CampbellReith
consulting engineers

Garages and land adjacent to 25 – 26 Wolsey Mews London, NW5 2DX

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-64

Revision: D2

July 2016

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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 the Garages and land adjacent to 25 – 26 Wolsey Mews (planning reference 2015/3741/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 original Basement Impact Assessment (BIA) was prepared by Ellis and Moore. The initial audit raised several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised and this audit only relates to the current BIA, however, the query tracker in Appendix 2 includes the queries on the previous BIA.

1.5. The qualifications of the individuals involved in the current BIA undertaken by Chelmer meet CPG4 requirements. A Structural Engineer's Report (SER) prepared by Price and Myers is also presented although it is requested this be updated with the findings of the further geotechnical work undertaken by Chelmer and to reflect the proposed pile configuration.

1.6. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a single storey basement. The basement is to be constructed by installing a secant pile wall with a reinforced concrete lining wall. The remaining building loads are to be supported on internal piles. Sketches to indicate the construction sequence and propping arrangements are included in the SER.

1.7. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed. This is subject to a separate approvals process.

1.8. The depth of excavation required is indicated to vary between 3.50 and 4.20m. The ground investigation encountered Made Ground over possible Head Deposits overlying the London Clay although the possible Head Deposits were not encountered in one of the boreholes.

1.9. Groundwater was monitored to within 0.80m bgl and a '*combined contiguous/secant bored piled wall*' where the 'male' piles are taken down to full depth and the 'female' piles taken only as deep as required to seal out groundwater is proposed in the BIA.

1.10. The BIA has confirmed the neighbouring properties do not comprise basements and a foundation depth of 1.15m bgl for No 25 Wolsey Mews was revealed by trial pitting. The foundations to No 3 – 7 Islip Street were not investigated but assumed to be at 0.90m bgl.

1.11. It is suggested in the impact assessment that consideration should be given to underpinning the 'flank' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

1.12. Mitigation measures are presented for the increase in run off due to the slight increase in hard surface area and also flooding from infrastructure failure.

1.13. Young's Modulus values for the different strata are not included. These will be required for detailed design.

1.14. The proposed basement is within the tree protection zone of a tree in the neighbouring property garden and the recommendations in the arboricultural assessment should be followed.

1.15. It is accepted there are no slope stability concerns due to the proposed development.

1.16. The full input and output from the Pdisp analysis is not presented and this is requested.

1.17. Negligible and Very Slight damage is predicted for the two neighbouring properties respectively, however, there are queries on the approach used in predicting ground movements due to pile installation and excavation and it is requested that the GMA be revised as discussed in Section 4.

1.18. A works programme has not been provided and this is requested.

1.19. Proposals for movement monitoring with trigger values are included. Details and trigger values should be agreed as part of the Party Wall awards, however, the trigger values may need revising based on the queries on the GMA as discussed above. Condition surveys are recommended.

1.20. Queries and requests for further information are discussed in Section 4 and summarised in Appendix 2.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for the Garages and land adjacent to 25 – 26 Wolsey Mews, Camden Reference 2015/3741/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 *"Erection of 2 x 2 storey plus basement dwellings following demolition of the three single storey garages."*

2.6. The Audit Instruction also confirmed the site does not comprise a listed building, nor is it a neighbour to a listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 30 October 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report – Ellis and Moore Consulting Engineers Ltd, dated June 2015 which includes as part of the appendices a factual Ground Investigation Report by Chelmer Site Investigations , dated March 2015
- Burd Harward Architects drawings Nos:

  1590_E01

  1590_E02

  1590_E03

  1590_E04

  1590_H04

  1590_P01C

  1590_P02C

  1590_P03C

  1590_P04A

  1590_P05B

  1590_P06A

  1590_P07
- 2 No residents' consultation responses

2.8. Following the initial audit, supplementary information has been provided between 26 May and 28 June 2016 by email and the documents provided are as follows:

- Basement Impact Assessment Report – Chelmer Consultancy Services, dated May 2016 which includes as part of the appendices a factual ground investigation information by Chelmer Site Investigations, dated January 2016
- Structural Engineer's Report (Stage C) – Price and Myers, dated April 2016
- Burd Harward Architect's Drawings comprising:

  Proposed plans

  Proposed sections

  Proposed elevations

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	See Audit paragraph 4.2.
Is data required by Cl.233 of the GSD presented?	No	Although most of the information required has been provided in the Chelmer BIA and supporting documents, a works programme has not been provided.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Chelmer BIA, Structural Engineer's Report (SER) and appendices.
Are suitable plan/maps included?	Yes	Architect's drawings and Arup GSD, Environment Agency (EA) and Camden SFRA map extracts with site location indicated within 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 7.3, although one of the Arup GSD maps has not been provided to support the response to the question.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Although a thorough screening has been largely undertaken in BIA Section 7.2, one of the Arup GSD maps has not been provided to support the response to Q2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.4.
Is a conceptual model presented?	Yes	BIA Sections 9.4 and 10.1.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.3.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.2 although one issue should have been carried forward from the screening.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.4.
Is factual ground investigation data provided?	Yes	Appendix C of the BIA.
Is monitoring data presented?	Yes	Section 9.8 and within Appendix C of the BIA.
Is the ground investigation informed by a desk study?	Yes	Additional ground investigation undertaken by Chelmer appears to be informed by the desk study in the leading sections of the BIA.
Has a site walkover been undertaken?	Yes	BIA Section 1.3.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Section 10.2.3 states there is no evidence of basements in the vicinity of the site.
Is a geotechnical interpretation presented?	Yes	Some interpretation presented in BIA Section 10.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Section 10.4.9.
Are reports on other investigations required by screening and scoping presented?	Yes	Ground Investigation and arboricultural assessment undertaken with reports provided.
Are baseline conditions described, based on the GSD?	Yes	Within various sections of the BIA.
Do the base line conditions consider adjacent or nearby basements?	Yes	BIA Sections 10.2.3 and 10.2.4.

Item	Yes/No/NA	Comment
Is an Impact Assessment provided?	Yes	BIA Section 10.
Are estimates of ground movement and structural impact presented?	Yes	However, there are queries on the approach used to predict ground movements and impact to the roadway not indicated.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Section 10.9.
Has the need for monitoring during construction been considered?	Yes	BIA Section 10.7.
Have the residual (after mitigation) impacts been clearly identified?	N/A	None identified.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	There are queries on the ground movement assessment (GMA) (see Audit paragraphs 4.15 to 4.19).
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	BIA report.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	There are queries on the GMA (see Audit paragraphs 4.15 to 4.19).
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Category 0 (Negligible) and Category 1 (Very Slight) damage predicted for the two immediate neighbouring properties, however, there are queries on the GMA.
Are non-technical summaries provided?	Yes	BIA Sections 7.5, 8.5, 9.15, 9.16 and 11.

4.0 DISCUSSION

4.1. A Basement Impact Assessment (BIA) prepared by Ellis and Moore was previously audited, however, several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties were raised. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised in the initial audit. This audit only relates to the current BIA although the query tracker in Appendix 2 includes the queries on the previous BIA.

4.2. The Basement Impact Assessment (BIA) was prepared by Chelmer Consultancy Services and the individuals involved have CEng MICE, C.WEM FCIWEM and CGeol FGS qualifications.

4.3. A Stage C Structural Engineers Report (SER) was prepared by Price and Myers and the author has CEng qualifications although it is not stated from which institution. This report was prepared prior to the BIA and there are several references to '*further geotechnical work'* being carried out. Given that the further geotechnical work has now been completed by Chelmer, these references are no longer valid.

4.4. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a basement. The basement is to be constructed by installing a secant pile wall with a reinforced concrete lining wall. A total of 10 internal piles are also proposed to support the remaining building loads. Sketches to indicate the construction sequence with temporary propping indicated are provided in the SER. The piles are indicated to be installed from ground level with the internal piles then cut down to basement level following excavation.

4.5. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed.

4.6. The founding level of the basement floor is indicated to be 3.57m below the finished floor level of the proposed ground floor. The depth of excavation required is indicated to vary between 3.50 and 4.20m. The ground investigation encountered Made Ground to a maximum depth of 1.80m below ground level (bgl) over possible Head Deposits described as gravelly clay and clayey gravel to maximum 2.90m bgl overlying the London Clay. The possible Head Deposits were not encountered in one of the boreholes.

4.7. Groundwater was monitored to within 0.80m bgl. Whilst a 'No' response is given to Question 1b of the Hydrogeology screening which relates to whether or not the proposed basement will extend beneath the water table surface, the presence of perched water is subsequently acknowledged. It is further stated in Section 10.2.7 of the BIA that current geotechnical standards require the use of a '*worse credible'* approach to selection of groundwater pressures therefore, a design groundwater level at ground level is recommended.

4.8. A '*combined contiguous/secant bored piled wall'* where the 'male' piles are taken down to full depth and the 'female' piles taken only as deep as required to '*seal out groundwater and to control groundwater pressures in order to minimise obstruction of any permeable horizons in the London Clay at depth'* is proposed in the BIA. This is not reflected in the SER which should be updated.

4.9. The BIA states that '*no evidence has been found for any existing modern basements in the vicinity of the site*'. A trial pit undertaken against the property to the south, No 25 Wolsey Mews, revealed brickwork over concrete founded on the Made Ground at 1.15m bgl. The foundations to the neighbouring property to the north, Nos 3 – 7 Islip Street, were not investigated.

4.10. It is suggested in the impact assessment that consideration should be given to underpinning the '*flank* ' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

4.11. The BIA Hydrology screening states there will be a small increase in the hard surfaced area as a result of the development and '*a temporary intervention storage which could include rainwater harvesting is proposed*'. Although the site is not in an area at risk from sewer flooding, a combined sewer is located beneath the roadway and non-return valves and '*pumped above ground loop systems on the drains serving the basement and lightwell*" are proposed to prevent water from the sewer system entering the basement in the event of surcharge from the sewer.

4.12. In response to Question 6 of the Land Stability screening, it is stated that part of the development is within the root protection area of a tree located in the rear garden of Nos 3 – 7 Islip Street. An arboricultural assessment was previously undertaken and it is stated in the BIA that guidance in this assessment should be followed. A 'Yes' response is given to Question 7 of which relates to whether or not there is a history of shrink/swell subsidence in the area although it is stated that there is no evidence of damage consistent with differential foundation movement.

4.13. The retaining wall parameters given on Section 10.4.9 are considered incomplete as the Young's Modulus of the different strata is not given. Appropriate values should be advised by a geotechnical engineer for detailed design.

4.14. A ground movement assessment considering heave/settlement from the excavation and construction using Oasys Pdisp and vertical and horizontal movements from installation and excavations based on an 'enhanced' CIRIA C580 approach from guidance by Ball, Langdon and Creighton (2014) is presented.

4.15. Four stages of the excavation and construction have been modelled using Oasys Pdisp; Stage 1 (construction of perimeter BPW and bearing piles, and bulk excavation of central areas to formation level condition – undrained condition), Stage 2 (construction of basement slab –

undrained condition), Stage 3 (construction of superstructure on basement slab/bearing piles and perimeter BPW – undrained condition) and Stage 4 (as Stage 3, except –drained condition). Although contour plots from the analysis and a summary of predicted displacements have been presented, the full input and output from the programme are not provided. There is no indication that unloading from the demolition of the three garages have been considered, however, in this case, they are considered negligible. The predicted movements are included in the damage assessment.

4.16. It is stated in Section 10.5.3 of the BIA which relates to the load take down for the Pdisp assessment that both the perimeter and internal bearing piles are assumed to be 11.75m long. An estimated pile depth of 8.50m below ground level (bgl) is however given in Section 10.5.13 which relates to the vertical and horizontal ground movements due to pile installation and excavation. Furthermore, the pile length and depth of excavation used to calculate ground movements due installation and excavation are the difference between the assumed pile length (8.50m) and the neighbouring property foundation depths and the difference between the excavation depth (4.20m) and the neighbouring property foundation depths respectively.

4.17. Rather than using the 0.08 and 0.05% of the wall depth to calculate vertical and horizontal movements at the wall for movements due to installation of the secant piled wall given in CIRIA C580, 0.025% of the wall depth has been used in both cases. The BIA text makes reference to a technical paper by Ball, Langdon and Creighton (2014) which, based on research on a site in London, concludes that movements can be controlled to less than those predicted in CIRIA C580. However, this was achieved on a highly controlled large construction site and requires rigorous monitoring methodologies set against rationally derived trigger limits. It is considered that without detailed design, predicted ground movements should not be based on an individual case study, but against recognised standards.

4.18. The lengths along the properties to where ground movements can be assumed to be zero have been used in the calculation of L/H rather than the full length of the properties, however, this is conservative. Corner stiffening effects have been used in the calculation of the ground movements for Nos 25 and 26 Wolsey Mews. Category 0 (Negligible) damage is predicted for Nos 25 and No 26 with Category 1 (Vey Slight) predicted for No 3 – 7 Islip Street.

4.19. It is requested the approach to the GMA be re-considered with the assumed pile length indicated, the full depth of excavation and length of the pile used, together with the percentages of wall depth given in CIRIA C580.

4.20. Although it is stated in the scoping that use of adequate temporary and permanent support and best practice methods would reduce the potential impact on the roadway, it is not discussed any further.

4.21. A works programme as required by cl.233 of the Arup GSD has not been provided.

4.22. Proposals are provided for monitoring with trigger levels and whilst such a mitigation measure should be adopted, the trigger levels may need to be revised following reconsideration of the approach to the GMA. The BIA recommends condition surveys.

5.0 CONCLUSIONS

5.1. The original Basement Impact Assessment (BIA) was prepared by Ellis and Moore. The initial audit raised several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised and this audit only relates to the current BIA, however, the query tracker in Appendix 2 includes the queries on the previous BIA.

5.2. The qualifications of the individuals involved in the current BIA undertaken by Chelmer meet CPG4 requirements. A Structural Engineer's Report (SER) prepared by Price and Myers is also presented although it is requested this be updated with the findings of the further geotechnical work undertaken by Chelmer and to reflect the proposed pile configuration.

5.3. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a single storey basement. The basement is to be constructed by installing a secant pile wall with a reinforced concrete lining wall. The remaining building loads are to be supported on internal piles. Sketches to indicate the construction sequence and propping arrangements are included in the SER.

5.4. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed. This is subject to a separate approvals process.

5.5. The depth of excavation required is indicated to vary between 3.50 and 4.20m. The ground investigation encountered Made Ground over possible Head Deposits overlying the London Clay although the possible Head Deposits were not encountered in one of the boreholes.

5.6. Groundwater was monitored to within 0.80m bgl and a '*combined contiguous/secant bored piled wall*" where the 'male' piles are taken down to full depth and the 'female' piles taken only as deep as required to seal out groundwater is proposed in the BIA.

5.7. The BIA has confirmed the neighbouring properties do not comprise basements and a foundation depth of 1.15m bgl for No 25 Wolsey Mews was revealed by trial pitting. The foundations to No 3 – 7 Islip Street were not investigated but assumed to be at 0.90m bgl.

5.8. It is suggested in the impact assessment that consideration should be given to underpinning the '*flank*' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

5.9. Mitigation measures are presented for the increase in run off due to the slight increase in hard surface area and also flooding from infrastructure failure.

5.10. Young's Modulus values for the different strata are not included. These will be required for detailed design.

5.11. The proposed basement is within the tree protection zone of a tree in the neighbouring property garden and the recommendations in the arboricultural assessment should be followed.

5.12. It is accepted there are no slope stability concerns due to the proposed development.

5.13. The full input and output from the Pdisp analysis is not presented and this is requested.

5.14. Negligible and Very Slight damage is predicted for the two neighbouring properties respectively, however, there are queries on the approach used in predicting ground movements due to pile installation and excavation and it is requested that the GMA be revised as discussed in Section 4.

5.15. A works programme has not been provided and this is requested.

5.16. Proposals for movement monitoring with trigger values are included. Details and trigger values should be agreed as part of the Party Wall awards, however, the trigger values may need revising based on the queries on the GMA as discussed above. Condition surveys are recommended.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Francis	Not given but states building is adjacent to the development	03-08-15	Stability and ground movements	See Audit paragraphs 4.15 to 4.19

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date Closed Out
1	BIA Author Qualifications	Input of a Chartered Geologist is required with respect to the appraisal of groundwater flow	Closed – Qualifications of individuals involved in current BIA meet requirements.	01/07/16
2	BIA format	Screening, scoping, impact assessment not undertaken in accordance with Arup GSD	Closed – Current BIA was broadly undertaken in accordance with CPG4 and Arup GSD requirements.	01/07/16
3	BIA format	Non-technical summaries and conceptual model not provided	Closed – Provided in current BIA.	01/07/16
4	BIA format	A sufficient desk study and site walkover not undertaken	Closed – Undertaken as part of current BIA.	01/07/16
5	BIA format	A works programme has not been submitted as required by cl.233 of the GSD	Open – Outline programme to be provided.	
6	BIA format	Geotechnical interpretation not provided	Closed – Interpretation in current BIA, however, Young's Modulus values will have to be provided for detailed design.	01/07/16
7	Hydrogeology	Groundwater level to be reconsidered	Closed – Further groundwater monitoring undertaken and conservative assumption suggested for design.	01/07/16
8	Surface flow and flooding & Subterranean flow	Contradictory information in Stage 1 and Stage 4 of the BIA report	Closed – Issues identified appropriately addressed in current BIA.	01/07/16
9	Flooding	Mitigation measures not provided in the event of flooding due to infrastructure failure	Closed – Provided in current BIA.	01/07/16
10	Stability	Supporting analyses for ground movement	Open – Provided however approach used to be reconsidered as discussed in Section 4 and GMA	

		assessment not provided	re-submitted. Full input and output from the Pdisp analysis to be provided.	
11	Stability	No impact assessment on the roadway	Closed – Measures to reduce potential impacts provided in scoping	01/07/16
12	Stability	BIA offers monitoring of vertical movements building to the '*right* ' (assumed to be 25 Wolsey Mews) but does not appear to consider horizontal movements and other properties such as 26 Wolsey Mews and 3- 7 Islip Street	Open – Monitoring proposals considering all the immediate neighbouring properties provided in current BIA together with trigger values. Details and trigger values to be agreed as part of Party Wall award however trigger values may need revising following reconsideration of approach used in GMA.	
13	Construction management plan	Not provided	To be provided by appointed Contractor at a later date with details to be agreed with Council.	N/A
14	Stability	Structural Engineer's report not up to date with geotechnical findings and pile configuration.	Open – to be updated.	

Appendix 3: Supplementary Supporting Documents

None

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