CampbellReith
consulting engineers

40 Frognal Lane
London NW3 6PP

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-47

Rev: F1

May 2017

Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
F:+44 (0)20 7340 1777
E:london@campbellreith.com
W:www.campbellreith.com

Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	May 2016	Comment	AJMav12336-47-40 Frognal Lane-180516-D1.doc	A Marlow	A Marlow	E Brown
D2	November 2016	Comment	AJMav12336-47-181116-40 Frognal Lane-D2.doc	A Marlow	G Kite	G Kite
F1	May 2017	Planning	AJMav12336-47-030517-40 Frognal Lane-F1.doc	G Harper	A Marlow	A Marlow

Document Details

Last saved	03/05/2017 11:16
Path	AJMav12336-47-030517-40 Frognal Lane-F1.doc
Author	A J Marlow, BSc CEng MIStructE FConsE
Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	12366-47
Project Name	40 Frognal Lane, London NW3 6PP
Planning Reference	2014/5915/P & 2014/6018/L

Contents

Appendices

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 40 Frognal Lane (planning reference 2014/5915/P). The basement is considered to fall with Category C as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and review it against an agreed audit check list.

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

1.5. 40 Frognal Lane is a three storey detached house which has its lowest floor set a half-storey into its surrounding gardens. It is proposed to construct a basement underground swimming pool below the garden on the house's western flank. Additional information has confirmed the excavation for the pool area as 23.2m long by 8.0m wide by 6.5m deep below existing Lower Ground Floor of the house.

1.6. A soils investigation has determined that the basement will be founded within laminated clays with lenses of fine sands (Claygate Member) although the deepest section of the basement swimming pool is likely to be founded in the London Clay.

1.7. Groundwater is likely to be encountered at the base of the Claygate Member although groundwater flow has been shown to be slight. The groundwater flows in a west-north-west direction and it is proposed to install a granular fill around the outside of the basement to assist this flow. Further groundwater monitoring was initially requested to inform the correct depth of granular fill required and allow the design of temporary and permanent groundwater control. However, standpipes have now been destroyed and it is accepted that further monitoring is made a pre-construction planning condition.

1.8. It is proposed to construct the basement using a secant bored pile retaining wall. This would ensure no loss of fine material through the wall during pumping operations and reduce potential ground settlement and is endorsed. The wall will be propped during construction, as reflected in the updated GMA and damage impact assessment.

1.9. It was requested that a Ground Movement Assessment be undertaken to determine potential vertical and horizontal ground movements during piling installation and excavation. Heave forces should also be evaluated to determine the effect on the proposed basement raft.

1.10. The GMA indicated that damage to the various structures considered will be: Negligible (Category 0) for the boundary wall, Very slight (Category 1) for No.38, and Slight (Category 2) for No.40 Frognal Lane. It is proposed that No.40 will be redecorated and repaired as part of the works.

1.11. It is accepted that the surrounding slopes to the development are stable.

1.12. It is accepted that there are no hydrogeological concerns and no hydrological concerns with respect to the development proposals.

1.13. Queries and requests for clarification/information are discussed in Section 4 and summarised in Appendix 2. Following receipt of the revised BIA and supporting supplementary documents, the criteria contained in CPG4 and DP27 have been met.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 13 April 2016 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 40 Frognal Lane, Camden Reference 2014/5915/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 "Excavation to create basement level swimming pool under garden area in connection with residential dwelling (Class C3)."

and confirmed that the basement proposals involved a Grade II listed building.

2.6. CampbellReith accessed LBC's Planning Portal on 27 April 2016 and gained access to the following relevant documents for audit purposes:

· Basement Impact Assessment (BIA) dated September 2015 by Train & Kemp.

- Structural Stability Report (SSR) dated February 2011 by Train & Kemp.
- Architect's Proposed Floor Plans, Sections and Elevations dated 2009 by TGN Architects Ltd.
- Letter dated 5 March 2009 by Train & Kemp regarding SUDS.

2.7. CampbellReith accessed additional information from LBC's Planning Portal on 27 October and from TGN Architects by email in response to the D1 revision of this audit as follows:

- Basement Impact Assessment (BIA) dated October 2016 by Train & Kemp
- Email dated 08 July 2016 from TGN Architects

2.8. Additional information was provided with regards to further information requested, comprising:

- BIA Rev 06 dated April 2017 by Train & Kemp, including a revised Ground Movement Assessment and damage impact assessment.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Cover Sheet.
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA Section 2.
Are suitable plan/maps included?	Yes	Included in Revised BIA.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 4.1.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 3.1.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 5.1.
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 4.2.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 3.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 5.2.
Is factual ground investigation data provided?	Yes	BIA Appendix 4.
Is monitoring data presented?	Yes	Standpipes monitored on five occasions. Further monitoring recommended.
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	Assumed no basements are present.
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Appendix 4.
Are reports on other investigations required by screening and scoping presented?	Yes	BIA Section 6.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	Although assumed no basements are present.
Is an Impact Assessment provided?	Yes	BIA Sections 3.4, 4.4, 5.4, 6.4 and 6.5.
Are estimates of ground movement and structural impact presented?	Yes	Included within revised BIA Section 4.4. However these require revision.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	Included in revised BIA Section 4.5
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	However, further information required with respect to mitigation against groundwater ingress.
Has the need for monitoring during construction been considered?	Yes	But unsatisfactory conclusion reached.
Have the residual (after mitigation) impacts been clearly identified?	Yes	BIA Sections 3.4, 4.4, 5.4, 6.4 and 6.5.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	Yes	Revised BIA Appendix 2. No 40 is of Damage Category 2. Proposed to repair and redecorate as part of the proposed works.
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	However, no supporting analysis provided.
Are non-technical summaries provided?	Yes	BIA Section 7.

4.0 DISCUSSION

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

4.2. 40 Frognal Lane is an established large detached house on two storeys above a lower ground floor which is approximately a half storey below the garden on its western flank. It is proposed to install a swimming pool and ancillary leisure facilities below the garden to the west of the existing house connected by a staircase from the house. The pool dimensions are 23.2m long by 8.0m wide. The BIA indicates that the excavation for the pool will not exceed 6.5m below the lower ground floor of the house.

4.3. An email received from TGN Architects on 08 July 2016 clarifies plan area dimensions of the pool structures and that they will be a maximum depth of 6m below current lower ground floor level.

4.4. A soils investigation has been undertaken in 2011, consisting of 2 no. boreholes to 18m in depth, followed by two window samplers installed in the forecourt of No.38 to a depth of 6m. This has shown that the excavation will generally pass through Made Ground, 0.9m to 1.3m in thickness, the Claygate Member (laminated clays with lenses of fine sands) varying in thickness between 5.1 and 5.6m and the London Clay to depth. The BIA states that the deepest part of the swimming pool will be founded within the London Clay, whereas the shallower surrounding part of the basement box will be founded in the Claygate Member.

4.5. The BIA anticipates that the excavation will encounter groundwater towards the base of the Claygate Member and has identified that groundwater flow is in the west-north-west direction, although it is questioned whether the groundwater table has been accurately clarified. The BIA proposes that a coarse granular fill material is placed outside of the basement construction box to intercept existing groundwater flows and route them around the proposed structure. The BIA notes that groundwater levels may marginally rise on the up-gradient (east) side of the basement, which may affect the lower ground floor construction of the existing house. It suggests further groundwater monitoring to inform the required depth of the granular fill. Whilst the provision of the drain will mitigate any obstruction to groundwater flow, further monitoring is required to allow permanent and temporary water proofing measures to be appropriately designed.

4.6. The revised BIA states that the initial standpipes used for water monitoring have now been destroyed and it is not possible to extend the current monitoring regime. The author recognises “that the quality of the data needs to be improved and it is suggested that further monitoring is

made a pre-construction planning condition with the need to submit say a further three data sets." In the circumstances, this is accepted.

4.7. The SSR proposes to install a contiguous bored pile retaining wall from existing external ground level, which is intended to act "as a vertical cantilever and allow the soil to be excavated without any additional propping. The piles will be 450mm diameter and installed at 600mm centres." It is worth noting that the BIA states that a better solution to overcome groundwater entering the basement excavation during construction would be to replace the contiguous wall with a secant bored pile retaining wall. This would ensure no loss of fine material through the wall during pumping of the groundwater and a lower possibility of ground settlement through dewatering. This alternative proposal is endorsed.

4.8. The BIA states that the basement excavation will be 3m from the existing lower ground floor and will require localised underpinning of the existing house in the location of the linking staircase. The deeper pool section of the excavation is 6.5m from the lower ground floor of the existing house and the same distance from No.38. It is generally accepted that basement excavation has a zone of influence of four times the depth of excavation and, hence, it is requested that a Ground Movement Assessment is undertaken to show the effect of pile installation and excavation upon the existing and surrounding properties by determining potential vertical and horizontal ground movements.

4.9. The revised BIA contains a Ground Movement Assessment, as requested. A propped piled structure with a high stiffness is considered. Vertical and horizontal movements are considered for both the insertion of the piles themselves, and the removal of the soil mass in front of the wall. The GMA considered Nos 38 and 40, and the boundary wall between the two properties. The GMA methodology was reviewed and is accepted.

4.10. The results of the GMA indicate that with good construction practice, damage to the various structures considered will be: Negligible (Category 0) for the boundary wall, Very slight (Category 1) for No.38, and Slight (Category 2) for No.40 Frognal Lane. The GMA should be reviewed and updated once detailed design is conducted and construction methodologies are refined. It is noted that CPG4 requires that mitigation proposals be offered to reduce potential damage when in excess of Category 1. It is proposed that No.40 will be redecorated and repaired as part of the works.

4.11. As the deepest portion of the excavation will extend into the London Clay, an assessment of potential heave forces is requested together with its effect on the proposed basement raft.

4.12. The revised BIA includes an assessment of the likely heave forces. The potential long term effect of this heave is considered for the basement slab design, and should be confirmed during the detailed design stage.

4.13. A programme of monitoring the adjoining structures is acknowledged in the BIA, and should be established before the work starts, which should include condition surveys, as part of the Party Wall agreement. The monitoring strategy should include trigger levels linked to the GMA and appropriate contingency measures.

4.14. 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.

4.15. The BIA has shown that the surrounding slopes to the development are stable and the basement is not within 5m of an adjacent highway. It is noted that the SSR discusses the fact that the new basement will be constructed close to the boundary walls of the neighbouring properties.

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

5.0 CONCLUSIONS

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

5.2. 40 Frognal Lane is a three storey detached house which has its lowest floor set a half-storey into its surrounding gardens. It is proposed to construct a basement underground swimming pool below the garden on the house's western flank. Additional information has confirmed the excavation for the pool area as 23.2m long by 8.0m wide by 6.5m deep below existing Lower Ground Floor of the house.

5.3. A soils investigation has determined that the basement will be founded within laminated clays with lenses of fine sands (Claygate Member) although the deepest section of the basement swimming pool is likely to be founded in the London Clay.

5.4. Groundwater is likely to be encountered at the base of the Claygate Member although groundwater flow has been shown to be slight. The groundwater flows in a west-north-west direction and it is proposed to install a granular fill around the outside of the basement to assist this flow. Further groundwater monitoring was initially requested to inform the correct depth of granular fill required and allow the design of temporary and permanent groundwater control. However, standpipes have now been destroyed and it is accepted that further monitoring is made a pre-construction planning condition.

5.5. It is proposed to construct the basement using a secant bored pile retaining wall. This would ensure no loss of fine material through the wall during pumping operations and reduce potential ground settlement and is endorsed. The wall will be propped during construction, as reflected in the updated GMA and damage impact assessment.

5.6. It was requested that a Ground Movement Assessment be undertaken to determine potential vertical and horizontal ground movements during piling installation and excavation. Heave forces should also be evaluated to determine the effect on the proposed basement raft.

5.7. The GMA indicated that damage to the various structures considered will be: Negligible (Category 0) for the boundary wall, Very slight (Category 1) for No.38, and Slight (Category 2) for No.40 Frognal Lane. It is proposed that No.40 will be redecorated and repaired as part of the works.

5.8. It is accepted that the surrounding slopes to the development are stable.

5.9. It is accepted that there are no hydrogeological concerns and no hydrological concerns with respect to the development proposals.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Lough	95 Redington Road	13.10.14	Effect on hydrogeology	See 4.5 and 4.6
McCarthy	19 Frognal Lane	24.10.14	Stability of neighbouring structures	See 4.7 to 4.13
diBorgoricco	42 Frognal Lane	31.10.14	Inadequate information	See Appendix 2 and 3
Hagemans	254a Finchley Road	11.11.14	Incorrect assessment of basement size and depth of water table	See 4.2 to 4.6
Coleman	18 Lindfield Gardens	-	Effect on hydrogeology	See 4.5 and 4.6

Appendix 2: Audit Query Tracker

CampbellReith
consulting engineers

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Drawings submitted	Cross-sections do not appear to agree with stated size of pool and no excavation size provided.	Open – Dimensions including depth of excavation to be clarified, on scaled / dimensioned drawings and a conceptual site model.	08/11/2016
2	Groundwater monitoring	Further monitoring required to inform depth of granular fill requirement to perimeter of basement box and allow design of permanent and temporary exclusion of groundwater.	Closed – additional groundwater monitoring to be made a pre-construction planning condition.	08/11/2016
3	Stability	Ground Movement Assessment required as well as Burland damage assessment.	Closed – GMA and Damage Assessment provided in revised BIA.	24/04/2017
4	Stability	Heave assessment required.	Closed – Heave assessment provided in revised BIA.	24/04/2017
5	Stability	Ground movement monitoring regime required.	NA – To be agreed as per Party Wall agreement.	NA
6	Stability	Boundary garden walls to be demolished and rebuilt. Clarification requested.	Closed – Damage assessment provided.	24/04/2017

CampbellReith
consulting engineers

Appendix 3: Supplementary Supporting Documents

Train & Kemp BIA Rev 06 dated April 2017
(available on Planning Portal)

London

Friars Bridge Court
41- 45 Blackfriars Road
London, SE1 8NZ

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com