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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a desk study and Basement Impact Assessment carried out by Geotechnical and Environmental Associates (GEA), on the instructions of Richard Tant Associates on behalf of Sharon Waterman. The purpose of the work has been to determine the history of the site, to assess the potential for contamination, to provide preliminary information on foundation options and to review any possible impact on the local soil and groundwater regime with respect to the proposed redevelopment of this site through the construction of an additional basement level and swimming pool constructed from the existing lower ground floor level. A ground investigation has recently been undertaken at this site by GEA and borehole records are included; the findings are discussed herein. A full ground investigation report is being prepared as a stand-alone document and has not yet been completed.

DESK STUDY FINDINGS

Greenwood's Map of London, dated 1827, shows Prince Albert Road to have been developed and labelled as Primrose Hill Road at that time, although no houses had been constructed. By 1859, John Snow's map shows the site to have been developed and the outline of the existing house can clearly be seen on the earliest OS map studied, dated 1876. Very little change is shown on subsequent maps throughout the 20th Century.

GROUND CONDITIONS

The boreholes encountered the expected ground conditions in that, beneath a moderate thickness of made ground, which extended to depths of between 0.5 m and 1.8 m, London Clay was encountered and extended to 20.0 m, the maximum depth investigated. Seepage of groundwater was recorded at a depth of 4.0 m in one of the window sampler boreholes advanced from lower ground floor level. No inflows were recorded in the cable percussion borehole at the front of the site. A standpipe was installed to a depth of 7.0 m at the front of the site and was recorded to be dry to a depth of 2.0 m, a couple of days after installation, where the pipe was noted to be blocked.

CONCLUSIONS

On the basis of the desk study findings, the contamination risk has been assessed as very low. It would, however, be prudent to carry out a ground investigation to provide a preliminary assessment of the presence of contamination.

The expected ground conditions at the site indicate that spread or piled foundations bearing on the London Clay should be a suitable solution for the anticipated moderately light loads. A ground investigation should be carried out to confirm the ground profile and strength of the soils.

BASEMENT IMPACT ASSESSMENT

Five potential impacts were identified as a result of the screening exercise but the majority of these impacts can be mitigated by appropriate design and standard construction practice. The canal is at sufficient distance and depth to be unaffected by the development. Monitoring of the standpipe should be continued to determine the equilibrium water level and protection from groundwater inflows may be required in the basement excavation. Any inflows from within the London Clay would be expected at a very slow rate which could be suitably controlled by sump pumping.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Richard Tant Associates on behalf of Sharon Waterman, to carry out a desk study and Basement impact assessment at 13 Prince Albert Road, London NW1 7SR. A ground investigation has recently been undertaken at this site by GEA and borehole records are included; the findings are discussed herein. A full ground investigation report is being prepared as a stand-alone document and has not yet been completed.

1.1 Proposed Development

Consideration is being given to the redevelopment of this site through the construction of a basement to a depth of 3 m below the existing lower ground floor level and a swimming pool constructed from basement level. The underside of the pool excavation will extend to a depth of 4.5 m below existing lower ground floor level. The proposed basement will extend beneath the existing house and the front driveway.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to determine the history of the site and surrounding area, particularly with respect to any previous or present potentially contaminative uses;
- to research the geology and hydrogeology of the site;
- to check records of data on groundwater, surface water and other publicly available environmental data;
- to use the information obtained in the above searches to carry out a qualitative risk assessment with respect to subsurface contamination; and
- to provide preliminary comments on foundation options and recommendations for appropriate ground investigation; and
- to provide a preliminary assessment of the impact of the proposed development on groundwater, surface water and land stability.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, comprising, in summary, the following activities:

- a review of readily available geological maps;
- a review of publicly available environmental data sourced from the Landmark Envirocheck database;
- a review of historical Ordnance Survey (OS) maps supplied by Landmark;

- a review of the GEA archive; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

In addition, a ground investigation has recently been undertaken at this site by GEA and borehole records are included; the findings are discussed herein. A full ground investigation report is being prepared as a stand-alone document and has not yet been completed.

The work carried out includes a Groundwater, Surface Water and Land Stability Screening Assessment, which forms part of the Basement Impact Assessment (BIA) procedure specified in the London Borough of Camden Planning Guidance CPG4[1] and their Guidance for Subterranean Development[2] prepared by Arup.

The aim of the work is to provide information on the groundwater, surface water and land stability of the site and in particular to assess whether the development will affect the neighbouring properties and whether any identified impacts can be appropriately mitigated by the design of the development.

1.4 Qualifications

The Basement Impact Assessment (BIA) has been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng) and member of the Institution of Civil Engineers (MICE), who has over 20 years specialist experience in ground engineering. The assessment has been made in conjunction with Steve Branch, a BSc in Engineering Geology and Geotechnics, MSc in Geotechnical Engineering, a chartered geologist (CGeol) and Fellow of the Geological Society (FGS) with 25 years experience in geotechnical engineering and engineering geology. Both assessors meet the Geotechnical Specialist criteria of the Site Investigation Steering Group and satisfy the qualification requirements of the Council guidance.

1.5 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside the stated scope of the research. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by GEA.

2.0 THE SITE

2.1 Site Description

The site is located 1200 m to the northwest of Euston railway station and may be additionally located by National Grid Reference 528350, 183700.

1 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*
2 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

The site fronts onto Prince Albert Road to the south and is bordered by semi-detached villas to the east and west, and semi-detached townhouses to the north. The site is roughly rectangular in shape, measuring approximately 30 m by 15 m. It is occupied by a semidetached Regency villa of five storeys, including a lower ground level. The house is centrally positioned on the site with a hard covered driveway to the front and garden at the rear. The rear garden is at lower ground floor level; is accessed by steps on the western side of the house and comprises a central lawn with bushes along the northern and western boundaries; a paved path runs along the back of the house and a small patio area is present in the east of the garden. There are two semi-mature silver birch trees located on the southern boundary of the site.

The site and surrounding area are essentially level at an Ordnance datum (OD) level of approximately 34.0 m OD according to the most recent Ordnance Survey (OS) map.

2.2 Site History

The site history has been researched by reference to online data and historical Ordnance Survey (OS) maps obtained from the Landmark database.

Greenwood's Map of London, date d 1827, shows Prince Albert Road to have been developed and labelled as Primrose Hill Road at that time, although no houses had been constructed. By 1859, John Snow's map shows the site to have been developed and the outline of the existing house can clearly be seen on the earliest OS map studied, dated 1876. Very little change is shown on subsequent maps throughout the 20th Century.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and a summary of the results of this search is included in the Appendix. More detailed information relating to the search can be provided on request.

No operational or historic landfills are recorded within 250 m of the site and there are no licensed waste transfer, treatment or disposal sites within 250 m. There are no controlled processes operating within 250 m of the site.

A minor pollution incident is recorded to have occurred 48 m to the west of the site in 1999, but this is unlikely to have had a detrimental impact on the site.

The site is located in an area where less than 1% of homes are affected by radon emissions; therefore no radon protective measures will be necessary.

The site is at low risk of potential stability hazards, including landslides and dissolution.

3.0 GROUND CONDITIONS

3.1 Soil Conditions

The British Geological Survey (BGS) map of the area (Sheet 256) shows the site to be directly underlain by London Clay.

A single cable percussion borehole was advanced to a depth of 20 m at the front of the site on 24 November 2011. The deep borehole was supplemented by two window sampler boreholes which

extended to a maximum depth of 6.0 m. The boreholes encountered the expected ground conditions in that beneath a moderate thickness of made ground, which extended to depths of between 0.5 m and 1.8 m, London Clay was encountered. The made ground comprised topsoil and clay with gravel, brick, concrete and charcoal in the rear garden, whereas 'Type 1' aggregate was recorded beneath the driveway at the front of the site. The London Clay initially comprised firm brown mottled grey fissured clay which extended to the base of the window sampler boreholes and to 13.0 m in Borehole No 1. Below the weathered clay, stiff grey fissured clay was encountered and extended to the maximum depth investigated of 20.0 m.

3.2 Surface and Groundwater Conditions

The Regent's Canal lies in a relatively steep sided cutting roughly 30 m to the south of the site. The canal forms part of the Grand Union Canal and connects with the River Thames at Limehouse, 8.5 km to the southeast.

The underlying London Clay is classified as Unproductive Strata. The site does not lie within an Environment Agency designated Source Protection Zone (SPZ), but the Barrow Hill reservoir, located 700 m to the west of the site is identified as a groundwater source. The site is not within an area indicated by the Environment Agency to be at risk from flooding.

Seepage of groundwater was recorded at a depth of 4.0 m in one of the window sampler boreholes advanced from lower ground floor level. No inflows were recorded in the cable percussion borehole at the front of the site. A standpipe was installed to a depth of 7.0 m at the front of the site and has been monitored on a single occasion. The standpipe was recorded to be dry to a depth of 2.0 m, but the pipe was noted to be blocked at that depth. Nearby investigations did not encounter groundwater within the London Clay.

The southern part of the site is currently covered by buildings or hard standing, and the adjacent land is covered in essentially the same arrangement. Infiltration of rain water therefore generally only occurs in the rear garden, with the majority of surface runoff likely to drain into combined sewers in the road, or possibly into a soakaway.

4.0 RISK ASSESSMENT

4.1 Environmental Risks

The desk study research has indicated this site to have been occupied by the existing house since at least 1859. As such, no potentially contaminative land uses have been identified on or within close vicinity to the site.

No landfill sites or areas of infilled ground have been identified within 250 m of the site and, therefore, a risk from soil gas is not envisaged.

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides a regulatory regime for the identification and remediation of contaminated land. As part of the new regime local authorities are required to carry out inspections of their area to identify sites that may be contaminated. The determination of contaminated sites is based on a "suitable for use" approach which involves investigating the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of establishing one or more "pollution linkages"; a pollution linkage requires a source of

contamination, a sensitive target or receptor that is at risk from the contamination and a pathway by which the contamination can travel from the source to the target.

For this site no sources of pollution have been identified and no new targets are at risk, there is therefore a VERY LOW risk of contamination.

4.2 Development Issues

The proposed redevelopment of the site includes the construction of a single level basement and a swimming pool constructed from basement level. On the basis of the information provided the formation level of the new basement is anticipated to be roughly 3 m below existing lower ground floor, which is assumed to be approximately 5 m to 6 m below the level of Prince Albert Road. The basement level will be locally deepened in the south of the site to accommodate the proposed swimming pool. The new basement will extend beneath the house and front drive, and partially below the rear garden. Formation level is therefore anticipated to be within the London Clay.

The foundation loads for the proposed development are unlikely to increase the existing loads of the house and no additional loads are proposed. It is understood that the current proposal is to support the structural loads by means of piled foundations, with mass concrete underpinning along the party wall. There may therefore be a small increase in loading along the party wall.

It would be prudent to carry out a ground investigation in order to confirm the ground conditions at the site and to obtain information on the strength of the soil for the purposes of foundation and retaining wall design.

5.0 SCREENING ASSESSMENT

The Council's guidance suggests that any development proposal that includes a subterranean basement should be screened to determine whether or not a full BIA is required.

A number of screening tools are included in the Arup document and for the purposes of this report reference has been made to Appendix E which includes a series of questions within a screening flowchart for three categories; Groundwater flow; Land stability; and Surface water flow. Responses to the questions are tabulated below.

5.1 Subterranean (groundwater) Screening Assessment

Question	Response for 13 Prince Albert Road
1a. Is the site located directly above an aquifer?	No
1b. Will the proposed basement extend beneath the water table surface?	Possibly – seepage of groundwater was recorded at a depth of 4.0 m below the rear garden
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential springline?	*Yes – the Regent's Canal is located roughly 30 m to the south of the site*
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No

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
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 above assessment has identified the following potential issues that need to be assessed:

Q1b The excavation may extend below the groundwater level.
Q2 The site is within 100 m of the Regent's Canal.

5.2 Stability Screening Assessment

Question	Response for 13 Prince Albert Road
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No
5. Is the London Clay the shallowest strata at the site?	No
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
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 area is prone to these effects as a result of the presence of shrinkable London Clay and abundant mature trees*
8. Is the site within 100 m of a watercourse or potential spring line?	*Yes – the Regent's Canal is located roughly 30 m to the south of the site*
9. Is the site within an area of previously worked ground?	No
10. Is the site within an aquifer?	No
11. Is the site within 50 m of Hampstead Heath ponds?	No
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes - the site fronts onto a public road*
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	*Yes – the development will include new piled foundations and it is understood that adjacent properties have shallow foundations*
14. Is the site over (or within the exclusion zone of) any tunnels, eg railway lines?	No

The above assessment has identified the following potential issues that need to be assessed:

Q7 The site is in an area of seasonal shrink-swell.
Q8 The site is within 100 m of the Regent's Canal.

Q12 The site is within 5 m of a public highway.
Q13 The development will increase the foundation depths relative to the neighbouring properties to a relatively significant extent.

5.3 Surface Flow and Flooding Screening Assessment

Question	Response for 13 Prince Albert Road
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No
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
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No
4. Will the proposed basement development 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 – the building footprint above ground will not increase
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	No – the building footprint above ground will not increase
6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?	No

No potential issues have been identified with respect to surface water flow.

6.0 SCOPING ASSESSMENT

The purpose of scoping is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified potential impact factors. An investigation has not been carried out to date.

6.1 Potential Impacts

The following potential impacts have been identified.

- The basement may extend below the groundwater level
- The close proximity of the Regent's Canal
- Seasonal shrink – swell
- The location of the public highway
- Founding depths relative to neighbours

6.2 Impact Assessment

The screening identified five potential impacts. The desk study and ground investigation information has been used below to review the potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

Groundwater level

The recent investigation recorded seepage of groundwater in the London Clay at a depth of 4.0 m below lower ground floor level. The proposed excavation for the swimming pool will extend to a depth of 4.5 m below lower ground floor level and as such groundwater may be encountered. The seepage of groundwater at one location may be attributable to perched groundwater associated with a claystone or pocket of sand and as such may not represent a true groundwater level. Monitoring of the standpipe should therefore be continued to determine the equilibrium water level. If the monitoring indicates a shallow groundwater table protection from groundwater inflows may be required in the basement excavation although any inflows from within the London Clay would be expected at a very slow rate which could be suitably controlled by sump pumping.

Regent's Canal

The canal is situated in a relatively deep cutting 30 m to the south of the site. The canal is a man-made feature, and is unlikely to have any impact, or be influenced by, the surrounding groundwater level. The exact water level of the canal is not known but evidence suggests that it is significantly lower than the site level, and will be below the proposed basement excavation.

Seasonal Shrink-Swell

The proposed development involves deepening the foundations to below what would be expected as a depth of influence of tree roots on the basis of the trees present on the site. If any trees are removed consideration would need to be given to the effects of clay swelling, but similarly the foundations are to be placed at depths that should not be affected. Subject to inspection of foundation excavations in the normal way to ensure that there is not significant unexpectedly deep root growth, it is not considered that the occurrence of shrink-swell issues in the local area has any bearing on the proposed development.

Location of public highway

We understand that retaining walls have been designed to maintain the stability of the adjacent road and associated infrastructure. There is nothing unusual or exceptional in the proposed development that gives rise to any concerns with regard to stability over and above any development of this nature.

Founding depths relative to neighbours

It is proposed to utilise mass concrete underpins to support the party wall between the two semi-detached houses. The excavations can be readily managed using standard engineering solutions to ensure that the stability of the adjacent foundations is maintained. These solutions include preventing excavation within a zone that would lead to instability, and constructing retaining walls in limited panel widths to ensure that no more general stability problems arise.

7.0 CONCLUSIONS

Consideration is being given to the redevelopment of this site through the excavation of a basement to a depth of 3 m below the existing lower ground floor level and a swimming pool constructed from basement level which will extend to 4.5 m.

7.1 Desk Study

On the basis of the findings of the research carried out there is considered to be a VERY LOW risk of contamination at this site. It would, however, be prudent to carry out chemical analyses on samples of the near-surface soil in order to determine whether any contaminants are present and to provide an assessment of classification for waste disposal purposes.

The expected ground conditions at the site indicate that spread or piled foundations bearing on the London Clay should be a suitable solution for the anticipated moderately light loads. A ground investigation has now been carried out should be carried out to confirm the ground profile and strength of the soils.

7.2 Basement Impact Assessment

A Basement Impact Assessment has been carried out following the information and guidance published by the London Borough of Camden. Five potential impacts were identified as a result of the screening exercise;

- The basement may extend below the groundwater level
- The close proximity of the Regent's Canal
- Seasonal shrink – swell
- The location of the public highway
- Founding depths relative to neighbours

It has been concluded that the majority of these impacts can be mitigated by appropriate design and standard construction practice, particularly with respect to seasonal shrink / swell, the founding depth relative to the neighbours, and the stability of the highway. The canal is at sufficient distance and depth to be unaffected by the development. Monitoring of the standpipe should be continued to determine the equilibrium water level and protection from groundwater inflows may be required in the basement excavation. Any inflows from within the London Clay would be expected at a very slow rate which could be suitably controlled by sump pumping.

It is concluded that standard safe working practices and measures that will be adopted to construct the basement mean that the proposed development is unlikely to result in any specific groundwater, surface water, land or slope stability issues.

APPENDIX

Borehole Records

Envirocheck Report

Historical Maps

Site Plan