CampbellReith
consulting engineers

31 St Mark's Crescent, London, NW1 7TT

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-65

Revision: F1

September 2017

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Contents

Appendix

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 31 St Mark's Crescent, London NW1 7TT (planning reference 2017/1534/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 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 proposed development involves the construction of a basement level beneath the lower ground floor to a depth of 3.50m bgl and the extension of the basement approximately 6m out to the rear of the building beneath the garden. The rear garden will be lowered to the equivalent of lower ground floor level to a distance of 10m from the existing property.

1.5. Two BIAs have been provided for review, by Chelmer Consultancy Services and Croft Structural Engineers. The authors' qualifications are in accordance with CPG4 guidelines for all sections.

1.6. Information within the two BIA documents is occasionally contradictory. Where this occurs, the Audit has considered the most conservative approach.

1.7. The BIA includes the majority of the information required from a desk study in line with the LBC guidance. In the revised submissions, utility companies have been approached with regards to the presence of underground infrastructure and no sensitive assets have been identified within the development's zone of influence.

1.8. A site investigation confirmed ground conditions comprising Made Ground overlying the London Clay Formation. In the revised submissions, factual site investigation data (logs) have been presented for review and are consistent with the assessments provided.

1.9. Groundwater monitoring indicates that the proposed basement excavation is likely to encounter groundwater. The Chelmer BIA notes that consideration should be given to temporary dewatering and also recommends that further groundwater monitoring is undertaken. Such monitoring should be undertaken prior to construction.

1.10. It is accepted that the proposed development will not impact the wider hydrogeological environment.

1.11. The site is within the Primrose Hill Local Flood Risk Zone, which is acknowledged in the BIA. The BIA assesses the flood risk as very low, based upon Environment Agency and LBC SFRA data, and provides generic flood risk mitigation advice. The flood risk assessment is accepted assuming that the mitigation measures proposed are adopted. The final development levels should be confirmed, including that threshold and lightwell levels are suitably elevated.

1.12. The development results in an increase in impermeable site area. The proposal is to construct the paved areas using permeable paving, including in the rear garden above the basement. In the revised submissions, it is proposed to place 1m of soil above the basement roof within the rear garden (below the paving) to ensure infiltration capacity will be suitably mitigated in accordance with LBC's and Thames Water's requirements.

1.13. Outline retaining wall calculations are presented, which includes a conservative allowance for groundwater at 1m below ground level. An appropriate outline temporary works plan and sequence is proposed. An outline construction programme has been provided.

1.14. A Ground Movement Assessment (GMA) has been presented, including an assessment of heave, which indicates movements broadly in accordance with expectations, considering the proposed dimensions and methodology. Damage impacts of Category 1 (Very Slight) to surrounding structures, in accordance with the Burland Scale, are predicted which are accepted. Appropriate structural monitoring of adjacent structures is proposed during the construction period.

1.15. In the revised submissions, the distance between the proposed development and the retaining wall with the Regent's Canal is confirmed as 10m. It is accepted that ground movements should not adversely impact the canal wall.

1.16. Non-technical summaries have been provided within the revised BIA submissions.

1.17. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. Considering the revised submissions, the requirements of CPG4 have been met.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 3 April 2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 31 St Mark's Crescent, London NW1 7TT, Camden Reference 2017/1534/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 planning portal describes the planning proposal as: "Excavation of a basement extension below the footprint of the dwelling (Use Class C3) including no.1 rear lightwell."

2.6. The planning portal has confirmed that the development is not a listed building but does lie within the Primrose Hill Conservation Area.

2.7. CampbellReith accessed LBC's Planning Portal on 27 April 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (ref BIA/8084A) dated February 2017 by Chelmer Consultancy Services.
- Basement Impact Assessment: Summary and Design and Construction Proposals (ref 161202) dated 15 March 2017 by Croft Structural Engineers.
- Design and Access Statement by the Basement Design Studio.
- Draft Construction Management Plan dated March 2017 by London Basement.
- SUDs report (ref 1767/RE/01) dated 2 February 2017 by Evans Rivers and Coastal.
- Existing and proposed floor plans and sections dated January 2017 by Sher and White Architects.
- Comments and objections to the proposed development from local residents.

2.8. CampbellReith was provided with the following revised BIA submissions in August 2017:

- Basement Impact Assessment (ref BIA/8084A rev 1) dated July 2017 by Chelmer Consultancy Services.
- Basement Impact Assessment: Summary and Design and Construction Proposals (ref 161202 Rev 2) dated 3 July 2017 by Croft Structural Engineers.
- Cover letter dated 18 August 2017 by Basement Design Studio.
- Utilities Search Mapping.

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	Utility information provided in revised submission
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 plans/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	
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Mapping referenced to provide evidence of Screening assessment. Proposed basement will result in increase in impermeable area. Site located in Primrose Hill Local Flood Risk Zone.
Is a conceptual model presented?	Yes	Chelmer BIA Report, section 4.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	However, consideration of proximity of retaining wall along the canal required and further consultation with the Canal & River Trust should be undertaken.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	There is a change in permeable / impermeable site ratio. Attenuation drainage assessment states that permeable block paving will be adopted with 0.5m soil above basement roof. This should be considered with regards to CPG4 2.16.
Is factual ground investigation data provided?	Yes	Summary provided in Chelmer BIA Section 3. However, report / logs of investigation not presented.
Is monitoring data presented?	Yes	Additional monitoring is recommended by the BIA.
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	The neighbouring properties in close proximity to the proposed development all have existing basements / lower ground floors to a similar level as No. 31's lower ground floor level.
Is a geotechnical interpretation presented?	Yes	Chelmer BIA Section 5.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Croft Structural Engineers BIA Appendix A.
Are reports on other investigations required by screening and scoping presented?	Yes	Site investigation report / logs in revised submission.

Item	Yes/No/NA	Comment
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	Chelmer BIA Section 4 (scoping / impact assessment combined).
Are estimates of ground movement and structural impact presented?	Yes	Chelmer BIA Sections 5 and 6.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	The Impact Assessment addresses those issues identified by screening and scoping. However, it does not address the potential stability impacts to the retaining wall of the Regent's Canal.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Temporary propping, monitoring and trigger levels are discussed (Croft Structural Engineers BIA Report: Appendix C (Basement Construction Method) and Appendix E (Proposed Monitoring Statement)).
Has the need for monitoring during construction been considered?	Yes	Croft Structural Engineers BIA Report: Appendix E (Proposed Monitoring Statement).
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	Revised submissions confirm proximity to utilities and canal.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Revised submissions confirm that 1m of soil will be provided above basement extending into rear garden.

Item	Yes/No/NA	Comment
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Longer term groundwater monitoring should inform temporary works design. Permanent works have adopted conservative water level for design purposes.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Damage Impact limited to Category 1 (Very Slight).
Are non-technical summaries provided?	Yes	Provided in revised submissions.

4.0 DISCUSSION

4.1. Two BIAs have been provided for review. The BIA prepared by Chelmer Consultancy Services includes the screening, ground investigation, impact assessment, ground movement assessment and damage impact assessment. The BIA prepared by Croft Structural Engineers includes a summary of the Chelmer BIA along with the construction sequence, temporary work systems, a monitoring strategy and structural calculations. There is not a single BIA report and as such statements within the documents do not always reference each other and are contradictory in places. The authors' qualifications are in accordance with CPG4 guidelines for all sections.

4.2. Where contradictory information is presented between BIA documents, the audit has considered the most conservative approach.

4.3. The proposed development involves the construction of a basement level beneath the lower ground floor to a depth of 3.50m bgl and the extension of the basement approximately 6m out to the rear of the building beneath the garden. The rear garden will be lowered to the equivalent of lower ground floor level to a distance of 10m from the existing property.

4.4. The BIA includes the majority of the information required from a desk study in line with the GSD Appendix G1. In the revised submissions, utility companies have been approached with regards to the presence of underground infrastructure and no sensitive assets have been identified within the development's zone of influence.

4.5. The Regent's Canal is at the end of the rear garden. Water level is approximately 1m below garden level. There is a retaining wall along the canal and the canal is understood to be lined with clay. The proximity of the wall to the development has been confirmed as 10m in the revised submissions. Correspondence is presented confirming consultation is being undertaken with the Canal & River Trust in regards to the proposed construction management e.g. utilisation of the canal for removal of construction waste on barges.

4.6. High Speed 2 (HS2) is proposed to run 32m to the northeast of the site and the top of the tunnel would be 15m below the proposed founding level of the basement. A railway line runs 75m east of the site. It is accepted that the proposed basement will not affect these infrastructure assets.

4.7. A site investigation was undertaken by Chelmer Consultancy Services in November 2016 and January 2017. The 2016 investigation comprised two boreholes to 6.1m below ground level (bgl). The second investigation comprised extending one borehole to a depth of 10.4m bgl and the excavation of two hand dug trial pits. The ground conditions comprise Made Ground underlain by the London Clay. In the revised submissions, the site investigation report / logs are presented for review.

4.8. Three rounds of groundwater monitoring were undertaken and levels were recorded at depths of 4.67m, 3.43m and 3.08m bgl. The proposed basement excavation is therefore likely to encounter groundwater. The Chelmer BIA notes that consideration should be given to temporary dewatering and also recommends that further groundwater monitoring is undertaken. Such monitoring should be undertaken prior to and during construction to inform temporary works design. It is accepted that the permanent design incorporates waterproofing and a conservative groundwater level for design purposes (i.e. 1m bgl).

4.9. It is accepted that the proposed development will not impact the wider hydrogeological environment.

4.10. St Mark's Crescent did not suffer from surface water flooding in 1975 or 2002 and the Environment Agency indicates the site to be at a 'very low' risk of surface water flooding. However, in line with CPG4 (section 3.48), as the proposed development is located within LBC's defined 'Primrose Hill' Local Flood Risk Zone (Critical Drainage Area Group 3-003), a flood risk assessment has been undertaken. Generic flood risk mitigation advice is provided. The flood risk assessment is accepted assuming that the mitigation measures proposed are adopted. The final development levels should be confirmed, including that threshold and lightwell levels are suitably elevated.

4.11. The development results in an increase in impermeable site area. The SUDS statement has assessed the attenuation options and concluded that it would be impractical to capture and attenuate surface water across the rear of the property due to the lack of space and difficulties in draining through the property to the sewers. The proposal is therefore to construct the paved areas using permeable block paving, including in the rear garden, and the revised submissions indicate that 1m of soil will be allowed for above the basement roof level (below the permeable paving) to ensure infiltration capacity in line with LBC guidance.

4.12. Outline retaining wall calculations are presented, which includes a conservative allowance for groundwater at 1m below ground level. An appropriate outline temporary works plan and sequence is proposed. The basement will be constructed by underpinning on a hit and miss sequence. The basement walls will be appropriately propped in both the temporary and permanent conditions.

4.13. An outline construction programme has been provided.

4.14. A Ground Movement Assessment (GMA) has been presented, including an assessment of heave, which indicates movements broadly in accordance with expectations, considering the proposed dimensions and methodology. Damage impacts of Category 1 (Very Slight) to surrounding structures, in accordance with the Burland Scale, are predicted which are accepted.

4.15. Appropriate structural monitoring of adjacent structures is proposed during the construction period. Trigger values are reasonably conservative to limit damage impacts to within the Category 1 predicted. The Contractor should adopt a monitoring strategy in accordance with the recommendations made, including preparing appropriate contingencies.

4.16. Non-technical summaries have been provided in the revised submissions.

4.17. Queries and matters requiring further information or clarification are summarised in Appendix 2.

5.0 CONCLUSIONS

5.1. The qualifications of the authors are in accordance with LBC requirements.

5.2. In the revised submissions, utility companies have been approached with regards to the presence of underground infrastructure and no sensitive assets have been identified within the development's zone of influence. It is also accepted that ground movements should not adversely affect the canal wall, given the distance from the proposed development.

5.3. A site investigation has confirmed the underlying ground conditions to comprise Made Ground over the London Clay Formation. In the revised submissions, the site investigation report / logs have been presented.

5.4. Groundwater is likely to be encountered during construction. Further groundwater monitoring is recommended prior to construction to inform temporary works design.

5.5. It is accepted that the proposed development will not impact the wider hydrogeological environment.

5.6. It is accepted that the site is at very low risk of flooding. Flood risk mitigation measures proposed should be adopted.

5.7. The development will result in an increase in impermeable site area. The revised submissions confirm that an appropriate amount of soil cover will be provided above the basement roof in accordance with CPG4 Section 2.16.

5.8. Structural calculations, temporary works and the GMA are accepted. Damage impacts of Category 1 (Very Slight) to surrounding structures, in accordance with the Burland Scale, are predicted.

5.9. A reasonably conservative outline methodology and guidance for monitoring structural movements during construction has been provided, which should be adopted.

5.10. Non-technical summaries have been provided in the revised submissions.

5.11. Queries and matters requiring further information or clarification are summarised in Appendix 2. Considering the revised submissions, the requirements of CPG4 have been met.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Sarah	11 St Mark's Crescent	10 April 2017	Objections to: structural integrity due to proximity of canal and HS2.	Proximity to canal has been confirmed and consultation underway with Canal and River Trust confirmed. HS2 beyond the zone of influence.
Beard	61 Gloucester Avenue	19 April 2017	Objections to: proximity of canal bank.	As above

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1.	Stability	Underground utility infrastructure within the zone of influence should be identified and risk / impacts assessed, as required.	Open	August 2017 (utilities mapping)
2.	BIA	Site investigation data (logs) should be provided for review.	Open	August 2017 (p229 Chelmer)
3.	Stability	Additional groundwater monitoring should be undertaken, as recommended in the BIA. Temporary works should be re-assessed if groundwater levels differ from those currently used for assessment.	Open	N/A – to be undertaken by contractor prior to construction
4.	Hydrology	In line with CPG4 2.16, depth of soil cover above the basement in the rear garden should be a minimum of 1m.	Open	August 2017 (p41 Croft)
5.	Stability	The proximity of the retaining wall to the Regent's Canal should be provided. Damage impact should be confirmed if within the zone of influence.	Open	August 2017 (p5 Chelmer)
6.	BIA	Non-technical summaries to be provided	Open	August 2017 (Croft/Chelmer)

Appendix 3: Supplementary Supporting Documents

Basement Impact Assessment (ref BIA/8084A rev 1) dated July 2017 by Chelmer Consultancy Services

Basement Impact Assessment: Summary and Design and Construction Proposals (ref 161202 Rev 2) dated 3 July 2017 by Croft Structural Engineers

Cover Letter dated 18 August 2017 by Basement Design Studio

Utilities Search Mapping

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[redacted]

To: Diver, John
Cc: camdenaudit@campbellreith.com
Subject: RE: 12466-65: 31 St Mark's Crescent F1

Categories: Key Info

Hi John

I have reviewed this further - the objector's comments refer to:

- distance from the canal, including potential for stability issues and groundwater issues (ie potential for water to leak from the canal into the excavation; potential for fill materials within the rear garden to collapse or provide inadequate support to the canal).

- distance from No 59, specifically the rear extension.

The BIA documents refer to 10m between the rear wall of the proposed basement and the canal structure itself. Site investigation undertaken to date, including in the rear garden, does not indicated hydraulic conductivity with the canal since groundwater was not observed during the works. Subsequent groundwater monitoring indicates seepages of groundwater, that may or may not be collecting within the borehole monitoring pipe (as this is within LC, the low permeability of the soil means that groundwater records are not always straightforward to interpret). The BIA (and audit report) indicate that further monitoring is required to plan any dewatering requirements for the temporary works. This monitoring should alert the engineer to any likelihood of connectivity / flow from the canal to the excavation works.

The retaining walls are to be formed in an 'underpinning style' sequence, meaning that individual panels of ground will be opened up and kept temporarily supported whilst the retaining wall is formed. This allows any potential stability / groundwater issues to be observed in small, discrete excavations - again, this provides the Engineer with adequate opportunity to supervise and ensure the works are properly controlled. The main excavation works will not be undertaken until all the individual 'pins' have been constructed, and these in turn will be propped as the excavation is undertaken.

In regards to the Canal & Rivers Trust, the works should be undertaken in consultation with them, and as the asset owner they should impose their own restrictions on movements / protection of their asset. The correspondence indicates the developer is in consultation with the C&RT.

The GMA does not mention No 59 or 61, but has concentrated on No 57 as a worst case. This approach seems sensible. The methodology and temporary works required to control damage to No 57 will also protect No 59 and 61. For this particular method of construction, we would not expect to see worse consequences further from the works (ie No 57, being closer, is the worst case. If piling works were involved, we may have required further assessment since ground movements from piling may cause maximum movements a little way from the works).

The structural monitoring strategy requires vertical / horizontal movements to be monitored and trigger levels / contingencies to control the works are proposed. No 59 / 61 should also be monitored and subject to the same trigger values.

Under the usual planning conditions, if the works have to progress as per the BIA, then all the above should be covered. However, if you wanted to be explicit you could condition: structural monitoring to ensure maximum damage of Cat 1 to neighbours including 57 , 59, 61 etc; groundwater monitoring in advance of the works to establish dewatering requirements and demonstrate that seepage / flow from the canal is sufficiently low rate as not to cause stability issues; works to be undertaken in

consultation with C&RT, adopting the protection and movement restrictions required by C&RT.

Is that helpful? I am happy to discuss this with you further.

Regards

Graham Kite

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