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Ground Investigation & Basement Impact Assessment – Non-Technical Summary

CLIENT	Eli Nathenson c/o Martin Evans Architects
SITE ADDRESS	43 Burghley Road, Kentish Town, Camden, London NW5 1UH
REPORT REFERENCE	GWPR2032/TS/November 2017
ENGINEER	Francis Williams M.Geol. (Hons) C.Geol FGS Cgeol CEnv AGS Rob Terrell BSc. (Hons) MSc Ian Harben Meng CEng MICE MIStructE
SITE DESCRIPTION	A Site Walkover was undertaken in August 2014. The site was occupied by a terraced four storey brick built residential house. A <0.80m wide gate allowed access up to a raised ground floor level. A paved rear garden was only accessible through the existing building. It was understood the property had no existing lower ground floor/basement level. A raised kerb was noted outside the property adjacent to Burghley Road. Burghley Road, located adjacent to the south-east boundary of the site, appeared to be at ~42.50m AOD. The paved front garden was understood to be situated at ~42.77m AOD (designated as front ground level (fgl)). The rear decking was situated at 44.36m AOD, at a similar level (with the rear decking slightly lower) to the ground floor of the existing property (designated as ground level (gl)). Steps were noted up to an upper terrace (upper ground level (ugl)) situated at 45.41m AOD. The sites environs were noted to be sloping gently to moderately down to the south-west.
PROPOSED DEVELOPMENT	At the time of reporting, November 2017, it was understood the proposed development will comprise the construction of a basement beneath the full footprint of the building. The basement was anticipated to be founded at ~1.70m below front garden level (bfgl) and ~3.00m below the rear garden level/ground floor level of the property (bgl). Lightwells will be formed at the front and rear of the structure. The lightwell to the rear of the property will be covered by glass, with the lightwell at the front open. The proposed development fell within Geotechnical Design Category 2 in accordance with Eurocode 7. The proposed foundations were noted to comprise a 1.50m thickened edge, with a bearing capacity of 105kN/m^2. The proposed development was understood not to involve any re-profiling of the site and its immediate environs. It is understood that no trees will be removed to facilitate the construction of the basement.
CONCEPTUAL SITE MODEL AND MATTERS OF CONCERN HIGHLIGHTED BY SCREENING	The following geotechnical concerns have been formulated by this desk based review and should be analysed by intrusive investigation: • Soils with the potential for volume change potential are likely to be encountered under the site. Soils volume change potential to be determined along with depth of root penetration with reference to proximity of nearby trees; • Protection of nearby trees; • Potential for Made Ground; • Proximity of railway tunnels; • Basement excavation and land stability given neighbouring properties and roads; • Potential for shallow groundwater to be encountered perched within shallow Made Ground; • Temporary works whilst underpinning; • Surface Water Run-off;

- Heave of soils following overburden pressure release.

FIELDWORK UNDERTAKEN

Fieldwork was undertaken on the 29th August 2014 and comprised the drilling of one window sampler borehole (WS1) to a depth of 5.00m below front garden level (bfgl) and the hand excavation of one trial pit foundation exposure (TP/FE1) at the front of the property.

It was not possible to install a standpipe in WS1 due to a collapse of the borehole at 2.30m bfgl upon completion of the borehole.

On the 30th August 2016 two windowless sampler boreholes (WSA and WSB) were drilled onsite. WSA was drilled at the front of the property to 4.00m bfgl with WSB drilled in the rear garden on the upper terrace to 3.00m bugl. A small diameter (33mm external diameter) combined bio-gas and ground water monitoring well was installed in WSA to 4.00m bgl.

On the 3rd March 2017, a Modular Windowless Sampling Rig attended site and drilled a single borehole (BHZ), at the front of the property, to a depth of 6.45m bfgl. Standard Penetration Tests (SPT's) were undertaken at 1.0m intervals during the drilling of the borehole.

GROUND CONDITIONS ENCOUNTERED

Trial Hole Logs can be seen in Appendix A.

Summary of Strata Encountered

Strata	Depth Encountered (m bgl)	Thickness (m)
CONCRETE/PATIO OVER SHARP SAND	GL	0.20 – 0.30
MADE GROUND: The Made Ground comprised an orange brown, pale brown to brown slightly gravelly to gravelly silty clay. The gravel was rare to occasional, fine, sub-angular brick and concrete.	GL – 0.30	0.60 – 2.30
LONDON CLAY FORMATION: Orange brown to brown silty clay, with blue grey/grey mottling, was encountered to a maximum depth of depth of 6.45m below the top of the borehole.	0.60 – 1.80	>2.40 – >5.45

ROOTS

Roots were noted to a depth of 1.00m bfgl in WS1, 1.20m bfgl within WSA and 0.60m bugl within WSB. No roots were noted in BHZ.

GROUNDWATER

A groundwater strike was noted in WS1 at 3.30m bfgl. Ponding perched water was noted at ~1.00m bfgl within WSA at the base of the Made Ground. No groundwater was observed during the drilling of BHZ nor WSB.

A return visit to monitor the combined bio-gas and groundwater well installed in WSA was undertaken by a Ground and Water Limited Engineer on Friday, 16th September 2016. Groundwater was noted to be resting at ground level in the 3.90m deep well installed.

STANDARD PENETRATION TESTING (SPT's)

London Clay Formation (cohesive): Low to High undrained shear strength (30 – 145kPa)

VOLUME CHANGE POTENTIAL

The cohesive soils of the London Clay Formation were shown to have a **High** potential for volume change in accordance both BRE240 and NHBC Standards Chapter 4.2. A moisture deficit was noted within WS1 at 5.00m bgl, assumed to be related to the lithology of the soil (heavily overconsolidated.

Geotechnical laboratory results can be seen in Appendix B.

FOUNDATION RECOMMENDATIONS

It was considered that 3.00m bgl was a suitably moisture stable depth for underpinning. Based on the loading regime provided the net change in effective stress at foundation depth may results in minimal to <10mm of settlement.

Based on a 5.60m by 17.00m basement slab constructed at 3.00m bgl, and a self-weight of the slab of 10kN/m^2, then the immediate heave on overburden pressure relief would be 5.34mm

It is estimated that 30-50% of the total heave will be immediate, indicating that between 10.7 – 17.8mm of total heave may occur beneath the slab. This does not take into account the potential for long term

	heave within the cohesive soils of the London Clay Formation, and this must be taken into account in final design. **The structural engineer will be required to account for this in the final design. Use of clayboard beneath partially suspended slab is likely to be required.**
HYDROGEOLOGICAL RISK ASSESSMENT	A groundwater strike was noted in WS1 at 3.30m bfgl. Ponding perched water was noted at ~1.00m bfgl within WSA at the base of the Made Ground. No groundwater was observed during the drilling of BHZ or WSB. Groundwater was noted to be resting at ground level in the 3.90m deep well installed within WSA during a return visit on Friday 16th September 2016. Therefore, it was considered unlikely that the basement would be constructed below the groundwater level and the cumulative effects of basements in groundwater is not a consideration at this site. However, significant perched groundwater was likely to be encountered during construction, especially after a period of excessive rainfall. In relation to the basement, once constructed, the Made Ground will act as a slightly porous medium for water to migrate and additional drainage should be considered as the London Clay Formation will act as a barrier for groundwater migration.
ASSESSMENT OF GROUND MOVEMENT	Ground movement assessment was carried out on the neighbouring properties within Section 7.7 of the full ground investigation report (GWPR2032/GIR/October 2017). In terms of building damage assessment and with reference to Table 2.5 of C580 (after Burland et al, 1977), the 'Description of typical damage' given the calculated movements it is likely to fall within category of damage '2' Slight to '0' Negligible, using the realistic line. Mitigation measures to minimise potential movements are provided in Section 7.7 of the full ground investigation report (GWPR2032/GIR/October 2017).
SUB-SURFACE CONCRETE	Sulphate concentrations measured in 2:1 water/soil extracts taken from the London Clay Formation, from both the geotechnical and chemical laboratory testing, fell into Class DS-1 and DS-2 of the BRE Special Digest 1, 2005, 'Concrete in Aggressive Ground'. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-2 for foundations within the London Clay Formation. For the classification given, the "mobile" and "natural" case was adopted given the presence of a groundwater strike and the residential use of the site.
SURFACE WATER/DRAINAGE	The basement includes the construction of a lightwell, which will increase the amount of hard-surfaces and paved areas. Information from the Architect indicates that rainwater discharges into a combined soil and surface water system within the grounds/garden area, which enters the main public sewer beneath Well Road. The foul drainage from the new Lower Ground floor and the surface drainage below the Delta system will be pumped into the existing system. No further actions considered necessary. Due to excavation of front and rear lightwells and additional hardstanding formed at the front lightwell, the flow and volume of surface water into the ground and existing surface water drainage system may change. As the rear lightwell is covered by glass, surface water ponding within this area will drain into the rear garden. The front lightwell will be drained via sump to the existing surface and foul drainage. Details to be provided in structural engineer's report. Surface water flooding noted to be an issue along Burghley Road; however, due to raised curb along the edge of the road and the overall topography of the road sloping north-west, surface water will migrate away from the site and lightwells.
SLOPE STABILITY	Based on the existing slope profile, no slope failures with a factor of safety below 1.3 was noted, and therefore are all acceptable risks. No evidence for such failures are present. Based on an angle of shearing resistance (ϕ') of 24°, the proposed shows minimum failure planes between ~1.5. These are assessed as being acceptable risks.

THIS NON-TECHNICAL SUMARY MUST BE READ IN CONJUNCTION WITH THE FULL REPORT.