BASEMENT IMPACT ASSESSMENT

65 ABERDARE GARDENS, NW6 5AN

CONTENTS

APPENDICES

1. INTRODUCTION

This report describes the results of a Basement Impact Assessment undertaken for the excavation and construction of a single storey basement at 65 Aberdare Gardens, London, NW6. The work was undertaken on behalf of Bubble Architects and was carried out by London Basement, Chelmer Site Investigations and MMP Design. Plans of the proposed basements are provided in Appendix A.

The purpose of this Report was to ascertain the potential impacts that the proposed basement would have on the ground stability, the hydrogeology and the hydrology in the vicinity of the site. The assessments were carried out in general accordance with the Camden Borough Council Development Policy 27 "Basements and Lightwells" and Camden Planning Guidance 1 "Design Note prepared by London Borough of Camden for New Basement Development and Extensions to Existing Basement Accommodation" (LBC, 2010).

As stated in Camden Development Policy DP27 paragraph 27.1, LB Camden "will only permit [basement and other underground development that] does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability".

The approach followed in this report is to initially provide a full site characterisation by a desk study of available geological, hydrological, hydrogeological, historical and topographic information together with a site visit and site specific borehole investigation. The Basement Impact Assessment (BIA) is then provided in full which is undertaken in general accordance with the recommended methodologies highlighted in Arup document "Guidance for Subterranean Development", prepared for the London Borough of Camden.

The five stage approach comprises of:

- Screening – Identification of matters of concern using checklists.
- Scoping – Definition of the matters of concern identified in the screening.
- Site Investigation and Study – Establishment of the baseline conditions
- Impact Assessment – Determination of the impact of the proposed basement on the baseline conditions.
- Review and decision making – Undertaken by London Borough of Camden.

2. THE SITE

2.1 Site Description

The site is located in Aberdare Gardens in South Hampstead, which is located to the north west of London City Centre. Photographs of the house are presented in Appendix B.

The existing property is an attractive brick and clay tiled semi-detached house in Aberdare Gardens and comprises a ground floor plus 2 upper floors as well as an existing part basement level. The building has previously been extended to the rear with a single storey extension and accommodates a dining area as well as a large artist studio used by the previous owner. As a result of the studio taking up much of the ground level, the main reception rooms are currently located on the first floor. All 5 bedrooms are on the top floor and are small for a home of this size. The front garden contains a soft landscape area as well as space for 2 cars. The property has a large garden to the rear.

To either side of the subject property are houses of a similar description. The rear boundary of the property backs onto gardens in Greencroft Gardens. To the front of the house as described above is space for 2 cars and some soft landscaping with a brick wall separating the site boundary between the house and the pavement of Aberdare Gardens.

All land on the site is relatively flat.

Roof drainage from the existing property was taken via down pipes into:

• A drainage system in the front garden which is understood to run northwards collecting drainage from the adjoining properties;

• A drainage system in the rear garden, which subsequently drains into the street drains beneath Aberdare Gardens.

The soft landscaped areas in the front garden together with soft landscaped areas in the rear garden provide some infiltration of rainwater into the ground.

Vegetation on the site comprised of a number of small trees and shrubs (up to 2.5m high) in the front and rear garden with a lawn.

2.2 Proposed Basement

The part existing basement level will be extended to the full depth of the ground floor. A lightwell will be added to the front and rear to improve daylight to the basement level. Attached at Appendix A are the proposed plans.

The property is a family dwelling and the additional space is predominantly for recreational and ancillary use and is not intended to be solely habitable such as a self-contained dwelling. No

sleeping accommodation is provided for at basement level and internal access is to be maintained for occupants to reach a higher floor within the building in the event of a flood. As such the flood risk and danger to life has been considerably reduced.

Practical measures are taken to reduce the impact of flooding and low level upstands will be formed around the lightwells to reduce the risk of localised flooding.

Basement spaces are drained by a surface water pump and 'dual' pumps are installed as standard. These are fitted with a high level alarm with battery backup to warn in the event of pump failure. A further battery back up system is available in high risk areas to ensure the pumps continue to operate in the event of mains failure; this is not considered necessary in this proposal and will not be fitted as standard.

Details of the water management systems are presented in Appendix I.

3. SITE HISTORY

Various historical maps and plans were inspected to assess the history of the site and it's past environments. The maps confirm those presented in the recent Fairhazel Gardens application (2012/0953/P).

The site was occupied by open ground until the late 19th Century. Residential properties and associated infrastructure were constructed in the area at the end of the 19th Century.

4. POTENTIAL CONTAMINATION & ARCHAEOLOGY

With the exception of made ground that may have been associated with the past residential development on the site and in the surrounding area, the historical map search has not identified any potential sources of contamination or archaeological features that could be present on the site. The former pond to the north east (which has been subsequently infilled) could be a potential source of ground gas, however given its size and distance from the site, this is considered unlikely to be a significant risk to the site.

A search of environmental databases via an Environsight report (provided by Centremaps) did not reveal any offsite sources of contamination that are considered likely to pose a risk to the site and the proposed development.

5. SITE GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

5.1 Geology

The published 1:50,000 scale British Geological Survey (BGS) geological map of the area (Sheet 256 "North London") shows the site to be underlain by the London Clay Formation of the Eocene epoch. An extract of the BGS geological map is provided on Figure 16 of Arup Report for London Borough of Camden "Guidance for Subterranean Development", 2010). Quaternary Head has been inferred to be present within 150m of the site (to the north east). Given the historical development of the site and surrounding areas, there may be made ground present on the site.

There is a very low risk that the site is affected by radon gas and as such, radon protection measures will not be required as part of the proposed development.

No geological faults are shown to be present within close proximity to the site. There is no evidence of past or present mining or quarrying activity in the vicinity of the site. The site is not shown to be within an area of significant landslide potential (reference Figure 17 of Arup Report for London Borough of Camden "Guidance for Subterranean Development", 2010). This is reinforced by the low slope angles recorded during the site walk over and for this area of Aberdare Gardens.

A number of relevant available historic borehole logs have been obtained from the BGS website and are summarised in Table 2 below. Copies of the referenced boreholes and a plan showing the borehole locations are provided in Appendix D.

TABLE 2
Summary of Historical Borehole Logs

BGS Reference	Approximate distance from Site	Brief Summary of Ground Conditions
TQ28SE520	300m N	GL to 0.91m – Made Ground. 0.91m to 2.05m – Soft to firm light brown mottled fissured Clay. 2.05m to 3.2m – Firm brown and grey mottled fissured Clay with fine gravel at 3m.
TQ28SE892	450m	E GL to 0.3m – Made Ground. 0.3m to 6.7m – Stiff brown Clay with sulphite crystals. 6.7m to 21.3m – Stiff to very stiff grey silty Clay.
TQ28SE276	180m	S GL to 0.76m – Topsoil.

		0.76m to 1.52m – Loamy Clay. 1.52m to 7.62m – Brown Clay.
TQ28SE2062	520m	W GL to 1.2m – Made Ground 1.2m to 7.8m – Firm becoming very stiff slightly silty brown mottled grey fissured Clay with claystones. Silt partings below 3m. Gypsum crystals below 5m. 7.8m to 10.0m – Very stiff to hard slightly silty blue grey fissured Clay with silt and sand partings.

From the site specific borehole undertaken by Chelmer Site Investigations (copy at Appendix __) the ground conditions were found to comprise:

- GL to 0.1m: Top soil
- 0.1m to 1.4: Medium compact, brown, very silty clay, with frequent brick and carbon fragments.
- 1.4m to 3.2m: Firm, moist, orange-brown and grey veined, very silty CLAY, with partings of orange and brown silt and fine sand, with occasional gravel and carbon flecks.
- 3.2m to 4.4m: Very stiff, brown and grey veined, silty CLAY, with partings of orange and brown
- 4.4m to 6.0m: Silt and fine sand with occasional fine gravel and crystals.. ....becoming stiff and moist from 3.80m.

5.2 Hydrogeology

The above referenced geological map indicates the site to be underlain by the London Clay Formation, which is an aquiclude. The Environment Agency have designated the London Clay Formation beneath the site as being “Unproductive”. The natural soils underlying the site are likely to comprise a superficial covering of made ground (potentially absent) overlying weathered London Clay (clay soils). The London Clay soils have low permeability and do not readily permit the downwards transfer of surface water or percolating groundwater.

There is one groundwater abstraction licence within 1000m of the site. This abstraction licence relates to an abstraction approximately 700m to the east of the site, which is used for direct spray irrigation from the Thames Groundwater at the Swiss Cottage Open Spaced Borehole. This is
unlikely to be affected by the proposed works at the site. Additionally, this abstraction is unlikely to have a detrimental impact on the site. An outer catchment source protection zone is situated approximately 490m east of the site. The site does not lie within a source protection

zone. Other unrecorded or unlicensed wells may be present close to the site, however abstractions are unlikely to be from the London Clay Formation.

5.3 Hydrology

Prior to the commencement of the construction works on the site, the rainfall over the area of the site would have drained in one of the following ways:

• Surface water from the rear roof, rear garden and patio would have drained into the drainage system beneath Aberdare Gardens via underground drainage.

• Surface water from the front roof would have drained into the drainage system that runs under the front garden of No.65 and the adjoining properties (anecdotal evidence provided by Client).

• Surface water from the front garden would have drained into the ground via the gravel and soft surfaced areas. The site is shown by the Environment Agency to not lie within a river, reservoir breach or sea flood zone. The site is also not in an area affected by groundwater flooding. Details of maps and information obtained from the Environment Agency are provided in Appendix E. There are no surface water features within 1km of the site. There are no biological river quality assessments within 1.5km of the site. There are no surface water abstraction licences within 1km of the site.

There are no records of authorisation issued by the Environment Agency to discharge to watercourses in accordance with the Water Resources Act 1991, within 500m of the site. A ditch was formerly present around 30m to the east of the site (identified on historical maps – see Section 3 above). The site is shown to be situated 50 metres west of the alignment of a former watercourse running through the area (reference Figure 11 of Arup Report for London Borough of Camden “Guidance for Subterranean Development”, 2010). However the presence of this former watercourse could not be seen from the historical map review undertaken in Section 3.

Aberdare Gardens is shown to have been affected (flooded) by the 1975 floods shown in Map 22 “Camden Flooding Map” (Drawing No. 722586/002) extracted from North London Strategic Flood Risk Assessment (Mouchel, 2008). The abovementioned figures from the Arup (2010) report “Guidance for Subterranean Development” have been reproduced in Appendix F of this report for reference.

6. BASEMENT IMPACT ASSESSMENT

6.1 Screening

The first stage of the Basement Impact Assessment process is to recognise the issues that are relevant to the site (screening). The screening process undertaken below initially highlights whether or not a basement impact assessment is required. The series of screening flowcharts provided in Appendix E of the Arup Report for London Borough of Camden "Guidance for Subterranean Development" (2010) have been used to identify what issues are relevant to the site. These screening flowcharts have been reproduced in Appendix H of this report. Each question posed in the flowcharts 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.
The results of the screening process for the site are provided in Table 3 below.

Table 3
Screening For Basement Impact Assessment

Question	Response	Details
Surface Flow and Flooding		
Is the site within the catchment of the ponds chain on Hampstead Heath?	No	Refer to Appendix F
As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak runoff) be materially changed from the existing route?	No	Developer to provide proposed drainage details to Building Control.
Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Proposed lightwells only to areas formerly hard-landscaped.
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 water originating from the site is not received by adjacent properties or downstream watercourses (other than run-off to sewers which will be reduced).
Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream	No	No surface water originating from the site is not received by adjacent properties or downstream watercourses (other than run-off to sewers

watercourses?		which will be reduced).
Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, 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?	Yes	The site has been affected by surface flooding in 1975.
Subterranean (groundwater) Flow		
Is the site located directly above an aquifer?	No	Site underlain by London Clay.
Will the proposed basement extend below the surface of the water table?	No	Site underlain by London Clay.
Is the site within 100m of a watercourse, well (disused / used) or a potential spring line?	Yes	Historic watercourse identified from "Lost Rivers of London" – See Appendix F. carried forward to scoping.
Is the site within the catchment of the pond chains on Hampstead Heath?	No	Refer to Appendix F.
Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	Lightwells will only cover areas formerly hard-landscaped.
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	Lightwells will only cover areas formerly laid to patio or other hard-landscaping.
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	No	No water feature within 1km of the site.

level in any local pond (not just the pond chains on (Hampstead Heath) or spring line?		
Slope Stability		
Does the existing site include slopes, natural or manmade, greater than 7°?	No.	Refer to site description
Will the proposed re-profiling of landscaping at site change slopes at the property to more than 7°?	No	Developer to provide details to LBC.
Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No	Refer to site description.
Is the London Clay the shallowest strata at the site?	Yes	Carried forward to Scoping
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 to be felled as part of proposed development.
Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Yes	London Clay. Carried forward to scoping.
Is the site within an area of previously worked ground?	No	Details in previous sections
Is the site within an aquifer? Is so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	Site underlain by London Clay.
Is the site within 50m of the Hampstead Heath ponds?	No	Refer to Appendix F.
Is the site within 5m of a pedestrian right of way?	Yes	Aberdare Gardens. Carried forward to scoping.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Carried forward to scoping.
Is the site over (or within the	No /	Site is not located over any

exclusion of) any tunnels, e.g. railway lines?	Unknown	railway tunnels as shown in Appendix F. Contractor to confirm site does not overlie other tunnels such as water / Royal Mail etc. Carried forward to screening.

6.2 Scoping, Requirements for Further Investigation and Impact Assessment

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.

The potential impacts for each of the matters highlighted in Table 3 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.

Question	Response	Details
Surface Flow and Flooding		
Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, 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?	Yes	The site has been affected by surface flooding in 1975.
Subterranean (groundwater) Flow		
Is the site within 100m of a watercourse, well (disused / used) or a potential spring line?	Yes	Historic watercourse identified from "Lost Rivers of London" – See Appendix F. carried forward to scoping.
Slope Stability		
Is the London Clay the shallowest strata at the site?	Yes	Carried forward to Scoping
Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Yes	London Clay. Carried forward to scoping.

Is the site within 5m of a pedestrian right of way?	Yes	Aberdare Gardens. Carried forward to scoping.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Carried forward to scoping.
Is the site over (or within the exclusion of) any tunnels, e.g. railway lines?	No / Unknown	Site is not located over any railway tunnels as shown in Appendix F. Contractor to confirm site does not overlie other tunnels such as water / Royal Mail etc. Carried forward to screening.

6.2.1 Past Flooding of Aberdare Gardens

Flooding of Aberdare Gardens was reported in 1975. Full details of the flooding are documented in London Borough of Camden report "Floods in Camden" *Report of the Floods Scrutiny Panel*. The site is not however located within a river, reservoir breach or sea flood zone. Planning Policy Statement PPS25 "Development and Flood Risk" seeks to protect development from flooding as well as preventing flooding. PPS25 states that developers are responsible for providing a flood risk assessment:

• demonstrating whether any proposed development is likely to be affected by current or future flooding from any source;
• satisfying the local planning authority that the development is safe and where possible reduces flood risk overall;
• demonstrating whether the development will increase flood risk elsewhere;
• demonstrating measures proposed to deal with these effects and risks.

With respect to the proposed development there is no reduction of existing soft landscaped areas
and no associated increase in impermeable areas, which means that there will be no increased risk
to flooding either at the site or elsewhere. The site is however in an area which has been affected by flooding in the past. Due to the low permeability of the London Clay, the site is not suitable for the use of soakaways to infiltrate excess surface water into the ground.

6.2.2 Proximity of the Site to a Watercourse

The property is close to the alignment of a former watercourse running through the area (Fairhazel Gardens) (reference Figure 11 of Arup Report for London Borough of Camden "Guidance for Subterranean Development", 2010). However the presence of this former watercourse could not be seen from the historical map review undertaken in Section 3 of this report. The accuracy of the mapping of the former watercourses shown on Figure 11 of the Arup

report is not known. No evidence of the presence of the former watercourse running through the site was detected on the historical maps.

The ground conditions encountered in the basement excavation are described in detail in Section 5.1 above.

6.2.3 London Clay Underlying the Site, Issues Associated with Shrinkage and Swelling, Deepening of Foundations to Neighbouring Property and Impacts on Adjacent Pavement

The published geological maps indicate that the London Clay directly underlies the site. The site visit confirmed the ground conditions to comprise a superficial covering of made ground overlying predominantly London Clay. The London Clay will be prone to seasonal shrinkage and swelling that arises due to changing water content in the soil, particularly when in the vicinity of mature trees (as is the site). In this regard, it should be assumed that the soils underlying the site are of high volume change potential in accordance with the NHBC Standards.

The most commonly used solution to the problem of subsidence on clay soils from shrinkage and swelling is to incorporate deeper foundations. The construction of the basements on the site will result in the existing building foundations being taken deeper, which will therefore improve the stability of the existing building. A knock-on effect however is that 63 will have their party wall with 65 underpinned and 67 will have an underpinned wall in close proximity to their house (being separated by a 4 feet wide path running between the properties). This could potentially lead to problems associated with differential settlement of the properties.

In addition to the above, the proposed basement excavation will be within 5m of the pavement running alongside Aberdare Gardens. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the footpath and any associated services.

It will be necessary to ensure that the basements are 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 No. 63 and 67 and the adjacent pavement with potential services);
- Determination of the most appropriate methods of construction of the proposed basements;
- Undertake pre-condition surveys of adjacent structures;
- Monitor movements and pre-existing cracks during construction;
- Establishment of contingencies to deal with adverse performance;
- Ensuring quality of workmanship by competent persons by utilising a specialist basement contractor.

Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Contractor to the London Borough of Camden.

6.2.4 Proximity of the Proposed Basement to Underground Tunnels

The proposed basement excavation will not be within the zone of influence of any of the London Underground (rail) tunnels shown on Figure 18 of Arup Report for London Borough of Camden "Guidance for Subterranean Development", 2010).

It is possible that other tunnels owned and maintained by other service providers may exist beneath the site that could be affected by the proposed excavation and construction works. It will be necessary to undertake a full search of potential tunnels that may underlie the site. On the assumption that it is confirmed that the site is not within the "zone of influence" of any underlying tunnels then no further activities in this regard will be required (the zone of influence is normally defined as the strip of land present above a tunnel with boundaries defined from a line drawn at 45° from the invert level of the tunnel to the ground surface). Alternatively, it will be necessary to liaise with the tunnel owner and undertake further engineering analysis to determine the potential impacts that the proposed basements could have on the tunnel.

7. FURTHER INVESTIGATIONS

The scoping element of this Basement Impact Assessment has identified the following issues relevant to the site that required further consideration:

• Past flooding of Aberdare Gardens;

• Proximity of the site to a (former) watercourse;

• London Clay underlying the site (issues associated with shrinkage and swelling);

• Deepening of foundations to neighbouring property and impacts on adjacent public pavement.

The comprehensive desk based assessment together with the site inspection and site borehole has been sufficient to allow the potential impacts of the above issues identified during the scoping stage of the project to be assessed.

The recommended scope of investigation comprise of the following:

- Excavation of trial pits beneath wall foundations to assess condition and soil formation.
- Presence of voids.
- In-situ strength testing of soils.
- Inspection of ground and groundwater conditions encountered whilst works are being undertaken

Any investigations undertaken should be designed, supervised and interpreted by a competent geotechnical engineering consultancy.

In addition to the above, the Contractor will need to undertake a comprehensive engineering design of the scheme as outlined in Section 6.2.4, together with further utilities searches as outlined in Section 6.2.5. It is recommended that the proposed engineer has sufficient experience with basement construction (such as MMP Design)