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Your Ref:

Our Ref: **14/22714-2**
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17 BRANCH HILL,

LONDON, NW3 7NA

BASEMENT IMPACT ASSESSMENT

Prepared for

Engineers Haskins Robinson Waters

Acting on behalf of

Mr Adam Kaye

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1.0 INTRODUCTION

1.1 Project Objectives

The purpose of this assessment is to consider the effects of a proposed basement construction on the local groundwater regime at the proposed new-build residential property at 17 Branch Hill, London, NW3 7NA. For this assessment a representative of SAS Limited visited the property on 10th October 2014.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the client and other parties including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

1.2 Planning Policy Context

Camden Planning Guidance for Basements and Lightwells has recently been revised (CPG4, September 2013) and requires proposed developments to mitigate against the effects of ground and surface water flooding and to include drainage systems that do not impact neighbouring property of the site or the water environment by way of changing the groundwater regime.

Camden Guidance CPG4 sets out 5 Stages:

1. Screening
2. Scoping
3. Site Investigation
4. Impact Assessment
5. Review and decision making

This report is intended to address the scoping process set out in CPG4 and the Camden Geological, Hydrogeological and Hydrological Study (CGHHS). It will review existing site investigation data and provide a preliminary assessment of the issues identified by the Site Analytical Services Limited screening process.

This report also provides an impact assessment (4) of the geo-environmental impacts on adjacent structures and the surrounding area based on available site investigation data.

As part of this guidance a subterranean (groundwater) flow, slope stability and surface water and flooding screening chart is provided (CPG 4, Figures 1, 2 and 3 respectively). The completed charts in relation to this development are provided as Table 1, to this report.

1.3 Qualifications

The report has been prepared by Mr Andrew Smith, a Fellow of the Geological Society (FGS) and Member of the Chartered Institute of Water and Environmental Management (MCIWEM) with over 8 years post graduate experience in co-ordination with Mr Brett Scott, a Chartered Engineer (CEng).

2.0 SITE DETAILS

(National Grid Reference: TQ 260 862)

2.1 Site Location

The site is located to the west of Branch Hill in the London Borough of Camden at approximate postcode NW3 7NA. The site comprises of a detached modern house with a driveway at the front and a rear garden area.

The surrounding land use is primarily residential and recreational with Hampstead Heath present to the north and north-east of the site.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the Bagshot Formation resting on the Claygate Member with the London Clay Formation at depth.

2.3 Previous Reports

The results from a Phase 1 Preliminary Risk Assessment and Phase 2 Intrusive Investigation are presented under separate cover in Site Analytical Services Limited reports (Project No's. 14/22714-1 and 14/22714 respectively) dated November 2014.

2.4 Site Layout and History

The site was attended on 10th October 2014 for the purposes of conducting the site walkover.

The site is roughly L-shaped and comprises of a large four storey house along with a swimming pool and garden space occupying the western part of the site and a driveway to the east. The site is cut into two levels, with the ground level of the property and garden approximately 2.5m lower than the site entrance and driveway.

Numerous mature trees are located surrounding the site

The site is essentially flat although immediately to the west of the rear garden, the ground falls towards the south-west at shallow angles of between 3-5 degrees. There is also a general slope in the wider hillside setting from north to south down towards the Thames Basin up to approximately 10 degrees.

From a review of the historical maps it would appear that small buildings first occupied the site in 1896 and the current building appeared between 1915 and 1934. The most contaminating land use in the area is the garage that appeared sometime between 1934 and 1954. Additionally, 350m south-east the hospital that appears on maps from 1896 to present was converted into a research laboratory between 1934 and 1954. The site and surrounding areas have not changed significantly from an environmental perspective since 1954.

2.5 Proposed Development

Proposals for the site include the demolition of the existing building on-site and the construction of a new three storey property with lower ground floor level, swimming pool and parking areas. The maximum depth of the proposed lower ground floor level is approximately 1.44m below existing lower ground floor level (116.56mOD is the existing level, 115.12mOD is the proposed).

2.6 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	Yes - refer to Sections 4.2 for scoping	The site lies above the Bagshot Formation. These deposits have been designated as Secondary A Class; 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
	1b. Will the proposed basement extend beneath the water table surface.	No	The maximum depth of the proposed lower ground floor level of 1.44m below existing lower ground floor level (115.12mOD) will be above the current water level of approximately 7.11m below the ground level (112.79mOD) as encountered in Borehole 1.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	Yes - refer to Section 4.3 for scoping	The nearest surface water relates to a stream running from Leg of Mutton pond located 299m north of the site. However, according to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is extremely close to one of the tributaries of the former River Westbourne.
	3. Is the site within the catchment of the pond chains on Hampstead Heath.	No	The site is away from this area. The nearest surface water feature is recorded to be at least 299m north from the site.
	4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	No	The amount of hardstanding on-site is not expected to change.
	5. As part of 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	Existing drainage paths are to be utilised where possible. Whether soakaways/SUDS are used on the proposed is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.
	6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line.	No	The nearest surface water relates to a stream running from Leg of Mutton pond located 299m north of the site.

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Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 1 in 8.	No	The site is set on two levels, with the ground floor is set lower than the site entrance and driveway. However the areas between these two levels the site is essentially flat.
	2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 1 in 8.	No	Re-profiling of landscaping at the site is not proposed.
	3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 1 in 8.	No	There are no railway cuttings close to the site.
	4. Is the site within a wider hillside setting in which the general slope is greater than 1 in 8.	Yes – refer to Section 5.2 for scoping	There is a general slope across the wider area towards the south at angles of around 10 degrees.
	5. Is the London Clay the shallowest strata at the site.	No	The investigation found that the site is underlain by Made Ground overlying the Bagshot Formation.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	No	It is understood that no trees are to be felled as part of the development.
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	No	The site lies above the Bagshot Formation, a predominantly granular material.
	8. Is the site within 100m of a watercourse or a potential spring line.	Yes – refer to Section 4.3 for scoping	The nearest surface water relates to a stream running from Leg of Mutton pond located 299m north of the site. However, according to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is close to one of the tributary's of the River Westbourne.
	9. Is the site within an area of previously worked ground.	Yes - refer to Section 5.3 for scoping	Made Ground has been encountered at the site. .
	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	According to the results of the most recent ground investigation the site lies above a Secondary A Aquifer (Bagshot Formation) and the basement is not likely to extend beneath the water table encountered at around 7.11m below ground level (112.79mOD).

	11. Is the site within 5m of a highway or pedestrian right of way.	No	The site is at least 15m from Branch Hill located to the east.
	12. Is the site within 50m of the Hampstead Heath ponds	No	The site is located over 100m south from the pond chains on Hampstead Heath.
	13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	Yes - refer to Section 5.4 for scoping	The development will increase the depths of foundation at the site, although the foundation depths of adjacent properties are not known.
	13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	Unknown / out of scope of report	A full statutory service search was out of scope of this report and must be completed prior to any excavations.
Surface Water and Flooding	1. Is the site within the catchment of the pond chains on Hampstead Heath.	No	The site is located over 100m south-west from the pond chains on Hampstead Heath.
	2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route.	No	The amount of hardstanding on-site is not changing therefore surface water will not be impacted by the development.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	No	The amount of hardstanding on-site is not expected to increase.
	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	As no changes are occurring above the ground, surface water will not be impacted by the development.
	4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	As the existing property is essentially being re-built the ground surface water will not be impacted by the development.
	5. Is the site in an area known to be at risk from surface water flooding.	No	According to the Envirocheck report included as part of the desk study (SAS Report Reference 14/22714-1) the site is at no risk from extreme flooding from rivers or sea with and without defences.

The Screening Exercise has indentified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Is the site located directly above an aquifer
- Is the site within 100m of a watercourse, well (used / disused) or potential spring line

Slope Stability

- Is the site within an area of previously worked ground
- Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties
- Is the site within a wider hillside setting in which the general slope is greater than 1 in 8.
- Is the site within 100m of a watercourse, well (used / disused) or potential spring line

3.0 EXISTING SITE INVESTIGATION DATA

3.1 Records of site investigations

Ground conditions at the site were investigated by Site Analytical Services Limited in October and November 2014 (SAS Report Reference 14/22714). The ground conditions revealed by the investigation are summarised in the following table.

Strata	Depth to top of strata, mbgl	Description
Made Ground	0.00	Surface layer of Yorkstone paving or grass covered topsoil overlying medium dense silty gravelly fine to coarse sand with brick fragments
Bagshot Formation	0.75 to 0.80	Loose becoming medium dense very clayey fine to coarse dense sand

Groundwater was encountered as a seepage at a depth of 8.00m below ground level (111.90mOD) in Borehole 1 rising to 7.20m below ground level (112.70mOD) in 20 minutes and at a depth of 5.00m below ground level (112.30mOD) in borehole 2.

Groundwater was subsequently found to have stabilised at a depth of 7.11m below ground level (112.79mOD) in the monitoring standpipe installed in Borehole 1 after a period of approximately two weeks.

4.0 SUBTERRANEAN (GROUNDWATER FLOW) - SCOPING ASSESSMENT

4.1 Introduction

This section addresses outstanding issues raised by the screening process regarding subterranean (groundwater flow).

4.2 Aquifer designations

The Environment Agency Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) and also their role in supporting surface water flows and wetland ecosystems.

The bedrock geology underlying the site is classified as Secondary Aquifer A class; materials with 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.

4.3 Springs, Wells and Watercourses

The nearest surface water feature is recorded to be in excess of 100m from the site. There are no fluvial or tidal floodplains located within 1km of the site.

With reference to 'The Lost Rivers of London' (Barton, 1992) and 'London's Lost River's (Talling, 2011), the site lies within 50m of a tributary of the River Westbourne, which ran in a south westerly direction from Hampstead Heath through Hampstead, Kilburn, Paddington, Hyde Park, onto Knightsbridge and out into the River Thames at Chelsea. The river is now completely enclosed and used as a sewer.

Given the clayey and low permeability nature of the near-surface Bagshot Sands, it is expected that there is very limited surface water infiltration potential and groundwater flow rates in the vicinity of the property will be very low. The historic development of the area for housing will have further limited surface water infiltration.

As a result it is considered that the proposed development will have minimal impact on any nearby watercourses

5.0 SCOPING ASSESSMENT - SLOPE AND GROUND STABILITY

5.1 Introduction

This section addresses outstanding issues raised by the screening process regarding land stability (see Table 1).

5.2 Slope Stability

The 1:50,000 scale geological map for the area indicates that the site does not lie within an 'Area of Significant Landslide Potential'. No mapped areas of landslips are present in the vicinity of the site and the natural ground stability hazards dataset supplied by the BGS (present in the desk study report for the site (SAS Report Reference 14/22714-1) gives the hazard rating for landslides in the site area as 'very low'.

Information obtained from the site walkover, site plans and ordnance survey maps indicates that the site and neighboring properties are located on an area of high ground north of Hampstead. Immediately to the west, the ground falls towards the south-west at shallow angles of between 3-5 degrees.

There is also a general slope in the wider hillside setting from north to south down towards the Thames Basin up to approximately 10 degrees, although it should be noted that the immediate site area is heavily urbanised and slopes at the site and in the close vicinity may have been altered historically or as part of developments and landscaping.

As part of the development it is proposed to excavate below the site by at least 1.44m below ground level (116.56mOD), although excavation may locally be to a greater depth to facilitate floor slab and foundation construction. It is anticipated that the natural Bagshot Formation would be encountered at this depth and therefore 'running sand' conditions and ground instability is possible and therefore some kind of retention will be required for the cuttings. This could take the form of sheet piling employed in the temporary case to exclude water and maintain the stability of excavations.

It is therefore considered that slope stability can be maintained through the proper design and construction of mitigation measures, similar to those outlined above.

All risks related to the stability of the slopes must be identified and managed in accordance with CDM legislation.

5.3 Made Ground

In the boreholes and trial pit drilled/excavated at the site, Made Ground was found to extend down to depths of up to 0.80m below ground level.

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto suitable underlying natural strata of adequate bearing characteristics.

The bearing capacity of the Made Ground should therefore be assumed to be less than 50kN/m^2 because of the likelihood of extreme variability within the material.

5.4 Structural Stability of Adjacent Properties

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.

The proposed development may also result in differential foundation depths between the site and adjacent property and as such it is recommended that the Party Wall Act will be used and considered during the design phase. For basement developments in densely built urban areas, the Party Wall Act (1996) will usually apply because neighbouring houses would typically lie within a defined space around the proposed building works. Specifically, the Party Wall Act applies to any excavation that is within 3m of a neighbouring structure; or that would extend deeper than that structure's foundation; or which is within 6m of the neighbouring structure and which also lies within a zone defined by a 45° line from the foundation of that structure. The party wall process should be followed and adhered to during this development.

Given the property is detached, a ground movement assessment was deemed to be unnecessary as part of this study.

6.0 CONCLUSIONS

1. It is proposed to demolish the existing building on the site and construct a new three storey residential property with a basement, swimming pool and parking areas. The maximum depth of the proposed basement floor level is approximately 1.44m below existing lower ground floor level (116.56mOD).

2. Conditions at the site were investigated by Site Analytical Services Limited in October and November 2014 (SAS Report Reference 14/22714). The exploratory holes revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised up to 0.80m thickness of Made Ground overlying materials typical of the Bagshot Formation.

3. The bedrock geology underlying the site is classified as Secondary Aquifer A class; materials with 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.

4. Water levels in the immediate vicinity of the property have been recorded below floor level of the proposed basement.

5. It is considered that slope stability can be maintained through the proper design and construction of mitigation measures for example sheet piling employed in the temporary case to exclude water and maintain the stability of excavations.

6. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.

7. The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.

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