engineers **Haskins Robinson Waters**

IStructE Supreme Award for Structural Engineering Excellence 2007

901 / SR

25 July 2011

David Graham
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Dear David,

The Waterhouse, Millfield Lane, London - Summary of Hydrology and Basement impact Assessment Reports

Please find attached the package of information which forms the Hydrology and Basement Impact Reports for the Planning Application for the above project. The package of information comprises of the following;

- RSK Group PLC, 'Geotechnical, Hydrogeological and Geoenvironmental Site Investigation Report' (Reference 241830-01 (00) February 2011).
- Haycock Associates, 'Initial comments and observations on the hydrological impact of the development on local surface and groundwater - Version 3 Updated June 2011.
- Engineers Haskins Robinson and Waters letter reports / responses to Haycocks Report, 21 February 2011 and 24 May 2011.
- Engineers Haskins Robinson and Waters summary hydrology drawings numbers 901/SK/020 P6. 901/SK/021 P5 and 901/SK/022 P2.
- SWP Ltd. 'Surface Water Drainage Strategy'.
- SWP Ltd. Drainage drawings numbers 2391-SKPH 01 to 04.

1.0 Introduction;

Engineers HRW, RSK Geotechnical Consultants and the design team, all have good previous experience of working in the Fitzroy Park area and have worked successfully in conjunction with Haycock Associates, the City of London's Hydrology Consultant.

The team has previously consulted with local interested parties and received helpful information and comment particularly from the Fitzroy Park Residents Association. Information has been reviewed and addressed in the approach to Hydrogeological issues.

The Fitzroy Park area lies within the catchment area of a stream formerly known as the Highgate Brook, forming one of the tributaries of the River Fleet. Environment Agency guidelines classify the London Clay beneath the site as a non-aquifer (non productive strata) and not within a Source Protection Zone. However the area does have local hydrology sensitivities due to the proximity of the recreational ponds on Hampstead Heath. A particular concern following heavy rainfall is the deterioration in the water quality caused by surface water washing organic matter into the ponds.

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The proposed scheme involves the demolition of the existing two storey house and pool, founded on traditional strip foundations and the construction of a new two storey house with localised basements, supported on a piled foundation. It is proposed that the new building is constructed with reinforced concrete at basement and ground floor levels with a light weight steel and timber frame over. A king post retaining wall is proposed for the construction of the basements, this has the advantage of reducing disturbance of the ground around the basements and also avoids cut-off of the minor ground water movements at lower level.

2.0 Design Approach;

- Detailed desk study and appraisal of existing reports, Camden's Guidelines and local information.
- Appraisal informed the specification of the insitu Site Investigation works with further reference to 'Camden Geological, hydrogeological and hydrological study - Guidance for subterranean developments' Arup November 2010.
- Production of a detailed report on geotechnical and hydrological issues, followed by an independent review and consultation.
- Incorporation of recommendations into the final design.

The overall strategy for the site is to ensure ground water flows are maintained in both the temporary and permanent conditions and fully protected during the construction works. To improve the attenuation capacity of the site (above standards required for a residential property) to provide better storm water protection to Millfield Lane and the ponds.

3.0 Geotechnical / Hydrological Site Investigation Results;

The Site Investigation included, 8 boreholes varying in depth from 4 to 20m, with 5 standpipe / piezometers for ground water monitoring, trial pits and laboratory testing as detailed in RSK's report.

The investigation found that this site is underlain by Unit D of the London Clay formation, from geological records the Claygate Beds run slightly to the north, the site lying in a minor valley with no surface water flow. Local information from the Residents Association suggests drainage in this area is diverted through a culvert. The investigation found perched water in the made ground overlying the London Clay, minor ground water flows traversing the site at the interface between the made ground and the clay. Mitigating measures to deal with any sub-surface flow will be required.

The report concludes, **'It is considered that the impact of the proposed development on the local hydrological / hydrogeological regime will be minimal and it is considered unlikely to have any significant affect on the water supply to the Highgate Ponds. Any potential disturbances to drainage from the site may be effectively mitigated by the measures outlined above'.** The report also noted slope stability issues are unlikely to affect the proposed residential structure.

4.0 Surface Water Drainage Strategy

The attached Surface Water Drainage Strategy, hydrology and drainage plans detail the proposed approach to safeguarding the hydrology (i.e. maintain groundwater flows across the site and protect the quality in the temporary and permanent conditions) and provide a strategy which significantly reduces storm water run-off by the provision of onsite attenuation (water storage).

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The surface water strategy states;

The existing surface water run off from the site has been estimated at being approximately 18L/S for a 1 in 100 year storm return period. There is no provision for the retention of surface water to the existing site, all surface water from the roof and hard standing areas discharges directly into the Millfield Lane combined sewer.

By introducing the on site storage controls described above the estimated surface water run off will be reduced to below 6L/S which gives up to 60% reduction of flow off site. The proposed strategy for surface water retention will greatly reduce the potential risk of flooding to Mill Field Lane.

5.0 Independent Assessment of Report by Haycock Associates for Client / City of London

Haycock Associates have undertaken a full review of the planning application information (as listed above) in terms of the hydrological and basement impact assessments and their final summary notes;

Summary of Observations (May 2011)

'Haycock 24.05.11.doc (EHRW letter) contains responses to the issues raised in April 2011. The only substantial issue that seems to exist is ensuring that a better understanding exist on the potential drainage issues between Waterhouse and the pond at 55 Fitzroy. It has been proposed that an agreed site investigation protocol is established and required mitigation measures are developed to ensure the protection of this important pond.'

Comments (May - June 2011)

'Additional documents in May and June 2011 clarify the proposed drainage strategy for the scheme and add clarification to the management of surface and groundwater. The proposal seeks to attenuate flow and then allow natural discharge into Hampstead Heath, along the existing seepage channels via a refurbished pipe under Millfield Lane. This arrangement is subject to agreement with the City of London. The principle of ensuring that normal flow that would be directed to the Ponds is maintained is welcome. The attenuation of this run-off is also welcome, since this will also assist with the naturalization of run-off in the area.'

Haycock's recommended in their May 2011 comments, that surplus groundwater from the attenuation tank is passed to the existing drainage ditch at the front of the property and thence under Millfield Lane to the Heath. The drawings have been updated to reflect this proposal and our client would be happy to undertake the work, which would obviously be subject to City of London approval. Final details would need to be agreed with Haycock Associates.

6.0 Further investigations;

Noted below are the further investigations agreed with Haycock Associates and in response to concerns raised by the Heath Consultative Committee (HCC) / Fitzroy Park Residents Association (FPRA).

- **Pond to Number 55;** Potential hydrology / drainage links between the drainage of the Waterhouse and the pond to number 55 to be investigated in greater detail; Further intrusive investigations to this area were proposed in the original report but have not yet been undertaken due to the building being currently occupied by tenants. The extent of the investigations and outcomes will be agreed with Haycock Associates.

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- **Spring below Waterhouse;** Concern was raised by the HCC / FPRA that a spring existed below the existing Waterhouse. The original report found no evidence that a spring existed in this location, however it will be a requirement of the contract that during demolition works RSK will be instructed to further investigate the ground strata beneath the building.
- **Proposed works to Number 53;** Haycock Associates raised concerns regarding the impact of proposed works to Number 53 Fitzroy Park. The proposed works were not originally considered as the planning application for this property was not submitted at the time of the original investigation. From the information available on Camden's website, an initial assessment suggests that the proposals will have a much more significant impact on number 55 this being lower lying than the Waterhouse and directly below the proposed works. It is proposed to await the outcome of the planning decision or re-assessing once more detailed information is provided. It is to be hoped that the final scheme will take the same approach as the Waterhouse scheme in ensuring temporary protection for ground and surface water during the works, ensuring ground water flows are maintained and providing improved on site attenuation through SUDS.

7.0 Proposed Temporary and Permanent Hydrology Works;

To mitigate any disturbance of the ground water flow, the following works are proposed in the temporary and permanent conditions and in line with the recommendations of the reports, reviews and consultations. These measures are also outline on the Hydrology summary drawings and the temporary and permanent drainage proposals, listed above.

Construction Phase;

- Prior to construction, the further investigation to the local hydrology adjacent to the pond at number 55 would be undertaken, along with a GPR radar survey to locate any existing land drainage in the area of the basement and any agreed works or diversions undertaken to ensure continuity of ground water flow.
- In the temporary condition a land drain channel at surface level would be constructed along the Millfield Lane and Number 55 boundaries to catch any excessive surface water flows during the construction activities, see hydrology and temporary drainage drawings. Drawing number 921/SK/022 shows a detailed section of the specific protection works adjacent to the pond to Number 55.
- Construction of a land drain / fin drain, around the basement behind the king post retaining wall (in both the temporary and permanent conditions) to ensure that ground water is kept out of the excavations and can pass around the basement in the permanent case.
- The Construction Management Plan gives further details on the careful management of construction works, material and waste management required by the contractor during the construction process.

Permanent Works;

- Land drain / fin drains around the basement as noted above will ensure groundwater movement around the basements is not impeded. It is proposed that the drain will also be constructed across the face of the 'downhill' basement wall where the water can collect and percolate into the made ground. Land drainage to the lawn channelled through a soak away placed in the location of the existing pond.
- Removal of the foundations of the existing building and construction of the new building on a piled foundation may improve flows across the site.
- Improved water attenuation on the site sustainable urban drainage systems (SUDS) and other, see attached SWP Storm Water Strategy statement and drainage drawings. Measures will include the perimeter fin drain to the basement, the green roof, soak away and rain water harvester.

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As previously noted, the overall strategy for the site, as indicated in the reports, drawings and statements, is to ensure ground water flows are maintained across the site in both the temporary and permanent conditions. That the ground water and ponds are fully protected during the construction works and that the attenuation capacity of the site is improved to provide better storm water protection to Millfield Lane and the ponds.

Please contact us should you have any queries on the above.

Yours sincerely

Simon Robinson
For and on behalf of Engineers Haskins Robinson Waters

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