

**41 Frogna  
London NW3 6YD**

**Basement Impact Assessment  
Audit**

For  
London Borough of Camden

Project Number: 12066-05

June 2015

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## Document Details

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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 41 Frognal (planning reference 2015/2026/P). The basement is considered to fall with Category B as defined by the Terms of Reference.
- 1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.
- 1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and review it against an agreed audit check list.
- 1.4. The BIA has been prepared and revised by personnel who have suitable qualifications.
- 1.5. The retained walls of the existing property will be underpinned and basement perimeter walls will be formed using piles in order to construct the proposed single storey basement.
- 1.6. It is accepted that the development will have no adverse effect on drainage or run off as there is no increase in impermeable area and the site is not in an area known to be at risk from surface water flooding.
- 1.7. It is accepted that the basement will be founded in London Clay and groundwater will not be affected by the development.
- 1.8. Although the surrounding slopes to the development are stable, the northern end of the basement is in close proximity to no. 2 Frognal Close and the retaining wall boundary between the two properties. Further investigations of existing footings are requested to inform the ground movement assessment and allow confirmation of the potential category of damage to adjacent properties.
- 1.9. The ground movement assessment subsequently received indicates potential damage is likely to occur to some walls of no. 2 Frognal Close and the Frognal Close garage block as well as the boundary retaining wall, although no predicted damage was greater than Burland Category 2 and, hence, complied with guidance within CPG4. However, insufficient supporting evidence is provided in the GMA to confirm whether the damage categories have been correctly derived.
- 1.10. Further groundwater monitoring should be carried out to confirm that groundwater will not be encountered during basement excavation, thus minimising the impact on adjacent structures, as offered within the BIA.

- 1.11. Investigation should be undertaken to quantify the presence of existing or consented basements in the vicinity of the proposal site to determine their hydrogeological impact.

## 2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 19 May 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 41 Frognal, Camden Reference 2015/2026/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 *"Part 2/part3 storey rear and side extension including the excavation of a basement and the creation of an additional self-contained dwelling."*

and confirmed that although the basement proposals did not involve a listed building, the neighbouring properties along Frognal Close are listed. 41 Frognal lies within the Redington/Frognal Conservation Area.

- 2.6. CampbellReith accessed LBC's Planning Portal on 9 June 2015 and gained access to the following relevant documents for audit purposes:
- Structural Engineering Report and Subterranean Construction Method Statement (CMS)
  - Construction Management Plan (CMP)
  - Design and Access Statement
  - Desk Study & Basement Impact Assessment Report (BIA)
- 2.7. LBC's Planning Department forwarded on 14 June an Addendum Ground Movements Analysis, the lack of which had already been discussed in section 4.7 of this Audit.
- 2.8. LBC's Planning Department identified a number of residents' consultation comments as being pertinent to the audit of the BIA. The comments have been reviewed and are summarised in Appendix A.

### 3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Section 1.3.2.
Is data required by Cl.233 of the GSD presented?	Yes	BIA, CMP and CMS.
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 Section 2.4 and 2.5.
Are suitable plan/maps included?	Yes	BIA Section 2.4 and 2.5.
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 3.1.2.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 3.1.1.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 3.1.3.
Is a conceptual model presented?	Yes	BIA Section 7.0.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 4.0.



Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 4.0.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 4.0.
Is factual ground investigation data provided?	Yes	BIA Appendix
Is monitoring data presented?	Yes	Standpipes monitored twice, see BIA Section 4.2.
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?	No	
Is a geotechnical interpretation presented?	Yes	BIA Section 8.0.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Section 8.1.1.
Are reports on other investigations required by screening and scoping presented?	na	
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	
Is an Impact Assessment provided?	Yes	BIA Section 9.0.
Are estimates of ground movement and structural impact presented?	Yes	Potential movement monitoring proposed, CMS Section 8.0. Addendum GMA received 14 June.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	No ground movement analysis, subsequently received 14 June.
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	A set of movement monitoring targets may be installed, see CMS Section 8.0. Addendum GMA confirmed requirement.
Have the residual (after mitigation) impacts been clearly identified?	Yes	BIA Section 10.0.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	No	Ground movement assessment received 14 June requires clarification.
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 2?	Yes	Addendum GMA states damage no greater than Burland Category 2, see 4.8 and 4.9, however further clarification is required.
Are non-technical summaries provided?	Yes	

## 4.0 DISCUSSION

- 4.1. The BIA and CMS have been carried out by established firms of consultants and the lead authors and reviewers have suitable qualifications.
- 4.2. The proposed single storey basement encompasses the footprint of the existing building, below a proposed rear extension, and under the existing driveway to the front of the property.
- 4.3. The retained walls of the existing property will be underpinned using traditional construction techniques and the basement perimeter walls will be formed using contiguous bored piles.
- 4.4. It is acknowledged that the basement is founded within the London Clay, which was encountered at between 1.3 metres and 2.3 metres in the two boreholes undertaken as part of the soils investigation. It is accepted that the minor seepages detected in the London Clay do not constitute a continuous water flow and that groundwater will not be affected by the excavation or the basement construction.
- 4.5. The BIA has shown the surrounding slopes to the development are stable and the basement is not within 5 metres of an adjacent highway. However, the northern end of the proposed basement extends to be in close proximity to the boundary between 41 Frognal and 2 Frognal Close and its adjacent retaining wall, see drg. no. 2140825/SK23 within the CSM. This drawing also indicates the existing foundation of 2 Frognal although it is unclear whether this is indicative only or has been confirmed by existing drawings or trial pit investigation.
- 4.6. A system of temporary propping is discussed and shown within the CSM although no mention is made of the external adjacent structures. The BIA identifies, within Section 10.0 "Outstanding Risks and Issues" that *"It would be prudent to carry out additional investigation to confirm the configuration of the existing footings of the house and garden boundary walls, prior to basement construction"*. This should be undertaken to inform the ground movement assessment.
- 4.7. Section B of the BIA Audit Instruction contains a series of questions to be completed by the Applicant. In response to Question 13, the Applicant has indicated *"A Ground Movement Assessment is currently being undertaken and will be issued shortly for review"*. CampbellReith received, from LBC's Planning Department on 14 June 2015, an Addendum Report, Ground Movement Assessment, produced by Geotechnical & Environmental Associates (GEA). This identified the adjacent walls of no. 2 Frognal Close and the boundary retaining wall between the two properties as being potentially sensitive to ground movements caused by piling and excavation for the proposed development, as well as the rear walls of Frognal Close garages. The results of the analysis identified that Very Slight Damage (Burland Category 1) will occur to

the boundary wall, the southwest wall and the northeast wall of 2 Frognal Close while Slight Damage (Burland Category 2) will occur to the rear walls of the Frognal Close garage block. However, the assumptions behind this assessment are not entirely clear and the conclusions cannot be verified. Detailed comments are presented in Appendix 4. The main areas requiring clarification are

- Input and output data are required to confirm assumptions behind the assessment.
- Building footprint dimensions and geometry differ between analyses and do not exactly reflect proposals.
- Confirmation required that movement due to underpinning has been included in damage assessment.
- Clarity required in presentation of output.

- 4.8. A consultation response on behalf of the owner/occupiers of Frognal Close includes a commentary on the effects of the proposed basement upon 2 Frognal Close. Whilst the Ground Movement Analysis predicts low values of potential damage, Burland's classification relates to structures that are in sound original condition. The consultation response notes that the boundary retaining wall has a vertical crack and that external paving and internal load bearing slabs have been affected by ground movement.
- 4.9. Monitoring of ground movements is confirmed as being necessary within the BIA but no details are provided at this stage. Actual movements during construction will be able to be compared to predicted values ensuring that propping arrangements, once finalised, can be adjusted as necessary to minimise potential damage.
- 4.10. Section 10 of the BIA also states that *"Further groundwater monitoring should be carried out to confirm that groundwater will not be encountered during basement excavation or ideally trial excavations are undertaken, to depths as close to the full basement depth"*. This additional investigation should be carried out to confirm the adequacy of the construction proposals and their impact on adjacent structures as well as the hydrogeology of the area throughout construction and in the long term.
- 4.11. It is accepted that there is no increase in impermeable area across the ground surface above the basement and it is also accepted that the development site is not in an area known to be at risk from surface water flooding.
- 4.12. Although the CMP states in response to Question 17 regarding typical vehicle sizes and travel frequency that *"We are aware of consented developments at numbers 1A, 2, 28, 40, 50 and 63 Frognal"*. No further mention of these developments is made in any other document even though there is a requirement on the Applicant to consider adjacent or nearby basements

within their assessment of hydrogeological impact. Some of these consents may include basements and other neighbouring properties may contain basements and any affect should be included within assessments to be carried out.

## 5.0 CONCLUSIONS

- 5.1. The BIA has been prepared and revised by personnel who have suitable qualifications.
- 5.2. The retained walls of the existing property will be underpinned and basement perimeter walls will be formed using piles in order to construct the proposed single storey basement.
- 5.3. It is accepted that the development will have no adverse effect on drainage or run off as there is no increase in impermeable area and the site is not in an area known to be at risk from surface water flooding.
- 5.4. It is accepted that the basement will be founded in London Clay and groundwater will not be affected by the development.
- 5.5. Although the surrounding slopes to the development are stable, the northern end of the basement is in close proximity to no. 2 Frognal Close and the retaining wall boundary between the two properties. Further investigations of existing footings are requested to inform a Ground Movement Analysis which, it is believed, is in preparation. This should allow agreement to be reached on the potential category of damage to adjacent properties.
- 5.6. A ground movement assessment was subsequently received which indicates that potential damage was likely to occur to some walls of no. 2 Frognal Close and the Frognal Close garage block as well as the boundary retaining wall, although no predicted damage was greater than Burland Category 2. However, it has not been possible to confirm whether these predictions have been arrived at correctly. These movements may produce greater damage to shallow founded elements of no. 2 Frognal Close which are reported to be suffering from existing ground settlements currently (consultation response).
- 5.7. Further groundwater monitoring should be carried out to confirm that groundwater will not be encountered during basement excavation, thus minimising the impact on adjacent structures, as offered within the BIA.
- 5.8. Investigation should be undertaken to quantify the presence of existing or consented basements in the vicinity of the proposal site to determine their hydrogeological impact on the area throughout construction and in the long term.

## **Appendix 1: Residents' Consultation Comments**

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Carrington	21 Frognal Lane	30.04.15	Proximity to underground river sources.	See 5.8.
Hagemans	254a Finchley Road	13.05.15	Stability of neighbouring structures.	See 5.5 to 5.7.
Watt	1 Frognal Close	29.04.15	Ground movement affecting structural stability and inadequate ground investigation.	See 5.5 to 5.8.
Mayo	Redington Frognal Conservation Neighbourhood Forum	30.04.15	Proximity to underground river sources. Risk of flooding.	See 5.3, 5.4 and 5.8.
Suchy	33 Frognal	29.04.15	Stability of neighbouring structures.	See 5.5 to 5.7.
Parker	2 Frognal Close	30.04.15	Stability of neighbouring structures. Effect on water table.	See 5.3 to 5.8
Asemi	37 Frognal	27.04.15	Surface Flooding	See 5.3, 5.4 and 5.8.
Orwell	31 Frognal	28.04.15	Effect on water table.	See 5.3, 5.4 and 5.8.



## **Appendix 2: Audit Query Tracker**

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Additional foundation investigation	Confirmation of existing house footings and garden boundary walls.	To be undertaken.	
2	Ground movement analysis	To be issued shortly.	Issued for audit but further clarifications sought.	
3	Groundwater monitoring / Trial excavations	To confirm adequacy of construction proposals and their impact on adjacent structures as well as hydrology of the area.	To be undertaken.	
4	Adjacent or nearby basements	To confirm hydrogeological impact of proposal	To be undertaken.	

### **Appendix 3: Supplementary Supporting Documents**

None

## **Appendix 4: Comments on Ground Movement Assessment**

## **Detailed Comments on Ground Movement Assessment**

### **Assumptions**

Basement plan area – The architects plans on the planning portal indicate the basement measures c. 19.1 - 29.5 x 38m. The output from the GMA indicates a footprint of c. 17.5 - 26.5 x 32m has been used for XDisp and c. 18.8 - 29.4 x 32.7m for PDisp.

The footprints used for XDisp and PDisp are different.

### **Neighbouring properties**

It would be helpful to have a plan illustrating the proposed development in relation to the neighbouring structures and infrastructure. At present it is not possible to fully understand or check the output data.

There are 6 displacement lines that have been assessed in XDisp and PDisp (although no plans or labels to confirm what they represent). These lines are not reflected in the building damage assessment tables on pages 7 and 8, nor do the names of the elevations in the two tables match.

The whole assessment is based on an assumed foundation level of 87m AOD for the neighbouring structures. There is no indication what this information is based on. Actual foundation depths could be significantly different and there is no statement as to whether 2 Frognal Close has a basement or not.

The full pdisp and xdisp input and output are not provided. The last paragraph on 5.0 says the full output can be provided on request and samples were included in the appendix. The samples in the appendix are extracts from the xdisp output.

### **Assessment of wall installation and excavation (XDisp)**

The input and output data are required to understand the assumptions made with respect to the influence of corner effects and selection of the basement geometry.

### **Assessment of basement excavation and building application (PDisp)**

The input and output data are required to check assumptions made with respect to soil strength and stiffness, and excavation depth and dimensions and loading/unloading assumptions.

The ground model has been extended to nearly 90m bgl and clarity is required on the undrained shear strength and Modulus profiles that has been assumed – i.e. is there a linear increase with depth or are they constant below a certain depth.

It is not clear how ground movements have been modelled using PDisp - two plans have the same title but different data.

### **Building damage assessment**

It is stated that 2-5mm of settlement is expected as a result of the underpinning but it is not clear whether it has been taken into account in the damage assessment or whether ground movements in the underpinned section have been derived using XDisp. If the latter, comment is required on how the XDisp results for a stiff embedded wall have been correlated to an underpinning scheme.

Whilst it is recognised that it is necessary to approximate the building footprint in the modelling software, it should be confirmed that the shape adopted for the XDisp is appropriate considering how close the neighbouring structures are.

Given that one of the assessments is Burland damage category 2, the ground movement and damage assessments must be clearly derived.

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