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51 Gloucester Crescent: Surface Water and Subsurface Flow Basement Impact Assessment: screening stage

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1. Introduction

1.1 Background

This report presents the surface water and subsurface flow (groundwater) components of a basement impact assessment, to be submitted in support of a planning application for the basement development at 51 Gloucester Crescent, Camden Town, London NW1 7EG (Figure 1.1, national grid reference TQ 2861 8387). The local planning authority is Camden Borough Council.

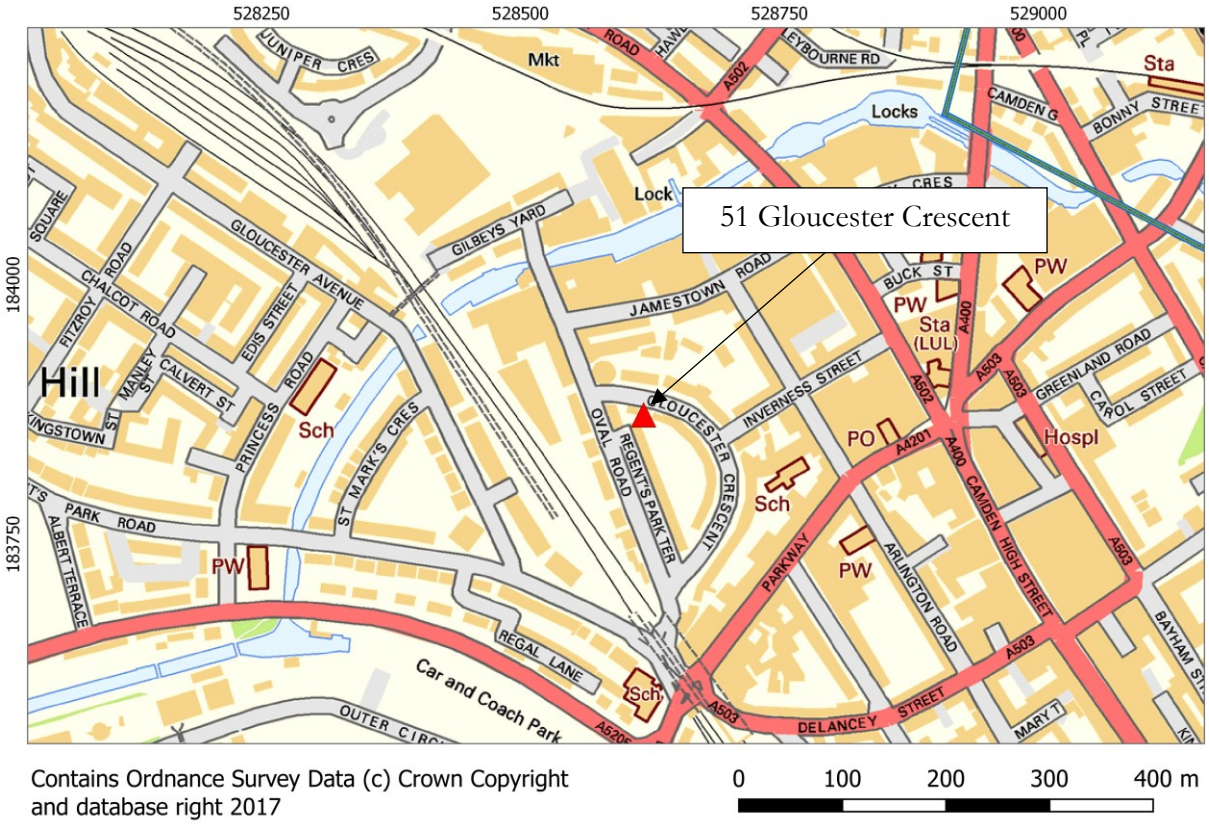

Figure 1.1 Location of 51 Gloucester Crescent

1.2 Basement Works

The site comprises 51 Gloucester Crescent which is currently a two-storey building on the south side of the street. To the east, south, and north of the site are neighbouring residential properties. Numbers 50 and 51a Gloucester Crescent adjoin the property, to the west and east respectively.

Plans for the new basement extension involve excavating beneath the existing building, and external hardstanding. The basement extension is to be roughly square, with sides c. 9 m. It is expected that the basement formation level will be about 4 m below ground level. Figure 1.2 shows a scan of the proposed basement outline.

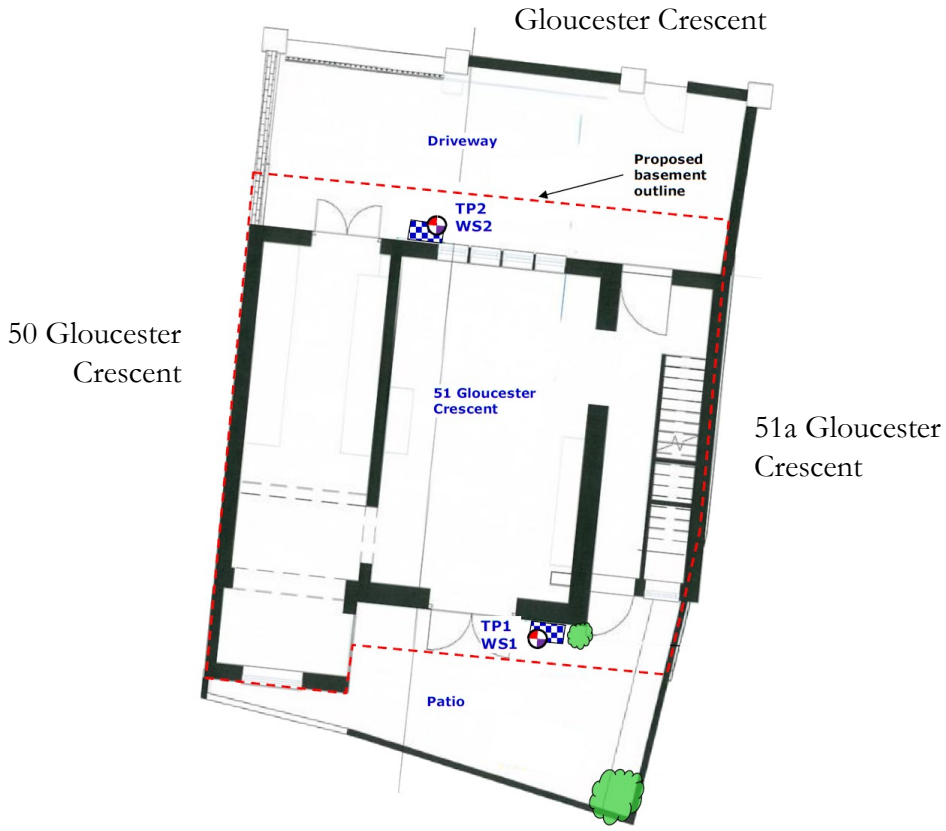

Figure 1.2 Plan of the proposed development (do not scale).

1.3 Scope of Report

This report presents the surface water, and sub-surface water, screening report for a basement development, that complies with CPG4 screening and scoping stages, and makes reference to the basement impact assessment guidance of ARUP (2010)[1].

1.4 Authorship of Report

Stephen Buss Environmental Consulting Ltd was instructed in March 2017 to complete this report. This report has been prepared by Dr Stephen Buss MA MSc CGeol. Dr Buss is a UK-based independent hydrogeologist with more than 17 years' consulting experience in solving groundwater issues for regulators, water companies and other private sector organisations. **Dr Buss is a Chartered Geologist with the Geological Society of London.** Dr Buss's CV and publications list is available at www.hydro-geology.co.uk.

Hydrology aspects of this report have been prepared by Rupert Evans MSc CEnv C.WEM MCIWEM AIEMA. Mr Evans is a UK-based independent hydrologist with more than 10 years' consultancy experience in flood risk assessment, surface water drainage schemes and hydrology/hydraulic modelling. **Mr Evans is a Chartered Water and Environmental Manager (C.WEM) and a Member of the Chartered Institution of Water and Environmental Management.**

[1] ARUP, 2010. Camden geological, hydrogeological and hydrological study. Guidance for subterranean development.

2. Basement Impact Assessment Screening: Surface Flow

Surface flow screening follows the procedure outlined in Figure 5: Surface flow and flooding screening chart of the Camden Planning Guidance 4 (CPG4) entitled Basements and Lightwells dated July 2015.

1) Is the site within the catchment of the pond chains on Hampstead Heath?

NO. Figure 14 of the Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010, confirms that the site is not located within this catchment area.

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. There will not be an increase in impermeable area across the ground surface above the basement, so the surface water flow regime will be unchanged.

The basement will be beneath the footprint of the existing building and front and rear hardstanding area, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 does not apply.

3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?

NO. There will not be an increase in impermeable area across the ground surface above the basement. The basement will be beneath the existing building footprint.

4) *Will the proposed basement development 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. There are negligible inflows from adjacent properties, and no flows to adjacent properties. The basement is entirely below the footprint of the existing building and therefore the existing drainage regime will remain the same.

There will not be an increase in impermeable area across the ground surface above the basement, so the surface water flow regime will be unchanged.

The basement will be beneath the footprint of the existing building and front and rear hardstanding area, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 does not apply.

5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

NO. The proposed basement is very unlikely to result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses as the surface water drainage regime will be unchanged and the land uses will remain the same.

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 of flooding, for example because the proposed basement is below the static water level of nearby surface water feature?

NO. The findings of this BIA together with the Camden Flood Risk Management Strategy dated 2013 and Figures 3ii, 4e, 5a and 5b of the SFRA dated 2014, in addition to

the Environment Agency online flood maps show that the site has a very low flooding risk from surface water, sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses.

It is possible that the basement will be constructed below a water table and the recommendations outlined in the sub-surface BIA with regards to water-proofing and tanking of the basement will reduce the risk to acceptable levels.

In accordance with paragraph 5.11 of the CPG a positive pumped device will be installed in the basement in order to further protect the site from sewer flooding.

The site is located within the Critical Drainage Area Group3_003, but not in a Local Flood Risk Zone as identified in the Camden SWMP and Updated SFRA Figure 6/Rev 2, so a separate flood risk assessment (FRA) is not required.

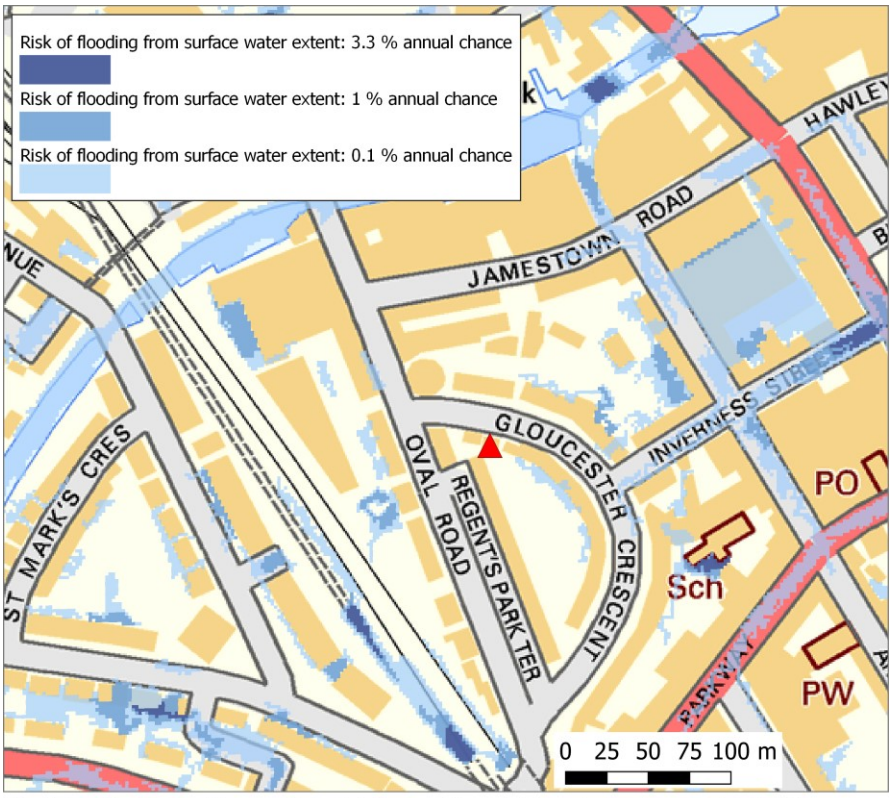

Figure 2.1 Risk of surface water flooding

3. Basement Impact Assessment Screening: Groundwater

Subterranean (groundwater) screening follows the procedure outlined in Figure 3: Subterranean (ground water) flow screening chart of the Camden Planning Guidance 4 (CPG4) entitled Basements and Lightwells dated July 2015.

1a) Is the site located directly above an aquifer?

NO. The geological map and the nearest off-site boreholes and trial pits indicate that a continuous layer of permeable superficial deposits is not present beneath the site. Boreholes and trial pits show up to 3 m of 'brown clay' over London Clay (Section 4.2). None of these can be considered an aquifer. Beneath these a significant thickness of London Clay isolates the deeper aquifer units of the London Basin aquifer from the surface.

1b) Will the proposed basement extend beneath the water table surface?

YES. Groundwater was observed in the Made Ground, in site boreholes, at about 2.3 m depth (Section 4.3). However, since there is a clay-dominated subsurface and there are no neighbouring receptors for water level rise, it is considered that there is no risk to neighbouring properties (Section 5).

2) Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

NO. There are no current surface water bodies within 100 m of the site. The site lies between the 'lost' River Tyburn and the River Fleet. There are no known water wells within 100 m of the site.

Geological conditions indicate that there is no potential for development of a spring line in the vicinity of the property, as the 1:50 000 geology map indicates that it is located upon the outcrop the London Clay, and there are no superficial deposits nearby.

3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

NO. The development is entirely beneath the current footprint of the house and adjacent hardstanding, so surface water flows will be unchanged.

4) As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?

NO. Discharge to the ground is not proposed.

5) 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 or spring line?

NO. The nearest water body is the Grand Union Canal, about 180 m to the north. This is too far from the site to be a concern, especially given that there are not permeable superficial deposits beneath the site.

4. Conceptual Site Model

4.1 Drainage and Topography

Elevation of 51 Gloucester Crescent is about 31 m above Ordnance Datum (m AOD) according to Ordnance Survey Terrain 5 data. Ground surface around the site slopes gently eastwards (gradient from Ordnance Survey 10 m contours is about 0.012).

The property location is between two historical rivers, but these have been culverted beneath the city. These were the 'lost' River Tyburn (c. 1400 m to the west and south west as Regent's Park Lake) and the River Fleet (c. 450 m to the and east)[2] (Figure 2.1). The nearest current surface water feature is the Grand Union Canal, about 180 m to the north east of the site.

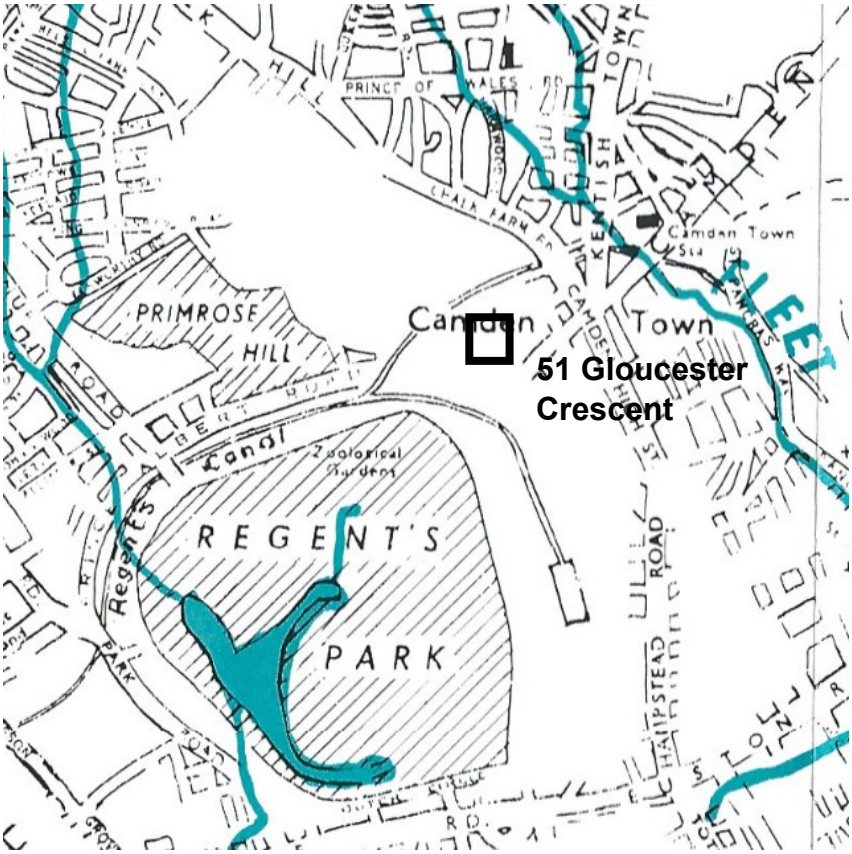

Figure 4.1 Location of tributaries of the River Tyburn (south west) and River Fleet (east)

4.2 Geology and Hydrogeology

Bedrock at the site comprises London Clay. The base of the London Clay is at about 44 m below ground level at the Pickfords borehole[3] (about 150 m to the west of the site) and isolates the main aquifer of the London Basin from the surface.

Nearby shallow borehole records available from the British Geological Survey show the absence of any thickness of permeable superficial deposits in the area:

[2] Barton, N.J., 1993. The Lost Rivers of London 3rd edition.
[3] http://scans.bgs.ac.uk/sobi_scans/boreholes/591491

- Trial pits were constructed from basement level at 220 Arlington Road, about 120 m north east of the site, in October 2016. Boreholes[4] TQ28SE2266 and TQ28SE2267show only 0.4 m of made ground above London Clay. Groundwater was encountered at 0.88 m and 0.35 m, respectively, below the basement floor.
- On the other hand, borehole[5] TQ28SE309, about 150 m to the south west of the site, shows 2.36 m of made ground below road surface level with 'Brown Clay' (c. 10 m thick), above 'Boulder Clay' (0.5 m thick), above 'Blue Clay' (London Clay). Water is not reported.

Referring back to the screening, a detailed assessment of the near-surface geology reinforces the view that there is not an aquifer directly beneath the site.

4.3 Site Geology and Groundwater

Two boreholes were constructed on site in February 2017, and standpipes were installed. These are reported in full in Soil Consultants report number 10067/OT. Borehole locations are shown on the ground floor plan in Figure 1.2.

Both boreholes were drilled from ground level and encountered clayey made ground to 4.2 m and 4.5 m below ground level (Figure 4.2). Beneath these was the London Clay. This indicates that the land may have been artificially raised in the past, though there is no other evidence for this in the topography of the ground.

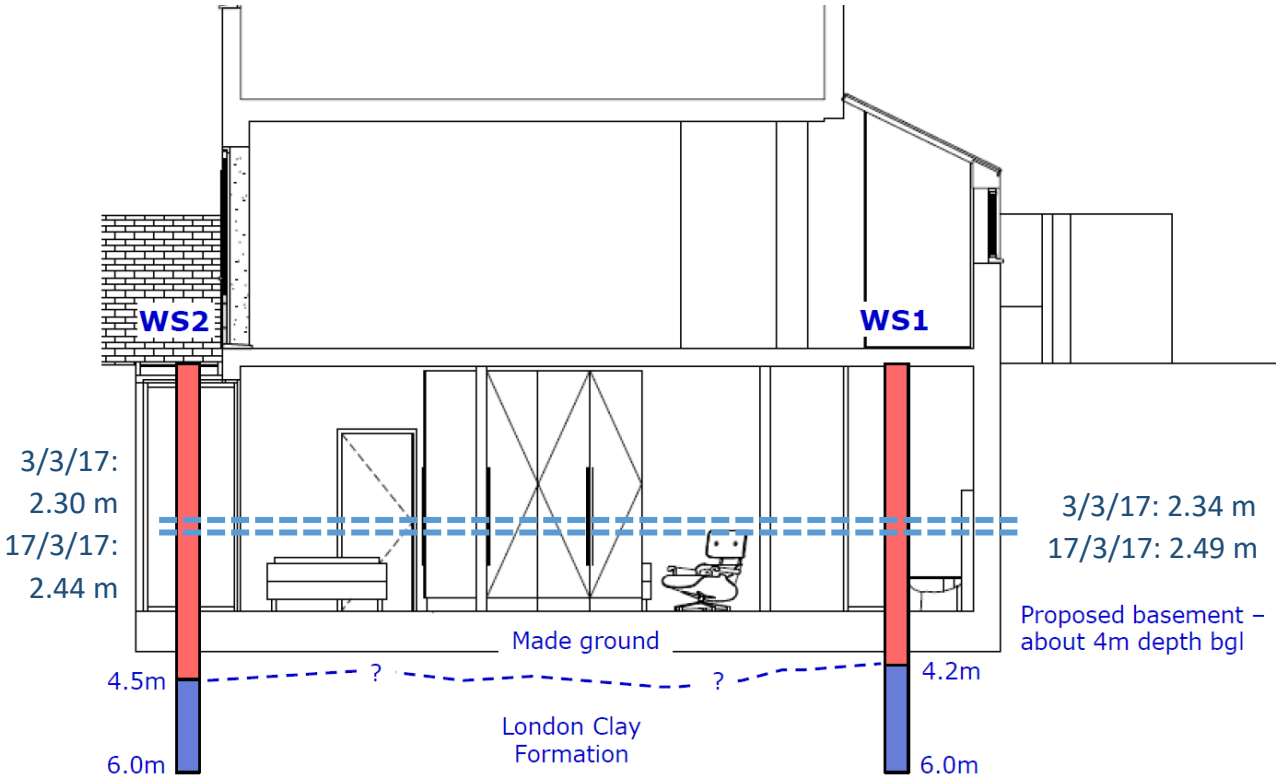

Figure 4.2 Borehole logs and water levels (looking southwards)

[4] http://scans.bgs.ac.uk/sobi_scans/boreholes/18375278, http://scans.bgs.ac.uk/sobi_scans/boreholes/18375276
[5] http://scans.bgs.ac.uk/sobi_scans/boreholes/591828

During construction, groundwater seepages were observed at levels of 2.2 m (BH1) and 2.5 m (BH2). Nevertheless the boreholes were dry on completion. Subsequent monitoring shows recovery of a water table with water levels measured at:

- 2.34 m (BH1) and 2.30 m (BH2) on 3 March 2017, and
- 2.34 m (BH1) and 2.30 m (BH2) on 3 March 2017

These water levels are marked on Figure 4.2.

4.4 Local basements

Details of any recent basement developments have searched for via the Camden Planning Portal. No developments are known from the adjacent (two storey) buildings 50 and 51a. 52 Gloucester Crescent (to the south of number 50) has a basement.

5. Scoping Impact Assessment

Groundwater levels have been observed, in monitoring boreholes, at levels above that of the floor of the proposed basement. This sub-section assesses the risk to neighbouring properties from construction of the basement.

Typical behaviour of the water table when intercepted by an impermeable basement (such as this) is to rise up-gradient of the basement, and to lower down-gradient of the basement. However, ARUP (2010, paragraph 160) states that: 'A solitary, isolated basement which intersects the groundwater table is unlikely to affect the groundwater flows in the wider area: the water will simply flow around the obstruction. The effects on water level are likely to be small and less significant than seasonal or other existing variations in the groundwater table'.

Typically, when modelling the impacts of domestic basements, SBEC finds that the maximum expected rise in the water table at adjacent properties is 0.15 to 0.20 m, and that drops off to negligible amounts over a distance of a few metres. The change in level tends not to be sensitive to hydraulic conductivity of the formation.

While the water level measurements from the two boreholes indicate that the groundwater level between them is roughly level, there must be some hydraulic gradient. Given the slope of the ground it is most likely to be eastwards, parallel to the slope. Hence the maximum rise in groundwater level (if there is one) is likely to be west of the basement, beneath the gardens of numbers 51 and 50, and properties on Oval Road / Regent's Park Terrace. The closest basement of another property is at number 52, which is to the south east, and would not be likely to see any change in level because it is not up the hydraulic gradient. Groundwater levels are far enough away from the ground surface to not affect the ground floors of numbers 50 and 51a.

In river terrace gravels, closer to the River Thames, seasonal variation is usually 0.2 to 0.3 m (CIRIA[6], 1993). But with this basement being in a clay-dominated subsurface environment, the seasonal range of water levels is expected to be smaller.

ARUP (2010) also mentions the cumulative impacts of basement development in a block. As this is not part of a contiguous block of basements, cumulative impacts are not an issue.

[6] CIRIA, 1993. A Study of the Impact of Urbanisation on the Thames Gravels Aquifer. CIRIA report 129

6. Conclusions

Potential environmental impacts of the basement extension at 51 Gloucester Crescent have been considered. The following summary conclusions are made:

- There will be no increase in man-made impermeable area so the amount, timing and quality of surface water runoff will not be affected by the development. No water will go to ground as a result of the basement development.
- The site is adjacent to an area mapped as having a very low risk of surface water flooding. Basement development is not expected to exacerbate this risk.
- Available geological and hydrogeological information indicates that there is no permeable aquifer beneath the site that is capable of maintaining a significant water table.
- Groundwater has been detected in site boreholes at depths above the floor level of the proposed basement. Dewatering may be required during basement construction, and the basement will need to be waterproofed.
- There may be a small rise in groundwater levels west of the proposed basement, once it is constructed. This is beneath the garden of the property. Given that there are no basements immediately adjacent to the proposed basement, it is considered that there is no risk of hydrogeological issues arising from the proposed development.

These conclusions are considered to be robust and no further investigations are needed to satisfy the screening criteria for sub-surface risk or flooding risk.