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GEO-ENVIRONMENTAL DESK STUDY AND BASEMENT SCREENING ASSESSMENT

38 CHESTER TERRACE

LONDON

NW1 4ND

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EXECUTIVE SUMMARY

Resource Building and Interiors Limited ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Basement Screening Assessment for a site referred to as 38 Chester Terrace, London, NW1 4ND.

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 currently comprises a five storey terraced residential building including a lower ground level. Three vaults are present on site in the lower ground level beneath the front courtyard.
Proposed Site Use	The proposed development for this site is understood to match a recent enhancement made by a neighbouring property (No. 36-37) and will comprise lowering the existing lower ground floor slab to a level that does not undermine the existing footings. The level of existing foundations has been proven by hand trial pits and therefore there will be no need for underpinning, or disruption to party walls or the historic corbelled foundation below.
Site History	On the earliest available map (1870), the site is shown to occupy a residential building in a row of terraced, residential style buildings running north-south. The building on site is bounded to the east by a smaller building as are some of the other buildings on Chester Terrace. No changes occur until 1968, where the smaller attached buildings to the east (the rear of Chester Terrace) are no longer present. The surrounding area is predominantly residential with Regents Park approximately 40m west of the site. A boating lake is 600m west and Euston Station is located 500m east of the site.
Planning and Anecdotal Information	A review of the planning portal found a Structural Engineer's Report for Planning which related to an identical development for the adjoining property, 36-37 Chester Terrace. The report concluded that the ground floor slab can be dropped to found at or above the level of the existing foundations, and that there will be no need for underpinning, or disruption to party walls or the historic corbelled foundation below. Internal hand pits were carried out within the existing lower ground floor and vaults of 38 Chester Terrace on Thursday 26th November 2020. These were commissioned by the designers, Form Structural Design Ltd. These prove that the existing foundations in the vaults extend beyond the proposed lower ground floor level in this area. With reference to the pits carried out in the adjoining property, as mentioned above, a trial pit was also carried out against the party wall and found similar ground conditions to that next door, i.e. that foundations extend beyond the depth at which the new lower ground floor slab will be constructed.

Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation, which borehole records indicate to be present up to 46m bgl. The London Clay Formation is identified as Unproductive. 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. There are no source protection zones within 500m of the site. There are 60No groundwater abstractions reported within 2km of the site, the nearest entry located 735m south west. There are 6No surface water abstractions reported within 2km of the site, the nearest entry located 1159m north. There are 17No potable water abstractions reported within 2km of the site, the nearest entry located 1182m south west. There are no detailed river entries or surface water features reported within 250m of the site.
Potential Geological Hazards	The Groundsure data generally identifies negligible to very low risks for the potential hazards assessed. A moderate risk was identified for shrink swell within the clays. The presence of Made Ground and London Clay Formation may be a source of elevated sulphate. Sulphate resistant concrete should be used as a precaution. Structural design should make reference to NHBC Standards Chapter 4.2 and the measures required for building in soils of a high volume change potential.
UXO	Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site. The data indicates there is a high risk. This does not constitute a formal UXO risk assessment. A formal UXO risk assessment is recommended.

Screening and Scoping	
Subterranean (Groundwater) Flow	The site is directly underlain by the London Clay Formation, an unproductive stratum. Based on BGS records (Section 3.3) the London Clay Formation is present to around 46m bgl and therefore the proposed lowering of the floor slab will not extend beyond the water table.
Land Stability	The site, as with the surrounding area, is generally flat. The Groundsure report has noted that there is a “very low” to “negligible” risk of land instability issues for the site with a moderate risk for shrink swell clays.
Surface Flow and Flooding	The proposed development will be formed within the existing building footprint; there will be no significant change in surface water run-off.

Basement Impact Assessment	
Impact Assessment	The overall assessment of the site is that the lowering of the existing lower ground floor to a level that will not undermine existing footings, will not adversely impact the site or its immediate environs. No significant vertical or lateral ground movements are anticipated given the proposed shallow excavations will not undermine existing foundations. It is considered that the proposed development will not adversely impact the stability of the surrounding ground, any associated services or structures. No underpinning existing foundations or formation of new foundations is proposed. It is therefore considered that limiting damage to Category 0 or 1 on the Burland Scale would be easily achieved by the proposed lowering of the slab. Nevertheless, it is recommended that a full inspection of the property should be undertaken prior to starting work and a watching brief of the structure and excavation is maintained during the works. From the studies that have been undertaken, it is concluded that the construction of the building will not present a problem for stability, groundwater or surface water. In consideration of the minor scale of the proposed development, and on the basis of the assessment herein, no further assessment is considered to be necessary.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Resource Building and Interiors Limited ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Desk Study and a Basement Screening Assessment (Screening & Scoping) at a site referred to as 38 Chester Terrace, London, NW1 4ND.

1.1.2 Jomas' work has been undertaken in accordance with email proposal dated 9th November 2020.

1.2 Proposed Development

1.2.1 The proposed development for this site is understood to match a recent enhancement made by a neighbouring property (No. 36-37) and will comprise lowering the existing lower ground floor slab to a level that does not undermine the existing footings.

1.2.2 The level of existing foundations has been proven by hand trial pits and therefore there will be no need for underpinning, or disruption to party walls or the historic corbelled foundation below. Further details are provided in Section 2.5 and Appendix 6.

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

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. 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.

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

1.3 Objectives

1.3.1 The objectives of Jomas' investigation was 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 screening assessment;
- 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 Screening Assessment

1.5.1 The site lies within the remit of the London Borough of Camden. 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.

1.5.2 Jomas' report covers most items required under CPGB, with the exception of;

- Plans and sections to show foundation details of adjacent structures
- Programme for enabling works, construction and restoration.
- 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.

1.5.3 This report 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.

1.5.4 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 Resource Building and Interiors 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

Name of Site	38 Chester Terrace
Address of Site	38 Chester Terrace, London, NW1 4ND
Approx. National Grid Ref.	528749, 182882
Site Area (Approx)	0.01 hectares
Site Occupation	Residential
Local Authority	London Borough of Camden
Proposed Site Use	Residential. Lowering of the existing lower ground floor slab to a level that does not undermine the existing footings.

2.2 Walkover Survey

2.2.1 The site was visited by a Jomas Engineer on 17th November 2020. The following information was noted while on site.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	Site consists of a five storey terraced residential building including a lower ground level. Three vaults are present on site in the lower ground level beneath the front courtyard.
	Evidence of historic uses:	No evidence of historic uses observed on site.
	Surfaces:	Site is hardstanding comprising of the building footprint, concrete in the rear courtyard and paving slabs in the front courtyard.
	Vegetation:	No vegetation was observed on site. A tree, 10-15m in height is situated approximately 5m east of the site. Regents Park is located less than 50m west of the site.
	Topography / Slope Stability:	The site is observed to be level. External and internal stairs access the lower ground level whereby a wall supports the laterally adjacent ground and overlying ground level.

Area	Item	Details
	Drainage:	Site appears to be connected to normal drainage facilities with no issues noted.
	Services:	Site appears to be connected to services which are in use.
	Controlled waters:	No controlled waters were observed on site.
	Tanks:	No tanks were observed on site.
Neighbouring land:	**North:**	Residential.
	East:	Chester Place Road, Residential, Regents Park underground station is within 650m of the site.
	South:	Residential.
	West:	Outer Circle Road, Regents Park with large boating lake within 1km of the site.

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**
1870-1882 1:1,056 1:2,500 1:10,560	Site appears to be occupied by a residential building in a row of terraced, residential style buildings running N-S.	The site is bounded to the west to Chester Terrace followed by a large building and garden area. The site is bounded to the east by an attached building as part of 38 Chester Terrace and outbuildings. Regents Park is located 40m W. Boating lake is identified from 600m W. Small lake within the Royal Botanic Gardens is located 550m SW. Regents Canal is identified 200m NE and Regents Park basin is located 150m E of the site. Euston Station identified 500m E.

		2No Reservoirs located 600m SW.
1895-1896 1:2,500 1:10,560	No significant changes.	Various Wharfs identified around the basin 150m E. Reservoir 1.4km NW.
1916-1951 1:2,500 1:10,560	No significant changes.	A few more Wharf's are identified around the basin to the E. Part of Regents Canal 1.2km N, now identified as Towing Path and Lock. Circular features associated with Zoological gardens are possible small ponds.
1952-1962 1:1,250 1:2,500 1:10,560	No significant changes.	Ruins are identified 25m and 40m S, on Chester Terrace. Regents canal and basin are no longer present to the E of the site, possibly infilled, as allotment gardens are now identified. The nearest part of Regents canal is now 850m NW.
1968-1969 1:1,250 1:10,560	No significant changes. The site appears to be in its current configuration.	There is no longer a row of buildings at the rear of Chester Terrace. Chester Close North is now present from 20m SE, consisting of what appears to be blocks of residential flats.
1971-1977 1:1,250 1:2,500 1:10,000	Incomplete Mapping.	Incomplete Mapping.
1989-2020 1:1,250 1:10,000	No significant changes.	No significant changes.

2.3.4 Aerial photographs supplied as part of the Groundsure EnviroInsight report and taken from 1999 to 2019 generally appear to confirm the comments made regarding the site and surrounding area for that period.

2.4 Planning Information

2.4.1 A review of the local authority's planning portal was undertaken on 24th November 2020 at https://www.camden.gov.uk/planning-building-development.

2.4.2 A Structural Engineer's Report for Planning was found which related to an identical development for the adjoining property, 36-37 Chester Terrace. The report was produced by Price & Myers, report ref. 19118, dated April 2017.

2.4.3 This report included trial pit information to indicate that the foundations of the vaults and party wall adjoining 38 Chester Terrace extend beyond the depth of the proposed deepening (<1m).

2.4.4 The report concluded that the ground floor slab can be dropped to found at or above the level of the existing foundations, and that there will be no need for underpinning, or disruption to party walls or the historic corbelled foundation below.

2.5 Previous Site Investigations/Anecdotal Information

2.5.1 Internal hand pits were carried out within the existing lower ground floor and vaults on Thursday 26th November 2020. These were commissioned by the designers, Form Structural Design Ltd.

2.5.2 The trial pit information is included in Appendix 6.

2.5.3 These prove that the existing foundations in the vaults extend beyond the proposed lower ground floor level in this area.

2.5.4 With reference to the pits carried out in the adjoining property, as mentioned above in Section 2.4, a trial pit was also carried out against the party wall and found similar ground conditions to that next door, i.e. that foundations extend beyond the depth at which the new floor slabs will be constructed.

2.6 Unexploded Ordnance

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

2.6.2 The initial data indicates that there is a high risk.

2.6.3 Barracks were identified during the historical map review 200m north of the site in 1882 until present day. They were later identified as 'TA centre' in 1973.

2.6.4 The identification of this feature does not alter the above assessment.

2.6.5 High-risk regions are those that show a bomb density of up to 150 bombs per $1km^2$ and that may contain potential WWII targets.

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

2.7 Radon

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

2.7.2 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 solid deposits of the London Clay Formation.

The BGS describes the London Clay Formation as:

> *"The London Clay mainly comprises 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. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels."*

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 reviewable record was located approximately 95m east of the site, in 1964.

3.3.3 This showed the underlying ground conditions to comprise the London Clay Formation to a depth of around 46m bgl, underlain by clay and sand of the Woolwich and Reading Beds to a depth of 59m bgl. These were overlying chalk to the base of the borehole at 93.57m bgl.

3.3.4 No information on groundwater strikes was reported.

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

3.4 Geological Hazards

3.4.1 The following are brief findings extracted from the GroundSure EnviroInsight 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	Moderate	Ground conditions predominantly high plasticity.	Assume soils with high volume change potential are present
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
Compressible deposits	Negligible	Compressible strata are not thought to occur.	No
Collapsible Rock	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	No
Running sand	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	No
Coal mining	No	There are no coal mining areas identified within 500m of the site boundary.	No
Non-coal mining	No	-	No
Brine affected areas	No	-	No

3.4.2 In addition, the GeoInsight report notes the following:

- 4No historical surface ground working features are reported within 250m of the site. Nearest reported is 151m east. All features reported are identified as canal.
- 9No. historical underground working features are reported within 1km of the site. Nearest reported is 672m north. All features reported are identified as tunnels.
- No BritPits (British Pits) are reported within 500m of the site.

3.4.3 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.

3.4.4 The presence of Made Ground derived from demolition material may be a source of elevated sulphate results associated with plaster from the previous structures.

3.4.5 The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate. Sulphate resistant concrete should be used as a precaution.

3.4.6 The London Clay Formation is reported directly beneath the site. This deposit is widely documented as being homogenous and of high volume change potential and is therefore likely be affected by shrinking and swelling as a result of water uptake of nearby trees. Reference to NHBC Chapter 4.2 should be made with regards to precautionary heave requirements.

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 London Clay Formation, to depths in excess of 40m. This is classed as unproductive strata and a permanent water table is not considered to be present within this stratum due to its very low permeability.

4.1.6 Regents canal is located approximately 1.2km north west of the site, in addition to a boating lake within Regents Park approximately 550m south west of the site. It is assumed that the canal is lined and not in continuity with any surrounding groundwater.

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
Aquifer	**Superficial:**	None	Secondary (A) Aquifer 433m SE.
	Solid:	Unproductive	Unproductive
Source Protection Zone		None	None within 500m.
Abstractions	Groundwater	None	60No reported; nearest entry located 735m SW.
	Surface water	None	6No reported; nearest entry is located 1159m N.
	Potable water	None	17No reported; nearest entry is located 1182m SW.
Surface Water	Features	None	No surface water features within 250m of site. Lake 550m SW.
	WFD bodies	None	-
Flood Risk	**EA Flood Zone 2**	No	-
	EA Flood Zone 3	No	-
	RoFRaS	Very low	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site	
	Surface water flooding	The highest risk for surface water flooding on site is Negligible.	
	Groundwater flooding	The highest risk for groundwater flooding on site is Negligible.	

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 very low.	Proposed development will be formed within the existing building footprint. Low risk
Groundwater	The highest risk for groundwater flooding on site is Negligible.	The proposed floors will be fully waterproofed as appropriate to industry standard. Low Risk
Artificial Sources	Only nearby surface water feature identified is a boating lake 550m west and the Regent's Canal 1.2km north west. This is at a lower elevation than the study site. In addition, the canal is likely lined and so not in hydraulic continuity with any groundwater that may be present beneath the site.	No nearby surface water features. Low Risk
Surface Water / Sewer Flooding	No surface water features within 250m of site. Condition, depth and location of surrounding infrastructure uncertain.	The proposed floors will be fully waterproofed as appropriate to industry standard. Low Risk
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

4.2.2 Information about the risk to the study site from flooding has been obtained from the following documents produced for London Borough of Camden: Strategic Flood Risk Assessment (URS, 2014); Surface Water Management Plan (London Borough of Camden, 2011). Potential impacts to the site are discussed below and relevant map extracts are included in Appendix 1.

Flooding from Fluvial/Tidal Sources

4.2.3 All main rivers historically located within the London Borough of Camden are now culverted and incorporated into the Thames Water sewer network and therefore there is no fluvial flood risk within the Borough.

4.2.4 The site lies with EA Flood Zone 1.

Groundwater Flooding

4.2.5 The site and surrounding area are directly underlain by solid deposits of the London Clay Formation.

4.2.6 These are unproductive strata and the site is therefore not prone to groundwater flooding.

4.2.7 The SFRA shows that the site is not within an area of increased susceptibility to elevated groundwater.

Surface Water Flooding

4.2.8 The site does not lie within an EA Flood Zone 2 or 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 and the site itself is not likely to be inundated.

4.2.9 As indicated by the Groundsure EnviroInsight report, the risk for surface water flooding on site is deemed to be negligible.

4.2.10 Furthermore, the SFRA deems there to be a very low risk of flooding from surface water (<1 in 1000 year).

Sewer/Artificial Flooding

4.2.11 There are no nearby surface water features that would likely impact the site.

4.2.12 Furthermore, the SFRA shows that the site does not lie within an area where internal or external sewer flooding has been recorded.

Critical Drainage Areas (CDAs)

4.2.13 A critical drainage area is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 a Critical Drainage Area is “an area within Flood Zone 1 which has critical drainage problems and which has been notified… [to]…the local planning authority by the Environment Agency”.

4.2.14 They are where man made drainage infrastructure has been identified as at critical risk of failure, resulting in flooding. Such areas can be completely different or similar, to the areas identified by the Environment Agency as at risk of natural watercourse, river and sea flooding.

4.2.15 4No Critical Drainage Areas (CDA) are located within the LBC Strategic Flood Risk Assessment (SFRA). The site is located within CDA Group3_003.

4.2.16 However, the site is not located within a Local Flood Risk Zone.

Conclusion

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

4.2.18 Plans and maps showing the topography of the site and surrounding area are included as part of 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: within FZ1 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: FZ1 hence pass by default and low risk posed to and from other sources.

4.4 Flood Resilience

4.4.1 In accordance with general 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:

- Walls and floors 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 lower ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event
- The 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.

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 A ground investigation is undertaken where necessary to establish base conditions and the impact assessment determines the impact of the proposed development on the baseline conditions, taking into account any mitigating measures proposed.

Table 5.1: Screening Assessment

Query	Y / N	Comment
Subterranean (Groundwater) Flow (see London Borough of Camden BIA Pro Forma Section 4.1.1)		
1a) Is the site located directly above an aquifer?	No	The site is directly underlain by solid deposits of the London Clay Formation, an unproductive stratum.
1b) Will the proposed basement extend below the surface of the water table?	No	The site is directly underlain by the London Clay Formation, an unproductive stratum. Based on BGS records (Section 3.3) the London Clay Formation is present to around 46m bgl and therefore the proposed lowering of the floor slab will not extend beyond the water table.
2) Is the site within 100m of a watercourse, well (disused or used) or a potential spring line?	No	No surface water features within 250m of site. No detailed river networks within 500m of site.
3) Is the site within the catchment of any surface water features?	No	No surface water features within 250m of site. No detailed river networks within 500m of site.
4) Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	No	The proposed development will comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings.
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	The proposed development will comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings .
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 surface water features within 250m of site.
Slope Stability ((see London Borough of Camden BIA Pro Forma Section 4.2)		
1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No	The site is flat and level with the main road. The site consists of a lower ground level accessed internally and externally by steps from ground level.
2) Will the proposed re-profiling of landscaping change slopes at the property to more than 7 degrees? (approximately 1 in 8)	No	Re-profiling of change of slopes is not anticipated as the proposed development is to take place within the footprint of the main building.

Query	Y / N	Comment
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 railway lines 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 flat.
5) Is the London Clay the shallowest strata at the site?	Yes	The site is directly underlain by solid deposits of the London Clay Formation.
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	No trees were noted on site during 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?	Yes	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. Appropriate design for soils of high volume change potential will be included, with reference to NHBC guidance.
8) Is the site within 100m of a watercourse or a spring line?	No	No surface water features within 250m of site. No detailed river networks within 500m 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?	No	The site is directly underlain by unproductive London Clay.
11) Is the site within 50m of the Hampstead Heath ponds (or other waterbody)?	No	-
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 west.
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	Neighbouring properties have a similar lower ground floor layout with the floor slab at 36-37 Chester Terrace having already been lowered. The proposed development will comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings. Therefore differential depth of foundations relative to neighbouring properties will not be increased by.

Query	Y / N	Comment
14) Is the site over (or within the exclusion of) any tunnels e.g. railway lines?	No	There are no tunnels or railways within 250m of the site.
Surface Flow and Flooding (see London Borough of Camden BIA Pro Forma Section 4.3)		
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	No surface water features within 250m of site.
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 comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings. Therefore, surface water flow is unlikely to be affected.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The proposed development will comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings.
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 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 to be 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	No nearby surface water features and not within an EA flood zone.

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 The site is directly underlain by the London Clay Formation, an unproductive stratum. Based on BGS records (Section 3.3) the London Clay Formation is present to around

46m bgl and therefore the proposed lowering of the floor slab will not extend beyond the water table.

Land Stability

5.2.4 The site, as with the surrounding area, is generally flat. The Groundsure report has noted that there is a "very low" to "negligible" risk of land instability issues for the site with a moderate risk for shrink swell clays.

5.2.5 The London Clay Formation is well documented as having a high volume change potential. Appropriate design for soils of a high volume change potential will be included, with reference to NHBC guidance.

Surface Flow and Flooding

5.2.6 The proposed development will lie within the existing building footprint; there will be no significant change in surface water run-off.

6 BASEMENT IMPACT ASSESSMENT

6.1 Proposed Development

6.1.1 The proposed development will comprise of lowering the existing lower ground floor slab to a level that does not undermine the existing footings.

6.2 Proposed Changes to Areas of External Hardstanding

6.2.1 Review of OS maps from 1870-present has shown that the current development footprint has not changed significantly over this time.

6.2.2 Existing areas of hardstanding cover the entire site, comprising the existing building on site, the front and rear courtyard. The proposed development will be contained within the building footprint.

6.2.3 As a result, there will not be an increase in the proportion of hardstanding areas and it is not considered necessary to undertake further assessment in relation to the proposed changes to areas of external hardstanding.

6.3 Past Flooding

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

6.3.2 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.

6.3.3 The site lies with EA Flood Zone 1.

6.3.4 The Camden SFRA shows that the site is not within an area of increased susceptibility to elevated groundwater.

6.3.5 The Camden SFRA deems there to be a very low risk of flooding from surface water (<1 in 1000 year).

6.3.6 The London Borough of Camden (LBC) Strategic Flood Risk Assessment (March 2014) has reported 101 properties flooded by overloaded sewers. The site is located within a NW1 6 postcode, for which no results are shown, reporting <51 recorded sewer incidents and deemed not a high risk.

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

6.4 Geological Impact

6.4.1 The published geological maps and BGS borehole records indicate that the site is directly underlain by solid deposits of the London Clay Formation up to approximately 46m bgl.

6.4.2 At the depths that the new floor slab would be constructed at the London Clay is unlikely to be prone to seasonal shrinkage and swelling that arises due to changing water content in the soil. This is due to a lack of significant vegetation capable of removing water within the zone of influence; the extensive hard cover minimising the amount of water entering the ground.

6.4.3 Nevertheless, new structures will be designed in accordance with NHBC guidance in relation to building within soils of high volume change potential.

6.4.4 The underlying London Clay Formation is identified as unproductive and the stratum cannot transmit groundwater under normal hydraulic gradient. No groundwater table is anticipated to be encountered within the proposed excavations in to London Clay Formation, which will facilitate the lowering of the existing lower ground floor slab to a level that does not undermine the existing footings.

6.4.5 Regents canal is located approximately 850m north west of the site, it is assumed that the canal is lined and therefore not in continuity with the surrounding groundwater.

6.5 Hydrology and Hydrogeology Impact

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

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

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

6.5.4 There are no surface water features on or within 250m of the site. It is therefore not anticipated that the site will have an impact upon the hydrology of the area.

6.5.5 According to the LBC SWMP, the site is located within a CDA area whereby 140No non-deprived households, 57No deprived households and 84No commercial/industrial properties (15 of which with basements) are at risk of flooding to a depth of greater than 0.03m.

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

6.5.7 The proposed lowering of the slab will not create a reduction of impermeable area in the post development scenario.

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

6.6 Impacts of Proposed Development on Adjacent Properties and Pavement

6.6.1 The proposed lower ground floor excavation will be within 5m of a public pavement. It is also within 5m of neighbouring properties.

6.6.2 The proposed development comprises dropping lower the ground floor slab to a level that does not undermine the existing footings. There will therefore be no need for underpinning, or disruption to party walls or the historic corbelled foundation below.

6.6.3 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.

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

	Category of damage	Description of Typical Damage	Approximate crack width (mm)	Limiting tensile strain (%)
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	

6.6.4 No underpinning existing foundations or formation of new foundations is proposed. It is therefore considered that limiting damage to Category 0 or 1 would be easily achieved by the proposed lowering of the slab.

6.6.5 The existing walls and foundations should provide adequate support to ensure long term 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.

6.6.6 No significant vertical or lateral ground movements are anticipated given the proposed shallow excavations will not undermine existing foundations. It is considered that the proposed development will not adversely impact the stability of the surrounding ground, any associated services or structures.

6.6.7 Nevertheless, it is recommended that a full inspection of the property should be undertaken prior to starting work and a watching brief of the structure and excavation is maintained during the works.

6.6.8 It will be necessary to ensure that the proposed development is 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 development;
- 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.

6.6.9 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 London Borough of Camden.

6.7 Accumulative Impacts

6.7.1 The site has been identified as being directly underlain by very low permeability London Clay Formation, defined as an unproductive stratum by the EA.

6.7.2 Such materials would prevent the movement of groundwater and the ingress of surface water into the ground.

6.7.3 The development would not significantly affect the groundwater flow through the ground due to the very low permeability London Clay Formation.

6.7.4 The adjacent properties also have lower ground floors and vaults, therefore the slight lowering of the floor slab by at 38 Chester Terrace would not reduce the groundwater flow through the general area, especially given the impermeability of the natural materials.

6.7.5 There are no significant issues of concern regarding stability, groundwater or surface water.

7 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 – TRIAL PIT RECORDS

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