



**BROWNFIELD  
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

## LDJ NEW HOMES

Land at 1 High Street / Myrtle Road, Hampton Hill

Phase I Geo-Environmental Assessment Report

LC/C5179/11374

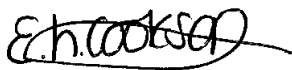
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**PROJECT QUALITY CONTROL DATA SHEET**

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**DRAWINGS**

Drawing Number	Rev	Title
Husband and Partners Architects – various	-	Proposed Development Layout Plans
C5179/01	-	Site Location Plan
C4012/02	-	Site Features Plan

**APPENDICES**

<b>Appendix</b>	<b>Title</b>
Appendix A	BSL Methodology and Guidance
Appendix B	Historical Maps
Appendix C	Geo-Environmental Data Report
Appendix D	UXO Screening Map

## 1.0 INTRODUCTION

### 1.1 Context

This report describes a desk-based Phase I Geo-Environmental Assessment Report carried out by Brownfield Solutions Limited (BSL) for LDJ New Homes as instructed by Husband Architects on a site off Myrtle Road / 1 High Street, Hampton Hill and has been completed in general accordance with the following guidance:

- 
- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
  - BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.
  - BS5930: 2015+A1:2020 Code of Practice for Ground Investigations.
  - BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
  - BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.
  - NHBC Standards. Chapter 4.1: Land Quality - Managing Ground Conditions.
- 

Definitions of terms and acronyms used within this report is presented in Section 8.0.

### 1.2 Proposed Development

The proposed development is for a residential end use with associated private gardens, highways, public open space (POS) areas and infrastructure. The existing warehouse buildings in the west of the site will be redeveloped into 1 and 2 bed apartments, and the existing residential building in the east will be retained as residential accommodation either as a single dwelling or splitting into 2 No. apartments (TBC).

Based on the proposed development plans to date, it is understood that no new buildings are to be constructed at the site.

Copies of the current proposed development plans have been provided to BSL by the client.

### 1.3 Objectives and Scope

The objectives of this assessment were to determine the environmental setting and ground conditions of the site, highlighting potential areas of concern that may govern the redevelopment.

The scope of works comprises a Phase I Assessment and site walk-over, with a review of the site, surroundings, historical uses and environmental setting in order to develop a preliminary Conceptual Site Model (CSM).

This report is intended to meet the requirements of a Preliminary Investigation as defined in BS10175:2011+A2:2017 and has been produced in general accordance with the recommendations for a Tier 1 Preliminary Risk Assessment as described in LCRM guidance.

### 1.4 Limitations

This Phase 1 Geo-Environmental Assessment Report has been prepared in accordance with the relevant legislative framework, guidance and risk assessment methodology as outlined in Appendix A.

The findings and opinions conveyed via this assessment are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and

reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

BSL have used reasonable skill, care and diligence in the production of this report. There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, LDJ New Homes. No other third party may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL); a charge may be levied against such approval. If any unauthorised third party comes into possession of this report, then they rely on it at their own risk and BSL do not owe them any Duty of Care.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Notwithstanding site observations concerning the presence or otherwise of archaeological issues, asbestos-containing materials (ACM) or invasive weeds (e.g. Japanese knotweed), this report does not constitute a formal survey of these potential issues and specialist advice should be sought.

## 2.0 THE SITE

### 2.1 Location

The site is located between Myrtle Road / 1 High Street, Hampton Hill, TW12 1NA, centred on National Grid Reference 514155, 170549 as shown on the Site Location Plan, Drawing No. C5179 /01.

### 2.2 Site Description

A site reconnaissance survey was carried out at the site on 22<sup>nd</sup> August 2018 alongside inspection of recent aerial/street view imagery with no major changes assumed since. The main site features and potential issues identified during this survey are detailed below and are shown on the Site Features Plan, Drawing No. C4012/02.

Feature	Description
Site Area	The site covers approximately 0.22 hectares.
Site Access	Access to the main site is gained off Myrtle Road to the north of the site. At the time of the walkover full access was not possible due to a locked gate, although sections of the site were visible from the boundary.  Access to the residential property is off High Street.
Current Land Use and Site Features	In the eastern part of the site is a two storey brick residential property and adjacent single storey garage facing High Street. The western part of the site comprises several one storey buildings of brick or cinderblock construction with corrugated roofs which may contain asbestos. Large amounts of abandoned machinery are located in the centre of these buildings.  There is evidence of fly tipping towards the centre of the site.
Potential Sources of Gross Contamination	No above ground fuel storage tanks (AST) have been noted at the site, however a full walkover was not possible due to access restrictions. Possible waste oil containers are present within the fly tipped rubbish.
Vegetation	Hedgerows and mature trees are present towards the south and western boundary. There are areas of soft landscaping present.
Topography	The site is generally flat and is higher in elevation than the offsite watercourse to the south.
Site Boundaries	Boundaries comprise brick walls to the north and hedgerows and mature trees to the south and west. A low wall and hedge form the boundary with High Street to the east of the site.
Surrounding Area	The site is set within a largely residential area. A depot is present to the north of the site and a railway to the west. The south of the site is bound by a river circa 0.5m lower than the site.
Anecdotal Information	A review of the site using publicly available aerial imagery from 2022 indicates that the buildings previously identified at the site are still present.

### 3.0 GEO-ENVIRONMENTAL SETTING

#### 3.1 Historical Setting

A review of the available historical Ordnance Survey Maps and satellite imagery has been conducted, with the pertinent issues that may have affected the site, or its environs, summarised below. The Historical Maps are presented in Appendix B. A review of the historical industrial data within the geo-environmental data report has also been undertaken below, the report is presented in Appendix C.

Notable features on site, and potentially contaminative or geotechnically relevant features within 100m of the site boundary have been presented. Any features that have potentially been infilled will be considered up to 250m from the site boundary.

Feature	Distance (m) & Direction	Years Present	Description
Residential building	Onsite – E	1914-Present	The building in the east first appeared on site in 1914 and had been extended by 1960.
Works	Onsite – W	1960-Present	Several buildings appeared on the map dated 1960 to the west of the site and subsequently labelled as works by the map dated 1983 until 2003 mapping. These buildings are still present.
Depot	10m N	1969-2002	The depot first appeared in 1969 and is no longer labelled after 2002. The area has since been redeveloped with residential houses and a three-storey residential apartment building.
Railway Line	90m W	1865-Present	The railway line is indicated on the earliest map dated 1865 and is still present today.
Electricity substation	150m SW	1969	No further information is shown on historical mapping which shows if the substation is still present.
Pond	230m W	1865-1914	The closest pond to the site is 230m away and was no longer shown on the map dated 1914, presumed to have been infilled. This area was redeveloped into residential properties by 1933.

In summary, the site was undeveloped until 1914 when a small unnamed building (the current residential property) was constructed in the east of the site. The site did not undergo any further development until 1960 when several buildings were constructed in the west of the site, labelled as a works by 1983.

Historical land use in the surrounding area has been predominantly residential, however a depot was located directly north of the site in an area which is now residential housing and apartments. Longford River borders the site to the south and a large area of parkland, including Bushy Park, is located directly east.

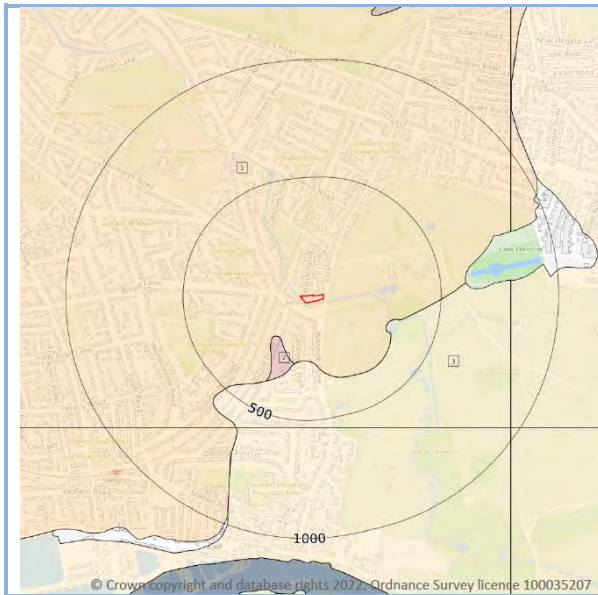
#### 2.3 Published Geology

The following publications of the British Geological Survey (BGS) were examined in respect of the geology underlying the site:

- British Geological Survey (BGS) 1:50,000 Scale Geological Map Sheet 270 South London. Solid and Drift Edition.
- BGS GeoIndex Onshore.
- Geo-Environmental Data Report.

Extracts of the 1:10,000 geological mapping from the Geo-Environmental Data Report are presented below for reference:



**BGS 1:10 000 Superficial Geology**

**BGS 1:10 000 Solid Geology**

***Made Ground***

BGS mapping does not display any made ground deposits on site, however based on the historical mapping and the development that has taken place, made ground deposits are highly likely to be present.

***Superficial Deposits***

The site is indicated to be underlain by River Terrace Deposits as part of the Taplow Gravel Member. This stratum typically comprises sand and gravel.

***Solid Geology***

The deeper solid geology underlying the superficial deposits is indicated to be part of the London Clay Formation.

No faults are shown on or within an influencing distance of the site

**3.2 BGS Exploratory Hole Records**

There are no BGS exploratory hole records within a relevant distance of the site (assumed as an approximate 50m radius).

**3.3 Mining and Mineral Extraction**

The site is outside the area of a designated coalfield or brine extraction area and no further consideration of coal mining/brine related risks is required.

***Non-Coal Mining***

There are 47 areas of surface ground workings listed between 50m and 250m of the site, however these appear to be predominantly associated with cuttings associated with the nearby railway line and are not likely to have affected the site. They are therefore not considered further within this report.

**3.4 Hydrogeology**

Based on the inferred geology, a summary of the Environment Agency aquifer designations is presented in the table below:

Stratum	Coverage	Aquifer Designation
Taplow Gravel Member	Full Site	Principal Aquifer. This is Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.
London Clay Formation	Full Site	Unproductive Strata. These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

A summary of the pertinent hydrogeological features within the Geo-Environmental Data Report are provided below:

Feature	Distance (m) & Direction	Details
Nearest Active Groundwater Abstraction	-	Licence No: 28/39/31/0172 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: THAMES GROUNDWATER Point: HAMPTON POOL BOREHOLE Annual Volume (m3): 15,000 Original Start Date: 02/04/1997
Nearest Active Potable Groundwater Abstraction	-	None within 2000m.
Source Protection Zones	-	None within 500m.

### 3.5 Hydrology

A summary of the pertinent hydrological aspects within the Geo-Environmental Data Report are provided below:

Feature	Distance (m) & Direction	Details
Nearest Watercourse	9m SW	Longford River borders the site to the south.
Nearest Surface Water Abstraction	1408m SE	Licence No: TH/039/0031/023 Details: Spray Irrigation - Direct Direct Source: THAMES SURFACE WATER - NON TIDAL Point: LEAT CHANNEL AT WATERHOUSE WOODLAND GARDEN, BUSHY PARK, HA Annual Volume (m3): 16,536 Original Start Date: 05/07/2021
Closest Active Licenced Discharge Consent	-	None within 2000m.

Information obtained from the Environment Agency (EA) Risk of Flooding from Rivers and the Sea (RoFRaS) database indicates that the site is not within a flood risk area, however the river 10m south is categorised as high (greater than or equal to 1 in 30 chance).

The site does not lie within an EA designated Zone, however the land 4m south (associated with the river) is categorised as a Zone 3 flood plain.

The British Geological Survey indicate there is a potential for groundwater flooding at the subject site, with a moderate risk rating.

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regards to drainage and flooding.

### 3.6 Landfill and Waste Management Sites

There are no active or historical landfill sites recorded within 500m of the site.

There are no current waste management sites recorded within 500m of the site.

### 3.7 Environmental Regulatory Data

A summary of the relevant environmental aspects, both on site and within 250m of the site contained in the Geo-Environmental Data Report, are presented in the table below:

Entry	On-site	0 – 50m	50 – 250m	Details
Recent Industrial Land Uses	1	0	5	The record on site relates to unspecified works or factories. The nearest offsite record is for an electricity substation 71m N.
Current or Recent Fuel Stations	0	0	0	
Licensed Industrial Activities (Part A(1))	0	0	0	
Licensed Pollutant Release (Part A(2)/B)	0	0	0	
Radioactive Substances	0	0	0	
Pollution Incidents (EA/NRW)	0	0	0	

### 3.8 Radon

Information from the environmental database report indicates the property is in an area where <1% of properties are above the Action Level for radon, and therefore radon protective measures are not required in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings' 2015 Edition.

### 3.9 UXO Risk

In accordance with CIRIA Report C681, BSL have reviewed non-specialist UXO data for the site using the online Zetica Bomb Risk Mapping data.

The map indicates the site to be in an area where the bomb risk is moderate and therefore further assessment is required.

A copy of the map is presented in Appendix D.

## 4.0 PHASE 1 SUMMARY AND RISK ASSESSMENT

### 4.1 Introduction

The risk posed by any contaminants in soil or groundwater will depend on the nature and level of the source, the probability of exposure occurring, the potential pollution pathway and the likely effects on the receptors.

A contaminant is defined as a substance that has the potential to cause harm, a risk is considered to exist if such a substance is present at sufficient concentrations to cause harm and if a pathway is present through which a receptor could be exposed to the contaminant.

The following sections discuss the identified potential on-site and off-site sources, and any pollution that could impact receptors via the pathways associated with the proposed development. Pollution linkages are assessed which may represent a risk to human health and/or controlled water receptors from the information gained from the Phase I Assessment searches. The assessment has been carried out on a qualitative basis and aims to produce a complete and comprehensive Preliminary Conceptual Site Model.

Three potential impacts exist for any given site and all three need to be considered in the qualitative risk assessment, these are:

- 
- On-site impacts.
  - The site impacting its surroundings.
  - Off-site sources impacting the subject site.
- 

### 4.2 Potential Contaminative Sources

#### *On-Site*

From the information obtained, the following sources have been identified which may affect the redevelopment of the site for residential end use:

- 
- Made ground associated with the existing development.
  - Unspecified works / factories
- 

#### *Off-Site*

The following off-site sources have been identified which may affect the redevelopment of the site:

- 
- Depot (10m N).
  - Railway (90m W).
  - Electricity Substations (Closest 70m N).
  - Potentially Backfilled Ponds (230m W).
- 

The electricity substations are located at least 70m from the site. Given the distances involved and the relatively immobile nature of associated PCB contamination, these are not considered to be significant sources of contamination. They are therefore not given further consideration within the CSM.

Additionally, given the age of the potentially infilled pond (circa 1914), the distance from site and the size of the original pond, it is considered that the pond is not a significant source of contamination / ground gas. The potentially backfilled pond is also not given any further consideration within the CSM.

### Associated Contaminants

The contaminants commonly associated with the potential sources of contamination identified are tabulated below:

Contaminative Sources	Department of the Environment Industry Profile or Other Source	Commonly Associated Contaminants
<b>On Site</b>		
Made Ground	-	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), asbestos, ground gases (carbon dioxide and methane).
Unspecified Works / Factories	-	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), hydrocarbons (TPHs), oils and solvents.
<b>Off Site</b>		
Depot	Road vehicle fuelling, service and repair	Hydrocarbons, oils and solvents
Railway	Railway Land Engineering works-Railway	PAHs, metals, localised pesticides and herbicides

### 4.3 Pathways

A pathway is defined as a medium by which a contaminant comes into contact with, or otherwise impacts a receptor.

At this stage the potential contaminants identified above are considered to present potential risks to site end users and controlled waters through the following pathways:

Potential Pathways	
Pathways in respect to Human Health	<ul style="list-style-type: none"> <li>• Ingestion of contaminated soils.</li> <li>• Dermal contact with contamination.</li> <li>• Inhalation of dusts.</li> <li>• Inhalation of gases or vapours in both indoor and outdoor air.</li> </ul>
Pathways in respect to Controlled Waters – Surface water	<ul style="list-style-type: none"> <li>• Surface run-off /over land flow.</li> <li>• Drainage discharge.</li> <li>• Base flow from groundwater.</li> </ul>
Pathways in respect to Controlled Waters – Groundwater	<ul style="list-style-type: none"> <li>• Leaching of mobile contamination into groundwater via the unsaturated zone.</li> <li>• Migration of perched groundwater in any permeable soils or along existing or proposed service runs.</li> <li>• Migration into the saturated zone and flow through the aquifers underlying the site.</li> </ul>
Pathways in respect to Property/structures/water pipes	<ul style="list-style-type: none"> <li>• Direct contact with substances deleterious to building materials and potable water supply pipelines.</li> <li>• Migration of ground gases (methane) into confined spaces (explosion and damage to property).</li> </ul>

### 4.4 Receptors

The identified receptors are listed below:

- Residential end users (human health).
- Structures/Property/Potable water supply pipes.
- Nearest watercourse. Longford River 10m S (Controlled waters).
- Superficial Aquifer – Principal Aquifer. Taplow Gravel (Controlled waters).

- 
- Bedrock Aquifer – Unproductive Aquifer. London Clay Formation (Controlled waters).
- 

Under current UK health and safety legislation, employers are required to carry out their own appropriate site-specific risk assessments and mitigation to protect employees. It has been assumed that any future construction works onsite will be undertaken in compliance with these requirements. Therefore, construction workers have not been specifically considered as part of this assessment.

#### **4.5 Preliminary Conceptual Site Model (CSM)**

The information obtained in the previous sections has been used to compile a Preliminary CSM. The identified potential contaminants and receptors have been assessed in the table below as to whether a plausible source-pathway-receptor pollutant linkage for the proposed end use of the site exists. The risk classification has been estimated in accordance with information in the BSL Guidance and Methodology in Appendix A.

The Preliminary CSM's are presented in the tables overleaf, any assessed risk above moderate will possibly require further action:

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
<b>On site Made Ground</b> Metals, PAH's, petroleum hydrocarbons, asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Low likelihood	Medium	Moderate / low	Significant made ground is not anticipated on-site as only one phase of development has taken place in the form of the current buildings. Possible ACM was noted on the buildings, which would need to be carefully removed by a suitable contractor during refurbishment/demolition. The risk to human health from made ground is considered to be moderate to low, however further investigation and assessment will be required to confirm the risk.
<b>On site Works</b> Heavy Metals, PAHs, hydrocarbons, oils and solvents	Ingestion, direct contact, inhalation of dusts / vapours	End-users	Likely	Medium	Moderate	It is not known what processes occurred at the works however contamination can be expected in the near surface soils. The majority of the site appears to be covered in soft landscaping and therefore any leaks or spills associated with the processes are unlikely to have been contained. At this stage the risk is considered to be moderate.
<b>On site Made Ground</b> Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Low likelihood	Medium	Moderate / low	Made ground is likely to be present on site although significant thickness is not anticipated. If deep made ground is present this could be a source of ground gas and further assessment will be required to confirm the risk. At this stage the risk is considered to be moderate to low.
<b>On site Made Ground</b> Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Severe	Moderate / low	Made ground is likely to be present on site although significant thickness is not anticipated. If deep made ground is present this could be a source of ground gas and further assessment will be required to confirm the risk. At this stage the risk is considered to be moderate to low.
<b>Off site Depot</b> Hydrocarbons, oils and solvents	Ingestion, direct contact, inhalation of vapours	End-users	Unlikely	Medium	Low	Any contamination associated with the railway will be small scale and localised. Due to the distances involved, any associated contaminants are unlikely to migrate on to site and the risk is considered to be low.
<b>Off site Railway</b> PAHs, metals,	Ingestion, direct contact, inhalation of	End-users/ Buildings	Unlikely	Medium	Low	Any contamination associated with the railway will be small scale and localised. Due to the distances involved, any associated contaminants are unlikely to migrate on to site and the risk is considered to be low.

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
localised pesticides and herbicides	dusts / vapours					



Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
<b>On site Made Ground</b> Metals, PAH's, petroleum hydrocarbons	Overland flow, / migration through saturated zone	Longford River 10m away (Surface waters)	Unlikely	Medium	Low	Significant made ground is not anticipated on site and if any contamination associated with this is present it will be localised and not considered to pose a risk to the offsite river.
	Leaching through unsaturated zone / Migration through saturated zone	Superficial Principal Aquifer (Groundwater)	Unlikely	Medium	Low	As above, significant made ground is not anticipated on site and if any contamination associated with this is present it will be localised and downward migration to the underlying Principal Aquifer is unlikely. Furthermore, it is wholly possible that the majority of made ground on site will likely be removed as part of the new development thereby removing the source. Therefore the risk is considered to be low.
	Migration through saturated zone	Solid Geology Unproductive Aquifer (Groundwater)	Unlikely	Mild	Very low	Significant contamination from made ground is not anticipated on site and the relatively impermeable nature of the Unproductive Aquifer will restrict any downward migration of any contaminants. Therefore the risk is considered to be very low.
<b>On site Works</b> Heavy Metals, PAHs, hydrocarbons, oils and solvents	Overland flow, / migration through saturated zone	Longford River 10m away (Surface waters)	Unlikely	Medium	Low	The extent of contamination from the sites previous use is unknown at this stage, however the presence of contamination cannot be ruled out. The river is lower in elevation than the site and a potential pathway is considered to exist, however the latest chemical testing of the river 19m east of the site is "A" which indicated the river is not being impacted by processes occurring at the site. At this stage the risk is considered to be low, however an investigation will be required to support the assessed level of risk.
	Leaching through unsaturated zone / Migration through saturated zone	Superficial Principal Aquifer (Groundwater)	Low likelihood	Medium	Moderate / low	The site is currently surfaced in limited hardstanding. By virtue of the development taking place, this should contribute to an overall "betterment" of groundwater quality and therefore reducing the risk to the Principal Aquifer. The nearest water well/ groundwater abstraction licence is 436m from the site and is for commercial use and not potable drinking water. The site is not located within 500m of a SPZ and there are no active potable water abstraction licences within 1500m of the site.

Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
	Migration through saturated zone	Solid Geology Unproductive Aquifer (Groundwater)	Unlikely	Mild	Very low	Significant contamination from made ground is not anticipated on site and the relatively impermeable nature of the Unproductive Aquifer will restrict any downward migration of any contaminants. Furthermore, the site is not located within 500m of a SPZ and there are no active potable water abstraction licences within 1500m of the site.

#### *Human Health Risk – Soils Contamination Summary*

Based on the preliminary CSM and the current use of the site, the overall risk from land contamination at the site is considered to be **low to moderate** for a redeveloped site. This would need to be confirmed by appropriate intrusive investigation, testing and assessment.

#### *Human Health Risk – Ground Gas Summary*

A potential on-site gas source has been identified associated with the made ground associated with previous developments. The preliminary CSM considers the sources to be a moderate to low risk to site end users and property.

In accordance with CIRIA C665 and as set out in Appendix A of this report, the gas generation potential is considered to be very low. The sensitivity of the development is moderate on account of the proposed development comprising flats.

Based on the above, recommended gas monitoring should comprise 6 visits over a 3 month period.

#### *Controlled Waters Risk - Summary*

Based on the preliminary CSM, BSL believes the overall risk to controlled waters at the site is **low to moderate**.

The above assessed level of risk will need to be confirmed by intrusive investigation and quantitative risk assessment.

## 5.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

### 5.1 Hazard Identification

A preliminary geotechnical hazard identification exercise has been undertaken in general accordance with the Highways England document CD 622, 'Managing geotechnical risk'. Potential geotechnical hazards based on the expected ground conditions are listed below:

- 
- Made ground of unknown nature; if placed in a non-engineered manner may cause excessive settlement of foundations, highways and infrastructure.
  - Attack of buried concrete by aggressive ground conditions; the site may contain unknown made ground and potentially sulphate bearing soils. The coal measures are known to be high in naturally occurring sulphates.
  - Running sands leading to difficulty with excavation due to trench collapse.
  - Shallow groundwater/groundwater rise causing resulting in difficulties with excavations due to trench collapse.
- 

The above identified geotechnical hazards will need to be considered as part of any further investigations and assessments.

### 5.2 Foundation and Geotechnical Design

It is understood that the proposed development will comprise redevelopment of the existing site buildings into apartments. The nature of the existing foundations may require confirmation via intrusive inspections, subject to input from a suitably qualified structural engineer.

If new buildings are proposed, suitable foundation options may include shallow pads and strip footings or piles depending on the ground conditions and expected loads.

Possible deepening of foundations or heave precautions due to clay volume change potential may be required near trees and the hedgerows if any foundations encounter London Clay.

This should be confirmed by an onsite intrusive investigation to confirm ground condition, should any new buildings be proposed.

### 5.3 Sustainable Drainage Systems (SuDS)

Drainage to SuDS is a potentially viable option for the site, given the indicated presence of permeable River Terrace deposits, subject to the depth to the groundwater and test results.

This would need to be confirmed by an onsite intrusive investigation to confirm ground conditions and infiltration rates. Testing should be carried out in general accordance with BRE Digest 365 "Soakaway design" and CIRIA C753 "The SuDS Manual".

## **6.0 OTHER DEVELOPMENT CONSTRAINTS**

### **6.1 Constraint Identification**

A formal survey of asbestos within structures is not covered in this report. It should be noted that an asbestos demolition survey will be required prior to any demolition of structures. If asbestos is present in soils, these will need to be dealt with in accordance with the Control of Asbestos Regulations (CAR) 2012.

No invasive species have been noted during the walkover, however it would be prudent to undertake a specialist survey prior to any works on site.

Notwithstanding any site observations concerning archaeological or ecological features, this report does not constitute a formal survey of these potential issues and specialist advice should be sought.

There are known services on site, these may need to be disconnected prior to any construction activities.

The preliminary risk assessment undertaken within this Phase I Assessment may identify potential risks to site demolition and construction workers. However, full consideration of occupational health and safety issues is beyond the scope of this report, with employers required to carry out their own site-specific risk assessments and mitigation as appropriate.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Geo-Environmental Summary

The site was undeveloped prior to 1914 when the residential property was erected to the east of the site. The site did not undergo any further development until 1960 when the works was constructed towards the west of the site.

The risk from onsite and off-site sources of contamination is considered to be moderate to low.

The risk from permanent ground gases is considered to be moderate to low.

The overall risk to controlled waters is considered to be low.

Intrusive investigations will be required to confirm the above assessed levels of risks and determine remedial requirements, if any.

### 7.2 Geotechnical Summary

Intrusive investigations will be required to confirm the most suitable foundation solution and to obtain parameters for concrete classification, floor slab and highways design.

Drainage to SuDS is potentially viable, subject to intrusive investigation and testing.

### 7.3 Further Work

To confirm the risks to the identified receptors and confirm the ground conditions in respect to the identified geotechnical and geo-environmental risks, an appropriate intrusive investigation will need to be undertaken. The following further works are recommended, although this list is not exhaustive and should be read in conjunction with any planning conditions that are applicable to the site:

- 
- Topographical survey / utility mapping.
  - Demolition Asbestos survey (if demolition works are taking place).
  - Preliminary UXO Risk Assessment Report.
  - Intrusive ground investigation comprising:
    - windowless sampling and / or cable percussive drilling to allow;
    - Installation of standpipes in boreholes to allow gas concentrations and groundwater levels to be monitored.
    - Foundation inspection pits adjacent to existing buildings.
    - The undertaking of soil infiltration rate testing (if required).
    - Geotechnical testing of soils (if required).
    - Contamination analyses of soil.
  - Assessment and recommendations based on the above, including requirements for further work, if necessary.
-

## 8.0 ABBREVIATIONS AND DEFINITIONS

GLOSSARY	
Term / Abbreviation	Definition
AST	Above Ground Storage Tank.
B(a)P	Benzo (a) Pyrene.
BGS	British Geological Survey.
BRE	Building Research Establishment.
BS	British Standard.
BSL	Brownfield Solutions Ltd.
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes.
CBR	California Bearing Ratio (used in pavement/highways design).
CAR 2012	Control of Asbestos Regulations (2012).
CBCB	Cheshire Brine Compensation Board.
CBCD	Cheshire Brine Compensation District.
CBR	California Bearing Ratio.
CIEH	Chartered Institute of Environmental Health.
CIRIA	Construction Industry Research Association.
CL:AIRE	Contaminated Land: Applications in Real Environments.
CLEA	Contaminated Land Exposure Assessment.
CLO	Contaminated Land Officer.
COMAH	Control of Major Accident Hazards.
<b>Contamination</b>	<p>Presence of a substance which is in, on or under land, and which has the potential to cause significant harm or to cause significant pollution of controlled water. There is no assumption in this definition that harm results from the presence of the contamination.</p> <p>Naturally enhanced concentrations of harmful substances can fall within this definition of contamination.</p> <p>Contamination may relate to soils, surface water, groundwater or ground gas.</p>
<b>Controlled Waters</b>	Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three-mile limit of territorial waters.
CPT	Cone Penetration Test.
<b>CSM</b>	<p>Conceptual Site Model. A schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information from the preliminary investigation and refined during subsequent phases of investigation and which is an essential part of the risk assessment process. The conceptual site model is initially derived from the information obtained by the preliminary investigation (i.e. the Phase I Phase I Assessment). This conceptual model is used to focus subsequent investigations, where these are considered to be necessary, in order to meet the objectives of the investigations and the risk assessment. The results of intrusive investigations can provide additional data that can be used to further refine the conceptual site model.</p>
DCP	Dynamic Cone Penetrometer.
DNAPL	Dense Non-Aqueous Phase Liquid.
DoWCoP	Definition of Waste Code of Practice.
DWS	Drinking Water Standard.
EA	Environment Agency.
EHO	Environmental health Officer.
EQS	Environmental Quality Standard.
GAC	Generic Assessment Criteria.

GLOSSARY	
Term / Abbreviation	Definition
<b>GDR</b>	Geotechnical Design Report.
<b>GFR</b>	Geotechnical Feedback Report.
<b>GIR</b>	Ground Investigation Report.
<b>GSV</b>	Gas Screening Value.
<b>Harm</b>	Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of human health, including property/structures and water supply pipelines.
<b>Hazard</b>	Inherently dangerous quality of a substance, procedure or event.
<b>HDPE</b>	High Density Polyethylene.
<b>HSV</b>	Hand Shear Vane.
<b>K</b>	Modulus of Subgrade Reaction.
<b>LCRM</b>	Land Contamination: Risk Management (EA guidance).
<b>LNAPL</b>	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene).
<b>LOD</b>	Limit of Detection (for particular method adopted).
<b>MMP</b>	Materials Management Plan.
<b>Mv</b>	Modulus of Volume of Compressibility.
<b>ND</b>	Not Detected.
<b>NHBC</b>	National House Building Council.
<b>NR</b>	Not Recorded.
<b>OS</b>	Ordnance Survey.
<b>PAH</b>	Polycyclic Aromatic Hydrocarbon.
<b>Pathway</b>	Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.
<b>PCB</b>	Poly-Chlorinated Biphenyl.
<b>PCSM</b>	Preliminary Conceptual Site Model.
<b>pH</b>	Scale used to specify how acidic or basic a water-based solution is.
<b>PHC</b>	Petroleum Hydrocarbons.
<b>PID</b>	Photo Ionisation Detector.
<b>PNEC</b>	Predicted No-Effect Concentration.
<b>Precision</b>	Level of agreement within a series of measurements of a parameter.
<b>PSD</b>	Particle Size Distribution.
<b>PVC</b>	Polyvinyl Chloride.
<b>Receptor</b>	Human health, living organisms, ecological systems, controlled waters (surface waters and groundwater within aquifers), atmosphere, structures and utilities that could potentially be adversely affected by contaminant(s).
<b>Risk</b>	Probability of the occurrence, magnitude and consequences of an unwanted adverse effect on a receptor.
<b>Risk Assessment</b>	Process of establishing, to the extent possible, the existence, nature and significance of risk.
<b>Sampling</b>	Methods and techniques used to obtain a representative sample of the material under investigation.
<b>SOM</b>	Soil Organic Matter.
<b>Source</b>	Location from which contamination is, or was, derived. This could possibly be the location of the highest soil, groundwater or gas concentration of the contaminant(s).
<b>SPT</b>	Standard Penetration Test.
<b>SVOCs</b>	Semi Volatile Organic Compounds.
<b>TOC</b>	Total Organic Carbon.
<b>TPH CWG</b>	Total Petroleum Hydrocarbon (Criteria Working Group).



<b>GLOSSARY</b>	
<b>Term / Abbreviation</b>	<b>Definition</b>
<b>TVOCs</b>	Total volatile organic compounds.
<b>UCS</b>	Unconfined Compressive Strength.
<b>Uncertainty</b>	Parameter, associated with the result of a measurement that characterises the dispersion of the values that could reasonably be attributed to the measurement.
<b>UST</b>	Underground Storage Tank.
<b>UXO</b>	Unexploded Ordnance.
<b>VCCs</b>	Vibro Concrete Columns.
<b>VSCs</b>	Vibro Stone Columns
<b>VOCs</b>	Volatile Organic Compounds.
<b>WAC</b>	Waste Assessment Criteria.
<b>WFD (in waste context)</b>	Waste Framework Directive.
<b>WFD (in water context)</b>	Water Framework Directive.
<b>Units</b>	<b>Definition</b>
<b>°</b>	Degrees
<b>Φ</b>	Phi angle (in degrees)
<b>g/l</b>	Grams per Litre
<b>Km</b>	Kilometres
<b>kPa</b>	Kilo Pascal (Equivalent to kN/m <sup>2</sup> )
<b>KN/m<sup>2</sup>/mm</b>	Kilo Newton per metered squared per millimeter
<b>kN/m<sup>2</sup></b>	Kilo Newtons per metre squared
<b>kPa</b>	Kilo Pascal (Equivalent to kN/m <sup>2</sup> )
<b>l/hr</b>	Litres per hour
<b>MJ/kg</b>	Mega joule per kilogram
<b>MN</b>	Mega Newton
<b>M<sup>2</sup>/MN</b>	Mega Newton per metre squared
<b>M</b>	Metres
<b>m bgl</b>	Metres Below Ground Level
<b>m OD</b>	Metres Ordnance Datum (sea level)
<b>µg/l</b>	Micrograms per Litre (parts per billion)
<b>µm</b>	Micrometre
<b>mb</b>	Millibars (atmospheric pressure)
<b>mg/kg</b>	Milligrams per kilogram (parts per million)
<b>mg/m<sup>3</sup></b>	Milligram per metre cubed
<b>mm</b>	Millimetre
<b>ppb</b>	Parts Per Billion
<b>Ppm</b>	Parts Per Million

## 9.0 REFERENCES

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