CampbellReith
consulting engineers

Royal Academy of Dramatic Art (RADA), 16 – 18 Chenies Street, WC1E 7EX

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-88
Revision: D1

January 2016

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

Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	15/01/2016	Comment	AGjw12066-88-190116-RADA-D1.doc	A Gleeson	E Brown	E Brown

Document Details

Last saved	19/01/2016 15:45
Path	AGjw12066-88-190116-RADA-D1.doc
Author	A Gleeson BEng
Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	12066-88
Project Name	RADA, 16-18 Chenies Street, WC1E 7EX
Planning Reference	2015/5759/P

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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 Royal Academy of Dramatic Art (RADA), 16-18 Chenies Street, London WC1E 7EX (planning reference 2015/5759/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 qualifications of the author of the BIA, SER and GMA are in compliance with the requirements of CPG4.

1.5. The BIA has confirmed that the proposed basement will be founded within Made Ground and its foundations will need to be deepened to encounter the Lynch Hill Gravel below.

1.6. It is unlikely that the groundwater table will be encountered during basement foundation excavation.

1.7. The BIA discusses two alternative basement construction proposals, underpinning and a piled perimeter retaining wall, both of which require proposals for suitable temporary propping arrangements. Underpinning is the preferred solution but concern is expressed regarding the significant depth of the Made Ground and potential groundwater ingress into excavations. The SER (which relates only to No 16) refers to underpinning but does not address either of the two potential problems noted above.

1.8. It is recommended that further investigation of neighbouring foundations and basements is carried out, together with groundwater monitoring to allow a decision to be taken on construction methodology. In the absence of this the methodology should consider the onerous option and provide the necessary mitigation for all the proposed basement extensions.

1.9. The GMA should be updated to include movements arising due to the formation of the two basement excavations, including the anticipated building damage category to any buildings within 6m of the basement, as well as 16 Chenies Street, which is a listed building known to be in a poor state of repair. The assessment shall also include predicted movements along Ridgmount Mews. The GMA should reflect the revised construction methodology.

1.10. The PDisp should be revised to include 18 Chenies Street, as well as the correct unloading for 16 Chenies Street. Clarification is also required as to whether any neighbouring properties have basements and whether they are supported on shallow foundations.

1.11. Proposals should be provided for all relevant structures for a movement monitoring strategy during excavation and construction.

1.12. Indicative calculations for wall design should be submitted with the BIA.

1.13. A method statement in the BIA should clearly show, the type of construction adopted, the sequencing of the construction and the propping arrangements for all stages.

1.14. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding. Similarly it is accepted that, with the exception of the surrounding structures and infrastructure, there are no adverse impacts on ground stability.

1.15. Queries and requests for clarification are summarised in Appendix 2 and discussed in Section 4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 03 December 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Royal Academy of Dramatic Art (RADA), 16-18 Chenies Street, London WC1E 7EX (planning reference 2015/5759/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.

The BIA should 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 *"Demolition of part of rear of 16 and 18 Chenies Street. Alterations, extensions (including at basement level) and general refurbishment to 16-18 Chenies Street to create 300 seat Richard Attenborough Theatre, new refectory, bar and kitchen, library, exhibition space, ancillary offices and 60 bed student accommodation."*

The Audit Instruction also confirmed 16-18 Chenies Street involved, or was a neighbour to, listed buildings. 16 Chenies Street is a Grade II listed building.

2.6. CampbellReith accessed LBC's Planning Portal on 10 November 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA)
- Structural Engineer's Report (SER) – Only relates to 16 Chenies Street, listed Grade II
- Planning Application Drawings consisting of

  Location Plan

  Existing Plans

  Demolition Plans

  Proposed Plans
- Design & Access Statement
- Planning Comments and Response
- Construction Method Statement
- Planning Statement
- Schedule of Works for listed building
- Thames Water and Crossrail response
- Ground Movement Assessment (GMA) Report

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
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	
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?	No	Ridgmount Mews is within 5m of the basement extension to 18 Chenies Street. Justification has not been provided for all 'No' answers, only for 'No' answers which require elaboration.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Justification has not been provided for all 'No' answers, only for 'No' answers which require elaboration.
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?	No	To be updated to include Ridgmount Mews.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	NA	No scoping required.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	However, it is noted that further groundwater monitoring is proposed but not as yet carried forward.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	No	The impact on one of the neighbouring properties has been taken into consideration; for other neighbouring properties the presence/absence of a basement has not been stated.
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	NA	None identified as being required.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	Clarification is required.
Is an Impact Assessment provided?	No	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	No	
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	No	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	Need for mitigation has been considered, however clarification is required with respect to construction sequencing for basement extension, temporary works requirements and foundation proposal.
Has the need for monitoring during construction been considered?	No	Proposals for monitoring of the existing buildings and neighbouring properties should be included in the BIA.
Have the residual (after mitigation) impacts been clearly identified?	No	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	There will be no increase to the impermeable area, so the surface water flow will remain unchanged.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	No	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA includes screening, scoping, site investigation and impact assessments stages as defined and required in the LBC Planning Guidance document 'Basement and Lightwells (CPG4)', dated July 2015.

4.2. The BIA has been carried out by a well-known firm of engineering consultants, Geotechnical & Environmental Associates (GEA). The qualifications of the authors of the BIA are in compliance with the requirements of CPG4.

4.3. The Structural Engineer's Report (SER) has similarly been carried out by a well-known firm of engineering consultants, Price & Myers. The author of the report is a chartered structural engineer.

4.4. The Ground Movement Assessment (GMA) Report has also been carried out by GEA. The qualifications of the authors of the GMA are in compliance with CPG4.

4.5. The current building is a 3 to 4 storey Victorian brick building with a single level basement, and is occupied by the Royal Academy of Dramatic Arts (RADA). Access is from the front of the building, and it is roughly L shaped, measuring approximately 45m by 40m. 16 Chenies Street was originally constructed as a drill hall and was converted into a theatre some years ago.

4.6. The site is located approximately 150m northwest of the British Museum and is bounded by Chenies Street to the north, Whittington House (a large office block) to the west, 20-22 Chenies Street to the east, which is also occupied by the RADA, and a building occupied by the University of Law to the south of the site.

4.7. The LBC Instruction to proceed with the audit identified that the basement proposal either involves a listed building or is adjacent to listed buildings. The Design & Access Statement identifies that 16-18 Chenies Street is located in the Bloomsbury Conservation Area and that 16 Chenies Street is listed Grade II. 18 and 20-22 Chenies Street are not listed but deemed to make a positive contribution to the Bloomsbury Conservation Area.

4.8. The proposal is to refurbish the interior of the existing property, including the construction of two separate multi-storey extensions with basements to the rear of the properties. The proposed basements consist of a single storey construction formed by extending the existing basements beneath the new building footprint and increasing the depth of the existing basement to be retained to the rear of No.16. The proposed basement extensions will extend to the same depth as the existing basement, of 2.8m below ground level (bgl). The existing rear block of No. 16 will be demolished above ground level to facilitate the development.

4.9. A ground investigation was undertaken comprising of a single borehole in the car park to the rear of the site to a depth of 18m, accompanied by a window sampler borehole in the rear light well and a single trial pit to investigate the foundations of the adjoining building to the south of the drill hall. A ground investigation was previously carried out on site by LBH Wembley in September 2001. The findings of the investigations indicate that the site is underlain by a significant thickness of Made Ground to a depth of 3.3m - 5.0m bgl, below which lies Lynch Hill Gravel, thickness 3.0m, below which lies London Clay Formation.

4.10. Groundwater monitoring has been undertaken and the BIA states that further monitoring is planned. Groundwater was monitored at 5.45m bgl between August and October 2015. Formation level of the basement will be within the Made Ground at 2.8m bgl. Based on the groundwater monitoring which has been carried out to date, it is unlikely that groundwater will be encountered in the basement excavations.

4.11. The BIA discusses two alternative proposals to construct the basement box. The first option is to underpin the perimeter walls and utilise spread foundations from basement level extending into the Lynch Gravel. This option may not be practical in the southwest of the site where the depth of the Made Ground increases up to 5.0m below ground level. The alternative option discussed is to underpin the existing footings and to construct the new retaining wall using a bored pile solution. Dependent upon the potential degree of groundwater inflow during excavation and construction this option maybe preferable if further groundwater monitoring shows the groundwater at an elevated level. The feasibility of underpinning should be confirmed or otherwise.

4.12. The SER relates only to No.16. This proposes to use mass concrete underpins 900mm deep beneath the existing walls and mass concrete underpins to the new lift pits and stair. It does not state the preferred construction for the new retaining wall. All underpinning should be carried out in a 'hit and miss' sequence. The ground movements will depend on the method of excavation, construction type and the use of temporary propping. Depending on the proposal adopted, temporary propping may be required to allow the basement excavation and basement slab and walls to be constructed in a manner that maintains stability of the existing structure and neighbouring properties and minimises any potential damage. A method statement outlining the construction methods to be used in the temporary and permanent cases should be provided.

4.13. The GMA provided assumes an underpinned scheme and has assessed the vertical movement expected due to soil heave offset by the proposed additional superstructure load in relation to 16 Chenies Street. However, the PDisp assessment has not correctly modelled the soil being removed, nor has 18 Chenies Street been modelled.

4.14. Camden's terms of reference require that any buildings within 6m of a proposed basement be considered. The GMA should therefore be updated to include the predicted horizontal and vertical movements arising due to the proposed basements to 16 and 18 Chenies Street, and also consider all properties within 6m of the proposed basement footprints. In addition, predicted movements of Ridgmount Mews shall also be provided as the road is located within 5m of the basement to 18 Chenies Street. Clarification is also required as to whether any neighbouring properties have basements and whether they are supported on shallow foundations or not.

4.15. In addition, the predicted building damage category to 16 Chenies Street should be assessed as the building is listed, and is noted in the Design and Access Statement as being in a poor state of repair.

4.16. An assessment of likely heave movements is provided in the BIA. In agreement with the author, heave movements should be re-analysed and confirmed once the final loadings and levels are known. Mitigation measures to overcome these movements will be dependent upon the chosen foundation solution.

4.17. The SER recommends regular monitoring surveys of the listed building to be carried out, adopting a traffic light system to alert the contractors to potential movements. No proposals are provided within the BIA for a movement monitoring strategy during excavation and construction. Although the final monitoring regime will be agreed with the party wall surveyors, outline proposals should be provided with the BIA.

4.18. The BIA has shown that although the development is underlain by the Lynch Gravel Secondary 'A' Aquifer, it will not impact on the wider hydrogeology of the area, any other watercourses, springs or the Hampstead Heath Pond chain catchment area. The basement is unlikely to extend beneath the groundwater level; further groundwater monitoring will confirm this.

4.19. It is accepted that there are no slope stability concerns regarding the proposed development and it is not in an area prone to flooding.

5.0 CONCLUSIONS

5.1. The BIA includes screening, scoping, site investigation and impact assessments stages as defined and required in the LBC Planning Guidance document 'Basement and Lightwells (CPG4)', dated July 2015.

5.2. The qualifications of the authors of the BIA, SER and GMA are in compliance with the requirements of CPG4.

5.3. The BIA has confirmed that the proposed basement will be founded within Made Ground and its foundations will need to be deepened to encounter the Lynch Hill Gravel below.

5.4. It is unlikely that the groundwater table will be encountered during basement foundation excavation. Further groundwater monitoring is to be carried out to confirm this.

5.5. The BIA discusses two alternative basement construction proposals, underpinning and a piled perimeter retaining wall, both of which require proposals for suitable temporary propping arrangements. Underpinning is the preferred solution but concern is expressed regarding the significant depth of the Made Ground and potential groundwater ingress into excavations. The SER (which relates only to No 16) refers to underpinning but does not address either the two potential problems noted above.

5.6. It is recommended that further investigation of neighbouring foundations and basements is carried out, together with groundwater monitoring to allow a decision to be taken on construction methodology. In the absence of this, the methodology should consider the onerous option and provide the necessary mitigation for all the proposed basement extensions.

5.7. The GMA should be updated to include a prediction of the horizontal and vertical movements arising due to the formation of the two basement excavations, including the anticipated building damage category to any buildings within 6m of the basement, as well as 16 Chenies Street, which is a listed building known to be in a poor state of repair. The assessment shall also include predicted movements along Ridgmount Mews. The GMA should reflect the revised construction methodology.

5.8. The PDisp should be revised to include 18 Chenies Street, as well as the correct unloading for 16 Chenies Street. Clarification is also required as to whether any neighbouring properties have basements and whether they are supported on shallow foundations.

5.9. Proposals should be provided for all relevant structures for a movement monitoring strategy during excavation and construction.

5.10. Indicative calculations for wall design should be submitted with the BIA.

5.11. A method statement in the BIA should clearly show, the type of construction adopted, the sequencing of the construction and the propping arrangements for all stages.

5.12. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding. Similarly it is accepted that, with the exception of the surrounding structures and infrastructure, there are no adverse impacts on ground stability.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	A method statement in the BIA should clearly show the assumed construction adopted, the sequencing of the construction and the propping arrangements for all stages, together with necessary mitigation. It should consider all the proposed basement extensions.	Open.	
2	Stability	Indicative calculations for wall design should be submitted with the BIA.	Open.	
3	Stability	The GMA should be updated to include a prediction of the damage category of properties within 6m, as well as 16 Chenies Street. Predicted movement of Ridgmount Mews should be included and the PDisp updated to include 18 Chenies Street and the correct basement proposal for 16 Chenies Street. It should reflect the revised construction methodology.	Open.	
4	Stability	Outline movement monitoring proposals should be included.	Open.	

Appendix 3: Supplementary Supporting Documents

None

London

Friars Bridge Court
41- 45 Blackfriars Road
London, SE1 8NZ

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

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com