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3 Eton Avenue, London, NW3 3EL

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12727-37
Revision: D1

March 2018

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	March 2018	Comment	NSjw12727-37-060318-3 Eton Avenue-D1.doc	NS	GK	GK

Document Details

Last saved	06/03/2018 14:47
Path	NSjw12727-37-060318-3 Eton Avenue-D1.doc
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Project Number	12727-37
Project Name	3 Eton Avenue
Planning Reference	2017/6275/P

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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 (BIA) submitted as part of the Planning Submission documentation for 81-87 High Holborn, Templar House (planning reference 2017/6275/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 existing property is located at 3 Eton Avenue in the London Borough of Camden, NW3 3EL.

1.5. The current layout comprises a 3-storey building with a footprint of approximately 19m long by 10m wide. It has a small front garden and large rear garden and the elevation of the site varies from 54.0m and 55.1m AOD, approximately.

1.6. The Basement Impact Assessment (BIA) has been carried out by Alan Baxter Ltd and the authors have suitable qualifications.

1.7. The BIA has confirmed that the proposed basement will be founded within London Clay.

1.8. The BIA has confirmed that the proposed basement will lie above groundwater level. However, it is recommended that further groundwater monitoring is undertaken prior to the works commencing. There will be no impact to the wider hydrogeological environment.

1.9. There is the potential for London Clay to expand in volume as a consequence of a decrease in the applied load. Whilst a general estimation 0f 10 - 20mm of heave at the site has been made, the BIA should also assess the impact that such soil heave may have on neighbouring properties, within the ground movement assessment (GMA).

1.10. A GMA is presented in the BIA stating that damage to neighbour properties will be Negligible to Very Slight. However, the approach followed in the calculation is not considered to be reasonably conservative. The GMA should be reviewed, noting the comments in Section 4.

1.11. Mitigation measures to ensure that ground movements will be contained within acceptable limits are presented in the BIA. However, a determination of the residual impacts after the application of mitigation measures should be specified in the BIA, considering also any revisions to the GMA.

1.12. It is accepted that there are no slope stability concerns regarding the basement development.

1.13. It is accepted that there are no surface water flow or flooding concerns regarding the basement development.

1.14. Queries and requests for information are described in Section 4 and summarised in Appendix 2. Until the additional information requested is provided, the BIA does not meet the criteria of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18/01/2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 3 Eton Avenue, London NW3 3EL (Reference: 2017/6275/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 Local Plan 2017: Policy A5 Basements.

2.4. The BIA should demonstrate that schemes:

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

2.5. 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.

2.6. LBC's Audit Instruction described the planning proposal as *"Excavation and extension of existing basement including formation of front lightwell."*

2.7. The Audit Instruction also confirmed that the proposal does not involve any listed building.

2.8. CampbellReith accessed LBC's Planning Portal on 29/01/2018 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) by Alan Baxter Ltd (1782/250/DP), dated October 2017.
- Arboricultural Impact Assessment by Dr. Frank Hope (independent Arboricultural Consultant) (Reference not specified), dated November 2016.
- Design and Access Statement by PP Partnership Ltd (Reference not specified), dated November 2017.
- Heritage Statement by Alan Baxter Ltd (1782/251/KW), dated November 2017.
- Architects General Arrangement Plans & Sections Existing and Proposed:

- 1 No. Location and site plan;
- 8 No. Existing floor plans, sections and elevations;
- 10 No. Proposed floor plans, sections and elevations.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
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	
Are suitable plan/maps included?	Yes	
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	Appropriate data sources have been consulted. Justifications are provided for 'No' answers.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	As per above.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	As per above.
Is a conceptual model presented?	Yes	Ground condition, sequence and depth of strata are presented along with the description of hydrology and hydrogeology of the area.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	
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	A ground investigation was performed by Southern Testing Consult in August 2017.
Is monitoring data presented?	Yes	Two groundwater monitoring visits were undertaken in June and July 2017.
Is the ground investigation informed by a desk study?	Yes	Desk study information is presented within the Southern Testing Consult report.
Has a site walkover been undertaken?	Yes	A walkover survey was carried out on 23rd May 2017.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Neighbouring buildings are identified as not having basements.
Is a geotechnical interpretation presented?	Yes	Geotechnical parameters have been evaluated in the Southern Testing Consult report.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	An arboricultural report was required by the scoping report and is presented in the BIA.

Item	Yes/No/NA	Comment
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	See Stage 4 of the BIA.
Are estimates of ground movement and structural impact presented?	Yes	See Section 12.7 of the BIA. However, basis of evaluation not considered reasonably conservative.
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	Mitigation measures have been qualitatively considered in Section 12.8 of the BIA.
Has the need for monitoring during construction been considered?	Yes	The BIA confirms that movements of surrounding buildings will be monitored throughout construction.
Have the residual (after mitigation) impacts been clearly identified?	No	Residual impacts are not clearly identified. Should be reviewed following GMA revision.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	A Ground Movement Assessment (GMA) has been undertaken. However, basis of evaluation not considered reasonably conservative.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	The proposed increase of 1.8% in hardstanding is considered to cause a negligible change in surface water flow.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	A Ground Movement Assessment (GMA) has been undertaken. However, basis of evaluation not considered reasonably conservative.

Item	Yes/No/NA	Comment
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	A Ground Movement Assessment (GMA) has been undertaken. However, basis of evaluation not considered reasonably conservative.
Are non-technical summaries provided?	Yes	See Section 12.12 of the BIA.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Alan Baxter Ltd and the authors have suitable qualifications. Supporting documents are presented by Southern Testing Consult (Ground Investigation Report) and by Dr. Frank Hope (Arboricultural Impact Assessment).

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal does not involve a listed building.

4.3. The existing property is located at 3 Eton Avenue, NW3 3EL, in the London Borough of Camden. The site is included in the Belsize Conservation Area.

4.4. The current layout comprises a 3-storey building with a footprint of approximately 19m long by 10m wide. It has a small front garden and large rear garden and the elevation of the site varies from 54.0m and 55.1m AOD, approximately.

4.5. The proposed new building comprises the construction of a single storey basement under the house with light wells to the front and rear of the building.

4.6. The construction sequence presented allows for a steel grillage on temporary piles to support the walls at ground floor level while the proposed basement is excavated. A contiguous piled wall will be installed in the rear garden to support the excavation of the basement whilst structural perimeter walls at ground level will be underpinned with reinforced concrete pins. King post walls will be formed at the front of the property.

4.7. A ground investigation was performed by Southern Testing Consult in August 2017 which identified Made Ground (0.9 to 1.2m bgl) underlain by Head Deposits to a depth of 2.5m bgl. London Clay is the founding stratum and was recorded to lie underneath the Head Deposits to the base of borehole BH1 (15.0m bgl).

4.8. Groundwater was not struck during the ground investigation. However, two groundwater monitoring visits recorded groundwater levels within the London Clay at a depth varying from 5.25 and 8.90m bgl. These levels lie approximately 1.5 to 5.4m below the proposed basement level. However, the BIA identified a potential risk for groundwater to rise during seasonal changes or after periods of heavy rainfall and it is consider prudent to continue ground water monitoring for as long as possible prior the construction and to employ minor groundwater ingress control measures during construction. There will be no impact to the wider hydrogeological environment.

4.9. An interpretive geotechnical report has been produced that provides geotechnical design parameters for shallow foundations, retaining walls and bearing capacity of bored piles

foundations. An allowable bearing pressure of 125 kN/m2 is recommended by the BIA for structures founded within the London Clay at a depth of 3m bgl or greater.

4.10. The BIA indicates the proposed building to impose less load than the mass of the excavated soil, such that an upward force on the raft foundation caused by the clay heave is likely to occur. The BIA estimates these movements to be 10-20mm inside the excavation but does not assess movements outside the excavation. Whilst it is accepted that heave movements are generally contained within piled retaining walls, piled retaining walls are not present along the full site perimeter, and as such there is the potential for neighbouring properties to be impacted by such ground movements. These movements should be considered as part of the ground movement assessment (GMA).

4.11. Structural drawings are presented in the BIA to demonstrate the viability of the proposed construction. These include the proposed development compared to the existing and proposed building footprints and basement outlines. A proposed construction sequence is also available in Appendix G of the BIA. In this regard, the BIA states: '*Although the works […] are relatively demanding from a structural point of view, they are not unusual and will be carried out in a careful and controlled manner using normal construction techniques'*. The scheme includes the use of a king post wall. Movements caused by its installation are difficult to quantify and depend greatly on the standard of workmanship. A detailed Construction Programme should be prepared by the Contractor, at the appropriate design stage, taking into account those matters.

4.12. A Ground Movement Assessment (GMA) was performed by Alan Baxter Ltd to assess the impacts that construction of the proposed basement will have on neighbouring properties. The assessment followed a modified CIRIA C580/760 approach. The ground movements due to wall installation are not calculated using the standard CIRIA approach but follow the paper "Prediction of Party Wall Movements using CIRIA Report 580" by Ball and Langdon (2014).

4.13. The paper's authors provide evidence that the predictions of ground movement during retaining wall installation suggested in CIRIA C580 are an upper bound. The paper argues that with good control, actual movements are less than half the figures suggested in C580. It should, however, be noted that the subject wall comprised contiguous piles (cased CFA piles) using hydraulic pre-loaded props at capping beam level and mid height and following a hit and miss sequence with rigorous monitoring undertaken throughout construction. Application to other basements without similar construction methods, geometry or controls should therefore be undertaken with caution.

4.14. CIRIA C580 has since been superseded by CIRIA C760. The general principles of ground movement assessment remain unchanged, however, ground movements for excavation in soft to firm clays are now considered. Thus, the approach adopted in the BIA is not considered reasonably conservative, in line with the requirements of LBC, and the GMA should be revised.

4.15. It is noted that CIRIA guidance is intended for embedded retaining walls, but accepted that this may provide a basis for which to undertake an assessment of an underpinned construction, and ground movements are within the range typically anticipated for underpinning techniques carried out with good control of workmanship.

4.16. Mitigation measures to ensure that ground movements will be contained within acceptable limits are included in the BIA. These should be reviewed following the revisions to the GMA. Residual impacts after the application of mitigation measures should be clearly stated in the BIA.

4.17. Buried services have been identified within the potential zone of influence of the works, running along the highway. Protection of these services should be considered, if applicable.

4.18. It is accepted that there are no slope stability concerns regarding the basement development.

4.19. It is accepted that there are no surface water flow or flooding concerns regarding the basement development.

4.20. Queries and requests for information are described in Section 4 and summarised in Appendix 2.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) has been carried out by Alan Baxter Ltd. The authors' qualifications follow the CPG4 requirements.

5.2. The BIA has confirmed that the proposed basement will be founded within London Clay and will be above the groundwater level. It is accepted that the development will not impact on the wider hydrogeological environment.

5.3. Geotechnical parameters have been determined from the site investigation to allow preliminary design of pile foundations and retaining wall.

5.4. There is the potential for London Clay to heave. The BIA should assess the impact that such soil heave may have on neighbouring properties, within the ground movement assessment (GMA).

5.5. A GMA is presented in the BIA stating that damage to neighbour properties will be Negligible to Very Slight (Category 0 to 1). However, the approach followed is not considered reasonably conservative. The GMA should be reviewed, noting the comments in Section 4.

5.6. Mitigation measures to ensure that ground movements will be contained within acceptable limits are presented in the BIA. However, a determination of the residual impacts after the application of mitigation measures should be specified in the BIA, considering also any revisions to the GMA.

5.7. It is accepted that there are no slope stability concerns regarding the basement development.

5.8. It is accepted that there are no surface water flow or flooding concerns regarding the basement development.

5.9. Queries and requests for information are summarised in Appendix 2. Until the additional information requested is presented, the BIA does not meet the criteria of CPG4.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Land stability	An Impact Assessment due to heave of the London Clay should be presented, included within the GMA.	Open	
2	Land Stability	Review of the GMA adopting a reasonably conservative assessment methodology.	Open	
3	Residual Impacts	Residual impacts after application of mitigation measures should be included in the BIA.	Open	

Appendix 3: Supplementary Supporting Documents

None

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