HR Wallingford
Working with water

Capo Di Monte

Basement Impact Assessment

MAM7359-RT001-R01-00 November 2014

Document information

Document permissions	Unrestricted
Project number	MAM7359
Project name	Capo Di Monte
Report title	Basement Impact Assessment
Report number	RT001
Release number	R01-00
Report date	November 2014
Client	Mr D J Green
Client representative	Julian Birch (Michael Barclay Partnership)
Project manager	Mike Briggs
Project director	Andrew Tagg

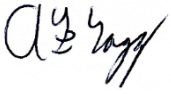
Document history

Date	Release	Prepared	Approved	Authorised	Notes
11 Nov 2014	01-00	MCB	AFT	AFT	

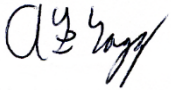
Document authorisation

Prepared

Approved



Authorised



Executive Summary

HR Wallingford was appointed by Michael Barclay Partnership to assist in preparing a Basement Impact Assessment (BIA) for the proposed new basement works at Capo Di Monte, Windmill Hill, Hampstead, London NW3 6RJ. The BIA forms part of the planning application documentation. HR Wallingford were to provide hydrological and hydrogeological inputs for the BIA, and incorporate geotechnical and structural design information prepared by others

This assessment has been based on the requirements of various planning documents prepared by the London Borough of Camden, including Core Strategy 14 – "Promoting high quality places and conserving our heritage" (CS14) – and Development Policy 27 - "Basements and Lightwells" (DP27). In particular the format is based on the planning guidance document CPG4 (Basements and Lightwells) – September 2013 version. As such it includes consideration of the following key issues:

- Subterranean flow (groundwater);
- Land stability;
- Surface flow and flooding.

The following are the key conclusions:

- The proposed works will not affect groundwater flows and levels;
- It is proposed that existing drainage systems will be reinstated, with no changes to the volumes of runoff and to their discharge rates;
- There will be no changes to flood risks at the site or experienced elsewhere;
- There are no issues anticipated with underground services running close to the site;
- There are no slope stability issues of concern;
- There are no significant issues associated with trees within or near Capo Di Monte, Windmill Hill;
- The proposed design takes account of existing foundations and other structures. It will include temporary propping of the works and monitoring for movement.

It is concluded that the proposed basement development meets the relevant requirements of DP27 and that it can be approved with respect to CPG4.

Contents

Executive Summary

1. Introduction 1

2. Site Details 1

2.1. Site location and topography 1
2.2. Existing property 2
2.3. Outline of the proposed works 3
2.4. Additional information 7

3. Basement Impact Assessment 9

3.1. Introduction 9
3.2. Subterranean flow (groundwater) 10
3.2.1. Summary of issues 10
3.2.2. Question 1b: aquifer and water table 12
3.2.3. Conclusions - groundwater 13
3.3. Land stability 14
3.3.1. Summary of issues 14
3.3.2. Question 13: structural and geotechnical considerations 16
3.3.3. Conclusions – slope stability 16
3.4. Surface flow and flooding 16
3.4.1. Summary of issues 16
3.4.2. Conclusions – drainage and flooding 17

4. Conclusions 17

Appendices 19

A. Existing basements

B. Proposed construction sequence

Figures

Figure 2.1: Location plan 1
Figure 2.2: Local topography (10m contours) 2
Figure 2.3: Capo Di Monte site area 3
Figure 2.4: Proposed basement layout 5
Figure 2.5: Cross-section through breakout / relaxation area 6
Figure 2.6: BGS Geological Sheet N1 S E (1:10,560) 9
Figure 3.1: Borehole 3 water levels 13

Tables

Table 2.1: Sources of additional information 7
Table 3.1: Subterranean (groundwater) issues 10
Table 3.2: Boreholes at 4 Upper Terrace – groundwater records 12
Table 3.3: Slope stability issues 14
Table 3.4: Surface flow and flooding issues 16

1. Introduction

In October 2014 HR Wallingford was appointed by Michael Barclay Partnership to assist in preparing a Basement Impact Assessment (BIA) for the proposed new basement works at Capo Di Monte, Windmill Hill, Hampstead, London NW3 6RJ. The BIA is to form part of the documentation in support of a planning application. HR Wallingford were to prepare hydrological and hydrogeological information, drawing on material prepared by other members of the client's project team.

The information in this document has been prepared by Mike Briggs, a Chartered Engineer and Member of the Institution of Civil Engineers. He has 26 years of experience carrying out and managing a wide range of drainage studies, flood risk assessments and other flood studies. He has prepared many FRA reports, contributed to Environmental Statements and prepared BIAs and other documents for planning applications and inquiries.

2. Site Details

2.1. Site location and topography

The property is located at Windmill Hill, which is at the south-western end of the ridge along Spaniards Lane. It is approximately 180m south-west of Whitestone Pond, a man-made pond fed by artificial means. The property is in the London Borough of Camden, to the west of Hampstead Heath and the south of West Heath. Its location is shown on Figure 2.1.

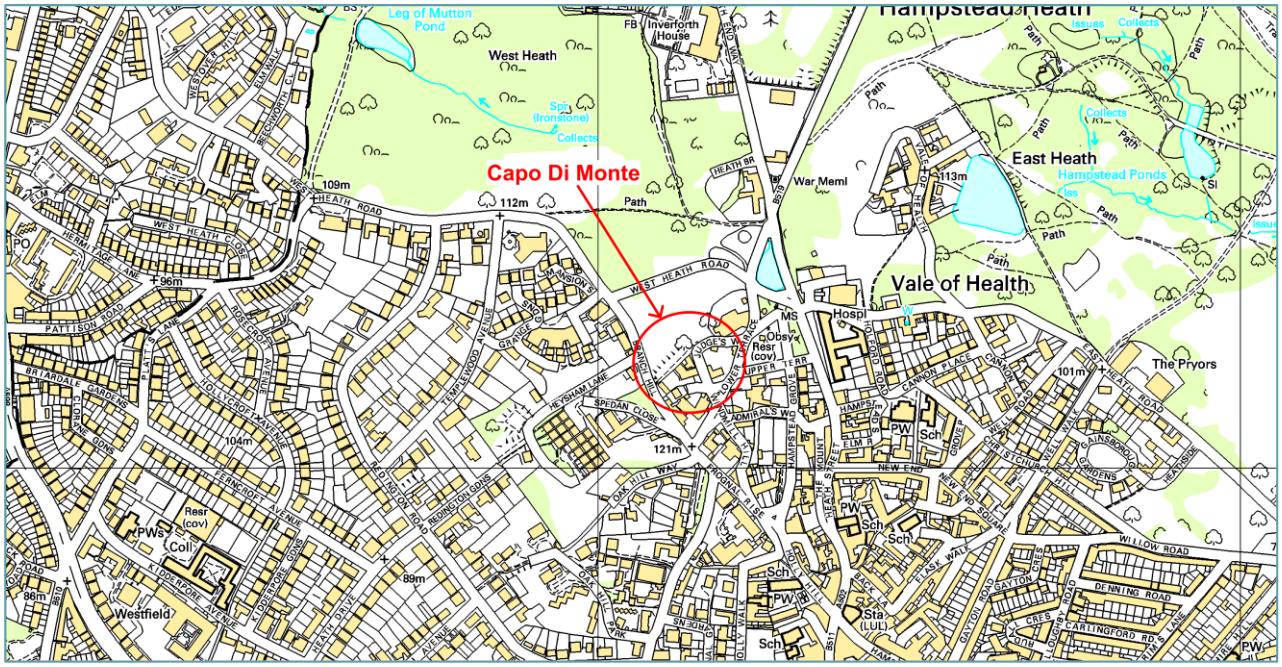


Figure 2.1: Location plan

Source: Contains Ordnance Survey data © Crown copyright and database right 2014

Ground at the property falls to the south and west, with surface water flowing through West Hampstead to the former River Westbourne – one of the "Lost Rivers of London". This forms part of the combined drainage system in London. The local topography is depicted on Figure 2.2, with contours at 10m intervals. This is based on data from the Ordnance Survey Terrain 50 digital terrain model under their OpenData licence. The ground level at the site is approximately 132.5m.

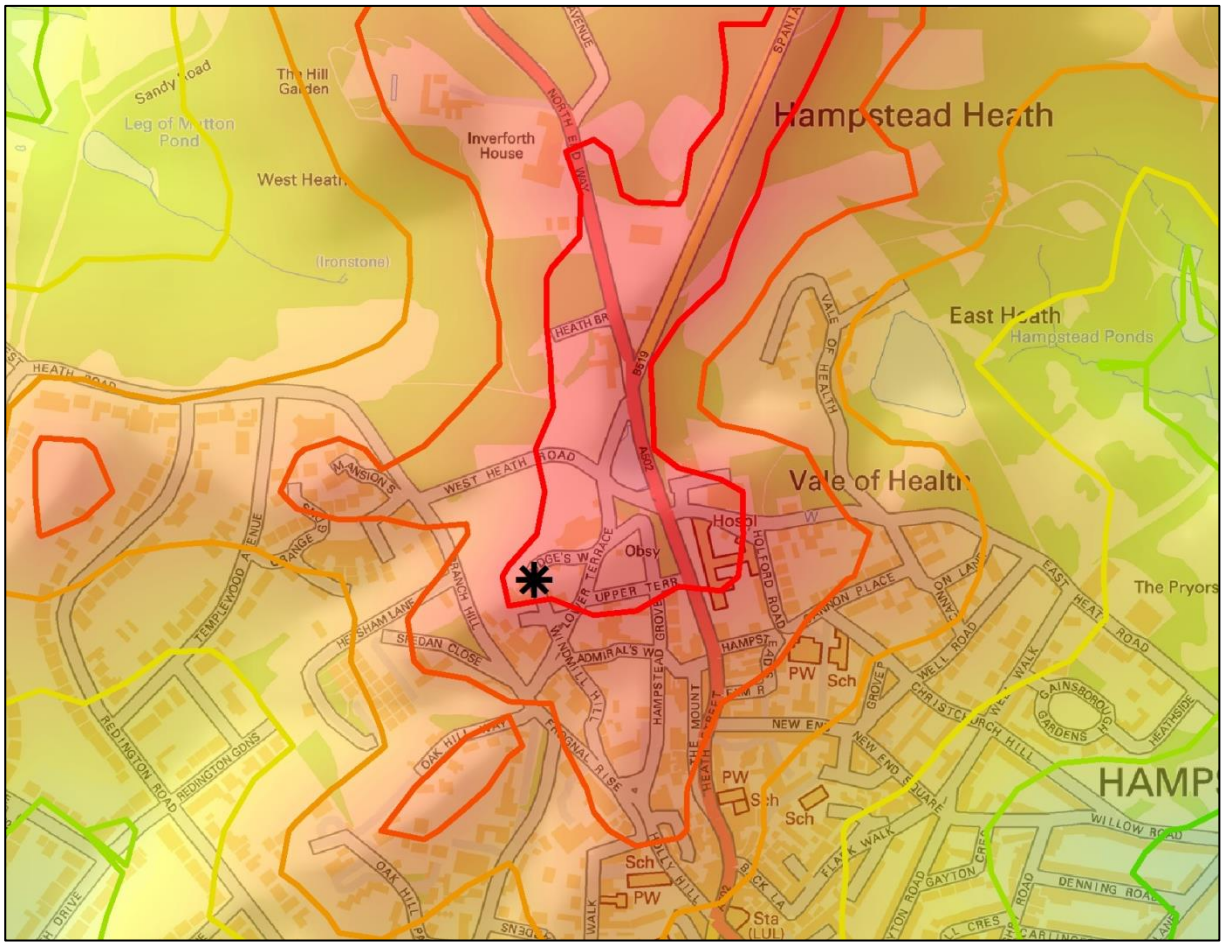


Figure 2.2: Local topography (10m contours)

Source: Contains Ordnance Survey data © Crown copyright and database right 2014

2.2. Existing property

Capo Di Monte is a 2 storey residential property within the London Borough of Camden, located on an elevated site to the north-west of Hampstead Heath. It is a Grade II Listed Building.

It is understood that the property was constructed in the 18th century (shown on a map dated 1879), originally as 2 properties. It has subsequently been altered on several occasions, with rear extensions constructed. Existing single level basements cover parts of the footprint of the existing building (both original properties). The existing basement floors are approximately 2.5m below ground level.

Whilst it is close to Nos. 1 – 3 Upper Terrace (to the south) and to No. 4 Upper Terrace (to the west) it does not connect physically to any of these. The location of Capo Di Monte relative to the other properties is shown on Figure 2.3.

Figure 2.3: Capo Di Monte site area

Source: Charlton Brown Architects (extract from plan 1249/ AP 01)

There is a small existing courtyard garden to the rear (west) of the building. This measures approximately 8m by 6m. It is predominantly paved, with limited planting. A raised area in the north-west corner of the courtyard includes a small pond. The courtyard level is slightly higher than the ground level at the front of the property. It is bordered by the main house on one side, by a single storey extension to the house on another side (the Drawing Room) and by garden walls on the other 2 sides.

The front elevation of the property is shown in Photograph 2.1 and the rear of the property in Photograph 2.2.

2.3. Outline of the proposed works

The proposed basement, which incorporates a small gym and a breakout / relaxation area, will be constructed immediately to the west of the property. The floor level will be about 3.5m below the existing garden level. It will be slightly deeper than the existing basement and will be adjacent to them and in their “shadow”.

Photograph 2.1: Capo Di Monte: front view - from Windmill Hill

Source: MBP

Photograph 2.2: Capo Di Monte: rear view - from 4 Upper Terrace

Source: MBP

A significant proportion of the new basement will be under the existing courtyard, with the remainder under the edge of the existing building or under an existing extension (to be removed and rebuilt). Paving in the rear garden will be reinstated following the alterations.

Figure 2.4 illustrates the proposed basement layout, with the blue areas being the existing basement areas. The thin blue line is the external face of the existing property and the thin red line is the site boundary.

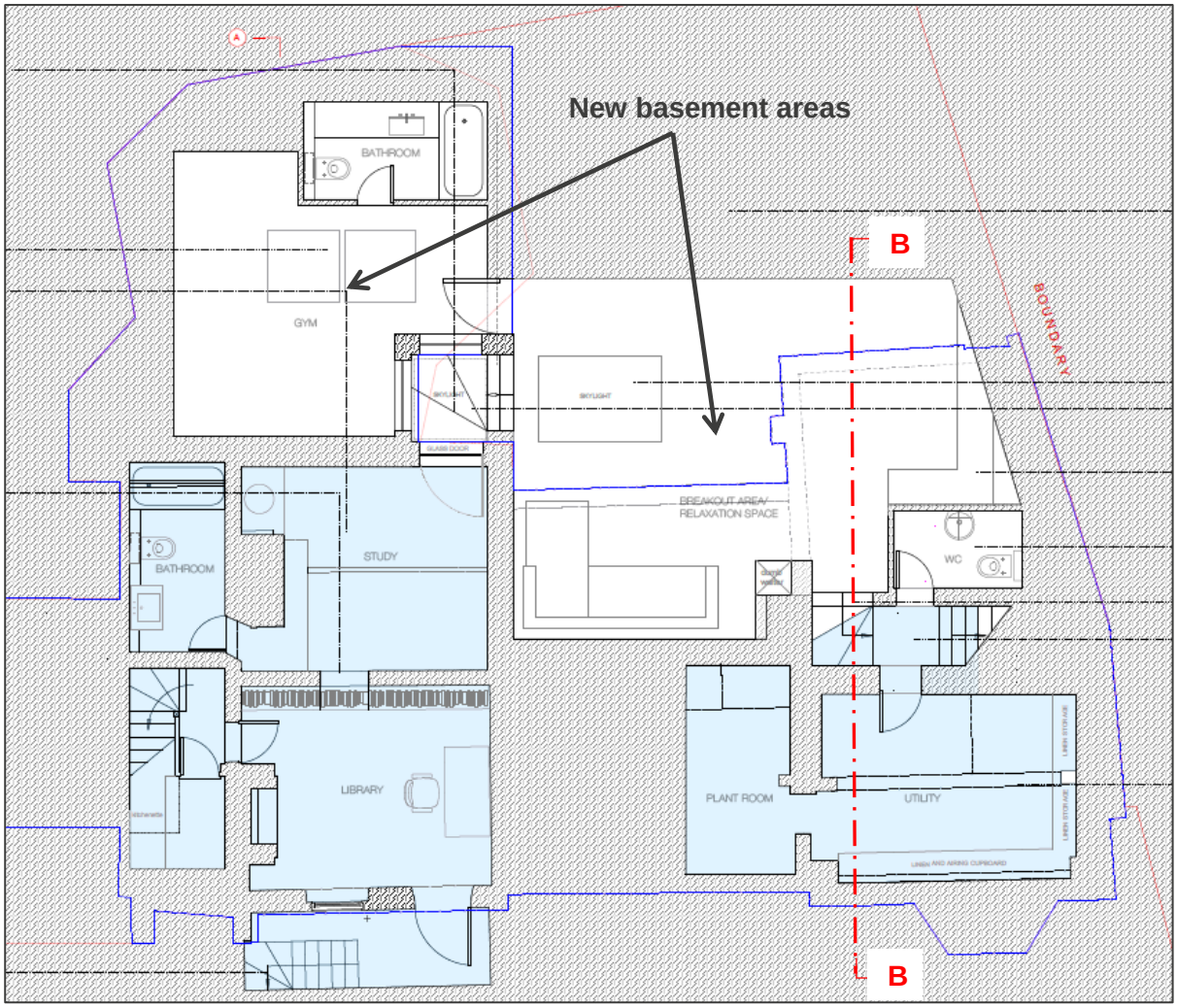


Figure 2.4: Proposed basement layout

Source: Charlton Brown Architects (extract from plan 1249/ AP 02)

In the south-west corner the existing Drawing Room will be demolished and a basement gym constructed on a similar footprint. A new kitchen will be constructed above this, at ground level.

Further north and east a breakout / relaxation area will be constructed as a basement. This will be in part under existing parts of the property and in part outside of the existing ground floor footprint.

Two walk on skylights are proposed in the part of the new basement outside of the ground floor footprint.

A cross-section (section B – B) of the proposed basement works and the existing property, through the breakout / relaxation area, is reproduced as Figure 2.5.

Figure 2.5: Cross-section through breakout / relaxation area (section B-B)

Source: Charlton Brown Architects (extract from plan 1249/ AP 07)

2.4. Additional information

Additional information relating to the site and to the surrounding area has been obtained to support the development of the proposals and to assist in the preparation of the BIA. This is summarised in Table 2.1.

Table 2.1: Sources of additional information

Source	Comments
Envirocheck report	• This provides overall details of ground conditions in the area (Bagshot Beds outcropping at the site and within at least 250m in all directions); • Claygate layer (CLGB) below Bagshot Beds (BGS); • Small area of worked ground to the north of the site, beyond Judges' Walk; • Old streams (starting at the edge of the Bagshot Beds) appear on the 1879 map.
Soils Site Report	• Identifies Soil Type 3 (free draining permeable soils on soft sandstone substrates with relatively high permeability and high storage capacity); • Low ground movement potential.
Walkover of site area	• Walkover around the site area, confirming that the site is on locally high ground, at the top of a relatively narrow ridge; • No local drainage issues were identified.
Ground investigation (Ground Engineering and Southern Testing)	• Ground investigation for the site in September 2014 – report C13361 by Ground Engineering; • Single 6.45m borehole at front of property, in front of garage; • Water recorded in borehole at a depth below ground level of about 5.3m; • More detailed ground investigation for a nearby site in April 2012. Permission obtained to use this information. Southern Testing, reference J10892; • 3 shell and auger boreholes (max. 20m depth) and 6 hand dug trial pits at nearby site (20m borehole only about 20m from proposed basement site); • No water recorded in these 3 boreholes at the time of drilling; • Long-term monitoring of groundwater levels – see Section 3.2.2; • Once below topsoil, the Bagshot Beds (a characteristically free-draining material) extended the full depth of the investigations.
Geotechnical Interpretative Report	• Interpretative report prepared by GCG for the adjacent site (December 2012). BGS geological sheet reproduced in this report as Figure 2.6; • Reviews the above ground investigation and provides interpretation of ground conditions; • Considers likely ground movements; • Discusses hydrogeological impacts.
Utilities information	• Inquiries covered all relevant utilities. Most had no services in the area; • Only local services identified - nothing unusual / particularly significant; • LV cables in road / footpath in Windmill Hill area and open land to north of site, but no HV in the area;

Source	Comments
	• Low pressure gas mains in road / footpath in Windmill Hill; • Virgin Media cabling in road / footpath in Windmill Hill; • London Underground and Network Rail – no lines / equipment in vicinity; • BT – local underground services in road / footpath in Windmill Hill; • Public sewers – 300mm combined sewer in Windmill Hill flowing to a large combined sewer in Frognal Rise, via Lower Terrace; • 4" water main in road / footpath in Windmill Hill.
Topographic Survey	• Survey data for site area, including the rear garden and the front of the property, plus review of Ordnance Survey Terrain 50 data (licence-free topographic data); • Indicates a gentle gradient away from the existing property, sloping to the south and the west (down Windmill Hill and Lower Terrace); • Rear courtyard garden only slightly higher than the front garden of the property.
Trees	• Details of trees at and close to the property is recorded. Advice on issues related to trees in and near the garden prepared by Tretec, of Scorrier, Cornwall (May 2914).
Structural Design Issues	• Michael Barclay Partnership has considered structural engineering aspects of the basement design and construction, in their Structural Engineer's Report, reference 6036. See Section 3.3.2 for comments.

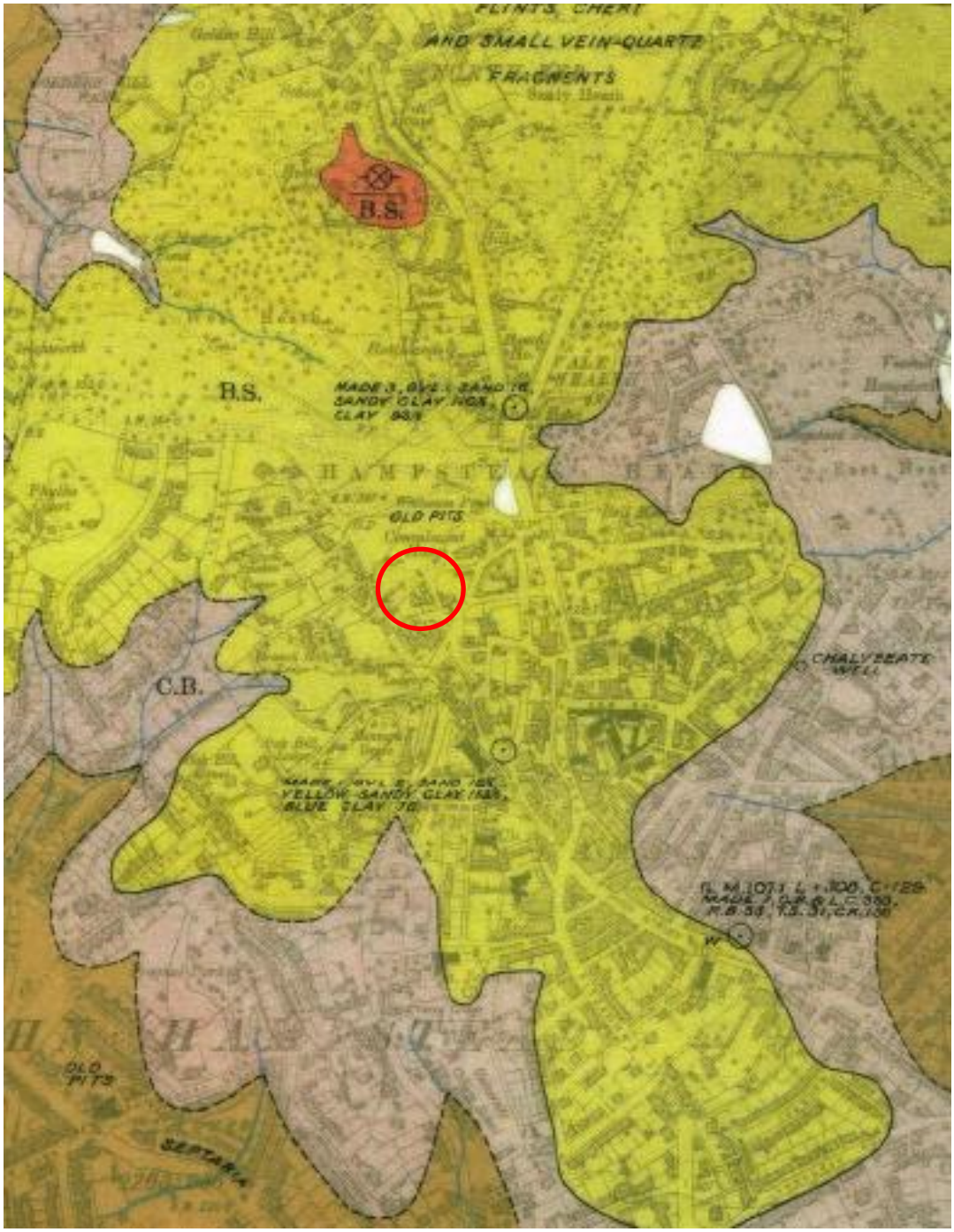


Figure 2.6: BGS Geological Sheet N1 S E (1:10,560)

3. Basement Impact Assessment

3.1. Introduction

The construction of basements is increasingly popular and the London Borough of Camden (LBC) requires the preparation of a Basement Impact Assessment (BIA) as part of the planning documentation.

This report has been prepared in consideration of the following Camden planning documents:

- Development Policy **DP27**: "Basements and Lightwells";
- Core Strategy 14 (**CS14**) "Promoting high quality places and conserving our heritage";
- Planning Guidance Note **CPG4** "Basements and Lightwells" (revised September 2013);
- "Camden Geological, Hydrogeological and Hydrological Study" (Arup 2010).

This report demonstrates that the proposed underground development will not cause harm to the built and natural environment and to local amenity, with particular consideration being given to the local water environment and to ground conditions.

As such it collates information provided by various disciplines, specifically covering the following three key areas identified in CPG4:

- Subterranean flow (groundwater);
- Land stability;
- Surface flow and flooding.

This document addresses all of the potential impacts identified in CPG4 under each of these key areas.

As such, this approach also covers the issues a) to c) of DP27 (maintaining structural stability of buildings, avoiding adverse drainage / run-off / water environment impacts and avoiding cumulative structural stability issues and water environment impacts).

Because much of the data collection work occurred prior to the detailed BIA preparation it was not considered appropriate to formally adopt the five staged approach detailed in CPG4 (screening, scoping, site investigation / study, impact assessment and review). Rather, each of the individual screening issues covered in CPG4 has been considered and is commented to a suitable level. Where appropriate, supporting information is referred to. In particular, it should be noted that the 2012 Geotechnical Interpretative Report prepared for an adjacent site provides useful information and discussion.

3.2. Subterranean flow (groundwater)

3.2.1. Summary of issues

It is important that the potential consequences of the underground development on groundwater flows in the immediate area and wider afield are considered. This is presented in Table 3.1, with reference to the questions raised in Figure 1 of CPG4.

Table 3.1: Subterranean (groundwater) issues

Ref.	Consideration	Comments
1a	Is the site located directly above an aquifer?	**Yes:** Camden considers all sites which do not outcrop with London Clay (LC) to be above an aquifer - surface outcrop of Bagshot Beds (BGS, depth approx. 20m at an adjacent site). EA mapping confirms this to be an area of a minor aquifer. There are no groundwater protection issues. No impacts on the Bagshot Beds aquifer are expected.

Ref.	Consideration	Comments
1b	Will the proposed basement extend beneath the water table surface?	**No:** Ground investigation data at the site indicates a water depth of about 5.2m below ground level. This is substantially lower than the depth of the proposed excavation – approximately 4m. The highest recorded water level at the nearest borehole at 4 Upper Terrace, over a protracted period, was 7.7m below ground level. Ground elevations at the two sites are similar. The basement will not act as a barrier to groundwater flows and there will be no impacts on groundwater. See Section 3.2.2 for further discussion of this issue.
2	Is the site within 100m of a watercourse or potential spring line?	**No:** No watercourses are marked on the geological map in the immediate vicinity of the site. The nearest watercourse is approx. 200m to the SW. This watercourse has a source near the outcrop of the Claygate Beds and flows in a W-SW direction. It becomes a tributary of the (former) River Westbourne. Whilst the "Lost Rivers of London" map appears to show the stream originating slightly closer to the site it is a less precise depiction.
3	Is the site within the catchment of the pond chains on Hampstead Heath?	**No:** The area drains to the south and west and is not within any of the pond catchments. This is clear from Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
4	Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	**No:** The small existing courtyard garden is already predominantly paved. There will be no material changes - contributing areas as existing.
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:** The existing drainage systems are to be reinstated as existing. No changes to flows discharged to the ground.
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 (not just the pond chains on Hampstead Heath) or spring line?	**No:** There are no relevant local ponds and the spring line is significantly downhill from the site - based on the BGS Geological Sheet N1 S E (1:10,560) the natural spring line is at / near the interface of the Claygate and Bagshot Beds, with the nearest outcrop being more than 200m away.

Source: Camden Planning Guidance: CPG4 – Basements and lightwells

3.2.2. Question 1b: aquifer and water table

During the site investigation (site work in September 2014) at the front of the property water was encountered at a depth of about 5.2m below ground level.

During the 2012 site investigation for 4 Upper Terrace no water was encountered in any of the three boreholes or in the trial pits. Subsequently loggers were installed at the boreholes, such that continual monitoring was carried out and long-term water level data stored. The water depth records (data available up to mid-March 2013) are summarised in Table 3.2 below and shown graphically for borehole 3 on Figure 3.1. This shows the lowest recorded water level being in October 2012 and the highest recorded water level in February 2013. There is an observed variation of 0.65m.

Table 3.2: Boreholes at 4 Upper Terrace – groundwater records

Borehole	Location	Comments
Borehole 1	In the West Garden of 4 Upper Terrace, about 20m from the proposed Capo Di Monte basement. Borehole 20m deep, with the depth sensor set at about 7.2m below ground level.	No water was recorded at or above a depth of 7.2m below ground. The system was manually checked at all site visits. On 10/01/13 water was detected at a depth of 7.69m. This date was within a few days of the highest level observed at BH3 (see Figure 3.1). This is the only time that water was observed at Borehole 1.
Borehole 2	In the West Garden of 4 Upper Terrace, about 40m from the proposed Capo Di Monte basement. Water depth sensor depth positioned about 6m below ground level.	The sensor appears to show a very small amount of water at the very bottom of the standpipe. However, it is uncertain whether or not this is accurate data.
Borehole 3	In the West Garden of 4 Upper Terrace, about 30m from the proposed Capo Di Monte basement. Water depth sensor depth positioned about 6m below ground level.	The recorded water level has varied between about 4.9m and 4.25m below ground level during the period from mid-June 2012 to mid-March 2013. Levels rose slowly from October 2012, with the highest water level being in February 2013. The level subsequently dropped.

Additional geological and hydrogeolgical information is available in the 2012 GCG report for 4 Upper Terrace. In particular, paragraphs in Section 5.1 discuss various basement issues. The Upper Terrace basement – substantially deeper than the one proposed at Capo Di Monte - would extend into the top part of the relatively permeable Bagshot Beds. Even based on a worst case scenario any impacts on local groundwater levels were anticipated to be minimal.

The differing results from the 3 boreholes close to one another might seem surprising. The most likely explanation provided in the GCG report was that observed bands of clay cause seasonal perched water to exist locally within the Bagshot Beds. It was also stated that it is very unlikely that there would be any significant resulting inflow during the excavation of the basement.

The excavation for the basement at 4 Upper Terrace has been carried out sucessfully, with no groundwater issues being encountered. Some evidence of perched water, at about 5m, was observed, as anticipated.

The lowest point of the proposed Capo Di Monte basement (about 4m below the garden level) will therefore be above the groundwater level in the area. This means that the basement structure will not form a barrier within an area of groundwater flows and so will not have an impact on groundwater flows and / or levels.

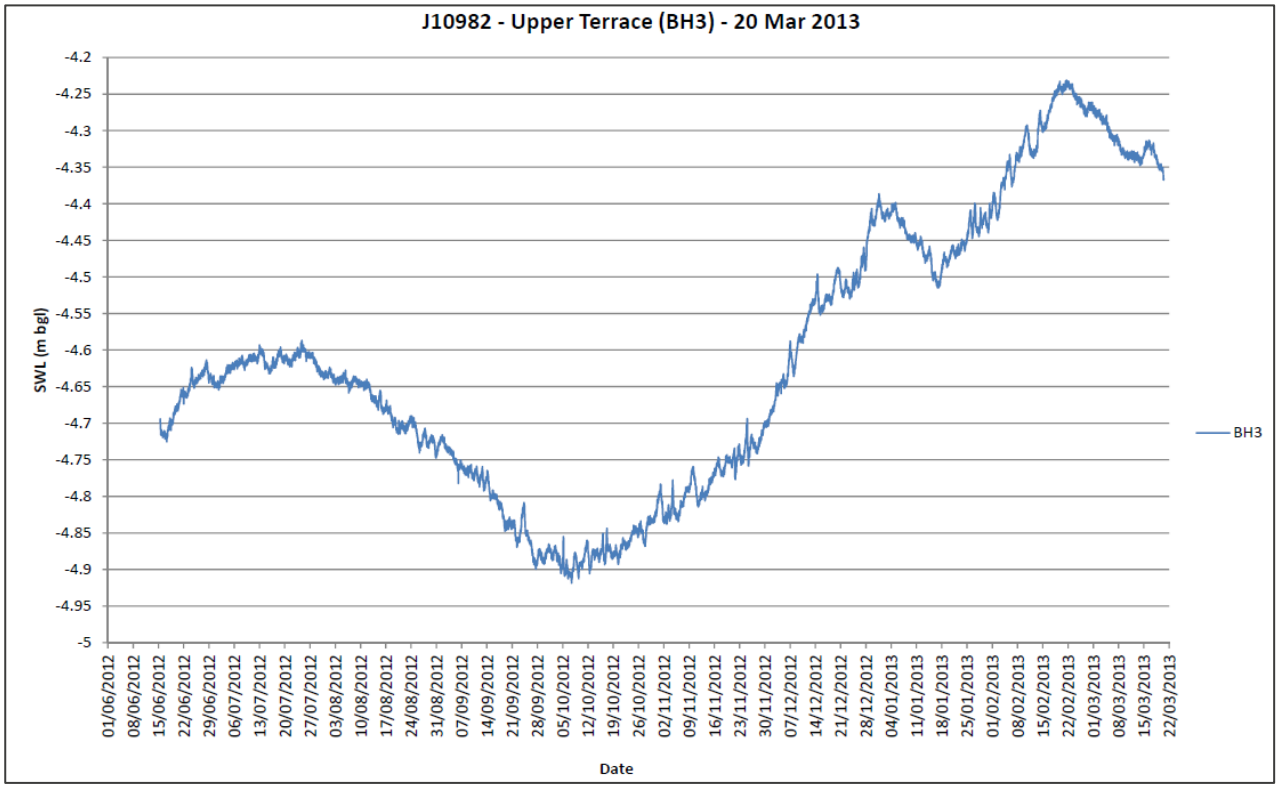


Figure 3.1: Borehole 3 water levels (relative to ground level)

Source: Southern Testing

Based on various items of information rainwater that soaks into the ground is likely to flow through the ground in a south-westerly direction and be intercepted a considerable distance away by the old stream system that flowed to the Westbourne Stream, and that now discharges to the combined sewer network. It is anticipated that the proposed basement will affect neither the amount of water nor where and how it flows through the ground. No impacts on the local aquifer are expected.

3.2.3. Conclusions - groundwater

- Although the site is considered to be above an aquifer there are no groundwater protection issues;
- The proposed basement is not expected to extend as far as the water table. As such it will not affect groundwater flows;
- Even if the groundwater levels are found to be higher than expected the scale of the basement is small. It will not affect groundwater flows;
- The site is a significant distance from the nearest watercourses and springs, as well as from the Hampstead Heath Ponds. It will have no impacts on these;
- There are no proposed changes affecting surface water runoff and discharges to soakaways.

This section of the assessment has identified no significant issues related to groundwater flows.

3.3. Land stability

3.3.1. Summary of issues

Underground construction sometimes presents stability issues, particularly in areas of deep excavation, close to buildings / retaining walls and where there are steep slopes. Slope stability issues for the site and the surrounding area are presented in Table 3.3, with reference to the questions raised in Figure 2 of CPG4.

Table 3.3: Slope stability issues

Ref.	Consideration	Comments
1	Does the existing site include slopes, natural or manmade, greater than 7° (approx. 1 in 8)?	**No:** There are no significant slopes at the site.
2	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7° (approx. 1 in 8)?	**No:** There is no re-profiling of ground levels around the site proposed.
3	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7° (approx. 1 in 8)?	**Yes:** There is a small area of land about 70m to the north of the site with a local slope greater than 7°. It is at a lower elevation than the site. The excavation for the basement will not cause any slope stability problems in that area.
4	Is the site within a wider hillside setting in which the general slope is greater than 7° (approx. 1 in 8)?	**No:** The average slope to the SW is approx. 1 in 10 (6°). The average slope to the NE is considerably flatter. A slope of less than 7° is confirmed on Figure 16 of the Camden Geological, Hydrogeological and Hydrological Study.
5	Is the London clay the shallowest strata at the site?	**No:** Site investigations have confirmed that the Bagshot Beds are the shallowest strata (Ground Engineering report C13361 and Southern Testing Report J10982).
6	Will any tree/s 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?	**Yes / No:** One tree (number 1) in the rear garden will be felled – a 6m high Bay tree. Tretec has stated that this should not be considered as a planning constraint. Tree number 10 – a 17m high Lime Heath tree - is well outside of the wall and about 5m from the closest part of the excavation – beyond Judges Walk. Whilst it could be a planning constraint, this is not the case due to the existing dwelling foot print. Incursions into Root Protection Areas are not anticipated. If they do occur they will be very minor – less than 1%.
7	Is there a history of seasonal shrink-swell subsidence in the local area,	**No:** Site-specific investigation confirmed that Bagshot Beds are the shallowest strata (Ground Engineering report C13361

Ref.	Consideration	Comments
	and / or evidence of such effects at the site?	and Southern Testing Report J10982).
8	Is the site within 100m of a watercourse or potential spring line?	**No:** See response to Question 2 under Subterranean (ground water) screening.
9	Is the site within an area of previously worked ground?	**No:** There is no evidence of worked ground at the site. (BGS Geological Sheet N1 S E (1:10,560) shows old sand pits to the north and worked ground well beyond Judge's Walk).
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?	**Yes / Unknown:** Based on the EA's aquifer designations the site is considered to be on a Secondary A aquifer. This consists of "*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*". Water level information from the borehole in the area suggest the slight possibility of a localised perched water table. If this is the case then dewatering requirements during construction should be quite limited.
11	Is the site within 50m of Hampstead Heath Ponds?	**No:** See Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
12	Is the site within 5m of a highway or pedestrian right of way? (this relates to critical infrastructure).	**Yes:** There is a local pedestrian right of way at the side, and a highway with a footpath at the front. Details of infrastructure in the area have been obtained. However, nothing that is critical has been identified, either within the site or in the surrounding area (see Table 2.1).
13	Will the proposed development significantly increase the differential depth of foundations relative to neighbouring properties?	**No:** Several of the nearby properties have basements – probably single storey (see Appendix A). Thus, they will have foundations typically 2.5m to 3m below ground. The new basement of 4 Upper Terrace is substantially deeper. Note: There has been careful consideration by the structural design team regarding the design of the basement works, to ensure the stability of the existing structure, as well as adjacent walls and properties. See Section 3.3.2.
14	Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	**No:** Enquiries made with all statutory authorities including London Underground and Network Rail.

Source: Camden Planning Guidance: CPG4 – Basements and lightwells

3.3.2. Question 13: structural and geotechnical considerations

MBP has put some thought into appropriate arrangements for temporary and permanent works for the proposed basement. These issues are outlined in Sections 9 and 10 of their Structural Engineer's Report.

It is proposed to use a combination of underpinning of existing walls and bored cfa piling. It is anticipated that contiguous piling will be used. There will be no discernible effect on any groundwater flows. Propping of the new walls will be required during the construction period, as well as a movement monitoring strategy.

A reinforced concrete structure will be constructed inside the piling envelope, to act as the primary waterproof barrier, with a secondary internal system also proposed.

3.3.3. Conclusions – slope stability

- Natural ground slopes in the area are shallow and the introduction of this basement will not adversely affect slope stability;
- The site is far enough away from watercourses, potential spring lines, the Hampstead Heath ponds and areas of previous working for these issues not to be of a concern;
- The existing property – Capo Di Monte - is immediately adjacent the construction site. This will be fully supported throughout the construction process;
- Only a limited requirement for the dewatering of the excavations is anticipated;
- The works have been designed to avoid adverse effects on all trees, other than a Bay tree in the garden, which is to be removed;
- The proposed design is to take full account of existing foundations and other structures. It will include temporary propping of the works and monitoring for movement.

Whilst this section of the assessment has identified the need to provide suitable supports to existing structures this issue is to be fully addressed – see Structural Engineer's report.

3.4. Surface flow and flooding

3.4.1. Summary of issues

This section considers the possibility of localized surface water flooding, related to local topography and soil conditions. This primarily concerns flooding during periods of intense rainfall when the local drainage system may not be able to accommodate very high flow rates and large runoff volumes. This is presented in Table 3.4, with reference to the questions raised in Figure 3 of CPG4.

Table 3.4: Surface flow and flooding issues

Ref.	Consideration	Comments
1	Is the site within the catchment of the pond chains on Hampstead Heath?	**No:** See Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
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:** Existing surfacing and drainage systems are to be replaced as existing / reinstated, with no changes to the flows discharged to sewers and to the ground.

Ref.	Consideration	Comments
3	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**No:** See comment to Question 2 above.
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:** See comment to Question 2 above.
5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**No:** There are no proposed changes to surface flows that discharge to the ground or to local drainage systems.
6	Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	**No:** Whilst an area at risk of surface flooding is shown for Windmill Hill on Figure 15 of the Camden Geological, Hydrogeological and Hydrological Study (flooded in 1975) it is to the south of the property. The local topography means that it does not affect the property. There will be no changes to flood risks elsewhere. All sources of flood map show no anticipated risk of groundwater or fluvial flooding. There is no history of such flooding

Source: Camden Planning Guidance: CPG4 – Basements and lightwells

3.4.2. Conclusions – drainage and flooding

- The site is not within the catchment of the Hampstead Heath ponds;
- Existing surfaces and drainage systems will be reinstated. There are no proposed changes that would affect the amount or rate of runoff;
- There will be no changes to the amount or quality of surface runoff from the site;
- The site is not in a flood risk area and there will be no risk of surface water flooding arising from this development.

This section of the assessment has identified no significant issues related to surface flows and flooding.

4. Conclusions

The following are the key conclusions from the work carried out for the Basement Impact Assessment:

- The proposed works will not affect groundwater flows and levels;
- It is proposed that existing surfaces and drainage systems will be reinstated, with no changes to the volumes of runoff and to their discharge rates;

- There will be no changes to flood risks at the site or experienced elsewhere;
- There are no issues anticipated with underground services running close to the site;
- There are no slope stability issues of concern;
- The project tree specialist has advised that there are no significant issues associated with trees within or near Capo Di Monte;
- The proposed design takes account of existing foundations and other structures. It will include temporary propping of the works and monitoring for movement.

It is concluded that the proposed basement development meets the relevant requirements of DP27 and that it can be approved with respect to CPG4.

Appendices

A. Existing basements

Although there are basements at a number of nearby properties, it is difficult to obtain details such as depths, extents, ages, construction information, etc. The following information has been obtained from searches of online planning applications.

- 1 Upper Terrace – has a single storey basement;
- 2 Upper Terrace (Highview House) – thought to have a single storey basement;
- 3 Upper Terrace – thought to have a single storey basement;
- 4 Upper Terrace – has an existing single storey basement and a new (deeper) one is under construction;
- 5 Upper Terrace – has a basement;
- Grove End, Upper Terrace – has a basement;
- 3 Branch Hill – has a basement flat;
- 5 Branch Hill – has a basement flat;
- Summit Lodge, Lower Terrace – has a large basement car park and multiple basement swimming pools;
- Fleet House, Admiral's Walk – single storey basement;
- Grove Lodge, Admiral's Walk – single storey basement.
- Admiral’s House, Admiral's Walk – single storey basement.

Whilst some of these properties are in the vicinity of Capo Di Monte others are some distance away – on higher ground to the north-east and lower ground to the south.

It is understood that the existing basements in properties 1 to 4 Upper Terrace, which are the closest properties to Capo Di Monte, are relatively small in plan area and are only one floor in height – typically about 2.5m to 3m. Because of this limited depth they will have no impacts on groundwater flows.

The new basement at 4 Upper Terrace has a maximum depth of approximately 7m.

HR Wallingford
Working with water

HR Wallingford is an independent engineering and environmental hydraulics organisation. We deliver practical solutions to the complex water-related challenges faced by our international clients. A dynamic research programme underpins all that we do and keeps us at the leading edge. Our unique mix of know-how, assets and facilities includes state of the art physical modelling laboratories, a full range of numerical modelling tools and, above all, enthusiastic people with world-renowned skills and expertise.

HR Wallingford, Howbery Park, Wallingford, Oxfordshire OX10 8BA, United Kingdom
tel +44 (0)1491 835381 fax +44 (0)1491 832233 email info@hrwallingford.com
www.hrwallingford.com

FS 516431
EMS 558310
OHS 595357