Independent Assessment
of
Basement Impact Assessment for planning application 2013/7182/P
at

Flat 1
15 Wedderburn Road
London
NW3 5QS

for
London Borough of Camden

LBH 4237

June 2014

LBH WEMBLEY

Geotechnical & Environmental

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Foreword-Guidance Notes

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Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in the future and any such reliance on the report in the future shall again be at the client's own and sole risk.

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The report may present an opinion on the disposition, configuration and composition of soils, strata and any contamination within or near the site based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. Introduction

It is proposed to excavate a new basement under the footprint of existing building and part of the front and rear gardens at 15 Wedderburn Road. It is indicated (May 2014) that the proposed basement excavation will extend to a level of +73.45 mOD, with a deepened section for a swimming pool in the southern section extending to a level of +69.80m.

The work is proposed to be carried out within the ground floor and lower ground floor levels of the building, without affecting the first and second floor levels of the property, which are occupied by different owners.

1.1 Brief

LBH WEMBLEY Geotechnical & Environmental have been commissioned to provide an Independent assessment of information submitted against the requirements of LDF policy DP27 (but also including CS5, CS14, CS15, CS17, CS18, DP23, DP24, DP25 and DP26 – as stated at paragraphs 1.5 and 1.6 of CPG4) and with reference to the procedures, processes and recommendations of the Arup Report and CPG4 2013.

1.2 Report Structure

This report commences with a description of the LDF policy requirements, and then considers and comments on the submission made and details any concerns in regards to:

1. The level of information provided (including the completeness of the submission and the technical sufficiency of the work carried out)
2. The proposed methodologies in the context of the site and the development proposals
3. The soundness of the evidence presented and the reasonableness of the assessments made.
4. The robustness of the conclusions drawn and the mitigation measures proposed in regard to:
    a. maintaining the structural stability of the building and any neighbouring properties
    b. avoiding adversely affecting drainage and run-off or causing other damage to the water environment and
    c. avoiding cumulative impacts on structural stability or the water environment in the local area
5. Specific details of any further information that is required to enable an assessment to be satisfactorily concluded.

1.3 Information Provided

The information studied comprises the following:

1. Site Investigation and Basement Impact Assessment (BIA) Report - by Geotechnical & Environmental Associates, Ref: J13235 Issue 2 Final (revised), dated 5th November 2013
2. Drawing Issue Sheet (and all drawings referenced by this) - by CSA, Ref: Job no 180, dated 28th March 2014
3. Construction Method Statement – by Fluid Structures, Ref: 23569 Rev B, dated March 2014
4. Construction Management Plan – by Walter Lilly, unreferenced, dated March 2014

5. BS5837 Tree Survey Assessment – by Indigo Surveys Ltd, Ref: 13891/A2, dated 1st November 2013
6. Ground Movement Analysis – by Geotechnical & Environmental Associates, Ref: J13235/HD/01, dated 9th May 2014

2. Policy DP27 – Basements and Lightwells

The CPG4 Planning Guidance on Basements and Lightwells refers primarily to Planning Policy DP27 on Basements and Lightwells.

The DP27 Policy reads as follows:

In determining proposals for basement and other underground development, the Council will require an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability, where appropriate. The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability. We will require developers to demonstrate by methodologies appropriate to the site that schemes:

a) maintain the structural stability of the building and neighbouring properties;
b) avoid adversely affecting drainage and run-off or causing other damage to the water environment;
c) avoid cumulative impacts upon structural stability or the water environment in the local area;

and we will consider whether schemes:

d) harm the amenity of neighbours;
e) lead to the loss of open space or trees of townscape or amenity value;
f) provide satisfactory landscaping, including adequate soil depth;
g) harm the appearance or setting of the property or the established character of the surrounding area; and
h) protect important archaeological remains.

The Council will not permit basement schemes which include habitable rooms and other sensitive uses in areas prone to flooding. In determining applications for lightwells, the Council will consider whether:

i) the architectural character of the building is protected;
j) the character and appearance of the surrounding area is harmed; and
k) the development results in the loss of more than 50% of the front garden or amenity area.

In addition to DP27, the CPG4 Guidance on Basements and Lightwells also supports the following Local Development Framework policies:

Core Strategies:

- CS5 Managing the impact of growth and development
- CS14 Promoting high quality places and conserving our heritage
- CS15 Protecting and improving our parks and open spaces & encouraging biodiversity
- CS17 Making Camden a safer place
- CS18 Dealing with our waste and encouraging recycling

Development Policies:

- DP23 Water

- DP24 Securing high quality design
- DP25 Conserving Camden's heritage
- DP26 Managing the impact of development on occupiers and neighbours

This report makes some specific further reference to these policies but relies essentially upon the technical guidance provided by the Council in November 2010 to assist developers to ensure that they are meeting the requirements of DP27, which is known as the Camden Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development (CGHHS), and was prepared by Arup.

3. Assessment of Adequacy of Information Provided

3.1 Basement Impact Assessment Stages

The methodology described for assessing the impact of a proposed basement with regard to the matters described in DP27 takes the form of a staged approach.

3.1.1 Stage 1: Screening

Screening uses checklists to identify whether there are matters of concern (with regard to hydrogeology, hydrology or ground stability) which should be investigated using a BIA (Section 6.2 and Appendix E of the CGHSS) and is the process for determining whether or not a BIA is required. There are three checklists as follows:

- subterranean (groundwater) flow
- slope stability
- surface flow and flooding

3.1.1.1 Subterranean (Groundwater) Flow

A screening checklist for the impact of the proposed basement on groundwater is included in the BIA (Document 1). This identifies that

- **the site lies directly over an aquifer**
- **the proposed basement will extend beneath the groundwater table**
- the site is **unlikely** to lie within 100m of a watercourse, well or potential spring line.

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3.1.1.2 Slope Stability

A screening checklist for the impact of the proposed basement on land stability is included in the BIA (Document 1). This identifies that

- **some trees will be felled as part of the development**
- **there is some potential for seasonal shrink-swell subsidence**
- the site is **not** within 100m of a watercourse or potential spring line.
- **the site is within an aquifer**
- **the site is within 5m of a highway or pedestrian right of way**
- **the proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties**
- the site is **possibly** within the exclusion zone of the New Belsize Tunnel

3.1.1.3 Surface Flow and Flooding

A screening checklist for the impact of the proposed basement on surface water flow and flooding is included in the BIA (Document 1). This has not identified any issues.

3.1.2 Stage 2: Scoping

Where the checklist is answered with a “yes” or “unknown” to any of the questions posed in the flowcharts, these matters are carried forward to the scoping stage of the BIA process.

The scoping produces a statement which defines further the matters of concern identified in the screening stage. This defining should be in terms of ground processes, in order that a site specific BIA can be designed and executed (Section 6.3 of the CGHSS).

A scoping stage is described in the BIA and the issues that have been identified as being of concern have been assigned bold text in the previous sections and are as follows

- **there is some potential for seasonal shrink-swell subsidence**
  The guidance advises that there are multiple potential impacts depending on the specific setting of the basement development. For example, in terraced properties, the implications of a deepened basement/foundation system on neighbouring properties should be considered.

- **the site is within 5m of a highway or pedestrian right of way**
  The guidance advises that excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway.

- **the site does lie directly over an aquifer**
  The guidance advises that the basement may extend into the underlying aquifer and thus affect the groundwater flow regime.

- **the proposed basement will extend beneath the groundwater table**
  The guidance advises that dewatering can cause ground settlement. The zone of settlement will extend for the dewatering zone, and thus could extend beyond a site boundary and affect neighbouring structures. Conversely, an increase in water levels can have a detrimental effect on stability.

- **trees will be felled as part of the development and some works are proposed within tree root zones**
  The guidance advises that the soil moisture deficit associated with felled tree will gradually recover. In high plasticity clay soils (such as London Clay) this will lead to gradual swelling of the ground until it reaches a new value. This may reduce the soil strength which could affect the slope stability. Additionally the binding effect of tree roots can have a beneficial effect on stability and the loss of a tree may cause loss of stability.

- the site **may** be within the exclusion zone of the New Belsize Tunnel
  The guidance advises that Excavation for a basement may result in damage to the tunnel.

- **the proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties**
  The guidance advises that excavation for a basement may result in structural damage to neighbouring properties if there is a significant differential depth between adjacent foundations.

3.1.3 Stage 3: Site Investigation and Study

Site investigation and study is undertaken to establish the baseline conditions. This can be done by utilising existing information and/or by collecting new information (Section 6.4 of the CGHSS).

The site investigation submitted comprised three boreholes constructed to depths of between 10m and 15m and three hand-dug pits excavated to investigate existing foundations.

The ground investigation has indicated the presence of Claygate Member strata beneath the site, underlain by the London Clay at between +71.4m OD and +72.3m OD.

The groundwater table was measured at a level of around +76m OD.

3.1.4 Stage 4: Impact Assessment

Impact assessment is undertaken to determine the impact of the proposed basement on the baseline conditions, taking into account any mitigation measures proposed (Section 6.5 of the CGHSS).

The submitted BIA (Document 1) includes an Impact Assessment.

- **there is some potential for seasonal shrink-swell subsidence**
  The BIA concludes that shrinkable clay is present within a depth that can be affected by tree roots, that there is no evidence of structural movement within the existing building and that the basement depth will extend well below the potential depth of root action.

- **the site is within 5m of a highway or pedestrian right of way**
  The BIA concludes that a retention system will need to be adopted that maintains the stability of the excavation at all times to protect the highways but that this is standard construction practice.

- **the site lies directly over an aquifer and the proposed basement will extend beneath the groundwater table**
  The BIA concludes that the proposed basement will not affect the amount of annual recharge into the Claygate Member and that the proposed basement would not result in a significant change to the groundwater flow regime in the vicinity of the proposal.

- **trees will be felled as part of the development and some works are proposed within tree root zones**
  The BIA concludes that the removal of trees may result in long term swelling of clay but that the foundations of the basement will extend beyond the zone of tree root activity.

- the site **may** be within the exclusion zone of the New Belsize Tunnel
  The BIA concludes that although piled foundations and the proposed excavation may have implications for the existing tunnel and Network Rail should be contacted, it is anticipated that there will not be any significant concerns.

- **the proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties**
  The BIA concludes that through the use of a suitable retention system, the stability of neighbouring properties and structures will be ensured at all times.

3.2 The Audit Process

The audit process is based on reviewing the BIA against the criteria set out in Section 6 of the CGHSS and requires consideration of specific issues:

3.2.1 Qualifications / Credentials of authors

Qualifications required for assessments

Surface flow and flooding	A Hydrologist or a Civil Engineer specialising in flood risk management and surface water drainage, with either: • The "CEng" (Chartered Engineer) qualification from the Engineering Council; or a Member of the Institution of Civil Engineers ("MICE"); or • The "C.WEM" (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management.
Subterranean (groundwater) flow	A Hydrogeologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London.
Land stability	A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering; or A Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group. With demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London.

Check qualifications / credentials of author(s):

Surface flow and flooding: The report meets the requirements.

Subterranean (groundwater) flow: The report meets the requirements.

Land stability: The report meets the requirements.

3.2.2 BIA Scope

Check BIA scope against flowcharts (Section 6.2.2 of the CGHSS). The scope of issues of concern has been checked against the flowcharts it is considered that they have been identified in section 3.1.2 above.

3.2.3 Description of Works

Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?

Document 1 provides discussion and comments regarding construction possible techniques and recommends the construction of a secant bored pile basement retaining wall.

Document 3 (Construction Method Statement) includes details of the excavation, temporary works and construction techniques to be adopted.

3.2.4 Investigation of Issues

Have the appropriate issues been investigated? This includes assessment of impacts with respect to DP27 including land stability, hydrology, hydrogeology.

Yes.

3.2.5 Mapping Detail

Is the scale of any included maps appropriate? That is, does the map show the whole of the relevant area of study and does it show sufficient detail?

Yes.

3.2.6 Assessment Methodology

Have the issues been investigated using appropriate assessment methodology? (Section 7.2 of the CGHSS).

Yes.

3.2.7 Mitigation

Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme? (Section 5 of the CGHSS)

Yes.

The proposed construction and mitigation methodology is considered robust enough to stand the test of DP27.

3.2.8 Monitoring

Has the need for monitoring been addressed and is the proposed monitoring sufficient and adequate? (Section 7.2.3 of the CGHSS)

Document 6 states that a regime of monitoring will be implemented. Details are not provided in the Construction Method Statement (Document 3) or the Construction Management Plan (Document 4), and but will need to be agreed as part of Party Wall negotiations.

3.2.9 Residual Impacts after Mitigation

Have the residual (after mitigation) impacts been clearly identified?

Yes, although it is noted that there has been no statement made regarding any potential cumulative effects.

4. Assessment of Acceptability of Residual Impacts

4.1 Proposed Construction Methodology

The Construction Method Statement (Document 3) states that "*a secant type wall is likely to be required to retain the perimeter materials and inhibit inflows of ground water into the basement*" and the subsequent Ground Movement Analysis (Document 6) states that "*the piled retaining walls will be of secant construction*" and that "*the proposed works will be undertaken through top-down construction*".

4.2 Soundness of Evidence Presented

The submitted evidence appears to be sound.

4.3 Reasonableness of Assessments

The submitted assessments appear to be reasonable.

4.4 Robustness of Conclusions and Proposed Mitigation Measures

The conclusions and proposed mitigation measures (secant piling and top-down construction) appear to be robust. The Ground Movement Analysis (Document 6) states that *"The two phases of work, piling and subsequent excavation will in practice be separated by a number of weeks during which time construction of capping beams and pile curing will take place. This will provide an opportunity for the ground movements during and immediately after piling to be measured and the data acquired can be fed back into the design and compared with the predicted values. Such a comparison will allow the ground model to be reviewed and the predicted wall movements to be reassessed prior to the main excavation taking place so that propping arrangements can be adjusted if required."*

5. Comments on Objections

5.1 Objections

During the consultation period, a statement commissioned by local objectors and produced by Glass Light and Special Structures and a report by the Heath & Hampstead Society was submitted, which disagreed with a number of the findings of the reports submitted by the applicant.

The information studied comprises the following documents:

7. Objecting Letter from Glass Light and Special Structures to Objectors dated 12th January 2014

8. Objection Letter from Heath & Hampstead Society Tree Officer (undated)

9. Objectors email of 21st March 2014

5.2 Concerns about the Adequacy of the Submission and the Construction Methodology

Document 7 was written before the Construction Method Statement (Document 3) and Ground Movement Analysis (Document 6) were prepared and the issues identified appear to have been satisfactorily addressed in these documents.

Document 8 raises a number of issues related to the BIA and most specifically to groundwater flow. Given the now intended form of construction the material issues considered to be of residual concern are as follows:

- Flooding: Document 8 appears to suggest that the proposed development may lead to an unacceptable risk of sewer flooding downstream.
- Trees: Document 8 suggests that the proposed development may lead to the blocking of water to some of the retained trees and potentially drown others.
- Harm to neighbours: Document 8 suggests that the proposed development may lead to the creation of a spring that could lead to washing out of the silt and sand beneath the neighbouring houses and roadway.

The investigation has not detected the presence of any substantial water-bearing sand or silt deposits within the Claygate at this site but has noted significant inflows of groundwater (BH3) from 3m to 10m depth. While it therefore does seem reasonable to suggest that there should be further consideration given as to whether the potential impact of the new development will necessitate specific mitigation in relation to any of these issues, they do not give sufficient cause for concern to refuse planning as explained below,

The new secant wall will undoubtedly form an impermeable barrier to any groundwater flow and this could potentially cause the groundwater level within the zone encompassed by the new flow route to increase or decrease locally. However, it is considered likely that in the case of any near-surface flows there will be

sufficient near surface permeable pathways maintained around the new basement to preserve the present regime. In the case of any deeper water-bearing seams, the lack of continuity as evidence by the construction of BH Nos. 1 and 2 without inflows, supports the assertion that there is not any substantial mass permeability.

It is considered that the concern regarding unacceptable downstream sewer loading is not supported by the evidence, that the future well-being of the retained trees has been considered by an aboriculturalist in conjunction with the council's tree officer and that there is no observed evidence at this site of any substantial water-bearing sand or silt deposits such as might give concerns regardng washing out.

Overall, while the Heath and Hampstead Society document is without doubt an earnest criticism containing some relevant criticisms, it is not considered that the BIA submission (as in its present state) is now so technically deficient that it is not considered robust enough to stand the test of DP27 in regards to:

a. maintaining the structural stability of the building and any neighbouring properties

b. avoiding adversely affecting drainage and run-off or causing other damage to the water environment and

c. avoiding cumulative impacts on structural stability or the water environment in the local area

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6. Conclusions

The submitted BIA appears to have followed the processes and procedures set out in DP27 and CPG4 and it is considered that the present submission is satisfactory.