potentially escalate precautions to control any exposure to asbestos in line with the Control of Asbestos Act.
- Made Ground is not a suitable growth medium for plants, and should therefore not be used within landscaped areas either at ground level, around the finished building, or at basement level in the proposed courtyard. Topsoil will need to be imported to site for use in those landscaped areas, which should be tested prior to import, to ensure it is suitable for use in a residential environment. At least 150mm of topsoil should be used in landscaped areas for successful plant growth of shallow rooted plants. Some plant species will require a greater thickness of topsoil/subsoil, and this should be considered alongside the landscape architects specifications.
- PE and PVC drinking water pipes should not be placed directly within any residual Made Ground, although it is noted that, as the proposed basement extends virtually to the back of the footpath, incoming services are in practice likely to be laid in clean trench backfill until they enter the building. Copper potable water pipes are considered unsuitable at this site if they are laid in the Made Ground. Barrier piping may be required although this depends on the position of potable pipes relative to the GI results and pipe locations. The selection of water supply pipes should be discussed with the local drinking water supplier prior to laying any drinking water pipes at the site. A copy of this report should be provided to the statutory undertaker, who may require a separate risk assessment.

Copies of relevant correspondence regarding the above should be sent to the Local Authority for their records.

It is possible that localized zones of contaminated material may be found on-site in areas that were not covered by the investigation. A watching brief should be kept on-site during the development for signs of contamination, particularly once the existing building has been demolished. If ashy, odorous or apparently contaminated material is found on site, this should be tested to check if it is contaminated. If it is found to be contaminated, after consultation with the regulatory authorities, then it should be removed or capped as appropriate.

12 Conclusions and Recommendations

Subsequent to intrusive GI at 40 to 68 Silver St, along with on-site and laboratory testing, the following is noted:

The site at 40 to 68 Silver Street is underlain by Made Ground to depths between 0.7m and 2.5m bgl, over superficial clay/sand/gravel of the Taplow Gravel Member and Lambeth Group clay, over weathered chalk bedrock. Groundwater monitoring has recorded groundwater from 11.23m bgl.

12.1 Geotechnical

- Foundations should be taken through any made, soft or loose ground. If potential differential settlements can be tolerated, then strip and pad footings may be utilised on the natural Taplow Gravels alternatively piled foundations will be required. Pile design should be undertaken by a specialist piling contractor.
- Allowing for the proposed basement excavation, at 3.75m bgl the Taplow Gravel is expected to provide an allowable bearing capacity around 100kN/m^2. Differential settlement should be considered as part of the design process.
- A retaining structure will be required to safely construct the basement.
- A ground bearing slab on the Taplow Gravel is expected to be acceptable for the basement floor slab.
- A CBR value of 2% is assumed for roadway design on any Made Ground and cohesive strata. The natural granular Taplow Gravel is expected to have a CBR of at least 5%. Any soft spots should also be removed and replaced with suitably compacted granular fill and the ground at formation level suitably proof rolled.
- To assist more economic roadworks and piling mat design; it is recommended that plate bearing tests are undertaken prior to construction to determine CBR values and inform bearing capacity.
- Below ground concrete should be designed to DS-3 and ACEC AC-3 for concrete in contact with any residual Made Ground. DS-1:AC-1 can be assumed for the natural ground.
- Radon protective measures are not required.
- Soakaways may be feasible although this will be dependent on the location of the soakaway and the ground type into which the soakaway would discharge. Soakaways are considered to be viable within the granular Taplow Gravel deposits however soakaway into cohesive deposits is not recommended.

12.2 Geo-environmental

A programme of ground gas monitoring (methane and carbon dioxide), comprising 6 monitoring visits, classifies the site as Characteristic Situation 1 where gas protective measures are not required.

Nine potential pollution linkages have been identified following GI however the majority of these would be removed by the excavation of the vast majority of the on-site Made Ground to construct the basement. Residual risks are thought to be very low providing the remedial measures suggested within Section 11 are followed during construction.

Topsoil will need to be imported for landscaped areas.

The local public water supplier should be consulted regarding selection of potable drinking water pipes.

Safe and appropriate working practices should be followed during construction.

The conclusions and recommendations made within this report should be agreed by the approving bodies, such as the Local Authority and Environment Agency, prior to commencing construction.

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Drawing – Site Location Plan

Site boundaries outlined in red.

Location plan extract from Groundsure report

Drawing - Proposed Future Site Layout

oea

Notes:

All dimensions are in millimetres unless stated otherwise. No dimensions to
be scaled from drawings. All dimensions to be checked on site prior to manufacture.

Any discrepancies between drawings and site conditions are to be reported to the contract manager.

This drawing is to be read in conjunction with all relevant Structural Engineers and Mechanical & Electrical Engineers drawings and specification.

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GRAPHIC SCALE

0 2000 4000 6000 8000

dwg status:

DRAFT

Rev	Description	Date	By	Chk

oea

oconnell east architects
63 Newton Street, Manchester, M1 1ET
t: 0161 839 9380 f: 0161 833 1638

dwg title:	Ground Floor Plan		
job title:	62-68 Silver Street, Reading		
scale:	1 : 100 @ A1	drawn:	PO
date:	10/04/17	job no:	1717
dwg no:	PL_101	rev:	

1 **Level 0**
1 : 100

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Drawing – GI Location Plan including Current Site Layout

Do not scale this drawing

G.I. LOCATION PLAN

SCALE 1:100

GENERAL NOTES

1. GROUND INVESTIGATION WORKS UNDERTAKEN IN JANUARY 2018.
2. DO NOT SCALE FROM THIS DRAWING, ONLY WRITTEN OR CALCULATED DIMENSIONS TO BE USED.
3. EXTRACT FROM GROUND SURVEYS LTD TOPOGRAPHIC SURVEY DRAWING NUMBER 5830-01, OCTOBER 2014.
4. WS1, WS2 AND BH1 REINSTATED AS GAS/GROUNDWATER MONITORING WELLS.

LEGEND

	SITE BOUNDARY
WS	APPROX WINDOW SAMPLE BOREHOLE LOCATION
BH	APPROX CABLE PERCUSSION BOREHOLE LOCATION
HDP	APPROX HAND DUG PIT LOCATION

Rev	Date	Revision Details	By	Chkd	Appd
P4	21.08.19	ADDITIONAL GROUND INVESTIGATION ADDED	JS	JT	CRP
P3	19.02.19	SITE BOUNDARY EXTENDED TO INCLUDE 62-68 SILVER ST.	JS	HB	CRP
P2	09.04.18	PRELIMINARY ISSUE	NS	HB	CRP
P1	07.02.18	PRELIMINARY ISSUE	NS	HB	CRP

Westlakes Consulting

Client: SILVER STREET DEVELOPMENTS Ltd.

Project: 40-68 SILVER STREET, READING

Title: G.I. LOCATION PLAN

Drawing No.: WL_1227_001

Revision: P4

Scale: AS SHOWN@A1 | Date: FEB '18

Drawn: N.S. | Chk: H.B. | App: C.R.P.

Unit 2.1, 20 Dale Street
Manchester.
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Do not scale this drawing

Appendix 1 - Exploratory Logs

Borehole Log

Westlakes Environmental

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Borehole No. **BH1** Sheet 1 of 2
Location: Reading		Level:	Hole Type CP
			Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
					0.10			MADE GROUND: Concrete.	
		0.30	ES		0.40			MADE GROUND: Grey clayey GRAVEL of aggregate.	
		0.90	ES		0.80			Mid brown slightly orange slightly silty slightly sandy slightly gravelly CLAY. Gravel is fine and medium of flint. (Taplow Gravel Member).	
		1.20		N=7 (5,/1,2,2,2)	1.20			Loose orange brown slightly silty slightly gravelly SAND. (Taplow Gravel Member).	1
		1.20 - 1.70	B					Soft to firm mid brown slightly silty slightly sandy slightly gravelly CLAY. Gravel is fine and medium of flint. (Taplow Gravel Member).	
		2.00		N=9 (3,/2,2,3,2)					2
		3.00		N=27 (6,/5,7,8,7)					3
					3.40			Mid brown slightly sandy GRAVEL. Gravel is fine to coarse of flint. (Taplow Gravel Member).	
					3.60			Firm orange brown sandy slightly gravelly CLAY. Gravel is fine to coarse of flint. (Taplow Gravel Member).	
		4.00		N=19 (9,/4,4,5,6)					4
		5.00		N=26 (7,/6,6,7,7)					5
					5.80			Firm grey brown mottled red with slight green tint sandy slightly gravelly CLAY. Gravel is fine and medium. (Lambeth Group)	6
		6.50 - 6.95	U						
		6.90	ES		7.00			Soft to firm white to cream slightly clayey slightly sandy gravelly SILT. Gravel is fine to coarse, sub-rounded to sub-angular of chalk. Flint band around 11m. (Weathered chalk bedrock - Grade Dm). At 12.7m thin slightly grey-blue band smells of hydrocarbons.	7
		7.50 - 8.00	B						
		8.00 - 8.45	U						8
									9
		9.50		N=14 (6,/4,3,4,3)					10

Continued on next sheet

Remarks

Groundwater encountered at 12.5m bgl, slow inflow, rising to 12m bgl. At 12.7m a thin slightly grey-blue band was encountered which smells of hydrocarbons.

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH1**

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		11.00		N=23 (5,/3,4,8,8)				
	▼	12.50		N=17 (5,/4,3,4,6)				
		12.70	ES					
					13.00			End of borehole at 13.00 m

11 12 13 14 15 16 17 18 19 20

Remarks

Groundwater encountered at 12.5m bgl, slow inflow, rising to 12m bgl. At 12.7m a thin slightly grey-blue band was encountered which smells of hydrocarbons.

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH2**

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 30/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
					0.03			MADE GROUND: Asphalt.	
					0.10			MADE GROUND: Concrete.	
		0.40	ES		0.20			MADE GROUND: Mid grey slightly sandy GRAVEL. Gravel is sub-angular to very angular of aggregate.	
					0.45			MADE GROUND: Dark brown to black clayey gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular of concrete and red brick.	1
		1.20	ES		1.20			MADE GROUND: Mid to light brown very clayey gravelly SAND with occasional cobles of red brick. Gravel is fine to coarse, sub-rounded to angular of red brick, flint and concrete.	
		1.20		N=8 (5,/2,2,2,2)					
		1.20 - 1.70	B						
		2.00 - 2.45	U					Soft to firm mid brown very sandy slightly gravelly CLAY. Gravel is fine to coarse, rounded to sub-angular of flint and chalk. (Taplow Gravel Member).	2
		3.00		N=12 (6,/2,3,4,3)					3
					3.80			Medium dense SAND AND GRAVEL. Gravel is fine to coarse, well rounded to sub-angular of flint. (Taplow Gravel Member).	
		4.00		N=18 (8,/4,4,5,5)					4
		4.00 - 5.00	B						
		5.00		N=24 (9,/5,5,6,8)					5
					5.80			Firm mid brown to grey sandy slightly gravelly CLAY. Gravel is sub-rounded to sub-angular of flint and chalk. (Lambeth Group)	
		6.00	ES						6
					6.20			Soft white to cream slightly clayey slightly sandy gravelly SILT. Gravel is fine to coarse, sub-rounded to sub-angular of chalk. (Weathered chalk bedrock - Grade Dm)	
		6.50 - 6.95	U						
		7.00	ES						7
		8.00		N=19 (10,/4,5,5,5)	8.00			Firm white to cream slightly clayey slightly sandy gravelly SILT. Gravel is fine to coarse, sub-rounded to sub-angular of chalk. (Weathered chalk bedrock)	8
									9
		9.50		N=11 (5,/3,2,2,4)					10

Continued on next sheet

Remarks

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH2**

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 30/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		11.00		N=15 (5,/3,4,3,5)					11
		12.00 - 13.00	B						12
		12.50		N=16 (5,/4,3,4,5)					
					13.00			End of borehole at 13.00 m	13
									14
									15
									16
									17
									18
									19
									20

Remarks

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH3**

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level: 48.00	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 19/08/2019 - 20/08/2019	Logged By

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.50	ES		0.70	47.30		MADE GROUND: Compact red-brown sandy fine to coarse angular gravel of brick and concrete. High content of whole and part bricks and cobble-sized fragments of concrete, Low content of metal and ceramic pipe fragments	
		1.20		N=4 (1,2/1,1,1,1)				Loose red-brown medium to coarse SAND (Taplow Gravel Member)	1
		2.00		N=6 (2,2/2,1,2,1)	2.10	45.90		Firm brown very sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of flint (Taplow Gravel Member)	2
		3.00		N=12 (3,4/4,2,3,3)					3
		4.00		N=30 (3,10/11,9,5,5)	3.90	44.10		Dense brown sandy fine to coarse subangular to subrounded GRAVEL of flint (Taplow Gravel Member)	4
		4.00 - 4.50	B						
		5.00		N=10 (1,2/3,2,2,3)	5.20	42.80		Firm grey-brown mottled red with slight green tint sandy slightly gravelly CLAY. Gravel is fine and medium (Lambeth Group)	5
									6
		6.50		N=22 (8,8/7,6,4,5)	6.30	41.70		Soft to firm white calcareous SILT with low content of fine to coarse subrounded to subangular gravel of chalk and flint (Weathered chalk bedrock - Grade Dm)	7
		7.50 - 8.00	B						
		8.00		N=17 (3,3/3,4,4,6)					8
									9
		9.50		N=11 (3,5/3,2,3,3)					10

Continued on next sheet

Remarks
Groundwater seepage at 13.2m bgl

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH3**

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level: 48.00	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 19/08/2019 - 20/08/2019	Logged By

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		11.00		N=20 (3,3/5,5,6,4)					11
		12.50		N=11 (1,2/2,3,4,2)					12, 13
		14.00		N=22 (3,4/7,6,5,4)					14
		15.00		N=18 (4,2/3,5,6,4)	15.00	33.00		End of borehole at 15.00 m	15, 16, 17, 18, 19, 20

Remarks
Groundwater seepage at 13.2m bgl

AGS

Borehole Log

Westlakes Environmental

Borehole No. **BH4**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type CP
Location: Reading		Level: 48.00	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 20/08/2019 - 20/08/2019	Logged By

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	ES					MADE GROUND: Compact red-brown sandy fine to coarse angular gravel of brick and concrete. High content of whole and part bricks and cobble-sized fragments of concrete, Low content of metal and ceramic pipe fragments
		1.00	ES		0.90	47.10		Loose red-brown medium to coarse SAND (Taplow Gravel Member)
					2.10	45.90		Dense brown sandy fine to coarse subangular to subrounded GRAVEL of flint (Taplow Gravel Formation)
					2.90	45.10		Firm brown very sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of flint (Taplow Gravel Member)
					3.70	44.30		Dense brown sandy fine to coarse subangular to subrounded GRAVEL of flint (Taplow Gravel Member)
					4.10	43.90		Firm grey-brown mottled red with slight green tint sandy slightly gravelly CLAY. Gravel is fine and medium (Lambeth Group)
		4.50	D					
					5.00	43.00		End of borehole at 5.00 m

Remarks
Groundwater not encountered

AGS

Trial Pit Log

Westlakes Environmental

TrialPit No: HDP1

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: - Level: 48.00	Date 20/08/2019
Location: Reading		Dimensions (m):	Scale 1:25
Client: Silver Street Developments Ltd		Depth 1.00	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Compact red-brown sandy fine to coarse angular gravel of brick and concrete. High content of whole and part bricks and cobble-sized fragments of concrete, Low content of metal and ceramic pipe fragments
				0.70	47.30		Loose red-brown medium to coarse SAND (Taplow Gravel Member)
				1.00	47.00		End of Pit at 1.000m

Remarks: Dry

Stability: Stable

AGS

Westlakes Environmental

Trial Pit Log

TrialPit No
HDP2
Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: - Level: 48.00	Date 20/08/2019
Location: Reading		Dimensions (m):	Scale 1:25
Client: Silver Street Developments Ltd		Depth 1.00	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
							MADE GROUND: Compact red-brown sandy fine to coarse angular gravel of brick and concrete. High content of whole and part bricks and cobble-sized fragments of concrete, Low content of metal and ceramic pipe fragments
				0.80	47.20		Loose red-brown medium to coarse SAND (Taplow Gravel Member)
	1.00	ES		1.00	47.00		End of Pit at 1.000m

1
2
3
4
5

Remarks: Dry

Stability: Stable

AGS

Trial Pit Log

Westlakes Environmental

TrialPit No: HDP3

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: - Level: 48.00	Date 20/08/2019
Location: Reading		Dimensions (m):	Scale 1:25
Client: Silver Street Developments Ltd		Depth 1.00	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Compact red-brown sandy fine to coarse angular gravel of brick and concrete. High content of whole and part bricks and cobble-sized fragments of concrete, Low content of metal and ceramic pipe fragments
				0.90	47.10		Loose red-brown medium to coarse SAND (Taplow Gravel Member)
				1.00	47.00		End of Pit at 1.000m

Remarks: Dry

Stability: Stable

AGS

Borehole Log

Westlakes Environmental

Borehole No. **WS1**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type WLS
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Concrete.
		0.35	ES		0.30			MADE GROUND: Brown gravelly COBBLES. Gravel and cobbles are sub-rounded to sub-angular of flint.
		1.20		N=6 (1,1/1,1,2,2)				MADE GROUND: Mid to dark brown slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular to very angular of red brick with rare pottery, glass and flint.
		2.00		N=17 (1,1/3,5,5,4)				
					2.50			Mid brown to orange slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular of flint. (Taplow Gravel Member).
		3.00		N=50 (8,9/10,13,13,14)	3.00			End of borehole at 3.00 m

Remarks

AGS

Borehole Log

Westlakes Environmental

Borehole No. **WS2**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type WLS
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Concrete.
		1.20		N=6 (1,1/1,2,2,1)				MADE GROUND: Mid to dark brown slightly clayey slightly silty slightly gravelly SAND with rare cobbles of red brick. Gravel is fine to coarse, sub-rounded to sub-angular to very angular of red brick with rare pottery, glass and flint.
		2.00		N=22 (4,5/5,5,6,6)	2.00			Mid brown to orange slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular of flint. (Taplow Gravel Member).
		2.50	ES					
		3.00		N=43 (7,7/8,9,13,13)	3.00			End of borehole at 3.00 m

Remarks

AGS

Borehole Log

Westlakes Environmental

Borehole No. **WS3**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type WLS
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Concrete.
					0.25			MADE GROUND: Brown GRAVEL. Gravel is sub-rounded to sub-angular of flint.
		0.50	ES					MADE GROUND: Mid to dark brown slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular to very angular of red brick with rare pottery, glass and flint.
		1.20		N=18 (3,4/4,5,5,4)				
		2.00		N=19 (6,5/4,4,5,6)	2.00			Very stiff mid brown to slightly orange sandy slightly gravelly CLAY. Gravel is fine and medium. (Poor recovery, obstruction in WS liner). (Lambeth Group)
		3.00		N=50 (9,9/11,14,13,12)	3.00			End of borehole at 3.00 m

1 2 3 4 5 6 7 8 9 10

Remarks

Poor recovery of natural ground.

AGS

Borehole Log

Westlakes Environmental

Borehole No. **WS4**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type WLS
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Concrete.
					0.25			MADE GROUND: Brown GRAVEL. Gravel is sub-rounded to sub-angular of flint.
		0.50	ES					MADE GROUND: Mid to dark brown slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular to very angular of red brick with rare pottery, glass and flint.
		1.20		N=3 (1,0/1,0,1,1)				
					1.50			Mid brown to orange slightly clayey slightly silty slightly gravelly SAND. Gravel is fine to coarse, sub-rounded to sub-angular of flint. (Taplow Gravel Member).
		2.00		N=13 (2,2/2,3,3,5)				
					2.20			Stiff mid brown to slightly orange sandy slightly gravelly CLAY. Gravel is fine and medium. (Lambeth Group)
		2.70	ES					
		3.00		N=16 (3,3/4,4,4,4)	3.00			End of borehole at 3.00 m

1 2 3 4 5 6 7 8 9 10

Remarks

AGS

Borehole Log

Westlakes Environmental

Borehole No. **WS5**

Sheet 1 of 1

Project Name: 40 - 68 Silver Street	Project No. 1227	Co-ords: -	Hole Type WLS
Location: Reading		Level:	Scale 1:50
Client: Silver Street Developments Ltd		Dates: 29/01/2018 - 29/01/2018	Logged By HB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Concrete.
		0.30	ES					MADE GROUND: Mid brown slightly gravelly slightly silty SAND. Gravel is fine and course of concrete.
		1.20		N=2 (1,0/1,0,1,0)				
		1.25	ES					
					1.50			(Possibly reworked). Mid brown slightly gravelly slightly silty SAND. Gravel is fine and course of chalk.
		2.00		N=2 (1,0/1,0,1,0)				
					2.50			Mid brown slightly silty SAND. (Wet). (Taplow Gravel Member).
		3.00		N=4 (1,1/1,1,1,1)				
					3.80			Mid brown to slightly orange sandy GRAVEL. Gravel is fine to coarse, sub-rounded to sub-angular of flint. (Taplow Gravel Member)
		4.00		N=4 (1,1/1,1,1,1)				
					4.50			Mid brown to slightly orange/grey slightly silty sandy CLAY. (Taplow Gravel Member).
					4.90			Mid brown slightly clayey SAND. (Taplow Gravel Member).
		5.00		N=13 (2,2/2,3,4,4)	5.00			End of borehole at 5.00 m

Remarks

Ground wet between 2.5m to 3.8m.

AGS

Appendix 2 – Falling Head Permeability Test Results

Westlakes Engineering

FALLING HEAD TEST IN BOREHOLE

PROJECT	40 to 68 Silver Street	DATE	20/08/2019	
CLIENT	Silver Street Developments Ltd.	BOREHOLE	BH4	Test 1

Borehole Diameter (D):	0.15 m	Casing diameter:	N/A
Installation Pipe Diameter mm (if any):	N/A	Gravel Filter (from - to):	N/A
Depth to base of BH:	5 m	Casing depth:	4.5
Length of Test Section (L):	0.5 m		
Stratum Thickness (L):	0.5 m	Lambeth Group at base	

Water Level Before Test	13m	(BH dry. Underlying gw level is circa 13m bgl at the site)

ELAPSED TIME (min)	Elapsed time (sec)	WATER LEVEL BELOW GROUND LEVEL (m)	ht	h0/ht	ln(h0/ht)
0.00	0.00	0.00	5.00	1.00	0.00
1.00	60.00	0.01	4.99	1.00	0.00
2.00	120.00	0.02	4.98	1.00	0.00
3.00	180.00	0.02	4.98	1.00	0.00
4.00	240.00	0.03	4.97	1.01	0.01
5.00	300.00	0.03	4.97	1.01	0.01
6.00	360.00	0.04	4.96	1.01	0.01
7.00	420.00	0.04	4.96	1.01	0.01
8.00	480.00	0.05	4.95	1.01	0.01
9.00	540.00	0.05	4.95	1.01	0.01
10.00	600.00	0.05	4.95	1.01	0.01
15.00	900.00	0.08	4.92	1.02	0.02
20.00	1200.00	0.10	4.90	1.02	0.02
25.00	1500.00	0.12	4.88	1.02	0.02
30.00	1800.00	0.14	4.86	1.03	0.03
45.00	2700.00	0.20	4.80	1.04	0.04
60.00	3600.00	0.25	4.75	1.05	0.05

AUTHOR	JRT	CHECKED	HB	APPROVED	

From BSENISO 22282-2:2012

By convention, the equation for open cased variable head borehole tests is:

$$\ln\left[\frac{h_0}{h(t)}\right] = \frac{k \cdot F\,(t - t_0)}{S} \qquad (B.4)$$

where

h_0 and $h(t)$ are the hydraulic heads measured respectively at the times t_0 and t;

S is the known actual internal cross-section of the liaison tube in which the measurement is carried out;

F is the shape factor calculated according to ISO 22282-1

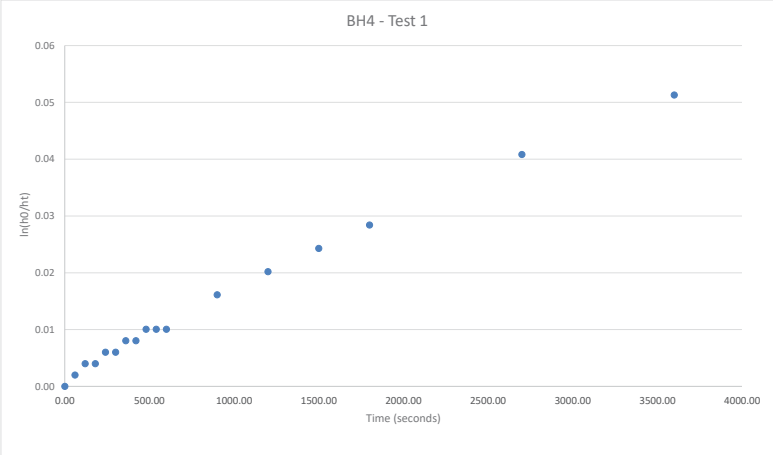
The plotting of $\ln[h_0/h(t)]$ versus elapsed time gives a straight line of slope α equal to $k \cdot F/S$ (Figure B.3). k is calculated directly by Equation (B.5):

$$k = \alpha \cdot S / F \qquad (B.5)$$

Where L/D >1.2 and <10

$$F = \frac{2\pi \cdot L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\left(\frac{L}{D}\right)^2 + 1\right)}\right)}$$

For Case 1, Lambeth Group (see log)



	Case 1
L	0.5
D	0.15
L/D	3.33

K= α.S/F

Slope α = 1.42E-05

Where S= cross section of BH = 0.018 m^2

Case 1 F = 1.64

Case 1 K= 1.54E-07 m/s

Westlakes Engineering

FALLING HEAD TEST IN BOREHOLE

PROJECT	40 to 68 Silver Street	DATE	20/08/2019	
CLIENT	Silver Street Developments Ltd.	BOREHOLE	BH4	Test 2

Borehole Diameter (D):	0.15 m	Casing diameter:	N/A
Installation Pipe Diameter mm (if any):	N/A	Gravel Filter (from - to):	N/A
Depth to base of BH:	5 m	Casing depth:	3.5

Length of Test Section (L):	1.5 m	
Stratum Thickness (L):	0.6 m	Taplow Gravel
Stratum Thickness (L):	0.9 m	Lambeth Group at base

WATER LEVEL BEFORE TEST 1.1 (water remaining from previous test)

ELAPSED TIME (min)	Elapsed time (sec)	WATER LEVEL BELOW GROUND LEVEL (m)	ht	h0/ht	ln(h0/ht)
0.00	0.00	0.00	5.00	1.00	0.00
0.25	15.00	0.10	4.90	1.02	0.02
0.50	30.00	0.20	4.80	1.04	0.04
0.75	45.00	0.35	4.65	1.08	0.07
1.00	60.00	0.46	4.54	1.10	0.10
1.50	90.00	0.54	4.46	1.12	0.11
2.00	120.00	0.63	4.37	1.14	0.13
2.50	150.00	0.69	4.31	1.16	0.15
3.00	180.00	0.74	4.26	1.17	0.16
3.50	210.00	0.85	4.15	1.20	0.19
4.00	240.00	0.94	4.06	1.23	0.21
4.50	270.00	1.02	3.98	1.26	0.23
5.00	300.00	1.10	3.90	1.28	0.25
6.00	360.00	1.20	3.80	1.32	0.27
7.00	420.00	1.30	3.70	1.35	0.30
8.00	480.00	1.40	3.60	1.39	0.33
10.00	600.00	1.55	3.45	1.45	0.37
12.00	720.00	1.66	3.34	1.50	0.40
14.00	840.00	1.79	3.21	1.56	0.44
16.00	960.00	1.87	3.13	1.60	0.47
18.00	1080.00	1.88	3.12	1.60	0.47
20.00	1200.00	1.90	3.10	1.61	0.48
25.00	1500.00	2.00	3.00	1.67	0.51
30.00	1800.00	2.05	2.95	1.69	0.53
40.00	2400.00	2.15	2.85	1.75	0.56
50.00	3000.00	2.20	2.80	1.79	0.58
60.00	3600.00	2.30	2.70	1.85	0.62

AUTHOR	JRT	CHECKED	HB	APPROVED	

From BSENISO 22282-2:2012

By convention, the equation for open cased variable head borehole tests is:

$$\ln\left[\frac{h_0}{h(t)}\right] = \frac{k \cdot F\,(t - t_0)}{S} \qquad (B.4)$$

where

h_0 and $h(t)$ are the hydraulic heads measured respectively at the times t_0 and t;

S is the known actual internal cross-section of the liaison tube in which the measurement is carried out;

F is the shape factor calculated according to ISO 22282-1

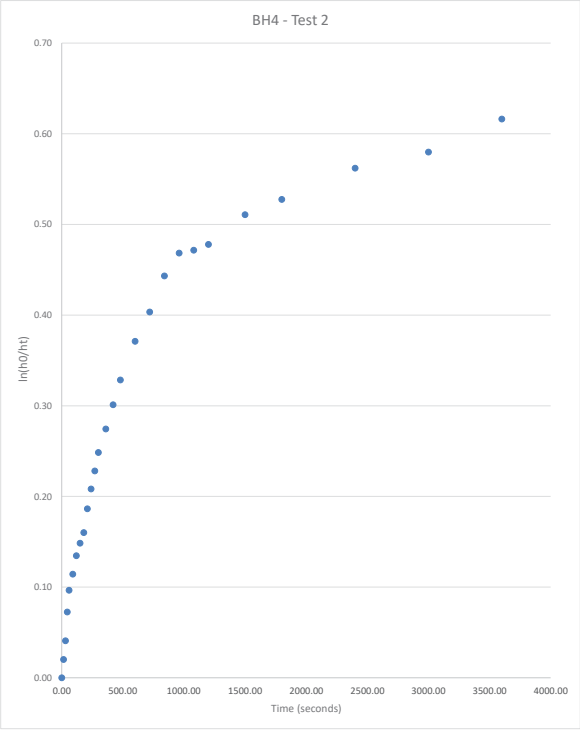
The plotting of $\ln[h_0/h(t)]$ versus elapsed time gives a straight line of slope α equal to $k \cdot F/S$ (Figure B.3). k is calculated directly by Equation (B.5):

$$k = \alpha \cdot S / F \qquad (B.5)$$

Where L/D >1.2 and <10

From BSENISO 2282-1:2012

$$F = \frac{2 \cdot \pi \cdot L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\left(\frac{L}{D}\right)^2 + 1\right)}\right)}$$



For Case 2, Taplow Gravel and Lambeth Group (see log)

	Case 2		
L	1.5		
D	0.15		
L/D	10.00		
K=	α.S/F		
Slope α =	1.71E-04	All Test	
Slope α =	5.60E-05	Taken over slope 960to3600seconds	
Slope α =	4.88E-04	Taken over slope 0 to 960	
Where S=	cross section of BH =	0.018 m^2	
Case 2 F =	3.14		
Case 2 K=	9.62E-07	m/s	All Test
	3.15E-07	m/s	Taken over slope 960to3600seconds
	2.74E-06	m/s	Taken over slope 0 to 960

If calculation is only in the Taplow Gravels (assume Lambeth is already saturated)

L	0.6		
D	0.15		
L/D	4.00		
F	1.80		
K=	1.68E-06	m/s	All Test

Westlakes Engineering

FALLING HEAD TEST IN BOREHOLE

PROJECT	40 to 68 Silver Street	DATE	20/08/2019	
CLIENT	Silver Street Developments Ltd.	BOREHOLE	BH4	Test 3

Borehole Diameter (D):	0.15 m	Casing diameter:	N/A
Installation Pipe Diameter mm (if any):	N/A	Gravel Filter (from - to):	N/A
Depth to base of BH:	5 m	Casing depth:	3.5
Length of Test Section (L):	1.5 m		
Stratum Thickness (L):	0.6 m	Taplow Gravel	
Stratum Thickness (L):	0.9 m	Lambeth Group at base	
WATER LEVEL BEFORE TEST	2.3	(water remaining from previous test)	

ELAPSED TIME (min:sec)	Change in Time (seconds)	WATER LEVEL BELOW GROUND LEVEL (m)	ht	h0/ht	ln(h0/ht)
0.00	0.00	0.00	5.00	1.00	0.00
0.25	15.00	0.04	4.96	1.01	0.01
0.50	30.00	0.10	4.90	1.02	0.02
0.75	45.00	0.15	4.85	1.03	0.03
1.00	60.00	0.18	4.82	1.04	0.04
1.50	90.00	0.31	4.69	1.07	0.06
2.00	120.00	0.41	4.59	1.09	0.09
2.50	150.00	0.57	4.43	1.13	0.12
3.00	180.00	0.70	4.30	1.16	0.15
3.50	210.00	0.82	4.18	1.20	0.18
4.00	240.00	0.93	4.07	1.23	0.21
4.50	270.00	1.05	3.95	1.27	0.24
5.00	300.00	1.07	3.93	1.27	0.24
6.00	360.00	1.25	3.75	1.33	0.29
7.00	420.00	1.40	3.60	1.39	0.33
8.00	480.00	1.55	3.45	1.45	0.37
10.00	600.00	1.70	3.30	1.52	0.42
12.00	720.00	1.77	3.23	1.55	0.44
14.00	840.00	1.85	3.15	1.59	0.46
16.00	960.00	1.90	3.10	1.61	0.48
18.00	1080.00	1.93	3.07	1.63	0.49
20.00	1200.00	1.95	3.05	1.64	0.49
25.00	1500.00	1.98	3.02	1.66	0.50
30.00	1800.00	2.00	3.00	1.67	0.51
40.00	2400.00	2.14	2.86	1.75	0.56
50.00	3000.00	2.20	2.80	1.79	0.58
60.00	3600.00	2.28	2.72	1.84	0.61

AUTHOR	JRT	CHECKED	HB	APPROVED	

From BSENISO 22282-2:2012

By convention, the equation for open cased variable head borehole tests is:

$$\ln\left[\frac{h_0}{h(t)}\right] = \frac{k \cdot F\,(t - t_0)}{S} \qquad (B.4)$$

where

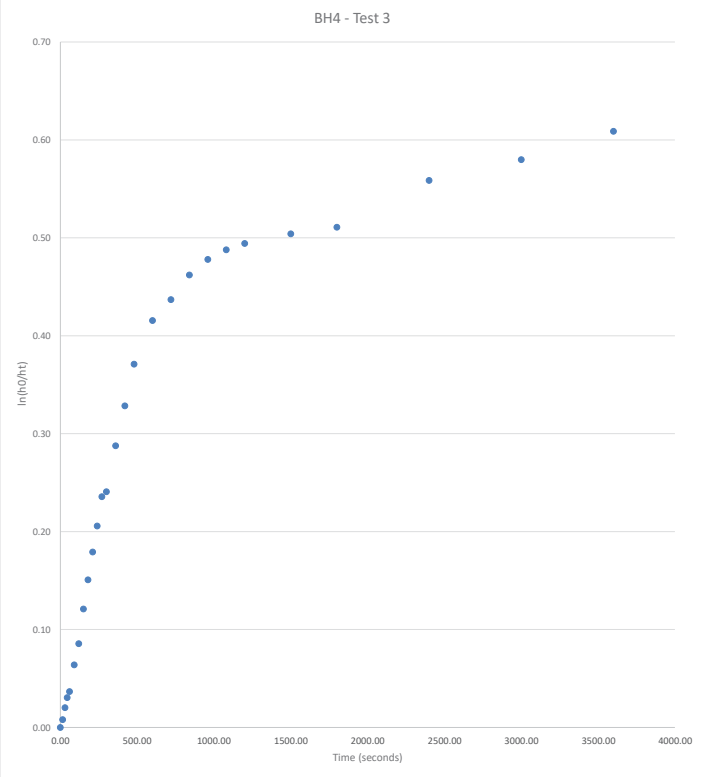
h_0 and $h(t)$ are the hydraulic heads measured respectively at the times t_0 and t;

S is the known actual internal cross-section of the liaison tube in which the measurement is carried out;

F is the shape factor calculated according to ISO 22282-1.

The plotting of $\ln[h_0/h(t)]$ versus elapsed time gives a straight line of slope α equal to $k \cdot F/S$ (Figure B.3). k is calculated directly by Equation (B.5):

$$k = \alpha \cdot S / F \qquad (B.5)$$



Where L/D >1.2 and <10

From BSENISO 2282-1:2012

$$F = \frac{2 \cdot \pi \cdot L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\left(\frac{L}{D}\right)^2 + 1\right)}\right)}$$

For Case 2, Taplow Gravel and Lambeth Group (see log)

	Case 2		
L	1.5		
D	0.15		
L/D	10.00		
K=	α.S/F		
Slope α =	1.69E-04	All Test	
Slope α =	4.95E-05	Taken over slope 960to3600seconds	
Slope α =	4.98E-04	Taken over slope 0 to 960	
Where S=	cross section of BH =	0.018 m^2	
Case 2 F =	3.14		
Case 2 K=	9.51E-07	m/s	All Test
	2.78E-07	m/s	Taken over slope 960to3600seconds
	2.80E-06	m/s	Taken over slope 0 to 960

If calculation is only in the Taplow Gravels (assume Lambeth is already saturated)

L	0.6		
D	0.15		
L/D	4.00		
F	1.80		
K=	1.66E-06	m/s	All Test

Appendix 3 – Geotechnical Test Results

TEST CERTIFICATE

Liquid and Plastic Limits

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

UKAS TESTING 4041

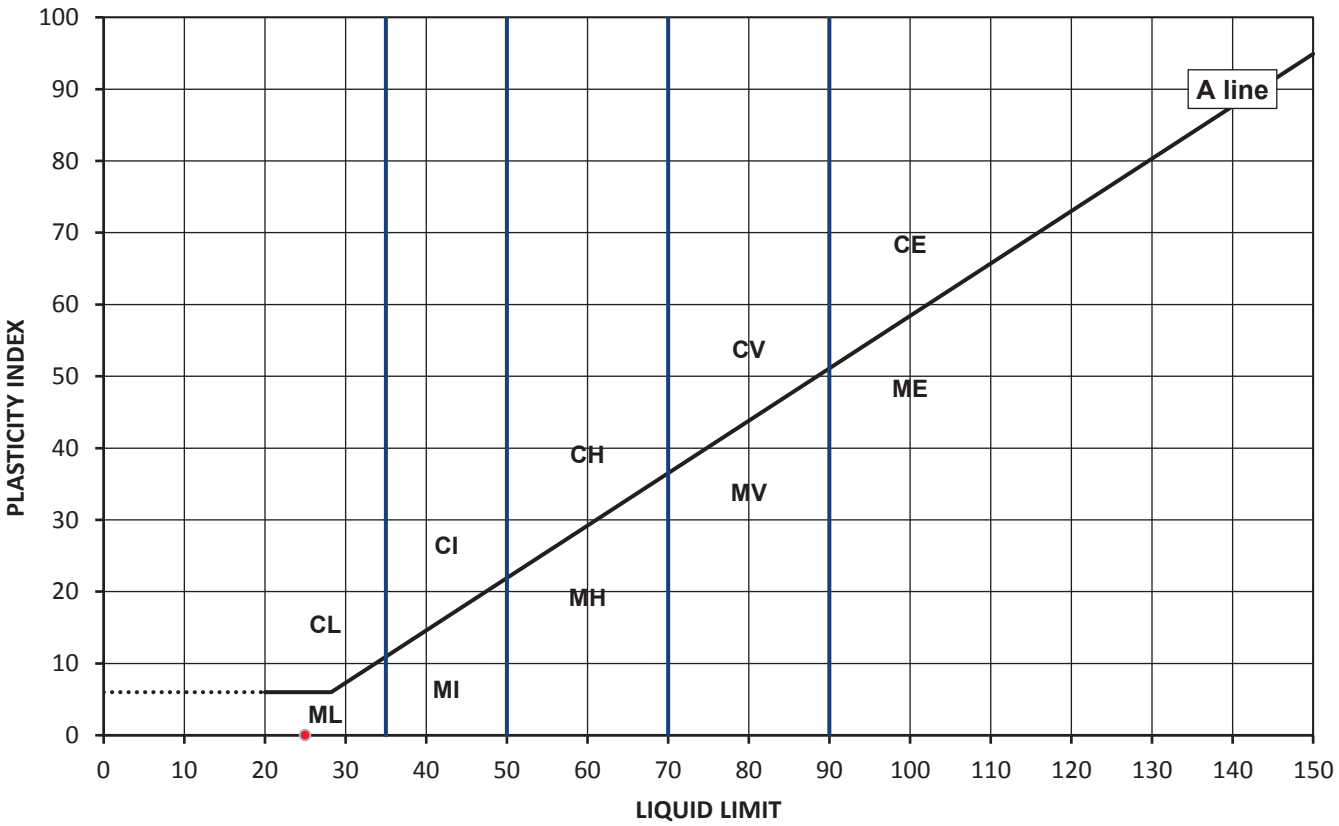
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Westlakes Consulting	Client Reference:	1227-6-0
Client Address:	Unit 2.1,, 20 Dale Street,, Manchester, M1 1EZ	Job Number:	19-55955
		Date Sampled:	Not Given
		Date Received:	21/08/2019
Contact:	John Taylor	Date Tested:	28/08/2019
Site Name:	Silver Street	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1298250	Depth Top [m]:	4.50
Hole No.:	BH4	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown slightly gravelly slightly clayey SAND		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	25	NP	NP.	98



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks: NP – non plastic

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/09/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

"Any assessment of compliance with specifications based the analytical results in a report take in to account no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request."

SUMMARY REPORT

Summary of Classification Test Results

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

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Westlakes Consulting

Client Address: Unit 2.1,, 20 Dale Street,, Manchester, M1 1EZ

Contact: John Taylor

Site Name: Silver Street

Site Address: Not Given

Client Reference: 1227-6-0

Job Number: 19-55955

Date Sampled: Not Given

Date Received: 21/08/2019

Date Tested: 28/08/2019

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	LL	PL	PI	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1298249	BH3	Not Given	7.50	8.00	B	White CHALK		30											
1298250	BH4	Not Given	4.50	Not Given	D	Brown slightly gravelly slightly clayey SAND	Atterberg 1 Point	18		98	25	NP	NP.						

Note: # Non accredited; NP - Non plastic

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/09/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 234.7**

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

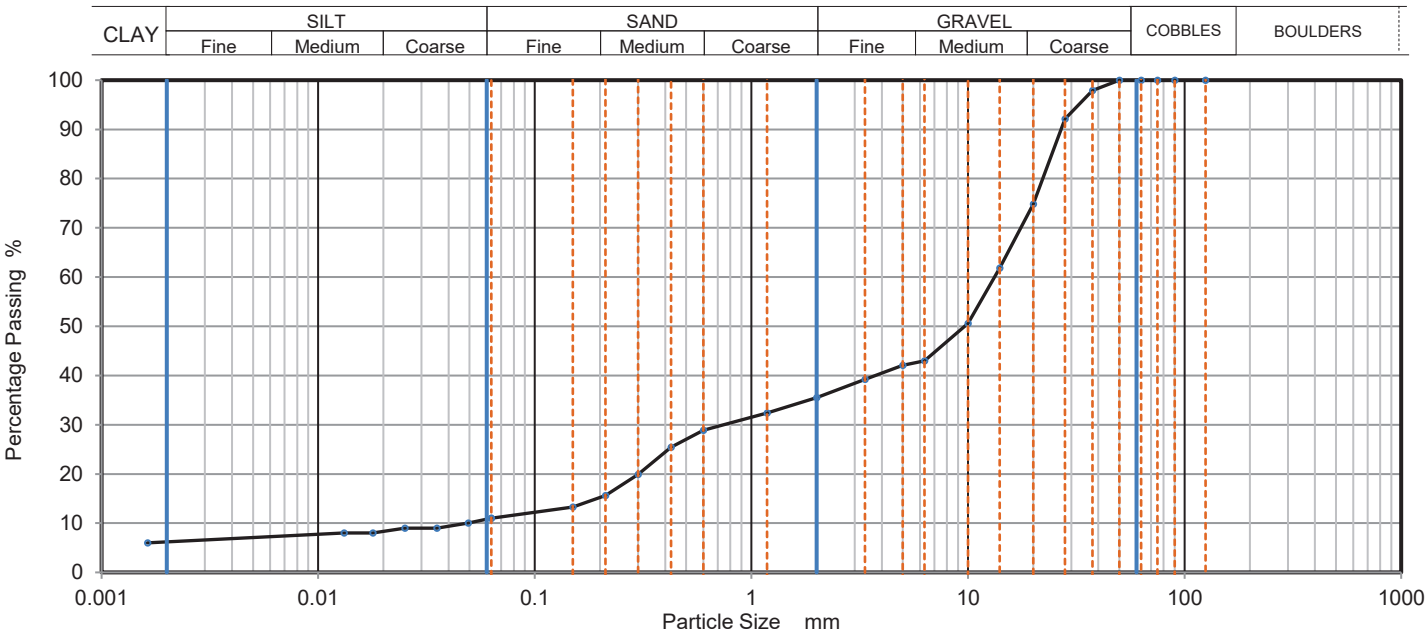
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	Westlakes Consulting	Client Reference:	1227-6-0
Client Address:	Unit 2.1,, 20 Dale Street,, Manchester, M1 1EZ	Job Number:	19-55955
		Date Sampled:	Not Given
		Date Received:	21/08/2019
Contact:	John Taylor	Date Tested:	27/08/2019
Site Name:	Silver Street	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1298248	Depth Top [m]:	4.00
Hole No.:	BH3	Depth Base [m]:	4.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly silty slightly clayey sandy GRAVEL		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	11
90	100	0.0493	10
75	100	0.0353	9
63	100	0.0251	9
50	100	0.0179	8
37.5	98	0.0131	8
28	92	0.0016	6
20	75		
14	62		
10	51		
6.3	43		
5	42		
3.35	39		
2	36		
1.18	32		
0.6	29	Particle density	(assumed)
0.425	25	2.65	Mg/m3
0.3	20		
0.212	16		
0.15	13		
0.063	11		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	64.50
Sand	24.80
Silt	4.90
Clay	5.80

Grading Analysis		
D100	mm	50
D60	mm	13.2
D30	mm	0.737
D10	mm	0.046
Uniformity Coefficient		290
Curvature Coefficient		0.89

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/09/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.12

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SUMMARY REPORT

Summary of Saturation Moisture Content Test Results

Tested in Accordance with: BS 1377-2: 1990: Clause 3.3

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

UKAS TESTING 4041

Client: Westlakes Consulting

Client Address: Unit 2.1,, 20 Dale Street,,
Manchester, M1 1EZ

Contact: John Taylor

Site Name: Silver Street

Site Address: Not Given

Client Reference: 1227-6-0

Job Number: 19-55955

Date Sampled: Not Given

Date Received: 21/08/2019

Date Tested: 27/08/2019

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	SMC	Bulk density	Dry density	MC
		Reference	Depth Top m	Depth Base m	Type			%	Mg/m3	Mg/m3	%
1298249	BH3	Not Given	7.50	8.00	B	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	31	1.91	1.47	30

Note: SMC - Saturation Moisture Content; MC - Moisture Content

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 05/09/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 132.9**

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LABORATORY REPORT

4043

Contract Number: PSL18/0644

Report Date: 26 February 2018

Client's Reference:

Client Name: Westlakes Engineering
Unit 2.1
20 Dale Street
Manchester
M1 1EZ

For the attention of: Helen Brown

Contract Title: 40 Silver Street, Reading

Date Received: 8/2/2018
Date Commenced: 8/2/2018
Date Completed: 26/2/2018

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1		U100	6.50	6.95	Stiff brown slightly gravelly sandy CLAY.
BH2		U100	2.00	2.45	Brown slightly gravelly sandy CLAY.
BH1		Bulk	1.20	1.70	Brown slightly gravelly very sandy CLAY.
BH2		Bulk	1.20	1.70	Brown slightly gravelly very sandy CLAY.
BH2		Bulk	4.00	5.00	Brown very sandy slightly clayey silty GRAVEL.

UKAS TESTING 4043

PSL Professional Soils Laboratory

40 Silver Street, Reading

Contract No: PSL18/0644

Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

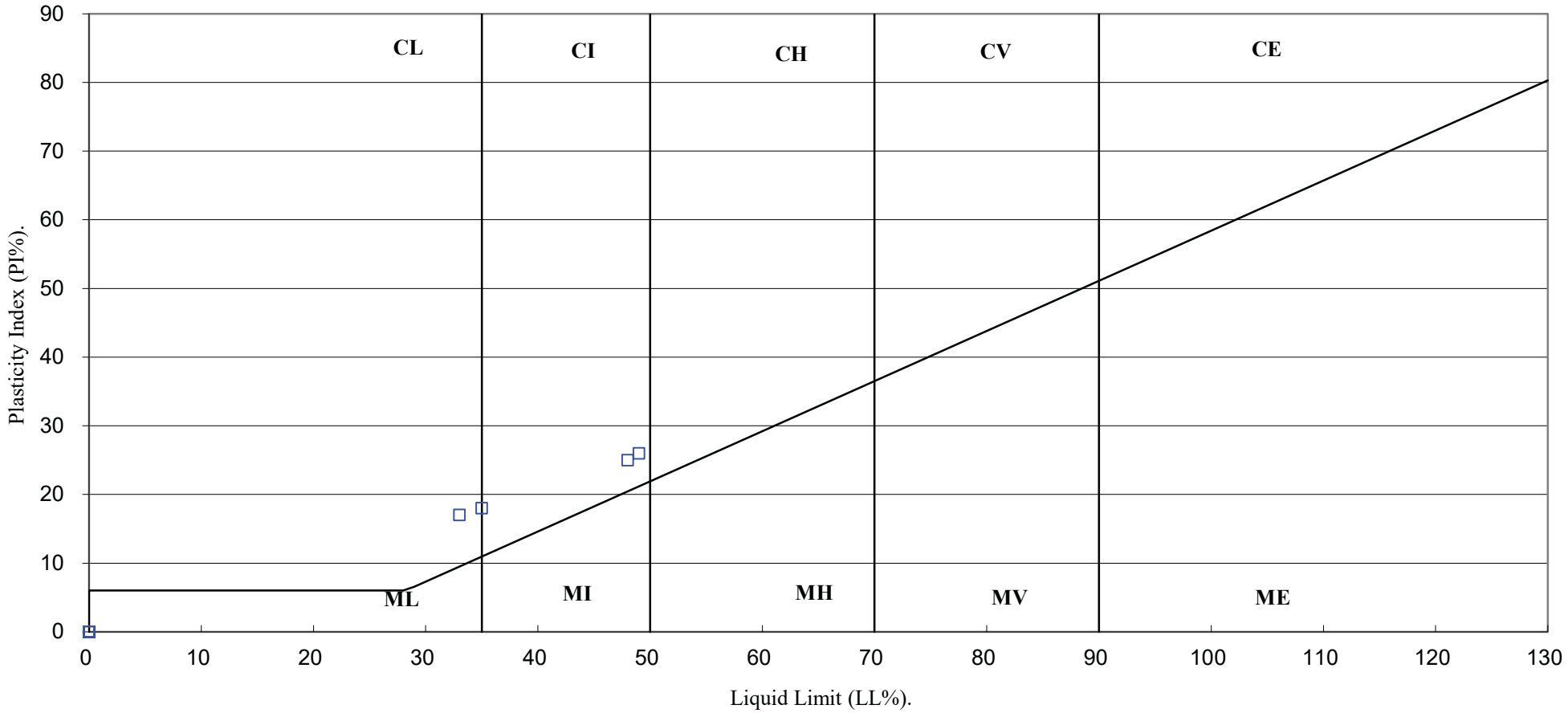
(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH1		U100	6.50	6.95	22			48	23	25	96	Intermediate plasticity CI.
BH2		U100	2.00	2.45	16			49	23	26	91	Intermediate plasticity CI.
BH1		Bulk	1.20	1.70	19			33	16	17	94	Low plasticity CL.
BH2		Bulk	1.20	1.70	21			35	17	18	93	Intermediate plasticity CI.

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043	PSL Professional Soils Laboratory	40 Silver Street, Reading	Contract No: PSL18/0644
			Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	40 Silver Street, Reading	Contract No: PSL18/0644
			Client Ref: 0

PARTICLE SIZE DISTRIBUTION TEST

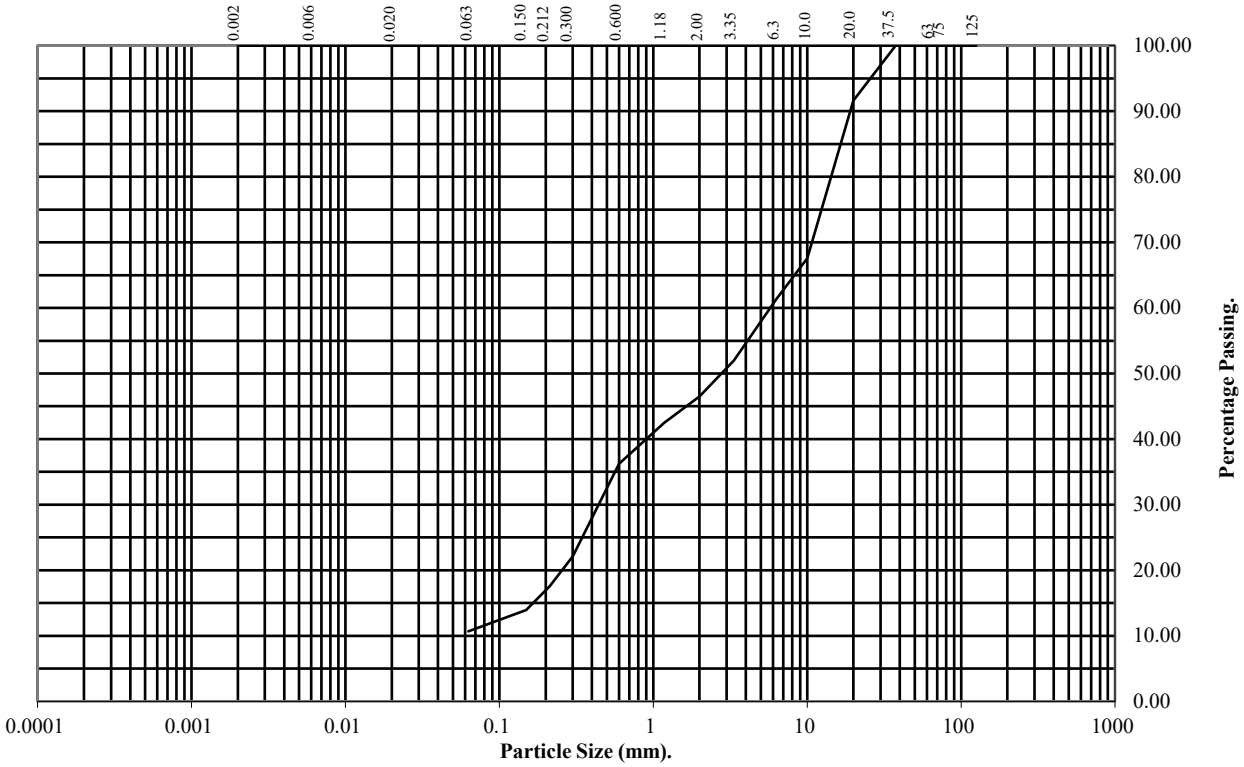
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BH2** **Top Depth (m):** **4.00**

Sample Number: **Base Depth(m):** **5.00**

Sample Type: **Bulk**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	68
6.3	61
3.35	52
2	47
1.18	42
0.6	36
0.3	22
0.212	18
0.15	14
0.063	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	36
Silt/Clay	11

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**40 Silver Street, Reading**	**Contract No:** PSL18/0644 **Client Ref:**

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

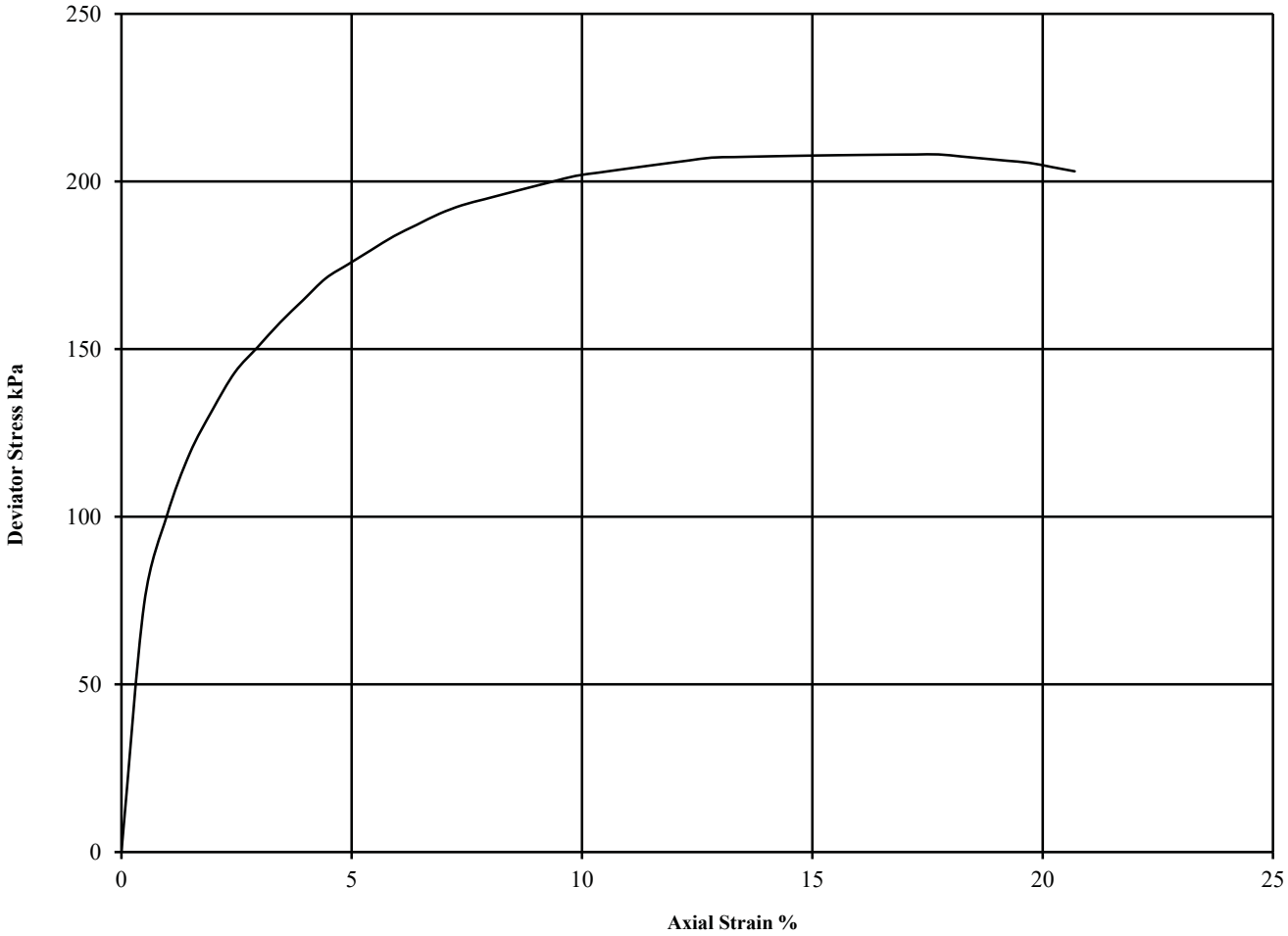
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH1 **Top Depth (m):** 6.50

Sample Number: **Base Depth (m):** 6.95

Sample Type U100



Diameter (mm):		102.0	Height (mm):		207.0	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34
1	22	2.11	1.73	120	208	104	17.7	Plastic	See summary of soil descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	40 Silver Street, Reading	Contract No: PSL18/0644 Client Ref:

SUMMARY OF CHALK TESTS

(BS1377 : PART 2 & 4 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Saturated MC %	Dry Density Mg/m^3	Passing 10mm Sieve %	Chalk Crushing Value CCV	Remarks
BH1		U100	8.00	8.45	28	28	1.55			
BH2		U100	6.50	6.95	20	19	1.77			
BH1		Bulk	7.50	8.00	28	29	1.50			
BH2		Bulk	12.00	13.00	29	30	1.49			

* Chalk Crushing Value is out of our UKAS Scope

UKAS TESTING 4043	PSL Professional Soils Laboratory	40 Silver Street, Reading	Contract No: PSL18/0644
			Client Ref:

PSL
Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: D Nicholson

To: Helen Brown

Date: 21 / 02 /2018

Laboratory Ref: PSL18/0644

Contract Number:

Location: 40 Silver Street, Reading

✓ BH02 o TP Sample Number

Depth (m): 2.00 - 2.45

Sample Type ✓ U o B o D o W o P o C

Test/s:

Q.U.T

The above sample cannot be tested for the following reasons:

- ☐ The Sample has not been received
- ☐ There is insufficient material for BS1377: 1990 testing

  Maximum Grain Size (Minimum 10%): o Fine o Medium o Coarse
  Sample Mass (kg): .....
  Required Mass (kg): .....

- ☐ The Sample has been previously tested.
- ☐ The Sample has been misplaced in the Laboratory.
- ☑ The Sample is unsuitable for testing because: insufficient intact material.

Please advise action required:

- ☐ Perform original test on the following alternative Sample:

  o BH o TP Sample Number: Depth (m):
  Sample Type: o U o B o D o W o P o C

- ☐ Combine original Sample with the following sample:

  o BH o TP Sample Number: Depth (m):

  Sample Type: o U o B o D o W o P o C

- ☐ Perform the following alternative test/s on the original Sample
- ☐ Perform non-standard test on material available
- ☐ Take no further action.

Signed ..... Date

.....
(Project Engineer)

Appendix 4 – Chemical Test Results

Certificate of Analysis

Certificate Number 18-02501-1

13-Feb-18

Client Westlakes Engineering Ltd
Unit 2.1
20 Dale Street
Manchester
M1 1EZ

Our Reference 18-02501-1

Client Reference 1227/SI

Order No (not supplied)

Contract Title 40 Silver Street, Reading

Description 13 Soil samples, 4 Leachate samples.

Date Received 01-Feb-18

Date Started 01-Feb-18

Date Completed 13-Feb-18

Test Procedures Identified by prefix DETSn (details on request).

Notes **This report supersedes 18-02501. Extra testing.**
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Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

			Lab No	1292048	1292049	1292050	1292051	1292052	1292053	1292054
			Sample ID	WS1	WS2	WS3	WS4	WS4	WS5	WS5
			Depth	0.35	2.50	0.50	0.50	2.70	0.30	1.25
			Other ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Asbestos Quantification	DETSC 1102	0.001	%							
Asbestos Quantification	DETSC 1102	0								
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	14	15	12	12	15	8.1	
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	< 0.1	0.2	0.2	< 0.1	0.1	
Chromium	DETSC 2301#	0.15	mg/kg	13	21	11	13	25	12	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	380	14	37	44	17	20	
Lead	DETSC 2301#	0.3	mg/kg	310	17	530	470	17	42	
Mercury	DETSC 2325#	0.05	mg/kg	0.61	< 0.05	0.47	1.0	< 0.05	0.09	
Nickel	DETSC 2301#	1	mg/kg	16	22	13	15	26	11	
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	0.6	0.6	
Zinc	DETSC 2301#	1	mg/kg	360	42	120	75	42	42	
Inorganics										
Conductivity	DETSC 2009	1	uS/cm	600			490			
pH	DETSC 2008#			8.0	8.8	9.2	7.7	7.6	7.9	
Organic matter	DETSC 2002#	0.1	%	2.3	0.3	1.4	2.6	0.4	1.2	
Redox Potential	DETSC 2016*	-500	mV	170			170			150
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	170			83			15
Sulphur as S, Total	DETSC 2320	0.01	%	0.05			0.03			< 0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.11			0.07			0.02
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	0.48
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5			< 1.5		< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2			< 1.2		< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5			< 1.5		< 1.5	3.1
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4			< 3.4		< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10			< 10		< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01			< 0.01		< 0.01	0.13
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9			< 0.9		< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5			< 0.5		< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6			< 0.6		< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4			1.8		< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10			< 10		< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10			< 10		< 10	< 10
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	0.7	0.4	< 0.3	< 0.3	

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

			Lab No	1292055	1292056	1292057	1292058	1292059	1292060
			Sample ID	BH01	BH01	BH02	BH02	BH02	BH02
			Depth	0.30	12.70	0.40	1.20	6.00	7.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%			0.001			
Asbestos Quantification	DETSC 1102	0				Y			
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	8.5	1.5	18	11	91	1.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.3	0.4	< 0.1	0.3	0.6
Chromium	DETSC 2301#	0.15	mg/kg	13	3.2	16	22	33	1.8
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	17	4.6	63	9.4	9.9	2.1
Lead	DETSC 2301#	0.3	mg/kg	32	4.9	360	16	22	2.2
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	0.82	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	9.8	2.8	17	18	26	3.4
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Zinc	DETSC 2301#	1	mg/kg	43	17	220	38	64	15
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	200		210	230		
pH	DETSC 2008#			8.1	8.5	8.2	8.1	7.9	8.5
Organic matter	DETSC 2002#	0.1	%	1.0	0.4	2.7	0.4	0.2	0.3
Redox Potential	DETSC 2016*	-500	mV	170		140	170		
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l			27	11	22	37
Sulphur as S, Total	DETSC 2320	0.01	%			0.03	< 0.01	0.01	0.02
Sulphate as SO4, Total	DETSC 2321#	0.01	%			0.07	0.05	0.06	0.06
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		2.6	< 1.5			
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		16	< 1.2			
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		20	< 1.5			
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4	< 3.4			
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		40	< 10			
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		4.0	< 0.9			
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		18	< 0.5			
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		21	< 0.6			
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		5.9	< 1.4			
Aromatic C5-C35	DETSC 3072*	10	mg/kg		48	< 10			
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg		89	< 10			
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

			Lab No	1292048	1292051	1292053	1292054	1292056	1292057
			Sample ID	WS1	WS4	WS5	WS5	BH01	BH02
			Depth	0.35	0.50	0.30	1.25	12.70	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

			Lab No	1292048	1292051	1292053	1292054	1292056	1292057
			Sample ID	WS1	WS4	WS5	WS5	BH01	BH02
			Depth	0.35	0.50	0.30	1.25	12.70	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	1.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

			Lab No	1292048	1292051	1292053	1292054	1292056	1292057
			Sample ID	WS1	WS4	WS5	WS5	BH01	BH02
			Depth	0.35	0.50	0.30	1.25	12.70	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18	29/01/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	0.6	0.2	< 0.1	< 0.1	< 0.1	0.3
Anthracene	DETSC 3433	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	1.7	0.5	< 0.1	< 0.1	< 0.1	0.7
Pyrene	DETSC 3433	0.1	mg/kg	1.5	0.4	< 0.1	< 0.1	< 0.1	0.6
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	0.8	0.3	< 0.1	< 0.1	< 0.1	0.4
Chrysene	DETSC 3433	0.1	mg/kg	1.1	0.4	< 0.1	< 0.1	< 0.1	0.5
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	1.3	0.3	< 0.1	< 0.1	< 0.1	0.7
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	0.4	0.1	< 0.1	< 0.1	< 0.1	0.2
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	1.2	0.3	< 0.1	< 0.1	< 0.1	0.4
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	1.1	0.3	< 0.1	< 0.1	< 0.1	0.3
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	0.8	0.2	< 0.1	< 0.1	< 0.1	0.3
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1292048	WS1 0.35	SOIL	NAD	none	Colin Patrick
1292050	WS3 0.50	SOIL	NAD	none	Colin Patrick
1292051	WS4 0.50	SOIL	NAD	none	Colin Patrick
1292053	WS5 0.30	SOIL	NAD	none	Colin Patrick
1292054	WS5 1.25	SOIL	NAD	none	Colin Patrick
1292055	BH01 0.30	SOIL	NAD	none	Colin Patrick
1292057	BH02 0.40	SOIL	Chrysotile	bundle of Chrysotile fibres	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading

Lab No	1292057
Sample ID	BH02
Depth	0.40
Other ID	
Sample Type	SOIL
Sampling Date	29/01/18
Sampling Time	

Test	**Method**	**Units**	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	858.42
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Chrysotile bundles in sample		Mass %	0.001
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Chrysotile fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading
Sample Id WS4 0.50

Sample Numbers 1292051 1292061 1292062
Date Analysed 09/02/2018

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	2.5	3	5	6
DETSC 2003# Loss On Ignition	%	4.6	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	36	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC2008# pH	pH Units		n/a	>6	n/a
DETS073* Acid Neutralisation Capacity (pH4)	mol/kg		n/a	TBE	TBE
DETS073* Acid Neutralisation Capacity (pH7)	mol/kg		n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	1.5	1.1	0.003	0.012	0.5	2	25
DETSC 2306 Barium as Ba	5.5	1.7	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.03	< 0.03	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.3	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	1	0.7	< 0.004	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	0.02	0.01	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.5	< 0.5	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.14	< 0.09	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.35	0.18	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.87	0.38	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	1.4	< 1.3	0.003	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	2900	1600	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	< 100	160	< 0.02	1.34	10	150	500
DETSC 2055 Sulphate as SO4	29000	9200	58	123.7	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	180000	70000	360	875.9	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
* Dissolved Organic Carbon	2800	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.8	7.5
DETSC 2009 Conductivity uS/cm	254	100
* Temperature*	13	12

Mass of Sample Kg	0.140
Mass of dry Sample Kg	0.124

Stage 1

Volume of Leachant L2	0.231
Volume of Eluate VE1	0.198

Stage 2

Volume of Leachant L8	0.991
Volume of Eluate VE2	0.91

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 18-02501-1
Client Ref 1227/SI
Contract Title 40 Silver Street, Reading
Sample Id BH01 0.30

Sample Numbers 1292055 1292063 1292064
Date Analysed 07/02/2018

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	0.6	3	5	6
DETSC 2003# Loss On Ignition	%	2.2	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC2008# pH	pH Units		n/a	>6	n/a
DETS073* Acid Neutralisation Capacity (pH4)	mol/kg		n/a	TBE	TBE
DETS073* Acid Neutralisation Capacity (pH7)	mol/kg		n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	1.2	1.1	0.002	0.011	0.5	2	25
DETSC 2306 Barium as Ba	1.2	1.1	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.03	< 0.03	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.7	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	0.8	< 0.4	< 0.004	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.01	< 0.01	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	1.5	1.4	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.5	< 0.5	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	< 0.09	< 0.09	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.21	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	< 1.3	< 1.3	< 0.002	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	2700	1500	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	< 100	< 100	< 0.02	< 0.1	10	150	500
DETSC 2055 Sulphate as SO4	4200	2400	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	47000	39000	94	402.2	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
* Dissolved Organic Carbon	4000	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8	8.9
DETSC 2009 Conductivity uS/cm	67	55
* Temperature*	14	14

Mass of Sample Kg	0.140
Mass of dry Sample Kg	0.121

Stage 1

Volume of Leachant L2	0.224
Volume of Eluate VE1	0.185

Stage 2

Volume of Leachant L8	0.971
Volume of Eluate VE2	0.9

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

Information in Support of the Analytical Results

Our Ref 18-02501-1
Client Ref 1227/SI
Contract 40 Silver Street, Reading

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1292048	WS1 0.35 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292049	WS2 2.50 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292050	WS3 0.50 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292051	WS4 0.50 SOIL	29/01/18	GJ 250ml x3, GJ 60ml x2, PT 1L x2		
1292052	WS4 2.70 SOIL	29/01/18	PT 1L		
1292053	WS5 0.30 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292054	WS5 1.25 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292055	BH01 0.30 SOIL	29/01/18	GJ 250ml x3, GJ 60ml x3, PT 1L x3		
1292056	BH01 12.70 SOIL	29/01/18	GJ 60ml		
1292057	BH02 0.40 SOIL	29/01/18	GJ 250ml, GJ 60ml, PT 1L		
1292058	BH02 1.20 SOIL	29/01/18	PT 1L		
1292059	BH02 6.00 SOIL	29/01/18	PT 1L		
1292060	BH02 7.00 SOIL	29/01/18	PT 1L		
1292061	WS4 0.50 LEACHATE	29/01/18	GJ 250ml x3, GJ 60ml x2, PT 1L x2		
1292062	WS4 0.50 LEACHATE	29/01/18	GJ 250ml x3, GJ 60ml x2, PT 1L x2		
1292063	BH01 0.30 LEACHATE	29/01/18	GJ 250ml x3, GJ 60ml x3, PT 1L x3		
1292064	BH01 0.30 LEACHATE	29/01/18	GJ 250ml x3, GJ 60ml x3, PT 1L x3		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

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Analytical Report Number : 19-55802

Project / Site name:	40 Silver Street, Reading	**Samples received on:**	21/08/2019
Your job number:	1227-6-0	**Samples instructed on:**	21/08/2019
Your order number:	2019_70	**Analysis completed by:**	02/09/2019
Report Issue Number:	1	**Report issued on:**	02/09/2019
Samples Analysed:	6 soil samples		

Signed: Karolina Marek

Karolina Marek
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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

Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297425	1297426	1297427	1297428	1297429
Sample Reference				BH3	BH4	BH4	HDP1	HDP2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	1.00
Date Sampled				19/08/2019	20/08/2019	20/08/2019	20/08/2019	20/08/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	21	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.6	8.4	8.9	5.0	3.8
Total mass of sample received	kg	0.001	NONE	1.0	1.2	1.1	1.3	1.1
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	11.1	7.3	8.8	8.3
Electrical Conductivity	µS/cm	10	ISO 17025	730	1600	1100	2200	150
Total Sulphate as SO_4	%	0.005	MCERTS	0.141	0.663	0.208	0.879	0.076
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.44	1.0	0.79	1.8	0.036
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	444	1030	787	1820	35.6
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	12	43	5.1	17	1.2
Total Sulphur	%	0.005	MCERTS	0.043	0.209	0.066	0.285	0.023
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	1.3	< 0.5	< 0.5
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	< 0.05	0.13	< 0.05	< 0.05
Organic Matter	%	0.1	MCERTS	0.9	1.4	0.4	1.6	1.3
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	9.0	6.4	7.9	2.5	22
Redox Potential	mV	-800	NONE	247.60	210.90	293.50	185.50	243.60
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.58	0.42
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	0.10
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.6	0.92
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.6	0.86
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.1	0.60
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.2	0.50
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.3	0.58
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.64	0.30
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.2	0.51
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.69	0.28
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.77	0.30
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	< 0.80	10.8	5.37
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	13	9.2	15	9.4
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	0.6	1.1	2.2	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	20	17	23	13
Copper (aqua regia extractable)	mg/kg	1	MCERTS	26	43	45	38	30
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	67	22	64	50
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.5	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	15	13	15	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	51	69	43	78	74
Magnesium (water soluble)	mg/kg	5	NONE	22	17	30	24	17
Magnesium (leachate equivalent)	mg/l	2.5	NONE	11	< 2.5	9.9	7.0	< 2.5

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

Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297425	1297426	1297427	1297428	1297429
Sample Reference				BH3	BH4	BH4	HDP1	HDP2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	1.00
Date Sampled				19/08/2019	20/08/2019	20/08/2019	20/08/2019	20/08/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	1.4	-	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	3.6	-	< 2.0	2.4	6.1
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	-	< 10	22	22
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	13	-	< 10	150	48
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	24	-	< 10	170	76

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297425	1297426	1297427	1297428	1297429
Sample Reference				BH3	BH4	BH4	HDP1	HDP2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	1.00
Date Sampled				19/08/2019	20/08/2019	20/08/2019	20/08/2019	20/08/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297425	1297426	1297427	1297428	1297429
Sample Reference				BH3	BH4	BH4	HDP1	HDP2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	1.00
Date Sampled				19/08/2019	20/08/2019	20/08/2019	20/08/2019	20/08/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.58	0.42
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	0.10
Carbazole	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.6	0.92
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.6	0.86
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.1	0.60
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.2	0.50
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.3	0.58
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.64	0.30
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	1.2	0.51
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.69	0.28
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.77	0.30

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297430				
Sample Reference				HDP3				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				20/08/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	31				
Moisture Content	%	N/A	NONE	4.1				
Total mass of sample received	kg	0.001	NONE	1.2				
Asbestos in Soil	Type	N/A	ISO 17025	-				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.0				
Electrical Conductivity	µS/cm	10	ISO 17025	140				
Total Sulphate as SO_4	%	0.005	MCERTS	0.044				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.017				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	16.7				
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.0				
Total Sulphur	%	0.005	MCERTS	0.018				
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5				
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05				
Organic Matter	%	0.1	MCERTS	1.7				
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0				
Redox Potential	mV	-800	NONE	230.30				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-				
Acenaphthylene	mg/kg	0.05	MCERTS	-				
Acenaphthene	mg/kg	0.05	MCERTS	-				
Fluorene	mg/kg	0.05	MCERTS	-				
Phenanthrene	mg/kg	0.05	MCERTS	-				
Anthracene	mg/kg	0.05	MCERTS	-				
Fluoranthene	mg/kg	0.05	MCERTS	-				
Pyrene	mg/kg	0.05	MCERTS	-				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-				
Chrysene	mg/kg	0.05	MCERTS	-				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-				
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.1				
Boron (water soluble)	mg/kg	0.2	MCERTS	1.0				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	38				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	58				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	62				
Magnesium (water soluble)	mg/kg	5	NONE	16				
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5				

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297430				
Sample Reference				HDP3				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				20/08/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	-				
Toluene	µg/kg	1	MCERTS	-				
Ethylbenzene	µg/kg	1	MCERTS	-				
p & m-xylene	µg/kg	1	MCERTS	-				
o-xylene	µg/kg	1	MCERTS	-				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-				

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297430				
Sample Reference				HDP3				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				20/08/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-				
Chloroethane	µg/kg	1	NONE	-				
Bromomethane	µg/kg	1	ISO 17025	-				
Vinyl Chloride	µg/kg	1	NONE	-				
Trichlorofluoromethane	µg/kg	1	NONE	-				
1,1-Dichloroethene	µg/kg	1	NONE	-				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-				
1,1-Dichloroethane	µg/kg	1	MCERTS	-				
2,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloromethane	µg/kg	1	MCERTS	-				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-				
1,2-Dichloroethane	µg/kg	1	MCERTS	-				
1,1-Dichloropropene	µg/kg	1	MCERTS	-				
Trans-1,2-dichloroethene	µg/kg	1	NONE	-				
Benzene	µg/kg	1	MCERTS	-				
Tetrachloromethane	µg/kg	1	MCERTS	-				
1,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloroethene	µg/kg	1	MCERTS	-				
Dibromomethane	µg/kg	1	MCERTS	-				
Bromodichloromethane	µg/kg	1	MCERTS	-				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Toluene	µg/kg	1	MCERTS	-				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-				
1,3-Dichloropropane	µg/kg	1	ISO 17025	-				
Dibromochloromethane	µg/kg	1	ISO 17025	-				
Tetrachloroethene	µg/kg	1	NONE	-				
1,2-Dibromoethane	µg/kg	1	ISO 17025	-				
Chlorobenzene	µg/kg	1	MCERTS	-				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Ethylbenzene	µg/kg	1	MCERTS	-				
p & m-Xylene	µg/kg	1	MCERTS	-				
Styrene	µg/kg	1	MCERTS	-				
Tribromomethane	µg/kg	1	NONE	-				
o-Xylene	µg/kg	1	MCERTS	-				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Isopropylbenzene	µg/kg	1	MCERTS	-				
Bromobenzene	µg/kg	1	MCERTS	-				
n-Propylbenzene	µg/kg	1	ISO 17025	-				
2-Chlorotoluene	µg/kg	1	MCERTS	-				
4-Chlorotoluene	µg/kg	1	MCERTS	-				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-				
tert-Butylbenzene	µg/kg	1	MCERTS	-				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-				
sec-Butylbenzene	µg/kg	1	MCERTS	-				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-				
p-Isopropyltoluene	µg/kg	1	ISO 17025	-				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-				
Butylbenzene	µg/kg	1	MCERTS	-				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-				
Hexachlorobutadiene	µg/kg	1	MCERTS	-				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-				

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Analytical Report Number: 19-55802

Project / Site name: 40 Silver Street, Reading
Your Order No: 2019_70

Lab Sample Number				1297430				
Sample Reference				HDP3				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				20/08/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-				
Phenol	mg/kg	0.2	ISO 17025	-				
2-Chlorophenol	mg/kg	0.1	MCERTS	-				
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-				
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-				
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-				
2-Methylphenol	mg/kg	0.3	MCERTS	-				
Hexachloroethane	mg/kg	0.05	MCERTS	-				
Nitrobenzene	mg/kg	0.3	MCERTS	-				
4-Methylphenol	mg/kg	0.2	NONE	-				
Isophorone	mg/kg	0.2	MCERTS	-				
2-Nitrophenol	mg/kg	0.3	MCERTS	-				
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-				
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-				
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-				
Naphthalene	mg/kg	0.05	MCERTS	-				
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-				
4-Chloroaniline	mg/kg	0.1	NONE	-				
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-				
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-				
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-				
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-				
2-Methylnaphthalene	mg/kg	0.1	NONE	-				
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-				
Dimethylphthalate	mg/kg	0.1	MCERTS	-				
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-				
Acenaphthylene	mg/kg	0.05	MCERTS	-				
Acenaphthene	mg/kg	0.05	MCERTS	-				
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-				
Dibenzofuran	mg/kg	0.2	MCERTS	-				
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-				
Diethyl phthalate	mg/kg	0.2	MCERTS	-				
4-Nitroaniline	mg/kg	0.2	MCERTS	-				
Fluorene	mg/kg	0.05	MCERTS	-				
Azobenzene	mg/kg	0.3	MCERTS	-				
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-				
Hexachlorobenzene	mg/kg	0.3	MCERTS	-				
Phenanthrene	mg/kg	0.05	MCERTS	-				
Anthracene	mg/kg	0.05	MCERTS	-				
Carbazole	mg/kg	0.3	MCERTS	-				
Dibutyl phthalate	mg/kg	0.2	MCERTS	-				
Anthraquinone	mg/kg	0.3	MCERTS	-				
Fluoranthene	mg/kg	0.05	MCERTS	-				
Pyrene	mg/kg	0.05	MCERTS	-				
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-				
Chrysene	mg/kg	0.05	MCERTS	-				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-				

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Analytical Report Number : 19-55802

Project / Site name: 40 Silver Street, Reading

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1297425	BH3	None Supplied	0.50	Brown sandy loam with gravel and chalk.
1297426	BH4	None Supplied	0.50	Brown loam and clay with gravel and stones.
1297427	BH4	None Supplied	1.00	Brown clay and sand with gravel.
1297428	HDP1	None Supplied	0.50	Brown sandy loam with gravel.
1297429	HDP2	None Supplied	1.00	Brown sandy loam with vegetation and gravel
1297430	HDP3	None Supplied	0.50	Brown sandy loam with gravel and stones.

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Analytical Report Number : 19-55802

Project / Site name: 40 Silver Street, Reading

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Electrical conductivity of soil	Determination of electrical conductivity in soil by electrometric measurement.	In-house method	L031-PL	W	ISO 17025
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Redox Potential of soil	Determination of redox potential in soil by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L084-PL	W	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS

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Analytical Report Number : 19-55802

Project / Site name: 40 Silver Street, Reading

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE

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

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Analytical Report Number : 19-55803

Project / Site name:	40 Silver Street, Reading	**Samples received on:**	21/08/2019
Your job number:	1227-6-0	**Samples instructed on:**	21/08/2019
Your order number:	2019_70	**Analysis completed by:**	03/09/2019
Report Issue Number:	1	**Report issued on:**	03/09/2019
Samples Analysed:	2 wac multi samples		

Signed: Karolina Marek

Karolina Marek
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-55803**						
					Client:	**WESTLAKESC**	
Location	**40 Silver Street, Reading**						
Lab Reference (Sample Number)	1297431				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	19/08/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH3						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.3				3%	5%	6%
Loss on Ignition (%) **	7.8				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.9				--	>6	--
Acid Neutralisation Capacity (mol / kg)	6.9				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.020	0.0080		0.096	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0025	< 0.0010		0.011	0.5	10	70
Copper *	0.0073	0.0080		0.079	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.025	0.0089		0.11	0.5	10	30
Nickel *	< 0.0010	0.0028		0.024	0.4	10	40
Lead *	< 0.0050	< 0.0050		< 0.020	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.0047	0.0083		0.078	4	50	200
Chloride *	9.5	4.3		51	800	4000	25000
Fluoride	0.50	0.40		4.2	10	150	500
Sulphate *	260	29		610	1000	20000	50000
TDS*	450	99		1500	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	7.0	10		98	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.0						
Dry Matter (%)	90						
Moisture (%)	9.6						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.25						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-55803**						
					Client:	**WESTLAKESC**	
Location	**40 Silver Street, Reading**						
Lab Reference (Sample Number)	1297432				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	20/08/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	HDP1						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	2.2				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	11				100	--	--
pH (units)**	8.3				--	>6	--
Acid Neutralisation Capacity (mol / kg)	38				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.054	0.022		0.26	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.012	0.0048		0.058	0.5	10	70
Copper *	0.015	0.0080		0.090	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.015	< 0.0030		0.044	0.5	10	30
Nickel *	0.0013	< 0.0010		0.0073	0.4	10	40
Lead *	< 0.0050	0.0083		0.070	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		0.060	0.1	0.5	7
Zinc *	0.0036	0.0068		0.063	4	50	200
Chloride *	12	< 4.0		42	800	4000	25000
Fluoride	0.26	0.37		3.5	10	150	500
Sulphate *	1300	160		3200	1000	20000	50000
TDS*	1300	260		4200	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	13	7.6		84	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.3						
Dry Matter (%)	95						
Moisture (%)	5.0						
Stage 1							
Volume Eluate L2 (litres)	0.34						
Filtered Eluate VE1 (litres)	0.26						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accrediited

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Analytical Report Number : 19-55803

Project / Site name: 40 Silver Street, Reading

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1297431	BH3	None Supplied	0.50	Brown sandy loam with gravel and chalk.
1297432	HDP1	None Supplied	0.50	Brown sandy loam with gravel.

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Analytical Report Number : 19-55803

Project / Site name: 40 Silver Street, Reading

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil C10 - C40	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031-PL	W	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS

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

Analytical Report Number : 19-55803

Project / Site name: 40 Silver Street, Reading

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

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

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

Appendix 5 – Risk Assessment Information

These tables are based on CIRIA 552 & 665 risk assessment methodology

Classification of Probability

Classification	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 pollutant 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 it is less likely in the short-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.

Classification of Consequence

Classification	Definition
Severe	Short-term acute risk to human health. Short-term risk of pollution of sensitive water resources. Short-term risk to a particular ecosystem. Catastrophic damage to building/property.
Medium	Chronic damage to human health. Pollution of sensitive water resources. A significant change in a particular organism or ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.
Minor	Harm, although not necessarily significant harm, which may result in financial loss, or expenditure to resolve. Non-permanent human health effects. Easily repairable effects of damage to buildings, structures and services.

Combination of Consequence vs. Probability

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

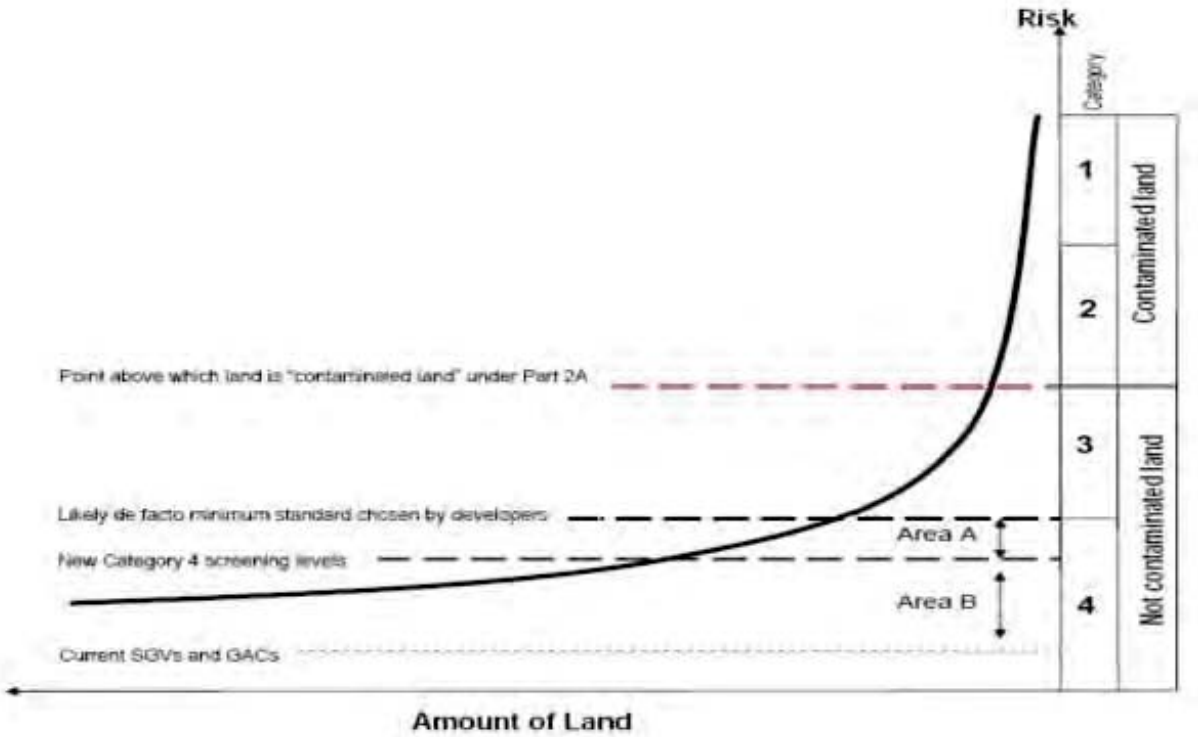
Description of Risk and Likely Action Required

Classification	Definition
Very high risk	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. This 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 risk	Harm if 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) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	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. Investigation (if not undertaken already) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the long-term.
Low risk	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 risk	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.

Human Health Soils Generic Assessment Criteria – Background Information

Current practice during the Generic Quantitative Risk Assessment (GQRA) stage of assessing land affected by contamination is to use generic screening values. These generic screening values have previously taken the form of risk-based Soil Guideline Values (SGVs) or other Generic Assessment Criteria (GACs) that are most typically derived using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model and are based on Health Criteria Values (HCVs) as defined in SR2 (Environment Agency 2009a). The assessment values derived using this approach are based on a minimal or tolerable level of risk and were developed to assist professionals in the assessment of long-term risk to health from human exposure to chemical contamination in soil.

However revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990 was published by Defra in April 2012 which introduced a new four-category system for classifying land under Part 2A. This new four-category system is displayed graphically below:



Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low. Land is determined as 'contaminated land' under Part 2A if it falls within Categories 1 or 2, such that the Category 2/3 border defines the point at which land is determined under the legislation.

New 'Category 4 Screening Levels' (C4SLs) have been developed by Defra to provide a simple test for deciding when land is suitable for use and definitely not contaminated land, thereby allowing 'low-risk' land to be dismissed from the need for further risk assessment more quickly and easily and allow regulators to focus efforts on the highest-risk land. The C4SLs are more pragmatic (whilst still strongly precautionary) compared to existing generic screening levels. C4SLs are presented as generic screening criteria for use within a GQRA; although it is acknowledged that they adopt a higher level of risk than previous/existing generic screening levels (i.e. SGVs and GAC produced using HCVs).

In December 2014 Defra published final Category 4 Screening Levels (C4SLs) for six contaminants: arsenic, benzene, benzo(a)pyrene, cadmium, chromium and lead. These C4SL were produced using updated assumptions relating to the modelling of human health exposure to soil contaminants and are based upon a

'Low Level of Toxicological Concern' (LLTC) rather than HCVs however the methodology for deriving both the previous SGVs and the new C4SLs is based on the Environment Agency's CLEA methodology. The LLTC is defined as a 'pragmatic intake level that remains sufficiently protective of health but represents a level of concern that is low' (SP1010, Main Report).

The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly. Policy responsibility for the National Planning Policy Framework and associated Planning Practice Guidance falls to the Department for Communities and Local Government (DCLG). DCLG's Planning Practice Guidance on Land Affected by Contamination now includes reference to the use of C4SLs in risk assessment under planning.

The C4SLs provide an assessment value where contaminant concentrations below the C4SL present an acceptable level of risk for a given land use whereby the land is suitable for use and definitely not contaminated (i.e. it is in Category 4). Exceeding a C4SL means that further investigation is required, not that the land is necessarily contaminated.

"Where a valid SGV exists for a contaminant where a C4SL has also been derived, it is anticipated that risk assessors will use the C4SL in line with the Part 2A Statutory Guidance. In the absence of a suitable C4SL, risk assessors should identify and select appropriate GAC in accordance with established good practice" (Defra SP1010, Companion Document).

Subsequent to the publication of C4SL; LQM/CIEH have published updated assessment values in 2015 termed LQM/CIEH Suitable 4 Use Levels (S4ULs), which are intended as an update and replacement for the "old" LQM/CIEH GAC. The S4ULs fundamentally differ from the C4SLs in that they remain based on the principals of 'minimal' and 'tolerable' risk enshrined in SR2. Thus, the authors of the LQM/CIEH publication, consider the S4ULs to be equivalent to the SGVs and previous editions of the LQM/CIEH GAC and hence that relevant S4ULs can be used in GQRA under both the planning a Part 2A regimes.

Plant Health Assessment Values

The assessment values for plant health are taken from 'The code of Good Agricultural Practice for the Protection of Soil', MAFF 1998 and are detailed in the table below.

Plant Health Assessment Value				
	pH 5-5.5	pH 5.5-6	pH6-7	pH >7
Zinc	200	200	200	300
Copper	80	100	135	200
Nickel	50	60	75	110

Soil Assessment Values (mg/kg) – S4UL			
Metals	**Residential with home-grown produce**	**Residential without home-grown produce**	**Source**
Arsenic	37	40	CIEH/LQM/C4SL
Beryllium	1.7	1.7	CIEH/LQM
Boron	290	11,000	CIEH/LQM
Cadmium	11 (22)	85 (150)	CIEH/LQM (C4SL)
Chromium III	910	910	CIEH/LQM
Chromium VI	6 (21)	6 (21)	CIEH/LQM (C4SL)
Copper	2,400	7,100	CIEH/LQM
Lead	200	310	C4SL
Mercury elemental	1.2	1.2	CIEH/LQM
Mercury Inorganic	40	56	CIEH/LQM
Mercury Methyl	11	15	CIEH/LQM
Nickel	130	180	CIEH/LQM
Selenium	250	430	CIEH/LQM
Vanadium	410	1,200	CIEH/LQM
Zinc	3,700	40,000	CIEH/LQM
Generic assessment criteria (GAC) taken from the 'Chartered Institute of Environmental Health / Land Quality Management 'The LQM/CIEH S4ULs for Human Health Risk Assessment'.			

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Residential Land Use Value (CIEH/LQM) – S4UL (RW and RWO = with and without plant uptake)

Petroleum Hydrocarbons	1% RW	1% RWO	2.5% RW	2.5% RWO	6% RW	6% RWO
Aliphatic EC 5-6	42	42	78	78	160	160
Aliphatic EC >6-8	100	100	230	230	530	530
Aliphatic EC >8-10	27	27	65	65	150	150
Aliphatic EC >10-12	130	130	330	330	760	770
Aliphatic EC >12-16	1,100	1,100	2,400	2,400	4,300	4,400
Aliphatic EC >16-35	65,000	65,000	92,000	92,000	110,000	110,000
Aliphatic EC >35-44	65,000	65,000	92,000	92,000	110,000	110,000
Aromatic EC 5-7 (benzene)	70	370	140	690	300	1,400
Aromatic EC >7-8 (toluene)	130	860	290	1,800	660	3,900
Aromatic EC >8-10	34	47	83	110	190	270
Aromatic EC >10-12	74	250	180	590	380	1,200
Aromatic EC >12-16	140	1,800	330	2,300	660	2,500
Aromatic EC >16-21	260	1,900	540	1,900	930	1,900
Aromatic EC >21-35	1,100	1,900	1,500	1,900	1,700	1,900
Aromatic EC >35-44	1,100	1,900	1,500	1,900	1,700	1,900
Aliphatic+Aromatic EC >44-70	1,600	1,900	1,800	1,900	1,900	1,900
Benzene	0.087	0.38	0.17	0.70	0.37	1.4
Ethylbenzene	47	83	110	190	260	440
Toluene	130	880	290	1,900	660	3,900
O-xylene	60	88	140	210	330	480
M-xylene	59	82	140	190	320	450
P-xylene	56	79	130	180	310	430
Phenol	120	440	200	690	380	1,200

Generic assessment criteria (GAC) taken from the 'Chartered Institute of Environmental Health / Land Quality Management 'The LQM/CIEH S4ULs for Human Health Risk Assessment'.

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Residential Land Use Value (CIEH/LQM) – S4UL (RW and RWO = with and without plant uptake)

Polyaromatic Hydrocarbons	1% RW	1% RWO	2.5% RW	2.5% RWO	6% RW	6% RWO
Acenaphthene	210	3,000	510	4,700	1,100	6,000
Acenaphthylene	170	2,900	420	4,600	920	6,000
Anthracene	2,400	31,000	5,400	35,000	11,000	37,000
Benz(a)anthracene	7.2	11	11	14	13	15
Benzo(a)pyrene (only)	2.2	3.2	2.7	3.2	3.0	3.2
Benzo(b)fluoranthene	2.6	3.9	3.3	4.0	3.7	4.0
Benzo(ghi)perylene	320	360	340	360	350	360
Benzo(k)fluoranthene	77	110	93	110	100	110
Chrysene	15	30	22	31	27	32
Dibenz(ah)anthracene	0.24	0.31	0.28	0.32	0.3	0.32
Fluoranthene	280	1,500	560	1,600	890	1,600
Fluorene	170	2,800	400	3,800	860	4,500
Indeno(123-cd)pyrene	27	45	36	46	41	46
Naphthalene	2.3	2.3	5.6	5.6	13	13
Phenanthrene	95	1,300	220	1,500	440	1,500
Pyrene	620	3,700	1,200	3,800	2,000	3,800
Coal Tar (Bap as surrogate marker)	0.79	1.2	0.98	1.2	1.1	1.2
Generic assessment criteria (GAC) taken from the 'Chartered Institute of Environmental Health / Land Quality Management 'The LQM/CIEH S4ULs for Human Health Risk Assessment'.						

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Residential Land Use Value (CIEH/LQM) – S4UL (RW and RWO = with and without plant uptake)

Chloroalkanes & Alkenes	1% RW	1% RWO	2.5% RW	2.5% RWO	6% RW	6% RWO
1,2-Dichloroethane	0.0071	0.0092	0.011	0.013	0.019	0.023
1,1,1-Trichloroethane	8.8	9.0	18	18	39	40
1,1,2,2- Tetrachloroethane	1.6	3.9	3.4	8.0	7.5	17
1,1,1,2- Tetrachloroethane	1.2	1.5	2.8	3.5	6.4	8.2
Tetrachloroethene	0.18	0.18	0.39	0.40	0.90	0.92
Tetrachloromethane (aka carbon tetrachloride)	0.026	0.026	0.056	0.056	0.13	0.13
Trichloroethene	0.016	0.017	0.034	0.036	0.075	0.080
Trichloromethane (aka chloroform)	0.91	1.2	1.7	2.1	3.4	4.2
Chloroethene (aka vinyl chloride)	0.00064	0.00077	0.00087	0.0010	0.0014	0.0015
Generic assessment criteria (GAC) taken from the 'Chartered Institute of Environmental Health / Land Quality Management 'The LQM/CIEH S4ULs for Human Health Risk Assessment'.						

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Residential Land Use Value (CIEH/LQM) – S4UL (RW and RWO = with and without plant uptake)

Chlorobenzenes	**1% RW**	**1% RWO**	**2.5% RW**	**2.5% RWO**	**6% RW**	**6% RWO**
Chlorobenzene	0.46	0.46	1.0	1.0	2.4	2.4
1,2-Dichlorobenzene	23	24	55	57	130	130
1,3-Dichlorobenzene	0.40	0.44	1.0	1.1	2.3	2.5
1,4-Dichlorobenzene	61	61	150	150	350	350
1,2,3-Trichlorobenzene	1.5	1.5	3.6	3.7	8.6	8.8
1,2,4-Trichlorobenzene	2.6	2.6	6.4	6.4	15	15
1,3,5-Trichlorobenzene	0.33	0.33	0.81	0.81	1.9	1.9
1,2,3,4-Tetrachlorobenzene	15	24	36	56	78	120
1,2,3,5-Tetrachlorobenzene	0.66	0.75	1.6	1.9	3.7	4.3
1,2,4,5-Tetrachlorobenzene	0.33	0.73	0.77	1.7	1.6	3.5
Pentachlorobenzene	5.8	19	12	30	22	38
Hexachlorobenzene	1.8 (0.2)^{vap}	4.1 (0.2)^{vap}	3.3 (0.5)^{vap}	5.7 (0.5)^{vap}	4.9	6.7 (1.2)^{vap}

Other Organics	**1% RW**	**1% RWO**	**2.5% RW**	**2.5% RWO**	**6% RW**	**6% RWO**
Chlorophenols (except pentachlorophenol)	0.87	94	2.0	150	4.5	210
Pentachlorophenol	0.22	27 (16.4)^{vap}	0.52	29	1.2	31
Carbon disulphide (aka carbon bisulphide, carbon sulphide ad dithiocarbonic anhydride)	0.14	0.14	0.29	0.29	0.62	0.62
Hexachlorobutadiene (aka perchlorobutadiene, 1,1,2,3,4,4-hexachloro-1,3-butadiene, 1,3-hexachlorobutadiene, HCB or HCBD)	0.29	0.32	0.7	0.78	1.6	1.8
Generic assessment criteria (GAC) taken from the 'Chartered Institute of Environmental Health / Land Quality Management 'The LQM/CIEH S4ULs for Human Health Risk Assessment'.						

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Final Category 4 Screening Levels (C4SL)

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

This table should be read in conjunction with the Final C4SL R&D report.

C4SL reproduced from SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. December 2014.

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Generic Assessment Criteria Derived by CL:AIRE

Table 2.1: Contaminants with EIC/AGS/CL:AIRE GAC

Substance	CAS	Synonyms
Metals		
Antimony	n/a	
Barium	n/a	
Molybdenum	n/a	
Hydrocarbons		
1,2,4-Trimethylbenzene	95-63-6	Pseudocumene; psicumene
Isopropylbenzene	98-82-8	Cumene; 2-phenylpropane
Propylbenzene	103-65-1	*n*-Propylbenzene; Isocumene; 1-phenylpropane; 1-propylbenzene
Styrene	100-42-5	Vinyl benzene; cinnamene; styrol; phenethylene; phenylethene
Phenols		
2,4-Dimethylphenol	105-67-9	2,4-DMP; 2,4-xylenol; *m*-xylenol; 1-hydroxy-2,4-dimethylbenzene
2-Methylphenol	95-48-7	*o*-Cresol; *ortho*-cresol
3-Methylphenol	108-39-4	*m*-Cresol; *meta*-cresol
4-Methylphenol	106-44-5	*p*-Cresol; *para*-cresol
Halogenated organics		
1,1,2 Trichloroethane	79-00-5	1,1,2-TCA; ethane trichloride; β-trichloroethane; vinyl trichloride
1,1-Dichloroethane	75-34-3	1,1-DCA; α,α-dichloroethane; CFC-150a
1,1-Dichloroethene	75-35-4	1,1-DCE; 1,1-dichloroethylene; vinylidine chloride
1,2-Dichloropropane	78-87-5	1,2-DCP; propylene dichloride
2-Chloronaphthalene	91-58-7	2-Naphthyl chloride; β-Chloronaphthalene
Bromobenzene	108-86-1	Phenyl bromide; bromobenzol; monobromobenzene
Bromodichloromethane	75-27-4	Dichlorobromomethane
Bromoform	75-25-2	Methyl tribromide; tribromomethane
Chloroethane	75-00-3	Monochloroethane; ethyl chloride; ethylene chloride
Chloromethane	74-87-3	Methyl chloride; Freon-40; monochloromethane
cis-1,2 Dichloroethene	156-59-2	*cis*-1,2-DCE; *cis*-1,2-dichloroethylene
trans-1,2 Dichloroethene	156-60-5	*trans*-1,2-DCE; trans-1,2-dichloroethylene
Dichloromethane	75-09-2	DCM; methylene chloride; methylene dichloride; Freon-30
Hexachloroethane	67-72-1	PCA; perchloroethane; carbon hexachloride; hexachloroethylene
Phthalates		
Bis (2-ethylhexyl) phthalate	117-81-7	DEHP; BEHP; di-2-ethyl hexyl phthalate
Butyl benzyl phthalate	85-68-7	BBP; n-butyl benzyl phthalate; benzyl butyl phthalate; BBzP
Diethyl Phthalate	84-66-2	DEP; ethyl phthalate; 1,2-benzenedicarboxylic acid diethyl ester
Di-*n*-butyl phthalate	84-74-2	DBP; *n*-butyl phthalate; 1,2-benzenedicarboxylic acid dibutyl ester
Di-*n*-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester
Other Organics		
Biphenyl	92-52-4	diphenyl; phenyl benzene; 1,1-biphenyl; lemonene
2,4-Dinitrotoluene	121-14-2	2,4-DNT
2,6-Dinitrotoluene	606-20-2	2,6-DNT
Tributyl tin oxide	56-35-9	TBTO; bis(tri-n-butyltin)oxide
Methyl *tert*-butyl ether	1634-04-4	MTBE; *tert*-butyl methyl ether; methyl *tertiary*-butyl ether

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Table 4.1a: EIC/AGS/CL:AIRE GAC for metals

Contaminant	GAC (mg.kg⁻¹)				Soil Saturation Concentration (mg.kg⁻¹)
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
Antimony	ND	550	ND	7500	NA
Barium	ND	1300	ND	22000	NA
Molybdenum	ND	670	ND	17000	NA

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC

These GAC are not soil organic matter dependent

ND: Not derived (see Section 3.4)

NA: Not applicable

Table 4.1b: Pathway exposure contributions (%) for metals for residential landuse without consumption of homegrown produce

Contaminant	Direct soil ingestion	Sum of consumption of homegrown produce and attached soil	Dermal contact (indoor and outdoor combined)	Inhalation of dust (indoor and outdoor combined)	Inhalation of vapour (indoor and outdoor combined)	Oral back-ground	Inhalation back-ground
Antimony	96.1	0.0	0.0	0.3	0.0	3.3	0.3
Barium	49.8	0.0	0.0	0.2	0.0	50.0	0.0
Molybdenum	49.9	0.0	0.0	0.2	0.0	49.9	0.0

Table 4.1c: Pathway exposure contributions (%) for metals for commercial landuse

Contaminant	Direct soil ingestion	Sum of consumption of homegrown produce and attached soil	Dermal contact (indoor and outdoor combined)	Inhalation of dust (indoor and outdoor combined)	Inhalation of vapour (indoor and outdoor combined)	Oral back-ground	Inhalation back-ground
Antimony	98.2	0.0	0.0	0.6	0.0	1.0	0.2
Barium	49.7	0.0	0.0	0.3	0.0	50.0	0.0
Molybdenum	80.1	0.0	0.0	0.5	0.0	19.4	0.0

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Table 4.2a: EIC/AGS/CL:AIRE GAC for organics with 1% SOM

Contaminant	GAC for 1% SOM (mg.kg^{-1})				Soil Saturation Concentration (mg.kg^{-1})
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	0.6	0.88	0.28	94	4030
1,1-Dichloroethane	2.4	2.5	9.2	280	1830
1,1-Dichloroethene	0.23	0.23	2.8	26	2230
1,2,4-Trimethylbenzene	0.35	0.41	0.38	42	557
1,2-Dichloropropane	0.024	0.024	0.62	3.3	1190
2,4-Dimethylphenol	19	210	3.1	16000	1380
2,4-Dinitrotoluene	1.5	170	0.22	3700	141
2,6-Dinitrotoluene	0.78	78	0.12	1900	287
2-Chloronaphthalene	3.7	3.8	40	390	114
Biphenyl	66	220	14	18000	34.4
Bis (2-ethylhexyl) phthalate	280	2700	47	85000	8.68
Bromobenzene	0.87	0.91	3.2	97	853
Bromodichloromethane	0.016	0.019	0.016	2.1	1790
Bromoform	2.8	5.2	0.95	760	2690
Butyl benzyl phthalate	1400	42000	220	940000	26.3
Chloroethane	8.3	8.4	110	960	2610
Chloromethane	0.0083	0.0085	0.066	1.0	1910
Cis 1,2 Dichloroethene	0.11	0.12	0.26	14	3940
Dichloromethane	0.58	2.1	0.10	270	7270
Diethyl Phthalate	120	1800	19	150000	13.7
Di-*n*-butyl phthalate	13	450	2.0	15000	4.65
Di-*n*-octyl phthalate	2300	3400	940	89000	32.6
Hexachloroethane	0.20	0.22	0.27	22	8.17
Isopropylbenzene	11	12	32	1400	390
Methyl *tert*-butyl ether	49	73	23	7900	20400
Propylbenzene	34	40	34	4100	402
Styrene	8.1	35	1.6	3300	626
Total Cresols (2-, 3- and 4-methylphenol)	80	3700	12	160000	15000
Trans 1,2 Dichloroethene	0.19	0.19	0.93	22	3420
Tributyl tin oxide	0.25	1.4	0.042	130	41.3

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

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Table 4.3a: EIC/AGS/CL:AIRE GAC for organics with 2.5% SOM

Contaminant	GAC for 2.5% SOM (mg.kg⁻¹)				Soil Saturation Concentration (mg.kg⁻¹)
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	1.2	1.8	0.61	190	8210
1,1-Dichloroethane	3.9	4.1	17	450	2960
1,1-Dichloroethene	0.40	0.41	5.6	46	3940
1,2,4-Trimethylbenzene	0.85	0.99	0.93	99	1360
1,2-Dichloropropane	0.042	0.042	1.2	5.9	2110
2,4-Dimethylphenol	43	410	7.2	24000	3140
2,4-Dinitrotoluene	3.2	170	0.49	3700	299
2,6-Dinitrotoluene	1.7	84	0.27	1900	622
2-Chloronaphthalene	9.2	9.3	98	960	280
Biphenyl	160	500	35	33000	84.3
Bis (2-ethylhexyl) phthalate	610	2800	120	86000	21.6
Bromobenzene	2.0	2.1	7.6	220	1970
Bromodichloromethane	0.030	0.034	0.032	3.7	3220
Bromoform	5.9	11	2.1	1500	5480
Butyl benzyl phthalate	3300	44000	550	940000	64.7
Chloroethane	11	11	200	1300	3540
Chloromethane	0.0098	0.0099	0.13	1.2	2240
Cis 1,2 Dichloroethene	0.19	0.20	0.50	24	6610
Dichloromethane	0.98	2.8	0.19	360	9680
Diethyl Phthalate	260	3500	41	220000	29.1
Di-*n*-butyl phthalate	31	450	5.0	15000	11.4
Di-*n*-octyl phthalate	2800	3400	2100	89000	81.5
Hexachloroethane	0.48	0.54	0.67	53	20.1
Isopropylbenzene	27	28	79	3300	950
Methyl *tert*-butyl ether	84	120	44	13000	33100
Propylbenzene	82	97	83	9700	981
Styrene	19	78	3.7	6500	1440
Total Cresols (2-, 3- and 4-methylphenol)	180	5400	27	180000	32500
Trans 1,2 Dichloroethene	0.34	0.35	1.9	40	6170
Tributyl tin oxide	0.59	3.1	0.10	180	101

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC.

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

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Table 4.4a: EIC/AGS/CL:AIRE GAC for organics with 6% SOM

Contaminant	GAC for 6% SOM (mg.kg⁻¹)				Soil Saturation Concentration (mg.kg⁻¹)
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	2.7	3.9	1.4	400	18000
1,1-Dichloroethane	7.4	7.7	35	850	5600
1,1-Dichloroethene	0.82	0.82	12	92	7940
1,2,4-Trimethylbenzene	2.0	2.3	2.2	220	3250
1,2-Dichloropropane	0.084	0.085	2.6	12	4240
2,4-Dimethylphenol	97	730	17	30000	7240
2,4-Dinitrotoluene	7.2	170	1.1	3800	669
2,6-Dinitrotoluene	3.9	87	0.61	1900	1400
2-Chloronaphthalene	22	22	230	2200	669
Biphenyl	360	980	83	48000	201
Bis (2-ethylhexyl) phthalate	1100	2800	280	86000	51.7
Bromobenzene	4.7	4.9	18	520	4580
Bromodichloromethane	0.061	0.070	0.068	7.6	6570
Bromoform	13	23	4.6	3100	12000
Butyl benzyl phthalate	7200	44000	1300	950000	154
Chloroethane	18	18	380	2100	5710
Chloromethane	0.013	0.013	0.23	1.6	2990
Cis 1,2 Dichloroethene	0.37	0.39	1.0	47	12900
Dichloromethane	1.7	4.5	0.34	560	15300
Diethyl Phthalate	570	6300	94	290000	65
Di-*n*-butyl phthalate	67	450	12	15000	27.3
Di-*n*-octyl phthalate	3100	3400	3900	89000	196
Hexachloroethane	1.1	1.3	1.6	120	48.1
Isopropylbenzene	64	67	190	7700	2250
Methyl *tert*-butyl ether	160	220	90	24000	62700
Propylbenzene	190	230	200	21000	2330
Styrene	43	170	8.7	11000	3350
Total Cresols (2-, 3- and 4-methylphenol)	400	6900	63	180000	73300
Trans 1,2 Dichloroethene	0.70	0.71	4.0	81	12600
Tributyl tin oxide	1.3	5.7	0.24	200	241

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC.

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

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Appendix 6 – Gas Monitoring Results

LANDFILL GAS RESULTS

40, SILVER STREET
READING

Date	Location	Atmospheric Pressure, mB	Oxygen, %	Carbon dioxide, %	Methane, % Vol	Methane % LEL	Flow, litres per hour	Water, m
19/2	WS 1	1008	19.8	1.3	0	0	0	None
	WS 2	1008	20.1	1.1	0	0	0	None
	BH1	1008	19.1	2.0	0	0	0	None
7/3	WS 1	989	20.0	1.2	0	0	0	None
	WS 2	989	19.9	1.7	0	0	0	None
	BH1	989	20.6	0.6	0	0	0	None
21/3	WS 1	1023	20.0	1.3	0	0	0	None
	WS 2	1023	20.0	1.6	0	0	0	None
	BH1	1023	19.1	1.1	0	0	0	11.55
11/4	WS 1	999	20.2	0.8	0	0	0	None
	WS 2	999	19.0	1.4	0	0	0	None
	BH1	999	20.1	1.1	0	0	0	11.23
1/5	WS 1	1004	19.4	1.8	0	0	0	None
	WS 2	1004	20.0	1.5	0	0	0	None
	BH1	1004	18.1	2.0	0	0	0	11.40
17/5	WS 1	1022	19.4	1.6	0	0	0	None
	WS 2	1022	19.8	1.6	0	0	0	None
	BH1	1022	16.8	2.5	0	0	0	11.60

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Appendix 7 – Previous Desk Study Report – 40 Silver Street

40 Silver Street
Reading
Berkshire

Preliminary Risk Assessment Report

ASHDOWN SITE INVESTIGATION LIMITED

Report No. LW26135/ds

May 2015

Report prepared for the benefit of:

Hurst Development Solutions
Davidson House
The Forbury
Reading
RG1 3EU

Document Control		
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Revisions			
Reference	**Revised By**	**Approved By**	**Date**

Limitations

This report was prepared specifically for the Client's project and the recommendations given may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned.

The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated. This is standard practice in the UK, being intrinsic to Part 2A of the Environmental Protection Act 1990 as amended.

The report considers the proposed end users as the most sensitive human health receptors. If significant risks to construction workers are identified by the preliminary assessment attention is drawn to this, although it is noted that no assessment of risk from acute exposure has been undertaken in this connection.

This report is not intended to be either an ecological, archaeological or flood risk assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the desk study undertaken in connection with the proposed development. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to demolish the existing building on the site of 40 Silver Street, Reading and to construct two residential buildings of two to three storeys incorporating communal gardens and courtyards, to provide a mixture of one and two bedroom self-contained flats, two bedroom semi-detached houses together with the provision of 15 car parking spaces, bicycle spaces and refuse storage.

At the time of the earliest historical map referenced in 1879 the site was located in a largely urban area and comprised of residential buildings and gardens within the eastern part of the site and park land in the western part of the site. The existing building on the site, indicated to be a 'works' was first shown on the 1957 mapping. At the time of the walkover survey the site was mainly occupied by a single storey steel framed commercial unit with asphalt and concrete hardstanding to the east and south.

Reference to geological datasets indicates that the site is expected to be underlain by the Taplow Gravel Formation overlying the Lambeth Group.

The Taplow Gravel Formation is classed as a Secondary A Aquifer. The Lambeth Group is classed as a Secondary A Aquifer. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

The preliminary contamination risk assessment (desk study) identified potentially significant pollutant linkages with regard to both proposed end users and controlled waters, relating to engineering works on and off site, made ground from demolition and redevelopment works on site and a chimney located within the industrial building to the south east of the site.

An intrusive ground investigation is recommended to allow a quantitative risk assessment of the potential contamination sources that have been identified to be undertaken.

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FIGURES AND APPENDICES

FIGURES

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Figure 2 Site Walkover Plan
Figure 3 Proposed Development Layout
Figure 4 Potential Contamination Source Plan

APPENDIX A

Site Walkover Photographs

APPENDIX B

Classification of Probability, Consequence and Risk

1. INTRODUCTION

It is proposed to demolish the existing building at 40 Silver Street, Reading and to construct two residential buildings of two and three storeys, along with the new areas of communal garden, courtyards and car parking.

Ashdown Site Investigation Limited was commissioned to carry out a preliminary contamination risk assessment of the site by Mr E Mather of Colony Architects Ltd, 4 Mount Pleasant Cottages, Brock Hill, Warfield, Berkshire RG42 6LA.

The scope of the commission and the terms and conditions under which the work was undertaken are set out within the offer letter Q15-0269 dated 9th April 2015. The instruction to proceed was received on behalf of the client, Hurst Development Solutions, in an email dated 29th April 2015.

The objectives of the works were to:

a) Establish the expected geology, hydrogeology and hydrology at the site;
b) Ascertain the development history and current site use;
c) Develop a preliminary conceptual model of the site identifying potentially significant pollutant linkages relating to end users of the development, to controlled waters or off-site sensitive receptors.

The preliminary conceptual model has been based on the findings of a walkover survey and reference to historical Ordnance Survey maps and published geological and environmental information obtained from various sources; the latter having been obtained from interrogation of database information compiled by GroundSure Limited.

Copies of the historical maps and geo-environmental data referred to in this report are included in a separate bound volume, entitled Geo-Environmental Data and Historical Maps (Ashdown Site Investigation Limited, Report Number LW26135/map, dated April 2015).

2. WALKOVER SURVEY

The site comprises an approximately rectangular shaped plot of land located at 40 Silver Street, Reading, Berkshire and is centred on the approximate Ordnance Survey national grid reference SU 7189 7273. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively. Photographs taken during the walkover survey are included in Appendix A.

The site is bound by residential properties to the north, west and south west and by Silver Street to the east. A derelict two storey commercial building, with a sign for "Brown Signs", was located to the south east of the site. A chimney, which may indicate the location of an existing or former boiler room, was present on the western edge of the derelict building, adjacent to the south east corner of the site.

At the time of the walkover survey the majority of the site was occupied by a vacant single storey, steel framed commercial unit. A small asphalt surfaced car parking area, in poor condition, lay to the east of the building and a heavily overgrown concrete surfaced area lay to the south. A painted out sign for "Sapphire" (a furniture store) was hung above the southern entrance to the building on the site. During discussions held on site with the land agent, it was also identified that the site had also previously been used as a tool hire store.

The easternmost part of the building appeared to have been in use as office space, whilst the western part of the building comprised an open warehouse with a painted concrete floor. Large gas heaters were suspended from the ceiling in this area of the building.

The residential buildings to the south were noted to be at a higher elevation to the site, which itself sloped gently downwards from south to north.

During the walkover survey there was no evidence of a small outbuilding in the south east of the site that was shown on the planning boundary map for the site (See Figure 2).

2.1 Potential Contamination Sources Identified by Walkover Survey

The walkover survey identified the following potential sources of contamination:

On Site

- Demolition of structure on the south east of the site. Potential for heavy metal, polycyclic aromatic hydrocarbon (PAH) compound and asbestos contaminated made ground.

Off Site

- Suspected boiler room to the south east of the site. Potential for localised petroleum hydrocarbon contamination.

3. GEOLOGICAL DATA REVIEW

3.1 Expected Geology

The data presented in the GeoInsight section of the accompanying Geo-Environmental Data has been reviewed. Reference has also been made to the British Geological Survey lexicon of named rock units and British Geological Survey mapping data.

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Geological Strata

Type	Stratum
Superficial Deposits	Taplow Gravel Formation
Bedrock Deposits	Lambeth Group

3.1.1 Taplow Gravel Formation

The Taplow Gravel Formation forms part of the River Terrace gravel associated with the Thames. It typically comprises sand, derived mainly from the Tertiary beds, together with gravel of sub angular flint, chert and Lower Greensand rock types.

3.1.2 Lambeth Group

The Lambeth Group (formerly named the Woolwich and Reading Beds) comprises a complex and laterally variable sequence of sedimentary deposits including clay, silt, sand and gravel. Inter-laminated clay and sand deposits are common in the lower part of the succession. The component formations are the Upnor Formation, Reading Formation and Woolwich Formation.

3.2 Radon Gas

The site is reported to be within an area where less than 1% of properties are above the action level requiring radon gas protection measures to be installed in new buildings. No radon protection measures are reported by the BGS to be necessary in the construction of new dwellings.

3.3 Ground Workings

No significant risks from ground workings are reported on or in the vicinity of the site.

3.4 Mining, Extractions and Natural Cavities

No significant risks from mining, natural cavities or extractions are reported on or in the vicinity of the site.

3.5 Background Mean Soil Concentrations of Metals

The GroundSure GeoInsight report provides information on background chemistry of the soils in the area of the site. The following estimated mean concentrations of metals are reported. It should be noted that the data set may not reflect higher concentrations of contaminants that may be present within made ground soils or natural soils that may have been affected by current or historical uses of the site.

Table 2. Background Mean Soil Concentrations of Metals

Metal	Mean Soil Concentration (mg/kg)	Remarks & ASI Ltd Assessment
Arsenic	15-25	The mean soil concentrations indicated are not considered to be significantly elevated for the proposed use.
Cadmium	<1.8	
Chromium	60-90	
Nickel	15-30	
Lead	<100	

3.6 Potential Contamination Sources identified by Geological Data Review

No significant sources of contamination were identified either on or off site by the geological data review.

4. HYDROGEOLOGY

4.1 Aquifer Classification

The Environment Agency designates aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The Taplow Gravel Formation and Lambeth Group expected beneath the site are classified as Secondary A Aquifers. Secondary A Aquifers are characterised by permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

4.2 Groundwater Source Protection Zones and Abstraction Licences

The closest groundwater abstraction licence is recorded to lie 486m to the east of the site. The abstraction is for potable supply.

The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

5. HYDROLOGY

5.1 Surface Water Features

No significant surface water features are recorded within 250m of the site.

There is no Environment Agency information on river quality within 250m of the site.

5.2 Surface Water Abstraction Licences

The closest surface water abstraction licence is recorded to lie 498m to the north west of the site. The abstraction is for a lake and pond throughflow.

5.3 Flooding

The site does not lie within an Environment Agency Flood Zone.

There are no flood defences, areas benefiting from flood defences or areas used for flood storage within 250m of the site.

The site lies within 50m of an area where the potential of Superficial Deposits Flooding (flooding associated with shallow sedimentary aquifers overlying unproductive strata) is recorded below the surface.

The BGS consider the confidence rating of their data in this area to be high.

6. SITE HISTORY

Historical Ordnance Survey maps covering the area of the site have been reviewed and are summarised in the following table.

It is noted that each map presents information applicable at the time of the survey (or revision date) and is subject to surveying and cartographic errors and/or advances. Revisions to maps are made at irregular intervals and it is possible that significant developments may have taken place on or within the vicinity of the site that are not shown on the maps.

'In the Vicinity of the Site' generally refers to features of relevance within approximately 250m of the site boundary, but may also include more distant features if considered to be pertinent to the assessment of the development history.

Table 3. Summary of Significant Features Identified on Historical Maps

Map Details	On-Site	In the Vicinity of the Site	Potential Contamination Sources Identified
1879 1:2,500	The eastern half of the site comprises residential buildings and gardens while the western half comprises part of a park which extends to the west.	The site is situated in a largely urban location of residential buildings and schools. Silver Street runs north to south along the eastern boundary of the site.	
1912 1:2,500	No significant changes.	Development work has taken place on the park land to the west of the site.	
1932 1:2,500	No significant changes.	An engineering works is shown ~50m to the west of the site.	
1957 1:2,500	A large building labelled as a works is shown on the footprint of the existing structure. A small building is shown in the south eastern corner of the site.	A building labelled as a garage is shown approximately 20m east of the site on the opposite side of Silver Street. The buildings adjacent to the northern boundary are no longer shown; a larger building is now shown.	Engineering works on site. Made ground from demolition works on the eastern part of the site.
1968 1:2,500 (partial)	No significant changes.	The works building to the west has been extended eastwards and now lies ~25m from the site. A tank is shown on the north eastern corner of this building. A second engineering works is shown approximately 25m to the south west.	Engineering works to the west.
1979 1:1,250	No significant changes.	The engineering works building to the west of the site has been extended again and is now ~10m from the site boundary.	Engineering works west of site.
1982 1:1,250 (partial)	No significant changes.	The building adjacent to the northern boundary is now labelled as a works and the garage building to the east is now labelled as a depot.	Works north of site.

Map Details	On-Site	In the Vicinity of the Site	Potential Contamination Sources Identified
1987 1:1,250	No significant changes.	The depot is no longer shown.	
2002 1:10,000	No significant changes.	The works buildings to the west of the site are no longer shown.	
2010 1:10,000	No significant changes.	The works building to the north of the site is no longer shown. Residential buildings are now shown to the west of the site along Illiffe Close.	

6.1 Potential Contamination Sources identified by Historical Map Review

The following potential sources of contamination were identified from the historical map review:

On Site

- Engineering works on site. Potential for heavy metal, PAH compound, petroleum hydrocarbon and volatile organic compound (VOC).
- Made ground from demolition and redevelopment works on the east of the site. Potential for heavy metal, PAH compound and asbestos contamination within resulting made ground soils.

Off Site

- Engineering works to the north and west of the site, including their demolition. Potential for heavy metal, PAH compound, petroleum hydrocarbon, VOC and asbestos contamination.

7. ENVIRONMENTAL DATA REVIEW

Records of potentially contaminative activities, authorisations, pollution incidents and land uses recorded by the regulatory authorities and compiled by GroundSure in their EnviroInsight Report have been reviewed. Data are supplied by the British Geological Survey (BGS), Environment Agency, Health Protection Agency, The Coal Authority and Local Authorities.

No environmental permits, incidents or register entries considered to pose a significant risk have been identified on or in the vicinity of the site.

No landfills or other waste sites considered to pose a significant risk have been identified on or in the vicinity of the site.

Table 4. Current Land Uses

Section	Remarks	Potential Contamination Sources Identified
Current Industrial Data	The data identifies fifteen records within 250m with the closest being a vehicle hire and rental service 43m east.	None of the entries are considered to pose a significant risk to the site.

No fuel sites or underground oil or gas pipelines considered to pose a significant risk have been identified on or in the vicinity of the site.

Table 5. Designated Environmentally Sensitive Sites

Section	Remarks	Potential Contamination Sources Identified
Designated Environmentally Sensitive Sites	The data identifies the site as being within a Nitrate Vulnerable Zone (NVZ) area.	The site is not considered to pose a significant risk to the NVZ.

7.1 Potential Contamination Sources Identified by Environmental Data Review

No significant sources of contamination were identified either on or off site by the environmental data review.

8. PRELIMINARY CONTAMINATION RISK ASSESSMENT

8.1 Basis of Risk Assessment

The preliminary risk assessment for the site considers the potential sources of contamination identified, the receptors that may be present in view of the development proposals and the contaminant pathways by which these may be linked.

A complete pollutant linkage is only deemed to exist where all three are present and a site is considered suitable for use where no complete pollutant linkages are identified.

Where a complete pollutant linkage is considered to be present, an assessment of the level of risk associated with the pollutant linkage has been carried out in line with guidance published within "Contaminated Land Risk Assessment: A guide to good practice" published by CIRIA (C552, 2001).

The level of risk is determined using the risk matrix presented in the following table. Classifications of probability, consequence and risk are presented in Appendix B.

Table 6. Risk Assessment Matrix

		Probability			
		Very Low	**Low**	**Moderate**	**High**
Consequence	**Very Minor**	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

The assessment of risk has been undertaken on the basis that the proposed development for the site will include the provision of new residential buildings along with areas of communal soft landscaping where residents may come into direct contact with the soils and be exposed to soil derived dust, but would not be allowed to grow their own fruit or vegetables.

The proposed development layout is presented in Figure 3. Should the proposed development plans be altered, a revised risk assessment may be required.

8.2 Preliminary Conceptual Model

The preliminary conceptual model for the proposed development is presented in the following table. A plan indicating the locations of the potential sources identified is presented as Figure 4.

Table 7. Preliminary Conceptual Model

Potential Sources Identified	Potential Contaminants	Receptor	Potential Pathways	Potential Pathway Present?	Probability	Consequence	Overall Assessment of Risk
Suspected boiler room to the south east of the site.	Petroleum hydrocarbons	Human Health (End Users)	a) Dermal contact with soil and dust (indoor & outdoor).	Yes	Very Low	Minor	Very Low
			b) Ingestion of soil and indoor dust.	Yes	Very Low	Minor	Very Low
			c) Consumption of homegrown produce and attached soil.	No	Not applicable		
			d) Inhalation of soil dust (indoor and outdoor).	Yes	Very Low	Minor	Very Low
			e) Contamination of incoming services.	Yes	Low	Minor	Low
			f) Inhalation of soil vapours.	Yes	Very Low	Minor	Very Low
			g) Inhalation of soil gases.	No	Not applicable		
		Groundwater	h) Migration to groundwater.	Yes	Low	Minor	Low
Engineering works on site.	Heavy metals, PAH compounds, petroleum hydrocarbons and VOCs	Human Health (End Users)	a) Dermal contact with soil and dust (indoor & outdoor).	Yes	Moderate	Moderate	Moderate
			b) Ingestion of soil and indoor dust.	Yes	Moderate	Moderate	Moderate
			c) Consumption of homegrown produce and attached soil.	No	Not applicable		
			d) Inhalation of soil dust (indoor and outdoor).	Yes	Moderate	Moderate	Moderate
			e) Contamination of incoming services.	Yes	Moderate	Moderate	Moderate
			f) Inhalation of soil vapours.	Yes	Low	Moderate	Low/ Moderate
			g) Inhalation of soil gases.	No	Not applicable		
	Heavy metals, PAH compounds, petroleum hydrocarbons and VOCs	Groundwater	h) Migration to groundwater.	Yes	Low	Minor	Low

Potential Sources Identified	Potential Contaminants	Receptor	Potential Pathways	Potential Pathway Present?	Probability	Consequence	Overall Assessment of Risk
Made ground from demolition works on the east and south east of the site.	Heavy metals, PAH compounds and asbestos	Human Health (End Users)	a) Dermal contact with soil and dust (indoor & outdoor).	Yes	Low	Minor	Low
			b) Ingestion of soil and indoor dust.	Yes	Low	Minor	Low
			c) Consumption of homegrown produce and attached soil.	No	Not applicable		
			d) Inhalation of soil dust (indoor and outdoor).	Yes	Low	Minor	Low
			e) Contamination of incoming services.	No	Not applicable		
			f) Inhalation of soil vapours.	No			
			g) Inhalation of soil gases.	No			
	Heavy metals and PAH compounds	Groundwater	h) Migration to groundwater.	Yes	Very Low	Very Minor	Negligible
Engineering works to the north and west of the site, including their demolition.	Heavy metals, PAH compounds, petroleum hydrocarbons, VOCs and asbestos	Human Health (End Users)	a) Dermal contact with soil and dust (indoor & outdoor).	Yes	Very Low	Moderate	Low
			b) Ingestion of soil and indoor dust.	Yes	Very Low	Moderate	Low
			c) Consumption of homegrown produce and attached soil.	No	Not applicable		
			d) Inhalation of soil dust (indoor and outdoor).	Yes	Very Low	Moderate	Low
			e) Contamination of incoming services.	Yes	Very Low	Moderate	Low
			f) Inhalation of soil vapours.	Yes	Very Low	Moderate	Low
			g) Inhalation of soil gases.	No	Not applicable		
	Heavy metals, PAH compounds, petroleum hydrocarbons and VOCs	Groundwater	h) Migration to groundwater.	Yes	Very Low	Minor	Very Low

8.3 Recommendations

A number of complete pollutant linkages have been identified as potentially being present at the site. It is therefore recommended that an intrusive ground investigation should be undertaken to allow a quantitative assessment to be made of the risks posed to end users and controlled waters.

The following table sets out recommendations for the locations of sampling positions and extent of testing that should be incorporated into an intrusive ground investigation in order to assess the potential sources identified.

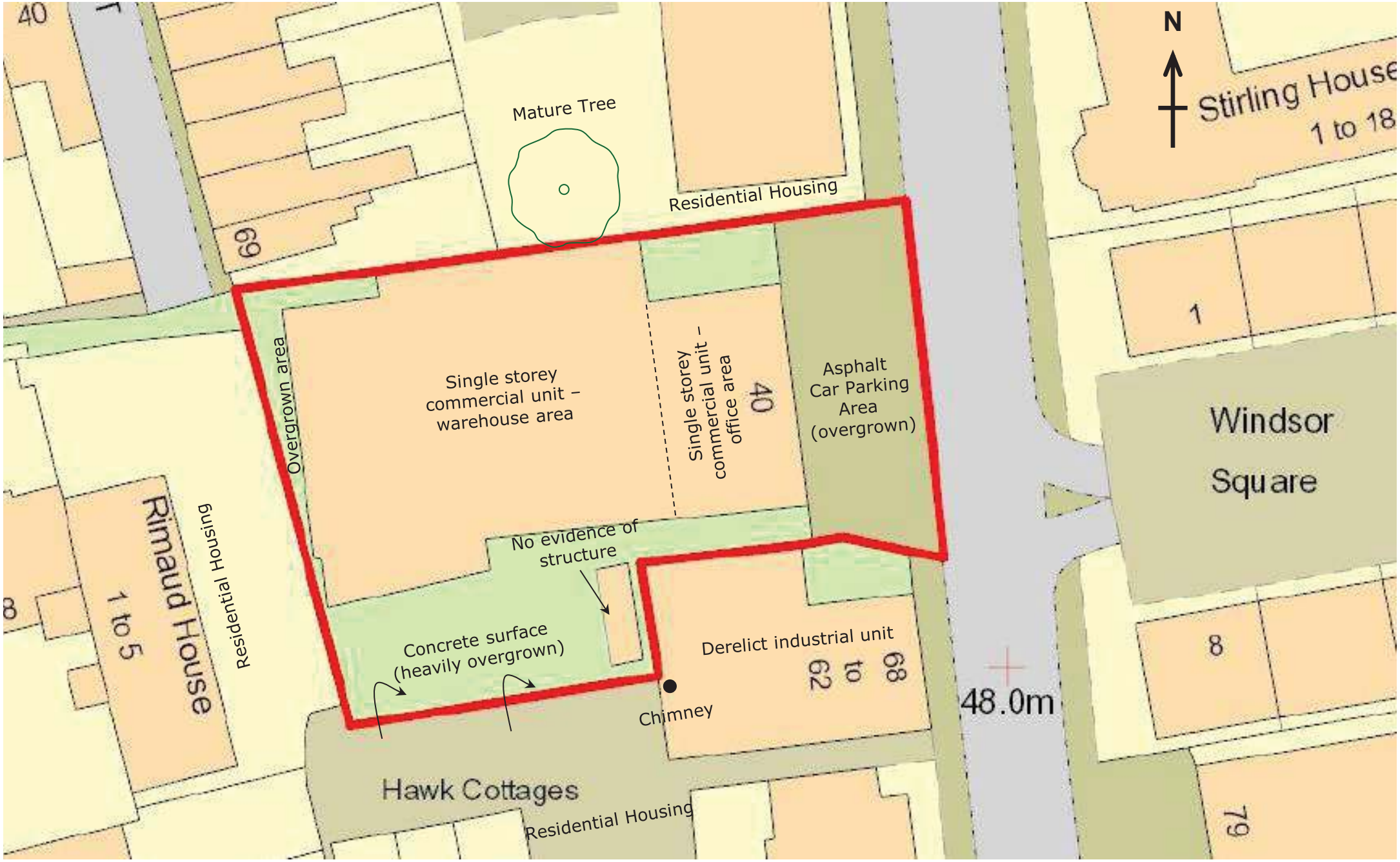
Table 8. Recommended Investigation Works

Potential Source of Contamination	Recommended Works	Recommended Testing
Suspected boiler room to the south east of the site.	Sampling position targeted adjacent to the south east corner of the site	Petroleum Hydrocarbons
Engineering works on site.	Sampling positions beneath and adjacent to the footprint of the existing building	Heavy Metals PAH Compounds Petroleum Hydrocarbons VOC Asbestos
Made ground from demolition works on the east and south east of the site.	Sampling positions across the eastern part of the site	Heavy Metals PAH Compounds Asbestos
Engineering works to the north and west of the site.	Sampling positions along the northern and western boundaries of the site	Heavy Metals PAH Compounds Petroleum Hydrocarbons VOC Asbestos

Ashdown Site Investigation
May 2015

FIGURES

Figure 1 Site Location Plan
Figure 2 Site Walkover Plan
Figure 3 Proposed Development Layout
Figure 4 Potential Contamination Source Plan



ASHDOWN SITE INVESTIGATION LIMITED

Site: 40 Silver Street, Reading, Berkshire

Site Walkover Plan.
Not To Scale

Figure 2
LW26135/ds

ASHDOWN SITE INVESTIGATION LIMITED	Site: 40 Silver Street, Reading, Berkshire	Pro osed evelo ent Plan. Not To Scale	Figure 3 LW26135/ds

ngineering orks to the north and est o the site, including their de olition

ngineering orks on site .

ade ground ro de olition orks on the east and south east o the site

Sus ected oiler roo to the south east o the site

ASHDOWN SITE INVESTIGATION LIMITED

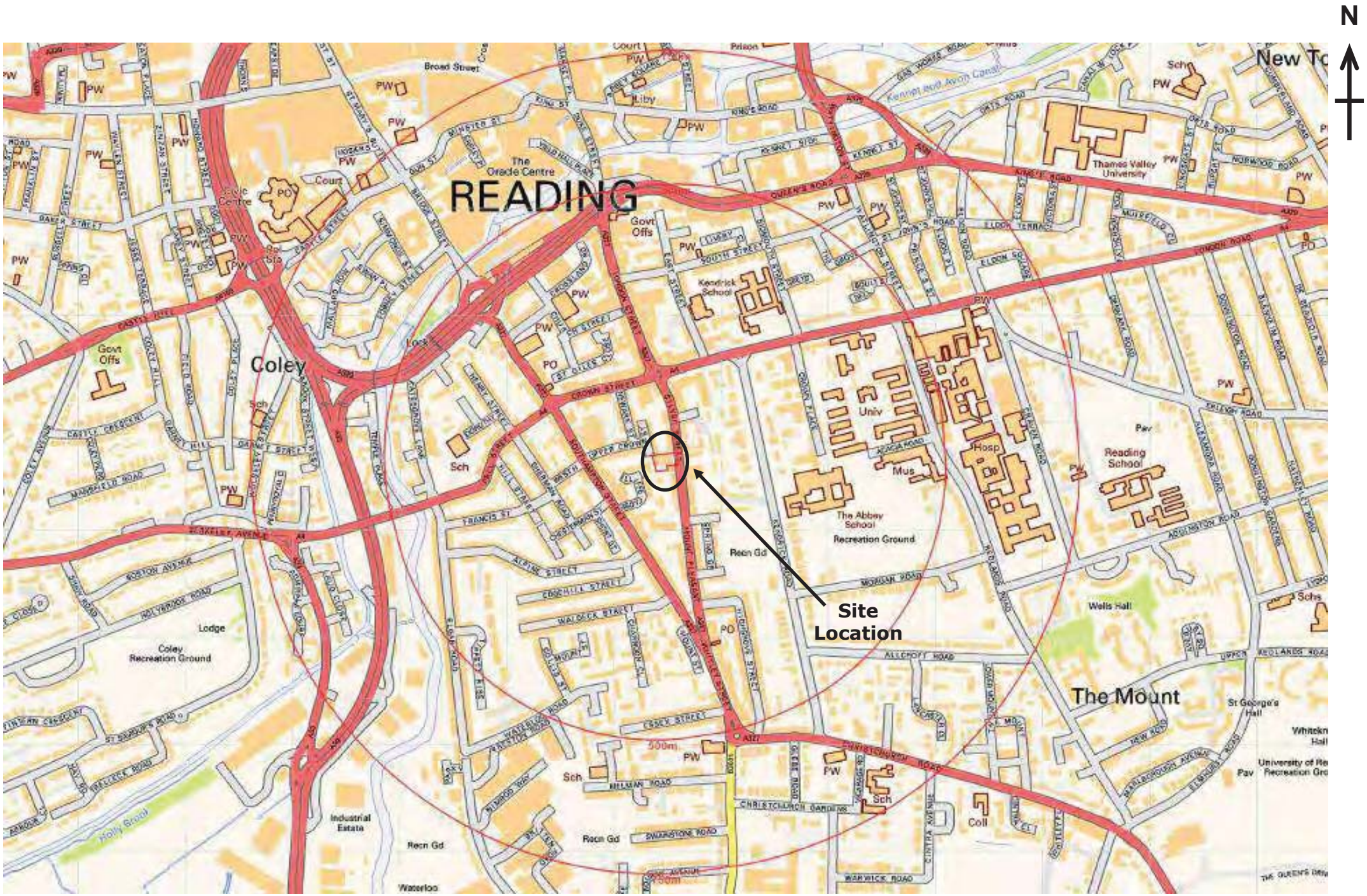
The Old Dairy,
Swanborough Farm,
Swanborough,
Lewes,
East Sussex
BN7 3PF
Tel: 01273 483119 Fax: 01273 483104
email: contact@ashdownsi.co.uk

DRAWN BY:	DATE:	SCALE (at A4):
AB	May 2015	NTS

SITE:
40 Silver Street
Reading
Berkshire

REPORT REF.:	FIGURE NO.:
LW26135/ds	4

DRAWING TITLE:
Potential Contamination Source Plan



ASHDOWN SITE INVESTIGATION LIMITED	Site: 40 Silver Street, Reading, Berkshire	Site Location Plan. Not To Scale	Figure 1 LW26135/ds

APPENDIX A

Site Walkover Photographs

Site vie ed ro the east

erelict industrial unit to the south east o the site

Western art o co ercial unit on the site – arehouse area

Southern art o the site – o site chi ne and area o or er structure

ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D	S T : 40 Silver Street, Reading, Berkshire	Photogra hs	LW26135

APPENDIX B

Classification of Probability, Consequence and Risk

Probability of risk being realised	
Classification	Definition
High	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.
Moderate	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	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 event would take place, and is less likely in the shorter term.
Very Low	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Consequence of risk being realised		
Classification	Category	Definition
Severe	Human Health	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA.
	Controlled Waters	Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.
	Property	Catastrophic damage to buildings/property.
	Ecological Systems	A short term risk to a particular ecosystem or organisation forming part of such ecosystem.
Moderate	Human Health	Chronic damage to Human Health.
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).
	Ecological System	A significant change in a particular ecosystem or organism forming part of such ecosystem.
Minor	Controlled Waters	Pollution of non-sensitive water resources.
	Property	Significant damage to crops, buildings, structures and services.
	Ecological Systems	Damage to sensitive buildings/structures/services or the environment.
Very Minor	Human Health	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).
	Property	Easily repairable effects of damage to buildings, structures and services.
	Project	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve.

Risk classification definitions	
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. This 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) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is 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. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm 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.

Appendix 8 – Geo-environmental Data and Historical Maps

40 Silver Street
Reading
Berkshire

Geo-Environmental Data
and
Historical Maps

ASHDOWN SITE INVESTIGATION
L•I•M•I•T•E•D

Report No. LW26135/map

April 2015

Report prepared for the benefit of:

urst evelo ent Solutions
avidson ouse
The For ur
Reading
R 1 3

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roundSure eo nsight Re ort

Appendix B

roundSure istorical a s

Scale 1:1,250 1:2,500

Scale 1:10,000 1:10,560

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roundSure nviro nsight Re ort

Appendix A

roundSure eo nsight Re ort

Groundsure Geoinsight

Address:	**40, SILVER STREET, READING, RG1 2ST**
Date:	**30 Apr 2015**
Reference:	**GS-2050819**
Client:	**Ashdown Site Investigation Ltd**

NW N NE

W

E

SW S SE

Aerial Photograph Capture date:	08-Jul-2013
Grid Reference:	471896,172730
Site Size:	0.12ha

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Overview of Findings

The Groundsure Geoinsight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1:Geology		
1.1 Artificial Ground	1.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?	Yes
	1.2.2 Are there any records relating to permeability of superficial geology within the study site boundary?	Yes
	1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	1.2.4 Are there any records relating to permeability of landslips within the study site boundary?	No
1.3 Bedrock, Solid Geology & Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records relating to permeability of bedrock within the study site boundary?	Yes
	1.3.3 Are there any records of faults within 500m of the study site boundary?	No
1.4 Radon data	1.4.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level
	1.4.2 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

Section 2:Ground Workings	On-site	0-50m	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	0	Not Searched	Not Searched
2.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
2.3 Current Ground Workings	0	0	1	1	4

Section 3: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	0
3.2 Coal Mining	0	0	0	0	0
3.3 Johnson Poole and Bloomer Mining Area	1	0	1	2	4
3.4 Non-Coal Mining	1	0	2	4	9
3.5 Non-Coal Mining Cavities	0	1	2	3	6
3.6 Natural Cavities	0	0	0	1	33
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

Section 4: Natural Ground Subsidence	On-site
4.1 Shrink Swell Clay	Moderate-High
4.2 Landslides	Very Low
4.3 Ground Dissolution of Soluble Rocks	Negligible
4.4 Compressible Deposits	Negligible
4.5 Collapsible Deposits	Very Low
4.6 Running Sand	Very Low

Section 5: Borehole Records	On-site	0-50m	51-250
5 BGS Recorded Boreholes	0	0	11

Section 6: Estimated Background Soil Chemistry	On-site	0-50m	51-250
6 Records of Background Soil Chemistry	1	1	13

Section 7: Railways and Tunnels	On-site	0-50m	51-250	251-500
7.1 Tunnels	0	0	0	Not Searched
7.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
7.3 Historical Railways	0	0	0	Not Searched
7.4 Active Railways	0	0	0	Not Searched

Section 7:Railways and Tunnels	On-site	0-50m	51-250	251-500
7.5 Railway Projects	0	0	0	0

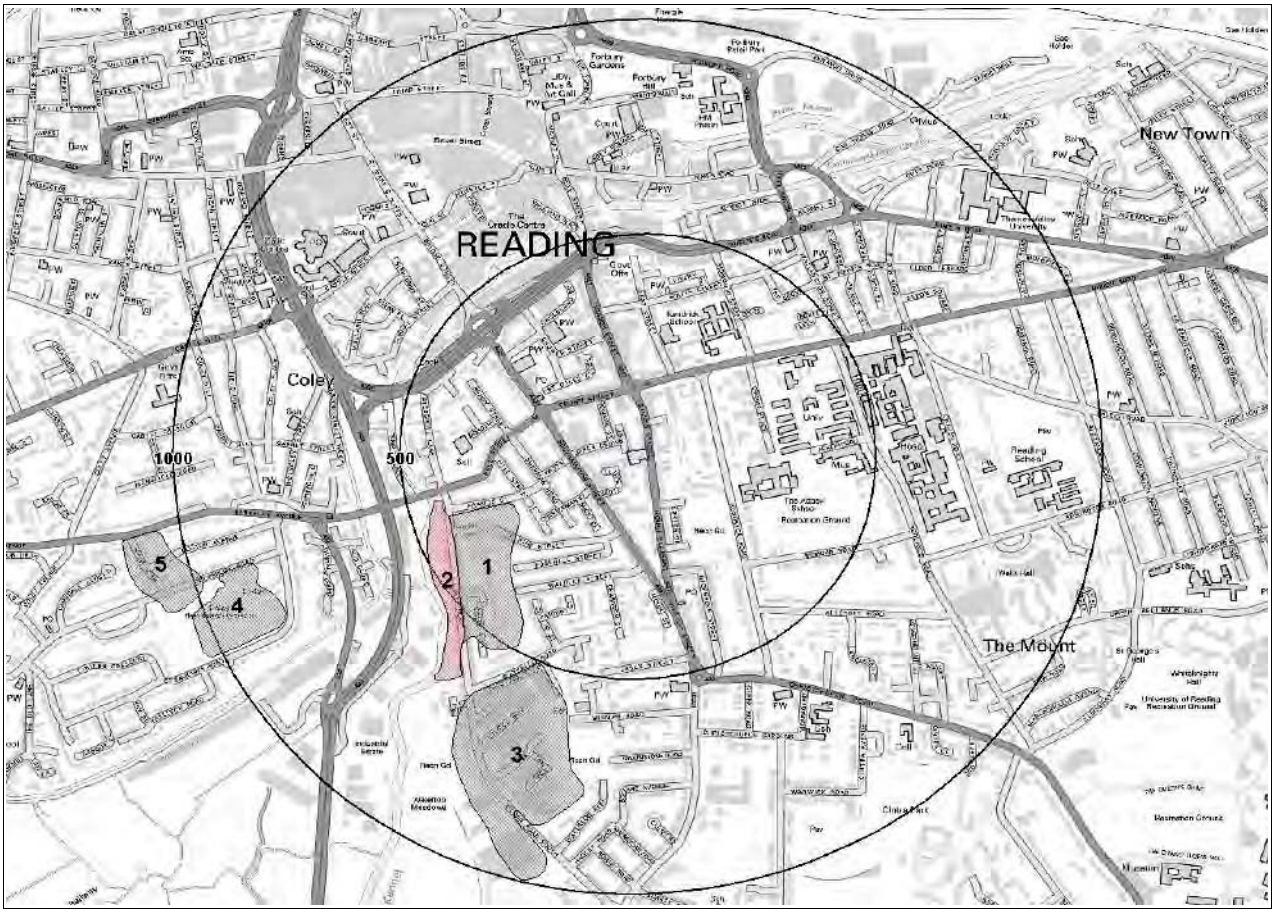
1 Geology

1.1 Artificial Ground Map

NW N NE

W E

SW S SE



Artificial Ground Legend

Mapping sourced from Ordnance Survey

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Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

Reclaimed Ground

1 Geology

1.1 Artificial Ground

1.1.1Artificial/ Made Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:268

Are there any records of Artificial/Made Ground within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	274.0	SW	WGR-OPEN	WORKED GROUND (UNDIVIDED)	VOID
2	418.0	W	WMGR-MGRD	INFILLED GROUND	ARTIFICIAL DEPOSIT

1.1.2 Permeability of Artificial Ground

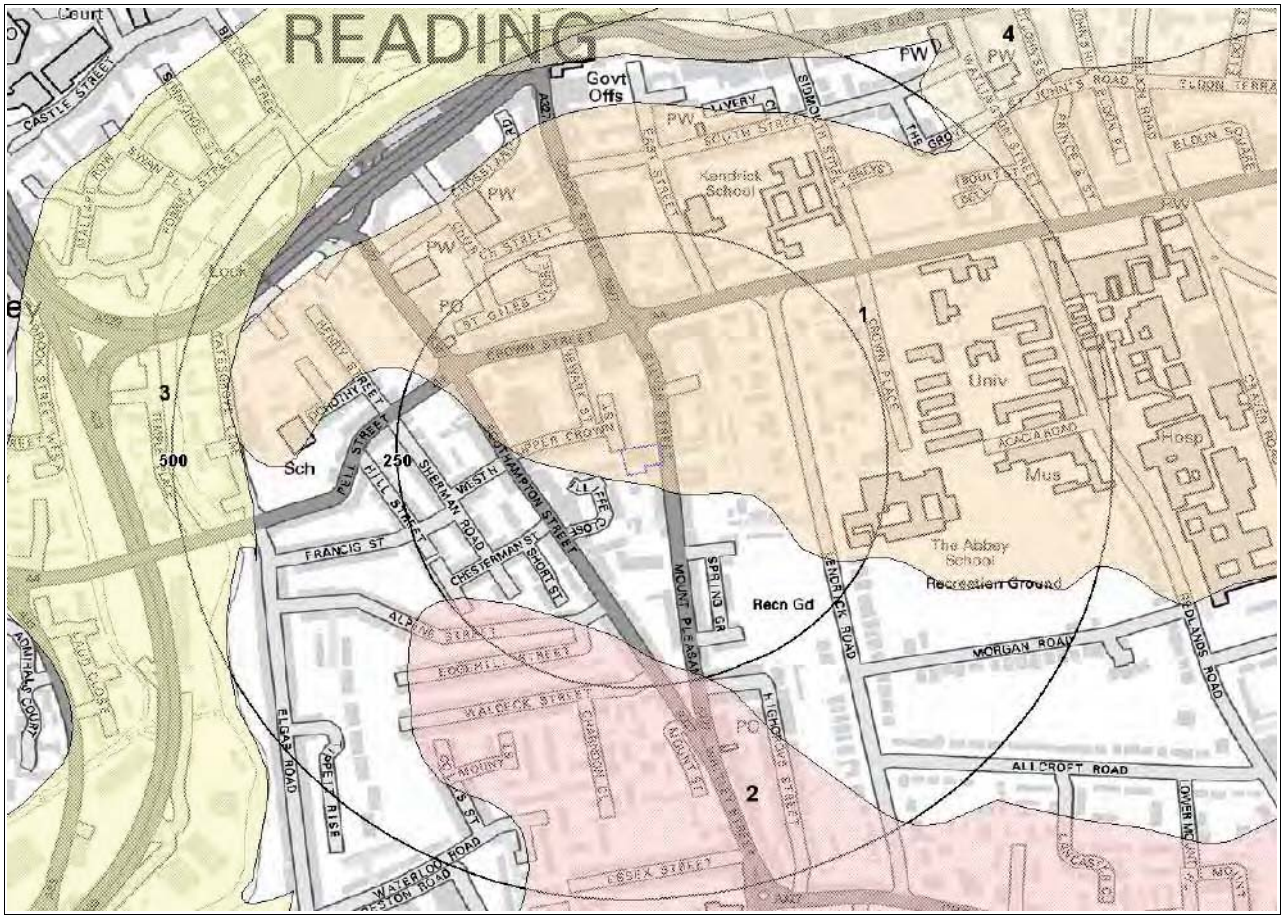
Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

1.2 Superficial Deposits and Landslips Map

NW N NE

W E



SW S SE

Superficial Deposits and Landslips Legend

Mapping sourced from Ordnance Survey

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Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TPGR	TAPLOW GRAVEL FORMATION	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
2	183.0	S	BHT	BOYN HILL GRAVEL MEMBER	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
3	415.0	W	ALV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
4	454.0	N	KPGR	KEMPTON PARK GRAVEL FORMATION	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Very High	High

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site*[*] boundary? No

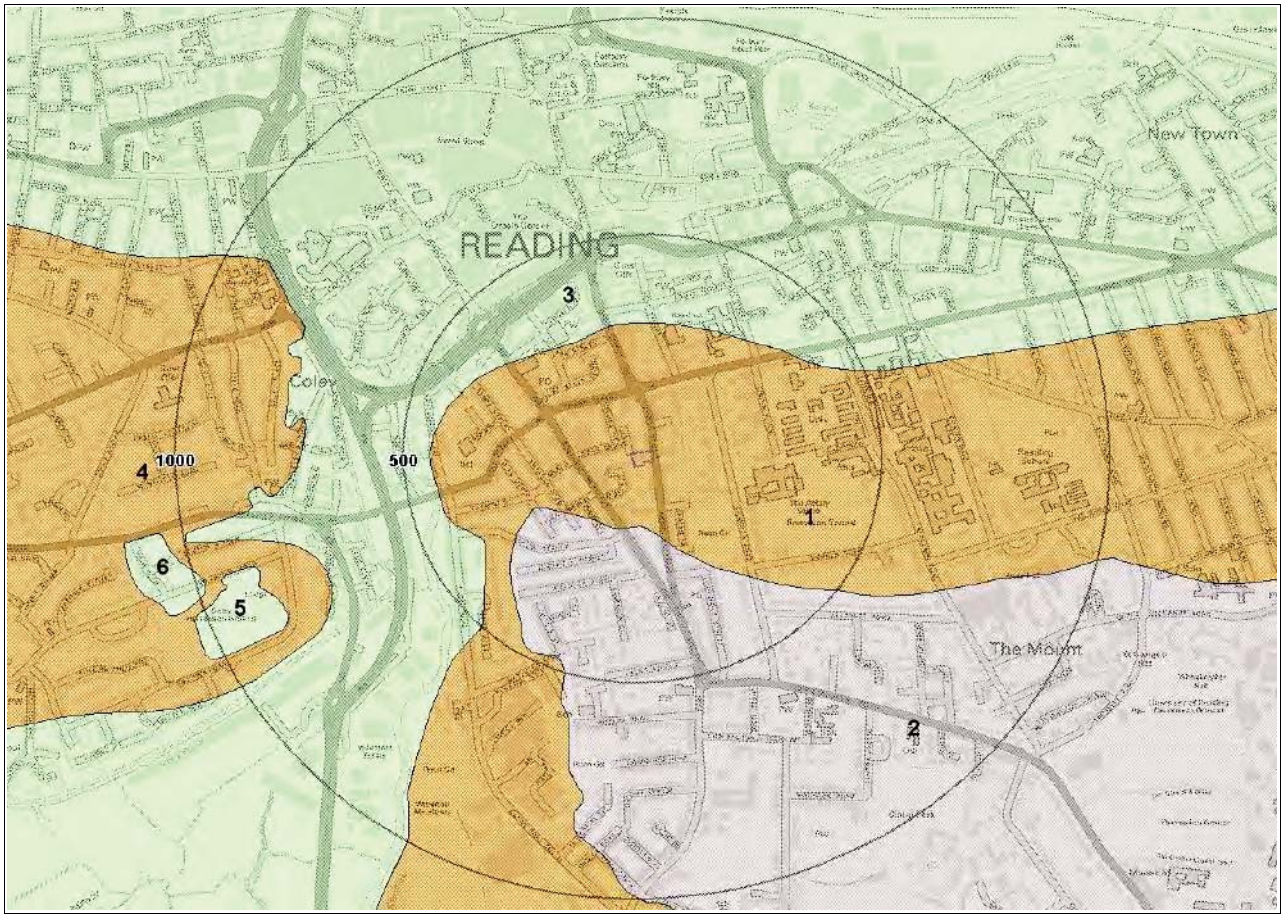
Database searched and no data found.

---

* This includes an automatically generated 50m buffer zone around the site

1.3 Bedrock and Faults Map

NW N NE



W E

SW S SE

Bedrock and Faults Legend

Mapping sourced from Ordnance Survey

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Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:268

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	LMBE-CLSISA	Lambeth Group - Clay, Silt And Sand	No Details
2	139.0	S	LC-CLSISA	London Clay Formation - Clay, Silt And Sand	No Details
3	284.0	NW	SNCK-CHLK	Seaford Chalk Formation And Newhaven Chalk Formation (undifferentiated) - Chalk	Campanian / Coniacian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	Moderate	Very Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

* This includes an automatically generated 50m buffer zone around the site

1.4 Radon Data

1.4.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level

---

1.4.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary

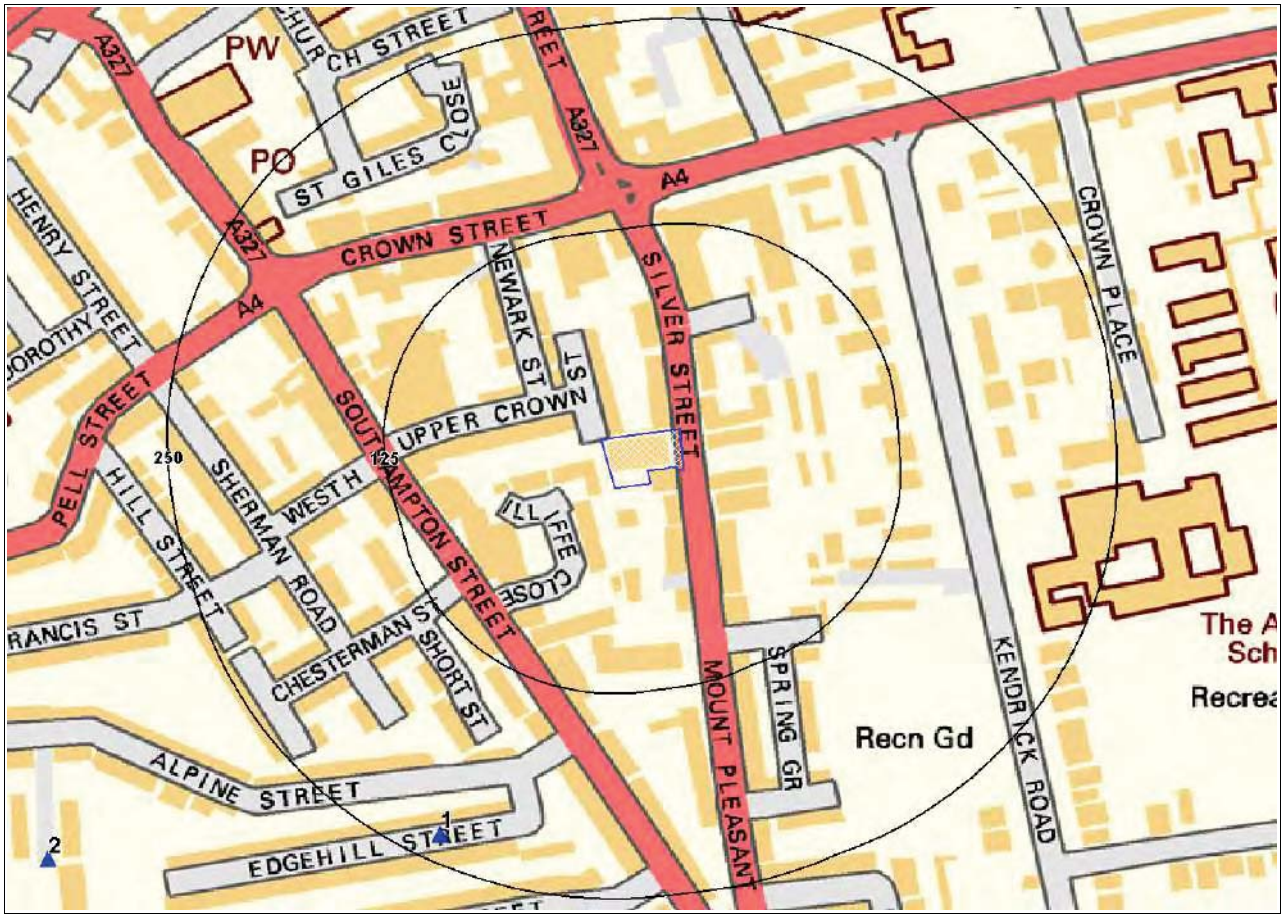
---

2 Ground Workings Map

NW N NE

W E

SW S SE



Ground Workings Legend

Mapping sourced from Ordnance Survey

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Site Outline

125 250 Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2 Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? No

Database searched and no data found.

2.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

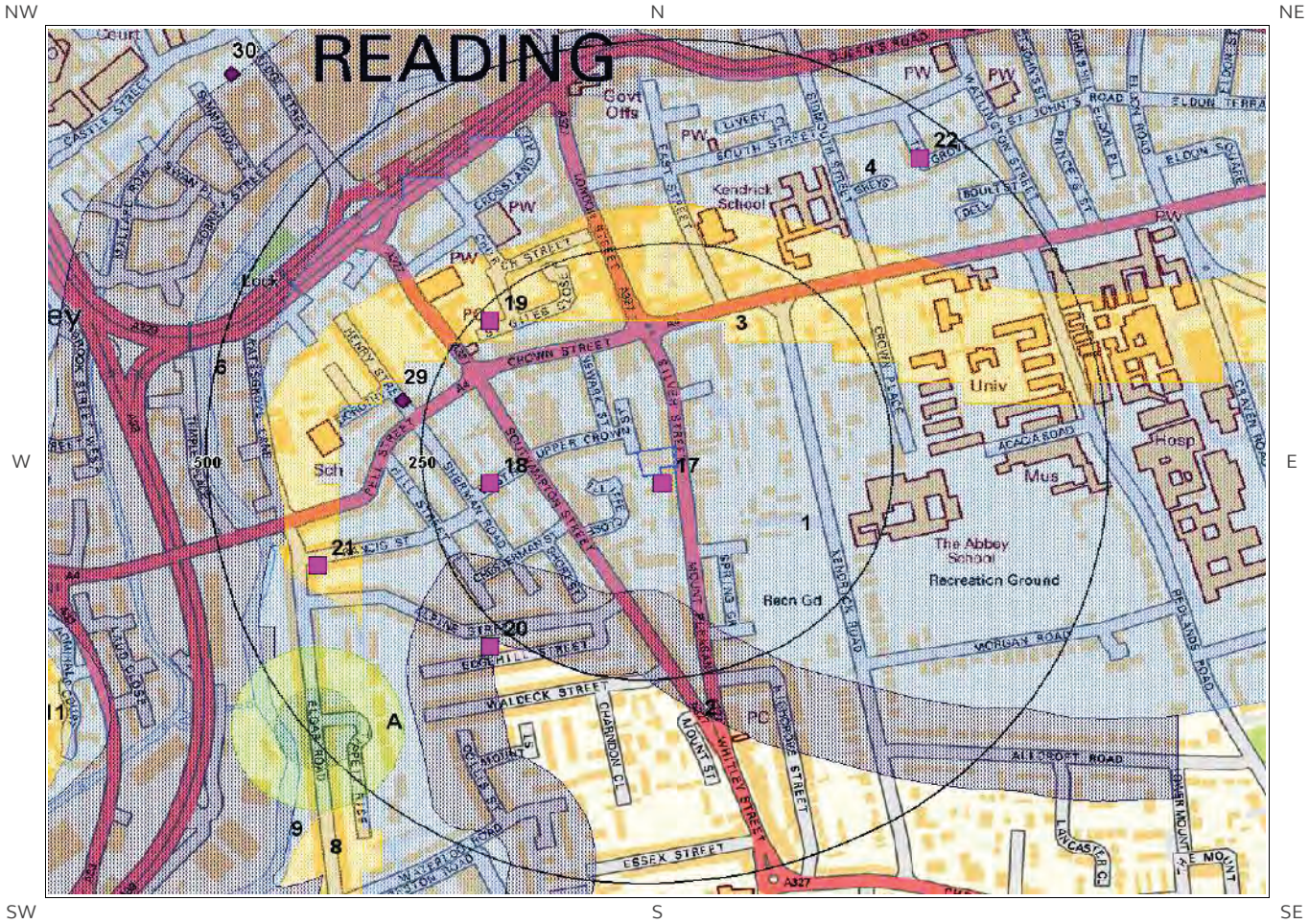
Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
1	234.0	SW	471778 172498	Clay & Shale	Kalesgrove Kilns	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
2	397.0	SW	471552 172483	Clay & Shale	Highgrove Brick Field	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	774.0	S	471650 171970	Clay & Shale	Waterloo Kilns Claypit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	829.0	W	471044 172680	Clay & Shale	Coley Pottery	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	871.0	W	471046 172456	Clay & Shale	Coley Kilns	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	984.0	W	470968 172336	Clay & Shale	Coley Kilns	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

3 Mining, Extraction & Natural Cavities Map



Mining, Extraction and Natural Cavities Legend

Mapping sourced from Ordnance Survey

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Site Outline

250 500 Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities

Non-Coal Mining

Highly likely

Likely

Unlikely

Highly unlikely

Rare

3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? Yes

The following information provided by JPB is not represented on mapping: Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.

3.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Chalk	Rare and localised small scale mining may have occurred.

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
2	139.0	S	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
3	142.0	NE	Not available	Chalk	Small scale mining may have occurred but restricted in extent.
4	284.0	NW	Not available	Chalk	Rare and localised small scale mining may have occurred.
5A	389.0	SW	Not available	Chalk	Underground mining is known or considered likely to have occurred within or close to the area. The location extent and nature of past mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
6	402.0	NW	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
7A	439.0	SW	Not available	Chalk	Underground or opencast mining is known or considered likely within or very close to the area. Location, extent & nature of past mining should be considered in site investigations. Potential for difficult ground conditions should be considered.
8	515.0	SW	Not available	Chalk	Small scale mining may have occurred but restricted in extent.
9	551.0	SW	Not available	Chalk	Rare and localised small scale mining may have occurred.
10	652.0	NW	Not available	Chalk	Rare and localised small scale mining may have occurred.
11	718.0	W	Not available	Chalk	Small scale mining may have occurred but restricted in extent.
Not shown	773.0	W	Not available	Chalk	Underground mining is known or considered likely to have occurred within or close to the area. The location extent and nature of past mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
Not shown	790.0	W	Hannover Mine	Chalk	Underground or opencast mining is known or considered likely within or very close to the area. Location, extent & nature of past mining should be considered in site investigations. Potential for difficult ground conditions should be considered.
Not shown	823.0	W	Not available	Chalk	Underground or opencast mining is known or considered likely within or very close to the area. Location, extent & nature of past mining should be considered in site investigations. Potential for difficult ground conditions should be considered.
Not shown	834.0	W	Not available	Chalk	Rare and localised small scale mining may have occurred.
Not shown	982.0	W	Not available	Chalk	Rare and localised small scale mining may have occurred.

3.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? Yes

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
17	12.0	S	471900 172700	'The Old Orchard Kiln', Reading, Berkshire	-	Lambeth Group, Upper Chalk Formation	Chalk
18	175.0	W	471700 172700	'Shearmans Brick Kiln', Reading, Berkshire	-	Lambeth Group, Upper Chalk Formation	Chalk

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
19	235.0	NW	471700 172900	Reading, Berkshire	Taplow Gravel	Lambeth Group, Upper Chalk Formation	Chalk
20	275.0	SW	471700 172500	'Ivy Lodge Brickfield/ Southampton Kiln', Reading, Berkshire	Boyn Hill Gravel	London Clay, Lambeth Group, Upper Chalk Formation	Chalk
21	394.0	W	471500 172600	'Katesgrove Kilns' (2), Reading, Berkshire	Worked Ground	Lambeth Group, Upper Chalk Formation	Chalk
22	454.0	NE	472200 173100	Reading, Berkshire	Taplow Gravel	Chalk Group	Chalk
Not shown	762.0	S	471600 172000	'Waterloo Kiln/Clackmans Field', Reading, Berkshire	Worked Ground	Lambeth Group, Upper Chalk Formation	Chalk
Not shown	772.0	W	471100 172700	'Coley Potteries', Reading (Coley), Berkshire	-	Lambeth Group, Upper Chalk Formation	Chalk
Not shown	829.0	S	471700 171900	'Waterloo Kiln', Reading, Berkshire	Worked Ground	Lambeth Group, Upper Chalk Formation	Chalk
Not shown	873.0	W	471000 172800	'Castle Hill Kiln', Reading (Coley), Berkshire	Lynch Hill Gravel	Lambeth Group, Upper Chalk Formation	Chalk
Not shown	904.0	SE	472300 171900	'Scout Hut Mine(s)', Emmer Green, Berkshire	Infilled Ground	London Clay, Lambeth Group, Upper Chalk Formation	Chalk
Not shown	932.0	W	471000 172400	'Wheeler Works', Reading (Coley), Berkshire	Worked Ground	Lambeth Group, Upper Chalk Formation	Chalk

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? Yes

The following Natural Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Superficial Deposits	Bedrock Deposits	Cavity Type and Number
29	278.0	W	471600 172800	-	Chalk Group, Lambeth Group	Unknown
30	659.0	NW	471400 173200	Taplow Gravel	Chalk Group	Solution Pipe x 2
Not shown	673.0	NW	471500 173300	Taplow Gravel	Chalk Group	Solution Pipe x 1
Not shown	729.0	W	471150 172850	-	Chalk Group	Solution Widened Joint or Fissure x 1
Not shown	731.0	W	471140 172730	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	735.0	NW	471550 173400	Taplow Gravel	Chalk Group	Solution Pipe x 5

ID	Distance (m)	Direction	NGR	Superficial Deposits	Bedrock Deposits	Cavity Type and Number
Not shown	741.0	W	471130 172730	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	758.0	NW	471500 173400	Taplow Gravel	Chalk Group	Solution Pipe x 3
Not shown	771.0	W	471100 172760	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	834.0	W	471040 172670	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	836.0	W	471040 172650	-	Chalk Group	Solution Pipe x 1
Not shown	837.0	W	471040 172640	-	Chalk Group	Solution Pipe x 1
Not shown	848.0	W	471030 172630	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	855.0	W	471060 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	857.0	W	471020 172640	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	857.0	W	471020 172840	-	Chalk Group, Lambeth Group	Solution Pipe x 3
Not shown	871.0	W	471000 172750	Lynch Hill Gravel	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	871.0	W	471000 172720	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	874.0	W	471040 173010	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	877.0	W	471000 172840	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	882.0	W	470990 172770	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	893.0	W	471020 173010	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	903.0	W	471010 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	903.0	W	471010 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	904.0	W	470990 172940	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	912.0	W	471000 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	912.0	W	471000 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	912.0	W	471000 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	922.0	W	470990 173010	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 1
Not shown	931.0	W	470990 173040	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	935.0	W	470970 172990	-	Chalk Group, Lambeth Group	Solution Pipe x 1

ID	Distance (m)	Direction	NGR	Superficial Deposits	Bedrock Deposits	Cavity Type and Number
Not shown	947.0	W	470980 173060	-	Chalk Group, Lambeth Group	Solution Pipe x 1
Not shown	952.0	W	470950 172980	Lynch Hill Gravel	Chalk Group, Lambeth Group	Solution Pipe x 2
Not shown	977.0	NW	471010 173200	-	Chalk Group, Lambeth Group	Solution Widened Joint or Fissure x 3

3.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.10 Clay Mining

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

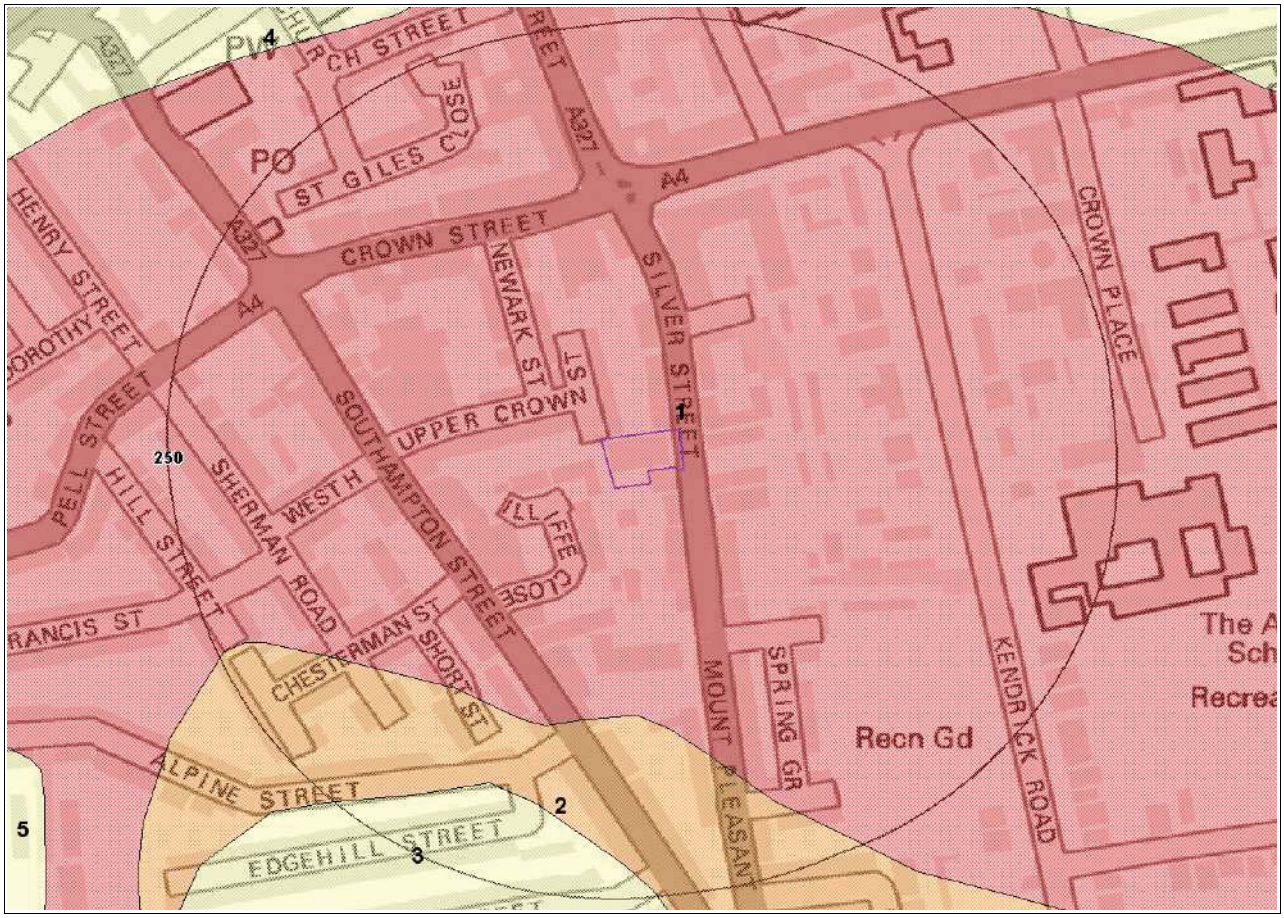
4 Natural Ground Subsidence

4.1 Shrink-Swell Clay Map

NW N NE

W E

SW S SE



Shrink Swell Clay Legend

Mapping sourced from Ordnance Survey

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

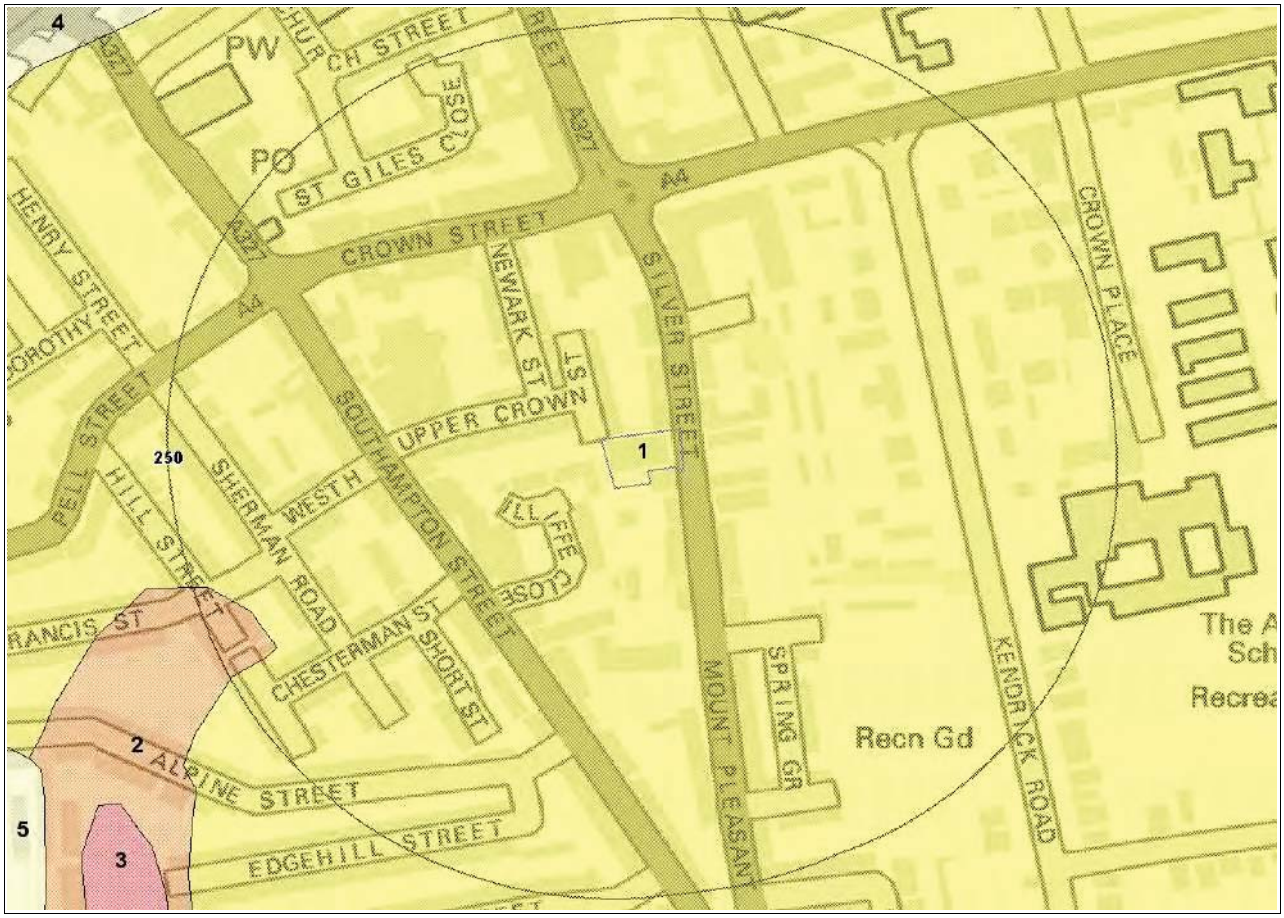
Low
Moderate
High

4.2 Landslides Map

NW N NE

W E

SW S SE



Landslides Legend

Mapping sourced from Ordnance Survey

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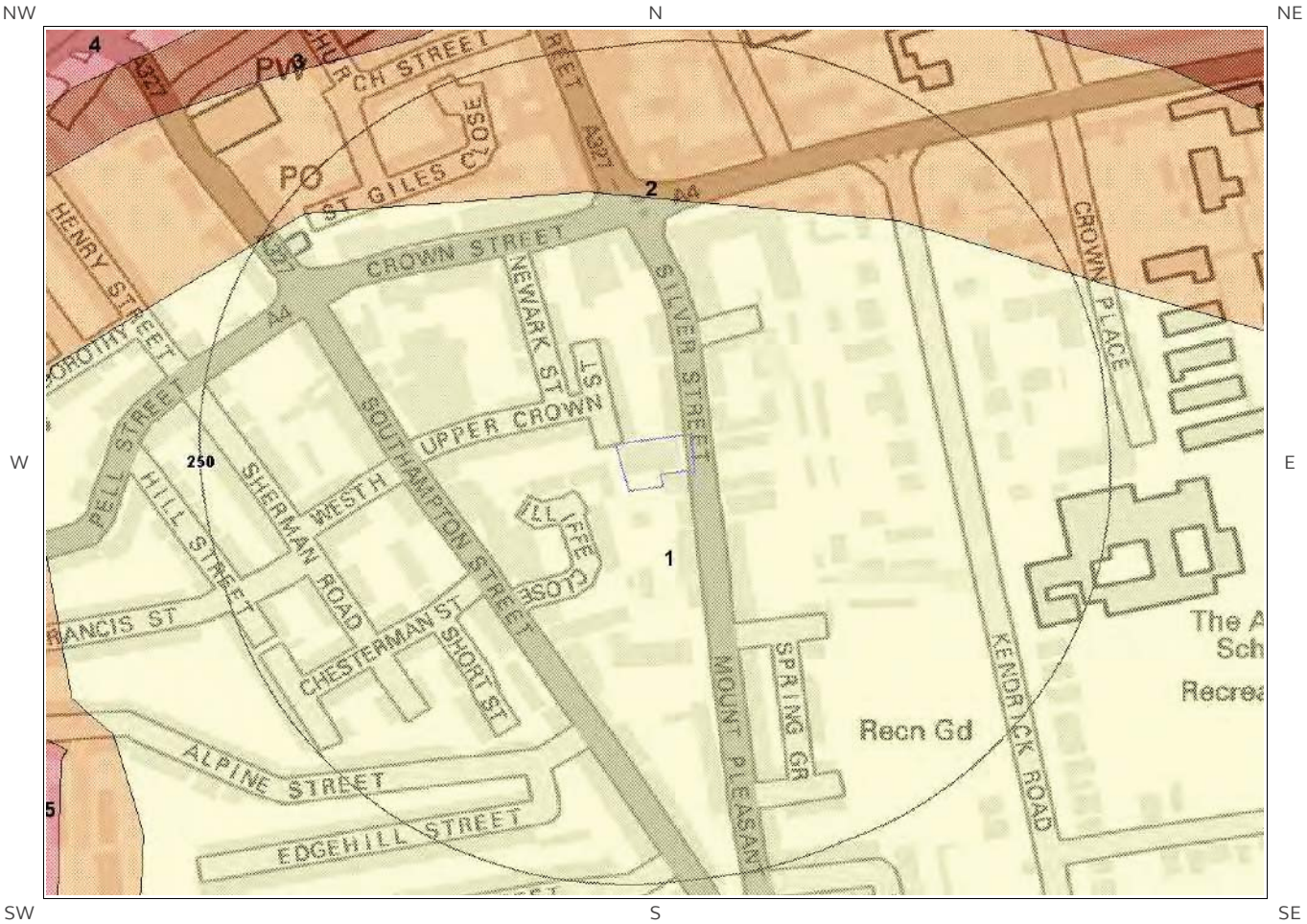
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low
Low
Moderate
High

4.3 Ground Dissolution Soluble Rocks Map



Ground Dissolution Soluble Rocks Legend

Mapping sourced from Ordnance Survey

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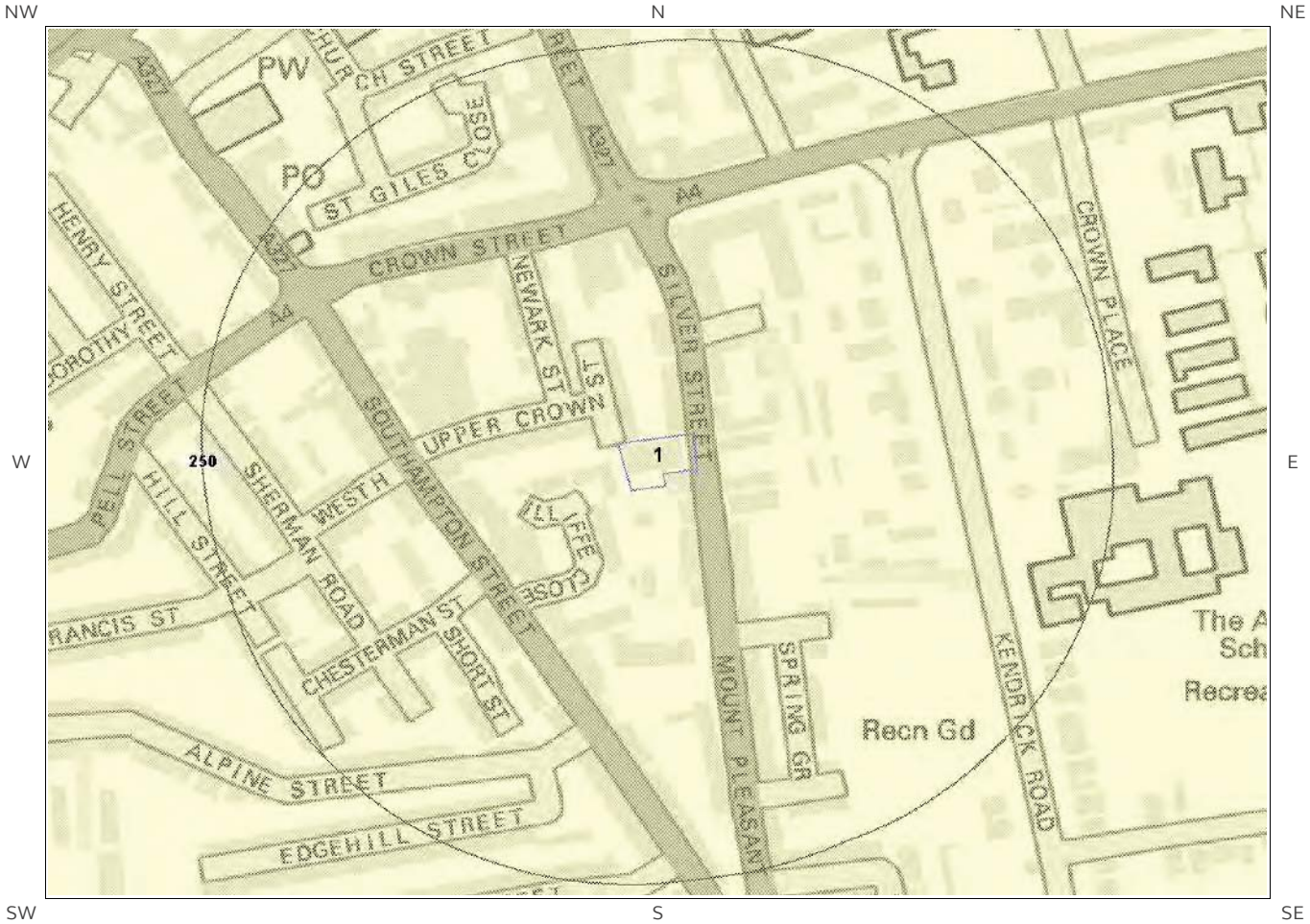
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low
Low
Moderate
High

4.4 Compressible Deposits Map



Compressible Deposits Legend

Mapping sourced from Ordnance Survey

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low
Low
Moderate
High

4.5 Collapsible Deposits Map

NW N NE

W E

SW S SE

Collapsible Deposits Legend

Mapping sourced from Ordnance Survey

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.6 Running Sand Map

Running Sand Legend

Mapping sourced from Ordnance Survey

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low
Low
Moderate
High

4 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site*[*] boundary? Moderate-High

4.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate-High-Moderate-High	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

* This includes an automatically generated 50m buffer zone around the site

4.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible ground identified. No special actions required to avoid problems due to compressible ground. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible ground.

4.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

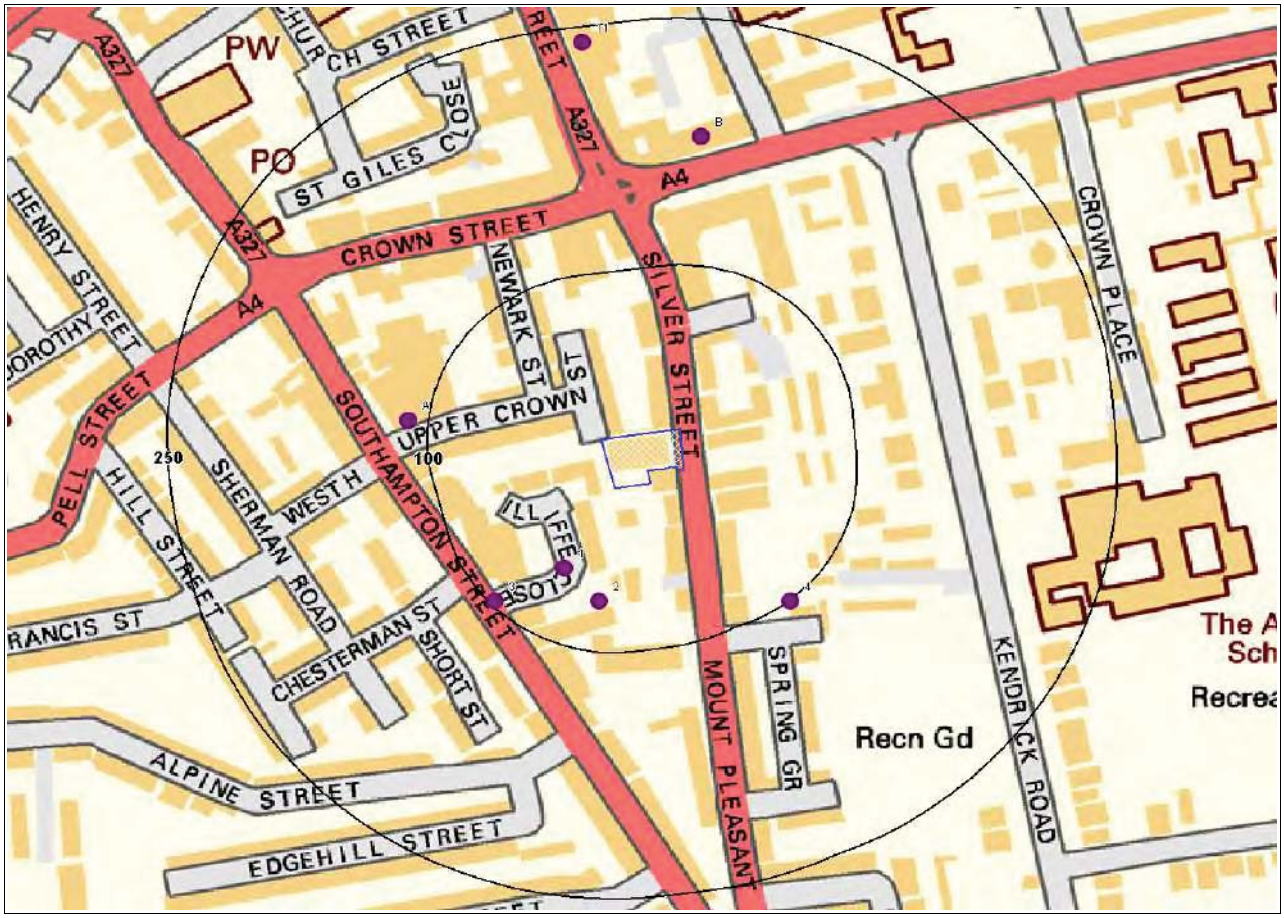
4.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5 Borehole Records Map

NW N NE



W E

SW S SE

Borehole Records Legend

Mapping sourced from Ordnance Survey

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Site Outline

Borehole Locations

125
250
Search Buffers (m)

5 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 11

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	57.0	SW	471850 172660	SU77SW792	2.0	SOUTHAMPTON STREET-READING TP 2
2	70.0	S	471870 172640	SU77SW793	2.0	SOUTHAMPTON STREET-READING TP 3
3	98.0	SW	471810 172640	SU77SW791	2.4	SOUTHAMPTON STREET-READING TP 1
4	101.0	SE	471980 172640	SU77SW702	10.0	MOUNT PLEASANT GROVE READING BH1
5A	112.0	W	471760 172750	SU77SW31/A	49.37	SOUTHAMPTON STREET READING
6A	112.0	W	471760 172750	SU77SW625	49.38	SOUTHAMPTON STREET READING
7A	112.0	W	471760 172750	SU77SW31/B	60.96	SOUTHAMPTON STREET READING
8A	112.0	W	471760 172750	SU77SW697	35.97	VENNER & SONS, SOUTHAMPTON STREET, READING
9B	178.0	N	471929 172923	SU77SW858	15.0	25-29 LONDON ROAD READING 2
10B	178.0	N	471929 172923	SU77SW857	15.0	25-29 LONDON ROAD READING 1
11	240.0	N	471860 172980	SU77SW23	16.76	LONDON STREET READING

Additional online information is available for the following boreholes listed above:

#1: scans.bgs.ac.uk/sobi_scans/boreholes/15613577
#2: scans.bgs.ac.uk/sobi_scans/boreholes/15613580
#3: scans.bgs.ac.uk/sobi_scans/boreholes/15613573
#4: scans.bgs.ac.uk/sobi_scans/boreholes/12709328
#5A: scans.bgs.ac.uk/sobi_scans/boreholes/428179
#6A: scans.bgs.ac.uk/sobi_scans/boreholes/428777
#7A: scans.bgs.ac.uk/sobi_scans/boreholes/428180
#8A: scans.bgs.ac.uk/sobi_scans/boreholes/1137654
#9B: scans.bgs.ac.uk/sobi_scans/boreholes/15637527
#10B: scans.bgs.ac.uk/sobi_scans/boreholes/15637525
#11: scans.bgs.ac.uk/sobi_scans/boreholes/428171

6 Estimated Background Soil Chemistry

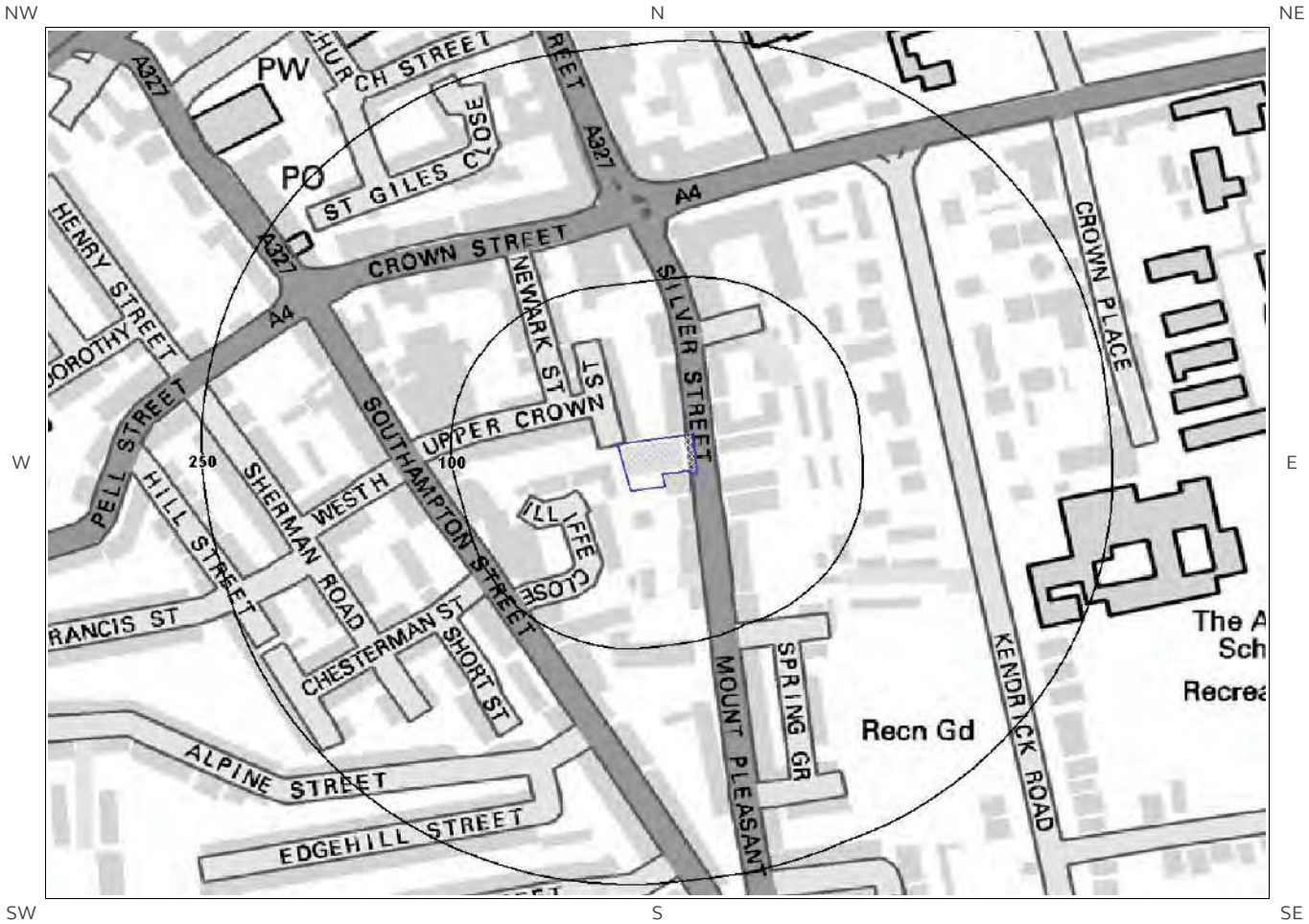
Records of background estimated soil chemistry within 250m of the study site boundary: 15

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geoinsight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
8.0	S	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
81.0	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
81.0	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
87.0	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
87.0	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
139.0	S	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
183.0	S	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
209.0	S	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
210.0	S	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
231.0	S	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
231.0	S	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
234.0	SE	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
234.0	SE	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
237.0	S	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7 Railways and Tunnels Map



Railways and Tunnels Legend

Mapping sourced from Ordnance Survey

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- Site Outline
- 250 / 500 Search Buffers (m)
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- Crossrail
- Railway and/or Tunnel Feature from Historical Mapping

7 Railways and Tunnels

7.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary?	No
Have any underground railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary?	No
Have any other railway tunnels been identified within 250m of the site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary?	No
Have any historical railway or tunnel features been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary?	No
Have any historical railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

7.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary?	No
Have any active railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

7.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail.

Is the study site within 5km of the route of the High Speed 2 rail project?	No
Is the study site within 500m of the route of the Crossrail rail project?	No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail Report.

Contact Details

Groundsure Helpline

Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

Johnson Poole & Bloomer Limited

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Contact Details

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Standard Terms and Conditions

1 Definitions

In these terms and conditions unless the context otherwise requires:
"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.
"Client" means the party or parties entering into a Contract with Groundsure.
"Commercial" means any building or property which is not Residential.
"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than
(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and
(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).
"Support Services" means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.
"Contract" means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.
"Third Party Data Provider" means any third party providing Third Party Content to Groundsure.
"Data Reports" means reports comprising factual data with no accompanying interpretation.
"Fees" has the meaning set out in clause 5.1.
"Groundsure" means Groundsure Limited, a company registered in England and Wales under number 03421028.
"Groundsure Materials" means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.
"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.
"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.
"Order" means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.
"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.
"Order Website" means the online platform through which Orders may be placed by the Client and accepted by Groundsure.
"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.
"Residential" means any building or property used as or intended to be used as a single dwelling.
"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.
"Services" means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.
"Site" means the area of land in respect of which the Client has requested Groundsure to provide the Services.
"Third Party Content" means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.
"User Guide" means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.
2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.
2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.
2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.
2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.
2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1The Client shall comply with the terms of this Contract and
(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and
(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.
3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.
3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.
3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.
3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.
3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.
4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;
(i) the Beneficiary,
(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
(iv) the first purchaser or first tenant of the Site, and
(v) the professional advisers and lenders of the first purchaser or tenant of the Site.
4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.
4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1Groundsure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").
5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.
5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to
(i) full payment of all relevant Fees and
(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.
6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure

acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.
6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.
6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.
6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.
7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.
7.4 Groundsure shall not be liable for

(i) loss of profits;
(ii) loss of business;
(iii) depletion of goodwill and/or similar losses;
(iv) loss of anticipated savings;
(v) loss of goods;
(vi) loss of contract;
(vii) loss of use;
(viii) loss or corruption of data or information;
(ix) business interruption;

(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.
7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.
8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.
9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.
12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.
12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.
12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.
12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.
12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Third Party Data Providers;
(viii) changes in law; or
(ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent
required by law

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