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16 Frognal Gardens
London, NW3 6UX

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12985-22
Revision: D2

February 2019

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	November 2018	Comment	CBcb12985-22-261118-16 Frognal Gardens-D1.doc	C Botsialas	E M Brown	E M Brown
D2	February 2019	Comment	CBcb12985-22-010219-16 Frognal Gardens-D2.doc	C Botsialas	E M Brown	E M Brown

Document Details

Last saved	01/02/2019 16:17
Path	CBcb12985-22-010219-16 Frognal Gardens-D2.doc
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Project Number	12985-22
Project Name	16 Frognal Gardens
Planning Reference	2018/2440/P

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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 16 Frognal Gardens, London, NW3 6UX (planning reference 2018/2440/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

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

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

1.4. CampbellReith issued an initial BIA audit report (rev. D1) on 26/11/2018 raising a number of queries on the BIA documents.

1.5. Revised BIA reports were received from LBC, in response to the queries raised in the initial BIA audit report (rev. D1). The present audit report discusses the contents of the revised BIA reports.

1.6. The site has approximately rectangular shape and comprises two blocks of garages and tarmac paved area. The proposed development involves demolition of one garage block and construction of a three storey residential building including a basement, the latter extending to about 4m below the ground level at its deepest part.

1.7. The revised BIA reports have been produced by professionals that possess suitable qualifications according to Camden Planning Guidance Basements (CPG).

1.8. Reference to current versions of CPG, CIRIA and British Standards is generally made within the revised BIA documents. Minor exceptions noted in this audit require amendments.

1.9. According to CPG, screening and scoping sections for surface flow and flooding should be included in the BIA documents.

1.10. A limited desktop utilities survey is presented in the revised BIA however, no information are included about sewer pipes or sewer tunnels or other underground utilities which could be sensitive to ground movement might be caused by the proposed development.

1.11. It is accepted that assuming good workmanship during construction, the proposed development is not expected to affect the overall slope stability.

1.12. Contradictory information is presented in the BIA documents about the type of the proposed ground floor slab.

1.13. 'Negligible' to 'very slight' damage is predicted from the ground movement assessment (GMA) for the neighbouring structures. However, the GMA should be revised to include additional information as discussed in this audit report.

1.14. The GMA should consider mitigation measures to any unacceptable ground movements if required.

1.15. The risk of ground movement and the associated potential damage to neighbouring properties discussed in the revised structural report (revised BIA-S) should be assessed on the basis of the site-specific GMA results. This issue is still pending.

1.16. The "Type of Works" information presented in the revised BIA-S report and the 'Structural Monitoring Statement' (SMS) report should be amended to reflect the subject site and the proposed development.

1.17. Information about 'front lightwells' and the distance to the nearest public highway presented in the revised BIA-S report should be clarified/amended as discussed in this audit.

1.18. Contradictory information about the use of SuDS measures presented in the revised BIA-S report should be amended.

1.19. Incorrect references presented in the SMS report should be amended as discussed in Section 4 of this audit.

1.20. Depending on the GMA outcome monitoring points should also be considered to be added along Holly Walk pavement and highway, and along the northern boundary garden wall.

1.21. A brief construction method statement, an outline construction programme, an outline plan for the proposed basement construction method, and indicative retaining wall calculations are presented in the revised BIA-S report.

1.22. Based on the above comments, it cannot currently be confirmed that the proposal adheres to the requirements of the CPG.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 29 October 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 16 Frognal Gardens, London, NW3 6UX (planning reference 2018/2440/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: Basements (CPG) (March 2018);
- Camden Development Policy (DP) 27: Basements and Lightwells;
- Camden Development Policy (DP) 23: Water;
- Local Plan 2017: 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 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 *"Erection of two storey 3-bed dwelling house (C3) fronting Holly Walk with PV panels following demolition of existing garage block; recladding of garage block; associated hard and soft landscape works including provision of cycle and bin store".*

2.6. The Audit Instruction also confirmed that no listed building is involved on site but there is a listed building on the opposite side of Holly Walk.

2.7. CampbellReith accessed LBC's Planning Portal on 9 November 2018 and gained access to the following relevant documents for audit purposes:

- "Structural appraisal" (SA), dated July 2018, job reference no. 180618, issued by Croft Structural Engineers;
- "Ground investigation report and basement impact assessment for the site at 16 Frognal Gardens, London NW3" (GI), dated October 2018, report reference no. GWPR2777/GIR, V1.01, issued by Ground & Water Ltd;
- "Basement Impact Assessment - Structural" (BIA-S), dated 8 October 2018, job reference no. 180618, issued by Croft Structural Engineers;
- Planning application drawings dated January 2018, job reference no. J1505, issued by MICTEC Ltd, consisting of:
  - "Existing site plan", drawing no. EX1;
  - "Existing street elevation", drawing no. EX2;
  - "Existing section A-A", drawing no. EX3;
  - "Existing section B-B", drawing no. EX4;
  - "Existing section C-C", drawing no. EX5.
- Planning application drawings dated May 2018, rev. A, issued by Peter Bernamont – Architect, consisting of:
  - "Proposed ground & lower ground plans", drawing no. FGH/6/01;
  - "Proposed upper floors plans", drawing no. FGH/6/02;
  - "Proposed east elevation & section X-X", drawing no. FGH/6/04;
  - "Proposed south elevation & section W-W", drawing no. FGH/6/05;
  - "Proposed west elevation & section Z-Z", drawing no. FGH/6/06;
  - "Proposed north elevation & section Y-Y", drawing no. FGH/6/07.
- "Design and access statement including heritage statement", dated May 2018, reference no. FGH/6/DAH, rev. A, issued by Peter Bernamont - Architect.
- Planning Comments and Responses.

2.8. CampbellReith issued a BIA audit report (rev. D1) on 26/11/2018 raising a number of queries on the above relevant documents.

2.9. The following revised reports and information were received from LBC on 2 January 2019, in response to the queries raised in the BIA audit report (rev. D1):

- "Ground investigation report and basement impact assessment for the site at 16 Frognal Gardens, London NW3" (revised GI), dated December 2018, report reference no. GWPR2777/GIR, V1.02, issued by Ground & Water Ltd;
- "Basement Impact Assessment - Structural" (revised BIA-S), dated 21 December 2018, job reference no. 180618, issued by Croft Structural Engineers;
- "Structural Monitoring Statement" (SMS), dated 21 December 2018, job reference no. 180618, issued by Croft Structural Engineers;
- "Monitoring Plan", dated December 2018, job reference no. 180618, issued by Croft Structural Engineers.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Refer to comment in audit paragraph 4.4.
Is data required by Cl.233 of the GSD presented?	Yes	However, reference to this audit should be made with regard to additional information required for the assessment of potential impact.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	No	Some additional information is required as per the findings of this audit. Refer to comments in Section 4.
Are suitable plan/maps included?	Yes	Suitable plans are included in the revised GI report. However, a utilities desktop survey still remains to be completed as discussed in audit paragraph 4.8.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	Suitable plans are appended to the GI and BIA reports.
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	The hydrogeology screening is covered sufficiently in the GI report.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	No hydrology screening is included in the revised BIA documents. Refer also to comments in audit paragraph 4.7.
Is a conceptual model presented?	Yes	A conceptual model is presented in Section 5 of the revised GI report.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	The hydrogeology scoping is consistent with the screening outcome and is discussed in Section 3.2.1 of the revised GI report.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	No hydrology scoping is included in the revised BIA documents. Refer also to comments in audit paragraph 4.7.
Is factual ground investigation data provided?	Yes	Refer to Sections 4 to 6 of the GI report.
Is monitoring data presented?	Yes	Refer to Section 7.2 of the GI report.
Is the ground investigation informed by a desk study?	Yes	Historical maps, BGS maps and other publicly available data are reviewed.
Has a site walkover been undertaken?	Yes	A site walkover is inferred from page 5 of the revised BIA-S report.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	The absence of nearby basements is confirmed in Section 7.1 of the revised GI report.
Is a geotechnical interpretation presented?	Yes	Refer to Section 7 of the revised GI report.
Does the geotechnical interpretation include information on retaining wall design?	Yes	However, the derived values of Young's Modulus and 'Oedometric Modulus' should be justified as discussed in audit paragraph 4.13.
Are reports on other investigations required by screening and scoping presented?	Yes	An outline construction method statement is provided in page 15 of the revised BIA-S.
Are the baseline conditions described, based on the GSD?	No	More information about any existing utilities and the existing and proposed loads is required as discussed in audit paragraphs 4.19 and 4.26.

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	The absence of nearby basements is confirmed in Section 7.1 of the revised GI report.
Is an Impact Assessment provided?	Yes	However, consideration of all neighbouring structures and additional information is required as discussed in audit paragraphs 4.14 to 4.26.
Are estimates of ground movement and structural impact presented?	Yes	A ground movement assessment is presented in Section 7 of the revised GI report. However, additional information is required as discussed in Section 4 of this audit.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	However, additional information is required as discussed in this audit.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Mitigation measures with regard to internal flooding and drainage are presented in the revised BIA-S report (p.13, 14), however, additional information is required as per Section 4 of this audit.
Has the need for monitoring during construction been considered?	Yes	However, the SMS report should be revised as discussed in Section 4 of this audit.
Have the residual (after mitigation) impacts been clearly identified?	No	Additional information is required as discussed in Section 4 of this audit.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	As above.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Refer to page 8 of the revised BIA-S report. However, contradictory information about SuDS is presented. Refer also to audit paragraph 4.33.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	Additional information is required as discussed in Section 4 of this audit.

Item	Yes/No/NA	Comment
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However, additional information is required to be included in the GMA to prove this outcome, as discussed in Section 4 of this audit.
Are non-technical summaries provided?	Yes	Refer to pages 3 and 4 of the revised BIA-S report.

4.0 DISCUSSION

4.1. Revised Basement Impact Assessment (BIA) reports have been provided in response to the queries raised in our initial BIA audit report (rev. D1).

4.2. The revised BIA reports consist of a "Ground investigation and basement impact assessment report" (revised GI) issued by Ground & Water Ltd, a revised "Basement Impact Assessment - Structural" report (revised BIA-S) and a "Structural Monitoring Statement" report (SMS), the latter reports issued by Croft Structural Engineers.

4.3. The revised BIA reports have not included a revised Structural Appraisal (SA) report, which was audited and discussed in our previous BIA audit report (rev. D1). According to applicant's Engineers, the SA report was prepared during the earlier stages of the project and for this reason was considered superseded and was not revised for audit purposes. However, the SA report included screening and scoping sections for surface flow and flooding which are not included elsewhere in the revised BIA reports, as discussed in this audit.

4.4. The revised BIA reports have been produced by the professionals shown on the first page of the revised BIA-S report that have suitable qualifications (CEng, MICE, CGeol) according to Section 4.7 of Camden Planning Guidance Basements (CPG).

4.5. The site has an approximately rectangular shape and comprises two blocks of garages and a tarmac paved area. The proposed development involves the demolition of one garage block and construction of a three storey residential building including a basement, the latter extending to about 4m below ground level at its deepest part. The revised GI report indicates that the ground conditions consist of Made Ground up to 1m thick over Head Deposits over the Bagshot Formation at depth. Reinforced concrete cantilevered retaining walls employing a 'hit and miss' method are proposed in the revised BIA-S to form the basement and the foundations of the proposed building.

4.6. With the exception of a reference to the superseded Camden CPG4 document (in page 16 of the revised BIA-S) all previous references to superseded documents, noted in our rev. D1 audit report, have been corrected. As such, this issue is considered closed and is not discussed any further in this audit.

4.7. As mentioned in our previous BIA audit report rev. D1 (paragraph 4.5), the SA report included screening and scoping sections for surface flow and flooding. As discussed above, a revised SA report was not issued and the revised GI report does not include screening and scoping sections for surface flow and flooding. According to CPG, screening and scoping sections for surface flow and flooding should be included in the BIA documents and this should be rectified.

The comments made on paragraph 4.6 of our previous BIA audit report rev.D1 should be included in the revised screening and scoping sections for surface flow and flooding.

4.8. According to existing information (old London sewer map dated 1930's), it appears that the site may be located close to an old sewer tunnel. This issue was raised in our previous BIA audit report rev. D1 (paragraph 4.6). A limited desktop utilities survey was carried out and presented in Appendix D of the revised BIA-S report which confirmed the presence of electricity cables in the vicinity of the site towards Holy Walk. However, no information was presented about sewer pipes or sewer tunnels or other underground utilities such as water or gas pipes etc., which could be sensitive to ground movement caused by the proposed development. As required in the previous BIA audit report rev.D1, the presence of any underground services that could potentially be affected by the proposed development should be identified. Also, the presence of any utilities at the site or within its proximity should inform the screening and scoping stages (refer also to answer in question 14 of the stability screening section of the revised GI report) and, where necessary, should be assessed in the ground movement analysis as discussed in the previous audit report. In this context, this issue is still pending.

4.9. It is accepted that assuming good workmanship during construction, the proposed development is not expected to affect the overall slope stability.

4.10. In the revised GI report it is clarified that the term 'Limit Bearing Capacity' refers to ultimate bearing capacity values. However, the calculation methodology for the bearing capacity values assumed in the revised GI report is not presented. There is only a reference to a proprietary software package used with no information about the calculation methodology adopted. Therefore, the proposed ultimate bearing capacity values still require justification.

4.11. The calculation methodology of the maximum anticipated heave of 26mm and 53mm below the floor slab at 2m and 4m depth respectively, discussed in page 27 of the revised GI report should be presented. As noted previously, there is only a reference to a proprietary software package used with no information about the calculation methodology adopted. Hence, this issue is still pending.

4.12. Contradictory information is presented about the proposed ground floor slab where a partially suspended floor slab is mentioned in the revised GI report (page 27) whilst a ground bearing floor slab is proposed in the revised BIA-S report (page 13). This issue is still pending.

4.13. The methodology for deriving Young's Modulus and 'Oedometric Modulus' values and the methodology of settlement calculation presented in the revised GI report (pages 25 and 26), should be clarified. There is a reference to a proprietary software package but this is not sufficient. Hence, the proposed values should be justified.

4.14. A ground movement analysis (GMA) was undertaken and presented in the revised GI report. The GMA assumed, in accordance with the architectural drawings, that underground excavations will be required at different levels ranging between approximately 2m and 4m below ground level. CIRIA C760 approach was adopted for assessing ground movements assuming two different scenarios based on the ground conditions encountered; one scenario considered that the basement will be founded in granular soils (sand) and a second scenario, assumed that the basement foundation will be constructed within cohesive soils (clay).

4.15. It is noted, that whilst CIRIA approach is intended for embedded retaining walls, it is accepted that this approach can predict ground movements within the range typically anticipated for the proposed 'hit and miss' retaining wall techniques when carried out with good control of workmanship.

4.16. The GMA outcome was checked against any potential impact and damage to the existing buildings at 18 Holly Walk and 16 Frognal Gardens, adopting the Burland scale according to CPG and CIRIA C760 methodology. 'Negligible' to 'very slight' damage has been predicted in both scenarios considered. However, the GMA should consider additional information and be revised as discussed in the following paragraphs. It is noted that the same queries were raised in our BIA audit report rev. D1 and are still pending as none of these queries was addressed satisfactorily by the revised GI report and the GMA analysis.

4.17. The GMA should consider the anticipated horizontal movements in the sand scenario. It is accepted that the adopted CIRIA C760 methodology does not present detailed estimates for horizontal ground movements in sand, however, such movements do occur in practice and this is acknowledged by CIRIA C760 report (refer to pages 162 and 169 of CIRIA C760 report for details). Although CIRIA C760 is applicable to piled retaining walls, horizontal movements may also be expected due to excavation in front of a retaining wall formed by underpinning techniques.

4.18. There are numerous errors in the application of CIRIA C760, however, as it is intended for piled retaining walls, they are not discussed in detail here. Whatever approach is adopted to derive likely ground movements, the assessment should include the anticipated long-term ground movements due to basement excavation by adopting an established methodology (such as Boussinesq, Mindlin etc.).

4.19. The GMA should consider the existing situation and proposed situation/development including the building loads for the correct calculation of ground movements.

4.20. The GMA considers the 'soft to firm clays' case to be a 'reasonably conservative' scenario for the subject development, an assumption which is not accurate. 'Soft to firm clays' typically include low to medium-strength clays with undrained shear strengths of less than 75kPa. According to

the revised GI report (page 24) 'the cohesive soils of the Bagshot Formation were shown to have medium undrained shear strength, (50–70kPa), based on in-situ test results'. In this context, the clayey scenario assumed in the GMA is a realistic scenario and not a 'reasonably conservative' scenario. The derived ground movements do not reflect those typically associated with underpinning and an amendment is required in the revised GI report.

4.21. The GMA should consider ground movements due to construction of the basement wall and the revised loading arrangements.

4.22. The GMA should consider the potential impact to Holly Walk, both the pedestrian pavement and the highway itself. The revised GI report refers to an assessment by a structural engineer however, no such impact assessment is presented in any of the BIA reports. Additional information is required.

4.23. The revised GMA estimates up to 12mm of settlement (sand scenario) to occur on the northern boundary wall however, it does not discusses the anticipated impact due to the expected ground movement and any mitigation measures, if required. The sand scenario GMA analysis should include anticipated horizontal movements as discussed in this audit.

4.24. The GMA should estimate the ground movements and discuss the potential impact to the remaining garages to the south of the site for the sand scenario.

4.25. The GMA should estimate the ground movements and discuss the potential impact to any sensitive utilities or underground services and pipes that might be present in the vicinity, including a suspected old sewer tunnel structure, as discussed previously in this audit. Also, the GI report refers to assessment by a structural engineer however, no such impact assessment is presented in any of the BIA reports.

4.26. The revised GMA should consider appropriate mitigation measures to any unacceptable ground movements for all neighbouring structures, including the adjacent pedestrian pavement and highway, and any utilities in the proximity. Also, part of the basement excavation will be in the medium dense sandy layers. The GMA should discuss mitigation measures for potential collapse of those sandy layers during the 'hit and miss' techniques.

4.27. The latest version of the revised GI report dated October 2018 is referred to in the revised BIA-S report. Therefore, our previous query is now closed.

4.28. Consistency of information with regard to proposed excavation depth (up to 4m deep) is presented across the BIA documents. Accordingly, our previous relevant query made in our D1 report is now closed.

4.29. In the revised BIA-S report (page 8) it is stated that "The design and construction methodology aim to limit damage to the existing building on the site, and to the neighbouring buildings, to Category 1 or lower…". This statement is in accordance with CPG Basements. Hence, our previous relevant query is now closed.

4.30. In the revised BIA-S report (page 9) it is stated that "It is not expected that any cracking will occur in nearby structures during the works. However, Croft's experience advises that there is a risk of movement to the neighbouring property". If this is the case then mitigation measures should be added in that report.

4.31. In the risk assessment section of the revised BIA-S report in page 10 the "Type of Works" contents should be amended as they refer to '…gravels…', '…basements up to 4.5m deep…' and '…underpinning works to grade I listed building…'. The same information is presented in the SMS report (page 2). These descriptions reflect neither the subject site nor the proposed development and should be amended.

4.32. There is a reference in the revised BIA-S report (page 13) about 'front lightwells retaining walls' which are not shown on architects or structural drawings. Also, on the same page it is mentioned that the basement is not within 5m of the public highway which is incorrect. These references should be clarified/amended.

4.33. There is a reference in the revised BIA-S report (page 13) that 'sustainable drainage systems such as on-site attenuation (if practicable) should be considered at detailed design stage' however, this is contradictory to another reference of the same report (page 8) where it is mentioned that no SuDs will be incorporated into the project. Amendment is required.

4.34. In the SMS report there are references about a 'neighbouring wall' (page 2), 'installation of reinforced concrete retaining walls under the existing footings' (page 3), a 'party wall' (pages 3, 5 & 6) all of which appear not to be applicable to the subject site. Also, in the SMS report there are references to BS5228:1197 and BS7385-1:1990 (page 4), which were superseded and withdrawn respectively. Furthermore, the ground movement analysis table presented in the SMS report (page 6) was derived from a previous version of the GI report and therefore should be replaced with the newest version. Amendments to the SMS report are required according to the comments above.

4.35. The ground movement trigger levels suggested in the SMS report (page 7) should be updated based on the outcome of the revised GMA required as per our comments in this audit.

4.36. The 'Monitoring Plan' (drawing no SD-22, dated December 2018) attached to the SMS report, presents 12 no monitoring points along the nearest walls of adjacent buildings situated at 16 Frognal Gardens and 18 Holly Walk. Depending on the outcome of the GMA monitoring points

should also be considered to be added along Holly Walk pavement and highway and also along the northern boundary garden wall.

4.37. An outline construction method statement is presented in the revised BIA-S report (page 15) along with an outline construction programme (Appendix B), an outline plan for the 'hit and miss' proposed basement construction (Appendix C), and indicative calculations for the proposed retaining walls (Appendix A).

4.38. Based on the above comments, a number of queries has been raised as summarised in Appendix 2. Some of the queries are new, compared to our previous audit report, due to the revised versions of the BIA documents and due to new information submitted (SMS report, monitoring plan etc.) for the subject project. It cannot currently be confirmed that the proposal adheres to the requirements of the CPG Basements.

5.0 CONCLUSIONS

5.1. The revised BIA reports have been produced by professionals that possess suitable qualifications according to Camden Planning Guidance Basements (CPG).

5.2. Reference to current versions of CPG, CIRIA and British Standards is generally made within the revised BIA documents. Minor exceptions noted in this audit should be corrected.

5.3. According to CPG, screening and scoping sections for surface flow and flooding should be included in the BIA documents. This issue is still pending.

5.4. A limited desktop utilities survey is presented in the BIA however, no information are included about sewer pipes or sewer tunnels or other underground utilities which could be sensitive to ground movement might be caused by the proposed development. This issue is still pending.

5.5. It is accepted that assuming good workmanship during construction, the proposed development is not expected to affect the overall slope stability.

5.6. The calculation methodology for the bearing capacity values shown in the revised GI report should be clarified. The bearing capacity values should be justified.

5.7. The calculation methodology of the anticipated heave should be presented. This issue is still pending.

5.8. Contradictory information is presented in the BIA reports about the type of the proposed ground floor slab. This issue is still pending.

5.9. The methodology for deriving Young's Modulus and 'Oedometric Modulus' values and the methodology of settlement calculation presented in the revised GI report should be clarified. The proposed values should be justified. This query is still pending.

5.10. The GMA should be revised to consider horizontal movements in the sand scenario, the anticipated long-term movements, the existing and proposed development loads and ground movements due to construction of the basement wall.

5.11. The GMA should consider and assess the potential impact to Holly Walk, both the pedestrian pavement and the highway itself, the northern boundary wall, the remaining garages (sand scenario), and any sensitive nearby utilities including a suspected old sewer tunnel structure.

5.12. The GMA should consider mitigation measures to any unacceptable ground movements. The GMA should discuss mitigation measures for potential collapse of the sandy layers during construction.

5.13. The latest version of the revised GI report is referred to in the revised BIA-S report. Therefore, our previous query is now closed.

5.14. Consistency of information with regard to proposed excavation depth (up to 4m deep) is presented across the BIA documents. Accordingly, our previous relevant query is now closed.

5.15. The revised BIA-S report is aligned to CPG with respect to acceptable damage levels to neighbouring properties. Hence, our previous relevant query is now closed.

5.16. The risk of ground movement and the associated potential damage to neighbouring properties discussed in the revised BIA-S report should be assessed on the basis of the site-specific GMA results. This issue is still pending.

5.17. The "Type of Works" information presented in the revised BIA-S report and the SMS report should be amended to reflect the subject site and the proposed development.

5.18. Information about 'front lightwells' and the distance to the nearest public highway presented in the revised BIA-S report should be clarified/amended as discussed in this audit.

5.19. Contradictory information about the use of SuDS measures presented in the revised BIA-S report should be amended.

5.20. Incorrect references presented in the SMS report should be amended as discussed in Section 4 of this audit.

5.21. The ground movement trigger levels suggested in the SMS report should be updated based on the outcome of the revised GMA required as per our comments in this audit.

5.22. Depending on the outcome of the GMA monitoring points should be considered to be added along Holly Walk pavement and highway, and along the northern boundary garden wall.

5.23. A brief construction method statement, an outline construction programme, an outline plan for the proposed basement construction method, and indicative retaining wall calculations are presented in the revised BIA-S report.

5.24. Based on the above comments, it cannot currently be confirmed that the proposal adheres to the requirements of the CPG.

Appendix 1: Residents' Consultation Comments

None pertinent to BIA

Appendix 2: Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	Authors qualifications.	Closed	
2	BIA	Superseded references of CPG, CIRIA & BS.	Closed	
3	BIA	The different screening and scoping sections should be made consistent to each other or incorporated into one report.	Open	
4	BIA	It is incorrectly mentioned (in the SA) that the site is located in London Clay.	Open	
5	BIA	Contradictory information is presented about the proposed floor slab type.	Open	
6	BIA	The latest version of the GI report should be referred to in the BIA-S report.	Closed	
7	BIA	Consistency is required across the BIA documents with regard to proposed excavation depths.	Closed	
8	BIA	The BIA-S report should be aligned to CPG with respect to acceptable damage levels.	Closed	
9	BIA	The “Type of Works” information presented in the revised BIA-S report and the SMS report should be amended to reflect the subject site and the proposed development.	Open	
10	BIA	Information about ‘front lightwells’ and the distance to the nearest public highway presented in the revised BIA-S report should be clarified/amended.	Open	
11	BIA	Incorrect references presented in the SMS report as discussed in Section 4 of this audit.	Open	
12	Hydrology	Contradictory information about SuDS measures are presented in the revised BIA-S report.	Open	
13	Stability & Hydrology	A desktop utilities survey is required.	Open	
14	Stability	The answer to question 4 of the slope stability screening and paragraph 2.5 of the GI report should be amended.	Closed	
15	Stability	The calculation methodology of bearing capacity and the ‘Limit Bearing Capacity’ term should be clarified. The adopted values should be justified.	Open	

16	Stability	The calculation methodology of heave and settlement should be clarified.	Open	
17	Stability	The GMA should assess the potential impact on all neighbouring structures and utilities, and include existing/proposed development loads, horizontal movements, long-term movements, and movements due to wall installation.	Open	
18	Stability	Mitigation measures should be included in the GMA as required. The GMA should discuss mitigation measures for potential collapse of the sandy layers.	Open	
19	Stability	A monitoring methodology informed by the GMA results should be provided.	Open	
20	Stability	The BIA-S retaining wall calculations should take into account the GI report's proposed ground parameters.	Closed	
21	Stability	The risk of ground movement and any potential damage discussed in the revised BIA-S report should be assessed on the basis of the site-specific GMA results.	Open	
22	Stability	The ground movement trigger levels suggested in the SMS report should be updated based on the outcome of the revised GMA.	Open	
23	Stability	Monitoring points should be added along Holly Walk pavement and highway, and along the northern boundary garden wall.	Open	

Appendix 3: Supplementary Supporting Documents

None

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