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35 Templewood Avenue
London, NW3 7UY

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12727-05
Revision: F1

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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 35 Templewood Avenue (planning reference 2017/4498/P). The basement is considered to fall within 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 reviewed it against an agreed audit check list.

1.4. The BIA, Structural Method Statement (SMS) and Ground Movement Assessment (GMA) have been carried out by individuals who possess suitable qualifications in compliance with the requirements of CPG4.

1.5. The original BIA has been revised to include full Screening and Scoping assessments, plus relevant reference documentation.

1.6. It is proposed to construct the new basement by forming reinforced concrete underpins in a hit and miss sequence, as described in the SMS.

1.7. The BIA has confirmed that the proposed basement will be founded within the Bagshot Formation, a Secondary A Aquifer.

1.8. It is unlikely that the ground water table will be encountered during basement foundation excavation. It is accepted that the proposed basement construction will not impact the wider hydrogeology of the area.

1.9. Designs have been provided for the retaining walls taking the watertable at 1.0m bgl, in line with good practice procedures.

1.10. It is proposed to underpin the existing perimeter walls in a hit and miss sequence, extending the foundations into the Bagshot Formation to a depth of approximately 3.7m deep.

1.11. The current basement proposal clashes with the root protection zone noted on the 'Tree Constraints Plan'. This should be considered and revised as required during detailed design.

1.12. It is accepted that there is a low shrink/swell potential in the Bagshot Formation, as noted in the BIA.

1.13. A revised GMA has been presented that confirms damage to structures within the zone of influence will be a maximum of Category 1 (Very Slight) and assesses there will be no adverse impact to utility infrastructure and highways.

1.14. The proposed development does not increase the impermeable site area. The revised submissions confirm a SUDS scheme will be adopted with hydrobrake to limit peak discharge flows off-site, which should be a benefit to the hydrological environment.

1.15. In the revised submissions, an outline works programme is provided.

1.16. It is accepted that the risk of flooding of the proposed development is very low

1.17. Considering the revised submissions, the BIA meets the requirements of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 17 August 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 35 Templewood Avenue, London NW3 7UY and 2017/4498/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.
- Local Plan (2017): Policy A5 Basements.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

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 *"Excavation of new basement level; erection of 2 storey extension to south east corner of the site to join the south and east wings; erection of new lift/stairwell to the eastern elevation of the south wing up to third floor level, extension of south wing 3rd floor level; installation of car lift to east elevation; refurbishment of listed swimming pool and associated landscaping."*

The Audit Instruction also confirmed that 35 Templewood Avenue involved, or was a neighbour to, listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 22 September 2017 and gained access to the following relevant documents for audit purposes:

- Architects General Arrangement Plans & Sections Existing (December 2016) and Proposed (July 2017)
- Desk Study, Ground Investigation & Basement Impact Assessment Report (BIA) including appendices prepared by Jomas Associates 10 August 2017
- Structural Methodology Statement for Basement Development (SMS) prepared by Barrett Mahony Rev P2 11 September 2017
- Design and Access Statement (DAS)
- Ground Movement Assessment prepared by Jomas Associates 05 September 2017
- Arboricultural and Planning Integration Report prepared by GHAtrees 12 December 2016
- Tree Constraints Plan November 2016
- Planning Comments and Response

2.7. The following supplementary documents were provided to CampbellReith between November 2017 and January 2018:

- Desk Study, Ground Investigation & Basement Impact Assessment Report (BIA) including appendices V1.1 prepared by Jomas Associates, November 2017
- An outline programme of works
- Existing and proposed drainage layouts
- Ground Movement Assessment V2 prepared by Jomas Associates, November 2017
- Email to CampbellReith from Jomas Associates with GMA statements and attachments, 03 January 2018
- Updated structural plans and sections
- Sections indicating neighbouring foundation depths

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	Updated in revised submissions
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
Are suitable 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?	Yes	Updated in revised submissions
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Updated in revised submissions
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Updated in revised submissions
Is a conceptual model presented?	Yes	

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Updated in revised submissions
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Updated in revised submissions
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Updated in revised submissions
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
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?	Yes	Updated in revised submissions
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	
Are the baseline conditions described, based on the GSD?	Yes	

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Updated in revised submissions
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	
Has the need for monitoring during construction been considered?	Yes	Updated in revised submissions
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Updated in revised submissions
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Updated in revised submissions
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 1?	Yes	Updated in revised submissions

Item	Yes/No/NA	Comment
Are non-technical summaries provided?	No	Executive summary provided, although still technical in nature

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been prepared by Jomas Associates (JA). The BIA includes a Ground Investigation (GI) and a desk study prepared by Groundsure. A Structural Methodology Statement for Basement Development (SMS) has been prepared by Barrett Mahony Consulting Engineers. The qualifications of the author of the BIA and the associated reports are in compliance with the requirements of CPG4.

4.2. The BIA includes screening, site investigations and impact assessment stages as defined and required in the LBC Planning Guidance document 'Basements and Lightwells (CPG4)', dated July 2015. The original BIA has been revised to include full Screening and Scoping assessments, plus relevant reference documentation.

4.3. 35 Templewood Avenue is an existing L-shaped building on plan, with the height of the building varying between two and four stories. It is located to the west of Hampstead Heath. There is an independent swimming pool structure with a glass domed roof to the rear of the L-shaped building. The swimming pool originally formed part of the neighbouring Grade II listed Schreiber building, which was constructed in 1968. The swimming pool and part of the garden where separated from the main Schreiber building following a change of ownership in the early 1990s and now form part of the 35 Templewood Avenue plot. The L-shaped dwelling was constructed on this plot adjacent to the existing Grade II listed swimming pool building.

4.4. 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 35 Templewood Avenue is located in the Redington and Frognal Conservation Area. It also confirmed that the neighbouring Schreiber building and the swimming pool at 35 Templewood Avenue are Grade II listed buildings.

4.5. The proposed works include the excavation of a new single story basement beneath the full footprint of the existing building, extending beyond the existing footprint at the rear adjacent to the swimming pool and to the front entrance to the basement garage. The depth of the proposed basement is approximately 3.7m below the existing lower ground floor. It is proposed to construct the new basement by forming reinforced concrete underpins in a hit and miss sequence beneath the existing property. It is proposed to construct the basement car park entrance to the front using a contiguous piled wall.

4.6. There are some discrepancies between the BIA and the SMS regarding the proposals for the existing listed swimming pool building. The BIA states that the proposal is to rebuild the existing buried swimming pool at a different location on the site however the SMS noted the swimming pool remaining as existing. The DAS confirms that the current proposal is to keep the listed swimming pool building in its current position.

4.7. The Arboricultural Report provided notes that the scheme requires the removal of a small number of relatively insignificant tress and that retained trees are at a satisfactory distance from the proposed new structures and highly unlikely to give rise to any issues. However this information is contradicted by the 'Tree Constraints Plan', which shows the root protection zones of two significant trees overlapping with the proposed basement construction. This should be considered and revised as required during detailed design.

4.8. It is accepted that there is a low shrink/swell potential in the Bagshot Formation, as noted in the BIA. The SMS notes that Cellcore heave board will be provided beneath the basement slab to mitigate the impact of heave.

4.9. A GI has been undertaken at the site by Jomas, June 2017. 2No. window sample boreholes to a depth of 6m and 1No. foundation trial pit where carried out. The investigations identified Made Ground up to 1m deep, underlain by sandy clay, Bagshot Formation, to the base of the bore holes.

4.10. The BIA confirms that no groundwater strikes where recorded during the ground investigations. Groundwater monitoring has been carried out, however, only over a very short period of time over the summer months. Allowance should be made for seasonal variations to the watertable and possible mitigation measures. However it is accepted that the proposed basement construction is unlikely to extend below the groundwater level. The basement retaining wall designs assume the ground water level at 1.0m bgl, in line with good practice procedures. Preliminary designs have been provided for the retaining walls. A ground bearing capacity of 150kN/m^2 has been adopted for the design, as recommended in the GI.

4.11. The proposed construction sequence is to remove the existing ground floor and extend the internal and external load bearing walls down to form the basement walls using traditional underpinning techniques, extending the foundations into the Bagshot Formation to a depth of approximately 3.7m bgl. The perimeter wall and underpins are to be laterally propped in the temporary condition, allowing the reinforced concrete basement slabs and walls to be constructed. It is proposed to cut back the face of the concrete ground beam/trench fill foundations flush with the face of the underpin wall to allow the underpins to be constructed. Following completion of the underpinning, it is then proposed to install the steel plunge columns within 450mm diameter piles and the proposed contagious piles to the carpark entrance. The reduced level dig well then be undertaken, installing temporary propping as the level reduces to the proposed basement slab formation level. The basement slab, walls and ground floor slab will then be constructed to complete the basement construction.

4.12. The GMA indicates that 33 Templewood Avenue contains an existing basement level to the entire building footprint. The revised submissions provides information on neighbouring foundation depths and basement levels.

4.13. Temporary works propping and sequencing proposals are provided. Assuming that the works are carefully controlled and monitored, the detail of temporary works and construction method can be considered in accordance with CPG4.

4.14. A movement monitoring proposal has been provided as part of the SMS. The update GMA (V2) has been extended to include all the structures within the zone of influence, utilities and the highways. Movement monitoring of the neighbouring properties and swimming pool is proposed. Trigger values are considered appropriate.

4.15. The GMA indicates the potential damage to neighbouring properties as no higher than Category 1 on the Burland scale, 'Slight Damage'. The GMA makes reference to carrying out the assessment to determine horizontal and vertical movement in accordance with CIRIA 580 which is considered a conservative approach to calculating ground movements beneath an underpinned building. Assuming good workmanship and close control, implementing the proposed monitoring strategy and maximum 5mm structural movements, it is considered feasible that the works can be completed with a maximum of Category 1 damage.

4.16. Updated structural drawings confirm L shaped reinforced concrete retaining walls to lightwells.

4.17. The proposed development does not increase the impermeable site area. The revised submissions confirm a SUDS scheme will be adopted with hydrobrake to limit peak discharge flows off-site, which should be a benefit to the hydrological environment.

4.18. Considering that the proposed basement is to be underlain by a Secondary A aquifer, it is accepted that the proposed basement is unlikely to extend into the groundwater and is unlikely to impact on the wider hydrogeology of the area.

4.19. The current sloping entrance to the basement carpark is identified in the screening as a slope stability concern. The scoping assessment considers the slope to be man-made and as such adequately engineered to maintain stability.

4.20. It is accepted that the risk of flooding of the proposed development is very low.

4.21. A summary of queries and response dates is presented in Appendix 2.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA), Structural Methodology Statement (SMS) and Ground Movement Assessment (GMA) have been carried out using individuals who possess suitable qualifications in compliance with the requirements of CPG4.

5.2. The original BIA has been revised to include full Screening and Scoping assessments, plus relevant reference documentation.

5.3. Generally it is proposed to construct the new basement by forming reinforced concrete underpins in a hit and miss sequence, as described in the SMS. Suitable propping and temporary works are proposed to maintain stability.

5.4. The BIA has confirmed that the proposed basement will be founded with the Bagshot Formation. Groundwater monitoring has confirmed that the proposed basement is unlikely to extend below the water table. It is accepted that the proposed basement construction will not impact the wider hydrogeology of the area.

5.5. The current basement proposal clashes with the root protection zone noted on the 'Tree Constraints Plan'. This should be considered and revised as required during detailed design.

5.6. A revised GMA has been presented that confirms damage to structures within the zone of influence will be a maximum of Category 1 (Very Slight) and assesses there will be no adverse impact to utility infrastructure and highways.

5.7. The movement monitoring proposal should be expanded to include the neighbouring infrastructure and Grade II listed swimming pool building, and should be secured via planning condition planning condition.

5.8. The proposed development does not increase the impermeable site area. The revised submissions confirm a SUDS scheme will be adopted with hydrobrake to limit peak discharge flows off-site, which should be a benefit to the hydrological environment.

5.9. In the revised submissions, an outline works programme is provided.

5.10. It is accepted that the risk of flooding of the proposed development is very low

5.11. Considering the revised submissions, the BIA meets the requirements of CPG4.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Kirsch	9 West Heath Road, NW3 7UX	11/09/17	Impact on existing structure with in 5m of property. Impact on groundwater.	Refer to Section 4.0 of the audit for comments on groundwater, ground movement assessment and predicted damage categories.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA General	Indicative programme of works noting anticipated works and duration periods should be provided.	Closed	December 2017
2	Stability, Hydrogeology, Hydrology	Responses to be provided for all screening questions as set out in CPG4, Figure 3, 4 and 5.	Closed	December 2017
3	Stability, Hydrogeology, Hydrology	Scoping should clearly identify mitigation measures for each of the screening questions answered 'Yes/Unknown'.	Closed	December 2017
4	Stability	GMA should also include the surrounding roadways within 5m, the existing Grade II listed swimming pool on site, and clarification of parameters taken for the analysis of Grade II listed Schrieber House.	Closed	January 2018
5	Hydrology	Clarification on surface water discharge to the existing sewer system required, with details of SUDS provided if required.	Closed	December 2017
6	Stability	Details of construction of south lightwell as indicated on proposed ground floor plan	Closed	December 2017

Appendix 3: Supplementary Supporting Documents

Desk Study, Ground Investigation & Basement Impact Assessment Report (BIA) including appendices V1.1 prepared by Jomas Associates, November 2017

An outline programme of works

Existing and proposed drainage layouts

Ground Movement Assessment V2 prepared by Jomas Associates, November 2017

Email to CampbellReith from Jomas Associates with GMA statements and attachments, 03 January 2018

Updated structural plans and sections

Sections indicating neighbouring foundation depths