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| Project Number | 13398-54 |
| Project Name | 49 Willow Road, London NW3 1TS |
| Planning Reference | 2020/3681/P |

Structural ◆ Civil ◆ Environmental ◆ Geotechnical ◆ Transportation

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Appendix

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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 49 Willow Road, London NW3 1TS (planning reference 2020/3681/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 BIA has been prepared by individuals who possess suitable qualifications.
- 1.5. The proposed basement forms an extension to an existing lower ground floor level. The basement will be formed using two lifts of underpinning and has a maximum excavation depth of 2.7m below the existing floor level.
- 1.6. The BIA indicates the site is underlain by Made Ground over Claygate Member soils.

 Groundwater level was reported to be around 1m below proposed basement level.
- 1.7. It is accepted that the proposed development will not impact the hydrology, hydrogeology or slope stability of the area.
- 1.8. A Building Damage Assessment (BDA) indicates that damage to neighbouring structures will not exceed Burland Category 1 (very slight). The impact to the highway is indicated to be negligible.
- 1.9. A monitoring strategy has been recommended and the trigger levels have been updated to reflect the outcome of the GMA.
- 1.10. Utility data is provided.
- 1.11. Based on the revised submission it can be confirmed that the BIA complies with the requirements of CPG: Basements.

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2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 9 October 2020 to carry out a Category B audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 49 Willow Road, London NW3 1TS.
- 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
 - Camden Local Plan 2017 Policy A5 Basements.
 - Camden Planning Guidance: Basements. March 2018
 - Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- 2.4. The BIA should demonstrate that schemes:
 - a) maintain the structural stability of the building and neighbouring properties;
 - avoid adversely affecting drainage and run off or causing other damage to the water environment;
 - 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 "Extension of basement to the rear under existing structure, to theatre use."
- 2.6. The Audit Instruction confirmed 49 Willow Road is not a listed building. The nearest listed structure is a wall and lamppost to the northeast, on the other side of Flask Walk.
- 2.7. CampbellReith accessed LBC's Planning Portal on 26 October 2020 and gained access to the following relevant documents for audit purposes:

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 Ground Investigation and Basement Impact Assessment (BIA) by Geotechnical & Environmental Associates Limited, ref. J20023, issue 4 dated 13 August 2020.



- Structural Engineer's Report Basement Impact Assessment (SER) by PK & Partners Limited, ref. 2136, rev C dated August 2020.
- Planning Application Drawings consisting of a Locations Plan and existing and proposed plans and elevation.
- Design & Access, Planning & Heritage Statement letter by Michael Burroughs Associates, ref. E/4488, dated 16 August 2020.
- Tree Assessment by Tretec, dated July 2020.
- 2.8. Additional supplementary information was provided to CampbellReith in response to the queries raised in Appendix 2 of the initial audit, as follows:
 - Ground Investigation and Basement Impact Assessment (BIA) by Geotechnical & Environmental Associates Limited, ref. J20023, issue 6 dated 1 April 2021.
 - Structural Engineer's Supplementary Report Basement Impact Assessment (SER) by PK & Partners Limited, ref. 2136 49 Willow Road – BIA Supplement, rev B, dated February 2021.
 - Schematic Lower Ground Floor Extension Construction Sequence drawing by PK and Partners, ref. 2136-101, rev E, dated 09 March 2021

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3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

| Item | Yes/No/NA | Comment |
|--|-----------|--|
| Are BIA Author(s) credentials satisfactory? | Yes | |
| Is data required by CI.233 of the GSD presented? | Yes | Utility data is provided in the revised BIA submission. Updated construction sequence and structural calculations are presented in the 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 plan/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 | |
| Is a conceptual model presented? | Yes | |
| Land Stability Scoping Provided? Is scoping consistent with screening outcome? | Yes | |

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| Item | Yes/No/NA | Comment |
|--|-----------|---|
| Hydrogeology Scoping Provided? Is scoping consistent with screening outcome? | Yes | |
| Hydrology Scoping Provided? Is scoping consistent with screening outcome? | N/A | No items carried forward. |
| Is factual ground investigation data provided? | Yes | |
| Is monitoring data presented? | Yes | Six groundwater monitoring visits were carried out. |
| Is the ground investigation informed by a desk study? | Yes | |
| Has a site walkover been undertaken? | Yes | Undertaken during the site investigation. |
| Is the presence/absence of adjacent or nearby basements confirmed? | Yes | Section 9.1.1 of the BIA. |
| Is a geotechnical interpretation presented? | Yes | Section 8.1.2 and 10.1 of the BIA. |
| Does the geotechnical interpretation include information on retaining wall design? | Yes | Revised submission presents appropriate parameters. |
| Are reports on other investigations required by screening and scoping presented? | Yes | A tree assessment for the adjacent tree to the rear is provided. |
| Are the 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 | |
| Are estimates of ground movement and structural impact presented? | Yes | The revised submission considers the adjacent garage and highway. |



| Item | Yes/No/NA | Comment |
|--|-----------|---|
| 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 | |
| Has the need for monitoring during construction been considered? | Yes | Trigger levels have been revised in line with the findings of the revised ground movement assessment. |
| 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 | The revised submission considers the adjacent garage and highway. |
| Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment? | Yes | |
| Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area? | Yes | Based on the revised submission. |
| Does report state that damage to surrounding buildings will be no worse than Burland Category 1? | Yes | Based on the revised submission. |
| Are non-technical summaries provided? | Yes | |



4.0 DISCUSSION

- 4.1. The Basement Impact Assessment (BIA) has been carried out by engineering consultants Geotechnical & Environmental Associates (GEA) and the individuals concerned in its production have suitable qualifications.
- 4.2. The LBC Instruction to proceed with the audit identified that the basement proposal does not involve a listed building. The nearest listed structure is identified as a wall and lamppost to the northeast of the site, on the other side of Flask Walk.
- 4.3. The subject property is a 4-storey building with a single basement level, referred to as the lower ground floor. At the rear of the building is a single storey extension built in the 1960's. The proposed basement development comprises an extension of the existing lower ground floor level to the rear of the property, below the 1960's extension, with internal remodelling to lower the existing ground floor. The maximum excavation depth is given as approximately 2.70m, to a level of c. 92.33m OD.
- 4.4. The Design and Access, Planning & Heritage Statement letter included in the planning submission indicates that a separate planning application was made to demolish the 1960's extension and rebuild up to 3-storeys high. The LBC planning portal indicates this application has now been granted. The redevelopment of the rear extension of the property is not referenced in the BIA or considered in any of the associated calculations.
- 4.5. A site investigation was carried out at the site, comprising 3no. window sampler holes. Ground condition were found to comprise Made Ground over Claygate Member soils. The Claygate Member soils were described as comprising a weathered horizon of soft becoming firm orange-brown, silty, very sandy clay. Below this, the unit was described as firm becoming stiff, dark bluish grey, silty, slightly sandy clay.
- 4.6. Groundwater was encountered in one location during the site investigation. Six rounds of groundwater monitoring were carried out at the site following completion of the site investigation. These found BH1 and BH3 to generally be dry, and that water levels in BH2 varied between 1.90m and 2.35m depth. Groundwater levels during monitoring were recorded to be at around 91.23m OD.
- 4.7. Sections 8.1.2 and 10.1 of the BIA present soil parameters for the ground conditions encountered. No soil strength data was obtained during the site investigation, therefore these parameters have been taken from an historic investigation undertaken by GEA approximately 100m northeast of the site. The revised BIA submission now includes a borehole log and a graph with SPT and cohesion data plotted against depth. The graph includes a design line of cu=5z + 50, which is the same correlation that is used in the BIA..

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- 4.8. Section 8.2 of the revised BIA submission gives an updated net allowable bearing pressure of 120 kN/m² for the firm sandy clay at basement formation level, which has been reduced from the 150kN/m² previously given.
- 4.9. Section 10.1 of the revised BIA submission provides an equation to derive a cu value based on the historic investigation and uses a correlation of 750 x cu to derive a Young's modulus value for the London Clay. The Claygate Member is now indicated to use a correlation of 500 x cu to derive a Young's modulus value.
- 4.10. The Claygate Member is identified as a Secondary 'A' Aquifer. The groundwater encountered during the site investigation and subsequent monitoring is considered to represent locally perched water held in pockets of granular material within the Claygate Member, as opposed to a continuous groundwater table. The property already has an existing lower ground floor which is to be extended, therefore the basement will not penetrate deeper into the Claygate soils and the excavation remains above the reported groundwater level. On the basis of the reported groundwater level, it is accepted that the proposed development will not have a significant impact on the hydrogeology of the area.
- 4.11. The BIA indicates that the site has a low risk of surface water flooding and was not affected by flooding events in 1975 or 2002. The Structural Engineers Report (SER) identifies that the property lies within a critical drainage area. The property is indicated to currently include no areas of soft landscaping, therefore the proposed development will not affect the surface water run-off from the site. As such, it is accepted that the development will not affect the hydrology of the area. Thames Water requirements regarding design of the drainage scheme should be noted.
- 4.12. The screening exercise for slope stability refers to Figure 16 of the Arup report, which shows that the site itself is not in an area indicated to have slopes greater than 7°. Figure 2 of the SER presents an extract from a topographical survey of the site which indicates an elevation of 97.0m OD on the northwest side of the site, and 95.4m OD on the southeast side of the site. It is accepted that the development is not in an area prone to slope instability.
- 4.13. The BIA identifies that the development is within the tree protection zone of a holm oak located in the adjacent property to the northwest. An assessment of this tree has been undertaken and is presented in a report by TreTec. The conclusion of the assessment is that the excavation of the land within the site will not impact the normal function of the tree due to the depth of the party wall, indicated to be 1.74m below the level of the holm oak, which acts as a continuous barrier to roots from the tree entering the site.
- 4.14. The BIA and SER indicate that the basement extension is to be formed by underpinning. The underpinning will be undertaken in two lifts following a 'hit and miss' construction sequence in

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bays not exceeding 1m wide. Paragraph 6.8 of the SER indicates soil arisings will be stored in the yard at the back of the property prior to removal on a 'wait and load' basis. The new basement is directly adjacent to the area identified for spoil storage, therefore the act of stockpiling soil in the yard will surcharge the wall being underpinned. The revised submission indicates that temporary propping will be used to support the retaining walls adjacent to the yard, including the existing basement.

- 4.15. The drawings presented in the revised SER show corbelling at the foot of the first stage of underpinning and the use of a 200mm long heel in the second stage underpin retaining wall construction. The revised submission indicates the heel will be formed of mass concrete to ensure that the bearing pressure in the short term does not exceed the existing applied pressure. The heel must be designed to avoid a crack developing between the mass concrete and reinforced concrete sections. The revised retaining wall calculations do not include any contribution from a heel.
- 4.16. Appendix A of the supplementary SER provides a construction sequence for the basement development, which includes temporary works to be used to maintain stability the basement construction. Prior to construction the existing ground floor will be removed and temporary bracing installed to support the existing walls during the first lift of underpinning.
- 4.17. The supplementary SER confirms that no bulk excavation of the basement will be undertaken after the first lift of underpinning. This is reflected in the revised drawing 2136-101. The second lift of underpinning will be backfilled after the pin is constructed. Once all the pins are constructed, bulk excavation will occur in increments, with additional temporary propping installed to support the underpins. Paragraph 2.13 and Figure 9 of the supplementary SER shows how the underpin bays will be supported during construction, and how groundwater ingress will be mitigated using sump pumping during construction. Further e-mail correspondence (presented in Appendix 3) confirms that screened pumping will be used to mitigate against the potential loss of fines from the Claygate soils.
- 4.18. Appendix B of the supplementary SER presents outline retaining wall calculations for the new basement retaining wall. The soil parameters used in these calculations have been revised to generally match those presented in the BIA and consideration of the surcharge loads from the adjacent higher land and garage are now included.
- 4.19. Section 10 of the revised BIA presents a Ground Movement Assessment (GMA) for the proposed basement development. An assessment of vertical ground movements associated with the excavation has been presented using PDisp software in the undrained, short-term condition and the drained, long-term condition. Full input and output data for these assessments are provided in the revised BIA appendix.

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- 4.20. The revised PDisp assessment now includes consideration of the garage located adjacent to the site on the northwest side, and the highway located adjacent to the site on the northwest side.
- 4.21. Section 11 of the BIA presents a Building Damage Assessment (BDA) following the methods described in CIRIA C760. Whilst the CIRIA approach is intended for embedded retaining walls, we accept that the predicted ground movements are within the range typically anticipated for underpinning techniques carried out with good control of workmanship. Horizontal movements have been modelled assuming a planar diaphragm wall and high support stiffness. The vertical ground movements calculated in the PDisp assessment have been imported into XDisp and have been added to the ground movements predicted using the CIRIA C760 approach.
- 4.22. The BDA indicates that predicted damage to the adjacent property at No. 36 Gayton Road will not exceed Burland Category 0 (negligible) and damage to the adjacent garage will not exceed Burland Category 1 (Very Slight).
- 4.23. Section 6.16 of the SER indicates that the property will be monitored prior to and during the works to safeguard the stability of the building and surrounding area. Monitoring trigger values are presented and reflect the findings of the GMA.

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4.24. Utility data has been provided in the revised BIA.



5.0 CONCLUSIONS

- 5.1. The BIA has been carried out by individuals who possess suitable qualifications.
- 5.2. The proposed basement forms an extension to an existing lower ground floor level. The basement will be formed using two lifts of underpinning and has a maximum excavation depth of 2.7m, to a level of 92.33m OD.
- 5.3. The BIA indicates the site is underlain by Made Ground over Claygate Member soils. Groundwater level was reported as c. 91.23m OD.
- 5.4. It is accepted that the proposed development will not impact the hydrology, hydrogeology or slope stability of the area.
- 5.5. The impact of the development on a holm oak tree located adjacent to the site to the northeast has concluded that the land within the site is not essential to the normal function of the tree.
- 5.6. The soil parameters have been revised to reflect the ground conditions at the site.
- 5.7. Structural calculations for the basement now consider surcharge loads from the boundary wall, the higher adjacent ground levels, and the garage. Consideration of the impact of storing soil arisings adjacent to the basement excavation is also provided.
- 5.8. A Ground Movement Assessment (GMA) has been carried out for the proposed basement development. The adjacent garage to the northwest is now included in the assessment, as is the adjacent highway to the northeast.
- 5.9. A Building Damage Assessment (BDA) has been carried out using XDisp software and shows that damage to the neighbouring property south of the site will not exceed Burland Category 0 (negligible). Damage to the adjacent garage is predicted to be Burland Category 1 (Very Slight). Ground movements affecting the adjacent highway are indicated to be negligible.
- 5.10. A monitoring strategy is recommended prior and during construction and the trigger levels have been updated to reflect the outcome of the GMA.
- 5.11. Utility data is now provided.
- 5.12. Based on the revised submission it can be confirmed that the BIA complies with the requirements of CPG: Basements.

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Appendix 1: Residents' Consultation Comments



Residents' Consultation Comments

| Surname | Address | Date | Issue raised | Response |
|---------|------------|----------|--|---|
| O'Neill | Flask Walk | 25/10/20 | The proposed basement extends into the root protection zone of a tree. | The BIA is supported by a Tree Assessment report. This report indicates that the boundary wall of the property has not been breached by the tree's roots, and extends to 1.74m depth below the ground level of the tree, thereby acting as a continuous barrier to roots. A borehole was undertaken adjacent to the boundary wall and did not indicate that roots were encountered. |



Appendix 2: Audit Query Tracker



Appendices

Audit Query Tracker

| Query No | Subject | Query | Status | Date closed out |
|----------|-----------|--|--------|-----------------|
| 1 | Stability | Supporting data and further clarification is required to justify the soil parameters derived for the site, in line with the comments presented in Section 4. | Closed | 19/02/2021 |
| | | Soil parameters should be used consistently in all assessments and calculations | Closed | 19/02/2021 |
| 2 | Stability | Further clarification is required regarding the use of corbelling and a heel in the underpin retaining wall construction, particularly with respect to the anticipated ground conditions and where it is shown to extend under neighbouring properties. | Closed | 19/02/2021 |
| 3 | Stability | Further information is required regarding the construction sequence during the first lift of underpinning, any backfilling during the first lift, and temporary support to be provided within the underpin bays during construction. Consideration of the impact of storing soil arisings adjacent to the basement excavation is required. | Closed | 10/03/2021 |
| 4 | Stability | Structural calculations for the basement should demonstrate how surcharge loads from the boundary wall, the higher adjacent ground levels, and the garage have been considered in the design. | Closed | 19/02/2021 |
| 5 | Stability | The adjacent garage and highway should be considered in the PDisp and XDisp assessments | Closed | 19/02/2021 |
| 6 | Stability | Further clarification is required to show how ground movements associated with the proposed two lifts of underpinning, and horizontal movements from yielding of the retaining walls, have been incorporated in the ground movement assessment. | Closed | 13/04/2021 |
| 7 | Stability | Full input and output data for the PDisp and XDisp assessments should be provided to confirm the parameters and geometry used. | Closed | 13/04/2021 |
| 8 | Stability | The monitoring strategy presented in the Structural Engineers Report should be updated to reflect the ground movements predicted by the BIA, and to consider the neighbouring garage. | Closed | 13/04/2021 |
| 9 | Stability | Utility data should be provided. | Closed | 19/02/2021 |



Appendix 3: Supplementary Supporting Documents

E-mail correspondence

From: "Matt Legg" <matt.legg@gea-ltd.co.uk>
To: "KatharineBarker@campbellreith.com"

<KatharineBarker@campbellreith.com>

Date: 29/04/2021 12:06

Subject: RE: 49 Willow Road BIA

Hi Kat,

Apologies I missed your call. This is not considered to be an issue for the proposed excavation at this site. Fine pockets of sand were noted in the initial layer of the Claygate only, none of which were interconnected such that distinct layers of sand were present. Additionally, and importantly, no seepage of groundwater was encountered in association with these fine pockets. As such, even if a slight loss of fines occurred within singular panels of underpinning, a risk of any form of settlement or instability is considered extremely negligible, such that specific precautions are not considered to be required.

Trust this provide further clarification.

Best Regards

Matt

Geotechnical & Environmental Associates

Widbury Barn | Widbury Hill | Ware | SG12 7QE





RE: 49 Willow Road BIA

Matt Legg to: KatharineBarker@campbellreith.com

Cc: "Phil Kwan"

From: "Matt Legg" <matt.legg@gea-ltd.co.uk>

То: "KatharineBarker@campbellreith.com" < KatharineBarker@campbellreith.com>

Cc: "Phil Kwan" <philip.kwan@pk-partners.com>

5 attachments











image001.png

image004.png

image001.png image001.png

Katharine,

By copy to the structural engineer, it will be ensured that, should sump pumping be necessary, that the provision of screened pumping will be utilised to prevent the drawing in and loss of fines.

Regards

Matt

Geotechnical & Environmental Associates

Widbury Barn | Widbury Hill | Ware | SG12 7QE



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From: KatharineBarker@campbellreith.com <KatharineBarker@campbellreith.com>

Sent: 30 April 2021 12:25

To: Matt Legg <matt.legg@gea-ltd.co.uk>

06/05/2021 14:38

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