

**HYDROLOGICAL ASSESSMENT
OF REDEVELOPMENT
PROPOSALS FOR
ATHLONE HOUSE**

**Athlone House
Hampstead Lane
Highgate
London
N6 4RU**

for

Athlone House Limited

LBH 2921c

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LBH
WEMBLEY



**Geotechnical &
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DRAWINGS

Any plans or drawings provided in this report are not meant to be an accurate base plan, but are used to present the general relative locations of features on, and surrounding, the site.

1.0 INTRODUCTION

Consideration is being given to the redevelopment of this former hospital site through the demolition of a substantial converted Victorian mansion known as Athlone House and the construction of a new of eight bedroom domestic house together with ancillary staff and guest accommodation and underground parking,

1.1 Brief

LBH WEMBLEY Geotechnical & Environmental have been commissioned by Withers LLP acting on behalf of the site owners Athlone House Limited to prepare an updated hydrology assessment for this site and to respond to the hydrology issues raised by various parties in objection to the planning application 2009/3413/P.

The following previous reports have been studied and their findings taken into account.

March 2002	Desk Study Report by LBH WEMBLEY Geotechnical & Environmental (LBH 2921)
June 2002	Site Investigation Report by LBH WEMBLEY Geotechnical & Environmental (LBH 2921)
September 2003	Report on Ground Water by LBH WEMBLEY Geotechnical & Environmental (LBH 2921a)
May 2004	Desk Study Letter by RPS (FLC1578/DBM/002L 1)
July 2005	Report on Ground Investigation by LBH WEMBLEY Geotechnical & Environmental (LBH 2921b)
November 2009	Queries on Groundwater Impact by Haycock Associates
February 2010	Review of Ground Water Reports by Price & Myers (16756)

2.0 THE SITE

2.1 Site Location

The site is located in an elevated position on the south side of Hampstead Lane near the top of the ridge between Hampstead Hill and Highgate Hill, on a southwest facing spur that overlooks Hampstead Heath. The property is bounded to the south and west by Hampstead Heath and to the east by three recently constructed apartment blocks with a basement car

park, known as Kenwood Place, built on what was the eastern section of the original Athlone House grounds.

The approximate National Grid reference of the site is 527700 187400.

2.2 Site Description

Athlone House is a two-storey Victorian villa with a partial basement. When it became a hospital the original building was extended a number of times and various outbuildings were added in the grounds for wards and staff accommodation.

The house is now vacant and derelict, and it is understood that the various post-war extensions and outbuildings have all been demolished.

2.3 Topography

The house itself is located on a relatively level plateau set at approximately +112.5mOD.

To the east of the house the natural ground surface falls away to the southeast past the recently constructed apartment blocks and the location of a former ornamental pond towards the head of a small valley containing a series of ornamental pools in the grounds of the adjacent Beechwood House.

To the west of the house the natural slope has been terraced into garden areas leading down into a second valley in the west which contains another pond, that was constructed as a miniature boating lake in the 19th Century to form a miniature boating lake with artificial "Pulhamite" rockwork.

3.0 REDEVELOPMENT PROPOSALS

The subject site comprises the western part of the Athlone House property and contains Athlone House itself in its centre, and Caen Cottage and the Gate House on the Hampstead Lane road frontage.

The planning application 2009/3413/P concerns demolition of Athlone House itself and the construction of a new of eight bedroom house on the same footprint and location as the existing house together with ancillary staff and guest accommodation. Underneath the whole complex of the main house and the ancillary buildings would be a basement storey containing an underground car park accessed by ramp on the north side of the staff cottages, plus cycle

parking, swimming pool, gymnasium and media room. It is understood that the total basement floor space would be approximately 2,205 m², and there would be a small further 200 m² area of sub-basement. The basement would be founded at around +108.00m OD. (see Figure 1).

4.0 **DESK STUDY**

4.1 **Site History**

Athlone House, otherwise known as Caen Wood Towers, was constructed in 1871, incorporating an earlier house on the site. The grounds as then established incorporated a neighbouring property that was demolished.

At the outbreak of the First World War the house was requisitioned for the temporary housing of Belgian refugees before being taken over for use as the American Hospital for English Soldiers until the end of the war, when the site was apparently handed back to its owners.

Following the outbreak of World War Two, the house was once again requisitioned by the Government and used to house the headquarters of a series of RAF units, reportedly including the RAF Intelligence School.

After the War, the house and grounds were passed to the Ministry of Health for use as a hospital. A number of new buildings were constructed across the northeastern portion for nurses' accommodation and ancillary buildings.

4.2 **Geological Information**

The Geological Survey map of the area shows the geological strata to have a sub-horizontal south-westwards dip in this area. The site itself is indicated to be underlain by soils of the London Clay Formation, commencing with its uppermost division, the Claygate Member. Stratigraphically younger (hence overlying) soils of the Bagshot Sand Formation are indicated capping the top of Highgate Hill a relatively short distance to the east of the site. (see Figure 2).

The Claygate Beds comprise a sequence of fine-grained sands, silts and firm to stiff clays and the upper parts of the Claygate Beds are generally sandy. From the findings of the site investigations carried out in 2002 and 2005, it is known that the upper levels of the Claygate Beds are a variable sequence of silty sandy clays and silts with abundant seams of clayey

silty sand and clayey sandy silt. In addition to occasional larger seams of sand, some reaching over 1m in thickness, smaller pockets, layers and partings of fine silt and sand were encountered throughout the beds. Below around 6m depth, similar grey variably silty and sandy clay soils were found to extend to depths of between 17m and 25m whereupon very stiff fissured grey clay, with occasional partings of pale grey sand, was encountered. The latter material is interpreted as the London Clay and this would appear to confirm the indications from the Geological Survey that the boundary between the Claygate Beds and the underlying London Clay lie at around +85 m OD to +95 m OD.

The London Clay is successively underlain by the Lambeth Group, the Thanet Sand and finally the Chalk.

4.3 Hydrological Information

It is likely that multiple perched groundwater regimes are present within the Claygate Beds beneath the site. Where the more permeable strata intersect the sloping section of the site, spring lines may be anticipated.

Groundwater has been recorded in the 2002 site investigation Borehole No.1 at +109.1 m OD immediately beside the proposed new basement area and at +109.4 m OD in Borehole No.2 a short distance to the East. Monitoring of the groundwater prior to the redevelopment of the adjacent Kenwood Place site indicated a groundwater table roughly following the surface terrain with monitored levels varying between +107.5 m OD and +110.5 m OD.

One obvious presence of water in the area was the former ornamental pond on the adjacent Kenwood Place site, with a water level at approximately +107.00m OD. This is also the approximate level of the nearby head of the sequence of ornamental pools on the neighbouring Beechwood property.

Although upon inspection, the bottom of the ornamental pond was found to be constructed of concrete, it is considered likely that that the pond may well have originally been constructed at a position where there was a spring line and hence seepages of ground water emanating from the ground.

Spring lines such as these can be expected at locations wherever saturated sandier layers within the Claygate Beds emerge onto the sloping ground surface. However, the recharge potential for this perched water table in an elevated situation such as this is considered to be limited and it was noted (September 2003) that the pond was being fed by a small pipe

(approx 2" diameter). The ground keeping staff indicated that it was necessary to feed the pond by a mains water supply in order to maintain the water level during the summer months.

The groundwater at this site can be regarded as a sensitive catchment source for the surface water streams and bathing ponds that are to be found lower down the slopes of Hampstead Heath.

Old maps show that Hampstead Hill in the area of the site drains generally to the south west as would be expected from the local topography. Historic surface watercourses are indicated to have run down in this direction along valleys at either end of the former Athlone House grounds, both eventually draining into the Highgate Ponds and thereby into the Fleet River to the south. (see Figures 3 and 4)

Seasonal variations in the groundwater conditions in the area of the site are of course likely, with appreciable rises in the groundwater table being probable during the wetter winter months.

5.0 HYDROLOGICAL ISSUES RAISED IN RESPONSE TO PLANNING APPLICATION

5.1 Failure to submit Hydrology Report.

The Athlone House Working Group, The Highgate Society and The Highgate Conservation Area Advisory Committee have all objected to the apparent absence of a hydrology study in support of the planning application.

5.2 Impact of the proposal on the Hydrology of Hampstead Heath (Haycock Report)

The Superintendent of Hampstead Heath at the City of London, acting through Urban Initiatives Limited and relying upon a report prepared for them by Haycock Associates Ltd has raised the following concerns:

1. There is no mention of how the proposed basement will affect the hydrological functioning of the current groundwater system. Athlone House's catchment for groundwater is believed to enter the Ladies Bathing Pond on Hampstead Heath, through the Claygate Geology, a minor aquifer. Any changes to the groundwater flow may be detrimental to the pond.

2. If the groundwater does cause flow to go around the basement this may divert water from the Ladies Bathing Pond downstream to the Bird Sanctuary Pond. We would recommend modelling the groundwater flows taking into account surrounding basements, the geology of

the site and flow direction. This is necessary to ascertain the impact and necessary mitigation of any excavation and sub terrannial building proposals in this area.

3. We cannot locate discussion of the geology of the site in any of the planning or supporting technical documents submitted. This is essential to fully understand the impact of this development. We therefore recommend that trial pits are taken around the site and depths of the London Clay in order to inform the groundwater model.

6.0 RESPONSE TO HYDROLOGICAL CONCERNS

In response to the above concerns in February 2010 the Structural Engineers Price & Myers produced a Review of Ground Water Reports (Price & Myers Report). This was a desktop report to address the issues of impact of development on local hydrology

The Price & Myers report states that the construction will include a basement with a founding depth of approx +108 m OD. The report also clarifies that the basement will be constructed of reinforced concrete in an open cut excavation with the soil battered back during construction and that free-draining material will be installed immediately around and below the basement to ensure any ground water reaching the basement structure will be diverted around and below it. Even at the highest level of groundwater found, the proposed basement is indicated to encroach the groundwater by only approximately 1m and the report concludes that the groundwater would simply flow around and below the basement.

7.0 REVIEW BY ENVIRONMENT AGENCY

The Planning Officers Report states that the Environment Agency (EA) have commented that they agree there is a definite risk of unwanted impact on groundwater flow and groundwater contribution to surface water flow in the area, that the EA agree with the proposal to make provision in the design to incorporate a drainage system that will allow the through-flow of groundwater to continue to support the existing flows to the surrounding ponds and that the EA agree that the development should not adversely affect local groundwater conditions provided that the suggested measure of providing an effective drainage system is properly implemented.

8.0 DISCUSSION

As a result of the combination of the semi-pervious geology and the sloping terrain, the natural landscape of Hampstead Heath contained many springs. However, while there would

have been swampy hollows, the present ponds were variously constructed in the 17th, 18th and 19th Centuries, when the headwaters of the Fleet River were dammed for water supply purposes.

8.1 Highgate Ponds

The Highgate ponds (Figure 3) are a series of eight former reservoirs originally dug in the 17th and 18th centuries, and include two single-sex swimming pools (the men's and ladies' bathing ponds), a model boating pond, a wildlife reserve pond and a fishing lake. These ponds lie to the southwest of Athlone House.

8.2 Highgate Ponds Catchment

The appended topographical plan (Figure 5) of the surrounding area indicates the notional approximate rainfall catchment area of the Highgate Ponds based upon the ground surface topography. In practice, given the possible slight southwesterly dip of the strata, it could be that there is possibly also some supplemental deeper drainage from those areas of the Claygate beds beneath Highgate Hill that lie directly to the north west of the Ponds. In either event, the water emerges as springs at or above the edge of the London Clay outcrop and runs down into the pond system.

The grounds of Athlone House occupy a small area within the overall rainfall catchment of the Highgate Ponds, and the proposed new basement area is very small in relation to the catchment. The grounds are expected to contribute some water into the Highgate Stock Pond and into the Ladies Bathing Pond by means of seasonal springs and intermittent flow down the two small valley features (see Figure 4). The Stock Pond acts as a reservoir feeding the Ladies Bathing Pond and the latter in turn acts as a reservoir to the Bird Sanctuary Pond (See Figure 3)

8.3 Groundwater in Relation to Proposed Basement

Excavation for the basement is expected to penetrate water-bearing layers of sand and silt within the Claygate Member. These beds are characterised by a limited vertical permeability, and a variable lateral permeability that is dependant upon the continuity of the sandy seams or lenses that are interbedded within the predominantly clay lithology.

In recognition of the above, it can be stated that in terms of cutting off groundwater flow paths through existing permeable seams of sand and presenting an obstruction to groundwater flow, the depth of a new basement is relatively insignificant compared with its maximum width

across the strike of the Claygate strata (the beds of which are indicated to be sub-horizontal, with a slight southwesterly dip).

It can be seen (Figure 1) that the proposed new basement has a width of some 35m in this direction, about 10m more than the existing Athlone House basement.

Although the pool terrace would almost emerge from the hillside onto the adjacent lawn, there would conceivably be a 1 m head of groundwater around the northern end of the new basement which would be dug further into the ground. Thus, it will be essential to design the basement structure to be waterproof.

There would be an impact upon the prevailing groundwater regime if the proposed basement structure were to prevent or significantly impede the anticipated general down-slope flow of groundwater. However, in the case of a conventional sealed box basement constructed in the soils at this site, it is likely that any groundwater would simply flow through the natural soils or made ground backfill around the perimeter of the new basement structure. The potential impact of such a basement without any special drainage measures is hence considered to be very small.

8.4 Proposed Surrounding Drainage to Basement

In order to ensure that there would be no impact upon the groundwater regime there would be a requirement for specific drainage to be installed to intercept any saturated strata to the north of the basement and to connect this back into any permeable strata at the southern margin of the proposed basement.

The basement construction proposals incorporate an external drainage system that would ensure the connectivity of any potential groundwater flow paths that may be intercepted. This collector drain, composed of free-draining material, would be installed immediately around and below the basement such that any groundwater would simply flow around and below the basement.

8.5 Predicted Effect of Proposed Basement upon Groundwater Regime

It is noted that there are proposals both for a SUDS drainage system to be installed as part of the redevelopment and also for a new pond to be created to the east of the house. It is expected that the ground in the immediate vicinity of these features will be affected by them.

Similarly, the ground immediately surrounding the new basement will have been disturbed and may in some cases conceivably experience improved drainage as a result of the

proposed new basement construction. However, it is considered that the basement construction with collector drainage as proposed would be unlikely to have any general effect on the local groundwater conditions within the grounds of Athlone House.

It is therefore considered unlikely that the proposed new basement would have any impact on either the hydrology of the nearby Highgate ponds or indeed the wider environment of Hampstead Heath.

9.0 CONCLUSIONS

- The grounds of Athlone House occupy a small area within the overall rainfall catchment of the Highgate Ponds, which lie to the southwest of the house in Hampstead Heath. The area is expected to contribute some water into the Ponds by means of seasonal springs and intermittent flow down two small valley features. The more western of these two valleys includes a small area impounded in the 19th Century within the grounds of Athlone House to form a pond (part of the work by Pulham).
- The basement of the new Athlone House would be dug into the Claygate Beds. These are characterised by a limited vertical permeability, and a variable lateral permeability that is dependant upon the continuity of the sandy seams or lenses that are interbedded within the predominantly clay lithology.
- In recognition of the above, it can be stated that in terms of presenting an obstruction to groundwater flow, the depth of the new basement is relatively insignificant compared with its maximum width across the strike of the Claygate strata (the beds of which are indicated to be sub-horizontal, with a slight southwesterly dip).
- The basement construction proposals would incorporate an external drainage system that will ensure the connectivity of any potential groundwater flow paths that may be intercepted.
- The basement would be constructed in an open cut excavation extending to around 1m below the highest observed groundwater within the Claygate Beds. A collector drain composed of free-draining material would be installed immediately around and below the basement such that any groundwater would simply flow around and below the basement.
- Taking into account the configuration of the proposed basement, in terms of its position relative to the water table and scale, the potential impact of a conventional sealed box

basement without any drainage system as described above is considered to be very small.

- It is concluded that the basement construction as proposed would be unlikely to have any effect on the local groundwater conditions within the grounds of Athlone House. Likewise, it would be unlikely to have any impact on the hydrology of the nearby Highgate ponds or the wider environment of Hampstead Heath.

APPENDIX

Figure 1

Plan showing extent of existing and proposed basements

Figure 2

Plan showing geology of the surrounding area

Figure 3

Plan showing the names of the Highgate Ponds

Figure 4

Plan showing the topographical relationship between the site and the Stock Pond

Figure 5

Plan showing the topography of the surrounding area and notional rainfall catchment area of the Highgate Ponds









