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5 Templewood Avenue
London NW3 7UY

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12466-69

Rev: D1

May 2017

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Appendices

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 5 Templewood Avenue (planning reference 2017/1229/P). The basement is considered to fall with Category C 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 review it against an agreed audit check list.

1.4. The BIA has been prepared by personnel who have suitable qualifications and experience.

1.5. No. 5 Templewood Avenue is a three/four storey detached property which has crawl space basements below half of its ground floor footprint. It is proposed to construct a single storey basement, including swimming pool, beneath the entire ground floor footprint extended beneath part of the rear garden and an enlarged extension on the east side of the house adjacent to No. 5a.

1.6. The scheme will comprise a contiguous bored pile retaining wall to form the extended basement and underpinning beneath the existing walls of the original house. Depths of excavation are anticipated to vary from 3.3m within the existing basement to 7.8m for the swimming pool beneath the rear garden.

1.7. A soils investigation has identified that the basement excavation will encounter Made Ground, Weathered Claygate Member and Un-weathered Claygate Member/London Clay. Monitoring of groundwater has shown that the groundwater level will be within the depth of the proposed basement.

1.8. It is accepted that the proposed basement construction will not impede groundwater flow and that the contiguous bored pile retaining wall will permit flow between the piles below basement level. The proposal to commence construction with the rear part (upslope) of the basement, to confirm whether it is necessary to include a groundwater bypass, is endorsed.

1.9. The BIA correctly identifies that the magnitude of movements during underpinning is dependent upon the adequacy of temporary support and quality of workmanship. The SER does not provide an indicative temporary works proposal, however, and this is requested. Special care is required during construction to ensure fine material is not removed during pumping operations.

1.10. A heave assessment was undertaken using Pdisp software, with a Ground Movement Assessment (GMA) and Damage Assessment performed for neighbouring properties using the recommendations within CIRIA Report C580. The assumptions used are considered reasonable and the assessments are accepted. The BIA acknowledges that the structure of the basement will need to be designed to enable it to accommodate the heave calculated. The assessment predicts a damage category of 0 (Negligible) for No. 3 and a damage category of 1 (Very slight) for No. 5a Templewood Avenue.

1.11. The documentation recommends suitable movement monitoring and condition surveys to be undertaken.

1.12. It is accepted that the site is not at risk from surface water flooding but a calculation is requested to identify the anticipated increase in the area of paved surfacing. Mitigation of surface water run-off is proposed by the including of below ground attenuation and details are requested. Proposals to protect the basement entrances and lightwells from surface water ingress are endorsed.

1.13. It is accepted that the surrounding slopes to the development are stable and that no known ponds, springlines or wells are in close vicinity to the site, which lies outside the Hampstead pond chain catchment area.

1.14. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. Until the additional information requested has been provided, it is not possible to assess whether the criteria of CPG4 have been met.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 12 April 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 5 Templewood Avenue, Camden Reference 2017/1229/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 "*Conversion of 3 existing units to provide 2 units (1x7 bed, 1x1 bed) (C3), including erection of rear and side extensions and plant enclosure to rear, excavation of single storey basement, hard and soft landscaping works*".

and confirmed that the basement proposals did not involve a listed building.

2.6. CampbellReith accessed LBC's Planning Portal on 02 May 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) dated November 2016 by Chelmer Consultancy Services.
- Structural Engineering Report (SER) and Subterranean Construction Method Statement dated December 2016 by Elliot Wood.
- Tree Report dated January 2017 by John Cromar Aboricultural Co. Ltd.
- Architects Existing & Proposed drawings nos. 1046-S01A, S02 to S11; 1046-AP01A, AP02 to AP13 by Brod Wight.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Foreword.
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	BIA Sections 2 and 3.
Are suitable plan/maps included?	Yes	Included throughout BIA.
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 Section 7.3.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.4.
Is a conceptual model presented?	Yes	BIA Section 10.1.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.3.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.4.
Is factual ground investigation data provided?	Yes	BIA Appendix C.
Is monitoring data presented?	Yes	Standpipes monitored on three occasions.
Is the ground investigation informed by a desk study?	Yes	BIA Appendices B, E, F & G.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Section 2.10.
Is a geotechnical interpretation presented?	Yes	BIA Section 9.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Section 10.4.
Are reports on other investigations required by screening and scoping presented?	Yes	Aboricultural Report.
Are 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	BIA Section 10.1 to 10.4.
Are estimates of ground movement and structural impact presented?	Yes	BIA Sections 10.5 and 10.6.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Section 10.9.
Has the need for monitoring during construction been considered?	Yes	BIA Section 10.7.
Have the residual (after mitigation) impacts been clearly identified?	Yes	BIA Section 10.9.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	No	Temporary works proposals to be confirmed.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Drainage assessment to be provided in more detail.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	
Are non-technical summaries provided?	Yes	BIA Sections 8.5, 9.9 and 11.0.

4.0 DISCUSSION

4.1. This BIA has been carried out by an established firm of consultants, Chelmer Consultancy Services, and the authors possess suitable qualifications and experience to comply with the requirements of CPG4.

4.2. No. 5 Templewood Avenue is a large, three/four storey, detached house situated within the Redington Frognal Conservation Area in the LBC and has partial basements with crawl spaces below half the footprint of the ground floor. It is proposed to construct a single storey basement beneath the full footprint of the house, to include a swimming pool and ancilliary leisure facilities, which will extend beneath part of the rear garden and an extension of the existing two-storey projection on the east side of the house, adjacent to No. 5a. A single car lift will also be installed in the forecourt area.

4.3. The Structural Engineering Report (SER) indicates that the scheme will comprise a contiguous bored pile retaining wall along the proposed rear wall of the basement and its side walls, where they extend beyond the footprint of the existing house, together with reinforced concrete underpinning beneath the existing walls. Founding level of the underpin bases will need to be approximately 4.5m below existing ground floor level of the upper part of the basement (around 97.0m AOD) and approximately 7.3m below existing ground floor level for the pool area (around 94.2m AOD), to cater for anticipated construction thickness of structure, insulation, drainage and finishes. The depths of excavation are identified to vary from around 3.3m, within the existing property with a 1.0m deep crawl space, up to around 7.8m for the swimming pool area beneath part of the rear garden.

4.4. A soils investigation has been undertaken consisting of 2 no. boreholes to 15.0m in depth and 4no. hand dug trial pits to investigate the existing foundations of the property. The boreholes have shown that that excavation will generally pass through Made Ground (0.5m to 1.2m thickness), Weathered Claygate Member (4.2m to 2.6m thickness) and Un-weathered Claygate Member/London Clay to the extent of the boreholes. Groundwater was monitored on three separate occasions and carried between 1.53m to 2.79m below ground level in BH1, whereas in BH2, a groundwater level of 2.05m bgl was recorded, i.e. within the depth of the proposed basement.

4.5. The BIA identified groundwater flow from the rear of the front of the property, down the slope of approximately 7^{o}, northwest to the southeast. It is accepted that given the lack of deep basement beneath No. 5a and adjacent access driveway between Nos. 5a and 3, it is considered unlikely that construction of the basement would cause an adverse impact on groundwater flow. It is also accepted that the contiguous piled wall will permit flow between

the piles below basement level, which will help to limit any build-up of groundwater pressure and levels on the upslope side of the piled wall.

4.6. The BIA discusses the possibility of encountering the permeable sand deposit of limited lateral continuity which would require the construction of a groundwater bypass in order to allow continued flow of the groundwater. The proposal to commence construction with the rear part (upslope) of the basement, to confirm whether to include a groundwater bypass, is endorsed.

4.7. The BIA accurately identifies that the magnitude of movements during underpinning operations is dependent upon the adequacy of temporary support and the quality of workmanship. It also notes that special care should be taken to ensure that fine material is not removed during sump pumping operations within the excavation.

4.8. Although the SER gives preliminary structural solutions for the intended superstructure alterations and an underpinning bay layout, no indicative temporary works proposals have been given to ensure a high stiffness temporary support will be provided as required by the Ground Movement Assessment, and this is requested from Elliot Wood.

4.9. A settlement / heave assessment was undertaken using Pdisp software based on input parameters informed by the site investigation and the proposed construction sequence. The contiguous bored pile wall was assumed to extend 6.0m below basement formation level, giving pile lengths of around 9.5m within the main upper part of the basement, and 12.3m within the proposed pool area. The effect of the tension piles, which were recommended in the BIA to resist hydraulic uplift, were not included in the analyses due to the limited influence they would have on the resulting heave. The assumptions used in the heave analysis are considered reasonable and is accepted.

4.10. The maximum post-construction displacements beneath the slab are likely to range from around 5-10mm of heave. It is acknowledged in the BIA that the structure of the basement will need to be designed to enable it to accommodate the heave developed underneath it.

4.11. A Ground Movement Assessment (GMA) and Damage Assessment was performed, based on the recommendations within CIRIA Report C580, for neighbouring properties No. 3 and No. 5a Templewood Avenues. It is accepted that Templewood Avenue will not be affected by the car lift as it is located approximately 9m from the road edge.

4.12. Numerous assumptions are made in the GMA; it is accepted that heave effects would be beneficial for vertical movement, with a worst case scenario of heave negating vertical settlement. Vertical settlement is considered in response to excavation. A maximum horizontal displacement of 5mm is assumed due to installation and excavation, although this should be based on published data as presented in Figures 2.9a and 2.11a of C580. A separate calculation

performed by CampbellReith revealed horizontal movements of approximately 5mm for No. 3 and 7mm for No. 5a. These movements, however, resulted in the same category of damage as predicted in the BIA.

4.13. The assessments predicted a damage category of 0 (Negligible) for No. 3 and a damage category of 1 (Very slight) for No. 5a Templewood Avenue. The results of the GMA are accepted, pending confirmation of the temporary works scheme. The use of best practice construction methods will be essential to ensure that the ground movements are kept in line with those predicted. It is noted that the Burland Damage Category assumes the structures considered are in good condition. The BIA indicates the brick boundary wall separating No. 5 and No. 5a shows significant crack damage, and this should be assessed in detail during the proposed condition survey and movement monitoring.

4.14. The BIA recommends a range of locations for monitoring of building movements which are acceptable and these are included within the SER. The BIA further recommends that a condition survey is undertaken prior to works commencing as part of the Party Wall process.

4.15. It is accepted that the site is not at risk from surface water flooding, although it is understood that flooding occurred to No. 5a in 2002. The BIA accepts that there is likely to be a modest increase in the area of paved surfacing and a calculation to identify that increase is requested. Both the BIA and SER identify that the increase in surface water run-off should be mitigated by the inclusion of appropriate Sustainable Urban Drainage Systems (SUDS). Although the BIA discusses various alternatives, the SER proposes the including of an attenuation tank into the drainage system. Further details of this proposal are requested.

4.16. The BIA proposes maintaining the channel drain at the rear of the house, raised thresholds to protect entrances to the basement, upstands around the lightwells and non-return valves and above ground loop systems on all outfall drains which connect to the mains drainage system, in order to prevent potential flooding of the basement. These proposals are endorsed.

4.17. The BIA has shown that the surrounding slopes to the development are stable and the basement is not within 5m of an adjacent highway.

4.18. It is accepted that no known ponds, springlines or wells are in close vicinity to the site and the site is outside the Hampstead pond chain catchment area.

5.0 CONCLUSIONS

5.1. The BIA has been prepared by personnel who have suitable qualifications and experience.

5.2. It is proposed to construct a single storey basement, including swimming pool, beneath the entire ground floor footprint extended beneath part of the rear garden.

5.3. The scheme will comprise a contiguous bored pile retaining wall to form the extended basement and underpinning beneath the existing walls of the original house. Depths of excavation are anticipated to vary from 3.3m to 7.8m.

5.4. The basement excavation will encounter Made Ground, Weathered Claygate Member and Un-weathered Claygate Member/London Clay. Groundwater will be encountered.

5.5. It is accepted that the proposed basement construction will not impede groundwater flow. The proposal to commence construction with the rear part (upslope) of the basement, to confirm whether it is necessary to include a groundwater bypass, is endorsed.

5.6. The SER does not provide an indicative temporary works proposal and this is requested. Special care is required during construction to ensure fine material is not removed during groundwater pumping operations.

5.7. A settlement / heave assessment was undertaken using Pdisp software and the assumptions used are considered reasonable and are accepted.

5.8. A Ground Movement Assessment (GMA) and Damage Impact Assessment was performed for neighbouring properties, and although minor discrepancies were identified, the results are accepted. The assessment predicts a damage category of 0 (Negligible) for No. 3 and a damage category of 1 (Very slight) for No. 5a Templewood Avenue.

5.9. The documentation recommends suitable movement monitoring and condition surveys to be undertaken.

5.10. A calculation is requested to identify the anticipated increase in the area of paved surfacing. Mitigation of surface water run-off is proposed by utilisation of below ground attenuation and details are requested. Proposals to protect the basement entrances and lightwells from surface water ingress are endorsed.

5.11. It is accepted that the surrounding slopes to the development are stable and that no known ponds, springlines or wells are in close vicinity to the site, which lies outside the Hampstead pond chain catchment area.

5.12. Queries and matters requiring further information or clarification are summarised in Appendix 2. Until the additional information requested has been provided, it is not possible to assess whether the criteria of CPG4 have been met.

Appendix 1: Residents' Consultation Comments

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Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Yass	5a Templewood Avenue	18/04/17	Surface water flooding threat. Vibration may de-stabilise cracked rear wall	See 4.9 to 4.16

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Indicative temporary works proposal requested	Open	
2	Hydrology	Calculation to identify increase in paved surfacing requested	Open	
3	Hydrology	Attenuation SUDS details requested	Open	

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Appendix 3: Supplementary Supporting Documents

None

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