DESK STUDY
BASEMENT IMPACT ASSESSMENT
(SCREENING & SCOPING)
REPORT

FOR

138-140 HIGHGATE ROAD
HIGHGATE
LONDON
NW5 1PB

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EXECUTIVE SUMMARY

Design Ventures Highgate Ltd ("The Client") has commissioned Jomas Associates Ltd ('Jomas), to prepare a Basement Impact Assessment and ground investigation for a site referred to as 138-140 Highgate Road, Highgate, London NW5 1PB. A single-storey basement excavation is to be included in the new proposed development . A preliminary Desk study and Basement Impact Assessment (Scoping & Screening) has previously been completed and has informed this ground investigation

The aim of this report is to assess whether the ground conditions within the local area represent an impediment to the proposed development.

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	
Current Site Use	The site is currently utilised as an operational fuel filling station and MOT test centre.
Proposed Site Use	It is understood that the proposed development will involve the demolition of the existing building and construction of a new four-storey residential development. The new development will include a lower ground floor (half of which is basement due to slope of ground) and a full single-storey basement below.
Site History	Earliest historical maps (1872) indicate that the site consists of an undeveloped agricultural field. Few major changes occur to the site until 1936 when an industrial-style unit was constructed on site, in the NW boundary of the site. By 1952 the industrial-style unit on site was identified as a garage which was demolished by 1970. By 1974 another garage was constructed in the NE of the site. The canopy above the forecourt are also appears to have been constructed at this time. The site appears to have remained in this configuration until present. The surrounding area has been utilised predominantly for residential use with limited industrial uses noted including railway, garages, various works and manufactories and an oil processing plant.
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation. No artificial deposits are reported within the site. Borehole records from approx. 200m northwest of site indicate the underlying geology to comprise stiff brown clay to an approximate depth of 10.7m bgl, overlying stiff blue clay to the base of the borehole at a depth 21.3m bgl. A review of the EnviroInsight Report indicates that there are no source protection zones within 500m of the site. There are no groundwater, surface water or potable water abstractions reported within 500m of the site.

	There are no detailed river entries or surface water features reported within 250m of the site.
Potential Sources	• Potential for hydrocarbon contaminated ground associated with previous site use as fuel station/garage – on site (S1) • Potential for Made Ground associated with previous development operations – on site (S2) • Potential buried tanks associated with former use as a fuel station/garage – on site (S3) • Current and previous industrial use – off site (S4) • Potential asbestos containing materials within existing buildings – on site (S5) • Potential asbestos impacted soils from demolition of previous buildings – on site (S6) • Potential ground gas generation associated with alluvial deposits and hydrocarbon impacted soils from historic use as fuel station - on site (S7).
Potential Receptors	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled Waters (Culvert) (R6)
Preliminary Risk Assessment	The risk estimation matrix indicates a moderate risk. The potential for significant contamination to be present on site is considered moderate. An intrusive investigation will be required to obtain geotechnical information and groundwater levels. Chemical testing on soil samples obtained should be undertaken to determine the presence and extent of any onsite contamination. A number of potential sources of ground gas have been noted on site, as a consequence ground gas monitoring is considered to be necessary. Groundwater monitoring will also be required for basement design and to confirm that the the fuel station is not affecting groundwater. Consequently, a minimum of 4No gas and groundwater visits are recommended and groundwater samples should also be obtained for chemical analysis
Potential Geological Hazards	The Groundsure data identifies a moderate risk of shrink/swell clay – all other geological hazards were reported as very low to negligible.

Basement Impact Assessment Screening and Scoping	
Subterranean (Groundwater) Flow	The proposed development should not increase the hardstanding and increase groundwater run-off into the ground. An intrusive investigation should be undertaken to confirm the ground conditions beneath the site including groundwater levels, if any.
Land Stability	The Groundsure report has noted that there is a "very low" risk of land instability issues. The site is currently supported by engineered methods (retaining wall) The investigation should also determine the possibility of encountering groundwater and the possibility of problematic Made Ground immediately beneath the site, indicating any potential issues relating to groundwater management and excavation stability.
Surface Flow and Flooding	The investigation should confirm the ground conditions beneath the site including the relative groundwater levels. No specific works are considered to be required to investigate surface flow and flooding.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Design Ventures Highgate Ltd ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Desk Study and Basement Impact Assessment (Screening and Scoping) report for a site referred to as 138-140 Highgate Road, Highgate, London, NW5 1PB.

1.1.2 Depending on the findings of this Desk Study, and Screening and Scoping stage of the Basement Impact Assessment, a Ground Investigation may be considered necessary.

1.1.3 Jomas' work has been undertaken in accordance with email proposal dated 10 January 2018.

1.2 Proposed Development

1.2.1 It is understood that the proposed development will involve the demolition of the existing building and construction of a new four-storey residential development. The new development will include a lower ground floor (half of which is basement due to slope of ground) and a full single -storey basement below.

1.2.2 The proposed development is deemed to be a "residential without plant uptake" site.

1.2.3 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. GC 2 projects are defined as involving:

- Conventional structures.
- Quantitative investigation and analysis.
- Normal risk.
- No difficult soil and site conditions.
- No difficult loading conditions.
- Routine design and construction methods.

1.2.4 A proposed development plan is attached in Appendix 1.

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 and historical Ordnance Survey maps
- A basement impact assessment;
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.
- Carrying out the Screening and Scoping stages of a Basement Impact Assessment.

1.5 Scope of Basement Impact Assessment (BIA)

1.5.1 The London Borough of Camden's document "Guidance for subterranean development" (Ref: CPG4 - November 2015) is used as a basis for these BIA works.

1.5.2 Jomas' BIA covers most items required under CPG4, with the exception of;

- Plans and sections to show foundation details of adjacent structures as no permission was granted for the acquisition of this information.
- 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 Burland Scale.
- Construction Sequence Methodology
- Proposals for monitoring during construction.
- Drainage assessment

1.6 Limitations

1.6.1 Jomas Associates Ltd ('Jomas') has prepared this report for the sole use of Design Ventures Highgate Ltd 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.

1.6.2 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.

1.6.3 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.

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

Name of Site	138-140 Highgate Road
Address of Site	138-140 Highgate Road Highgate London NW5 1PB
Approx. National Grid Ref.	528629, 185800
Site Area (Approx.)	0.07ha
Site Ownership	Unknown
Site Occupation	Petrol station and MOT test centre
Local Authority	London Borough of Camden
Proposed Site Use	Residential without plant uptake inclusive of single-storey basement

2.2 Walkover Survey

2.2.1 The site was visited by a Jomas Engineer on 05th February 2018. The following information was noted while on site.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	The site is an operational fuel filling station and MOT test centre.
	Evidence of historic uses:	Appears to have been a filling station for a significant amount of time.
	Surfaces:	The majority of the site is hardcover comprising the footprint of the building and external concrete slab. There is a limited soft-landscaping.
	Vegetation:	A small flowerbed is situated adjacent to the western boundary, and also in the NW corner of the site. Vegetation consists of flowers and small shrubs and trees.

Area	Item	Details
	Topography / Slope Stability:	Overall the site reduces gently in level from north to south. The ground surrounding the site slopes significantly to the SW. This reduction in level is highlighted on the NW, NE and SW boundaries where walls retain the ground outside the site (site appears to have been cut in). The ground to the NE is approx. 2m higher than site level. The NW and SE walls taper down from approx. 2.00m high in the east to 0.50m high in the west.
	Drainage:	Drainage channels appear to divert surface run-off to an interceptor in the SW corner of the site.
	Services:	The site appears to be connected to normal statutory services.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	There are a number of manhole covers across the site, most of which are located in proximity to the fuel pumps and presumably indicate fuel tanks. There also appears to be an interceptor in the SW corner.
Neighbouring land:	**North:**	Residential
	East:	MOT garage approx. 30m to the SE of site.
	South:	Residential
	West:	Commercial/residential

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

2.3 Anecdotal Information

2.3.1 During Jomas' site visit, no anecdotal information regarding the contaminative status of the site, including historic or current fuel tanks on site was provided.

2.4 Historical Mapping Information

2.4.1 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 provided in Appendix 3 of this report.

2.4.2 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**
1872 1:1,056 1:10,560	Site is currently undeveloped land.	The majority of the immediately surrounding land is undeveloped with some residential dwellings. Large residential development of Kentish Town is located 750m south. A **railway line** is shown approx. 30m south running broadly NE-SW. Highgate Road Station is shown approx. 50m south. Grove Farm is located 450m NW. Reservoirs are shown 600m NE. Highgate Ponds are located 800m NW.
1882 1:10,560	No significant changes.	No significant change.
1894-1896 1:1,056 1:2,500 1:10,560	No significant changes.	Road immediately adjacent to the NE now identified as College Road. A **tramway** has been constructed immediately adjacent to the SW. Residential development of the Highgate area in the form of terrace housing approx. 20m NE. A **tunnel** appears to have been constructed approx. 60m south. **Coal depot** shown approx. 300m SE. **Brick works** shown approx. 400m SE. Midland **works located** 600m south. A **Tramway depot** is shown 1km NE.
1915-1920 1:1,056 1:10,560	No significant changes.	An **electric generating station** is now located approx. 150m SE. A **miniature rifle range** is located approx. 150m NE. **Locomotive sheds** are shown approx. 120m SW. Bottling stores are noted 450m SW. Further residential development of the surrounding Highgate area.
1936-1938 1:2,500 1:10,560	An industrial-style unit has now been constructed on the NW boundary of the site.	Allotment gardens have been developed 150m to the NE and SE. **Harbar Works** (Iron strips & bar) located 200m east. **Wallpaper factory** noted 250m SE. **Timber yard** is shown 500m SW.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1952-1954 1:10,560	The industrial-style unit is now identified as a **garage.**	Disused **coal hoppers** located 90m SW. **Garages** are listed 100m west. **Wallpaper factory** located 120m west. **Oil processing plant** with numerous **tanks** located 150m SW. **Cardboard box factory** is noted 120m south. **Vacuum flask factory** is noted 220m SW.
1968 – 1970 1:2,500 (partial coverage) 1:10,560	The industrial-style unit identified as a **garage** appears to have been demolished.	**Printing works** located 110m south. **Electronics works** located 120m south.
1974 1:2,500	Another industrial-style unit has been constructed on the NE boundary of the site. This is also identified as a **garage**. There also appears to be a canopy constructed above the forecourt area.	No significant changes.
1981 1:1,250	No significant changes, site appears to be in its current configuration from this point.	Railway depot 120m SW has now been redeveloped into residential housing.
1991 1:1,250 1:10,000	No significant changes.	Continued small scale expansion of the developed areas.
2002 1:10,000	No significant changes.	No significant changes.
2010 1:10,000	No significant changes.	No significant changes.
2014 1:10,000	No significant changes.	No significant changes.

2.4.4 An aerial photograph supplied as part of the GroundSure EnviroInsight report and taken in 2016 generally appears to confirm the comments made regarding the site and surrounding area for that period.

2.5 Previous Site Investigations

2.5.1 A desk study report was undertaken by Soils Limited in 2014.

2.5.2 The report highlighted the onsite garage (underground tanks, petrol interceptors, fuel supply lines) as a potential source of hazardous organic compounds.

2.5.3 Soils Limited also identified the localised soil geochemistry as a potential source of hazardous metals or metallic compounds.

2.5.4 Potential offsite sources identified by Soils Limited included: railways, garages, depots, an oil processing plant and various works and factories.

2.5.5 As a result of their desk study report, Soils Limited went on to recommend an intrusive ground investigation. It was recommended that this should comprise drilling of boreholes using a window sampler and cable percussive drilling rig at various positions across the site. Chemical testing of the subsequent soil samples would then be undertaken to assess the validity of the conceptual site model.

2.5.6 Due to the current and former uses of the site as a petrol filling station, a Petroleum Environmental Search from the London Fire and Emergency Planning Authority (LFEPA) was requested by Soils Limited as part of their desk study. This search identified 4No subsurface fuel containing petrol, diesel and kerosene. The appendices of this report are not available and therefore the full correspondence with LFEPA cannot be accessed.

2.6 London Fire and Emergency Planning Authority (LFEPA)

2.6.1 Due to the identified use of the site as a garage and the presumed presence of underground storage tanks, a request for information from the London Fire and Emergency Planning Authority (LFEPA) was undertaken by Jomas.

2.6.2 A response the LFEPA dated 13 February 2018 is included in Appendix 6.

2.6.3 The LFPA response is summarised below:

- According to the LFEPA records the site was first licensed in 1959 and the site has been occupied by A S F Garages Ltd since1969.
- There are four known in-use tanks on site that are used for the storage of diesel and petrol. 2 tanks (which are split into 4 compartments, each with a capacity of ~18000 litres) were installed in 1998 and are of double skin steel construction. These are shown to be located beneath the existing canopy.
- A further 2 tanks, each of ~14000 litre capacity, are recorded to be in-use on site and are of single steel construction and were installed in 1959. These are recorded to store kerosene and diesel. The locations of these tanks are not known, although a site plan dated 1972 shows a kerosene and waste oil tank located north east of the canopy (towards the workshop). The 1972 plan also shows two further tanks located approximately below the current canopy, which are assumed to have been removed during the 1998 retank. Further abandoned tanks are shown to the east and west of the existing canopy.
- A petrol interceptor is indicated to have been present in the southern corner of the site (beneath the site egress), although this appears to have been demolished with a new interceptor installed to the north of it in 1998.
- The current tanks on site are a combination of both single and double skin steel tanks.

- The petrol station is currently licensed for sale of petroleum spirits, with the license last granted in December 2017.

- There are no known leaks or spills recorded on file pertaining to this site.

2.7 Local Authority Information

2.7.1 Jomas have made a request to London Borough of Camden for information relating to contamination on the site and surrounding areas. A copy of the correspondence between Jomas and the London Borough of Camden is included in Appendix 6.

2.7.2 A response is pending.

2.8 Planning Information

2.8.1 A review of the local authority's planning portal was undertaken on 19th February 2018 at http://planningrecords.camden.gov.uk/Northgate/PlanningExplorer17/Generic/StdResults.aspx?PT=Planning%20Applications%20On-Line&SC=Date%20Validated%20is%20between%2001%20January%201928%20and%2031%20December%202018%20and%20Site%20Address%20contains%20140%20HIGHGATE%20ROAD&FT=Planning%20Application%20Search%20Results&XMLSIDE=/Northgate/PlanningExplorer17/SiteFiles/Skins/Camden/Menus/PL.xml&XSLTemplate=/Northgate/PlanningExplorer17/SiteFiles/Skins/Camden/xslt/PL/PLResults.xslt&PS=10&XMLLoc=/Northgate/PlanningExplorer17/generic/XMLtemp/ch3qyi55lakbdiybczll40jh/ed099ce7-a0f9-441e-a5bb-c76f121afa36.xml

2.8.2 A number of similar planning applications were noted for similar developments. These were either withdrawn or refused. The main quoted reasons being the loss of employment space and architectural matters.

2.8.3 A number of applications were also noted for the renewal of the license to store and sell petrol. These were approved.

2.8.4 No information pertinent to these works were noted.

2.9 Unexploded Ordnance

2.9.1 Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site.

2.9.2 The initial data indicates that there is a moderate to high risk. No feature was identified during the historical map review that would suggest that the site or its surroundings had been subject to large scale high explosive or incendiary bombardment and would therefore not alter this assessment.

2.9.3 High-risk regions are those that show a bomb density of up to 150 bombs per 1000 acres and that may contain potential WWII targets.

2.9.4 A watching brief should be maintained during below ground works, with site personnel made aware that there remains a potential, if negligible, risk of unexploded ordnance, any suspicious item uncovered during site works should be reported immediately.

2.9.5 This does not comprise a full UXO risk assessment. A preliminary UXO threat assessment is recommended.

3 ENVIRONMENTAL SETTING

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 indicates that the site is directly underlain by solid deposits of the London Clay Formation. An extract of the BGS description of the London clay Formation is provided below:

> *"bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite."*

3.2.2 Superficial and artificial deposits are not reported within the site.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, the BGS archives regarding publicly available borehole records were searched.

3.3.2 A historic borehole log was recorded at Gordon House, Highgate (approx. 200m northwest of site) at an undisclosed date.

3.3.3 This log records the underlying geology to comprise stiff brown clay to a depth of 10.7m bgl, overlying stiff blue clay to the base of the borehole at a depth 21.3m bgl. It is assumed that these lithologies are representative of the London Clay Formation.

3.3.4 A copy of the historic borehole log is attached in Appendix 1.

3.4 Hydrogeology & Hydrology

3.4.1 General information about the hydrogeology of the site was obtained from the Environment Agency website.

Groundwater Vulnerability

3.4.2 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)

3.4.3 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.

Hydrology

3.4.4 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.

3.4.5 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.

3.4.6 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.)

3.4.7 These two areas show the extent of the natural floodplain if there were no flood

defences or certain other manmade structures and channel improvements.

3.4.8 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.)

3.4.9 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.

3.4.10 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 3.1: Summary of Hydrogeological & Hydrology

Feature		On Site	Off Site	Potential Receptor?
Aquifer	**Superficial:**	None	None	N
	Solid:	Unproductive	Unproductive	N
Source Protection Zone		None	None	N
Abstractions	Groundwater	None	None within 1000m	N
	Surface water	None	None within 1500m	N
	Potable water	None	None within 1000m	N
Surface Water Features/Detailed River Network		None	2No within 250m of the site, closest being 182m east.	Y
Flood Risk		None	No environment agency flood zones within 250m RoFRaS – Very Low	N

3.5 Detailed River Network

3.5.1 There is 1No detailed river network entry reported within 500m of the site. This is a culvert located 271m SW of site.

3.6 Radon

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

3.6.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2007).

4 GEOLOGICAL HAZARDS

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

Table 4.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell	Moderate	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.	Yes
Landslides	Very low	Slope instability problems are unlikely to be present. No special actions are required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks.	No
Compressible deposits	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.	No
Collapsible Rock	Very Low	Deposits with the potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required.	No
Running sand	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.	No
Coal mining	No	There are no coal mining areas identified within 1000m of the site boundary.	No

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Non-coal mining	No	-	No
Brine affected areas	No	-	No

4.1.2 In addition, the GeoInsight report notes the following:

- 40No active railway lines have been identified within 250m of the boundary of the site, the closest being 35m SE of site.
- 3No historic railway lines have been identified within 250m of the boundary of the site, the closest being 51m SE of site.
- 2No railway tunnels have been identified within 250m of the site boundary, the closest being 50m SE of site.

4.1.3 The clearance of the site, including removal of foundations and services (including tanks) is likely to increase the depth of Made Ground on the site. Foundations should not be formed within Made Ground or Topsoil due to the unacceptable risk of total and differential settlement.

4.1.4 The presence of Made Ground derived from demolition material may be a source of elevated sulphate results associated with plaster from the previous structures. If such levels are noted then sulphate resistant concrete may be required.

4.1.5 The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate results. If such levels are noted then sulphate resistant concrete may be required.

4.1.6 The resultant thickness of Made Ground and the potential for clays beneath the proposed footprint would likely mean that a suspended floor slab would be required. Given that a basement is proposed it may be that the finished floor level would be at a sufficient depth where a ground bearing floor slab emplaced on a blanket of suitably engineered granular materials would suffice.

4.1.7 Although soluble rocks are noted to exist immediately beneath the site, they are not considered to pose a significant risk due to the overlying anticipated thickness of clay.

4.1.8 It is noted that the GeoInsight report indicates that the site is underlain by materials that are considered to pose a “moderate” risk of shrink / swell. It is likely that excavations to form the basement would take foundations below the zone where seasonal moisture content is likely to occur.

4.1.9 It is recommended that a geotechnical ground investigation is undertaken to inform foundation design.

5 HYDROLOGY AND FLOOD RISK

5.1 Hydrology and Flood Risk

5.1.1 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".

Table 4.1: Flood Risks

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 very low.	Proposed development consists of alterations to an existing property The proposed extension to the basement is under an area of patio. As such there is no/negligible increase in impermeable areas hence no additional SUDS required.
Groundwater	The BGS doesn't consider the area to be susceptible to groundwater flooding.	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	No artificial sources of groundwater / surface water within 250m	Low Risk
Surface Water / Sewer Flooding	The site is not within 250m of any surface water features. Condition, depth and location of surrounding infrastructure uncertain	No significant increase in impermeable areas – no SUDS required Development will utilise existing connection to sewers, gravity drainage and non-return valves Development unlikely to significantly increase the peak flow/volume of discharge from the site: Low Risk No further drainage assessment required
Climate Change	Included in the flood modelling extents Site not within climate change flood extent area	Development will not significantly increase the peak flow and volume of discharge from the site Low risk posed to and from the development

5.1.2 Based on the available data, the site is in 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.

Surface Water Flood Risk

5.1.3 Based on EA mapping, the site and highways surrounding the site are not within an area identified as a high risk for surface water flooding potential; site is not likely to be inundated.

5.1.4 It should be noted that although not included in the 2015 version, in earlier versions of CPG4, a table summarising the roads in Camden that flooded in the flood events of 1975 and 2002. This notes that Highgate Road flooded in 1975, it should be noted that this does not indicate the areas of the road that flooded and this does not mean that the site was affected by the flood event in 1975.

No Significant Increase in Impermeable Areas

5.1.5 The site is defined by the footprint of the existing building; there is no opportunity to significantly increase impermeable areas and hence no further SUDS are considered necessary. The SUDS toolkit does not apply to this site.

5.2 Hydrogeology

5.2.1 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.

5.2.2 The available data indicates that the geology of the area consists of London Clay. If present, it is unlikely that any significant quantities of shallow groundwater are present beneath the site.

5.3 Sequential and Exception Tests

5.3.1 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: within FZ1 and no additional dwelling hence pass by default.

5.3.2 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: FZ1 hence pass by default and low risk posed to and from other sources

5.4 Flood Resilience

5.4.1 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.

5.4.2 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
- 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.

6 LAND CONTAMINATION ASSESSMENT

6.1 Industrial and Statutory Consents

6.1.1 The Groundsure EnviroInsight Report provides information on various statutory and industrial consents on and in the vicinity of the site. The following section summarises the information collected from the available sources.

Table 6.1: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact on Site from a land contamination perspective
Discharge Consents.	None	None reported within 500m of the site.	X
Water Industry Act Referrals	None	None reported within 500m of the site.	X
Red List Discharges	None	None reported within 500m of the site.	X
List 1 and List 2 Dangerous Substances	None	None reported within 500m of the site.	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites.	None	None reported within 500m of the site.	X
Planning Hazardous Substance Consents	None	None reported within 500m of the site.	X
Category 3 or 4 Radioactive substances Authorisations	None	None reported within 500m of the site.	X
Pollution Incidents (List 2).	None	1No reported within 500m of site, located 198m NW in 2001.	X
Pollution Incidents (List 1)	None	None reported within 500m of the site.	X
Contaminated Land Register Entries and Notices.	None	None reported within 500m of the site.	X
Registered Landfill Sites.	None	None reported within 500m of the site.	X
Waste Treatment and/or Transfer Sites.	None	None reported within 500m of the site.	X
Fuel Station Entries	Yes	No others reported within 500m of the site.	✓
Current Industrial Site Data.	Fuel station, MOT test centre and car repairs	16No. reported within 250m of site including vehicle repair and testing, textiles manufactory, storage depot, gas and electrical features.	✓

6.2 Landfill and Made Ground

6.2.1 According to the Environment Agency, there are no licensed landfill sites within 1km of the site.

6.3 Environmental Risk - Legislative Framework

6.3.1 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.

6.3.2 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."

6.3.3 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.

6.3.4 Contaminated land will only be identified when a 'pollutant linkage' has been established.

6.3.5 A 'pollutant linkage' is defined in Part IIA as:

"A linkage between a contaminant Source and a Receptor by means of a Pathway".

6.3.6 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.

6.3.7 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.

6.3.8 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.

6.4 Conceptual Site Model

6.4.1 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.

6.4.2 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).

6.4.3 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.

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

Table 6.2: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
• Potential for hydrocarbon contaminated ground associated with previous site use as fuel station/garage – on site (S1) • Potential for Made Ground associated with previous development operations – on site (S2) • Buried tanks, interceptors, former fuel lines and offset fills associated with former use as a fuel station/garage – on site (S3) • Current and previous industrial use – off site (S4) • Potential asbestos containing materials within existing buildings – on site (S5) • Potential asbestos impacted soils from demolition of previous buildings – on site (S6) • Potential ground gas generation associated with hydrocarbon impacted soils from historic use as fuel station - on site (S7)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • 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) • Horizontal and vertical migration of contaminants within groundwater (P4) • Accumulation and migration of soil gases (P5) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled Waters (Culvert) (R6)

6.5 Qualitative Risk Estimation

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

6.5.2 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

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

- Severe
- Medium
- Mild
- Minor

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

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

6.5.5 This relationship can be represented graphically as a matrix (Table 6.3).

Table 6.3: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Low Risk
	Likely	High Risk	Moderate Risk	Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	Unlikely	Low Risk	Low Risk	Very Low Risk	Very Low Risk

6.5.6 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.

6.5.7 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.

6.5.8 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)

6.5.9 The preliminary risk assessment for the site is presented in Table 7.4 overleaf.

Table 6.4: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence	Probability of pollutant linkage	Risk Estimation	Hazard Assessment
• Potential for hydrocarbon contaminated ground associated with previous site use as fuel station/garage – on site (S1) • Potential for Made Ground associated with previous development operations – on site (S2) • Potential buried tanks associated with former use as a fuel station/garage – on site (S3) • Current and previous industrial use – off site (S4) • Potential asbestos containing materials within existing buildings – on site (S5) • Potential asbestos impacted soils from demolition of previous buildings – on site (S6) • Potential ground gas generation associated with hydrocarbon impacted soils from historic use as fuel station - on site (S7)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium Severe for Asbestos	Likely	Moderate	GI – Ground Investigation required.
	• Accumulation and migration of soil gases (P5)		Severe	Low likelihood	Moderate	
	• 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) • Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Controlled Waters (Culvert) (R6) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low likelihood	Moderate	

6.5.10 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 CLR 11.

6.6 Outcome of Risk Assessment

6.6.1 It is understood that the proposed development comprises the excavation of a basement below the existing residential property.

6.6.2 The risk estimation matrix indicates a **moderate** risk as defined above. A high risk has been designated due to possible asbestos.

6.6.3 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.

6.6.4 Due to the current and historical site usage as a fuel station and MOT test centre, it is recommended that a number of soil samples obtained during the geotechnical investigation are analysed for hydrocarbons, and a suite of other general contaminants, to confirm the presence and extent of any onsite contamination.

6.6.5 It should be noted that the removal of tanks as part of the enabling works for the development will remove significant sources. In addition, the construction of the proposed basement would remove significant amounts of soils that may have been historically impacted by the site use as a garage.

6.6.6 A number of potential sources of ground gas have been noted on site, as a consequence ground gas monitoring is considered to be necessary. Groundwater monitoring will be required for basement design. Consequently, a minimum of 4No gas and groundwater visits are recommended and groundwater samples should also be obtained for chemical analysis.

6.7 List of Key Contaminants

6.7.1 The possible contamination implications for both on-site and off-site sources have been assessed based on the information presented in the report. This has been achieved using guidance publications by the Environment Agency, together with other sources.

6.7.2 In the case of the site uses identified as part of the desk study research, reference to DoE industry profiles would indicate a specific use reference to the “road vehicle fuelling, service and repair” industry profile. In addition reference has been made to the miscellaneous industries profile

6.7.3 Based on recommendations within the guidance publications, an initial soil and water chemical testing suite would need to consider a range of contaminants as follows:

- *Metals*: cadmium, chromium, copper, lead, mercury, nickel, zinc;
- *Semi-metals and non-metals*: arsenic, boron, sulphur;
- *Inorganic chemicals*: cyanide, nitrate, sulphate and sulphide;

- *Organic chemicals*: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbon, chlorinated solvents. BTEX, naphthalene, benzene;
- *Others*: pH, Asbestos

7 SCREENING AND SCOPING ASSESSMENT

7.1 Screening Assessment

7.1.1 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.

7.1.2 The scoping stage highlights areas of concern where further investigation, intrusive soil and water testing and groundwater monitoring may be required.

7.1.3 A series of flowcharts have been used to identify what issues are relevant to the site. These flow charts are based on the London Borough of Camden's document "Guidance for subterranean development" (2015) (CPG4).

7.1.4 Each question posed in the flowcharts 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.

7.1.5 The results of the screening process for the site are provided in Table 7.1 below. Where further discussion is required the items have been carried forward to scoping.

7.1.6 The numbering within the questions refers the reader to the appropriate question in CPG4. It should be noted that CPG4 is mainly concerned with the pond chain on Hampstead Heath, if other ponds / waterbodies may similarly affect the development Jomas will indicate this.

7.1.7 A Site 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 7.1: Screening Assessment

Query	Y / N	Comment
Subterranean (Groundwater) Flow (see CPG4 Figure 3)		
1a) Is the site located directly above an aquifer?	No	The basement will extend into the London Clay which is classified as unproductive strata.
1b) Will the proposed basement extend below the surface of the water table?	No	Highly unlikely that a groundwater table will be encountered within the London Clay underlying the site.
2) Is the site within 100m of a watercourse, well (disused or used) or a potential spring line?	No	Nearest such feature identified is over 250m away.

Query	Y / N	Comment
3) Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is situated approx. 500m SW of the nearest catchment of the pond chains on Hampstead Heath.
4) Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	No	The proposed development is understood to involve the construction of a new residential unit and associated basement within the footprint of the existing building.
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)?	No	There is no reason to believe that more water than at present will be or could be discharged 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?	Yes	The site is at a slightly lower elevation than the Hampstead Heath pond chain however this is unlikely to be an issue due to the distance from Hampstead Heath and the low permeability London Clay Formation
Land Stability (see CPG4 Figure 4)		
1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No	Surrounding the site, the ground slopes gently to the south but the site itself is generally level, with only minor slopes.
2) Will the proposed re-profiling of landscaping change slopes at the property to more than 7 degrees? (approximately 1 in 8)	No	The site will remain level, with the adjacent slope not be altered as part of the new development.
3) Does the developments' neighbouring land include railway cuttings and the like, with a slope greater than 7 degrees? (approximately 1 in 8)	Yes	The surrounding land slopes significantly to the south.
4) Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)	Yes	The surrounding land slopes significantly to the south. The site has been cut in to the hillside.
5) Is the London Clay the shallowest strata at the site?	Yes	-
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?	No	Available plans do not show any trees on the property. Confirmed by the walkover.
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 directly underlain by the London Clay. The site is reported to be in area at moderate risk from shrink-swell clays. But evidence of cracking was not observed during the walkover.

Query	Y / N	Comment
8) Is the site within 100m of a watercourse or a spring line?	No	Closest water course is a culvert 271m SW of site.
9) Is the site within an area of previously worked ground?	No	
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?	No	The basement will extend into the London Clay which is classified as unproductive strata.
11) Is the site within 50m of the Hampstead Heath ponds?	No	
12) Is the site within 5m of a highway or pedestrian 'right of way'?	Yes	The southwest boundary of the site abuts a public highway.
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The closest properties to the site is a block of apartments to the north-east over 15m away from the site. It is likely that given this development, it has been piled and as such the development would not affect the adjacent structures foundations.
14) Is the site over (or within the exclusion of) any tunnels e.g. railway lines?	No	There are no reports of railway lines or tunnels within 30m of the site.
Surface Flow and Flooding (see CPG4 Figure 5)		
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?	No	The proposed development will add a basement within the existing footprint. This will not affect the run off at ground level.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	
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?	No	No surface waters in the area expected to be impacted.
5) Will the proposed basement result in changes to the quality of surface waters being received by adjacent properties or downstream watercourses?	No	No surface waters in the area expected to be impacted. Potentially with the removal of the possible sources of hydrocarbons, this development may improve the quality of surface waters being received by adjacent properties or downstream watercourses.
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	No	No nearby surface water features and site is not reported within an EA flood zone.

Query	Y / N	Comment
flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?		

7.2 Scoping

7.2.1 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.

7.2.2 The potential impacts for each of the matters highlighted in Table 7.1 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

7.2.3 The investigation should confirm the ground conditions beneath the site including if the site is directly above an the London Clay Formation (unproductive strata) and groundwater levels. This can then confirm the relative depths of the basement to the groundwater levels.

Land Stability

7.2.4 The Groundsure report has noted that there is “very low” risk of land instability issues.

7.2.5 Although the site is approximately level this is because it has been cut into a slope dipping the south.

7.2.6 This level area (the site) is not a natural terrace but is engineered and includes retaining walls. As such will have been designed taking into account the ground conditions and with a suitable factor of safety. It is therefore considered that investigation works to specifically investigate and model the slope is not required.

7.2.7 The investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground immediately beneath the site. Therefore, any issues relating to groundwater management and excavation stability.

Surface Flow and Flooding

7.2.8 No specific investigation considered necessary.

7.2.9 Plans and maps showing the topography of the site and surrounding area are included as part of Appendix 3.

8 REFERENCES

Groundsure EnviroInsight Report Ref HMD-377-4559701 December 2017

Groundsure GeoInsight Report Ref HMD-377-4559702 December 2017

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Investigation of Potentially Contaminated Sites – Code of Practice BS10175: 2011

BRE Report BR211; Radon: Protective measures for new dwellings, 2007

British Standards Institution (2015) BS 5930:2015 *Code of practice for site investigations*. Milton Keynes: BSI

CIRIA C580, Embedded retaining walls – guidance for economic design

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODODLOGY

APPENDIX 5 – LOCAL AUTHORITY CORRESPONDENCES

APPENDIX 6 – LONDON FIRE AND EMERGENCY PLANNING AUTHORITY (LFEPA) CORRESPONDENCES