PAUL WHITLEY ARCHITECTS

19 EAST HEATH HOSTEL, NW3

Hydrogeological Review

August 2009

Rev 3

Geotechnical Consulting Group
52A Cromwell Road, London SW7 5BE
Tel: +44 (0) 2075818348
Fax: +44 (0) 2075840157
Web: www.gcg.co.uk

PAUL WHITLEY ARCHITECTS

19 EAST HEATH HOSTEL, NW3

Hydrogeological Review

August 2009

Rev 3

Introduction

The proposed project at 19 East Heath, London NW3, includes the construction of a single level basement to the front of the existing house and the refurbishment of the existing garage. The architect for the re-development is Paul Whitley Architects. GCG has received an instruction to investigate the effects of the project on the flow of water across the site.

This report sets down an outline of the requirements for the development that need to be met to ensure that the property remains well-drained and that there would be no detrimental influence on the existing house and on neighbouring properties in respect of ground water. At present, no site-specific ground investigation has been carried out. The comments herein are therefore made subject to review following receipt of an investigation identifying the nature and thickness of the most near surface soils in which water may flow.

This report has been prepared for Paul Whitley Architects in connection with the 19 East Heath Road, NW3 London project, taking into account particular instructions and requirements. It is not intended for, and should not be relied upon by, any third party.

The property and the proposed re-development

The site is located to the south of Vale of Health, London NW3 (Figure 1). It occupies a total area of approximately 220 x 80 metres, the longer axis being orientated south-north. Its northern part is occupied by a four storey brick house with semi-level basement and a private access road. An examination of historical maps shows that the existing house was constructed in the first half of the last century to replace a small construction that was already in place since 1862. The southern part of the site is occupied by a courtyard and a garage, as shown in Figure 2. Mature trees are located to the south east of the existing house. The property is bounded to the west by a wall, which retains the ground that steps about 2.5 metres above the level of the property and to the east by a neighbouring property that is at a lower level. To the south the property is bounded by the rear gardens of neighbouring properties.

It is proposed to construct a basement in the southern part of the site, under the existing courtyard and garage areas, and to replace the garage creating a single level residential house. The formation level of the new basement will be approximately 4-5 metres below ground. A courtyard will be created in the central part of the basement area. The mature trees located to the front of the current property will be retained.

Topography and geology

The site sits on the eastern side of an area of high ground north of Hampstead. The ground in this area generally falls towards south-east at an approximate gradient 1:10. The ground level at the property is about +120mOD, and varies by approximately 0.5 metres between the western and eastern edges. To the west, the ground steps up by about 2 metres to a road and it is retained by a wall.

The pond in Vale Health is at about 150 metres to the north of the site and the western branch of the Fleet River runs through Hampstead Heath 150 metres to the east of East Heath Road. Numerous springs surround the area of the site, as shown in Figure 3, reflecting the geology and topography of the ground. There is no indication of other water features in the immediate vicinity of the property (Fig. 3).

The geology of the area is shown on the British Geological Survey 1:10560 sheet TQ28NE (Fig. 4a). The site is underlain by Bagshot Formation Sand overlaying the Claygate Member and London Clay. The Bagshot Formation is predominantly composed of horizontally bedded sands with occasional thin gravel beds and lenses of silt and clay and represents deposition in a shallow water marine environment. The Claygate Member is composed of fine-grained sands, silts and firm to stiff clays. It outcrops at about 20-30 metres to the north of the site at a level that appears to be about +118mOD. The base of the Bagshot Formation falls towards south and west away from the site, as shown in a northwest-southeast section through Hampstead Heath close to the site (Fig.4b). In a record borehole about 180 metres to the north west of the site (BH88 in Fig.4) the Bagshot Formation was found to be about 26.6 metres thick and the thickness of the Claygate Member was not proven to 38 metres depth. In a record borehole located about 300 metres to the south west of the site (BH8 in Fig 4) the Bagshot Formation was found to be about 20 metres thick and the Claygate Member was found about 27 metres thick. The thickness of the London Clay underneath the Claygate Member was not proved at about 62.5 metres below ground level. Given the vicinity of the site to the area where the Claygate Member outcrops, the thickness of the Bagshot Formation at the site can be expected to be probably 4-5 metres (+115-116mOD).

An accurate assessment of the thickness of the superficial deposits at the site will be necessary prior to construction for the reasons discussed in the next section.

Lambeth Group underlay the London Clay at about -20mOD and it is probably about 20 metres thick. About 10-15 meters of Thanet Sand underlay the Lambeth Group and Chalk is thought to be present at about -40mOD.

Hydrogeological conditions and Geohazards

The London Clay acts as a barrier to downward flow between the lower (chalk) aquifer and superficial groundwater. The water head in the chalk was about -40OD in 1965, and has been rising since as the demand for water abstraction began to diminish after 1965; in 2006, the water level in the chalk in the area of the site was approximately -10mOD (see Figs. 4 and 5). The current policy, implemented by the Environment Agency, is to maintain water levels in the chalk at about their present levels. Thus, the property is unlikely to be influenced by directly groundwater levels in the chalk, even in the long-term. There are no known underground structures in the vicinity of the site that might indirectly induce local changes of water pressures in the London Clay, which could affect the development.

The geology of the area suggests that a perched groundwater level lies in the Bagshot Formation, probably at some depth below ground level. Within the Bagshot Formation the water flow is expected to be mostly horizontal and the topography of the area suggests that the groundwater would flow above the clayey horizon of the Claygate Member towards northwest and towards south. The presence of numerous springs around the area of the site also reflects the topography and the outcrops of Claygate Members. Some horizontal water flow is expected to occur also within the silt and sand lenses of the Claygate Member, but it is thought to be less than an issue than the flow in the Bagshot Formation.

The existing property includes a semi-basement with foundation level at approximately 1.5 metres below ground level. The semi-basement is expected to be within the Bagshot Member and probably above the water level.

The proposed project includes the construction of a new basement immediately to the south of the existing house and a sligh deepening of the ground level underneath the existing house. The formation level of the new basement will be approximately 4 metres below ground level, at about +116mOD. On the basis of levels estimated from the BGS map, the basement is likely to be above the level of the Claygate Member. It is possible that the basement will intercept the water currently flowing across the site. This should be verified by the site-specific ground investigation before finalising the design.

The scheme currently envisages the use of contiguous pile walls on the west and south sides and open cut excavations on the other sides (Fig. 6). This scheme could be adopted only if the basement formation level is above the water and above the top of the Claygate Member. The use of contiguous piles would avoid the basement wall to obstacle water flow at higher depths and in these conditions the basement would not affect groundwater.

If instead the basement formation level is below the water level, it would not be possible to carry out open cut excavations and dewatering operations would be necessary. Secant pile walls should be used on all sides to ensure water proofing of the basement. The walls should extend into the clayey strata of the Claygate Member to create a cut-off to water and to ease the dewatering. The slab could be designed for water pressure and uplift. In this case the basement would have the potential to create a barrier to the water flowing within the Bagshot Formation. Although this effect would be limited due to the underground topography of the Claygate Member that suggests that the water would tend to flow away from the site, there is a potential for an increase in water pressure on the up-slope side of the basement, which could affect the main house to the north and neighbouring properties to the east side. Effects on the properties to the west of the site are likely to be negligible because the ground rises by over a metre. If this second case is verified by a site specific ground investigation, special drainage measures to control groundwater could be implemented to prevent any influence on adjacent properties.

Ground Investigation

The ground investigation should be sufficient to establish the thickness of the Bagshot Formation and the nature of the upper Claygate member up to a depth higher than the depth of the wall over the full length of the new basement, to identify any adverse ground conditions and to establish the groundwater conditions. Boreholes with standpipes should be carried out within the area of the new basement and on the north-west corner of the site in order to establish the direction of the water flow.

A survey of existing drains could also be carried out to identify how water could be discharged into the existing storm water system.

Land Drainage design requirements

Fig. 6 shows a section of the proposed basement. As mentioned earlier, the basement has the potential to interfere with the current water flow. In this case dewatering operations would be necessary during construction and adequate drainage should be provided to allow the re-establishment of the natural groundwater flow down-slope, to ensure that the property is well drained and to prevent any potential effects of water pressure on the existing house and on neighbouring properties.

It is understood that a rainwater collection system will be provided, so that water falling into the properties can be stored and re-used.

A drainage blanket could be provided beneath the basement slab in order to facilitate water flow underneath it and the slab could be designed for water pressures and uplift.

Soil Make-Up over the Basement Roof

It is understood that soil make-up is to be placed over the basement roof in the courtyard area. The soil make-up should ensure that water run-off can effectively and rapidly drain across the courtyard area, in order to avoid the formation of ponding and wet areas.

It is understood that the make – up will include 60mm permeable brick paviors on 50mm crushed stone laying course on 300mm of sub base crushed gravel, on a geotextile membrane. This composite stratum will be placed above an insulation layer sited above the basement roof and falling at 1:80 towards a gulley at the centre of the courtyard, where there will be located a below ground water holding tank with a controlled pumped output to the existing drainage system.

Where paved areas are created, the hard landscaping should be adequately sloped to allow surface water run-off and gulleys should be provided to discharge water.

Conclusions

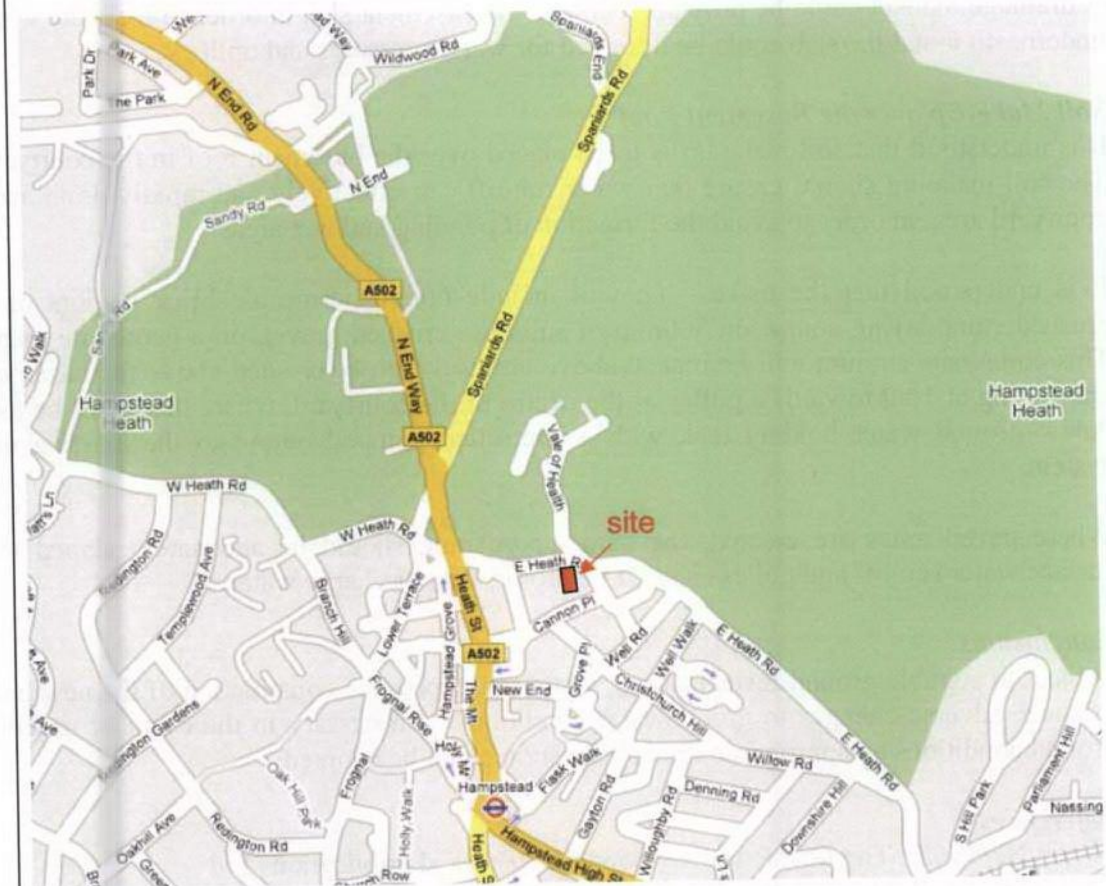
Subject to suitable ground investigation, we do not expect the construction of the new basement to cause adverse changes to groundwater conditions. If necessary in the event of unfavourable ground conditions an appropriate drainage system could be adopted.

References :

Barton N. (1962): The Lost Rivers of London. Historical Publications Ltd

CIRIA Special Publication 69 (1989). The engineering implications of rising groundwater levels in the deep aquifer beneath London

Environmental Agency (2006): Groundwater levels in the Chalk-Basal Sands Aquifer in the London Basin.

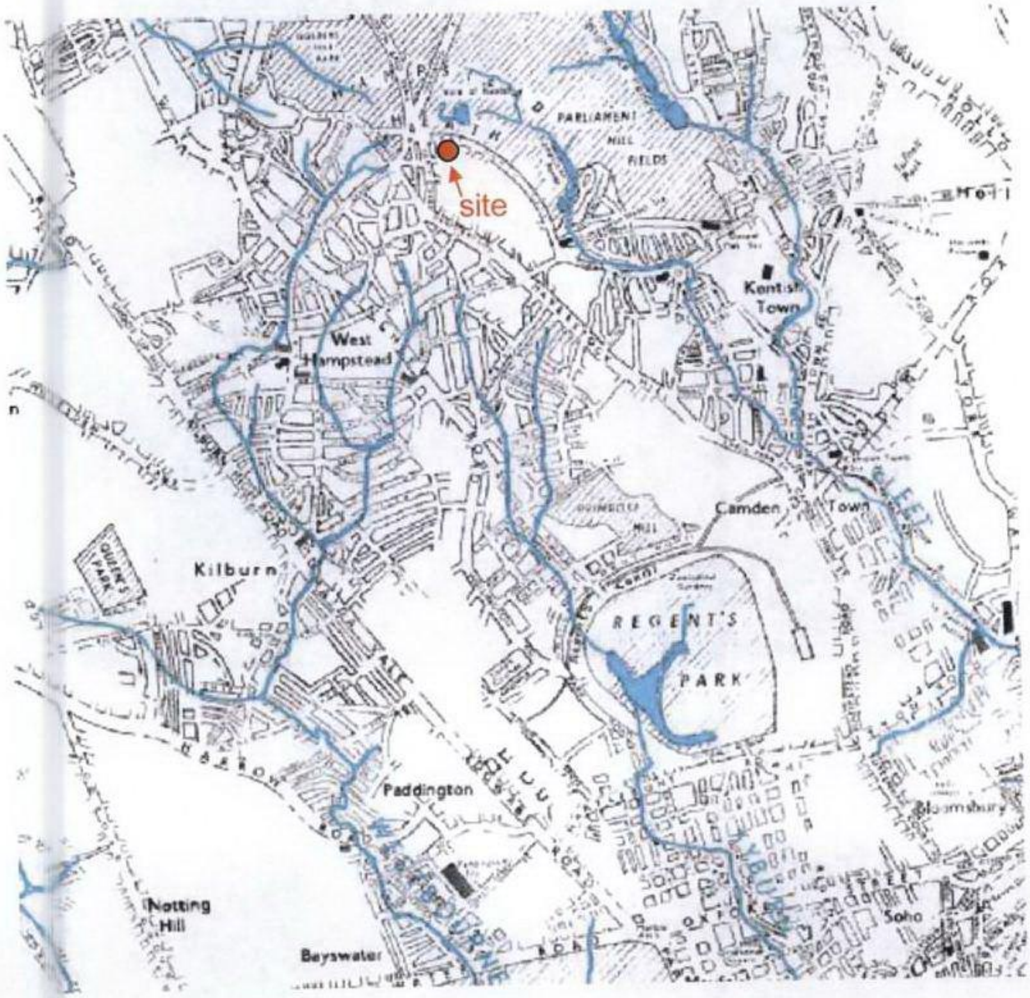


Geotechnical Consulting Group	Site location	Figure 1
19 East Heath Road		

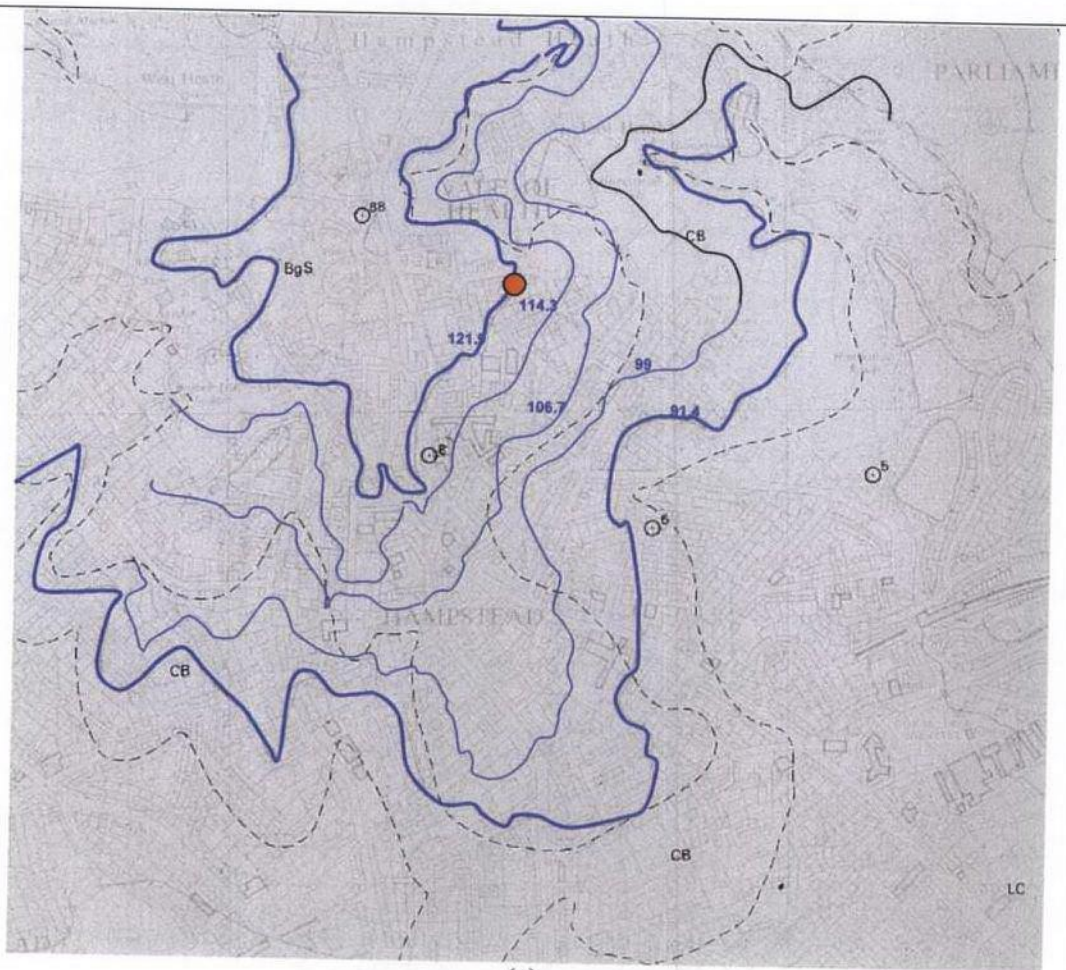
(a)

(b)

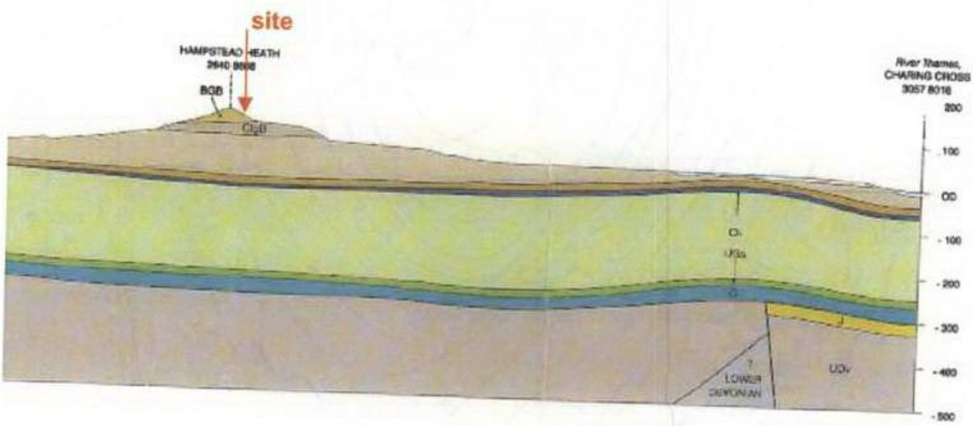
Geotechnical Consulting Group	Current property (a) aerial view and (b) panoramic view from the west side	Figure 2
19 East Heath Road		



Geotechnical Consulting Group	**Extract from The Lost Rivers of London Map (Burton N., 1962)**	Figure 3
19 East Heath Road		



(a)



(b)

Geotechnical Consulting Group	**Geology of the area (a) extract from the British Geological Survey 1:10560 sheet TQ28NW; (b) section through Hampstead Heath**	Figure 4
19 East Heath Road		