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38 Frognal Lane, London NW3 6PP

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13398-62
Revision: D1

November 2020

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	November 2020	Comment	KBcb-13398-62-301120-38 Frognal Lane_D1.doc	KB	CB	CB

Document Details

Last saved	30/11/2020 14:53
Path	KBcb-13398-62-301120-38 Frognal Lane_D1.doc
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Project Number	13398-62
Project Name	38 Frognal Lane, London NW3 6PP
Planning Reference	2020/4667/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 submitted as part of the Planning Submission documentation for 38 Frognal Lane, London NW3 6PP (planning reference 2020/4667/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. The BIA has confirmed that the proposed basement will be founded within Claygate Member soils. It is anticipated that the groundwater table will be encountered during basement excavation.

1.6. It is proposed to construct the basement using a contiguous pile wall.

1.7. Interpretative soil parameters should be provided.

1.8. The screening and scoping exercises should be updated to present consistent information.

1.9. Based on the proposed mitigation measures described in the Flood Risk Assessment it is accepted that the development will not impact the hydrology of the area.

1.10. Further consideration of the impact to the hydrogeology of the area is required once the scheduled groundwater monitoring rounds have been completed.

1.11. Further structural drawings and information is requested.

1.12. The Ground Movement Assessment should be revised in line with the comments presented in Section 4 of this audit and should consider the impact to the adjacent highway and any utilities.

1.13. Where a building damage category is anticipated to exceed Burland Category 2, details of the additional mitigation measures to be employed should be provided in order to keep damage within acceptable levels.

1.14. Utility data should be provided.

1.15. It cannot be confirmed that the BIA complies with the requirements of CPG: Basements until the queries raised in Section 4 and Appendix 2 are addressed.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 2 November 2020 to carry out a Category B audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 38 Frognal Lane, London NW3 6PP.

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 *"Erection of replacement 2 storey dwelling plus basement following demolition of existing building"*.

2.6. The Audit Instruction confirmed the development does not involve a listed building. The neighbouring property at 40 Frognal Lane is identified as being a Grade II listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 12 November 2020 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) by Train and Kemp (Consulting Engineers) LLP, rev 01, dated 6 November 2020.

- Main Investigation Report (as Appendix 2 of the BIA) by Soils Limited, ref. 18577/MIR_R27, dated October 2020.
- Ground Investigation Letter Report (as Appendix 2 of the BIA) by Soils Limited, ref. 14005/FDL/RG, dated 10 January 2014.
- Ground Movement and Building Damage Assessment (as Appendix 4 of the BIA) by Train and Kemp (Consulting Engineers) LLP, ref 14604, revision 0, dated 1 October 2020.
- Flood Risk Assessment (as Appendix 6 of the BIA) by Train and Kemp (Consulting Engineers) LLP, ref. 14604, revision 2, dated 5 October 2020.
- Tree Survey and Arboricultural Method Statement by Tretec, ref. 20022, dated September 2020.
- Planning Application Drawings by Charlton Brown Architecture and Interiors, consisting of a location plan, existing and proposed plans, sections, elevations and demolition section plans, dated 2 October and 23 November 2020.
- Design & Access Statement by Charlton Brown Architects Ltd, rev 2 dated September 2020.

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?	No	Drawings showing the foundation layout are required. Utility data is required.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	No	Drawings showing where the different pile lengths will be used, temporary works arrangement and a section of the split level basement should be provided.
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?	No	Question 8 regarding watercourses/spring line within 100m requires further consideration. The figure referenced shows two tributaries of the Lost Rivers of London within 100m of the site. Question 10 regarding dewatering should be 'yes'.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	Question 4 regarding an increase in impermeable area should be 'yes'.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	Question 3 regarding a change in the proportion of impermeable area should be 'yes'.
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	Further consideration is required.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	However, further assessment is required on completion of groundwater monitoring.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Despite the omission in the screening exercise, the increase in impermeable area is addressed.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	One groundwater monitoring visit is reported, with a further two visits yet to be undertaken. Two visits were undertaken in 2014.
Is the ground investigation informed by a desk study?	Unknown	BIA includes a Desk Study but it is unclear whether this data was used to design the ground 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	
Does the geotechnical interpretation include information on retaining wall design?	No	Retaining wall design parameters and Young's modulus are not specified.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural Assessment and Flood Risk Assessment are provided.
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	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	No	Estimates of heave from the basement excavation are not provided.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	No	Impact to highway should be considered.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	Further information regarding the installation of a 'pea shingle blanket' around the piles is required. Mitigation relating to the predicted Category 2 damage is required.
Has the need for monitoring during construction been considered?	Yes	However recommendations should be revised once the GMA has been updated.
Have the residual (after mitigation) impacts been clearly identified?	Yes	However this should be revised once the GMA has been updated.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	Impact to highway should be considered.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Further consideration of the impact to the hydrogeology is required once all groundwater monitoring is complete.
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	One of the critical section assessed returns Category 2. The ground movement assessment requires further consideration.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out Train and Kemp consulting Engineers, with input from Soils Limited. The individuals involved in the production of the BIA hold suitable qualifications.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal does not involve a listed building. The BIA identifies the neighbouring property at No. 40 Frognal Lane as being a Grade II listed building.

4.3. The proposed development comprises the demolition of the existing 2-storey building on site and the construction of a new 3-storey building with a single basement level extending beyond the footprint of the proposed building. The basement will include a pool in the north. It is proposed to construct the basement using a contiguous pile wall. The basement excavation is indicated to extend to 86.2m OD, with excavation in the pool area extending to 84.4m OD. Ground level is given as 90.9m OD at the front of the property and 90.5m OD in the rear garden.

4.4. Intrusive site investigation was carried out at the site by Soils Limited in 2014 and 2020, and is presented in Appendix 2 of the BIA. It is unclear whether the scope of either of the site investigations has been informed by a Desk Study. The ground conditions are indicated to comprise Made Ground over Claygate Member soils, with London Clay below, extending to depth.

4.5. Groundwater was noted in two boreholes during each of the 2014 and 2020 site investigations. Two groundwater monitoring visits were undertaken in 2014 and recorded levels between 0.8m and 2.8m depth. One groundwater monitoring visit has been carried out following the 2020 investigation and recorded groundwater in all installations, at levels between 1.67m and 2.56m depth. The Soils Limited report indicates two further visits are due to be undertaken, the last of which will be in the beginning of December 2020.

4.6. Basic soil parameters are summarised in Appendix B of the Ground Investigation report provided in Appendix 2 of the BIA. Retaining wall design parameters and Young's modulus values are not provided and are requested.

4.7. The proposed basement will be constructed within the Claygate Member, which is identified as a Secondary (A) Aquifer. Two tributaries of the River Westbourne are identified to originate close to the site and the site investigation identified shallow groundwater across the site. The BIA identifies that the basement excavation will extend below groundwater level.

4.8. The screening exercise indicates there will be no increase in impermeable surfaces however paragraph 5.3.2 of the BIA scoping exercise subsequently indicates the area of impermeable surfaces will increase from 200m^2 to 230m^2. Paragraph 5.3.1 of the scoping exercise states that the site is not within a Critical Drainage Area (CDA), however a Flood Risk Assessment (FRA) presented in Appendix 6 of the BIA identifies the site to be within CDA 3_010. Questions 8 and 10 of the Land Stability screening exercise also require further consideration to ensure answers are consistent throughout the BIA. The screening and scoping exercises should be updated to present consistent information.

4.9. Section 5.5.7 of the BIA calculates a flow rate of 0.018l/s for the site, however in Section 5.5.10 the groundwater flow through the site is stated to be no more than 0.003l/s. This is based on an assumed permeability of the Claygate Member of 1 x 10^{-6}m/s. The flow rate is also based on groundwater level being at 6m depth: the level at which groundwater was encountered in WS101 during drilling. Groundwater was encountered in the 2014 investigation at 2m and 2.8m depth during drilling, and seepage was recorded in BH01 during the 2020 investigation at 2.8m depth. The value used for the gradient of the phreatic surface is indicated to be based on the results of the groundwater monitoring (Section 6.1 of the BIA). The groundwater monitoring presented in the BIA indicates groundwater level is levels between 1.67m and 2.56m, significantly higher than the value of 6m used in the assessment. The hydrogeological assessment should adopt a consistent approach when selecting representative data to use in subsequent calculation, and should adopt cautious or moderately conservative values, as required by LBC's guidance. The groundwater assessment should be revised, with data and calculations presented consistently once the outstanding groundwater monitoring visits have been completed.

4.10. To mitigate the impact to hydrogeology it is proposed by the BIA to use a pea shingle layer, installed around the outside of the basement, to allow water to flow around the basement. It is unclear where this layer will be placed with respect to the basement construction, as paragraph 3.2.3 of the GMA suggests it will be placed around the outside of the piles. Further detail regarding the location and installation of the pea shingle layer is required. The suitability of this mitigation measure should also be revised based on the updated hydrogeological assessment. The BIA should assess the hazard of loss of fines from the Claygate Member and potential additional ground settlement due to anticipated groundwater seepages between the contiguous piles and/or the basement excavation and due to the proposed pumping. Mitigation measures should be included, as required.

4.11. The FRA indicates that attenuation geocells will be included in the development and flows off site will be restricted to 2L/second. A freeboard will be included at the entrance of the property to mitigate water ingress from Frognal Lane. Based on the mitigation measures described in the FRA it is accepted that the development will not impact the hydrology of the area.

4.12. A topographical survey of the site is provided. It shows Frognal Lane at the front of the property rising from c. 90.7m OD in the west to c. 93m OD in the east. To accommodate this slope the building platform for the site is cut into the slope on the north side to form a flat courtyard area at the front of the property. The sloping land and adjacent road are proposed by the BIA to be supported by a retaining wall which is shown to be c. 2.2m high at its highest point. Further information is required to show how the stability of this retaining wall and the land it supports, will be maintained during construction.

4.13. Appendix 5 of the BIA is indicated to contain Structural Engineer's Statement and Calculations. No calculations are provided and structural drawings showing the pile layout, outline temporary works including any propping arrangements and a representative section of the two basement levels are also absent. This information is requested.

4.14. A Ground Movement Assessment (GMA) has been carried out and is presented in Appendix 4 of the BIA. Throughout the GMA reference to CIRIA C580 is made. It should be noted that this document was withdrawn in 2017 and has been superseded by CIRIA C760.

4.15. The GMA indicates that the length of the piles forming the basement will be 10m, extending to 15m around the pool area. Calculations presented in Appendix 2 of the GMA are used to predict a Damage Category for the adjacent structures assessed. A number of inconsistencies are noted in the GMA, as follows:

- 12LG-1 – the length of the building (L) is given as 8m however the distance used to assess the horizontal strain is given as 6m.
- The elevation of the basement at pool and leisure level are presented differently in all four of the sections analysed.
- 40FL-2 assesses a 10m long pile for the swimming pool basement. It has previously been indicated that piles will be 15m long in the pool area.
- The drawing presented in Appendix A of the GMA identifies the extent of the deep piles around the swimming pool area. However, the swimming pool area is shown to extend beyond the line of deep piles adjacent to 12 Langford Gardens. Further clarification is required.

4.16. The GMA considers the neighbouring properties however the adjacent highway, and any utilities therein, are not included in the assessment. It is requested that these elements are considered in the analysis and utility data are provided to inform the GMA.

4.17. Consideration should be given to vertical ground movements/heave that will occur within the basement footprint due to excavation.

4.18. The report text for the BIA and GMA states that the impact to adjacent properties will be limited to Burland Category 1 (Very Slight) damage, however Figure 1 of the GMA shows the critical

section for 12LG/1 exceeds the threshold for Category 1 damage. The building damage assessment should be revised once the GMA has been updated, and further consideration of mitigation should be provided where movements are indicated to exceed Category 1 damage.

4.19. Section 6.5 of the GMA states that the maximum predicted movements for the neighbouring structures (5mm horizontal and 3mm vertical) are too small for any meaningful monitoring regime. The BIA recommends that a condition survey of neighbouring properties be undertaken and that monitoring of existing cracks may be undertaken if required. The monitoring strategy should be updated based on the outcome of the revised GMA and it is requested that a monitoring strategy and plan with trigger levels and outline contingency measures are provided to show how the risk of ground movement will be mitigated.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the proposed basement will be founded within Claygate Member soils. It is anticipated that the groundwater table will be encountered during basement excavation.

5.3. It is proposed to construct the basement using a contiguous pile wall. Piles will be 10m long around the majority of the basement, extending to 15m long around a proposed pool area at the front of the property.

5.4. Interpretative soil parameters should be provided.

5.5. The screening and scoping exercises should be updated to provide appropriate responses for the development.

5.6. Based on the mitigation measures described in the Flood Risk Assessment it is accepted that the development will not impact the hydrology of the area.

5.7. Further consideration of the impact to the hydrogeology of the area is required once the scheduled groundwater monitoring rounds have been completed.

5.8. Assessment of the potential loss of fines/ground settlement due to seepages and proposed pumping is requested, with mitigation measures presented as necessary.

5.9. Structural drawings showing the location of deep piles around the pool, the temporary propping arrangement and an indicative section of the split level basement should be provided.

5.10. The Ground Movement Assessment (GMA) should be revised in line with the comments presented in Section 4 of this audit.

5.11. The GMA should consider the impact to the adjacent highway (Frognal Lane) and any nearby utilities, particularly where the road is supported by a retaining wall on the east side. Utility data should be provided to inform the GMA.

5.12. Where a building damage category is anticipated to exceed Burland Category 2, details of the additional mitigation measures to be employed should be provided. It is requested that a monitoring plan with trigger levels and outline contingency measures are provided to show how the risk of ground movement will be mitigated.

5.13. It cannot be confirmed that the BIA complies with the requirements of CPG: Basements until the queries raised in Section 4 and Appendix 2 are addressed.

Appendix 1: Residents' Consultation Comments

None pertinent to the BIA

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Interpretative soil parameters should be provided.	Open	
2	Screening and Scoping	Screening and Scoping exercises should be updated in line with the comments in Sections 3 and 4 of this report.	Open	
3	Hydrogeology	Further consideration of the impact to the hydrogeology of the area should be undertaken on completion of the scheduled groundwater monitoring visits.	Open	
4	Hydrogeology	Further details regarding the use of a pea shingle layer as a mitigation measure should be provided in line with the comments in Section 4 of this report.	Open	
5	Hydrogeology	Assessment of potential loss of fines/ground settlement due to seepages and pumping, with mitigation measures are requested.	Open	
6	Stability	Calculations, structural drawings showing the pile layout, outline temporary works drawings and a representative section of the two basement levels are requested.	Open	
7	Stability	The GMA should be updated in line with the comments in Section 4, and, where damage exceeds Burland Category 1, additional mitigation measures should be discussed to keep anticipated damage within acceptable levels. It is requested that a monitoring plan with trigger levels and outline contingency measures is provided to show how the risk of ground movement will be mitigated.	Open	
8	Stability	Consideration of the impact to the adjacent highway, and any utilities therein, is required.	Open	
9	Stability	Utility data should be provided.	Open	
10	Stability	Further information is required to show how the stability of the proposed retaining wall to the front of the site, will be maintained during construction.	Open	

Appendix 3: Supplementary Supporting Documents

None

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