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## DESK STUDY & BASEMENT IMPACT ASSESSMENT REPORT

20 WATFORD ROAD,  
RADLETT,  
WD7 8LE



**Report Title:** Desk Study & Basement Impact Assessment for 20 Watford Road, Radlett, WD7 8LE

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## EXECUTIVE SUMMARY

Roundbush Services Limited (“The Client”) has commissioned Jomas Associates Ltd (‘Jomas’), to prepare a Basement Impact Assessment for a site referred to as 20 Watford Road, Radlett, WD7 8LE.

The aim of this report is to assess whether the ground conditions within the local area represent an impediment to the proposed development. A preliminary risk assessment is also undertaken to establish if possible contaminant linkages exist, which require further investigation in accordance with the Environment Agency (EA) land contamination risk management (LCRM) and relevant guidance within the National Planning Policy Framework (NPPF).

*It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.*

Desk Study	
<b>Current Site Use</b>	The site currently comprises an occupied residential building fronting directly onto Watford Road. The building is associated with a large driveway area, a rear patio area, a grass lawn area, tennis courts, and a pond.
<b>Proposed Site Use</b>	The proposed development is to comprise the demolition of the existing buildings, and construction of a 3-storey building with an associated basement, parking areas, driveway, and terracing.
<b>Site History</b>	<p>On the earliest available map (1871), the site is shown as a vacant plot of land, potentially being used for agricultural use. The site remains devoid of any features until the map dated 1913, when a single large building is shown towards the south of the site. By this time, the north of site appears to be wooded. With the exceptions of various small-scale extensions at the end of the 1960’s, no significant changes have occurred to the site until the most recent map dated 2023. The site remains currently a residential house.</p> <p>Historically, the surrounding area has comprised mainly agricultural, with residential developments taking place in a period of urbanisation in the first half of the 20th century.</p> <p>Various ponds were noted in the site vicinity during the historical map review. In the first historical map dated 1871, small ponds were reported approximately 170m south-east, 220m south, 250m east, and 280m south-west. By the map dated 1913, the ponds 170m south-east and 250m east appear to have been infilled. In addition, by 1970 the ponds 220m south and 280m south-west appear to have been infilled. Furthermore, a suspected small old quarry is present 157m to the northwest of the site, noted on mapping between 1971 and 1989. Dense vegetation shown on aerial photographs makes it unclear whether this has been infilled or otherwise.</p>
<b>Site Setting</b>	<p>The British Geological Survey indicates that the site is directly underlain by superficial deposits of the Gerrards Cross Gravel Member. These are underlain by solid deposits of the Lambeth Group, potentially underlain at shallow depth by Undifferentiated Chalk deposits.</p> <p>The underlying Gerrards Cross Gravel Member and Lambeth Group are both identified as Secondary (A) aquifers. The Chalk is identified as a Principal Aquifer.</p> <p>A review of the EnviroInsight Report indicates that there are no Environment Agency Zone 2 or Zone 3 flood zones within 250m of the site.</p>

Desk Study	
	<p>The site is within an EA Source Protection Zone 2 with a EA Source Protection Zone 1 located 48m north-west.</p> <p>There are 15No groundwater abstractions reported within 2km of site; nearest recorded as an active abstraction for direct spray irrigation 1262m east.</p> <p>There are no surface water abstractions reported within 2km of site.</p> <p>There is 1No potable water abstraction reported within 2km of site; recorded as an active abstraction for direct water supply 1738m north.</p> <p>There are 6No surface water features and detailed river networks within 500m of site; nearest recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site.</p>
<b>Potential Sources</b>	<ul style="list-style-type: none"> <li>• Potential for Made Ground associated with previous development operations – on site (S1)</li> <li>• Potential asbestos containing materials within existing buildings – on site (S2)</li> <li>• Potential infilled land – off site (S3) <ul style="list-style-type: none"> <li>- Possible old quarry: 157m NW</li> <li>- Ponds: 170m SE, 220m S, 250m E and 280m SW</li> </ul> </li> </ul>
<b>Potential Receptors</b>	<ul style="list-style-type: none"> <li>• Controlled Waters (R6) <ul style="list-style-type: none"> <li>- Secondary A aquifer</li> <li>- SPZ 2 (outer catchment) on site</li> <li>- SPZ 1 (inner catchment) 48m NW</li> <li>- 15No reported groundwater abstractions within 2km of site; nearest recorded as an active abstraction for direct spray irrigation 1262m east</li> <li>- 1No reported potable abstraction within 2km of site, recorded as an active abstraction for direct water supply 1738m north</li> <li>- 6No surface water features and detailed river networks within 500m of site; nearest recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site</li> </ul> </li> </ul>
<b>Preliminary Risk Assessment</b>	<p>The risk estimation matrix indicates a low risk.</p> <p>Due to the potential presence of asbestos containing materials, an asbestos survey should be undertaken, with any asbestos containing materials found, removed under suitably controlled conditions. There should be no risk to end users from asbestos if the potential asbestos containing materials are removed by suitably qualified and experienced specialists under controlled conditions.</p> <p>No significant potential sources of contamination were identified during the desk-based assessment. However, it is recommended that a number of soil samples obtained during the below-recommended geotechnical investigation are analysed for a suite of general contaminants to confirm the anticipated absence of significant contamination at the site.</p>
<b>Potential Geological Hazards</b>	<p>The Groundsure data identifies a moderate risk on-site for shrink swell clays.</p> <p>The presence of Made Ground may be a source of elevated sulphate. If such levels are noted then sulphate resistant concrete may be required.</p>

Desk Study	
	<p>Given the identified geology and nearby rises/issues of a stream, a relatively shallow groundwater table should be anticipated.</p> <p>It is recommended that a geotechnical ground investigation is undertaken to inform foundation design.</p> <p>This should also explore the possibility of localised historical chalk mining beneath the footprint of the proposed development.</p>

Screening and Scoping (Basement Impact Assessment)	
<b>Subterranean (Groundwater) Flow</b>	A ground investigation is recommended to confirm the ground conditions and groundwater levels (if any) beneath the site. This can then confirm the relative depths of the basement to the groundwater levels.
<b>Land Stability</b>	<p>The site, as with the surrounding area, is sloping down towards the north at an angle of approximately 5 degrees. The Groundsure report has noted that there is a “very low” risk of land instability issues for the site.</p> <p>The investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg Limits of the underlying clay should be determined by the ground investigation to establish shrink/swell potential.</p> <p>The Groundsure report indicates there to be a requirement to consider the possible impact of localised historical chalk mining beneath the site. This should also be addressed by the ground investigation.</p>
<b>Surface Flow and Flooding</b>	The proposed development will comprise the demolition of the existing building and construction of a structure with a larger footprint and, as a result, there may be a significant change in surface water run-off.

Basement Impact Assessment	
<b>Impact Assessment</b>	<p>The overall assessment of the site is that the creation of a basement for the existing development will not adversely impact the site or its immediate environs, providing measures are taken to protect surrounding land and properties during construction.</p> <p>The proposed basement excavation will not be within 5m of a public pavement. It is, however, laterally within 5m of neighbouring properties.</p> <p>Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services.</p> <p>During the construction phase careful and regular monitoring will need to be undertaken to ensure that the property above, is not adversely affected. This may mean that the property needs to be suitably propped and supported.</p> <p>From the studies that have been undertaken so far, and subject to the findings of an intrusive investigation, it is concluded that the construction of the building will not</p>



**Basement Impact Assessment**

present a problem for groundwater. The proposed development is not expected to cause significant problems to the subterranean drainage.

This should be confirmed by a ground investigation and a subsequently updated Basement Impact Assessment.

**Recommended Further Work****Works**

An intrusive ground investigation is recommended to confirm the ground conditions and groundwater levels (if any) beneath the site, as well as to inform foundation design.

A Ground Movement Assessment is also recommended.

## **1 INTRODUCTION**

### **1.1 Terms of Reference**

1.1.1 Roundbush Services Limited (“The Client”) has commissioned Jomas Associates Ltd (‘Jomas’), to prepare a Desk Study and a Basement Impact Assessment (Screening & Scoping) at a site referred to as 20 Watford Road, Radlett, WD7 8LE.

1.1.2 Jomas’ work has been undertaken in accordance with the technical survey proposal dated 14<sup>th</sup> March 2023.

### **1.2 Proposed Development**

1.2.1 The proposed development for this site is understood to comprise the demolition of the existing buildings, and construction of a 3-storey building with an associated basement, parking areas, driveway, and terracing.

1.2.2 A plan of the proposed development is included in Appendix 1.

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as ‘Residential with plant uptake’.

1.2.4 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1.

1.2.5 This will be reviewed at each stage of the project.

### **1.3 Objectives**

1.3.1 The objectives of Jomas’ investigation were as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas;
- To assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs.

### **1.4 Scope of Works**

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- A walkover survey of the site;
- A desk study, which included the review of a database search report (GeoInsight Report, attached in Appendix 2) and historical Ordnance Survey maps (attached in Appendix 3);

- A Basement Impact Assessment (BIA);
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

## **1.5 Scope of Basement Impact Assessment**

1.5.1 The site lies within the remit of Hertsmere Borough Council. The council has published a document "Hertsmere Planning and Design Guide SPD Part D" (September 2016). This gives a lot of detail on the issues relevant to basements within the borough of Hertsmere but does not go into detail as to how these issues should be assessed.

1.5.2 Consequently, Jomas has based the methodology of the BIA on the guidance given in the London Borough of Camden document "Camden Planning Guidance Basements" (CPGB) (January 2021). This document has been used as it is generally accepted that this gives the best available guidance on the practicalities regarding how to the undertake a BIA.

1.5.3 Jomas' BIA covers most items required under CPGB, with the exception of;

- Plans and sections to show foundation details of adjacent structures – no access to adjacent properties was possible.
- Programme for enabling works, construction and restoration.
- Evidence of consultation with neighbours.
- Ground Movement Assessment (GMA), to include assessment of significant adverse impacts and specific mitigation measures required, as well as confirmatory and reasoned statement identifying likely damage to nearby properties according to the Burland Scale.
- Construction Sequence Methodology.
- Proposals for monitoring during construction.
- Drainage assessment.

1.5.4 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided.

1.5.5 A number of the requirements set out in the London Borough of Camden document CPGB will need to be addressed in a construction management plan, this stage is not within the scope of work that Jomas Associates have been commissioned.

## **1.6 Supplied Documentation**

1.6.1 Jomas Associates have not been supplied with any previously produced reports at the time of writing this report.

**1.7 Limitations**

- 1.7.1 Jomas Associates Ltd has prepared this report for the sole use of Roundbush Services Limited in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.
- 1.7.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.
- 1.7.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.7.4 ***This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.***

## 2 SITE SETTING & HISTORICAL INFORMATION

### 2.1 Site Information

2.1.1 The site location plan is appended to this report in Appendix 1.

**Table 2.1: Site Information**

<b>Name of Site</b>	-
<b>Address of Site</b>	20 Watford Road, Radlett, WD7 8LE
<b>Approx. National Grid Ref.</b>	515762 199860
<b>Site Area (Approx)</b>	0.27 hectares
<b>Site Occupation</b>	Residential
<b>Local Authority</b>	Hertsmere Borough Council
<b>Proposed Site Use</b>	Residential with a basement located within the footprint of the building

### 2.2 Walkover Survey

2.2.1 The site was visited by a Jomas Engineer on 14<sup>th</sup> April 2023. The following information was noted while on site.

**Table 2.2: Site Description**

Area	Item	Details
On-site:	<b>Current Uses:</b>	Site consists of an occupied residential two storey brick construction fronting onto Watford Road. The building has an associated driveway and rear patio.  The rear patio has steps leading down to a garden area which comprised a grassy open space, a decommissioned water feature, tennis court with flood lights, 1No outhouse, 1No greenhouse, and a pond in the far north of site.  There are various terraced brick retaining walls to the north of the patio that facilitate the change in ground elevation to the rear garden. The height of the walls ranges between approximately 0.4m-1.0m.
	<b>Evidence of historic uses:</b>	No evidence of historic uses observed on site.
	<b>Surfaces:</b>	Site approximately 75% hardstanding underfoot made up of the footprint of the building, paved pathways and patio area, and asphalt areas in the rear garden.  The remainder of site is soft landscaping, comprising a gravel driveway and grass area in the rear garden.

Area	Item	Details
	<b>Vegetation:</b>	There are large trees up to 15m high along the northern and southern site boundaries. In addition, a large tree roughly 25m high is present in the middle of the garden along the eastern site boundary.  There are various flowerbeds and planters located around site.
	<b>Topography / Slope Stability:</b>	The site slopes generally down towards the north, at an angle of approximately 5 degrees.
	<b>Drainage:</b>	Site appears to be connected to normal drainage facilities. Areas of the rear lawn were noted to be waterlogged.
	<b>Services:</b>	Site appears to be connected to services which are in use.
	<b>Controlled waters:</b>	No controlled waters were observed on site.
	<b>Tanks:</b>	No tanks were observed on site.
<b>Neighbouring land:</b>	<b>North:</b>	Residential.
	<b>East:</b>	Residential.
	<b>South:</b>	Residential.
	<b>West:</b>	Residential.

2.2.2 Photos taken during the site walkover are provided in Appendix 1.

## 2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, procured from GroundSure, and these are provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

**Table 2.3: Historical Development**

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1871 – 1872 1:2,500 1:10,560	Site appears to be located within agricultural land and is devoid of any features.	The land surrounding the site is predominantly comprised of agricultural land with some small-scale residential uses such as farms and cottages.  Various small ponds are located in the site vicinity, including roughly 170m SE, 220m S, 250m E, and 280m SW.

## SECTION 2

### SITE SETTING & HISTORICAL INFORMATION

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
		<p>A well is located roughly 180m E of site. In addition, 2No wells are present between approximately 250m-500m S.</p> <p><b>Cuttings</b> associated with Darnells Farm are present approximately 300m E.</p> <p>An area of woodland with associated <b>cuttings</b> is present 480m SW.</p> <p><b>Cuttings</b> associated with 'The Scrubbits' area of woodland 500m SE.</p> <p><b>Railway line</b> located roughly 600m E, in an NW-SE orientation. A <b>station</b> and <b>cuttings</b> associated with this railway are also present.</p> <p>Tykes Water is located roughly 600m E, flowing towards the NW.</p>
1896 – 1897 1:2,500 1:10,560	No significant changes.	<p>The cuttings associated with Darnells Farm 300m E and The Scrubbits 500m SE appear to have been <b>infilled</b>.</p> <p>A <b>smithy</b> is located roughly 500m E.</p> <p>A <b>goods shed</b> is present 670m E.</p>
1913 – 1914 1:2,500 1:10,560	A large building has been constructed in the S of site, with an associated driveway and garden area. The N of the site appears to be a wooded area.	<p>The land in the site vicinity has seen residential developments of large, detached houses. In addition, residential developments associated with Radlett have taken place from 250m SE.</p> <p>Watford Road is now present immediately adjacent to the S of site.</p> <p>The ponds 170m SE and 250m E appear to have been <b>infilled</b>.</p> <p>2No <b>nurseries</b> are present roughly 200m SW.</p> <p>Allotment gardens located roughly 350m S.</p> <p><b>Filter beds</b> associated with a <b>Sewage Farm</b> are present 450m S.</p> <p>A <b>gravel pit</b> is located approximately 650m S.</p>
1938 1:10,560	No significant changes.	No significant changes.
1960 – 1968 1:1,250 1:10,560	No significant changes.	<p>Further residential developments have taken place to the S and SW with the expansion of Radlett.</p> <p>A waterway running W-E immediately adjacent to the N of site is labelled as 'drain'.</p> <p><b>Cuttings</b> are present roughly 200m NW of site.</p>
1970 – 1975 1:2,500 1:10,000	It appears that various small extensions have taken place to the building on site.	The ponds 220m S and 280m SW appear to have been <b>infilled</b> .

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
<i>Large scale historic maps are incomplete</i>		
1990 – 1992 1:1,250 1:10,000	No significant changes.	<b>Works</b> located roughly 740m NE.
2001 – 2010 1:1,250 1:10,000	No significant changes.	The cuttings 200m NW appear to be associated with a large pond.
2023 1:10,000	No significant changes.	No significant changes.

Potentially polluting/contaminating uses/activities shown in **bold**

2.3.4 Aerial photographs supplied as part of the GroundSure Enviro+GeoInsight report range from 1999 to 2019. These show a general consistency with the historical map review. Various properties in the surrounding area are noted to have swimming pools.

## 2.4 Past Land Use

2.4.1 Groundsure provide some information on past land use on and in the vicinity of the site. Table 2.4 below summarises the information provided, which is presented in further detail in the Enviro+Geoinsight in Appendix 2. Where the identified features have appeared on more than one map they have been counted multiple times and therefore the reported numbers may be higher than the actual count.

**Table 2.4: Past Land Use**

Type of Use	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Industrial Land Uses	None reported	16No reported; nearest recorded as an unspecified pit 157m NW (1971-1989). Other records of note include a nursery 174m SW (1913-1938), a telephone exchange 384m east (1971)	<b>X</b>
Historical Tanks	None reported	None reported	<b>X</b>
Historical Energy Features	None reported	7No reported; nearest recorded as an electricity substation 184m SW (1968-1992)	<b>X</b>
Historical Petrol Stations	None reported	None reported	<b>X</b>
Historical Garages	None reported	None reported	<b>X</b>
Historical Military Land	None reported	None reported	<b>X</b>



\* From a land contamination/site development perspective

## 2.5 Landfill, Waste and Potentially Infilled Surface Ground Workings

2.5.1 The Groundsure Enviro+Geoinsight Report provides information on active and historical landfills and waste sites. It also provides information on historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface; these features may or may not have been subsequently infilled. The following section summarises the information collected from the available sources.

**Table 2.5: Landfill, Waste and Potentially Infilled Ground Surface Workings**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Active or Recent Landfill	None reported	None reported	X
Historical Landfill	None reported	1No reported by EA/NRW records 494m SE for inert waste	X
Historical Waste Sites	None reported	None reported	X
Licensed Waste Sites	None reported	None reported	X
Waste Exemptions	None reported	None reported	X
Potentially Infilled Surface Ground Workings	None reported	2No reported as unspecified pit 157m NW (1971-1989). This appears to relate to a small old quarry and dense vegetation shown on aerial photographs makes it unclear whether this has been infilled or otherwise.	✓

\* From a land contamination/site development perspective

## 2.6 Current Industrial Land Use

2.6.1 The Groundsure Enviro+Geoinsight Report also provides information on various records relating to current industrial land use on and in the vicinity of the site. The following section summarises the information collected from the available sources.

**Table 2.6: Current Industrial Land Use**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Recent Industrial Land Uses	None reported	3No reported; nearest recorded as electricity substation 18m SE. All records available are for electricity substations	X
Current or Recent Petrol Stations	None reported	None reported	X
High Voltage Electricity Cables	None reported	None reported	X
High Pressure Gas Pipelines	None reported	None reported	X
Sites Determined as Contaminated	None reported	None reported	X

**SECTION 2**  
**SITE SETTING & HISTORICAL**  
**INFORMATION**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Land			
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites	None reported	None reported	X
Regulated Explosive Sites	None reported	None reported	X
Hazardous Substance Storage/Usage	None reported	None reported	X
Historical Licensed Industrial Activities	None reported	None reported	X
Licensed Industrial Activities	None reported	None reported	X
Licensed Pollutant Release	None reported	None reported	X
Radioactive Substance Authorisations	None reported	None reported	X
Licensed Discharge to Controlled Waters	None reported	None reported	X
Pollutant Release to Surface Waters (Red List)	None reported	None reported	X
Pollutant Release to Public Sewer	None reported	None reported	X
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Pollution Incidents	None reported	None reported	X
Pollution Inventory Substances	None reported	None reported	X
Pollution Inventory Waste Transfers	None reported	None reported	X
Pollution Inventory Radioactive Waste	None reported	None reported	X

\* From a land contamination/site development perspective

**2.7 Tunnels and Railways**

2.7.1 The Groundsure Enviro+Geosight Report provides information on railway tunnels and railways on and within the vicinity of the site, as summarised in the table below.

**Table 2.7: Tunnels and Railways**

Feature	On site	Off-site (within 250m of site, unless stated otherwise)	Potential to Impact Site*
Underground Railways (London)	None reported	None reported	X
Underground Railways (Non-	None reported	None reported	X

**SECTION 2**  
**SITE SETTING & HISTORICAL**  
**INFORMATION**

Feature	On site	Off-site (within 250m of site, unless stated otherwise)	Potential to Impact Site*
London)			
Railway Tunnels	None reported	None reported	X
Historical Railway and Tunnel Features	None reported	None reported	X
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	None reported	X

\* From a land contamination/site development perspective

**2.8 Previous Site Investigations**

2.8.1 No previous site investigation reports were provided at the time of writing.

**2.9 Local Authority Information**

2.9.1 Jomas have made a request to Hertsmere Borough Council for information relating to contamination on the site and surrounding areas. A copy of the correspondence is included in Appendix 6.

2.9.2 A response is pending.

**2.10 Planning Information**

2.10.1 A review of the local authority's planning portal was undertaken on 20<sup>th</sup> April 2023 at <https://www.hertsmere.gov.uk/online-applications/search>.

2.10.2 Various applications were reported within a postal code search, but none were recorded with information pertaining to land contamination.

2.10.3 However, a Flood Risk Assessment report was found for a neighbouring property relating to an application (ref: 16/1931/FUL) for 'Demolition of existing dwelling and erection of a three storey block including accommodation in the roofspace comprising 7 x 2 bed and 3 x 3 bed apartments with refuse store and underground car parking'.

2.10.4 The reader is referred to the full report, but the following salient information was reported. A very low flood risk was concluded for the site for surface water, and a low flood risk for river flooding.

2.10.5 The report contains a Jomas Associates report dated 20/12/2016 detailing trial holes and infiltration testing. It was summarised that the ground conditions comprise gravelly Clay to a depth of at least 2.5m bgl, with infiltration testing showing that the clay is not sufficiently permeable for soakaways.

## SECTION 2

### SITE SETTING & HISTORICAL INFORMATION

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2.10.6 This report showed that the site could be developed using sustainable urban drainage systems including porous paving and surface water storage. It would be feasible to provide surface water storage to protect the site against a storm return period of 100 years plus 40% climate change subject to detail design.

#### **2.11 Sensitive Land Uses**

2.11.1 The site is not located within a Nitrate Vulnerable Zone.

2.11.2 Hounds Wood Designated Ancient Woodland is located 1299m north-east of the site.

2.11.3 The London Green Belt is reported 105m north-west and 886m north of site.

2.11.4 The site lies within a Site of Special Scientific Interest (SSSI) Impact Risk Zone, however, no action is required to be taken as a result of this.

2.11.5 No sensitive land use was identified within 1km of the site.

#### **2.12 Radon**

2.12.1 The site is reported not to lie within a Radon affected area, as less than 1% of properties are above the action level.

2.12.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2015).

### 3 GEOLOGICAL SETTING & HAZARD REVIEW

3.1.1 The following section summarises the principal geological resources of the site and its surroundings. The data discussed herein is generally based on the information given within the Groundsure Report (in Appendix 2).

#### 3.2 Solid and Drift Geology

3.2.1 Information provided by the British Geological Survey (BGS) indicates that the site is directly underlain by superficial deposits of the Gerrards Cross Gravel Member. The deposits have an average thickness of 4m, and are described as:

*“sand and gravel, locally with lenses of silt, clay or peat and organic material.”*

3.2.2 These superficial deposits overlie solid deposits of the Lambeth Group. An extract of the BGS description is provided below:

*“Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.”*

3.2.3 The geological mapping indicates the presence of the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) 113m north west of the site, therefore, it is possible that chalk may be encountered at shallow depth beneath the Lambeth Group deposits.

3.2.4 No Made Ground is reported on site but given the sites identified history, a depth of Made Ground should be expected.

#### 3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were obtained and reviewed from the surrounding area. The local records obtained are presented in Appendix 5.

3.3.2 The nearest such record was located approximately 194m north of the site, from November 2006.

3.3.3 This showed the underlying ground conditions to comprise ‘Topsoil over light brown sandy Clay’ (inferred to be the Gerrards Cross Gravel Member) to a depth of around 2.0m bgl. This was overlying multicoloured sandy Clay (likely representing the Lambeth Group) to a depth of up to 5.0m bgl, which in turn was overlying Chalk with flints to the base of the borehole, at approximately 65.0m bgl.

3.3.4 During the drilling of the borehole groundwater was first struck at 35.5m bgl within the Chalk.

3.3.5 All depths and measurements should be viewed as approximate, due to the age of the borehole.

**3.4 Geological Hazards**

3.4.1 The following are brief findings extracted from the GroundSure GeolInsight Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

**Table 3.1: Geological Hazards**

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell clays	Moderate	Ground conditions predominantly high plasticity.	YES - GI
Running sands	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	No
Compressible deposits	Negligible	Compressible strata are not thought to occur.	No
Collapsible Deposits	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	No
Landslides	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.	No
	Low	Soluble rocks are present within the ground. Some dissolution features may be present. Potential for difficult ground conditions are at a level where they may be considered, localised subsidence need not be considered except in exceptional circumstances.	No
Coal mining	None	The study site is not located within the specified search distance of an identified coal mining area.	No
Non-coal mining	Class C for Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered.	YES

3.4.2 In addition, the GeolInsight report notes the following:

- 2No historical surface ground working features are reported within 250m of the site. Both features are recorded for an unspecified pit 157m north-west.
- No historical underground working features are reported within 1km of the site.
- No BGS Current Ground Working Features are reported within 1km of the site.

3.4.3 The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site.

- 3.4.4 Foundations should not be formed within Made Ground or organic rich materials (i.e. Topsoil) due to the unacceptable risk of total and differential settlement.
- 3.4.5 The presence of Made Ground derived from demolition material may be a source of elevated sulphate results associated with plaster from the previous structures.
- 3.4.6 The potential impacts of shallow groundwater should be considered during foundation design. The affects that this may have include (but are not limited to):
- Permanent excavations – i.e. for items such as basements and drainage. This is likely to need waterproofing / tanking and may have flotation issues.
  - Temporary excavations – likely to affect side stability especially where the excavations are formed in granular materials.
  - Soakaways – likely to affect the permeability and therefore the effective use of soak-away drainage.
  - Concrete classification on the site (in accordance with BRE SD-1) due to the potential for a mobile groundwater table.
  - May require dewatering or groundwater exclusion techniques to be used.
  - Foundation design – likely to reduce the allowable bearing capacity that could be achieved in the superficial deposits.
- 3.4.7 The deposits underlying the site are likely to be affected by shrinking and swelling as a result of water uptake of nearby trees.
- 3.4.8 It is recommended that a geotechnical ground investigation is undertaken to inform design.
- 3.4.9 This should also explore the possibility of localised historical chalk mining beneath the footprint of the proposed development.

## 4 HYDROGEOLOGY, HYDROLOGY AND FLOOD RISK REVIEW

### 4.1 Hydrogeology & Hydrology

4.1.1 General information about the hydrogeology of the site was obtained from the MAGIC website.

#### Groundwater Vulnerability

4.1.2 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **Secondary A** - 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. These are generally aquifers formerly classified as minor aquifers;
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.
- **Unproductive Strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

#### Source Protection Zones (SPZ)

4.1.3 In terms of aquifer protection, the EA generally adopts a three-fold classification of SPZs for public water supply abstraction wells.

- Zone I - or 'Inner Protection Zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone II - or 'Outer Protection Zone' is defined by a 400-day travel time to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone III - or 'Total Catchment' is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.



Hydrogeology

- 4.1.4 The baseline hydrogeology of the site is based on available hydrogeological mapping, including the BGS online mapping, and generic information obtained from the Groundsure Report.
- 4.1.5 The available data indicates that the geology of the area consists of the Gerrards Cross Gravel underlain by the Lambeth Group. It would be expected that a groundwater table would be encountered at a relatively shallow depth within the superficial deposits, however, the depth is ultimately unknown and should be confirmed by a ground investigation.
- 4.1.6 It is unclear whether the drain / river immediately adjacent to the north of site is in hydraulic conductivity with the groundwater table, this should be confirmed by a ground investigation.

Hydrology

- 4.1.7 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.
- 4.1.8 The Environment Agency defines a floodplain as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.
- 4.1.9 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:

Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
- or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

(For planning and development purposes, this is the same as Flood Zone 3, in England only.)

- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

(For planning and development purposes, this is the same as Flood Zone 2, in England only.)

- 4.1.10 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

- 4.1.11 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)
- 4.1.12 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.
- 4.1.13 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

**Table 4.1: Summary of Hydrogeological & Hydrology**

Feature		On Site	Off Site	Potential Receptor?
Aquifer	Superficial:	Secondary (A) Aquifer	Secondary (A) Aquifer within 500m	✓
	Solid:	Secondary (A) Aquifer	Secondary (A) Aquifer within 500m Principal Aquifer within 500m	✓
Source Protection Zone (SPZ)		SPZ 2 (outer catchment)	SPZ 1 (inner catchment) located 48m north-west of site.	✓
Abstractions	Groundwater	None	15No reported within 2km of site; nearest recorded as an active abstraction for direct spray irrigation 1262m east.	✓
	Surface water	None	None reported within 2km of site.	X
	Potable water	None	1No reported within 2km of site as an active abstraction for direct water supply 1738m north.	✓
Surface Water Features		1No pond in the north of site noted during the walkover.	6No detailed river networks within 500m of site; nearest recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site. 6No surface water features within 250m of site.	✓
Discharge Consents		None	No records within 500m of site.	X
Flood Risk	EA Flood Zone 2	No		
	EA Flood Zone 3	No		
	RoFRaS	None		

Feature	On Site	Off Site	Potential Receptor?
Historical Flood Events	None reported within 250m of site.		
Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site		
Surface Water Flooding	Highest risk on site is '1 in 100yr, 0.1m-0.3m'.		
Groundwater Flooding	High risk on site is 'Low'.		

## 4.2 Flood Risk Review

4.2.1 In accordance with the NPPF Guidance, below is a review of flood risks posed to and from the development and recommendations for appropriate design mitigation where necessary. Specific areas considered are based on the requirements laid out in the "Camden Guidance for Subterranean Development" as this document is generally considered to be the most comprehensive Local Authority Guidance in the London area.

**Table 4.2: Flood Risk Review**

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site is not within 250m of an Environment Agency Zone 2 or zone 3 floodplain. Risk of flooding from rivers and the sea (RoFRaS) rating negligible.	Very low risk of flooding from fluvial and tidal sources.
Groundwater	Groundsure reports a "Low" risk of groundwater flooding on, and within 50m of site.	As SUDS will be required by NPPF, PPG and LLFA policy requirements, this is likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of groundwater flooding. Basement will be fully waterproofed as appropriate to industry standard. Low Risk.
Artificial Sources	Pond on site and multiple swimming pools in surrounding area (private).	Given that the pond and pools are at ground level and are likely to be lined with impermeable barriers, there is considered to be a Low Risk.
Surface Water / Sewer Flooding	6No detailed river networks and surface water features within 500m of site; nearest recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site.	The proposed development will extend over an area larger than is covered by existing hardstanding and, as a result, is likely to increase impermeable areas on site. As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to

	Condition, depth and location of surrounding infrastructure uncertain.	include attenuation before releasing to the existing sewer network. If permeable paving is used this would likely reduce the risk of surface water flooding. Combined, these are likely to reduce the risk of both surface and sewer flooding to both the site and surrounding properties.  Basement will be fully waterproofed as appropriate to industry standard.  Low Risk.
<b>Climate Change</b>	Included in the flood modelling extents. Site not within climate change flood extent area	Development is not likely to increase the peak flow and volume of discharge from the site.  Low risk posed to and from the development.

4.2.2 Information about the risk to the study site from flooding has been obtained from the following document produced for Hertsmere Borough Council: Strategic Flood Risk Assessment Volume 1 (Halcrow Group Limited, 2008), Strategic Flood Risk Assessment Level 1 (Aecom, 2018).

4.2.3 Potential impacts to the site are discussed below.

Flooding from Fluvial/Tidal Sources

4.2.4 The nearest water network is located immediately adjacent to the north of site identified as an inland river not influenced by normal tidal action, and labelled on the historical maps as a drain.

4.2.5 The nearest main river is located approximately 650m east (Radlett Brook). Figure 06.2 of the 2018 SFRA reports the shows that the site is approximately 600m away from the largest modelled fluvial flood risk river (1 in 2 year defended modelled extent). In addition, Figure 08 of the 2018 SFRA shows that the site lies roughly 600m away from the nearest flood alert area associated with this river.

4.2.6 Tile B from the 2008 SFRA reports an incident of fluvial flooding approximately 270m south of the site. However, according to the 2008 SFRA no properties have been flooded from Radlett Brook since the implementation of a Flood Storage Area in 2002, designed to impound a 1 in 75 year flood on the Brook. In addition, Figure 09 of the 2018 SFRA reports no historic flood records from a main river within 500m of site.

4.2.7 No EA recorded flood outlines or EA historic flooding events are shown within 250m of site.

4.2.8 Given this information, and the fact that the site does not lie within an EA Flood Zone, it is considered there is a very low risk from fluvial flooding to occur at the site.

Groundwater Flooding

- 4.2.9 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather.
- 4.2.10 The Groundsure report shows the site within an area of low risk of groundwater flooding. Figure 11 of the 2018 SFRA indicates the site to lie within an area with 'limited potential for groundwater flooding to occur'.
- 4.2.11 Tile B from the 2008 SFRA reports 2 incidents of groundwater flooding within 500m of the site. The nearest incident is reported approximately 100m south.
- 4.2.12 A Flood Risk Assessment carried out for an adjacent property, discovered during a search of local planning applications, did not identify there to be a significant risk of groundwater flooding.
- 4.2.13 Given that the site is directly underlain by stratum of the Gerrards Cross Gravel Member and the Lambeth Group, there is potential for groundwater flooding to occur, but the risk is considered to be low.

Surface Water Flooding

- 4.2.14 Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems. It can run quickly off land and result in localised flooding.
- 4.2.15 According to the Figure 10.2 of the 2018 SFRA, the site is reported to be located within a very low risk surface water flood extent (<0.1% Annual Exceedance Probability (AEP)). This is likely associated with the drain located immediately north of site. The highest risk (3.3% AEP) associated with this waterway is situated 150m to the north.
- 4.2.16 Tile B reports that the site does not lie within 500m of a surface water flooding incident.
- 4.2.17 Figure 09 of the 2018 SFRA reports a historic flood record for land drainage 50m to the north.
- 4.2.18 The Groundsure reports the highest risk of surface water flooding on site and within 50m of site as 1 in 100 year, 0.1m – 0.3m.
- 4.2.19 The site does not lie within an EA Flood Zone.
- 4.2.20 The risk of surface water flooding is therefore considered to be low.

Sewer/Artificial Flooding

- 4.2.21 Although a pond was noted on-site during the walkover, it is considered too small to be an artificial source of flooding. In addition, swimming pools were noted in the area from aerial images and historical maps. However, they will be at ground level and have associated overflow drainage. It is therefore considered that these items do not pose a risk of flooding to the site.
- 4.2.22 No other artificial water sources were identified within 100m of site. Figure 13 of the 2018 SFRA indicates the site to not be within the maximum extent of flooding of reservoirs.
- 4.2.23 Tile K from the 2008 SFRA indicates that the site lies within an area of low risk of sewer flooding. Tile E reports the nearest drainage infrastructure flooding incident approximately 475m south-east of the site.
- 4.2.24 Figure 12 from the 2018 SFRA shows the area around site has recorded between 6-10 sewer flooding incidents.
- 4.2.25 The risk of sewer/artificial flooding is therefore considered to be low.

Sustainable Drainage Systems (SuDS)

- 4.2.26 The proposed development comprises a building footprint that is larger than the existing hardstanding and, as a result, is likely to increase the proportion of impermeable areas on site.
- 4.2.27 However, in accordance with the NPPF, PPG and LLFA policy requirements, sustainable drainage systems (SUDS) should be incorporated wherever possible to reduce positive surface water run-off and flood risk to other areas.
- 4.2.28 Given the expected underlying ground and hydrogeological conditions it is considered that some infiltration drainage may be suitable. Furthermore, Figure 14 of the 2018 SFRA notes that the site lies within an area that is 'probably compatible for infiltration SuDS', although an area where 'very significant constraints are identified' is shown in close proximity to the north of the site. Infiltration testing carried out by Jomas in 2016 at a neighbouring property concluded that soakaways were not suitable. Therefore, the suitability for alternative infiltration SuDS drainage should be confirmed by a ground investigation.
- 4.2.29 SuDS drainage may include the replacement of hard cover with permeable hardstanding and surface / above-ground attenuation prior to discharge to storm sewers.

Conclusion

4.2.30 Based on the available data, the site is considered to be at low risk from identified potential sources of flooding. The basement can be constructed and operated safely in flood risk terms without increasing flood risk elsewhere and is therefore considered NPPF compliant.

4.2.31 Excerpts of maps contained within in the Hertsmere Borough Council documents (See 4.2.2.) are included in Appendix 1.

**4.3 Sequential and Exception Tests**

4.3.1 The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

**Sequential Test:** site is not within a Flood Zone and no additional dwelling hence pass by default.

4.3.2 Paragraph 19 of PPS25 recognizes the fact that wider sustainable development criteria may require the development of some land that cannot be delivered through the sequential test. In these circumstances, the Exception Test can be applied to some developments depending on their vulnerability classification (Table D.2 of PPS25). The Exception Test provides a method of managing flood risk while still allowing necessary development to occur.

**Exception Test:** site is not within a Flood Zone hence pass by default and low risk posed to and from other sources.

**4.4 Flood Resilience**

4.4.1 In accordance with general basement flood policy and basement design, the proposed development will utilize the flood resilient techniques recommended in the NPPF Technical Guidance where appropriate and also the recommendations that have previously been issued by various councils.

4.4.2 These include:

- Basement to be fully waterproofed (tanked) and waterproofing to be tied in to the ground floor slab as appropriate: to reduce the turnaround time for returning the property to full operation after a flood event.
- Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event.
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property.

## SECTION 4

### HYDROGEOLOGY, HYDROLOGY AND FLOOD RISK REVIEW

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- Any wood fixings on basement / ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event.
- The basement waterproofing where feasible will be extended to an appropriate level above existing ground levels.
- The concrete sub floor as standard will likely be laid to fall to drains or gullies which will remove any build-up of ground water to a sump pump where it will be pumped into the mains sewer. This pump will be fitted with a non-return valve to prevent water backing up into the property should the mains sewer become full.
- Insulation to the external walls will be specified as rigid board which has impermeable foil facings that are resistant to the passage of water vapour and double the thermal resistance of the cavity.



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## 5 SCREENING AND SCOPING ASSESSMENT

### 5.1 Screening Assessment

- 5.1.1 Screening is the process of determining whether or not there are areas of concern which require a BIA for a particular project. This was undertaken in previous sections by the site characterisation. Scoping is the process of producing a statement which defines further matters of concern identified in the screening stage. This defining is in terms of ground processes in order that a site specific BIA can be designed and executed by deciding what aspects identified in the screening stage require further investigation by desk research or intrusive drilling and monitoring or other work.
- 5.1.2 The scoping stage highlights areas of concern where further investigation, intrusive soil and water testing and groundwater monitoring may be required.
- 5.1.3 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided. Within the pro forma a series of tables have been used to identify what issues are relevant to the site.
- 5.1.4 Each question posed in the tables is completed by answering “Yes”, “No” or “Unknown”. Any question answered with “Yes” or “Unknown” is then subsequently carried forward to the scoping phase of the assessment.
- 5.1.5 The results of the screening process for the site are provided in Table 5.1 below. Where further discussion is required the items have been carried forward to scoping.
- 5.1.6 The numbering within the questions refers the reader to the appropriate question / section in the London Borough of Camden BIA pro forma.
- 5.1.7 It should also be noted that the Hertsmere Borough Council may not place the same importance on the issues identified in the London Borough of Camden’s guidance documents. It should be noted that the pro forma is mainly concerned with the pond chain on Hampstead Heath, if other ponds / waterbodies may similarly affect the development Jomas will indicate this.
- 5.1.8 A ground investigation is undertaken where necessary to establish base conditions and the impact assessment determines the impact of the proposed basement on the baseline conditions, taking into account any mitigating measures proposed.

**Table 5.1: Screening Assessment**

Query	Y / N	Comment
<b>Subterranean (Groundwater) Flow (see London Borough of Camden BIA Pro Forma Section 4.1.1)</b>		
1a) Is the site located directly above an aquifer?	Yes	The site is directly underlain by the Gerrards Cross Gravel Member, a Secondary (A) aquifer.
1b) Will the proposed basement extend below the surface of the water table?	Unknown	The basement may potentially extend below a water table within the superficial deposits. This should be confirmed by a ground investigation.
2) Is the site within 100m of a watercourse, well (disused or used) or a potential spring line?	Yes	1No detailed river network and surface water feature within 100m of site; recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site.
3) Is the site within the catchment of any surface water features?	Yes	6No detailed river networks and surface water features within 500m of site; nearest recorded as an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site. It is possible that groundwater under the site (if present), would be in continuity with this feature.  The Groundsure report reports the site to lie within the surface water body catchment of Tykeswater River.
4) Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	Yes	The proposed development will extend over an area larger than is covered by existing hardstanding and, as a result, is likely to increase impermeable areas on site.
5) As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	Yes	The proposed development will extend over an area larger than is covered by existing hardstanding and, as a result, is likely to increase rainfall and run-off discharge to the ground.
6) Is the lowest point of the proposed excavation (allowing of any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath or spring line)?	No	No ponds within 250m of the site.
<b>Slope Stability ((see London Borough of Camden BIA Pro Forma Section 4.2)</b>		
1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No	The site level reduces in elevation from south to north at an angle of approximately 5 degrees.
2) Will the proposed re-profiling of landscaping change slopes at the property to more than 7 degrees? (approximately 1 in 8)	Unknown	Re-profiling of change of slopes is anticipated as the proposed development will comprise the

**SECTION 5**  
**SCREENING AND SCOPING ASSESSMENT**

Query	Y / N	Comment
		demolition of the existing building, and construction of a new larger house.
3) Does the developments' neighbouring land include railway cuttings and the like, with a slope greater than 7 degrees? (approximately 1 in 8)	No	No railways are reported within 250m of the site. Other land uses neighbouring site are residential.
4) Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)	No	Surrounding area is generally sloping down towards the north at an angle of approximately 5 degrees.
5) Is the London Clay the shallowest strata at the site?	No	The site is directly underlain by superficial deposits of the Gerrards Cross Gravel Member, these deposits are underlain by the Lambeth Group.
6) Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	Yes	Numerous trees were noted on site during the walkover. The proposed plans suggest that a tree along the southern boundary will be felled to create access space into site.
7) Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Unknown	The site is reported to be in area at moderate risk from shrink-swell clays. No evidence of structural distress caused by seasonal shrink / swell was noted during the external walkover.
8) Is the site within 100m of a watercourse or a spring line?	Yes	The nearest recorded watercourse is an 'inland river not influenced by normal tidal action' immediately adjacent to the north of site.
9) Is the site within an area of previously worked ground?	No	Site has only had the current development in place.
10) Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Unknown	The site is directly underlain by the Gerrards Cross Gravel Member, a Secondary (A) aquifer, underlain by the Lambeth Group, also a Secondary A aquifer. Ground water level should be assessed by a ground investigation prior to construction to confirm its presence and level.
11) Is the site within 50m of the Hampstead Heath ponds (or other waterbody)?	No	No waterbodies within 50m of the site.
12) Is the site within 5m of a highway or pedestrian 'right of way'?	Yes	The site faces onto a pavement and road on the south.
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Unknown	Neighbouring foundations are unknown.
14) Is the site over (or within the exclusion of) any tunnels e.g. railway lines?	No	No railway tunnels or underground railways are reported within 250m of site.

Query	Y / N	Comment
<b>Surface Flow and Flooding (see London Borough of Camden BIA Pro Forma Section 4.3)</b>		
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	-
2) As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially different from the existing route?	Yes	The proposed development will comprise a basement within the footprint of a new building that is larger than the existing building, and therefore surface water flow is likely to be affected.  The site is currently partially covered by hardstanding. Consequently, replacement of the hardstanding with permeable paving as part of the likely required SUDs would increase the amount of water that would be discharged to the ground.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	The proposed development will comprise a basement within the footprint of a new building that is larger than the existing building. It is likely there will be a significant increase in the proportion of hard surfaces.
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	Yes	The proposed development will comprise a basement within the footprint of a new building that is larger than the existing building. It is likely there will be a significant impact to surface water flow.
5) Will the proposed basement result in changes to the quality of surface waters being received by adjacent properties or downstream watercourses?	No	Surface water quality is unlikely to be significantly impacted.
6) Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No	Site is not located within an EA flood zone, and negligible to low risk of flooding from sources outlined in Section 4.2.

## 5.2 Scoping

5.2.1 Scoping is the activity of defining in further detail the matters to be investigated as part of the BIA process. Scoping comprises of the definition of the required investigation needed in order to determine in detail the nature and significance of the potential impacts identified during screening.

5.2.2 The potential impacts for each of the matters highlighted in Table 5.1 above are discussed in further detail below together with the requirements for further

investigations. Detailed assessment of the potential impacts and recommendations are provided where possible.

Subterranean (Groundwater) Flow

- 5.2.3 A ground investigation is recommended to confirm the ground conditions and groundwater levels (if any) beneath the site. This can then be used to confirm the relative depths of the basement to the groundwater levels.

Land Stability

- 5.2.4 The site, as with the surrounding area, is sloping down towards the north at an angle of approximately 5 degrees. The Groundsure report has noted that there is a “very low” risk of land instability issues for the site.
- 5.2.5 The recommended ground investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg Limits of the underlying clay should be determined by the ground investigation to assess shrink/swell potential of the soils.
- 5.2.6 The Groundsure report indicates there to be a requirement to consider the possible impact of localised historical chalk mining beneath the site. This should also be addressed by the ground investigation.
- 5.2.7 It is noted that the London Borough of Camden’s guidance documents requires a Ground Movement Assessment to be undertaken as part of the Basement Impact Assessment. Such an assessment uses a ground model based on a zone of influence equivalent of four times the proposed depth of excavation. Consequently, such a study is recommended.

Surface Flow and Flooding

- 5.2.8 The proposed development will comprise the demolition of the existing building and construction of a larger structure; as a result, it is likely there will be increases in surface water run-off.
- 5.2.9 However, SUDS will be required by NPPF, PPG and LLFA policy requirements, which will be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of flooding.

## **6 PRELIMINARY BASEMENT IMPACT ASSESSMENT**

### **6.1 Proposed Changes to Areas of External Hardstanding**

6.1.1 The existing site is approximately 75% hardstanding underfoot made up of the footprint of the building, paved pathways and patio area, and asphalt areas in the rear garden. The remainder of site is soft landscaping, comprising a gravel driveway and grass area in the rear garden.

6.1.2 The proposed development comprises the demolition of the existing buildings, and construction of a 3-storey building with an associated basement, parking areas, driveway, and terracing. As a result, there is likely to be an increase in the proportion of hardstanding.

6.1.3 However, as SUDS will be required by NPPF, PPG and LLFA policy requirements, this will mitigate the impact of any increase in surface water runoff.

### **6.2 Past Flooding**

6.2.1 The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.

6.2.2 When assessing the site-specific flood risk and the potential for historic flooding to reoccur the above guidance recommends that, historic flooding records and any other relevant and available information including flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired are assessed.

6.2.3 Tile B of the 2008 SFRA reports an incident of groundwater flooding approximately 100m south of the site. No flood incidents relating to fluvial, sewers or artificial sources was reported within 250m of site by the 2008 SFRA. Figure 09 of the 2018 SFRA reports a historic surface water flood event for land drainage 50m north. However, the site is not reported to be located within a surface water flood extent.

6.2.4 The site is therefore considered to be at low risk of flooding based on historic flooding.

### **6.3 Geological Impact**

6.3.1 The published geological maps indicate that the site is directly underlain by superficial deposits of the Gerrards Cross Gravel member. These superficial deposits are underlain by solid deposits of the Lambeth Group. This will be confirmed by the intrusive investigation.

6.3.2 There is a possibility that soils may be prone to seasonal shrinkage and swelling that arises due to changing water content in the soil, and this may require consideration to accommodate in the basement design.

6.3.3 The proximity of the nearby water course means that it and groundwater within the expected granular superficial deposits beneath the site may be in hydraulic continuity. This may reduce the suitability/capacity of soakaways as part of the required SUDS.

6.3.4 The groundwater conditions and shrink/swell properties of soils should be determined by a ground investigation.

#### **6.4 Hydrology and Hydrogeology Impact**

6.4.1 Based on the information available at the time of writing, the risk of flooding from groundwater is considered to be low. The proposed basement is unlikely to have a detectable impact on the local groundwater regime.

6.4.2 Appropriate water proofing measures should be included within the whole of the proposed basement wall/floor design as a precaution.

6.4.3 The proposed development will lie outside of flood risk zones and is therefore assessed as being at a low probability of fluvial flooding.

6.4.4 There are 2No surface water features on or within 250m of the site. The nearest is reported as 'an inland river not influenced by normal tidal action', located adjacent to the northern boundary of the site. Due to the potentially permeable nature of the superficial deposits, the water course may be in hydraulic conductivity with any groundwater that may be present beneath the site. There is therefore the potential that the site development will have an impact upon the hydrology of the area. This should be confirmed by ground investigation.

6.4.5 The Gerrards Cross Gravel Member and Lambeth Group are both classed as Secondary A Aquifers but the creation of the basement is considered unlikely to have any significant impact upon the hydrogeology of the area.

6.4.6 The information available suggests that the site lies in an area that is at low risk of surface water flooding.

6.4.7 The proposed basement construction is considered unlikely to create a reduction of impermeable area in the post development scenario.

6.4.8 No risk of flooding to the site from artificial sources has been identified.

#### **6.5 Impacts of Basement on Adjacent Properties and Pavement**

6.5.1 The proposed basement excavation will not be within 5m of a public pavement, but it is within 5m of neighbouring properties.

6.5.2 Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact

adversely on the stability of the surrounding ground, any associated services and structures.

6.5.3 It is recommended that the site is supported by suitably designed temporary support with a basement box construction. This will ensure that the adjacent land is adequately supported in the temporary and permanent construction.

6.5.4 Careful and regular monitoring of the structure will need to be undertaken during the construction phase to ensure that vertical movements do not adversely affect the above property. If necessary, the works may have to be carried out in stages with the above structure suitably propped and supported.

6.5.5 It will be necessary to ensure that the basements are designed in accordance with the NHBC Standards and take due cognisance of the potential impacts highlighted above. This may be achieved by ensuring best practice engineering and design of the proposed scheme by competent persons and in full accordance with the Construction (Design and Management) Regulations. This will include:

- Establishment of the likely ground movements arising from the temporary and permanent works and the mitigation of excessive movements;
- Assessment of the impact on any adjacent structures (including adjacent properties and the adjacent pavement with potential services);
- Determination of the most appropriate methods of construction of the proposed basements;
- Undertake pre-condition surveys of adjacent structures;
- Monitor any movements and pre-existing cracks during construction;
- Establishment of contingencies to deal with adverse performance;
- Ensuring quality of workmanship by competent persons.

6.5.6 Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Developer to the Hertsmere Borough Council.

## **6.6 Cumulative Impacts**

6.6.1 Based on a review of the above, it is unlikely that the above individual effects could interact to form a greater issue to the hydrology or hydrogeology of the area.



**6.7 Ground Movement**

6.7.1 CIRIA C580 Table 2.5 uses information on the damage to walls of buildings based on Burland et al (1977), Boscardin and Cording (1989) and Burland (2001) to categorise damage into 5 categories. A summary of Table 2.5 from CIRIA C580 is provided below.

6.7.2 It would be generally good practise to ensure that the design and construction should aim to limit damage to all buildings to a maximum of Category 2 (Slight) as set out in CIRIA Report 580.

**Table 6.1: Summary of CIRIA C580 Table 2.5 (after Burland et al (1977), Boscardin and Cording (1989) and Burland (2001))**

Category of damage	Description of Typical Damage	Approximate crack width (mm)	Limiting tensile strain (%)	
0	Negligible	Hairline cracks of less than about 0.1mm are classes as negligible.	< 0.1	0.0-0.05
1	Very Slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	<1	0.05-0.075
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weather tightness. Doors and windows may stick slightly	<5	0.075-0.15
3	Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired.	5-15 or a number of cracks >3	0.15 – 0.3
4	Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floors sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15-25 but also depends on number of cracks	>0.3
5	Very Severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25 but depends on number of cracks	

6.7.3 The first three categories (namely Negligible, Very Slight and Slight categories) are generally regarded as acceptable for buildings where no structural damage is permissible.

**SECTION 6**  
**PRELIMINARY BASEMENT IMPACT**  
**ASSESSMENT**

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- 6.7.4 Assuming cantilever retaining walls are formed in short sections, it is considered that in the short term maintaining the category of damage to Category 1 could be relatively easily achieved. It would be recommended that a full inspection of the neighbouring properties should be undertaken prior to starting work and a watching brief of the structure, the excavations and the adjacent properties is maintained during the works.
- 6.7.5 In the long term a suitably designed and constructed retaining wall should provide sufficient support to ensure that post construction movement is minimal and the damage classification post construction of any cracks caused in the short term should not get worse. It is considered unlikely that new cracks would occur post construction.
- 6.7.6 This advice is provided based on the limited ground investigation undertaken and is not a full Ground Movement Assessment.

## 7 QUALITATIVE RISK ASSESSMENT

### 7.1 Legislative Framework

7.1.1 A qualitative risk assessment has been prepared for the site, based on the information collated. This highlights the potential sources, pathways and receptors. Intrusive investigations will be required to confirm the actual site conditions and risks.

7.1.2 Under Part IIA of the Environmental Protection Act 1990, the statutory definition of contaminated land is:

*“land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*

*(a) significant harm is being caused or there is a significant possibility of such harm being caused; or*

*(b) pollution of controlled waters is being, or is likely to be, caused.”*

7.1.3 The Statutory Guidance provided in the DEFRA Circular 01/2006 lists the following categories of significant harm:

- death, disease, serious injury, genetic mutation, birth defects or the impairment of reproduction functions in human beings;
- irreversible adverse change, or threat to endangered species, affecting an ecosystem in a protected area (i.e. site of special scientific interest);
- death, serious disease or serious physical damage to pets, livestock, game animals or fish;
- a substantial loss in yield or value of crops, timber or produce; and
- structural failure, substantial damage or substantial interference with right of occupation to any building.

7.1.4 Contaminated land will only be identified when a ‘pollutant linkage’ has been established.

7.1.5 A ‘pollutant linkage’ is defined in Part IIA as:

*“A linkage between a contaminant Source and a Receptor by means of a Pathway”.*

7.1.6 Therefore, this report presents an assessment of the potential pollutant linkages that may be associated with the site, in order to determine whether additional investigations are required to assess their significance.

7.1.7 In accordance with the National Planning Policy Framework, where development is proposed, the developer is responsible for ensuring that the development is safe and suitable for use for the purpose for which it is intended, or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:

- whether the land in question is already affected by contamination through source – pathway – receptor pollutant linkages and how those linkages are represented in a conceptual model;

- whether the development proposed will create new linkages, e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors; and
- what action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable development and future occupancy of the site and neighbouring land.

7.1.8 A potential developer will need to satisfy the Local Authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

## **7.2 Conceptual Site Model**

7.2.1 On the basis of the information summarised above, a conceptual site model (CSM) has been developed for the site. The CSM is used to guide the investigation activities at the site and identifies potential contamination sources, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential “pollutant linkages” is a key aspect of the evaluation of potentially contaminated land.

7.2.2 The site investigation is then undertaken in order to prove or disprove the presence of these potential source-pathway-receptor linkages. Under current legislation an environmental risk is only deemed to exist if there are proven linkages between all three elements (source, pathway and receptor).

7.2.3 This part of the report lists the potential sources, pathways and receptors at the site, and assesses based on current and future land use, whether pollution linkages are possible.

7.2.4 Potential pollutant linkages identified at the site are detailed below:

**Table 7.1: Potential Sources, Pathways and Receptors**

Source(s)	Pathway(s)	Receptor(s)
<ul style="list-style-type: none"> <li>● Potential for Made Ground associated with previous development operations – on site (S1)</li> <li>● Potential asbestos containing materials within existing buildings – on site (S2)</li> <li>● Potential infilled land – off site (S3)                             <ul style="list-style-type: none"> <li>- Possible old quarry: 157m NW</li> <li>- Ponds: 170m SE, 220m S, 250m E and 280m SW</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Ingestion and dermal contact with contaminated soil (P1)</li> <li>● Inhalation or contact with potentially contaminated dust and vapours (P2)</li> <li>● Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hard standing or via service pipe/corridors and surface water runoff. (P3)</li> <li>● Horizontal and vertical migration of contaminants within groundwater (P4)</li> <li>● Accumulation and Migration of Soil Gases (P5)</li> <li>● Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)</li> </ul>	<ul style="list-style-type: none"> <li>● Construction workers (R1)</li> <li>● Maintenance workers (R2)</li> <li>● Neighbouring site users (R3)</li> <li>● Future site users (R4)</li> <li>● Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> <li>● Controlled Waters (R6)                             <ul style="list-style-type: none"> <li>- Secondary A aquifer</li> <li>- SPZ 2 (outer catchment) on site</li> <li>- SPZ 1 (inner catchment) 48m NW</li> <li>- 15No reported groundwater abstractions within 2km of site; nearest recorded as an active abstraction for direct spray irrigation 1262m east</li> <li>- 1No reported potable abstraction within 2km of site, recorded as an active abstraction for direct water supply 1738m north</li> <li>- 6No surface water features and detailed river networks within 500m of site; nearest recorded as an ‘inland river not influenced by normal tidal action’ immediately adjacent to the north of site</li> </ul> </li> </ul>

**7.3 Qualitative Risk Estimation**

7.3.1 Based on information previously presented in this report, a qualitative risk estimation was undertaken.

7.3.2 For each potential pollutant linkage identified in the conceptual model, the potential risk can be evaluated, based on the following principle:

Overall contamination risk = Probability of event occurring x Consequence of event occurring

7.3.3 In accordance with CIRIA C552, the consequence of a risk occurring has been classified into the following categories:

- Severe
- Medium
- Mild
- Minor

7.3.4 The probability of a risk occurring has been classified into the following categories:

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

7.3.5 This relationship can be represented graphically as a matrix (Table 7.2).

**Table 7.2: Overall Contamination Risk Matrix**

		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

7.3.6 The risk assessment process is based on guidance provided in CIRIA C552 (2001) *Contaminated Land Risk Assessment – A Guide to Good Practice*. Further information including definitions of descriptive terms used in the risk assessment process is included in Appendix 4.

7.3.7 The degree of risk is based on a combination of the potential sources and the sensitivity of the environment. The risk classifications can be cross checked with reference to Table A4.4 in Appendix 4.

7.3.8 Hazard assessment was also carried out, the outcome of which could be:

- Urgent Action (UA) required to break existing source-pathway-receptor link.
- Ground Investigation (GI) required to gather more information.
- Watching Brief there is no evidence of potential contamination but the possibility of it exists and so the site should be monitored for local and olfactory evidence of contamination.
- No action required (NA).

7.3.9 The preliminary risk assessment for the site is presented in Table 7.3 overleaf.

SECTION 7

QUALITATIVE RISK ASSESSMENT



Table 7.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
<ul style="list-style-type: none"> <li>Potential for Made Ground associated with previous development operations – on site (S1)</li> <li>Potential asbestos containing materials within existing buildings – on site (S2)</li> <li>Potential infilled land – off site (S3)                             <ul style="list-style-type: none"> <li>Possible old quarry: 157m NW</li> <li>Ponds: 170m SE, 220m S, 250m E, and 280m SW</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Ingestion and dermal contact with contaminated soil (P1)</li> <li>Inhalation or contact with potentially contaminated dust and vapours (P2)</li> <li>Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)</li> </ul>	<ul style="list-style-type: none"> <li>Construction workers (R1)</li> <li>Maintenance workers (R2)</li> <li>Neighbouring site users (R3)</li> <li>Future site users (R4)</li> <li>Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> </ul>	Medium	Unlikely	Low	Watching brief
	<ul style="list-style-type: none"> <li>Accumulation and migration of soil gases (P5)</li> </ul>		Severe	Unlikely	Low	
	<ul style="list-style-type: none"> <li>Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3)</li> <li>Horizontal and vertical migration of contaminants within groundwater (P4)</li> </ul>	<ul style="list-style-type: none"> <li>Neighbouring site users (R3)</li> <li>Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> <li>Controlled Waters (R6)                             <ul style="list-style-type: none"> <li>Secondary A aquifer</li> <li>SPZ 2 (outer catchment) on site</li> <li>SPZ 1 (inner catchment) 48m NW</li> <li>15No reported groundwater abstractions within 2km; nearest for direct spray irrigation 1262m east</li> <li>1No reported potable abstraction within 2km of site, recorded as an active abstraction for direct water supply 1738m north</li> <li>6No surface water features and detailed river networks within 500m of site; nearest recorded as an ‘inland river not influenced by normal tidal action’ immediately adjacent to the north of site</li> </ul> </li> </ul>	Medium	Unlikely	Low	



7.3.10 It should be noted that the identification of potential pollutant linkages does not necessarily signify that the site is unsuitable for its current or proposed land use. It does however act as a way of focussing data collection at the site in accordance with regulatory guidance in LCRM.

#### **7.4 Outcome of Risk Assessment**

7.4.1 It is understood that the proposed development comprises the demolition of the existing buildings, and construction of a 3-storey building with an associated basement, parking areas, driveway, and terracing.

7.4.2 The risk estimation matrix indicates a low risk as defined above.

7.4.3 Due to the potential presence of asbestos containing materials, an asbestos survey should be undertaken, with any asbestos containing materials found, removed under suitably controlled conditions. There should be no risk to end users from asbestos if the potential asbestos containing materials are removed by suitably qualified and experienced specialists under controlled conditions.

7.4.4 On the earliest available map (1871), the site is shown as a vacant plot of land, potentially being used for agricultural use. The site remains devoid of any features until the map dated 1913, when a single large building is shown towards the south of the site. By this time, the north of site appears to be wooded. With the exceptions of various small-scale extensions at the end of the 1960's, no significant changes have occurred to the site until the most recent map dated 2023. The site remains currently a residential house.

7.4.5 Historically, the surrounding area has comprised mainly agricultural use, with residential developments taking place in a period of urbanisation in the first half of the 20<sup>th</sup> century.

7.4.6 Various ponds were noted in the site vicinity during the historical map review. In the first historical map dated 1871, small ponds were reported approximately 170m south-east, 220m south, 250m east, and 280m south-west. By the map dated 1913, the ponds 170m south-east and 250m east appear to have been infilled. In addition, by 1970 the ponds 220m south and 280m south-west appear to have been infilled. Furthermore, a suspected small old quarry is present 157m to the northwest of the site, noted on mapping between 1971 and 1989. Dense vegetation shown on aerial photographs makes it unclear whether this has been infilled or otherwise. Nonetheless, due to the small size, age of (potential) infill material and distance from the site, these features are not considered to pose a significant risk of ground gas to the site.

7.4.7 No significant potential sources of contamination were identified during the desk-based assessment. However, it is recommended that a number of soil samples obtained during the recommended geotechnical investigation are analysed for a suite

of general contaminants to confirm the anticipated absence of significant contamination at the site.

- 7.4.8 It is also recommended that testing is undertaken to help categorise the material that will be excavated for waste disposal purposes.

**8 REFERENCES**

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## **APPENDICES**

## **APPENDIX 1 – FIGURES**

## **APPENDIX 2 – GROUNDSURE REPORTS**

## **APPENDIX 3 – OS HISTORICAL MAPS**

## **APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY**



## **APPENDIX 5 – BGS BOREHOLE RECORDS**

## **APPENDIX 6 – LOCAL AUTHORITY INFORMATION**

WE LISTEN, WE PLAN, WE DELIVER

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The Chartered Institution of Wastes Management



The Geological Society



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