CampbellReith
consulting engineers

Great Hall, Library & Under Treasurers House, Lincolns Inn , London,WC23TL

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-44
Revision: D1

September 2015

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	Sept 2015	Draft	SLGjap12066-44-300915-D1.doc	S Goodchild	S Goodchild	L Brown

Document Details

Last saved	30/09/2015 09:38
Path	SLGjap12066-44-300915-D1.doc
Author	S L Goodchild, BSc CEng MICE FConsE
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Project Number	12066-44
Project Name	Great Hall, Library & Under Treasurers House
Planning Reference	2015/4404/P & 2015/4408/P

Contents

Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for the Great Hall, Library & Under Treasurers House (planning references 2015/4404/P & 2015/4408/P). The two basements are considered to fall within Category C as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessments 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 Structural Report (SR) and Basement Impact Assessment (BIA) have been prepared by a firm of engineering consultants using individuals who possess suitable qualifications. The geotechnical aspects of the BIA have been provided by a firm of Geotechnical and Environmental Consultants with suitable qualifications.

1.5. The BIA has confirmed that the two basements will be founded on piles in the London Clay. It is likely that the ground water table will be encountered during foundation excavation of the two storey East Terrace basement only. The construction methodology should be developed in a Basement Construction Plan with a programme, detailed design of underpins and piles, and temporary works arrangements.

1.6. It is considered that damage may occur to the south tower of the Great Hall and to the west boundary wall as a result of differential settlement resulting from partial underpinning. Also it is anticipated that damage may occur to the Great Hall structure due to the effects of ground settlements caused by the piling works in close proximity to the existing foundations and from the ground movements resulting from the basement excavations. It is considered that damage may occur to the south tower of the Great Hall and the west boundary wall as a result of differential settlement resulting from partial underpinning. Also it is anticipated that damage may occur to the Great Hall structure due to the effects of ground settlements caused by the piling works in close proximity to the existing foundations and from the ground movements resulting from the basement excavations. The ground movement assessment has demonstrated that, assuming the buildings are in sound condition and good control of workmanship, building damage can be limited to not worse than Burland Category 2. It is recommended that the GMA is reviewed and refined for the final construction sequence in a Basement Construction Plan.

1.7. During the works it is proposed to monitor the Great Hall structure for horizontal and vertical movements and to monitor groundwater levels. Proposals should be provided in the Basement Construction Plan, together with proposals for condition surveys.

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 and is not in an area subject to flooding.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 12th August 2015 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for the Great Hall , Library & Under Treasurers House, Lincolns Inn References 2015/4404/P & 2015/4408/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 proposals as:

2015/4404/P as " *Erection of three storey plus basement library and administration building following demolition of Under Treasurer's House, with two storey glazed link to existing library, installation of rooflights over existing lightwells, provision of 6x cycle spaces, provision of attenuation soakaway, and associated landscaping*".

2015/4408/P as "*Excavation to create two storey basement development to provide education and training floorspace underneath East Terrace, replacement lighting in lightwells and installation of roof lights, installation of new southern entrance door, removal of external northern stairs to create fire escape, provision of 10x cycle parking spaces and 2 disabled car parking spaces, and associated landscaping*".

The audit instruction also confirmed that the Great Hall is a Grade 2* Listed building

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

Structural Report & Basement Impact Assessment (SR & BIA)

Appendices

A Outline Specification

B Design Parameters

C Proposed Structural Drawings

D Geotechnical Report (GEA)

E Thames Water Assets

F Ground Movement Assessment

G Construction Management Plan

H Proposed Drainage Strategy

Statement of Significance

Historic Environmental Assessment

Architectural Drawings (Rick Mather Architects)

Key Plan

Location Plan

Boundary Plan

Existing Elevations

Existing Plans

Existing Sections

Proposed Demolition Plans

Proposed Elevations

Proposed Floor Plans

Proposed Sections

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	SR & BIA & Construction Management Plan
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	SR & BIA Sections 3-5
Are suitable plan/maps included?	Yes	SR & BIA + Architectural Drawings
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	SR & BIA + Architectural Drawings
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	SR & BIA Screening does not recognise that basement will result in significant differential depth of foundations
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	SR & BIA Section 3
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	SR & BIA Section 3
Is a conceptual model presented?	Yes	SR & BIA 7
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	Screening does not recognise that basement will result in significant differential depth of foundations

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	SR & BIA - Appendix D
Is monitoring data presented?	Yes	SR & BIA - Appendix D
Is the ground investigation informed by a desk study?	Yes	SR & BIA - Appendix D
Has a site walkover been undertaken?	Yes	Undertaken during ground investigation
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	SR & BIA - Existing basement below Great Hall and Library
Is a geotechnical interpretation presented?	Yes	SR & BIA - Appendix D
Does the geotechnical interpretation include information on retaining wall design?	No	Design parameters and alternative solutions are provided
Are reports on other investigations required by screening and scoping presented?	No	None required
Are 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	SR & BIA - Section 9

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	SR & BIA - Appendix F
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	
Has the need for monitoring during construction been considered?	Yes	Building movements and groundwater
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	
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	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Eckersley O'Callaghan, a firm of engineering consultants and GEA, Geotechnical & Environmental Associates. The individuals concerned in its production have suitable qualifications.

4.2. The LBC Instruction to proceed with the audit identified that the proposals are included in two planning applications on the site, both of which involve basements which adjoin or are in close proximity to the Grade 2 * Listed Great Hall, namely:

4.3. (i) 2015/4408/P - Excavation to create a two storey basement underneath the existing East Terrace adjacent to the Great Hall.

4.4. (i) 2015/4404/P - Erection of a three storey building with a single level basement on the site of the existing Under Treasurers House which is to be demolished.

4.5. The proposed two storey basement extends approximately 6.0m below the existing East Terrace level and will be founded on piles in the London Clay. The retaining walls are to be formed by concrete secant piles and the basement slab is to be cast onto void formers and suspended between piles to allow for clay heave. The construction methodology notes that the piled wall will be propped in the permanent and temporary case. It is noted that the line of the secant piles directly adjacent to the Great Hall appears to clash or is very close to some of the foundations of the buttresses and arches and this should be investigated.

4.6. The single level basement adjoins the existing basement of the Great Hall at the northern façade and is founded on piles in the London Clay. The lowest basement slab level is above the highest recorded groundwater level and contiguous concrete piled retaining walls have been specified with concrete lining walls and drained cavity construction to protect the basement library and storage space.

4.7. At the south west corner of the new basement it is proposed to locally underpin the south tower of the Great Hall down to the underside of the proposed two storey basement excavation. It is also proposed to underpin the western boundary wall adjacent to the Under Treasurers House. The pins are to be cast in a 'hit & miss' sequence and will be limited to 1.0m wide. The existing foundations of the Great Hall comprise corbelled brickwork on concrete strips founded approx. 1.5m below an existing single level basement on the sands and gravels. Partial underpinning of the tower down to the gravel / clay interface may result in differential settlements occurring which could cause damage in the long term.

4.8. During excavation of the basement it will be essential to keep the underpinning and the secant wall piles propped at all times to prevent horizontal ground movements from affecting the Great Hall stability. It is proposed to monitor the adjoining structure of the Great Hall for horizontal and vertical movements associated with the basement construction. Condition surveys pre and post construction are also required.

4.9. A ground movement assessment has been undertaken by GEA using Oasys software Pdisp and Xdisp. The assessment considers movements resulting from the installation of the piled retaining walls and underpins, the excavation in front of the wall and heave resulting from the removal of the soil within the basement excavation. It is considered that the methodology is broadly acceptable although it is not possible to fully check the assumptions made without the input and output data from the software. It is also noted that the assessment refers to a contiguous piled wall, while the SR refers to a secant piled wall for the East Terrace basement.

4.10. The GMA predicts up to 20mm settlement but less that 2mm horizontal movement. Although propping will control horizontal movements. It is thought likely that horizontal movements would exceed this value, particularly for a 2 level basement. Nevertheless, the GMA and building damage assessment confirm that it should be possible to restrict building damage to less than Burland Category 2 assuming that the existing buildings are in sound condition and there is good control of workmanship. It is recommended that the GMA and damage assessment are updated in a Basement Construction Plan once the final construction sequence is known.

4.11. The present ground water level has been measured at 14.1m datum in the sands and gravels which overly the London Clay and the basement slab has been set at 13.5m i.e. just below the water level. Although the basement will be constructed below the water table, no significant effects on the hydrogeology and ground water flows in the area are to be expected as there is considerable space between this and other basements in the vicinity. Protection of the internal basement space from water penetration will be provided by a concrete lining wall and drained cavity construction.

4.12. It is accepted that there are no slope stability concerns regarding the proposed development and it is not in an area prone to flooding. The diverted and new drainage is to be collected into storm and foul runs and connected to the existing main sewer network. Although there is an increase in impermeable area, it is proposed that the increased run off is discharged to the sewer network and controlled via attenuation.

5.0 CONCLUSIONS

5.1. The SR and BIA have been carried out by a firm of engineering consultants and a firm of geotechnical consultants using individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the two basements will be founded on piles in the London Clay with piled retaining walls. It is likely that the ground water table will be encountered during foundation excavation of the two storey East Terrace basement only. The internal basement space will be protected by the provision of a drained cavity. Only an Indicative Construction Methodology has been provided to date and a detailed methodology should be provided in a Basement Construction Plan with a programme, the detailed design of the underpins and piles, and proposal for temporary works.

5.3. It is considered that damage may occur to the south tower of the Great Hall and to the west boundary wall as a result of differential settlement resulting from partial underpinning. Also it is anticipated that damage may occur to the Great Hall structure due to the effects of ground settlements caused by the piling works in close proximity to the existing foundations and from the ground movements resulting from the basement excavations. It is considered that damage may occur to the south tower of the Great Hall and the west boundary wall as a result of differential settlement resulting from partial underpinning. Also it is anticipated that damage may occur to the Great Hall structure due to the effects of ground settlements caused by the piling works in close proximity to the existing foundations and from the ground movements resulting from the basement excavations. The ground movement assessment has demonstrated that, assuming the buildings are in sound condition and good control of workmanship, building damage can be limited to not worse than Burland Category 2. It is recommended that the GMA is reviewed and refined for the final construction sequence in a Basement Construction Plan.

5.4. During the works it is proposed to monitor the Great Hall structure for horizontal and vertical movements and to monitor groundwater levels. Proposals should be provided in the Basement Construction Plan, together with proposals for condition surveys.

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

5.6. 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.

Appendix 1: Resident's 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	Further details of construction methodology to be provided including programme, detailed design of underpins and piles, temporary works arrangements and proposal for monitoring and construction surveys	To be provided in Basement Construction Plan	N/A
2	Stability	Ground Movement Assessment to be reviewed for final construction methodology	To be provided in BCP	N/A

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Appendix 3: Supplementary Supporting Documents

None

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