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51 Calthorpe Street, London, WC1X 0HH

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-39

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 51 Calthorpe Street, London, WC1X 0HH (planning reference 2015/3049/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 individuals who possess suitable qualifications.

1.5. A ground investigation has been carried out and examines the various strata below ground level. This confirms approximately 8m of made ground over 2.9m of clay. Beneath the clay, granular deposits extended to the depth of the borehole.

1.6. The existing depth of suitable bearing strata is unknown and it is proposed further trial pits will be carried out to confirm this depth, as well as the depth of neighbouring foundations. Two different construction methods have been proposed to allow for either a shallow or deep bearing strata.

1.7. Ground water was encountered at approximately 5.6m and is likely to require sump pumping during excavation.

1.8. The conceptual model discusses a variety of construction proposals including underpinning, secant piled walls, mini piles and RC retaining walls in order to provide permanent structural stability. However, further investigation is required before a suitable construction method can be adopted.

1.9. It is recommended that further investigation of the below ground soils and neighbouring foundations is carried out, together with groundwater monitoring to confirm the sequence of strata and allow a decision to be taken on construction methodology.

1.10. No analysis has been undertaken of horizontal and vertical ground movements and this should be carried out based on the construction method used. Building damage assessment for potentially affected properties are required and condition surveys may be necessary.

1.11. The BIA identifies that the layer of London Clay is prone to shrink-swell. However the London Clay is believed to be present at depth and therefore not prone to their mechanism. However, heave may occur due to excavation and the basement should be designed to accommodate any forces or movement this may impose on the structure.

1.12. Groundwater flow is anticipated within the made ground above the clay. This may be in a southerly direction depending on the influence of any scour feature and the construction of this basement could affect the local hydrogeology.

1.13. Proposals are provided for a movement monitoring strategy during excavation and construction. These are included in the BIA Supplementary Statement.

1.14. It is proposed to include an attenuation tank to limit outflows to the public sewer and further details are requested.

1.15. It is accepted that the area of surface run off will be slightly reduced due to additional soft landscaping being provided in the permanent scheme.

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

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

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 6th August 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 51 Calthorpe Street, London WC1X 0HH, Reference 2015/3049/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

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.

2.5. LBC's Audit Instruction described the planning proposal as *"The erection of an additional storey on top of the existing building, the insertion of a mezzanine storey and the excavation of a sub-basement and lowering of the garden level, in connection with the change of use of the building from offices to residential, to provide a total of 17 new units."*

The Audit Instruction also confirmed that the building, or a neighbouring building to the site, is listed.

2.6. CampbellReith accessed LBC's Planning Portal on 21st August 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (Volume 1) – (BIA)
- Basement Impact Assessment (Volume 2) – (BIA)
- Basement Impact Assessment (Volume 3) – (BIA)
- Existing Drawings
    - EXISTING - Sections-Layout
    - Existing Basement Plan
    - Existing First Floor Plan
    - Existing Ground Floor Plan(2)
    - Existing Roof Plan
- Proposed Drawings
    - 939.110 - Ground Floor-A2(2)
    - 939.111 - First Floor-A3(4)
    - 939.112 - Second Floor-Second Floor(3)
    - 939.311- Proposed Elevation Pakenham Street(2)
    - BB West elevational Section(2)
    - Basement-A3(2)
    - ELEVATION EE
    - Elevations AA 1
    - Elevations AA
    - Lower Ground Floor-A3(2)
    - Proposed Rear Elevation(2)
    - Proposed Calthorpe Street Elevation(2)
    - Rear elevation(2)
    - Third Floor-A3(5)
- Resident's Consultation Comments
- Design & Access Statement

Note: Basement Impact Assessment (Volume 4) was not available during first document retrieval. This document was provided by email on 24th August 2015.

Note: The BIA Supplementary Statement and the Resident's comments were received 16th September 2015.

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?	NO	
Are suitable plan/maps included?	YES	Throughout BIA. Also see Appendix J (Volume 4 of 4)
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	YES	See BIA Volume 4 of 4
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	YES	See BIA Section 4 and Table 4.3
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	YES	See BIA Section 4 and Table 4.1
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	YES	See BIA Section 4 and Table 4.2
Is a conceptual model presented?	YES	See BIA Section 7
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	YES	See BIA Table 5.1

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	YES	See BIA Table 5.1
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	YES	See BIA Table 5.1
Is factual ground investigation data provided?	YES	See BIA Section 5.0 and Appendix I
Is monitoring data presented?	YES	See BIA Table 6.2 (Section 5)
Is the ground investigation informed by a desk study?	YES	Stated in BIA Section 5.2. Historic maps not provided.
Has a site walkover been undertaken?	YES	Stated in BIA Section 3.16
Is the presence/absence of adjacent or nearby basements confirmed?	NO	See BIA Section 3.16. Further investigation required.
Is a geotechnical interpretation presented?	YES	See BIA Sections 5.25 to 5.27
Does the geotechnical interpretation include information on retaining wall design?	NO	Information for the design is limited to Cu Strength only, given in Table 6.1 (Section 5) and Section 5.27. There is no design of the retaining walls/secant piles/underpins provided.
Are reports on other investigations required by screening and scoping presented?	YES	See BIA Section 7.4 to 7.7 and 7.18
Are baseline conditions described, based on the GSD?	YES	See BIA Section 4.2
Do the base line conditions consider adjacent or nearby basements?	NO	See BIA Section 3.16. Further investigation required.
Is an Impact Assessment provided?	YES	See Section 6.0 and Table 6.1 (Section 6)

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	NO	The BIA Supplementary Statement states that these will be confirmed at a later stage and the design modified (if required) to ensure the scheme achieves Burland Category 2 or below.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	YES	See BIA Table 6.1 (Section 6)
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	YES	See BIA Table 6.1 (Section 6)
Has the need for monitoring during construction been considered?	YES	See BIA Table 6.1 (Section 6)
Have the residual (after mitigation) impacts been clearly identified?	YES	See BIA Table 6.1 (Section 6)
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	NO	Ground movement assessment to be carried out.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	YES	Attenuation tank to be provided to limit discharge rates to the public sewer. Also area of soft landscaping to be increased.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	NO	Ground movement assessment to be carried out.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	NO	Ground movement assessment to be carried out.
Are non-technical summaries provided?	NO	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by engineering consultants, Create Consulting Engineers, and the individuals concerned in its production have suitable qualifications.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal either involved a listed building or was adjacent to listed buildings but gave no details. The Design & Access Statement identified that a group of three storey grade II listed Georgian houses are situated to the west of the site. The site also sits within the Bloomsbury Conservation area.

4.3. The proposed basement consists of a single storey construction formed under the existing footprint of the Lower Ground Floor. It is also proposed to extend the lower ground floor out towards the public highway at the front of the site.

4.4. The borehole undertaken as part of the Ground Investigation has identified that the existing reinforced concrete ground slab is underlain by Made Ground to a depth of 8.00 metres, below which lies soft to firm clay, thickness 2.90 metres, below which lies Gravel. However, this is not in agreement with the geology as stated in the BIA in section 3.8. No explanation is given for this discrepancy despite the site being close to a known scour feature and the former course of the River Fleet. Both could impact the design and stability of the basement.

4.5. The BIA generally includes a high level of detail with regards to the Architect's drawings. It is clear that a lot of work and coordination has gone into producing a suitable scheme. However, there are no Structural Engineering drawings to show details of the retaining walls/underpins/secant piles or mini piles.

4.6. The permanent works section in the BIA discusses in depth two alternative proposals to construct the basement. These depend on the depth of the suitable bearing stratum and the neighbouring foundations. It is recommended that further investigation is carried out to confirm the adjacent foundation depths and type. In view of the discrepancy between the anticipated and encountered geology, further investigation of the ground conditions is also recommended. The building to the east of the site is understood to have a basement that extends below the proposed basement of this site.

4.7. Irrespective of the adoption of either proposal, no assessment of vertical and horizontal ground movements has been produced, so no indication of potential damage to adjoining properties can be reviewed. The BIA Supplementary Statement states that the calculations on movement will be carried out at a later stage.

4.8. It is recommended that measures be undertaken, as indicated in 4.6, to allow confirmation of which construction methodology is viable and a Ground Movement Analysis be carried out in conjunction with the chosen solution. Further investigation of the foundations to the surrounding properties is also recommended. An assessment should also be provided of likely heave movements and measures to overcome these movements dependent upon the chosen system.

4.9. Proposals are provided for a movement monitoring strategy during excavation and construction. It is also suggested that visual condition surveys be carried out to neighbouring properties.

4.10. The site is located at approximately 20.0m AOD and the land surrounding the site is generally flat (gradients less than 7^{o}).

4.11. The site is not located within a groundwater Source Protection Zone (SPZ), however it does sit within a secondary 'A' Aquifer.

4.12. The site is located in Flood Risk Zone 1 but it is accepted that the site is not at potential risk from surface water flooding and did not flood during the floods in 1975 and 2002.

4.13. Further groundwater monitoring should also identify the direction of flow of groundwater (currently assumed to be South) and, together with a review of the proposed basement and other adjacent basements, allow an assessment to be made within the BIA of their impact on the local hydrogeology. It is not possible, at this time, to agree that the basement structure will have no adverse effect on the local hydrogeology.

4.14. Waterproofing of the basement is proposed to be provided by adding additives to the concrete and also limiting crack widths through detailing of reinforcement. Although this does provide two defences against water ingress, given the fact that the water table may rise above the level of the basement, it would be prudent to allow a means of drainage should water penetrate the basement floors and walls. Further details should be provided.

4.15. An attenuation tank is proposed to reduce peak run off to the public sewer. This is to be located under the lower ground floor slab (presumably at the front of the site). There are no indications of how this is to be constructed being so close to the public highway. It is suggested that this should be discussed in the construction sequence.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) has been carried out by engineering consultants, Create Consulting Engineers, and the individuals concerned in its production have suitable qualifications.

5.2. It is likely that the groundwater table will be encountered during basement foundation excavation. This could be complicated due to the presence of a scour feature.

5.3. The permanent works discusses two alternative basement construction proposals, underpinning and piled perimeter retaining walls. Further investigation is required to confirm neighbouring foundations and bearing strata levels.

5.4. The further soils investigation should be tailored to confirm the sequence of strata in light of the current conflicting information. It should also allow further consideration of any potential heave movements below the basement slab and likelihood of groundwater flow and direction affecting the local hydrogeology.

5.5. No analysis has been undertaken of horizontal and vertical ground movements and this should be carried out once a decision on methodology has been taken and the above investigations have been completed.

5.6. Proposals are provided for a movement monitoring strategy during excavation and construction.

5.7. It is accepted that the surrounding slopes to the development site are stable. However, an assessment of movement is required to confirm the effect of the development on neighbouring structures. Dependent on the findings of the ground movement and building damage assessments, condition surveys and movement monitoring are likely to be required.

5.8. It is not accepted that the development will not impact on the wider hydrogeology of the area. Further investigation is required.

5.9. It is accepted that the site is not in an area subject to flooding.

Appendix 1: Resident's Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Mahoupe	49 Calthorpe Street	Unknown	1) The proposed basement excavation- a basement under the existing basement will endanger the listed building adjoining 51 and the whole listed terrace. 2) The 'made ground' . The engineers who dug a hole this year at 51 were called AF Howland. They dug down 15 metres and still found no clay. They ground was all soft and moving. You could see the gravel and wet mud. Other engineers reports have mentioned the 'made ground' and the 'mound of shale'. 3) Basement Impact Assessments: I quote from the draft local plan: Basement Impact Assessments must contain a non-technical summary of the evidence that applicants have gathered against each stage of the assessment. This should be presented in a format which can be fully understood by those with no specialist technical knowledge in these matters. 4) River Fleet: In the B I A vol 1 there is a table on page 12 and page 14. It is claimed that the site is NOT within 100 metres of a watercourse. It mentions the Fleet as being 'culverted'. Now the engineers reports of 1985, where measurements were made from 51 down to 45, showed the ground getting wetter and wetter towards 45. These engineers (sent by Camden), said that there was slippage towards the wet ground in the garden of 45, and they recommended underpinning the whole terrace, which was not done. If you cross the road and look at the terrace, you can see this tendency. 45 lists down to the West and 49 list down to the East. 5) 1990's: It was in the 1990's, when the Holiday Inn was built that no 51 slipped to the East and all its window arches broke. My house no 49 slipped at that time also; and its top wall (adjoining 51) became bowed. The crookedness is visible.	1) Further detailed analysis of the expected movement has been requested in the Audit Query Tracker. 2) Further investigation into the ground conditions has been requested in the Audit Query Tracker. It is noted that are discrepancies between the BIA and the Soil Report. 3) It has been noted that this is not available. Non-technical summaries have been requested in the Audit Query Tracker. 7) The proposal is to use a Secant piled wall inside the boundary of 51 (adjacent to the boundary of 49). This proposal would avoid the need to underpin the party wall. However, the movement analysis, based on this construction technique is yet to be submitted.

			6) More about the Basement Impact Assessment 7) Vol 1 page 23 of the new BIA shows an Assessment of Impacts Table. Boxes 3,7,13 all show that movement could affect the neighbouring building. Further danger to curtilage structures. My old Victorian brick underground vault is under my garden, and it is joined to the garden wall of 49/51. Any digging down will certainly have a deleterious effect. All or nothing. The only way to stabilise 51, 49, 47, and 45 would be to underpin all four buildings together. I own 49, Camden Council owns 47, and Camden is the freeholder of 45. Jonathan Avis (Leaseholder of lower flat at 45) might well agree to co-operate with underpinning the whole row, if that is necessary.	
Unknown	Wren Street	Unknown	1) The excavation of a very deep extra basement and the insertion of concrete risks undermining the water-table and seriously affecting the adjacent three period listed terrace houses. Their foundations could be dislodged and undermined. Number 51 is itself listed and any planning application ought to be approved by English Heritage as well as Camden Council.	1) Further investigation to confirm ground water flow has been added to the Audit Query Tracker, together with ground movement and building damage assessment.
Unknown	50 Tavistock Place	Unknown	1) As a local resident and supporter of Bloomsbury's architectural heritage, I am concerned that the proposed plans will have a detrimental effect on the adjacent row of private houses. These properties are unique and I already suffer some underpinning weakness which no doubt would be aggravated by the deep excavation in the basement of the proposed development.	1) Ground movement and building damage assessments requested for potentially affected properties.

Note: Relevant comments not received at time of issue.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Hydrogeology	Confirm direction of groundwater flow and how the basement will effect this considering that the neighbouring property also has a deep basement.	Open	
2	Hydrogeology and stability	Further ground investigation required to confirm possible influence of scour feature or former River Fleet.	Open	
3	Stability	Confirm order of strata below ground level. As table 3.3 or as sections 5.20 to 5.22.	Open	
4	Stability	Confirm structure/type of basement walls.	Open	
5	Stability	Confirm neighbouring foundation depths/type.	Open	
6	Stability	Confirm temporary works for installation of attenuation tank.	Open	
7	Stability	Carry out assessment of movement analysis for various sections through the basement walls. Confirm anticipated movement in relation to the Burland Category Scale.	Open	
8	Stability	Confirm design parameters for the foundations and retaining wall design.	Open	
9	Stability	Confirm proximity of any tunnels beneath the site or within the tunnel exclusion zones	Open	
10	All	Non Technical summaries need to be added for each section.	Open	

Appendix 3: Supplementary Supporting Documents

None

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