XUL Architecture

9 Templewood Avenue, NW3

HYDROGEOLOGICAL REVIEW

September 2012

Rev 2

GEOTECHNICAL CONSULTING GROUP
52A Cromwell Road
London SW7 5BE
United Kingdom

Tel: +44 (0) 20 7581 8348
Fax: +44 (0) 20 7584 0157
Email: admin@gcg.co.uk

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1 INTRODUCTION

It is proposed to extend the basement currently under the front area of the main house on 9 Templewood Avenue, London NW3 to the whole area of the house. GCG has received an instruction from XUL Architecture to undertake a review of the local hydrogeological conditions and the impact that the proposed basement may have on the flow of groundwater across the area.

This report reviews the available information about the site and the current scheme and aims to produce a hydrogeological impact assessment for the proposed basement construction on this site in accordance with the requirements of the London Borough of Camden. These requirements are set out within the Development Policy DP27, the Camden Planning Guidance CPG4 - Basements and Lightwells and the LB Camden guidance document entitled 'Camden geological, hydrogeological and hydrological study – Guidance for subterranean development'.

GCG have been supplied with information by XUL Architecture.

This report has been prepared for XUL Architecture as part of the requirements set by the DP27/CPG4 and LB Camden's 'Guidance for Subterranean Development'. It addresses the issues of the subterranean (ground water) flow screening chart that is shown in full details in Appendix A.

2 THE PROPERTY AND THE PROPOSED RE-DEVELOPMENT

The site lies within the Belsize Camden Administrative Boundary and is located on the west side of Templewood Avenue, at approximately 200m to the south of West Heath (figure 1). It has a rectangular shape of around 70m x 30m extending northwest-southeast and includes a mansion house set back from the road and a rear garden.

The house is approximately 20m by 20m and has a single level basement under most of its front area. Figure 2 shows a plan of the existing basement. An examination of historical data indicates that the house was constructed between 1910 and 1912, when Templewood Avenue was developed.

Mature trees are located at the front of the house and along the edges of the rear garden.

It is proposed to deepen the existing basement and extend it to the rear of the house. The new

basement will extend beyond the footprint of the existing house under an area currently paved. Figure 3 shows a plan of the proposed basement extension relative to the existing ground floor and the existing basement. The new basement would be less than 1m deeper than the existing and would require around 4m of excavation below the existing ground level (bgl) at the rear of the house. It is understood that the basement will be formed by underpinning the walls of the existing house.

A swimming pool is also to be constructed in the rear garden with a plan area of around 2 metres by 12 metres. This will be approximately 1 metre deep.

3 TOPOGRAPHY AND GEOLOGY

The site is on ground sloping to the south at an approximate gradient of 1:40 (figure 4). The ground level at the front of the site is approximately +103mOD and about +105mOD at the rear edge of the site.

The geology of the area is shown on the 1922 British Geological Survey Map, London Sheet IV N.E (figure 5) and on the British Geological Survey 1:50000 England and Wales Sheet 256 – North London (figure 6). The site appears to be underlain by the Claygate Member of the London Clay Formation, but it is close to the boundary with the Bagshot Beds, which extend northwards immediately to the north of the site.

The Claygate Member is composed of inter bedded layers of fine-grained sands, silts and firm to stiff clays. The Bagshot Formation is predominantly composed of horizontally bedded sands with occasional thin gravel beds and lenses of silt and clay.

A site specific ground investigation including the sinking of two boreholes to about 6m depth was carried out in September 2012 by Herts and Essex Site Investigation (H&E SI). The boreholes were sunk in the rear garden at the back of the main house. Below a paving slab, the boreholes showed the presence of silty clay with sand partings up to their full depths. Sand lenses were identified between about 2.5m and 4m depth. These soils are likely to be part of the Claygate Member.

Below the Claygate Member the stratigraphy of the site then includes London Clay, Lambeth Group, Thanet Sand and Chalk.

The London Clay outcrops at about 300m to the south of the site at levels that appear to be about +95mOD. The topographical contour levels and the geology of the area suggest that the thickness of the Claygate Member at the site can be expected to be between 10m and 15m.

The thickness of the London Clay underneath the Claygate Member in this area is expected to exceed 60m. .

4 HYDROGEOLOGICAL CONDITIONS AND HAZARDS

Given the nature of the Claygate Member and the vicinity of the site to the border with the Bagshot Beds, the water would be expected to be encountered underneath the site. Horizontal water flow could also occur in the most permeable layers of the Claygate Member.

During the site investigation slow seepage was observed at about 3m depth in both boreholes and the water raised by about 0.2m in 20 minutes. A standpipe piezometer was installed in one of the boreholes at 5m depth, but information on water levels is not currently available.

The 1922 BGS map in Figure 4 and a map from Barton (1962) 'The lost Rivers of London' (Figure 7) show that numerous streams exist in the area of the site and, from Figure 7, that a stream is very close to the site. This stream starts at the geological boundary of the Claygate Member with the Bagshot Beds immediately to the north of the site; it then crosses Templewood Avenue immediately to the east of the site and runs southwards parallel to the road to feed the Westbourne River to the south. Groundwater in the area of the site would be expected to flow towards this stream.

Other streams are further than 100m from the site and flow into various drainage channels to form tributaries of the four main rivers within the LB Camden. All these springs would be expected to be culverted or filled in.

The site is more than 100m away from the Hampstead Chain Catchment. The closest ponds appear to be at approximately 600m to the north of the site (Leg of Mutton), although smaller ponds are known to be present within West Heath.

The London Clay that underlies the Claygate Member acts as a barrier to flow between the lower (Chalk) aquifer and superficial groundwater. Water infiltrating the London Clay will generally tend to flow vertically downwards at a very slow rate towards the lower aquifer.

The water head in the Chalk was about -50 mOD in 1965 (see figure 11), and has been rising since as the demand for water abstraction began to diminish after 1965; in 2010, the water level in the Chalk in the area of the site was approximately -30 mOD (see figure 12). 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 directly by 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.

According to the Camden Flood Map (figure 8), Templewood Avenue was flooded in 2002. Flooding occurred after intense rainfall and most likely it was due to poor drainage of superficial water and run off. Measures should therefore be implemented to deal was surface water in the proposed redevelopment of the site.

The site is not included in a Source Protection Zone and is also not in a sensitive land use or in a potentially contaminative industrial land use.

5 LAND DRAINAGE REQUIREMENTS

Given nature of the Claygate Member underlying the site and the vicinity of the site to the boundary with the Bagshot Beds, water would be expected to be found from relatively shallow depths below ground. The former stream to the east of the site, although likely to be currently culverted or filled in, would represent a preferential way for the water in the area,

which would be expected to flow towards it in the most sandy layers of the Claygate Member.

Water seepage was observed in the site investigation at about 3m depth and the groundwater level should be confirmed by monitoring of the standpipe installed in one of the boreholes.

The existing house is likely to be founded in the Claygate Member and the existing basement probably already obstructs, to some extent, any water running across the site near the surface. The light deepening of the existing basement and its extension to the rear of the house could extend the area of the potential obstruction, but not significantly. The proposed basement extension, being at the rear of the existing basement, will be aligned along the expected direction of water flow and therefore will probably cause only an earlier deviation of the groundwater flow across the site. Also, water will be able to continue its flow underneath the new extension and the existing basement.

The proposal is therefore unlikely to have any significant impact on the local waterflow in the area. Potential issues would be limited to a minor increase of perched water pressure on the uphill side of the basement, which is likely to be currently occurring behind the uphill wall of the existing basement. If this is of concern, it could be mitigated installing a suitable drainage system that would facilitate groundwater flow if the water rose to high levels and would also enable to deal with potential issues related to superficial groundwater.

The drainage system could include, for example, french drains to a nominal depth of about 2m around the perimeter of the proposed basement extension and extending to the sides of the existing basement. The drains should be piped, with perforations facing upwards, falling at 1:100 towards the downhill side of the basement, where the pipe should be fully perforated. The pipes should be a minimum of 100mm diameter to allow ease of inspection and cleaning. Access pits should be provided at convenient locations on both sides of the basement.

Water should be expected to be encountered during construction and provision for dewatering during underpinning and excavation might be required. In the permanent condition there will need to be a suitable internal construction to bring the structure to an acceptable standard with regard to moisture ingress.

The swimming pool which is set well above the level of the existing basement will not have a a significant impact on the local ground water conditions.

6 CONCLUSIONS

It is proposed to deepen the existing basement under the front part of the house at 9 Templewood Avenue, London NW3 and extend it to the whole area of the house.

The local stratigraphy of the site, showed by a site specific ground investigation and record data, includes Claygate Member over London Clay. The thickness of the Claygate Member has not been proved, but could be expected to exceed 10m. Bagshot Beds are marked in the geological maps immediately to the north of the site.

Given the nature of the Claygate Member, free water would be expected to be found at relatively shallow depths below ground and horizontal flow could occur in the most permeable layers of the Claygate Member. The water flow is likely to be directed eastwards towards the 'lost river' present in the immediate vicinity of the site.

The existing basement probably already intersects the groundwater flowing across the site. Its extension is believed to have no significant impact on the local groundwater. Any potential issues would be limited to a local increase of water level and pore pressure on the uphill side of the basement, similarly to what is already occurring behind the uphill wall of the existing basement. This could be mitigated by placing drains along the perimeter of the new basement extension. The new drainage system would also enable to deal with any potential issues related to superficial water and would improve the situation currently existing. The proposal is unlikely to adversely affect the adjacent properties.

No other known ponds and wells are in close vicinity to the site and the site is outside the Hampstead pond chain catchment area.

The proposed basement will extend outside the footprint of the existing building, beneath the paved area leading to the garden at the rear. The proposed construction will not result therefore in a change in the proportion of hard surfaced/paved areas.

The proposed swimming pool will not have a significant effect on the local ground water flow.

Water ingress could occur during construction and provision should be made to excavate in the dry.

In summary, on the basis of the available information on ground and groundwater conditions at the site, the proposed basement extension is not expected to cause adverse changes to the local hydrogeology provided that adequate drainage measures are adopted.

7 REFERENCES

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British Geological Survey. 1982. Geological Survey Sheet TQ28NE. 1: 10,560

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

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Appendix A

SUBTERRANEAN GROUND WATER FLOW SCREENING CHART

Question 1a: Is the site located directly above an aquifer?

The site is located above a secondary aquifer (Claygate Member). Given the nature of this soil, composed of interbedded layers of clay and silt and sand, free water could locally be found.

Question 1b: Will the proposed basement extend beneath the water table surface?
The basement will extend to about 3-4m depth and possibly below some of the layers where water could percolate.

Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?
Yes. The site seems to be close to a 'lost river', which crosses Templewood Avenue immediately to the east of the site and then flows in a southern direction parallel to the road to form one of the tributaries of the Westbourne River. This is likely to be currently culverted or filled in.

Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?
No. The site is more than 100m away from the Hampstead Chain Catchment.

Question 4: Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?
No. The proposed basement will extend below the footprint of the existing building and only locally below the existing paved area at the rear of the main house.

Question 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. All surface water will be collected in harvesting rainwater tank to be re-used for gardening. The volume of discharged water will not be greater than in the existing condition.

Question 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?
Yes. The nearby stream is expected to originate at the junction between the Bagshot Beds and the Claygate Member to the north of the site and to run superficially within the Claygate Member deposits. As such the lowest point of the proposed excavation will probably be lower than the spring line.