

79 Avenue Road

Basement Impact Assessment  
Audit

For  
London Borough of Camden

Project Number: 13398-08  
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May 2020

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## Document Details

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Contents

1.0 Non-technical summary ..... 1

2.0 Introduction ..... 2

3.0 Basement Impact Assessment Audit Check List..... 4

4.0 Discussion ..... 7

5.0 Conclusions ..... 9

Appendix

- Appendix 1: Residents' Consultation Comments
- Appendix 2: Audit Query Tracker
- Appendix 3: Supplementary Supporting Documents

## 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 79 Avenue Road, London, NW8 6JD (planning reference 2020/0519/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 has been prepared by Card Geotechnics Limited, by individuals who possess suitable qualifications.
- 1.5. The development proposes a double basement that will be founded within the London Clay Formation. There will be no impact to the wider hydrogeological environment.
- 1.6. A Flood Risk Assessment has been undertaken and it is accepted that there will be no significant impact to the hydrology of the area.
- 1.7. Consultation with the King Scholar Sewer asset owners should be undertaken, with asset protection criteria agreed as applicable.
- 1.8. There are no slope stability issues in regards to the proposed development.
- 1.9. The ground movement assessment has been updated in the revised BIA submission and indicates damage to neighbours will be no greater than Category 1 (Very Slight).
- 1.10. It is recommended that a Basement Construction Plan (BCP) is submitted to ensure a suitably robust monitoring strategy and mitigation scheme are adopted, in line with assumptions made in the ground movement assessment.
- 1.11. The submission suitably addresses the queries in Appendix 2 on the basis that the recommended BCP is submitted. The BIA is considered to meet the criteria of CPG Basements.

## 2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 2 March 2020 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 79 Avenue Road, London, NW8 6JD.
- 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 Basements. March 2018.
  - Camden Development Policy (DP) 27: Basements and Lightwells.
  - Camden Development Policy (DP) 23: Water.
  - Local Plan 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;
  - d) 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 and rebuild of the existing residential dwelling for a single residential dwelling with basement (Class C3)"*.
- 2.6. CampbellReith accessed LBC's Planning Portal on 5 March 2020 and gained access to the following relevant documents for audit purposes:
- Basement Impact Assessment (BIA), by Card Geotechnics Limited (CGL), ref. CG/38181, rev. 0, dated January 2020.

- Construction Management Statement (CMS), by Form Structural Design, ref. 193219, rev. P1, dated January 2020.
- Flood Risk Assessment (FRA), by Form Structural Design, ref. 193219/001, dated 14 October 2019.
- Proposed and Existing Drawings by KSR Architects & Interior Designers.
- Proposed Cross Sections, by Form Structural Design, re 193219 A(28)01, rev P2, dated December 2019.
- Suggested Sequence of Works Drawings, by Form Structural Design, drawing numbers 193219-FSD-A(30)01 to 05.
- Arboricultural Impact Assessment and Method Statement, by Cantia Arboricultural Services, ref. CAS/2018/246, dated December 2019.
- Planning Comments and Responses.

2.7. The following additional documents were provided to CampbellReith in April 2020 in response to the initial audit report and queries summarised in Appendix 2:

- Card Geotechnics Limited's responses to Audit D1 (provided in Appendix 3 for reference).
- Basement Impact Assessment (BIA), by Card Geotechnics Limited (CGL), ref. CG/38181, rev. 1, dated April 2020.
- Utility records.

### 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	
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	
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Response provided to previous query re Q6.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	One monitoring visit was carried out.
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	
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	Presented in Table 7 of the BIA.
Are reports on other investigations required by screening and scoping presented?	Yes	Flood Risk Assessment and Arboricultural Impact Assessment.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Neighbours considered to have shallow foundations for GMA.
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	



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	
Has the need for monitoring during construction been considered?	Yes	
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	However a Basement Construction Plan (BCP) is recommended to ensure stability final temporary works scheme and monitoring strategy is suitably robust, as per GMA assumptions.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However a Basement Construction Plan (BCP) is recommended to ensure stability final temporary works scheme and monitoring strategy is suitably robust, as per GMA assumptions.
Are non-technical summaries provided?	Yes	

## 4.0 DISCUSSION

- 4.1. The Basement Impact Assessment (BIA) has been carried out by Card Geotechnics Limited (CGL) and the individuals concerned in its production have suitable qualifications.
- 4.2. The Construction Method Statement identified that the site was not a listed building and that the site is not in a conservation area.
- 4.3. The proposed development comprises the demolition of the existing two-storey dwelling on site and the construction of a new three-storey dwelling with two below ground basement levels. The first basement level (B1) will occupy the entire footprint of the new dwelling and will extend into the front and rear garden areas. The second basement level (B2) will occupy a reduced footprint below the first basement level, and is positioned towards the front of the property.
- 4.4. The BIA has identified that the ground conditions on site comprise Made Ground to a maximum depth of 0.5m, below which lies Head Deposits to 2.65m depth (2.15m thickness), with London Clay Formation below this. The upper horizon of the London Clay was identified as a weathered horizon, which extended to 8.85m depth (6.2m thickness).
- 4.5. It is accepted that there are no slope stability issues in relation to the proposed development.
- 4.6. The BIA identifies the King Scholar Sewer, which culverts the River Tyburn, running near the site along Avenue Road. This is also shown in Figure 8 of the Construction Management Statement. No assessment of the impact to the King Scholar Sewer is presented. Whilst it is accepted that the sewer is >20m from the proposed basement, consultation with LBC and the asset owners should be undertaken, with asset protection criteria agreed as applicable.
- 4.7. According to the Flood Risk Assessment (FRA), the proposed development will result in an increase in impermeable site area of >160m<sup>2</sup>. The revised BIA submission has been updated to consider this increase. The FRA outlines the SUDS strategy to mitigate impacts to the hydrological environment, by implementing an attenuation strategy in accordance with best practice and the London Plan, including consideration of climate change.
- 4.8. The basement wall will be constructed using a contiguous pile wall and the method of installation considered in the BIA is continuous flight auger (CFA) piling.
- 4.9. An outline sequence of works is presented in Section 8 of the BIA and in Section 4.1 of the Construction Management Statement. The latter includes underpinning of the party walls in the garden, which is considered in Section 9.1 of the revised BIA.

- 4.10. The outline sequence of works states that the contiguous pile walls for both the B1 and B2 basement levels, and the load bearing piles for the structure, will be installed from ground level (given as 45.80mOD) and will be cut down to the relevant level as the basement excavations progress.
- 4.11. Section 8.2.2 of the BIA identifies the maximum excavation depth of B1 to be 4.74m, and the maximum excavation depth of B2 to be 7.31m. Based on these depths, Table 10 summarises the initial pile wall design and gives a preliminary pile design length of 15m for the north, east and south elevations, and 9.5m for the west elevation. A revised GMA will be required if the final pile length exceeds 15m.
- 4.12. In Section 9.3 of the BIA it is stated that the method of ground movement analysis will be in accordance with CIRIA C760. It is then proposed to reduce the predicted ground movements due to installation of the wall by half, based on a technical paper by Ball, Langdon and Creighton (2014). This approach is considered acceptable only where the proposed development is analogous to that assessed in the technical paper i.e. where monitoring can be used to control construction and provide timely intervention and contingency measures, as required. It is therefore recommended that a monitoring strategy and mitigation scheme are submitted as part of a Basement Construction Plan (BCP) to ensure a suitably robust scheme is adopted, in line with assumptions made in the ground movement assessment (GMA).
- 4.13. The revised BIA submission indicates in Section 9.1 that the foundations of the neighbouring properties are assumed to be at 1m below ground level for the purposes of the GMA, which is considered reasonably conservative.
- 4.14. A damage assessment is presented in the revised BIA and indicates that ground movements will not induce damage greater than Category 1 (Very Slight) for both neighbouring properties. This should be reviewed as part of the BCP, noting also the final design, construction methodology, pile depth and formation levels as 4.8 to 4.11.
- 4.15. Whilst Plate 12 shows the same graph as Plate 13, for the property at No. 77 Avenue Road, it is noted that the assessment data for both properties is provided and has been assessed.

## 5.0 CONCLUSIONS

- 5.1. The BIA has been prepared by individuals who possess suitable qualifications.
- 5.2. The development proposes a double basement that will be founded within the London Clay Formation. There will be no impact to the wider hydrogeological environment.
- 5.3. A Flood Risk Assessment has been undertaken and it is accepted that there will be no significant impact to the hydrology of the area.
- 5.4. Consultation with the King Scholar Sewer asset owners should be undertaken, with asset protection criteria agreed as applicable.
- 5.5. There are no slope stability issues in regards to the proposed development.
- 5.6. The GMA has been updated in the revised BIA submission that indicates that ground movements will not induce damage greater than Category 1 (Very Slight) for both neighbouring properties. This should be reviewed as part of the recommended BCP (as 5.7).
- 5.7. A BCP is recommended to ensure a suitably robust monitoring strategy and mitigation scheme are adopted, in line with assumptions made in the GMA.
- 5.8. The revised submission suitably addresses the queries in Appendix 2 on the basis that the recommended BCP is submitted. The BIA is considered to meet the criteria of CPG Basements.

## Appendix 1: Residents' Consultation Comments

None

## Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Hydrology / Hydrogeology	The BIA Screening and Scoping assessments should be updated to confirm the proposed drainage strategy. The BIA and FRA should be consistent.	Closed	May 2020
2	Stability	Whilst it is accepted that the King Scholar Sewer is >20m from the proposed basement, consultation with LBC and the asset owners should be undertaken, with asset protection criteria agreed as applicable.	Note Only	N/A
3	Stability	The level of adjacent foundations should be clarified (as 4.14).	Closed	May 2020
2	Stability	Assessment of ground movements associated with underpinning the garden party walls should be undertaken (as 4.9, 4.17).	Closed	May 2020
3	Stability	Horizontal movements during the excavation phase do not appear to be consistent with the presented calculations or CIRIA C7660 methodology (as 4.15).	Closed	May 2020
4	Stability	The GMA should assess damage to all structural walls within the zone of influence of the works (as 4.16).	BCP to be provided	May 2020
5	Stability	A monitoring strategy and mitigation scheme should be provided or, in the absence of these documents, a ground movement assessment in full accordance with C760 should be carried out (as 4.13).	BCP to be provided	May 2020

## Appendix 3: Supplementary Supporting Documents

Card Geotechnics Limited's responses to Audit D1



Query No	Subject	Query	Status	Date closed out
1	Hydrology / Hydrogeology	The BIA Screening and Scoping assessments should be updated to confirm the proposed drainage strategy. The BIA and FRA should be consistent.	Open	
2	Stability	Whilst it is accepted that the King Scholar Sewer is >20m from the proposed basement, consultation with LBC and the asset owners should be undertaken, with asset protection criteria agreed as applicable.	Note Only	N/A
3	Stability	The level of adjacent foundations should be clarified (as 4.14).	Open	
2	Stability	Assessment of ground movements associated with underpinning the garden party walls should be undertaken (as 4.9, 4.17).	Open	
3	Stability	Horizontal movements during the excavation phase do not appear to be consistent with the presented calculations or CIRIA C7660 methodology (as 4.15).	Open	
4	Stability	The GMA should assess damage to all structural walls within the zone of influence of the works (as 4.16).	Open	
5	Stability	A monitoring strategy and mitigation scheme should be provided or, in the absence of these documents, a ground movement assessment in full accordance with C760 should be carried out (as 4.13).	Open	

4.7. According to the Flood Risk Assessment (FRA), the proposed development will result in an increase in impermeable site area of >160m<sup>2</sup>. The 'no' responses within the Screening assessments and subsequent justifications given in Tables 3 and 5 of the BIA are therefore not accepted. However, the FRA does consider the increase in impermeable area and outlines the SUDS strategy to mitigate impacts to the hydrological environment, by implementing an attenuation strategy in accordance with best practice and the London Plan, including consideration of climate change. The BIA Screening and Scoping assessments should be updated to confirm the proposed drainage strategy. The BIA and FRA should be consistent.

#### CGL response

The ground conditions across the site comprise of Made Ground overlying Head Deposits, which are underlined by the London Clay Formation. The London Clay Formation is typically of very low permeability, to the extent that the stratum can be described as practically impermeable. During the site investigation no groundwater was encountered and only during the subsequent monitoring visit was groundwater recorded. Given that no groundwater was encountered during the site investigation, it can be assumed that the existing ground conditions across the site have very low permeability.

While the proposed development will increase the total area of hardstanding, it is unlikely to impact surface runoff given the very low permeability of the existing ground conditions across the site. For this reason the response of 'none' was given, however this will be changed to reference the SUDS strategy proposed to mitigate the hydrological impact.

4.14. In Figure 2 of the BIA, the assumed foundations formation level for the two adjacent buildings is given as 44.70mOD; however, it is stated in Section 9.1 that one of the assumptions made for the GMA is that the foundations for the neighbouring properties are assumed to be at ground level. Ground level is given as 45.80mOD for the site, suggesting a 1.1m drop in ground level on both sides of the site. Please provide clarification regarding ground level of the site and surrounding areas, or the FFL of the adjacent properties, and revise the GMA assumptions to ensure consistency.

#### CGL response

The GMA and building impact assessment have assumed that the depth of the neighbouring building foundations are at 1m below ground level (44.8mOD) as would be typical for a residential foundation. Text in Section 9.1 to be updated.

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- 4.9. An outline sequence of works is presented in Section 8 of the BIA and in Section 4.1 of the Construction Management Statement. The latter includes underpinning of the party walls in the garden. This stage of development is not included in the BIA and no assessment of the impact of this underpinning work on the adjacent properties has been undertaken.
- 4.17. As 4.9, movements resulting from the proposed underpinning should be considered within the GMA.

#### CGL response

The underpins are proposed to be constructed using the 'hit-and-miss' construction methodology, by constructing underpins in 1m wide sections in five stages. By following this method, the lateral expansion of the London Clay Formation at each successive underpin section is very localised and therefore unlikely to impact on the strip footing of the adjacent property. Therefore the ground movements and impact on the adjacent properties are expected to be negligible. It is noted that the neighbouring properties are not underpinned.

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- 4.15. Section 9.4, and consequently Section 9.5, does not appear to consider the horizontal movements resulting from excavation of the basement, either as indicated in the WALLAP calculations or in accordance with CIRIA C760. The data source for the horizontal ground movement graphs presented as Plates 9 and 11 should be clarified.

#### CGL response

Lateral ground movements have been based on the output from the WALLAP model by assuming a parabolic reduction in lateral ground movements away from the pile wall. Maximum horizontal ground movements across each neighbouring building are presented in Table 13 and Table 15 to Table 17.

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- 4.16. Figure 2 of the BIA gives the shortest distance between the adjacent properties at No.s 77 and 81 and the existing building on site as 2.88m and 1.32m respectively, on the eastern sides of the buildings. However, the critical section lines shown on Figures 6, 7 and 8 are located on the west side of the building, where the neighbouring buildings are further from the proposed basement. Any update GMA should assess impacts to all structural walls within the zone of influence of the works.

#### CGL response

The position of the critical section lines has been determined based on the worst case for vertical movements produced by PDISP. The distance between the pile retaining wall and the neighbouring

building foundations, as presented in Plate 8 to Plate 11, is based on the minimum distance, therefore the analysis captures the theoretical worst case of both vertical movements and lateral displacements.

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- 4.13. In Section 9.3 of the BIA it is stated that the method of ground movement analysis will be in accordance with CIRIA C760. It is then proposed to reduce the predicted ground movements due to installation of the wall by half, based on a technical paper by Ball, Langdon and Creighton (2014). This approach is considered acceptable only where the proposed development is analogous to that assessed in the technical paper i.e. where monitoring can be used to control construction and provide timely intervention and contingency measures, as required. A monitoring strategy and mitigation scheme should be provided or, in the absence of these documents, a ground movement assessment in full accordance with C760 should be carried out.

CGL response

A monitoring strategy is provided in Section 9.7. The strategy recommends carrying out monitoring of adjacent buildings and the preparation of mitigation strategies and predefined trigger values. Predefined trigger values and specific mitigation strategies will need to be agreed following discussions concerning the party wall.

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