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49 Belsize Lane, London, NW3 5AU

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12985-83

Revision: D1

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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 49 Belsize Lane, London NW3 5AU (planning reference 2019/4411/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 proposed development comprises the deepening of an existing basement by approximately 0.5m and the construction of an extension to the basement, approximately 2.5m deep, into the rear garden by 4.5m.

1.5. The Basement Impact Assessment (BIA) has been carried out by CET, by individuals with suitable qualifications. Clarification is required regarding whether the issuing company is CET Infrastructure or CET Structures, and whether the BIA can be relied on.

1.6. Site investigation data indicates the ground conditions comprise Made Ground to 1.1m depth, with London Clay below. Interpretative geotechnical information should be provided including retaining wall parameters.

1.7. It is accepted that the proposed development will not impact upon slope stability.

1.8. The BIA confirmed that the site is located above an 'Unproductive' aquifer, the London Clay Formation, therefore no further consideration of the hydrogeology of the site is required.

1.9. Further consideration of surface water drainage is required, including the potential for surface water flooding.

1.10. Further assessment of the impact of removing trees on the basement and surrounding properties is required.

1.11. A revised Site Conceptual Model is recommended based on the outcome of 1.9 and 1.10 above.

1.12. Structural drawings provided in the Planning Construction Method Statement present conflicting information regarding the basement construction and should be clarified.

1.13. A utility search should be carried out and any impacted services included in the ground movement assessment.

1.14. The ground movement assessment should be revised in accordance with the comments of Section 4 of this audit.

1.15. The trigger values for ground movement monitoring should be revised based on the outcome of the revised ground movement assessment.

1.16. A number of queries have been raised as summarised in Appendix 2. It cannot be confirmed that the proposal adheres to the requirements of the CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 24 October 2019 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 49 Belsize Lane, London NW3 5AU, Camden Reference 2019/4411/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): Basements.
- 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:

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.

LBC's Planning Portal described the planning proposal as: *"Excavation to extend existing basement into rear garden, erection of raised and sunken terraces in rear garden, and alterations to rear and front facades."*

LBC's Planning Portal confirmed that the property is not a Listed building and the site does no neighbour any listed buildings

2.5. CampbellReith accessed LBC's Planning Portal on 07 November 2019 and gained access to the following relevant documents for audit purposes:

- Site location plan, dated 28/08/2019
- Basement Impact Assessment (BIA) dated July 2019 (ref 527194, version V0) by CET Infrastructure
- Existing Drawings PL-011 and PL-101, and proposed drawings PL-01 rev B and PL-02 rev B, all dated 10.01.2019, by Ensoul Ltd.
- Design and Access Statement dated August 2019 by Ensoul Ltd.
- Planning Construction Method Statement (PCMS), ref 2019-051, dated 28 August 2019 by Elite Designers Ltd.
- Landmark Trees, Arboricultural Impact Assessment Report, ref. ESL/49BLS/AIA/01, dated 15 August 2019

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	A basic construction methodology and mitigation measures are presented.
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 plans/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	BIA report (July 2019), Section 4.1.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report (July 2019), Section 4.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report (July 2019), Section 4.3.
Is a conceptual model presented?	Yes	Described textually in Section 3.6

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 5.1.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 5.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 5.3.
Is factual ground investigation data provided?	Yes	Described in Section 6 of BIA
Is monitoring data presented?	Yes	Only one monitoring visit carried out and presented in the BIA
Is the ground investigation informed by a desk study?	Yes	BIA report, Section 3
Has a site walkover been undertaken?	Yes	During the ground investigation
Is the presence/absence of adjacent or nearby basements confirmed?	No	BIA states the presence of neighbouring basements is unknown.
Is a geotechnical interpretation presented?	No	BIA report only provides a summary of the work undertaken and ground conditions encountered in Section 6.
Does the geotechnical interpretation include information on retaining wall design?	No	Limited soil parameters provided in the BIA but further validation is required.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural Impact Assessment provided.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	

Item	Yes/No/NA	Comment
Is an Impact Assessment provided?	Yes	Included in Section 5 of the BIA.
Are estimates of ground movement and structural impact presented?	Yes	BIA includes a ground movement assessment that presents predicted vertical movement but does not assess the impacts.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	No	Further consideration of the hydrological implications is required.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	General statements regarding good construction practices and the need for monitoring are included.
Has the need for monitoring during construction been considered?	Yes	Generic statement regarding mitigation measures and monitoring strategies.
Have the residual (after mitigation) impacts been clearly identified?	No	No discussion provided
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Identifies loss of soft landscaping but provides no further discussion on mitigation.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	No	Category 2 identified for adjoining property. Construction methods will use underpinning.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been prepared by CET Infrastructure with supporting documents provided by Elite Designers Ltd. The BIA authors' qualifications are in accordance with CPG guidelines. Clarification is required regarding whether the issuing company is CET Infrastructure or CET Structures, as this is unclear from the Foreword of the BIA. It should also be confirmed whether the interpretation presented in the BIA can be relied on.

4.2. The proposed development will comprise the deepening of an existing single-storey basement by approximately 0.5m and the construction of a full height basement extension approximately 2.5m deep, into the rear garden area by 4.5m. The new basement area is indicated as being 31m^2. The property shares a party wall with neighbouring properties 47a and 51.

4.3. No information has been gathered to confirm the presence or absence of basements in the adjoining properties 47a or 51. The BIA has been carried out on the assumption that no basements are present. It is accepted that, for this application, the assumption is conservative.

4.4. The site investigation and BIA have been informed by a desk study broadly in accordance with the GSD Appendix G1.

4.5. The BIA considers the proposed development in the context of the slope across the site, which is identified as being less than 7 degrees. It is accepted that the proposed development will not impact upon slope stability.

4.6. A site investigation (SI) was undertaken comprising one window sample borehole to 8m depth and one trial pit to a target depth of 1.8m depth. Information regarding the location of these investigations in relation to the proposed development was not provided. The window sample log revealed Made Ground soils to 1.1m depth with London Clay Formation below this, extending to at least 6.5m depth.

4.7. A basic conceptual site model is presented textually in the BIA. It does not fully consider the site in the context of the proposed development and surrounding properties. It is recommended that the site conceptual model be updated following completion of the further assessment detailed below.

4.8. Whilst soil strength parameters were derived from pocket penetrometers and hand vane data, a full summary of soil parameters informed by the site investigation is not provided in the BIA. The subsequent ground movement assessment uses derived parameters however no technical references have been provided to support their selection. A Poisson's Ratio suitable for the undrained condition has been provided but the value used in the drained condition is not stated.

4.9. The site is identified as being underlain by an Unproductive aquifer (the London Clay Formation). During the site investigation a groundwater strike was recorded at a depth of 6.5m in the window sample borehole. A standpipe was installed with a response zone from 1m to 4m below ground level (bgl), which encompasses both the natural London Clay and the Made Ground deposits that were encountered from ground level to 1.1m depth. One subsequent water monitoring visit was carried out one week after the borehole was constructed and recorded a standing water level of 0.99m bgl.

4.10. The BIA report states that groundwater flow in the London Clay is expected to be slow due to it having a low permeability. The data recorded from the site investigation indicates a 3m head of water accumulated over the space of 1 week. The installation did not extend to the depth at which a water strike was recorded and no further consideration is given to the possible source or profile of this groundwater. The BIA subsequently adopts the level of 0.99m bgl as the groundwater table. It is accepted that this is a conservative assumption. The CMS identifies the potential need for dewatering to keep excavations dry through the construction phase.

4.11. The proposed scheme is identified in Section 2.6 of the BIA as increasing the proportion of hardstanding in the rear garden, occupying about 30% of the garden space and resulting in a loss of 31m^2 of surface area. This is identified in the screening and scoping stages and the mitigation measure proposed in Table 5.2 identifies the use of a soakaway to accommodate this surface water drainage.

4.12. The paragraph directly below Table 5.2 describes the groundwater table having been encountered near the surface of the London Clay at 0.99m bgl and identifies the London Clay as having relatively low permeability. No consideration has been given to the implications of this shallow 'groundwater table' and the low permeability of the London Clay on the suitability of a soakaway system. Further assessment of the surface water drainage for the development and the potential for surface water flooding is required.

4.13. The London Clay has been identified as having a high volume change potential and to be prone to shrink/swell behaviour. Two trees are due to be removed from the garden to allow basement construction to proceed. The BIA correctly identifies the need for ground heave to be considered as a result of these trees being removed. No further assessment of the impact of the removal of trees on the basement and surrounding properties has been carried out, although it has been identified as requiring further consideration. This should be provided.

4.14. The PCMS provides a construction method (Section 9) detailing a possible excavation, propping and construction sequence for the works. However, in Section 1 of the PCMS it is stated that the contents of the report should only be used as a guide, therefore the suggested construction sequence and temporary works are subject to change.

4.15. Preliminary calculations for a basement underpinning and retaining wall scheme are provided in Appendix B of the PCMS. Clarification is required regarding the use of a 0.8m long heel in the general arrangement of the underpin design. Clarification is also required regarding the thickness of the underpins, which is noted as 300mm in Appendix B calculations and 350mm in Section 9 of the PCMS.

4.16. In Appendix A of the PCMS drawing 2019-051-01, rev B requires clarification for Section A-A of the proposed basement. The drawing appears to show a suspended basement floor slab however the BIA states that the basement slab will be ground bearing.

4.17. In the BIA a Ground Movement Assessment is provided. It has been carried out using PDisp software and assesses the vertical ground movements resulting from the construction process. The basement construction is described as a reinforced concrete box with no internal columns or pads. The average bearing pressure in the completed condition is given as 35kN/m^2 and the overall soil unloading is given as 50kN/m^2. The PCMS describes in section 6 that uplift is allowed for in the basement slab design.

4.18. The BIA states that geotechnical parameters for Made Ground are not used in the PDisp analysis because all Made Ground soils will be excavated, however the PDisp exports presented in Appendix E show ground movement contours at 0.5m depth, which is within the Made Ground soils. Further clarification should be provided regarding the ground model and parameters used to account for ground conditions between 0.5m and 1.1m depth.

4.19. In the BIA a Damage Category Assessment is provided. It has been carried out using the method proposed by Burland and CIRIA C760 which is intended for embedded retaining walls, however, it is accepted that this approach can predict ground movements within the range typically anticipated for the proposed 'hit and miss' retaining wall techniques when carried out with good control of workmanship.

4.20. The Damage Category Assessment indicates damage to neighbouring properties will be a maximum of Category 1 (Very Slight) and one instance of Category 2 (Slight), in accordance with the Burland Scale. The maximum permitted damage category is Category 1. Confirmation of likely ground movement and potential building damage is required, taking into account the comments made above.

4.21. The BIA recommends that an 'observational approach' be adopted to 'keep any damage within Category 1' and identifies that a monitoring strategy with appropriate trigger levels is required. The BIA recommends that the vertical deflection must not exceed 4.5mm but further assessment of appropriate trigger levels is not provided. The PCMS suggests trigger values for ground movement monitoring that exceed the permissible movement identified in the BIA. These should be revised accordingly.

4.22. A utility search is not provided and assessment of the impact of the development on buried services has not been undertaken.

5.0 CONCLUSIONS

5.1. The qualifications of the authors are in accordance with LBC requirements.

5.2. Clarification is required regarding whether the issuing company is CET Infrastructure or CET Structures, and whether the BIA can be relied on.

5.3. Desk Study information within the BIA is broadly in line with aspects recommended in the GSD Appendix G1.

5.4. A site investigation has confirmed the underlying ground conditions comprise Made Ground over London Clay. The scope of the investigation is considered insufficient to adequately characterise the site.

5.5. Provision of interpretative geotechnical information and retaining wall parameters is required with technical references to justify any derived parameters. A full list of parameters used for the drained and undrained conditions should be provided.

5.6. The surface water drainage (hydrology) and the potential for surface water flooding requires further assessment in light of the shallow groundwater and low permeability London Clay identified in the site investigation.

5.7. Further assessment of the impact of removing trees on the basement and surrounding properties is required. The site conceptual model should be updated based on the outcome of this and the above assessments.

5.8. A generic construction methodology, structural scheme and proposed temporary works are presented, including sequencing and propping arrangements. Drawings provided in the PCMS present conflicting information regarding the basement construction and should be clarified.

5.9. The BIA considers the proposed development in the context of the slope across the site. The proposed development will not impact upon slope stability.

5.10. A ground movement assessment (GMA) has been undertaken that indicates damage to neighbouring properties will be a maximum of Category 2 (Slight), in accordance with the Burland Scale. Camden Planning Policy allows a maximum damage category of 1 (very slight), therefore further assessment of ground movement and potential building damage is required.

5.11. The proposed ground movement monitoring strategy provided in the PCMS should be revised to include appropriate trigger values that reflect the outcome of the ground movement assessment.

5.12. A utility search should be undertaken and any impacted services should be included in the ground movement assessment.

5.13. A number of queries have been raised as summarised in Appendix 2. It cannot currently be confirmed that the proposal adheres to the requirements of the CPG Basements.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	General	Confirm whether the issuing company is CET Infrastructure or CET Structures, and whether the interpretation in the BIA can be relied on.	Open	
2	Hydrology	Further assessment of surface water drainage is required in light of the shallow groundwater and low permeability London Clay encountered in the site investigation.	Open	
3	Stability	Interpretative geotechnical information should be provided including all retaining wall parameters in both the drained and undrained condition. Technical references should be provided to justify any derived parameters.	Open	
4	Stability	Further assessment of the impact of removing trees on the basement and surrounding properties is required	Open	
5	Stability	Structural drawings provided in the Planning Construction Method Statement present conflicting information regarding the basement construction and should be clarified.	Open	
6	Stability	Further assessment of the ground movement and mitigation methods to reduce the maximum anticipated category of damage from 2 to 1 is required.	Open	
7	Stability	A utility search should be carried out and any affected services should be included in the ground movement assessment.	Open	
8	Stability	The GMA should be updated to consider the potential impacts and mitigation measures for all potentially affected surrounding structures and infrastructure.	Open	
9	Stability	Trigger levels for ground movement monitoring should be revised to reflect the outcome of the ground movement assessment.	Open	

Appendix 3: Supplementary Supporting Documents

None

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