CampbellReith
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Land adjacent to 1 Ellerdale Road
London, NW3 6BA

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12336-57
Revision: F1

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for Land adjacent to 1 Ellerdale Road (planning reference 2015/7036/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The BIA has been prepared by engineering consultants using individuals who possess suitable qualifications.

1.5. The BIA is an update to a previously submitted and approved BIA (Camden ref: 2012/6484/P) with the principal changes being the increased depth from a single basement to a double basement, along with the omission of underpinning to the boundary walls and replacement with a contiguous piled solution to the whole basement perimeter.

1.6. The BIA has confirmed that the proposed basement slab and the surrounding contiguous piles will be founded within the Claygate Member.

1.7. There is potential for groundwater within the Claygate Member to enter the excavation due to the relief of pressure above. The BIA allows for dewatering during construction where necessary and the risk of base failure is addressed in supplementary information presented in Appendix 3.

1.8. An analysis has been undertaken of horizontal and vertical ground movements and their effects on the surrounding building though no proposals are provided for a movement monitoring strategy during excavation and construction. The detailed proposals for this should be agreed as part of the party wall awards.

1.9. It is accepted following review that the surrounding slopes to the development site are stable.

1.10. It is accepted that the basement will extend into the Claygate Member and that there is potential for lenses of material containing groundwater under pressure to be encountered. The inclusion of permeable material around the outside of the basement walls is accepted as a mitigation measure to allow groundwater flow to be maintained. It is accepted following review

that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

1.11. Category 0 to 1 damage is anticipated for the neighbouring structures considered with the exception of the Kitchen extension to 1 Ellerdale Road and the boundary wall which are indicated to be Category 2. The BIA states the damage assessment is considered to be conservative and the damage to the neighbouring structures is unlikely to exceed Category 1. Whilst the conclusions are considered reasonable, clarification is requested on the wall embedment depth as discussed in Audit paragraph 4.13.

1.12. The magnitude of anticipated heave as a result of the excavation is not indicated and this is requested.

1.13. The BIA offers movement monitoring of the adjacent structures, however no details are given. Details and trigger levels may be agreed as part of the Party Wall awards. Condition surveys are recommended.

1.14. Queries and requests for further information raised in the initial audit are discussed in Section 4 and summarised in Appendix 2. It is accepted that the BIA and supplementary information presented in Appendix 3 adequately identify the potential impacts arising out of the basement proposals and describe sufficient mitigation.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 04/05/16 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for land adjacent to 1 Ellerdale Road, London, NW3 6BA (planning reference 2015/7036/P).

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

The BIA should demonstrate 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; and,

c) avoid cumulative impacts upon structural stability or the water environment in the local area

and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.4. LBC's Audit Instruction described the planning proposal as "Erection of a new single storey dwelling house with 2 storey basement on land to the rear garden of No. 81 Fitzjohn's Avenue, with access of Ellerdale Road.

2.5. CampbellReith accessed LBC's Planning Portal on 24/05/16 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report for two storey scheme (BIA) - Revision A dated December 2015.
- Planning Application Drawings by Knight Architecture & Design consisting of
- Location Plan
- Existing site survey, block plan and site location plan
- Existing site sections and elevations
- Proposed floor plans, roof plan and site location
- Proposed Site Sections and Elevations
- Design & Access Statement by Philips Planning Services Ltd dated December 2016

2.6. Further to the issue of the initial audit report, supplementary information was provided in a note by the structural engineer, dated 27 June 2016. This is presented in Appendix 3 and has been considered in this updated audit report.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	The authors and contributors to the BIA all have suitable credentials (see Audit paragraph 4.1).
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Within BIA.
Are suitable plan/maps included?	Yes	BIA & Drawings.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 2.0 and Appendix C.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 2.0 and Appendix C.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 2.0 and Appendix C.
Is a conceptual model presented?	Yes	BIA Section 3.1.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	BIA Appendix E-G.
Is monitoring data presented?	Yes	Over a period of time and in different Site Investigation reports.
Is the ground investigation informed by a desk study?	Yes	Ground Engineering 2014 Investigation.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	
Is a geotechnical interpretation presented?	Yes	BIA Appendix E-G.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Ground Engineering 2014 Investigation.
Are reports on other investigations required by screening and scoping presented?	Yes	References and relevant extracts included.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Vertical and horizontal movements with regards to pile installation and excavation given, however, heave movements are not indicated.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA section 5.3.
Has the need for monitoring during construction been considered?	Yes	BIA section 5.8.
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Although additional information with regards to the ground movement assessment and assumptions made is requested (see Audit paragraphs 4.13 to 4.16).
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Green roofs.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Based on the assumptions made although additional information with regards to the ground movement assessment is requested (see Audit paragraph 4.13 to 4.16).
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	BIA section 5.3 & 5.8.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been produced by authors who possess suitable qualifications.

4.2. The proposed basement is to be formed on the site of an existing garden and consists of a two storey basement construction formed within a ring of contiguous piles installed from ground level. The basement extends approximately 8m below the existing garden level.

4.3. The BIA is an update to a previously submitted and approved BIA (Camden ref: 2012/6484/P). The original BIA has not been reviewed though the original officer's report was reviewed and the following was noted;

"This application follows on from a similar application for a new dwelling submitted in 2010 (ref: 2010/5841/P). This application did not include a basement as part of the proposal and therefore a BIA was not required. Since the application has been received and during consultation, local residents supplied comments that challenged the robustness of the BIA. Therefore, the Council sought an independent view from GCG. GCG has found that the BIA is considered to be compliant with the requirement of CPG4. An issue was raised by GCG about the replacement of the existing fencing. GCG recommend that it would be better to pile the boundary before reconstructing the boundary wall. This would give greater control of ground movements caused by the construction of the basement. The BIA was revised based on the recommendation of GCG."

4.4. The principal update to the BIA reviewed as part of this audit was the omission of underpinning to the boundary walls. The updated scheme involves installing a piled foundation solution to the whole perimeter of the basement.

4.5. The ground investigation recorded Made Ground to 3m bgl over a 1.70m thick layer of Head Deposits underlain by the Claygate Member which was proven to the base of the borehole at 15.50m bgl. Groundwater was monitored between 6.15 and 7.20m bgl over a number of visits.

4.6. The BIA identifies in section 5.2 that the Claygate Member was encountered in the site investigation and that whilst generally impermeable, this strata is known to contain lenses of more permeable material, which can contain water under pressure. Commentary on the anticipated relationship between the head deposits, the Claygate Member and the groundwater levels recorded during the site investigation is provided in section 5.2 of the BIA and on the drawings in Appendix J. The commentary provided in Section 5.2 is considered reasonable and is accepted.

4.7. It is acknowledged in BIA Section 5.2 that there is a risk of heave failure at the base of the basement excavation due to the removal of the overburden weight of soil and the potential of

encountering water under pressure. It is noted in the BIA that further measures may be required to remove this risk including monitoring of groundwater pressures and drainage. The sequencing and methods employed in relation to this will be key to maintaining the stability of the excavation and further details of this were requested from the applicant.

4.8. The applicant confirmed via a separate statement received 27/06/16 that:

The results from the ground investigation, set out on drawing 1706/02/31 in Appendix J of the BIA indicated that the groundwater pressures are not significant and therefore this is unlikely to be an issue.

The bored contiguous piles will extend to around 12m below ground level. The boring of the piles will be monitored to establish whether they intersect any sand lenses containing water under pressure. As the piles will extend to around 4m below the base of the excavation they will puncture any sand lenses containing water under pressure thus relieving the pressure. Lenses containing water under pressure below this will have at least a 4m overburden at the base of the excavation. Given the basement's small plan area, it is very unlikely that a lens containing any significant amounts of water under pressure will be located solely within the piled wall.

Although we don't think it necessary, based on our reasoning above, the groundwater pressures below the base of the excavation will be monitored and action taken if this appears to be an issue. Broadly how this could be achieved is set out in section 5.2 of the BIA but the details will need to be developed by the contractor once the nature of the issue is known.

4.9. Based on the commentary provided in 4.8, we have no further queries on this point.

4.10. The basement will extend into the Claygate Member and there is the potential for lenses of material containing groundwater to be encountered. The inclusion of permeable material around the outside of the basement walls is accepted as a mitigation measure to allow groundwater flow to be maintained. The BIA also makes reference to allowing for the incorporation of dewatering measures during construction if shown to be required.

4.11. It is accepted that the site currently is soft landscaped and that the addition of the building will reduce the volume of rainfall seeping into underground aquifers. It is accepted however that the small footprint of the site means this will have negligible effect.

4.12. It is accepted that the green roof being provided will help to slow the rate of discharge from the roof of the new development into the surrounding drainage infrastructure.

4.13. A ground movement analysis has been undertaken based on an excavation depth of 8m and contiguous piled with an embedment depth of 4m. The calculations are based on the CIRIA C580 approach with high support stiffness assumed as the excavation will be propped throughout. Damage assessments have been undertaken for neighbouring properties/structures which comprise the garden wall, the kitchen extension to 1 Ellerdale Road, No 1 to 3 Ellerdale Road, 79 to 87 Fitzjohn's avenue, Coach House, 14 to 16 Prince Arthur Road and 5 Ellerdale Road located between 0 to 30m of the proposed development respectively.

4.14. The predicted damage for the neighbouring structures are between Category 0 (Negligible) and Category 1 (Very Slight) with the exception of the kitchen extension to 1 Ellerdale Road and the garden wall which are indicated to be Category 2 (Slight). CPG4 requires mitigation measures where damage exceeds Category 1 and the impacts to be re-evaluated. It is stated in Section 5.8 of the BIA that the predicted damage has been reduced as far as reasonably practical given the proximity of the kitchen extension and boundary wall.

4.15. It is further stated in Section 5.8 of the BIA that the predicted damage is considered to be a conservative estimate and that the damage is likely to be less than Category 2 due to a number of reasons which include the following: the CIRIA C580 guidance is considered to be conservative; the kitchen extension is founded on a reinforced concrete (RC) slab and RC foundation which is indicated to have tension capacity and therefore more robust and less susceptible to movement than unreinforced masonry structures; and the boundary wall is founded on mini piles whereas the building damage assessment assumes the wall is founded at ground level.

4.16. Whilst the above conclusions are considered reasonable, clarification was requested on whether the wall embedment depth of 4m assumed for the 8m excavation satisfies the requirements of Section 6.3.5 of CIRIA C580 which states '*the wall toe level should be the deeper of that required to satisfy load bearing capacity, hydraulic cut-off and uplift, global stability or lateral stability*'.

4.17. The applicant provided a response to this request via a separate statement received 27/06/16 which is included in Appendix 3. This summary confirmed that a preliminary assessment of the pile capacity has been carried out and reviewed against the requirements of CIRIA C580. Based on the information provided we have no further queries on this point.

4.18. Mitigation measures with respect to heave are given in Section 5.5 of the BIA. The magnitude of heave on adjacent structures was queried however it was agreed that given the presence of a heave protection layer and the small footprint of the basement, a full calculation would not be required as part of the BIA.

4.19. The BIA offers movement monitoring of the adjacent structures, however no details are given. Details and trigger levels may be agreed as part of the Party Wall awards. Condition surveys are recommended.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) has been carried out by a well-known firm of engineering consultants, Alan Baxter Associates and the individuals concerned in its production have suitable qualifications.

5.2. The BIA has referenced Camden Planning Guidance – Basements & Lightwells CPG4 and other the associated relevant documents in its production.

5.3. Category 0 to 1 damage is anticipated for the neighbouring structures considered with the exception of the Kitchen extension to 1 Ellerdale Road and the boundary wall which are indicated to be Category 2. The BIA states the damage assessment is considered to be conservative and the damage to the neighbouring structures is unlikely to exceed Category 1. Whilst the conclusions are considered reasonable, clarification is requested on the wall embedment depth as discussed in Audit paragraph 4.13.

5.4. The magnitude of anticipated heave as a result of the excavation is not indicated and this is requested.

5.5. There is a risk of base failure of the excavation due to the presence of groundwater under pressure and that dewatering during construction may be required. These matters are addressed in the BIA and supplementary information presented in Appendix 3.

5.6. It is accepted that the surrounding slopes to the development site are stable.

5.7. It is accepted that following the proposed mitigation measures, the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

5.8. The BIA offers movement monitoring of the adjacent structures, however no details are given. Details and trigger levels may be agreed as part of the Party Wall awards. Condition surveys are recommended.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Hydrogeology / Stability	Clarification on methods to be adopted to avoid excavation base failure as discussed in Section 4.0	Closed – Refer to Appendix 3	06.07.2016
2	Stability	Clarification on wall embedment depth as discussed in Section 4	Closed – Refer to Appendix 3	06.07.2016
3	Stability	Magnitude of anticipated heave not given	Closed – Refer to Appendix 3	06.07.2016

Appendix 3: Supplementary Supporting Documents

Garden House, Ellerdale Road, NW3

Response to comments by Campbell Reith

1.0 Introduction

This report has been prepared for Jon McElory, by Alan Baxter Ltd. We produced a Basement Impact Assessment for the proposed basement at Garden House, Ellerdale Road as part of planning application 2015/7036/P. Our BIA has since been reviewed by Campbell Reith (CR) and their comments set out in their report dated June 2016, reference 12336-7 Rev D1.

We note that CR has raised three queries which require a response as set out in the audit query tracker in Appendix 2 of their report. This note sets out our response to the comments. The query numbers are as per the audit query tracker.

2.0 Response to comments

2.1 Query 1

Clarification was requested on the methods to be adopted to avoid excavation base failure due to groundwater pressures beneath the base of the excavation.

The results from the ground investigation, set out on drawing 1706/02/31 in Appendix J of the BIA indicated that the groundwater pressures are not significant and therefore this is unlikely to be an issue.

The bored contiguous piles will extend to around 12m below ground level. The boring of the piles will be monitored to establish whether they intersect any sand lenses containing water under pressure. As the piles will extend to around 4m below the base of the excavation they will puncture any sand lenses containing water under pressure thus relieving the pressure. Lenses containing water under pressure below this will have at least a 4m overburden at the base of the excavation. Given the basement's small plan area, it is very unlikely that a lens containing any significant amounts of water under pressure will be located solely within the piled wall.

Although we don't think it necessary, based on our reasoning above, the groundwater pressures below the base of the excavation will be monitored and action taken if this appears to be an issue. Broadly how this could be achieved is set out in section 5.2 of the BIA but the details will need to be developed by the contractor once the nature of the issue is known.

2.2 Query 2

Campbell Reith has requested clarification on whether the wall embedment depth of 4m satisfies the requirements of Section 6.3.5 of CIRIA C580 which states 'the wall toe level should be the deeper of that required to satisfy load bearing capacity, hydraulic cut-off and uplift, global stability or lateral stability'.

The piles are to be contractor designed however we have carried out our preliminary assessment of the design for the BIA.

We have estimated the depth of the piles required to satisfy load bearing capacity is 3.5m. This is based on shaft adhesion and end bearing values provided in the SI report and assuming a FOS of 3.0, which is in excess of normal requirements.

Hydraulic cut-off is not relevant here as a contiguous pile wall is proposed.

We have estimated the highest credible groundwater level to be at 3mbgl for reasons set out in drawing 1706/02/04 in Appendix B of the BIA. The weight of the basement itself is sufficient to resist uplift on this basis. Should the groundwater rise above the highest credible level the FOS against uplift, using the self-weight only, is still greater than one discounting loads from finishes and friction between the basement and surrounding ground (i.e. conservative).

Global stability is not an issue. As shown in the sequence of construction drawings set out in Appendix K of the BIA, stiff temporary propping will be provided at high, mid and low level and in the permanent case propping of the retaining walls is provided by stiff RC slabs.

By inspection, laterally stability is not an issue.

Therefore a pile embedment depth of 4m is deemed sufficient to satisfy the requirements of section 6.3.5 of CIRIA C580.

2.3 Query 3

The report notes that the magnitude of heave has not been given. This was discussed with Campbell Reith and it was concluded that given a heave protection layer is provided and the basement is small on plan, calculating the magnitude would not be necessary for the BIA.

2.4 Other

The report notes that proposals for a movement monitoring strategy are not set out in the report. As suggested these will be agreed as part of the party wall award process.

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