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Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 13398-81
Revision: D1

March 2021

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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 8 Inglewood Road, NW6 1QZ (planning reference 2020/4360/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 (BIA) 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 site currently comprises a three storey terraced property with a partial basement to the front of the property. The proposed development includes deepening of the basement and extension of basement area to the rear of the property.

1.5. The qualifications of the individuals involved in the BIA are in accordance with LBC guidance.

1.6. Screening and scoping assessments are presented, supported by desk study information.

1.7. The existing basement floor level and the proposed basement floor level should be clearly stated in the BIA. A maximum excavation depth of 3.00m bgl has been assumed in the BIA. A proposed formation level should be also presented.

1.8. A site investigation has been undertaken, with the BIA stating ground conditions as being Made Ground directly overlying the London Clay. However, the shallow soil descriptions suggest the presence of either Head Deposits or Alluvium. Ground conditions should be clarified.

1.9. A culverted river may be present nearby or even below the site. Mitigation measures to deal with the potential interception of the alluvial deposits associated with the historic river during the basement excavation should be presented in the BIA.

1.10. The impact assessment on the wider hydrogeological environment should be revised in light of the updated ground model and considering the potential presence of nearby basements which could cause a cumulative impact to groundwater level.

1.11. The site is confirmed to have a high risk from surface water flooding. The Flood Risk Assessment (FRA) indicates various mitigation measures to deal with surface water flooding which should be adopted during construction.

1.12. The site is within a critical drainage area and the FRA presented mitigation measures against the potential of increased flow rates into the public sewer. It is noted that the final drainage scheme will require approval by the local flood authority and the owner of the public sewer system present in the area (Thames Water).

1.13. There is a discrepancy between the BIA and the outline structural calculations for some geotechnical parameters. This should be clarified. Additionally, the potential for softer Head Deposits or Alluvium to be present at formation level, should be addressed.

1.14. A Ground Movement Assessment (GMA) has been undertaken. The analysis confirms that the anticipated damage from the basement excavation and construction will be within LBC's policy criteria. However, the GMA should be revised and clarified, as described in Section 4.

1.15. There are trees present on site. In the event of tree removal, then a shrink/swell assessment following NHBC guidance should be presented in the BIA to determine whether there is any impact to neighbouring foundations.

1.16. Queries and requests for information are summarised in Appendix 2. Until the clarifications requested are presented, the BIA does not meet the requirements of Camden Planning Guidance: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 5 February 2021 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 8 Inglewood Road, London NW6 1QZ, Camden Reference 2020/4360/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:

- Camden Local Plan 2017 - Policy A5 Basements.
- Camden Planning Guidance: Basements. March 2018.
- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.

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;

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 "*Extension of basement to form 1 x 2 bedroom flat, associated alterations*."

2.6. The Audit Instruction confirmed applicant's property and neighbouring properties are not listed.

2.7. CampbellReith accessed LBC's Planning Portal on 23rd February 2021 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (ref.:18481/BIA_R38), dated September 2020, by Soils Limited;
- Basement Construction Method Statement (ref.: 5492/13/RJ/PG LR1), dated December 2020 by Arcelle Consulting;

- Flood Risk Assessment (ref.: 18846/FRA), dated November 2020 by Soils Limited;
- Arboricultural Impact Assessment (ref.: IGS/8IWR/AIA/01), dated 3rd August 2020, by Landmark Trees.
- Planning Application Drawings consisting of Location Plan, Existing and Proposed Plans, Existing and Proposed Sections dated September 2020 by Iungo Studio.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Document Control Section of the BIA.
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	Section 2, 3 and 4 of the BIA.
Are suitable plan/maps included?	Yes	The assessment is supported by suitable drawings of existing and proposed development and by suitable maps to describe the environmental setting.
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	Section 3 of the
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3 of the BIA.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3 of the BIA.
Is a conceptual model presented?	Yes	Section 5 of the BIA.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the BIA.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the BIA.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the BIA.
Is factual ground investigation data provided?	Yes	Appendix A and B of the BIA. The BIA states that London Clay is the shallowest stratum on site. However, the ground investigation logs suggest the presence of either Head Deposits. Ground conditions should be reviewed.
Is monitoring data presented?	Yes	Section 5.5 of the BIA.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	No	Conservative assumptions have been made in the GMA. However, the hydrogeological assessment should be reviewed considering the potential presence of nearby basements.
Is a geotechnical interpretation presented?	Yes	Section 7 of the BIA. BIA. The BIA states that London Clay is the shallowest stratum on site. However, the ground investigation logs suggest the presence of either Head Deposits. Ground conditions should be reviewed.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Section 9 of the BIA. These should be consistently adopted within the structural calculations. Bearing capacity value presented in the BIA should be reviewed in line with the ground model and adopted in the structural calculations.

Item	Yes/No/NA	Comment
Are reports on other investigations required by screening and scoping presented?	Yes	Flood Risk Assessment and Arboricultural Impact Assessment presented.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	Conservative assumptions have been made in the GMA. However, the hydrogeological assessment should be revised considering the potential presence of nearby basements and ground model.
Is an Impact Assessment provided?	Yes	Section 8 and 9 of the BIA.
Are estimates of ground movement and structural impact presented?	Yes	Section 9 and 10 of the BIA. However, further review ad detailed in Section 4 is required.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	No	A preliminary shrink/swell assessment should be presented in the BIA. The GMA should be reviewed according to Section 4 of this audit. Mitigation measures to deal with the potential presence of softer, shallow soils potentially associated with an historic culverted river on site should be presented in the BIA. The hydrogeological assessment should be revised considering the potential presence of nearby basements and ground model.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	They need to be updated after the impact assessment is completed.
Has the need for monitoring during construction been considered?	Yes	Section 10 of the BIA.
Have the residual (after mitigation) impacts been clearly identified?	Yes	The BIA concludes that residual impacts will be negligible. However, this will need to be confirmed after the impact assessment is completed.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	The GMA should be reviewed according to Section 4 of this audit. Review of the ground model and potential for softer soils at formation level to be considered.

Item	Yes/No/NA	Comment
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	As above.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However, the GMA should be reviewed according to Section 4 of this audit.
Are non-technical summaries provided?	Yes	Section 11.2 of the BIA.

4.0 DISCUSSION

4.1. The BIA was undertaken by Soils Ltd. The qualifications of the authors are in line with those requested by LBC guidance.

4.2. The site is currently occupied by a three storey property which is part of a terrace along Inglewood Road. There is an existing basement covering part of the footprint of the building, which is accessible via an open air stairwell to the front of the property. The current basement floor level is not indicated in the BIA. A row of large mature trees is present along the northern boundary of the site.

4.3. The proposed works comprise the lateral extension and deepening of the existing part basement to cover approximately the entire footprint of the building. The proposed finished basement floor level is not indicated in the BIA. The existing basement floor level and the proposed basement floor level should be clearly stated in the BIA. A maximum excavation depth of 3.00m bgl has been assumed in the BIA. A proposed formation level should be also presented in the BIA.

4.4. The LBC Instruction to proceed with the audit confirmed that both applicant's property and neighbouring properties are not listed. The BIA does not present information on neighbouring foundations.

4.5. Screening and scoping assessments are presented and informed by desktop study information. Most of the relevant figures/maps from the Arup GSD and other guidance documents are referenced within the BIA to support responses to the screening questions.

4.6. The BIA states that underground infrastructure present beneath/close to the site is limited to simple utilities and no underground tunnels are present near the site. The report also states that a culverted river (the 'Lost River Westbourne') may be present approximately 50m south west of the site. However, independent search (based on in-house geographic information database) indicates that the historic river may have been present in close proximity of the site or even below the property. Mitigation measures to deal with the potential interception of the alluvial soils associated with an historic river during the basement excavation should be presented in the BIA.

4.7. A site investigation was undertaken in January 2020 to inform the basement design. A total of one cable percussive borehole (BH1), one window sample borehole (WS1) and two foundation inspection pits (TP1, TP3) were completed. The ground investigation encountered Made Ground to a maximum depth of 1.50m bgl. The BIA states that London Clay underlies the Made Ground. However, the soil description presented in the logs and the results of in situ and laboratory testing suggest the presence of either Head Deposits or Alluvium below the Made Ground to depths of between 3.00m bgl (BH1) to greater than 4.00m bgl (WS1). Its noted that no insitu testing was undertaken in WS1 but based on comparison of soil descriptions with BH1 then the soils at

formation level can be anticipated to be soft to firm Head or Alluvium, and not consistent with firm to stiff London Clay. This should be clarified in the BIA and the ground model presented in Section 5.3 updated.

4.8. Groundwater was not struck during drilling, however it was monitored between 0.93 and 1.84m bgl during three subsequent monitoring visits. The monitored groundwater levels are above the proposed formation level. The BIA states that groundwater control measures will be required and that localised dewatering may be required to deal with groundwater ingress into the excavation.

4.9. Of the potential for groundwater rise caused by the basement construction, the BIA states that considering the long axis of the footprint of the proposed basement is to be in alignment with existing groundwater flow, there will be only a minor deflection from its original path. However, the assessment should be revised in light of the updated ground model and considering the potential presence of nearby basements which could cause a cumulative effect and impact the groundwater level.

4.10. A Flood Risk Assessment (FRA) has been presented in the BIA. The site is at very low risk from flooding from rivers, seas and reservoirs, and from groundwater, while it is at high risk from surface water flooding. The FRA indicates various mitigation measures to deal with surface water flooding which should be adopted during construction.

4.11. The site is within a Critical Drainage Area. The BIA and the FRA confirmed that impermeable areas of the site will not increase as a result of the proposed development. An outline drainage strategy is presented in Section 5 of the FRA. The FRA recommends the development to utilise sustainable drainage system (SuDS) to reduce the pressure on the combined sewer network. The SuDS should aim to achieve greenfield run-off rates. It is noted that the final drainage scheme will require approval by the local flood authority and the owner of the public sewer system present in the area (Thames Water).

4.12. An outline construction sequence and outline structural calculations are presented in the Basement Construction Method Statement (BCMS). It is proposed to construct the new basement using traditional reinforced concrete underpinning following a typical 'hit and miss' sequence. The sequence confirmed that temporary propping is proposed in the short term and that the new retaining walls will not be cantilevered at any stage.

4.13. Geotechnical parameters to inform settlement, retaining wall calculations and foundation design have been presented in the BIA. However, the following should be reviewed:

there is a discrepancy between the value for the angle of shearing resistance of the London Clay presented in the BIA (24°) and in the outline structural calculations (26°). This should be clarified and the calculations updated.

- The BIA indicates an allowable bearing capacity of 110kPa at a minimum depth of 3.00m bgl. However, according to the WS1 log, soft clay may be encountered at and below formation level. This should be clarified in the BIA, and the outline structural calculation revised, if needed.

4.14. A Ground Movement Assessment (GMA) has been undertaken to demonstrate that ground movements and consequential damage to neighbouring properties will be within LBC's policy requirements. Soil parameters adopted in the analysis and presented in Table 9.1 and 9.2 of the BIA should be revised following the update of the ground model and the GMA updated.

4.15. An estimation of heave occurring due to the basement excavation has been included in the GMA. From the results presented in the GMA, it seems that heave movements used in the calculations counteract the settlement, resulting in an under-estimation of the resulting ground movements which are less than 2mm in both the vertical and horizontal direction. In addition the BIA states the following in regard to heave movements: *"Should the construction pause or stop before the basement is completed then a complete re-evaluation of the ground movement assessment will be required […]*."

4.16. The GMA states that the additional ground movements considered were due to excavation, application of structural loads and to workmanship errors. The horizontal deflection occurring at the proposed retaining wall has been calculated using the software WALLAP. From the analysis presented, it is unclear how the horizontal movements propagate at the back of the wall and how they have been included in the analysis. This should be clarified.

4.17. It should be noted that in good ground conditions for underpinning, within stiff cohesive deposits and without the presence of groundwater, ground movements of between 5mm and 10mm vertically and horizontally are typically anticipated. Any review of the GMA should carefully consider the ground model and provide a reasonably conservative assessment of movements and impacts, with additional mitigation measures to be proposed, if required, in accordance with LBC guidance.

4.18. It is confirmed in the GMA and in the BCMS that a ground movements monitoring regime will be implemented throughout construction of the basement, in accordance with current guidance.

4.19. The BIA indicates the London Clay to have a high volume change potential so that the area may be prone to seasonal shrink-swell which can result in foundation movements when located in the vicinity of trees. An Arboricultural Impact Assessment has been presented and does not recommend any tree removal as part of the development. The BIA should confirm the proposal at this stage and in case any tree is going to be removed, then a shrink/swell assessment following NHBC guidance should be presented to determine whether there is any impact to neighbouring foundations.

5.0 CONCLUSIONS

5.1. The qualifications of the individuals involved in the BIA are in accordance with LBC guidance.

5.2. Screening and scoping assessments are presented, supported by desk study information.

5.3. The existing basement floor level and the proposed basement floor level should be clearly stated in the BIA. A maximum excavation depth of 3.00m bgl has been assumed in the BIA. A proposed formation level should be also presented in the BIA.

5.4. The ground investigation logs suggest the presence of either Head Deposits or Alluvium in the geological sequence and the ground model should be updated accordingly.

5.5. A culverted river may be present nearby or even below the site. Mitigation measures to deal with the potential interception of alluvial deposits associated with an river during the basement excavation should be presented in the BIA.

5.6. The impact assessment on the wider hydrogeological environment should be revised in light of an updated ground model and considering the potential presence of nearby basements which could cause a cumulative effect and a significant rise in the groundwater level.

5.7. The site is confirmed to have a high risk from surface water flooding. The FRA indicates various mitigation measures to deal with surface water flooding which should be adopted during construction.

5.8. The site is within a critical drainage area and the FRA presented mitigation measures against the potential of increased flow rates into the public sewer. It is noted that the final drainage scheme will require approval by the local flood authority and the owner of the public sewer system present in the area (Thames Water).

5.9. There is a discrepancy between the BIA and the outline structural calculations on geotechnical parameters. This should be clarified. Bearing capacity values may need to be revised according to an updated ground model.

5.10. A Ground Movement Assessment (GMA) has been undertaken. The analysis indicates that the anticipated damage from the basement excavation will be within LBC's policy criteria. However, the GMA should be revised according to Section 4.

5.11. If trees are going to be removed, then a shrink/swell assessment following NHBC guidance should be presented in the BIA to determine whether there is any impact to neighbouring foundations.

5.12. Queries and requests for information are summarised in Appendix 2. Until the clarifications requested are presented, the BIA does not meet the requirements of Camden Planning Guidance: Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Mac Leod	Inglewood Road	29/01/2021	Flood Risk and culverted river	See Sections 4.5., 4.10 – 4.11 of this audit

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA format	The existing basement floor level and the proposed basement floor level should be clearly stated in the BIA to confirm the anticipated maximum excavation depth and formation level.	Open – See 4.3.	
2	Ground model	The soil description presented in the ground investigation report and the results of in situ and laboratory testing suggest the presence of either Head Deposits or Alluvium below the Made Ground. This should be clarified and the ground model presented in Section 5.3 updated.	Open – See 4.5. and 4.7.	
2	Hydrology Impact Assessment	A culverted river may be present nearby or even below the site. Mitigation measures to deal with the potential interception of alluvial deposits associated with an historic river during the basement excavation should be presented in the BIA.	Open – See 4.6.	
3	Hydrogeology Impact Assessment	The impact assessment on the wider hydrogeological environment should be revised considering the potential presence of nearby basements and a revised ground model which could cause a cumulative effect and impact the groundwater level.	Open – See 4.9.	
4	Geotechnical interpretation	There is a discrepancy between the BIA and the BCMS report on some geotechnical parameters. This should be clarified. The value for the bearing capacity (110kPa) should be reviewed in the BIA, and the outline structural calculation revised.	Open – See 4.13.	
5	Land stability	The GMA should be revised to exclude ground movements due to heave as it this may result in an under-estimation of the category of damage occurring at neighbouring properties. Clarification on the propagation of horizontal movements at the back of the wall is required. Geotechnical parameters adopted in the analysis should be revised according to an updated ground model.	Open – See 4.14 – 4.17.	
6	Land stability	The BIA should confirm if any tree is going to be removed as part of the development. If so, a shrink/swell assessment should be presented.	Open – See 4.18.	

Appendix 3: Supplementary Supporting Documents

None

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