CampbellReith
consulting engineers

Lower Ground Floor
9 St George's Terrace
London NW1

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12066-59
Rev: D1

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Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
F:+44 (0)20 7340 1777
E:london@campbellreith.com
W:www.campbellreith.com

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Author	A J Marlow, BSc CEng MIStructE FConsE
Project Partner	E M Brown, BSc MSc CGeol FGS
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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 (BIA) submitted as part of the Planning Submission documentation for Lower Ground Floor, 9 St Goerge's Terrace (planning reference 2014/7274/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 basements 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 review it against an agreed audit check list.

1.4. The BIA and EMS have been produced by individuals possessing acceptable qualifications.

1.5. The proposed development extends the existing lower ground floor flat into its rear garden and forms a garden terrace on the extension's roof, together with a lower garden from the extension to the rear boundary wall. An enclosed second lower garden terrace area is formed by removal of an existing conservatory adjacent to No. 10.

1.6. A Construction Management Plan proposes the use of a conveyor to remove excavated material but does not evaluate the volume of material nor the number of lorry movements.

1.7. The BIA has confirmed that the proposed basement will be founded within the London Clay and that the surrounding slopes are stable. The development is unlikely to affect any existing groundwater flow.

1.8. The basement construction proposal is a mix of conventional underpinning and retaining wall methodologies which are acceptable but floor levels and existing loading on the rear wall of Nos. 6 and 7 St George's Mews are requested.

1.9. An anomaly between the BIA and the EMS should be investigated concerning the ability of the central spoil berm to withstand temporary prop loadings during excavation and construction of the basement.

1.10. An acceptable ground movement analysis has been carried out which shows potential damage to the rear wall of St George's Mews to be "Negligible – Burland Category O". Confirmation is required that calculated heave pressures on the London Clay will be catered for in the design of the basement slab.

1.11. It is accepted that the proposed basement development will not affect the hydrogeology of the general area.

1.12. Although it is also accepted that the development will not affect the hydrology of the general area, the adjacent Primrose Hill Road flooded in 1975 and 2002. Basement flood mitigation measures proposed in the BIA should be incorporated into final design details.

1.13. Further information is requested to verify statements regarding the area of hard surfacing which should also include details of the existing drainage system, retention proposals, and how the basement roof terrace and lower courtyard garden will be connected into the system.

1.14. Existing cracks to surrounding walls should be repaired before any construction commencement together with condition surveys of adjoining properties.

1.15. The scoping stage of the BIA should have had two items concerning man-made slope stability transferred to it from the screening process for discussion.

1.16. It is proposed that the preceding requests for further or better information, including a services search, be provided within a Basement Construction Plan.

1.17. Queries and requests for further information are included in Appendix 2.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 29 September 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Lower Ground Floor, 9 St George's Terrace, Camden Reference 2014/7274/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 "*Rear extension at lower ground level with garden above including excavation of rear garden.*"

and confirmed that the basement proposals involved listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 19 October 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) dated August 2015
- Heritage Planning Statement and Supporting Documentation dated June and July 2015
- Construction Management Plan (CMP) undated
- Architects drawings
  - Site Location Plan
  - Existing
  - Proposed

2.7. CampbellReith contacted the Structural Engineers, Green Structural Engineering, on 19 October 2015 to provide the following missing information:

- Basement Impact Assessment Engineering Method Statement (EMS) dated November 2014 revised July 2015.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Foreword.
Is data required by Cl.233 of the GSD presented?	Yes	BIA Sections 2 and 3.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA Sections 4 to 6.
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	BIA Section 7.3. But Q1 and Q2 should be assessed under scoping.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.4. But Q4 required further details of retention facility.
Is a conceptual model presented?	Yes	BIA Section 10.1.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes No	BIA Section 8.3. Q1 and Q2 not considered.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes Yes	BIA Section 8.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes Yes	BIA Section 8.4. But details of retention facility required.
Is factual ground investigation data provided?	Yes	BIA Section 9.0.
Is monitoring data presented?	Yes	BIA Section 9.0.
Is the ground investigation informed by a desk study?	Yes	BIA Section 4.4.
Has a site walkover been undertaken?	Yes	BIA Section 1.3.
Is the presence/absence of adjacent or nearby basements confirmed?	No	
Is a geotechnical interpretation presented?	Yes	BIA Section 9.0.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Section 10.4.
Are reports on other investigations required by screening and scoping presented?	No	Aboricultural Report identified.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	
Is an Impact Assessment provided?	Yes	BIA Section 10.0.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	BIA Section 10.5.
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	BIA Section 10.7.
Has the need for monitoring during construction been considered?	Yes	BIA Section 10.8.
Have the residual (after mitigation) impacts been clearly identified?	Yes	BIA Section 11.0.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	Yes	
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	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Burland Category Damage 0.
Are non-technical summaries provided?	Yes	BIA Section 11.0.

4.0 DISCUSSION

4.1. The BIA has been carried out by a well established firm of consultants, Chelmer Consultancy Services, and the lead authors have suitable qualifications.

4.2. A Construction Management Plan by ABTech refers to Architects drawings, which are available on the LBC Planning Portal and Structural Engineering design, calculations and details, by GSE Engineers, which are not on the portal. GSE Engineers were contacted and a Basement Impact Assessment Engineering Method Statement (EMS) issued electronically. This document was produced by a Chartered Structural Engineer and GSE appear to have undertaken a significant number of basement developments.

4.3. No. 9 St George's Terrace is part of a grade II listed terrace within the Primrose Hill Conservation Area and is bounded on either side by Nos. 8 and 10, and at its rear by Nos. 6 and 7 St George's Mews. The proposed extension to the lower ground floor flat is to be created by extending the lower ground level backwards and constructing a new garden roof slab over. An adjacent conservatory will be left open to form a garden area terrace at lower ground floor level. The scheme involves cutting into the existing terraced rear garden to form living space beyond which a second lower garden will be formed up to the boundary wall with Nos. 6 and 7 St George's Mews. The excavation to form the extension and rear garden is full width of the property, approximately 6 metres, by approximately 15 metres in length to the rear boundary wall. The Construction Management Plan (CMP) identified that spoil removal will be carried out by conveyor to the front of the property but no estimate of spoil volume, and hence no lorry movements, have been made. This should be reviewed and confirmed.

4.4. The BIA has shown that the basement extension will be founded in the London Clay and the terraced rear garden, to be removed, is formed from Made Ground and weathered London Clay thus there are unlikely to be any significant groundwater flows which could be impacted. It is acknowledged that the London Clay can be prone to shrink-swell and the BIA recommends that the damage which is evident in surrounding walls is taken into account during design and construction. This is further covered in 4.13.

4.5. The BIA has not identified any railway tunnels within the vicinity of the site. However, a services search is recommended within the document in order to identify any sewers, cable tunnels or similar which may exist in close proximity.

4.6. The BIA has identified that there is a natural slope down St George's Terrace from west (No. 10) to east (No. 8) and beyond of approximately 5^{o} which is acceptable. The man-made slope of the rear garden terraces approximates to 30^{o} and, when excavated, will form a retained face of approximately 4 metres in height on the boundary with Nos 6 and 7 St George's Mews. The

EMS identifies that floor levels within Nos 6 and 7 should be confirmed and this should be carried out prior to construction commencement as part of the Party Wall process. This should also include verification of the loadings carried by this wall which will allow acceptability of the proposed underpinning proposal to be confirmed.

4.7. It is proposed to also form a retaining wall on the No. 10 flank excavation and acceptable calculations are included within the EMS which use a relatively conservative value for the foundation bearing stress in the London Clay.

4.8. The construction methodology proposed within the EMS uses well established techniques albeit high quality workmanship will be required. The BIA identified that thrust blocks will be required to resist temporary lateral loadings during construction because the rear garden of No. 8 is much lower than that of No. 10 and is not possible to prop across the site from No. 10 to No. 8. The EMS proposes to temporarily prop both flank walls from a central spoil berm, which could be a concern if it is of Made Ground. This anomaly should be investigated prior to construction commencement by a trial pit dug in the relevant terrace planting area.

4.9. The BIA has carried out a ground movement analysis using information provided on the Architect's and Engineer's drawings and a building damage assessment has also been presented. The methodology is generally acceptable and it is considered that appropriate assumptions have been made. The analysis predicts that the damage category is likely to be "negligible" – Burland Category O to Nos. 6 and 7 St George's Mews. A heave assessment has also been carried out and as no void former is indicated on the engineering drawings, it is assumed the basement slab will be designed for the heave pressures generated. This should be confirmed.

4.10. It is accepted that minor water seepages may occur as excavation proceeds and that these can be dealt with by sump pumping.

4.11. It is accepted that no known ponds, springlines or wells are in close proximity to the site and that the site is outside the Hampstead pond chain catchment area. The BIA has also shown that the site is at negligible risk of flooding from rivers or the sea. However, the BIA has also demonstrated that there is a "Medium" risk to flooding from surface water and the adjacent Primrose Hill Road flooded in both the 1975 and 2002 events. Although there is no record of St George's Terrrace or St George's Mews flooding nor Ainger Road to the upslope northwest, it would be sensible to provide mitigation design details, as have been proposed in principle. These should be followed through into the detailed design stage.

4.12. The BIA states that there will be a reduction in the area of hard surfacing due to the creation of the lower gardens. Calculations to verify this statement should be provided which should also take into account the reduction of permeable garden area caused by the new L-shaped retaining wall foundations shown within the EMS. Further details should be provided to show

the existing drainage system and how it discharges from the basement roof terrace and the courtyard will be connected into it, including retention facilities.

4.13. The BIA identifies cracking to surrounding walls and states that they should be repaired before any underpinning is carried out, which is agreed, together with condition surveys of adjoining properties.

4.14. Item 7.3, questions 1 and 2 in the BIA refer to slopes, natural or man-made, greater than 7^{o} and responds with a negative answer. The existing rear garden contains a series of terraces with a general slope approaching 30^{o}. These items should have received positive responses and been transferred to the scoping stage for discussion.

4.15. It is proposed that the items above requiring additional or better information could be incorporated into a Basement Construction Plan to be produced prior to commencement of construction.

5.0 CONCLUSIONS

5.1. The BIA and EMS have been produced by individuals possessing acceptable qualifications.

5.2. The proposed development extends the existing lower ground floor flat into its rear garden and forms a garden terrace on the extensions roof, together with a lower garden from the extension to the rear boundary wall. An enclosed second lower garden terrace area is formed by removal of an existing conservatory adjacent to No. 10.

5.3. A Construction Management Plan proposes the use of a conveyor to remove excavated material but does not evaluate the volume of material nor the number of lorry movements.

5.4. The BIA has confirmed that the proposed basement will be founded within the London Clay and that the surrounding slopes are stable. The development is unlikely to effect any existing groundwater flow.

5.5. The basement construction proposal is a mix of conventional underpinning and retaining wall methodologies which are acceptable but floor levels and existing loading on the rear wall of Nos. 6 and 7 St George's Mews are requested.

5.6. An anomaly between the BIA and the EMS should be investigated concerning the ability of the central spoil berm to withstand temporary prop loadings during excavation and construction of the basement.

5.7. An acceptable ground movement analysis has been carried out which shows potential damage to the rear wall of St George's Mews to be "Negligible – Burland Category O". Confirmation is required that calculated heave pressures on the London Clay will be catered for in the design of the basement slab.

5.8. It is accepted that the proposed basement development will not affect the hydrogeology of the general area.

5.9. Although it is also accepted that the development will not affect the hydrology of the general area, the adjacent Primrose Hill Road flooded in 1975 and 2002. Basement flood mitigation measures proposed in the BIA should be incorporated into final design details.

5.10. Further information is requested to verify statements regarding the area of hard surfacing which should also include details of the existing drainage system, retention proposals, and how the basement roof terrace and lower courtyard garden will be connected into the system.

5.11. Existing cracks to surrounding walls should be repaired before any construction commencement together with condition surveys of adjoining properties.

5.12. The scoping stage of the BIA should have had two items concerning man-made slope stability transferred to it from the screening process for discussion.

5.13. It is proposed that the preceding requests for further or better information, including a services search, be provided within a Basement Construction Plan.

5.14. Queries and requests for further information are included in Appendix 2.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue Raised	Response
Cottrell	Flat 5, 10 St George's Terrace	22.12.14	Building damage caused by: • Shrink/swell of soil • Temporary works methodology • Subsidence • Tunnels • Surface water flooding	See 4.4 to 4.13
Stephens	Flat 4, 10 St George's Terrace	29.12.14	Building damage	See 4.9 and 4.13
Primrose Hill Conservation Area Advisory Committee	N/A	17.12.14	Building stability	See 4.9 and 4.13
Rodford	Flat 2, 10 St George's Terrace	30.12.14	Building damage	See 4.9 and 4.13
Kochavi	Flat 4, 9 St George's Terrace	29.12.14	Building stability	See 4.9 and 4.13

Appendix 2: Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA Process	Man-made slopes to be included in scoping analysis	Open	
2	Stability	Floor levels and wall loadings on Nos 6 and 7 St George's Mews	Open	
3	Stability	Central spoil berm's ability to withstand temporary prop loads	Open	
4	Stability	Design loadings for basement floor include heave pressures	Open	
5	Stability	Existing cracks to be repaired and Condition Surveys	To be incorporated into BCP	N/A
6	Stability	Utilities search required	To be incorporated into BCP	N/A
7	Drainage	Flood mitigation measures to be incorporated into final design	To be incorporated into BCP	N/A
8	Drainage	Hard surfacing areas, existing drainage system, retention, etc.	Open	
9	Excavation Spoil	Volume of excavated material and number of lorry movements	Open	

Appendix 3: Supplementary Supporting Documents

None