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69 Avenue Road
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NW8 6HP

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 13398-39
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 69 Avenue Road, NW8 6HP (planning reference 2020/2330/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. Details of the site layout and proposed development are given in paragraphs 4.2 and 4.3.

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 site investigation indicates the proposed basement will be excavated in the Head Deposits and London Clay.

1.8. The BIA confirmed that there will be no adverse impact on the hydrogeological environment.

1.9. There will be an increase in surface water run-off from the site. The Flood Risk Assessment states that a sustainable urban drainage system (SuDS) should be implemented to ensure the surface water rates do not increase post development.

1.10. The Lead Local Flood Authority submitted a response (see Appendix 3) where further actions/clarifications are required on the FRA, water efficiency, sewers pressure, drainage design etc. Liaison shall be made with the local authority as part of the detailed drainage design.

1.11. The site is located close to the original route of a tributary of the River Tyburn, one of the 'lost rivers' of London. The BIA confirmed that the river will not be encountered during the excavation. However, mitigation measures in case the culvert is encountered during the basement construction should be considered by the appointed contractor.

1.12. A Basement Structural Methodology has been presented as requested in the previous BIA audit.

1.13. The GMA has been reviewed in accordance with the queries raised in the previous BIA audit.

1.14. A check shall be made against NHBC guidelines when a detailed proposal is available, to ensure

that neighbouring foundations will not be adversely affected by swelling of the clay soils due to trees removal.

1.15. Considering the additional information presented, the BIA meets the requirements of Camden Planning Guidance: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 6 August 2020 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 69 Avenue Road, London NW8 6HP, Camden Reference 2020/2330/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 "*Demolition of existing side extension and erection of a single storey side and rear extension; erection of a two storey rear extension with associated roof alterations; excavation of a basement; and associated works*."

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

2.7. CampbellReith accessed LBC's Planning Portal on 25th August 2020 and gained access to the following relevant documents for audit purposes:

- Basement Impact and Ground Movement Assessment Report (ref.: J19104), dated May 2020, by Geotechnical & Environmental Associates Ltd;
- Existing and proposed plans, elevations and sections by KSR Architects & Interior Designers;

- Surface Water Flow and Flood Risk Assessment (ref.:18024), dated February 2020, by Water Environment Limited;
- Arboricultural Impact Assessment (ref.: KSR/69AVR/AIA/02a), dated February 2020, by Landmark Trees.
- Lead Local Flood Authority comments.

2.8. CampbellReith issued on 02/09/2020 a draft audit report (NSjap13398-39-020920-69 Avenue Road-D1) with comments on the above BIA documents.

2.9. In response to the initial audit report CampbellReith received from LBC, the following documents:

- Basement Impact Assessment – Structural Methodology (ref.: 200203, Rev. 1) dated November 2020, by Croft Structural Engineers;
- Updated Basement Impact and Ground Movement Assessment Report (ref.: J19104), Issue no.2), dated November 2020, by Geotechnical & Environmental Associates Ltd;
- Updated Surface Water Flow and Flood Risk Assessment (ref.:18024, Rev A), dated December 2020, by Water Environment Limited;
- Thames Water Asset Location Search;
- Response to the London Borough of Camden Lead Local Flood Authority, dated 14/09/2020 by Water Environment Limited.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Paragraph 1.3.2. 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	See Sections 2 and 3 of the BIA.
Are suitable plan/maps included?	Yes	The assessment is supported by suitable plan/maps. Where not presented in the report, they are referenced in Section 13 of the BIA. A survey plan showing the location of the sewers within the zone of influence of the proposed basement has been presented.
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 BIA.
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 and 7 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 1 of the BIA.
Is monitoring data presented?	Yes	Section 5.4 of the BIA.
Is the ground investigation informed by a desk study?	Yes	Information presented in Section 2 of the BIA.
Has a site walkover been undertaken?	Yes	As part of the site investigation.
Is the presence/absence of adjacent or nearby basements confirmed?	No	However, they have been conservatively assumed in the GMA.
Is a geotechnical interpretation presented?	Yes	Section 7.1 and 8.1.1 of the BIA.
Does the geotechnical interpretation include information on retaining wall design?	Yes	As above.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural report, FRA.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Foundation details of neighbouring foundations are assumed.

Item	Yes/No/NA	Comment
Is an Impact Assessment provided?	Yes	Part 4 of the BIA.
Are estimates of ground movement and structural impact presented?	Yes	Part 3 of the BIA.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	Mitigation measures in case the culverted River Tyburn is encountered on site during the excavation have been presented. The GMA has been revised as per previous audit comments.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	As above.
Has the need for monitoring during construction been considered?	Yes	Paragraph 11.2 of the BIA.
Have the residual (after mitigation) impacts been clearly identified?	Yes	The BIA concludes that residual impacts will be negligible.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	The GMA has been reviewed in accordance with the original audit's comments.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	A formal response to the Lead Local Flood Authority comments (Appendix 3) has been presented in the BIA. The applicant shall liaise with the local authority during the detailed design stage to resolve any pending issues.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	As above.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	Section 11.1 of the BIA.
Are non-technical summaries provided?	Yes	Section 13.3 of the BIA.

4.0 DISCUSSION

4.1. The BIA was undertaken by Geotechnical & Geoenvironmental Associates Ltd (GEA) and the reported qualifications of the authors are in line with those requested by LBC guidance.

4.2. The site is currently occupied by a detached two storey, L-shaped building. It was built in the late 1930's and is unlisted. The original building has been enlarged to the north-west with a large single storey extension incorporating a garage and service areas. A single level basement is present beneath part of the single storey side extension. There is a driveway at the front of the property and a garden at the rear.

4.3. The proposed development comprises the retention of the original building with a rear extension to the south west facing the garden, a new wing to the north-west and a new basement with swimming pool beneath the house and part of the garden. The basement will extend to a depth of c. 4.00m bgl, with additional 2.00m excavation in the area of the proposed swimming pool.

4.4. The LBC Instruction to proceed with the audit identified that the applicant's property is not listed and that the basement proposal does not neighbour any listed buildings. The site is bounded on three sides by adjacent buildings. The details of the neighbouring foundations have not been confirmed but have conservatively been assumed in the BIA.

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. A site investigation has been undertaken comprising five boreholes to inform on the deep ground conditions and nine foundation inspection pits were undertaken to provide information on the existing foundations. The ground investigation indicates Made Ground to a maximum depth of 2.00m bgl. The Head Deposits underlie the Made Ground to a depth of between 5.50 and 6.50m bgl. The London Clay Formation underlies the Head Deposits and is proven to the bottom of the boreholes to a depth of 20.00m bgl.

4.7. Groundwater was encountered during drilling, associated with claystone bands within the London Clay at depth of between 8.60 and 9.50mbgl. Three boreholes were installed with standpipes and monitoring was undertaken at the time of the site investigation (2016) and in February 2020. The most recent water levels observed were up to 1.70m bgl. The BIA states that those levels are likely to have resulted from entry of surface water inflows following period of heavy rain. The BIA also states that the London Clay is designated as unproductive strata, and as such, considering the depth and extent of the proposed basement there will be no adverse impact on the hydrogeological environment and this is accepted.

4.8. As the basement will extend below the garden, impermeable areas on site will be increasing (approximately by 200m^2) and subsequently there will be an increase in surface water run-off from the site. A Flood Risk Assessment (FRA) has been presented. The FRA report states that it will be required to implement a sustainable urban drainage system (SuDS) to ensure the surface water rates do not increase post development. It is noted that the site is located within the Critical Drainage Area Group3_005.

4.9. The site is at low risk from flooding from rivers, seas and reservoirs and at medium risk from surface water flooding. The FRA states that after the application of the mitigation measures presented in the report, the residual risk from surface water flooding will be low. However, the Lead Local Flood Authority submitted a response (see Appendix 3) where further actions/clarification are required. The applicant submitted a formal response to the local authority. The applicant shall liaise with the local authority during the detailed design stage to resolve any pending issues.

4.10. It is understood that the site is located close to the original route of a tributary of the River Tyburn, one of the 'lost rivers' of London. Based on the assets' survey presented, the BIA confirmed that the watercourse is incorporated into the local sewer network and that no evidence of the presence of the river was found on site during the site walkover and investigation. Recommendations for the contractor to have a contingency plan in place to deal with higher than expected inflows is already included within the existing report to address this risk.

4.11. According to the BIA, the sequence of works will comprise the installation of a contiguous piled wall to support the majority of the basement excavation, whilst limited sections of underpinning will be installed on the southern part of the site, where the basement is coincident with the existing foundations. A Basement Structural Methodology has been presented. The report confirms that the retaining wall will be propped in the temporary case. Outline retaining wall design calculations are also presented.

4.12. Geotechnical parameters to inform settlement, retaining wall calculations and foundation design have been presented in the BIA and are considered reasonable. The BIA indicates an allowable bearing capacity of 150kPa for the ground at formation level. The proposed geotechnical parameters have been adopted in the outline retaining wall design calculations.

4.13. 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. Analysis of horizontal and vertical ground movements has been undertaken utilising proprietary software (PDisp and XDisp) and analysed basement excavation in both the short and long term. Ground movement curves due to pile installation presented in CIRIA C760 have been halved in the GMA as suggested by a paper from Ball et al. However, within the updated BIA the analysis has been re-run with the more conservative ground movement curves from CIRIA C760.

The results indicate that category of damage occurring at neighbouring properties will be within Category 1 of the Burland Scale.

4.14. The depth of the piled retaining wall has been set at c. 10.00m bgl in the main basement area and at c. 12.00m bgl in the vicinity of the proposed swimming pool. The BIA confirmed that the adopted pile lengths in the existing analysis represent a conservative assessment of the pile length required for stability, with an embedment equivalent to, or slightly greater than, the retained height.

4.15. The BIA indicates that the predictions of ground movement based on the GMA should be checked by monitoring of adjacent properties and structures and states that a detailed ground movement monitoring strategy will be developed at a later stage.

4.16. An assets survey plan has been presented. The BIA confirmed the proposed basement is not located within 5m of a public highway nor within the vicinity of any tunnels or sensitive assets.

4.17. The Screening section of the BIA indicates the area to be prone to seasonal shrink-swell which can result in foundation movements. An Arboricultural Impact Assessment has been undertaken. The BIA states that a number of trees may be felled during the proposed development, noting that a detailed proposal has not been developed yet. At this stage, it is accepted that the potential impact of these tree removal works is considered to be low and at sufficient distance from the adjoining properties. However, it is recommended that a final check is made against NHBC guidelines as part of the detailed design of the scheme, to ensure that neighbouring foundations are not going to be adversely affected by future swelling of the clay soils due to trees removal.

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 site investigation indicates the proposed basement will be founded in the Head Deposits and London Clay.

5.4. The BIA confirmed that there will be no adverse impact on the hydrogeological environment.

5.5. There will be an increase in surface water run-off from the site. The FRA states that a sustainable urban drainage system (SuDS) shall be implemented to ensure the surface water rates do not increase post development.

5.6. The Lead Local Flood Authority submitted a response (see Appendix 3) where further actions/clarification are required on the FRA, water efficiency, sewers pressure, drainage design etc. A formal response has been presented in the BIA. The applicant shall liaise further with the local authority in that regard during the detailed design stage.

5.7. The site is located close to the original route of a tributary of the River Tyburn, one of the 'lost rivers' of London. The BIA confirmed that the river is not expected to be encountered during the excavation. However, relevant mitigation measures should be considered by the appointed contractor during the construction.

5.8. A Basement Structural Methodology has been presented as requested in the previous BIA audit.

5.9. The GMA has been reviewed in accordance to the queries raised in the previous BIA audit.

5.10. It is recommended that a final check is made in accordance with NHBC guidelines when a detailed proposal is available, to ensure that neighbouring foundations are not adversely affected by future swelling of the clay soils due to trees removal.

5.11. Considering the additional information presented, the BIA meets the requirements of Camden Planning Guidance: Basements.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Surface flow and flooding	The Lead Local Flood Authority submitted a response (see Appendix 3). It is recommended liaison is ongoing with the local authority during the detailed design stage.	Closed – See Section 4.9.	03/03/21
2	Surface flow and flooding	The presence on site of a historically culverted river cannot be fully discounted. Mitigation measures in case the culvert is encountered during the basement construction should be included in the BIA.	Closed – See Section 4.10.	03/03/21
3	BIA format	The Croft Structural Engineers report (ref.: 200203, April 2020) has not been presented and is required. The structural engineer should adopt the value for allowable bearing capacity presented in the BIA.	Closed – See Sections 4.11. – 4.12.	03/03/21
4	Stability	The GMA and damage assessment should be revised according to Sections 4.13 – 4.17 of this audit. This includes review of the analysis method, clarification on the piled retaining wall depth, estimate of ground movements for nearby infrastructure.	Closed – See Sections 4.13 – 4.16.	03/03/21
5	Stability	It is recommended that a final check is made in accordance with NHBC guidelines as part of the detailed design, to ensure that neighbouring foundations will not be adversely affected by future swelling of the clay soils due to trees removal.	Note Only	-

Appendix 3: Supplementary Supporting Documents

Lead Local Flood Authority comments

Lead Local Flood Authority comments

Scheme Address	69 Avenue Road
Planning Reference	2020/2330/P
Date	12/8/20

The site is on a previously flooded street (2002 major flood incident) and therefore is designated locally as an area of higher flood risk under the Local Plan (policy CC3). See extract below from Camden's Strategic Flood Risk Assessment.

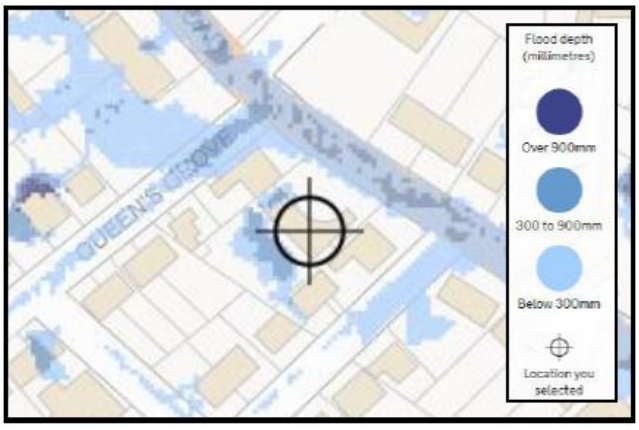


Figure 5 - GOV.UK Low Occurrence Risk of Flooding from Surface Water

Figure 5 from the report gives an approximate indication of the modelled extents and locations of surface water flooding at or around the site.

In addition section 5.22 of the Surface Water Flow and Flood Risk Assessment identifies that the site as being located within close proximity to the original route of a tributary of the River Tyburn and that overland flow may still be following the original course. Overland flow is shown to drain along Avenue Road.

Local Plan policy CC3 requires developments to reduce their water consumption, reduce pressure on the combined sewer network and mitigate the risk of flooding as per following extracts for areas of elevated flood risk:

- Developments must be designed to be water efficient. This can be achieved through the installation of water efficient fittings and appliances (which can help reduce energy consumption as well as water consumption) and by capturing and re-using rain water and grey water on-site. Residential developments will be expected to meet the requirement of 110 litres per person per day (including 5 litres for external water use)

- A Flood Risk Assessment should identify how a development will be designed to cope with flooding and how the risk will be mitigated without increasing the risk elsewhere. Recommendations in the FRA will be secured by planning condition.

- Development located within areas at risk of flooding should not place additional pressure on the existing drainage infrastructure.

- The Council will require developments to utilise Sustainable Drainage Systems (SuDS), to achieve greenfield run-off rates, unless demonstrated that this is not Feasible. Surface water should be managed as close to its source as possible, in line with the drainage hierarchy in the London Plan.

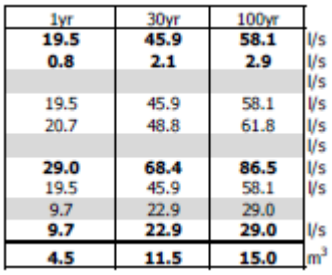
- Development should also demonstrate how it will mitigate the potential flooding of other properties. When determining the suitability of SuDS, vulnerability and the importance of local ecological resources, such as water quality and biodiversity should be considered

- A drainage report should be submitted with all major applications, basement developments and other vulnerable development in areas identified at risk of flooding. This should include:
    - identification of flood risk;
    - assessment of existing run-off rates;
    - calculation of greenfield run-off rates;
    - identification of measures, in line with the drainage hierarchy, to reduce runoff
    - rates; and
    - calculation of proposed run-off rates.

- The Council will not permit basement schemes which include habitable rooms and other sensitive uses for self-contained basement flats and other underground structures in areas prone to flooding ("Policy A5 Basements").

The following comments and required actions are noted:

Policy requirement	***Comments***	***Actions required***
Water efficiency	Energy and Sustainability Statement Page 19 states the development aim to reduce water consumption to below 105 litres per person per day.	To be secured through s106
FRA	A FRA is submitted. The FRA section 5.3 notes that "Avenue Road is recorded of being flooded in the 2002 event. There is no record of the site being affected by this flooding event." Proposed mitigation includes the following: • the basement extension includes an appropriate tanked system or equivalent to prevent groundwater ingress into the basement. • Finished Floor Levels being set above the design flood water level. (150mm above the surrounding ground levels – 5.32). With the mitigation measure of retaining walls for the proposed lightwell in place. • It is recommended that non-return valves or a positive pumped system are implemented within the proposed basement to reduce the risk of sewers surcharging into the property. (5.31) • Levels on the site are higher than Avenue Road carriageway (5.31) • Proposed to implement a green roof with 10-15cm subbase which is underlain with a blue roof.	The road was previously flooded (2002) and therefore is considered locally designated as an area of higher flood risk. In addition the site is in close proximity to the original route of a tributary of the River Tyburn and overland flow may still be following the original course. See "No habitable basements" below
No extra pressure on sewers	5.30 Flows off the site without any mitigation will increase post development (ignoring climate change), as there is an increase in hard standing on the site. The site will be implementing mitigation measures to reduce surface water flows off the site post development. These mitigation measures should not change the risk of flooding from sewers.	Further details required.
SuDS and drainage hierarchy	Green –blue roof proposed roof to ensure a 50% decrease in surface water runoff rates.	Blue-green combination roof is encouraged. Details required.

Drainage report	5.65 The detailed surface water system should be designed in accordance with local planning policy and will be designed such that runoff from the 1% AEP rainfall event plus climate change allowance is fully retained on the site and discharged at the controlled rate. Full drainage design will be undertaken at the detailed design stage 	Drainage should include climate change +40% and include a maintenance plan.
No habitable basements	Basement includes habitable rooms and sensitive uses such as plant rooms.	The Local Plan is clear in policy A5 that the Council will not permit basement schemes which include habitable room and other sensitive uses in areas prone to flooding. The plans propose a number of habitable rooms and also plant rooms which could create risks to health and safety if flooded. Proposed use of the basement should not include habitable rooms or sensitive uses. If the proposals are not amended then refusal is recommended.

Further action for applicant: Please see list above.

The proposal is in an area considered locally designated as an area of higher flood risk and therefore the basement should not include habitable rooms or other sensitive uses (such as plant rooms) and refusal is recommended if this is not amended. In addition the drainage plan does not account for climate change and does not set out the required storage volumes.

Recommendation: Further information required. Refusal recommended if the basement includes habitable rooms and sensitive uses.

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