BIA screening and scoping: groundwater

128-130 Grafton Road, NW5 4BA

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EXECUTIVE SUMMARY

The proposed development is to demolish the existing single-storey industrial building/warehouse, and construct a five-storey residential building with a basement and roof terrace. The basement would be approximately 3m deep, and would include sunken terraces at the front and rear. The proportion of hardstanding at the site is not anticipated to change.

The underlying geology comprises London Clay, which is likely to be overlain by Made Ground. Groundwater flow within the London Clay is generally negligible, although some groundwater movement occurs on discrete sand partings or other discontinuities. A BGS record from a borehole 125m northeast of the site recorded a groundwater seepage in the made ground at 2.8m (31.2m OD), and a groundwater level was measured at 1m (33m OD).

There is the potential for groundwater to be present in Made Ground below the site, or on sand partings or other discontinuities within the London Clay. Groundwater may be present at elevations above the base of the proposed basement; groundwater elevation and the seasonal variation in groundwater level are not known. In addition, there is the potential for soil moisture to affect the development.

There may be some groundwater ingress to the basement excavation, particularly during times of heavy rainfall. On the basis of the available information, it is considered likely that commonly adopted procedures for managing water in an excavation, such as pumping from a sump, will be sufficient to deal with groundwater ingress.

The current and proposed drainage arrangements for the site are not known. The proportion of hardstanding at the site is not anticipated to change, as the site is fully covered by buildings/hardstanding. It is unlikely that surface water will be discharged to ground under the proposed scheme due to the low permeability of the London Clay underlying the site.

Groundwater elevation and the seasonal variation in groundwater level are not known. Groundwater may be present at elevations above the base of the proposed basement; there is the therefore the potential for groundwater flow to the basement excavation and to the finished structure. Soil moisture may also affect the finished basement. It is considered unlikely that groundwater will back up around the structure to the extent that nuisance is caused, owing to the lack of basements at neighbouring properties.

It is recommended that the proposed development should comply with Grade 3 (no water penetration or dampness is permitted) and Type C (internal drained cavity protection with a sump and pump for removal of water or its disposal by gravity) of British Standard BS 8102:2009 'Code of practice for protection of below ground structures against water from the ground'.

It is recommended that a ground investigation is undertaken to confirm the geology underlying the site and groundwater elevations. Given the low sensitivity of the setting, specifically the lack of neighbouring basements, the ground investigation could be appropriately be a condition of a planning permission, provided that waterproofing measures are designed on the basis of water to the full height of the retained ground at some time during the structure's life.

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1 INTRODUCTION

Ground and Projects Consultants Ltd (GPC) has instructed H Fraser Consulting Ltd (HFCL) to provide the hydrogeological aspects of a Basement Impact Assessment (screening and scoping) at the following property:

128-130 Grafton Road, NW5 4BA.

The site is in the London Borough of Camden.

1.1 Objective

The objective of this report is to provide the hydrogeological aspects of a screening and scoping study for a Basement Impact Assessment at 128-130 Grafton Road, NW5 4BA.

1.2 Scope of works

The following works have been undertaken:

- Review of relevant desk based information
- Screening and scoping of groundwater issues
- Reporting

The work has been undertaken in accordance with the requirements of London Borough of Camden's (LBC) Planning Guidance CPG4 'Basements and Lightwells' (referred to as CPG4) and Arup's 'Geological Hydrogeological and Hydrological Study, Guidance for Subterranean Development' (Arup, 2012, referred to throughout this report as the GHHS).

This assessment is limited to an assessment of the hydrogeological aspects of the proposed development and does not purport to make any comment on surface water flooding, hydrology, contamination or pollution, engineering, slope stability, design or construction issues.

The work has been undertaken by Hannah Fraser, Director of HFCL, who is a Chartered Geologist with 21 years' experience as a hydrogeologist and consultant.

2 BACKGROUND INFORMATION

Background information has been derived from a Groundsure report for the site (Appendix A); geological information has been derived from on-line BGS sources (Geology of Britain Viewer, GeoIndex, Lexicon); on-line mapping and aerial photography have been derived from Streetmap, Googlemaps, Bing Maps and GoogleEarth. Table 2.1 presents relevant background information for the site. The site location is shown in Figure 2.1.

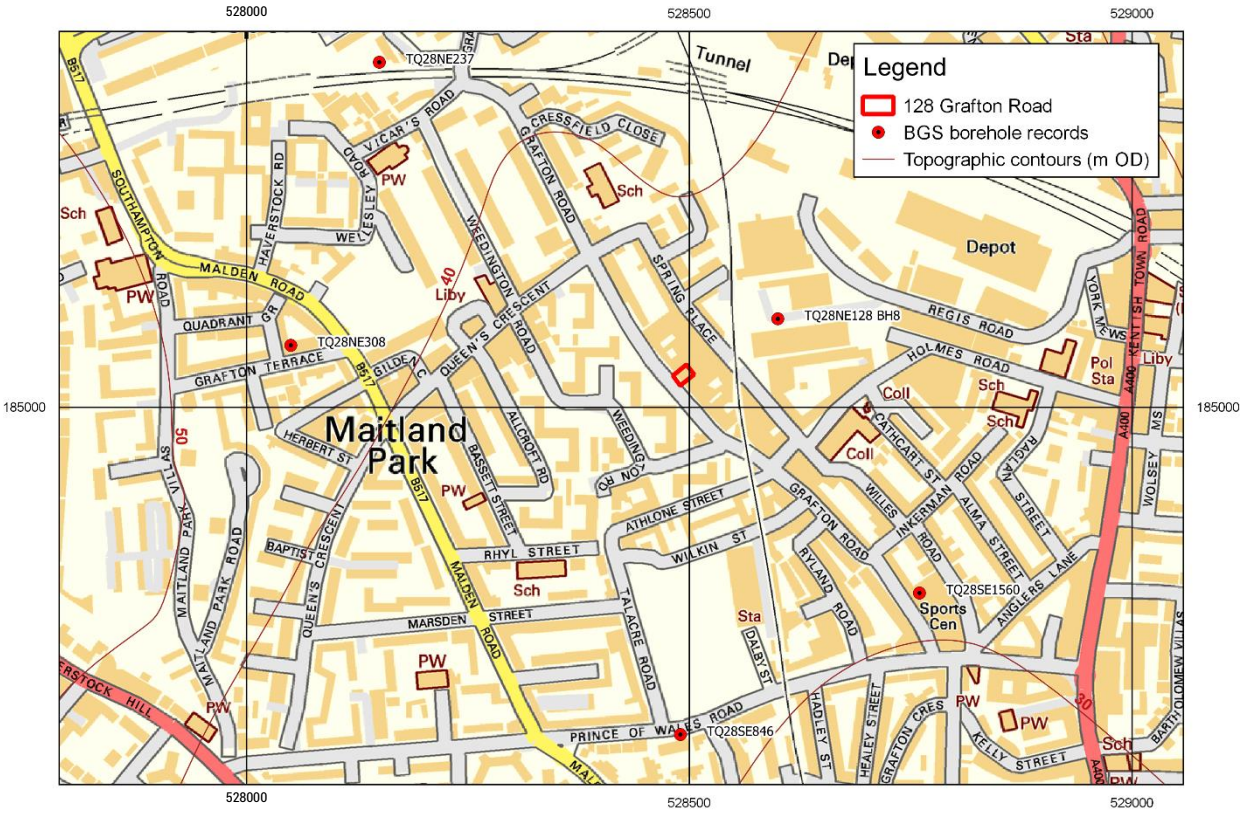

Figure 2.1 Site location

Contains Ordnance Survey data © Crown copyright and database right 2017

Table 2.1 Background information

Address	128-130 Grafton Road, NW5 4BA
NGR	528488, 185034
Description	The existing structure is a single-storey terraced industrial building/warehouse comprising a ground floor and a mezzanine floor, forecourt area and off-street parking for approximately. 5 vehicles. It is currently occupied by E & D Scaffolding Co Ltd. The ground cover at the front of the property comprises hardstanding. The property adjoins a large residential scheme on its eastern side (no. 126). There is a single-storey industrial building "Spring Lighting" on its western side (no. 132-134). The property backs onto a significantly larger building fronting Spring Place, which is in residential use. Aerial photography indicates that there is no exterior space at the rear of the property. The site area is 258m^2.

	Across the wider area, the topography falls to the southeast from 96m OD at Parliament Hill, located approximately 1.4km to the northwest. The elevation locally is estimated at around 37m OD[1].
Proposed development	It is proposed to construct a five-storey residential building with a basement and roof terrace. The basement will be approximately 3m deep. Sunken terraces are proposed at basement level, at the front and the rear, and will be paved. The footprint of the basement including sunken terraces is approximately 14.1m wide by 16.8m deep with a resultant area of around 237m^2 (the dimensions above have been provided by GPC). Plans of the proposed development are shown in Appendix B.
Planning records	The Camden online planning database has been searched to find available information about basements at neighbouring properties. Planning consent was granted in 1997at 126 Grafton Road for '*the erection of a four-storey building to provide four flats with associated car parking spaces on the ground floor, plus the provision of residential amenity space to the rear of the adjoining office building at nos. 116-12.*' There are three planning applications listed for 132-134 Grafton Road, all of which were refused. There are several planning applications for 10 Spring Place, and 8-9 Spring Place. There is no indication of a basement at any of the adjoining properties within the planning records viewed.
Geology	Geological mapping[2] shows the area to be underlain by the London Clay, which is extensive across the area. 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 occur in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.[3] Table 2.2 presents geological data from selected BGS borehole records,[4] and Figure 2.1 shows the location of the boreholes. The borehole logs confirm that the area is underlain by London Clay, with 0m to 2.9m of fill/Made Ground above.

[1] https://routecalculator.co.uk/elevation
[2] http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[3] http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=LC
[4] http://mapapps2.bgs.ac.uk/geoindex/home.html

Aquifer status	The London Clay is classified by the Environment Agency as unproductive strata.[5] Groundwater was not recorded in three of the five BGS borehole logs. At TQ28SE1560, groundwater was encountered at 54.87m, in the Reading Beds underlying the London Clay. At TQ28NE128 (BH8), a groundwater seepage was encountered at 2.8m (31.2m OD), and a groundwater level was measured at 1m (33m OD) on 12 January 1979.
Watercourses	A culvert lies 185m north east of the site. There are no surface water features within 250m of the site. [6] There are no rivers within 500m of the site. There are no surface water abstractions within 1000m of the site.[7] The site lies approximately 190m west and 360m east of two tributaries of the former River Fleet[8]. It may be that the culvert 185m north east is in fact the now culverted River Fleet.
Springs	There are no springs shown on OS mapping.
Wells	The closest groundwater abstraction is 449m to the south east at Kentish Town Sports Centre, which is also the closest potable water abstraction. There are no source protection zones within 500m of the site. [9] BGS records hold three well records, two at St Pancras Baths (TQ28/48A and TQ28/48B and one at Alexandra House, Haverstock Hill (TQ28/47). All three wells target the Chalk aquifer, underlying the London Clay. [10]
Groundwater flooding	There are no groundwater flooding susceptibility areas within 50m of the site. The area is not considered to be prone to groundwater flooding based on rock type. [11]

[5] Groundsure report GS-4228183
[6] Groundsure report GS-4228183
[7] Groundsure report GS-4228183
[8] GHHS, Figure 11
[9] Ground sure report-3836241
[10] http://mapapps2.bgs.ac.uk/geoindex/home.html
[11] Groundsure report GS-4228183

Table 2.2 BGS borehole records

Ref	Name	Easting	Northing	Description
TQ28NE128 BH8	NORTH LONDON-SKILL CENTRE	528600	185100	Ground level at 34m OD. FILL: cemented bricks (possibly old foundation) to 0.3 m, FILL: ash and brick rubble to 1 m, FILL: silty clay with small brick fragments and topsoil to 2.9 m, CLAY: silty slightly organic clay to 4.5 m, CLAY: silty brown grey with scattered patches of orange/brown fine sand/silt (well fissured) to 10 m, CLAY: silty grey well fissured and occasionally laminated to 21 m. Water seepage at 2.8m (31.2m OD). Groundwater level at 1m (33m OD) on 12 January 1979.
TQ28SE1560	ST PANCRAS BATHS, PRINCE OF WALES ROAD	528760	184790	London Clay - brown clay to 6.1 m, London Clay - blue clay and septaria to 39.32 m, Reading beds to 59.14 m, Thanet Sands to 61.88 m, Upper Chalk to 137.16 m. Water level at 54.87 m.
TQ28SE846	HARMOOD ST. CAMDEN 2	528490	184630	Ground level at at 30.05m OD. Fill (tarmac) to 0.35 m, fill (brick rubble) to 0.9 m, soft black silty clay to 1.4 m, firm fissured grey and brown mottled sandy silty CLAY to 2 m, stiff fissured brown slightly sandy silty CLAY with grey staining in the fissures and small pockets of orange-brown fine sand to 6.2 m, stiff to very stiff fissured grey brown silty CLAY with partings of silty fine sand and some selenite crystals to 20 m. Groundwater was not encountered.
TQ28NE308	SPRING HILL 2	528050	185070	Concrete to 0.77 m, brown Clay to 6.1 m, claystone to 6.25 m, brown clay to 11.59 m, blue clay to 12.04 m. Water observations - nil.
TQ28NE237	GOSPEL OAK LAMBLE ST BH3	528150	185390	Ground level at 43.2m OD. Made Ground (brick, stones and clay) to 1.22 m, brown mottled clay with stones to 2.29 m, brown mottled clay to 5.8 m, brown clay to 7.78 m, blue clay to 9.15 m. Water struck - none.

3 SCREENING

A screening assessment has been undertaken in accordance with the methodology set out in CPG4 and GHHS (Arup, 2012). The results are presented in Table 3.1.

Table 3.1 Screening assessment

Ref	Question	Answer (yes/no/unknown)	Action
Q1a	Is the site located directly above an aquifer?	No, the site is on the London Clay (GHHS Figure 8)	No further action
Q1b	Will the proposed basement extend beneath the water table surface?	Unknown	Take forward to scoping stage
Q2	Is the site within 100m of a watercourse, well (used/ disused) or potential spring line?	No, a culvert, possibly the former River Fleet, lies 185m north east. (GHHS, Figure 11)	No further action
Q3	Is the site within the catchment of the pond chains on Hampstead Heath?	No (GHHS, Figure 14)	No further action
Q4	Will the proposed basement development result in a change in the proportion of hard surface/paved areas?	No, the current and proposed properties have similar (c.100%) paved/hard surfaced areas	No further action
Q5	As part of the 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)	Drainage proposals are currently unknown.	Take forward to scoping stage
Q6	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?	There are no local ponds, surface water features or spring lines within 250m of the property. The culvert (possible former River Fleet) 186m from the site is unlikely to affect the property due to distance.	No further action

4 SCOPING

This section of the report summarises the pertinent information as a Conceptual Model, and then describes the matters of concern that need to be considered in the Impact Assessment.

4.1 Conceptual model

The proposed development is to demolish the existing single-storey industrial building/warehouse, and construct a five-storey residential building with a basement and roof terrace. The basement would be approximately 3m deep, and would include sunken terraces at the front and rear. The proportion of hardstanding at the site is not anticipated to change.

The underlying geology comprises London Clay, which is likely to be overlain by Made Ground. Groundwater flow within the London Clay is generally negligible, although some groundwater movement occurs on discrete sand partings or other discontinuities. A BGS record from a borehole 125m northeast of the site recorded a groundwater seepage in the Made Ground at 2.8m (31.2m OD), and a groundwater level was measured at 1m (33m OD).

There is the potential for groundwater to be present in Made Ground below the site, or on sand partings or other discontinuities within the London Clay. Groundwater may be present at elevations above the base of the proposed basement; groundwater elevation and the seasonal variation in groundwater level are not known. In addition, there is the potential for soil moisture to affect the development.

There may be some groundwater ingress to the basement excavation, particularly during times of heavy rainfall. On the basis of the available information, it is considered likely that commonly adopted procedures for managing water in an excavation, such as pumping from a sump, will be sufficient to deal with groundwater ingress.

The current and proposed drainage arrangements for the site are not known. The proportion of hardstanding at the site is not anticipated to change, as the site is fully covered by buildings/hardstanding. It is unlikely that surface water will be discharged to ground under the proposed scheme due to the low permeability of the London Clay underlying the site.

4.2 Discussion

There are well documented best-practice methods for waterproofing basement structures, to prevent ingress of groundwater to the built structure, and to counter the effects of soil moisture, as outlined in BS 8102:2009 'Code of practice for protection of below ground structures against water from the ground.'

BS 8102 gives guidance on the construction of new basements, introducing three performance grades, as shown in Table 1. BS 8102 also specifies three types of waterproof protection, Types A, B and C; shown in Table 2.

Table 4.1 Level of performance of waterproofing system

Grade	Required level of performance
1	Some seepage and dampness is permitted
2	No water penetration, but dampness is permitted
3	No water penetration or dampness is permitted

Table 4.2 Types of waterproof protection

Type	Waterproof protection
A	Internal or external tanking
B	Structurally integral protection
C	Internal drained cavity protection with a sump and pump for removal of water or its disposal by gravity

The National House Building Council (NHBC) requires basements which are to be used for habitable accommodation to be constructed to Grade 3, and those used for parking cars to be constructed to Grade 2. [12]

NHBC also require that ground investigations should be undertaken to identify the most appropriate waterproofing options, in conjunction with the construction materials to be used[13]. In the absence of adequate ground investigations to establish the ground water regime and drainage characteristics, BS 8102 (Clause 6.1) requires that '*Waterproofing measures should be designed on the basis of water to the full height of the retained ground at some time during the structure's life*'.

4.3 Matters of concern

Five attributes are considered as potential matters of concern, as discussed below.

1. Groundwater level –local records indicate that there may be shallow groundwater within Made Ground, and in any case, the London Clay may bear groundwater on discrete sand partings or other discontinuities, if these are present. It is not anticipated that there will be significant inflows to the basement excavation, but some groundwater management may be required. Waterproofing of the basement to Grade 3 (BS 8102) will be required. This should take into account the local ground conditions. It is not anticipated that backing up of groundwater around the structure will be an issue at this location, due to the lack of neighbouring basements.
2. Range of seasonal fluctuation in groundwater levels – the range of fluctuation in groundwater levels is not known. Provided that the waterproofing measures are designed on the basis of water to the full height of the retained ground at some time during the structure's life, the seasonal fluctuation in groundwater levels should not pose a risk to the development. Comprehensive characterisation of the groundwater regime might allow less stringent design standards to be adopted, however it is good practice to design for groundwater levels of up to 1m bgl in any case, to provide protection against burst drains etc.
3. Spring/stream hydrographs – there are no surface water courses in the vicinity of the site. This does not require further consideration.
4. Soil moisture – there is the potential for soil moisture content to affect the development. Waterproofing to Grade 3 (BS 8102) will be required.
5. Water quality – there is no evidence that the development will affect water quality, provided good practice is followed with regard to pollution management. This does not require further consideration.

[12] NHBC Standards 2017
[13] NHBC Standards 2017

5 CONCLUSIONS

There is the potential for groundwater flow to the basement excavation and to the finished structure, and for soil moisture to affect the finished basement. It is considered unlikely that groundwater will back up around the structure to the extent that nuisance is caused, owing to the lack of basements at neighbouring properties.

It is recommended that the proposed development should comply with Grade 3 (no water penetration or dampness is permitted) and Type C (internal drained cavity protection with a sump and pump for removal of water or its disposal by gravity) of British Standard BS 8102:2009 'Code of practice for protection of below ground structures against water from the ground'.

It is recommended that a ground investigation is undertaken to confirm the geology underlying the site and groundwater elevations. Given the low sensitivity of the setting, specifically the lack of neighbouring basements, the ground investigation could be appropriately be a condition of a planning permission, provided that waterproofing measures are designed on the basis of water to the full height of the retained ground at some time during the structure's life.

6 REFERENCES

Arup, 2012. Geological Hydrogeological and Hydrological Study, Guidance for subterranean development

Ground and Water, 2017. Preliminary summary - ground investigation report. 11 Garrad's Road. Ref GWPR2048.

London Borough of Camden CPG4 'Basements and Lightwells'

NHBC Standards

NHBC, 2011. NHBC Technical Extra April 2011 Issue 02

APPENDIX A

Groundsure Report

APPENDIX B

Site plans