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29 Compayne Gardens, London, NW6 3DD

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-29

Revision: F1

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1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 29 Compayne Gardens, London, NW6 3DD (planning reference 2016/0320/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. Further to submission of CampbellReith's initial BIA audit report (AFjw-12336-29-230316-29 Compayne Gardens-D1) additional information was made available. CampbellReith report AFjw-12336-29-060516-29 Compayne Gardens-D2.doc dated May 2016 took account of the information and represented the updated BIA audit.

1.5. Further to the above, additional information has been provided in a document titled 'Design of Underpinning to Basement Extension, 29 Compayne Gardens-Proposed Basement Extension', dated March 2016.

1.6. The BIA has been carried out by individuals who possess suitable qualifications.

1.7. The BIA has confirmed that the basement will found within the London Clay.

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

1.9. It is accepted that the development will not impact on the wider hydrogeology of the area.

1.10. Minor seepage may be encountered during excavation and provision is made for this scenario.

1.11. The Thames Water's NW Storm Relief Sewer passes directly beneath the site. A detailed understanding of its depth and any restrictions enforced by Thames Water must be understood and implemented.

1.12. Whilst the site has been shown to have a low risk from flooding, provisions are proposed to allow for surface run off from increased hard surfacing.

1.13. Basement walls will be formed from underpinning and retaining walls.

1.14. It is accepted that the proposed underpin and retaining wall solution is appropriate. It should be ensured that the detailed design allows for groundwater at surface level.

1.15. The proposed underpinning methodology is appropriate. It needs to ensure stability of the underpin sections in the temporary case, particularly as they are around 3m deep. However, underpinning of some walls beneath the neighbouring property (No.31 Compayne Gardens) is proposed. Since there are no guarantees this will be permitted, the impacts of not doing these works need to be assessed.

1.16. Potential horizontal ground movements and Damage Categories (all less than Burland Category 1) have been based on assumed construction techniques, design and temporary support etc. Design/analyses, construction methods and sequencing are required to ensure these assumptions are correct, especially since they also presumably rely on the proposed underpinning to the adjacent property.

1.17. A monitoring strategy is described and appears appropriate in principle. However, no trigger or action levels are provided and these will need to be developed ahead of the works.

1.18. 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) on 15th February 2016 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 29 Compayne Gardens, NW6 3DD planning reference 2016/0320/P.

2.2. Further to submission of CampbellReith's previous BIA audit reports (AFjw-12336-29-230316-29 Compayne Gardens-D1 and AFjw-12336-29-060516-29 Compayne Gardens-D2) additional information has been made available. The current report takes account of that information and updates the BIA audit.

2.3. 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.

2.4. 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.

2.5. 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.

2.6. LBC's Audit Instruction described the planning proposal as *"basement extension to ground floor flat."*

2.7. The Audit Instruction also confirmed that neither the site nor neighbouring site are listed buildings.

2.8. CampbellReith accessed LBC's Planning Portal on 8th March 2016 and gained access to the following relevant documents for audit purposes:

· Basement Impact Assessment Report (BIA) by Chelmer Consultancy Services reference BIA/6028 dated January 2016.

· Design and Access Statement by Viewport Studio dated 19 January 2016.

· Planning application drawings by Viewport Studio: drawings

Existing Site

- 15123/100 Site Plan
- 15123/101 Basement & Ground Floor Plans
- 15123/102 Front & Rear Elevations
- 15123/104 Front & Rear Elevations
- 15123/105 Side Elevation
- 15123/106 Long Section A
- 15123/107 Long Section B
- 15123/108 Cross Section C

Proposed Development

- 15123/300 Site Plan
- 15123/301 Basement & Ground Floor Plans
- 15123/304 Front & Rear Elevations
- 15123/305 Side Elevation
- 15123/306 Long Section A

- 15123/307 Long Section B
- 15123/308 Cross Section C

2.9. Additional information was provided to CampbellReith for the updated BIA audit Revision D2:

- Underpinning Method Statement, 2160119 Rev P2, March 2016 by Elliot Wood
- Proposed Basement Extension (structural calculations), March 2016 – unknown author

2.10. Additional information was provided to CampbellReith for the current, updated BIA audit:

- Underpinning Method Statement, 2160119 Rev P2, March 2016 by Elliot Wood
- Proposed Basement Extension (Design of Underpinning to Basement Extension, 29 Compayne Gardens), March 2016 – unknown author

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Section 1.2 of BIA.
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Good overall descriptions of proposed works are provided. Temporary works design and methodology were subsequently provided.
Are suitable plan/maps included?	Yes	Relevant maps provided in the various sections of the BIA.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	Relevant maps provided in the various sections of the BIA.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 4 and 7 of BIA.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 6 and 7 of BIA.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 5 and 7 of BIA.
Is a conceptual model presented?	Yes	Section 10.1 of BIA.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 8 of BIA.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 8 of BIA.

Item	Yes/No/NA	Comment
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 8 of BIA.
Is factual ground investigation data provided?	Yes	Section 9 of BIA.
Is monitoring data presented?	Yes	However, groundwater monitoring is limited to a period of only a few weeks after installation. BIA states that water levels in standpipes likely not to have reached equilibrium with surrounding ground by this time.
Is the ground investigation informed by a desk study?	Yes	Section 2 – 6 and Appendices E, F & G of BIA.
Has a site walkover been undertaken?	Yes	Section 1.3 of BIA refers to site inspection / walkover survey.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	A search of planning applications in the area has been made. Discussions with neighbours is advised (and in fact will be required under the Party Wall Act) to establish this.
Is a geotechnical interpretation presented?	Yes	Section 9 and 10.1 of BIA.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Suggested design parameters are provided in Section 10.4.10 of BIA.
Are reports on other investigations required by screening and scoping presented?	Yes	However, further information on Thames Water NW Storm Relief Sewer, proposed retaining wall design and SuDs drainage needed.
Are the baseline conditions described, based on the GSD?	Yes	Various sections of BIA.
Do the base line conditions consider adjacent or nearby basements?	Yes	A search of planning applications in the area has been made. Discussions with neighbours is advised (and in fact will be required under the Party Wall Act) to establish this.
Is an Impact Assessment provided?	Yes	Section 10 of BIA.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Retaining wall design and underpin sequencing are acceptable. Additional allowance for groundwater at ground surface to be incorporated in detailed design and ensuring temporary support or underpin sections is required during detailed design.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Section 10.9 of BIA.
Has the need for monitoring during construction been considered?	Yes	Section 10.7 of BIA. However, trigger and action levels have not been established/provided.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Section 10.9 of BIA.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Notably, underpinning of part of the adjacent property (No.31 Compayne Road) is recommended, including non Party walls.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Sections 5 & 10.9 of BIA.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Sections 5, 6, 10 of the BIA.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Section 10.6 of BIA.
Are non-technical summaries provided?	Yes	Sections 7.5, 8.5, 9.13 and Section 11 of BIA.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Chelmer Consultancy Services. The individuals concerned in its production have suitable qualifications and previous experience in the production of BIAs.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal is not within or adjacent to listed buildings.

4.3. The proposed basement requires extension of a single storey basement beneath the ground floor flat. This will require; demolition of the existing single storey rear extension and forming a single storey basement beneath the full width of the middle and rear of the property. The basement will also extend partly beneath the ground floor extension and the existing rear bay at the west side of the house

4.4. Underpinning and reinforced concrete retaining walls are the currently suggested methods for forming the basement.

4.5. Topography at the site and its surround is in the region of 1 degree and the proposed development will not change this scenario.

4.6. Ground conditions have been proven as: a veneer of Made Ground to around 0.68m (silty gravelly clay) over weathered insitu London Clay (stiff becoming very stiff with depth and fissured) to a proven depth of 8m but described as likely to extend to depths in excess of 10m.

4.7. Selenite (sulphate) crystals were identified in the London Clay. The London Clay also had a high to very high plasticity making it susceptible to volume changes upon wetting and drying (shrink/swell).

4.8. The BIA identified that there are no trees close to the basement and tree removal will not be required as part of the development. Subsidence due to shrink swell is well reported in the local area and widespread internal cracking was noted within the property.

4.9. The property was not recorded as damaged by bombing but the adjacent No. 31 was, along with nearby Nos. 27 and 40.

4.10. Trial pits proved foundations on Party walls to be around 1.5-2m below current external ground level. Proposed basement development will substantially increase the differential depth of foundations relative to neighbouring properties.

4.11. Since the basement is in the middle of the property, it was identified as not being within 5m of a highway or pedestrian right of way.

4.12. Searches of Planning documents identified that Nos. 40, 44 and 50 Canfield Gardens are likely to have basements.

4.13. Whilst the site is not over or within the exclusion zone of any railway tunnels, the Thames Water's NW Storm Relief Sewer passes directly beneath the site. From interpretation of available information it was believed likely to be at around 12m below site level. It was noted that the actual invert level of the sewer MUST be obtained from Thames Water and any implications addressed in conjunction with such discussions.

4.14. No groundwater was encountered during the ground investigation but was at 1.26m bgl 3 weeks later. This was believed likely to represent perched groundwater in the Made Ground. As such it was suggested that the basement will not extend beneath the 'water table' surface within the London Clay but will be affected by the perched groundwater.

4.15. Notwithstanding the groundwater readings to date, it was advised that the basement be designed to withstand buoyant uplift pressures associated with groundwater at ground surface level.

4.16. The site is not within 1km of a water course or within the catchment of the pond chains on Hamstead Heath. The former culverted Westbourne Tributary may be within the local area although consultations were held with Thames Water, the Environment Agency and London Borough Council's Assest Management and Highway teams none of whom had records of any culverts in the vicinity of Compayne Gardens.

4.17. The proposed rear extension is likely to increase the hard surfaced area at the site. However, since soakaway drainage will not be suitable, water volumes discharged to the ground will not increase.

4.18. The lowest point of proposed excavation will not be lower than the mean water level in any local water courses.

4.19. Quality of surface water received by neighbours or nearby water courses was deemed unaffected by the proposed development since none will go to a water course and there will be no significant change to surfaces generating run-off.

4.20. The London Clay directly beneath the site is classified by the Environment Agency as 'unproductive strata'. In addition, the BIA confirms that the Chalk principal aquifer occurs at depth beneath the London Clay will not be affected by the proposed development.

4.21. Whilst the site is in South Hampstead, the road did not flood during the 1975 or 2002 flood events. Moreover, whilst it is also in both CDA Group 3_010 and the Goldhurst Local Flood Risk

Zone, surface water flood modelling by the Environment Agency indicates a 'Very Low' flood risk i.e. the lowest rating for this part of Compayne Gardens.

4.22. The BIA advises that SuDS systems(s) design is required due to the hard surfacing increase in the area of the lightwell. In addition, design of non return valves or a pumped above ground loop system was advised for drains serving the basement as well as an assessment for temporary interception storage for the predicted maximum volume of discharge from all sources via the protected outfall pipe.

4.23. The proposed underpin and retaining wall solutions and methodology is acceptable, although the BIA advises that progressive stepping be undertaken between foundations of differing depths along with transitional underpins beneath load bearing walls in the front of No. 29 Compayne Gardens, the 29/31 party wall, and subject to Party Wall agreements, all load bearing walls in No.31 which adjoin No. 29 except where the cellar already provides adequate transition are appropriate. Detailed design needs to allow for groundwater at ground surface level.

4.24. The works need to ensure stability of the underpins in the temporary condition, particularly as they are around 3m deep.

4.25. A number of considerations to be included in design are listed, as are recommended parameters for use in design. These are based on the findings of the intrusive ground investigation.

4.26. An assessment of potential heave/settlement was undertaken. Standard and widely accepted correlations between the undrained shear strength of the London Clay and both short term and long term Young's Modulus were adopted. Net settlements beneath walls of <8mm and net post construction displacements beneath the slab of 5mm were predicted.

4.27. The basement slab will need to accommodate the swelling displacements/pressures developed underneath it.

4.28. No site/method specific assessment of potential horizontal displacements was undertaken. Instead, it was generally stated that "bulk movements of ground alongside a single basement from underpinning should not exceed 5mm in either horizontal or vertical directions as long as the temporary support follows best practice".

4.29. A Damage Category assessment was undertaken based on the generic 5mm vertical and horizontal displacement anticipated using the method proposed by Burland. The maximum predicted Damage is Burland Category 1.

4.30. Condition surveys for neighbouring properties ahead of the works were recommended. Precise movement monitoring was also recommended on a weekly basis throughout the construction

slab have been constructed. Various locations for proposed monitoring were provided along with a suggested accuracy for monitoring of +/- 2mm. No trigger or action levels were proposed.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the basement will found within the London Clay.

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

5.4. It is unlikely that the ground water table will be encountered during basement or foundation excavation but provisions are suggested to account for perched water in the Made Ground.

5.5. Whilst limited groundwater monitoring has been undertaken to date, proposals are to allow for groundwater at surface level in the detailed design, including design for buoyant uplift i.e. credible worst case scenario. This is a suitable approach.

5.6. It is accepted that the development will not impact on the wider hydrogeology of the area.

5.7. Whilst the site has been shown to have a low risk from flooding, provisions are proposed to design SuDS schemes since there will be a slight increase in hard surfacing. This is considered a sensible approach.

5.8. The Thames Water's NW Storm Relief Sewer passes directly beneath the site. A detailed understanding of its depth and any restrictions enforced by Thames Water must be understood and implemented.

5.9. The BIA suggests that a combination of reinforced concrete underpinning and reinforced concrete retaining walls are the most likely method for forming the basement walls. Suggested geotechnical parameters are provided and these are appropriate.

5.10. The proposed underpin and retaining wall solutions methodology are appropriate subject to the query raised in paragraph 5.11. Detailed design needs to allow for groundwater at ground surface level. The works need to ensure stability of the underpins in the temporary condition, particularly as they are around 3m deep.

5.11. Underpinning of some 'non basement walls' within the property, on Party Walls to neighbouring properties and even beneath the neighbouring property (No.31) are recommended. Clearly, works to the neighbouring property will require detailed Party Wall negotiations. Implications of not being able to undertake these works should be considered.

5.12. No analyses of potential horizontal ground movement has been undertaken. Instead, an empirical value of 5mm has been established based on assumed construction methods, sequencing, the use of stiff props, protection of the exposed London Clay etc. Outline design

and sequencing are required in order to assure the validity of the estimate and the assumptions made.

5.13. The damage assessment suggests Burland Category 0-1 in all cases. Since this relies on the movement assessment described above, Damage Categories should also be reviewed after outline design is complete i.e. to ensure assumptions used are correct. Presumably, the designated categories also rely on the proposed underpinning of 'non basement' walls within the property, on Party Walls and indeed beneath the adjacent property. Implications of not being able to underpin sections of the adjacent property should be assessed.

5.14. A monitoring strategy is described and appears appropriate in principal. However, no trigger or action levels are provided and these will need to be developed ahead of the works.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Thames Water to be consulted to confirm depth/level of the NW Storm Relief Sewer and determine any constraints, restrictions or analyses etc required.	Open – subject to separate approvals	N/A
2	Stability	Retaining wall, temporary works and construction sequence design are currently at concept level only.	Designs and construction sequences developed to date are acceptable. Detailed design to allow for groundwater at ground surface level and works need to ensure stability of the underpins in the temporary condition, particularly as they are around 3m deep.	07.06.16
3	Stability	Ground movement assessment is based on assumed retaining wall type, temporary works and construction sequence. These need to be finalised before the assessment can be confirmed.	Closed	07.06.16
4	Stability	BIA requires that consideration be given to underpinning of all load bearing walls in No.31 Compayne Road that adjoin No.29. Negotiation under Party Wall Act required for this to possible. What are the implications if this is not accepted?	Open – To be agreed as part of party wall award	N/A
5	Stability	Trigger and Action levels needed for proposed property monitoring.	Open – To be agreed as part of the party wall award	N/A

Appendix 3: Supplementary Supporting Documents

None

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